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Industrial systems, installations and equipment and industrial products — Structuring principles and reference designations —

Part 101: Modelling concepts, guidelines and requirements for power supply systems

Systèmes industriels, installations et appareils et produits industriels — Principes de structuration et désignation de référence —

Partie 101: Concepts de modélisation, lignes directrices et exigences pour les systèmes d'alimentation électrique

Reference number
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Contents

Page

Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives or www.iec.ch/members_experts/refdocs).

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This document was prepared jointly by Technical Committee ISO/TC 10, *Technical product documentation*, Subcommittee SC 10, *Process plant documentation*, and Technical Committee IEC/TC 3, *Documentation, graphical symbols and representations of technical information*.

A list of all parts in the ISO/IEC 81346 series can be found on the ISO and IEC websites.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

Introduction

This document provides guidelines for the understanding and application of the ISO 81346 and IEC 81346 reference designation system (RDS) for power supply systems (PS). It was developed in response to demands by the power supply sector for guidelines to the application of the ISO 81346 and IEC 81346 series, in particular ISO 81346-10.

PS, and the target industries of this document, include but are not limited to: wind, photovoltaic, thermal, nuclear and hydropower production.

The very basics of the RDS are not explained in this document. It is assumed that the user of this document already is familiar with the major concepts detailed in IEC 81346-1 and IEC 81346-2. These concepts include the four RDS aspects, the basic RDS semantics and basic RDS classification rules.

Industrial systems, installations and equipment and industrial products — Structuring principles and reference designations —

Part 101: Modelling concepts, guidelines and requirements for power supply systems

1 Scope

This document gives guidelines to support the application of the ISO 81346 and IEC 81346 series to power supply systems. It also specifies best practice for its use and implementation depending on the user and situation. The application of this document supports harmonization within and between the power supply technical domains and industries.

Introductory examples of the use of reference designation systems (RDS) can be found in Annex A and Annex B. Annex C provides an example of a conversion table between an example structuring system and the classes specified in this document and other parts of the ISO 81346 and IEC 81346 series.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 81346-1:2022, *Industrial systems, installations and equipment and industrial products — Structuring principles and reference designations — Part 1: Basic rules*

IEC 81346-2:2019, *Industrial systems, installations and equipment and industrial products — Structuring principles and reference designations — Part 2: Classification of objects and codes for classes*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 81346-1:2022, IEC 81346-2:2019 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
horizontal system
system which has an impact or supports one or more *vertical systems* (3.3) without being one

EXAMPLE Managing systems (e.g. =F1) or supporting systems (e.g. =D1)

Note 1 to entry: There can be supporting systems within core process (vertical) systems (e.g. the monitoring system of the generator =A1.RA1.LE1).

3.2
preferred reference designation
PRD
reference designation (RD) used as the main key to identify an object within a database

3.3
vertical system
system that is a part of the core process of the power production, distribution or transmission for power supply systems

EXAMPLE Production unit systems (e.g. =A1) or energy transport systems (e.g. =C1).

4 Abbreviated terms

For the purposes of this document, the abbreviated terms listed in Table 1 apply.

Table 1 — List of abbreviations

Abbreviation	Meaning
BIM	building information modelling
CB	circuit breaker
CDD	IEC common data dictionary
CID	construction identifier
CW	construction works
DOI	digital object identifier
GIS	geographic information system
HSE	health security and environment
IOD	individual object database
P&ID	piping and instrumentation diagram
PRD	preferred reference designation
PS	power supply systems
RD	reference designation
RDS	reference designation system
SCADA	supervisory control and data acquisition
SSOT	single source of truth

5 Modelling principles

5.1 Design for purpose

A system can be a constituent of a large and complex system. If so, it will often have a multi-levelled reference designation (RD). Or it can be such a simple overall system, and the constituents will be represented by a single level RD. It is the designer’s responsibility to select the appropriate structure to reflect the complexity of the system in question.

The depth and complexity of a structured representation will be influenced by the innate complexity of the overall system in question. A nuclear power plant needs many levels to correctly represent and model all the functionality within it. Not all systems need that level of detail. The representation of highly complex systems can often benefit from simplifications. It would likely not make sense to include every single system down to individual bolts and screws when modelling a complete nuclear power plant.

The purpose of creation of the structure (also called model in this document) should also influence the complexity and granulation of the representation of the system. A model designed to provide an overview of a chemical park main processes, for example, does not need to include a detailed overview of the layers in the roof construction of the gardening equipment shed.

The framework set by the selection of aspect should be considered when designing a structure. When structuring a system based on the functional aspect, the system functional complexity and process criticality should be looked at, not physical size or cost. Large or costly objects, or both, are not always complex from a functional point of view. A transformer can be considered quite simple in the functional aspect, no matter what physical size, complexity of construction or costs it has. It usually has few functional sub-systems, and a simple functionality. With an RD-based model, depth and level of details should be influenced by its intended use. The structure should be a tool to benefit the user, not an absolute mirror of reality and all its details.

EXAMPLE 1 A component in the lower levels of a complex structure (e.g. a motor within a critical sub-system for the process, =A1.KA1.KK1.MAA1) can be of such importance to the process that a data collecting system can be required and of interest to the operating party (e.g. =A1.KA1.KK1.MAA1.KED1). Even the sensors connected can be of interest and can be represented (e.g. =A1.KA1.KK1.MAA1.KED1.BTA1) if useful.

EXAMPLE 2 A simple gate can be represented by a simple structure e.g. only two levels, all within the component system:

=C1.QQF1 – Gate system

  =C1.QQF1.MAA1 – Gate motor

or it can be a complex system with heating system, auxiliary power supply, monitoring systems and so on:

=C1.KA1 – Gate system

  =C1.KA1.LE1 – Gate system monitoring system

    =C1.KA1.LE1.BPA1 – Upstream pressure monitoring system

      =C1.KA1.LE1.BPA1.BPA1 – Upstream pressure monitoring 1

      = C1.KA1.LE1.BPA1.BPA2 – Upstream pressure monitoring 2

      = C1.KA1.LE1.BPA1.BPA3 – Upstream pressure monitoring 3

  =C1.KA1.HE1 – Gate heating system

  ...

The structure gives the proper representation of the system and lets the user of this document understand the system complexity through the model complexity.

Throughout this document, the basic semantics and classification rules for reference designation systems in accordance with IEC 81346-1 and IEC 81346-2 are used.

5.2 Receiver's ownership principle

According to the receiver's ownership principle shown in Figure 1 and the example in Figure 2, when a system is intended to link two other systems on the same hierarchical level, and when it is unclear to which system it belongs, the linking system should be part of the receiving system (in terms of information, matter or energy of any kind).

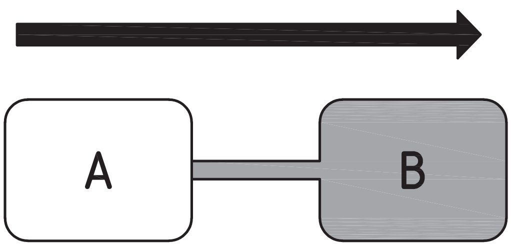
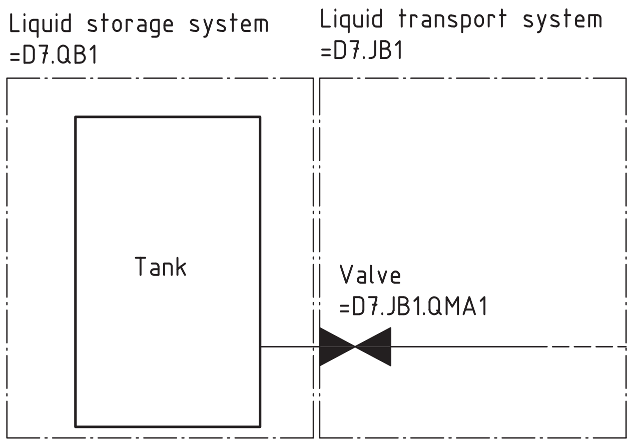


Figure 1 — Receiver's ownership principle



NOTE A valve is the separating agent between a liquid storage system (=D7.QB1) and a transport system (=D7.JB1). The valve is a sub-system of the transport system, not the storage system, because the transport system is the receiving system.

Figure 2 — Example of the receiver's ownership principle

The receiver's ownership principle is to be used in situations when doubt arises. Common sense and intuitive ownership should come first. The main goal is that systems should be where a future user expects them to be.

EXAMPLE The cord between a laptop and its charger constitutes the connecting agent between these two systems, with the laptop being the receiving system. The charger cord is however still a part of the charger, not the laptop.

The receiver's ownership principle can be used for all aspects.

5.3 Collector system principle

An exception to the receiver's ownership principle (see 5.2), in the functional aspect, is where multiple systems meet in a new system where energy, data or matter is collected. This is called the collector system principle. Examples are systems where a dominant feature is a busbar (i.e. collecting/distributing power to multiple other systems), or a liquid collection/distribution system.

For these systems the flow control system separating each supplying system to the collecting system should belong to the former. This is exemplified in Figure 3.

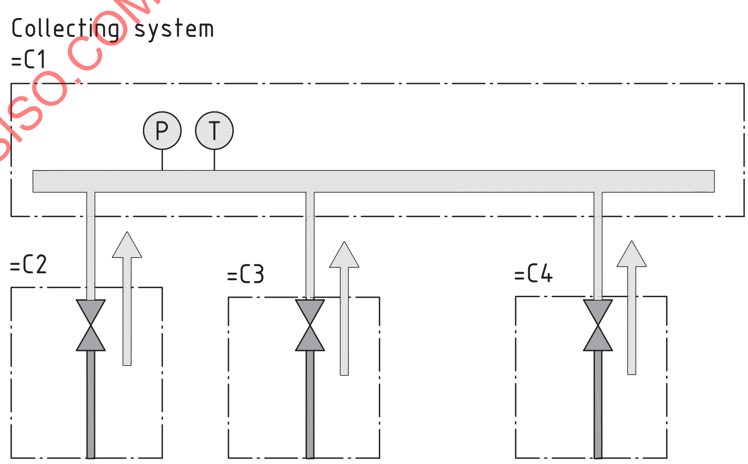


Figure 3 — Example of the collector system principle

It is useful from a process (or even safety) point of view to know which system is being isolated.

The collector system principle only applies to the functional aspect, not the product aspect, where an array of valves, such as the ones depicted in Figure 3 can be part of the collecting system -C1 (pointing to the same object individual as =C1).

This situation will often occur for switchgear systems, where breakers isolating a certain larger system are, in the product aspect, part of the switchgear system. However, in the functional aspect the breakers will be part of the systems to which the flow of electrical power is being controlled.

5.4 Classification according to inherent functionality

In accordance with the principles of IEC 81346-2, the object should always be classified according to what it was designed to do, not what it is being used for in a particular case.

EXAMPLE 1 Even if the overall function of the lubrification oil system is to reduce friction, the system supplying the lubrification oil does not see the final use of the oil, it just supplies it. It is a liquid matter supply system (JB), not a friction reduction system (KJ).

EXAMPLE 2 A valve opening the flow of the sprinkler system will have the effect of fighting fire. But the valve is a valve, it is a controlling device for flow, a QMA.

The overall use of a system will often be reflected by a parent system. In the case of Example 2 above, the valve (QMA) will most likely be a constituent of a firefighting system (PB).

5.5 Immaterial instantiation

In accordance with the principles of IEC 81346-1, instantiating the occurrences (object reference designations) should avoid situations where the numbering in itself carries meaning, including leading zeroes. Such information is considered metadata/properties of the object.

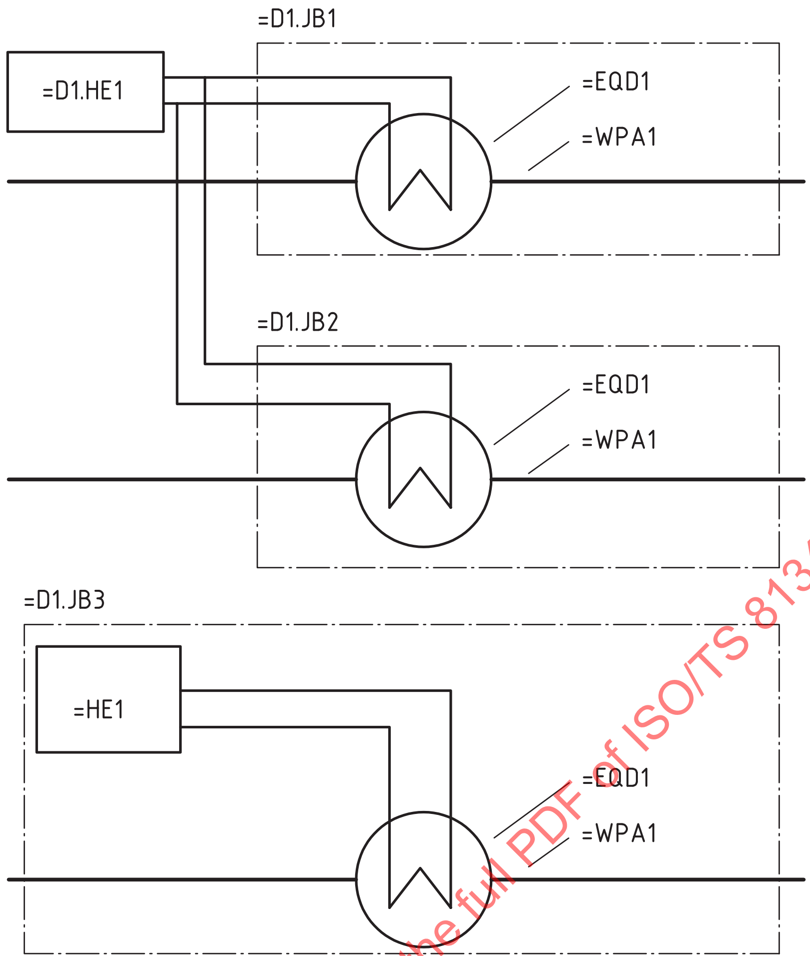
EXAMPLE =RA2, where "=RA2" is not necessarily the second generator (in any sense of the word).

The primary concern is to avoid situations where the instantiation carries technical information about the object in question that should be covered by the type aspect. Certain exceptions are acceptable for grouping/clustering purposes (see 5.7) and the type aspect (see 7.3). If a company selects to employ meaningful numbering, the rule should be well documented.

5.6 Parent system and sub-systems

If a system (e.g. HE) primarily affects a larger system (e.g. =D1.JB3), and only that, the former (HE) should be a sub-system of the latter (=D1.JB3). See "Distribution system 3", the lower system in Figure 4.

If a system (HE) affects multiple larger system (e.g. =D1.JB1 and =D1.JB2), that system should be considered lifted to the same level as the two latter systems (=D1.JB1 and D1.JB2). See "Distribution system 1 and 2", the two upper systems in Figure 4.

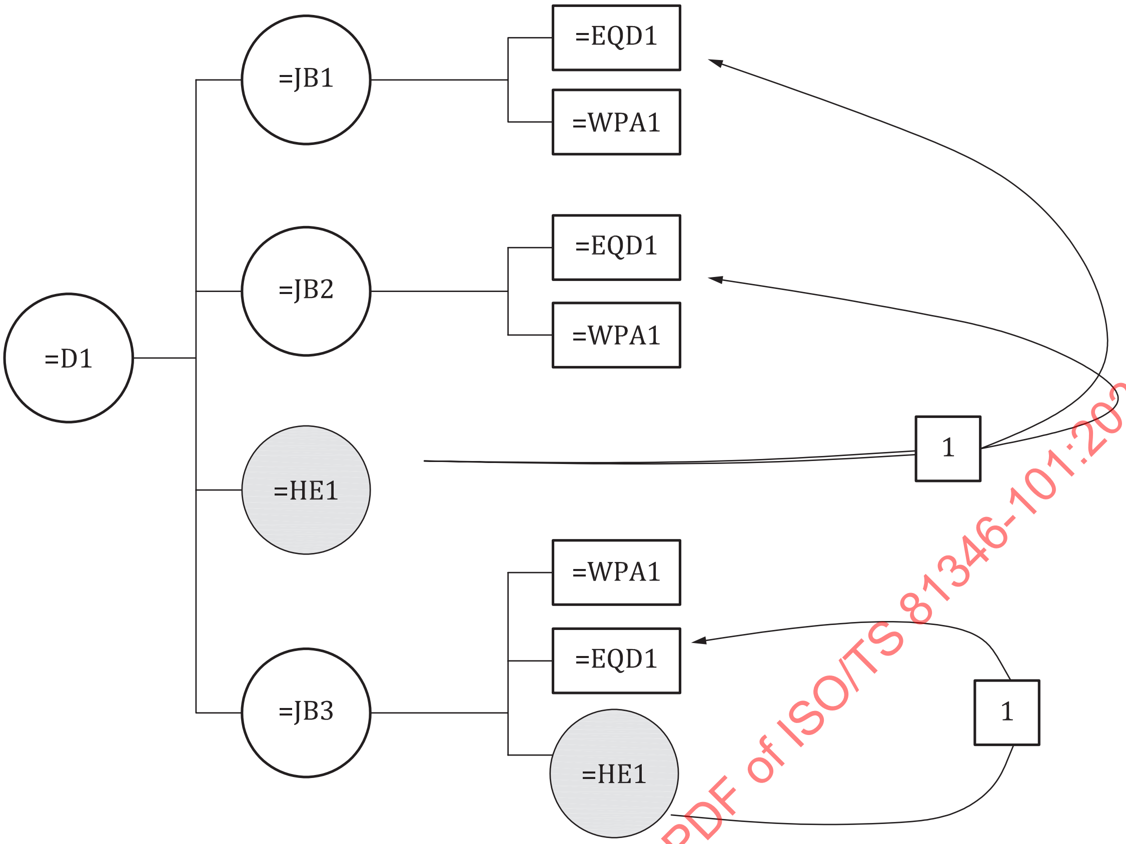


Key

=D1.JB1	cooling water distribution system 1
=D1.JB1.EQD1	cooling water distribution system 1, cooling system
=D1.JB1.WPA1	cooling water distribution system 1, distribution pipe
=D1.JB2	cooling water distribution system 2
=D1.JB2.EQD1	cooling water distribution system 2, cooling system
=D1.JB2.WPA1	cooling water distribution system 2, distribution pipe
=D1.HE1	cooling water supply (supplying distribution systems 1 and 2)
=D1.JB3	cooling water distribution system 3
=D1.JB3.EQD1	cooling water distribution system 3, cooling system
=D1.JB3.WPA1	cooling water distribution system 3, distribution pipe
=D1.JB3.HE1	cooling water distribution system 3, cooling water supply

Figure 4 — Example of structure showing cooling systems on different levels — P&ID

Figure 5 shows a model of an auxiliary water distribution system with its cooling system. Each of the major piping systems (=D1.JB1, =D1.JB2 and =D1.JB3) have their own cooling systems (=D1.JBn.EQD1). Each of the (EQD) cooling systems are sub-systems dedicated solely to their respective (JB) piping systems.



Key

1 supplying cooling water

Figure 5 — Example of structure showing cooling systems on different levels

Cooling water on the other hand is supplied to systems =D1.JB1 and D1.JB2 by a common cooling water supply system (=D1.HE1). Because this system is common to multiple systems on the second level of the structure it is also on the second level. The third distribution system (=D1.JB3) is particular in that it has a dedicated cooling water supply system (=D1.JB3.HE1). It is only supplying cooling water to this particular distribution system and is therefore a sub-system of it.

This proposed design guideline is not absolute. The second cooling water supply system (=D1.JB3.HE1) can already at this point be elevated to the second level of the structure (=D1.HE2) if, e.g.:

— it is expected (in the future) to feed a fourth piping system;

— it can be used as auxiliary supply systems to the other distribution systems;

— in similar situations, it is expected to feed multiple distribution systems.

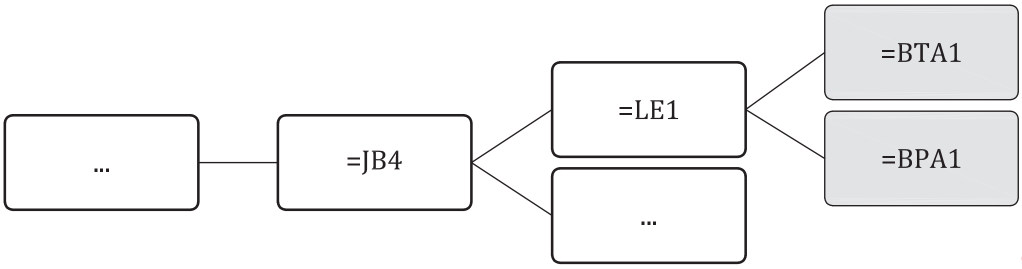
5.7 Limited constituent systems

5.7.1 General

The RDS-structures provide the users with a clear overview of the object/system of interest and its constituent sub-systems. To ensure readability and use friendliness, the system should contain between 5 and 25 sub-systems; a guideline to the lower and upper limits of that range is given in 5.7.2 and 5.7.3.

5.7.2 Lower limit

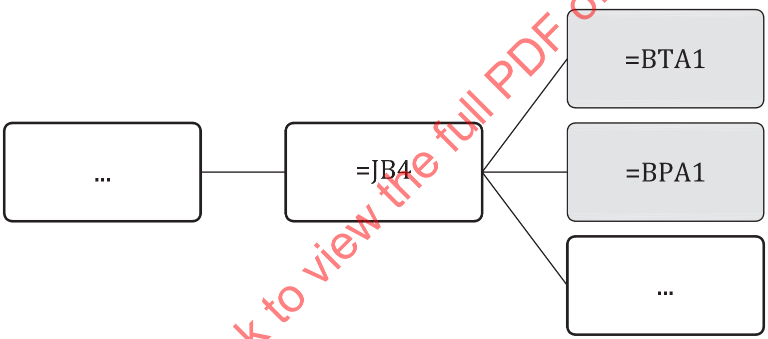
In cases with systems that contain less than five sub-systems, it is recommended to review the structure and consider lifting the few sub-systems up one level; such as illustrated in the examples in Figure 6 and Figure 7, where the monitoring system (=LE1) was superfluous.



Key

...=JB4	oil distribution system
...=JB4.LE1	oil distribution system, monitoring system
...=JB4.LE1.BTA1	oil distribution system, monitoring system, temperature measurement
...=JB4.LE1.BPA1	oil distribution system, monitoring system, pressure measurement

Figure 6 — Example of a potentially unnecessary system



Key

...=JB4	oil distribution system
...=JB4.LE1.BTA1	oil distribution system, temperature measurement
...=JB4.LE1.BPA1	oil distribution system, pressure measurement

Figure 7 — Example of a simplified and improved structure

This principle is a general recommendation. There are many situations where only a few, or even a single sub-system should figure in the structure.

EXAMPLE If the oil distribution system 4 (=JB4) only had the one single temperature sensor system (=BTA1) as a child system, it can still belong there. The placement would indicate that the temperature sensor system is a sub-system of that particular oil distribution system.

5.7.3 Upper limit

Many industrial systems include extreme numbers of similar systems, such as lithium battery racks, solar panel arrays, or individual pipes or poles in a large distribution line. In these cases, the proposed upper limit of 25 can be difficult to follow.

Handling of a potentially extreme number of sibling systems can be done by creating multiple instances of parent systems and distributing the siblings between them by clusters. This can be done either by using the existing parent classes, or by creating a new level in the structure.

5.8 Modelling for the future

Modelling the systems should be done in accordance with the principles of the ISO 81346 and IEC 81346 series and this document. Modelling with the intent to retrofit old systems, or simply to appease old habits which can force a suboptimal solution, should be avoided.

It has often been a norm to group systems according to deliveries which shall be avoided in aspects that do not take this into account; the grouping shall rather follow the functional aspect.

EXAMPLE 1 Hydropower generator bearings are often grouped with the generator because they are supplied together.

A reference designation shall not be forcefully shortened to meet outdated requirements of old systems.

EXAMPLE 2 Some older SCADA systems are not able to handle object references (tags) of more than 30 characters.

5.9 Preferred semantics

For multi-level reference designations, full stop "." can be used between elements with only the first prefix as lead, as illustrated in Figure 8. This is in accordance with the rules of IEC 81346-1.

Although the readability is unaffected by the selection of one or the other, full stop is more commonly accepted by IT systems than equal, minus or plus signs.

=A1=KA1=JB1=QNA2

=A1.KA1.JB1.QNA2

Figure 8 — Example for preferred syntax

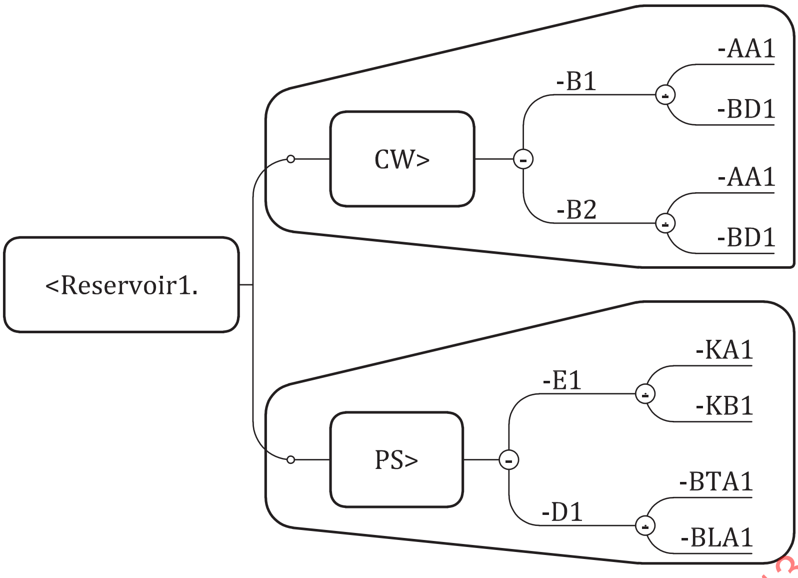
5.10 RDS implemented to multiple domains (RDS-PS and RDS-CW)

When modelling systems using the RDS, some class libraries will be better suited than others depending on the nature of the system in question. In particular ISO 81346-10:2022 (RDS-PS) and ISO 81346-12 (RDS-CW) provide different tables for functional ("main") systems and technical systems, corresponding to the power supply domain (PS), or the construction works domain (CW), in order. These are called "RDS libraries" in this subclause.

RDS-CW should be used for all systems belonging to the construction work domain. This includes buildings, general housing, garages and workshops, roads, access tunnels and so on.

Within the hydropower domain it also includes dams, which should be considered wall systems ("B" CW systems in accordance with ISO 81346-12). With regards to the water storage system, the reservoir function (i.e. the body of water behind the dam) and all sub-systems related to water management (even those located within the dam itself) should be considered part of a power supply storage system (E-systems, the reservoir system) and should be modelled using RDS-PS.

As illustrated in Figure 9, to distinguish and ensure unambiguity when reading the reference designations, the top node should reflect what RDS library has been used (see Clause 6).



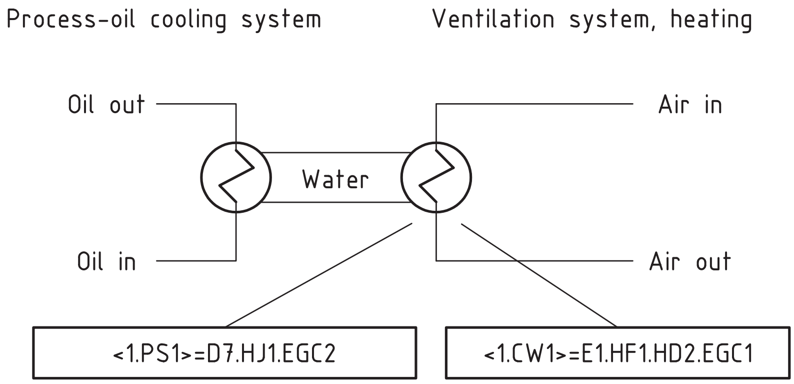
Key

<Reservoir1.CW>-B1	dam 1
<Reservoir1.CW>-B1.AA1	dam 1, top/road
<Reservoir1.CW>-B1.BD1	dam 1, dam structure
<Reservoir1.CW>-B2	dam 2
<Reservoir1.CW>-B2.AA1	dam 2, top/road
<Reservoir1.CW>-B2.BD1	dam 2, dam structure
<Reservoir1.PS>-E1	reservoir
<Reservoir1.PS>-E1.KA1	reservoir, flood gate system
<Reservoir1.PS>-E1.KB1	reservoir, overflow control system
<Reservoir1.PS>-D1	auxiliary monitoring
<Reservoir1.PS>-D1.BTA1	auxiliary monitoring, atmospheric temperature monitoring
<Reservoir1.PS>-D1.BLA1	auxiliary monitoring, snow depth monitoring

Figure 9 — Example of a reservoir, modelling the constituent power supply systems using ISO 81346-10:2022 and the constituent construction works systems using ISO 81346-12

In situations where multiple domains/libraries are used, there will often be situations where certain systems can rightfully belong to both structures or constitute the meeting point, or both, between the two domains.

Another example is shown in Figure 10.



NOTE The heat-exchanger system in a plant extracts heat from process oil. This is part of the power supply system domain (RDS-PS). The heat is in turn extracted from the cooling water and used to pre-heat ventilation air in the building – a system within the construction works domain. The heat exchanger between these two systems, the water-air heat exchanger, can have two reference designations, one in each domain.

Figure 10 — Example of an object with both a PS and CW reference designation

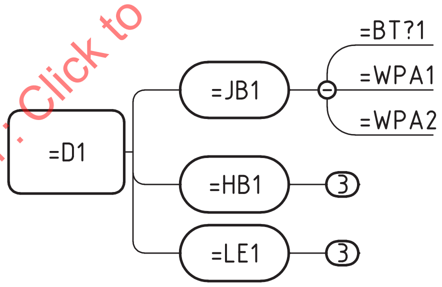
Methods and principles to handle multiple reference designations to the same object are proposed in 12.2.

5.11 Use of the symbol “?”

In situations where component systems are required and should be added to a model, but details about them are yet undecided, there can be difficulties in assigning them a class.

EXAMPLE Is a certain temperature sensing object going to be a system with Boolean output (BTB), used to trigger alarms – or is the temperature sensing object going to be a system with scalar output (BTA), where the alarm is triggered by another system (potentially based on this scalar output)?

In these situations, the question mark “?” can be used in the last position of the reference designation, to indicate that the last letter is yet to be determined. This is illustrated in Figure 11 (=BT?1).



NOTE It is an important distinction that “BT?” is not a "Sensing object for temperature", which is the group definition for all component systems that start with BT. It means that the BT? system is either a BTA or a BTB.

Figure 11 — Example of the use of the question mark within reference designation

5.12 Structuring guidelines

For all systems, the user shall choose a class level, i.e. choose whether the object be designated by a prime system [_], technical system [_ _] or component system [_ _ _]. Some guidelines to support the choice are:

a) Only one prime system should exist in any multi-level reference designation. Potential exceptions are large, complex compact systems within power production facilities such as wind turbines.

EXAMPLE 1 =A1.KA1.WPA1 is acceptable, whereas =A1.B1.KA1.WPA1 is not recommended.

b) When working with structures modelling whole power plants (or systems of equivalent complexity), a multi-level RD should always start with a prime system class, with the exception of the application of RDS-CW on power supply systems (see structure identifier principles in 10.2).

EXAMPLE 2 =A1.KA1.WPA1 is acceptable, whereas =KA1.WPA1 is not recommended.

c) It is the designer's choice to model a second level (after a prime system) as a technical or component system. The complexity of the objects and the depth of the structure should be taken into consideration.

EXAMPLE 3 =A1.KA1 and =A1.WPA1 are acceptable.

d) It is suggested not to exceed three levels of technical systems before using component systems.

EXAMPLE 4 =A1.KA1.KA1.LE1.WPA1 is acceptable, whereas =A1.KA1.KA1.LE1.JB1.WPA1 is not recommended.

e) Once the structure reaches an object which can be characterised as an "of the shelf product" it should be modelled as a component system (e.g. a small general-purpose pump, a smart-sensor or a small valve).

EXAMPLE 5 For a standard, off the shelf valve, =A1[...]QMA1 is acceptable, whereas =A1[...]KA1 is not recommended.

f) A reference designation identifies systems on all levels. A reference designation does not need to end with a component system level.

EXAMPLE 6 =A1 and =A1.KA1 and =A1.KA1.WPA1 are all acceptable.

6 Top node

6.1 General

To discern similar systems from another, the RDS provides unambiguous object identifiers.

An unambiguous reference designation implies certainty to which single object/system the object points to within a given larger system (often a plant or a station). And the larger systems can themselves be designated by the top nodes, see Figure 12.

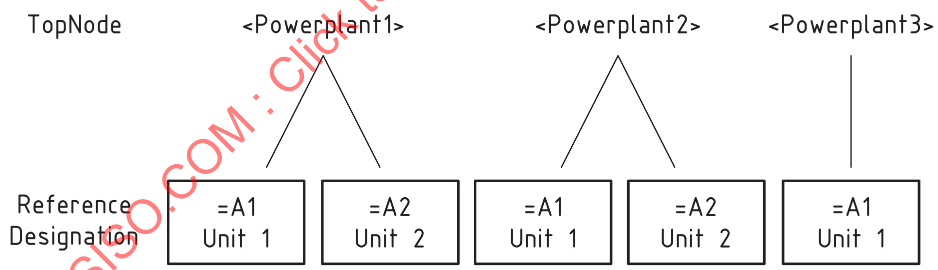


Figure 12 — The top node is the key to differentiate between similar systems in a full fleet/machine park overview

The top node is what gives any reference designation its context. The information contained within the top node is not regulated by the ISO 81346 and IEC 81346 series, but metadata information about the structure is (see IEC 81346-1:2022, Annex K). It is suggested that certain elements of the structure metadata should be found in the top node. This will help the readability and usability of the structures and provide unambiguity on a larger scale.

Elements to be added to the top node are proposed in 6.2, 6.3, 6.4 and 6.5, depending on the aspect chosen and the situation.

Each piece of information presented in 6.2, 6.3, 6.4 and 6.5 will also have a recommended metadata tag among the ones listed in IEC 81346-1:2022, Annex K (e.g. "ReferencedObjectId").

6.2 Top nodes identifying large systems (stations, plants and factories)

This is the proposed method to use the top node in the case where a large system (such as a photovoltaic power station, a hydropower station or a large stand-alone substation) is modelled by the RD hierarchical structure:

<SiteIdentifier.*Profile*.RDS-Library>

<Sophie11.*HP1*.PS1>

This RD includes the following elements:

1) Site identifier (ReferencedObjectId): The ReferencedObjectId identifies the object represented by the structure (the modelled system), the power plant/station/wind farm/transmission line site. Geographic location name or code, a power plant name or a code-id associated to it can be used. The identifier should end with a number but does not have to contain letters.

EXAMPLE 1 Sophie11, Viking11, Itaipu1 or 2109

2) Profile (StructureId) – Optional: The StructureId should refer to an application profile used for RDS modelling. This information can aid in the understanding of the structure. To differentiate according to the technology type, the proposed syntax “HP” for HydroPower, “WP” for WindPower, “PV” for PhotoVoltaic, “SS” for SubStation, etc., can be used. The numbering in the end should reflect the edition of the profile.

EXAMPLE 2 HP1 or WP1

3) RDS-Library (RdsDomainId): The RdsDomainId should point to the reference designation classes domain used (also known as “RDS library” in this document). ISO 81346-10:2022 and ISO 81346-12 define classes for Power supply Systems and Construction Works. The abbreviations PS and CW can be used along with a number indicating the respective edition of the applicable document (the StructureVersionId).

EXAMPLE 3 PS1 or CW1

Each variation of the top node represents its own model. For a single power plant (same site identifier), each profile, RDS-Library, or indeed aspect will present a different model of the same power plant, such as exemplified in Table 2.

Table 2 — Example of systems represented in different models of the same power plant

Top node site identifier	Top node profile	Top node library	Aspect	Example of RD
PowerPlant1	HP1	PS1	= (Functional aspect)	<PowerPlant1.HP1.PS1>=A1
PowerPlant1	HP1	PS1	- (Functional aspect)	<PowerPlant1.HP1.PS1>-A1
PowerPlant1	HP1	PS1	+ (Functional aspect)	<PowerPlant1.HP1.PS1>+A1
PowerPlant1	HP1	CW1	= (Functional aspect)	<PowerPlant1.HP1.CW1>=A1
PowerPlant1	HP1	CW1	- (Functional aspect)	<PowerPlant1.HP1.CW1>-A1

6.3 Other purpose top nodes — temporary structures

6.3.1 General

Some structures are created to meet a need of limited temporary purpose. The context and therefore the temporary reference designation structures/models depend on the nature of the creation/use of the structure.

Some examples are given in 6.3.2 and 6.3.3.

6.3.2 Orders and bills of materials

In this example, a list a of materials provided by a supplier for the construction of a particular system (see example in 7.4.3) is considered:

<ProjectID/RecurID.OrderID.Profile.RDS-Library>

<HDrefurb2020.Order023.HP1.PS1>

The RD includes the following elements:

1) ProjectID (StructureIdDomainId): The ReferencedObjectId should identify the time-dependent context, such as a project identifier or a contract number. The identifier should end with a number but does not have to contain letters.

EXAMPLE 1 HDrefurb2020, B2054 or 6112020

2) RecurID (StructureIdDomainId): StructureIdDomainId can be used to identify recurrent tasks and potentially locations. The identifier should end with a number but does not have to contain letters.

EXAMPLE 2 A1001 or B1003 with:

— Class A: replenishment of workshop reserve-parts stock;

— Class B: replenishment of workshop tools and consumables;

— 1001/1003: identifier of the workshop/location.

3) OrderID (ReferencedObjectId): The ReferencedObjectId should identify the object described by the structure (the modelled system). This can be an order identifier, contract number or equivalent. To be able to separate this identifier from the others in the top node it is recommended to start the identifier with a letter and end it with a number.

EXAMPLE 3 Order023 or TX3456 or nr12345

4) Profile (StructureId) — Optional: The StructureId should refer to an application profile used for RDS modelling. This information can aid in the understanding of the structure. To differentiate according to the technology type, the proposed syntax is “HP” for HydroPower, “WP” for WindPower, “PV” for PhotoVoltaic, “SS” for SubStation, etc. The numbering in the end should reflect the edition of the profile.

EXAMPLE 4 HP1 or WP1

5) RDS-Library (RdsDomainId): The RdsDomainId should point to the reference designation classes (domain) used. ISO 81346-10:2022 and ISO 81346-12 define class-tables for Power supply Systems and Construction Works. The abbreviations PS and CW should be used along with a numbering indicating the edition of the standard parts (the StructureVersionId).

EXAMPLE 5 PS1 or CW1

If a material order contains items belonging to both domains (e.g. pumps, valves and joins but also concrete, plugs and steel framework), then two structures should be created.

EXAMPLE 6 <A1001.Order345.PS1> and <A1001.Order345.CW1>

6.3.3 Modular tasks and views, temporary structures

For some projects and tasks system grouping and modularization can be helpful for the organization of information, tasks and work:

<ProjectID.TaskID.Profile.RDS-Library>

<B2345.03.HP1.PS1>

Structures can be created to clarify and/or support the work if:

— different actors work on different parts of a system (e.g. entrepreneur X is responsible for systems -A1, and entrepreneur Y for -A2);

— a difference in timeline of the project shall be visible (e.g. -A1 systems will be constructed during the first month of the project, then -A2 and -A3);

— HSE issues should be grouped (e.g. -A1 systems are to be created in a temporary potential toxic environment (marsh gases));

— other structuring needs based on other factors than physical assembly or function.

The structure of the top node would look similar to the one described in 6.3.2 (for bills of materials) with a TaskID (ReferencedObjectId, instead of an OrderID), selected to represent the temporary task within the project.

EXAMPLE

01: Design and planning

02: Purchase and delivery

03: Construction on site A

04: Construction on site B

6.4 Top nodes for cataloguing purposes

This application would typically come from supplier documentation, describing a certain system in detail without allocating it in a larger functional structure which would reflect what it is being used for.

As an example, a pump is to be supplied with a full set of documentation describing in detail its parts and assembly. The drawings and documentation all refer to the structure in the product aspect modelling the pump:

<CompanyID.SystemID.Profile.RDS-Library>

<SuperSupplier1.Pump6300.HP1.PS1>

The RD includes the following elements:

1) CompanyID (StructureIdDomainId): The StructureIdDomainId can be used to identify the supplier of the system. This piece of information can be added by a client after purchase to help identify the modelled system.

EXAMPLE 1 SuperSupplier1, s987876

2) SystemID (ReferencedObjectId): The ReferencedObjectId identifies the object described by the structure (the modelled system). This can be done in numerous ways depending on each company's internal information structure principles. Internal designations can be asset codes, a reference to a catalogue or systems library.

EXAMPLE 2 SnowRacer5000, B1A1AA1

Once the system has been purchased, the reference designation structure can be appended to the larger system structure.

A supplier of a given system (e.g. a valve) can, along with the delivery, supply a full RDS-structure modelling the component in question. This will be useful for cross-reference and identification in the documentation attached to the object.

The operator incorporating the new system in a larger scheme (e.g. a power plant), can directly incorporate the supplier's RDS-structure into the full structure of the larger system. This is illustrated in Figure 13.

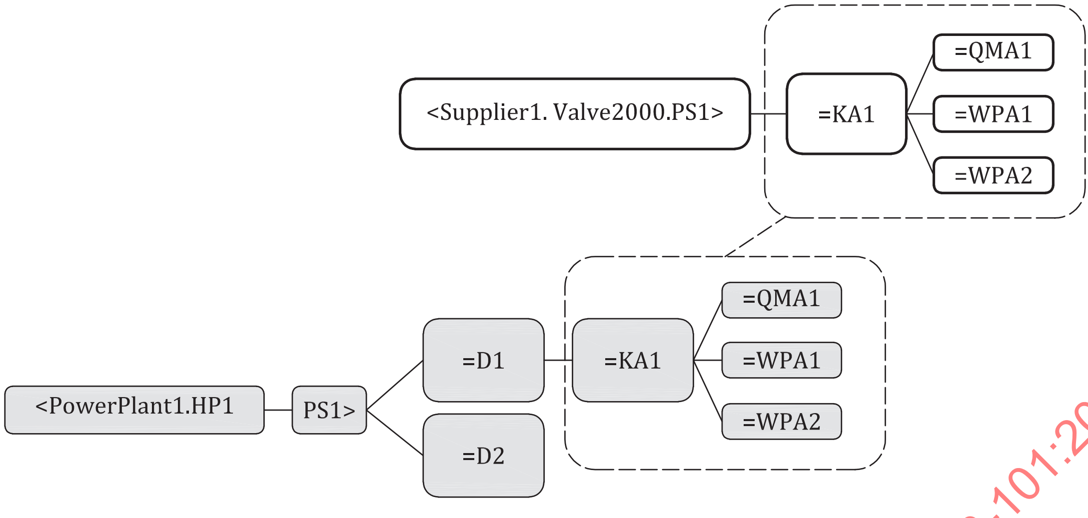


Figure 13 — Example of an integration of a lesser system into a larger system

This will be useful for both the operator and the supplier as the supplied documentation will still refer to the structure in use by the operator. This will minimize errors in identification of subcomponents and systems during later operation and maintenance.

6.5 Other purpose top nodes — (%) type aspects top nodes

The type aspect provides a mean to classify further within the common RDS classes. It is a tool for information structuring, organizing, filtering and sub-grouping. There are many ways the aspect can be employed to aid an organization, as such it needs a flexibility of use. There is however a need to contextualize the type aspect, as there are multiple different interpretations of the type classes.

As an example, a KA system can have different types defined, depending on the information user – defined for different purposes: the HydrType can be created by the hydrology department, and the MaintType by the maintenance department (see Table 3).

Table 3 — Example for a KA system with different types defined

HydrType	MaintType
%KA1 – Water control systems for flows below 1 m^3/s	%KA1 – Gates
%KA2 – Water control systems for flows above 1 m^3/s	%KA2 – Valves

A dedicated top node can be used to contextualise/identify tables of class types:

<DomainID.RDS-Library>

<MaintType.PS1>

The RD includes the following element:

DomainID (StructureIdDomainId): The StructureIdDomainId can be used to identify the type aspect tables. In addition to internal types, system suppliers can have their own definitions. That information can be relevant to add to the RD-set of the object of interest.

EXAMPLE The Inlet gate system of "PowerPlant 4" has the following RD-set:

<PowerPlant4.PS1>=C1.KA1

<PowerPlant4.PS1>-C1.KA1

<HydrType.PS1>%KA2

<MaintType.PS1>%KA2

<SupplierCompanyX.PS1>%KA34

7 Aspects

7.1 Reference designation sets

7.1.1 General

The use of the reference designations of an object within different aspects creates a clear overview of the systems unencumbered by irrelevant information for specific tasks. Depending on the IT-tool, the setting, or the required type of information, one aspect is likely to be better suited than the others. For example, the location aspect would be best suited for any map-based application (notably GIS-systems).

The collection of reference designations designating a particular object, called a reference designation set (RD-set), can be created stepwise in a project. Identifying an object at an early stage (often using the functional or product aspect) helps to keep track of the object in question, as other designations can be added to the RD-set as the project moves along.

It is the RD-sets (see Figure 14) that will be the key to navigate different systems and domains. In any given situation, one aspect is going to be dominant (e.g. for maps, where navigating the physical locational structures would be based on the ++site of location). Once an object/space of interest has been reached, the other aspect RD will be the key to gather information about the object/space in other systems.

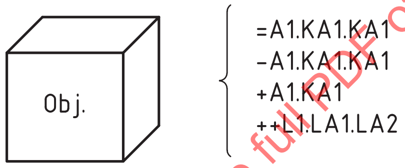
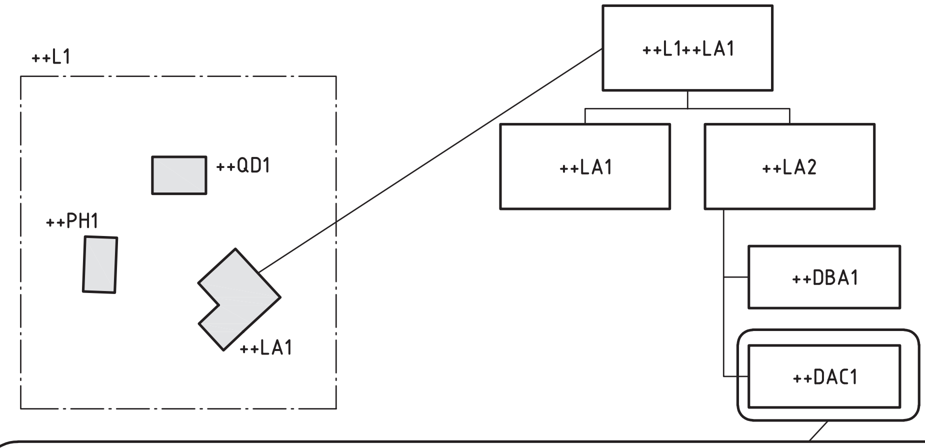


Figure 14 — RD-set

EXAMPLE All systems, identifiable by their reference designation in the functional aspect (e.g. =A1.RB1 and =A1.KA1 in Figure 15) located in a specific space, would share a location reference designation. By using the location aspect in e.g. a building information model (BIM) system, to navigate to a specific room ++L1.LA1.LA2.DAC1, where functions performed within that location would be grouped.



Location RD	Location name	Functional RD	Function name
++L1.LA1.LA2.DBA1.DAC1	2nd flr, mech eq. space	=A1.RB1	Turbine 1
++L1.LA1.LA2.DBA1.DAC1	2nd flr, mech eq. space	=A1.KA1	Main valve 1
++L1.LA1.LA2.DBA1.DAC1	2nd flr, mech eq. space	=A1.RB1.BPA11	Turbine inlet pressure
++L1.LA1.LA2.DBA1.DAC1	2nd flr, mech eq. space	=A1.RB1.BPA21	Turbine outlet pressure

Key

++L1	power plant complex
++L1.QD1	garage
++L1.PH1	workshop
++L1.LA1	hydropower plant
++L1.LA1.LA1	hydropower plant, first floor
++L1.LA1.LA2	hydropower plant, second floor
++L1.LA1.LA2.DBA1	hydropower plant, second floor, control equipment space1
++L1.LA1.LA2.DAC1	hydropower plant, second floor, mechanical installation space

Figure 15 — Functions located in a specific room

7.1.2 Semantics

Usually RD-sets are expressed by dedicating a new line to each RD. RDs part of an RD-set can however be expressed in one line when separated with a slash “/”. RDs in a RD-set will not always have the same top node, if this is the case the top node shall also be indicated.

EXAMPLE

If top nodes are the same:	++D1.DD1.DDD2/-B2.BB2.DDD1
If not:	<TopNode1>++D1.DD1.DDD2/<TopNode2>-B2.BB2.DDD1

Annex A and Annex B contain other examples of the creation and use of an RD-set.

7.2 Functional aspect [=]

The proposed use for the functional aspect is in P&IDs, general process diagrams, topology overviews or overview diagrams (single-line, multiline, etc.). With regards to signals and data tags, it is recommended that the functional aspect structure is used to identify the relevant owning asset. A signal tag should be created by combining a reference designation with another standardized tag, such as the signal modelling system of the IEC 61850-7 series.

The functional aspect structure shows the hierarchical structure of systems functionalities. It shows what systems are intended to do, and how they do it (what functions work together to accomplish a more aggregated function).

The functional aspect will mainly be used to structure systems related to process flow. As such, it is recommened to select what systems to model as follows:

Systems related to a signal or measurement (systems related to the “process” point of view) should be modelled, i.e. systems expected to be part of a P&ID or a single-line diagram. Other systems, although having a functionality, will be visible only in the product aspect (e.g. covers, support beams, wires). Asset data (mechanical attributes or object individual related data) is information usually held by systems where the product aspect is prominent.

In Figure 16, only process-related levels are visible (no cover, housing, screws, or other mechanical components exist in the structure).

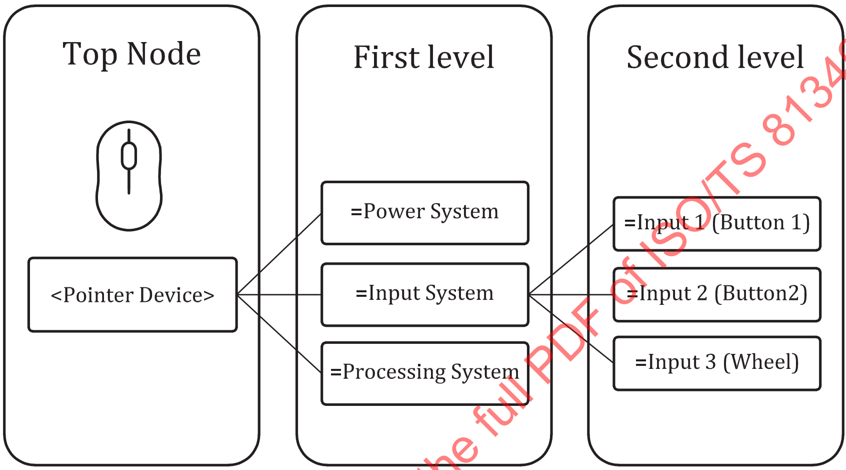


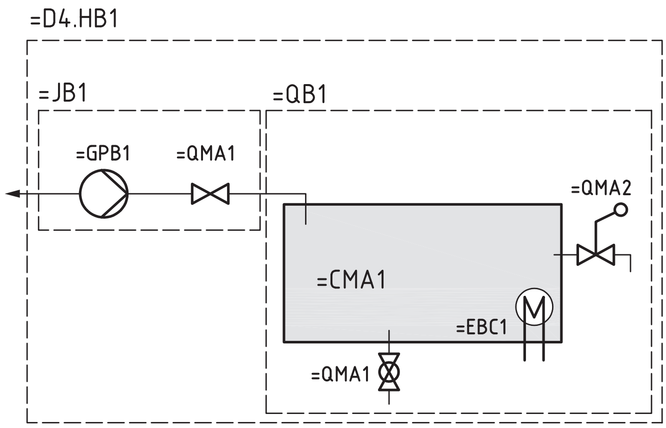
Figure 16 — Functional aspect — Example 1: A computer mouse

The functional aspect structures are generally reliably stable because the functional requirements for a process are stable, while the choice of equipment type, applied physical solution and geographic location of any given system can vary and evolve over time. For example, an elevator system will always need a driving function (motor), whether it is hand-driven, located at the top or bottom of the building, and regardless of how it is assembled.

The functionals structure will often be similar to the product aspect, especially for the upper levels. It will however likely have fewer constituent systems and likely fewer levels to the full model.

The function aspect offers a way of structuring the system functionalities in a way that both supports and adds to the understanding of the role of the object within a larger system.

In Figure 17, the overflow valve =D4.HB1.QB1.QMA2 is a sub-system to the oil storage system.



Key

=D4.HB1	aux syst. 4, oil supply
=D4.HB1.JB1	aux syst. 4, oil supply, oil transport
=D4.HB1.JB1.GPB1	aux syst. 4, oil supply, oil transport, Pump
=D4.HB1.JB1.QMA1	aux syst. 4, oil supply, oil transport, Valve
=D4.HB1.QB1	aux syst. 4, oil supply, oil storage
=D4.HB1.QB1.CMA1	aux syst. 4, oil supply, oil storage, tank
=D4.HB1.QB1.EBC1	aux syst. 4, oil supply, oil storage, heater
=D4.HB1.QB1.QMA1	aux syst. 4, oil supply, oil storage, drain valve
=D4.HB1.QB1.QMA2	aux syst. 4, oil supply, oil storage, overflow valve

Figure 17 — Functional aspect — Example 2: An oil supply system

7.3 Type aspect [%]

The use of the type aspect, exemplified in Figure 18, provides the means to subdivide the classes defined in the ISO 81346 and IEC 81346 series. It is a handy tool to provide additional information about the object of interest while remaining in the RDS framework.

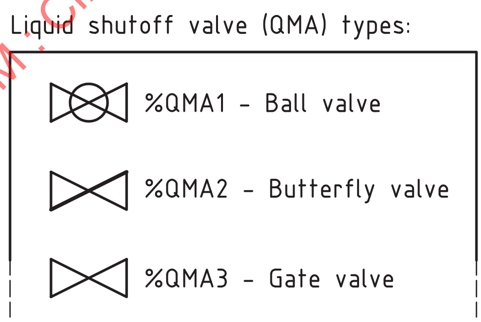


Figure 18 — Type aspect

The type aspect can be useful in applications where either the functional or the product aspect is predominant.

The aspect is suited for situations and application when listing requirements which can be associated to certain system types.

EXAMPLE 1 Electronic equipment can be designed to work with either AC or DC currents, "%XDA1" for AC type electrical terminal, and "%XDA2" for DC type electrical terminal.

It can also be used in the setting of grouping for comparison. For example, to be able to compare the age of all slide-gates in a portfolio, it would be useful to be able to detail the gate class (KA), which is the class generic for all gates, valves, breakers and more. It would be useful to sort out all KA-systems by types to provide useful comparisons, e.g. by picking and comparing all %KA1.KA2 (Gate systems, slide gates).

The type structure is a natural part of an ontology to define type-of associations.

Types classes are not defined by the ISO 81346 and IEC 81346 series; this means that a type library can be tailored for specific purposes or deliveries. The type aspect is an information holding tool, but the regulations and rules of application are practically non-existent. Different parties confronted with the type aspect should not assume a shared understanding of the classes. The type-library should be clearly stated, see suggestions on the use of the top node for this purpose in 6.5.

A suggested type structure for power supply equipment is to couple equipment types to the ones listed in the IEC Common Data Dictionary (CDD).[1] Four domains are available through the CDD:

— electric/electronic components (IEC 61360-4 [2]);

— process automation (IEC 61987 series);

— low voltage switchgear (IEC 62683-1);

— measuring equipment for electrical quantities (IEC/TR 63213).

The type aspects should, as far as possible, be employed to mirror and fill the structure of the CDD.

Some classes have their equivalent in both standards and do not require the creation of a new type.

EXAMPLE 2 Linear stepping motors, which are represented by the AAA164 classes in IEC 61360-4 and by the MBB class in IEC 81346-2:2019). See Table 4.

Because the CDD is much more detailed in their equipment classifications, there are many classes whose equivalent will have to be created as type-classes of the generic IEC 81346-2 classes.

EXAMPLE 3 Linear DC motor, AAA163 in the CDD, but this is a narrower description of the IEC 81346 class MBA. To correctly mirror the class definition, a type of MBA is defined. See Table 4.

Table 4 — Example for a CDD/RDS conversion

CDD — Motor classes (IEC 61360-4)	RDS — Motor class types (IEC 81346-2:2019)
AAA 160 – motor	*not available*
AAA 161 – linear motor	MBA – electromagnetic linear driving object providing a continuous movement
AAA 162 – linear ac motor	%MBA1 – linear ac motor
AAA 163 – linear dc motor	%MBA2 – linear dc motor
AAA 165 – linear universal motor	%MBA3 – linear universal motor
AAA 164 – linear stepping motor	MBB – electromagnetic linear driving object providing a continuous movement
AAA 166 – rotational motor	MAA – electromagnetic rotational driving object providing continuous rotation
AAA 167 – rotational ac motor	%MAA1 – rotational ac motor
AAA 168 – rotational dc motor	%MAA2 – rotational dc motor
AAA 170 – rotational universal motor	%MAA3 – rotational universal motor
AAA 169 – rotational stepping motor	MAB – electromagnetic rotational driving object providing discrete rotational steps

1) Component Data Dictionary (CDD - V2.0011.0002). Online database featuring 440 classes and 1 400 characteristic properties for electric/electronic components and materials. Free access to database: https://std.iec.ch/iec61360

2) Withdrawn.

7.4 Product aspect [-]

7.4.1 General

The product aspect, exemplified in the Figure 19, shall not be confused with the type aspect. The product aspect does not present a view of "products" fulfilling specific functions, but it provides the means for modelling systems by the nature of their composing systems, i.e. systems are grouped to constitute their parent-systems.

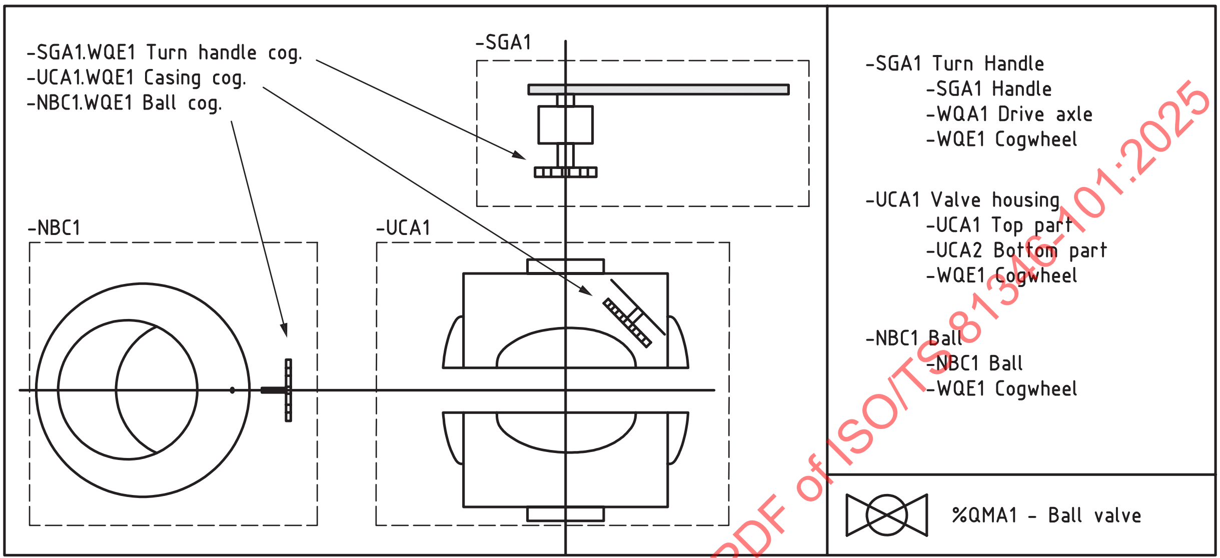
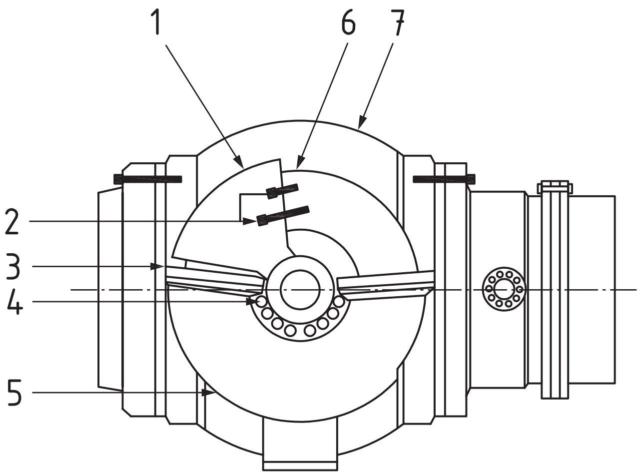


Figure 19 — Product aspect

There are several ways of interpreting/using the product aspect, they are detailed in 7.4.2 and 7.4.3.

7.4.2 Assembly structure

The most common use of the aspect (denoted here as the "assembly" take on the aspect), will be used to represent the physical associations between systems in a hierarchical structure, such as shown in Figure 20 and Figure 21. This take on the product aspect is well suited for e.g. assembly drawings where the physical construction of machines or assemblies is viewed and explained.



Key

1 force link
2 pin bolt
3 axle
4 bolt system
5 piston housing
6 piston shaft
7 valve body

Figure 20 — Example of the use of the product aspect to structure a physical component — Drawing

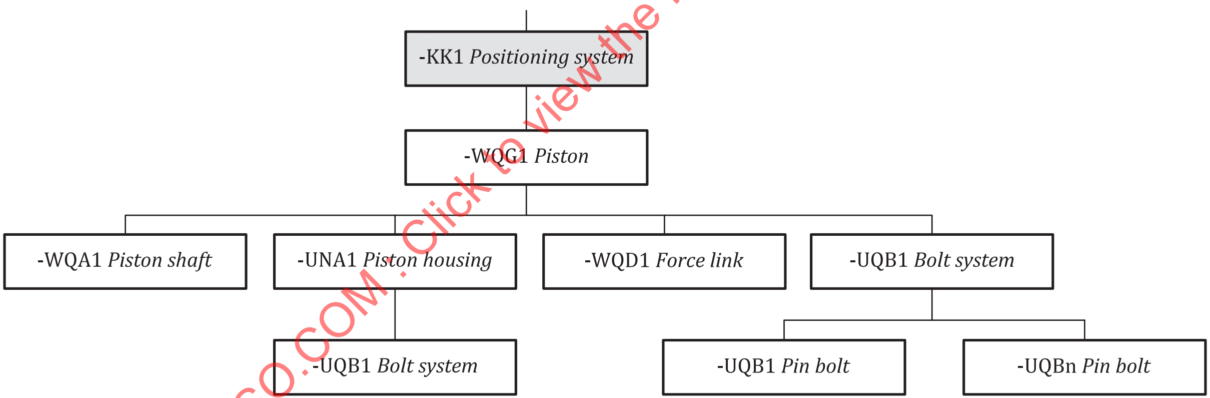


Figure 21 — Example of the use of the product aspect to structure a physical component — Structure

This aspect is useful for the production and assembly stages of a component life cycle, but also for most maintenance and work planning. This aspect is typically preferred by maintenance staff and for system suppliers as it is well suited for identification of components not typically relevant in the functional aspect models.

As it becomes evident when comparing the example in Figure 22 to the functional structure in Figure 16, the product structure is more complex and displays more constituent systems than the functional aspect. Some of the subsystems are obviously related (button input for instance) and will be part of the same RD-sets.

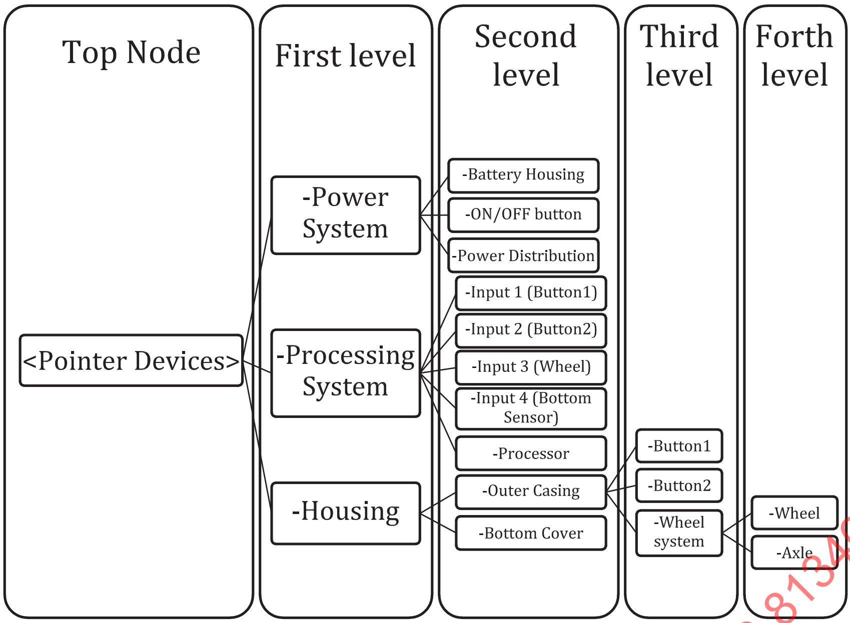


Figure 22 — Product aspect illustration — A computer mouse

Cubicles and power component cabinets will see the benefits of the product aspect, as they are often manufactured/assembled prior to installation. The product aspect will provide the means to create a descriptive structure limited to the cubicle and its components, disregarding the components placement in a larger structure in the functional aspect.

7.4.3 Bill of material structures

The product aspect is also relevant for purchasing/ordering purposes e.g. for bills of materials or when a supplier proposes a detailed offer featuring many systems, which when employed can be functionally unrelated or geographically separated, or both.

Figure 23 shows the example of an order for a multitude of plumbing components, organized in an offer where groups of components have been grouped according to project specific needs (e.g. shipment waves or locations).

Group 1 - Pipes and valves 1 (JB1) - 1 000 £ - Pipe 1 (-JB1.WPA1) - Pipe n (-JB1.WPAn) - Valve 1 (-JB1.QNA1) Group 2 - Pipes and valves 2 (JB2) - 1 000 £ -Pipe 1 (-JB2.WPA1) -Pipe n (-JB2.WPAn) -Valve 1 (-JB2.QNA1) Group 3 - Filters (KC1) - 500 £ - Oil filter 1 (-KC2.HQB1/%HQB1) - Oil filter n (-KC2.HQBn/%HQB1) - Water filter 1 (-KC2.HQBn+1/%HQB2) Sum(-JB1, -JB2 & -KC1) : 2 500 £	%HQB1 - Filter type 1: Oil filter %HQB2 - Filter type 2: Water filter

Figure 23 — Example of the use of the product aspect to structure content

Once shipped and installed, the components can be part of different models and acquire new reference designations.

EXAMPLE A certain pipe (see Figure 23) can have the RD-set:

<Owner1>=D1.HB1.WPA1

<Owner1>-D1.HB1.JB1.WPA1

<MasterInc.Purchase1234>-JB1.WPA1

7.5 Location aspect [+Host of installation]

The host of installation system (see ISO 81346-10:2022) provides information about objects physical situation. This is done by designating the system physically hosting the object of interest, i.e. the object of interest is physically placed either on or inside the hosting system.

The hosting system is identified using its product reference designation. To indicate that the reference designation is the host of installation aspect, the product aspect prefix "-" is replaced with the location aspect prefix "+" as exemplified in Figure 24.

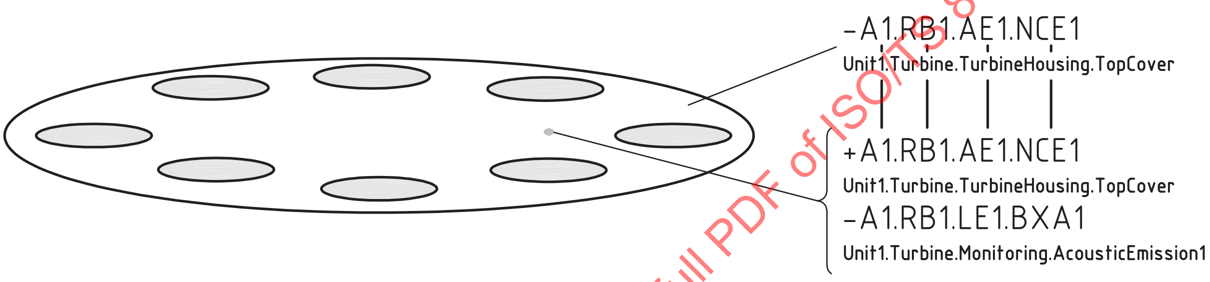


Figure 24 — Host of installation illustration

EXAMPLE A control unit -D8.[...].KEB1, is located inside one of the control system cubicles of another system: -F4.[...].UCA2. The cubicle is hosting the control unit. (Part of) the RD-set for the control unit:

-D8.[...].KEB1

+F4.[...].UCA2

The aspect is useful for a number of situations and cases, notably to identify the cubicle in which electro components (such as a fuse, breaker or control unit) are located, or sensor placements.

7.6 Location aspect [++Site of installation]

7.6.1 General

Site of installation, exemplified by Figure 25, provides the means to point out a physical location (without referring to any other structure defined by another aspect).

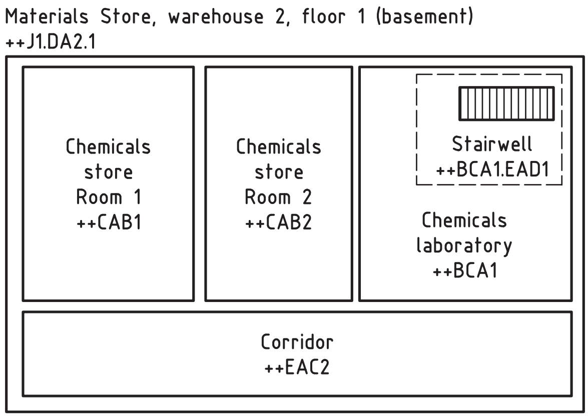


Figure 25 — Site of installation aspect

The site of installation is different from the other aspects in that it employs its own distinct class tables. Figure 26 illustrates the three classes representing the different levels of abstraction available: construction complexes, construction entities and installation spaces (one-, two- or three-letter codes, in order). They are all available in IEC 81346-2.

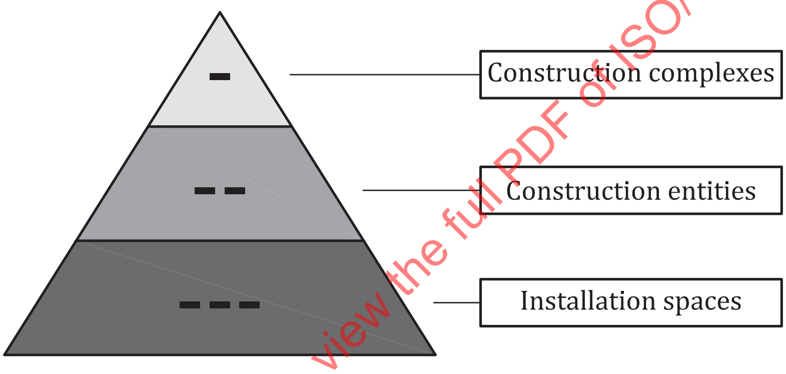
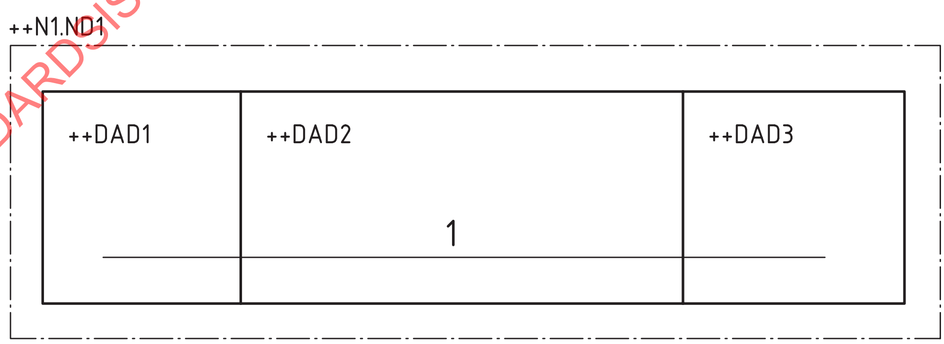


Figure 26 — RDS-libraries for host of installation aspect

The site of installation is typically the aspect preferred for 3D-representation, maps and geographic location-based information systems such as a Geographic Information System (GIS) or Building Information Model (BIM) systems (ISO 19650 series).

Figure 27 illustrates a situation where an electrical cable is stretched over three different spaces.



Key

1 electrical cable =D1.JE1

Figure 27 — Example of the benefit of the use of the full RD-set

The parts of the cable in each of the three spaces have the following RD-sets:

=D1.JE1 ++N1.ND1.DAD1	=D1.JE1 ++N1.ND1.DAD2	=D1.JE1 ++N1.ND1.DAD3

By labelling the cable with its functional (or product) aspect reference designation, one can identify the cable across the spaces it goes through.

7.6.2 Levels and floors

7.6.2.1 General

It is in the nature of the location aspect that the RD of an object should also contain information about the floor/level in which the object can be found. This causes a dilemma. The floor level is represented by a number, and according to best practice, numbers should not hold any meaning, nor should numbers alone be used to represent a level in a reference designation.

The level can be introduced into the object RD in three ways, as described in 7.6.2.2 (repeated entity level), 7.6.2.3 (stand-alone level) and 7.6.2.4 (space numbering including level). All represent exceptions in the application of general modelling principles regarding the use of numbering.

The choice of method to represent the level in a construction entity should be well documented, and detailed, either through a description or through a reference to one of the three methods proposed in this document.

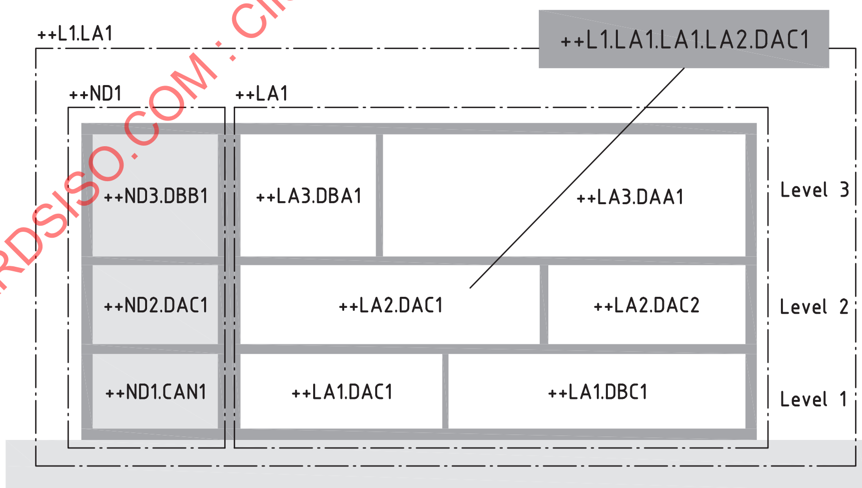
7.6.2.2 Repeated entity level

A first solution, illustrated in Figure 28, is to add a distinct level in the RD as the last technical system level (i.e. the last construction entity (two-letter code) level before the space of installation (three-letter code) levels). This will often refer to a repetition of the former's class-code.

EXAMPLE ++L1.LA1.LA2.DAC1

The use of this concept does have some requirements, as the last entity-level (the second "LA" level in the example) is understood as the bearer of the floor level information.

This is the recommended solution for use on power plants, even if this level-instantiation does carry meaning. It is an unavoidable problem as levels in a building are of a numeric nature.



Key

++L1.LA1	power plant
++L1.LA1.ND1	power plant, workshop
++L1.LA1.LA1	power plant, power plant

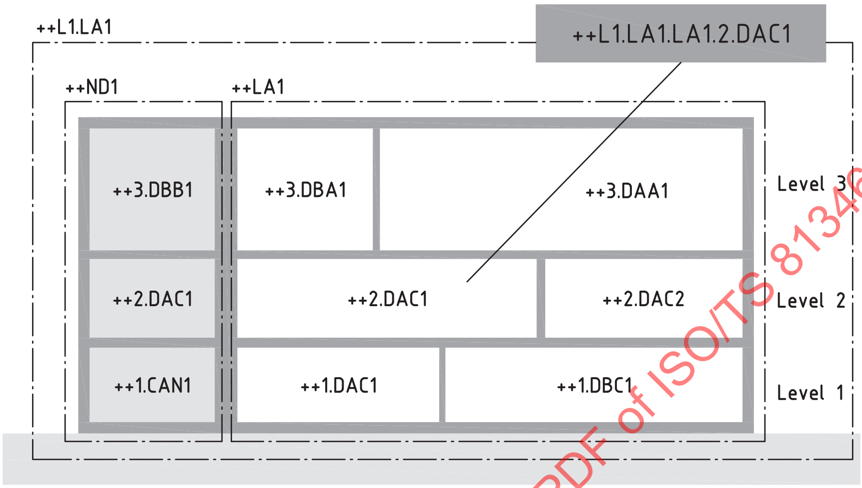
Figure 28 — First principle for level numbering in the RDS location aspect — Repeated entity level

7.6.2.3 Stand-alone level

The potentially most user-friendly solution, illustrated in Figure 29, is to add the level in the building as a distinct level in the RD. It should still be placed between the last construction entity (two-letter code) level and the first space of installation (three-letter code) level.

EXAMPLE ++L1.LA1.LA1.2.DAC1

Although this choice provides an easy distinction of the level, it does require all digital applications to accept the use of the separating character ("." or "++"). The floor shall remain a distinct level, and not an additional digit in the parent-level numbering (e.g. A1CA11CAB1).



Key

++L1.LA1 power plant

++L1.LA1.ND1 power plant, workshop

++L1.LA1.LA1 power plant, power plant

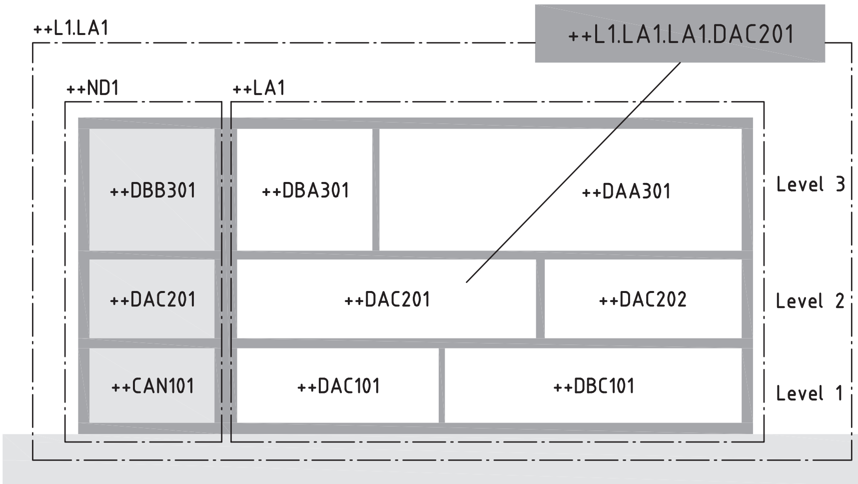
Figure 29 — Second principle for level numbering in the RDS location aspect — Stand-alone level

7.6.2.4 Space numbering including level

The solution following ISO 4157-2, illustrated in Figure 30 is to add the level into the instantiating number of the different spaces.

EXAMPLE ++A1.CA1.CAB101

This standardized method is generally applied on hotel/building room numbering and should feel familiar (see ISO 4157-2). The major flaw of this is meaningful numbering.



Key

++L1.LA1	power plant
++L1.LA1.ND1	power plant, workshop
++L1.LA1.LA1	power plant, power plant

Figure 30 — Third principle for level numbering in the RDS location aspect — Space numbering including level

Level 1 is defined as the lowest level in a construction entity where activities can be performed (including below ground level). This means that while there can be negative floor numbering (subterranean floors), there can never be negative levels. Buried objects such as pipes or cables can be considered placed on Level 0.

7.6.3 Syntax

In many situations a location RD will point to a space/system containing multiple objects of interest, e.g. it will point to the room where a list of functions is located, each of which share the same location RD. This location RD is *ambiguous* to these objects, as it does not identify each of the systems within. The RD will unambiguously identify the space containing them all.

The location aspect RD of an object will usually identify a parent level to the object of interest (e.g. the room where a cabinet is located, not the space that the cabinet represents). In accordance with IEC 81346-1, such a reference designation shall end the space/host system designation with a horizontal ellipsis ("…"), see the following example RD-set:

EXAMPLE

=A1.XXX1

++A1.AAA12…

Because the location aspect is most often used in this manner (no confusion is likely), the ellipsis may be omitted for this aspect (see IEC 81346-1:2022, Rule 32).

7.7 Location-type aspect [%%]

The site of installation aspect classes is different from the other aspects. While the regular (%) type aspect is employed for types of Power supply Systems, the location-type aspect is reserved for types of construction complexes, construction entities and activity spaces as defined by the tables used by the site of installation aspect. As illustrated in Figure 31 and Table 5, the location-type refers to the site of installation aspect classes (construction complex, construction entity and installation space). This can be useful to indicate zones with particular requirements or HSE hazard, such as a high voltage area indicated by the yellow triangle in Figure 31.

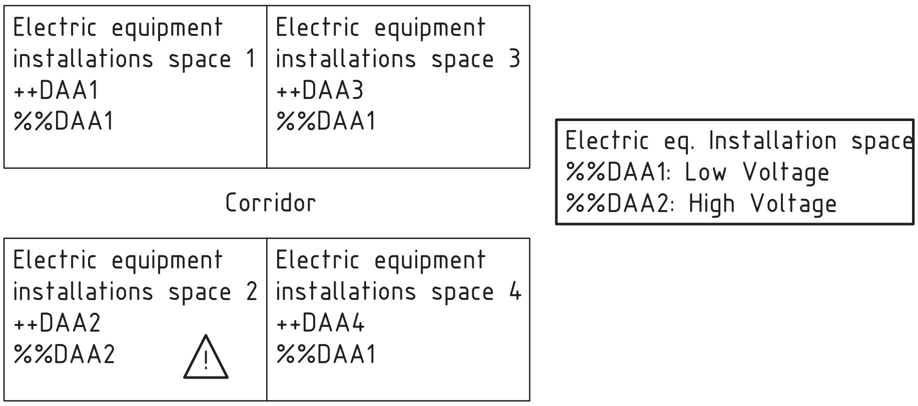


Figure 31 — Location-type aspect example

Table 5 — Type and location-type applications

Type (%)			**Location-Type** (%%)		
A	Prime systems	%A1 Hydropower plant	A	Construction complex	%A1 Apartment residential area
AA	Functional systems	%HB1 Liquid supply system (Oil)	AA	Construction entity	%HG1 Ball sport facility (Tennis)
AAA	Component systems	%WPA1 Water pipe	AAA	Space	%CAE1 Fluid storage space (Water)

All other principles for the type aspect (see 7.3) are valid and useable for the location-type aspect as well.

8 System associations and relationship classification

8.1 Implicit association of the hierarchical structure

An RD-based hierarchical structure is created by classifying its constituent systems and defining part-of relationships between them.

EXAMPLE -D1-JB2-WPA3 is the reference designation of a pipe, part of a water distribution system (-D1-JB2), part of an auxiliary system (-D1).

“Sibling” relationships between systems (multiple systems part of the same larger system) is another relationship type implicitly derived from the hierarchical structure.

These are the most basic of association principles, implicitly given by the object reference designations themselves. In 8.2, 8.3 and 8.4 explicit relationships between systems are discussed.

8.2 RD-set

One of the primary benefits of the RD-sets is that they enable the linking of information about a certain system throughout different domains and IT systems.

Within a company, different IT-tools/software/systems will base their information structures on one of the RDS aspects (e.g. map-based systems will most likely be based on the location aspect structures, while automation processes will be built on the functional aspect). Other types of information about the object of interest can be found on other platforms. Because of the RD-set of the object in question, it can be located on any platform, even those based on another aspect.

Figure 32 gives an example for using the RDS to navigate a Geographic Information System (GIS) and locating a certain space (a valve chamber); the GIS database can reveal all systems with that particular location occurrence (i.e. the available list of systems in that location). Once a system among them is selected (e.g. the inlet pressure monitoring system) the RD in another aspect (-A1.RB1.BPA1 in Figure 32) will link to, e.g. the system documentation, stored in the digital archives, organized using the product aspect.

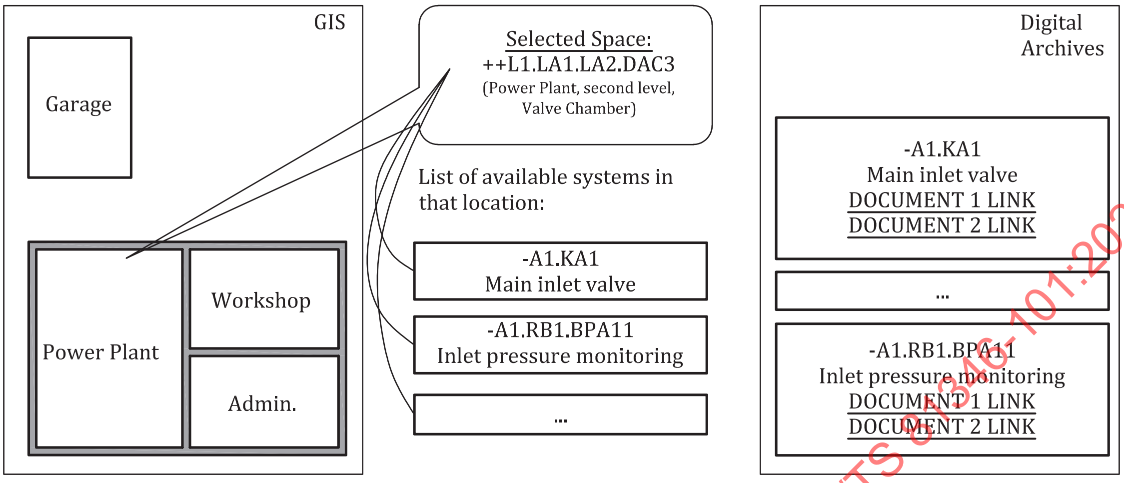


Figure 32 — Navigating between systems (geographic information system and digital archives) using RD-set

A requirement for object recognition over IT systems is the possibility to associate/attach information about the other RDs to the object of interest (usually as attributes/metadata).

8.3 Relationship classification

IEC 81346-1:2022, Annex I specifies a method to designate and classify the relationship between object occurrences. It allows relationships between different objects to be established and classified.

The relationship is identified by inserting the relationship class between the two occurrence RDs, separated by the "|"-character on both sides, such as in the example below.

Some few relationship classes are provided as examples in IEC 81346-1.

EXAMPLE Relationship where matter flows between two systems in liquid form, between the main inlet valve and the turbine (receiving system is on the right side of the relationship class): =A1.KA1|DB|=A1.RB1.

In Figure 33 an auxiliary oil supply system (<Odin.PS1>=D3.HB1) has its own dedicated power supply system (<Odin.PS1>=D3.HB1.HD1).

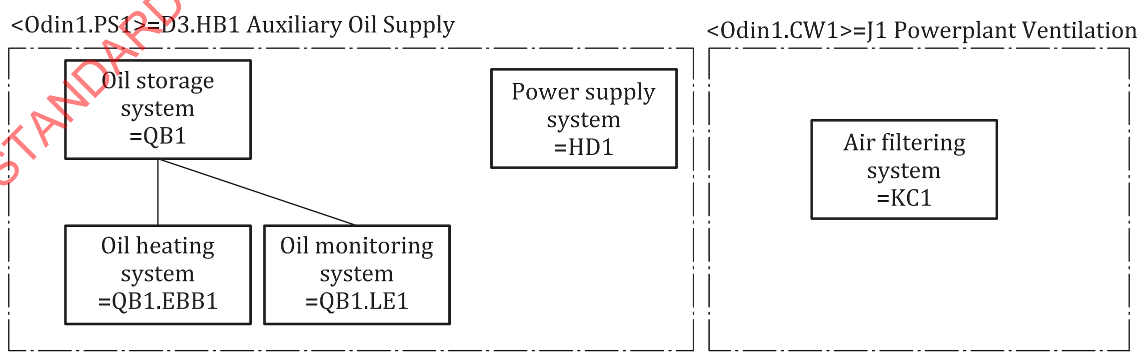


Figure 33 — Example of use of the association classification on a system — System description

The relationship within the oil supply system can be classified as such:

=D3.HB1.HD1|CA|=D3.HB1.QB1.EBB1

The power supply system |supplies power to| the oil heating system

or

=D3.HB1.HD1|CA|=D3.HB1.QB1.LE1

The power supply system |supplies power to| the oil monitoring system

As an HSE action, the power plant ventilation system (<Odin.CW1>=J1) was equipped with an air filtering system. For convenience, power to the filtering system is supplied by the auxiliary oil supply system power supply (<Odin.PS1>=D3.HB1.HD1):

<Odin.PS1>=D3.HB1.HD1|CA|<Odin.CW1>=J1.KC1

The auxiliary oil supply power supply system |supplies power to| the ventilation system

With this information stored and made available, HSE and root cause analysis can be helped by the classification of the system dependencies. As an example, a user would in the case above be made aware that precautions should be taken because maintenance tasks involving the auxiliary oils supply system and its power supply, can impact the air in the power plant.

8.4 Relationships between aspects

One object individual can be represented uniformly in the different aspects.

There will be cases where an object individual, as referred to unambiguously in the product aspect (e.g. a sensor), can in fact perform multiple functions. In which case, each of these functions exist, and can be identified by their reference designations in the functional aspect.

EXAMPLE

<u>RD-set 1</u>

-D1.LE1.BTA4	auxiliary system 1, monitoring system 1, temperature sensor 4
=D1.PF1.BTA3	auxiliary system 1, protection system 1, temperature sensor 3

<u>RD-set 2</u>

-D1.LE1.BTA4	auxiliary system 1, monitoring system 1, temperature sensor 4
=D1.HE1.BTA2	auxiliary system 1, cooling system 1, temperature sensor 2

In the example above, the same sensor (-D1.LE1.BTA4) fulfils two functions (=D1.PF1.BTA3 and =D1.HE1.BTA2). There is a one-to-many relationship between these occurrences.

There will be occasions where the situation is reversed, and many objects (with individual product occurrences) fulfil one single function. Such a situation can be found in a stretch of pipes, where the full stretch is modelled as e.g. =D1.JB1, while every single pipe segment can be individually identified in the product aspect (-D1.WPA1, -D1.WPA2, etc.).

An equivalent one-to-many relationship will exist regarding the location aspects as well, as some objects are large enough to exist in multiple defined spaces at the same time (e.g. cables stretching over multiple rooms in a building).

In any given system where these one-to-many relationships exist, the one is the unambiguous reference designation of the object in question (i.e. that points specifically to the object in question, and only that object).

9 Classification guidelines — Power supply systems

9.1 Prime systems (main systems)

9.1.1 General

Prime systems, formerly known as “power supply systems”, are reference designations of the highest level of abstraction. Prime system classes are represented by one-letter codes.

The classes discussed in 9.1.2, 9.1.3 and 9.1.4 can be found in ISO 81346-10:2022, Table B.1.

9.1.2 Electric power transporting systems (B-systems)

B-systems are difficult to model in a uniformed manner because of their great variety. The following rules of thumb can help users to model systems in a homogenous way:

— The separating system between electrical systems is often a circuit breaker (CB). If in doubt, the ownership of the separating/connecting system is given by the receiver’s ownership principle (see 5.2) or the collector system principle (see 5.3).

— A power distribution system collecting power from the process and submitting it to the grid should be modelled as B-system. A power distribution system submitting power for internal or secondary purposes (notably local power supply) should generally be modelled as a D-system.

9.1.3 Supporting systems (D-systems)

Systems supporting the main process, in particular systems that potentially support several units at once should be modelled as D-systems.

The following is a list of some of the proposed systems classified as support systems:

— Multi-purpose hydraulics oil supply systems;

— Main cooling water supply systems (hydro);

— Auxiliary power supply system.

Many auxiliary systems would naturally fit in the construction works structure (see Clause 10), they would therefore not figure as D-systems within the power supply hierarchy. Examples of these are:

— building ventilation systems;

— building heating/cooling systems;

— access control systems;

— general firefighting systems;

— local alarm systems (sound/light).

Some systems, such as station power self-supply systems or earthing systems, can exist in both domains. This is allowed and supported if required (see 5.10).

9.1.4 Managing systems (F-systems)

Power supply systems are complex and hold a great many sub-systems that require some sort of control system. A control system can be considered a part of the object of interest itself (e.g. the manual control system of a motorized crane) or it can be a dedicated external system (e.g. a plant management automation system).

The following are proposed guidelines for determining what systems should or should not be part of dedicated F-systems:

— If a control system Alpha is solely dedicated to a single system Beta, then the control system Alpha is part of system Beta. This situation will often apply to local control systems.

— If a control system Alpha is dedicated to multiple (functionally) dispersed systems, it should probably be considered as an F-system, or a part thereof. This situation will often apply to remote control and overall plant automation systems.

— If a system is dedicated to, or supports general information flow, it can be considered part of an F-system, e.g. signal transmission systems.

— If a cubicle/rack/equipment housing system holds information handling equipment dedicated to multiple functionally dispersed systems, it should be considered part of an F-system.

Especially within these F-systems, there will likely exist functions that are, at least partly, performed by non-physical devices (software), such as IT networks.

9.2 Technical systems

9.2.1 General

Technical systems can be found in ISO 81346-10:2022, Table B.2.

9.2.2 Consecutive duplicated classes

The RDS hierarchies are created by structuring systems within systems. Any given system has an essence to its functionality that leads to the selection of its classification: A gate in a waterway controls the flow of water, it is a KA technical system.

Some systems can be complex, with many sub-systems reflecting that complexity (see 5.1). In such a situation it can be desired to designate the part of a larger system that incorporates the essence of the parent system functionality. In these cases, it is natural to find a reference designation with a duplicated class.

EXAMPLE 1 A gate system =KA1 can be a complex system with multiple gates such as in Figure 34. It is essential for the control system to be able to reference each individual gate within the larger gate system (=KA1.KA1 and =KA1.KA2), as exemplified in Figure 35.

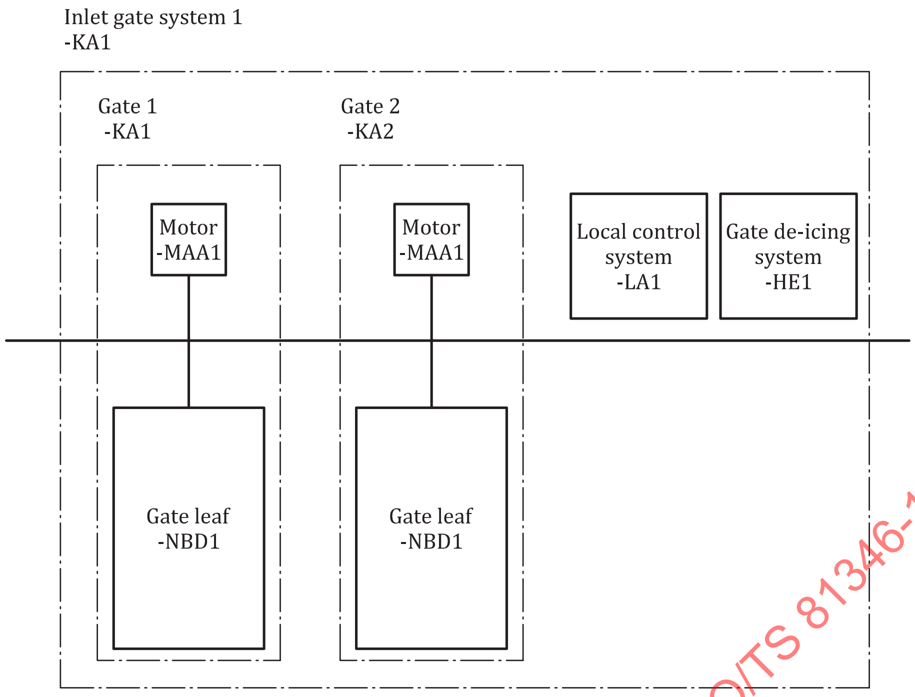


Figure 34 — Gate system example

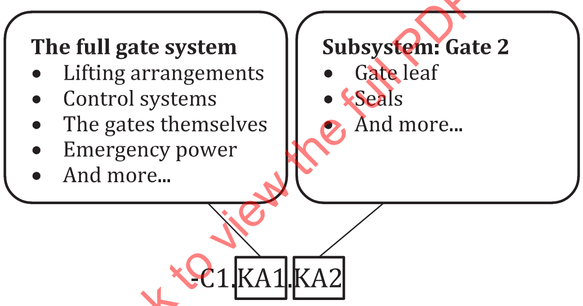


Figure 35 — Gate system example details

Duplicated classes can also be used to group large quantities of similar systems.

EXAMPLE 2 For a long and complex oil distribution system, there can be hundreds of pipe sections attached in a complicated network. It is sensible to group sections of pipes into meaningful systems:

[...]-JB1 Oil distribution system

- -JB1.WPA1 Pipe system leading oil to customer systems on first floor
  - -JB1.WPA1.WPA1 Pipe section 1
  - -JB1.WPA1.WPA2 Pipe section 2
  - -JB1.WPA1.WPAn Pipe section n
- -JB1.WPA2 Pipe system leading oil to customer systems on second floor
  - -JB1.WPA2.WPA1 Pipe section 1
  - -JB1.WPA2.WPA2 Pipe section 2

-JB1.WPA2.WPAn Pipe section n

...

9.2.3 AA-AE Structural support classes

For PS, the functional aspect is proposed to be used primarily for process related tasks (signals, automation, process control). Because of the mechanical nature of the AA-AE structural classes, they can not figure in the functional aspect model at all.

There are however some exceptions. Notable among these are dams. It is proposed to model dams, and the dam sub-systems using the following classes:

— AE: Dam;

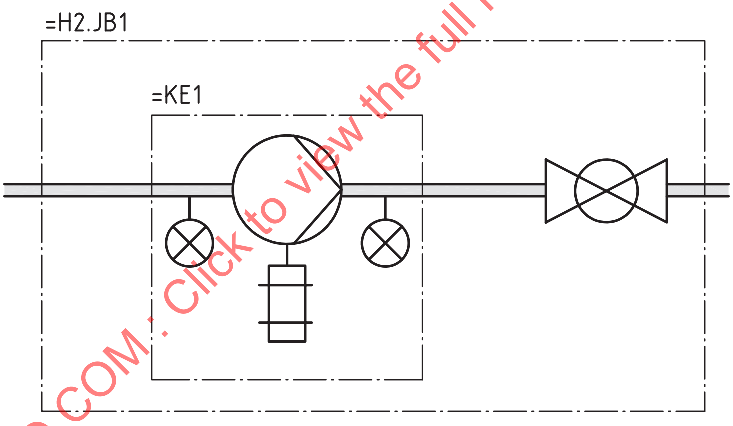
— AA: Dam Structure;

— AB: Dam Foundation.

9.2.4 Pumping systems (KE) or Liquid matter transport systems (JB)

Pumping systems (KE) are treatment systems, they increase pressure. The overall purpose of the increased pressure is often used to lift/transport matter; when that is the case, it is recommended to model a liquid matter transportation system (JB) to model the overall system function, and then add the pump as a sub-function to it.

Figure 36 provides an example.



Key

=H2.JB1 drain water ejection (transport) system

=H2.JB1.KE1 pump system

Figure 36 — Pump system =H2.JB1.KE1 within a liquid transport system =H2.JB1

9.2.5 Electrical power supply (HD) or electrical energy storage system (QD)

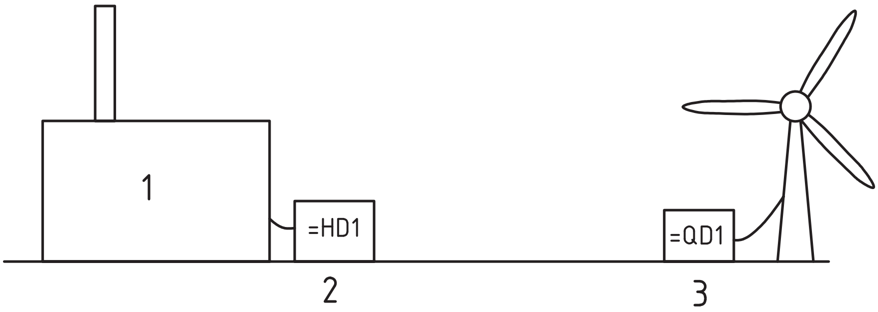
Electrical power supply (HD) or electrical energy storage system (QD) can both be applied to battery system.

The selection of class shall come from the primary intended use:

— If the system's goal is to supply energy in need (blackouts/start-up), it is a power supply system (HD). See Figure 37.

— If the system was installed to be a temporary recipient of energy for subsequent retrieval and use (e.g. a lithium-based battery system installed to store surplus energy from a wind power farm), it is a storage system, i.e. a QD system.

— If both uses can be claimed as equally important, QD should be selected.



Key

1 hydropower plant
2 auxiliary power supply
3 surplus energy storage

Figure 37 — Selection of class — HD or QD

It is not suggested to use both HD and QD if both uses are relevant. "=HD1.QD1" is not both a power supply system and an energy storage system, it is an energy storage system within an energy supply system (i.e. the battery arrays within the power supply system).

Battery systems can be used to provide grid frequency restoration services (i.e. fast power supply to the grid to stabilize the frequency, when the power output suddenly is higher than the produced power). The full system providing the power to the grid can be considered an A-system, however the battery arrays themselves would still be energy storage (i.e. "QD" class) systems.

9.2.6 Electrical energy flow control system (KL) or electrical power distribution system (JE)

A switchgear (or equivalent) system e.g. collecting power from multiple units (such as the ones that can be found on a photovoltaic power plant) should be classified as electrical power distribution system (JE), even if it mainly consists of a set of circuit breakers or disconnectors.

The following description of classes should be used:

— KL systems are controlling electricity flow (e.g. a breaker bay);

— JE systems are conducting electricity flow (e.g. a busbar system).

Note The two ownership principles (see 5.2 and 5.3) are relevant in determining the structural part of relationships of these systems. Figure 3 can just as well be about circuit breakers and busbars.

9.2.7 Power system phases

To accommodate the need to separate systems into three phases, the system in question should be followed by a second level (repeated class) instantiated using the phase number.

EXAMPLE

=B1.JE1.JE1 (Phase 1)

=B1.JE1.JE2 (Phase 2)

=B1.JE1.JE3 (Phase 3)

9.3 Component systems

9.3.1 General

Component systems can be found in IEC 81346-2:2019, Table 3.

9.3.2 High voltage systems (WB?/WD?)

Voltage levels above 1 kV AC or 1,5 kV DC are considered "high voltage".

9.3.3 QMA/QNA/RNA Valves

IEC 81346-2 proposes many solutions for valve modelling. For liquid flow control in particular the options are proposed used as described below:

— QMA – Liquid shutoff valve: Proposed to be used for valve systems that are primarily designed to be either fully open or fully closed;

— QNA – Liquid control valve: Proposed to be used for valve systems that are designed to be partially opened to control the flow through the valve, with the possibility of fully opening or closing the waterway;

— RNA – Regulating valve: Proposed to be used for valve systems that are designed to be partially opened to control the flow through the valve, without the possibility of fully opening or closing the waterway.

9.3.4 System phases

Same principle as for technical systems, see 9.2.7.

10 Classification guideline — Construction works

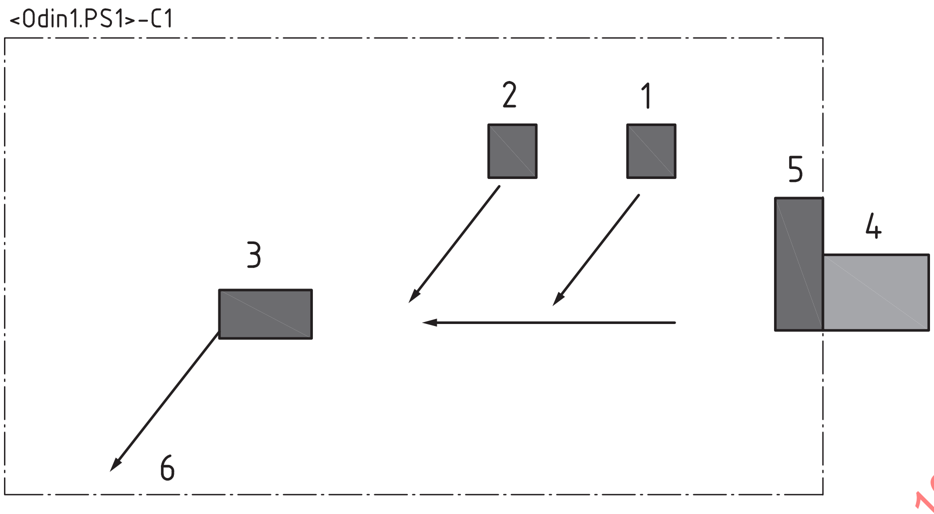
10.1 General

Power plants are composed of power systems as well as construction works systems. It can be useful to create hierarchical structures (models) of a plant using both the classes in ISO 81346-10:2022 (RDS-PS) and ISO 81346-12 (RDS-CW), where each model represents the systems naturally belong to its domain. See 5.10 for more details.

10.2 Structure identifier

ISO 81346-10:2022 (RDS-PS) proposes tools to model power production and transmission schemes. The upper level of a multi-level structure can point to systems spread over multiple locations.

Figure 38 shows an example of such a system with a water transport system containing an inlet structure, gates for additional water input from "creek intakes", and an emergency closing valve chamber.



Key

1 creek intake 1, gatehouse
2 creek intake 2, gatehouse
3 emergency closing valve chamber
4 reservoir
5 main intake, gatehouse
6 towards the power plant

Figure 38 — Example of a water transport system in a hydropower plant — PS point of view

Within this system, each of the main sub-systems will be identified with a technical system (each of the creek intakes, the inlet, the emergency closing valve, the tunnels, etc...). The PS classes (see ISO 81346-10:2022) were created to fit this level of abstraction.

ISO 81346-12 (RDS-CW) upper levels were created with the assumption that only one structure entity would be modelled by the structure (i.e. the upper level of ISO 81346-12 are wall/roof/ventilation systems and so on). The classes are not made to be able to handle the same level of abstraction as in ISO 81346-10:2022.

There is a hierarchical discrepancy between these two parts of the ISO 81346 series.

To identify the construction entity before employing ISO 81346-12 (Construction Works, CW) classes, it is proposed to add a structure identifier (construction identifier, CID) based on the construction entity classification found in ISO 81346-10:2022, Table C.2. The CID should be added to the top node.

By adding the CID as illustrated in Figure 39, each building/construction entity can be identified before using the CW-classes (found in ISO 81346-12) for further modelling of the systems.

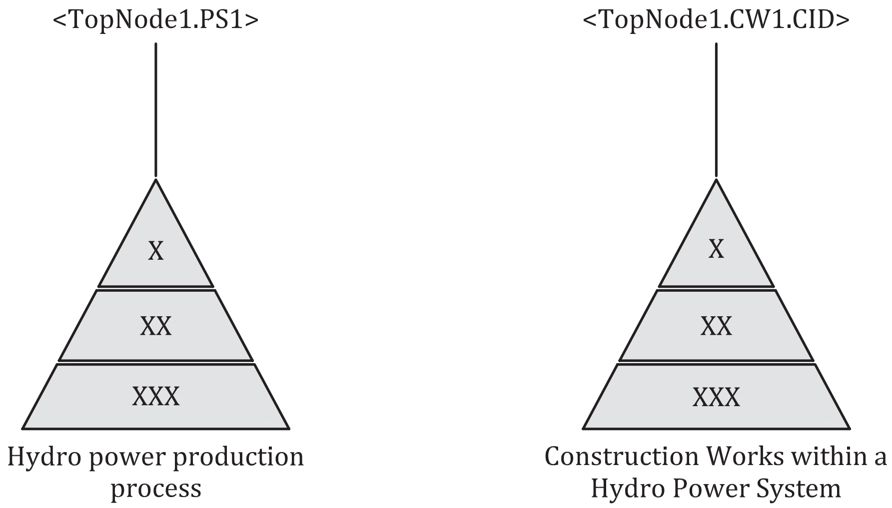
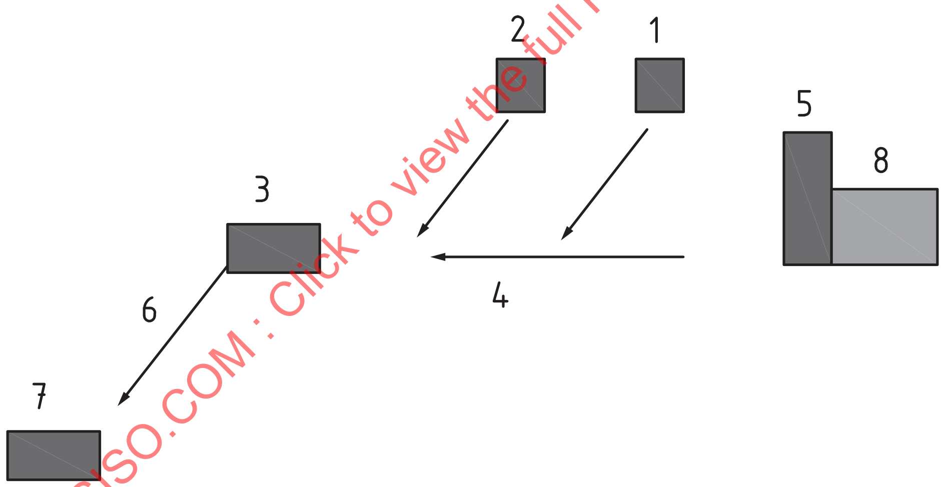


Figure 39 — Addition of the Construction Identifier (CID) to the top node

Because the CID is part of the top node, any system for identifying the construction entities can theoretically be used (e.g. just naming the entities such as “Main Inlet Gatehouse” can be adequate), however such a long name would be pushing the length of the full RD as well as being subjective to the user of this document. The construction entity classification is ideal for the identification of the entities and is strongly recommended.

Figure 40 depicts the same example water transport system as in Figure 38, with the added CID for the different construction entities.



Key

1 creek intake 1, gatehouse
2 creek intake 2, gatehouse
3 emergency closing valve chamber
4 inlet tunnel
5 main intake, gatehouse
6 penstock
7 power plant
8 reservoir (body of water)

Figure 40 — Example of a water transport system in a hydropower plant — Construction works point of view

Alternatively, the construction complex level (one-letter code) can be employed to the CID if necessary (presumably for very large systems).

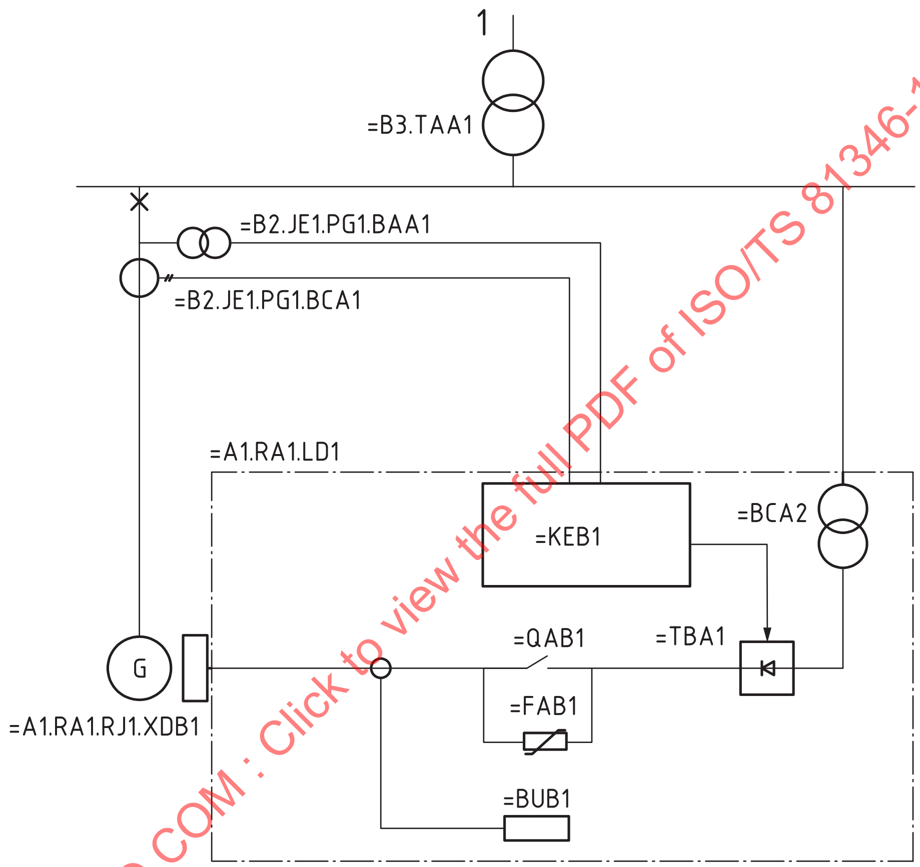
EXAMPLE

<Odin1.CW1.M1.UH2>

11 Examples

11.1 Generator Excitation System

Figure 41 shows an example of a generator excitation system in what can be a part of a single line diagram.



Key

1	grid
=B3.TAA1	transformer
=B2.JE1.PG1.BAA1	voltage measuring transformer
=B2.JE1.PG1.BCA1	current measuring transformer
=A1.RA1.RJ1.XDB1	generator brush
=A1.RA1.LD1	unit 1, generator excitation system
=A1.RA1.LD1.KEB1	automatic voltage regulator
=A1.RA1.LD1.BCA2	field current transformer
=A1.RA1.LD1.QAB1	field breaker
=A1.RA1.LD1.TBA1	AC/DC converter (Thyristor – rectifier)
=A1.RA1.LD1.FAB1	varistor
=A1.RA1.LD1.BUB1	loss of magnetic overcurrent, under current

Figure 41 — Example of a generator excitation system

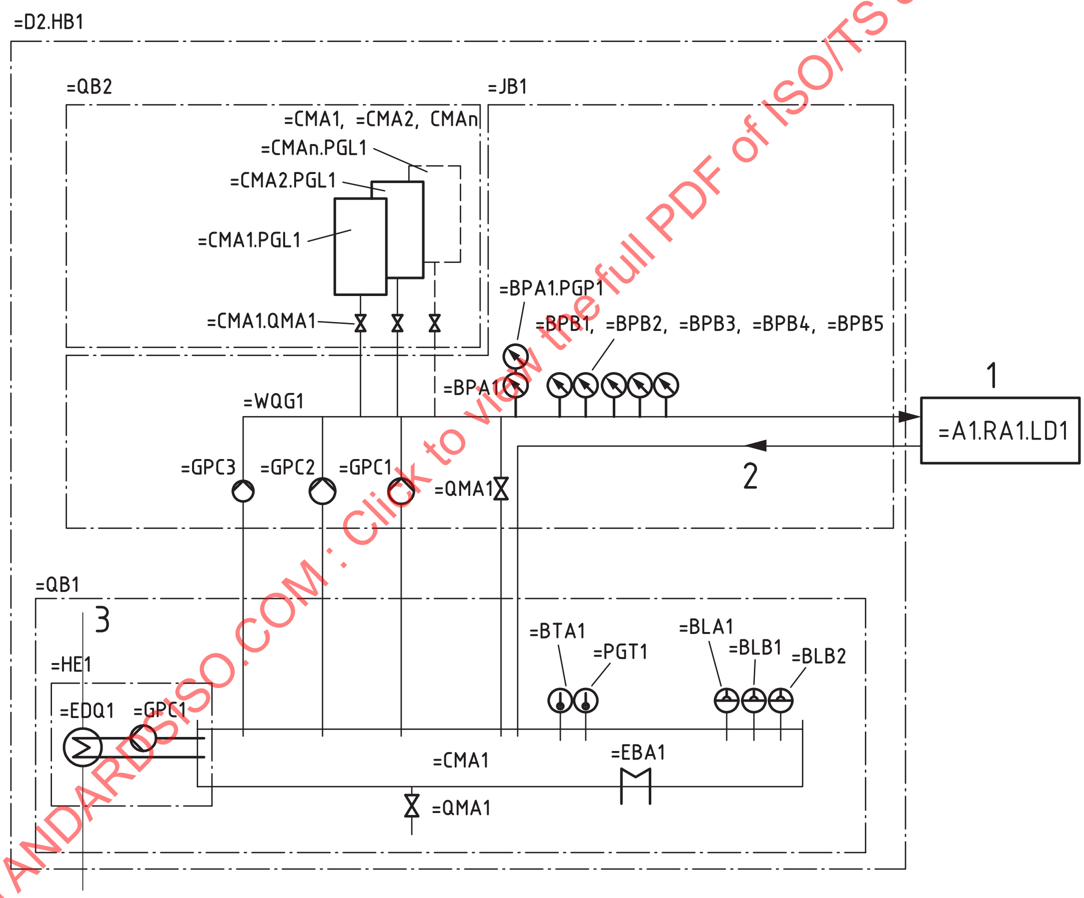
Table 5 shows the reference designations that are visible in Figure 41:

Table 5 — Example of a generator excitation system

Parent level	4th level	5th level	Description
=A1.RA1.LD1	—	—	Unit 1, Generator excitation system
=A1.RA1.LD1	=KEB1	—	Automated voltage regulator (AVR)
=A1.RA1.LD1	=KEB1	=BCA2	Field current transformer
=A1.RA1.LD1	=KEB1	=TBA1	Rectifier (AC/DC)
=A1.RA1.LD1	=QAB1	—	Field breaker
=A1.RA1.LD1	=FAB1	—	Varistor
=A1.RA1.LD1	=BUB1	—	Protection, detector

11.2 High pressure oil supply system

Figure 42 shows an example of an oil supply system in what can be a part of a piping and instrumentation diagram.



Key

1	turbine governing system
2	returning oil
3	air
=D2.HB1	high pressure oil system – supply system 1
=JB1	oil distribution system
=WQG1	main distribution pipe
=CMAn	oil tank *n*
=PGL1	tank *n*, level indicator

=QMA1	tank *n*, shutoff valve
=BPA1	pressure sensor
=BPA1.PGP1	pressure sensor, pressure indicator
=BPBn	pressure switch *n*
=GPC1	circulation pump 1
=GPC2	circulation pump 2
=GPC3	circulation pump 3 (“jockey” pump)
=QB1	oil storage system
=CMA1	oil sump
=BTA1	temperature measurement
=PGT1	temperature indicator
=BLA1	level measurement
=BLB1	level switch (L<L)
=BLB2	level switch (L<LL)
=EBA1	oil sump heater
=QMA1	sump draining valve
=HE1	oil cooling valve
=GPC1	pump
EDQ1	cooler (heat exchanger)

Figure 42 — Example of an oil supply system in the functional aspect

12 Implementation guidelines

12.1 A recommended aspect

The RDS provides the means to identify any given object through its multiple occurrences in the different aspects. Any IT system handling large quantities of information requires a structure to organize the information it uses and potentially creates. Depending on the nature and purpose of the IT system, one aspect can be more adequate than the others.

Table 6 lists some recommended predominant aspects for different purpose IT systems.

Table 6 — Recommended aspects for different uses

(=) Functional aspect	(-) Product aspect	(++) Location aspect	(%) Type aspect
— Automation systems — Data historians — Condition monitoring systems — Process models (e.g. production planning systems) — Supervisory Control and Data Acquisition (SCADA)	— Assembly schematics — Maintenance systems — Spare part systems — Asset documentation archive	— 3D-visualization systems — GIS systems — Maps	— System catalogues — Requirement databases — Variant library

The information structures within a system (using predominantly one aspect) will provide the means to identify systems within that aspect. Once reached, the object of interest should be represented by an information node, to which information can be attached. Depending on the nature of the IT system, this can be information such as the system vendor, size, datapoints, maintenance history, etc.

Also attached to the nodes should be the object occurrences in the other aspects. For example, when searching through the data historian for data on a particular temperature measurement, the temperature sensor occurrence in the product aspect should be added. This provides a link to the maintenance system and the sensor calibration history.

12.2 Depth and structure complexity

System models should contain subsystems in levels down to the lowest level of interest, and never further. The product aspect can be used to model and structure the most minute details in a system. The structures can in fact provide an RD to every single bolt and screw. It is useful to keep in mind that a model can be expanded whenever a need arises.

A master model including minute details about mostly insignificant components such as couplings, bolts and screws should be avoided on power plant sized models. The wealth of information on a mostly insignificant detail level would likely be worth neither the creation nor the upkeep.

Any system supplied with an RDS model by the manufacturer can be modelled differently when applied in a larger system. System manufacturers and operators have different sets of needs and requirements to the depth of the structure.

The object in question would in a such a case be part of different structures:

— one created by the system supplier;

— one created by the system operator.

These two structures should be distinguished by their top node, and metadata attached.

Figure 43 shows the difference between the structure of a computer mouse, and the structure of the user workstation in which the mouse is incorporated.

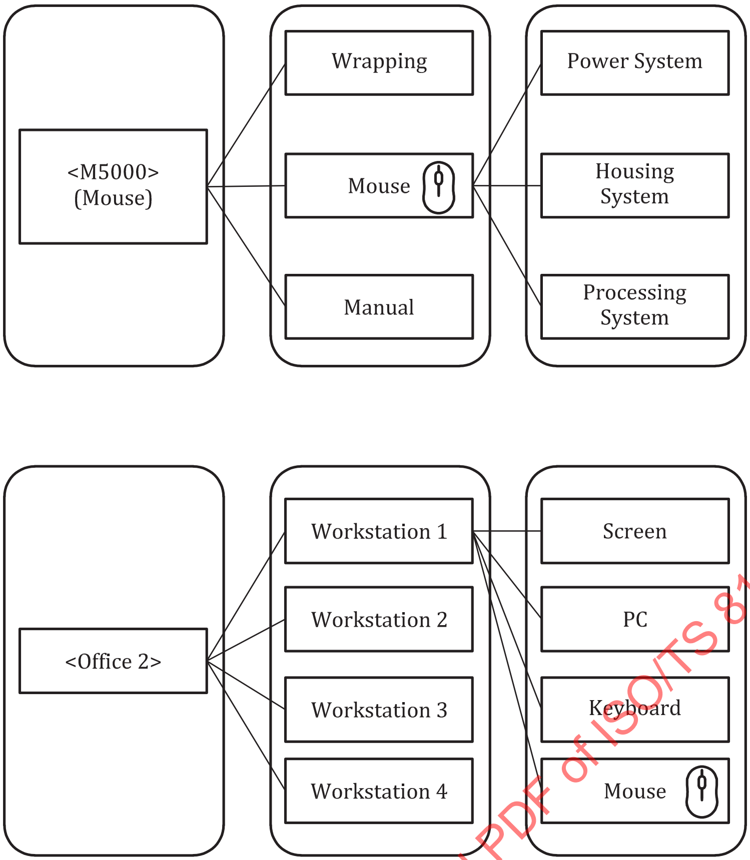


Figure 43 — Model comparison between a computer mouse supplier (upper part) and user (lower part), both figuring a computer mouse

It would be possible to add all details provided by the supplier to the operator model (e.g. adding reference designations for every input on every mouse in the company workstation model): -Office2.Workstation1.Mouse1.InputSystem1.Input2

However, the full structure of the mouse subcomponents (the part provided by the supplier) is not of any interest to most users. It should be kept in the data archives for future.

Identifying the different structures should be done with the use of the top node.

EXAMPLE

<Office2>-Workstation1.Mouse1

<M5000>-Mouse1

12.3 One object performing multiple functions

12.3.1 Multiple functions and Single Source of Truth (SSOT) within one system

Two distinct occurrences within one structure fulfilling different functions, are occurrences of two distinct objects. However, it is not uncommon that one object individual performs multiple tasks. For the functional aspect, this is irrelevant: if two different functions are performed, they should be represented by two distinct occurrences in the functional aspect.

This is not the case for the product aspect, where only one occurrence can exist for any given object.

As an example, Figure 44 shows an oil temperature measurement system which is part of a bearing protection system. The bearing oil outlet runs to an automated oil quality monitoring system, which also uses the oil temperature measurement. These temperature measurement systems have distinct RDs (within the same structure), one belonging to a protection system (=...PF1.BTA1), one to a condition monitoring system (=...LE3.BTA1): Two different object occurrences, two different reference designations. In fact, it is one single physical object individual (asset), with the temperature measurement data branching out to two different functions.

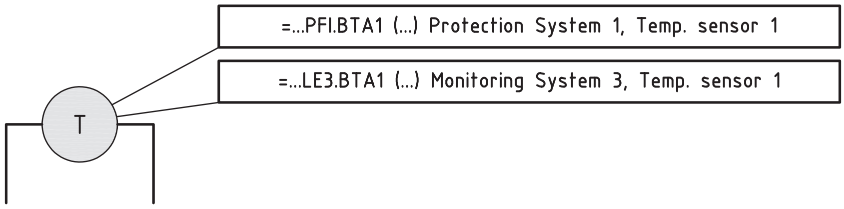


Figure 44 — Example of an object individual performing multiple functions

Although unproblematic from an RDS point of view, multiple functions associated with one single system can present problems in a digital system. Both occurrences represent information nodes where the same information would figure twice.

As illustrated in Figure 45, the information attached to the device can in this case potentially be duplicated (two sets of information belonging to the same object individual can be attached to each occurrence in the structure). This is usually quite problematic and a severe liability to the information quality, as nothing stops these two entries from being handled differently (e.g. an updated piece of information can be added to only one of the entries).

This is a specialized case where the Single Source of Truth (SSOT) can be determined within a specific system.

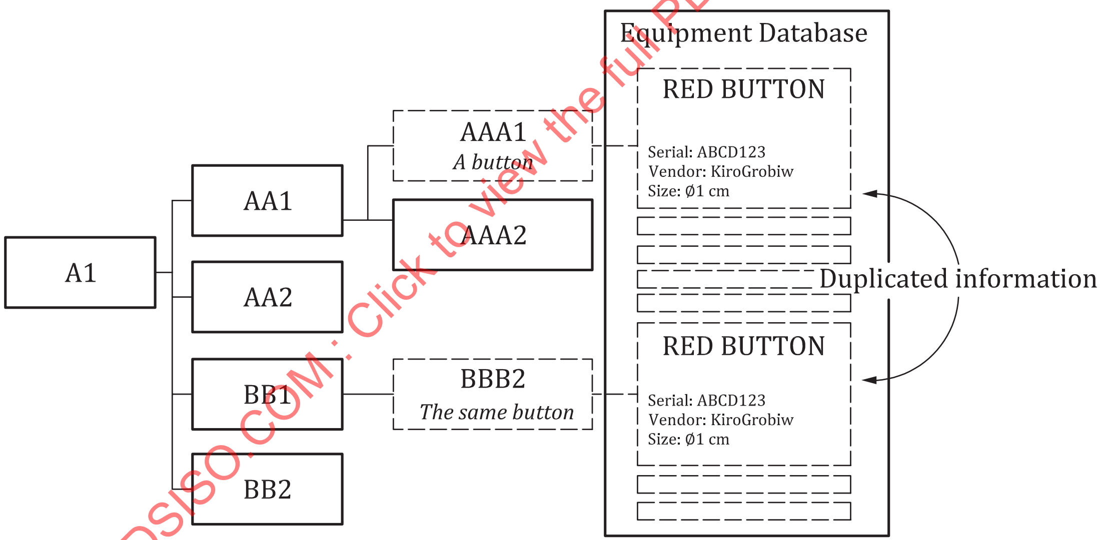


Figure 45 — Illustration of the problem attaching information to multiple RDS occurrences referring to the same object individual

There are several ways of handling the issue, they will be presented in 12.3.2, 12.3.3 and 12.3.4.

To designate the relation between two RDs sharing the same object individual, the relationship classification system (see Clause 8) can be used, specifically the class QA, indicating "shared object individual": =...PF3.BTA1|QA|=...LE1.BTA1

12.3.2 Strict singular product aspect occurrence

Unlike the functional aspect, the product aspect should not accept multiple occurrences from the same object individual (within one model/structure).

As illustrated in Figure 46, when all information related to the object individual ("asset information") relevant to a system in the functional aspect is kept in a system based on the product aspect, no duplication of this information should be possible.

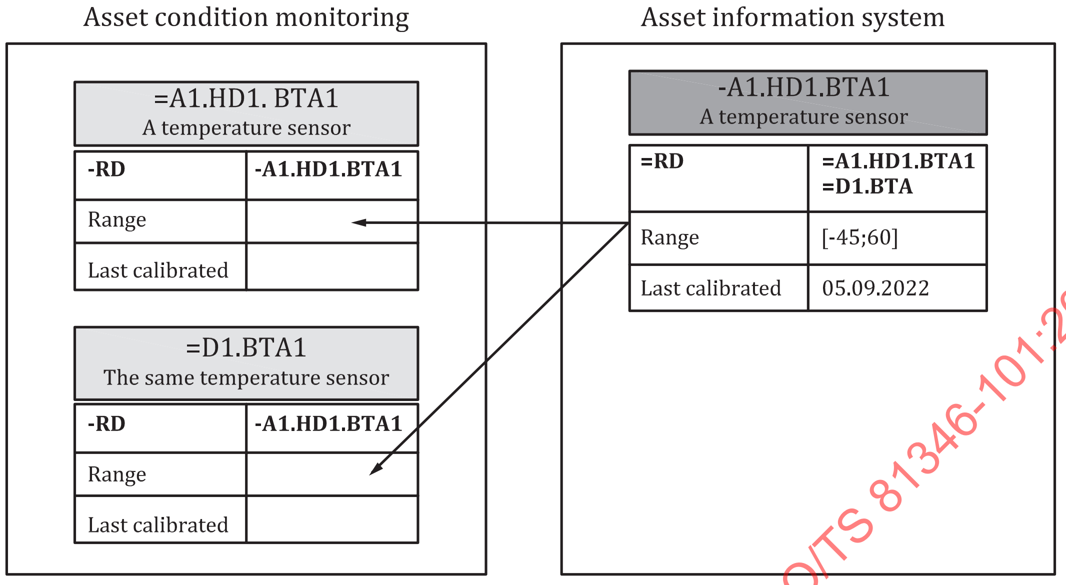


Figure 46 — Example of use of a singular product aspect occurrence-based information system

Some attributes are of a strictly functional nature, and should be attached to the relevant function occurrence (e.g. alarm thresholds of a temperature sensor). Depending on the function, a setting or attribute can be different from occurrence to occurrence even if they both designate the same object individual (e.g. a temperature threshold can trigger a heating system in a local automation system, but the same measurement can trigger a shutdown for another threshold in a protective system). The chances for duplicated information are smaller when all information related to the object individual ("asset" information) is owned by a product aspect based information system (since multiple occurrence for the same individual should not occur in this aspect).

Some functional occurrences do not have an occurrence in the product aspect. If this is the case, the functional occurrence will likely not require any asset information (weight, dimensions, vendor, etc.) as it probably will not have a physical presence (e.g. an aggregated alarm function).

12.3.3 Digital Object Identifier (DOI)

ISO 26324 proposes a method to create a digital object identifier (DOI), a persistent identifier (handle) that can be used to uniquely identify object individuals.

By using the DOI as specified in ISO 26324 as an intermediate between the object occurrence and the information attached to the object individual ("asset information") no information is duplicated.

The DOI and RDS are complementary, as the RDS identifies and structures object occurrences, while the DOI identifies single object individuals in a flat structure (i.e. which requires a mean to identify and retrieve the information in a structured manner).

The example shown in Figure 47 shows how two RD-based systems pull data from the individual object database (IOD). This last system, IOD, contains potentially many millions of entries in a flat structureless database. The RD-based systems linked to the IOD provide a tool for navigating the assets and retrieving information from the IOD. In turn, the IOD provides the SSOT for data used/made available on many other platforms and systems.

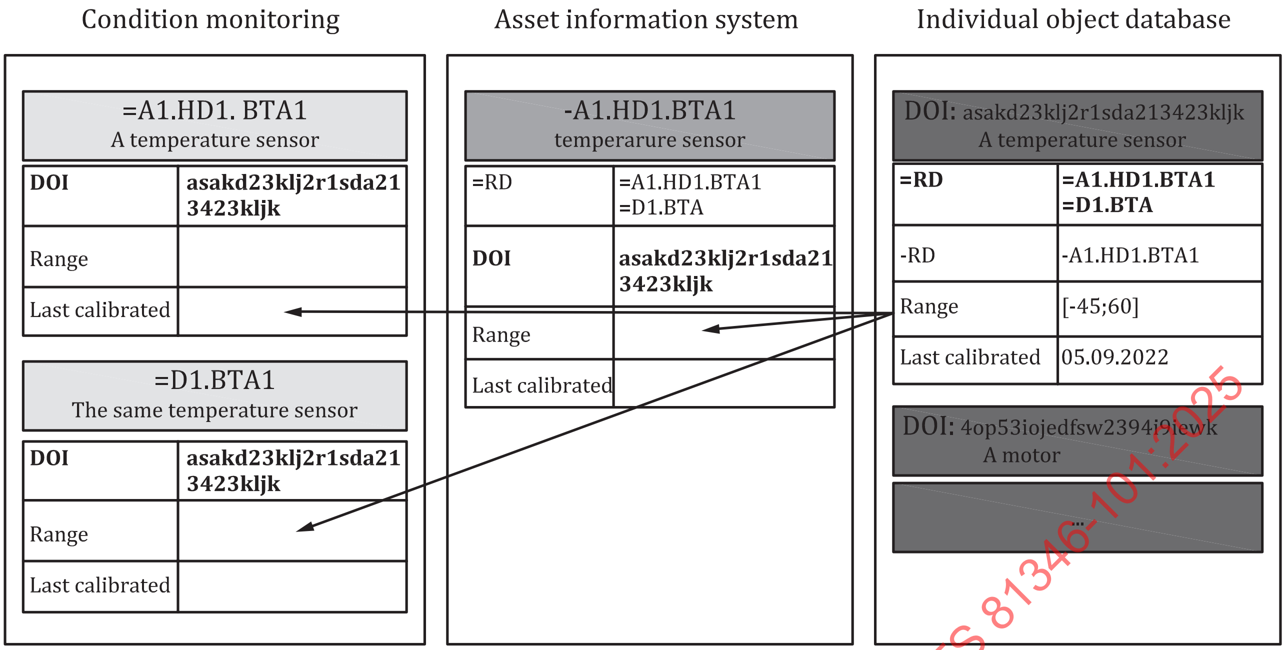


Figure 47 — Example of use of a DOI system to avoid duplicated information problems in databases

12.3.4 Preferred reference designations (PRD)

If there are still issues concerning potential information duplication within a system, then the PRD should be the preferred repository of information.

Among the function occurrences of any one object within the same system, one (the PRD) should be selected as the owner of common attributes and information. All other RDs should mirror/refer to the PRD.

Figure 48 shows how data should be made available (referred to) by the secondary occurrences by pointing to the PRD, instead of having information associated to it directly.

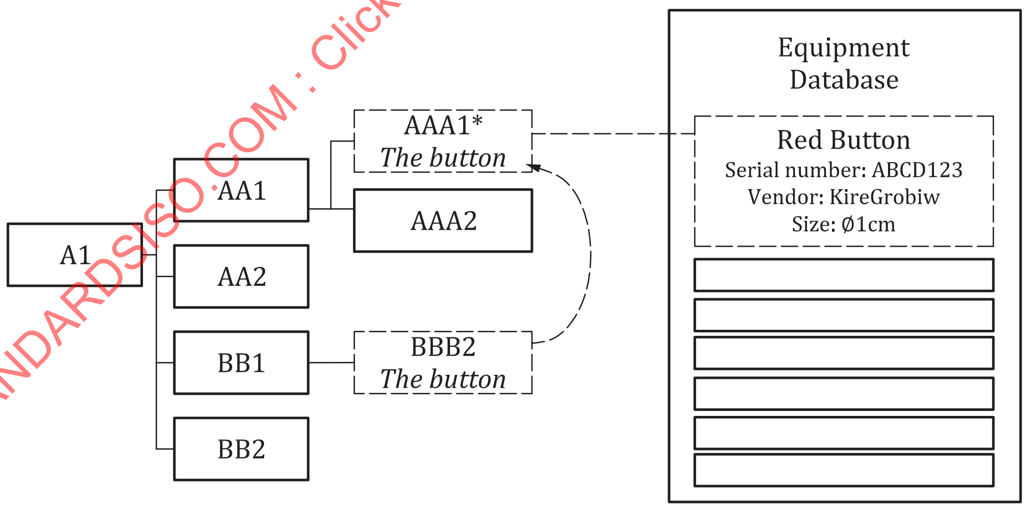


Figure 48 — Example of use of a PRD system to avoid duplicated information problems in databases

Figure 49 shows a set of suggestions to determine which of the occurrences should be the PRD.

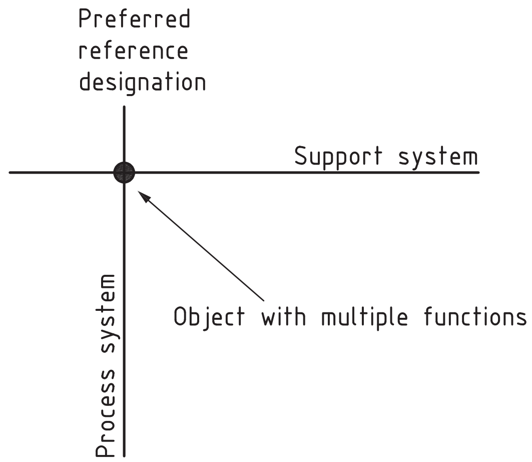
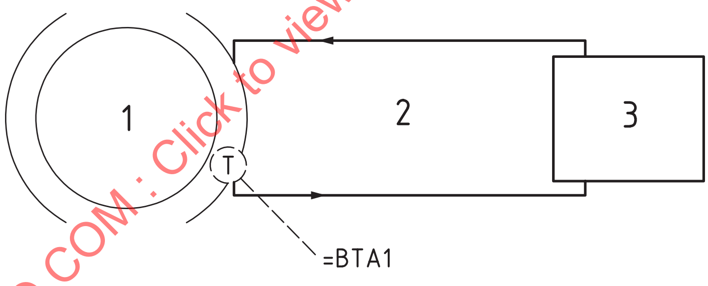


Figure 49 — Preferred reference designation

As a general guideline the allocation of data should go to vertical systems (i.e. systems that follow the process flow) before horizontal ones (i.e. systems supporting the main process, or common to several main processes). For the prime systems (one-letter code classes in ISO 81346-10:2022, RDS-PS), A-, C- and B-systems will be prioritized before D- or F-systems.

Within them, the one closest (within the chosen aspect) to the central process should be the primary RD. For RDS-PS the central process of any system is the energy conversion/electricity production or transmission, or both. This means that the one e.g. physically closest to the turbine shaft in a location aspect or, for the functionally aspect, the one closest (or part of) the energy conversion process.

As an example, in Figure 50 an oil temperature sensor (BTA) exists within the functional structure of the bearing itself (e.g. =A1.JF1.KJ3.BTA1). The same sensor fulfils another role as the temperature measurement function for the return oil in the oil supply system (e.g. =D1.HE1.JB3.BTA1).



Key

1 bearing system =A1.JF1.KJ3

2 lube oil supply system 1, circulation system 3, =D1.HE1.JB3

3 heat exchanger

Figure 50 — Bearing oil exit temperature measurement system

These are two separate functions, even part of two different prime systems (=A1 and =D1). It is however, by coincidence, the same sensor that provides the information to both systems. From a functional point of view, it is irrelevant (i.e. these are two distinct objects since they perform two distinct functions), but it does present a challenge when information is to be added to the model.

The RD pointing to the sensor as a part of the unit 1 system (= A1.JF1.KJ3.BTA1), i.e. part of an A-system, is a vertical system, it is the primary RD. The oil supply system (=D7.HE1.JB3) is a horizontal system.

12.4 Simplification/adaptation guideline

12.4.1 General

Reference designations can be required to be simplified for specific uses within certain software or digital systems, e.g. for systems that do not permit the use of the prefix-characters (=, -, +, %). The user should be aware that when simplification rules are applied, the tags are not in accordance with the ISO 81346 and IEC 81346 series. Simplifications should only be used when strictly necessary. If relevant, simplified RD tags should only feature in official documentation when describing the simplification itself, along with a mandatory listing of the simplification rules applied.

Some simplification rule suggestions are proposed in 12.4.2 and 12.4.3.

12.4.2 Function aspect for signal structuring

When using the RDS as object reference for signal tags, the prefixes are often not accepted (as in the case of the IEC 61850-7 series). A simplification to avoid the problem is to only allow the use of the functional aspect for signal structuring. With this rule established, the prefix is superfluous and may be omitted.

The same rule can also be applied for the angle brackets (“< … >”) identifying the top node of a reference designation, if the top node structure allows it.

12.4.3 Omitting full stops “.” in between RDS levels

Since every level of a reference designation starts with letters and ends with numbers, full stops in between levels may be omitted, and the reference designations is still machine-readable. This harms the readability of the tag but allows the use of them in demanding digital tools.

The same rule can also be applied to:

— the aspect prefix, if the setting makes the chosen aspect certain;

— the top node of the reference designations, if the top node structure allows it. This is why it is suggested that all top node information follow the same pattern of starting a piece of information with letters and ending with numbers.

EXAMPLE <PP1.PS1>=A1.KA1 can be reduced to: PP1PS1A1KA1

Annex A
(informative)

Example of use — The circuit breaker

Figure A.1 and Table A.1 provide a more detailed example of the designation and use of the aspects for a particular component. The object of interest is a circuit breaker ("CB") in a cubicle placed on the first floor of a small substation building.

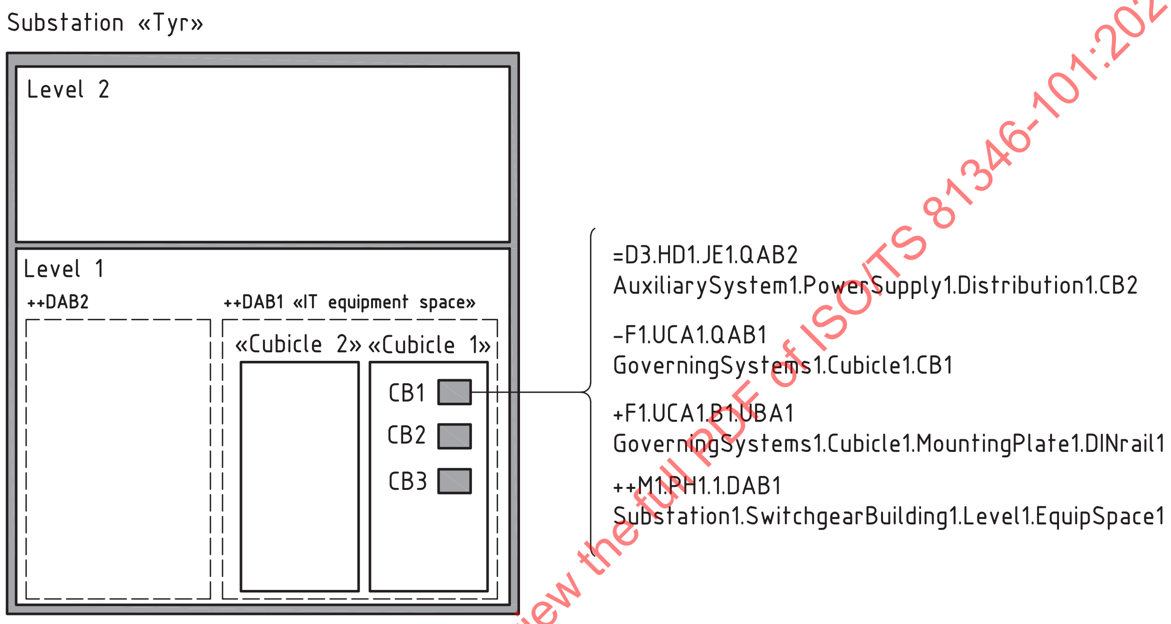


Figure A.1 — RD-set of a circuit breaker

Table A.1 — Designation and use of the aspects — RD-set of a circuit breaker

Aspect [a]	RD (see Figure A.1)	Explanation (see Figure A.1)
=	AuxiliarySystem1.PowerSupply1.CircuitBreaker2	The CB is a part of an auxiliary power supply system (=D3.HD1) in substation "Tyr". The function aspect reference designation of the CB will be used in e.g. single line diagrams of the power distribution system.
-	GoverningSystems1.Cubicle1.CB1	The CB is a part of the cubicle 1 (=F1.UCA1). The cubicle is a generic cubicle used for hosting miscellaneous objects which are part of different systems. This will not be visible from the product point of view, which presents a structure of the physical constituents within the cubicle. All items placed inside the cubicle will be a part of the cubicle (=F1.UCA1), also CB3 (=F1.UCA1.QAB3), which is a part of the building ventilation system).
+	GoverningSystems1.Cubicle1.MountingPlate1.DINrail1	The host of installation will tell where the CB is mounted. The first part points to the cubicle. This is repeating the product designation of the cubicle (the host).
++	Substation1.SwitchgearBuilding1.Level1.EquipSpace1	The site of installation contains general information of the location of a system. The aspect designates a space (in contrast to the other aspects designating systems/objects). It is an aspect which should remain on a high granulation level designating larger spaces (rooms and potentially zones within the plant).
[a] Function aspect (=), product aspect (-), host of installation aspect (+), site of installation aspect (++)		

Annex B
(informative)

Example of use — Creation and evolution of an RD-set

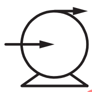
B.1 General

This annex describes the creation and evolution of a system (in this case a pump) throughout the system lifetime.

B.2 Step 1

Early in the design phase, it is known that a pumping system (two redundant pumps) will be needed to evict drain water from the plant. This information is enough to designate the pumps within a product structure, e.g. -H2.JB1.KE1.GPA1 (Plant drainage system 1, drain water transportation system 1, pump system 1, pump 1).

In this situation the functional aspect would follow the structure of the product aspect and the pump functional aspect reference designation would be the same as the product aspect =H2.JB1.KE1.GPA1. See Figure B.1 for the evolution of the RD-set.



Drain Pump 1 — RD-set:
-H2.JB1.KE1.GPA1
=H2.JB1.KE1.GPA1

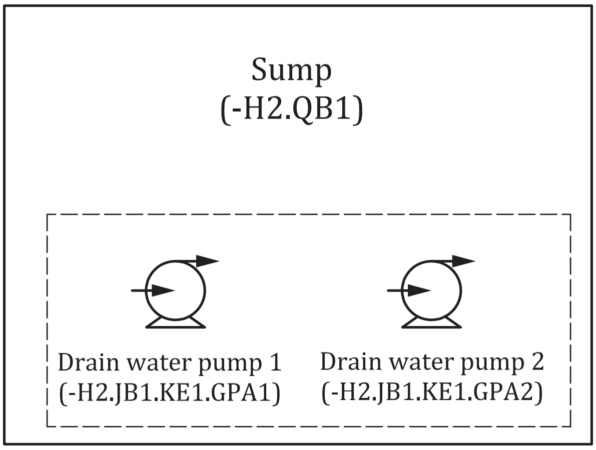
Figure B.1 — Example for the creation and evolution of an RD-set — Step 1

B.3 Step 2

A rough sketch of the plant has been made, it is assumed that the pumps will be standing on a platform within the drain water collection system itself, the “sump” (-H2.QB1 Plant drainage system 1, Liquid storage system 1). See Figure B.2 for the evolution of the RD-set.

A location (point of installation) reference can be set, as the hosting system is defined in the product structure.

The platform on which the pumps are placed will be modelled (in the product aspect) as sub-systems of the pump system (-H2.JB1.KE1.AA1), because the platform is a support system dedicated to the pumps.



Drain Pump 1 — RD-set:
-H2.JB1.KE1.GPA1
=H2.JB1.KE1.GPA1
+H2.QB1

Figure B.2 — Example for the creation and evolution of an RD-set — Step 2

B.4 Step 3

The design and planning phase (step 2, see Clause B.3) goes into more detail. There is delivery time for these large pumps so orders to suppliers should preferably be made quite fast. Different pump types are available (%GPA1, %GPA2, ...). Type %GPA2 was selected and deemed well suited for the task. See Figure B.3 for the evolution of the RD-set.

Drain Pump 1 — RD-set:
-H2.JB1.KE1.GPA1
=H2.JB1.KE1.GPA1
+H2.QB1
%GPA2

Figure B.3 — Example for the creation and evolution of an RD-set — Step 3

B.5 Step 4

Plans are being drawn for the power station. The sump is obviously placed at the power station bottom level, which has the following site of installation reference: ++C1.CA1.1. The space allocated to the sump is given the reference ++CAE1. Since the pumps are within this space, it is this space that also represents their site of installation.

For further information, it is being stated in the documentation that the sump represents a storage space for water, i.e. %%CAE3.

The pump system platform can also be given its own site of installation reference, within the sump system (e.g.: ++C1.CA1.1.CAE1.DAC1); however the reference pointing to the sump was considered accurate enough. See Figure B.4 for the evolution of the RD-set.

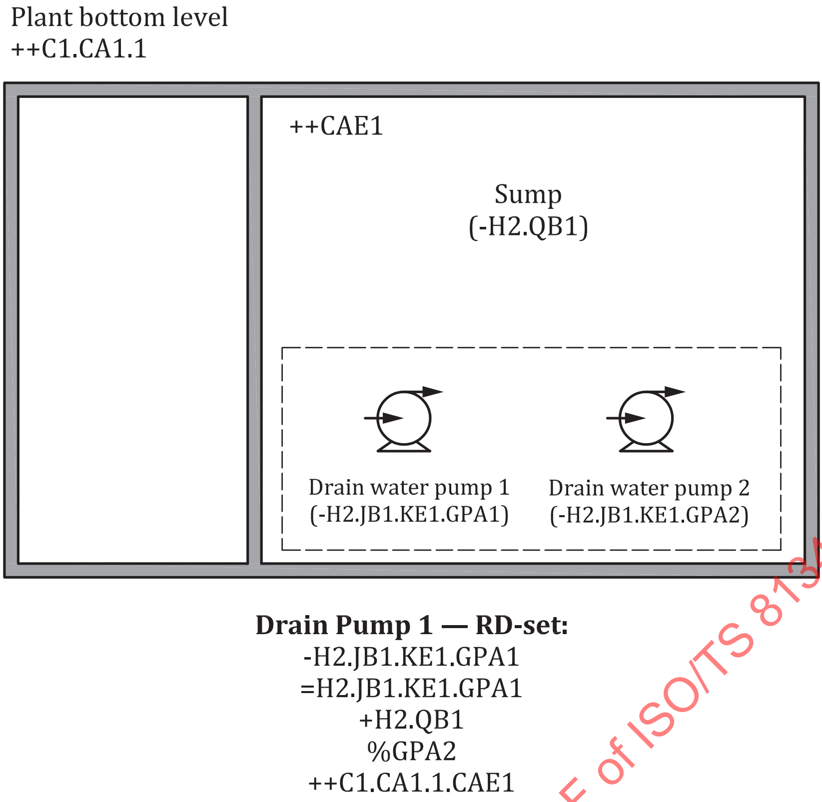


Figure B.4 — Example for the creation and evolution of an RD-set — Step 4

B.6 Step 5

In an effort to avoid expensive system redundancy (Drain pump 2 =H2.JB1.KE1.GPA2), a monitoring system was ordered for the pump system (=H2.JB1.KE1.LE1). The redundant pump 2 was removed and replaced with a cheaper emergency backup system. This system is considered an automated reservoir overflow protection system. It is functionally a sub-system to the sump system (=H2.QB1), the backup system reference designation is =H2.QB1.PF1/H2.QB1.PF1.

This choice is also affected by the type of pump 1, as a more sturdy and reliable type was chosen (%GPA7). There are no other consequences for the other aspects. See Figure B.5 for the evolution of the RD-set.

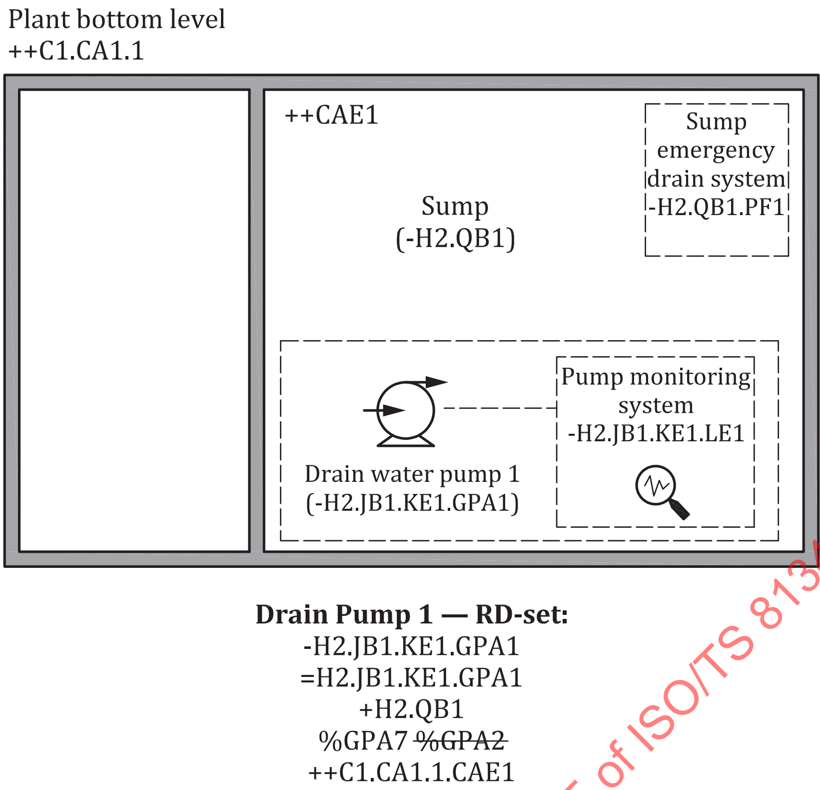


Figure B.5 — Example for the creation and evolution of an RD-set — Step 5

B.7 Step 6

During the construction process a choice was made to create a separate technical space (++C1.CA1.1.DBA1) next to the sump (++C1.CA1.1.CAE1) to host the sump monitoring and control systems (=H2.QB1.LA1). This is also where an individual emergency off-switch (SJA) for pump 1 was to be placed.

Because of the existing structures and the placement of the switch within the hierarchies, it is an easy task to allocate reference designations to the switch:

— Functionally it is a sub-system of the pump (=H2.JB1.KE1.GPA1.SJA1);

— Within the product aspect the switch is part of the control system cabinet;

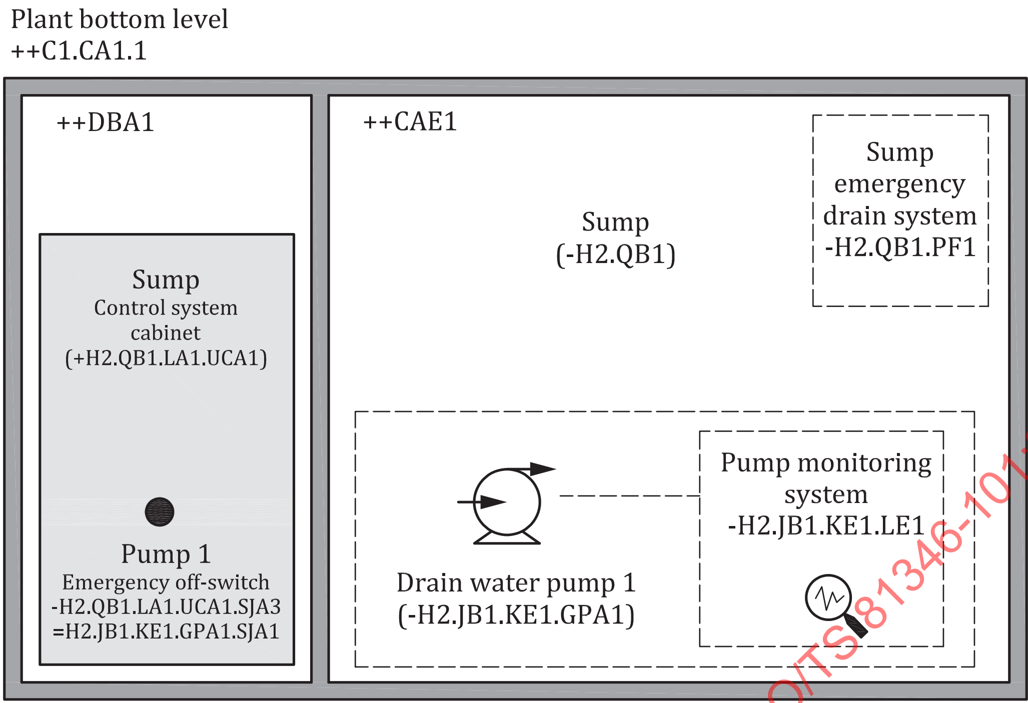
— The point of installation (the physical host-system) is also the control system cabinet;

NOTE No relevant information comes from the point of installation RD in this case, as the switch is located in the parent system in the product aspect. It can be considered omitting the RD in the RD-set.

— No SJA-type has been selected;

— The site of installation (reference designation of the space where the object can be found) is the technical space created for the control equipment (++C1.CA1.1.DBA1).

See Figure B.6 for the evolution of the RD-set.



Drain Pump emergency off-switch — RD-set:
=H2.JB1.KE1.SJA1
-H2.QB1.LA1.UCA1.SJA1
(+H2.QB1.LA1.UCA1)
NO TYPE
++C1.CA1.1.DBA1

Figure B.6 — Example for the creation and evolution of an RD-set — Step 6

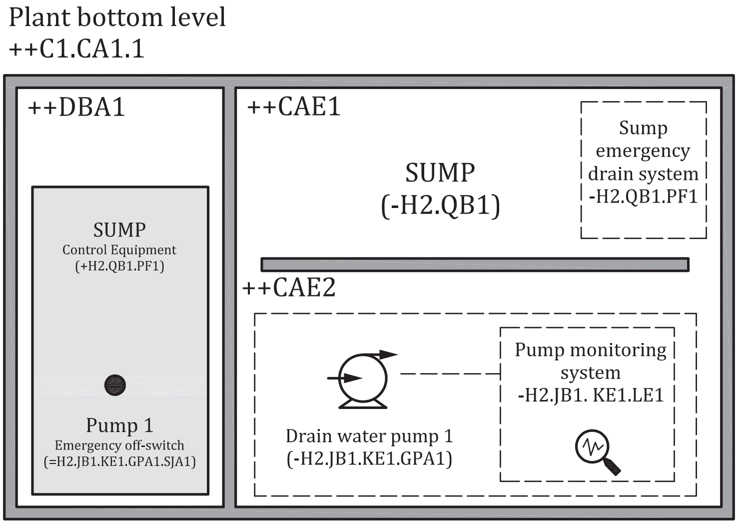
B.8 Step 7

It was decided to divide the sump into two (connected) chambers. By creating two spaces a renaming of the site of installation aspect of the pump was necessary.

The change was only of a physical geographic nature, i.e. only the one aspect representing this view of the object (the point of installation aspect) was changed.

No changes had to be done to the maintenance system, based on the functional system, the support documentation in the product aspect, the BIM model based on the point of installation.

See Figure B.7 for the evolution of the RD-set.



Drain Pump 1 — RD-set:
=H2.JB1.KE1.SJA1
-H2.QB1.LA1.UCA1.SJA1
+H2.QB1
%GPA7
++C1.CA1.1.CAE2 ~~++C1.CA1.1.CAE1~~

Figure B.7 — Example for the creation and evolution of an RD-set — Step 7

Annex C
(informative)

Example of a class conversion table

Table C.1 shows an example of a conversion table between the proposed classes of a structuring system in this document and the classes specified in other parts of the ISO 81346 and IEC 81346 series.

The column "Parent class code" contains suggestions for the one-letter code classes from RDS-PS, the most likely parent system.

The column "System class code" contains suggestions for the two-letter code classes from RDS-PS. The entry "Space" means that it is not a system but should be found in the space tables of IEC 81346-2. The entry "Construction works" means that the system is most likely a part of the building and should be classified according to ISO 81346-12. If the system class code is "N/A", it was not possible to make the mapping with the current knowledge.

Table C.1 — Conversion between the proposed classes of a structuring system in this document and the classes specified in the other parts of the ISO 81346 and IEC 81346 series

System codes			Classes RDS-PS			
S1	**S2**	**S3**	**Parent class code**	**System class code**	**Type aspect**	**Class definition**
A			=B			**power supply system transporting electric power**
	AA					
		AAA	=B	LA		monitor and/or control system in a central unit for process operation
		AAB	=B	LE		monitor and/or control system which provides data acquisition
		AAC	=B	LA		monitor and/or control system in a central unit for process operation
		AAF	=B	JH		transport or distribution system for data
		AAG	=B	HD		supply system for electrical energy
		AAK	=B	JE		transport or distribution system for electrical energy
		AAL	=B	LE		monitor and/or control system which provides data acquisition
		AAM	=B	LE		monitor and/or control system which provides data acquisition
		AAN	=B	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
		AAS	=B	LE		monitor and/or control system which provides data acquisition
	AB					
		ABA	=B	JE		transport or distribution system for electrical energy
		ABC	=B	JE		transport or distribution system for electrical energy
		ABE	=B	JE		transport or distribution system for electrical energy

Table C.1 *(continued)*

System codes			Classes RDS-PS			
S1	**S2**	**S3**	**Parent class code**	**System class code**	**Type aspect**	**Class definition**
		ABG	=B	JE		transport or distribution system for electrical energy
		ABP	=B	PG	%PG1	protection system against electrical fault
		ABS	=B	LD		monitor and/or control system which provides regulation of voltage, load and/or frequency
	AC					
		ACA	=B	JE		transport or distribution system for electrical energy
		ACP	=B	PG	%PG1	protection system against electrical fault
		ACS	=B	LD		monitor and/or control system which provides regulation of voltage, load and/or frequency
	AD					
		ADA	=B	JE		transport or distribution system for electrical energy
		ADC	=B	JE		transport or distribution system for electrical energy
		ADE	=B	JE		transport or distribution system for electrical energy
		ADP	=B	PG	%PG1	protection system against electrical fault
		ADS	=B	LD		monitor and/or control system which provides regulation of voltage, load and/or frequency
	AE					
		AEA	=B	JE		transport or distribution system for electrical energy
		AEC	=B	JE		transport or distribution system for electrical energy
		AEE	=B	JE		transport or distribution system for electrical energy
		AEG	=B	JE		transport or distribution system for electrical energy
		AEP	=B	PG	%PG1	protection system against electrical fault
		AES	=B	LD		monitor and/or control system which provides regulation of voltage, load and/or frequency
	AF					
		AFA	=B	JE		transport or distribution system for electrical energy
		AFP	=B	PG	%PG1	protection system against electrical fault
		AFS	=B	LD		monitor and/or control system which provides regulation of voltage, load and/or frequency
	AG					
		AGA	=B	JE		transport or distribution system for electrical energy
		AGP	=B	PG	%PG1	protection system against electrical fault
		AGS	=B	LD		monitor and/or control system which provides regulation of voltage, load and/or frequency
	AH					

Table C.1 *(continued)*

System codes			Classes RDS-PS			
S1	**S2**	**S3**	**Parent class code**	**System class code**	**Type aspect**	**Class definition**
		AHA	=B	JE		transport or distribution system for electrical energy
		AHP	=B	PG	%PG1	protection system against electrical fault
		AHS	=B	LD		monitor and/or control system which provides regulation of voltage, load and/or frequency
	AJ					
		AJA	=B	JE		transport or distribution system for electrical energy
		AJP	=B	PG	%PG1	protection system against electrical fault
		AJS	=B	LD		monitor and/or control system which provides regulation of voltage, load and/or frequency
	AK					
		AKA	=B	JE		transport or distribution system for electrical energy
		AKP	=B	PG	%PG1	protection system against electrical fault
		AKS	=B	LD		monitor and/or control system which provides regulation of voltage, load and/or frequency
	AL					
		ALA	=B	JE		transport or distribution system for electrical energy
		ALP	=B	PG	%PG1	protection system against electrical fault
		ALS	=B	LD		monitor and/or control system which provides regulation of voltage, load and/or frequency
	AM					
		AMA	=B	JE		transport or distribution system for electrical energy
		AMP	=B	PG	%PG1	protection system against electrical fault
		AMS	=B	LD		monitor and/or control system which provides regulation of voltage, load and/or frequency
	AN					
		ANA	=B	JE		transport or distribution system for electrical energy
		ANB	=B	JE		transport or distribution system for electrical energy
		ANC	=B	HD		supply system for electrical energy
		AND	=B	KF		treatment system for transforming electrical energy
		ANE	=B	JE		transport or distribution system for electrical energy
		ANF	=B	JE		transport or distribution system for electrical energy
		ANG	=B	HD		supply system for electrical energy
		ANH	=B	KF		treatment system for transforming electrical energy
		ANJ	=B	HD		supply system for electrical energy
		ANK	=B	JE		transport or distribution system for electrical energy

Table C.1 *(continued)*

System codes			Classes RDS-PS			
S1	**S2**	**S3**	**Parent class code**	**System class code**	**Type aspect**	**Class definition**
		ANM	=B	QD		storage system for electrical energy
		ANN	=B	KF		treatment system for transforming electrical energy
		ANP	=B	HD		supply system for electrical energy
		ANQ	=B	JE		transport or distribution system for electrical energy
		ANR	=B	JE		transport or distribution system for electrical energy
		ANS	=B	QD		storage system for electrical energy
		ANT	=B	KF		treatment system for transforming electrical energy
		ANU	=B	HD		supply system for electrical energy
		ANV	=B	LD		monitor and/or control system which provides regulation of voltage, load and/or frequency
	AP					
		APA	=B	PC		protection system against dangerous electrical currents by earthing of electrical systems
		APB	=B	PC		protection system against dangerous electrical currents by earthing of electrical systems
		APC	=B	PD		protection system against lightning
		APD	=B	PD		protection system against lightning
		APG	=B	PD		protection system against lightning
		APS	=B	PC		protection system against dangerous electrical currents by earthing of electrical systems
	AS					
		ASA	=B	LD		monitor and/or control system which provides regulation of voltage, load and/or frequency
		ASA	=B	LE		monitor and/or control system which provides data acquisition
		ASB	=B	LE		monitor and/or control system which provides data acquisition
		ASF	=B	PG	%PG2	protection system against electrical fault
		ASK	=B	LE		monitor and/or control system which provides data acquisition
		ASP	=B	LB	%LB1	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
		ASW		Construction works		
	AT					
		ATA	=B	KF		treatment system for transforming electrical energy
		ATD	=B	KF		treatment system for transforming electrical energy
		ATG	=B	KL		Treatment system controlling a flow of electrical energy
	AV					

Table C.1 *(continued)*

System codes			Classes RDS-PS			
S1	**S2**	**S3**	**Parent class code**	**System class code**	**Type aspect**	**Class definition**
		AVA	=B	QC		storage system for solid matter
	AW					
		AWA	=B	KC	%KC2	treatment system for separating substances
		AWB	=B	PJ		protection system against human injury
	AX					
		AXA	=B	HE		supply system for heating and/or cooling
		AXB	=B	PA		protection system against fire
		AXC	=B	HD		supply system for electrical energy
		AXD	=B	HB		supply system for liquid matter
		AXE	=B	HB		supply system for liquid matter
		AXF	=B	HA		supply system for gaseous matter
		AXG	=B	JB	%JB5	transport or distribution system for liquid matter
		AXH	=B	JC	%JC2	transport or distribution system for solid matter
		AXJ	=B	JC		transport or distribution system for solid matter
		AXK	=B	JC		transport or distribution system for solid matter
		AXK	=B	JB		transport or distribution system for liquid matter
		AXK	=B	JA		transport or distribution system for gaseous matter
		AXP		Construction works		
		AXQ		Construction works		
		AXR		AC		Structural system holding a supply or distribution system
		AXS		Construction works		
		AXT	=B	QC		storage system for solid matter
		AXX	=B	HB	%HB2	supply system for liquid matter
	AY					
		AYA	=B	KG		treatment system for bidirectional transforming between wireless and wired signals
		AYB		Construction works		
		AYC	=B	LA		monitor and/or control system in a central unit for process operation
		AYD	=B	LE		monitor and/or control system which provides data acquisition
		AYE	=B	JH		transport or distribution system for data
	AZ					
		AZA		Construction works		
		AZC	=B	Space		
		AZF		Construction works		

Table C.1 *(continued)*

System codes			Classes RDS-PS			
S1	**S2**	**S3**	**Parent class code**	**System class code**	**Type aspect**	**Class definition**
		AZG		Construction works		

B			=B			
	BB		=B			
		BBA	=B	HD		supply system for electrical energy
		BBB	=B	HD		supply system for electrical energy
		BBS	=B	LE		monitor and/or control system which provides data acquisition
		BBT	=B	KF		treatment system for transforming electrical energy
		BBX	=B	HB	%HB2	supply system for liquid matter
		BBY	=B	PG	%PG2	protection system against electrical fault
	BC		=B			
		BCA	=B	HD		supply system for electrical energy
		BCB	=B	HD		supply system for electrical energy
		BCS	=B	LE		monitor and/or control system which provides data acquisition
		BCT	=B	KF		treatment system for transforming electrical energy
		BCX	=B	HB	%HB2	supply system for liquid matter
		BCY	=B	PG	%PG2	protection system against electrical fault
	BD		=B			
		BDA	=B	HD		supply system for electrical energy
		BDB	=B	HD		supply system for electrical energy
		BDS	=B	LD		monitor and/or control system which provides regulation of voltage, load and/or frequency
		BDT	=B	KF		treatment system for transforming electrical energy
		BDV	=B	RD		energy conversion system between chemical energy and enthalpy
		BDX	=B	HB	%HB2	supply system for liquid matter
		BDY	=B	PG	%PG2	protection system against electrical fault
	BF		=B			
		BFA	=B	HD		supply system for electrical energy
		BFB	=B	HD		supply system for electrical energy
		BFC	=B	HD		supply system for electrical energy
		BFS	=B	LE		monitor and/or control system which provides data acquisition
		BFT	=B	KF		treatment system for transforming electrical energy

	BFX	=B	HB	%HB2	supply system for liquid matter
	BFY	=B	PG	%PG2	protection system against electrical fault
BG		=B			
	BGA	=B	HD		supply system for electrical energy
	BGB	=B	HD		supply system for electrical energy
	BGC	=B	HD		supply system for electrical energy
	BGS	=B	LE		monitor and/or control system which provides data acquisition
	BGT	=B	KF		treatment system for transforming electrical energy
	BGX	=B	HB	%HB2	supply system for liquid matter
	BGY	=B	PG	%PG2	protection system against electrical fault
BH		=B			
	BHA	=B	HD		supply system for electrical energy
	BHB	=B	HD		supply system for electrical energy
	BHC	=B	HD		supply system for electrical energy
	BHS	=B	LE		monitor and/or control system which provides data acquisition
	BHT	=B	KF		treatment system for transforming electrical energy
	BHX	=B	HB	%HB2	supply system for liquid matter
	BHY	=B	PG	%PG2	protection system against electrical fault
BK		=B			
	BKA	=B	HD		supply system for electrical energy
	BKB	=B	HD		supply system for electrical energy
	BKC	=B	HD		supply system for electrical energy
	BKS	=B	LD		monitor and/or control system which provides regulation of voltage, load and/or frequency
	BKT	=B	KF		treatment system for transforming electrical energy
	BKV	=B	HD		supply system for electrical energy
	BKX	=B	HB	%HB2	supply system for liquid matter
	BKY	=B	PG	%PG2	protection system against electrical fault
BL		=B			
	BLA	=B	HD		supply system for electrical energy
	BLB	=B	HD		supply system for electrical energy
	BLC	=B	HD		supply system for electrical energy
	BLS	=B	LD		monitor and/or control system which provides regulation of voltage, load and/or frequency
	BLT	=B	KF		treatment system for transforming electrical energy
	BLV	=B	HD		supply system for electrical energy
	BLX	=B	HB	%HB2	supply system for liquid matter
	BLY	=B	PG	%PG2	protection system against electrical fault
BM		=B			

		BMA	=B	JE		transport or distribution system for electrical energy
		BMB	=B	JE		transport or distribution system for electrical energy
		BMC	=B	JE		transport or distribution system for electrical energy
		BMS	=B	LE		monitor and/or control system which provides data acquisition
		BMU	=B	KF		treatment system for transforming electrical energy
		BMY	=B	PG	%PG2	protection system against electrical fault
	BP		=B			
		BPA	=B	HD		supply system for electrical energy
		BPB	=B	HD		supply system for electrical energy
		BPC	=B	HD		supply system for electrical energy
		BPS	=B	LE		monitor and/or control system which provides data acquisition
		BPU	=B	KF		treatment system for transforming electrical energy
		BPV	=B	QD		storage system for electrical energy
		BPY	=B	PG	%PG2	protection system against electrical fault
	BQ		=B			
		BQA	=B	HD		supply system for electrical energy
		BQB	=B	HD		supply system for electrical energy
		BQC	=B	HD		supply system for electrical energy
		BQS	=B	LD		monitor and/or control system which provides regulation of voltage, load and/or frequency
		BQU	=B	KF		treatment system for transforming electrical energy
		BQV	=B	QD		storage system for electrical energy
		BQY	=B	PG	%PG2	protection system against electrical fault
	BR		=B			
		BRA	=B	HD		supply system for electrical energy
		BRB	=B	HD		supply system for electrical energy
		BRC	=B	HD		supply system for electrical energy
		BRS	=B	LD		monitor and/or control system which provides regulation of voltage, load and/or frequency
		BRU	=B	KF		treatment system for transforming electrical energy
		BRV	=B	QD		storage system for electrical energy
		BRY	=B	PG	%PG2	protection system against electrical fault
	BS		=B			
		BSA	=B	LE		monitor and/or control system which provides data acquisition
		BSB	=B	LE		monitor and/or control system which provides data acquisition

		BSF	=B	PG	%PG2	protection system against electrical fault
		BSK	=B	LA		monitor and/or control system in a central unit for process operation
		BSP	=B	LB	%LB1	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
		BSW		Construction works		
	BX		=B			
		BXA	=B	HB	%HB2	supply system for liquid matter
	BY		=B			
		BYA	=B	PG	%PG2	protection system against electrical fault

C			=F			
	CA					
		CAA	=F	LA		monitor and/or control system in a central unit for process operation
		CAB	=F	LA		monitor and/or control system in a central unit for process operation
		CAC	=F	LA		monitor and/or control system in a central unit for process operation
		CAD	=F	LA		monitor and/or control system in a central unit for process operation
		CAE	=F	LA		monitor and/or control system in a central unit for process operation
		CAF	=F	LA		monitor and/or control system in a central unit for process operation
		CAG	=F	LA		monitor and/or control system in a central unit for process operation
		CAH	=F	LA		monitor and/or control system in a central unit for process operation
		CAJ	=F	LA		monitor and/or control system in a central unit for process operation
		CAK	=F	LA		monitor and/or control system in a central unit for process operation
		CAL	=F	LA		monitor and/or control system in a central unit for process operation
		CAM	=F	LA		monitor and/or control system in a central unit for process operation
		CAN	=F	LA		monitor and/or control system in a central unit for process operation
		CAP	=F	LA		monitor and/or control system in a central unit for process operation
		CAS	=F	LA		monitor and/or control system in a central unit for process operation
	CB					
		CBA	=F	LE		monitor and/or control system which provides data acquisition

		CBB	=F	LE		monitor and/or control system which provides data acquisition
		CBC	=F	LE		monitor and/or control system which provides data acquisition
		CBD	=F	LE		monitor and/or control system which provides data acquisition
		CBE	=F	LE		monitor and/or control system which provides data acquisition
		CBF	=F	LE		monitor and/or control system which provides data acquisition
		CBG	=F	LE		monitor and/or control system which provides data acquisition
		CBH	=F	LE		monitor and/or control system which provides data acquisition
		CBJ	=F	LE		monitor and/or control system which provides data acquisition
		CBK	=F	LE		monitor and/or control system which provides data acquisition
		CBL	=F	LE		monitor and/or control system which provides data acquisition
		CBM	=F	LE		monitor and/or control system which provides data acquisition
		CBN	=F	LE		monitor and/or control system which provides data acquisition
		CBP	=F	LE		monitor and/or control system which provides data acquisition
		CBS	=F	LE		monitor and/or control system which provides data acquisition
	CC					
		CCA	=F	LA		monitor and/or control system in a central unit for process operation
		CCB	=F	LA		monitor and/or control system in a central unit for process operation
		CCC	=F	LA		monitor and/or control system in a central unit for process operation
		CCD	=F	LA		monitor and/or control system in a central unit for process operation
		CCE	=F	LA		monitor and/or control system in a central unit for process operation
		CCF	=F	LA		monitor and/or control system in a central unit for process operation
		CCG	=F	LA		monitor and/or control system in a central unit for process operation
		CCH	=F	LA		monitor and/or control system in a central unit for process operation
		CCJ	=F	LA		monitor and/or control system in a central unit for process operation
		CCK	=F	LA		monitor and/or control system in a central unit for process operation

		CCL	=F	LA		monitor and/or control system in a central unit for process operation
		CCM	=F	LA		monitor and/or control system in a central unit for process operation
		CCN	=F	LA		monitor and/or control system in a central unit for process operation
		CCP	=F	LA		monitor and/or control system in a central unit for process operation
		CCS	=F	LA		monitor and/or control system in a central unit for process operation
	CD					
		CDA	=F	LE		monitor and/or control system which provides data acquisition
		CDB	=F	LE		monitor and/or control system which provides data acquisition
		CDC	=F	LE		monitor and/or control system which provides data acquisition
		CDD	=F	LE		monitor and/or control system which provides data acquisition
		CDE	=F	LE		monitor and/or control system which provides data acquisition
		CDF	=F	LE		monitor and/or control system which provides data acquisition
		CDG	=F	LE		monitor and/or control system which provides data acquisition
		CDH	=F	LE		monitor and/or control system which provides data acquisition
		CDJ	=F	LE		monitor and/or control system which provides data acquisition
		CDK	=F	LE		monitor and/or control system which provides data acquisition
		CDL	=F	LE		monitor and/or control system which provides data acquisition
		CDM	=F	LE		monitor and/or control system which provides data acquisition
		CDN	=F	LE		monitor and/or control system which provides data acquisition
		CDP	=F	LE		monitor and/or control system which provides data acquisition
		CDS	=F	LE		monitor and/or control system which provides data acquisition
	CE					
		CEA	=F	LE		monitor and/or control system which provides data acquisition
		CEB	=F	LE		monitor and/or control system which provides data acquisition
		CEC	=F	LE		monitor and/or control system which provides data acquisition
		CED	=F	LE		monitor and/or control system which provides data acquisition

		CEE	=F	LE		monitor and/or control system which provides data acquisition
		CEF	=F	LE		monitor and/or control system which provides data acquisition
		CEG	=F	LE		monitor and/or control system which provides data acquisition
		CEH	=F	LE		monitor and/or control system which provides data acquisition
		CEJ	=F	LE		monitor and/or control system which provides data acquisition
		CEK	=F	LE		monitor and/or control system which provides data acquisition
		CEL	=F	LE		monitor and/or control system which provides data acquisition
		CEM	=F	LE		monitor and/or control system which provides data acquisition
		CEN	=F	LE		monitor and/or control system which provides data acquisition
		CEP	=F	LE		monitor and/or control system which provides data acquisition
		CES	=F	AE		Structural system providing protection against undesirable environmental impacts
	CF					
		CFA	=F	JH		transport or distribution system for data
		CFB	=F	JH		transport or distribution system for data
		CFC	=F	JH		transport or distribution system for data
		CFD	=F	JH		transport or distribution system for data
		CFE	=F	JH		transport or distribution system for data
		CFF	=F	JH		transport or distribution system for data
		CFG	=F	JH		transport or distribution system for data
		CFH	=F	JH		transport or distribution system for data
		CFJ	=F	JH		transport or distribution system for data
		CFK	=F	JH		transport or distribution system for data
		CFL	=F	JH		transport or distribution system for data
		CFM	=F	JH		transport or distribution system for data
		CFN	=F	JH		transport or distribution system for data
		CFP	=F	JH		transport or distribution system for data
		CFQ	=F	JH		transport or distribution system for data
		CFR	=F	JH		transport or distribution system for data
		CFS	=F	JH		transport or distribution system for data
		CFT	=F	JH		transport or distribution system for data
		CFU	=F	JH		transport or distribution system for data
		CFV	=F	JH		transport or distribution system for data
		CFW	=F	JH		transport or distribution system for data
	CJ					
		CJA	=F	LA		monitor and/or control system in a central unit for process operation

		CJB	=F	LA		monitor and/or control system in a central unit for process operation
		CJC	=F	LA		monitor and/or control system in a central unit for process operation
		CJD	=F	LA		monitor and/or control system in a central unit for process operation
		CJE	=F	LA		monitor and/or control system in a central unit for process operation
		CJF	=F	LA		monitor and/or control system in a central unit for process operation
		CJG	=F	LA		monitor and/or control system in a central unit for process operation
		CJH	=F	LA		monitor and/or control system in a central unit for process operation
		CJJ	=F	LA		monitor and/or control system in a central unit for process operation
		CJK	=F	LA		monitor and/or control system in a central unit for process operation
		CJL	=F	LA		monitor and/or control system in a central unit for process operation
		CJM	=F	LA		monitor and/or control system in a central unit for process operation
		CJN	=F	LA		monitor and/or control system in a central unit for process operation
		CJP	=F	LA		monitor and/or control system in a central unit for process operation
		CJS	=F	AE		Structural system providing protection against undesirable environmental impacts
	CK					
		CKA	=F	LB	%LB1	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
		CKB	=F	LB	%LB1	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
		CKC	=F	LC		monitor and/or control system which provides remote visual monitoring
		CKD	=F	LB	%LB1	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
		CKH	=F	LE		monitor and/or control system which provides data acquisition
		CKJ	=F	LE		monitor and/or control system which provides data acquisition
		CKS	=F	LE		monitor and/or control system which provides data acquisition
	CM					
		CMA	=F	LE		monitor and/or control system which provides data acquisition

		CMB	=F	LE		monitor and/or control system which provides data acquisition
		CMC	=F	LE		monitor and/or control system which provides data acquisition
		CMD	=F	LE		monitor and/or control system which provides data acquisition
		CME	=F	LE		monitor and/or control system which provides data acquisition
		CMF	=F	LE		monitor and/or control system which provides data acquisition
		CMG	=F	LE		monitor and/or control system which provides data acquisition
		CMH	=F	LE		monitor and/or control system which provides data acquisition
		CMJ	=F	LE		monitor and/or control system which provides data acquisition
		CMK	=F	LE		monitor and/or control system which provides data acquisition
		CML	=F	LE		monitor and/or control system which provides data acquisition
		CMM	=F	LE		monitor and/or control system which provides data acquisition
		CMN	=F	LE		monitor and/or control system which provides data acquisition
		CMP	=F	LE		monitor and/or control system which provides data acquisition
		CMS	=F	AE		Structural system providing protection against undesirable environmental impacts
	CP					
		CPA	=F	LE		monitor and/or control system which provides data acquisition
		CPB	=F	LE		monitor and/or control system which provides data acquisition
		CPC	=F	LE		monitor and/or control system which provides data acquisition
		CPD	=F	LE		monitor and/or control system which provides data acquisition
		CPE	=F	LE		monitor and/or control system which provides data acquisition
		CPF	=F	LE		monitor and/or control system which provides data acquisition
		CPG	=F	LE		monitor and/or control system which provides data acquisition
		CPH	=F	LE		monitor and/or control system which provides data acquisition
		CPJ	=F	LE		monitor and/or control system which provides data acquisition
		CPK	=F	LE		monitor and/or control system which provides data acquisition

		CPL	=F	LE		monitor and/or control system which provides data acquisition
		CPM	=F	LE		monitor and/or control system which provides data acquisition
		CPN	=F	LE		monitor and/or control system which provides data acquisition
		CPP	=F	LE		monitor and/or control system which provides data acquisition
		CPS	=F	AE		Structural system providing protection against undesirable environmental impacts
	CS					
		CSA	=F	AE		Structural system providing protection against undesirable environmental impacts
		CSE	=F	AE		Structural system providing protection against undesirable environmental impacts

D			=F			
	DA					
		DAA	=F	K?		transport or distribution system for data
		DAB	=F	R?		storage system for data
		DAC	=F	R?		storage system for data
		DAD	=F	JC		transport or distribution system for solid matter
	DB					
		DBA	=F	K?		transport or distribution system for data
		DBB	=F	R?		storage system for data
		DBC	=F	R?		storage system for data
		DBD	=F	JC		transport or distribution system for solid matter
	DC					
		DCA	=F	K?		transport or distribution system for data
		DCB	=F	R?		storage system for data
		DCC	=F	R?		storage system for data
		DCD	=F	JC		transport or distribution system for solid matter
	DU					
		DUA	=F	Space		
		DUB	=F	Space		
		DUC	=F	Space		
		DUD	=F	Space		
E			=C,H			
	EA					
		EAA	=C	JC		transport or distribution system for solid matter
		EAB	=C	JC		transport or distribution system for solid matter
		EAC	=C	JC		transport or distribution system for solid matter

		EAD	=C	JC		transport or distribution system for solid matter
		EAE	=C	QC		storage system for solid matter
		EAF	=C	JC	%JC2	transport or distribution system for solid matter
		EAV	=C	HB	%HB7	supply system for liquid matter
		EAV	=C	KJ	%KJ2	treatment system limiting friction
		EAW	=C	HB	%HB9	supply system for liquid matter
		EAX	=C	HB	%HB2	supply system for liquid matter
		EAY	=C	PG	%PG2	protection system against electrical fault
	EB					
		EBA	=D	JC		transport or distribution system for solid matter
		EBB	=D	KD		treatment system for adding substances
		EBC	=D	KH		treatment system for changing the form/ shape of solid matter
		EBD	=D	KC		treatment system for separating substances
		EBE	=D	JC		transport or distribution system for solid matter
		EBE	=D	KC		treatment system for separating substances
		EBF	=D	QC		storage system for solid matter
		EBG	=D	KC	%KC4	treatment system for separating substances
		EBH	=D	KC	%KC4	treatment system for separating substances
		EBJ	=D	JC	%JC4	transport or distribution system for solid matter
		EBK	=D	QC		storage system for solid matter
		EBM	=D	JA		transport or distribution system for gaseous matter
		EBQ	=D	KD		treatment system for adding substances
		EBR	=D	KC	%KC8	treatment system for separating substances
		EBV	=D	HB	%HB7	supply system for liquid matter
		EBV	=D	KJ	%KJ2	treatment system limiting friction
		EBX	=D	HB	%HB2	supply system for liquid matter
		EBY	=D	PG	%PG2	protection system against electrical fault
	EC					
		ECA	=C	JC		transport or distribution system for solid matter
		ECC	=C	JC		transport or distribution system for solid matter
		ECE	=C	QC		storage system for solid matter
		ECV	=C	HB	%HB7	supply system for liquid matter
		ECV	=C	KJ	%KJ2	treatment system limiting friction
		ECW	=C	HB	%HB9	supply system for liquid matter
		ECX	=C	HB	%HB2	supply system for liquid matter
		ECY	=C	PG	%PG2	protection system against electrical fault
	EF					

		EFA	=C	HA		supply system for gaseous matter
		EFB	=C	HE	%HE2	supply system for heating and/or cooling
		EFV	=C	HB	%HB7	supply system for liquid matter
		EFV	=C	KJ	%KJ2	treatment system limiting friction
		EFW	=C	HB	%HB9	supply system for liquid matter
		EFX	=C	HB	%HB2	supply system for liquid matter
		EFY	=C	PG	%PG2	protection system against electrical fault
	EG					
		EGA	=C	HB		supply system for liquid matter
		EGB	=C	QC		storage system for solid matter
		EGC	=C	JB		transport or distribution system for liquid matter
		EGD	=C	HE	%HE4	supply system for heating and/or cooling
		EGE	=C	KC	%KC2	treatment system for separating substances
		EGF	=C	QC		storage system for solid matter
		EGG	=C	JB	%JB6	transport or distribution system for liquid matter
		EGR	=C	KC	%KC8	treatment system for separating substances
		EGT	=C	HE	%HE4	supply system for heating and/or cooling
		EGU	=C	LE		monitor and/or control system which provides data acquisition
		EGV	=C	HB	%HB7	supply system for liquid matter
		EGV	=C	KJ	%KJ2	treatment system limiting friction
		EGW	=C	HB	%HB9	supply system for liquid matter
		EGX	=C	HB	%HB2	supply system for liquid matter
		EGY	=C	PG	%PG2	protection system against electrical fault
	EH					
		EHA	=D	KC	%KC8	treatment system for separating substances
		EHA	=D	KD		treatment system for adding substances
		EHB	=D	KC	%KC8	treatment system for separating substances
		EHB	=D	KD		treatment system for adding substances
		EHC	=D	KC	%KC8	treatment system for separating substances
		EHC	=D	KD		treatment system for adding substances
		EHV	=D	HB	%HB7	supply system for liquid matter
		EHV	=D	KJ	%KJ2	treatment system limiting friction
		EHW	=D	HB	%HB9	supply system for liquid matter
		EHX	=D	HB	%HB2	supply system for liquid matter
		EHY	=D	PG	%PG2	protection system against electrical fault
	EK					
		EKA	=C	JA		transport or distribution system for gaseous matter
		EKB	=C	KC		treatment system for separating substances
		EKC	=C	KE		treatment system for changing pressure in a fluid
		EKD	=C	HE	%HE4	supply system for heating and/or cooling
		EKE	=C	KC	%KC2	treatment system for separating substances

		EKF	=C	QC		storage system for solid matter
		EKG	=C	JA		transport or distribution system for gaseous matter
		EKH	=C	KE		treatment system for changing pressure in a fluid
		EKR	=C	KC	%KC8	treatment system for separating substances
		EKT	=C	HE	%HE4	supply system for heating and/or cooling
		EKU	=C	LE		monitor and/or control system which provides data acquisition
		EKV	=C	HB	%HB7	supply system for liquid matter
		EKV	=C	KJ	%KJ2	treatment system limiting friction
		EKW	=C	HB	%HB9	supply system for liquid matter
		EKX	=C	HB	%HB2	supply system for liquid matter
		EKY	=C	PG	%PG2	protection system against electrical fault
	EL					
		ELA	=H	KC		treatment system for separating substances
		ELB	=H	KC	%KC2	treatment system for separating substances
		ELC	=H	KC		treatment system for separating substances
		ELD	=H	KC		treatment system for separating substances
		ELE	=H	HE	%HE2	supply system for heating and/or cooling
		ELF	=H	KC		treatment system for separating substances
		ELG	=H	KC		treatment system for separating substances
		ELP	=H	KD		treatment system for adding substances
		ELV	=H	HB	%HB7	supply system for liquid matter
		ELV	=H	KJ	%KJ2	treatment system limiting friction
		ELW	=H	HB	%HB9	supply system for liquid matter
		ELX	=H	HB	%HB2	supply system for liquid matter
		ELY	=H	PG	%PG2	protection system against electrical fault
	EM					
		EMA	=C	QC		storage system for solid matter
		EMB	=C	JC		transport or distribution system for solid matter
		EMC	=C	JC		transport or distribution system for solid matter
		EMC	=C	JB		transport or distribution system for liquid matter
		EMC	=C	JA		transport or distribution system for gaseous matter
		EMD	=C	KD		treatment system for adding substances
		EME	=C	HB		supply system for liquid matter
		EMF	=C	KC	%KC2	treatment system for separating substances
		EMV	=C	HB	%HB7	supply system for liquid matter
		EMV	=C	KJ	%KJ2	treatment system limiting friction
		EMW	=C	HB	%HB9	supply system for liquid matter
		EMX	=C	HB	%HB2	supply system for liquid matter
		EMY	=C	PG	%PG2	protection system against electrical fault

	EN					
		ENA	=D	KC	%KC2	treatment system for separating substances
		ENB	=D	KD		treatment system for adding substances
		ENC	=D	KE		treatment system for changing pressure in a fluid
		END	=D	HE	%HE2	supply system for heating and/or cooling
		ENE	=D	HE		supply system for heating and/or cooling
		ENF	=D	KC		treatment system for separating substances
		ENU	=D	QA		storage system for air and other gaseous matter
		ENV	=D	HB	%HB7	supply system for liquid matter
		ENV	=D	KJ	%KJ2	treatment system limiting friction
		ENW	=D	HB	%HB9	supply system for liquid matter
		ENX	=D	HB	%HB2	supply system for liquid matter
		ENY	=D	PG	%PG2	protection system against electrical fault
	ER					
		ERA	=C	HA		supply system for gaseous matter
		ERB	=C	HB		supply system for liquid matter
		ERC	=C	HA		supply system for gaseous matter
		ERV	=C	HB	%HB7	supply system for liquid matter
		ERV	=C	KJ	%KJ2	treatment system limiting friction
		ERW	=C	HB	%HB9	supply system for liquid matter
		ERX	=C	HB	%HB2	supply system for liquid matter
		ERY	=C	PG	%PG2	protection system against electrical fault
	ET					
		ETA	=H	JC	%JC1	transport or distribution system for solid matter
		ETB	=H	QC		storage system for solid matter
		ETC	=H	JC	%JC1	transport or distribution system for solid matter
		ETD	=H	JC		transport or distribution system for solid matter
		ETE	=H	QC		storage system for solid matter
		ETG	=H	JC	%JC1	transport or distribution system for solid matter
		ETH	=H	QC		storage system for solid matter
		ETK	=H	JC	%JC1	transport or distribution system for solid matter
		ETL	=H	QC		storage system for solid matter
		ETM	=H	JC	%JC1	transport or distribution system for solid matter
		ETN	=H	JC	%JC1	transport or distribution system for solid matter
		ETQ	=H	JA		transport or distribution system for gaseous matter
		ETV	=H	HB	%HB7	supply system for liquid matter
		ETV	=H	KJ	%KJ2	treatment system limiting friction

		ETW	=H	HB	%HB9	supply system for liquid matter
		ETX	=H	HB	%HB2	supply system for liquid matter
		ETY	=H	PG	%PG2	protection system against electrical fault
	EU					
		EUA	=C	KC	%KC8	treatment system for separating substances
		EUB	=C	KC	%KC8	treatment system for separating substances
		EUC	=C	KC	%KC2	treatment system for separating substances
		EUD	=C	KC		treatment system for separating substances
		EUE	=C	KC		treatment system for separating substances
		EUF	=C	KD		treatment system for adding substances
		EUV	=C	HB	%HB7	supply system for liquid matter
		EUV	=C	KJ	%KJ2	treatment system limiting friction
		EUW	=C	HB	%HB9	supply system for liquid matter
		EUX	=C	HB	%HB2	supply system for liquid matter
		EUY	=C	PG	%PG2	protection system against electrical fault

F			=C,H			
	FA					
		FAA	=E	QC		storage system for solid matter
		FAB	=E	QC		storage system for solid matter
		FAE	=E	QB		storage system for liquid matter
		FAF	=E	QC		storage system for solid matter
		FAH	=E	QC		storage system for solid matter
		FAK	=E	JG	%JG1	transport or distribution system for heating and/or cooling
		FAL	=E	KC	%KC2	treatment system for separating substances
		FAM	=E	KC		treatment system for separating substances
		FAN	=E	JG	%JG1	transport or distribution system for heating and/or cooling
		FAQ	=E	KC	%KC1	treatment system for separating substances
		FAR	=E	HA	%HA2	supply system for gaseous matter
		FAS	=E	HE	%HE4	supply system for heating and/or cooling
		FAT	=E	HE	%HE2	supply system for heating and/or cooling
		FAU	=E	HB	%HB4	supply system for liquid matter
		FAV	=E	HB	%HB7	supply system for liquid matter
		FAV	=E	KJ	%KJ2	treatment system limiting friction
		FAW	=E	HB	%HB9	supply system for liquid matter
		FAX	=E	HB	%HB2	supply system for liquid matter
		FAY	=E	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	FB					
		FBA	=D	LE		monitor and/or control system which provides data acquisition
		FBB	=D	HA		supply system for gaseous matter

		FBC	=D	KC	%KC2	treatment system for separating substances
		FBD	=D	HA		supply system for gaseous matter
		FBE	=D	HA		supply system for gaseous matter
		FBF	=D	KC	%KC2	treatment system for separating substances
		FBQ	=D	KC	%KC1	treatment system for separating substances
		FBR	=D	HA	%HA2	supply system for gaseous matter
		FBS	=D	HE	%HE4	supply system for heating and/or cooling
		FBT	=D	HE	%HE2	supply system for heating and/or cooling
		FBU	=D	HB	%HB4	supply system for liquid matter
		FBV	=D	HB	%HB7	supply system for liquid matter
		FBV	=D	KJ	%KJ2	treatment system limiting friction
		FBW	=D	HB	%HB9	supply system for liquid matter
		FBX	=D	HB	%HB2	supply system for liquid matter
		FBY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	FC					
		FCA	=D	JC	%JC4	transport or distribution system for solid matter
		FCB	=D	JC	%JC4	transport or distribution system for solid matter
		FCC	=D	JC		transport or distribution system for solid matter
		FCD	=D	QC		storage system for solid matter
		FCF	=D	AE		Structural system providing protection against undesirable environmental impacts
		FCJ	=D	JC	%JC4	transport or distribution system for solid matter
		FCK	=D	JC	%JC4	transport or distribution system for solid matter
		FCL	=D	JC	%JC4	transport or distribution system for solid matter
		FCQ	=D	KC	%KC1	treatment system for separating substances
		FCR	=D	HA	%HA2	supply system for gaseous matter
		FCS	=D	HE	%HE4	supply system for heating and/or cooling
		FCT	=D	HE	%HE2	supply system for heating and/or cooling
		FCU	=D	HB	%HB4	supply system for liquid matter
		FCV	=D	HB	%HB7	supply system for liquid matter
		FCV	=D	KJ	%KJ2	treatment system limiting friction
		FCW	=D	HB	%HB9	supply system for liquid matter
		FCX	=D	HB	%HB2	supply system for liquid matter
		FCY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	FD					
		FDA	=E	QC		storage system for solid matter
		FDB	=E	QC		storage system for solid matter

		FDC	=E	QC		storage system for solid matter
		FDE	=E	QC		storage system for solid matter
		FDF	=E	JC	%JC4	transport or distribution system for solid matter
		FDG	=E	AE		Structural system providing protection against undesirable environmental impacts
		FDJ	=E	QC		storage system for solid matter
		FDK	=E	JG	%JG1	transport or distribution system for heating and/or cooling
		FDL	=E	KC	%KC2	treatment system for separating substances
		FDM	=E	KC	%KC2	treatment system for separating substances
		FDQ	=E	KC	%KC1	treatment system for separating substances
		FDR	=E	HA	%HA2	supply system for gaseous matter
		FDS	=E	HE	%HE4	supply system for heating and/or cooling
		FDT	=E	HE	%HE2	supply system for heating and/or cooling
		FDU	=E	HB	%HB4	supply system for liquid matter
		FDV	=E	HB	%HB7	supply system for liquid matter
		FDV	=E	KJ	%KJ2	treatment system limiting friction
		FDW	=E	HB	%HB9	supply system for liquid matter
		FDX	=E	HB	%HB2	supply system for liquid matter
		FDY	=E	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	FE					
		FEA	=E	QC		storage system for solid matter
		FEB	=E	QC		storage system for solid matter
		FEC	=D	QC		storage system for solid matter
		FEE	=D	QC		storage system for solid matter
		FEF	=E	JC		transport or distribution system for solid matter
		FEG	=E	AE		Structural system providing protection against undesirable environmental impacts
		FEJ	=E	JC		transport or distribution system for solid matter
		FEK	=E	JG	%JG1	transport or distribution system for heating and/or cooling
		FEL	=E	KC	%KC2	treatment system for separating substances
		FEM	=E	KC	%KC2	treatment system for separating substances
		FEQ	=E	KC	%KC1	treatment system for separating substances
		FER	=E	HA	%HA2	supply system for gaseous matter
		FES	=E	HE	%HE4	supply system for heating and/or cooling
		FET	=E	HE	%HE2	supply system for heating and/or cooling
		FEU	=E	HB	%HB4	supply system for liquid matter
		FEV	=E	HB	%HB7	supply system for liquid matter
		FEV	=E	KJ	%KJ2	treatment system limiting friction
		FEW	=E	HB	%HB9	supply system for liquid matter

	FEX	=E	HB	%HB2	supply system for liquid matter
	FEY	=E	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
FH					
	FHG	=A	AE		Structural system providing protection against undesirable environmental impacts
	FHJ	=A	JC		transport or distribution system for solid matter
	FHM	=A	KC	%KC2	treatment system for separating substances
	FHQ	=A	KC	%KC1	treatment system for separating substances
	FHR	=A	HA	%HA2	supply system for gaseous matter
	FHS	=A	HE	%HE4	supply system for heating and/or cooling
	FHT	=A	HE	%HE2	supply system for heating and/or cooling
	FHU	=A	HB	%HB4	supply system for liquid matter
	FHV	=A	HB	%HB7	supply system for liquid matter
	FHV	=A	KJ	%KJ2	treatment system limiting friction
	FHW	=A	HB	%HB9	supply system for liquid matter
	FHX	=A	HB	%HB2	supply system for liquid matter
	FHY	=A	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
FJ					
	FJA	=D	N/A		monitor and/or control system which provides data acquisition
	FJB	=D	N/A		monitor and/or control system which provides data acquisition
	FJC	=D	LE		monitor and/or control system which provides data acquisition
	FJD	=D	LE		monitor and/or control system which provides data acquisition
	FJE	=D	N/A		monitor and/or control system which provides data acquisition
	FJF	=D	LE		monitor and/or control system which provides data acquisition
	FJL	=D	N/A		monitor and/or control system which provides data acquisition
	FJM	=D	LE		monitor and/or control system which provides data acquisition
	FJN	=D	N/A		monitor and/or control system which provides data acquisition
FK					
	FKQ	=D	KC	%KC1	treatment system for separating substances
	FKR	=D	HA	%HA2	supply system for gaseous matter
	FKS	=D	HE	%HE4	supply system for heating and/or cooling
	FKT	=D	HE	%HE2	supply system for heating and/or cooling
	FKU	=D	HB	%HB4	supply system for liquid matter
	FKV	=D	HB	%HB7	supply system for liquid matter

		FKV	=D	KJ	%KJ2	treatment system limiting friction
		FKW	=D	HB	%HB9	supply system for liquid matter
		FKX	=D	HB	%HB2	supply system for liquid matter
		FKY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	FQ					
		FQR	=D	HA	%HA2	supply system for gaseous matter
		FQS	=D	HE	%HE4	supply system for heating and/or cooling
		FQT	=D	HE	%HE2	supply system for heating and/or cooling
		FQU	=D	HB	%HB4	supply system for liquid matter
		FQV	=D	HB	%HB7	supply system for liquid matter
		FQV	=D	KJ	%KJ2	treatment system limiting friction
		FQW	=D	HB	%HB9	supply system for liquid matter
		FQX	=D	HB	%HB2	supply system for liquid matter
		FQY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	FR					
		FRQ	=D	KC	%KC1	treatment system for separating substances
		FRS	=D	HE	%HE4	supply system for heating and/or cooling
		FRT	=D	HE	%HE2	supply system for heating and/or cooling
		FRU	=D	HB	%HB4	supply system for liquid matter
		FRV	=D	HB	%HB7	supply system for liquid matter
		FRV	=D	KJ	%KJ2	treatment system limiting friction
		FRW	=D	HB	%HB9	supply system for liquid matter
		FRX	=D	HB	%HB2	supply system for liquid matter
		FRY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	FS					
		FSU	=D	HB	%HB4	supply system for liquid matter
		FSV	=D	HB	%HB7	supply system for liquid matter
		FSV	=D	KJ	%KJ2	treatment system limiting friction
		FSW	=D	HB	%HB9	supply system for liquid matter
		FSX	=D	HB	%HB2	supply system for liquid matter
		FSY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	FT					
		FTU	=D	HB	%HB4	supply system for liquid matter
		FTV	=D	HB	%HB7	supply system for liquid matter
		FTV	=D	KJ	%KJ2	treatment system limiting friction
		FTW	=D	HB	%HB9	supply system for liquid matter
		FTX	=D	HB	%HB2	supply system for liquid matter

		FTY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	FU					
		FUV	=D	HB	%HB7	supply system for liquid matter
		FUV	=D	KJ	%KJ2	treatment system limiting friction
		FUW	=D	HB	%HB9	supply system for liquid matter
		FUX	=D	HB	%HB2	supply system for liquid matter
		FUY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	FV					
		FVW	=D	HB	%HB9	supply system for liquid matter
		FVX	=D	HB	%HB2	supply system for liquid matter
		FVY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	FW					
		FWV	=D	HB	%HB7	supply system for liquid matter
		FWV	=D	KJ	%KJ2	treatment system limiting friction
		FWX	=D	HB	%HB2	supply system for liquid matter
		FWY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	FX					
	FY					

G			=C,H			
	GA					
		GAA	=C	KC	%KC2	treatment system for separating substances
		GAB	=C	JB	%JB6	transport or distribution system for liquid matter
		GAC	=C	JB		transport or distribution system for liquid matter
		GAD	=C	HB		supply system for liquid matter
		GAF	=C	QB		storage system for liquid matter
		GAV	=C	HB	%HB7	supply system for liquid matter
		GAV	=C	KJ	%KJ2	treatment system limiting friction
		GAX	=C	HB	%HB2	supply system for liquid matter
		GAY	=C	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	GB					
		GBB	=D	KC	%KC2	treatment system for separating substances
		GBC	=D	KD		treatment system for adding substances
		GBD	=D	KC	%KC7	treatment system for separating substances

		GBE	=D	HB	%HB1	supply system for liquid matter
		GBE	=D	LE		monitor and/or control system which provides data acquisition
		GBF	=D	KC	%KC9	treatment system for separating substances
		GBG	=D	HE	%HE3	supply system for heating and/or cooling
		GBG	=D	KC	%KC5	treatment system for separating substances
		GBH	=D	KC	%KC3	treatment system for separating substances
		GBJ	=D	HE		supply system for heating and/or cooling
		GBK	=D	JB	%JB6	transport or distribution system for liquid matter
		GBL	=D	QB		storage system for liquid matter
		GBN	=D	HC		supply system for solid matter
		GBN	=D	HB	%HB1	supply system for liquid matter
		GBP	=D	JB		transport or distribution system for liquid matter
		GBQ	=D	HB	%HB6	supply system for liquid matter
		GBR	=D	KC	%KC6	treatment system for separating substances
		GBS	=D	KC		treatment system for separating substances
		GBT	=D	JB		transport or distribution system for liquid matter
		GBV	=D	HB	%HB7	supply system for liquid matter
		GBV	=D	KJ	%KJ2	treatment system limiting friction
		GBX	=D	HB	%HB2	supply system for liquid matter
		GBY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	GC					
		GCB	=D	KC	%KC2	treatment system for separating substances
		GCC	=D	KD		treatment system for adding substances
		GCD	=D	KC	%KC7	treatment system for separating substances
		GCE	=D	HB	%HB1	supply system for liquid matter
		GCE	=D	LE		monitor and/or control system which provides data acquisition
		GCF	=D	KC	%KC9	treatment system for separating substances
		GCG	=D	HE	%HE3	supply system for heating and/or cooling
		GCG	=D	KC	%KC5	treatment system for separating substances
		GCH	=D	KC	%KC3	treatment system for separating substances
		GCJ	=D	HE		supply system for heating and/or cooling
		GCK	=D	JB	%JB6	transport or distribution system for liquid matter
		GCL	=D	QB		storage system for liquid matter
		GCN	=D	HC		supply system for solid matter
		GCN	=D	HB	%HB1	supply system for liquid matter
		GCP	=D	JB		transport or distribution system for liquid matter
		GCQ	=D	HB	%HB6	supply system for liquid matter

		GCR	=D	KC	%KC6	treatment system for separating substances
		GCS	=D	KC		treatment system for separating substances
		GCT	=D	JB		transport or distribution system for liquid matter
		GCV	=D	HB	%HB7	supply system for liquid matter
		GCV	=D	KJ	%KJ2	treatment system limiting friction
		GCX	=D	HB	%HB2	supply system for liquid matter
		GCY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	GD					
		GDB	=D	KC	%KC2	treatment system for separating substances
		GDC	=D	KD		treatment system for adding substances
		GDD	=D	KC	%KC7	treatment system for separating substances
		GDE	=D	HB	%HB1	supply system for liquid matter
		GDE	=D	LE		monitor and/or control system which provides data acquisition
		GDF	=D	KC	%KC9	treatment system for separating substances
		GDG	=D	HE	%HE3	supply system for heating and/or cooling
		GDG	=D	KC	%KC5	treatment system for separating substances
		GDH	=D	KC	%KC3	treatment system for separating substances
		GDJ	=D	HE		supply system for heating and/or cooling
		GDK	=D	JB	%JB6	transport or distribution system for liquid matter
		GDL	=D	QB		storage system for liquid matter
		GDN	=D	HC		supply system for solid matter
		GDN	=D	HB	%HB1	supply system for liquid matter
		GDP	=D	JB		transport or distribution system for liquid matter
		GDQ	=D	HB	%HB6	supply system for liquid matter
		GDR	=D	KC	%KC6	treatment system for separating substances
		GDS	=D	KC		treatment system for separating substances
		GDT	=D	JB		transport or distribution system for liquid matter
		GDV	=D	HB	%HB7	supply system for liquid matter
		GDV	=D	KJ	%KJ2	treatment system limiting friction
		GDX	=D	HB	%HB2	supply system for liquid matter
		GDY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	GH					
		GHA	=C	JB		transport or distribution system for liquid matter
		GHB	=C	JB		transport or distribution system for liquid matter
		GHC	=C	JB		transport or distribution system for liquid matter

		GHD	=C	JB		transport or distribution system for liquid matter
		GHW	=C	HB	%HB9	supply system for liquid matter
	GM					
		GMA	=H	JB	%JB3	transport or distribution system for liquid matter
	GN					
		GNB	=H	KC	%KC2	treatment system for separating substances
		GNC	=H	KD		treatment system for adding substances
		GND	=H	KC	%KC7	treatment system for separating substances
		GNE	=H	HB	%HB1	supply system for liquid matter
		GNE	=H	LE		monitor and/or control system which provides data acquisition
		GNF	=H	KC	%KC9	treatment system for separating substances
		GNG	=H	HE	%HE3	supply system for heating and/or cooling
		GNG	=H	KC	%KC5	treatment system for separating substances
		GNH	=H	KC	%KC3	treatment system for separating substances
		GNJ	=H	HE		supply system for heating and/or cooling
		GNK	=H	JB	%JB6	transport or distribution system for liquid matter
		GNL	=H	QB		storage system for liquid matter
		GNN	=H	HC		supply system for solid matter
		GNN	=H	HB	%HB1	supply system for liquid matter
		GNP	=H	JB		transport or distribution system for liquid matter
		GNQ	=H	HB	%HB6	supply system for liquid matter
		GNR	=H	KC	%KC6	treatment system for separating substances
		GNS	=H	KC		treatment system for separating substances
		GNT	=H	JB		transport or distribution system for liquid matter
		GNV	=H	HB	%HB7	supply system for liquid matter
		GNV	=H	KJ	%KJ2	treatment system limiting friction
		GNX	=H	HB	%HB2	supply system for liquid matter
		GNY	=H	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions

H			=A,C,H			
	HA					
		HAA	=A	HE	%HE4	supply system for heating and/or cooling
		HAB	=A	HE	%HE4	supply system for heating and/or cooling
		HAC	=A	HE		supply system for heating and/or cooling
		HAD	=A	HE	%HE3	supply system for heating and/or cooling
		HAD	=A	KC	%KC5	treatment system for separating substances
		HAG	=A	JB		transport or distribution system for liquid matter

		HAH	=A	HE		supply system for heating and/or cooling
		HAJ	=A	HE		supply system for heating and/or cooling
		HAK	=A	HE		supply system for heating and/or cooling
		HAL	=A	JB	%JB3	transport or distribution system for liquid matter
		HAM	=A	HE		supply system for heating and/or cooling
		HAN	=A	JB	%JB3	transport or distribution system for liquid matter
		HAP	=A	JD		transport or distribution system for multiphase matter
		HAV	=A	HB	%HB7	supply system for liquid matter
		HAV	=A	KJ	%KJ2	treatment system limiting friction
		HAW	=A	HB	%HB9	supply system for liquid matter
		HAX	=A	HB	%HB2	supply system for liquid matter
		HAY	=A	PG	%PG2	protection system against electrical fault
	HB					
		HBA		AB		#NV
		HBB		AE		Structural system providing protection against undesirable environmental impacts
		HBC		Construction works		
		HBE		QA		storage system for air and other gaseous matter
		HBK		Construction works		
	HC					
		HCA	=A	HA	%HA1	supply system for gaseous matter
		HCB	=A	HA	%HA8	supply system for gaseous matter
		HCC	=A	HB		supply system for liquid matter
		HCD	=A	KC	%KC6	treatment system for separating substances
		HCE	=A	KC		treatment system for separating substances
		HCF	=A	KC	%KC2	treatment system for separating substances
		HCG	=A	KC		treatment system for separating substances
		HCV	=A	HB	%HB7	supply system for liquid matter
		HCV	=A	KJ	%KJ2	treatment system limiting friction
		HCW	=A	HB	%HB9	supply system for liquid matter
		HCX	=A	HB	%HB2	supply system for liquid matter
		HCY	=A	PG	%PG2	protection system against electrical fault
	HD					
		HDA	=A	KC		treatment system for separating substances
		HDB	=A	JC	%JC1	transport or distribution system for solid matter
		HDC	=A	JC	%JC1	transport or distribution system for solid matter
		HDT	=A	HB		supply system for liquid matter
		HDU	=A	HA	%HA1	supply system for gaseous matter

		HDV	=A	HB	%HB7	supply system for liquid matter
		HDV	=A	KJ	%KJ2	treatment system limiting friction
		HDW	=A	HB	%HB9	supply system for liquid matter
		HDX	=A	HB	%HB2	supply system for liquid matter
		HDY	=A	PG	%PG2	protection system against electrical fault
	HF					
		HFA	=D	KH		treatment system for changing the form/ shape of solid matter
		HFB	=D	HC		supply system for solid matter
		HFC	=D	KH		treatment system for changing the form/ shape of solid matter
		HFD	=D	JA		transport or distribution system for gaseous matter
		HFE	=D	JA		transport or distribution system for gaseous matter
		HFF	=D	JA		transport or distribution system for gaseous matter
		HFG	=D	QC		storage system for solid matter
		HFR	=D	JC		transport or distribution system for solid matter
		HFV	=D	HB	%HB7	supply system for liquid matter
		HFV	=D	KJ	%KJ2	treatment system limiting friction
		HFW	=D	HB	%HB9	supply system for liquid matter
		HFX	=D	HB	%HB2	supply system for liquid matter
		HFY	=D	PG	%PG2	protection system against electrical fault
	HH					
		HHA	=A	RD		energy conversion system between chemical energy and enthalpy
		HHB	=A	KC		treatment system for separating substances
		HHC	=A	RD		energy conversion system between chemical energy and enthalpy
		HHD	=A	KC		treatment system for separating substances
		HHE	=A	JC	%JC4	transport or distribution system for solid matter
		HHF	=A	JB	%JB5	transport or distribution system for liquid matter
		HHG	=A	JA		transport or distribution system for gaseous matter
		HHH	=A	QB		storage system for liquid matter
		HHJ	=A	QB		storage system for liquid matter
		HHK	=A	QB		storage system for liquid matter
		HHL	=A	HA	%HA1	supply system for gaseous matter
		HHM	=A	HA	%HA8	supply system for gaseous matter
		HHN	=A	HA	%HA1	supply system for gaseous matter
		HHP	=A	HE	%HE2	supply system for heating and/or cooling
		HHQ	=A	HE	%HE2	supply system for heating and/or cooling
		HHR	=A	HA	%HA8	supply system for gaseous matter

		HHS	=A	HA	%HA1	supply system for gaseous matter
		HHT	=A	HE	%HE4	supply system for heating and/or cooling
		HHU	=A	HE	%HE4	supply system for heating and/or cooling
		HHV	=A	HB	%HB7	supply system for liquid matter
		HHV	=A	KJ	%KJ2	treatment system limiting friction
		HHW	=A	HB	%HB9	supply system for liquid matter
		HHX	=A	HB	%HB2	supply system for liquid matter
		HHY	=A	PG	%PG2	protection system against electrical fault
		HHZ	=A	HE		supply system for heating and/or cooling
	HJ					
		HJA	=A	HE		supply system for heating and/or cooling
		HJE	=A	JC	%JC4	transport or distribution system for solid matter
		HJF	=A	JB	%JB5	transport or distribution system for liquid matter
		HJG	=A	JA		transport or distribution system for gaseous matter
		HJL	=A	HA	%HA1	supply system for gaseous matter
		HJM	=A	HA	%HA8	supply system for gaseous matter
		HJN	=A	HA	%HA1	supply system for gaseous matter
		HJP	=A	HE	%HE2	supply system for heating and/or cooling
		HJQ	=A	HE	%HE2	supply system for heating and/or cooling
		HJR	=A	HA	%HA8	supply system for gaseous matter
		HJS	=A	HA	%HA1	supply system for gaseous matter
		HJT	=A	HE	%HE4	supply system for heating and/or cooling
		HJU	=A	HE	%HE4	supply system for heating and/or cooling
		HJV	=A	HB	%HB7	supply system for liquid matter
		HJV	=A	KJ	%KJ2	treatment system limiting friction
		HJW	=A	HB	%HB9	supply system for liquid matter
		HJX	=A	HB	%HB2	supply system for liquid matter
		HJY	=A	PG	%PG2	protection system against electrical fault
	HK					
		HKA	=A	KC		treatment system for separating substances
		HKE	=A	JC	%JC4	transport or distribution system for solid matter
		HKF	=A	JB	%JB5	transport or distribution system for liquid matter
		HKG	=A	JA		transport or distribution system for gaseous matter
		HKL	=A	HA	%HA1	supply system for gaseous matter
		HKM	=A	HA	%HA8	supply system for gaseous matter
		HKN	=A	HA	%HA1	supply system for gaseous matter
		HKP	=A	HE	%HE2	supply system for heating and/or cooling
		HKQ	=A	HE	%HE2	supply system for heating and/or cooling
		HKR	=A	HA	%HA8	supply system for gaseous matter
		HKS	=A	HA	%HA1	supply system for gaseous matter

		HKT	=A	HE	%HE4	supply system for heating and/or cooling
		HKU	=A	HE	%HE4	supply system for heating and/or cooling
		HKV	=A	HB	%HB7	supply system for liquid matter
		HKV	=A	KJ	%KJ2	treatment system limiting friction
		HKW	=A	HB	%HB9	supply system for liquid matter
		HKX	=A	HB	%HB2	supply system for liquid matter
		HKY	=A	PG	%PG2	protection system against electrical fault
	HL					
		HLA	=A	JA		transport or distribution system for gaseous matter
		HLB	=A	HA		supply system for gaseous matter
		HLC	=A	HE		supply system for heating and/or cooling
		HLD	=A	HE		supply system for heating and/or cooling
		HLE	=A	JA		transport or distribution system for gaseous matter
		HLF	=A	HA	%HA7	supply system for gaseous matter
		HLG	=A	HE		supply system for heating and/or cooling
		HLH	=A	HE		supply system for heating and/or cooling
		HLV	=A	HB	%HB7	supply system for liquid matter
		HLV	=A	KJ	%KJ2	treatment system limiting friction
		HLW	=A	HB	%HB9	supply system for liquid matter
		HLX	=A	HB	%HB2	supply system for liquid matter
		HLY	=A	PG	%PG2	protection system against electrical fault
	HM					
		HMA	=A	HE		supply system for heating and/or cooling
		HMB	=A	HE		supply system for heating and/or cooling
		HMC	=A	HE		supply system for heating and/or cooling
		HMD	=A	HE		supply system for heating and/or cooling
		HMV	=A	HB	%HB7	supply system for liquid matter
		HMV	=A	KJ	%KJ2	treatment system limiting friction
		HMW	=A	HB	%HB9	supply system for liquid matter
		HMX	=A	HB	%HB2	supply system for liquid matter
		HMY	=A	PG	%PG2	protection system against electrical fault
	HP					
		HPA	=A	HE		supply system for heating and/or cooling
		HPB	=A	JG		transport or distribution system for heating and/or cooling
		HPC	=A	JG		transport or distribution system for heating and/or cooling
		HPV	=A	HB	%HB7	supply system for liquid matter
		HPV	=A	KJ	%KJ2	treatment system limiting friction
		HPW	=A	HB	%HB9	supply system for liquid matter
		HPX	=A	HB	%HB2	supply system for liquid matter
		HPY	=A	PG	%PG2	protection system against electrical fault
	HQ					

		HQA	=A	RF		energy conversion system from solar energy to enthalpy
		HQB	=A	KK		technical system which provides treatment controlling a position
		HQC	=A	JG	%JG2	transport or distribution system for heating and/or cooling
		HQD	=A	JG	%JG2	transport or distribution system for heating and/or cooling
		HQV	=A	HB	%HB7	supply system for liquid matter
		HQV	=A	KJ	%KJ2	treatment system limiting friction
		HQW	=A	HB	%HB9	supply system for liquid matter
		HQX	=A	HB	%HB2	supply system for liquid matter
		HQY	=A	PG	%PG2	protection system against electrical fault
	HY					
		HYA	=A	PG	%PG2	protection system against electrical fault

J			=A			
	JA					
		JAA	=A	RH		energy conversion system from nuclear energy to enthalpy
		JAB	=A	RH		energy conversion system from nuclear energy to enthalpy
		JAC	=A	RH		energy conversion system from nuclear energy to enthalpy
		JAD	=A	AE		Structural system providing protection against undesirable environmental impacts
		JAE	=A	HE	%HE2	supply system for heating and/or cooling
		JAF	=A	AE		Structural system providing protection against undesirable environmental impacts
		JAG	=A	AE		Structural system providing protection against undesirable environmental impacts
		JAH	=A	AE		Structural system providing protection against undesirable environmental impacts
		JAJ	=A	AE		Structural system providing protection against undesirable environmental impacts
		JAT	=A	LE		monitor and/or control system which provides data acquisition
		JAV	=A	HB	%HB7	supply system for liquid matter
		JAV	=A	KJ	%KJ2	treatment system limiting friction
		JAW	=A	HB	%HB9	supply system for liquid matter
		JAX	=A	HB	%HB2	supply system for liquid matter
		JAY	=A	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	JB					
		JBA	=A	AE		Structural system providing protection against undesirable environmental impacts

	JD					
		JDA	=A	KK		technical system which provides treatment controlling a position
		JDC	=A	KA		Treatment system controlling a flow of matter
		JDE	=A	AE		Structural system providing protection against undesirable environmental impacts
		JDH	=A	AE		Structural system providing protection against undesirable environmental impacts
		JDJ	=A	AE		Structural system providing protection against undesirable environmental impacts
		JDK	=A	LB		monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
		JDM	=A	AE		Structural system providing protection against undesirable environmental impacts
		JDP	=A	HD		supply system for electrical energy
		JDT	=A	JB		transport or distribution system for liquid matter
		JDV	=A	HB	%HB7	supply system for liquid matter
		JDV	=A	KJ	%KJ2	treatment system limiting friction
		JDW	=A	HB	%HB9	supply system for liquid matter
		JDX	=A	HB	%HB2	supply system for liquid matter
		JDY	=A	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	JE					
		JEA	=D	HE	%HE2	supply system for heating and/or cooling
		JEB	=D	JG	%JG1	transport or distribution system for heating and/or cooling
		JEC	=D	JG	%JG1	transport or distribution system for heating and/or cooling
		JEF	=D	KE		treatment system for changing pressure in a fluid
		JEG	=D	KB		treatment system controlling a threshold
		JET	=D	QB		storage system for liquid matter
		JEV	=D	HB	%HB7	supply system for liquid matter
		JEV	=D	KJ	%KJ2	treatment system limiting friction
		JEW	=D	HB	%HB9	supply system for liquid matter
		JEX	=D	HB	%HB2	supply system for liquid matter
		JEY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	JF					
		JFA	=D	HE		supply system for heating and/or cooling
		JFB	=D	JB		transport or distribution system for liquid matter
		JFC	=D	JB	%JB6	transport or distribution system for liquid matter

		JFD	=D	QB		storage system for liquid matter
		JFF	=D	KE		treatment system for changing pressure in a fluid
		JFG	=D	KB		treatment system controlling a threshold
		JFT	=D	JB		transport or distribution system for liquid matter
		JFV	=D	HB	%HB7	supply system for liquid matter
		JFV	=D	KJ	%KJ2	treatment system limiting friction
		JFW	=D	HB	%HB9	supply system for liquid matter
		JFX	=D	HB	%HB2	supply system for liquid matter
		JFY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	JG					
		JGA	=D	JG	%JG1	transport or distribution system for heating and/or cooling
		JGB	=D	JG	%JG1	transport or distribution system for heating and/or cooling
		JGC	=D	JG	%JG1	transport or distribution system for heating and/or cooling
		JGF	=D	JG	%JG1	transport or distribution system for heating and/or cooling
		JGG	=D	JG	%JG1	transport or distribution system for heating and/or cooling
		JGT	=D	QB		storage system for liquid matter
		JGV	=D	HB	%HB7	supply system for liquid matter
		JGV	=D	KJ	%KJ2	treatment system limiting friction
		JGW	=D	HB	%HB9	supply system for liquid matter
		JGX	=D	HB	%HB2	supply system for liquid matter
		JGY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	JK					
		JKQ	=A	LB		monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
		JKS	=A	LE		monitor and/or control system which provides data acquisition
		JKT	=A	LE		monitor and/or control system which provides data acquisition
		JKU	=A	LE		monitor and/or control system which provides data acquisition
	JM					
		JMA	=D	AE		Structural system providing protection against undesirable environmental impacts
		JMB	=D	PJ		protection system against human injury
		JMC	=D	PJ		protection system against human injury
		JMD	=D	JC	%JC4	transport or distribution system for solid matter

		JME	=D	PJ		protection system against human injury
		JME	=D	AE		Structural system providing protection against undesirable environmental impacts
		JMF	=D	PJ		protection system against human injury
		JMF	=D	AE		Structural system providing protection against undesirable environmental impacts
		JMG	=D	PJ		protection system against human injury
		JMG	=D	AE		Structural system providing protection against undesirable environmental impacts
		JMH		Construction works		
		JMJ		AA		energy conversion system between electro-magnetic field in motion and electric energy
		JMK		AC		Structural system holding a supply or distribution system
		JML		AC		Structural system holding a supply or distribution system
		JMM	=D	LE		monitor and/or control system which provides data acquisition
		JMN	=D	KE		treatment system for changing pressure in a fluid
		JMP	=D	KE		treatment system for changing pressure in a fluid
		JMQ	=D	JG	%JG2	transport or distribution system for heating and/or cooling
		JMR	=D	KC		treatment system for separating substances
		JMS	=D	KD		treatment system for adding substances
		JMT	=D	KC		treatment system for separating substances
		JMU	=D	LE		monitor and/or control system which provides data acquisition
		JMV	=D	HB	%HB7	supply system for liquid matter
		JMV	=D	KJ	%KJ2	treatment system limiting friction
		JMW	=D	HB	%HB9	supply system for liquid matter
		JMX	=D	HB	%HB2	supply system for liquid matter
		JMY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	JN					
		JNA	=A	HE		supply system for heating and/or cooling
		JNB	=A	HE		supply system for heating and/or cooling
		JND	=A	HB		supply system for liquid matter
		JNG	=A	HB		supply system for liquid matter
		JNK	=A	QB		storage system for liquid matter
		JNM	=A	HE		supply system for heating and/or cooling
		JNP	=A	LA		monitor and/or control system in a central unit for process operation
		JNV	=A	HB	%HB7	supply system for liquid matter
		JNV	=A	KJ	%KJ2	treatment system limiting friction

		JNW	=A	HB	%HB9	supply system for liquid matter
		JNX	=A	HB	%HB2	supply system for liquid matter
		JNY	=A	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	JQ					
		JQA	=D	LA		monitor and/or control system in a central unit for process operation
	JR					
		JRA	=A	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	JS					
		JSA	=A	LA		monitor and/or control system in a central unit for process operation
	JT					
		JTA	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	JV					
		JVA	=D	HB	%HB7	supply system for liquid matter
		JVA	=D	KJ	%KJ2	treatment system limiting friction
	JW					
		JWA	=A	HB	%HB9	supply system for liquid matter
	JX					
		JXA	=A	HB	%HB2	supply system for liquid matter
	JY					
		JYC	=A	LE		monitor and/or control system which provides data acquisition
		JYE	=A	LA		monitor and/or control system in a central unit for process operation
		JYF	=A	LE		monitor and/or control system which provides data acquisition
		JYG	=A	LE		monitor and/or control system which provides data acquisition
		JYH	=A	LE		monitor and/or control system which provides data acquisition
		JYJ	=A	LE		monitor and/or control system which provides data acquisition
		JYK	=A	LE		monitor and/or control system which provides data acquisition
		JYL	=A	LE		monitor and/or control system which provides data acquisition
		JYM	=A	LE		monitor and/or control system which provides data acquisition
		JYN	=A	LE		monitor and/or control system which provides data acquisition
		JYV	=A	LE		monitor and/or control system which provides data acquisition

K			=D			
	KA					
		KAA	=D	HE	%HE2	supply system for heating and/or cooling
		KAB	=D	HE	%HE2	supply system for heating and/or cooling
		KAC	=D	HE	%HE2	supply system for heating and/or cooling
		KAD	=D	HE	%HE2	supply system for heating and/or cooling
		KAV	=D	HB	%HB7	supply system for liquid matter
		KAV	=D	KJ	%KJ2	treatment system limiting friction
		KAW	=D	HB	%HB9	supply system for liquid matter
		KAX	=D	HB	%HB2	supply system for liquid matter
		KAY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	KB					
		KBA	=D	LA		monitor and/or control system in a central unit for process operation
		KBB	=D	HE	%HE2	supply system for heating and/or cooling
		KBC	=D	LA		monitor and/or control system in a central unit for process operation
		KBD	=D	LA		monitor and/or control system in a central unit for process operation
		KBE	=D	KC		treatment system for separating substances
		KBF	=D	KC		treatment system for separating substances
		KBG	=D	KC		treatment system for separating substances
		KBH	=D	KD		treatment system for adding substances
		KBJ	=D	KD		treatment system for adding substances
		KBV	=D	HB	%HB7	supply system for liquid matter
		KBV	=D	KJ	%KJ2	treatment system limiting friction
		KBW	=D	HB	%HB9	supply system for liquid matter
		KBX	=D	HB	%HB2	supply system for liquid matter
		KBY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	KF					
		KFA	=D	LD		monitor and/or control system which provides regulation of voltage, load and/or frequency
		KFB	=D	HC		supply system for solid matter
		KFE	=D	KC		treatment system for separating substances
		KFW	=D	HB	%HB9	supply system for liquid matter
		KFX	=D	HB	%HB2	supply system for liquid matter
		KFY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	KG					

		KGA	=D	LD		monitor and/or control system which provides regulation of voltage, load and/or frequency
		KGB	=D	HE	%HE2	supply system for heating and/or cooling
		KGD	=D	LD		monitor and/or control system which provides regulation of voltage, load and/or frequency
		KGE	=D	KD		treatment system for adding substances
		KGV	=D	HB	%HB7	supply system for liquid matter
		KGV	=D	KJ	%KJ2	treatment system limiting friction
		KGW	=D	HB	%HB9	supply system for liquid matter
		KGX	=D	HB	%HB2	supply system for liquid matter
		KGY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	KH					
		KHA	=D	LE		monitor and/or control system which provides data acquisition
		KHB	=D	LE		monitor and/or control system which provides data acquisition
		KHC	=D	LE		monitor and/or control system which provides data acquisition
		KHW	=D	HB	%HB9	supply system for liquid matter
		KHX	=D	HB	%HB2	supply system for liquid matter
		KHY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	KJ					
		KJA	=D	HE	%HE2	supply system for heating and/or cooling
		KJB	=D	JA		transport or distribution system for gaseous matter
		KJL	=D	HE	%HE2	supply system for heating and/or cooling
		KJM	=D	HE		supply system for heating and/or cooling
		KJN	=D	JG	%JG1	transport or distribution system for heating and/or cooling
		KJP	=D	JG	%JG1	transport or distribution system for heating and/or cooling
		KJQ	=D	JG	%JG1	transport or distribution system for heating and/or cooling
		KJW	=D	HB	%HB9	supply system for liquid matter
		KJX	=D	HB	%HB2	supply system for liquid matter
		KJY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	KL					
		KLA	=D	HE	%HE1	supply system for heating and/or cooling
		KLB	=D	HE	%HE1	supply system for heating and/or cooling
		KLC	=D	HE	%HE1	supply system for heating and/or cooling

		KLE	=D	HE	%HE1	supply system for heating and/or cooling
		KLF	=D	HE	%HE1	supply system for heating and/or cooling
		KLL	=D	HE	%HE1	supply system for heating and/or cooling
		KLV	=D	HB	%HB7	supply system for liquid matter
		KLV	=D	KJ	%KJ2	treatment system limiting friction
		KLW	=D	HB	%HB9	supply system for liquid matter
		KLX	=D	HB	%HB2	supply system for liquid matter
		KLY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	KM					
		KMA	=H	K?		transport or distribution system for data
		KMD	=H	K?		transport or distribution system for data
		KME	=H	QC		storage system for solid matter
		KMV	=H	HB	%HB7	supply system for liquid matter
		KMV	=H	KJ	%KJ2	treatment system limiting friction
		KMW	=H	HB	%HB9	supply system for liquid matter
		KMX	=H	HB	%HB2	supply system for liquid matter
		KMY	=H	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	KN					
		KNC	=H	K?		transport or distribution system for data
		KNF	=H	K?		transport or distribution system for data
		KNK	=H	QB		storage system for liquid matter
		KNV	=H	HB	%HB7	supply system for liquid matter
		KNV	=H	KJ	%KJ2	treatment system limiting friction
		KNW	=H	HB	%HB9	supply system for liquid matter
		KNX	=H	HB	%HB2	supply system for liquid matter
		KNY	=H	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	KP					
		KPL	=H	K?		transport or distribution system for data
		KPQ	=H	QA		storage system for air and other gaseous matter
		KPV	=H	HB	%HB7	supply system for liquid matter
		KPV	=H	KJ	%KJ2	treatment system limiting friction
		KPW	=H	HB	%HB9	supply system for liquid matter
		KPX	=H	HB	%HB2	supply system for liquid matter
		KPY	=H	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	KR					
		KRA	=D	HA	%HA2	supply system for gaseous matter
		KRB	=D	HA	%HA2	supply system for gaseous matter

		KRC	=D	HA	%HA2	supply system for gaseous matter
		KRD	=D	HA	%HA2	supply system for gaseous matter
		KRE	=D	HA	%HA2	supply system for gaseous matter
		KRF	=D	HA	%HA2	supply system for gaseous matter
		KRG	=D	HA	%HA2	supply system for gaseous matter
		KRH	=D	HA	%HA2	supply system for gaseous matter
		KRJ	=D	HA	%HA5	supply system for gaseous matter
		KRK	=D	HA	%HA5	supply system for gaseous matter
		KRL	=D	HA	%HA5	supply system for gaseous matter
		KRM	=D	HA	%HA5	supply system for gaseous matter
		KRN	=D	HA	%HA5	supply system for gaseous matter
		KRV	=D	HB	%HB7	supply system for liquid matter
		KRV	=D	KJ	%KJ2	treatment system limiting friction
		KRW	=D	HB	%HB9	supply system for liquid matter
		KRX	=D	HB	%HB2	supply system for liquid matter
		KRY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	KT					
		KTA	=H	QB		storage system for liquid matter
		KTX	=H	HB	%HB2	supply system for liquid matter
		KTY	=H	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	KU					
		KUA	=D	JB	%JB7	transport or distribution system for liquid matter
		KUB	=D	JB	%JB7	transport or distribution system for liquid matter
		KUF	=D	JA		transport or distribution system for gaseous matter
		KUK	=D	LE		monitor and/or control system which provides data acquisition
		KUL	=D	JA		transport or distribution system for gaseous matter
		KUX	=D	HB	%HB2	supply system for liquid matter
		KUY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	KV					
		KVA	=D	HB	%HB7	supply system for liquid matter
		KVA	=D	KJ	%KJ2	treatment system limiting friction
	KW					
		KWA	=D	HB	%HB2	supply system for liquid matter
		KWX	=D	HB	%HB2	supply system for liquid matter

		KWY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	KX					
		KXA	=D	HB	%HB2	supply system for liquid matter
	KY					
		KYA	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions

L			=C,H			
	LA					
		LAA	=A	QB		storage system for liquid matter
		LAB	=A	JB	%JB6	transport or distribution system for liquid matter
		LAC	=A	JB		transport or distribution system for liquid matter
		LAD	=A	HE		supply system for heating and/or cooling
		LAE	=A	HB	%HB6	supply system for liquid matter
		LAF	=A	HB	%HB6	supply system for liquid matter
		LAV	=A	HB	%HB7	supply system for liquid matter
		LAV	=A	KJ	%KJ2	treatment system limiting friction
		LAW	=A	HB	%HB9	supply system for liquid matter
		LAX	=A	HB	%HB2	supply system for liquid matter
		LAY	=A	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	LB					
		LBA	=A	JA		transport or distribution system for gaseous matter
		LBB	=A	JG	%JG2	transport or distribution system for heating and/or cooling
		LBC	=A	JG	%JG2	transport or distribution system for heating and/or cooling
		LBD	=A	JD		transport or distribution system for multiphase matter
		LBE	=A	JD		transport or distribution system for multiphase matter
		LBF	=A	PF		protection system against mechanical and hydraulic fault
		LBG	=A	JG	%JG3	transport or distribution system for heating and/or cooling
		LBH	=A	JD		transport or distribution system for multiphase matter
		LBJ	=A	KC		treatment system for separating substances
		LBK	=A	PF		protection system against mechanical and hydraulic fault

		LBL	=A	JD		transport or distribution system for multiphase matter
		LBQ	=A	JD		transport or distribution system for multiphase matter
		LBR	=A	JG	%JG3	transport or distribution system for heating and/or cooling
		LBS	=A	JD		transport or distribution system for multiphase matter
		LBT	=A	KB		treatment system controlling a threshold
		LBU	=A	JA		transport or distribution system for gaseous matter
		LBV	=A	HB	%HB7	supply system for liquid matter
		LBV	=A	KJ	%KJ2	treatment system limiting friction
		LBW	=A	HB	%HB9	supply system for liquid matter
		LBX	=A	HB	%HB2	supply system for liquid matter
		LBY	=A	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	LC					
		LCB	=C	JB	%JB6	transport or distribution system for liquid matter
		LCC	=C	JB	%JB2	transport or distribution system for liquid matter
		LCD	=C	HE		supply system for heating and/or cooling
		LCE	=C	KB		treatment system controlling a threshold
		LCF	=C	JB	%JB6	transport or distribution system for liquid matter
		LCG	=C	JB	%JB2	transport or distribution system for liquid matter
		LCH	=C	JB	%JB2	transport or distribution system for liquid matter
		LCJ	=C	JB	%JB2	transport or distribution system for liquid matter
		LCK	=C	JB	%JB2	transport or distribution system for liquid matter
		LCM	=C	JB	%JB3	transport or distribution system for liquid matter
		LCN	=C	JB	%JB2	transport or distribution system for liquid matter
		LCP	=C	QB		storage system for liquid matter
		LCP	=C	JB	%JB2	transport or distribution system for liquid matter
		LCR	=C	JB	%JB2	transport or distribution system for liquid matter
		LCS	=C	HE		supply system for heating and/or cooling
		LCT	=C	KC		treatment system for separating substances
		LCV	=C	HB	%HB7	supply system for liquid matter
		LCV	=C	KJ	%KJ2	treatment system limiting friction

		LCW	=C	JB	%JB3	transport or distribution system for liquid matter
		LCX	=C	HB	%HB2	supply system for liquid matter
		LCY	=C	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	LD					
		LDA	=C	JB	%JB2	transport or distribution system for liquid matter
		LDB	=C	KC	%KC2	treatment system for separating substances
		LDC	=C	KD		treatment system for adding substances
		LDD	=C	KC		treatment system for separating substances
		LDE	=C	KD		treatment system for adding substances
		LDF	=C	KC	%KC9	treatment system for separating substances
		LDG	=C	HE	%HE3	supply system for heating and/or cooling
		LDG	=C	KC	%KC5	treatment system for separating substances
		LDH	=C	KC	%KC3	treatment system for separating substances
		LDJ	=C	HE		supply system for heating and/or cooling
		LDK	=C	JB	%JB6	transport or distribution system for liquid matter
		LDL	=C	QB		storage system for liquid matter
		LDN	=C	HC		supply system for solid matter
		LDN	=C	HB	%HB1	supply system for liquid matter
		LDP	=C	KD		treatment system for adding substances
		LDQ	=C	HB	%HB6	supply system for liquid matter
		LDR	=C	KC	%KC6	treatment system for separating substances
		LDS	=C	KC		treatment system for separating substances
		LDT	=C	JB		transport or distribution system for liquid matter
		LDV	=C	HB	%HB7	supply system for liquid matter
		LDV	=C	KJ	%KJ2	treatment system limiting friction
		LDX	=C	HB	%HB2	supply system for liquid matter
		LDY	=C	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	LE					
		LEA	=C	JB		transport or distribution system for liquid matter
		LEB	=C	RD		energy conversion system between chemical energy and enthalpy
		LEC	=C	JD		transport or distribution system for multiphase matter
		LED	=C	JG	%JG2	transport or distribution system for heating and/or cooling
		LEV	=C	HB	%HB7	supply system for liquid matter
		LEW	=C	HB	%HB9	supply system for liquid matter
		LEX	=C	HB	%HB2	supply system for liquid matter

		LEY	=C	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	LJ					
		LJA	=C	HB	%HB3	supply system for liquid matter
		LJB	=C	HB	%HB3	supply system for liquid matter
		LJC	=C	HB	%HB3	supply system for liquid matter
		LJD	=C	HB	%HB3	supply system for liquid matter
		LJK	=C	HB	%HB3	supply system for liquid matter
		LJL	=C	HB	%HB3	supply system for liquid matter
		LJM	=C	HB	%HB3	supply system for liquid matter
		LJN	=C	HB	%HB3	supply system for liquid matter
		LJV	=C	HB	%HB7	supply system for liquid matter
		LJV	=C	KJ	%KJ2	treatment system limiting friction
		LJW	=C	HB	%HB9	supply system for liquid matter
		LJX	=C	HB	%HB2	supply system for liquid matter
		LJY	=C	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	LN					
		LNA	=C	QB		storage system for liquid matter
		LNB	=C	KC	%KC2	treatment system for separating substances
		LNC	=C	QB		storage system for liquid matter
		LND	=C	PF		protection system against mechanical and hydraulic fault
		LNE	=C	JB	%JB3	transport or distribution system for liquid matter
		LNF	=C	JB		transport or distribution system for liquid matter
		LNG	=C	KC		treatment system for separating substances
		LNH	=C	JB		transport or distribution system for liquid matter
		LNV	=C	HB	%HB7	supply system for liquid matter
		LNV	=C	KJ	%KJ2	treatment system limiting friction
		LNW	=C	HB	%HB9	supply system for liquid matter
		LNX	=C	HB	%HB2	supply system for liquid matter
		LNY	=C	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	LP					
		LPA	=C	KC	%KC2	treatment system for separating substances
		LPB	=C	AE		Structural system providing protection against undesirable environmental impacts
		LPC	=C	JB	%JB6	transport or distribution system for liquid matter
		LPE	=C	QB		storage system for liquid matter
		LPG	=C	KC		treatment system for separating substances

		LPV	=C	HB	%HB7	supply system for liquid matter
		LPV	=C	KJ	%KJ2	treatment system limiting friction
		LPW	=C	HB	%HB9	supply system for liquid matter
		LPX	=C	HB	%HB2	supply system for liquid matter
		LPY	=C	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	LQ					
		LQA	=C	JB	%JB6	transport or distribution system for liquid matter
		LQB	=C	QB		storage system for liquid matter
		LQC	=C	AE		Structural system providing protection against undesirable environmental impacts
		LQE	=C	KC	%KC2	treatment system for separating substances
		LQG	=C	JB		transport or distribution system for liquid matter
		LQV	=C	HB	%HB7	supply system for liquid matter
		LQV	=C	KJ	%KJ2	treatment system limiting friction
		LQW	=C	HB	%HB9	supply system for liquid matter
		LQX	=C	HB	%HB2	supply system for liquid matter
		LQY	=C	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	LR					
		LRA	=D	JB		transport or distribution system for liquid matter
		LRB	=D	JB		transport or distribution system for liquid matter
		LRC	=D	KC		treatment system for separating substances
		LRV	=D	HB	%HB7	supply system for liquid matter
		LRW	=D	HB	%HB9	supply system for liquid matter
		LRX	=D	HB	%HB2	supply system for liquid matter
		LRY	=D	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	LS					
		LSB	=D	JC	%JC4	transport or distribution system for solid matter
		LSC	=D	JC	%JC4	transport or distribution system for solid matter
		LSD	=D	JB		transport or distribution system for liquid matter
		LSL	=D	JB	%JB3	transport or distribution system for liquid matter
	LX					
		LXA	=C	HB	%HB2	supply system for liquid matter
	LY					

		LYA	=F	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions

M			=A			
	MA					
		MAA	=A	RC		energy conversion system between mechanical energy and enthalpy
		MAB	=A	RC		energy conversion system between mechanical energy and enthalpy
		MAC	=A	RC		energy conversion system between mechanical energy and enthalpy
		MAD	=A	KJ	%KJ1	treatment system limiting friction
		MAG	=A	HE		supply system for heating and/or cooling
		MAH	=A	HB		supply system for liquid matter
		MAJ	=A	KC	%KC1	treatment system for separating substances
		MAK	=A	JF		transport or distribution system for mechanical energy
		MAL	=A	JB	%JB3	transport or distribution system for liquid matter
		MAL	=A	JA		transport or distribution system for gaseous matter
		MAM	=A	KB		treatment system controlling a threshold
		MAN	=A	PF		protection system against mechanical and hydraulic fault
		MAN	=A	JD		transport or distribution system for multiphase matter
		MAN	=A	JA		transport or distribution system for gaseous matter
		MAP	=A	PF		protection system against mechanical and hydraulic fault
		MAP	=A	JA		transport or distribution system for gaseous matter
		MAQ	=A	KB		treatment system controlling a threshold
		MAV	=A	HB	%HB7	supply system for liquid matter
		MAV	=A	KJ	%KJ2	treatment system limiting friction
		MAW	=A	HE		supply system for heating and/or cooling
		MAX	=A	HB	%HB2	supply system for liquid matter
		MAY	=A	PG	%PG2	protection system against electrical fault
	MB					
		MBA	=A	RK		energy conversion system between electromagnetic field in motion and electric energy
		MBB	=A	RJ		energy conversion system between mechanical energy and electromagnetic field in motion
		MBC	=A	KE		treatment system for changing pressure in a fluid

		MBD	=A	KJ	%KJ1	treatment system limiting friction
		MBE	=A	HE	%HE2	supply system for heating and/or cooling
		MBH	=A	HE	%HE2	supply system for heating and/or cooling
		MBJ	=A	KK		technical system which provides treatment controlling a position
		MBK	=A	JF		transport or distribution system for mechanical energy
		MBL	=A	JA		transport or distribution system for gaseous matter
		MBM	=A	RD		energy conversion system between chemical energy and enthalpy
		MBN	=A	HB	%HB5	supply system for liquid matter
		MBP	=A	HA		supply system for gaseous matter
		MBQ	=A	HB	%HB5	supply system for liquid matter
		MBR	=A	HA	%HA3	supply system for gaseous matter
		MBS	=A	RB		energy conversion system between mechanical energy and pressure and/or kinetic energy
		MBT	=A	RD		energy conversion system between chemical energy and enthalpy
		MBU	=A	HC		supply system for solid matter
		MBV	=A	HB	%HB7	supply system for liquid matter
		MBV	=A	KJ	%KJ2	treatment system limiting friction
		MBW	=A	HB	%HB9	supply system for liquid matter
		MBX	=A	HB	%HB2	supply system for liquid matter
		MBY	=A	PG	%PG2	protection system against electrical fault
		MBZ	=A	KA		Treatment system controlling a flow of matter
	MD					
		MDA	=A	RJ		energy conversion system between mechanical energy and electromagnetic field in motion
		MDK	=A	JF		transport or distribution system for mechanical energy
		MDL	=A	KK		technical system which provides treatment controlling a position
		MDV	=A	HB	%HB7	supply system for liquid matter
		MDV	=A	KJ	%KJ2	treatment system limiting friction
		MDX	=A	HB		supply system for liquid matter
		MDY	=A	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	ME					
		MEA	=A	JF		transport or distribution system for mechanical energy
		MEA	=A	AE		Structural system providing protection against undesirable environmental impacts

		MEB	=A	AE		Structural system providing protection against undesirable environmental impacts
		MED	=A	KJ	%KJ1	treatment system limiting friction
		MEG	=A	KA		Treatment system controlling a flow of matter
		MEK	=A	JF		transport or distribution system for mechanical energy
		MEL	=A	HA	%HA1	supply system for gaseous matter
		MES	=A	HE	%HE2	supply system for heating and/or cooling
		MEV	=A	HB	%HB7	supply system for liquid matter
		MEV	=A	KJ	%KJ2	treatment system limiting friction
		MEW	=A	HB	%HB9	supply system for liquid matter
		MEX	=A	HB	%HB2	supply system for liquid matter
		MEY	=A	PG	%PG2	protection system against electrical fault
	MF					
		MFA	=A	KE		treatment system for changing pressure in a fluid
		MFB	=A	AE		Structural system providing protection against undesirable environmental impacts
		MFD	=A	KJ	%KJ1	treatment system limiting friction
		MFG	=A	KA		Treatment system controlling a flow of matter
		MFK	=A	JF		transport or distribution system for mechanical energy
		MFL	=A	HA	%HA1	supply system for gaseous matter
		MFM	=A	KK		technical system which provides treatment controlling a position
		MFS	=A	HE	%HE2	supply system for heating and/or cooling
		MFV	=A	HB	%HB7	supply system for liquid matter
		MFV	=A	KJ	%KJ2	treatment system limiting friction
		MFW	=A	HB	%HB9	supply system for liquid matter
		MFX	=A	HB	%HB2	supply system for liquid matter
		MFY	=A	PG	%PG2	protection system against electrical fault
	MG					
		MGA	=A	KE		treatment system for changing pressure in a fluid
		MGB	=A	AE		Structural system providing protection against undesirable environmental impacts
		MGD	=A	KJ	%KJ1	treatment system limiting friction
		MGG	=A	KA		Treatment system controlling a flow of matter
		MGK	=A	JF		transport or distribution system for mechanical energy
		MGL	=A	HA	%HA1	supply system for gaseous matter
		MGM	=A	KK		technical system which provides treatment controlling a position
		MGS	=A	HE	%HE2	supply system for heating and/or cooling

		MGV	=A	HB	%HB7	supply system for liquid matter
		MGV	=A	KJ	%KJ2	treatment system limiting friction
		MGW	=A	HB	%HB9	supply system for liquid matter
		MGX	=A	HB	%HB2	supply system for liquid matter
		MGY	=A	PG	%PG2	protection system against electrical fault
	MJ					
		MJA	=A	RA		energy conversion system between mechanical energy and electrical energy
		MJE	=A	HE	%HE2	supply system for heating and/or cooling
		MJK	=A	JF		transport or distribution system for mechanical energy
		MJN	=A	HB	%HB5	supply system for liquid matter
		MJP	=A	QE		storage system for kinetic energy
		MJV	=A	HB	%HB7	supply system for liquid matter
		MJV	=A	KJ	%KJ2	treatment system limiting friction
		MJW	=A	HB	%HB9	supply system for liquid matter
		MJX	=A	HB	%HB2	supply system for liquid matter
		MJY	=A	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	MK					
		MKA	=A	RA		energy conversion system between mechanical energy and electrical energy
		MKC	=A	KL		Treatment system controlling a flow of electrical energy
		MKD	=A	KJ	%KJ1	treatment system limiting friction
		MKE	=A	HE	%HE2	supply system for heating and/or cooling
		MKF	=A	HE	%HE2	supply system for heating and/or cooling
		MKG	=A	HE	%HE2	supply system for heating and/or cooling
		MKH	=A	HE	%HE2	supply system for heating and/or cooling
		MKJ	=A	HE	%HE2	supply system for heating and/or cooling
		MKK	=A	HE	%HE2	supply system for heating and/or cooling
		MKQ	=A	HA	%HA3	supply system for gaseous matter
		MKV	=A	HB	%HB7	supply system for liquid matter
		MKV	=A	KJ	%KJ2	treatment system limiting friction
		MKW	=A	HB	%HB9	supply system for liquid matter
		MKX	=A	HB	%HB2	supply system for liquid matter
		MKY	=A	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	ML					
		MLA	=A	AE		Structural system providing protection against undesirable environmental impacts
		MLC	=A	KL		Treatment system controlling a flow of electrical energy
		MLD	=A	KJ	%KJ1	treatment system limiting friction
		MLE	=A	HE	%HE2	supply system for heating and/or cooling

		MLF	=A	HE	%HE2	supply system for heating and/or cooling
		MLJ	=A	HE	%HE2	supply system for heating and/or cooling
		MLQ	=A	HA	%HA3	supply system for gaseous matter
		MLV	=A	HB	%HB7	supply system for liquid matter
		MLV	=A	KJ	%KJ2	treatment system limiting friction
		MLW	=A	HB	%HB9	supply system for liquid matter
		MLX	=A	HB	%HB2	supply system for liquid matter
		MLY	=A	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	MN					
		MNX	=A	HB	%HB2	supply system for liquid matter
		MNY	=A	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	MQ					
		MQA	=A	RG		energy conversion system from solar energy to electrical energy
		MQX	=A	HB	%HB2	supply system for liquid matter
		MQY	=A	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	MR					
		MRA	=A	RA		energy conversion system between mechanical energy and electrical energy
		MRE	=A	HE	%HE2	supply system for heating and/or cooling
		MRK	=A	JF		transport or distribution system for mechanical energy
		MRN	=A	HB	%HB5	supply system for liquid matter
		MRV	=A	HB	%HB7	supply system for liquid matter
		MRV	=A	KJ	%KJ2	treatment system limiting friction
		MRW	=A	HB	%HB9	supply system for liquid matter
		MRX	=A	HB	%HB2	supply system for liquid matter
		MRY	=A	LB	%LB2	monitor and/or control system which raises an alarm in the presence of dangerous or undesirable conditions
	MS					
		MSA	=A	HD		supply system for electrical energy
		MSC	=A	PG	%PG2	protection system against electrical fault
		MSD	=A	KL		treatment system controlling a flow of electrical energy
		MSE	=A	KF		treatment system for transforming electrical energy
		MSS	=A	PG	%PG1	protection system against electrical fault
		MST	=A	KF		treatment system for transforming electrical energy
		MSX	=A	HB	%HB2	supply system for liquid matter