IEC 61968-13

Edition 2.0 2021-03

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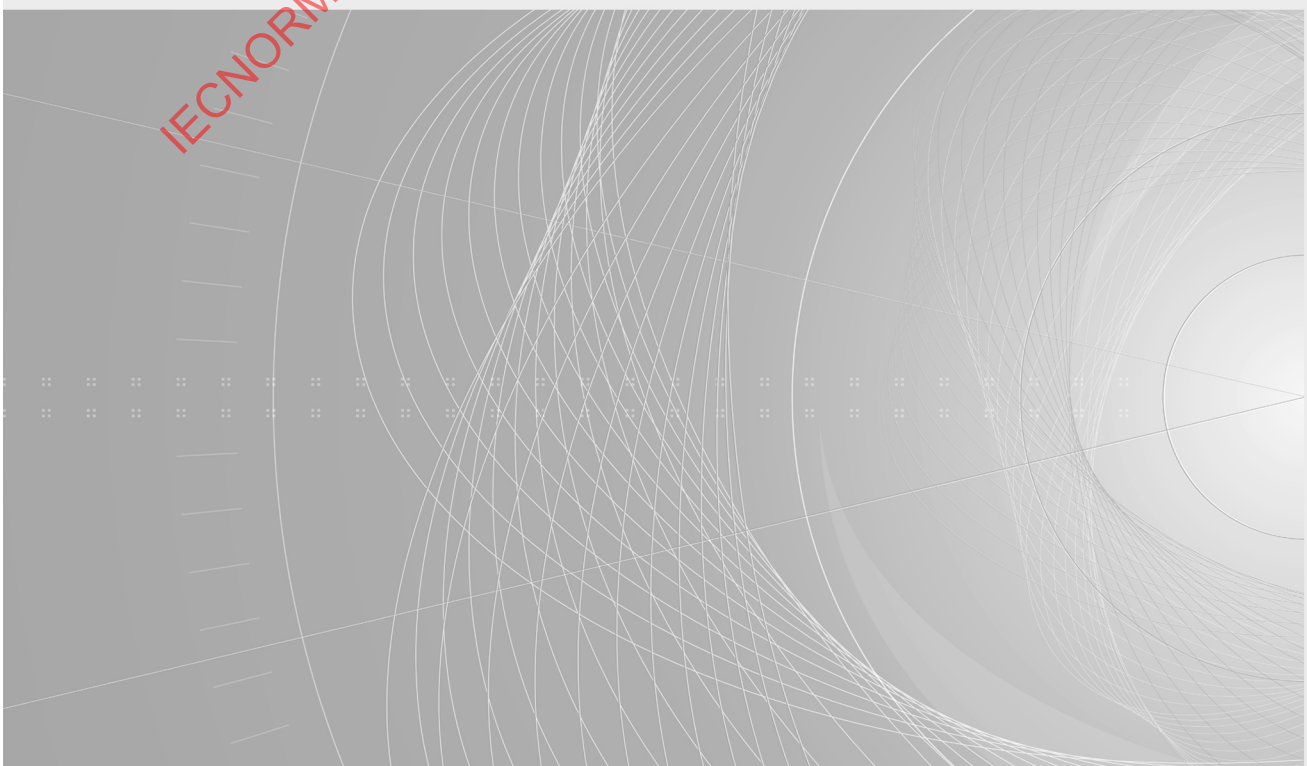
Application integration at electric utilities – System interfaces for distribution management –
Part 13: Common distribution power system model profiles

Intégration d'applications pour les services électriques – Interfaces système pour la gestion de la distribution –
Partie 13: Profils de modèle commun de système électrique de distribution



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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APPLICATION INTEGRATION AT ELECTRIC UTILITIES – SYSTEM INTERFACES FOR DISTRIBUTION MANAGEMENT –

Part 13: Common distribution power system model profiles

FOREWORD

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International Standard IEC 61968-13 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

This second edition cancels and replaces the first edition published in 2008. This edition constitutes a technical revision. This edition was pre-tested during 2016 ENTSO-E interoperability tests [1][1]. The interoperability test report mentions: "Some vendors demonstrated that the transformation between distribution network and CGMES is possible. This is a first step towards the efforts to have closer integration between CGMES and profiles for exchanging distribution data (CDPSM)."

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1 Numbers in square brackets refer to the bibliography.

This edition includes the following significant technical changes with respect to the previous edition:

a) Alignment with "CIM100" UML version fixed in July 2018:
iec61970cim17v24_iec61968cim13v05_iec62325cim03v14.eap
Namespace associated to this version was: http://iec.ch/TC57/2017/CIM-schema-cim100#

b) Test of Data Sets against "CIM100" version given in a).

c) Test of Data Sets against a newer "CIM100" version of May 2019:
iec61970cim17v34_iec61968cim13v12_iec62325cim03v17a.eap
Namespace associated to this version was: http://iec.ch/TC57/CIM100#

d) Alignment with "CIM100" after CDV stage in order to align 61968-13 with the latest CIM version iec61970cim17v38_iec61968cim13v12_iec62325cim03v17a. A new alignment was done in March/April 2020 on a new CIM100:
iec61970cim17v38_iec62968cim13v13_iec62325cim03v17a.eap. This document has been properly updated with latest developments to minimize the need for any convergence.

e) Test of Data Sets were validated against the profiles derived from these two newer versions of CIM100 in order to guarantee consistency. Validation include syntax validation, and load flow calculation.

f) Informative extensions included (NEK, EDF) which are based on some utility needs, which shall be discussed and which could be integrated in the IEC CIM model. These extensions have been put in a dedicated annex. These extensions will be discussed in IEC TC 57, and eventually be put in the official CIM Model. These extensions are managed through specific namespaces and do not block any interoperability test. Amendments to IEC 61968-13 or new parts to IEC 61968-13 will potentially address these "extensions" in the near future (when integrated into the IEC CIM Model).

g) Namespaces and associated URI modified.

h) Use of last CIM Feeder modelling and unbalanced networks modelling artefacts.

i) New annex illustrating CDPSM usage by EDF in H2020 TDX-ASSIST European project.

j) New annex illustrating CDPSM usage by the Norwegian AutoFOS project. The extension is governed by the Norwegian National Committee (NEK).

k) New paragraph and annex illustrating Observability Area concept.

l) Tools that were used are MODSARUS®[2] (Copyright © 2019, EDF R&D contact: modsarus@edf.fr) for Use Case definition (according to IEC 62559-2, IEC SRD 62913-1 methodology) and CDPSM UML profiling. Riseclipse tool was used for Data Set Validation (RiseClipse Web https://rise-clipse.pam-retd.fr/ Rise Clipse Code: https://wdi.supelec.fr/software/RiseClipse/). CIMTool (https://wiki.cimtool.org/) was also used to verify tools compatibility (profiling and data set validation). A modified version of jCleanCim (http://www.tanjakostic.org/jCleanCim/) was used to generate this documentation. Other tools like CimConteXtor and CimSyntaxGen could be used to produce the profiles and documentation. (https://www.cimcontextor.net/).

m) Replacement of Figure 6 on Network Model Management. Introduction of a new informative annex on CDPSM to CGMES conversion, replacing Figure 7 of the CDV document.

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2 MODSARUS is the trademark of a product supplied by EDF. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
57/2311/FDIS	57/2336/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61968 series, published under the general title *Application integration at electric utilities – System interfaces for distribution management*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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INTRODUCTION

The organization of IEC 61968-13 is described in Table 1.

Table 1 – Document overview for IEC 61968-13

Clause	Title	Purpose
1	Scope	Scope of IEC 61968-13.
2	Normative references	Define the normative references that the document depends on.
3	Terms and definitions	Define the terms and defintions that are used in the document.
4	Use Case list	Use cases related to CDPSM.
5	Distribution network modelling and CIM related issues resolved	Feeder modelling Partial-phase devices modelling Manage LV cable in Catalog
6	CIM Distribution Network Static Model Profiles	
Informative Annex A	Use Cases	
Informative Annex C	Example of a European CDPSM MV/LV urban and rural network	CDPSM usage and associated satellite image.
Informative Annex D	Example of a European CDPSM MV/LV urban network	CDPSM usage and associated satellite image.
Informative Annex E	Example of a European CDPSM MV Urban and Rural Network	CDPSM usage and associated satellite image.
Informative Annex F	Example of CDPSM usage in H2020 TDX-ASSIST project	CDPSM usage in European project H2020 TDX-ASSIST project.
Informative Annex G	Example of a nuclear distribution network	CDPSM was leveraged to model internal distribution network of Nuclear Power Plant.
Informative Annex H	Observability area concept	The CIM modelling should be able to represent the concept of observability area.
Informative Annex I	CDPSM to CGMES conversion	Illustrates how CDSPM data sets could be transformed in CGMES data sets.
Informative Annex J	Norwegian Electrotechnical Committee (NEK) CDPSM related Use Cases	Describe the use of CDPSM in the context of Autofos project.

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APPLICATION INTEGRATION AT ELECTRIC UTILITIES – SYSTEM INTERFACES FOR DISTRIBUTION MANAGEMENT –

Part 13: Common distribution power system model profiles

1 Scope

This part of IEC 61968 specifies profiles that can be used to exchange Network Models in a Utility or between a Utility and external applications to the utility. This document provides a list of profiles which allow to model balanced and unbalanced distribution networks in order to conduct network analysis (Power flow calculation). Therefore, it leverages already existing profiles (IEC 61970-45x based on IEC 61970-301 (CIM base) or profiles based on IEC 61968-11 CIM extension for Distribution). This document reuses some profiles without any change, or eventually extends them or restricts them. Moreover, it proposes other profiles to reflect Distribution needs.

Use of CIM in Distribution is not a new topic. Several documents can be of interest [13][17][18][19][20]. This document includes informative parts, as CIM model extensions, which could be integrated in future versions of the IEC CIM Model. These extensions have been used by some utilities for utility internal information exchange use cases and to support information exchanges between different market participants like Transmisstion System Operators (TSO), Distributed System Operators (DSO), Distributed Network Operators (DNO) and Significant Grid Users (SGU) including generators and industry (see Annex J for example).

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 TS 61968-2, *Application integration at electric utilities – System interfaces for distribution management – Part 2: Glossary*

IEC 61968-11:2013, *Application integration at electric utilities – System interfaces for distribution management – Part 11: Common information model (CIM) extensions for distribution*

IEC 61970-301:2020, *Energy management system application program interface (EMS-API) – Common information model (CIM) base*

IEC 61970-452, *Energy management system application program interface (EMS-API) – Part 452: CIM static transmission network model profiles*

IEC 61970-501:2006, *Energy management system application program interface (EMS-API) – Part 501: Common Information Model Resource Description Framework (CIM RDF) schema*

IEC 61970-552:2016, *Energy management system application program interface (EMS-API) – Part 552: CIMXML Model exchange format*

IEC 62325-301, *Framework for energy market communications – Part 301: Common information model (CIM) extensions for markets*

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3 Terms, definitions and abbreviated terms

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

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

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

Where there is a difference between the definitions in this document and those contained in other referenced IEC standards, then those defined in IEC TS 61968-2 shall take precedence over the others listed, and those defined in IEC 61968-13 shall take precedence over those defined in IEC TS 61968-2.

3.1 Terms and definitions

3.1.1
DMS
Distribution Management System
as used in IEC 61968, system consisting of various distributed application components for the utility to manage electrical distribution networks

Note 1 to entry: These capabilities include monitoring and control of equipment for power delivery, management processes to ensure system reliability, voltage management, demand side management, outage management, work management, automated mapping and facilities management. Standards interfaces are defined for each class of applications identified in the Interface Reference Model (IRM), which is described in Part 1: Interface Architecture and General Requirements.

3.1.2
profile
agreed-upon subset or derived from a specification

Note 1 to entry: A common profile is required for achieving interoperability especially in those cases when a specification could have more than one interpretation and there are probably many optional features

Note 2 to entry: A profile may be more restrictive than the CIM but not less so.

[SOURCE: IEC TR 62361-103:2018, 3.11, modified – Note 2 to entry has been added.]

3.1.3
use case
specification of a set of actions performed by a system, which yields an observable result that is, typically, of value for one or more actors or other stakeholders of the system

Note 1 to entry: There are two types of Use Cases:

– Business Use Cases describe how Business Roles interact to execute a business process. These processes are derived from services, i.e. business transactions, which have previously been identified.

– System Use Cases describe how System and/or Business Roles of a given system interact to perform a Smart Grid Function required to enable / facilitate the business processes described in Business Use Cases. Their purpose is to detail the execution of those processes from an Information System perspective.

Note 2 to entry: Since a Smart Grid Function can be used to enable / facilitate more than one business process, a System Use Case can be linked to more than one Business Use Case.

[SOURCE: IEC SRD 62913-1:2019, 3.1.22, modified – Table 1 has been deleted from Note 2 to entry.]

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3.2 Abbreviated terms

BUC	Business Use Case (Use Case)
CGMES	Common Grid Model Exchange Standard
CIM	Common Information Model
DER	Distributed Energy Resource(s)
DERMS	Distributed Energy Resources Management System
DL	Diagram Layout
DMS	Distribution Management System
DNO	Distribution Network Operator
DSO	Distribution System Operator. Generally a DSO manages an MV/LV network
EQ	Equipement
EHV	Extra High Voltage
EMS-API	Energy Management System Application Program Interface
HV	High Voltage
IEC	International Electrotechnical Commission
LV	Low Voltage
MV	Medium Voltage
RDF	Resource Description Framework
SUC	System Use Case (USE Case)
SGU	Significant Grid User
SV	State Variable
SSH	Steady State Hypothesis
TP	Topology
TSO	Transmission System Operator. Generally a TSO manages an EHV/HV network
UML	Unified modelling language
UUID	Universally unique identifier
XML	eXtended Markup Language
XSD	XML Schema Definition

4 Use Cases list

4.1 Use Cases related to the Common Distribution Power System Model Profiles

Business Processes and the associated interaction between business roles (inside and outside a given domain) can be described as Business Use Cases, Smart Grid Functions and the associated interactions between roles (Business and/or System roles) can be described in System Use Cases according to IEC SRD 62913 (all parts). IEC TR 62357-2 refers to Use Cases presented in this document.

The definition of the Common Distribution Power System Model Profiles (CDPSM) standard is mainly based on the identification of the related Business and System Use Cases and their description using the IEC 62559-2 use case template.

In order to identify the Business Use Cases of interest for CDPSM objectives, firstly an analysis of the BUC (Business Use Cases) collection specified in IEC SRD 62913-2-1:2019 was carried out (see Table 2 – Identified Generic Business Use Cases of the Domain).

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Table 2 – Identified Business Use Cases

Identified Business Use Cases	Brief description
Elaborate the distribution network multiannual masterplan	The Business Use Case describes how the HV and MV/LV System Operator elaborates the network multiannual masterplan by simulating constraints likely to appear on the network and prioritise network investments. *This Business Use Case is generic and applied to the European region*
Optimise network operations in operational planning based on a schedule	The Business Use Case describes how the HV and MV/LV System Operator anticipates / optimises network operations in medium-term (month and week ahead) and short-term (day ahead and intraday) operational planning. It consists of: – anticipating the operating points based on local load and generation forecasts, identify and qualify risks of constraints on the network (primary substation, MV network, and HV network if managed by the HV and MV/LV System Operator), – defining the network configuration in order to satisfy the contractual commitments, with the use of several optimisation levers which aim at solving detected constraints at the lowest cost, – taking into consideration for all timeframes the work programmes, – taking into consideration real-time network constraints (faults, transmission limitation or transmission outage, load transfers) and evaluating the impact on the operating points. *This Business Use Case is generic and applied to the European region*
Optimise work programmes (EHV and HV System Operator, Producers, and HV and MV/LV System Operator works)	The Business Use Case describes how the HV and MV/LV System Operator optimises work programmes on the HV and MV networks, i.e. schedules for operations related to the creation, maintenance, and repair of network assets – including works determined by the EHV and HV System Operator, HV and/or MV Producers, and the HV and MV/LV System Operator – in order to minimise their impact on the system and maximise renewable energy. *This Business Use Case is generic and applied to the European region*
Decide asset renewal priorities and optimise maintenance programmes	The Business Use Case describes how the System Operator decides asset renewal priorities and optimises maintenance programmes in the planning phase, based on the network assets analysis and the development of failure predictive and condition-based maintenance models. *This Business Use Case is generic and applied to the European region*
Decide to carry out urgent maintenance operations	The Business Use Case describes how the HV and MV/LV System Operator analyses network assets health indexes using archived data (assets use, maintenance operations, faults, voltage excursions…) and real-time data monitoring. Based on this information, the HV and MV/LV System Operator evaluates the risk of default and decides to carry out urgent maintenance operations to prevent faults. *This Business Use Case is generic and applied to the European region*
Operate the MV network in real-time in an optimised way using new automations and advanced functions	The Business Use Case describes how the MV/LV System Operator manages the MV network in real-time by optimising the configuration of the network, while ensuring coordination with the EHV-HV System Operator, maintaining voltage profile within acceptable limits, preventing critical situations using emergency levers, and restoring supply in case of faults. *This Business Use Case is generic and applied to the European region*
Monitor and manage the LV network	The Business Use Case describes how the MV/LV System Operator manages the LV network in real-time in normal conditions and in case of faults to maintain quality and continuity of supply, using for instance data from smart meters and other equipment installed on the network. *This Business Use Case is generic and applied to the European region*

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Identified Business Use Cases	Brief description
Optimise grid operating conditions using available levers (LV phase balance optimisation and off-line MV/LV tap changers)	The Business Use Case describes how the HV and MV/LV System Operator performs load flow calculations based on archived metered, network and weather data and optimises: – the set point of the off line MV/LV tap changers, – the grid connection requirements, – the grid connection phase of single-phase meters which are already connected or to be connected to the LV network. This allows the HV and MV/LV System Operator to prevent network constraints and increase grid capacity. *This Business Use Case is generic and applied to the European region*
Electrical Data Management in Nuclear Power Plants	Electrical data in nuclear power plants have to be managed, from the engineering studies to operation and maintenance. The electrical distribution grid of a nuclear power plant is substantial and shall be managed carefully for safety reasons. Nuclear power plants have to be stopped regularly for refueling and maintenance (unit outage). The goal of nuclear utilities is to keep these unit outages as short as possible, in order to optimize the energy availability factor. The unit outages shall then be planned very precisely. Indeed, a lot of work shall be done in parallel, while some cooling circuits need to be preserved for nuclear safety. In this context, it is very important to be able to know (and simulate) which equipment is impacted by the unavailability of a distribution switch board: during planning, in order to optimize the maintenance work and during the unit outage itself, in order to face unexpected events. In addition, engineering teams shall also run simulations for power balance calculations and other network analyses.

The above statement "This Business Use Case is Generic and applied to the European region" is extracted from IEC SRD 62913-2-1. It means that at least Europe implements such a use case, but that it is not specific to Europe. The above Use Cases show that some network models need to be managed and potentially exchanged globally or in-part. These network models can include Asset related information.

From that list the BUC mainly considered for the definition of CDPSM are:

- optimise network operations in operational planning based on a schedule,
- optimise network operations in real-time in an optimised way using new automations and advanced functions.

CDPSM shall support the following requirements extracted from the Business Use Case listed in Table 3.

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Table 3 – Identified requirements

Requirement brief description
The MV/LV system operator, in coordination with the EHV/HV System Operator, Producer and Customer, shall have optimised the configuration of the network before real-time by using operational planning tools and load and generation forecasts at the primary substation level.
The MV/LV system operator, in coordination with the EHV/HV System Operator, Producer and Customer, shall have taken into account the works planned on the MV/LV network and production schedules of Distributed Generators connected to the MV network if available.
The Advanced FLISR System exchanges with MV System Operator: • topological data and real-time operating conditions, • load on Network assets and power flows, • contextual information, • protection plan and Network constraints in real time.
The State estimation function shall integrate in its calculations the real-time network topology (position of switches) and impedances.
In case of a restoration plan requiring a load transfer, from one Primary Substation to another one, greater than a certain threshold, the MV System Operator exchanges information with the EHV/HV System Operator, in compliance with the Network operation contract in force between the two parties.
Several voltage level mixing AC, DC networks shall be managed (case of a nuclear distribution network).

4.2 Use Case overview table

More detailed BUCs related to the CDPSM scope are reported in Table 4.

Table 4 – Business Use Cases related to CDPSM

Name of Use Case	Short description	Actors	General remarks
DSO provides its power system models to TSO	In order to calculate the TSO grid power flow, the DSO provides to TSO an aggregate view of its power system model, including the related states and measurements.	TSO DSO	
A customer provides its DER plant power system models to DSO	A DER connection to the Distribution grid request is supported by the description of an aggregate view of the DER plant power system model.	DSO DER	
DSO1 and DSO2 mutual exchange their power system models	DSO1 and DSO2 mutually exchange their power system models in order to manage the grid in case of outages on a boundary feeder.	DSO1 DSO2	
TSO and DSO provides their power system models to a third party	TSO and DSO provide their power system models to a third party in order to perform an ex-post analysis of a power quality issue (i.e voltage dips).	TSO DSO Authority	
DSO/DNO internal information exchange	A DSO/DNO exchanges various information or data between different systems within the company.	DSO or DNO	
DNOs provide their power system models to DSO	In order to perform network planning, various analyses, outage management, etc., of the whole distribution grid, the DSO needs power system models of the subordinate DNOs grids.	DSO DNO	DNOs own and operate a part of the whole distribution grid for which the DSO is responsible for

In order to support the definition of the CDPSM data requirement related to a concrete scenario, Clause A.2 defines a System Use Case (SUC) related to TSO-DSO information exchange supporting the first BUC listed in Table 4.

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This support also the same Use Case for an EMS: loadflow simulations (SV, SSH), transfer from detailed topology to bus branch model (TP Profile).

It is to be highlighted that the System Use Case supporting the BUC involving DSO and TSO roles defined in Clause A.2, could also be applied for BUCs involving other roles (DSO/DSO, DSO/MicroGridSystemOperator, etc.), since the profile requirements are equivalent. Microgrid use cases are studied in IEC TC 8 (microgrid Energy Management System) and will provide use cases relevant to this document.

5 Distribution network modelling specificities and CIM related issues resolved

5.1 Feeder modelling

The need/purpose of the feeder model is that a Feeder construct is intended to support naming, user navigation and tracing.

Unlike other CIM containers, which require that objects be contained in only one container, the Feeder is a container that can contain both equipment and other containers.

In order to cover Use Cases such as outage management in a feeder (determine from which feeder load can be transferred), it is necessary to model the feeder with the CIM.

To do this with the current version of the CIM, there is a need to process the network connectivity, starting from the breaker in the primary substation, and following the connectivity chain (conducting equipment, terminals, and connectivity nodes) until the next switch. A different set of rules, depending on utilities, is applied to define the spreading part of network concerned by the connectivity processing.

This is typical to Distribution networks, where networks can be managed as radial.

- Usually one Switch feeds a network part.
- Open Switches serve as borderline with other network parts (used to rescue when a feeder-switch is down).
- To satisfy different detailed level applications, expressing the composition of the feeder should be possible at 2 detail-levels: Containers and elementary equipment.
  - Containers: Substation, Line, VoltageLevel for undetailed definition.
  - ConductingEquipment or ConnectivityNodes for detailed definition.
- Feeders might be hierarchically subdivided (for example a MV-Feeder feeds/includes several LV subnetworks).

One primary substation, having 3 feeders and 5 secondary substations is illustrated in Figure 1.

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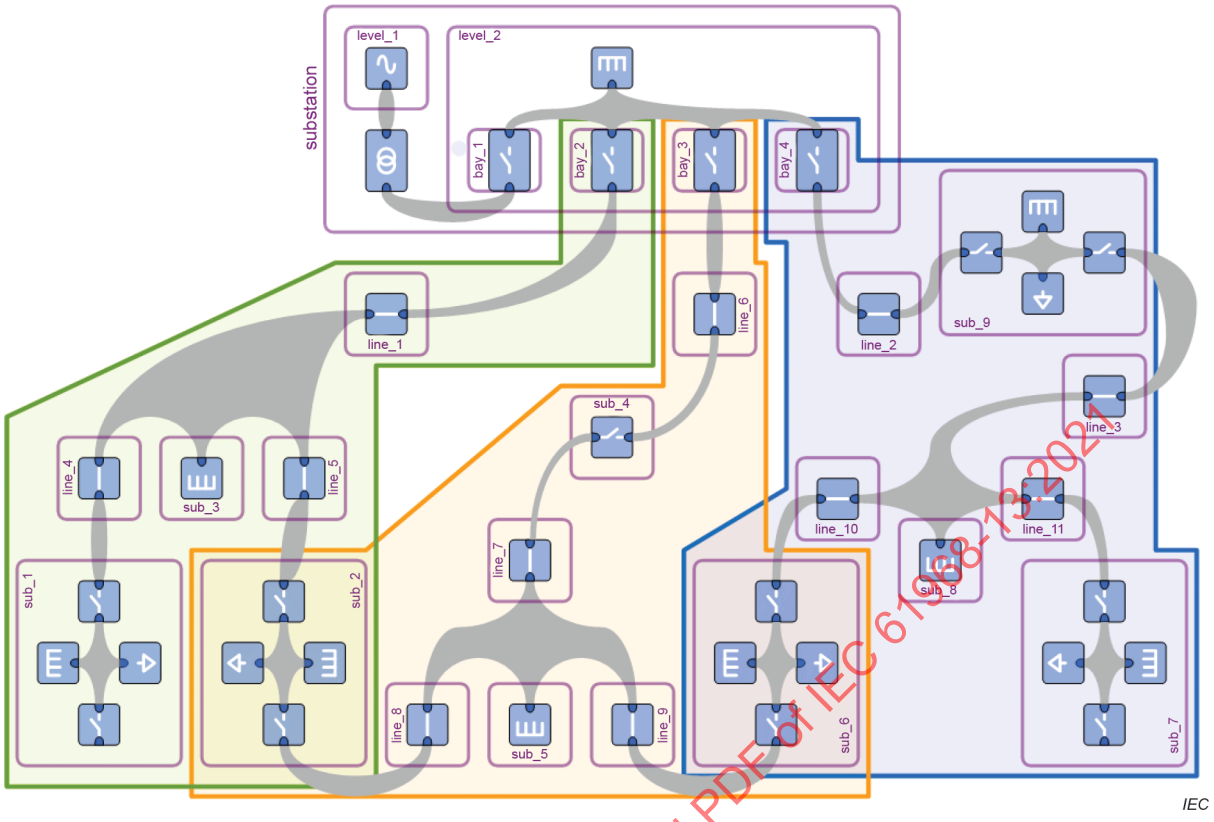

Figure 1 – Feeder containment principles

In the above figure, Substation and Sub_x will use CIM:Substation, Line_x will use CIM:Line, Level will use CIM:Voltage_Level, Bay_x will use CIM:Bay. The different feeders are groups using a colour code (green, yellow, blue). This figure illustrates a MV/LV network, that this document can implement.

The UML CIM Feeder model has been included in the last version of the CIM Model. See associated IEC 61970-301:2020, 4.5.16 and IEC 61970-301:2020, Figure 68.

The tests data sets provided in Annex C, Annex D, Annex E and Annex F have validated this model proposal. This model proposal shall be consolidated through other data sets.

5.2 Partial-phase devices modelling

IEC 61970-301 and IEC 61968-11 already have support for partial phase conducting devices through the PhaseCode enumeration which may be a combination of any or all of the letters A, B, C, and N. In general one can think of a partial phase conducting device as being the same as a full 3-phase device with some of the phases missing.

Impedances of unbalanced and partial phase devices:

IEC 61970-301 specifies impedance of conducting devices in terms of the real and reactive positive and zero sequence impedance. Unfortunately, this is only valid for perfectly symmetric 3-phase networks where all 3 phases have the same value of self-impedance and the same mutual impedance value.

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The impedance of unbalanced 3-phase conducting devices such as AC line segments shall be specified as a three by three complex matrix where the diagonal terms specify the self impedance of each phase and the off-diagonal terms specify the mutual impedance between each phase pair. These values can be computed using Carson's equations based on the geometric mean radius, the linear resistance and the geometric arrangement of the three phases on the pole. For 2-phase devices the impedance matrix is two by two and for single-phase devices it is a complex scalar specifying the self impedance of the single phase conductor.

Refer to IEC 61968-11:2013, 4.4.3 (Network modelling concepts and examples) and IEC 61970-301 for more precise modelling concepts including unbalance modelling concepts.

5.3 Manage LV cables in catalog

LV cables are commonly compounded in a single asset of conductors with different characteristics: three identical conductors for phases, a different conductor to the neutral.

To manage them in catalog, associated with AssetModel, it needs to set an assetinfo subtype that allows the description of these assemblies:

- characteristics (WireInfo) of each of the different type of conductors,
- their respective quantities or assignment to phases/neutral,
- impedances.

(Quantities or phase/neutral assignment are needed to identify clearly which phasing usage can be done, and which WireInfo affects which column if PhaseImpedance by only using the level objects "catalog" without resorting to an ACLineSegmentPhase link).

This applies to underground cables or twisted-assembled overhead use, but it would also be helpful for overhead with single conductors. Good practices mounting rules in several utilities allow a limited amount of opportunities for wires and positions assemblies. As it is more simple and concise to manage a catalog of predefined assemblies, associating them with ACLineSegments, without the need to repeatedly declare ACLineSegmentPhase to distinguish the two different WireInfos needed.

Figure 2 describes a solution which includes informative extensions, which will need to be discussed in IEC TC 57.

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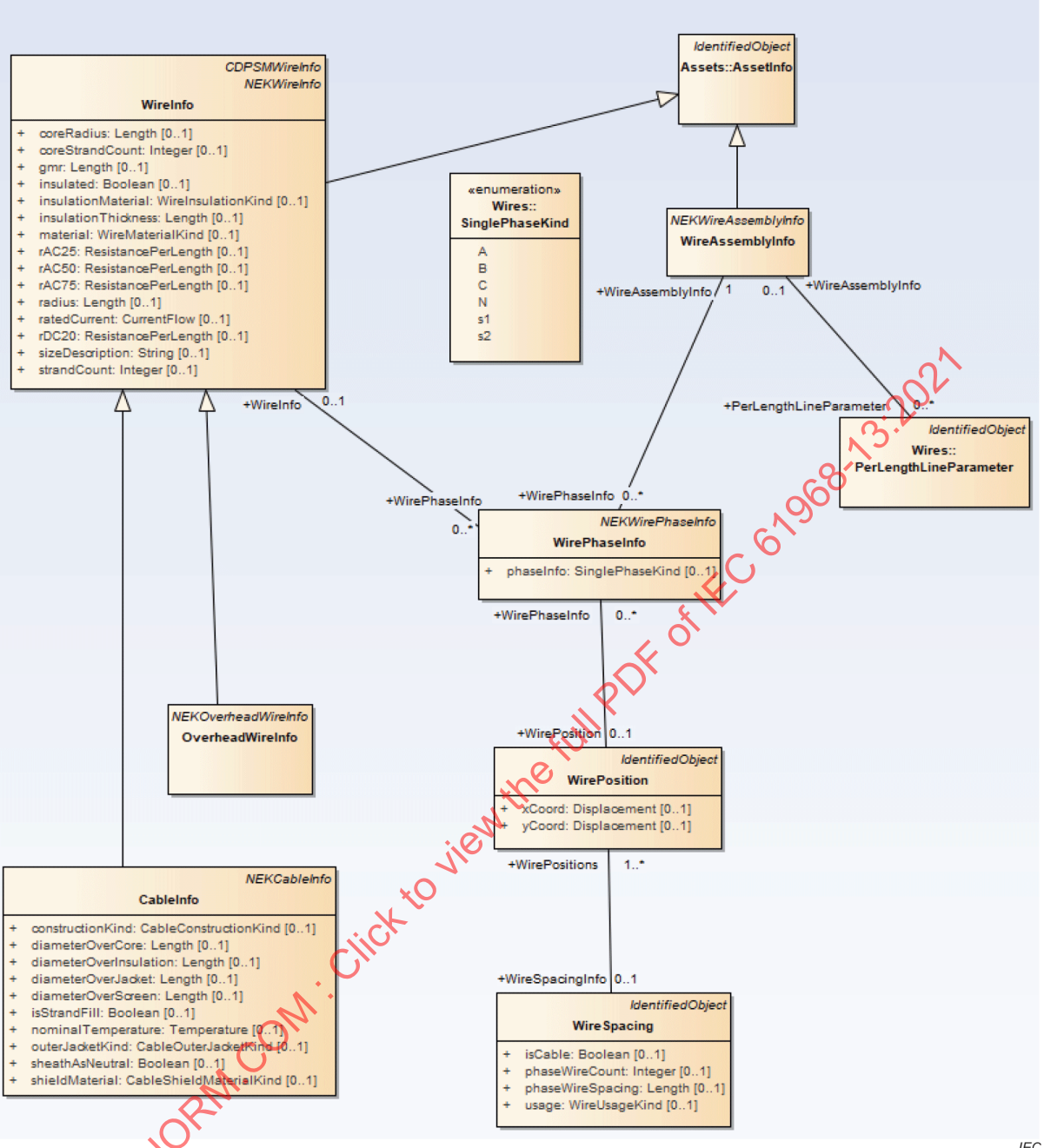

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Figure 2 – UML Wire arrangement (informative)

See informative Annex J for background information on proposed extensions.

5.4 Observability Area (informative)

As explained in [3], according to [5], "*each system operator is responsible for its own grid, also called 'responsibility area'. To operate this grid properly, it is important to also know what is happening in part of the surrounding grids. The responsibility area together with this part of surrounding grids that can affect the responsibility area is called the Observability Area*".

The concept of an Observability Area for each System Operator is the portion of a grid related to a specific operator's grid that affects flows in another operator's grid [6] [7]. This is related to meshed grids as grids connected radially only affect connecting grids on the border. According to this reference, "Observability Area means its own Transmission System and the relevant parts Distribution Networks and neighbouring TSOs' Transmission Systems, on which TSO implements real-time monitoring and modelling to ensure Operational Security in its Responsibility Area". However, the mentioned document only reflects the point of view of the TSOs, which means that from a DSO and third-party point-of-view, not only a Transmission System needs to be considered but the Distribution System is also of great importance on this concept.

In general, an exchange of structural, scheduled and real-time data is necessary since the Observability Area is a key element for the network operation management. Several elements from the System Operators shall be exchanged to achieve security in the operations that affect a grid operator's border. The exchange of information between TSOs, DSOs and other market participants can be included from articles 40 to 53 of the System Operation Guidelines.

See Annex H for more information about the Observability Area concept.

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6 CIM Distribution Power System Model Profiles

6.1 General

Subclause 6.1 lists the profiles that will be used for data exchange and the classes, attributes, and associations that are a part of each profile. Included are all the classes that a data consumer would be expected to recognize in the data being consumed. Additional classes are also referenced in this clause when the classes to be exchanged inherit attributes or associations.

The main steps for profiling CDPSM with CIM are presented in Figure 3.

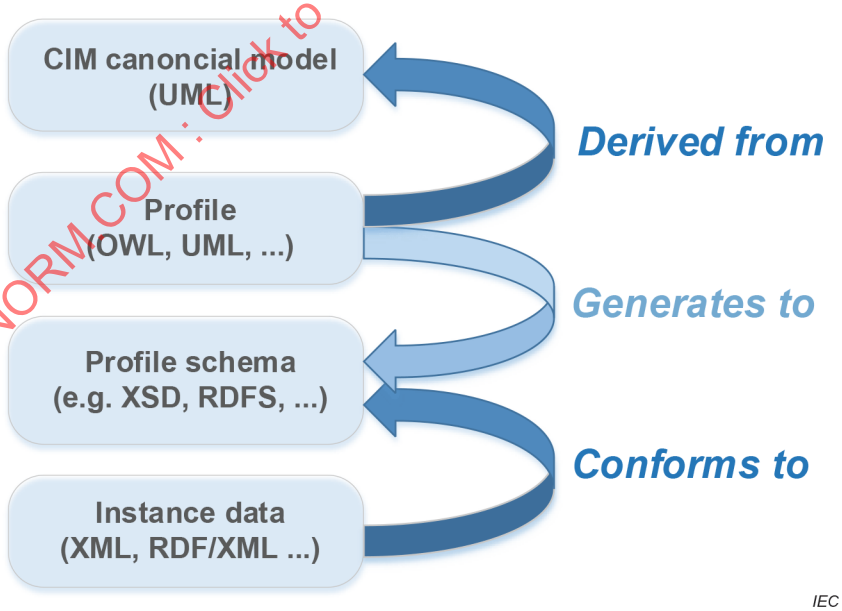

Figure 3 – Main steps for profiling CIM

The CDPSM Profiles described in 6.2 to 7.5 are derived from the CIM Model (IEC 61970-301, IEC 61968-11) as described in Figure 3.

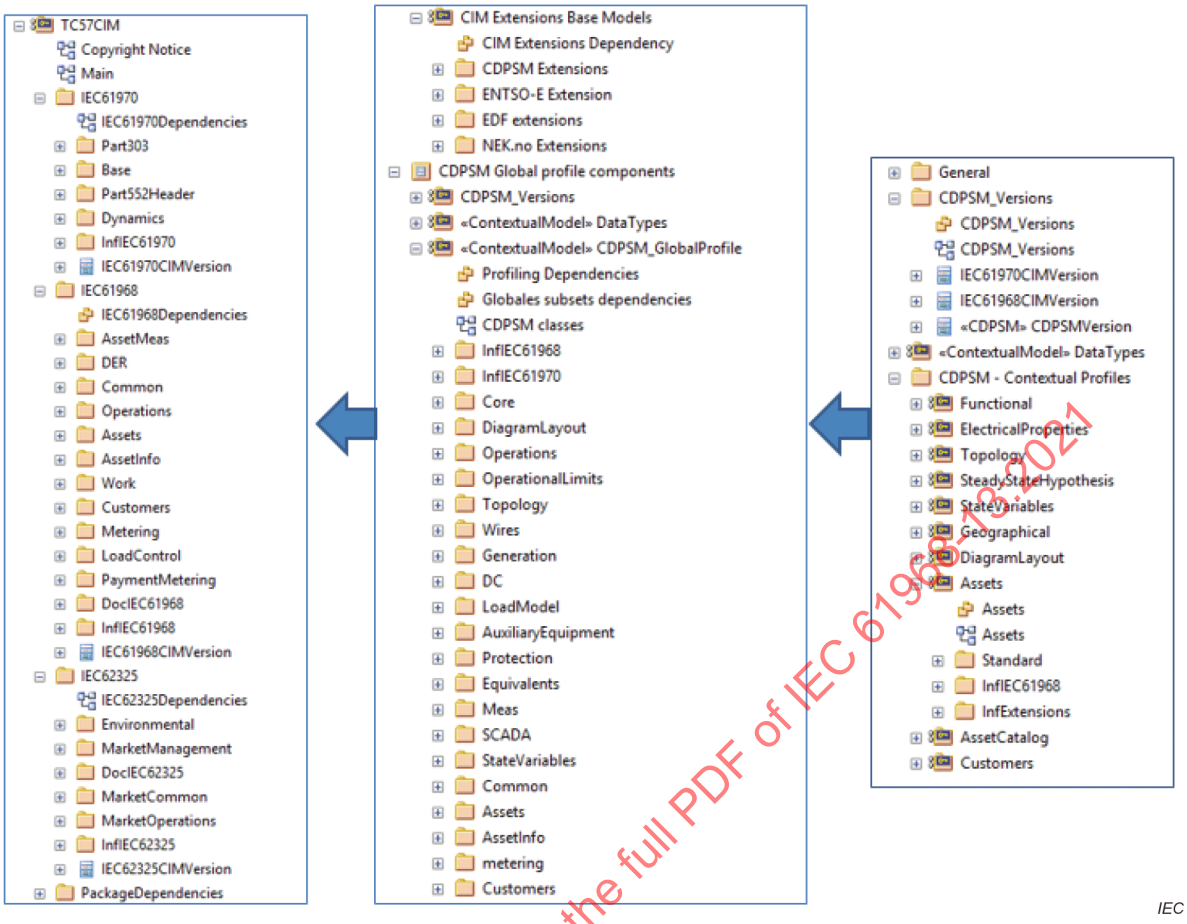

Figure 4 – UML CDPSM profiles (informative)

Figure 4 illustrates how the CDPSM group of profiles is managed, and how profiles are then derived from the CDPSM group of profiles. The CDPSM group of profile is a subset of the IEC TC 57 CIM Model. A group of profiles will result in one associated profile file. A group of profiles can be split into several profiles, each profile associated with one file. In case of profiles, there can exist cross references between these profiles. Extensions are exported in informative Annex B.

Some Extensions shall be taken into account when integrated officially into the IEC CIM model (IEC 61970-301, IEC 61968-11, IEC 62325-301) in future.

The CIM UML version used was: iec61970cim17v24_iec61968cim13v11_iec62325cim03v14.eap. It was identified as CIM100 in June 2018. Then this document was updated and aligned with more recent CIM100 versions: iec61970cim17v38_iec61968cim13v12_iec62325cim03v17a (end of 2019) and iec61970cim17v38_iec61968cim13v13_iec62325cim03v17a.eap (March 2020).

As mentioned in the Foreword, data sets have also been tested against CIM100 versions provided since 2018. The data sets are compliant with IEC 61970-501 and IEC 61970-552.

Convergence will occur between CDPSM 2.0 and the CGMES consolidated version [8][9][10][11] that is based on CIM17/CIM100. The following profiles will evolve according to the convergence process. IEC 61970-452 will also evolve to include Distribution network concerns (and be renamed). The profiles and associated URIs (namespaces) are listed below:

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CIM Standard

Base UML CIM	"http://iec.ch/TC57/ CIM100#"
DataTypes	"http://iec.ch/TC57/CIM100#"

Informative packages in CIM

InfIEC61970	"http://iec.ch/TC57/CIM100-info#"
InfIEC61968	"http://iec.ch/TC57/CIM100-info#"

Extensions (informative)

Entsoe_Extensions_3.1	"http://entsoe.eu/CIM/SchemaExtension/3/1#"
Entsoe_Extensions_3.2	"http://entsoe.eu/CIM/SchemaExtension/3/2#"
CDPSM_Extensions_1.0	"http://iec.ch/TC57/CIM/CDPSM/SchemaExtension/1/0#"
CDPSM_Extensions_2.0	"http://iec.ch/TC57/CIM/CDPSM/SchemaExtension/2/0#"
MSITE_Extensions_3.1.a	"http://der.edf.fr/mire/MSite-v3.1.a#"
NEK_Extensions_1.0	"http://NEK.no/NK57/CIM/CIM100-Extension/1/0#"

Group of profiles for CDPSM2.0

GlobalProfile	"http://iec.ch/TC57/CIM/CDPSM/GlobalProfile/2/0"

CDPSM2.0 profiles

Functional	"http://iec.ch/TC57/CIM/Functional/2/0"
ElectricalProperties	"http://iec.ch/TC57/CIM/ElectricalProperties/2/0"
Geographical	"http://iec.ch/TC57/CIM/Geographical/2/0"
Assets	"http://iec.ch/TC57/CIM/Asset/2/0"
AssetCatalog	"http://iec.ch/TC57/CIM/AssetCatalogue/2/0"
SteadyStateHypothesis	"http://iec.ch/TC57/CIM/SteadyStateHypothesis/2/0"
Topology	"http://iec.ch/TC57/CIM/Topology/2/0"
Customers	"http://iec.ch/TC57/CIM/Customers/2/0"

Profiles Functional, ElectricalProperties, Asset, AssetCatalog and Customers are specific to CDPSM 2.0. Functional and ElectricalProperties are based on IEC 61970-452. Assets, AssetCatalog are based on IEC 61968-4 [22] and Customers is based on IEC 61968-8 [23] Nevertheless they can use classes, attributes, relations which are not listed in these associated documents, but which are at least in the IEC CIM Model of IEC 61970-301, IEC 61968-11 and IEC 62325-325.

Profiles Topology, Geographical, and SteadyStateHypothesis are not identical to CGMES profiles, therefore they are included in CDPSM 2.0. Following CDPSM and CGMES convergence, these profiles might be unique.

Profiles common to CDPSM2.0 and CGMES

StateVariables [14]	"http://entsoe.eu/CIM/StateVariables/4/1"
DiagramLayout [15]	"http://entsoe.eu/CIM/DiagramLayout/3/1"

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Figure 5 illustrates CDPSM interoperability usage between two or several applications that can be hosted by a Utility (GIS/SCADA/Network Operation systems) or hosted by two utilities (like TSO-DSO, DSO-DSO, DSO-SGU). This allows a data synchronisation management between systems. Two systems can exchange data based on CDPSM profiles to align their databases, and then exchange messages based on these reference data which are stored in databases. This figure illustrates the complementarity of IEC 61968-13 with other IEC 61968-X standards, which are message based.

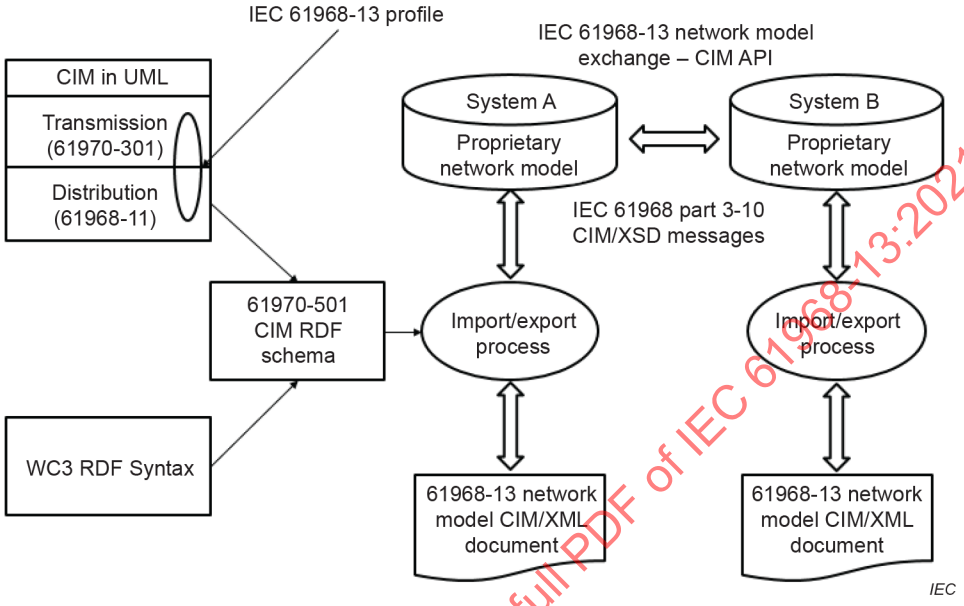

Figure 5 – CDPSM interoperability scheme

Figure 6 illustrates how CDPSM related profiles can be used in a utility environment and by a Network Model Management System.

The Network Model Management [21] will manage Power System Resources and their electrical properties. The properties are default or calculated values held on Power System Resources, usually derived from external data sources, such as datasheets of assets coming from either asset catalogues, or from actual assets. CDPSM related profiles can be provided by GIS system or equivalent to a Network Model Management System.

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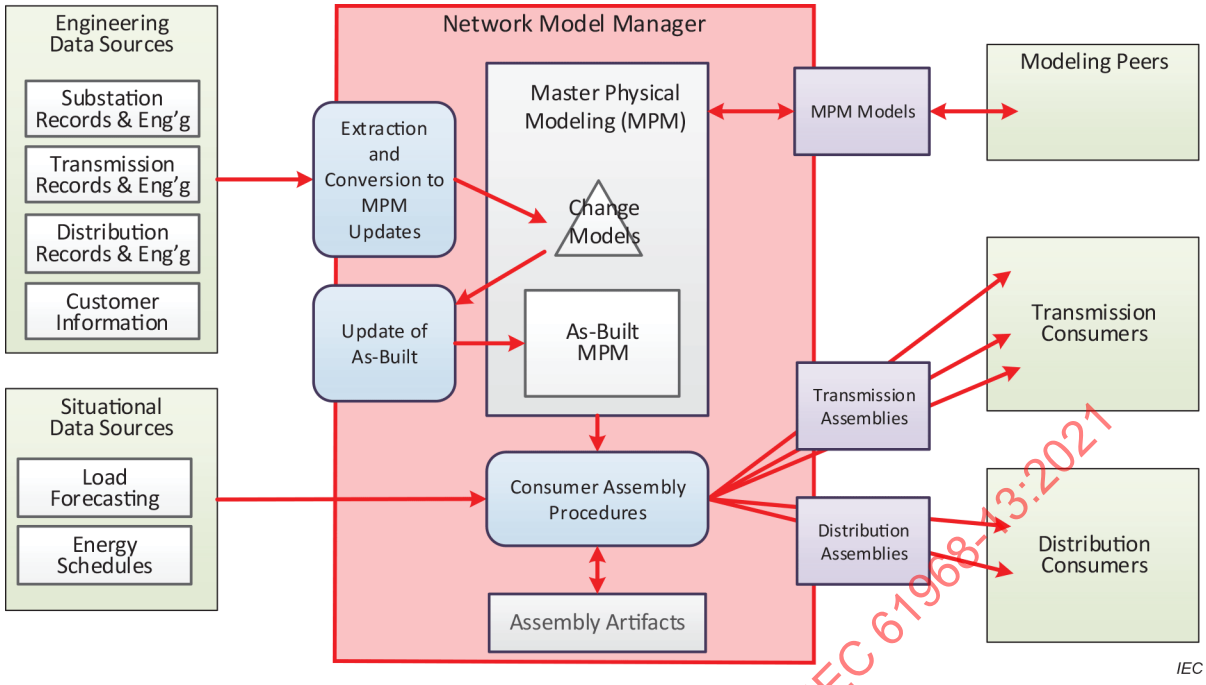

Figure 6 – Network Model Management overview

As some electrical properties can be managed by catalog and AssetInfo, if a topology or Network solution algorithm requires electrical properties for each Equipment related classes, then the individual Network Case will be exported from Network Model Management with a processing on the Data Sets, in order to be in the requested format and to have each electrical property on each equipment.

In Europe, ENTSO-E has defined a Common Grid Model Exchange Standard (CGMES) associated to IEC 61970-600-1 and IEC 61970-600-2, which defines the interface between ENTSO-E members' software in order to exchange power system modelling information as required by the ENTSO-E and TSO business processes. Some profiles, defined by ENTSO-E, are not used by DSOs at the present time. This does not prevent a DSO network Distribution data set compliant with CDPSM profiles from leveraging CGMES profiles implemented by a Vendor product. Annex I illustrates the process.

Some network diagram examples are given in Annex B, Annex C, Annex D, Annex E, and Annex F.

Annex B describes CDPSM extensions (informative).

Annex C, Figure C.1 describes an example of a European CDPSM MV/LV urban network.

Annex D, Figure D.1 describes an example of a European CDPSM MV Urban and Rural Network.

Annex E, Figure E.1 describes an example of CDPSM usage in European H2020 TDX-ASSIST project

Annex F, Figure F.1 describes an example of a Nuclear Distribution Network.

6.2 Top package General

Figure 7 describes CDPSM profiles.

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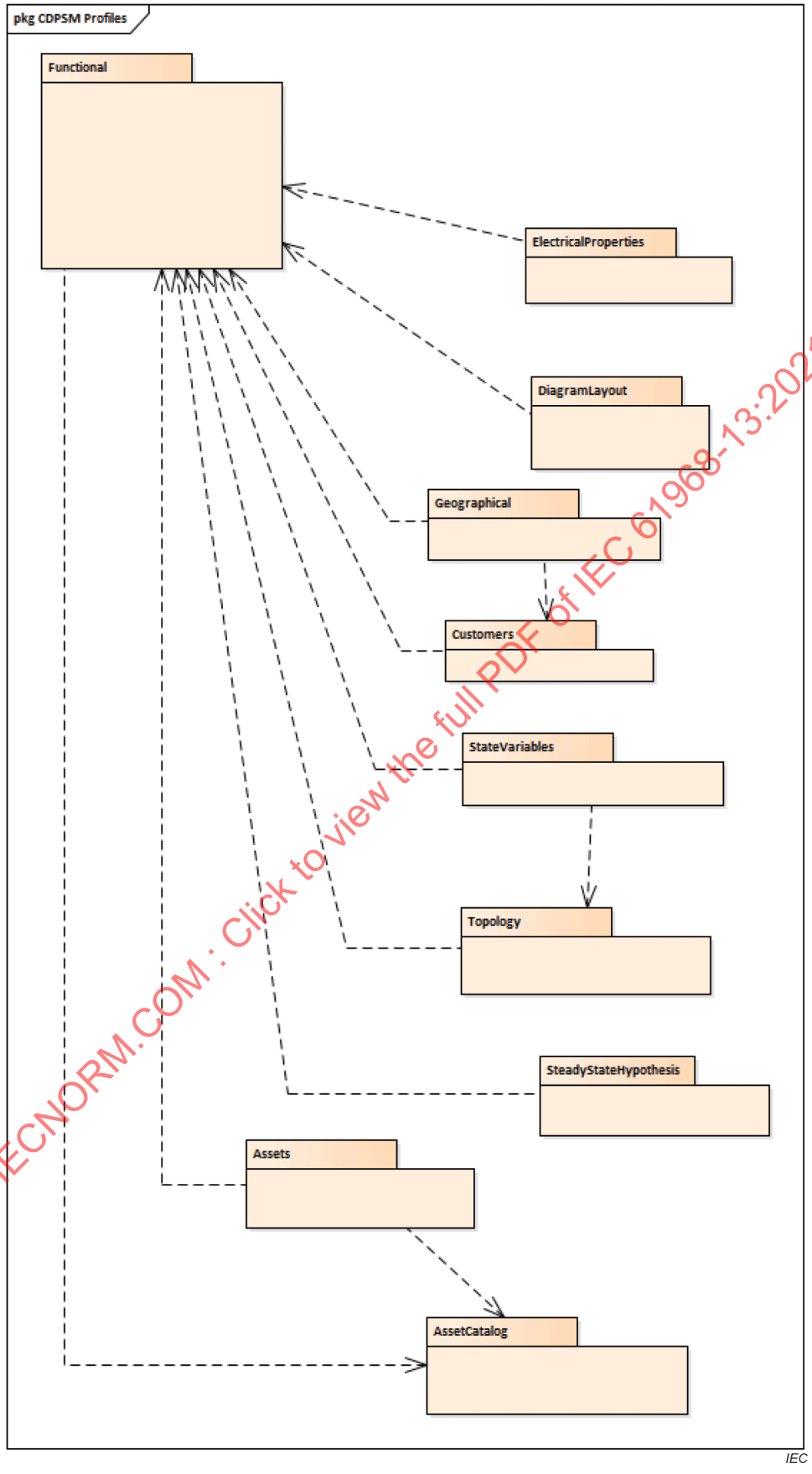

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Figure 7 – Package diagram General::CDPSM Profiles

6.3 Package Functional

6.3.1 General

See Figure 8 for Package diagram Functional and Figure 9 to Figure 28 for the various Class diagram Functional.

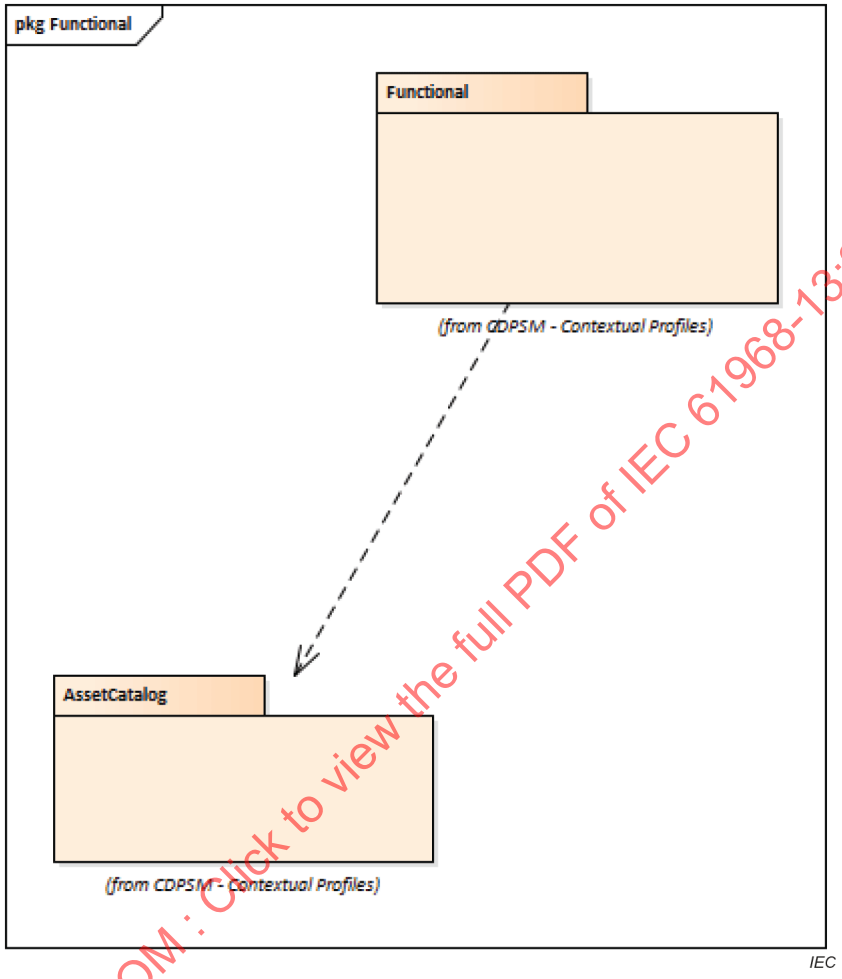

Figure 8 – Package diagram Functional::Functional

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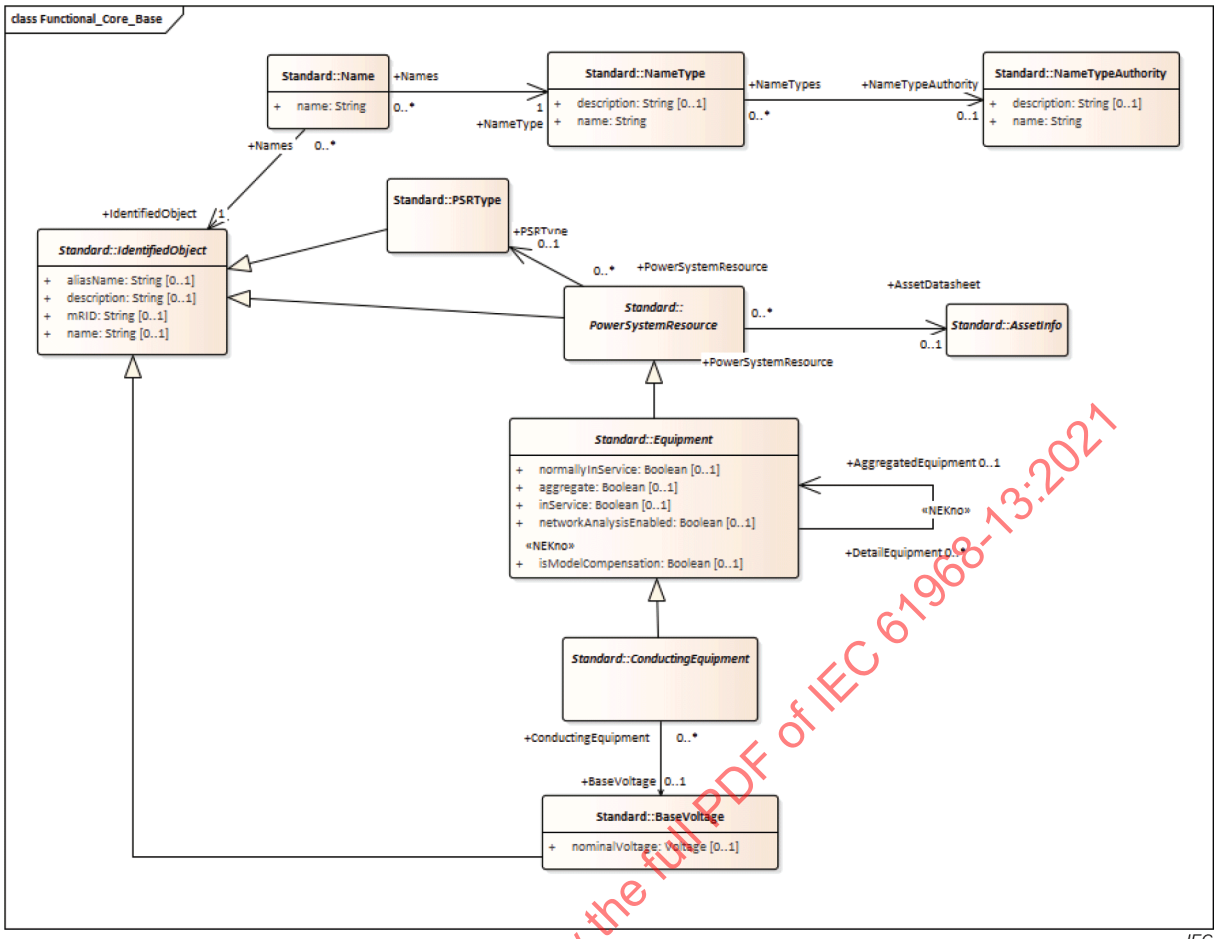

Figure 9 – Class diagram Functional::Functional_Core_Base

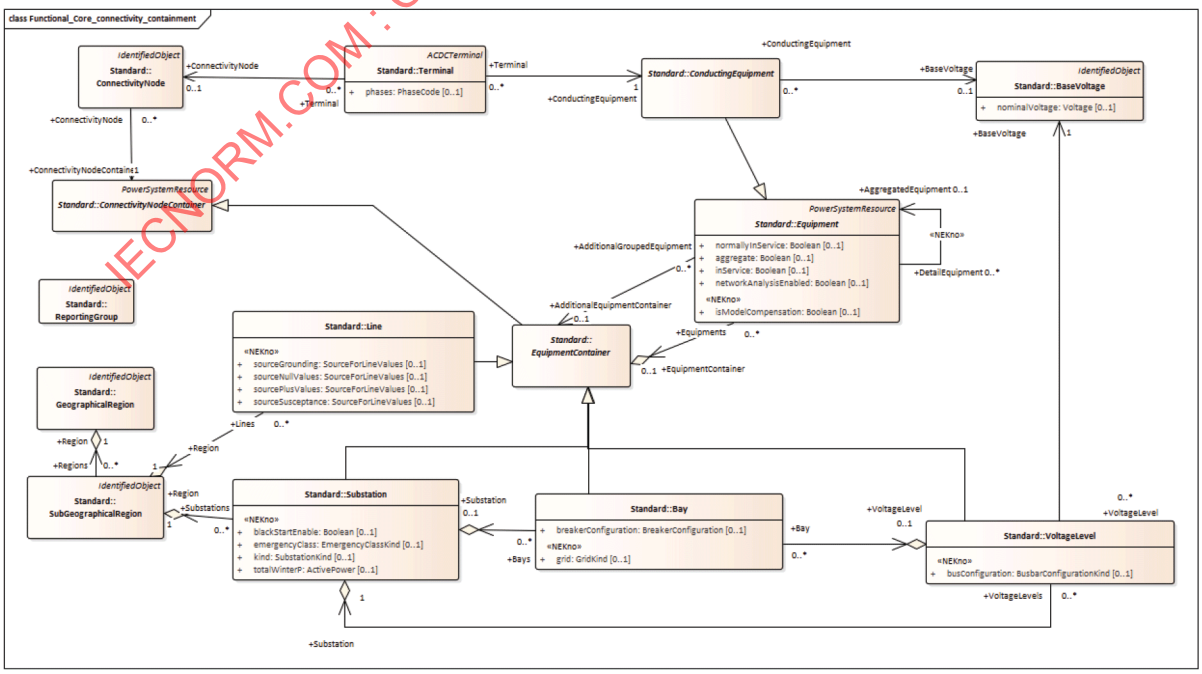

Figure 10 – Class diagram Functional::Functional_Core_connectivity_containment

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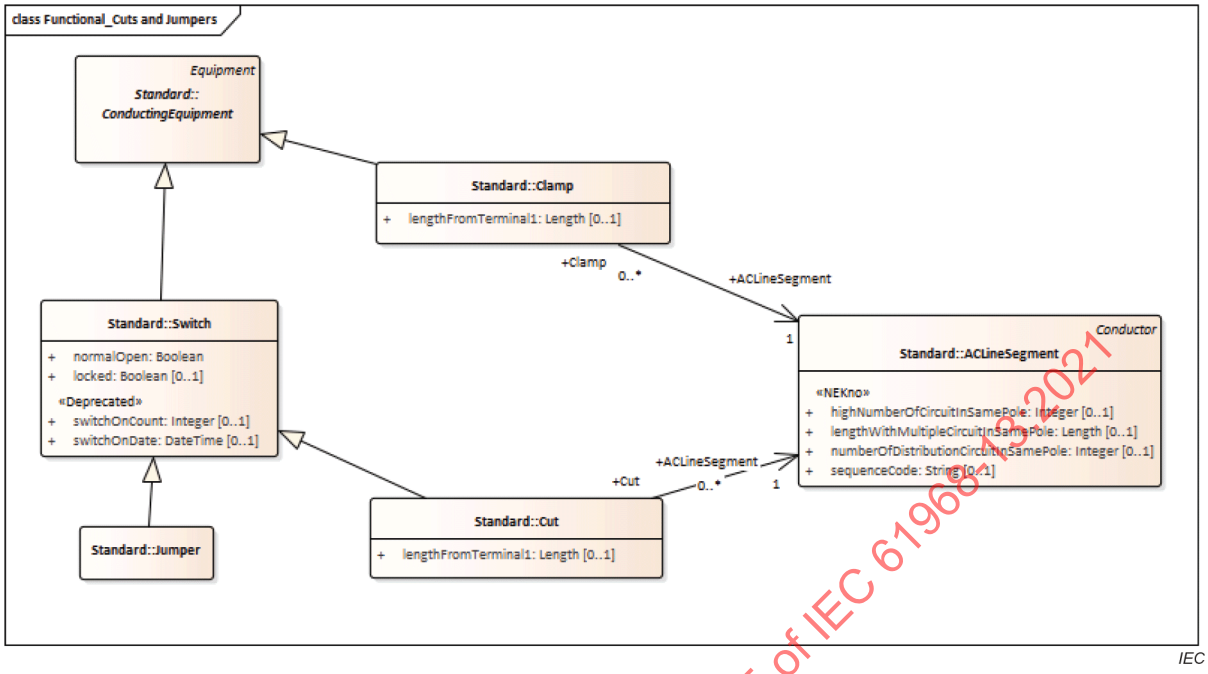

Figure 11 – Class diagram Functional::Functional_Cuts and Jumpers

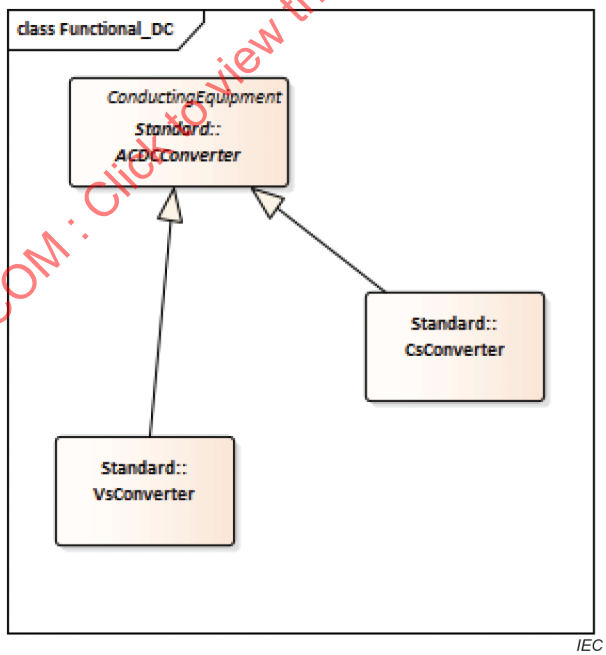

Figure 12 – Class diagram Functional::Functional_DC

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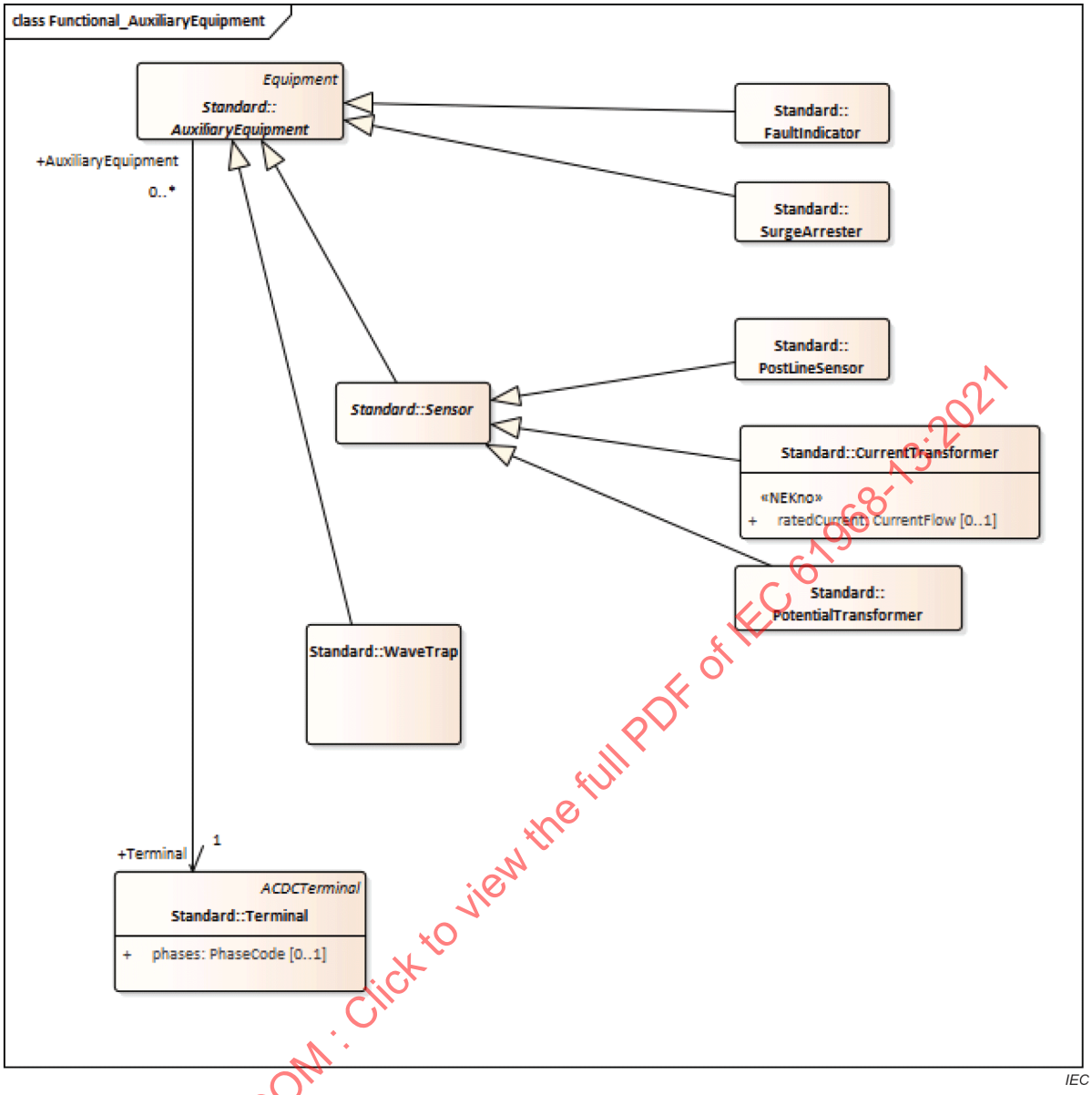

Figure 13 – Class diagram Functional::Functional_AuxiliaryEquipment

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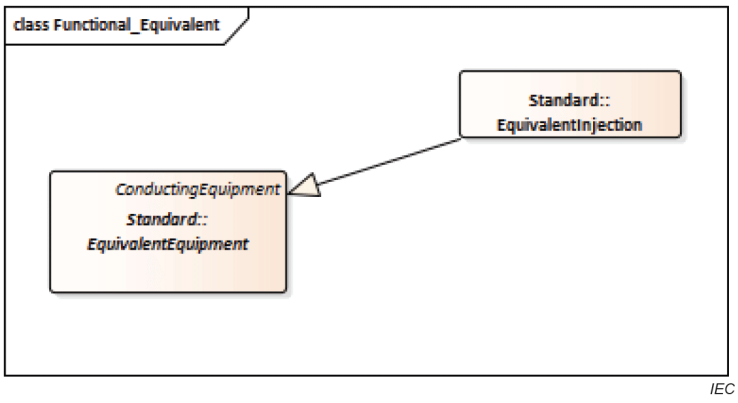

Figure 14 – Class diagram Functional::Functional_Equivalent

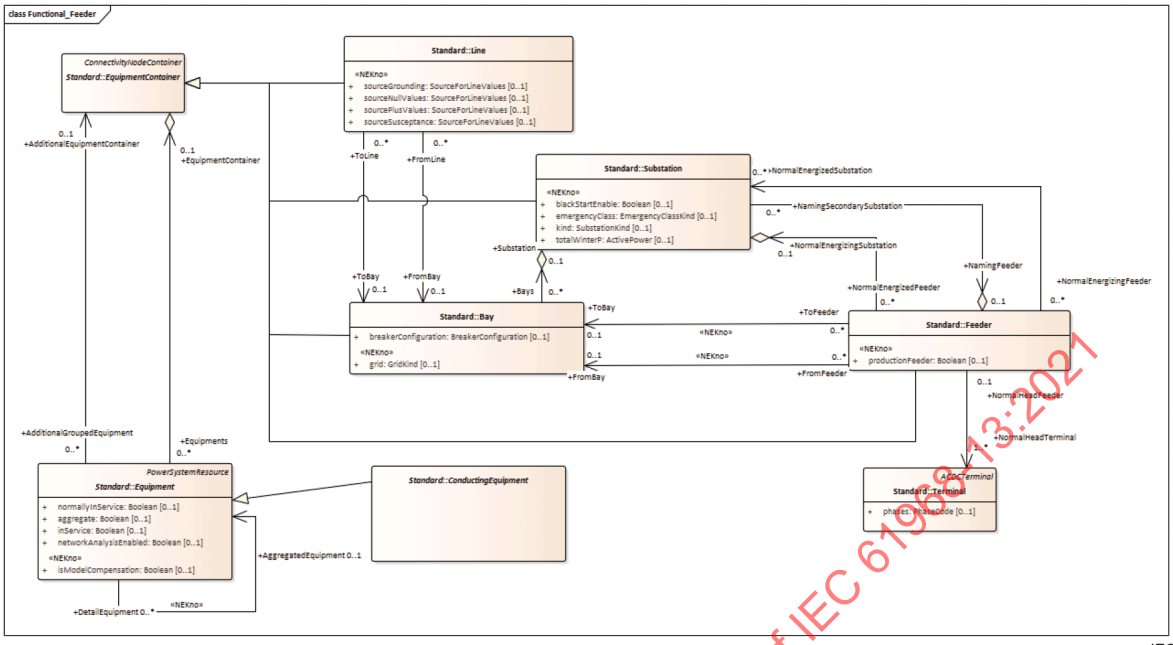

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Figure 15 – Class diagram Functional::Functional_Feeder

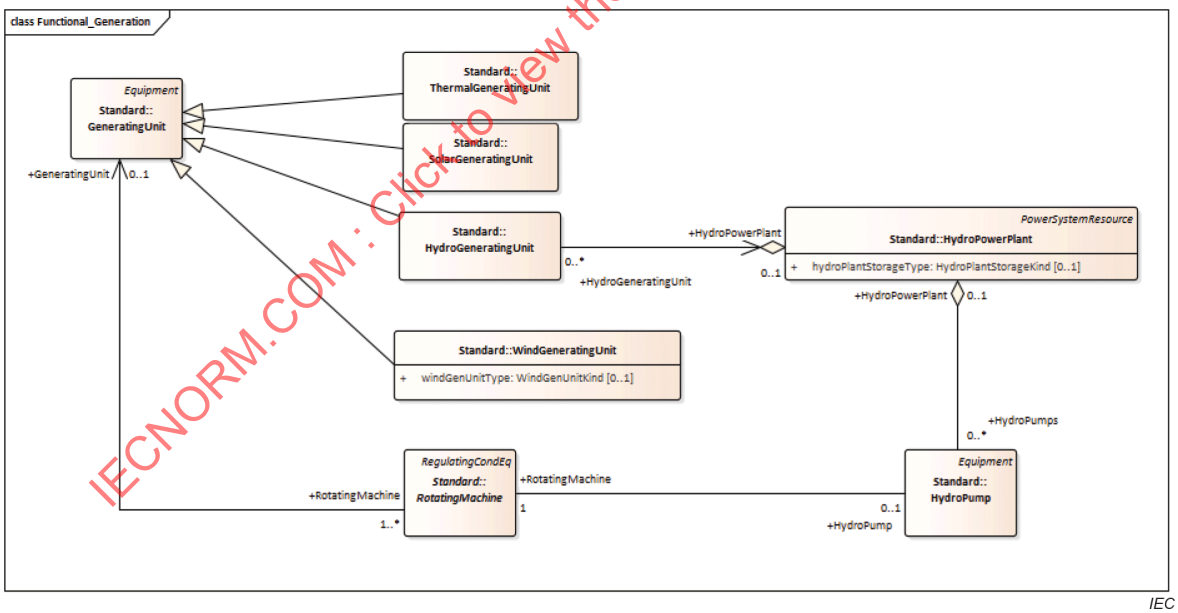

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Figure 16 – Class diagram Functional::Functional_Generation

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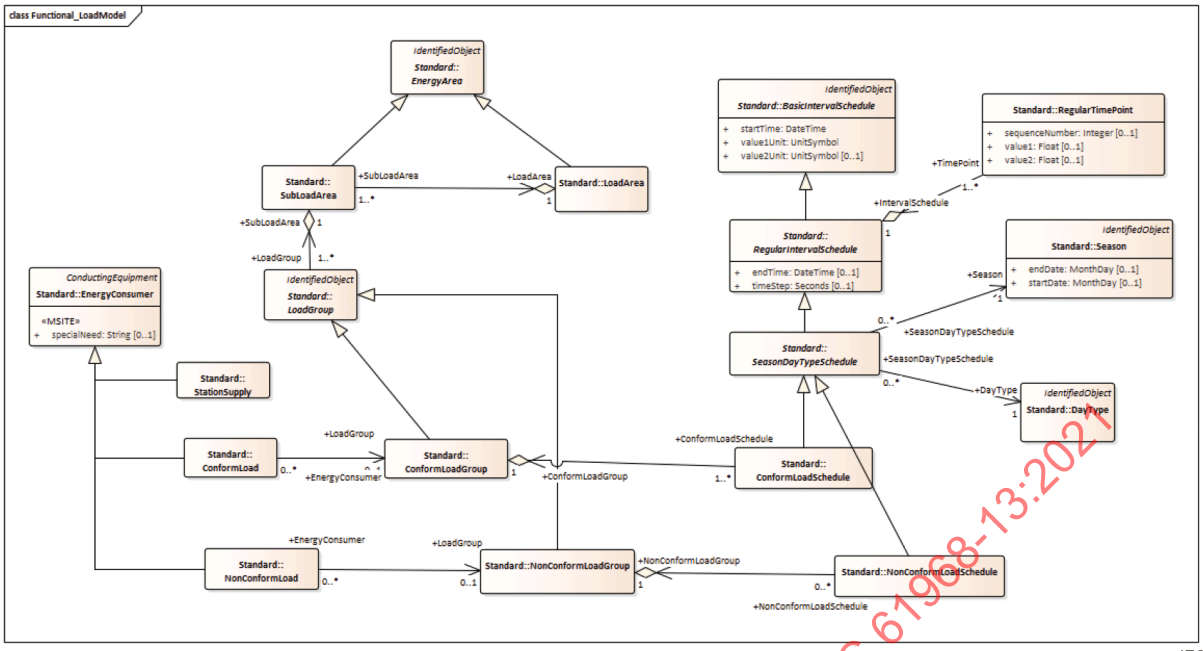

Figure 17 – Class diagram Functional::Functional_LoadModel

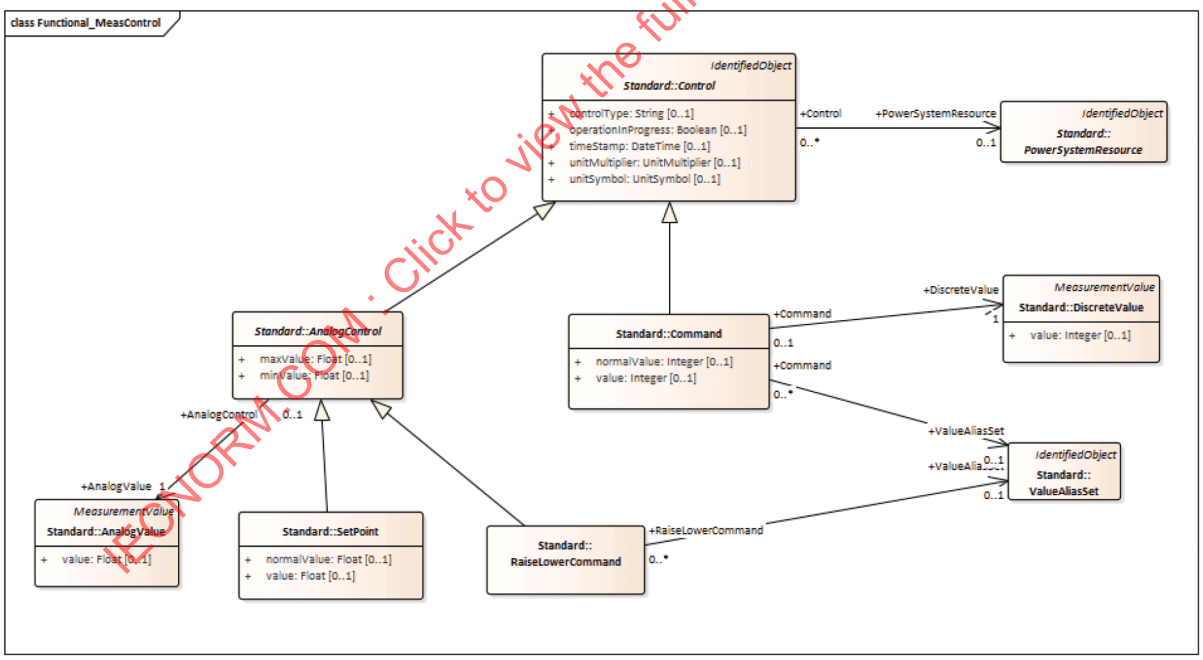

Figure 18 – Class diagram Functional::Functional_MeasControl

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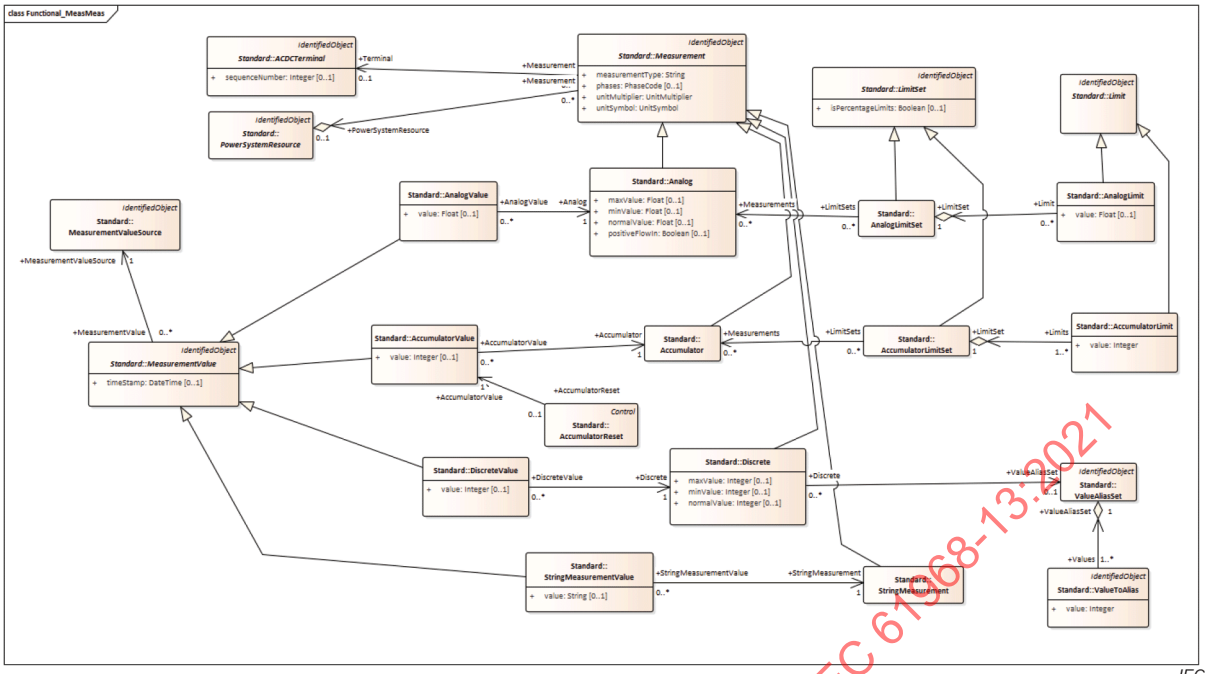

Figure 19 – Class diagram Functional::Functional_MeasMeas

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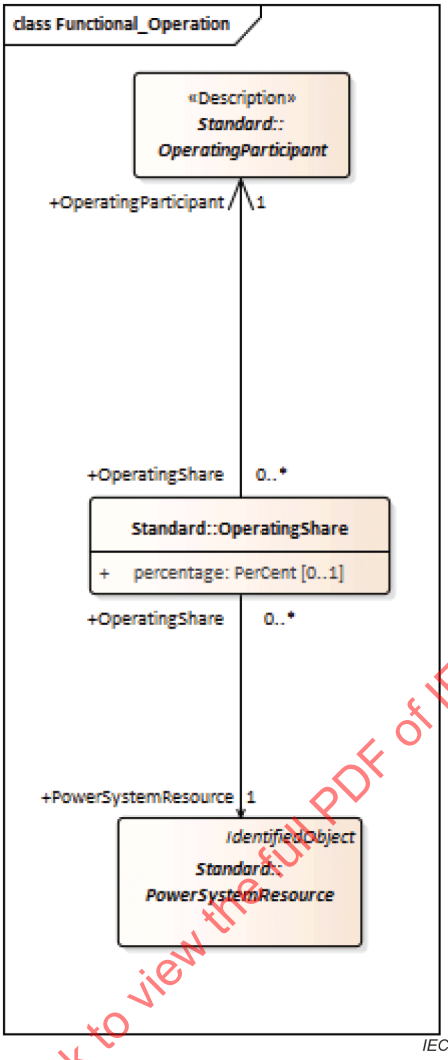

Figure 20 – Class diagram Functional::Functional_Operation

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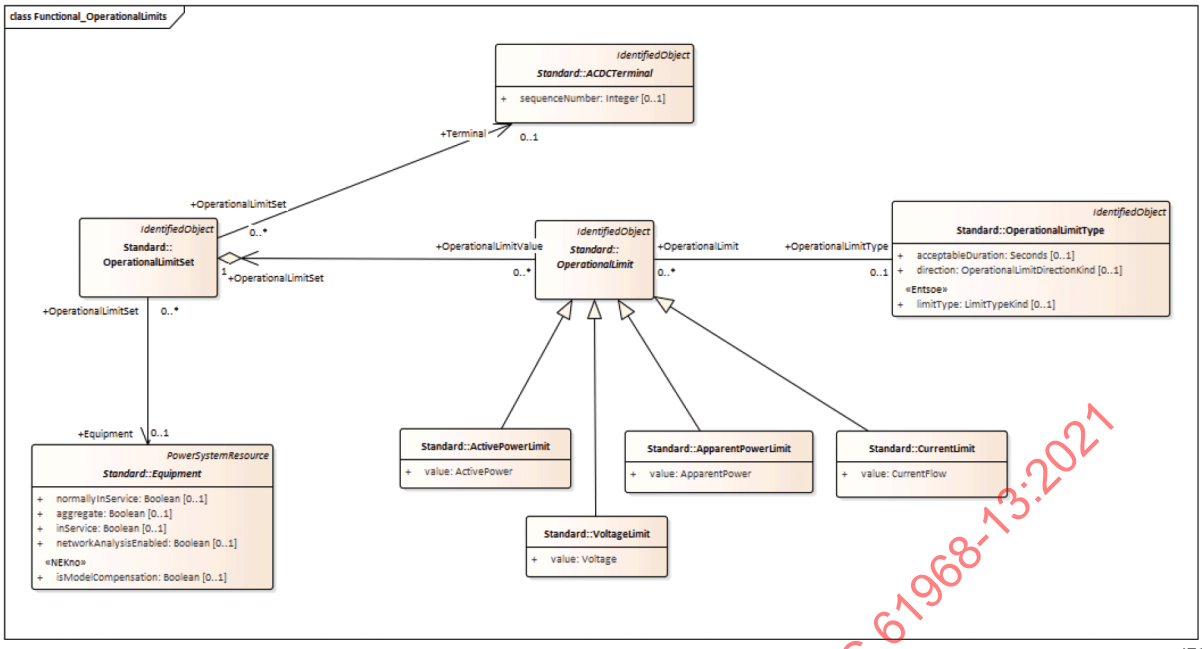

Figure 21 – Class diagram Functional::Functional_OperationalLimits

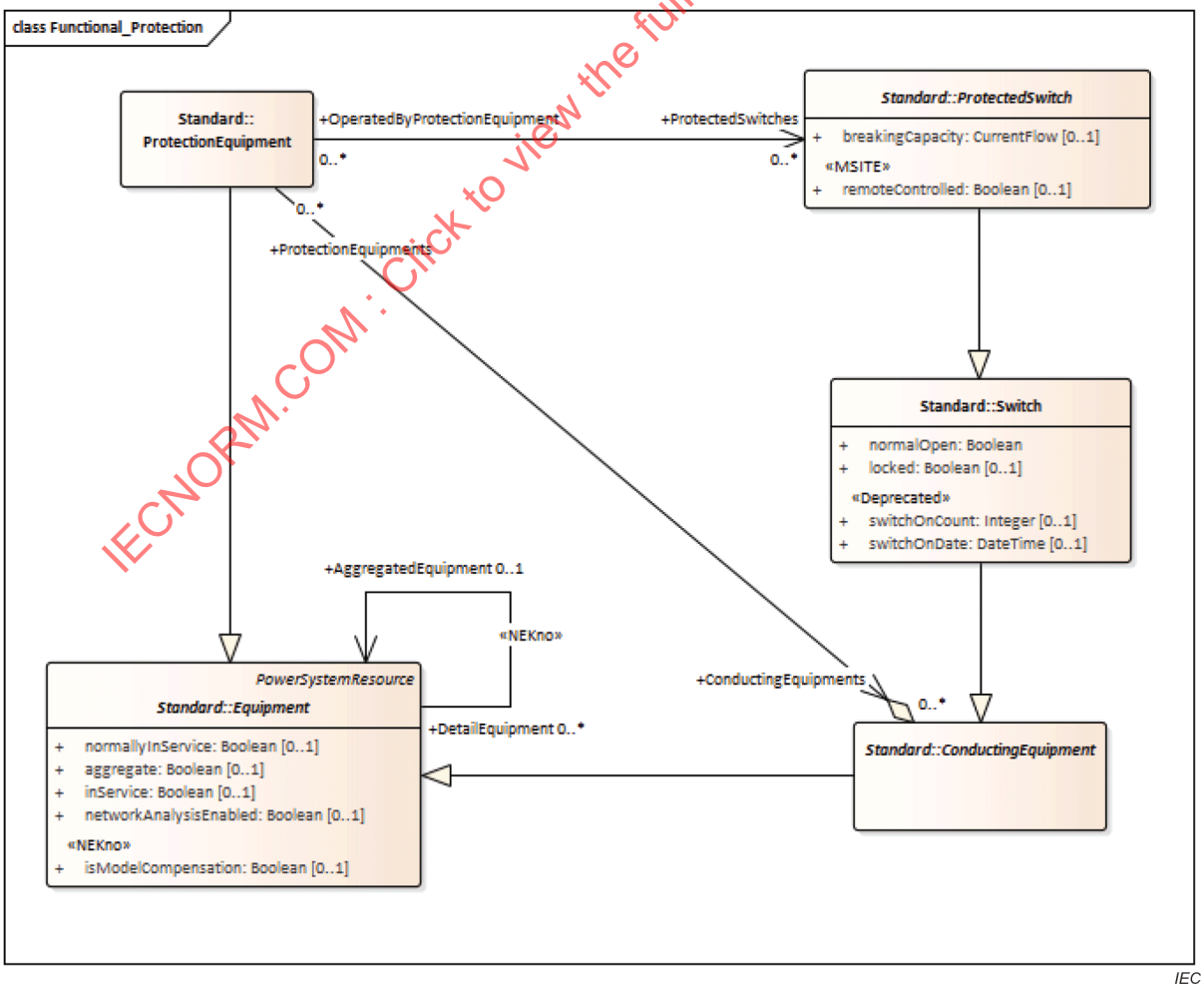

Figure 22 – Class diagram Functional::Functional_Protection

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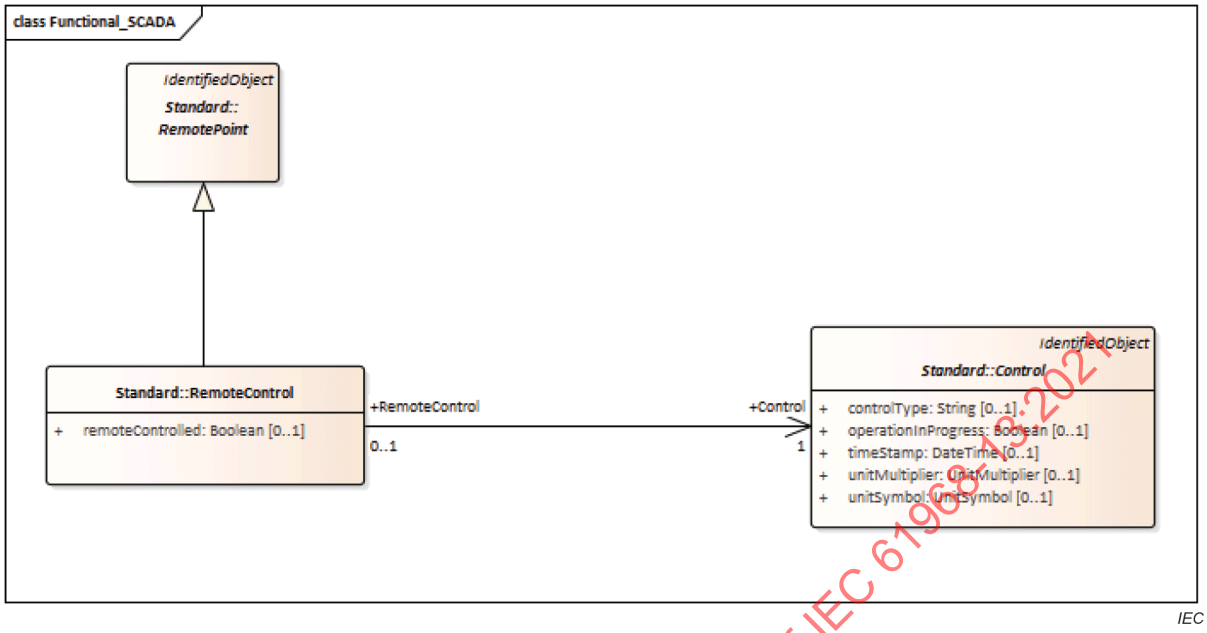

Figure 23 – Class diagram Functional::Functional_SCADA

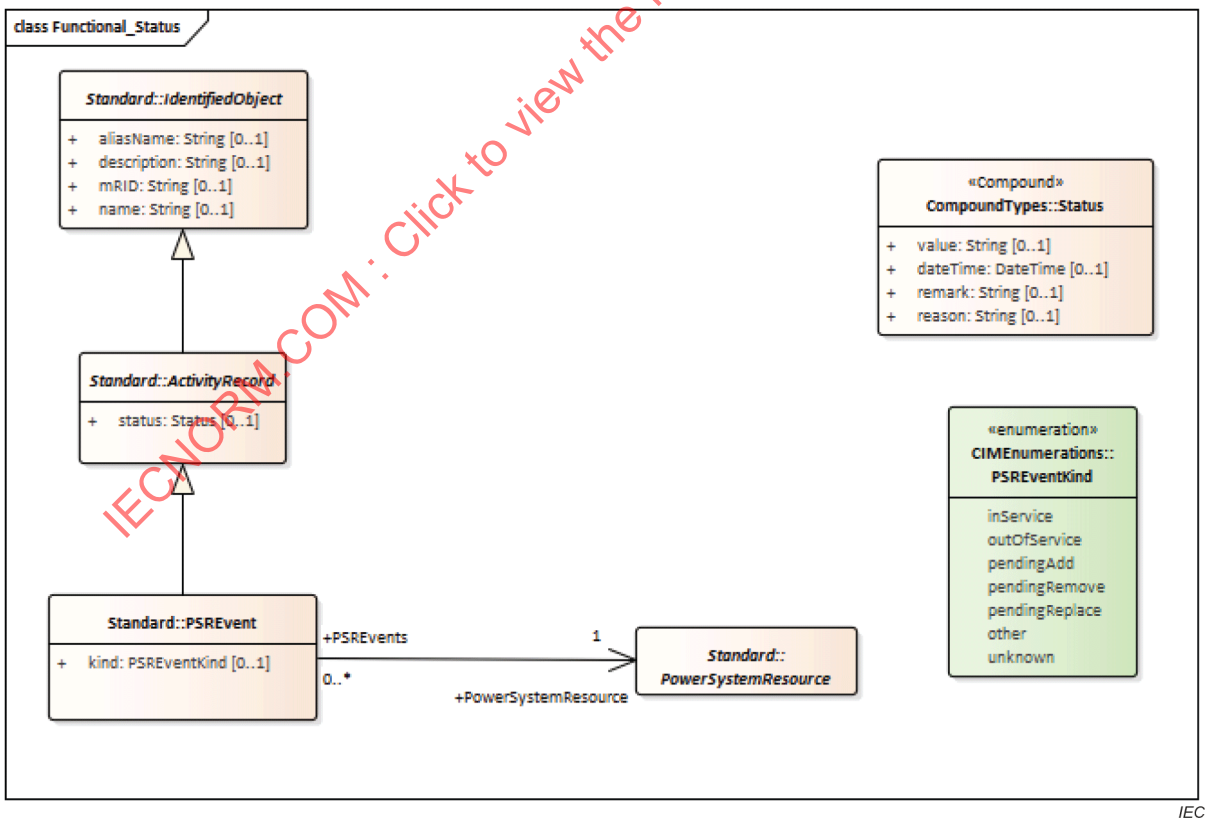

Figure 24 – Class diagram Functional::Functional_Status

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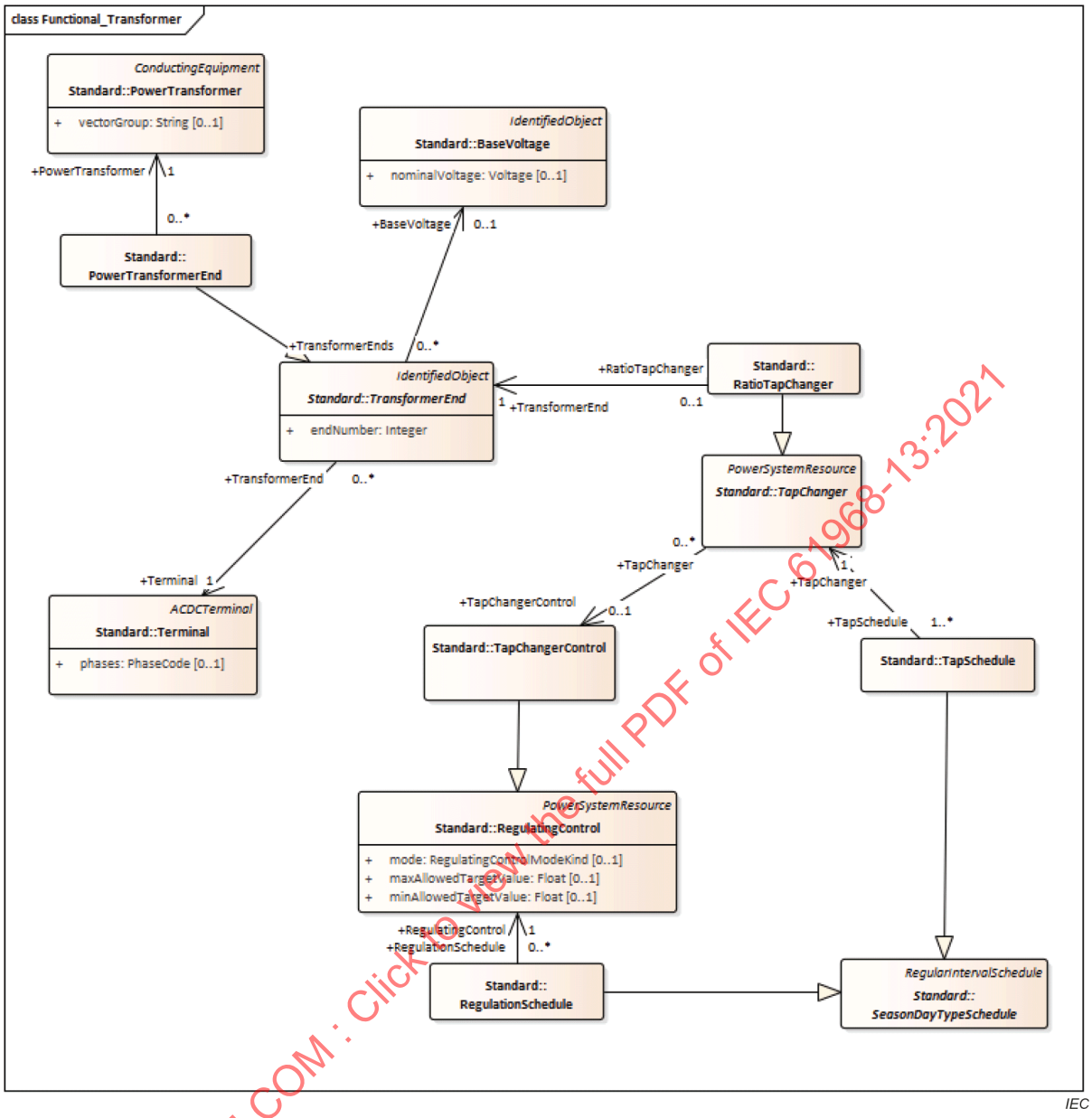

Figure 25 – Class diagram Functional::Functional_Transformer

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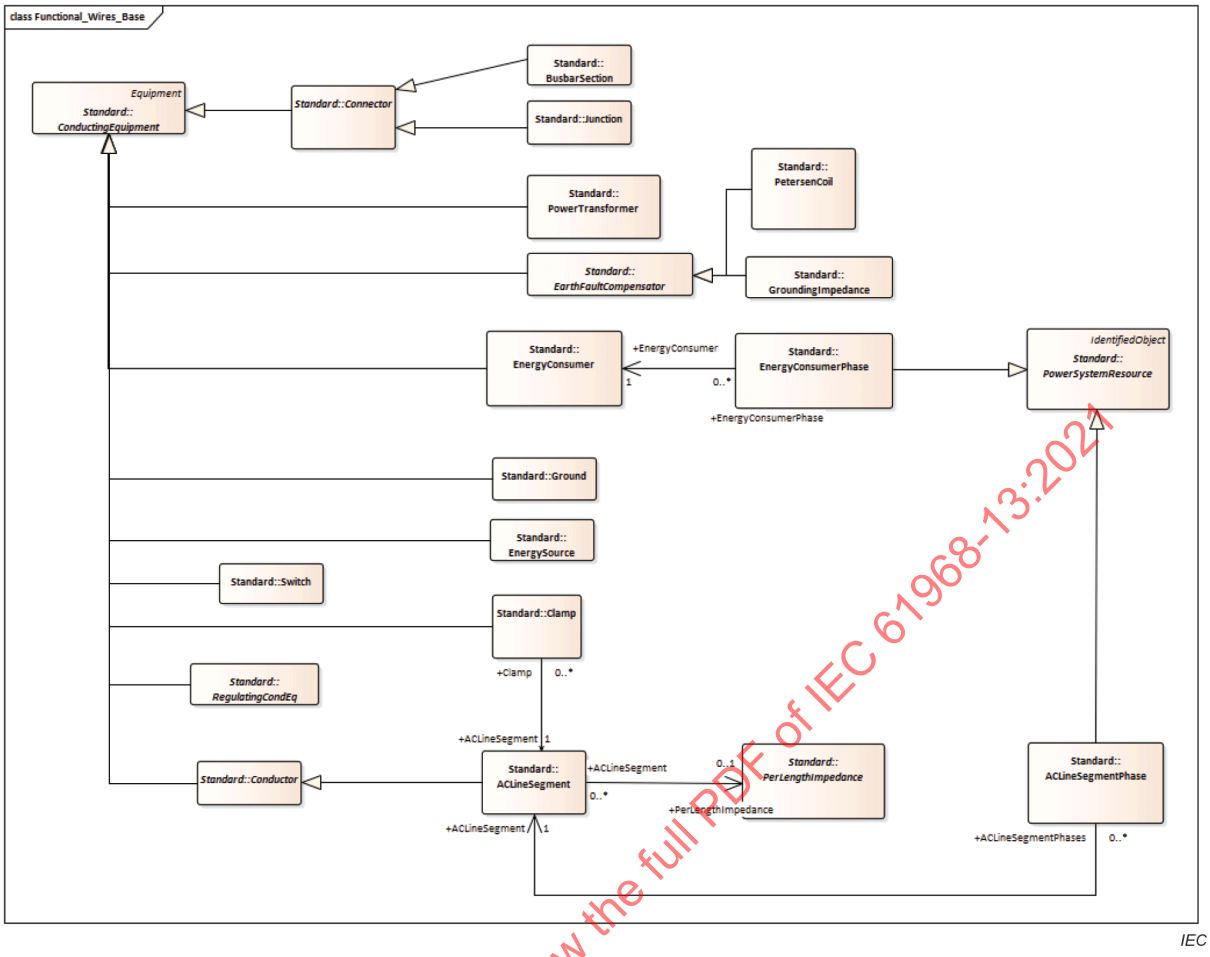

Figure 26 – Class diagram Functional::Functional_Wires_Base

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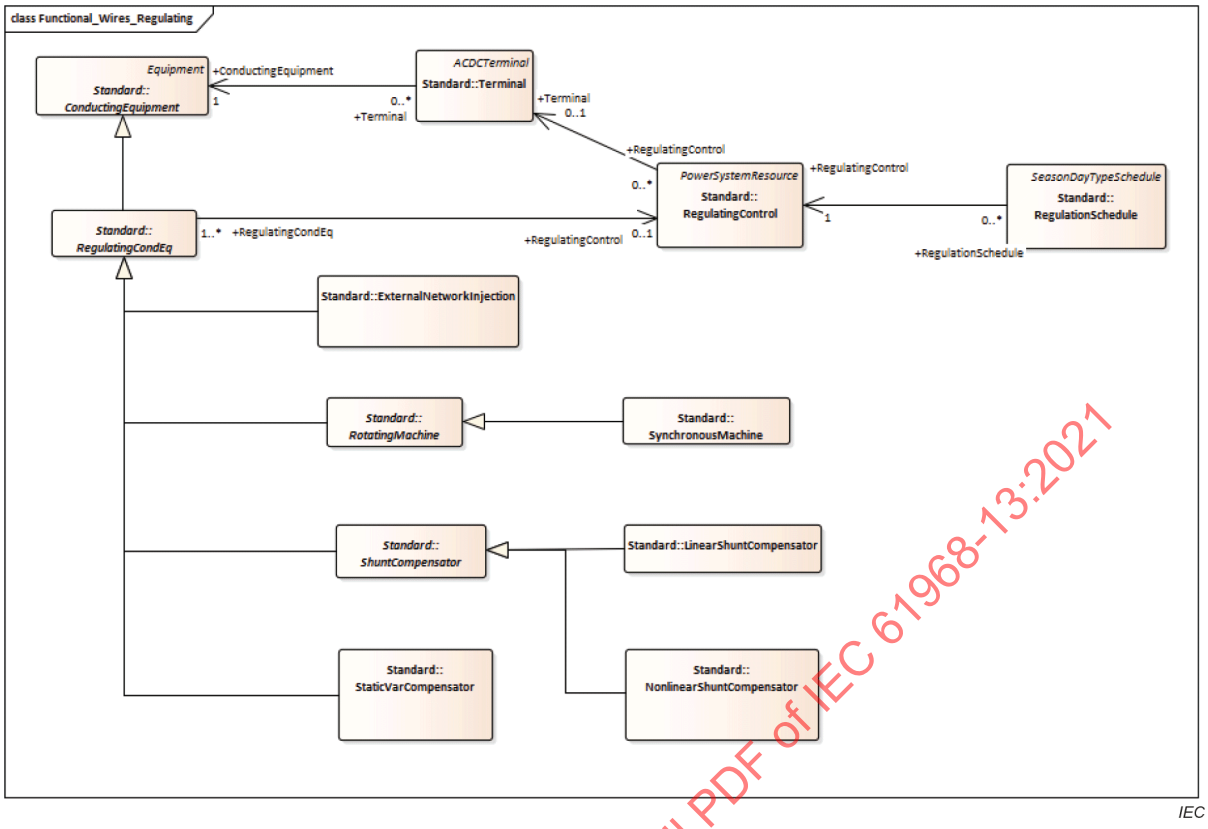

Figure 27 – Class diagram Functional::Functional_Wires_Regulating

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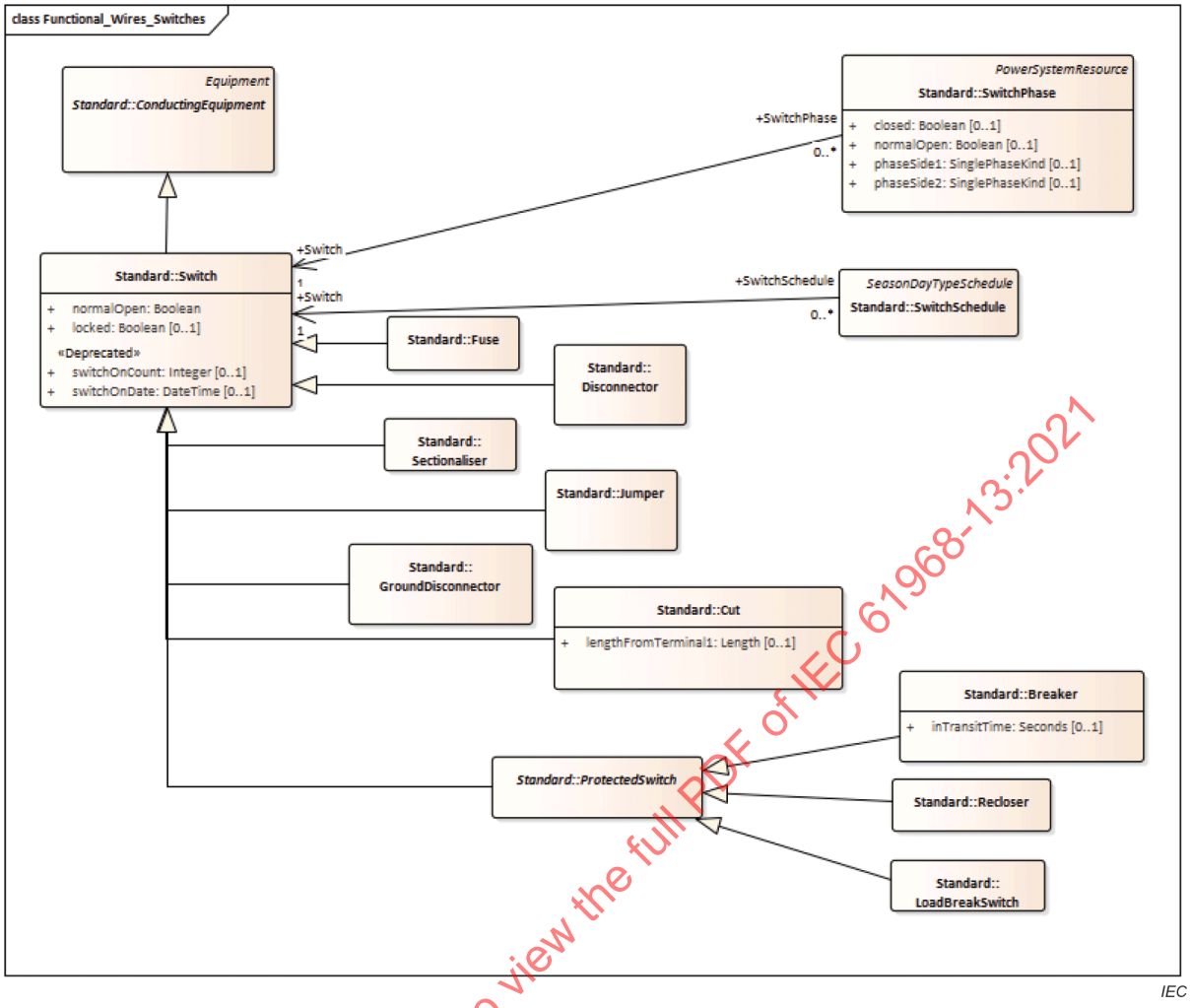

Figure 28 – Class diagram Functional::Functional_Wires_Switches

6.3.2 Package Standard

6.3.2.1 Accumulator

Accumulator represents an accumulated (counted) Measurement, e.g. an energy value.

Table 5 shows all attributes of Accumulator.

Table 5 – Attributes of Standard::Accumulator

name	mult	type	description
unitSymbol	1..1	UnitSymbol	inherited from: Measurement
measurementType	1..1	String	inherited from: Measurement
phases	0..1	PhaseCode	inherited from: Measurement
unitMultiplier	1..1	UnitMultiplier	inherited from: Measurement
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

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Table 6 shows all association ends of Accumulator with other classes.

Table 6 – Association ends of Standard::Accumulator with other classes

mult from	name	mult to	type	description
0..*	Terminal	0..1	ACDCTerminal	inherited from: Measurement
0..*	PowerSystemResource	0..1	PowerSystemResource	inherited from: Measurement

6.3.2.2 AccumulatorLimit

Limit values for Accumulator measurements.

Table 7 shows all attributes of AccumulatorLimit.

Table 7 – Attributes of Standard::AccumulatorLimit

name	mult	type	description
value	1..1	Integer	The value to supervise against. The value is positive.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 8 shows all association ends of AccumulatorLimit with other classes.

Table 8 – Association ends of Standard::AccumulatorLimit with other classes

mult from	name	mult to	type	description
1..*	LimitSet	1..1	AccumulatorLimitSet	The set of limits.

6.3.2.3 AccumulatorLimitSet

An AccumulatorLimitSet specifies a set of Limits that are associated with an Accumulator measurement.

Table 9 shows all attributes of AccumulatorLimitSet.

Table 9 – Attributes of Standard::AccumulatorLimitSet

name	mult	type	description
isPercentageLimits	0..1	Boolean	inherited from: LimitSet
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 10 shows all association ends of AccumulatorLimitSet with other classes.

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Table 10 – Association ends of Standard::AccumulatorLimitSet with other classes

mult from	name	mult to	type	description
0..*	Measurements	0..*	Accumulator	The Measurements using the LimitSet.

6.3.2.4 AccumulatorReset

This command reset the counter value to zero.

Table 11 shows all attributes of AccumulatorReset.

Table 11 – Attributes of Standard::AccumulatorReset

name	mult	type	description
unitSymbol	0..1	UnitSymbol	inherited from: Control
controlType	0..1	String	inherited from: Control
operationInProgress	0..1	Boolean	inherited from: Control
timeStamp	0..1	DateTime	inherited from: Control
unitMultiplier	0..1	UnitMultiplier	inherited from: Control
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 12 shows all association ends of AccumulatorReset with other classes.

Table 12 – Association ends of Standard::AccumulatorReset with other classes

mult from	name	mult to	type	description
0..1	AccumulatorValue	1..1	AccumulatorValue	The accumulator value that is reset by the command.
0..*	PowerSystemResource	0..1	PowerSystemResource	inherited from: Control

6.3.2.5 AccumulatorValue

AccumulatorValue represents an accumulated (counted) MeasurementValue.

Table 13 shows all attributes of AccumulatorValue.

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Table 13 – Attributes of Standard::AccumulatorValue

name	mult	type	description
value	0..1	Integer	The value to supervise. The value is positive.
timeStamp	0..1	DateTime	inherited from: MeasurementValue
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 14 shows all association ends of AccumulatorValue with other classes.

Table 14 – Association ends of Standard::AccumulatorValue with other classes

mult from	name	mult to	type	description
0..*	Accumulator	1..1	Accumulator	Measurement to which this value is connected.
0..*	MeasurementValueSource	1..1	MeasurementValueSource	inherited from: MeasurementValue

6.3.2.6 (abstract) ACDCConverter

A unit with valves for three phases, together with unit control equipment, essential protective and switching devices, DC storage capacitors, phase reactors and auxiliaries, if any, used for conversion.

Table 15 shows all attributes of ACDCConverter.

Table 15 – Attributes of Standard::ACDCConverter

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 16 shows all association ends of ACDCConverter with other classes.

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Table 16 – Association ends of Standard::ACDCConverter with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.7 (abstract) ACDCTerminal

An electrical connection point (AC or DC) to a piece of conducting equipment. Terminals are connected at physical connection points called connectivity nodes.

Table 17 shows all attributes of ACDCTerminal.

Table 17 – Attributes of Standard::ACDCTerminal

name	mult	type	description
sequenceNumber	0..1	Integer	The orientation of the terminal connections for a multiple terminal conducting equipment. The sequence numbering starts with 1 and additional terminals should follow in increasing order. The first terminal is the "starting point" for a two terminal branch.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.3.2.8 ACLineSegment

A wire or combination of wires, with consistent electrical characteristics, building a single electrical system, used to carry alternating current between points in the power system.

For symmetrical, transposed 3ph lines, it is sufficient to use ACLineSegment attributes, which describe sequence impedances and admittances for the entire length of the segment.

If per lenght impedance data is available from a library of standard types, impedances and admittances can be calculated in one of the following ways:

– Calculate electrical parameters from asset data, using associated ConductorInfo, with values then multiplied by Conductor.length to produce a matrix model.
– Calculate unbalanced electrical parameters from associated PerLengthPhaseImpedance, then multiplied by Conductor.length to produce a matrix model.
– Calculate transposed electrical parameters from associated PerLengthSequenceImpedance, then multiplied by Conductor.length to produce a sequence model.

Table 18 shows all attributes of ACLineSegment.

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Table 18 – Attributes of Standard::ACLineSegment

name	mult	type	description
length	0..1	Length	inherited from: Conductor
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 19 shows all association ends of ACLineSegment with other classes.

Table 19 – Association ends of Standard::ACLineSegment with other classes

mult from	name	mult to	type	description
0..*	PerLengthImpedance	0..1	PerLengthImpedance	Per-length impedance of this line segment.
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.9 ACLineSegmentPhase

Represents a single wire of an alternating current line segment.

Table 20 shows all attributes of ACLineSegmentPhase.

Table 20 – Attributes of Standard::ACLineSegmentPhase

name	mult	type	description
phase	0..1	SinglePhaseKind	The phase connection of the wire at both ends.
sequenceNumber	0..1	Integer	Number designation for this line segment phase. Each line segment phase within a line segment should have a unique sequence number. This is useful for unbalanced modelling to bind the mathematical model (PhaseImpedanceData of PerLengthPhaseImpedance) with the connectivity model (this class) and the physical model (WirePosition) without tight coupling.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

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Table 21 shows all association ends of ACLineSegmentPhase with other classes.

Table 21 – Association ends of Standard::ACLineSegmentPhase with other classes

mult from	name	mult to	type	description
0..*	ACLineSegment	1..1	ACLineSegment	The line segment to which the phase belongs.
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.10 ActivePowerLimit

Limit on active power flow.

Table 22 shows all attributes of ActivePowerLimit.

Table 22 – Attributes of Standard::ActivePowerLimit

name	mult	type	description
value	1..1	ActivePower	Value of active power limit.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 23 shows all association ends of ActivePowerLimit with other classes.

Table 23 – Association ends of Standard::ActivePowerLimit with other classes

mult from	name	mult to	type	description
0..*	OperationalLimitType	0..1	OperationalLimitType	inherited from: OperationalLimit
0..*	OperationalLimitSet	1..1	OperationalLimitSet	inherited from: OperationalLimit

6.3.2.11 (abstract) ActivityRecord

Records activity for an entity at a point in time; activity may be for an event that has already occurred or for a planned activity.

Table 24 shows all attributes of ActivityRecord.

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Table 24 – Attributes of Standard::ActivityRecord

name	mult	type	description
status	0..1	Status	Information on consequence of event resulting in this activity record.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.3.2.12 Analog

Analog represents an analog Measurement.

Table 25 shows all attributes of Analog.

Table 25 – Attributes of Standard::Analog

name	mult	type	description
positiveFlowIn	0..1	Boolean	If true then this measurement is an active power, reactive power or current with the convention that a positive value measured at the Terminal means power is flowing into the related PowerSystemResource.
maxValue	0..1	Float	Normal value range maximum for any of the MeasurementValue.values. Used for scaling, e.g. in bar graphs or of telemetered raw values.
minValue	0..1	Float	Normal value range minimum for any of the MeasurementValue.values. Used for scaling, e.g. in bar graphs or of telemetered raw values
normalValue	0..1	Float	Normal measurement value, e.g., used for percentage calculations.
unitSymbol	1..1	UnitSymbol	inherited from: Measurement
measurementType	1..1	String	inherited from: Measurement
phases	0..1	PhaseCode	inherited from: Measurement
unitMultiplier	1..1	UnitMultiplier	inherited from: Measurement
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

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Table 26 shows all association ends of Analog with other classes.

Table 26 – Association ends of Standard::Analog with other classes

mult from	name	mult to	type	description
0..*	Terminal	0..1	ACDCTerminal	inherited from: Measurement
0..*	PowerSystemResource	0..1	PowerSystemResource	inherited from: Measurement

6.3.2.13 (abstract) AnalogControl

An analog control used for supervisory control.

Table 27 shows all attributes of AnalogControl.

Table 27 – Attributes of Standard::AnalogControl

name	mult	type	description
minValue	0..1	Float	Normal value range minimum for any of the Control.value. Used for scaling, e.g. in bar graphs.
maxValue	0..1	Float	Normal value range maximum for any of the Control.value. Used for scaling, e.g. in bar graphs.
unitSymbol	0..1	UnitSymbol	inherited from: Control
controlType	0..1	String	inherited from: Control
operationInProgress	0..1	Boolean	inherited from: Control
timeStamp	0..1	DateTime	inherited from: Control
unitMultiplier	0..1	UnitMultiplier	inherited from: Control
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 28 shows all association ends of AnalogControl with other classes.

Table 28 – Association ends of Standard::AnalogControl with other classes

mult from	name	mult to	type	description
0..1	AnalogValue	1..1	AnalogValue	The MeasurementValue that is controlled.
0..*	PowerSystemResource	0..1	PowerSystemResource	inherited from: Control

6.3.2.14 AnalogLimit

Limit values for Analog measurements.

Table 29 shows all attributes of AnalogLimit.

Table 29 – Attributes of Standard::AnalogLimit

name	mult	type	description
value	0..1	Float	The value to supervise against.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 30 shows all association ends of AnalogLimit with other classes.

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Table 30 – Association ends of Standard::AnalogLimit with other classes

mult from	name	mult to	type	description
0..*	LimitSet	1..1	AnalogLimitSet	The set of limits.

6.3.2.15 AnalogLimitSet

An AnalogLimitSet specifies a set of Limits that are associated with an Analog measurement.

Table 31 shows all attributes of AnalogLimitSet.

Table 31 – Attributes of Standard::AnalogLimitSet

name	mult	type	description
isPercentageLimits	0..1	Boolean	inherited from: LimitSet
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 32 shows all association ends of AnalogLimitSet with other classes.

Table 32 – Association ends of Standard::AnalogLimitSet with other classes

mult from	name	mult to	type	description
0..*	Measurements	0..*	Analog	The Measurements using the LimitSet.

6.3.2.16 AnalogValue

AnalogValue represents an analog MeasurementValue.

Table 33 shows all attributes of AnalogValue.

Table 33 – Attributes of Standard::AnalogValue

name	mult	type	description
value	0..1	Float	The value to supervise.
timeStamp	0..1	DateTime	inherited from: MeasurementValue
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 34 shows all association ends of AnalogValue with other classes.

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Table 34 – Association ends of Standard::AnalogValue with other classes

mult from	name	mult to	type	description
0..*	Analog	1..1	Analog	Measurement to which this value is connected.
0..*	MeasurementValueSource	1..1	MeasurementValueSource	inherited from: MeasurementValue

6.3.2.17 ApparentPowerLimit

Apparent power limit.

Table 35 shows all attributes of ApparentPowerLimit.

Table 35 – Attributes of Standard::ApparentPowerLimit

name	mult	type	description
value	1..1	ApparentPower	The apparent power limit.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 36 shows all association ends of ApparentPowerLimit with other classes.

Table 36 – Association ends of Standard::ApparentPowerLimit with other classes

mult from	name	mult to	type	description
0..*	OperationalLimitType	0..1	OperationalLimitType	inherited from: OperationalLimit
0..*	OperationalLimitSet	1..1	OperationalLimitSet	inherited from: OperationalLimit

6.3.2.18 (abstract) AssetInfo root class

Set of attributes of an asset, representing typical data-sheet information of a physical device, that can be instantiated and shared in different data exchange contexts:

– as attributes of an asset instance (installed or in stock),
– as attributes of an asset model (product by a manufacturer),
– as attributes of a type asset (generic type of an asset as used in designs/extension planning).

6.3.2.19 (abstract) AuxiliaryEquipment

AuxiliaryEquipment describe equipment that is not performing any primary functions but support for the equipment performing the primary function.

AuxiliaryEquipment is attached to primary eqipment via an association with Terminal.

Table 37 shows all attributes of AuxiliaryEquipment.

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Table 37 – Attributes of Standard::AuxiliaryEquipment

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 38 shows all association ends of AuxiliaryEquipment with other classes.

Table 38 – Association ends of Standard::AuxiliaryEquipment with other classes

mult from	name	mult to	type	description
0..*	Terminal	1..1	Terminal	The Terminal at the equipment where the AuxiliaryEquipment is attached.
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

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6.3.2.20 BaseVoltage

Defines a system base voltage which is referenced.

Table 39 shows all attributes of BaseVoltage.

Table 39 – Attributes of Standard::BaseVoltage

name	mult	type	description
nominalVoltage	0..1	Voltage	The PowerSystemResource's base voltage.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.3.2.21 (abstract) BasicIntervalSchedule

Schedule of values at points in time.

Table 40 shows all attributes of BasicIntervalSchedule.

Table 40 – Attributes of Standard::BasicIntervalSchedule

name	mult	type	description
value2Unit	0..1	UnitSymbol	Value2 units of measure.
startTime	1..1	DateTime	The time for the first time point.
value1Unit	1..1	UnitSymbol	Value1 units of measure.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.3.2.22 Bay

A collection of power system resources (within a given substation) including conducting equipment, protection relays, measurements, and telemetry.

Table 41 shows all attributes of Bay.

Table 41 – Attributes of Standard::Bay

name	mult	type	description
breakerConfiguration	0..1	BreakerConfiguration	Breaker configuration.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 42 shows all association ends of Bay with other classes.

Table 42 – Association ends of Standard::Bay with other classes

mult from	name	mult to	type	description
0..*	VoltageLevel	0..1	VoltageLevel	The voltage level containing this bay.
0..*	Substation	0..1	Substation	Substation containing the bay.
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.23 Breaker

A mechanical switching device capable of making, carrying, and breaking currents under normal circuit conditions and also making, carrying for a specified time, and breaking currents under specified abnormal circuit conditions e.g. those of short circuit.

Table 43 shows all attributes of Breaker.

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Table 43 – Attributes of Standard::Breaker

name	mult	type	description
inTransitTime	0..1	Seconds	The transition time from open to close.
breakingCapacity	0..1	CurrentFlow	inherited from: ProtectedSwitch
normalOpen	1..1	Boolean	inherited from: Switch
locked	0..1	Boolean	inherited from: Switch
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
switchOnCount	0..1	Integer	(Deprecated) inherited from: Switch
switchOnDate	0..1	DateTime	(Deprecated) inherited from: Switch

Table 44 shows all association ends of Breaker with other classes.

Table 44 – Association ends of Standard::Breaker with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

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6.3.2.24 BusbarSection

A conductor, or group of conductors, with negligible impedance, that serve to connect other conducting equipment within a single substation.

Voltage measurements are typically obtained from VoltageTransformers that are connected to busbar sections. A bus bar section may have many physical terminals but for analysis is modelled with exactly one logical terminal.

Table 45 shows all attributes of BusbarSection.

Table 45 – Attributes of Standard::BusbarSection

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 46 shows all association ends of BusbarSection with other classes.

Table 46 – Association ends of Standard::BusbarSection with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.25 Clamp

A Clamp is a galvanic connection at a line segment where other equipment is connected. A Clamp does not cut the line segment.

A Clamp is ConductingEquipment and has one Terminal with an associated ConnectivityNode. Any other ConductingEquipment can be connected to the Clamp ConnectivityNode.

Table 47 shows all attributes of Clamp.

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Table 47 – Attributes of Standard::Clamp

name	mult	type	description
lengthFromTerminal1	0..1	Length	The length to the place where the clamp is located starting from side one of the line segment, i.e. the line segment terminal with sequence number equal to 1.
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 48 shows all association ends of Clamp with other classes.

Table 48 – Association ends of Standard::Clamp with other classes

mult from	name	mult to	type	description
0..*	ACLineSegment	1..1	ACLineSegment	The line segment to which the clamp is connected.
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.26 Command

A Command is a discrete control used for supervisory control.

Table 49 shows all attributes of Command.

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Table 49 – Attributes of Standard::Command

name	mult	type	description
value	0..1	Integer	The value representing the actuator output.
normalValue	0..1	Integer	Normal value for Control.value e.g. used for percentage scaling.
unitSymbol	0..1	UnitSymbol	inherited from: Control
controlType	0..1	String	inherited from: Control
operationInProgress	0..1	Boolean	inherited from: Control
timeStamp	0..1	DateTime	inherited from: Control
unitMultiplier	0..1	UnitMultiplier	inherited from: Control
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 50 shows all association ends of Command with other classes.

Table 50 – Association ends of Standard::Command with other classes

mult from	name	mult to	type	description
0..1	DiscreteValue	1..1	DiscreteValue	The MeasurementValue that is controlled.
0..*	ValueAliasSet	0..1	ValueAliasSet	The ValueAliasSet used for translation of a Control value to a name.
0..*	PowerSystemResource	0..1	PowerSystemResource	inherited from: Control

6.3.2.27 (abstract) ConductingEquipment

The parts of the power system that are designed to carry current or that are conductively connected therewith. ConductingEquipment is contained within an EquipmentContainer that may be a Substation, or a VoltageLevel or a Bay within a Substation.

Table 51 shows all attributes of ConductingEquipment.

Table 51 – Attributes of Standard::ConductingEquipment

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 52 shows all association ends of ConductingEquipment with other classes.

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Table 52 – Association ends of Standard::ConductingEquipment with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	Base voltage of this conducting equipment. Use only when there is no voltage level container used and only one base voltage applies. For example, not used for transformers.
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.28 (abstract) Conductor

Combination of conducting material with consistent electrical characteristics, building a single electrical system, used to carry current between points in the power system.

Table 53 shows all attributes of Conductor.

Table 53 – Attributes of Standard::Conductor

name	mult	type	description
length	0..1	Length	Segment length for calculating line section capabilities.
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 54 shows all association ends of Conductor with other classes.

Table 54 – Association ends of Standard::Conductor with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

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6.3.2.29 ConformLoad

ConformLoad represent loads that follow a daily load change pattern where the pattern can be used to scale the load with a system load.

Table 55 shows all attributes of ConformLoad.

Table 55 – Attributes of Standard::ConformLoad

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 56 shows all association ends of ConformLoad with other classes.

Table 56 – Association ends of Standard::ConformLoad with other classes

mult from	name	mult to	type	description
0..*	LoadGroup	0..1	ConformLoadGroup	Group of this ConformLoad.
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.30 ConformLoadGroup

A group of loads conforming to an allocation pattern.

Table 57 shows all attributes of ConformLoadGroup.

Table 57 – Attributes of Standard::ConformLoadGroup

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 58 shows all association ends of ConformLoadGroup with other classes.

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Table 58 – Association ends of Standard::ConformLoadGroup with other classes

mult from	name	mult to	type	description
1..*	SubLoadArea	1..1	SubLoadArea	inherited from: LoadGroup

6.3.2.31 ConformLoadSchedule

A curve of load versus time (X-axis) showing the active power values (Y1-axis) and reactive power (Y2-axis) for each unit of the period covered. This curve represents a typical pattern of load over the time period for a given day type and season.

Table 59 shows all attributes of ConformLoadSchedule.

Table 59 – Attributes of Standard::ConformLoadSchedule

name	mult	type	description
timeStep	0..1	Seconds	inherited from: RegularIntervalSchedule
endTime	0..1	DateTime	inherited from: RegularIntervalSchedule
value2Unit	0..1	UnitSymbol	inherited from: BasicIntervalSchedule
startTime	1..1	DateTime	inherited from: BasicIntervalSchedule
value1Unit	1..1	UnitSymbol	inherited from: BasicIntervalSchedule
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 60 shows all association ends of ConformLoadSchedule with other classes.

Table 60 – Association ends of Standard::ConformLoadSchedule with other classes

mult from	name	mult to	type	description
1..*	ConformLoadGroup	1..1	ConformLoadGroup	The ConformLoadGroup where the ConformLoadSchedule belongs.
0..*	DayType	1..1	DayType	inherited from: SeasonDayTypeSchedule
0..*	Season	1..1	Season	inherited from: SeasonDayTypeSchedule

6.3.2.32 ConnectivityNode

Connectivity nodes are points where terminals of conducting equipment are connected together with zero impedance.

Table 61 shows all attributes of ConnectivityNode.

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Table 61 – Attributes of Standard::ConnectivityNode

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 62 shows all association ends of ConnectivityNode with other classes.

Table 62 – Association ends of Standard::ConnectivityNode with other classes

mult from	name	mult to	type	description
0..*	ConnectivityNodeContainer	1..1	ConnectivityNodeContainer	Container of this connectivity node.

6.3.2.33 (abstract) ConnectivityNodeContainer

A base class for all objects that may contain ConnectivityNodes or TopologicalNodes.

Table 63 shows all attributes of ConnectivityNodeContainer.

Table 63 – Attributes of Standard::ConnectivityNodeContainer

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 64 shows all association ends of ConnectivityNodeContainer with other classes.

Table 64 – Association ends of Standard::ConnectivityNodeContainer with other classes

mult from	name	mult to	type	description
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.34 (abstract) Connector

A conductor, or group of conductors, with negligible impedance, that serve to connect other conducting equipment within a single substation and are modelled with a single logical terminal.

Table 65 shows all attributes of Connector.

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Table 65 – Attributes of Standard::Connector

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 66 shows all association ends of Connector with other classes.

Table 66 – Association ends of Standard::Connector with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.35 (abstract) Control

Control is used for supervisory/device control. It represents control outputs that are used to change the state in a process, e.g. close or open breaker, a set point value or a raise lower command.

Table 67 shows all attributes of Control.

Table 67 – Attributes of Standard::Control

name	mult	type	description
unitSymbol	0..1	UnitSymbol	The unit of measure of the controlled quantity.
controlType	0..1	String	Specifies the type of Control, e.g. BreakerOn/Off, GeneratorVoltageSetPoint, TieLineFlow, etc. The ControlType.name shall be unique among all specified types and describe the type.
operationInProgress	0..1	Boolean	Indicates that a client is currently sending control commands that has not completed.
timeStamp	0..1	DateTime	The last time a control output was sent.
unitMultiplier	0..1	UnitMultiplier	The unit multiplier of the controlled quantity.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

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Table 68 shows all association ends of Control with other classes.

Table 68 – Association ends of Standard::Control with other classes

mult from	name	mult to	type	description
0..*	PowerSystemResource	0..1	PowerSystemResource	Regulating device governed by this control output.

6.3.2.36 CsConverter

DC side of the current source converter (CSC).

Table 69 shows all attributes of CsConverter.

Table 69 – Attributes of Standard::CsConverter

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 70 shows all association ends of CsConverter with other classes.

Table 70 – Association ends of Standard::CsConverter with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.37 CurrentLimit

Operational limit on current.

Table 71 shows all attributes of CurrentLimit.

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Table 71 – Attributes of Standard::CurrentLimit

name	mult	type	description
value	1..1	CurrentFlow	Limit on current flow.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 72 shows all association ends of CurrentLimit with other classes.

Table 72 – Association ends of Standard::CurrentLimit with other classes

mult from	name	mult to	type	description
0..*	OperationalLimitType	0..1	OperationalLimitType	inherited from: OperationalLimit
0..*	OperationalLimitSet	1..1	OperationalLimitSet	inherited from: OperationalLimit

6.3.2.38 CurrentTransformer

Instrument transformer used to measure electrical qualities of the circuit that is being protected and/or monitored. Typically used as current transducer for the purpose of metering or protection. A typical secondary current rating would be 5A.

Table 73 shows all attributes of CurrentTransformer.

Table 73 – Attributes of Standard::CurrentTransformer

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 74 shows all association ends of CurrentTransformer with other classes.

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Table 74 – Association ends of Standard::CurrentTransformer with other classes

mult from	name	mult to	type	description
1..1	CurrentTransformerPhase	0..*	CurrentTransformerPhase	
0..*	Terminal	1..1	Terminal	inherited from: AuxiliaryEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.39 Cut

A cut separates a line segment into two parts. The cut appears as a switch inserted between these two parts and connects them together. As the cut is normally open there is no galvanic connection between the two line segment parts. But it is possible to close the cut to get galvanic connection.

The cut terminals are oriented towards the line segment terminals with the same sequence number. Hence the cut terminal with sequence number equal to 1 is oriented to the line segment's terminal with sequence number equal to 1.

The cut terminals also act as connection points for jumpers and other equipment, e.g. a mobile generator. To enable this, connectivity nodes are placed at the cut terminals. Once the connectivity nodes are in place any conducting equipment can be connected at them.

Table 75 shows all attributes of Cut.

Table 75 – Attributes of Standard::Cut

name	mult	type	description
lengthFromTerminal1	0..1	Length	The length to the place where the cut is located starting from side one of the cut line segment, i.e. the line segment Terminal with sequenceNumber equal to 1.
normalOpen	1..1	Boolean	inherited from: Switch
locked	0..1	Boolean	inherited from: Switch
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
switchOnCount	0..1	Integer	(Deprecated) inherited from: Switch
switchOnDate	0..1	DateTime	(Deprecated) inherited from: Switch

Table 76 shows all association ends of Cut with other classes.

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Table 76 – Association ends of Standard::Cut with other classes

mult from	name	mult to	type	description
0..*	ACLineSegment	1..1	ACLineSegment	The line segment to which the cut is applied.
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.40 DayType

Group of similar days. For example it could be used to represent weekdays, weekend, or holidays.

Table 77 shows all attributes of DayType.

Table 77 – Attributes of Standard::DayType

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.3.2.41 Disconnector

A manually operated or motor operated mechanical switching device used for changing the connections in a circuit, or for isolating a circuit or equipment from a source of power. It is required to open or close circuits when negligible current is broken or made.

Table 78 shows all attributes of Disconnector.

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Table 78 – Attributes of Standard::Disconnector

name	mult	type	description
normalOpen	1..1	Boolean	inherited from: Switch
locked	0..1	Boolean	inherited from: Switch
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
switchOnCount	0..1	Integer	(Deprecated) inherited from: Switch
switchOnDate	0..1	DateTime	(Deprecated) inherited from: Switch

Table 79 shows all association ends of Disconnector with other classes.

Table 79 – Association ends of Standard::Disconnector with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

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6.3.2.42 Discrete

Discrete represents a discrete Measurement, i.e. a Measurement representing discrete values, e.g. a Breaker position.

Table 80 shows all attributes of Discrete.

Table 80 – Attributes of Standard::Discrete

name	mult	type	description
normalValue	0..1	Integer	Normal measurement value, e.g., used for percentage calculations.
maxValue	0..1	Integer	Normal value range maximum for any of the MeasurementValue.values. Used for scaling, e.g. in bar graphs or of telemetered raw values.
minValue	0..1	Integer	Normal value range minimum for any of the MeasurementValue.values. Used for scaling, e.g. in bar graphs or of telemetered raw values
unitSymbol	1..1	UnitSymbol	inherited from: Measurement
measurementType	1..1	String	inherited from: Measurement
phases	0..1	PhaseCode	inherited from: Measurement
unitMultiplier	1..1	UnitMultiplier	inherited from: Measurement
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 81 shows all association ends of Discrete with other classes.

Table 81 – Association ends of Standard::Discrete with other classes

mult from	name	mult to	type	description
0..*	ValueAliasSet	0..1	ValueAliasSet	The ValueAliasSet used for translation of a MeasurementValue.value to a name.
0..*	Terminal	0..1	ACDCTerminal	inherited from: Measurement
0..*	PowerSystemResource	0..1	PowerSystemResource	inherited from: Measurement

6.3.2.43 DiscreteValue

DiscreteValue represents a discrete MeasurementValue.

Table 82 shows all attributes of DiscreteValue.

Table 82 – Attributes of Standard::DiscreteValue

name	mult	type	description
value	0..1	Integer	The value to supervise.
timeStamp	0..1	DateTime	inherited from: MeasurementValue
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 83 shows all association ends of DiscreteValue with other classes.

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Table 83 – Association ends of Standard::DiscreteValue with other classes

mult from	name	mult to	type	description
0..*	Discrete	1..1	Discrete	Measurement to which this value is connected.
0..*	MeasurementValueSource	1..1	MeasurementValueSource	inherited from: MeasurementValue

6.3.2.44 (abstract) EarthFaultCompensator

A conducting equipment used to represent a connection to ground which is typically used to compensate earth faults. An earth fault compensator device modeled with a single terminal implies a second terminal solidly connected to ground. If two terminals are modeled, the ground is not assumed and normal connection rules apply.

Table 84 shows all attributes of EarthFaultCompensator.

Table 84 – Attributes of Standard::EarthFaultCompensator

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 85 shows all association ends of EarthFaultCompensator with other classes.

Table 85 – Association ends of Standard::EarthFaultCompensator with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.45 (abstract) EnergyArea

Describes an area having energy production or consumption. Specializations are intended to support the load allocation function as typically required in energy management systems or planning studies to allocate hypothesized load levels to individual load points for power flow analysis. Often the energy area can be linked to both measured and forecast load levels.

Table 86 shows all attributes of EnergyArea.

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Table 86 – Attributes of Standard::EnergyArea

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.3.2.46 EnergyConsumer

Generic user of energy – a point of consumption on the power system model

Table 87 shows all attributes of EnergyConsumer.

Table 87 – Attributes of Standard::EnergyConsumer

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 88 shows all association ends of EnergyConsumer with other classes.

Table 88 – Association ends of Standard::EnergyConsumer with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.47 EnergyConsumerPhase

Table 89 shows all attributes of EnergyConsumerPhase.

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Table 89 – Attributes of Standard::EnergyConsumerPhase

name	mult	type	description
phase	0..1	SinglePhaseKind	Phase of this energy consumer component. If the energy consumer is wye connected, the connection is from the indicated phase to the central ground or neutral point. If the energy consumer is delta connected, the phase indicates an energy consumer connected from the indicated phase to the next logical non-neutral phase.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 90 shows all association ends of EnergyConsumerPhase with other classes.

Table 90 – Association ends of Standard::EnergyConsumerPhase with other classes

mult from	name	mult to	type	description
0..*	EnergyConsumer	1..1	EnergyConsumer	The energy consumer to which this phase belongs.
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.48 EnergySource

A generic equivalent for an energy supplier on a transmission or distribution voltage level.

Table 91 shows all attributes of EnergySource.

Table 91 – Attributes of Standard::EnergySource

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 92 shows all association ends of EnergySource with other classes.

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Table 92 – Association ends of Standard::EnergySource with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.49 (abstract) Equipment

The parts of a power system that are physical devices, electronic or mechanical.

Table 93 shows all attributes of Equipment.

Table 93 – Attributes of Standard::Equipment

name	mult	type	description
normallyInService	0..1	Boolean	If true, the equipment is normally in service.
aggregate	0..1	Boolean	The single instance of equipment represents multiple pieces of equipment that have been modeled together as an aggregate. Examples would be power transformers or synchronous machines operating in parallel modeled as a single aggregate power transformer or aggregate synchronous machine. This is not to be used to indicate equipment that is part of a group of interdependent equipment produced by a network production program.
inService	0..1	Boolean	If true, the equipment is in service.
networkAnalysisEnabled	0..1	Boolean	The equipment is enabled to participate in network analysis. If unspecified, the value is assumed to be true.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 94 shows all association ends of Equipment with other classes.

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Table 94 – Association ends of Standard::Equipment with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	Additional equipment container beyond the primary equipment container. The equipment is contained in another equipment container, but also grouped with this equipment container.
0..*	EquipmentContainer	0..1	EquipmentContainer	Container of this equipment.
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.50 (abstract) EquipmentContainer

A modeling construct to provide a root class for containing equipment.

Table 95 shows all attributes of EquipmentContainer.

Table 95 – Attributes of Standard::EquipmentContainer

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 96 shows all association ends of EquipmentContainer with other classes.

Table 96 – Association ends of Standard::EquipmentContainer with other classes

mult from	name	mult to	type	description
0..*	WeatherStation	0..*	WeatherStation	
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

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6.3.2.51 (abstract) EquivalentEquipment

The class represents equivalent objects that are the result of a network reduction. The class is the base for equivalent objects of different types.

Table 97 shows all attributes of EquivalentEquipment.

Table 97 – Attributes of Standard::EquivalentEquipment

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 98 shows all association ends of EquivalentEquipment with other classes.

Table 98 – Association ends of Standard::EquivalentEquipment with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.52 EquivalentInjection

This class represents equivalent injections (generation or load). Voltage regulation is allowed only at the point of connection.

Table 99 shows all attributes of EquivalentInjection.

Table 99 – Attributes of Standard::EquivalentInjection

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 100 shows all association ends of EquivalentInjection with other classes.

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Table 100 – Association ends of Standard::EquivalentInjection with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.53 ExternalNetworkInjection

This class represents external network and it is used for IEC 60909 calculations.

Table 101 shows all attributes of ExternalNetworkInjection.

Table 101 – Attributes of Standard::ExternalNetworkInjection

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 102 shows all association ends of ExternalNetworkInjection with other classes.

Table 102 – Association ends of Standard::ExternalNetworkInjection with other classes

mult from	name	mult to	type	description
1..*	RegulatingControl	0..1	RegulatingControl	inherited from: RegulatingCondEq
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.54 FaultIndicator

A FaultIndicator is typically only an indicator (which may or may not be remotely monitored), and not a piece of equipment that actually initiates a protection event. It is used for FLISR (Fault Location, Isolation and Restoration) purposes, assisting with the dispatch of crews to "most

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likely" part of the network (i.e. assists with determining circuit section where the fault most likely happened).

Table 103 shows all attributes of FaultIndicator.

Table 103 – Attributes of Standard::FaultIndicator

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 104 shows all association ends of FaultIndicator with other classes.

Table 104 – Association ends of Standard::FaultIndicator with other classes

mult from	name	mult to	type	description
0..*	Terminal	1..1	Terminal	inherited from: AuxiliaryEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.55 Feeder

Table 105 shows all attributes of Feeder.

Table 105 – Attributes of Standard::Feeder

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 106 shows all association ends of Feeder with other classes.

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Table 106 – Association ends of Standard::Feeder with other classes

mult from	name	mult to	type	description
0..*	ToBay	0..1	Bay	
0..*	FromBay	0..1	Bay	
0..1	NormalHeadTerminal	1..*	Terminal	The normal head terminal or terminals of the feeder.
0..*	NormalEnergizingSubstation	0..1	Substation	The substation that nominally energizes the feeder. Also used for naming purposes.
0..*	NormalEnergizedSubstation	0..*	Substation	The substations that are normally energized by the feeder.
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.56 Fuse

An overcurrent protective device with a circuit opening fusible part that is heated and severed by the passage of overcurrent through it. A fuse is considered a switching device because it breaks current.

Table 107 shows all attributes of Fuse.

Table 107 – Attributes of Standard::Fuse

name	mult	type	description
normalOpen	1..1	Boolean	inherited from: Switch
locked	0..1	Boolean	inherited from: Switch
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
switchOnCount	0..1	Integer	(Deprecated) inherited from: Switch
switchOnDate	0..1	DateTime	(Deprecated) inherited from: Switch

Table 108 shows all association ends of Fuse with other classes.

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Table 108 – Association ends of Standard::Fuse with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.57 GeneratingUnit

A single or set of synchronous machines for converting mechanical power into alternating-current power. For example, individual machines within a set may be defined for scheduling purposes while a single control signal is derived for the set. In this case there would be a GeneratingUnit for each member of the set and an additional GeneratingUnit corresponding to the set.

Table 109 shows all attributes of GeneratingUnit.

Table 109 – Attributes of Standard::GeneratingUnit

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 110 shows all association ends of GeneratingUnit with other classes.

Table 110 – Association ends of Standard::GeneratingUnit with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.58 GeographicalRegion

A geographical region of a power system network model.

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Table 111 shows all attributes of GeographicalRegion.

Table 111 – Attributes of Standard::GeographicalRegion

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.3.2.59 Ground

A common point for connecting grounded conducting equipment such as shunt capacitors. The power system model can have more than one ground.

Table 112 shows all attributes of Ground.

Table 112 – Attributes of Standard::Ground

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 113 shows all association ends of Ground with other classes.

Table 113 – Association ends of Standard::Ground with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.60 GroundDisconnector

A manually operated or motor operated mechanical switching device used for isolating a circuit or equipment from Ground.

Table 114 shows all attributes of GroundDisconnector.

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Table 114 – Attributes of Standard::GroundDisconnector

name	mult	type	description
normalOpen	1..1	Boolean	inherited from: Switch
locked	0..1	Boolean	inherited from: Switch
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
switchOnCount	0..1	Integer	(Deprecated) inherited from: Switch
switchOnDate	0..1	DateTime	(Deprecated) inherited from: Switch

Table 115 shows all association ends of GroundDisconnector with other classes.

Table 115 – Association ends of Standard::GroundDisconnector with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.61 GroundingImpedance

A fixed impedance device used for grounding.

Table 116 shows all attributes of GroundingImpedance.

Table 116 – Attributes of Standard::GroundingImpedance

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 117 shows all association ends of GroundingImpedance with other classes.

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Table 117 – Association ends of Standard::GroundingImpedance with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.62 HydroGeneratingUnit

A generating unit whose prime mover is a hydraulic turbine (e.g. Francis, Pelton, Kaplan).

Table 118 shows all attributes of HydroGeneratingUnit.

Table 118 – Attributes of Standard::HydroGeneratingUnit

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 119 shows all association ends of HydroGeneratingUnit with other classes.

Table 119 – Association ends of Standard::HydroGeneratingUnit with other classes

mult from	name	mult to	type	description
0..*	HydroPowerPlant	0..1	HydroPowerPlant	The hydro generating unit belongs to a hydro power plant.
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.63 HydroPowerPlant

A hydro power station which can generate or pump. When generating, the generator turbines receive water from an upper reservoir. When pumping, the pumps receive their water from a lower reservoir.

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Table 120 shows all attributes of HydroPowerPlant.

Table 120 – Attributes of Standard::HydroPowerPlant

name	mult	type	description
hydroPlantStorageType	0..1	HydroPlantStorageKind	The type of hydro power plant water storage.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 121 shows all association ends of HydroPowerPlant with other classes.

Table 121 – Association ends of Standard::HydroPowerPlant with other classes

mult from	name	mult to	type	description
0..1	HydroPumps	0..*	HydroPump	The hydro pump may be a member of a pumped storage plant or a pump for distributing water.
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.64 HydroPump

A synchronous motor-driven pump, typically associated with a pumped storage plant.

Table 122 shows all attributes of HydroPump.

Table 122 – Attributes of Standard::HydroPump

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 123 shows all association ends of HydroPump with other classes.

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Table 123 – Association ends of Standard::HydroPump with other classes

mult from	name	mult to	type	description
0..*	HydroPowerPlant	0..1	HydroPowerPlant	The hydro pump may be a member of a pumped storage plant or a pump for distributing water.
0..1	RotatingMachine	1..1	RotatingMachine	The synchronous machine drives the turbine which moves the water from a low elevation to a higher elevation. The direction of machine rotation for pumping may or may not be the same as for generating.
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.65 (abstract) IdentifiedObject root class

This is a root class to provide common identification for all classes needing identification and naming attributes.

Table 124 shows all attributes of IdentifiedObject.

Table 124 – Attributes of Standard::IdentifiedObject

name	mult	type	description
name	0..1	String	The name is any free human readable and possibly non unique text naming the object.
aliasName	0..1	String	The aliasName is free text human readable name of the object alternative to IdentifiedObject.name. It may be non unique and may not correlate to a naming hierarchy. The attribute aliasName is retained because of backwards compatibility between CIM relases. It is however recommended to replace aliasName with the Name class as aliasName is planned for retirement at a future time.
description	0..1	String	The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.
mRID	0..1	String	Master resource identifier issued by a model authority. The mRID is globally unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended. For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.

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6.3.2.66 Jumper

A short section of conductor with negligible impedance which can be manually removed and replaced if the circuit is de-energized. Note that zero-impedance branches can be modelled by an ACLineSegment with a zero impedance ConductorType.

Table 125 shows all attributes of Jumper.

Table 125 – Attributes of Standard::Jumper

name	mult	type	description
normalOpen	1..1	Boolean	inherited from: Switch
locked	0..1	Boolean	inherited from: Switch
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
switchOnCount	0..1	Integer	(Deprecated) inherited from: Switch
switchOnDate	0..1	DateTime	(Deprecated) inherited from: Switch

Table 126 shows all association ends of Jumper with other classes.

Table 126 – Association ends of Standard::Jumper with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

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6.3.2.67 Junction

A point where one or more conducting equipments are connected with zero resistance.

Table 127 shows all attributes of Junction.

Table 127 – Attributes of Standard::Junction

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 128 shows all association ends of Junction with other classes.

Table 128 – Association ends of Standard::Junction with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.68 (abstract) Limit

Specifies one limit value for a Measurement. A Measurement typically has several limits that are kept together by the LimitSet class. The actual meaning and use of a Limit instance (i.e., if it is an alarm or warning limit or if it is a high or low limit) is not captured in the Limit class. However the name of a Limit instance may indicate both meaning and use.

Table 129 shows all attributes of Limit.

Table 129 – Attributes of Standard::Limit

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.3.2.69 (abstract) LimitSet

Specifies a set of Limits that are associated with a Measurement. A Measurement may have several LimitSets corresponding to seasonal or other changing conditions. The condition is captured in the name and description attributes. The same LimitSet may be used for several Measurements. In particular percentage limits are used this way.

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Table 130 shows all attributes of LimitSet.

Table 130 – Attributes of Standard::LimitSet

name	mult	type	description
isPercentageLimits	0..1	Boolean	Tells if the limit values are in percentage of normalValue or the specified Unit for Measurements and Controls.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.3.2.70 Line

Contains equipment beyond a substation belonging to a power transmission line.

Table 131 shows all attributes of Line.

Table 131 – Attributes of Standard::Line

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 132 shows all association ends of Line with other classes.

Table 132 – Association ends of Standard::Line with other classes

mult from	name	mult to	type	description
0..*	FromBay	0..1	Bay	
0..*	ToBay	0..1	Bay	
0..*	Region	1..1	SubGeographicalRegion	The sub-geographical region of the line.
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.71 LinearShuntCompensator

A linear shunt compensator has banks or sections with equal admittance values.

Table 133 shows all attributes of LinearShuntCompensator.

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Table 133 – Attributes of Standard::LinearShuntCompensator

name	mult	type	description
maximumSections	0..1	Integer	inherited from: ShuntCompensator
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 134 shows all association ends of LinearShuntCompensator with other classes.

Table 134 – Association ends of Standard::LinearShuntCompensator with other classes

mult from	name	mult to	type	description
1..*	RegulatingControl	0..1	RegulatingControl	inherited from: RegulatingCondEq
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.72 LoadArea

The class is the root or first level in a hierarchical structure for grouping of loads for the purpose of load flow load scaling.

Table 135 shows all attributes of LoadArea.

Table 135 – Attributes of Standard::LoadArea

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.3.2.73 LoadBreakSwitch

A mechanical switching device capable of making, carrying, and breaking currents under normal operating conditions.

Table 136 shows all attributes of LoadBreakSwitch.

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Table 136 – Attributes of Standard::LoadBreakSwitch

name	mult	type	description
breakingCapacity	0..1	CurrentFlow	inherited from: ProtectedSwitch
normalOpen	1..1	Boolean	inherited from: Switch
locked	0..1	Boolean	inherited from: Switch
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
switchOnCount	0..1	Integer	(Deprecated) inherited from: Switch
switchOnDate	0..1	DateTime	(Deprecated) inherited from: Switch

Table 137 shows all association ends of LoadBreakSwitch with other classes.

Table 137 – Association ends of Standard::LoadBreakSwitch with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

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6.3.2.74 (abstract) LoadGroup

The class is the third level in a hierarchical structure for grouping of loads for the purpose of load flow load scaling.

Table 138 shows all attributes of LoadGroup.

Table 138 – Attributes of Standard::LoadGroup

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 139 shows all association ends of LoadGroup with other classes.

Table 139 – Association ends of Standard::LoadGroup with other classes

mult from	name	mult to	type	description
1..*	SubLoadArea	1..1	SubLoadArea	The SubLoadArea where the Loadgroup belongs.

6.3.2.75 (abstract) Measurement

A Measurement represents any measured, calculated or non-measured non-calculated quantity. Any piece of equipment may contain Measurements, e.g. a substation may have temperature measurements and door open indications, a transformer may have oil temperature and tank pressure measurements, a bay may contain a number of power flow measurements and a Breaker may contain a switch status measurement.

The PSR – Measurement association is intended to capture this use of Measurement and is included in the naming hierarchy based on EquipmentContainer. The naming hierarchy typically has Measurements as leafs, e.g. Substation-VoltageLevel-Bay-Switch-Measurement.

Some Measurements represent quantities related to a particular sensor location in the network, e.g. a voltage transformer (PT) at a busbar or a current transformer (CT) at the bar between a breaker and an isolator. The sensing position is not captured in the PSR – Measurement association. Instead it is captured by the Measurement – Terminal association that is used to define the sensing location in the network topology. The location is defined by the connection of the Terminal to ConductingEquipment.

Two possible paths exist:

1) Measurement-Terminal- ConnectivityNode-Terminal-ConductingEquipment
2) Measurement-Terminal-ConductingEquipment

Alternative 2 is the only allowed use.

When the sensor location is needed both Measurement-PSR and Measurement-Terminal are used. The Measurement-Terminal association is never used alone.

Table 140 shows all attributes of Measurement.

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Table 140 – Attributes of Standard::Measurement

name	mult	type	description
unitSymbol	1..1	UnitSymbol	The unit of measure of the measured quantity.
measurementType	1..1	String	Specifies the type of Measurement, e.g. IndoorTemperature, OutDoorTemperature, BusVoltage, GeneratorVoltage, LineFlow, etc.
phases	0..1	PhaseCode	Indicates to which phases the measurement applies and avoids the need to use 'measurementType' to also encode phase information (which would explode the types). Since Controls have associations with Measurements, they will have the capability to handle each phase. The phase information in Measurement, along with 'measurementType' and 'phaseConnection' uniquely defines a Measurement for a device, based on normal network phase. Their meaning will not change when the computed energizing phasing is changed due to jumpers or other reasons.
unitMultiplier	1..1	UnitMultiplier	The unit multiplier of the measured quantity.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 141 shows all association ends of Measurement with other classes.

Table 141 – Association ends of Standard::Measurement with other classes

mult from	name	mult to	type	description
0..*	Terminal	0..1	ACDCTerminal	One or more measurements may be associated with a terminal in the network.
0..*	PowerSystemResource	0..1	PowerSystemResource	The power system resource that contains the measurement.

6.3.2.76 (abstract) MeasurementValue

The current state for a measurement. A state value is an instance of a measurement from a specific source. Measurements can be associated with many state values, each representing a different source for the measurement.

Table 142 shows all attributes of MeasurementValue.

Table 142 – Attributes of Standard::MeasurementValue

name	mult	type	description
timeStamp	0..1	DateTime	The time when the value was last updated.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 143 shows all association ends of MeasurementValue with other classes.

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Table 143 – Association ends of Standard::MeasurementValue with other classes

mult from	name	mult to	type	description
0..*	MeasurementValueSource	1..1	MeasurementValueSource	A reference to the type of source that updates the MeasurementValue, e.g. SCADA, CCLink, manual, etc. User conventions for the names of sources are contained in the introduction to IEC 61970-301.

6.3.2.77 MeasurementValueSource

MeasurementValueSource describes the alternative sources updating a MeasurementValue. User conventions for how to use the MeasurementValueSource attributes are described in the introduction to IEC 61970-301.

Table 144 shows all attributes of MeasurementValueSource.

Table 144 – Attributes of Standard::MeasurementValueSource

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.3.2.78 Name root class

The Name class provides the means to define any number of human readable names for an object. A name is not to be used for defining inter-object relationships. For inter-object relationships, instead use the object identification 'mRID'.

Table 145 shows all attributes of Name.

Table 145 – Attributes of Standard::Name

name	mult	type	description
name	1..1	String	Any free text that name the object.

Table 146 shows all association ends of Name with other classes.

Table 146 – Association ends of Standard::Name with other classes

mult from	name	mult to	type	description
0..*	IdentifiedObject	1..1	IdentifiedObject	Identified object that this name designates.
0..*	NameType	1..1	NameType	Type of this name.

6.3.2.79 NameType root class

Type of name. Possible values for attribute 'name' are implementation dependent but standard profiles may specify types. An enterprise may have multiple IT systems each having its own

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local name for the same object, e.g. a planning system may have different names from an EMS. An object may also have different names within the same IT system, e.g. localName and aliasName as defined in CIM version 14. Their definitions from CIM14 are

The localName is a human readable name of the object. It is only used with objects organized in a naming hierarchy. localName: A free text name local to a node in a naming hierarchy similar to a file directory structure. A power system related naming hierarchy may be: Substation, VoltageLevel, Equipment, etc. Children of the same parent in such a hierarchy have names that typically are unique among them.

aliasName: A free text alternate name typically used in tabular reports where the column width is limited.

Table 147 shows all attributes of NameType.

Table 147 – Attributes of Standard::NameType

name	mult	type	description
name	1..1	String	Name of the name type.
description	0..1	String	Description of the name type.

Table 148 shows all association ends of NameType with other classes.

Table 148 – Association ends of Standard::NameType with other classes

mult from	name	mult to	type	description
0..*	NameTypeAuthority	0..1	NameTypeAuthority	Authority responsible for managing names of this type.

6.3.2.80 NameTypeAuthority root class

Authority responsible for creation and management of names of a given type; typically an organization or an enterprise system.

Table 149 shows all attributes of NameTypeAuthority.

Table 149 – Attributes of Standard::NameTypeAuthority

name	mult	type	description
name	1..1	String	Name of the name type authority.
description	0..1	String	Description of the name type authority.

6.3.2.81 NonConformLoad

NonConformLoad represent loads that do not follow a daily load change pattern and changes are not correlated with the daily load change pattern.

Table 150 shows all attributes of NonConformLoad.

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Table 150 – Attributes of Standard::NonConformLoad

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 151 shows all association ends of NonConformLoad with other classes.

Table 151 – Association ends of Standard::NonConformLoad with other classes

mult from	name	mult to	type	description
0..*	LoadGroup	0..1	NonConformLoadGroup	Group of this ConformLoad.
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.82 NonConformLoadGroup

Loads that do not follow a daily and seasonal load variation pattern.

Table 152 shows all attributes of NonConformLoadGroup.

Table 152 – Attributes of Standard::NonConformLoadGroup

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 153 shows all association ends of NonConformLoadGroup with other classes.

Table 153 – Association ends of Standard::NonConformLoadGroup with other classes

mult from	name	mult to	type	description
1..*	SubLoadArea	1..1	SubLoadArea	inherited from: LoadGroup

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6.3.2.83 NonConformLoadSchedule

An active power (Y1-axis) and reactive power (Y2-axis) schedule (curves) versus time (X-axis) for non-conforming loads, e.g. large industrial load or power station service (where modeled).

Table 154 shows all attributes of NonConformLoadSchedule.

Table 154 – Attributes of Standard::NonConformLoadSchedule

name	mult	type	description
timeStep	0..1	Seconds	inherited from: RegularIntervalSchedule
endTime	0..1	DateTime	inherited from: RegularIntervalSchedule
value2Unit	0..1	UnitSymbol	inherited from: BasicIntervalSchedule
startTime	1..1	DateTime	inherited from: BasicIntervalSchedule
value1Unit	1..1	UnitSymbol	inherited from: BasicIntervalSchedule
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 155 shows all association ends of NonConformLoadSchedule with other classes.

Table 155 – Association ends of Standard::NonConformLoadSchedule with other classes

mult from	name	mult to	type	description
0..*	NonConformLoadGroup	1..1	NonConformLoadGroup	The NonConformLoadGroup where the NonConformLoadSchedule belongs.
0..*	DayType	1..1	DayType	inherited from: SeasonDayTypeSchedule
0..*	Season	1..1	Season	inherited from: SeasonDayTypeSchedule

6.3.2.84 NonlinearShuntCompensator

A non linear shunt compensator has bank or section admittance values that differs.

Table 156 shows all attributes of NonlinearShuntCompensator.

Table 156 – Attributes of Standard::NonlinearShuntCompensator

name	mult	type	description
maximumSections	0..1	Integer	inherited from: ShuntCompensator
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

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Table 157 shows all association ends of NonlinearShuntCompensator with other classes.

Table 157 – Association ends of Standard::NonlinearShuntCompensator with other classes

mult from	name	mult to	type	description
1..*	RegulatingControl	0..1	RegulatingControl	inherited from: RegulatingCondEq
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.85 (abstract) OperatingParticipant root class

An operator of multiple power system resource objects. Note multple operating participants may operate the same power system resource object. This can be used for modeling jointly owned units where each owner operates as a contractual share.

6.3.2.86 OperatingShare root class

Specifies the operations contract relationship between a power system resource and a contract participant.

Table 158 shows all attributes of OperatingShare.

Table 158 – Attributes of Standard::OperatingShare

name	mult	type	description
percentage	0..1	PerCent	Percentage operational ownership between the pair (power system resource and operatging participant) associated with this share. The total percentage ownership for a power system resource should add to 100 %.

Table 159 shows all association ends of OperatingShare with other classes.

Table 159 – Association ends of Standard::OperatingShare with other classes

mult from	name	mult to	type	description
0..*	OperatingParticipant	1..1	OperatingParticipant	The operating participant having this share with the associated power system resource.
0..*	PowerSystemResource	1..1	PowerSystemResource	The power system resource to which the share applies.

6.3.2.87 (abstract) OperationalLimit

A value associated with a specific kind of limit.

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The sub class value attribute shall be positive.

The sub class value attribute is inversely proportional to OperationalLimitType.acceptableDuration (acceptableDuration for short). A pair of value_x and acceptableDuration_x are related to each other as follows:

– if value_1 > value_2 > value_3 >... then
– acceptableDuration_1 < acceptableDuration_2 < acceptableDuration_3 < ...

A value_x with direction="high" shall be greater than a value_y with direction="low".

Table 160 shows all attributes of OperationalLimit.

Table 160 – Attributes of Standard::OperationalLimit

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 161 shows all association ends of OperationalLimit with other classes.

Table 161 – Association ends of Standard::OperationalLimit with other classes

mult from	name	mult to	type	description
0..*	OperationalLimitType	0..1	OperationalLimitType	The limit type associated with this limit.
0..*	OperationalLimitSet	1..1	OperationalLimitSet	The limit set to which the limit values belong.

6.3.2.88 OperationalLimitSet

A set of limits associated with equipment. Sets of limits might apply to a specific temperature, or season for example. A set of limits may contain different severities of limit levels that would apply to the same equipment. The set may contain limits of different types such as apparent power and current limits or high and low voltage limits that are logically applied together as a set.

Table 162 shows all attributes of OperationalLimitSet.

Table 162 – Attributes of Standard::OperationalLimitSet

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 163 shows all association ends of OperationalLimitSet with other classes.

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Table 163 – Association ends of Standard::OperationalLimitSet with other classes

mult from	name	mult to	type	description
1..*	RateTemperature	0..1	RateTemperature	A rate temperature may be associated with a limit set.
0..*	Terminal	0..1	ACDCTerminal	
0..*	Equipment	0..1	Equipment	The equipment to which the limit set applies.

6.3.2.89 OperationalLimitType

The operational meaning of a category of limits.

Table 164 shows all attributes of OperationalLimitType.

Table 164 – Attributes of Standard::OperationalLimitType

name	mult	type	description
acceptableDuration	0..1	Seconds	The nominal acceptable duration of the limit. Limits are commonly expressed in terms of the a time limit for which the limit is normally acceptable. The actual acceptable duration of a specific limit may depend on other local factors such as temperature or wind speed.
direction	0..1	OperationalLimitDirectionKind	The direction of the limit.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 165 shows all association ends of OperationalLimitType with other classes.

Table 165 – Association ends of Standard::OperationalLimitType with other classes

mult from	name	mult to	type	description
0..1	OperationalLimit	0..*	OperationalLimit	The operational limits associated with this type of limit.

6.3.2.90 (abstract) PerLengthImpedance root class

Common type for per-length impedance electrical catalogues.

6.3.2.91 PetersenCoil

A tunable impedance device normally used to offset line charging during single line faults in an ungrounded section of network.

Table 166 shows all attributes of PetersenCoil.

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Table 166 – Attributes of Standard::PetersenCoil

name	mult	type	description
mode	0..1	PetersenCoilModeKind	The mode of operation of the Petersen coil.
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 167 shows all association ends of PetersenCoil with other classes.

Table 167 – Association ends of Standard::PetersenCoil with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.92 ProtectionEquipment

An electrical device designed to respond to input conditions in a prescribed manner and after specified conditions are met to cause contact operation or similar abrupt change in associated electric control circuits, or simply to display the detected condition. Protection equipment are associated with conducting equipment and usually operate circuit breakers.

Table 168 shows all attributes of ProtectionEquipment.

Table 168 – Attributes of Standard::ProtectionEquipment

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 169 shows all association ends of ProtectionEquipment with other classes.

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Table 169 – Association ends of Standard::ProtectionEquipment with other classes

mult from	name	mult to	type	description
0..*	ProtectedSwitches	0..*	ProtectedSwitch	Protected switches operated by this ProtectionEquipment.
0..*	ConductingEquipments	0..*	ConductingEquipment	Protection equipment may be used to protect specific conducting equipment.
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.93 PSRType

Classifying instances of the same class, e.g. overhead and underground ACLineSegments. This classification mechanism is intended to provide flexibility outside the scope of this standard, i.e. provide customisation that is non standard.

Table 170 shows all attributes of PSRType.

Table 170 – Attributes of Standard::PSRType

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.3.2.94 PostLineSensor

A sensor used mainly in overhead distribution networks as the source of both current and voltage measurements.

Table 171 shows all attributes of PostLineSensor.

Table 171 – Attributes of Standard::PostLineSensor

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

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Table 172 shows all association ends of PostLineSensor with other classes.

Table 172 – Association ends of Standard::PostLineSensor with other classes

mult from	name	mult to	type	description
0..*	Terminal	1..1	Terminal	inherited from: AuxiliaryEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.95 PotentialTransformer

Instrument transformer (also known as Voltage Transformer) used to measure electrical qualities of the circuit that is being protected and/or monitored. Typically used as voltage transducer for the purpose of metering, protection, or sometimes auxiliary substation supply. A typical secondary voltage rating would be 120 V.

Table 173 shows all attributes of PotentialTransformer.

Table 173 – Attributes of Standard::PotentialTransformer

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 174 shows all association ends of PotentialTransformer with other classes.

Table 174 – Association ends of Standard::PotentialTransformer with other classes

mult from	name	mult to	type	description
0..*	Terminal	1..1	Terminal	inherited from: AuxiliaryEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

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6.3.2.96 (abstract) PowerSystemResource

A power system resource can be an item of equipment such as a Switch, an EquipmentContainer containing many individual items of equipment such as a Substation, or an organisational entity such as Company or SubControlArea. This provides for the nesting of collections of PowerSystemResources within other PowerSystemResources. For example, a Switch could be a member of a Substation and a Substation could be a member of a division of a Company.

Table 175 shows all attributes of PowerSystemResource.

Table 175 – Attributes of Standard::PowerSystemResource

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 176 shows all association ends of PowerSystemResource with other classes.

Table 176 – Association ends of Standard::PowerSystemResource with other classes

mult from	name	mult to	type	description
0..*	AssetDatasheet	0..1	AssetInfo	Datasheet information for this power system resource.
0..*	PSRType	0..1	PSRType	Custom classification for this power system resource.

6.3.2.97 PowerTransformer

An electrical device consisting of two or more coupled windings, with or without a magnetic core, for introducing mutual coupling between electric circuits. Transformers can be used to control voltage and phase shift (active power flow).

A power transformer may be composed of separate transformer tanks that need not be identical.

The same power transformer can be modelled in two ways, namely with and without tanks:

1) The power transformer that uses power transformer ends directly (without tanks) is suitable for balanced three-phase models. This is typical for transmission and sub-transmission network modelling. Such a transformer will require one power transformer end for each physical winding. There must be a one-to-one association between PowerTransformerEnd and Core::Terminal.
2) The power transformer that uses transformer tanks is suitable for an unbalanced transformer, a balanced transformer within a single tank, or a balanced transformer made up of three tanks. This is typical for distribution network modelling and the only choice when modelling an unbalanced transformer, or a transformer that has more than three windings. Power transformer modelled with tanks will require for each tank, one transformer tank end per physical winding in the tank. There may be one, two, or three phases in the transformer tank end. Examples: 3 phases for 3-phase delta or wye connected windings, 2 for one phase-to-phase winding, and 1 for a phase-to-neutral or phase-to-ground winding. With 1 or 2 phases, more than one transformer tank end may be associated to the same 3-phase Core::Terminal instance, while with 3 phases there should be a one-to-one association.

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This power transformer model is flexible in order to support different kinds of data exchange requirements. There are 5 possible ways to combine available classes and their attributes:

1) Instance parameters – Use the r, x, r0, x0, b, b0, g, and g0 attributes on PowerTransformerEnd and ignore related TransformerStarImpedance, TransformerMeshImpedance, or TransformerCoreAdmittance. This option assumes a star connection of the series impedances. It is suitable for typical transmission, balanced three-phase transformer models, for transformers with 2 or three windings.
2) Star instance parameters by association – Instead of the r, x, r0, x0, b, b0, g, and g0 attributes, use associations to TransformerStarImpedance and TransformerCoreAdmitance. This option is suitable in same scenarios as option 1, but when catalogue data is available for transformers.
3) Mesh instance parameters by association: Instead of the r, x, r0, x0, b, b0, g, and g0 attributes, use associations to TransformerMeshImpedance and TransformerCoreAdmittance. This option supports transformers with more than three windings.
4) Catalog mesh parameters by association – Instead of attributes r, x, r0, x0, b, b0, g, and g0 and associations to TransformerStarImpedance, TransformerMeshImpedance, or TransformerCoreAdmittance, use the association to TransformerEndInfo. The TransformerEnd.endNumber should match the corresponding TransformerEndInfo.endNumber, following the IEC standard convention of numbering from the highest voltage ends to the lowest, starting at 1. This matching supports higher-level use of a catalog, through just one association between TransformerTank and TransformerTankInfo, with simpler exchanges and incremental updates. The associated TransformerEndInfo will have associations to TransformerMeshImpedance and TransformerCoreAdmittance. This option supports unbalanced transformer, with more than three windings and is suitable whenever the transformer test data has been converted to an electrical model.
5) Catalog test data by association – This is the same as option 4, except TransformerEndInfo will have associations to AssetModels::TransformerTest decendents, instead of to TransformerMeshImpedance and TransformerCoreAdmittance. This option is suitable when the test data is available, and the receiving application is able to interpret the test data.

Every profile should specify which one or more of these options are supported.

Table 177 shows all attributes of PowerTransformer.

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Table 177 – Attributes of Standard::PowerTransformer

name	mult	type	description
vectorGroup	0..1	String	Vector group of the transformer for protective relaying, e.g. Dyn1. For unbalanced transformers, this may not be simply determined from the constituent winding connections and phase angle dispacements. The vectorGroup string consists of the following components in the order listed: high voltage winding connection, mid voltage winding connection (for three winding transformers), phase displacement clock number from 0 to 11, low voltage winding connection phase displacement clock number from 0 to 11. The winding connections are D (delta), Y (wye), YN (wye with neutral), Z (zigzag), ZN (zigzag with neutral), A (auto transformer). Upper case means the high voltage, lower case mid or low. The high voltage winding always has clock postion 0 and is not included in the vector group string. Some examples: YNy0 (two winding wye to wye with no phase displacement), YNd11 (two winding wye to delta with 330 degrees phase displacement), YNyn0d5 (three winding transformer wye with neutral high voltgage, wye with neutral mid voltgage and no phase displacement, delta low voltage with 150 degrees displacement). Phase displacement is defined as the angular difference between the phasors representing the voltages between the neutral point (real or imaginary) and the corresponding terminals of two windings, a positive sequence voltage system being applied to the high-voltage terminals, following each other in alphabetical sequence if they are lettered, or in numerical sequence if they are numbered: the phasors are assumed to rotate in a counter-clockwise sense.
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

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Table 178 shows all association ends of PowerTransformer with other classes.

Table 178 – Association ends of Standard::PowerTransformer with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.98 PowerTransformerEnd

A PowerTransformerEnd is associated with each Terminal of a PowerTransformer.

The impdedance values r, r0, x, and x0 of a PowerTransformerEnd represents a star equivalent as follows:

1) For a two Terminal PowerTransformer, the high voltage PowerTransformerEnd has non zero values on r, r0, x, and x0 while the low voltage PowerTransformerEnd has zero values for r, r0, x, and x0.
2) For a three Terminal PowerTransformer, the three PowerTransformerEnds represents a star equivalent with each leg in the star represented by r, r0, x, and x0 values.
3) For a PowerTransformer with more than three Terminals, the PowerTransformerEnd impedance values cannot be used. Instead use the TransformerMeshImpedance or split the transformer into multiple PowerTransformers.

Table 179 shows all attributes of PowerTransformerEnd.

Table 179 – Attributes of Standard::PowerTransformerEnd

name	mult	type	description
endNumber	1..1	Integer	inherited from: TransformerEnd
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 180 shows all association ends of PowerTransformerEnd with other classes.

Table 180 – Association ends of Standard::PowerTransformerEnd with other classes

mult from	name	mult to	type	description
0..*	PowerTransformer	1..1	PowerTransformer	The power transformer of this power transformer end.
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: TransformerEnd
0..*	Terminal	1..1	Terminal	inherited from: TransformerEnd

6.3.2.99 (abstract) ProtectedSwitch

A ProtectedSwitch is a switching device that can be operated by ProtectionEquipment.

Table 181 shows all attributes of ProtectedSwitch.

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Table 181 – Attributes of Standard::ProtectedSwitch

name	mult	type	description
breakingCapacity	0..1	CurrentFlow	The maximum fault current a breaking device can break safely under prescribed conditions of use.
normalOpen	1..1	Boolean	inherited from: Switch
locked	0..1	Boolean	inherited from: Switch
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
switchOnCount	0..1	Integer	(Deprecated) inherited from: Switch
switchOnDate	0..1	DateTime	(Deprecated) inherited from: Switch

Table 182 shows all association ends of ProtectedSwitch with other classes.

Table 182 – Association ends of Standard::ProtectedSwitch with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

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6.3.2.100 PSREvent

Event recording the change in operational status of a power system resource; may be for an event that has already occurred or for a planned activity.

Table 183 shows all attributes of PSREvent.

Table 183 – Attributes of Standard::PSREvent

name	mult	type	description
kind	0..1	PSREventKind	Kind of event.
status	0..1	Status	inherited from: ActivityRecord
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 184 shows all association ends of PSREvent with other classes.

Table 184 – Association ends of Standard::PSREvent with other classes

mult from	name	mult to	type	description
0..*	PowerSystemResource	1..1	PowerSystemResource	Power system resource that generated this event.

6.3.2.101 RaiseLowerCommand

An analog control that increase or decrease a set point value with pulses.

Table 185 shows all attributes of RaiseLowerCommand.

Table 185 – Attributes of Standard::RaiseLowerCommand

name	mult	type	description
minValue	0..1	Float	inherited from: AnalogControl
maxValue	0..1	Float	inherited from: AnalogControl
unitSymbol	0..1	UnitSymbol	inherited from: Control
controlType	0..1	String	inherited from: Control
operationInProgress	0..1	Boolean	inherited from: Control
timeStamp	0..1	DateTime	inherited from: Control
unitMultiplier	0..1	UnitMultiplier	inherited from: Control
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 186 shows all association ends of RaiseLowerCommand with other classes.

Table 186 – Association ends of Standard::RaiseLowerCommand with other classes

mult from	name	mult to	type	description
0..*	ValueAliasSet	0..1	ValueAliasSet	The ValueAliasSet used for translation of a Control value to a name.
0..1	AnalogValue	1..1	AnalogValue	inherited from: AnalogControl
0..*	PowerSystemResource	0..1	PowerSystemResource	inherited from: Control

6.3.2.102 RatioTapChanger

A tap changer that changes the voltage ratio impacting the voltage magnitude but not the phase angle across the transformer.

Table 187 shows all attributes of RatioTapChanger.

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Table 187 – Attributes of Standard::RatioTapChanger

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 188 shows all association ends of RatioTapChanger with other classes.

Table 188 – Association ends of Standard::RatioTapChanger with other classes

mult from	name	mult to	type	description
0..1	TransformerEnd	1..1	TransformerEnd	Transformer end to which this ratio tap changer belongs.
0..*	TapChangerControl	0..1	TapChangerControl	inherited from: TapChanger
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.103 Recloser

Pole-mounted fault interrupter with built-in phase and ground relays, current transformer (CT), and supplemental controls.

Table 189 shows all attributes of Recloser.

Table 189 – Attributes of Standard::Recloser

name	mult	type	description
breakingCapacity	0..1	CurrentFlow	inherited from: ProtectedSwitch
normalOpen	1..1	Boolean	inherited from: Switch
locked	0..1	Boolean	inherited from: Switch
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
switchOnCount	0..1	Integer	(Deprecated) inherited from: Switch
switchOnDate	0..1	DateTime	(Deprecated) inherited from: Switch

Table 190 shows all association ends of Recloser with other classes.

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Table 190 – Association ends of Standard::Recloser with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.104 (abstract) RegularIntervalSchedule

The schedule has time points where the time between them is constant.

Table 191 shows all attributes of RegularIntervalSchedule.

Table 191 – Attributes of Standard::RegularIntervalSchedule

name	mult	type	description
timeStep	0..1	Seconds	The time between each pair of subsequent regular time points in sequence order.
endTime	0..1	DateTime	The time for the last time point.
value2Unit	0..1	UnitSymbol	inherited from: BasicIntervalSchedule
startTime	1..1	DateTime	inherited from: BasicIntervalSchedule
value1Unit	1..1	UnitSymbol	inherited from: BasicIntervalSchedule
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.3.2.105 RegularTimePoint root class

Time point for a schedule where the time between the consecutive points is constant.

Table 192 shows all attributes of RegularTimePoint.

Table 192 – Attributes of Standard::RegularTimePoint

name	mult	type	description
value2	0..1	Float	The second value at the time. The meaning of the value is defined by the derived type of the associated schedule.
sequenceNumber	0..1	Integer	The position of the regular time point in the sequence. Note that time points don't have to be sequential, i.e. time points may be omitted. The actual time for a RegularTimePoint is computed by multiplying the associated regular interval schedule's time step with the regular time point sequence number and adding the associated schedules start time.

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name	mult	type	description
value1	0..1	Float	The first value at the time. The meaning of the value is defined by the derived type of the associated schedule.

Table 193 shows all association ends of RegularTimePoint with other classes.

Table 193 – Association ends of Standard::RegularTimePoint with other classes

mult from	name	mult to	type	description
1..*	IntervalSchedule	1..1	RegularIntervalSchedule	Regular interval schedule containing this time point.

6.3.2.106 (abstract) RegulatingCondEq

A type of conducting equipment that can regulate a quanity (i.e. voltage or flow) at a specific point in the network.

Table 194 shows all attributes of RegulatingCondEq.

Table 194 – Attributes of Standard::RegulatingCondEq

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 195 shows all association ends of RegulatingCondEq with other classes.

Table 195 – Association ends of Standard::RegulatingCondEq with other classes

mult from	name	mult to	type	description
1..*	RegulatingControl	0..1	RegulatingControl	The regulating control scheme in which this equipment participates.
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

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6.3.2.107 RegulatingControl

Specifies a set of equipment that works together to control a power system quantity such as voltage or flow.

Remote bus voltage control is possible by specifying the controlled terminal located at some place remote from the controlling equipment.

In case multiple equipment, possibly of different types, control same terminal, there must be only one RegulatingControl at that terminal. The most specific subtype of RegulatingControl shall be used in case such equipment participate in the control, e.g. TapChangerControl for tap changers.

For flow control, load sign convention is used, i.e. positive sign means flow out from a TopologicalNode (bus) into the conducting equipment.

Table 196 shows all attributes of RegulatingControl.

Table 196 – Attributes of Standard::RegulatingControl

name	mult	type	description
mode	0..1	RegulatingControlModeKind	The regulating control mode presently available. This specification allows for determining the kind of regulation without need for obtaining the units from a schedule.
maxAllowedTargetValue	0..1	Float	Maximum allowed target value (RegulatingControl.targetValue).
minAllowedTargetValue	0..1	Float	Minimum allowed target value (RegulatingControl.targetValue).
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 197 shows all association ends of RegulatingControl with other classes.

Table 197 – Association ends of Standard::RegulatingControl with other classes

mult from	name	mult to	type	description
0..*	Terminal	0..1	Terminal	The terminal associated with this regulating control. The terminal is associated instead of a node, since the terminal could connect into either a topological node or a connectivity node. Sometimes it is useful to model regulation at a terminal of a bus bar object.
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.108 RegulationSchedule

A pre-established pattern over time for a controlled variable, e.g. busbar voltage.

Table 198 shows all attributes of RegulationSchedule.

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Table 198 – Attributes of Standard::RegulationSchedule

name	mult	type	description
timeStep	0..1	Seconds	inherited from: RegularIntervalSchedule
endTime	0..1	DateTime	inherited from: RegularIntervalSchedule
value2Unit	0..1	UnitSymbol	inherited from: BasicIntervalSchedule
startTime	1..1	DateTime	inherited from: BasicIntervalSchedule
value1Unit	1..1	UnitSymbol	inherited from: BasicIntervalSchedule
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 199 shows all association ends of RegulationSchedule with other classes.

Table 199 – Association ends of Standard::RegulationSchedule with other classes

mult from	name	mult to	type	description
0..*	RegulatingControl	1..1	RegulatingControl	Regulating controls that have this schedule.
0..*	DayType	1..1	DayType	inherited from: SeasonDayTypeSchedule
0..*	Season	1..1	Season	inherited from: SeasonDayTypeSchedule

6.3.2.109 RemoteControl

Remote controls are ouputs that are sent by the remote unit to actuators in the process.

Table 200 shows all attributes of RemoteControl.

Table 200 – Attributes of Standard::RemoteControl

name	mult	type	description
remoteControlled	0..1	Boolean	Set to true if the actuator is remotely controlled.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 201 shows all association ends of RemoteControl with other classes.

Table 201 – Association ends of Standard::RemoteControl with other classes

mult from	name	mult to	type	description
0..1	Control	1..1	Control	The Control for the RemoteControl point.

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6.3.2.110 (abstract) RemotePoint

For a RTU remote points correspond to telemetered values or control outputs. Other units (e.g. control centers) usually also contain calculated values.

Table 202 shows all attributes of RemotePoint.

Table 202 – Attributes of Standard::RemotePoint

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.3.2.111 ReportingGroup

A reporting group is used for various ad-hoc groupings used for reporting.

Table 203 shows all attributes of ReportingGroup.

Table 203 – Attributes of Standard::ReportingGroup

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.3.2.112 (abstract) RotatingMachine

A rotating machine which may be used as a generator or motor.

Table 204 shows all attributes of RotatingMachine.

Table 204 – Attributes of Standard::RotatingMachine

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 205 shows all association ends of RotatingMachine with other classes.

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Table 205 – Association ends of Standard::RotatingMachine with other classes

mult from	name	mult to	type	description
1..1	HydroPump	0..1	HydroPump	The synchronous machine drives the turbine which moves the water from a low elevation to a higher elevation. The direction of machine rotation for pumping may or may not be the same as for generating.
1..*	GeneratingUnit	0..1	GeneratingUnit	A synchronous machine may operate as a generator and as such becomes a member of a generating unit.
1..*	RegulatingControl	0..1	RegulatingControl	inherited from: RegulatingCondEq
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.113 Season

A specified time period of the year.

Table 206 shows all attributes of Season.

Table 206 – Attributes of Standard::Season

name	mult	type	description
startDate	0..1	MonthDay	Date season starts.
endDate	0..1	MonthDay	Date season ends.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.3.2.114 (abstract) SeasonDayTypeSchedule

A time schedule covering a 24 hour period, with curve data for a specific type of season and day.

Table 207 shows all attributes of SeasonDayTypeSchedule.

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Table 207 – Attributes of Standard::SeasonDayTypeSchedule

name	mult	type	description
timeStep	0..1	Seconds	inherited from: RegularIntervalSchedule
endTime	0..1	DateTime	inherited from: RegularIntervalSchedule
value2Unit	0..1	UnitSymbol	inherited from: BasicIntervalSchedule
startTime	1..1	DateTime	inherited from: BasicIntervalSchedule
value1Unit	1..1	UnitSymbol	inherited from: BasicIntervalSchedule
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 208 shows all association ends of SeasonDayTypeSchedule with other classes.

Table 208 – Association ends of Standard::SeasonDayTypeSchedule with other classes

mult from	name	mult to	type	description
0..*	DayType	1..1	DayType	DayType for the Schedule.
0..*	Season	1..1	Season	Season for the Schedule.

6.3.2.115 Sectionaliser

Automatic switch that will lock open to isolate a faulted section. It may, or may not, have load breaking capability. Its primary purpose is to provide fault sectionalising at locations where the fault current is either too high, or too low, for proper coordination of fuses.

Table 209 shows all attributes of Sectionaliser.

Table 209 – Attributes of Standard::Sectionaliser

name	mult	type	description
normalOpen	1..1	Boolean	inherited from: Switch
locked	0..1	Boolean	inherited from: Switch
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
switchOnCount	0..1	Integer	(Deprecated) inherited from: Switch
switchOnDate	0..1	DateTime	(Deprecated) inherited from: Switch

Table 210 shows all association ends of Sectionaliser with other classes.

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Table 210 – Association ends of Standard::Sectionaliser with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.116 (abstract) Sensor

This class describe devices that transform a measured quantity into signals that can be presented at displays, used in control or be recorded.

Table 211 shows all attributes of Sensor.

Table 211 – Attributes of Standard::Sensor

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 212 shows all association ends of Sensor with other classes.

Table 212 – Association ends of Standard::Sensor with other classes

mult from	name	mult to	type	description
0..*	Terminal	1..1	Terminal	inherited from: AuxiliaryEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.117 SetPoint

An analog control that issue a set point value.

Table 213 shows all attributes of SetPoint.

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Table 213 – Attributes of Standard::SetPoint

name	mult	type	description
value	0..1	Float	The value representing the actuator output.
normalValue	0..1	Float	Normal value for Control.value e.g. used for percentage scaling.
minValue	0..1	Float	inherited from: AnalogControl
maxValue	0..1	Float	inherited from: AnalogControl
unitSymbol	0..1	UnitSymbol	inherited from: Control
controlType	0..1	String	inherited from: Control
operationInProgress	0..1	Boolean	inherited from: Control
timeStamp	0..1	DateTime	inherited from: Control
unitMultiplier	0..1	UnitMultiplier	inherited from: Control
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 214 shows all association ends of SetPoint with other classes.

Table 214 – Association ends of Standard::SetPoint with other classes

mult from	name	mult to	type	description
0..1	AnalogValue	1..1	AnalogValue	inherited from: AnalogControl
0..*	PowerSystemResource	0..1	PowerSystemResource	inherited from: Control

6.3.2.118 (abstract) ShuntCompensator

A shunt capacitor or reactor or switchable bank of shunt capacitors or reactors. A section of a shunt compensator is an individual capacitor or reactor. A negative value for reactivePerSection indicates that the compensator is a reactor. ShuntCompensator is a single terminal device. Ground is implied.

Table 215 shows all attributes of ShuntCompensator.

Table 215 – Attributes of Standard::ShuntCompensator

name	mult	type	description
maximumSections	0..1	Integer	The maximum number of sections that may be switched in.
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

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Table 216 shows all association ends of ShuntCompensator with other classes.

Table 216 – Association ends of Standard::ShuntCompensator with other classes

mult from	name	mult to	type	description
1..*	RegulatingControl	0..1	RegulatingControl	inherited from: RegulatingCondEq
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.119 SolarGeneratingUnit

A solar thermal generating unit.

Table 217 shows all attributes of SolarGeneratingUnit.

Table 217 – Attributes of Standard::SolarGeneratingUnit

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 218 shows all association ends of SolarGeneratingUnit with other classes.

Table 218 – Association ends of Standard::SolarGeneratingUnit with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

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6.3.2.120 StaticVarCompensator

A facility for providing variable and controllable shunt reactive power. The SVC typically consists of a stepdown transformer, filter, thyristor-controlled reactor, and thyristor-switched capacitor arms.

The SVC may operate in fixed MVar output mode or in voltage control mode. When in voltage control mode, the output of the SVC will be proportional to the deviation of voltage at the controlled bus from the voltage setpoint. The SVC characteristic slope defines the proportion. If the voltage at the controlled bus is equal to the voltage setpoint, the SVC MVar output is zero.

Table 219 shows all attributes of StaticVarCompensator.

Table 219 – Attributes of Standard::StaticVarCompensator

name	mult	type	description
sVCControlMode	0..1	SVCControlMode	SVC control mode.
voltageSetPoint	0..1	Voltage	The reactive power output of the SVC is proportional to the difference between the voltage at the regulated bus and the voltage setpoint. When the regulated bus voltage is equal to the voltage setpoint, the reactive power output is zero.
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 220 shows all association ends of StaticVarCompensator with other classes.

Table 220 – Association ends of Standard::StaticVarCompensator with other classes

mult from	name	mult to	type	description
1..*	RegulatingControl	0..1	RegulatingControl	inherited from: RegulatingCondEq
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.121 StationSupply

Station supply with load derived from the station output.

Table 221 shows all attributes of StationSupply.

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Table 221 – Attributes of Standard::StationSupply

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 222 shows all association ends of StationSupply with other classes.

Table 222 – Association ends of Standard::StationSupply with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.122 StringMeasurement

StringMeasurement represents a measurement with values of type string.

Table 223 shows all attributes of StringMeasurement.

Table 223 – Attributes of Standard::StringMeasurement

name	mult	type	description
unitSymbol	1..1	UnitSymbol	inherited from: Measurement
measurementType	1..1	String	inherited from: Measurement
phases	0..1	PhaseCode	inherited from: Measurement
unitMultiplier	1..1	UnitMultiplier	inherited from: Measurement
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 224 shows all association ends of StringMeasurement with other classes.

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Table 224 – Association ends of Standard::StringMeasurement with other classes

mult from	name	mult to	type	description
0..*	Terminal	0..1	ACDCTerminal	inherited from: Measurement
0..*	PowerSystemResource	0..1	PowerSystemResource	inherited from: Measurement

6.3.2.123 StringMeasurementValue

StringMeasurementValue represents a measurement value of type string.

Table 225 shows all attributes of StringMeasurementValue.

Table 225 – Attributes of Standard::StringMeasurementValue

name	mult	type	description
value	0..1	String	The value to supervise.
timeStamp	0..1	DateTime	inherited from: MeasurementValue
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 226 shows all association ends of StringMeasurementValue with other classes.

Table 226 – Association ends of Standard::StringMeasurementValue with other classes

mult from	name	mult to	type	description
0..*	StringMeasurement	1..1	StringMeasurement	Measurement to which this value is connected.
0..*	MeasurementValueSource	1..1	MeasurementValueSource	inherited from: MeasurementValue

6.3.2.124 SubGeographicalRegion

A subset of a geographical region of a power system network model.

Table 227 shows all attributes of SubGeographicalRegion.

Table 227 – Attributes of Standard::SubGeographicalRegion

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 228 shows all association ends of SubGeographicalRegion with other classes.

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Table 228 – Association ends of Standard::SubGeographicalRegion with other classes

mult from	name	mult to	type	description
0..*	Region	1..1	GeographicalRegion	The geographical region to which this sub-geographical region is within.

6.3.2.125 SubLoadArea

The class is the second level in a hierarchical structure for grouping of loads for the purpose of load flow load scaling.

Table 229 shows all attributes of SubLoadArea.

Table 229 – Attributes of Standard::SubLoadArea

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 230 shows all association ends of SubLoadArea with other classes.

Table 230 – Association ends of Standard::SubLoadArea with other classes

mult from	name	mult to	type	description
1..*	LoadArea	1..1	LoadArea	The LoadArea where the SubLoadArea belongs.

6.3.2.126 Substation

A collection of equipment for purposes other than generation or utilization, through which electric energy in bulk is passed for the purposes of switching or modifying its characteristics.

Table 231 shows all attributes of Substation.

Table 231 – Attributes of Standard::Substation

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 232 shows all association ends of Substation with other classes.

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Table 232 – Association ends of Standard::Substation with other classes

mult from	name	mult to	type	description
0..*	NamingFeeder	0..1	Feeder	The primary feeder that normally energizes the secondary substation. Used for naming purposes. Either this association or the substation to subgeographical region should be used for hiearchical containment specification.
0..*	SupplyingStation	0..1	Station	
0..*	Station	0..1	Station	Member of station.
0..*	Region	1..1	SubGeographicalRegion	The SubGeographicalRegion containing the substation.
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.127 SurgeArrester

Shunt device, installed on the network, usually in the proximity of electrical equipment in order to protect the said equipment against transient voltage transients caused by lightning or switching activity.

Table 233 shows all attributes of SurgeArrester.

Table 233 – Attributes of Standard::SurgeArrester

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 234 shows all association ends of SurgeArrester with other classes.

Table 234 – Association ends of Standard::SurgeArrester with other classes

mult from	name	mult to	type	description
0..*	Terminal	1..1	Terminal	inherited from: AuxiliaryEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

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6.3.2.128 Switch

A generic device designed to close, or open, or both, one or more electric circuits.

Table 235 shows all attributes of Switch.

Table 235 – Attributes of Standard::Switch

name	mult	type	description
normalOpen	1..1	Boolean	The attribute is used in cases when no Measurement for the status value is present. If the Switch has a status measurment the Discrete.normalValue is expected to match with the Switch.normalOpen.
locked	0..1	Boolean	If true, the switch is locked. The resulting switch state is a combination of locked and Switch.open attributes as follows: – locked=true and Switch.open=true. The resulting state is open and locked; – locked=false and Switch.open=true. The resulting state is open; – locked=false and Switch.open=false. The resulting state is closed.
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
switchOnCount	0..1	Integer	(Deprecated) The switch on count since the switch was last reset or initialized.
switchOnDate	0..1	DateTime	(Deprecated) The date and time when the switch was last switched on.

Table 236 shows all association ends of Switch with other classes.

Table 236 – Association ends of Standard::Switch with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.129 SwitchPhase

Single phase of a multi-phase switch when its attributes might be different per phase.

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Table 237 shows all attributes of SwitchPhase.

Table 237 – Attributes of Standard::SwitchPhase

name	mult	type	description
closed	0..1	Boolean	The attribute tells if the switch is considered closed when used as input to topology processing.
normalOpen	0..1	Boolean	Used in cases when no Measurement for the status value is present. If the SwitchPhase has a status measurement the Discrete.normalValue is expected to match with this value.
phaseSide1	0..1	SinglePhaseKind	Phase of this SwitchPhase on the side with terminal sequence number equal to 1. Should be a phase contained in that terminal's phases attribute.
phaseSide2	0..1	SinglePhaseKind	Phase of this SwitchPhase on the side with terminal sequence number equal to 2. Should be a phase contained in that terminal's Terminal.phases attribute.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 238 shows all association ends of SwitchPhase with other classes.

Table 238 – Association ends of Standard::SwitchPhase with other classes

mult from	name	mult to	type	description
0..*	Switch	1..1	Switch	The switch of the switch phase.
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.130 SwitchSchedule

A schedule of switch positions. If RegularTimePoint.value1 is 0, the switch is open. If 1, the switch is closed.

Table 239 shows all attributes of SwitchSchedule.

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Table 239 – Attributes of Standard::SwitchSchedule

name	mult	type	description
timeStep	0..1	Seconds	inherited from: RegularIntervalSchedule
endTime	0..1	DateTime	inherited from: RegularIntervalSchedule
value2Unit	0..1	UnitSymbol	inherited from: BasicIntervalSchedule
startTime	1..1	DateTime	inherited from: BasicIntervalSchedule
value1Unit	1..1	UnitSymbol	inherited from: BasicIntervalSchedule
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 240 shows all association ends of SwitchSchedule with other classes.

Table 240 – Association ends of Standard::SwitchSchedule with other classes

mult from	name	mult to	type	description
0..*	Switch	1..1	Switch	A SwitchSchedule is associated with a Switch.
0..*	DayType	1..1	DayType	inherited from: SeasonDayTypeSchedule
0..*	Season	1..1	Season	inherited from: SeasonDayTypeSchedule

6.3.2.131 SynchronousMachine

An electromechanical device that operates with shaft rotating synchronously with the network. It is a single machine operating either as a generator or synchronous condenser or pump.

Table 241 shows all attributes of SynchronousMachine.

Table 241 – Attributes of Standard::SynchronousMachine

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 242 shows all association ends of SynchronousMachine with other classes.

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Table 242 – Association ends of Standard::SynchronousMachine with other classes

mult from	name	mult to	type	description
1..1	HydroPump	0..1	HydroPump	inherited from: RotatingMachine
1..*	GeneratingUnit	0..1	GeneratingUnit	inherited from: RotatingMachine
1..*	RegulatingControl	0..1	RegulatingControl	inherited from: RegulatingCondEq
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.132 (abstract) TapChanger

Mechanism for changing transformer winding tap positions.

Table 243 shows all attributes of TapChanger.

Table 243 – Attributes of Standard::TapChanger

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 244 shows all association ends of TapChanger with other classes.

Table 244 – Association ends of Standard::TapChanger with other classes

mult from	name	mult to	type	description
0..*	TapChangerControl	0..1	TapChangerControl	The regulating control scheme in which this tap changer participates.
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.133 TapChangerControl

Describes behavior specific to tap changers, e.g. how the voltage at the end of a line varies with the load level and compensation of the voltage drop by tap adjustment.

Table 245 shows all attributes of TapChangerControl.

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Table 245 – Attributes of Standard::TapChangerControl

name	mult	type	description
mode	0..1	RegulatingControlModeKind	inherited from: RegulatingControl
maxAllowedTargetValue	0..1	Float	inherited from: RegulatingControl
minAllowedTargetValue	0..1	Float	inherited from: RegulatingControl
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 246 shows all association ends of TapChangerControl with other classes.

Table 246 – Association ends of Standard::TapChangerControl with other classes

mult from	name	mult to	type	description
0..*	Terminal	0..1	Terminal	inherited from: RegulatingControl
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.134 TapSchedule

A pre-established pattern over time for a tap step.

Table 247 shows all attributes of TapSchedule.

Table 247 – Attributes of Standard::TapSchedule

name	mult	type	description
timeStep	0..1	Seconds	inherited from: RegularIntervalSchedule
endTime	0..1	DateTime	inherited from: RegularIntervalSchedule
value2Unit	0..1	UnitSymbol	inherited from: BasicIntervalSchedule
startTime	1..1	DateTime	inherited from: BasicIntervalSchedule
value1Unit	1..1	UnitSymbol	inherited from: BasicIntervalSchedule
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 248 shows all association ends of TapSchedule with other classes.

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Table 248 – Association ends of Standard::TapSchedule with other classes

mult from	name	mult to	type	description
1..*	TapChanger	1..1	TapChanger	A TapSchedule is associated with a TapChanger.
0..*	DayType	1..1	DayType	inherited from: SeasonDayTypeSchedule
0..*	Season	1..1	Season	inherited from: SeasonDayTypeSchedule

6.3.2.135 Terminal

An electrical connection point to a piece of conducting equipment. Terminals are connected at physical connection points called "connectivity nodes".

Table 249 shows all attributes of Terminal.

Table 249 – Attributes of Standard::Terminal

name	mult	type	description
phases	0..1	PhaseCode	Represents the normal network phasing condition.
sequenceNumber	0..1	Integer	inherited from: ACDCTerminal
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 250 shows all association ends of Terminal with other classes.

Table 250 – Association ends of Standard::Terminal with other classes

mult from	name	mult to	type	description
0..*	ConductingEquipment	1..1	ConductingEquipment	The conducting equipment of the terminal. Conducting equipment have terminals that may be connected to other conducting equipment terminals via connectivity nodes or topological nodes.
0..*	ConnectivityNode	0..1	ConnectivityNode	The connectivity node to which this terminal connects with zero impedance.

6.3.2.136 ThermalGeneratingUnit

A generating unit whose prime mover could be a steam turbine, combustion turbine, or diesel engine.

Table 251 shows all attributes of ThermalGeneratingUnit.

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Table 251 – Attributes of Standard::ThermalGeneratingUnit

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 252 shows all association ends of ThermalGeneratingUnit with other classes.

Table 252 – Association ends of Standard::ThermalGeneratingUnit with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.137 (abstract) TransformerEnd

TransformerEnd is a conducting connection point of a power transformer. It corresponds to a physical transformer winding terminal. In earlier CIM versions, the TransformerWinding class served a similar purpose. This successor TransformerEnd class is more flexible and has important differences with TransformerWinding.

Table 253 shows all attributes of TransformerEnd.

Table 253 – Attributes of Standard::TransformerEnd

name	mult	type	description
endNumber	1..1	Integer	Number for this transformer end, corresponding to the end's order in the PowerTransformer.vectorGroup attribute. Highest voltage winding should be 1.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 254 shows all association ends of TransformerEnd with other classes.

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Table 254 – Association ends of Standard::TransformerEnd with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	Base voltage of the transformer end. This is essential for PU calculation.
0..*	Terminal	1..1	Terminal	Terminal of the power transformer to which this transformer end belongs.

6.3.2.138 ValueAliasSet

Describes the translation of a set of values into a name and is intendend to facilitate cusom translations. Each ValueAliasSet has a name, description, etc. A specific Measurement may represent a discrete state like Open, Closed, Intermediate, etc. This requires a translation from the MeasurementValue.value number to a string, e.g. 0->"Invalid", 1->"Open", 2->"Closed", 3->"Intermediate". Each ValueToAlias member in ValueAliasSet.Value describe a mapping for one particular value to a name.

Table 255 shows all attributes of ValueAliasSet.

Table 255 – Attributes of Standard::ValueAliasSet

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.3.2.139 ValueToAlias

Describes the translation of one particular value into a name, e.g. 1 as "Open".

Table 256 shows all attributes of ValueToAlias.

Table 256 – Attributes of Standard::ValueToAlias

name	mult	type	description
value	1..1	Integer	The value that is mapped.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 257 shows all association ends of ValueToAlias with other classes.

Table 257 – Association ends of Standard::ValueToAlias with other classes

mult from	name	mult to	type	description
1..*	ValueAliasSet	1..1	ValueAliasSet	The ValueAliasSet having the ValueToAlias mappings.

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6.3.2.140 VoltageLevel

A collection of equipment at one common system voltage forming a switchgear. The equipment typically consist of breakers, busbars, instrumentation, control, regulation and protection devices as well as assemblies of all these.

Table 258 shows all attributes of VoltageLevel.

Table 258 – Attributes of Standard::VoltageLevel

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 259 shows all association ends of VoltageLevel with other classes.

Table 259 – Association ends of Standard::VoltageLevel with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	1..1	BaseVoltage	The base voltage used for all equipment within the voltage level.
0..*	Substation	1..1	Substation	The substation of the voltage level.
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.141 VoltageLimit

Operational limit applied to voltage.

Table 260 shows all attributes of VoltageLimit.

Table 260 – Attributes of Standard::VoltageLimit

name	mult	type	description
value	1..1	Voltage	Limit on voltage. High or low limit nature of the limit depends upon the properties of the operational limit type.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 261 shows all association ends of VoltageLimit with other classes.

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Table 261 – Association ends of Standard::VoltageLimit with other classes

mult from	name	mult to	type	description
0..*	OperationalLimitType	0..1	OperationalLimitType	inherited from: OperationalLimit
0..*	OperationalLimitSet	1..1	OperationalLimitSet	inherited from: OperationalLimit

6.3.2.142 VsConverter

DC side of the voltage source converter (VSC).

Table 262 shows all attributes of VsConverter.

Table 262 – Attributes of Standard::VsConverter

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 263 shows all association ends of VsConverter with other classes.

Table 263 – Association ends of Standard::VsConverter with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	inherited from: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.143 WaveTrap

Line traps are devices that impede high frequency power line carrier signals yet present a negligible impedance at the main power frequency.

Table 264 shows all attributes of WaveTrap.

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Table 264 – Attributes of Standard::WaveTrap

name	mult	type	description
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 265 shows all association ends of WaveTrap with other classes.

Table 265 – Association ends of Standard::WaveTrap with other classes

mult from	name	mult to	type	description
0..*	Terminal	1..1	Terminal	inherited from: AuxiliaryEquipment
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.3.2.144 WindGeneratingUnit

A wind driven generating unit. May be used to represent a single turbine or an aggregation.

Table 266 shows all attributes of WindGeneratingUnit.

Table 266 – Attributes of Standard::WindGeneratingUnit

name	mult	type	description
windGenUnitType	0..1	WindGenUnitKind	The kind of wind generating unit.
normallyInService	0..1	Boolean	inherited from: Equipment
aggregate	0..1	Boolean	inherited from: Equipment
inService	0..1	Boolean	inherited from: Equipment
networkAnalysisEnabled	0..1	Boolean	inherited from: Equipment
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 267 shows all association ends of WindGeneratingUnit with other classes.

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Table 267 – Association ends of Standard::WindGeneratingUnit with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	inherited from: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

6.4 Package ElectricalProperties

6.4.1 General

See Figure 29, Figure 30 and Figure 31.

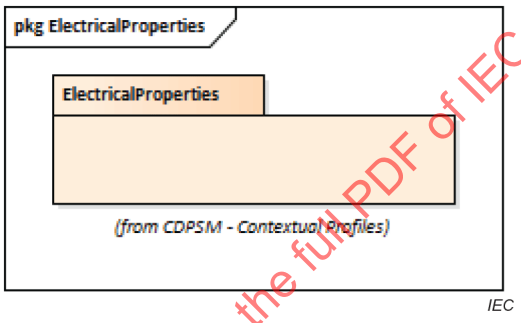

Figure 29 – Package diagram ElectricalProperties::ElectricalProperties

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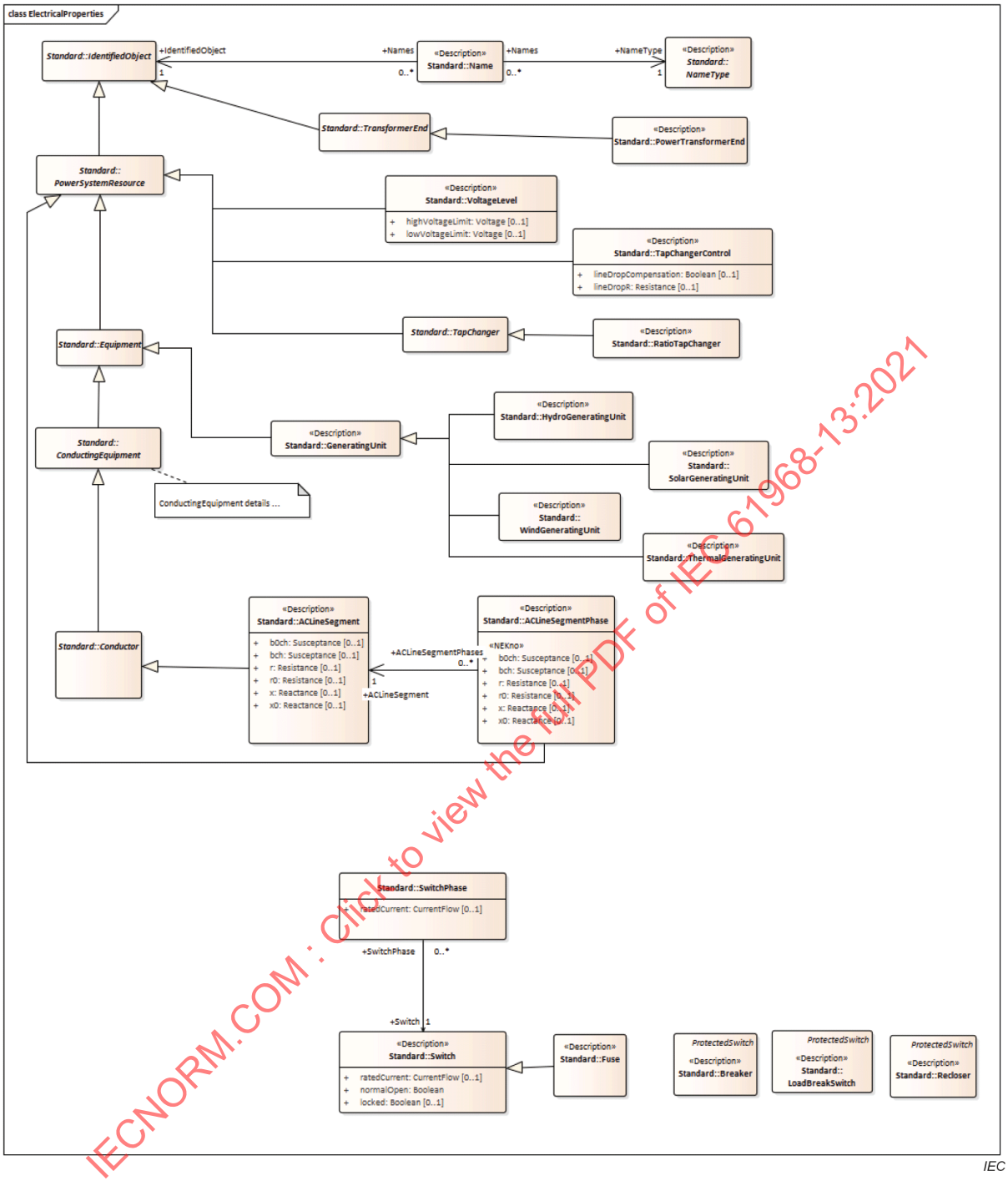

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Figure 30 – Class diagram ElectricalProperties::ElectricalProperties

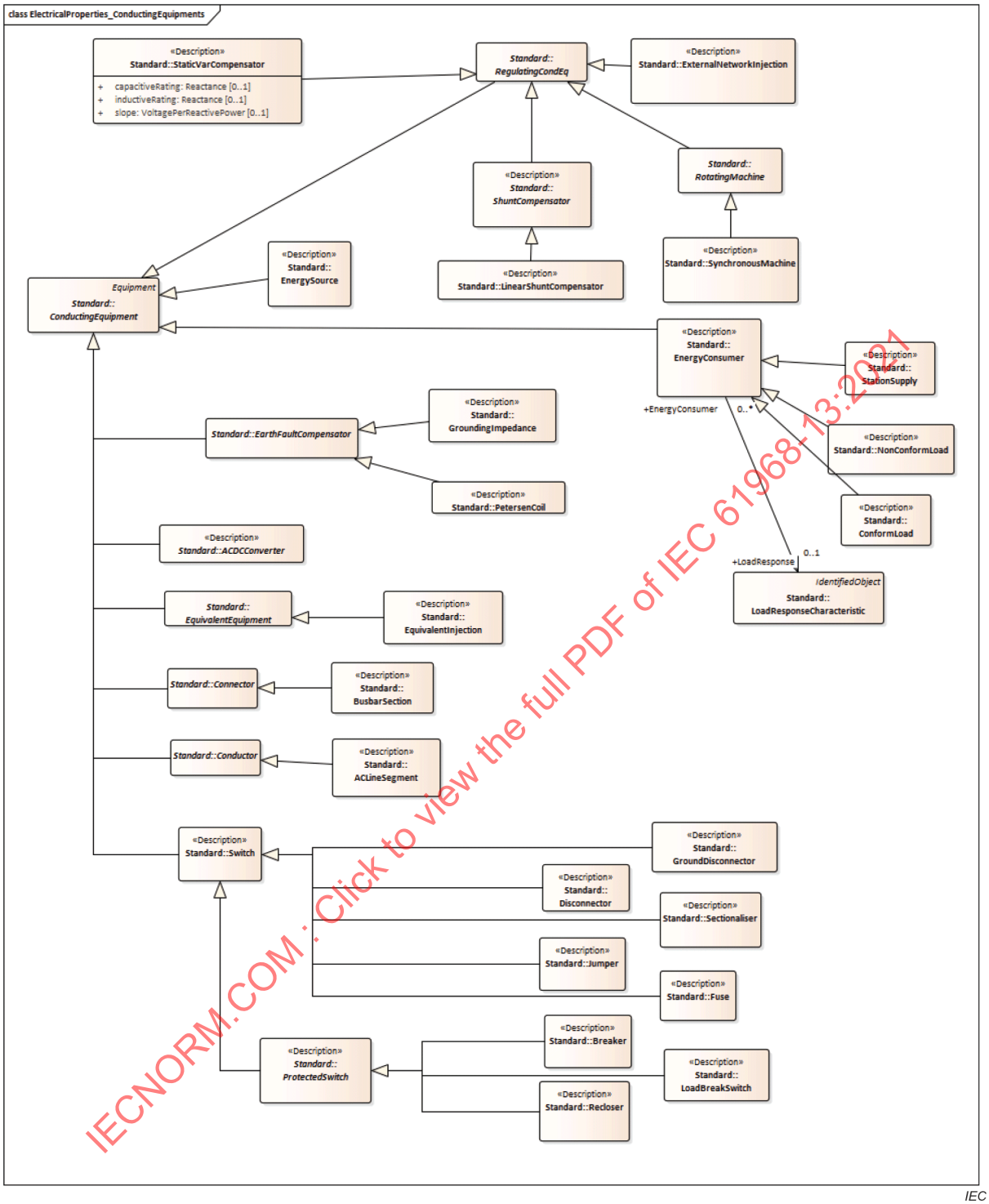

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Figure 31 – Class diagram ElectricalProperties::ElectricalProperties_ConductingEquipments

6.4.2 Package Standard

6.4.2.1 General

See Figure 32.

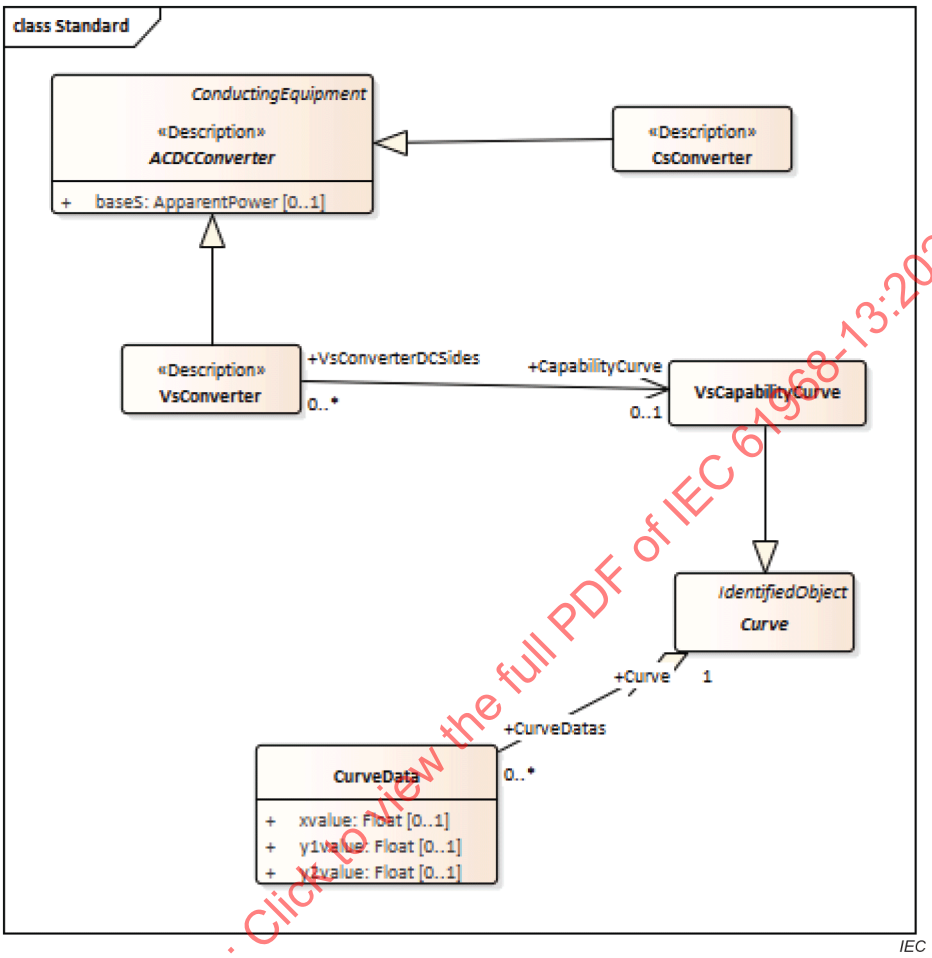

Figure 32 – Class diagram Standard::Standard

6.4.2.2 (abstract) ACDCConverter

A unit with valves for three phases, together with unit control equipment, essential protective and switching devices, DC storage capacitors, phase reactors and auxiliaries, if any, used for conversion.

Table 268 shows all attributes of ACDCConverter.

Table 268 – Attributes of Standard::ACDCConverter

name	mult	type	description
baseS	0..1	ApparentPower	Base apparent power of the converter pole.
name	0..1	String	inherited from: IdentifiedObject

6.4.2.3 (Description) ACLineSegment

A wire or combination of wires, with consistent electrical characteristics, building a single electrical system, used to carry alternating current between points in the power system.

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For symmetrical, transposed 3ph lines, it is sufficient to use ACLineSegment attributes, which describe sequence impedances and admittances for the entire length of the segment.

If per lenght impedance data is available from a library of standard types, impedances and admittances can be calculated in one of the following ways:

– Calculate electrical parameters from asset data, using associated ConductorInfo, with values then multiplied by Conductor.length to produce a matrix model.
– Calculate unbalanced electrical parameters from associated PerLengthPhaseImpedance, then multiplied by Conductor.length to produce a matrix model.
– Calculate transposed electrical parameters from associated PerLengthSequenceImpedance, then multiplied by Conductor.length to produce a sequence model.

Table 269 shows all attributes of ACLineSegment.

Table 269 – Attributes of Standard::ACLineSegment

name	mult	type	description
b0ch	0..1	Susceptance	Zero sequence shunt (charging) susceptance, uniformly distributed, of the entire line section.
bch	0..1	Susceptance	Positive sequence shunt (charging) susceptance, uniformly distributed, of the entire line section. This value represents the full charging over the full length of the line.
r	0..1	Resistance	Positive sequence series resistance of the entire line section.
r0	0..1	Resistance	Zero sequence series resistance of the entire line section.
x	0..1	Reactance	Positive sequence series reactance of the entire line section.
x0	0..1	Reactance	Zero sequence series reactance of the entire line section.
name	0..1	String	inherited from: IdentifiedObject

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6.4.2.4 (Description) ACLineSegmentPhase

Represents a single wire of an alternating current line segment.

Table 270 shows all attributes of ACLineSegmentPhase.

Table 270 – Attributes of Standard::ACLineSegmentPhase

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject

Table 271 shows all association ends of ACLineSegmentPhase with other classes.

Table 271 – Association ends of Standard::ACLineSegmentPhase with other classes

mult from	name	mult to	type	description
0..*	ACLineSegment	1..1	ACLineSegment	The line segment to which the phase belongs.

6.4.2.5 (Description) Breaker

A mechanical switching device capable of making, carrying, and breaking currents under normal circuit conditions and also making, carrying for a specified time, and breaking currents under specified abnormal circuit conditions e.g. those of short circuit.

Table 272 shows all attributes of Breaker.

Table 272 – Attributes of Standard::Breaker

name	mult	type	description
breakingCapacity	1..1	CurrentFlow	inherited from: ProtectedSwitch
ratedCurrent	0..1	CurrentFlow	inherited from: Switch
normalOpen	1..1	Boolean	inherited from: Switch
locked	0..1	Boolean	inherited from: Switch
name	0..1	String	inherited from: IdentifiedObject

6.4.2.6 (Description) BusbarSection

A conductor, or group of conductors, with negligible impedance, that serve to connect other conducting equipment within a single substation.

Voltage measurements are typically obtained from VoltageTransformers that are connected to busbar sections. A bus bar section may have many physical terminals but for analysis is modelled with exactly one logical terminal.

Table 273 shows all attributes of BusbarSection.

Table 273 – Attributes of Standard::BusbarSection

name	mult	type	description
ipMax	0..1	CurrentFlow	Maximum allowable peak short-circuit current of busbar (Ipmax in the IEC 60909-0). Mechanical limit of the busbar in the substation itself. Used for short circuit data exchange according to IEC 60909.
name	0..1	String	inherited from: IdentifiedObject

6.4.2.7 (abstract) ConductingEquipment

The parts of the power system that are designed to carry current or that are conductively connected therewith. ConductingEquipment is contained within an EquipmentContainer that may be a Substation, or a VoltageLevel or a Bay within a Substation.

Table 274 shows all attributes of ConductingEquipment.

Table 274 – Attributes of Standard::ConductingEquipment

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject

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6.4.2.8 (abstract) Conductor

Combination of conducting material with consistent electrical characteristics, building a single electrical system, used to carry current between points in the power system.

Table 275 shows all attributes of Conductor.

Table 275 – Attributes of Standard::Conductor

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject

6.4.2.9 (Description) ConformLoad

ConformLoad represent loads that follow a daily load change pattern where the pattern can be used to scale the load with a system load.

Table 276 shows all attributes of ConformLoad.

Table 276 – Attributes of Standard::ConformLoad

name	mult	type	description
customerCount	0..1	Integer	inherited from: EnergyConsumer
pfixed	0..1	ActivePower	inherited from: EnergyConsumer
pfixedPct	0..1	PerCent	inherited from: EnergyConsumer
qfixed	0..1	ReactivePower	inherited from: EnergyConsumer
qfixedPct	0..1	PerCent	inherited from: EnergyConsumer
name	0..1	String	inherited from: IdentifiedObject

Table 277 shows all association ends of ConformLoad with other classes.

Table 277 – Association ends of Standard::ConformLoad with other classes

mult from	name	mult to	type	description
0..*	LoadResponse	0..1	LoadResponseCharacteristic	inherited from: EnergyConsumer

6.4.2.10 (abstract) Connector

A conductor, or group of conductors, with negligible impedance, that serve to connect other conducting equipment within a single substation and are modelled with a single logical terminal.

Table 278 shows all attributes of Connector.

Table 278 – Attributes of Standard::Connector

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject

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6.4.2.11 (Description) CsConverter

DC side of the current source converter (CSC).

Table 279 shows all attributes of CsConverter.

Table 279 – Attributes of Standard::CsConverter

name	mult	type	description
baseS	0..1	ApparentPower	inherited from: ACDCConverter
name	0..1	String	inherited from: IdentifiedObject

6.4.2.12 (abstract) Curve

A multi-purpose curve or functional relationship between an independent variable (X-axis) and dependent (Y-axis) variables.

Table 280 shows all attributes of Curve.

Table 280 – Attributes of Standard::Curve

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject

6.4.2.13 CurveData root class

Multi-purpose data points for defining a curve. The use of this generic class is discouraged if a more specific class can be used to specify the X- and Y-axis values along with their specific data types.

Table 281 shows all attributes of CurveData.

Table 281 – Attributes of Standard::CurveData

name	mult	type	description
xvalue	0..1	Float	The data value of the X-axis variable, depending on the X-axis units.
y1value	0..1	Float	The data value of the first Y-axis variable, depending on the Y-axis units.
y2value	0..1	Float	The data value of the second Y-axis variable (if present), depending on the Y-axis units.

Table 282 shows all association ends of CurveData with other classes.

Table 282 – Association ends of Standard::CurveData with other classes

mult from	name	mult to	type	description
0..*	Curve	1..1	Curve	The curve of this curve data point.

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6.4.2.14 (Description) Disconnector

A manually operated or motor operated mechanical switching device used for changing the connections in a circuit, or for isolating a circuit or equipment from a source of power. It is required to open or close circuits when negligible current is broken or made.

Table 283 shows all attributes of Disconnector.

Table 283 – Attributes of Standard::Disconnector

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	inherited from: Switch
normalOpen	1..1	Boolean	inherited from: Switch
locked	0..1	Boolean	inherited from: Switch
name	0..1	String	inherited from: IdentifiedObject

6.4.2.15 (abstract) EarthFaultCompensator

A conducting equipment used to represent a connection to ground which is typically used to compensate earth faults. An earth fault compensator device modeled with a single terminal implies a second terminal solidly connected to ground. If two terminals are modeled, the ground is not assumed and normal connection rules apply.

Table 284 shows all attributes of EarthFaultCompensator.

Table 284 – Attributes of Standard::EarthFaultCompensator

name	mult	type	description
r	0..1	Resistance	Nominal resistance of device.
name	0..1	String	inherited from: IdentifiedObject

6.4.2.16 (Description) EnergyConsumer

Generic user of energy – a point of consumption on the power system model.

Table 285 shows all attributes of EnergyConsumer.

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Table 285 – Attributes of Standard::EnergyConsumer

name	mult	type	description
customerCount	0..1	Integer	Number of individual customers represented by this Demand.
pfixed	0..1	ActivePower	Active power of the load that is a fixed quantity. Load sign convention is used, i.e. positive sign means flow out from a node.
pfixedPct	0..1	PerCent	Fixed active power as per cent of load group fixed active power. Load sign convention is used, i.e. positive sign means flow out from a node.
qfixed	0..1	ReactivePower	Reactive power of the load that is a fixed quantity. Load sign convention is used, i.e. positive sign means flow out from a node.
qfixedPct	0..1	PerCent	Fixed reactive power as per cent of load group fixed reactive power. Load sign convention is used, i.e. positive sign means flow out from a node.
name	0..1	String	inherited from: IdentifiedObject

Table 286 shows all association ends of EnergyConsumer with other classes.

Table 286 – Association ends of Standard::EnergyConsumer with other classes

mult from	name	mult to	type	description
0..*	LoadResponse	0..1	LoadResponseCharacteristic	The load response characteristic of this load. If missing, this load is assumed to be constant power.

6.4.2.17 (Description) EnergySource

A generic equivalent for an energy supplier on a transmission or distribution voltage level.

Table 287 shows all attributes of EnergySource.

Table 287 – Attributes of Standard::EnergySource

name	mult	type	description
reactivePower	0..1	ReactivePower	High voltage source reactive injection. Load sign convention is used, i.e. positive sign means flow out from a node. Starting value for steady state solutions.
voltageAngle	0..1	AngleRadians	Phase angle of a-phase open circuit.
voltageMagnitude	0..1	Voltage	Phase-to-phase open circuit voltage magnitude.
x	0..1	Reactance	Positive sequence Thevenin reactance.
activePower	0..1	ActivePower	High voltage source active injection. Load sign convention is used, i.e. positive sign means flow out from a node. Starting value for steady state solutions.
nominalVoltage	0..1	Voltage	Phase-to-phase nominal voltage.
r	0..1	Resistance	Positive sequence Thevenin resistance.
name	0..1	String	inherited from: IdentifiedObject

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6.4.2.18 (abstract) Equipment

The parts of a power system that are physical devices, electronic or mechanical.

Table 288 shows all attributes of Equipment.

Table 288 – Attributes of Standard::Equipment

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject

6.4.2.19 (abstract) EquivalentEquipment

The class represents equivalent objects that are the result of a network reduction. The class is the base for equivalent objects of different types.

Table 289 shows all attributes of EquivalentEquipment.

Table 289 – Attributes of Standard::EquivalentEquipment

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject

6.4.2.20 (Description) EquivalentInjection

This class represents equivalent injections (generation or load). Voltage regulation is allowed only at the point of connection.

Table 290 shows all attributes of EquivalentInjection.

Table 290 – Attributes of Standard::EquivalentInjection

name	mult	type	description
x	1..1	Reactance	Positive sequence reactance. Used to represent Extended-Ward (IEC 60909). Usage: Extended-Ward is a result of network reduction prior to the data exchange.
maxP	0..1	ActivePower	Maximum active power of the injection.
maxQ	0..1	ReactivePower	Used for modeling of infeed for load flow exchange. Not used for short circuit modeling. If maxQ and minQ are not used ReactiveCapabilityCurve can be used.
r	1..1	Resistance	Positive sequence resistance. Used to represent Extended-Ward (IEC 60909). Usage: Extended-Ward is a result of network reduction prior to the data exchange.
name	0..1	String	inherited from: IdentifiedObject

6.4.2.21 (Description) ExternalNetworkInjection

This class represents external network and it is used for IEC 60909 calculations.

Table 291 shows all attributes of ExternalNetworkInjection.

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Table 291 – Attributes of Standard::ExternalNetworkInjection

name	mult	type	description
minQ	1..1	ReactivePower	Not for short circuit modelling. It is used for modelling of infeed for load flow exchange. If maxQ and minQ are not used ReactiveCapabilityCurve can be used.
governorSCD	1..1	ActivePowerPerFrequency	Power Frequency Bias. This is the change in power injection divided by the change in frequency and negated. A positive value of the power frequency bias provides additional power injection upon a drop in frequency.
maxInitialSymShCCurrent	1..1	CurrentFlow	Maximum initial symmetrical short-circuit currents (Ik" max) in A (Ik" = Sk"/(SQRT(3) Un)). Used for short circuit data exchange according to IEC 60909.
maxP	1..1	ActivePower	Maximum active power of the injection.
maxQ	1..1	ReactivePower	Not for short circuit modelling. It is used for modelling of infeed for load flow exchange. If maxQ and minQ are not used ReactiveCapabilityCurve can be used.
minP	1..1	ActivePower	Minimum active power of the injection.
name	0..1	String	inherited from: IdentifiedObject

6.4.2.22 (Description) Fuse

An overcurrent protective device with a circuit opening fusible part that is heated and severed by the passage of overcurrent through it. A fuse is considered a switching device because it breaks current.

Table 292 shows all attributes of Fuse.

Table 292 – Attributes of Standard::Fuse

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	inherited from: Switch
normalOpen	1..1	Boolean	inherited from: Switch
locked	0..1	Boolean	inherited from: Switch
name	0..1	String	inherited from: IdentifiedObject

6.4.2.23 (Description) GeneratingUnit

A single or set of synchronous machines for converting mechanical power into alternating-current power. For example, individual machines within a set may be defined for scheduling purposes while a single control signal is derived for the set. In this case there would be a GeneratingUnit for each member of the set and an additional GeneratingUnit corresponding to the set.

Table 293 shows all attributes of GeneratingUnit.

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Table 293 – Attributes of Standard::GeneratingUnit

name	mult	type	description
totalEfficiency	0..1	PerCent	The efficiency of the unit in converting the fuel into electrical energy.
genControlSource	0..1	GeneratorControlSource	The source of controls for a generating unit.
initialP	0..1	ActivePower	Default Initial active power which is used to store a powerflow result for the initial active power for this unit in this network configuration.
ratedNetMaxP	0..1	ActivePower	The net rated maximum capacity determined by subtracting the auxiliary power used to operate the internal plant machinery from the rated gross maximum capacity.
baseP	0..1	ActivePower	For dispatchable units, this value represents the economic active power basepoint; for units that are not dispatchable, this value represents the fixed generation value. The value must be between the operating low and high limits.
governorSCD	0..1	PerCent	Governor Speed Changer Droop. This is the change in generator power output divided by the change in frequency normalized by the nominal power of the generator and the nominal frequency and expressed in percent and negated. A positive value of speed change droop provides additional generator output upon a drop in frequency.
maxOperatingP	1..1	ActivePower	This is the maximum operating active power limit the dispatcher can enter for this unit.
minOperatingP	1..1	ActivePower	This is the minimum operating active power limit the dispatcher can enter for this unit.
nominalP	0..1	ActivePower	The nominal power of the generating unit. Used to give precise meaning to percentage based attributes such as the governor speed change droop (governorSCD attribute). The attribute shall be a positive value equal or less than RotatingMachine.ratedS.
normalPF	0..1	Float	Generating unit economic participation factor.
ratedGrossMaxP	0..1	ActivePower	The unit's gross rated maximum capacity (book value).
ratedGrossMinP	0..1	ActivePower	The gross rated minimum generation level which the unit can safely operate at while delivering power to the transmission grid.
shortPF	0..1	Float	Generating unit short term economic participation factor.
name	0..1	String	inherited from: IdentifiedObject

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6.4.2.24 (Description) GroundDisconnector

A manually operated or motor operated mechanical switching device used for isolating a circuit or equipment from Ground.

Table 294 shows all attributes of GroundDisconnector.

Table 294 – Attributes of Standard::GroundDisconnector

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	inherited from: Switch
normalOpen	1..1	Boolean	inherited from: Switch
locked	0..1	Boolean	inherited from: Switch
name	0..1	String	inherited from: IdentifiedObject

6.4.2.25 (Description) GroundingImpedance

A fixed impedance device used for grounding.

Table 295 shows all attributes of GroundingImpedance.

Table 295 – Attributes of Standard::GroundingImpedance

name	mult	type	description
x	1..1	Reactance	Reactance of device.
r	0..1	Resistance	inherited from: EarthFaultCompensator
name	0..1	String	inherited from: IdentifiedObject

6.4.2.26 (Description) HydroGeneratingUnit

A generating unit whose prime mover is a hydraulic turbine (e.g., Francis, Pelton, Kaplan).

Table 296 shows all attributes of HydroGeneratingUnit.

Table 296 – Attributes of Standard::HydroGeneratingUnit

name	mult	type	description
totalEfficiency	0..1	PerCent	inherited from: GeneratingUnit
genControlSource	0..1	GeneratorControlSource	inherited from: GeneratingUnit
initialP	0..1	ActivePower	inherited from: GeneratingUnit
ratedNetMaxP	0..1	ActivePower	inherited from: GeneratingUnit
baseP	0..1	ActivePower	inherited from: GeneratingUnit
governorSCD	0..1	PerCent	inherited from: GeneratingUnit
maxOperatingP	1..1	ActivePower	inherited from: GeneratingUnit
minOperatingP	1..1	ActivePower	inherited from: GeneratingUnit
nominalP	0..1	ActivePower	inherited from: GeneratingUnit
normalPF	0..1	Float	inherited from: GeneratingUnit
ratedGrossMaxP	0..1	ActivePower	inherited from: GeneratingUnit
ratedGrossMinP	0..1	ActivePower	inherited from: GeneratingUnit
shortPF	0..1	Float	inherited from: GeneratingUnit
name	0..1	String	inherited from: IdentifiedObject

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6.4.2.27 (abstract) IdentifiedObject root class

This is a root class to provide common identification for all classes needing identification and naming attributes.

Table 297 shows all attributes of IdentifiedObject.

Table 297 – Attributes of Standard::IdentifiedObject

name	mult	type	description
name	0..1	String	The name is any free human readable and possibly non unique text naming the object.

6.4.2.28 (Description) Jumper

A short section of conductor with negligible impedance which can be manually removed and replaced if the circuit is de-energized. Note that zero-impedance branches can be modelled by an ACLineSegment with a zero impedance ConductorType.

Table 298 shows all attributes of Jumper.

Table 298 – Attributes of Standard::Jumper

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	inherited from: Switch
normalOpen	1..1	Boolean	inherited from: Switch
locked	0..1	Boolean	inherited from: Switch
name	0..1	String	inherited from: IdentifiedObject

6.4.2.29 (Description) LinearShuntCompensator

A linear shunt compensator has banks or sections with equal admittance values.

Table 299 shows all attributes of LinearShuntCompensator.

Table 299 – Attributes of Standard::LinearShuntCompensator

name	mult	type	description
bPerSection	0..1	Susceptance	Positive sequence shunt (charging) susceptance per section.
gPerSection	0..1	Conductance	Positive sequence shunt (charging) conductance per section.
normalSections	1..1	Integer	inherited from: ShuntCompensator
aVRDelay	0..1	Seconds	inherited from: ShuntCompensator
nomU	0..1	Voltage	inherited from: ShuntCompensator
name	0..1	String	inherited from: IdentifiedObject

6.4.2.30 (Description) LoadBreakSwitch

A mechanical switching device capable of making, carrying, and breaking currents under normal operating conditions.

Table 300 shows all attributes of LoadBreakSwitch.

Table 300 – Attributes of Standard::LoadBreakSwitch

name	mult	type	description
breakingCapacity	1..1	CurrentFlow	inherited from: ProtectedSwitch
ratedCurrent	0..1	CurrentFlow	inherited from: Switch
normalOpen	1..1	Boolean	inherited from: Switch
locked	0..1	Boolean	inherited from: Switch
name	0..1	String	inherited from: IdentifiedObject

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6.4.2.31 LoadResponseCharacteristic

Models the characteristic response of the load demand due to to changes in system conditions such as voltage and frequency. This is not related to demand response.

If LoadResponseCharacteristic.exponentModel is True, the voltage exponents are specified and used as to calculate:

– Active power component = Pnominal * (Voltage/cim:BaseVoltage.nominalVoltage) ** cim:LoadResponseCharacteristic.pVoltageExponent

– Reactive power component = Qnominal * (Voltage/cim:BaseVoltage.nominalVoltage)** cim:LoadResponseCharacteristic.qVoltageExponent

where * means "multiply" and ** is "raised to power of".

Table 301 shows all attributes of LoadResponseCharacteristic.

Table 301 – Attributes of Standard::LoadResponseCharacteristic

name	mult	type	description
qVoltageExponent	0..1	Float	Exponent of per unit voltage effecting reactive power. This model used only when "useExponentModel" is true.
exponentModel	1..1	Boolean	Indicates the exponential voltage dependency model (pVoltateExponent and qVoltageExponent) is to be used. If false, the coeficient model (consisting of pConstantImpedance, pConstantCurrent, pConstantPower, qConstantImpedance, qConstantCurrent, and qConstantPower) is to be used.
pConstantCurrent	0..1	Float	Portion of active power load modeled as constant current. Used only if the useExponentModel is false. This value is noralized against the sum of pZ, pI, and pP.
pConstantImpedance	0..1	Float	Portion of active power load modeled as constant impedance. Used only if the useExponentModel is false. This value is noralized against the sum of pZ, pI, and pP.
pConstantPower	0..1	Float	Portion of active power load modeled as constant power. Used only if the useExponentModel is false. This value is noralized against the sum of pZ, pI, and pP.
pFrequencyExponent	0..1	Float	Exponent of per unit frequency effecting active power.
pVoltageExponent	0..1	Float	Exponent of per unit voltage effecting real power. This model used only when "useExponentModel" is true.
qConstantCurrent	0..1	Float	Portion of reactive power load modeled as constant current. Used only if the useExponentModel is false. This value is noralized against the sum of qZ, qI, and qP.
qConstantImpedance	0..1	Float	Portion of reactive power load modeled as constant impedance. Used only if the useExponentModel is false. This value is noralized against the sum of qZ, qI, and qP.
qConstantPower	0..1	Float	Portion of reactive power load modeled as constant power. Used only if the useExponentModel is false. This value is noralized against the sum of qZ, qI, and qP.
qFrequencyExponent	0..1	Float	Exponent of per unit frequency effecting reactive power
name	0..1	String	inherited from: IdentifiedObject

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6.4.2.32 (abstract) Name root class

The Name class provides the means to define any number of human readable names for an object. A name is not to be used for defining inter-object relationships. For inter-object relationships instead use the object identification 'mRID'.

Table 302 shows all attributes of Name.

Table 302 – Attributes of Standard::Name

name	mult	type	description
name	1..1	String	Any free text that name the object.

Table 303 shows all association ends of Name with other classes.

Table 303 – Association ends of Standard::Name with other classes

mult from	name	mult to	type	description
0..*	IdentifiedObject	1..1	IdentifiedObject	Identified object that this name designates.
0..*	NameType	1..1	NameType	Type of this name.

6.4.2.33 (abstract) NameType root class

Type of name. Possible values for attribute 'name' are implementation dependent but standard profiles may specify types. An enterprise may have multiple IT systems each having its own local name for the same object, e.g. a planning system may have different names from an EMS. An object may also have different names within the same IT system, e.g. localName and aliasName as defined in CIM version 14. Their definitions from CIM14 are

The localName is a human readable name of the object. It is only used with objects organized in a naming hierarchy. localName: A free text name local to a node in a naming hierarchy similar to a file directory structure. A power system related naming hierarchy may be: Substation, VoltageLevel, Equipment, etc. Children of the same parent in such a hierarchy have names that typically are unique among them.

aliasName: A free text alternate name typically used in tabular reports where the column width is limited.

6.4.2.34 (Description) NonConformLoad

NonConformLoad represent loads that do not follow a daily load change pattern and changes are not correlated with the daily load change pattern.

Table 304 shows all attributes of NonConformLoad.

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Table 304 – Attributes of Standard::NonConformLoad

name	mult	type	description
customerCount	0..1	Integer	inherited from: EnergyConsumer
pfixed	0..1	ActivePower	inherited from: EnergyConsumer
pfixedPct	0..1	PerCent	inherited from: EnergyConsumer
qfixed	0..1	ReactivePower	inherited from: EnergyConsumer
qfixedPct	0..1	PerCent	inherited from: EnergyConsumer
name	0..1	String	inherited from: IdentifiedObject

Table 305 shows all association ends of NonConformLoad with other classes.

Table 305 – Association ends of Standard::NonConformLoad with other classes

mult from	name	mult to	type	description
0..*	LoadResponse	0..1	LoadResponseCharacteristic	inherited from: EnergyConsumer

6.4.2.35 (abstract) PowerSystemResource

A power system resource can be an item of equipment such as a Switch, an EquipmentContainer containing many individual items of equipment such as a Substation, or an organisational entity such as Company or SubControlArea. This provides for the nesting of collections of PowerSystemResources within other PowerSystemResources. For example, a Switch could be a member of a Substation and a Substation could be a member of a division of a Company.

Table 306 shows all attributes of PowerSystemResource.

Table 306 – Attributes of Standard::PowerSystemResource

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject

6.4.2.36 (Description) PetersenCoil

A tunable impedance device normally used to offset line charging during single line faults in an ungrounded section of network.

Table 307 shows all attributes of PetersenCoil.

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Table 307 – Attributes of Standard::PetersenCoil

name	mult	type	description
nominalU	0..1	Voltage	The nominal voltage for which the coil is designed.
offsetCurrent	0..1	CurrentFlow	The offset current that the Petersen coil controller is operating from the resonant point. This is normally a fixed amount for which the controller is configured and could be positive or negative. Typically 0 to 60 Amperes depending on voltage and resonance conditions.
xGroundMax	0..1	Reactance	The maximum reactance.
xGroundMin	0..1	Reactance	The minimum reactance.
xGroundNominal	0..1	Reactance	The nominal reactance. This is the operating point (normally over compensation) that is defined based on the resonance point in the healthy network condition. The impedance is calculated based on nominal voltage divided by position current.
r	0..1	Resistance	inherited from: EarthFaultCompensator
name	0..1	String	inherited from: IdentifiedObject

6.4.2.37 (Description) PowerTransformerEnd

A PowerTransformerEnd is associated with each Terminal of a PowerTransformer.

The impdedance values r, r0, x, and x0 of a PowerTransformerEnd represents a star equivalent as follows:

1) For a two Terminal PowerTransformer, the high voltage PowerTransformerEnd has non zero values on r, r0, x, and x0 while the low voltage PowerTransformerEnd has zero values for r, r0, x, and x0.
2) For a three Terminal PowerTransformer, the three PowerTransformerEnds represents a star equivalent with each leg in the star represented by r, r0, x, and x0 values.
3) For a PowerTransformer with more than three Terminals, the PowerTransformerEnd impedance values cannot be used. Instead use the TransformerMeshImpedance or split the transformer into multiple PowerTransformers.

Table 308 shows all attributes of PowerTransformerEnd.

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Table 308 – Attributes of Standard::PowerTransformerEnd

name	mult	type	description
b	0..1	Susceptance	Magnetizing branch susceptance (B mag). The value can be positive or negative.
connectionKind	0..1	WindingConnection	Kind of connection.
g	0..1	Conductance	Magnetizing branch conductance.
r	0..1	Resistance	Resistance (star-model) of the transformer end. The attribute shall be equal or greater than zero for non-equivalent transformers.
ratedS	0..1	ApparentPower	Normal apparent power rating. The attribute shall be a positive value. For a two-winding transformer the values for the high and low voltage sides shall be identical.
ratedU	0..1	Voltage	Rated voltage: phase-phase for three-phase windings, and either phase-phase or phase-neutral for single-phase windings. A high voltage side, as given by TransformerEnd.endNumber, shall have a ratedU that is greater or equal than ratedU for the lower voltage sides.
x	0..1	Reactance	Positive sequence series reactance (star-model) of the transformer end.
phaseAngleClock	0..1	Integer	Terminal voltage phase angle displacement where 360 degrees are represented with clock hours. The valid values are 0 to 11. For example, for the secondary side end of a transformer with vector group code of 'Dyn11', specify the connection kind as wye with neutral and specify the phase angle of the clock as 11. The clock value of the transformer end number specified as 1, is assumed to be zero. Note the transformer end number is not assumed to be the same as the terminal sequence number.
grounded	1..1	Boolean	inherited from: TransformerEnd
rground	0..1	Resistance	inherited from: TransformerEnd
xground	0..1	Reactance	inherited from: TransformerEnd
name	0..1	String	inherited from: IdentifiedObject

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6.4.2.38 (abstract) ProtectedSwitch

A ProtectedSwitch is a switching device that can be operated by ProtectionEquipment.

Table 309 shows all attributes of ProtectedSwitch.

Table 309 – Attributes of Standard::ProtectedSwitch

name	mult	type	description
breakingCapacity	1..1	CurrentFlow	The maximum fault current a breaking device can break safely under prescribed conditions of use.
ratedCurrent	0..1	CurrentFlow	inherited from: Switch
normalOpen	1..1	Boolean	inherited from: Switch
locked	0..1	Boolean	inherited from: Switch
name	0..1	String	inherited from: IdentifiedObject

6.4.2.39 (Description) RatioTapChanger

A tap changer that changes the voltage ratio impacting the voltage magnitude but not the phase angle across the transformer.

Table 310 shows all attributes of RatioTapChanger.

Table 310 – Attributes of Standard::RatioTapChanger

name	mult	type	description
stepVoltageIncrement	1..1	PerCent	Tap step increment, in per cent of nominal voltage, per step position. For a symmetrical PhaseTapChanger, the stepVoltageIncrement is used in the formula for calculation of the phase angle. For a symmetrical PhaseTapChanger, the voltage magnitude does not change with tap step.
tculControlMode	1..1	TransformerControlMode	Specifies the regulation control mode (voltage or reactive) of the RatioTapChanger.
highStep	1..1	Integer	inherited from: TapChanger
lowStep	1..1	Integer	inherited from: TapChanger
neutralStep	1..1	Integer	inherited from: TapChanger
neutralU	1..1	Voltage	inherited from: TapChanger
normalStep	1..1	Integer	inherited from: TapChanger
controlEnabled	0..1	Boolean	inherited from: TapChanger
step	0..1	Float	inherited from: TapChanger
initialDelay	0..1	Seconds	inherited from: TapChanger
ltcFlag	0..1	Boolean	inherited from: TapChanger
subsequentDelay	0..1	Seconds	inherited from: TapChanger
name	0..1	String	inherited from: IdentifiedObject

6.4.2.40 (Description) Recloser

Pole-mounted fault interrupter with built-in phase and ground relays, current transformer (CT), and supplemental controls.

Table 311 shows all attributes of Recloser.

Table 311 – Attributes of Standard::Recloser

name	mult	type	description
breakingCapacity	1..1	CurrentFlow	inherited from: ProtectedSwitch
ratedCurrent	0..1	CurrentFlow	inherited from: Switch
normalOpen	1..1	Boolean	inherited from: Switch
locked	0..1	Boolean	inherited from: Switch
name	0..1	String	inherited from: IdentifiedObject

6.4.2.41 (abstract) RegulatingCondEq

A type of conducting equipment that can regulate a quanity (i.e. voltage or flow) at a specific point in the network.

Table 312 shows all attributes of RegulatingCondEq.

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Table 312 – Attributes of Standard::RegulatingCondEq

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject

6.4.2.42 (abstract) RotatingMachine

A rotating machine which may be used as a generator or motor.

Table 313 shows all attributes of RotatingMachine.

Table 313 – Attributes of Standard::RotatingMachine

name	mult	type	description
ratedU	0..1	Voltage	Rated voltage (nameplate data, Ur in IEC 60909-0). It is primarily used for short circuit data exchange according to IEC 60909.
ratedPowerFactor	0..1	Float	Power factor (nameplate data). It is primarily used for short circuit data exchange according to IEC 60909.
ratedS	0..1	ApparentPower	Nameplate apparent power rating for the unit. The attribute shall have a positive value.
name	0..1	String	inherited from: IdentifiedObject

6.4.2.43 (Description) Sectionaliser

Automatic switch that will lock open to isolate a faulted section. It may, or may not, have load breaking capability. Its primary purpose is to provide fault sectionalising at locations where the fault current is either too high, or too low, for proper coordination of fuses.

Table 314 shows all attributes of Sectionaliser.

Table 314 – Attributes of Standard::Sectionaliser

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	inherited from: Switch
normalOpen	1..1	Boolean	inherited from: Switch
locked	0..1	Boolean	inherited from: Switch
name	0..1	String	inherited from: IdentifiedObject

6.4.2.44 (abstract) ShuntCompensator

A shunt capacitor or reactor or switchable bank of shunt capacitors or reactors. A section of a shunt compensator is an individual capacitor or reactor. A negative value for reactivePerSection indicates that the compensator is a reactor. ShuntCompensator is a single terminal device. Ground is implied.

Table 315 shows all attributes of ShuntCompensator.

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Table 315 – Attributes of Standard::ShuntCompensator

name	mult	type	description
normalSections	1..1	Integer	For a capacitor bank, the normal number of sections switched in.
aVRDelay	0..1	Seconds	An automatic voltage regulation delay (AVRDelay) which is the time delay from a change in voltage to when the capacitor is allowed to change state. This filters out temporary changes in voltage.
nomU	0..1	Voltage	The voltage at which the nominal reactive power may be calculated. This should normally be within 10 % of the voltage at which the capacitor is connected to the network.
name	0..1	String	inherited from: IdentifiedObject

6.4.2.45 (Description) SolarGeneratingUnit

A solar thermal generating unit.

Table 316 shows all attributes of SolarGeneratingUnit.

Table 316 – Attributes of Standard::SolarGeneratingUnit

name	mult	type	description
totalEfficiency	0..1	PerCent	inherited from: GeneratingUnit
genControlSource	0..1	GeneratorControlSource	inherited from: GeneratingUnit
initialP	0..1	ActivePower	inherited from: GeneratingUnit
ratedNetMaxP	0..1	ActivePower	inherited from: GeneratingUnit
baseP	0..1	ActivePower	inherited from: GeneratingUnit
governorSCD	0..1	PerCent	inherited from: GeneratingUnit
maxOperatingP	1..1	ActivePower	inherited from: GeneratingUnit
minOperatingP	1..1	ActivePower	inherited from: GeneratingUnit
nominalP	0..1	ActivePower	inherited from: GeneratingUnit
normalPF	0..1	Float	inherited from: GeneratingUnit
ratedGrossMaxP	0..1	ActivePower	inherited from: GeneratingUnit
ratedGrossMinP	0..1	ActivePower	inherited from: GeneratingUnit
shortPF	0..1	Float	inherited from: GeneratingUnit
name	0..1	String	inherited from: IdentifiedObject

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6.4.2.46 (Description) StaticVarCompensator

A facility for providing variable and controllable shunt reactive power. The SVC typically consists of a stepdown transformer, filter, thyristor-controlled reactor, and thyristor-switched capacitor arms.

The SVC may operate in fixed MVar output mode or in voltage control mode. When in voltage control mode, the output of the SVC will be proportional to the deviation of voltage at the controlled bus from the voltage setpoint. The SVC characteristic slope defines the proportion. If the voltage at the controlled bus is equal to the voltage setpoint, the SVC MVar output is zero.

Table 317 shows all attributes of StaticVarCompensator.

Table 317 – Attributes of Standard::StaticVarCompensator

name	mult	type	description
capacitiveRating	0..1	Reactance	Maximum available capacitive reactance.
inductiveRating	0..1	Reactance	Maximum available inductive reactance.
slope	0..1	VoltagePerReactivePower	The characteristics slope of an SVC defines how the reactive power output changes in proportion to the difference between the regulated bus voltage and the voltage setpoint.
name	0..1	String	inherited from: IdentifiedObject

6.4.2.47 (Description) StationSupply

Station supply with load derived from the station output.

Table 318 shows all attributes of StationSupply.

Table 318 – Attributes of Standard::StationSupply

name	mult	type	description
customerCount	0..1	Integer	inherited from: EnergyConsumer
pfixed	0..1	ActivePower	inherited from: EnergyConsumer
pfixedPct	0..1	PerCent	inherited from: EnergyConsumer
qfixed	0..1	ReactivePower	inherited from: EnergyConsumer
qfixedPct	0..1	PerCent	inherited from: EnergyConsumer
name	0..1	String	inherited from: IdentifiedObject

Table 319 shows all association ends of StationSupply with other classes.

Table 319 – Association ends of Standard::StationSupply with other classes

mult from	name	mult to	type	description
0..*	LoadResponse	0..1	LoadResponseCharacteristic	inherited from: EnergyConsumer

6.4.2.48 (abstract) Switch

A generic device designed to close, or open, or both, one or more electric circuits.

Table 320 shows all attributes of Switch.

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Table 320 – Attributes of Standard::Switch

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	The maximum continuous current carrying capacity in amps governed by the device material and construction.
normalOpen	1..1	Boolean	The attribute is used in cases when no Measurement for the status value is present. If the Switch has a status measurment the Discrete.normalValue is expected to match with the Switch.normalOpen.
locked	0..1	Boolean	If true, the switch is locked. The resulting switch state is a combination of locked and Switch.open attributes as follows: - locked=true and Switch.open=true. The resulting state is open and locked; - locked=false and Switch.open=true. The resulting state is open; - locked=false and Switch.open=false. The resulting state is closed.
name	0..1	String	inherited from: IdentifiedObject

6.4.2.49 (Description) SwitchPhase

Single phase of a multi-phase switch when its attributes might be different per phase.

Table 321 shows all attributes of SwitchPhase.

Table 321 – Attributes of Standard::SwitchPhase

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	The maximum continuous current carrying capacity in amps governed by the device material and construction.
name	0..1	String	inherited from: IdentifiedObject

Table 322 shows all association ends of SwitchPhase with other classes.

Table 322 – Association ends of Standard::SwitchPhase with other classes

mult from	name	mult to	type	description
0..*	Switch	1..1	Switch	The switch of the switch phase.

6.4.2.50 (Description) SynchronousMachine

An electromechanical device that operates with shaft rotating synchronously with the network. It is a single machine operating either as a generator or synchronous condenser or pump.

Table 323 shows all attributes of SynchronousMachine.

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Table 323 – Attributes of Standard::SynchronousMachine

name	mult	type	description
r	1..1	Resistance	Equivalent resistance (RG) of generator. RG is considered for the calculation of all currents, except for the calculation of the peak current ip. Used for short circuit data exchange according to IEC 60909
maxQ	0..1	ReactivePower	Maximum reactive power limit. This is the maximum (nameplate) limit for the unit.
minQ	0..1	ReactivePower	Minimum reactive power limit for the unit.
operatingMode	1..1	SynchronousMachineOperatingMode	Current mode of operation.
type	1..1	SynchronousMachineKind	Modes that this synchronous machine can operate in.
baseQ	1..1	ReactivePower	Default base reactive power value. This value represents the initial reactive power that can be used by any application function.
ratedU	0..1	Voltage	inherited from: RotatingMachine
ratedPowerFactor	0..1	Float	inherited from: RotatingMachine
ratedS	0..1	ApparentPower	inherited from: RotatingMachine
name	0..1	String	inherited from: IdentifiedObject

6.4.2.51 (abstract) TapChanger

Mechanism for changing transformer winding tap positions.

Table 324 shows all attributes of TapChanger.

Table 324 – Attributes of Standard::TapChanger

name	mult	type	description
highStep	1..1	Integer	Highest possible tap step position, advance from neutral.
lowStep	1..1	Integer	Lowest possible tap step position, retard from neutra.l
neutralStep	1..1	Integer	The neutral tap step position for this winding.
neutralU	1..1	Voltage	Voltage at which the winding operates at the neutral tap setting.
normalStep	1..1	Integer	The tap step position used in "normal" network operation for this winding. For a "Fixed" tap changer indicates the current physical tap setting.
controlEnabled	0..1	Boolean	Specifies the regulation status of the equipment. True is regulating, false is not regulating.
step	0..1	Float	Tap changer position. Starting step for a steady state solution. Non integer values are allowed to support continuous tap variables. The reasons for continuous value are to support study cases where no discrete tap changers has yet been designed, a solutions where a narrow voltage band force the tap step to oscillate or accommodate for a continuous solution as input. The attribute shall be equal or greater than lowStep and equal or less than highStep.
initialDelay	0..1	Seconds	For an LTC, the delay for initial tap changer operation (first step change).

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name	mult	type	description
ltcFlag	0..1	Boolean	Specifies whether or not a TapChanger has load tap changing capabilities.
subsequentDelay	0..1	Seconds	For an LTC, the delay for subsequent tap changer operation (second and later step changes).
name	0..1	String	inherited from: IdentifiedObject

6.4.2.52 (Description) TapChangerControl

Describes behavior specific to tap changers, e.g. how the voltage at the end of a line varies with the load level and compensation of the voltage drop by tap adjustment.

Table 325 shows all attributes of TapChangerControl.

Table 325 – Attributes of Standard::TapChangerControl

name	mult	type	description
lineDropCompensation	0..1	Boolean	If true, the line drop compensation is to be applied.
lineDropR	0..1	Resistance	Line drop compensator resistance setting for normal (forward) power flow.
name	0..1	String	inherited from: IdentifiedObject

6.4.2.53 (Description) ThermalGeneratingUnit

A generating unit whose prime mover could be a steam turbine, combustion turbine, or diesel engine.

Table 326 shows all attributes of ThermalGeneratingUnit.

Table 326 – Attributes of Standard::ThermalGeneratingUnit

name	mult	type	description
totalEfficiency	0..1	PerCent	inherited from: GeneratingUnit
genControlSource	0..1	GeneratorControlSource	inherited from: GeneratingUnit
initialP	0..1	ActivePower	inherited from: GeneratingUnit
ratedNetMaxP	0..1	ActivePower	inherited from: GeneratingUnit
baseP	0..1	ActivePower	inherited from: GeneratingUnit
governorSCD	0..1	PerCent	inherited from: GeneratingUnit
maxOperatingP	1..1	ActivePower	inherited from: GeneratingUnit
minOperatingP	1..1	ActivePower	inherited from: GeneratingUnit
nominalP	0..1	ActivePower	inherited from: GeneratingUnit
normalPF	0..1	Float	inherited from: GeneratingUnit
ratedGrossMaxP	0..1	ActivePower	inherited from: GeneratingUnit
ratedGrossMinP	0..1	ActivePower	inherited from: GeneratingUnit
shortPF	0..1	Float	inherited from: GeneratingUnit
name	0..1	String	inherited from: IdentifiedObject

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6.4.2.54 (abstract) TransformerEnd

TransformerEnd is a conducting connection point of a power transformer. It corresponds to a physical transformer winding terminal. In earlier CIM versions, the TransformerWinding class served a similar purpose. This successor TransformerEnd class is more flexible and has important differences with TransformerWinding.

Table 327 shows all attributes of TransformerEnd.

Table 327 – Attributes of Standard::TransformerEnd

name	mult	type	description
grounded	1..1	Boolean	(for Yn and Zn connections) True if the neutral is solidly grounded.
rground	0..1	Resistance	(for Yn and Zn connections) Resistance part of neutral impedance where 'grounded' is true.
xground	0..1	Reactance	(for Yn and Zn connections) Reactive part of neutral impedance where 'grounded' is true.
name	0..1	String	inherited from: IdentifiedObject

6.4.2.55 (Description) VoltageLevel

A collection of equipment at one common system voltage forming a switchgear. The equipment typically consist of breakers, busbars, instrumentation, control, regulation and protection devices as well as assemblies of all these.

Table 328 shows all attributes of VoltageLevel.

Table 328 – Attributes of Standard::VoltageLevel

name	mult	type	description
highVoltageLimit	0..1	Voltage	The bus bar's high voltage limit.
lowVoltageLimit	0..1	Voltage	The bus bar's low voltage limit.
name	0..1	String	inherited from: IdentifiedObject

6.4.2.56 (Description) VsConverter

DC side of the voltage source converter (VSC).

Table 329 shows all attributes of VsConverter.

Table 329 – Attributes of Standard::VsConverter

name	mult	type	description
baseS	0..1	ApparentPower	inherited from: ACDCConverter
name	0..1	String	inherited from: IdentifiedObject

Table 330 shows all association ends of VsConverter with other classes.

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Table 330 – Association ends of Standard::VsConverter with other classes

mult from	name	mult to	type	description
0..*	CapabilityCurve	0..1	VsCapabilityCurve	Capability curve of this converter.

6.4.2.57 VsCapabilityCurve

The P-Q capability curve for a voltage source converter, with P on x-axis and Qmin and Qmax on y1-axis and y2-axis.

Table 331 shows all attributes of VsCapabilityCurve.

Table 331 – Attributes of Standard::VsCapabilityCurve

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject

6.4.2.58 (Description) WindGeneratingUnit

A wind driven generating unit. May be used to represent a single turbine or an aggregation.

Table 332 shows all attributes of WindGeneratingUnit.

Table 332 – Attributes of Standard::WindGeneratingUnit

name	mult	type	description
totalEfficiency	0..1	PerCent	inherited from: GeneratingUnit
genControlSource	0..1	GeneratorControlSource	inherited from: GeneratingUnit
initialP	0..1	ActivePower	inherited from: GeneratingUnit
ratedNetMaxP	0..1	ActivePower	inherited from: GeneratingUnit
baseP	0..1	ActivePower	inherited from: GeneratingUnit
governorSCD	0..1	PerCent	inherited from: GeneratingUnit
maxOperatingP	1..1	ActivePower	inherited from: GeneratingUnit
minOperatingP	1..1	ActivePower	inherited from: GeneratingUnit
nominalP	0..1	ActivePower	inherited from: GeneratingUnit
normalPF	0..1	Float	inherited from: GeneratingUnit
ratedGrossMaxP	0..1	ActivePower	inherited from: GeneratingUnit
ratedGrossMinP	0..1	ActivePower	inherited from: GeneratingUnit
shortPF	0..1	Float	inherited from: GeneratingUnit
name	0..1	String	inherited from: IdentifiedObject

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6.5 Package Topology

6.5.1 General

See Figure 33 and Figure 34.

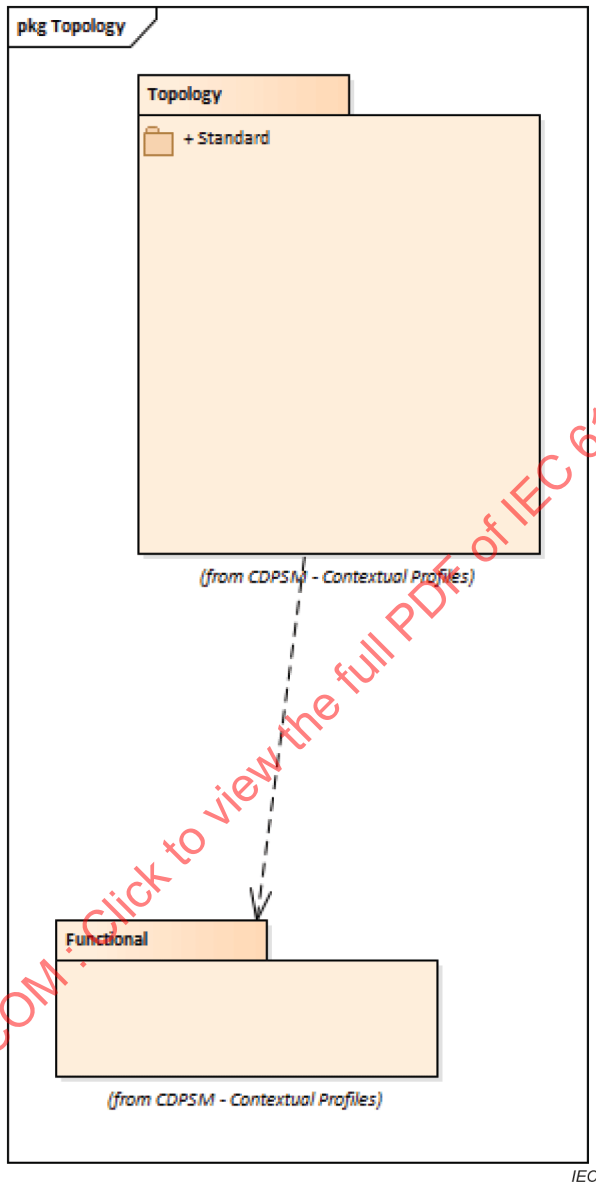

Figure 33 – Package diagram Topology::Topology

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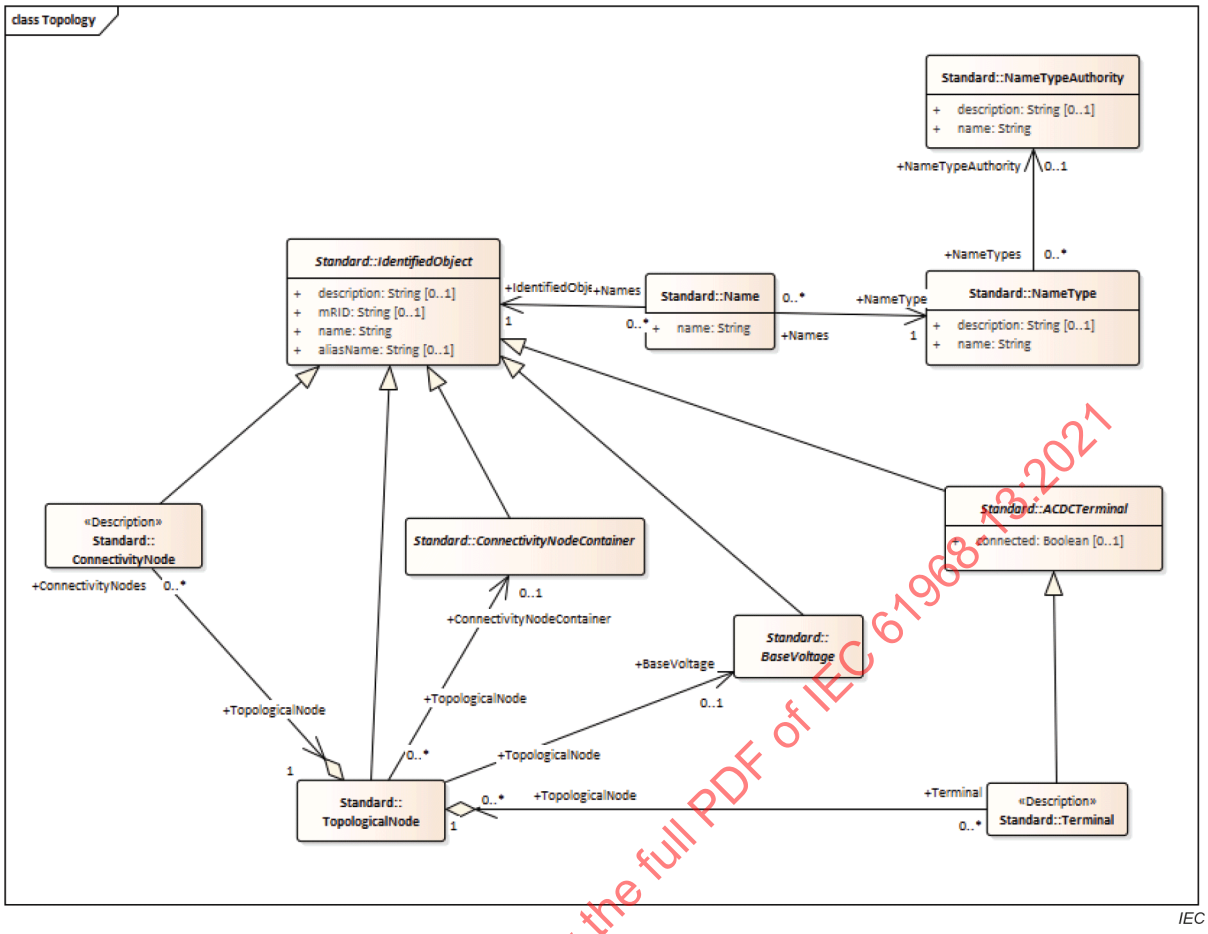

Figure 34 – Class diagram Topology::Topology

6.5.2 Package Standard

6.5.2.1 (abstract) ACDCTerminal

An electrical connection point (AC or DC) to a piece of conducting equipment. Terminals are connected at physical connection points called connectivity nodes.

Table 333 shows all attributes of ACDCTerminal.

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Table 333 – Attributes of Standard::ACDCTerminal

name	mult	type	description
connected	0..1	Boolean	The connected status is related to a bus-branch model and the topological node to terminal relation. True implies the terminal is connected to the related topological node and false implies it is not. In a bus-branch model, the connected status is used to tell if equipment is disconnected without having to change the connectivity described by the topological node to terminal relation. A valid case is that conducting equipment can be connected in one end and open in the other. In particular for an AC line segment, where the reactive line charging can be significant, this is a relevant case.
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.5.2.2 (abstract) BaseVoltage

Defines a system base voltage which is referenced.

Table 334 shows all attributes of BaseVoltage.

Table 334 – Attributes of Standard::BaseVoltage

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.5.2.3 (Description) ConnectivityNode

Connectivity nodes are points where terminals of conducting equipment are connected together with zero impedance.

Table 335 shows all attributes of ConnectivityNode.

Table 335 – Attributes of Standard::ConnectivityNode

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 336 shows all association ends of ConnectivityNode with other classes.

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Table 336 – Association ends of Standard::ConnectivityNode with other classes

mult from	name	mult to	type	description
0..*	TopologicalNode	1..1	TopologicalNode	The topological node to which this connectivity node is assigned. May depend on the current state of switches in the network.

6.5.2.4 (abstract) ConnectivityNodeContainer

A base class for all objects that may contain ConnectivityNodes or TopologicalNodes.

Table 337 shows all attributes of ConnectivityNodeContainer.

Table 337 – Attributes of Standard::ConnectivityNodeContainer

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.5.2.5 (abstract) IdentifiedObject root class

This is a root class to provide common identification for all classes needing identification and naming attributes.

Table 338 shows all attributes of IdentifiedObject.

Table 338 – Attributes of Standard::IdentifiedObject

name	mult	type	description
name	1..1	String	The name is any free human readable and possibly non unique text naming the object.
aliasName	0..1	String	The aliasName is free text human readable name of the object alternative to IdentifiedObject.name. It may be non unique and may not correlate to a naming hierarchy. The attribute aliasName is retained because of backwards compatibility between CIM relases. It is however recommended to replace aliasName with the Name class as aliasName is planned for retirement at a future time.
description	0..1	String	The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.
mRID	0..1	String	Master resource identifier issued by a model authority. The mRID is globally unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended. For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.

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6.5.2.6 Name root class

The Name class provides the means to define any number of human readable names for an object. A name is not to be used for defining inter-object relationships. For inter-object relationships instead use the object identification 'mRID'.

Table 339 shows all attributes of Name.

Table 339 – Attributes of Standard::Name

name	mult	type	description
name	1..1	String	Any free text that name the object.

Table 340 shows all association ends of Name with other classes.

Table 340 – Association ends of Standard::Name with other classes

mult from	name	mult to	type	description
0..*	IdentifiedObject	1..1	IdentifiedObject	dentified object that this name designates.
0..*	NameType	1..1	NameType	Type of this name.

6.5.2.7 NameType root class

Type of name. Possible values for attribute 'name' are implementation dependent but standard profiles may specify types. An enterprise may have multiple IT systems each having its own local name for the same object, e.g. a planning system may have different names from an EMS. An object may also have different names within the same IT system, e.g. localName and aliasName as defined in CIM version 14. Their definitions from CIM14 are

The localName is a human readable name of the object. It is only used with objects organized in a naming hierarchy. localName: A free text name local to a node in a naming hierarchy similar to a file directory structure. A power system related naming hierarchy may be: Substation, VoltageLevel, Equipment, etc. Children of the same parent in such a hierarchy have names that typically are unique among them.

aliasName: A free text alternate name typically used in tabular reports where the column width is limited.

Table 341 shows all attributes of NameType.

Table 341 – Attributes of Standard::NameType

name	mult	type	description
name	1..1	String	Name of the name type.
description	0..1	String	Description of the name type.

Table 342 shows all association ends of NameType with other classes.

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Table 342 – Association ends of Standard::NameType with other classes

mult from	name	mult to	type	description
0..*	NameTypeAuthority	0..1	NameTypeAuthority	Authority responsible for managing names of this type.

6.5.2.8 NameTypeAuthority root class

Authority responsible for creation and management of names of a given type; typically an organization or an enterprise system.

Table 343 shows all attributes of NameTypeAuthority.

Table 343 – Attributes of Standard::NameTypeAuthority

name	mult	type	description
name	1..1	String	Name of the name type authority.
description	0..1	String	Description of the name type authority.

6.5.2.9 (Description) Terminal

An electrical connection point to a piece of conducting equipment. Terminals are connected at physical connection points called "connectivity nodes".

Table 344 shows all attributes of Terminal.

Table 344 – Attributes of Standard::Terminal

name	mult	type	description
connected	0..1	Boolean	inherited from: ACDCTerminal
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 345 shows all association ends of Terminal with other classes.

Table 345 – Association ends of Standard::Terminal with other classes

mult from	name	mult to	type	description
0..*	TopologicalNode	1..1	TopologicalNode	The topological node associated with the terminal. This can be used as an alternative to the connectivity node path to topological node, thus making it unneccesary to model connectivity nodes in some cases. Note that the if connectivity nodes are in the model, this association would probably not be used as an input specification.

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6.5.2.10 TopologicalNode

For a detailed substation model a TopologicalNode is a set of connectivity nodes that, in the current network state, are connected together through any type of closed switches, including jumpers. Topological nodes changes as the current network state changes (i.e. switches, breakers, etc. change state).

For a planning model switch, statuses are not used to form TopologicalNodes. Instead they are manually created or deleted in a model builder tool. TopologialNodes maintained this way are also called "busses".

Table 346 shows all attributes of TopologicalNode.

Table 346 – Attributes of Standard::TopologicalNode

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 347 shows all association ends of TopologicalNode with other classes.

Table 347 – Association ends of Standard::TopologicalNode with other classes

mult from	name	mult to	type	description
0..*	BaseVoltage	0..1	BaseVoltage	The base voltage of the topologocial node.
0..*	ConnectivityNodeContainer	0..1	ConnectivityNodeContainer	The connectivity node container to which the toplogical node belongs.

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6.6 Package SteadyStateHypothesis

6.6.1 General

See Figure 35 and Figure 36.

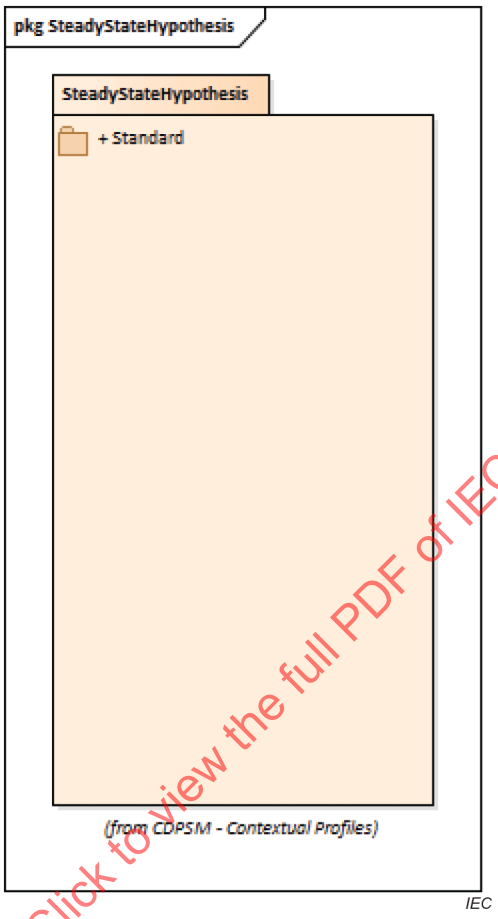

Figure 35 – Package diagram SteadyStateHypothesis::SteadyStateHypothesis

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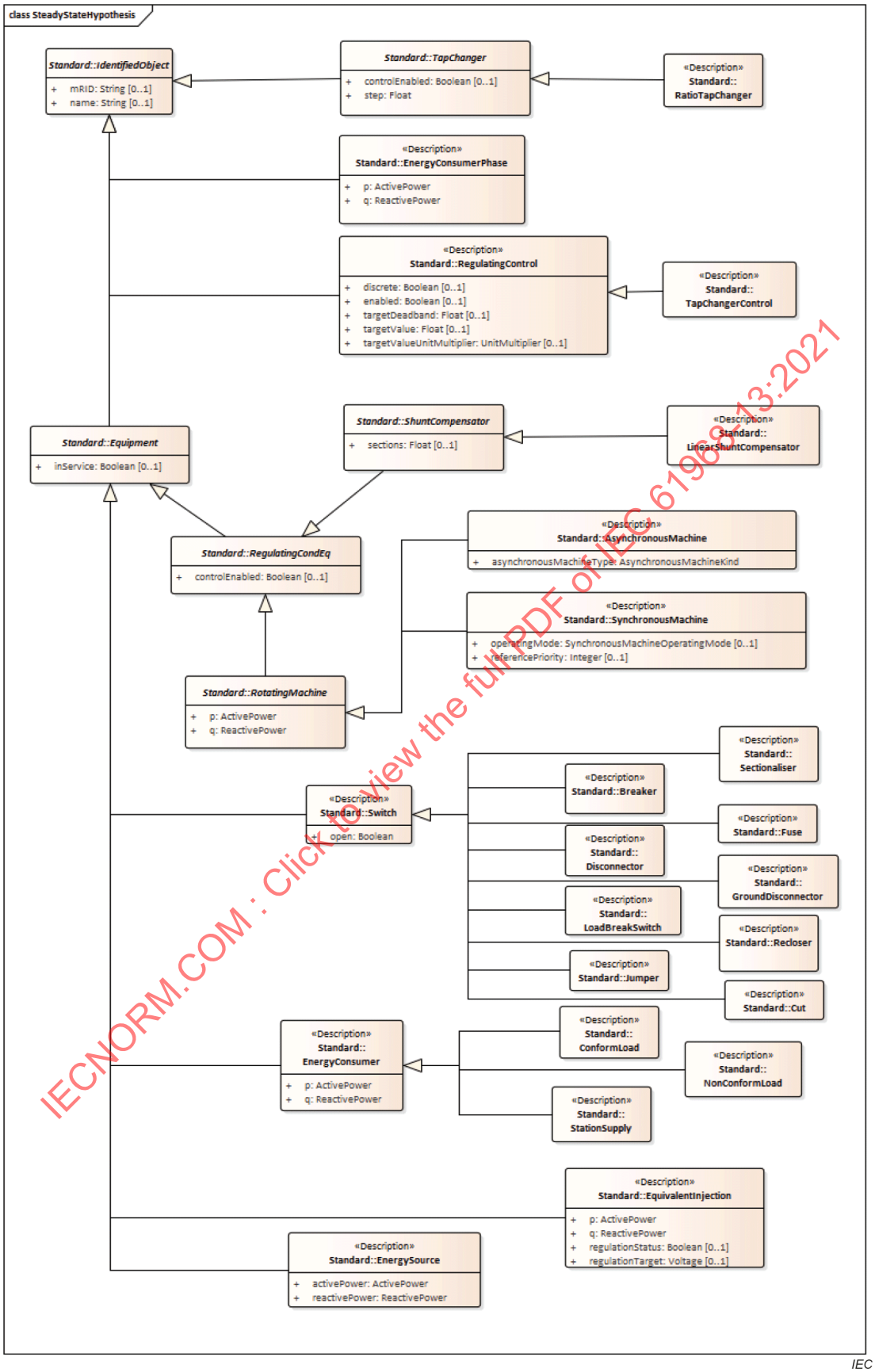

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Figure 36 – Class diagram SteadyStateHypothesis::SteadyStateHypothesis

6.6.2 Package Standard

6.6.2.1 (Description) AsynchronousMachine

A rotating machine whose shaft rotates asynchronously with the electrical field. Also known as an induction machine with no external connection to the rotor windings, e.g squirrel-cage induction machine.

Table 348 shows all attributes of AsynchronousMachine.

Table 348 – Attributes of Standard::AsynchronousMachine

name	mult	type	description
asynchronousMachineType	1..1	AsynchronousMachineKind	Indicates the type of Asynchronous Machine (motor or generator).
p	1..1	ActivePower	inherited from: RotatingMachine
q	1..1	ReactivePower	inherited from: RotatingMachine
controlEnabled	0..1	Boolean	inherited from: RegulatingCondEq
inService	0..1	Boolean	inherited from: Equipment
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.2 (Description) Breaker

A mechanical switching device capable of making, carrying, and breaking currents under normal circuit conditions and also making, carrying for a specified time, and breaking currents under specified abnormal circuit conditions e.g. those of short circuit.

Table 349 shows all attributes of Breaker.

Table 349 – Attributes of Standard::Breaker

name	mult	type	description
open	1..1	Boolean	inherited from: Switch
inService	0..1	Boolean	inherited from: Equipment
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.3 (Description) ConformLoad

ConformLoad represent loads that follow a daily load change pattern where the pattern can be used to scale the load with a system load.

Table 350 shows all attributes of ConformLoad.

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Table 350 – Attributes of Standard::ConformLoad

name	mult	type	description
p	1..1	ActivePower	inherited from: EnergyConsumer
q	1..1	ReactivePower	inherited from: EnergyConsumer
inService	0..1	Boolean	inherited from: Equipment
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.4 (Description) Cut

A cut separates a line segment into two parts. The cut appears as a switch inserted between these two parts and connects them together. As the cut is normally open there is no galvanic connection between the two line segment parts. But it is possible to close the cut to get galvanic connection.

The cut terminals are oriented towards the line segment terminals with the same sequence number. Hence the cut terminal with sequence number equal to 1 is oriented to the line segment's terminal with sequence number equal to 1.

The cut terminals also act as connection points for jumpers and other equipment, e.g. a mobile generator. To enable this, connectivity nodes are placed at the cut terminals. Once the connectivity nodes are in place any conducting equipment can be connected at them.

Table 351 shows all attributes of Cut.

Table 351 – Attributes of Standard::Cut

name	mult	type	description
open	1..1	Boolean	inherited from: Switch
inService	0..1	Boolean	inherited from: Equipment
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.5 (Description) Disconnector

A manually operated or motor operated mechanical switching device used for changing the connections in a circuit, or for isolating a circuit or equipment from a source of power. It is required to open or close circuits when negligible current is broken or made.

Table 352 shows all attributes of Disconnector.

Table 352 – Attributes of Standard::Disconnector

name	mult	type	description
open	1..1	Boolean	inherited from: Switch
inService	0..1	Boolean	inherited from: Equipment
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

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6.6.2.6 (Description) EnergyConsumer

Generic user of energy – a point of consumption on the power system model.

Table 353 shows all attributes of EnergyConsumer.

Table 353 – Attributes of Standard::EnergyConsumer

name	mult	type	description
p	1..1	ActivePower	Active power of the load. Load sign convention is used, i.e. positive sign means flow out from a node. For voltage dependent loads the value is at rated voltage. Starting value for a steady state solution.
q	1..1	ReactivePower	Reactive power of the load. Load sign convention is used, i.e. positive sign means flow out from a node. For voltage dependent loads the value is at rated voltage. Starting value for a steady state solution.
inService	0..1	Boolean	inherited from: Equipment
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.7 (Description) EnergyConsumerPhase

Table 354 shows all attributes of EnergyConsumerPhase.

Table 354 – Attributes of Standard::EnergyConsumerPhase

name	mult	type	description
p	1..1	ActivePower	Active power of the load. Load sign convention is used, i.e. positive sign means flow out from a node. For voltage dependent loads the value is at rated voltage. Starting value for a steady state solution.
q	1..1	ReactivePower	Reactive power of the load. Load sign convention is used, i.e. positive sign means flow out from a node. For voltage dependent loads the value is at rated voltage. Starting value for a steady state solution.
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.8 (Description) EnergySource

A generic equivalent for an energy supplier on a transmission or distribution voltage level.

Table 355 shows all attributes of EnergySource.

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Table 355 – Attributes of Standard::EnergySource

name	mult	type	description
activePower	1..1	ActivePower	High voltage source active injection. Load sign convention is used, i.e. positive sign means flow out from a node. Starting value for steady state solutions.
reactivePower	1..1	ReactivePower	High voltage source reactive injection. Load sign convention is used, i.e. positive sign means flow out from a node. Starting value for steady state solutions.
inService	0..1	Boolean	inherited from: Equipment
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.9 (abstract) Equipment

The parts of a power system that are physical devices, electronic or mechanical.

Table 356 shows all attributes of Equipment.

Table 356 – Attributes of Standard::Equipment

name	mult	type	description
inService	0..1	Boolean	If true, the equipment is in service.
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.10 (Description) EquivalentInjection

This class represents equivalent injections (generation or load). Voltage regulation is allowed only at the point of connection.

Table 357 shows all attributes of EquivalentInjection.

Table 357 – Attributes of Standard::EquivalentInjection

name	mult	type	description
p	1..1	ActivePower	Equivalent active power injection. Load sign convention is used, i.e. positive sign means flow out from a node. Starting value for steady state solutions.
q	1..1	ReactivePower	Equivalent reactive power injection. Load sign convention is used, i.e. positive sign means flow out from a node. Starting value for steady state solutions.
regulationStatus	0..1	Boolean	Specifies the default regulation status of the EquivalentInjection. True is regulating. False is not regulating.
regulationTarget	0..1	Voltage	The target voltage for voltage regulation.
inService	0..1	Boolean	inherited from: Equipment
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

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6.6.2.11 (Description) Fuse

An overcurrent protective device with a circuit opening fusible part that is heated and severed by the passage of overcurrent through it. A fuse is considered a switching device because it breaks current.

Table 358 shows all attributes of Fuse.

Table 358 – Attributes of Standard::Fuse

name	mult	type	description
open	1..1	Boolean	inherited from: Switch
inService	0..1	Boolean	inherited from: Equipment
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.12 (Description) GroundDisconnector

A manually operated or motor operated mechanical switching device used for isolating a circuit or equipment from Ground.

Table 359 shows all attributes of GroundDisconnector.

Table 359 – Attributes of Standard::GroundDisconnector

name	mult	type	description
open	1..1	Boolean	inherited from: Switch
inService	0..1	Boolean	inherited from: Equipment
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.13 (abstract) IdentifiedObject root class

This is a root class to provide common identification for all classes needing identification and naming attributes.

Table 360 shows all attributes of IdentifiedObject.

Table 360 – Attributes of Standard::IdentifiedObject

name	mult	type	description
mRID	0..1	String	Master resource identifier issued by a model authority. The mRID is globally unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended. For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.
name	0..1	String	The name is any free human readable and possibly non unique text naming the object.

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6.6.2.14 (Description) Jumper

A short section of conductor with negligible impedance which can be manually removed and replaced if the circuit is de-energized. Note that zero-impedance branches can be modelled by an ACLineSegment with a zero impedance ConductorType.

Table 361 shows all attributes of Jumper.

Table 361 – Attributes of Standard::Jumper

name	mult	type	description
open	1..1	Boolean	inherited from: Switch
inService	0..1	Boolean	inherited from: Equipment
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.15 (Description) LinearShuntCompensator

A linear shunt compensator has banks or sections with equal admittance values.

Table 362 shows all attributes of LinearShuntCompensator.

Table 362 – Attributes of Standard::LinearShuntCompensator

name	mult	type	description
sections	0..1	Float	inherited from: ShuntCompensator
controlEnabled	0..1	Boolean	inherited from: RegulatingCondEq
inService	0..1	Boolean	inherited from: Equipment
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.16 (Description) LoadBreakSwitch

A mechanical switching device capable of making, carrying, and breaking currents under normal operating conditions.

Table 363 shows all attributes of LoadBreakSwitch.

Table 363 – Attributes of Standard::LoadBreakSwitch

name	mult	type	description
open	1..1	Boolean	inherited from: Switch
inService	0..1	Boolean	inherited from: Equipment
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.17 (Description) NonConformLoad

NonConformLoad represent loads that do not follow a daily load change pattern and changes are not correlated with the daily load change pattern.

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Table 364 shows all attributes of NonConformLoad.

Table 364 – Attributes of Standard::NonConformLoad

name	mult	type	description
p	1..1	ActivePower	inherited from: EnergyConsumer
q	1..1	ReactivePower	inherited from: EnergyConsumer
inService	0..1	Boolean	inherited from: Equipment
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.18 (Description) RatioTapChanger

A tap changer that changes the voltage ratio impacting the voltage magnitude but not the phase angle across the transformer.

Table 365 shows all attributes of RatioTapChanger.

Table 365 – Attributes of Standard::RatioTapChanger

name	mult	type	description
controlEnabled	0..1	Boolean	inherited from: TapChanger
step	1..1	Float	inherited from: TapChanger
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.19 (Description) Recloser

Pole-mounted fault interrupter with built-in phase and ground relays, current transformer (CT), and supplemental controls.

Table 366 shows all attributes of Recloser.

Table 366 – Attributes of Standard::Recloser

name	mult	type	description
open	1..1	Boolean	inherited from: Switch
inService	0..1	Boolean	inherited from: Equipment
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.20 (abstract) RegulatingCondEq

A type of conducting equipment that can regulate a quanity (i.e. voltage or flow) at a specific point in the network.

Table 367 shows all attributes of RegulatingCondEq.

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Table 367 – Attributes of Standard::RegulatingCondEq

name	mult	type	description
controlEnabled	0..1	Boolean	Specifies the regulation status of the equipment. True is regulating, false is not regulating.
inService	0..1	Boolean	inherited from: Equipment
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.21 (Description) RegulatingControl

Specifies a set of equipment that works together to control a power system quantity such as voltage or flow.

Remote bus voltage control is possible by specifying the controlled terminal located at some place remote from the controlling equipment.

In case multiple equipment, possibly of different types, control same terminal there must be only one RegulatingControl at that terminal. The most specific subtype of RegulatingControl shall be used in case such equipment participate in the control, e.g. TapChangerControl for tap changers.

For flow control, load sign convention is used, i.e. positive sign means flow out from a TopologicalNode (bus) into the conducting equipment.

Table 368 shows all attributes of RegulatingControl.

Table 368 – Attributes of Standard::RegulatingControl

name	mult	type	description
discrete	0..1	Boolean	The regulation is performed in a discrete mode. This applies to equipment with discrete controls, e.g. tap changers and shunt compensators.
enabled	0..1	Boolean	The flag tells if regulation is enabled.
targetDeadband	0..1	Float	This is a deadband used with discrete control to avoid excessive update of controls like tap changers and shunt compensator banks while regulating. The units of those appropriate for the mode.
targetValue	0..1	Float	The target value specified for case input. This value can be used for the target value without the use of schedules. The value has the units appropriate to the mode attribute.
targetValueUnitMultiplier	0..1	UnitMultiplier	Specify the multiplier for used for the targetValue.
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.22 (abstract) RotatingMachine

A rotating machine which may be used as a generator or motor.

Table 369 shows all attributes of RotatingMachine.

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Table 369 – Attributes of Standard::RotatingMachine

name	mult	type	description
p	1..1	ActivePower	Active power injection. Load sign convention is used, i.e. positive sign means flow out from a node. Starting value for a steady state solution.
q	1..1	ReactivePower	Reactive power injection. Load sign convention is used, i.e. positive sign means flow out from a node. Starting value for a steady state solution.
controlEnabled	0..1	Boolean	inherited from: RegulatingCondEq
inService	0..1	Boolean	inherited from: Equipment
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.23 (Description) Sectionaliser

Automatic switch that will lock open to isolate a faulted section. It may, or may not, have load breaking capability. Its primary purpose is to provide fault sectionalising at locations where the fault current is either too high, or too low, for proper coordination of fuses.

Table 370 shows all attributes of Sectionaliser.

Table 370 – Attributes of Standard::Sectionaliser

name	mult	type	description
open	1..1	Boolean	inherited from: Switch
inService	0..1	Boolean	inherited from: Equipment
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.24 (abstract) ShuntCompensator

A shunt capacitor or reactor or switchable bank of shunt capacitors or reactors. A section of a shunt compensator is an individual capacitor or reactor. A negative value for reactivePerSection indicates that the compensator is a reactor. ShuntCompensator is a single terminal device. Ground is implied.

Table 371 shows all attributes of ShuntCompensator.

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Table 371 – Attributes of Standard::ShuntCompensator

name	mult	type	description
sections	0..1	Float	Shunt compensator sections in use. Starting value for steady state solution. Non integer values are allowed to support continuous variables. The reasons for continuous value are to support study cases where no discrete shunt compensators has yet been designed, a solutions where a narrow voltage band force the sections to oscillate or accommodate for a continuous solution as input.
controlEnabled	0..1	Boolean	inherited from: RegulatingCondEq
inService	0..1	Boolean	inherited from: Equipment
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.25 (Description) StationSupply

Station supply with load derived from the station output.

Table 372 shows all attributes of StationSupply.

Table 372 – Attributes of Standard::StationSupply

name	mult	type	description
p	1..1	ActivePower	inherited from: EnergyConsumer
q	1..1	ReactivePower	inherited from: EnergyConsumer
inService	0..1	Boolean	inherited from: Equipment
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.26 (Description) Switch

A generic device designed to close, or open, or both, one or more electric circuits.

Table 373 shows all attributes of Switch.

Table 373 – Attributes of Standard::Switch

name	mult	type	description
open	1..1	Boolean	The attribute tells if the switch is considered open when used as input to topology processing.
inService	0..1	Boolean	inherited from: Equipment
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.27 (Description) SynchronousMachine

An electromechanical device that operates with shaft rotating synchronously with the network. It is a single machine operating either as a generator or synchronous condenser or pump.

Table 374 shows all attributes of SynchronousMachine.

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Table 374 – Attributes of Standard::SynchronousMachine

name	mult	type	description
operatingMode	0..1	SynchronousMachineOperatingMode	Current mode of operation.
referencePriority	0..1	Integer	Priority of unit for use as powerflow voltage phase angle reference bus selection. 0 = don't care (default) 1 = highest priority. 2 is less than 1 and so on.
p	1..1	ActivePower	inherited from: RotatingMachine
q	1..1	ReactivePower	inherited from: RotatingMachine
controlEnabled	0..1	Boolean	inherited from: RegulatingCondEq
inService	0..1	Boolean	inherited from: Equipment
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.6.2.28 (abstract) TapChanger

Mechanism for changing transformer winding tap positions.

Table 375 shows all attributes of TapChanger.

Table 375 – Attributes of Standard::TapChanger

name	mult	type	description
controlEnabled	0..1	Boolean	Specifies the regulation status of the equipment. True is regulating, false is not regulating.
step	1..1	Float	Tap changer position. Starting step for a steady state solution. Non integer values are allowed to support continuous tap variables. The reasons for continuous value are to support study cases where no discrete tap changers has yet been designed, a solutions where a narrow voltage band force the tap step to oscillate or accommodate for a continuous solution as input. The attribute shall be equal or greater than lowStep and equal or less than highStep.
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

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6.6.2.29 (Description) TapChangerControl

Describes behavior specific to tap changers, e.g. how the voltage at the end of a line varies with the load level and compensation of the voltage drop by tap adjustment.

Table 376 shows all attributes of TapChangerControl.

Table 376 – Attributes of Standard::TapChangerControl

name	mult	type	description
discrete	0..1	Boolean	inherited from: RegulatingControl
enabled	0..1	Boolean	inherited from: RegulatingControl
targetDeadband	0..1	Float	inherited from: RegulatingControl
targetValue	0..1	Float	inherited from: RegulatingControl
targetValueUnitMultiplier	0..1	UnitMultiplier	inherited from: RegulatingControl
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

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6.7 Package StateVariables

6.7.1 General

SeeFigure 37, Figure 38 and Figure 39.

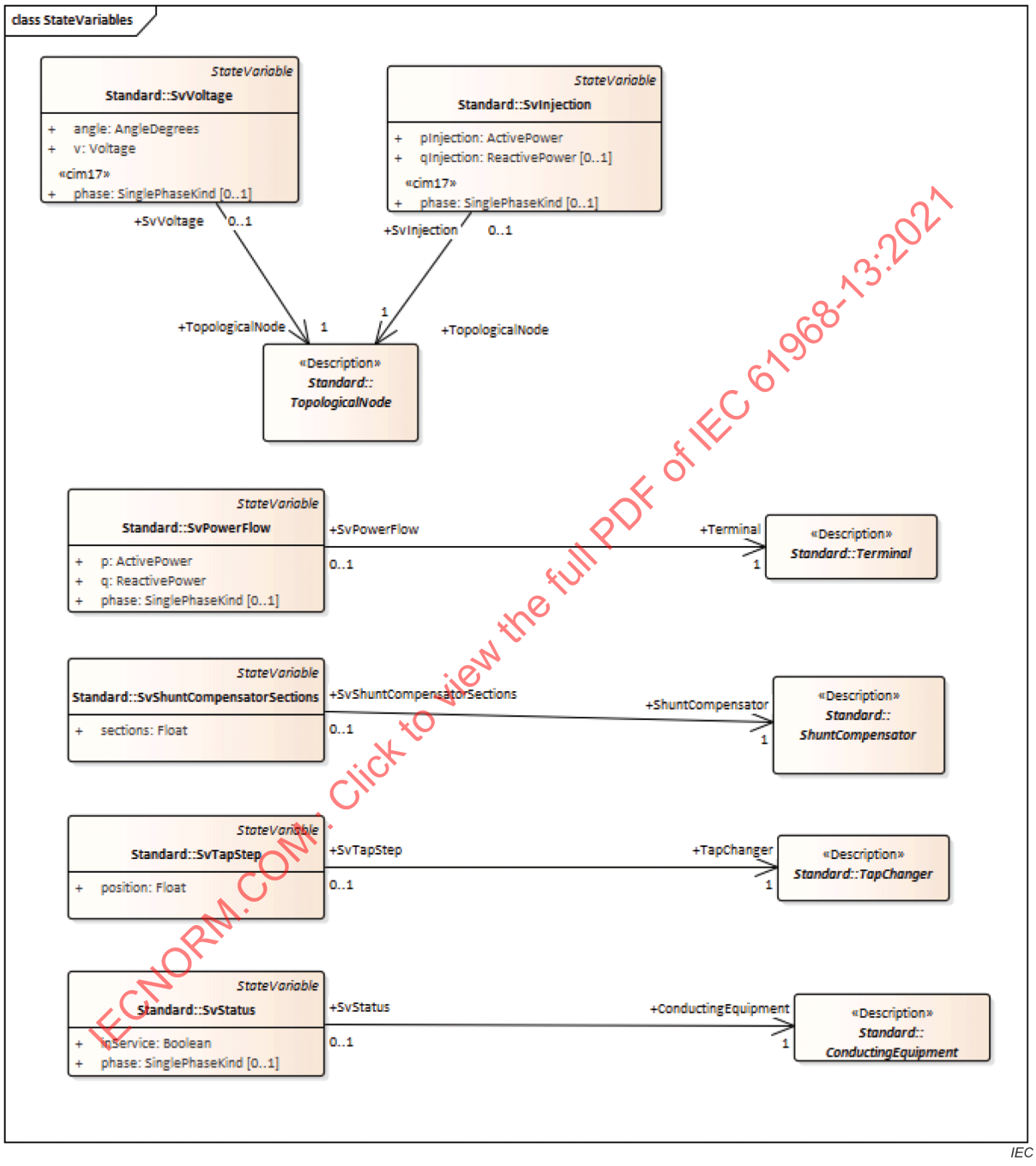

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Figure 37 – Class diagram StateVariables::StateVariables

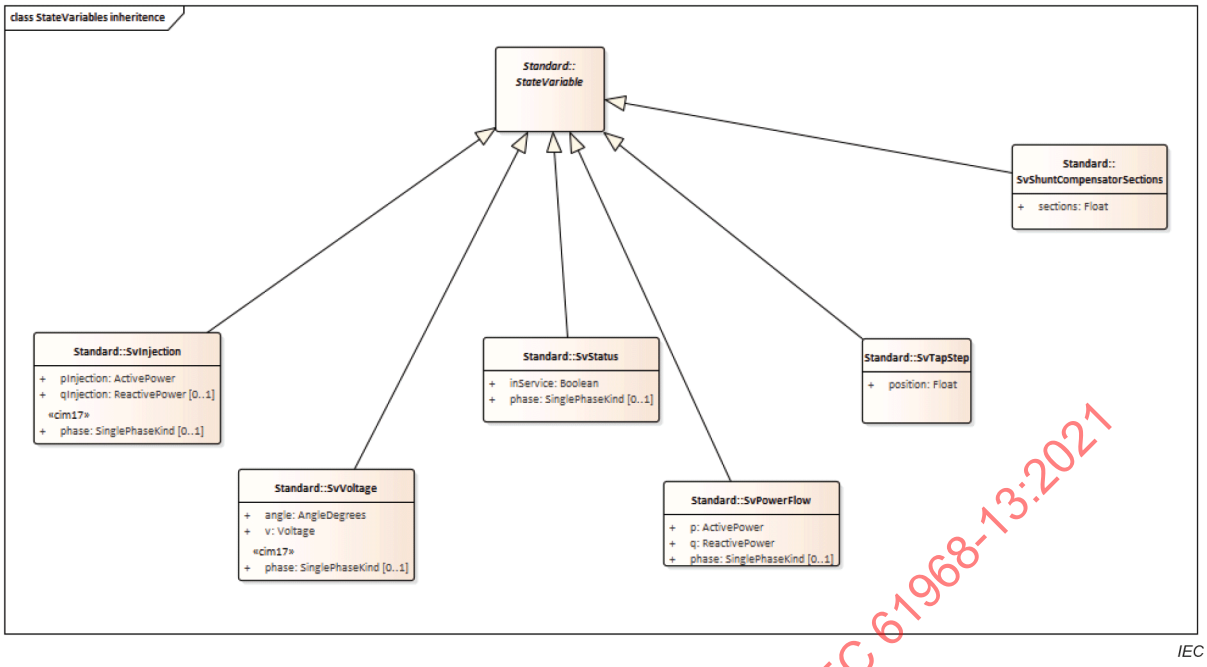

Figure 38 – Class diagram StateVariables::StateVariables inheritence

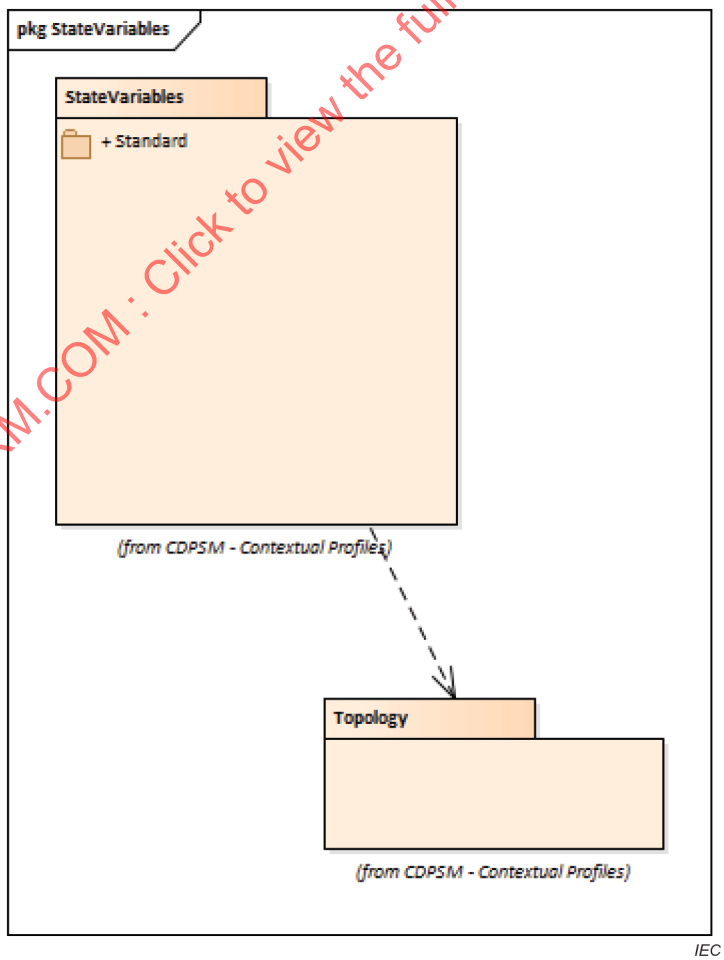

Figure 39 – Package diagram StateVariables::StateVariables

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6.7.2 Package Standard

6.7.2.1 (abstract) ConductingEquipment root class

The parts of the power system that are designed to carry current or that are conductively connected therewith. ConductingEquipment is contained within an EquipmentContainer that may be a Substation, or a VoltageLevel or a Bay within a Substation.

6.7.2.2 (abstract) ShuntCompensator root class

A shunt capacitor or reactor or switchable bank of shunt capacitors or reactors. A section of a shunt compensator is an individual capacitor or reactor. A negative value for reactivePerSection indicates that the compensator is a reactor. ShuntCompensator is a single terminal device. Ground is implied.

6.7.2.3 (abstract) StateVariable root class

An abstract class for state variables.

6.7.2.4 SvInjection

Injection state variable. Positive sign means flow into the TopologicalNode.

Table 377 shows all attributes of SvInjection.

Table 377 – Attributes of Standard::SvInjection

name	mult	type	description
qInjection	0..1	ReactivePower	The reactive power injected into the bus at this location. Positive sign means injection into the bus.
pInjection	1..1	ActivePower	The active power injected into the bus at this location. Positive sign means injection into the bus.

Table 378 shows all association ends of SvInjection with other classes.

Table 378 – Association ends of Standard::SvInjection with other classes

mult from	name	mult to	type	description
0..1	TopologicalNode	1..1	TopologicalNode	The topological node associated with the flow injection state variable.

6.7.2.5 SvPowerFlow

State variable for power flow. Load convention is used for flow direction. This means flow out from the TopologicalNode into the equipment is positive.

Table 379 shows all attributes of SvPowerFlow.

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Table 379 – Attributes of Standard::SvPowerFlow

name	mult	type	description
q	1..1	ReactivePower	The reactive power flow. Load sign convention is used, i.e. positive sign means flow out from a node.
phase	0..1	SinglePhaseKind	The individual phase of the flow. If unspecified, then assumed to be balanced among phases.
p	1..1	ActivePower	The active power flow. Load sign convention is used, i.e. positive sign means flow out from a node.

Table 380 shows all association ends of SvPowerFlow with other classes.

Table 380 – Association ends of Standard::SvPowerFlow with other classes

mult from	name	mult to	type	description
0..1	Terminal	1..1	Terminal	The terminal associated with the power flow state variable.

6.7.2.6 SvShuntCompensatorSections

State variable for the number of sections in service for a shunt compensator.

Table 381 shows all attributes of SvShuntCompensatorSections.

Table 381 – Attributes of Standard::SvShuntCompensatorSections

name	mult	type	description
sections	1..1	Float	The number of sections in service as a continous variable. To get integer value scale with ShuntCompensator.bPerSection.

Table 382 shows all association ends of SvShuntCompensatorSections with other classes.

Table 382 – Association ends of Standard::SvShuntCompensatorSections with other classes

mult from	name	mult to	type	description
0..1	ShuntCompensator	1..1	ShuntCompensator	The shunt compensator for which the state applies.

6.7.2.7 SvStatus

State variable for status.

Table 383 shows all attributes of SvStatus.

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Table 383 – Attributes of Standard::SvStatus

name	mult	type	description
inService	1..1	Boolean	The in service status as a result of topology processing.
phase	0..1	SinglePhaseKind	The individual phase status. If the attribute is unspecified, then three phase model is assumed.

Table 384 shows all association ends of SvStatus with other classes.

Table 384 – Association ends of Standard::SvStatus with other classes

mult from	name	mult to	type	description
0..1	ConductingEquipment	1..1	ConductingEquipment	The conducting equipment associated with the status state variable.

6.7.2.8 SvTapStep

State variable for transformer tap step. This class is to be used for taps of LTC (load tap changing) transformers, not fixed tap transformers. Normally a profile specifies only one of the attributes "position"or "tapRatio".

Table 385 shows all attributes of SvTapStep.

Table 385 – Attributes of Standard::SvTapStep

name	mult	type	description
position	1..1	Float	The floating point tap position. To get integer value scale with range and round off.

Table 386 shows all association ends of SvTapStep with other classes.

Table 386 – Association ends of Standard::SvTapStep with other classes

mult from	name	mult to	type	description
0..1	TapChanger	1..1	TapChanger	The tap changer associated with the tap step state.

6.7.2.9 SvVoltage

State variable for voltage.

Table 387 shows all attributes of SvVoltage.

Table 387 – Attributes of Standard::SvVoltage

name	mult	type	description
v	1..1	Voltage	The voltage magnitude of the topological node.
angle	1..1	AngleDegrees	The voltage angle in radians of the topological node.

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Table 388 shows all association ends of SvVoltage with other classes.

Table 388 – Association ends of Standard::SvVoltage with other classes

mult from	name	mult to	type	description
0..1	TopologicalNode	1..1	TopologicalNode	The topological node associated with the voltage state.

6.7.2.10 (abstract) TapChanger root class

Mechanism for changing transformer winding tap positions.

6.7.2.11 (abstract) Terminal root class

An electrical connection point to a piece of conducting equipment. Terminals are connected at physical connection points called "connectivity nodes".

6.7.2.12 (abstract) TopologicalNode root class

For a detailed substation model a TopologicalNode is a set of connectivity nodes that, in the current network state, are connected together through any type of closed switches, including jumpers. Topological nodes changes as the current network state changes (i.e. switches, breakers, etc. change state).

For a planning model switch statuses are not used to form TopologicalNodes. Instead they are manually created or deleted in a model builder tool. TopologialNodes maintained this way are also called "busses".

6.8 Package Geographical

6.8.1 General

See Figure 40 and Figure 41.

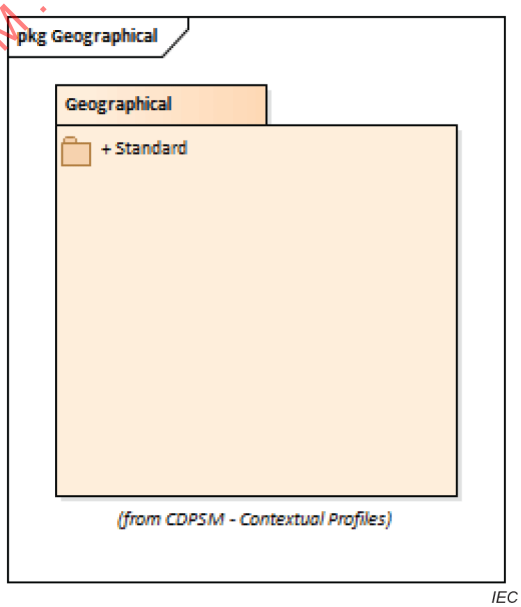

Figure 40 – Package diagram Geographical::Geographical

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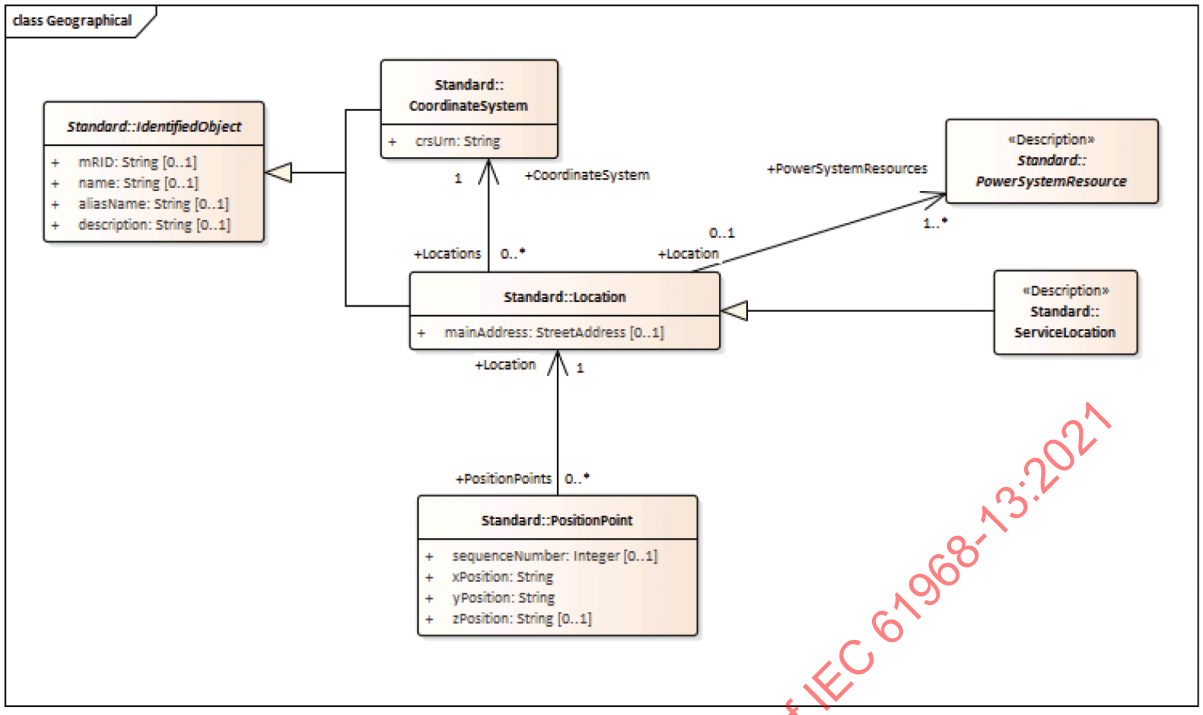

Figure 41 – Class diagram Geographical::Geographical

6.8.2 Package Standard

6.8.2.1 CoordinateSystem

Coordinate reference system.

Table 389 shows all attributes of CoordinateSystem.

Table 389 – Attributes of Standard::CoordinateSystem

name	mult	type	description
crsUrn	1..1	String	A Uniform Resource Name (URN) for the coordinate reference system (crs) used to define 'Location.PositionPoints'. An example would be the European Petroleum Survey Group (EPSG) code for a coordinate reference system, defined in URN under the Open Geospatial Consortium (OGC) namespace as: urn:ogc:def:uom:EPSG::XXXX, where XXXX is an EPSG code (a full list of codes can be found at the EPSG Registry website http://www.epsg-registry.org/). To define the coordinate system as being WGS84 (latitude, longitude) using an EPSG OGC, this attribute would be urn:ogc:def:uom:EPSG::4236. A profile should limit this code to a set of allowed URNs agreed to by all sending and receiving parties.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

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6.8.2.2 (abstract) IdentifiedObject root class

This is a root class to provide common identification for all classes needing identification and naming attributes.

Table 390 shows all attributes of IdentifiedObject.

Table 390 – Attributes of Standard::IdentifiedObject

name	mult	type	description
name	0..1	String	The name is any free human readable and possibly non unique text naming the object.
aliasName	0..1	String	The aliasName is free text human readable name of the object alternative to IdentifiedObject.name. It may be non unique and may not correlate to a naming hierarchy. The attribute aliasName is retained because of backwards compatibility between CIM relases. It is however recommended to replace aliasName with the Name class as aliasName is planned for retirement at a future time.
description	0..1	String	The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.
mRID	0..1	String	Master resource identifier issued by a model authority. The mRID is globally unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended. For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.

6.8.2.3 Location

The place, scene, or point of something where someone or something has been, is, and/or will be at a given moment in time. It can be defined with one or more postition points (coordinates) in a given coordinate system.

Table 391 shows all attributes of Location.

Table 391 – Attributes of Standard::Location

name	mult	type	description
mainAddress	0..1	StreetAddress	Main address of the location.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 392 shows all association ends of Location with other classes.

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Table 392 – Association ends of Standard::Location with other classes

mult from	name	mult to	type	description
0..1	PowerSystemResources	1..*	PowerSystemResource	All power system resources at this location.
0..*	CoordinateSystem	1..1	CoordinateSystem	Coordinate system used to describe position points of this location.

6.8.2.4 PositionPoint root class

Set of spatial coordinates that determine a point, defined in coordinate system specified in 'Location.CoordinateSystem'. Use a single position point instance to desribe a point-oriented location. Use a sequence of position points to describe a line-oriented object (physical location of non-point oriented objects like cables or lines), or area of an object (like a substation or a geographical zone – in this case, have first and last position point with the same values).

Table 393 shows all attributes of PositionPoint.

Table 393 – Attributes of Standard::PositionPoint

name	mult	type	description
zPosition	0..1	String	(if applicable) Z axis position.
sequenceNumber	0..1	Integer	Zero-relative sequence number of this point within a series of points.
xPosition	1..1	String	X axis position.
yPosition	1..1	String	Y axis position.

Table 394 shows all association ends of PositionPoint with other classes.

Table 394 – Association ends of Standard::PositionPoint with other classes

mult from	name	mult to	type	description
0..*	Location	1..1	Location	Location described by this position point.

6.8.2.5 (abstract) PowerSystemResource root class

A power system resource can be an item of equipment such as a Switch, an EquipmentContainer containing many individual items of equipment such as a Substation, or an organisational entity such as Company or SubControlArea. This provides for the nesting of collections of PowerSystemResources within other PowerSystemResources. For example, a Switch could be a member of a Substation and a Substation could be a member of a division of a Company.

6.8.2.6 ServiceLocation

A real estate location, commonly referred to as premises.

Table 395 shows all attributes of ServiceLocation.

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Table 395 – Attributes of Standard::ServiceLocation

name	mult	type	description
mainAddress	0..1	StreetAddress	inherited from: Location
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 396 shows all association ends of ServiceLocation with other classes.

Table 396 – Association ends of Standard::ServiceLocation with other classes

mult from	name	mult to	type	description
0..1	PowerSystemResources	1..*	PowerSystemResource	inherited from: Location
0..*	CoordinateSystem	1..1	CoordinateSystem	inherited from: Location

6.9 Package DiagramLayout

6.9.1 General

See Figure 42 and Figure 43.

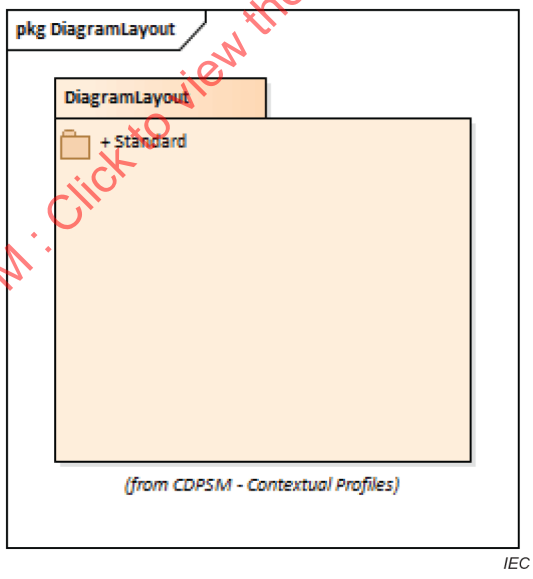

Figure 42 – Package diagram DiagramLayout::DiagramLayout

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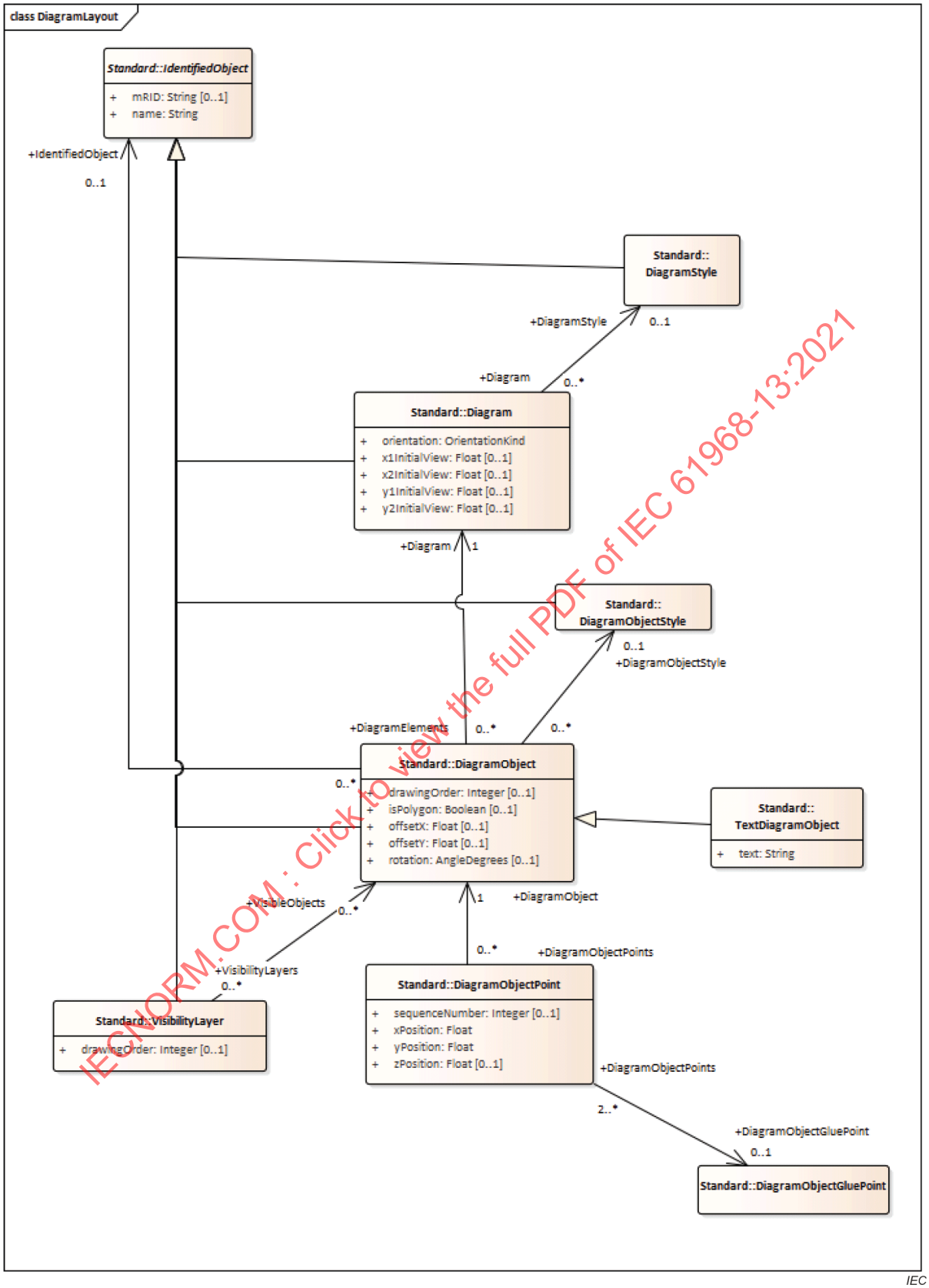

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Figure 43 – Class diagram DiagramLayout::DiagramLayout

6.9.2 Package Standard

6.9.2.1 Diagram

The diagram being exchanged. The coordinate system is a standard Cartesian coordinate system and the orientation attribute defines the orientation.

Table 397 shows all attributes of Diagram.

Table 397 – Attributes of Standard::Diagram

name	mult	type	description
orientation	1..1	OrientationKind	Coordinate system orientation of the diagram.
x1InitialView	0..1	Float	X coordinate of the first corner of the initial view.
x2InitialView	0..1	Float	X coordinate of the second corner of the initial view.
y1InitialView	0..1	Float	Y coordinate of the first corner of the initial view.
y2InitialView	0..1	Float	Y coordinate of the second corner of the initial view.
mRID	0..1	String	inherited from: IdentifiedObject
name	1..1	String	inherited from: IdentifiedObject

Table 398 shows all association ends of Diagram with other classes.

Table 398 – Association ends of Standard::Diagram with other classes

mult from	name	mult to	type	description
0..*	DiagramStyle	0..1	DiagramStyle	A Diagram may have a DiagramStyle.

6.9.2.2 DiagramObject

An object that defines one or more points in a given space. This object can be associated with anything that specializes IdentifiedObject. For single line diagrams such objects typically include such items as analog values, breakers, disconnectors, power transformers, and transmission lines.

Table 399 shows all attributes of DiagramObject.

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Table 399 – Attributes of Standard::DiagramObject

name	mult	type	description
drawingOrder	0..1	Integer	The drawing order of this element. The higher the number, the later the element is drawn in sequence. This is used to ensure that elements that overlap are rendered in the correct order.
isPolygon	0..1	Boolean	Defines whether or not the diagram objects points define the boundaries of a polygon or the routing of a polyline. If this value is true then a receiving application should consider the first and last points to be connected.
offsetX	0..1	Float	The offset in the X direction. This is used for defining the offset from centre for rendering an icon (the default is that a single point specifies the centre of the icon). The offset is in per-unit with 0 indicating there is no offset from the horizontal centre of the icon. -0.5 indicates it is offset by 50 % to the left and 0.5 indicates an offset of 50 % to the right.
offsetY	0..1	Float	The offset in the Y direction. This is used for defining the offset from centre for rendering an icon (the default is that a single point specifies the centre of the icon). The offset is in per-unit with 0 indicating there is no offset from the vertical centre of the icon. The offset direction is dependent on the orientation of the diagram, with -0.5 and 0.5 indicating an offset of ±50 % on the vertical axis.
rotation	0..1	AngleDegrees	Sets the angle of rotation of the diagram object. Zero degrees is pointing to the top of the diagram. Rotation is clockwise.
mRID	0..1	String	inherited from: IdentifiedObject
name	1..1	String	inherited from: IdentifiedObject

Table 400 shows all association ends of DiagramObject with other classes.

Table 400 – Association ends of Standard::DiagramObject with other classes

mult from	name	mult to	type	description
0..*	Diagram	1..1	Diagram	A diagram object is part of a diagram.
0..*	DiagramObjectStyle	0..1	DiagramObjectStyle	A diagram object has a style associated that provides a reference for the style used in the originating system.
0..*	IdentifiedObject	0..1	IdentifiedObject	The domain object to which this diagram object is associated.

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6.9.2.3 DiagramObjectGluePoint root class

This is used for grouping diagram object points from different diagram objects that are considered to be glued together in a diagram even if they are not at the exact same coordinates.

6.9.2.4 DiagramObjectPoint root class

A point in a given space defined by 3 coordinates and associated to a diagram object. The coordinates may be positive or negative as the origin does not have to be in the corner of a diagram.

Table 401 shows all attributes of DiagramObjectPoint.

Table 401 – Attributes of Standard::DiagramObjectPoint

name	mult	type	description
sequenceNumber	0..1	Integer	The sequence position of the point, used for defining the order of points for diagram objects acting as a polyline or polygon with more than one point.
xPosition	1..1	Float	The X coordinate of this point.
yPosition	1..1	Float	The Y coordinate of this point.
zPosition	0..1	Float	The Z coordinate of this point.

Table 402 shows all association ends of DiagramObjectPoint with other classes.

Table 402 – Association ends of Standard::DiagramObjectPoint with other classes

mult from	name	mult to	type	description
0..*	DiagramObject	1..1	DiagramObject	The diagram object with which the points are associated.
2..*	DiagramObjectGluePoint	0..1	DiagramObjectGluePoint	The 'glue' point to which this point is associated.

6.9.2.5 DiagramObjectStyle

A reference to a style used by the originating system for a diagram object. A diagram object style describes information such as line thickness, shape such as circle or rectangle, etc, and color.

Table 403 shows all attributes of DiagramObjectStyle.

Table 403 – Attributes of Standard::DiagramObjectStyle

name	mult	type	description
mRID	0..1	String	inherited from: IdentifiedObject
name	1..1	String	inherited from: IdentifiedObject

6.9.2.6 DiagramStyle

The diagram style refer to a style used by the originating system for a diagram. A diagram style describes information such as schematic, geographic, bus-branch, etc.

Table 404 shows all attributes of DiagramStyle.

Table 404 – Attributes of Standard::DiagramStyle

name	mult	type	description
mRID	0..1	String	inherited from: IdentifiedObject
name	1..1	String	inherited from: IdentifiedObject

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6.9.2.7 (abstract) IdentifiedObject root class

This is a root class to provide common identification for all classes needing identification and naming attributes.

Table 405 shows all attributes of IdentifiedObject.

Table 405 – Attributes of Standard::IdentifiedObject

name	mult	type	description
mRID	0..1	String	Master resource identifier issued by a model authority. The mRID is globally unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended. For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.
name	1..1	String	The name is any free human readable and possibly non unique text naming the object.

6.9.2.8 TextDiagramObject

A diagram object for placing free-text or text derived from an associated domain object.

Table 406 shows all attributes of TextDiagramObject.

Table 406 – Attributes of Standard::TextDiagramObject

name	mult	type	description
text	1..1	String	The text that is displayed by this text diagram object.
drawingOrder	0..1	Integer	inherited from: DiagramObject
isPolygon	0..1	Boolean	inherited from: DiagramObject
offsetX	0..1	Float	inherited from: DiagramObject
offsetY	0..1	Float	inherited from: DiagramObject
rotation	0..1	AngleDegrees	inherited from: DiagramObject
mRID	0..1	String	inherited from: IdentifiedObject
name	1..1	String	inherited from: IdentifiedObject

Table 407 shows all association ends of TextDiagramObject with other classes.

Table 407 – Association ends of Standard::TextDiagramObject with other classes

mult from	name	mult to	type	description
0..*	Diagram	1..1	Diagram	inherited from: DiagramObject
0..*	DiagramObjectStyle	0..1	DiagramObjectStyle	inherited from: DiagramObject
0..*	IdentifiedObject	0..1	IdentifiedObject	inherited from: DiagramObject

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6.9.2.9 VisibilityLayer

Layers are typically used for grouping diagram objects according to themes and scales. Themes are used to display or hide certain information (e.g. lakes, borders), while scales are used for hiding or displaying information depending on the current zoom level (hide text when it is too small to be read, or when it exceeds the screen size). This is also called de-cluttering.

CIM based graphics exchange will support an m:n relationship between diagram objects and layers. It will be the task of the importing system to convert an m:n case into an appropriate 1:n representation if the importing system does not support m:n.

Table 408 shows all attributes of VisibilityLayer.

Table 408 – Attributes of Standard::VisibilityLayer

name	mult	type	description
drawingOrder	0..1	Integer	The drawing order for this layer. The higher the number, the later the layer and the objects within it are rendered.
mRID	0..1	String	inherited from: IdentifiedObject
name	1..1	String	inherited from: IdentifiedObject

Table 409 shows all association ends of VisibilityLayer with other classes.

Table 409 – Association ends of Standard::VisibilityLayer with other classes

mult from	name	mult to	type	description
0..*	VisibleObjects	0..*	DiagramObject	A visibility layer can contain one or more diagram objects.

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6.10 Package Assets

6.10.1 General

See Figure 44 and Figure 45.

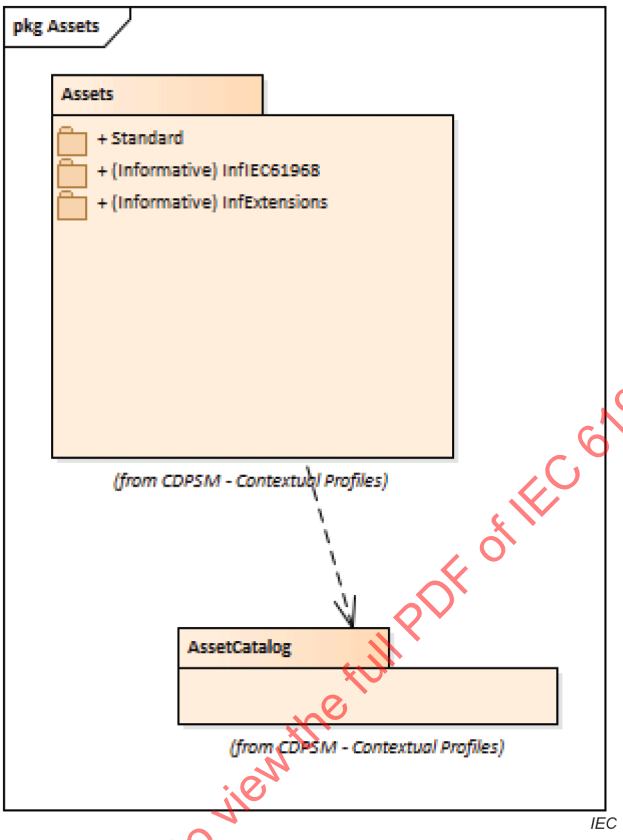

Figure 44 – Package diagram Assets::Assets

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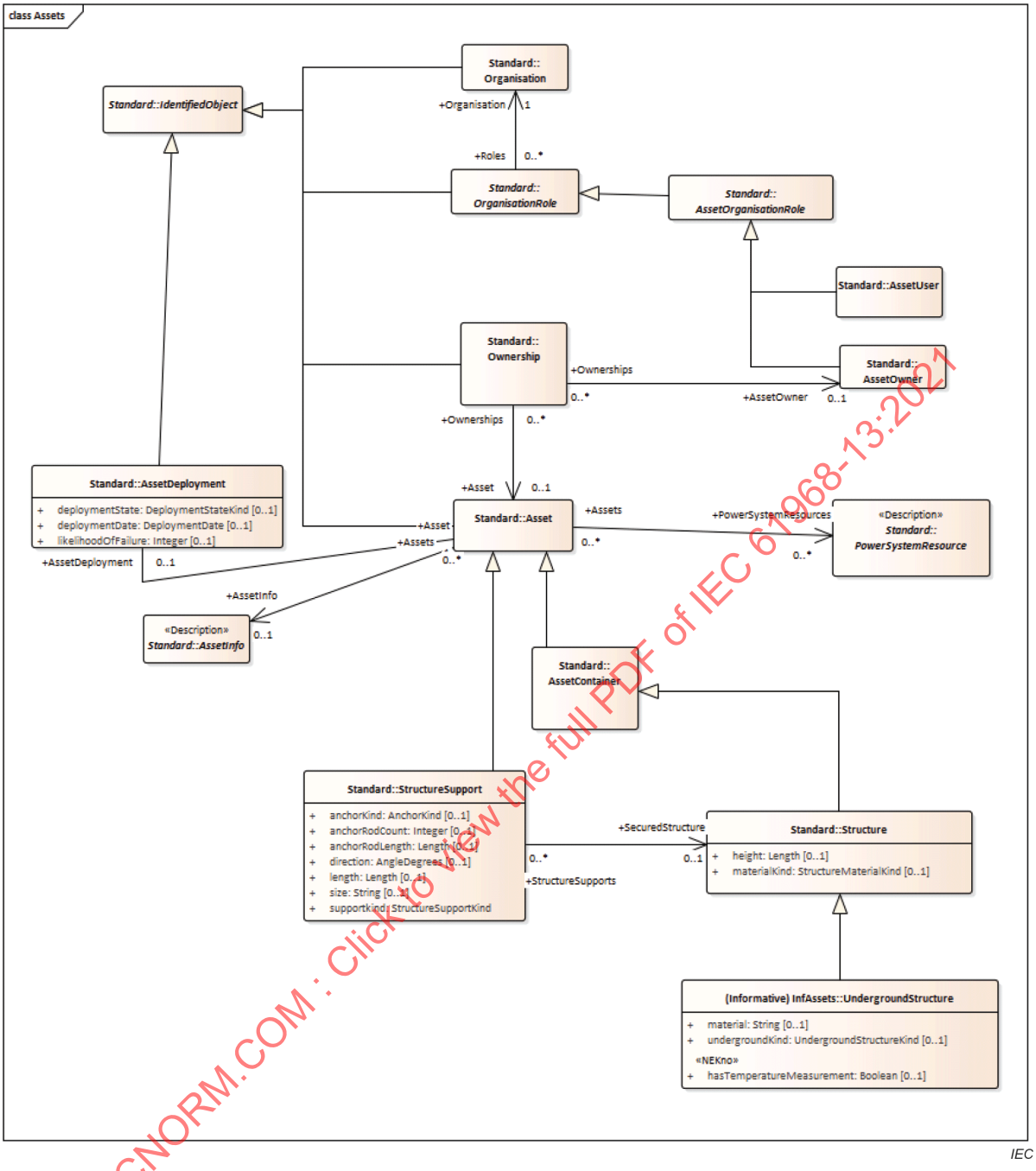

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Figure 45 – Class diagram Assets::Assets

6.10.2 Package Standard

6.10.2.1 Asset

Tangible resource of the utility, including power system equipment, cabinets, buildings, etc. For electrical network equipment, the role of the asset is defined through PowerSystemResource and its subclasses, defined mainly in the Wires model (refer to IEC 61970-301 and model package IEC61970::Wires). Asset description places emphasis on the physical characteristics of the equipment fulfilling that role.

Table 410 shows all attributes of Asset.

Table 410 – Attributes of Standard::Asset

name	mult	type	description
type	0..1	String	Utility-specific classification of Asset and its subtypes, according to their corporate standards, practices, and existing IT systems (e.g. for management of assets, maintenance, work, outage, customers, etc.).
lotNumber	0..1	String	Lot number for this asset. Even for the same model and version number, many assets are manufactured in lots.
lifecycleDate	0..1	LifecycleDate	<was lifecycle> Lifecycle dates for this asset.
baselineCondition	0..1	String	Condition of asset at last baseline. Examples include new, rebuilt, overhaul required, other. Refer to inspection data for information on the most current condition of the asset.
baselineLossOfLife	0..1	PerCent	Percentage of initial life expectancy that has been lost as of the last life expectancy baseline. Represents: (initial life expectancy – current life expectancy) / initial life expectancy.
critical	0..1	Boolean	True if asset is considered critical for some reason (for example, a pole with critical attachments).
electronicAddress	0..1	ElectronicAddress	Electronic address.
inUseDate	0..1	InUseDate	In use dates for this asset.
inUseState	0..1	InUseStateKind	Indication of whether asset is currently deployed (in use), ready to be put into use or not available for use.
kind	0..1	AssetKind	Kind of asset. Used in description of asset components in asset instance templates.
lifecycleState	0..1	AssetLifecycleStateKind	Current lifecycle state of asset.
position	0..1	String	Position of asset or asset component. May often be in relation to other assets or components.
purchasePrice	0..1	Money	Purchase price of asset.
retiredReason	0..1	RetiredReasonKind	Reason asset retired.
status	0..1	Status	Status of this asset.
utcNumber	0..1	String	Uniquely tracked commodity (UTC) number.
serialNumber	0..1	String	Serial number of this asset.
acceptanceTest	0..1	AcceptanceTest	Information on acceptance test.
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

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Table 411 shows all association ends of Asset with other classes.

Table 411 – Association ends of Standard::Asset with other classes

mult from	name	mult to	type	description
1..1	AssetDeployment	0..1	AssetDeployment	This asset's deployment.
0..*	PowerSystemResources	0..*	PowerSystemResource	All power system resources used to electrically model this asset. For example, transformer asset is electrically modelled with a transformer and its windings and tap changer.
0..*	AssetInfo	0..1	AssetInfo	Data applicable to this asset.

6.10.2.2 AssetContainer

Asset that is aggregation of other assets such as conductors, transformers, switchgear, land, fences, buildings, equipment, vehicles, etc.

Table 412 shows all attributes of AssetContainer.

Table 412 – Attributes of Standard::AssetContainer

name	mult	type	description
type	0..1	String	inherited from: Asset
lotNumber	0..1	String	inherited from: Asset
lifecycleDate	0..1	LifecycleDate	inherited from: Asset
baselineCondition	0..1	String	inherited from: Asset
baselineLossOfLife	0..1	PerCent	inherited from: Asset
critical	0..1	Boolean	inherited from: Asset
electronicAddress	0..1	ElectronicAddress	inherited from: Asset
inUseDate	0..1	InUseDate	inherited from: Asset
inUseState	0..1	InUseStateKind	inherited from: Asset
kind	0..1	AssetKind	inherited from: Asset
lifecycleState	0..1	AssetLifecycleStateKind	inherited from: Asset
position	0..1	String	inherited from: Asset
purchasePrice	0..1	Money	inherited from: Asset
retiredReason	0..1	RetiredReasonKind	inherited from: Asset
status	0..1	Status	inherited from: Asset
utcNumber	0..1	String	inherited from: Asset
serialNumber	0..1	String	inherited from: Asset
acceptanceTest	0..1	AcceptanceTest	inherited from: Asset
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 413 shows all association ends of AssetContainer with other classes.

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Table 413 – Association ends of Standard::AssetContainer with other classes

mult from	name	mult to	type	description
1..1	AssetDeployment	0..1	AssetDeployment	inherited from: Asset
0..*	PowerSystemResources	0..*	PowerSystemResource	inherited from: Asset
0..*	AssetInfo	0..1	AssetInfo	inherited from: Asset

6.10.2.3 AssetDeployment

Deployment of asset deployment in a power system resource role.

Table 414 shows all attributes of AssetDeployment.

Table 414 – Attributes of Standard::AssetDeployment

name	mult	type	description
deploymentState	0..1	DeploymentStateKind	Current deployment state of asset.
deploymentDate	0..1	DeploymentDate	Dates of asset deployment.
likelihoodOfFailure	0..1	Integer	Likelihood of asset failure on a scale of 1(low) to 100 (high).
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 415 shows all association ends of AssetDeployment with other classes.

Table 415 – Association ends of Standard::AssetDeployment with other classes

mult from	name	mult to	type	description
0..1	Asset	1..1	Asset	Asset in this deployment.

6.10.2.4 (abstract) AssetInfo root class

Set of attributes of an asset, representing typical data-sheet information of a physical device, that can be instantiated and shared in different data exchange contexts:

– as attributes of an asset instance (installed or in stock);
– as attributes of an asset model (product by a manufacturer);
– as attributes of a type asset (generic type of an asset as used in designs/extension planning).

6.10.2.5 (abstract) AssetOrganisationRole

Role an organisation plays with respect to asset.

Table 416 shows all attributes of AssetOrganisationRole.

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Table 416 – Attributes of Standard::AssetOrganisationRole

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 417 shows all association ends of AssetOrganisationRole with other classes.

Table 417 – Association ends of Standard::AssetOrganisationRole with other classes

mult from	name	mult to	type	description
0..*	Organisation	1..1	Organisation	inherited from: OrganisationRole

6.10.2.6 AssetOwner

Owner of the asset.

Table 418 shows all attributes of AssetOwner.

Table 418 – Attributes of Standard::AssetOwner

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 419 shows all association ends of AssetOwner with other classes.

Table 419 – Association ends of Standard::AssetOwner with other classes

mult from	name	mult to	type	description
0..*	Organisation	1..1	Organisation	inherited from: OrganisationRole

6.10.2.7 AssetUser

Organisation that is a user of the asset.

Table 420 shows all attributes of AssetUser.

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Table 420 – Attributes of Standard::AssetUser

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 421 shows all association ends of AssetUser with other classes.

Table 421 – Association ends of Standard::AssetUser with other classes

mult from	name	mult to	type	description
0..*	Organisation	1..1	Organisation	inherited from: OrganisationRole

6.10.2.8 (abstract) IdentifiedObject root class

This is a root class to provide common identification for all classes needing identification and naming attributes

Table 422 shows all attributes of IdentifiedObject.

Table 422 – Attributes of Standard::IdentifiedObject

name	mult	type	description
name	1..1	String	The name is any free human readable and possibly non unique text naming the object.
aliasName	0..1	String	The aliasName is free text human readable name of the object alternative to IdentifiedObject.name. It may be non unique and may not correlate to a naming hierarchy. The attribute aliasName is retained because of backwards compatibility between CIM relases. It is however recommended to replace aliasName with the Name class as aliasName is planned for retirement at a future time.
description	0..1	String	The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.
mRID	0..1	String	Master resource identifier issued by a model authority. The mRID is globally unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended. For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.

6.10.2.9 Organisation

Organisation that might have roles as utility, contractor, supplier, manufacturer, customer, etc.

Table 423 shows all attributes of Organisation.

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Table 423 – Attributes of Standard::Organisation

name	mult	type	description
electronicAddress	0..1	ElectronicAddress	Electronic address.
phone1	0..1	TelephoneNumber	Phone number.
phone2	0..1	TelephoneNumber	Additional phone number.
postalAddress	0..1	StreetAddress	Postal address, potentially different than 'streetAddress' (e.g. another city).
streetAddress	0..1	StreetAddress	Street address.
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.10.2.10 (abstract) OrganisationRole

Identifies a way in which an organisation may participate in the utility enterprise (e.g. customer, manufacturer, etc).

Table 424 shows all attributes of OrganisationRole.

Table 424 – Attributes of Standard::OrganisationRole

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 425 shows all association ends of OrganisationRole with other classes.

Table 425 – Association ends of Standard::OrganisationRole with other classes

mult from	name	mult to	type	description
0..*	Organisation	1..1	Organisation	Organisation having this role.

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6.10.2.11 Ownership

Ownership of e.g. asset.

Table 426 shows all attributes of Ownership.

Table 426 – Attributes of Standard::Ownership

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 427 shows all association ends of Ownership with other classes.

Table 427 – Association ends of Standard::Ownership with other classes

mult from	name	mult to	type	description
0..*	Asset	0..1	Asset	Asset that is object of this ownership.
0..*	AssetOwner	0..1	AssetOwner	Asset owner that is subject in this ownership.

6.10.2.12 (abstract) PowerSystemResource root class

A power system resource can be an item of equipment such as a Switch, an EquipmentContainer containing many individual items of equipment such as a Substation, or an organisational entity such as Company or SubControlArea. This provides for the nesting of collections of PowerSystemResources within other PowerSystemResources. For example, a Switch could be a member of a Substation and a Substation could be a member of a division of a Company.

Table 428 shows all association ends of PowerSystemResource with other classes.

Table 428 – Association ends of Standard::PowerSystemResource with other classes

mult from	name	mul t to	type	description
0..*	OperationOrganisationRole	0..1	OperationOrganisationRole	
0..*	Concessionaire	0..1	Concessionaire	

6.10.2.13 Structure

Construction holding assets such as conductors, transformers, switchgear, etc. Where applicable, number of conductors can be derived from the number of associated wire spacing instances.

Table 429 shows all attributes of Structure.

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Table 429 – Attributes of Standard::Structure

name	mult	type	description
height	0..1	Length	Visible height of structure above ground level for overhead construction (e.g. Pole or Tower) or below ground level for an underground vault, manhole, etc. Refer to associated DimensionPropertiesInfo for other types of dimensions.
materialKind	0..1	StructureMaterialKind	Material this structure is made of.
type	0..1	String	inherited from: Asset
lotNumber	0..1	String	inherited from: Asset
lifecycleDate	0..1	LifecycleDate	inherited from: Asset
baselineCondition	0..1	String	inherited from: Asset
baselineLossOfLife	0..1	PerCent	inherited from: Asset
critical	0..1	Boolean	inherited from: Asset
electronicAddress	0..1	ElectronicAddress	inherited from: Asset
inUseDate	0..1	InUseDate	inherited from: Asset
inUseState	0..1	InUseStateKind	inherited from: Asset
kind	0..1	AssetKind	inherited from: Asset
lifecycleState	0..1	AssetLifecycleStateKind	inherited from: Asset
position	0..1	String	inherited from: Asset
purchasePrice	0..1	Money	inherited from: Asset
retiredReason	0..1	RetiredReasonKind	inherited from: Asset
status	0..1	Status	inherited from: Asset
utcNumber	0..1	String	inherited from: Asset
serialNumber	0..1	String	inherited from: Asset
acceptanceTest	0..1	AcceptanceTest	inherited from: Asset
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 430 shows all association ends of Structure with other classes.

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Table 430 – Association ends of Standard::Structure with other classes

mult from	name	mult to	type	description
1..1	AssetDeployment	0..1	AssetDeployment	inherited from: Asset
0..*	PowerSystemResources	0..*	PowerSystemResource	inherited from: Asset
0..*	AssetInfo	0..1	AssetInfo	inherited from: Asset

6.10.2.14 StructureSupport

Support for structure assets.

Table 431 shows all attributes of StructureSupport.

Table 431 – Attributes of Standard::StructureSupport

name	mult	type	description
anchorKind	0..1	AnchorKind	(if anchor) Kind of anchor.
anchorRodCount	0..1	Integer	(if anchor) Number of rods used.
anchorRodLength	0..1	Length	(if anchor) Length of rod used.
direction	0..1	AngleDegrees	Direction of this support structure.
length	0..1	Length	Length of this support structure.
size	0..1	String	Size of this support structure.
supportkind	1..1	StructureSupportKind	
type	0..1	String	inherited from: Asset
lotNumber	0..1	String	inherited from: Asset
lifecycleDate	0..1	LifecycleDate	inherited from: Asset
baselineCondition	0..1	String	inherited from: Asset
baselineLossOfLife	0..1	PerCent	inherited from: Asset
critical	0..1	Boolean	inherited from: Asset
electronicAddress	0..1	ElectronicAddress	inherited from: Asset
inUseDate	0..1	InUseDate	inherited from: Asset
inUseState	0..1	InUseStateKind	inherited from: Asset
kind	0..1	AssetKind	inherited from: Asset
lifecycleState	0..1	AssetLifecycleStateKind	inherited from: Asset
position	0..1	String	inherited from: Asset
purchasePrice	0..1	Money	inherited from: Asset
retiredReason	0..1	RetiredReasonKind	inherited from: Asset
status	0..1	Status	inherited from: Asset
utcNumber	0..1	String	inherited from: Asset
serialNumber	0..1	String	inherited from: Asset
acceptanceTest	0..1	AcceptanceTest	inherited from: Asset
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

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Table 432 shows all association ends of StructureSupport with other classes.

Table 432 – Association ends of Standard::StructureSupport with other classes

mult from	name	mult to	type	description
0..*	SecuredStructure	0..1	Structure	
1..1	AssetDeployment	0..1	AssetDeployment	inherited from: Asset
0..*	PowerSystemResources	0..*	PowerSystemResource	inherited from: Asset
0..*	AssetInfo	0..1	AssetInfo	inherited from: Asset

6.11 Package AssetCatalog

6.11.1 General

See Figure 46 to Figure 51.

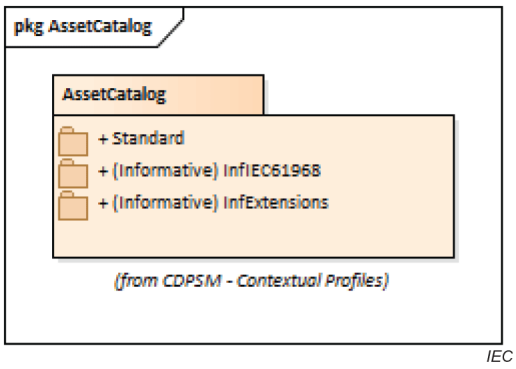

Figure 46 – Package diagram AssetCatalog::AssetCatalog

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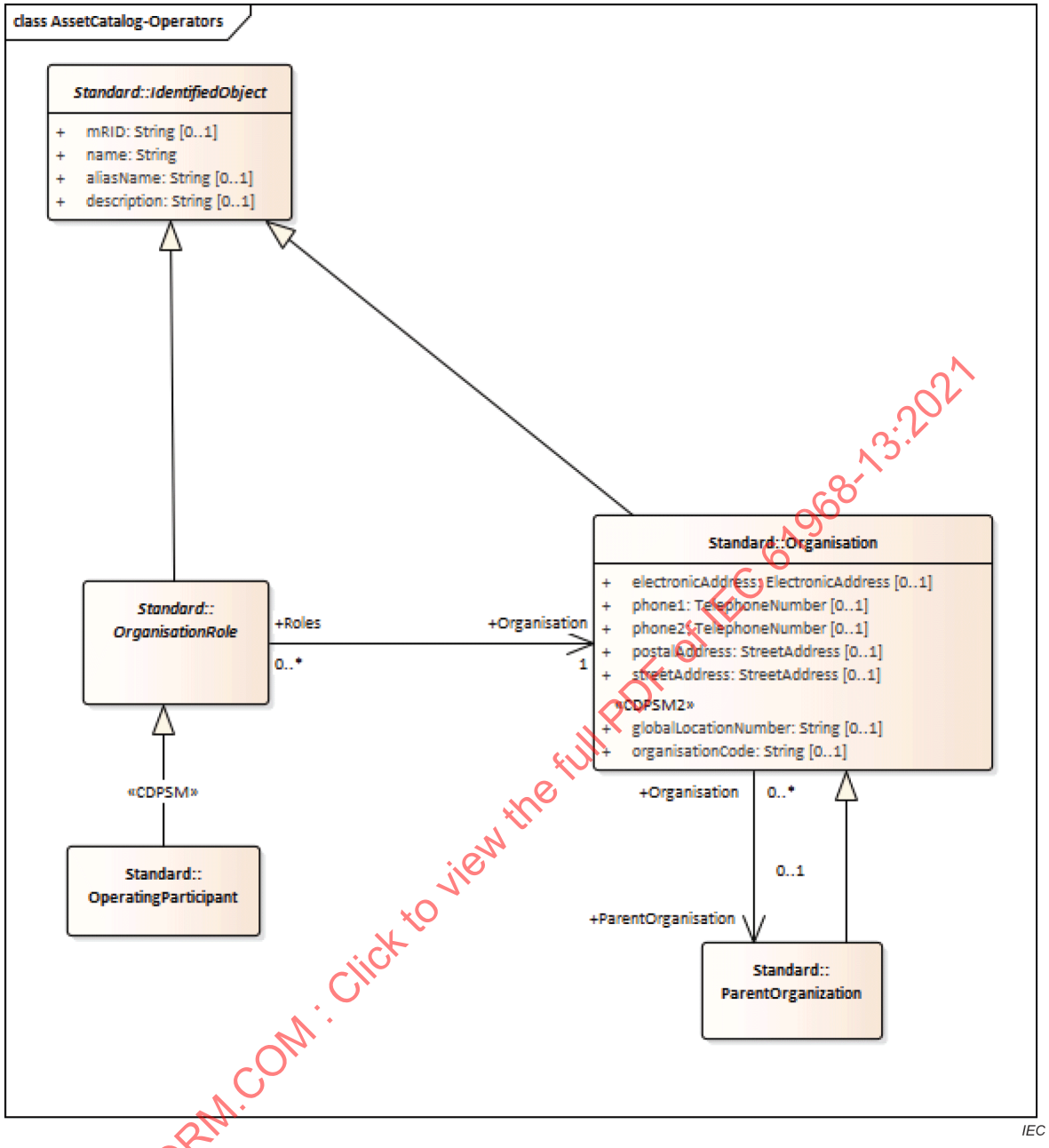

Figure 47 – Class diagram AssetCatalog::AssetCatalog-Operators

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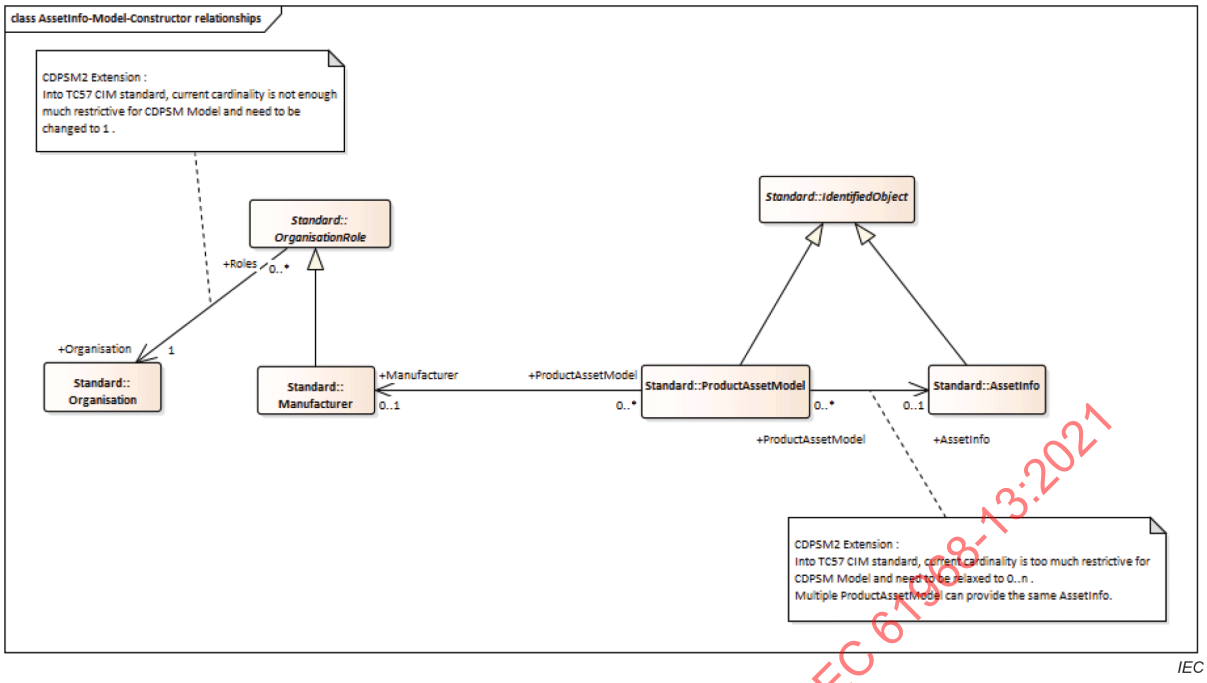

Figure 48 – Class diagram AssetCatalog::AssetInfo-Model-Constructor relationships

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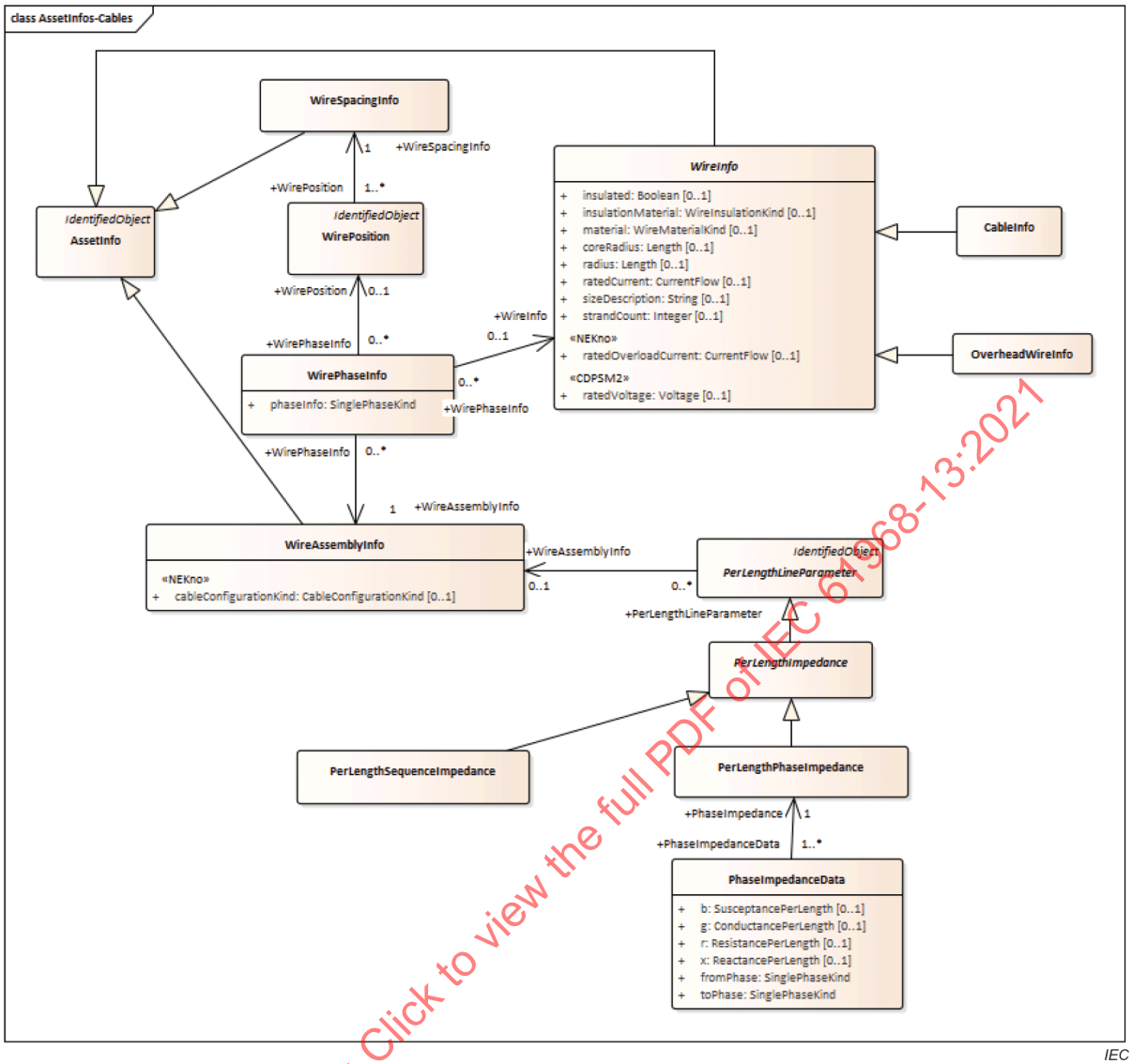

Figure 49 – Class diagram AssetCatalog::AssetInfos-Cables

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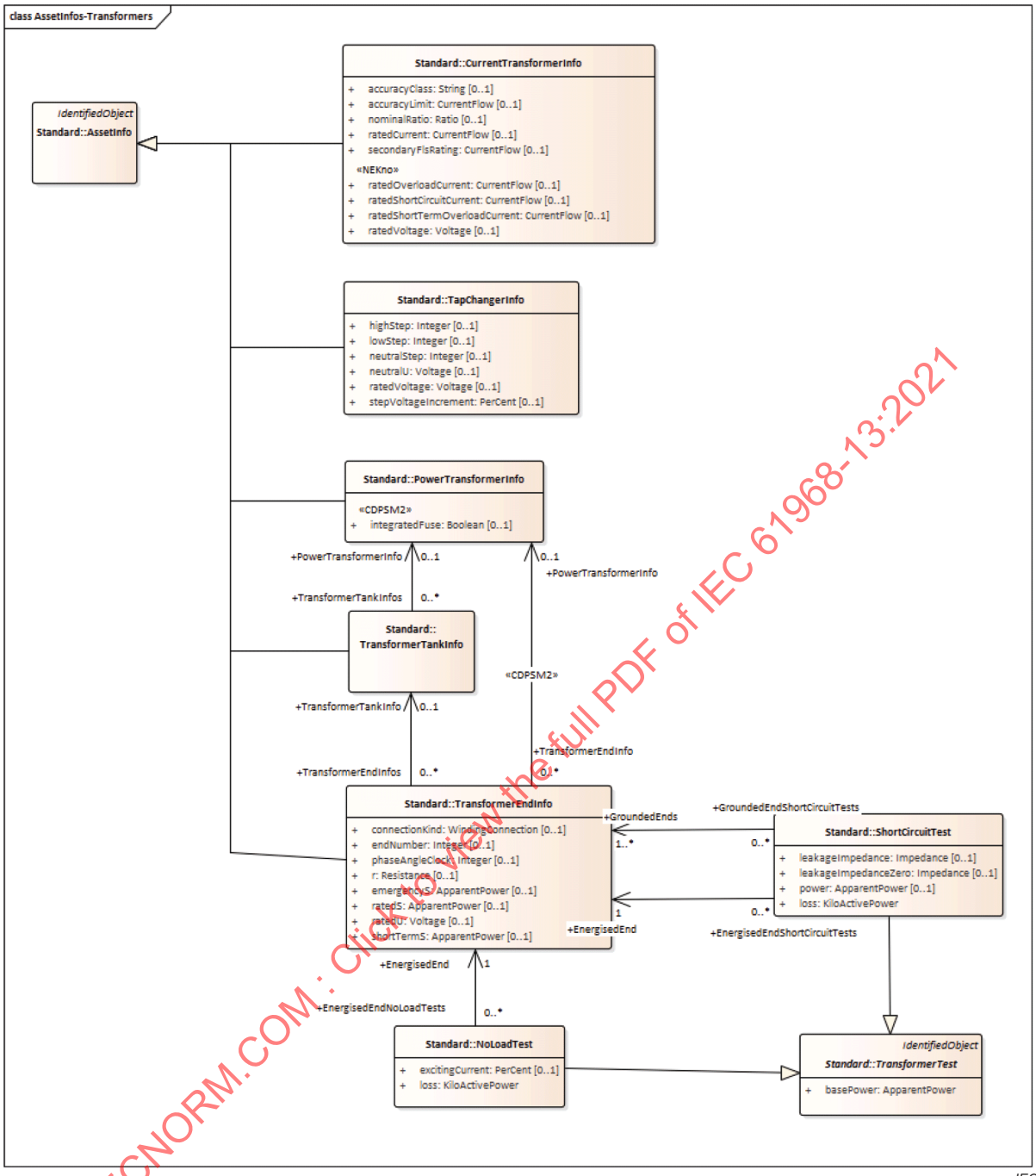

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Figure 50 – Class diagram AssetCatalog::AssetInfos-Transformers

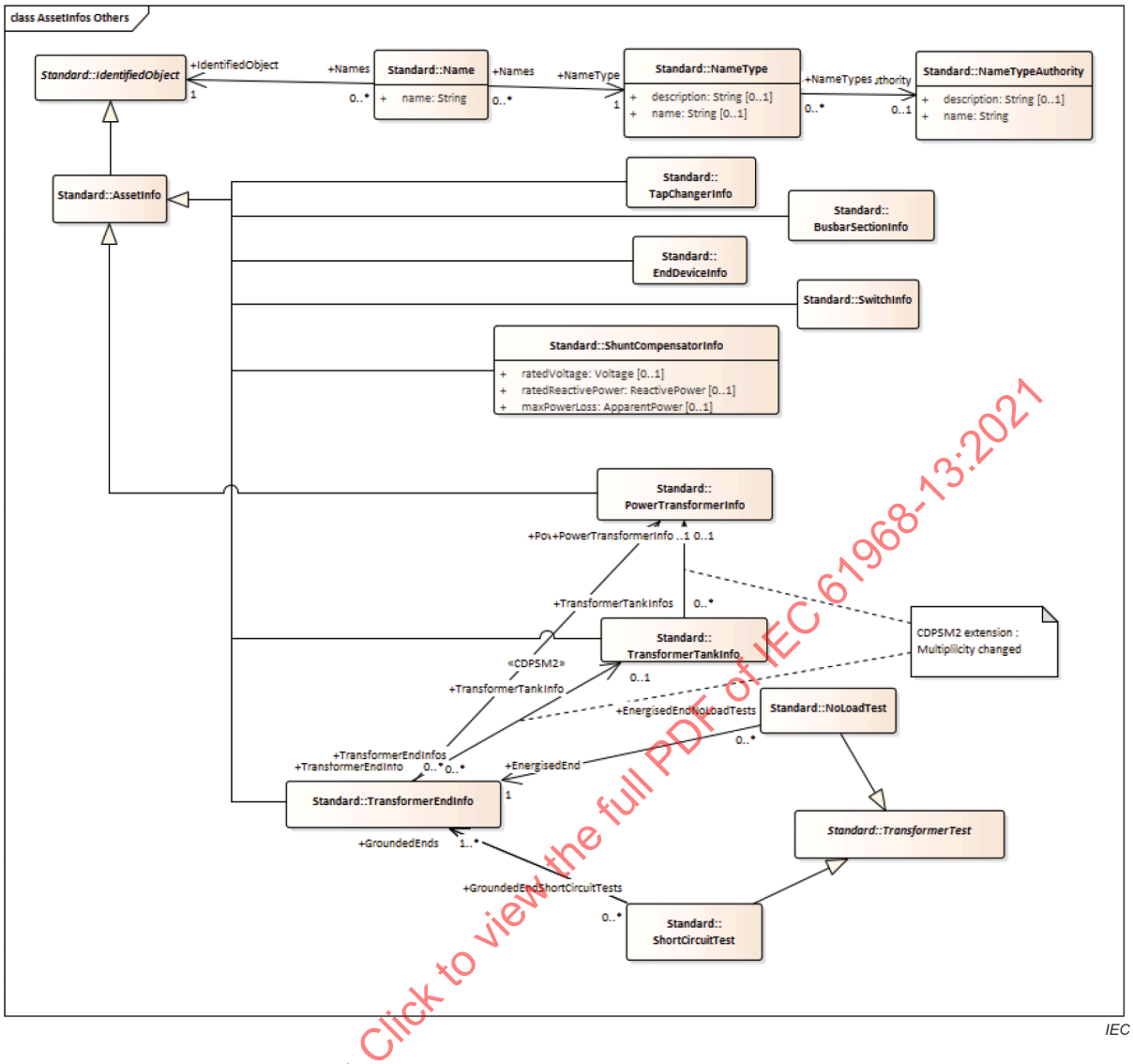

Figure 51 – Class diagram AssetCatalog::AssetInfos Others

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6.11.2 Package Standard

6.11.2.1 AssetInfo

Set of attributes of an asset, representing typical data-sheet information of a physical device, that can be instantiated and shared in different data exchange contexts:

– as attributes of an asset instance (installed or in stock);

– as attributes of an asset model (product by a manufacturer);

– as attributes of a type asset (generic type of an asset as used in designs/extension planning).

Table 433 shows all attributes of AssetInfo.

Table 433 – Attributes of Standard::AssetInfo

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.11.2.2 BusbarSectionInfo

Busbar section data.

Table 434 shows all attributes of BusbarSectionInfo.

Table 434 – Attributes of Standard::BusbarSectionInfo

name	mult	type	description
ratedVoltage	1..1	Voltage	Rated voltage.
ratedCurrent	1..1	CurrentFlow	Rated current.
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.11.2.3 CableInfo

Cable data.

Table 435 shows all attributes of CableInfo.

Table 435 – Attributes of Standard::CableInfo

name	mult	type	description
constructionKind	0..1	CableConstructionKind	Kind of construction of this cable.
nominalTemperature	0..1	Temperature	Maximum nominal design operating temperature.
insulated	0..1	Boolean	inherited from: WireInfo
insulationMaterial	0..1	WireInsulationKind	inherited from: WireInfo
material	0..1	WireMaterialKind	inherited from: WireInfo
coreRadius	0..1	Length	inherited from: WireInfo
radius	0..1	Length	inherited from: WireInfo
ratedCurrent	0..1	CurrentFlow	inherited from: WireInfo
sizeDescription	0..1	String	inherited from: WireInfo
strandCount	0..1	Integer	inherited from: WireInfo
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

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6.11.2.4 CatalogAssetType

Assets that may be used for planning, work or design purposes.

Table 436 shows all attributes of CatalogAssetType.

Table 436 – Attributes of Standard::CatalogAssetType

name	mult	type	description
type	0..1	String	
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 437 shows all association ends of CatalogAssetType with other classes.

Table 437 – Association ends of Standard::CatalogAssetType with other classes

mult from	name	mult to	type	description
0..*	TypeAssetCatalogue	0..1	TypeAssetCatalogue	
0..1	AssetInfo	1..1	AssetInfo	

6.11.2.5 CurrentTransformerInfo

Properties of current transformer asset.

Table 438 shows all attributes of CurrentTransformerInfo.

Table 438 – Attributes of Standard::CurrentTransformerInfo

name	mult	type	description
accuracyClass	0..1	String	CT accuracy classification.
accuracyLimit	0..1	CurrentFlow	Accuracy limit.
nominalRatio	0..1	Ratio	Nominal ratio between the primary and secondary current; i.e. 100:5.
ratedCurrent	0..1	CurrentFlow	Rated current on the primary side.
secondaryFlsRating	0..1	CurrentFlow	Full load secondary (FLS) rating for secondary winding.
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.11.2.6 EndDeviceInfo

End device data.

Table 439 shows all attributes of EndDeviceInfo.

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Table 439 – Attributes of Standard::EndDeviceInfo

name	mult	type	description
ratedVoltage	1..1	Voltage	Rated voltage.
phaseCount	1..1	Integer	Number of potential phases the end device supports, typically 0, 1 or 3.
ratedCurrent	1..1	CurrentFlow	Rated current.
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.11.2.7 (abstract) IdentifiedObject root class

This is a root class to provide common identification for all classes needing identification and naming attributes.

Table 440 shows all attributes of IdentifiedObject.

Table 440 – Attributes of Standard::IdentifiedObject

name	mult	type	description
name	1..1	String	The name is any free human readable and possibly non unique text naming the object.
aliasName	0..1	String	The aliasName is free text human readable name of the object alternative to IdentifiedObject.name. It may be non unique and may not correlate to a naming hierarchy. The attribute aliasName is retained because of backwards compatibility between CIM relases. It is however recommended to replace aliasName with the Name class as aliasName is planned for retirement at a future time.
description	0..1	String	The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.
mRID	0..1	String	Master resource identifier issued by a model authority. The mRID is globally unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended. For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.

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6.11.2.8 Manufacturer

Organisation that manufactures asset products.

Table 441 shows all attributes of Manufacturer.

Table 441 – Attributes of Standard::Manufacturer

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 442 shows all association ends of Manufacturer with other classes.

Table 442 – Association ends of Standard::Manufacturer with other classes

mult from	name	mult to	type	description
0..*	Organisation	1..1	Organisation	inherited from: OrganisationRole

6.11.2.9 Name root class

The Name class provides the means to define any number of human readable names for an object. A name is not to be used for defining inter-object relationships. For inter-object relationships, instead use the object identification 'mRID'.

Table 443 shows all attributes of Name.

Table 443 – Attributes of Standard::Name

name	mult	type	description
name	1..1	String	Any free text that name the object.

Table 444 shows all association ends of Name with other classes.

Table 444 – Association ends of Standard::Name with other classes

mult from	name	mult to	type	description
0..*	NameType	1..1	NameType	Type of this name.
0..*	IdentifiedObject	1..1	IdentifiedObject	Identified object that this name designates.

6.11.2.10 NameType root class

Type of name. Possible values for attribute 'name' are implementation dependent but standard profiles may specify types. An enterprise may have multiple IT systems each having its own local name for the same object, e.g. a planning system may have different names from an EMS. An object may also have different names within the same IT system, e.g. localName and aliasName as defined in CIM version 14. Their definitions from CIM14 are

The localName is a human readable name of the object. It is only used with objects organized in a naming hierarchy. localName: A free text name local to a node in a naming hierarchy similar to a file directory structure. A power system related naming hierarchy may be: Substation, VoltageLevel, Equipment, etc. Children of the same parent in such a hierarchy have names that typically are unique among them.

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aliasName: A free text alternate name typically used in tabular reports where the column width is limited.

Table 445 shows all attributes of NameType.

Table 445 – Attributes of Standard::NameType

name	mult	type	description
description	0..1	String	Description of the name type.
name	0..1	String	Name of the name type.

Table 446 shows all association ends of NameType with other classes.

Table 446 – Association ends of Standard::NameType with other classes

mult from	name	mult to	type	description
0..*	NameTypeAuthority	0..1	NameTypeAuthority	Authority responsible for managing names of this type.

6.11.2.11 NameTypeAuthority root class

Authority responsible for creation and management of names of a given type; typically an organization or an enterprise system.

Table 447 shows all attributes of NameTypeAuthority.

Table 447 – Attributes of Standard::NameTypeAuthority

name	mult	type	description
description	0..1	String	Description of the name type authority.
name	1..1	String	Name of the name type authority.

6.11.2.12 NoLoadTest

No-load test results determine core admittance parameters. They include exciting current and core loss measurements from applying voltage to one winding. The excitation may be positive sequence or zero sequence. The test may be repeated at different voltages to measure saturation.

Table 448 shows all attributes of NoLoadTest.

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Table 448 – Attributes of Standard::NoLoadTest

name	mult	type	description
excitingCurrent	0..1	PerCent	Exciting current measured from a positive-sequence or single-phase excitation test.
loss	1..1	KiloActivePower	Losses measured from a positive-sequence or single-phase excitation test.
basePower	1..1	ApparentPower	inherited from: TransformerTest
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 449 shows all association ends of NoLoadTest with other classes.

Table 449 – Association ends of Standard::NoLoadTest with other classes

mult from	name	mult to	type	description
0..*	EnergisedEnd	1..1	TransformerEndInfo	Transformer end that current is applied to in this no-load test.

6.11.2.13 OperatingParticipant

An operator of multiple power system resource objects. Note multple operating participants may operate the same power system resource object. This can be used for modeling jointly owned units where each owner operates as a contractual share.

Table 450 shows all attributes of OperatingParticipant.

Table 450 – Attributes of Standard::OperatingParticipant

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 451 shows all association ends of OperatingParticipant with other classes.

Table 451 – Association ends of Standard::OperatingParticipant with other classes

mult from	name	mult to	type	description
0..*	Organisation	1..1	Organisation	inherited from: OrganisationRole

6.11.2.14 Organisation

Organisation that might have roles as utility, contractor, supplier, manufacturer, customer, etc.

Table 452 shows all attributes of Organisation.

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Table 452 – Attributes of Standard::Organisation

name	mult	type	description
electronicAddress	0..1	ElectronicAddress	Electronic address.
phone1	0..1	TelephoneNumber	Phone number.
phone2	0..1	TelephoneNumber	Additional phone number.
postalAddress	0..1	StreetAddress	Postal address, potentially different than 'streetAddress' (e.g. another city).
streetAddress	0..1	StreetAddress	Street address.
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 453 shows all association ends of Organisation with other classes.

Table 453 – Association ends of Standard::Organisation with other classes

mult from	name	mult to	type	description
0..*	ParentOrganisation	0..1	ParentOrganization	Parent organisation of this organisation.

6.11.2.15 (abstract) OrganisationRole

Identifies a way in which an organisation may participate in the utility enterprise (e.g. customer, manufacturer, etc).

Table 454 shows all attributes of OrganisationRole.

Table 454 – Attributes of Standard::OrganisationRole

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 455 shows all association ends of OrganisationRole with other classes.

Table 455 – Association ends of Standard::OrganisationRole with other classes

mult from	name	mult to	type	description
0..*	Organisation	1..1	Organisation	Organisation having this role.

6.11.2.16 OverheadWireInfo

Overhead wire data.

Table 456 shows all attributes of OverheadWireInfo.

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Table 456 – Attributes of Standard::OverheadWireInfo

name	mult	type	description
insulated	0..1	Boolean	inherited from: WireInfo
insulationMaterial	0..1	WireInsulationKind	inherited from: WireInfo
material	0..1	WireMaterialKind	inherited from: WireInfo
coreRadius	0..1	Length	inherited from: WireInfo
radius	0..1	Length	inherited from: WireInfo
ratedCurrent	0..1	CurrentFlow	inherited from: WireInfo
sizeDescription	0..1	String	inherited from: WireInfo
strandCount	0..1	Integer	inherited from: WireInfo
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.11.2.17 ParentOrganization

Table 457 shows all attributes of ParentOrganization.

Table 457 – Attributes of Standard::ParentOrganization

name	mult	type	description
electronicAddress	0..1	ElectronicAddress	inherited from: Organisation
phone1	0..1	TelephoneNumber	inherited from: Organisation
phone2	0..1	TelephoneNumber	inherited from: Organisation
postalAddress	0..1	StreetAddress	inherited from: Organisation
streetAddress	0..1	StreetAddress	inherited from: Organisation
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 458 shows all association ends of ParentOrganization with other classes.

Table 458 – Association ends of Standard::ParentOrganization with other classes

mult from	name	mult to	type	description
0..*	ParentOrganisation	0..1	ParentOrganization	inherited from: Organisation

6.11.2.18 (abstract) PerLengthImpedance

Common type for per-length impedance electrical catalogues.

Table 459 shows all attributes of PerLengthImpedance.

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Table 459 – Attributes of Standard::PerLengthImpedance

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 460 shows all association ends of PerLengthImpedance with other classes.

Table 460 – Association ends of Standard::PerLengthImpedance with other classes

mult from	name	mult to	type	description
0..*	WireAssemblyInfo	0..1	WireAssemblyInfo	inherited from: PerLengthLineParameter

6.11.2.19 (abstract) PerLengthLineParameter

Common type for per-length electrical catalogues describing line parameters.

Table 461 shows all attributes of PerLengthLineParameter.

Table 461 – Attributes of Standard::PerLengthLineParameter

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 462 shows all association ends of PerLengthLineParameter with other classes.

Table 462 – Association ends of Standard::PerLengthLineParameter with other classes

mult from	name	mult to	type	description
0..*	WireAssemblyInfo	0..1	WireAssemblyInfo	

6.11.2.20 PerLengthPhaseImpedance

Impedance and admittance parameters per unit length for n-wire unbalanced lines, in matrix form.

Table 463 shows all attributes of PerLengthPhaseImpedance.

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Table 463 – Attributes of Standard::PerLengthPhaseImpedance

name	mult	type	description
conductorCount	0..1	Integer	Number of phase, neutral, and other wires retained. Constrains the number of matrix elements and the phase codes that can be used with this matrix.
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 464 shows all association ends of PerLengthPhaseImpedance with other classes.

Table 464 – Association ends of Standard::PerLengthPhaseImpedance with other classes

mult from	name	mult to	type	description
0..*	WireAssemblyInfo	0..1	WireAssemblyInfo	inherited from: PerLengthLineParameter

6.11.2.21 PerLengthSequenceImpedance

Sequence impedance and admittance parameters per unit length, for transposed lines of 1, 2, or 3 phases. For 1-phase lines, define x=x0=xself. For 2-phase lines, define x=xs-xm and x0=xs+xm.

Table 465 shows all attributes of PerLengthSequenceImpedance.

Table 465 – Attributes of Standard::PerLengthSequenceImpedance

name	mult	type	description
x0	0..1	ReactancePerLength	Zero sequence series reactance, per unit of length.
b0ch	0..1	SusceptancePerLength	Zero sequence shunt (charging) susceptance, per unit of length.
bch	1..1	SusceptancePerLength	Positive sequence shunt (charging) susceptance, per unit of length.
g0ch	0..1	ConductancePerLength	Zero sequence shunt (charging) conductance, per unit of length.
gch	0..1	ConductancePerLength	Positive sequence shunt (charging) conductance, per unit of length.
r	1..1	ResistancePerLength	Positive sequence series resistance, per unit of length.
r0	0..1	ResistancePerLength	Zero sequence series resistance, per unit of length.
x	1..1	ReactancePerLength	Positive sequence series reactance, per unit of length.
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

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Table 466 shows all association ends of PerLengthSequenceImpedance with other classes.

Table 466 – Association ends of Standard::PerLengthSequenceImpedance with other classes

mult from	name	mult to	type	description
0..*	WireAssemblyInfo	0..1	WireAssemblyInfo	inherited from: PerLengthLineParameter

6.11.2.22 PhaseImpedanceData root class

Triplet of resistance, reactance, and susceptance matrix element values.

Table 467 shows all attributes of PhaseImpedanceData.

Table 467 – Attributes of Standard::PhaseImpedanceData

name	mult	type	description
b	0..1	SusceptancePerLength	Susceptance matrix element value, per length of unit.
g	0..1	ConductancePerLength	Conductance matrix element value, per length of unit.
r	0..1	ResistancePerLength	Resistance matrix element value, per length of unit.
x	0..1	ReactancePerLength	Reactance matrix element value, per length of unit.
fromPhase	1..1	SinglePhaseKind	Refer to the class description.
toPhase	1..1	SinglePhaseKind	Refer to the class description.

Table 468 shows all association ends of PhaseImpedanceData with other classes.

Table 468 – Association ends of Standard::PhaseImpedanceData with other classes

mult from	name	mult to	type	description
1..*	PhaseImpedance	1..1	PerLengthPhaseImpedance	Conductor phase impedance to which this data belongs.

6.11.2.23 PowerTransformerInfo

Set of power transformer data, from an equipment library.

Table 469 shows all attributes of PowerTransformerInfo.

Table 469 – Attributes of Standard::PowerTransformerInfo

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

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6.11.2.24 ProductAssetModel

Asset model by a specific manufacturer.

Table 470 shows all attributes of ProductAssetModel.

Table 470 – Attributes of Standard::ProductAssetModel

name	mult	type	description
usageKind	0..1	AssetModelUsageKind	Intended usage for this asset model.
modelNumber	0..1	String	Manufacturer's model number.
modelVersion	0..1	String	Version number for product model, which indicates vintage of the product.
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 471 shows all association ends of ProductAssetModel with other classes.

Table 471 – Association ends of Standard::ProductAssetModel with other classes

mult from	name	mult to	type	description
0..*	AssetInfo	0..1	AssetInfo	
0..*	Manufacturer	0..1	Manufacturer	Manufacturer of this asset model.

6.11.2.25 ShortCircuitTest

Short-circuit test results determine mesh impedance parameters. They include load losses and leakage impedances. For three-phase windings, the excitation can be positive sequence (the default) or zero sequence. There must be at least one grounded winding.

Table 472 shows all attributes of ShortCircuitTest.

Table 472 – Attributes of Standard::ShortCircuitTest

name	mult	type	description
leakageImpedance	0..1	Impedance	Leakage impedance measured from a positive-sequence or single-phase short-circuit test.
leakageImpedanceZero	0..1	Impedance	Leakage impedance measured from a zero-sequence short-circuit test.
power	0..1	ApparentPower	Short circuit apparent power.
loss	1..1	KiloActivePower	Load losses from a positive-sequence or single-phase short-circuit test.
basePower	1..1	ApparentPower	inherited from: TransformerTest
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

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Table 473 shows all association ends of ShortCircuitTest with other classes.

Table 473 – Association ends of Standard::ShortCircuitTest with other classes

mult from	name	mult to	type	description
0..*	GroundedEnds	1..*	TransformerEndInfo	All ends short-circuited in this short-circuit test.
0..*	EnergisedEnd	1..1	TransformerEndInfo	Transformer end that voltage is applied to in this short-circuit test. The test voltage is chosen to induce rated current in the energised end.

6.11.2.26 ShuntCompensatorInfo

Properties of shunt capacitor, shunt reactor or switchable bank of shunt capacitor or reactor assets.

Table 474 shows all attributes of ShuntCompensatorInfo.

Table 474 – Attributes of Standard::ShuntCompensatorInfo

name	mult	type	description
ratedVoltage	0..1	Voltage	Rated voltage.
ratedReactivePower	0..1	ReactivePower	Rated reactive power.
maxPowerLoss	0..1	ApparentPower	Maximum allowed apparent power loss.
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 475 shows all association ends of ShuntCompensatorInfo with other classes.

Table 475 – Association ends of Standard::ShuntCompensatorInfo with other classes

mult from	name	mult to	type	description
1..1	ShuntCompensatorControl	0..1	ShuntCompensatorControl	

6.11.2.27 SwitchInfo

Switch data.

Table 476 shows all attributes of SwitchInfo.

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Table 476 – Attributes of Standard::SwitchInfo

name	mult	type	description
breakingCapacity	1..1	CurrentFlow	The maximum fault current a breaking device can break safely under prescribed conditions of use.
ratedCurrent	1..1	CurrentFlow	Rated current.
ratedVoltage	1..1	Voltage	Rated voltage.
isSinglePhase	0..1	Boolean	If true, it is a single phase switch.
isUnganged	0..1	Boolean	If true, the switch is not ganged (i.e. a switch phase may be operated separately from other phases).
lowPressureAlarm	0..1	Pressure	Gas or air pressure at or below which a low pressure alarm is generated.
lowPressureLockOut	0..1	Pressure	Gas or air pressure below which the breaker will not open.
oilVolumePerTank	0..1	Volume	Volume of oil in each tank of bulk oil breaker.
ratedFrequency	0..1	Frequency	Frequency for which switch is rated.
ratedImpulseWithstandVoltage	0..1	Voltage	Rated impulse withstand voltage, also known as BIL (Basic Impulse Level).
ratedInterruptingTime	0..1	Seconds	Switch rated interrupting time in seconds.
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.11.2.28 TapChangerInfo

Tap changer data.

Table 477 shows all attributes of TapChangerInfo.

Table 477 – Attributes of Standard::TapChangerInfo

name	mult	type	description
highStep	0..1	Integer	Highest possible tap step position, advance from neutral.
lowStep	0..1	Integer	Lowest possible tap step position, retard from neutral.
neutralStep	0..1	Integer	The neutral tap step position for the winding.
neutralU	0..1	Voltage	Voltage at which the winding operates at the neutral tap setting.
ratedVoltage	0..1	Voltage	Rated voltage.
stepVoltageIncrement	0..1	PerCent	Tap step increment, in per cent of rated voltage, per step position.
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

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6.11.2.29 TransformerEndInfo

Transformer end data.

Table 478 shows all attributes of TransformerEndInfo.

Table 478 – Attributes of Standard::TransformerEndInfo

name	mult	type	description
connectionKind	0..1	WindingConnection	Kind of connection.
endNumber	0..1	Integer	Number for this transformer end, corresponding to the end's order in the PowerTransformer.vectorGroup attribute. Highest voltage winding should be 1.
phaseAngleClock	0..1	Integer	Winding phase angle where 360 degrees are represented with clock hours, so the valid values are {0, ..., 11}. For example, to express winding code 'Dyn11', set attributes as follows: 'connectionKind' = Yn and 'phaseAngleClock' = 11.
r	0..1	Resistance	DC resistance.
ratedS	0..1	ApparentPower	Normal apparent power rating.
shortTermS	0..1	ApparentPower	Apparent power that this winding can carry for a short period of time (in emergency).
emergencyS	0..1	ApparentPower	Apparent power that the winding can carry under emergency conditions (also called long-term emergency power).
ratedU	0..1	Voltage	Rated voltage: phase-phase for three-phase windings, and either phase-phase or phase-neutral for single-phase windings.
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 479 shows all association ends of TransformerEndInfo with other classes.

Table 479 – Association ends of Standard::TransformerEndInfo with other classes

mult from	name	mult to	type	description
0..*	PowerTransformerInfo	0..1	PowerTransformerInfo	
0..*	TransformerTankInfo	0..1	TransformerTankInfo	Transformer tank data that this end description is part of.

6.11.2.30 TransformerTankInfo

Set of transformer tank data, from an equipment library.

Table 480 shows all attributes of TransformerTankInfo.

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Table 480 – Attributes of Standard::TransformerTankInfo

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 481 shows all association ends of TransformerTankInfo with other classes.

Table 481 – Association ends of Standard::TransformerTankInfo with other classes

mult from	name	mult to	type	description
0..*	PowerTransformerInfo	0..1	PowerTransformerInfo	Power transformer data that this tank description is part of.

6.11.2.31 (abstract) TransformerTest

Test result for transformer ends, such as short-circuit, open-circuit (excitation) or no-load test.

Table 482 shows all attributes of TransformerTest.

Table 482 – Attributes of Standard::TransformerTest

name	mult	type	description
basePower	1..1	ApparentPower	Base power at which the tests are conducted, usually equal to the rateds of one of the involved transformer ends.
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.11.2.32 WireAssemblyInfo

Table 483 shows all attributes of WireAssemblyInfo.

Table 483 – Attributes of Standard::WireAssemblyInfo

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

6.11.2.33 (abstract) WireInfo

Wire data that can be specified per line segment phase, or for the line segment as a whole in case its phases all have the same wire characteristics.

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Table 484 shows all attributes of WireInfo.

Table 484 – Attributes of Standard::WireInfo

name	mult	type	description
insulated	0..1	Boolean	True if conductor is insulated.
insulationMaterial	0..1	WireInsulationKind	(if insulated conductor) Material used for insulation.
material	0..1	WireMaterialKind	Conductor material.
coreRadius	0..1	Length	(if there is a different core material) Radius of the central core.
radius	0..1	Length	Outside radius of the wire.
ratedCurrent	0..1	CurrentFlow	Current carrying capacity of the wire under stated thermal conditions.
sizeDescription	0..1	String	Describes the wire guage or cross section (e.g. 4/0, #2, 336.5).
strandCount	0..1	Integer	Number of strands in the conductor.
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 485 shows all association ends of WireInfo with other classes.

Table 485 – Association ends of Standard::WireInfo with other classes

mult from	name	mult to	type	description
0..*	WireInfoType	0..1	WireInfoType	

6.11.2.34 WirePhaseInfo root class

Table 486 shows all attributes of WirePhaseInfo.

Table 486 – Attributes of Standard::WirePhaseInfo

name	mult	type	description
phaseInfo	1..1	SinglePhaseKind	

Table 487 shows all association ends of WirePhaseInfo with other classes.

Table 487 – Association ends of Standard::WirePhaseInfo with other classes

mult from	name	mult to	type	description
0..*	WireAssemblyInfo	1..1	WireAssemblyInfo	
0..*	WireEarthInfo	0..1	WireEarthInfo	
0..*	WireInfo	0..1	WireInfo	
0..*	WirePosition	0..1	WirePosition	Wire position with this wire phase information.

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6.11.2.35 WirePosition

Identification, spacing and configuration of the wires of a conductor with respect to a structure.

Table 488 shows all attributes of WirePosition.

Table 488 – Attributes of Standard::WirePosition

name	mult	type	description
xCoord	1..1	Displacement	Signed horizontal distance from the wire at this position to a common reference point.
yCoord	1..1	Displacement	Signed vertical distance from the wire at this position: above ground (positive value) or burial depth below ground (negative value).
sequenceNumber	0..1	Integer	Numbering for wires on a WireSpacingInfo. Neutrals should be numbered last.
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table 489 shows all association ends of WirePosition with other classes.

Table 489 – Association ends of Standard::WirePosition with other classes

mult from	name	mult to	type	description
1..*	WireSpacingInfo	1..1	WireSpacingInfo	Wire spacing data this wire position belongs to.

6.11.2.36 WireSpacingInfo

Wire spacing data that associates multiple wire positions with the line segment, and allows to calculate line segment impedances. Number of phases can be derived from the number of associated wire positions whose phase is not neutral.

Table 490 shows all attributes of WireSpacingInfo.

Table 490 – Attributes of Standard::WireSpacingInfo

name	mult	type	description
usage	1..1	WireUsageKind	
isCable	1..1	Boolean	If true, this spacing data describes a cable.
phaseWireCount	1..1	Integer	Number of wire sub-conductors in the symmetrical bundle (typically between 1 and 4).
phaseWireSpacing	1..1	Length	Distance between wire sub-conductors in a symmetrical bundle.
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

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6.12 Package Customers

6.12.1 General

See Figure 52 and Figure 53.

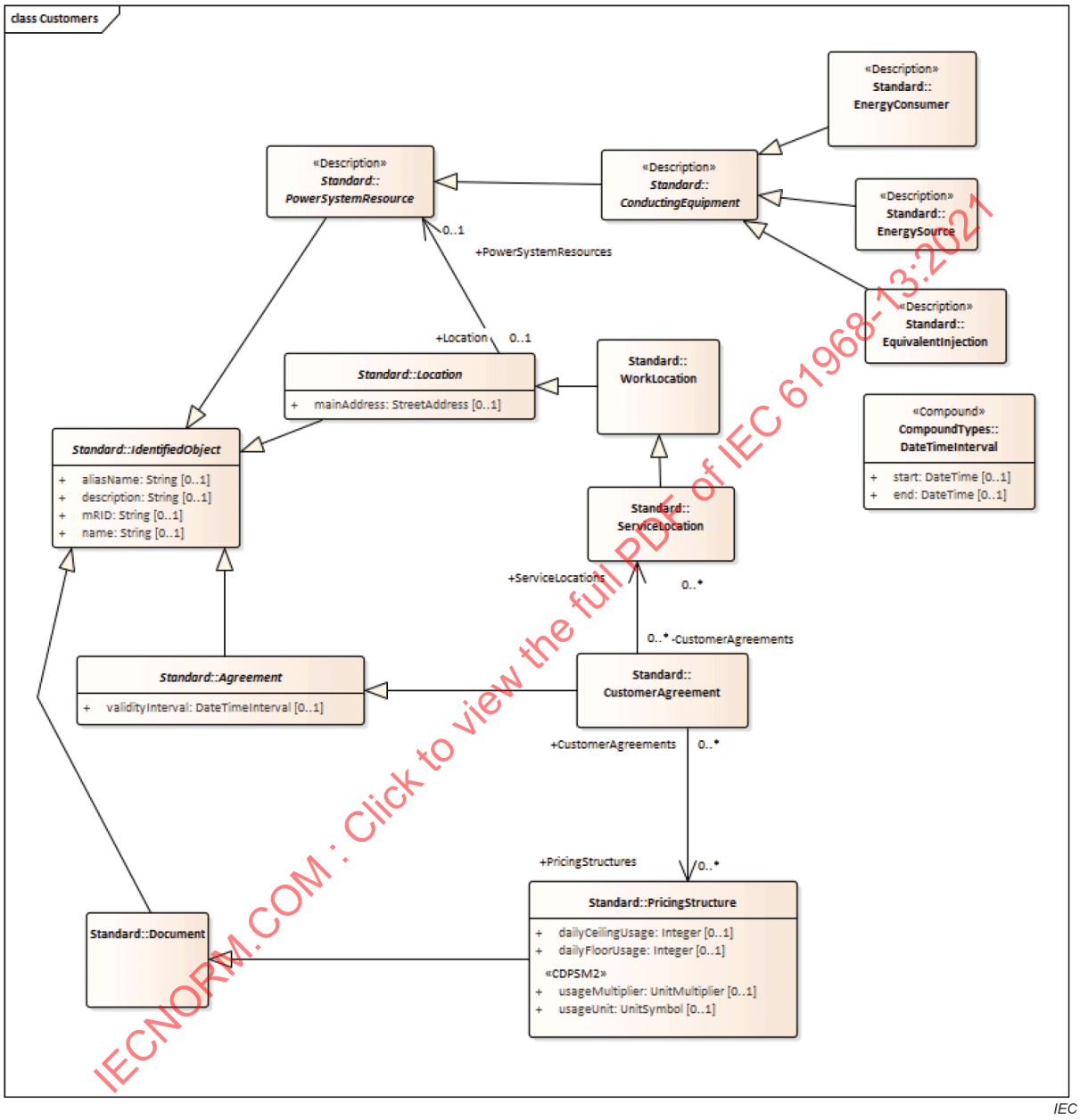

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Figure 52 – Class diagram Customers::Customers

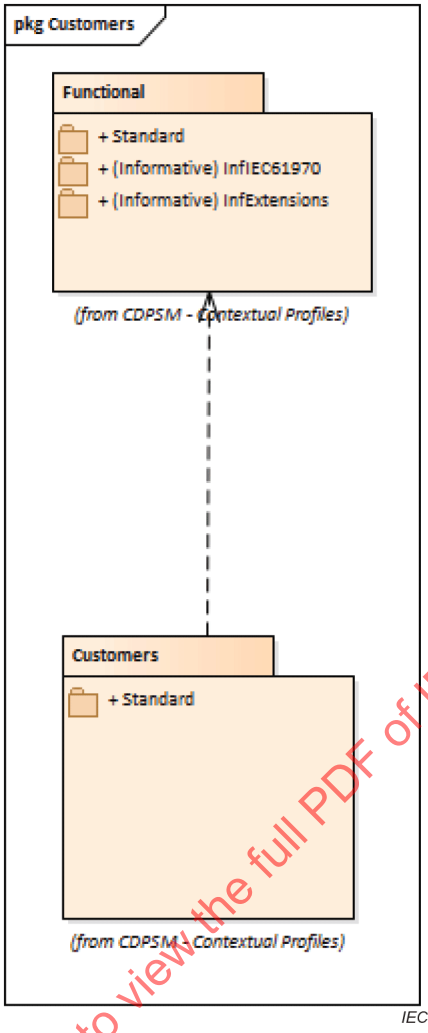

Figure 53 – Package diagram Customers::Customers

6.12.2 Package Standard

6.12.2.1 WorkLocation

Information about a particular location for various forms of work.

Table 491 shows all attributes of WorkLocation.

Table 491 – Attributes of Standard::WorkLocation

name	mult	type	description
mainAddress	0..1	StreetAddress	inherited from: Location
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

Table 492 shows all association ends of WorkLocation with other classes.

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Table 492 – Association ends of Standard::WorkLocation with other classes

mult from	name	mult to	type	description
0..1	PowerSystemResources	0..1	PowerSystemResource	inherited from: Location

6.12.2.2 (abstract) PowerSystemResource

A power system resource can be an item of equipment such as a Switch, an EquipmentContainer containing many individual items of equipment such as a Substation, or an organisational entity such as Company or SubControlArea. This provides for the nesting of collections of PowerSystemResources within other PowerSystemResources. For example, a Switch could be a member of a Substation and a Substation could be a member of a division of a Company.

Table 493 shows all attributes of PowerSystemResource.

Table 493 – Attributes of Standard::PowerSystemResource

name	mult	type	description
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.12.2.3 (abstract) Agreement

Formal agreement between two parties defining the terms and conditions for a set of services. The specifics of the services are, in turn, defined via one or more service agreements.

Table 494 shows all attributes of Agreement.

Table 494 – Attributes of Standard::Agreement

name	mult	type	description
validityInterval	0..1	DateTimeInterval	Date and time interval this agreement is valid (from going into effect to termination).
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.12.2.4 (Description,abstract) ConductingEquipment

The parts of the power system that are designed to carry current or that are conductively connected therewith. ConductingEquipment is contained within an EquipmentContainer that may be a Substation, or a VoltageLevel or a Bay within a Substation.

Table 495 shows all attributes of ConductingEquipment.

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Table 495 – Attributes of Standard::ConductingEquipment

name	mult	type	description
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.12.2.5 CustomerAgreement

Agreement between the customer and the service supplier to pay for service at a specific service location. It records certain billing information about the type of service provided at the service location and is used during charge creation to determine the type of service.

Table 496 shows all attributes of CustomerAgreement.

Table 496 – Attributes of Standard::CustomerAgreement

name	mult	type	description
validityInterval	0..1	DateTimeInterval	inherited from: Agreement
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

Table 497 shows all association ends of CustomerAgreement with other classes.

Table 497 – Association ends of Standard::CustomerAgreement with other classes

mult from	name	mult to	type	description
0..*	PricingStructures	0..*	PricingStructure	All pricing structures applicable to this customer agreement.
0..*	ServiceLocations	0..*	ServiceLocation	All service locations regulated by this customer agreement.

6.12.2.6 (Description) EnergyConsumer

Generic user of energy – a point of consumption on the power system model.

Table 498 shows all attributes of EnergyConsumer.

Table 498 – Attributes of Standard::EnergyConsumer

name	mult	type	description
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

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6.12.2.7 (Description) EnergySource

A generic equivalent for an energy supplier on a transmission or distribution voltage level.

Table 499 shows all attributes of EnergySource.

Table 499 – Attributes of Standard::EnergySource

name	mult	type	description
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.12.2.8 (Description) EquivalentInjection

This class represents equivalent injections (generation or load). Voltage regulation is allowed only at the point of connection.

Table 500 shows all attributes of EquivalentInjection.

Table 500 – Attributes of Standard::EquivalentInjection

name	mult	type	description
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.12.2.9 (abstract) Document

Parent class for different groupings of information collected and managed as a part of a business process. It will frequently contain references to other objects, such as assets, people and power system resources.

Table 501 shows all attributes of Document.

Table 501 – Attributes of Standard::Document

name	mult	type	description
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.12.2.10 (abstract) IdentifiedObject root class

This is a root class to provide common identification for all classes needing identification and naming attributes.

Table 502 shows all attributes of IdentifiedObject.

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Table 502 – Attributes of Standard::IdentifiedObject

name	mult	type	description
aliasName	0..1	String	The aliasName is free text human readable name of the object alternative to IdentifiedObject.name. It may be non unique and may not correlate to a naming hierarchy. The attribute aliasName is retained because of backwards compatibility between CIM relases. It is however recommended to replace aliasName with the Name class as aliasName is planned for retirement at a future time.
description	0..1	String	The description is a free human readable text describing or naming the object. It may be non unique and may not correlate to a naming hierarchy.
mRID	0..1	String	Master resource identifier issued by a model authority. The mRID is globally unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended. For CIMXML data files in RDF syntax conforming to IEC 61970-552 Edition 1, the mRID is mapped to rdf:ID or rdf:about attributes that identify CIM object elements.
name	0..1	String	The name is any free human readable and possibly non unique text naming the object.

6.12.2.11 (abstract) Location

The place, scene, or point of something where someone or something has been, is, and/or will be at a given moment in time. It can be defined with one or more postition points (coordinates) in a given coordinate system.

Table 503 shows all attributes of Location.

Table 503 – Attributes of Standard::Location

name	mult	type	description
mainAddress	0..1	StreetAddress	Main address of the location.
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

Table 504 shows all association ends of Location with other classes.

Table 504 – Association ends of Standard::Location with other classes

mult from	name	mult to	type	description
0..1	PowerSystemResources	0..1	PowerSystemResource	All power system resources at this location.

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6.12.2.12 PricingStructure

Grouping of pricing components and prices used in the creation of customer charges and the eligibility criteria under which these terms may be offered to a customer. The reasons for grouping include state, customer classification, site characteristics, classification (i.e. fee price structure, deposit price structure, electric service price structure, etc.) and accounting requirements.

Table 505 shows all attributes of PricingStructure.

Table 505 – Attributes of Standard::PricingStructure

name	mult	type	description
dailyCeilingUsage	0..1	Integer	Absolute maximum valid non-demand usage quantity used in validating a customer's billed non-demand usage.
dailyFloorUsage	0..1	Integer	Absolute minimum valid non-demand usage quantity used in validating a customer's billed non-demand usage.
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

6.12.2.13 ServiceLocation

A real estate location, commonly referred to as premises.

Table 506 shows all attributes of ServiceLocation.

Table 506 – Attributes of Standard::ServiceLocation

name	mult	type	description
mainAddress	0..1	StreetAddress	inherited from: Location
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject
name	0..1	String	inherited from: IdentifiedObject

Table 507 shows all association ends of ServiceLocation with other classes.

Table 507 – Association ends of Standard::ServiceLocation with other classes

mult from	name	mult to	type	description
0..1	PowerSystemResources	0..1	PowerSystemResource	inherited from: Location

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7 Top package DataTypes

7.1 General

See Figure 54.

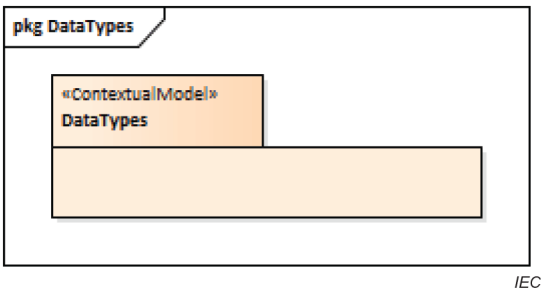

Figure 54 – Package diagram DataTypes::DataTypes

7.2 Package PrimitiveTypes

See Figure 55.

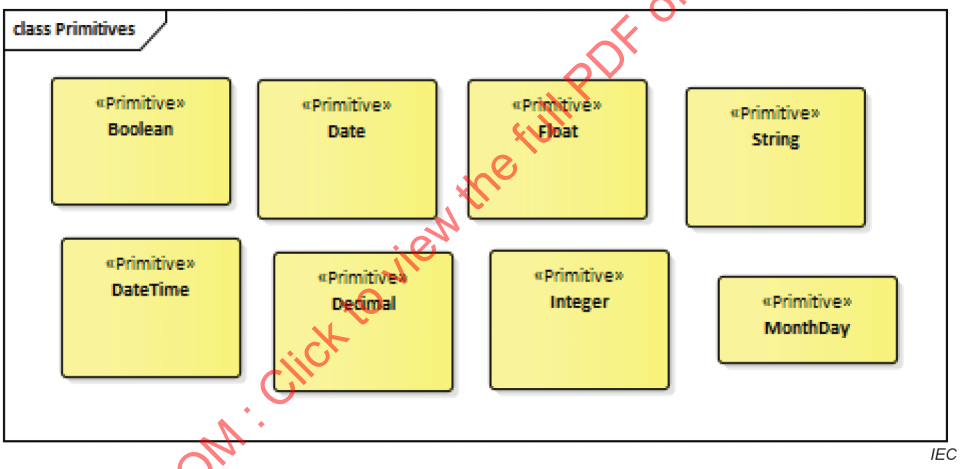

Figure 55 – Class diagram PrimitiveTypes::Primitives

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7.3 Package CIMDataTypes

See Figure 56.

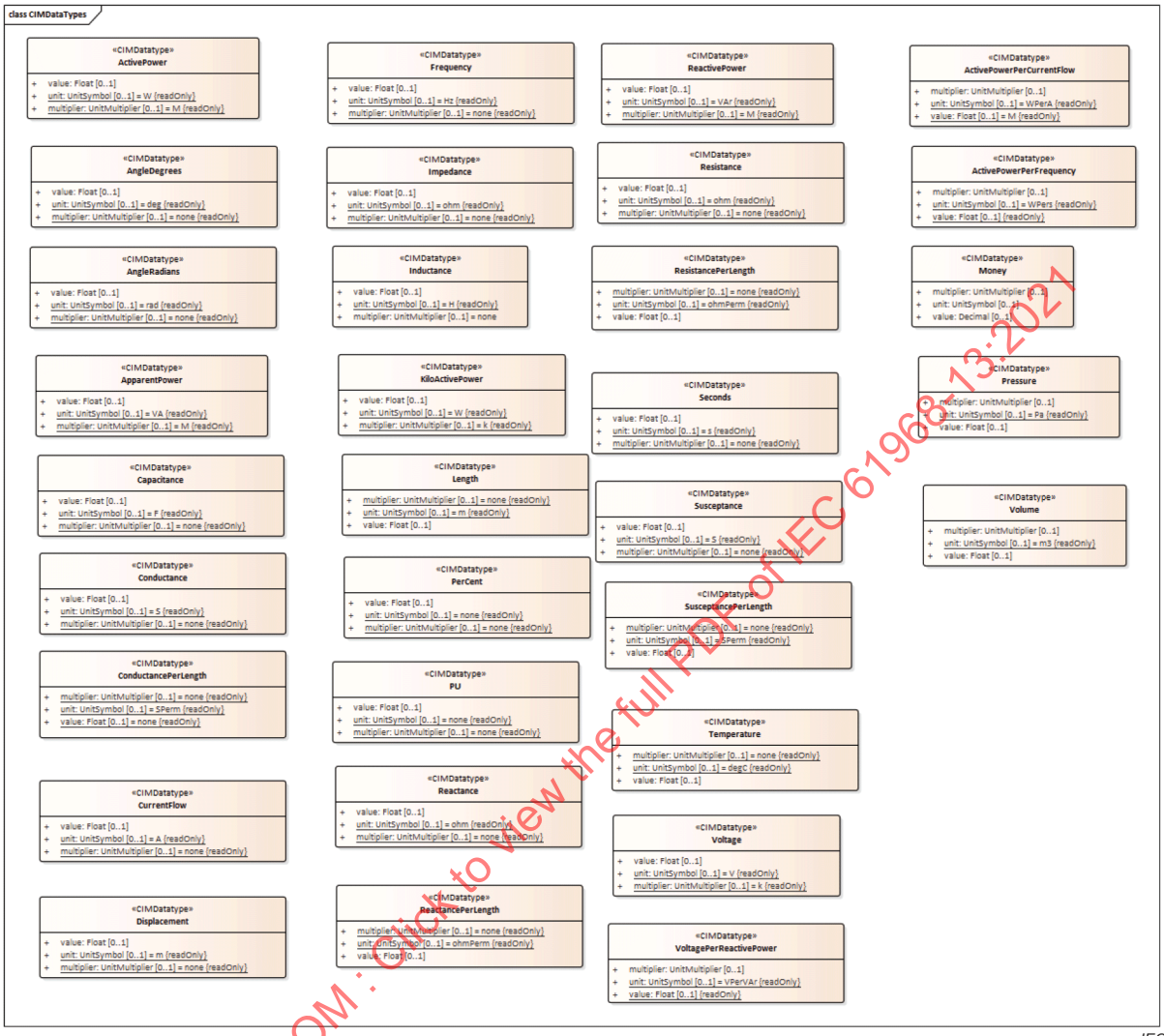

Figure 56 – Class diagram CIMDataTypes::CIMDataTypes

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7.4 Package CIMEnumerations

7.4.1 General

See Figure 57.

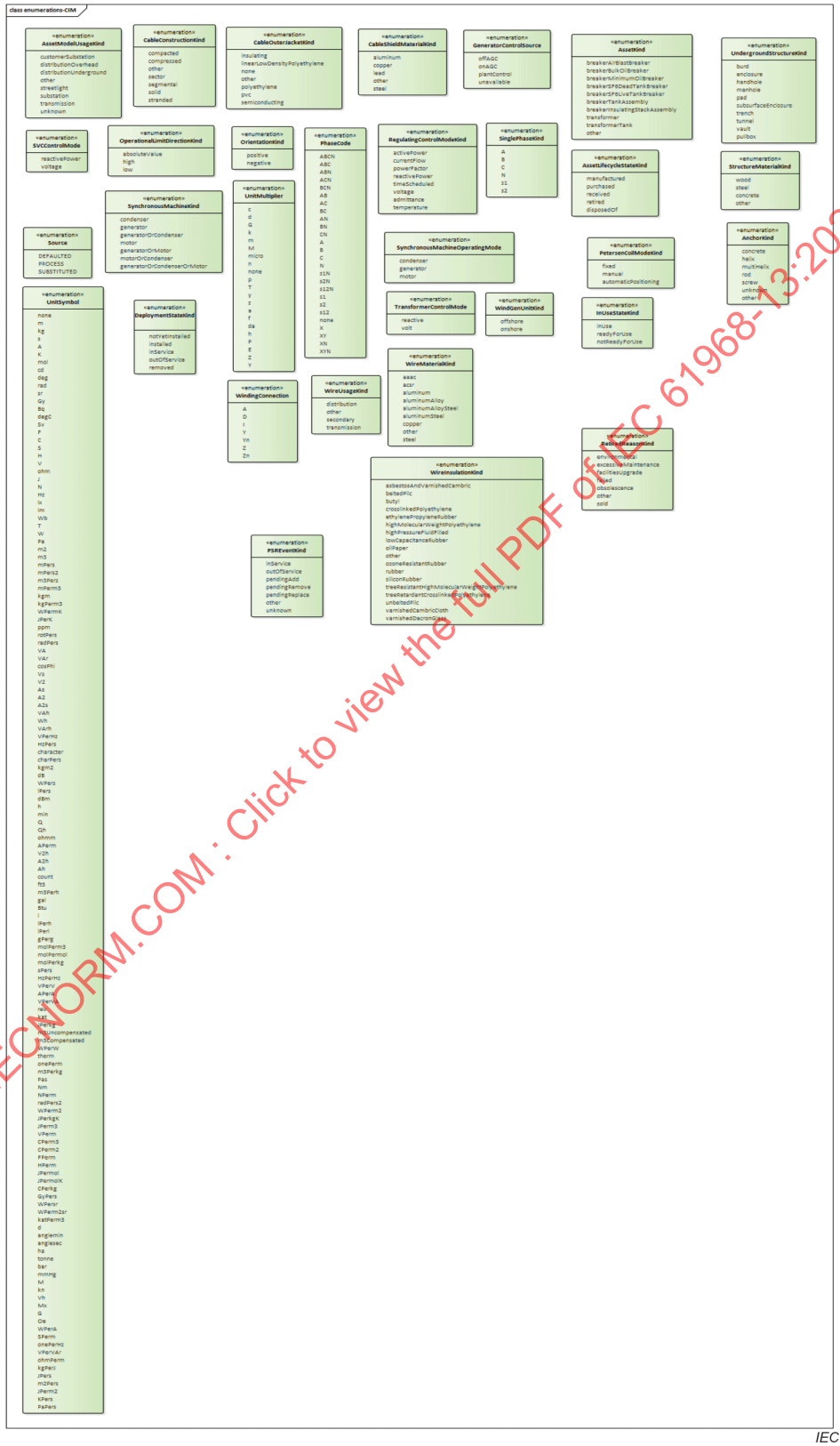

Figure 57 – Class diagram CIMEnumerations::enumerations-CIM

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7.4.2 AsynchronousMachineKind enumeration

Kind of Asynchronous Machine.

Table 508 shows all literals of AsynchronousMachineKind.

Table 508 – Literals of CIMEnumerations::AsynchronousMachineKind

literal	value	description
generator		(enum) The Asynchronous Machine is a generator.
motor		(enum) The Asynchronous Machine is a motor.

7.4.3 OrientationKind enumeration

The orientation of the coordinate system with respect to top, left, and the coordinate number system.

Table 509 shows all literals of OrientationKind.

Table 509 – Literals of CIMEnumerations::OrientationKind

literal	value	description
positive		(enum) For 2D diagrams, a positive orientation will result in X values increasing from left to right and Y values increasing from bottom to top. This is also known as a right hand orientation.
negative		(enum) For 2D diagrams, a negative orientation gives the left-hand orientation (favoured by computer graphics displays) with X values increasing from left to right and Y values increasing from top to bottom. This is also known as a left hand orientation.

7.4.4 AnchorKind enumeration

Kind of anchor.

Table 510 shows all literals of AnchorKind.

Table 510 – Literals of CIMEnumerations::AnchorKind

literal	value	description
concrete		(enum)
helix		(enum)
multiHelix		(enum)
rod		(enum)
screw		(enum)
unknown		(enum)
other		(enum)

7.4.5 UndergroundStructureKind enumeration

Kind of underground structure.

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Table 511 shows all literals of UndergroundStructureKind.

Table 511 – Literals of CIMEnumerations::UndergroundStructureKind

literal	value	description
burd		(enum)
enclosure		(enum)
handhole		(enum)
manhole		(enum)
pad		(enum)
subsurfaceEnclosure		(enum)
trench		(enum)
tunnel		(enum)
vault		(enum)
pullbox		(enum)

7.4.6 WindGenUnitKind enumeration

Kind of wind generating unit.

Table 512 shows all literals of WindGenUnitKind.

Table 512 – Literals of CIMEnumerations::WindGenUnitKind

literal	value	description
onshore		The wind generating unit is located onshore.
offshore		The wind generating unit is located offshore.

7.4.7 SinglePhaseKind enumeration

Enumeration of single phase identifiers. Allows designation of single phases for both transmission and distribution equipment, circuits and loads.

Table 513 shows all literals of SinglePhaseKind.

Table 513 – Literals of CIMEnumerations::SinglePhaseKind

literal	value	description
s2		Secondary phase 2.
A		Phase A.
B		Phase B.
C		Phase C.
N		Neutral.
s1		Secondary phase 1.

7.4.8 PetersenCoilModeKind enumeration

The mode of operation for a Petersen coil.

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Table 514 shows all literals of PetersenCoilModeKind.

Table 514 – Literals of CIMEnumerations::PetersenCoilModeKind

literal	value	description
fixed		(enum) Fixed position.
manual		(enum) Manual positioning.
automaticPositioning		(enum) Automatic positioning.

7.4.9 SynchronousMachineKind enumeration

Synchronous machine type.

Table 515 shows all literals of SynchronousMachineKind.

Table 515 – Literals of CIMEnumerations::SynchronousMachineKind

literal	value	description
condenser		
generator		
generatorOrCondenser		(enum)
motor		(enum)
generatorOrMotor		(enum)
motorOrCondenser		(enum)
generatorOrCondenserOrMotor		(enum)

7.4.10 UnitSymbol enumeration

The units defined for usage in the CIM.

Table 516 shows all literals of UnitSymbol.

Table 516 – Literals of CIMEnumerations::UnitSymbol

literal	value	description
none	0	Dimension less quantity, e.g. count, per unit, etc.
m	2	Length in metres.
kg	3	Mass in kilograms. NOTE Multiplier "k" is included in this unit symbol for compatibility with IEC 61850-7-3.
s	4	Time in seconds.
A	5	Current in amperes.
K	6	Temperature in kelvins.
mol	7	Amount of substance in moles.
cd	8	Luminous intensity in candelas.
deg	9	Plane angle in degrees.
rad	10	Plane angle in radians (m/m).
sr	11	Solid angle in steradians (m^2/m^2).
Gy	21	Absorbed dose in grays (J/kg).

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literal	value	description
Bq	22	Radioactivity in becquerels (1/s).
degC	23	Relative temperature in degrees Celsius. In the SI unit system the symbol is °C. Electric charge is measured in coulomb that has the unit symbol C. To distinguish degree Celsius from coulomb the symbol used in the UML is degC. The reason for not using °C is that the special character ° is difficult to manage in software.
Sv	24	Dose equivalent in sieverts (J/kg).
F	25	Electric capacitance in farads (C/V).
C	26	Electric charge in coulombs (A·s).
S	27	Conductance in siemens.
H	28	Electric inductance in henrys (Wb/A).
V	29	Electric potential in volts (W/A).
ohm	30	Electric resistance in ohms (V/A).
J	31	Energy in joules (N·m = C·V = W·s).
N	32	Force in newtons (kg·m/s^2).
Hz	33	Frequency in hertz (1/s).
lx	34	Illuminance in lux (lm/m^2).
lm	35	Luminous flux in lumens (cd·sr).
Wb	36	Magnetic flux in webers (V·s).
T	37	Magnetic flux density in teslas (Wb/m^2).
W	38	Real power in watts (J/s). Electrical power may have real and reactive components. The real portion of electrical power (I^{2}R or VIcos(phi)), is expressed in watts. See also apparent power and reactive power.
Pa	39	Pressure in pascals (N/m^2). NOTE The absolute or relative measurement of pressure is implied with this entry. See below for more explicit forms.
m2	41	Area in square metres (m^2).
m3	42	Volume in cubic metres (m^3).
mPers	43	Velocity in metres per second (m/s).
mPers2	44	Acceleration in metres per second squared (m/s^2).
m3Pers	45	Volumetric flow rate in cubic metres per second (m^3/s).
mPerm3	46	Fuel efficiency in metres per cubic metres (m/m^3).
kgm	47	Moment of mass in kilogram metres (kg·m) (first moment of mass). NOTE Multiplier "k" is included in this unit symbol for compatibility with IEC 61850-7-3.
kgPerm3	48	Density in kilogram/cubic metres (kg/m^3). NOTE Multiplier "k" is included in this unit symbol for compatibility with IEC 61850-7-3.
m2Pers	49	Viscosity in square metres per second (m^2/s).
WPermK	50	Thermal conductivity in watt/metres kelvin.
JPerK	51	Heat capacity in joules/kelvin.
ppm	52	Concentration in parts per million.

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literal	value	description
rotPers	53	Rotations per second (1/s). See also Hz (1/s).
radPers	54	Angular velocity in radians per second (rad/s).
WPerm2	55	Heat flux density, irradiance, watts per square metre.
JPerm2	56	Insulation energy density, joules per square metre or watt second per square metre.
SPerm	57	Conductance per length (F/m).
KPers	58	Temperature change rate in kelvins per second.
PaPers	59	Pressure change rate in pascals per second.
JPerkgK	60	Specific heat capacity, specific entropy, joules per kilogram kelvin.
VA	61	Apparent power in volt amperes. See also real power and reactive power.
VAr	63	Reactive power in volt amperes reactive. The "reactive" or "imaginary" component of electrical power (VIsin(phi)). (See also real power and apparent power). NOTE Different meter designs use different methods to arrive at their results. Some meters may compute reactive power as an arithmetic value, while others compute the value vectorially. The data consumer should determine the method in use and the suitability of the measurement for the intended purpose.
cosPhi	65	Power factor, dimensionless. NOTE 1 This definition of power factor only holds for balanced systems. See the alternative definition under code 153. NOTE 2 Beware of differing sign conventions in use between the IEC and EEI. It is assumed that the data consumer understands the type of meter in use and the sign convention in use by the utility.
Vs	66	Volt seconds (Ws/A).
V2	67	Volt squared (W^2/A^2).
As	68	Ampere seconds (A·s).
A2	69	Amperes squared (A^2).
A2s	70	Ampere squared time in square amperes (A^2s).
VAh	71	Apparent energy in volt ampere hours.
Wh	72	Real energy in watt hours.
VArh	73	Reactive energy in volt ampere reactive hours.
VPerHz	74	Magnetic flux in volt per hertz.
HzPers	75	Rate of change of frequency in hertz per second.
character	76	Number of characters.
charPers	77	Data rate (baud) in characters per second.
kgm2	78	Moment of mass in kilogram square metres ($kg·m^2$) (Second moment of mass, commonly called the moment of inertia). NOTE Multiplier "k" is included in this unit symbol for compatibility with IEC 61850-7-3.
dB	79	Sound pressure level in decibels. NOTE Multiplier "d" is included in this unit symbol for compatibility with IEC 61850-7-3.

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literal	value	description
WPers	81	Ramp rate in watts per second.
lPers	82	Volumetric flow rate in litres per second.
dBm	83	Power level (logarithmic ratio of signal strength, Bel-mW), normalized to 1 mW. NOTE Multiplier "d" is included in this unit symbol for compatibility with IEC 61850-7-3.
h	84	Time in hours, hour = 60 min = 3 600 s.
min	85	Time in minutes, minute = 60 s.
Q	100	Quantity power, Q.
Qh	101	Quantity energy, Qh.
ohmm	102	Resistivity, ohm metres, (rho).
APerm	103	A/m, magnetic field strength, amperes per metre.
V2h	104	Volt-squared hour, volt-squared-hours.
A2h	105	Ampere-squared hour, ampere-squared hour.
Ah	106	Ampere-hours, ampere-hours.
count	111	Amount of substance, Counter value.
ft3	119	Volume, cubic feet.
m3Perh	125	Volumetric flow rate, cubic metres per hour.
gal	128	Volume in gallons, US gallon (1 gal = 231 in3 = 128 fl ounce).
Btu	132	Energy, British Thermal Units.
l	134	Volume in litres, litre = dm^3 = m^3/1 000.
lPerh	137	Volumetric flow rate, litres per hour.
lPerl	143	Concentration, the ratio of the volume of a solute divided by the volume of the solution. NOTE Users may need to use a prefix such a 'µ' to express a quantity such as 'µL/L'.
gPerg	144	Concentration, The ratio of the mass of a solute divided by the mass of the solution. NOTE Users may need use a prefix such a 'µ' to express a quantity such as 'µg/g'.
molPerm3	145	Concentration, The amount of substance concentration, (c), the amount of solvent in moles divided by the volume of solution in m^3.
molPermol	146	Concentration, Molar fraction, the ratio of the molar amount of a solute divided by the molar amount of the solution.
molPerkg	147	Concentration, Molality, the amount of solute in moles and the amount of solvent in kilograms.
sPers	149	Time, Ratio of time. NOTE Users may need to supply a prefix such as 'µ' to show rates such as 'µs/s'.
HzPerHz	150	Frequency, rate of frequency change. NOTE Users may need to supply a prefix such as 'm' to show rates such as 'mHz/Hz'.
VPerV	151	Voltage, ratio of voltages. NOTE Users may need to supply a prefix such as 'm' to show rates such as 'mV/V'.
APerA	152	Current, ratio of amperages. NOTE Users may need to supply a prefix such as 'm' to show rates such as 'mA/A'.

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literal	value	description
VPerVA	153	Power factor, PF, the ratio of the active power to the apparent power. NOTE The sign convention used for power factor will differ between IEC meters and EEI (ANSI) meters. It is assumed that the data consumers understand the type of meter being used and agree on the sign convention in use at any given utility.
rev	154	Amount of rotation, revolutions.
kat	158	Catalytic activity, katal = mol / s.
JPerkg	165	Specific energy, Joules / kg.
m3Uncompensated	166	Volume, cubic metres, with the value uncompensated for weather effects.
m3Compensated	167	Volume, cubic metres, with the value compensated for weather effects.
WPerW	168	Signal Strength, ratio of power. NOTE Users may need to supply a prefix such as 'm' to show rates such as 'mW/W'.
therm	169	Energy, therms.
onePerm	173	Wavenumber, reciprocal metres, (1/m).
m3Perkg	174	Specific volume, cubic metres per kilogram, v.
Pas	175	Dynamic viscosity, pascal seconds.
Nm	176	Moment of force, newton metres.
NPerm	177	Surface tension, newton per metre.
radPers2	178	Angular acceleration, radians per second squared.
JPerm3	181	Energy density, joules per cubic metre.
VPerm	182	Electric field strength, volts per metre.
CPerm3	183	Electric charge density, coulombs per cubic metre.
CPerm2	184	Surface charge density, coulombs per square metre.
FPerm	185	Permittivity, farads per metre.
HPerm	186	Permeability, henrys per metre.
JPermol	187	Molar energy, joules per mole.
JPermolK	188	Molar entropy, molar heat capacity, joules per mole kelvin.
CPerkg	189	Exposure (x rays), coulombs per kilogram.
GyPers	190	Absorbed dose rate, grays per second.
WPersr	191	Radiant intensity, watts per steradian.
WPerm2sr	192	Radiance, watts per square metre steradian.
katPerm3	193	Catalytic activity concentration, katals per cubic metre.
d	195	Time in days, day = 24 h = 86 400 s.
anglemin	196	Plane angle, minutes.
anglesec	197	Plane angle, seconds.
ha	198	Area, hectares.
tonne	199	Mass in tons, "tonne" or "metric ton" (1 000 kg = 1 Mg).
bar	214	Pressure in bars, (1 bar = 100 kPa).

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literal	value	description
mmHg	215	Pressure, millimetres of mercury (1 mmHg is approximately 133,3 Pa).
M	217	Length, nautical miles (1 M = 1 852 m).
kn	219	Speed, knots (1 kn = 1 852/3 600) m/s.
Mx	276	Magnetic flux, maxwells (1 Mx = 10^{-8} Wb).
G	277	Magnetic flux density, gausses (1 G = 10^{-4} T).
Oe	278	Magnetic field in oersteds, (1 Oe = (103/4p) A/m).
Vh	280	Volt-hour, Volt hours.
WPerA		Active power per current flow, watts per ampere.
onePerHz		Reciprocal of frequency (1/Hz).
VPerVAr		Power factor, PF, the ratio of the active power to the apparent power. NOTE The sign convention used for power factor will differ between IEC meters and EEI (ANSI) meters. It is assumed that the data consumers understand the type of meter being used and agree on the sign convention in use at any given utility.
ohmPerm	86	Electric resistance per length in ohms per metre ((V/A)/m).
kgPerJ		Weight per energy in kilograms per joule (kg/J). NOTE Multiplier "k" is included in this unit symbol for compatibility with IEC 61850-7-3.
JPers		Energy rate in joules per second (J/s).

7.4.11 StructureSupportKind enumeration

Kind of structure support.

Table 517 shows all literals of StructureSupportKind.

Table 517 – Literals of CIMEnumerations::StructureSupportKind

literal	value	description
anchor		(enum)
guy		(enum)

7.4.12 WireMaterialKind enumeration

Kind of wire material.

Table 518 shows all literals of WireMaterialKind.

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Table 518 – Literals of CIMEnumerations::WireMaterialKind

literal	value	description
steel		
aaac		Aluminum-alloy conductor steel reinforced.
acsr		Aluminum conductor steel reinforced.
aluminum		
aluminumAlloy		
aluminumAlloySteel		
aluminumSteel		
copper		
other		

7.4.13 WindingConnection enumeration

Winding connection type.

Table 519 shows all literals of WindingConnection.

Table 519 – Literals of CIMEnumerations::WindingConnection

literal	value	description
I		Independent winding, for single-phase connections
Y		Wye
Yn		Wye, with neutral brought out for grounding.
Z		ZigZag
Zn		ZigZag, with neutral brought out for grounding.
A		Autotransformer common winding
D		Delta

7.4.14 TransformerControlMode enumeration

Control modes for a transformer.

Table 520 shows all literals of TransformerControlMode.

Table 520 – Literals of CIMEnumerations::TransformerControlMode

literal	value	description
volt		Voltage control
reactive		Reactive power flow control

7.4.15 GeneratorControlSource enumeration

The source of controls for a generating unit.

Table 521 shows all literals of GeneratorControlSource.

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Table 521 – Literals of CIMEnumerations::GeneratorControlSource

literal	value	description
unavailable		
offAGC		
onAGC		
plantControl		

7.4.16 WireUsageKind enumeration

Kind of wire usage.

Table 522 shows all literals of WireUsageKind.

Table 522 – Literals of CIMEnumerations::WireUsageKind

literal	value	description
transmission		
distribution		
other		
secondary		

7.4.17 InUseStateKind enumeration

Possible 'in use' states that an asset can be in.

Table 523 shows all literals of InUseStateKind.

Table 523 – Literals of CIMEnumerations::InUseStateKind

literal	value	description
inUse		(enum) Asset is deployed (in use) or is being put into use.
readyForUse		(enum) Asset is ready to be put into use.
notReadyForUse		(enum) Asset is not ready to be put into use.

7.4.18 PhaseCode enumeration

Enumeration of phase identifiers. Allows designation of phases for both transmission and distribution equipment, circuits and loads.

Residential and small commercial loads are often served from single-phase, or split-phase, secondary circuits. Phases 1 and 2 refer to hot wires that are 180 degrees out of phase, while N refers to the neutral wire. Through single-phase transformer connections, these secondary circuits may be served from one or two of the primary phases A, B, and C. For three-phase loads, use the A, B, C phase codes instead of s12N.

Table 524 shows all literals of PhaseCode.

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Table 524 – Literals of CIMEnumerations::PhaseCode

literal	value	description
ABCN		(enum) Phases A, B, C, and N.
ABC		(enum) Phases A, B, and C.
ABN		(enum) Phases A, B, and neutral.
ACN		(enum) Phases A, C and neutral.
BCN		(enum) Phases B, C, and neutral.
AB		(enum) Phases A and B.
AC		(enum) Phases A and C.
BC		(enum) Phases B and C.
AN		(enum) Phases A and neutral.
BN		(enum) Phases B and neutral.
CN		(enum) Phases C and neutral.
A		(enum) Phase A.
B		(enum) Phase B.
C		(enum) Phase C.
N		(enum) Neutral phase.
s1N		(enum) Secondary phase 1 and neutral.
s2N		(enum) Secondary phase 2 and neutral.
s12N		(enum) Secondary phases 1, 2, and neutral.
s1		(enum) Secondary phase 1.
s2		(enum) Secondary phase 2.
s12		(enum) Secondary phase 1 and 2.
none		(enum) No phases specified.
X		(enum) Unknown non-neutral phase.
XY		(enum) Two unknown non-neutral phases.
XN		(enum) Unknown non-neutral phase plus neutral.
XYN		(enum) Two unknown non-neutral phases plus neutral.

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7.4.19 SVCControlMode enumeration

Static VAr Compensator control mode.

Table 525 shows all literals of SVCControlMode.

Table 525 – Literals of CIMEnumerations::SVCControlMode

literal	value	description
reactivePower		(enum)
voltage		(enum)

7.4.20 StructureMaterialKind enumeration

Kind of material used for structures.

Table 526 shows all literals of StructureMaterialKind.

Table 526 – Literals of CIMEnumerations::StructureMaterialKind

literal	value	description
wood		(enum)
steel		(enum)
concrete		(enum)
other		(enum)

7.4.21 CurveStyle enumeration

Style or shape of curve.

Table 527 shows all literals of CurveStyle.

Table 527 – Literals of CIMEnumerations::CurveStyle

literal	value	description
constantYValue		(enum) The Y-axis values are assumed constant until the next curve point and prior to the first curve point.
straightLineYValues		(enum) The Y-axis values are assumed to be a straight line between values. Also known as linear interpolation.

7.4.22 DeploymentStateKind enumeration

Possible states of asset deployment.

Table 528 shows all literals of DeploymentStateKind.

Table 528 – Literals of CIMEnumerations::DeploymentStateKind

literal	value	description
notYetInstalled		(enum) Asset not yet installed in deployment location.
installed		(enum) Asset installed in deployment location.
inService		(enum) Asset in service in deployment location.
outOfService		(enum) Asset out of service, but in deployment location.
removed		(enum) Asset removed from deployment location.

7.4.23 UnitMultiplier enumeration

The unit multipliers defined for the CIM.

Table 529 shows all literals of UnitMultiplier.

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Table 529 – Literals of CIMEnumerations::UnitMultiplier

literal	value	description
T		(enum) Tera 10**12
y		(enum) yocto 10**-24
z		(enum) zepto 10**-21
a		(enum) atto 10**-18
f		(enum) femto 10**-15
da		(enum) deca 10**1
h		(enum) hecto 10**2
P		(enum) Peta 10**15
E		(enum) Exa 10**18
Z		(enum) Zetta 10**21
Y		(enum) Yotta 10**24
c		(enum) Centi 10**-2
d		(enum) Deci 10**-1
G		(enum) Giga 10**9
k		(enum) Kilo 10**3
m		(enum) Milli 10**-3
M		(enum) Mega 10**6
micro		(enum) Micro 10**-6
n		(enum) Nano 10**-9
none		(enum)
p		(enum) Pico 10**-12

7.4.24 RegulatingControlModeKind enumeration

The kind of regulation model. For example regulating voltage, reactive power, active power, etc.

Table 530 shows all literals of RegulatingControlModeKind.

Table 530 – Literals of CIMEnumerations::RegulatingControlModeKind

literal	value	description
voltage		(enum) Voltage is specified.
admittance		(enum) Admittance is specified.
temperature		(enum) Control switches on/off based on the local temperature (i.e., a thermostat).
activePower		(enum) Active power is specified.
currentFlow		(enum) Current flow is specified.
powerFactor		(enum) Power factor is specified.
reactivePower		(enum) Reactive power is specified.
timeScheduled		(enum) Control switches on/off by time of day. The times may change on the weekend, or in different seasons.

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7.4.25 RetiredReasonKind enumeration

Reason asset retired.

Table 531 shows all literals of RetiredReasonKind.

Table 531 – Literals of CIMEnumerations::RetiredReasonKind

literal	value	description
environmental		(enum)
excessiveMaintenance		(enum)
facilitiesUpgrade		(enum)
failed		(enum)
obsolescence		(enum)
other		(enum)
sold		(enum)

7.4.26 AssetLifecycleStateKind enumeration

Lifecycle states an asset can be in.

While the possible lifecycle states are standardized, the allowed transitions are not – they are intended to be defined by the business process requirements of local implementations.

Table 532 shows all literals of AssetLifecycleStateKind.

Table 532 – Literals of CIMEnumerations::AssetLifecycleStateKind

literal	value	description
manufactured		(enum)
purchased		(enum)
received		(enum)
retired		(enum)
disposedOf		(enum)

7.4.27 PSREventKind enumeration

Kind of power system resource event.

Table 533 shows all literals of PSREventKind.

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Table 533 – Literals of CIMEnumerations::PSREventKind

literal	value	description
inService		(enum) Power system resource state change to in service.
outOfService		(enum) Power system resource state change to out of service.
pendingAdd		(enum) Power system resource state change to pending add.
pendingRemove		(enum) Power system resource state change to pending remove.
pendingReplace		(enum) Power system resource state change to pending replace.
other		(enum) Other power system resource state change.
unknown		(enum) Unknown power system resource state change.

7.4.28 Source enumeration

Source gives information related to the origin of a value.

Table 534 shows all literals of Source.

Table 534 – Literals of CIMEnumerations::Source

literal	value	description
SUBSTITUTED		The value is provided by input of an operator or by an automatic source.
DEFAULTED		The value contains a default value.
PROCESS		The value is provided by input from the process I/O or being calculated from some function.

7.4.29 AssetKind enumeration

Table 535 shows all literals of AssetKind.

Table 535 – Literals of CIMEnumerations::AssetKind

literal	value	description
breakerAirBlastBreaker		(enum)
breakerBulkOilBreaker		(enum)
breakerMinimumOilBreaker		(enum)
breakerSF6DeadTankBreaker		(enum)
breakerSF6LiveTankBreaker		(enum)
breakerTankAssembly		(enum)
breakerInsulatingStackAssembly		(enum)
transformer		(enum)
transformerTank		(enum)
other		(enum) Other type of Asset. The type attribute may provide more details in this case.

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7.4.30 OperationalLimitDirectionKind enumeration

The direction attribute describes the side of a limit that is a violation.

Table 536 shows all literals of OperationalLimitDirectionKind.

Table 536 – Literals of CIMEnumerations::OperationalLimitDirectionKind

literal	value	description
low		Low means a monitored value below the limit is a violation. If applied to a terminal flow, the positive direction is into the terminal.
absoluteValue		An absoluteValue limit means that a monitored absolute value above the limit value is a violation.
high		High means that a monitored value above the limit value is a violation. If applied to a terminal flow, the positive direction is into the terminal.

7.4.31 BusbarConfiguration enumeration

Busbar layout for bay.

Table 537 shows all literals of BusbarConfiguration.

Table 537 – Literals of CIMEnumerations::BusbarConfiguration

literal	value	description
singleBus		(enum) Single bus.
doubleBus		(enum) Double bus.
mainWithTransfer		(enum) Main bus with transfer bus.
ringBus		(enum) Ring bus.

7.4.32 CableShieldMaterialKind enumeration

Kind of cable shield material.

Table 538 shows all literals of CableShieldMaterialKind.

Table 538 – Literals of CIMEnumerations::CableShieldMaterialKind

literal	value	description
steel		
aluminum		
copper		
lead		
other		

7.4.33 AssetModelUsageKind enumeration

Usage for an asset model.

Table 539 shows all literals of AssetModelUsageKind.

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Table 539 – Literals of CIMEnumerations::AssetModelUsageKind

literal	value	description
unknown		Usage of the asset model is unknown.
customerSubstation		Asset model is intended for use in customer substation.
distributionOverhead		Asset model is intended for use in distribution overhead network.
distributionUnderground		Asset model is intended for use in underground distribution network.
other		Other kind of asset model usage.
streetlight		Asset model is intended for use as streetlight.
substation		Asset model is intended for use in substation.
transmission		Asset model is intended for use in transmission network.

7.4.34 WireInsulationKind enumeration

Kind of wire insulation.

Table 540 shows all literals of WireInsulationKind.

Table 540 – Literals of CIMEnumerations::WireInsulationKind

literal	value	description
varnishedDacronGlass		
asbestosAndVarnishedCambric		
beltedPilc		
butyl		
crosslinkedPolyethylene		
ethylenePropyleneRubber		
highMolecularWeightPolyethylene		
highPressureFluidFilled		
lowCapacitanceRubber		
oilPaper		
other		
ozoneResistantRubber		
rubber		
siliconRubber		
treeResistantHighMolecularWeightPolyethylene		
treeRetardantCrosslinkedPolyethylene		
unbeltedPilc		
varnishedCambricCloth		

7.4.35 SynchronousMachineOperatingMode enumeration

Synchronous machine operating mode.

Table 541 shows all literals of SynchronousMachineOperatingMode.

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Table 541 – Literals of CIMEnumerations::SynchronousMachineOperatingMode

literal	value	description
condenser		
generator		
motor		(enum)

7.4.36 CableOuterJacketKind enumeration

Kind of cable outer jacket.

Table 542 shows all literals of CableOuterJacketKind.

Table 542 – Literals of CIMEnumerations::CableOuterJacketKind

literal	value	description
semiconducting		
insulating		
linearLowDensityPolyethylene		
none		
other		
polyethylene		
pvc		

7.4.37 CableConstructionKind enumeration

Kind of cable construction.

Table 543 shows all literals of CableConstructionKind.

Table 543 – Literals of CIMEnumerations::CableConstructionKind

literal	value	description
stranded		
compacted		
compressed		
other		
sector		
segmental		
solid		

7.4.38 HydroPlantStorageKind enumeration

The type of hydro power plant.

Table 544 shows all literals of HydroPlantStorageKind.

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Table 544 – Literals of CIMEnumerations::HydroPlantStorageKind

literal	value	description
runOfRiver		(enum) Run of river.
pumpedStorage		(enum) Pumped storage.
storage		(enum) Storage.

7.4.39 BreakerConfiguration enumeration

Switching arrangement for bay.

Table 545 shows all literals of BreakerConfiguration.

Table 545 – Literals of CIMEnumerations::BreakerConfiguration

literal	value	description
singleBreaker		(enum) Single breaker.
breakerAndAHalf		(enum) Breaker and a half.
doubleBreaker		(enum) Double breaker.
noBreaker		(enum) No breaker.

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7.5 Package CompoundTypes

See Figure 58.

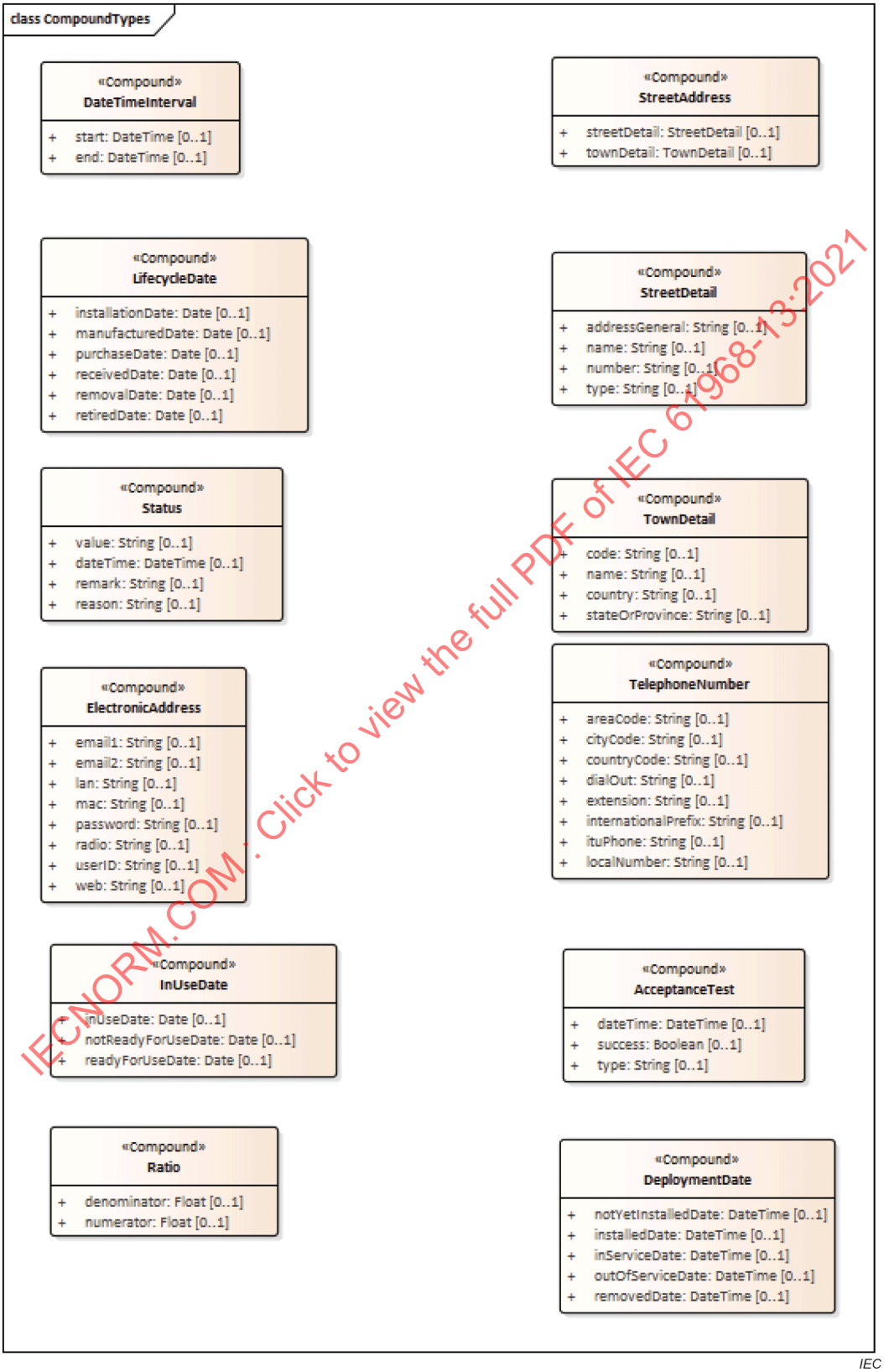

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Figure 58 – Class diagram CompoundTypes::CompoundTypes

Annex A
(informative)

Use case

A.1 Overview

This use case conforms to IEC 62559-2 and IEC 62913-1 and illustrates potential usage of IEC 61968-13. Some references are outdated as this use case was drafted several years ago, but it is still valid in the context of this second edition of IEC 61968-13.

A.2 Provision of DSO network model and state to TSO

A.2.1 Description of the use case

A.2.1.1 Name of use case

Use case identification		
ID	***Area(s)/Domain(s)/Zone(s)***	***Name of use case***
	Energy System / Distribution-Transmission	Provision of DSO network model and state to TSO

A.2.1.2 Version management

Version management				
Version No.	***Date***	***Name of author(s)***	***Changes***	***Approval status***
0.2	2015-02-01	G. Proserpio	Second draft	WD Working Document

A.2.1.3 Scope and objectives of use case

Scope and objectives of use case	
Scope	The evolution of the power system requires a coordinated management involving both TSO and DSO roles. This system use case describes the provision of the DSO's network state information to the TSO, in order to improve the overall system management. More specifically, the current and forecasted power flow information related to an aggregated view of the DSO network, will feed the TSO network "Operational Planning" and "Network Operations" functions.
Objective(s)	Improve system management providing to the TSO the knowledge of the current and forecast DSO network topology and power flow state.
Related business case(s)	Optimise Network Operations in Operational Planning Optimise Network Operations in real-time in an optimised way using new automations and advanced functions.

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A.2.1.4 Narrative of use case

Narrative of use case
Short description
The System Use Case describes how the TSO is provided with an aggregate view of the DSO power system model including the current and forecasted active and reactive power related to loads and different kind of distributed generation.
Complete description
In order to control the electrical system, which presupposes the knowledge of DER production on MV and LV level both predictive and in real-time, the TSO needs to know the current and forecasted DSO grid state. For each primary substation, the DSO will provide the aggregated network model part and both forecasted and real-time active and reactive power, differentiated by load and source of generation (i.e wind, solar). The simplest network model representation consider the DSO side equivalent load and the equivalent generating units associated to each kind of source. More detailed network model representation, including for example busbar, power transformer, breaker, etc., could be considered in future perspective. Each load and generating unit type have both real time and forecasted associated power flow values that will be used by the TSO in order to manage the system. Summary of use case • DSO current Steady State Update Description: Current DSO Steady State is periodically sent to TSO – **Provide current Steady State** Description: The current DSO topology and aggregated Power Flow related to loads and any kind of DER is periodically sent to TSO • DSO forecasted Steady State Update Description: Forecasted DSO Steady State is periodically sent to TSO – **Provide forecasted Steady State** Description: The forecasted DSO topology and aggregated Power Flow related to loads and any kind of DER is periodically sent to TSO • DSO network model update Description: DSO power system model change is notified to TSO – **Provide DSO network model** Description: DSO network model change is notified to TSO

A.2.1.5 Key performance indicators (KPI)

Key performance indicators			
ID	***Name***	***Description***	***Reference to mentioned use case objectives***

A.2.1.6 Use case conditions

Use case conditions	
Assumptions	
1	The DSO would provide its model in accordance with CGMES definitions which might be extended by the TSO requesting this type of exchange.
Prerequisites	
1	Models covering transmission or distribution parts of the power system can be exchanged based on a mutual agreement between the TSOs and the DSOs – At least it's requested the definition of a Boundary Set2 and the related Boundary Points.

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A.2.1.7 Further information to the use case for classification/mapping

Classification information
Relation to other use cases
<<BUC>> Optimise Network Operations in Operational Planning <<BUC>> Optimise Network Operations in real-time
Level of depth
Generic – Black Box
Prioritisation
Generic, regional or national relation
Generic
Nature of the use case
SUC
Further keywords for classification
ENTSO-E, CDPSM, CGMES

A.2.1.8 General remarks

General remarks

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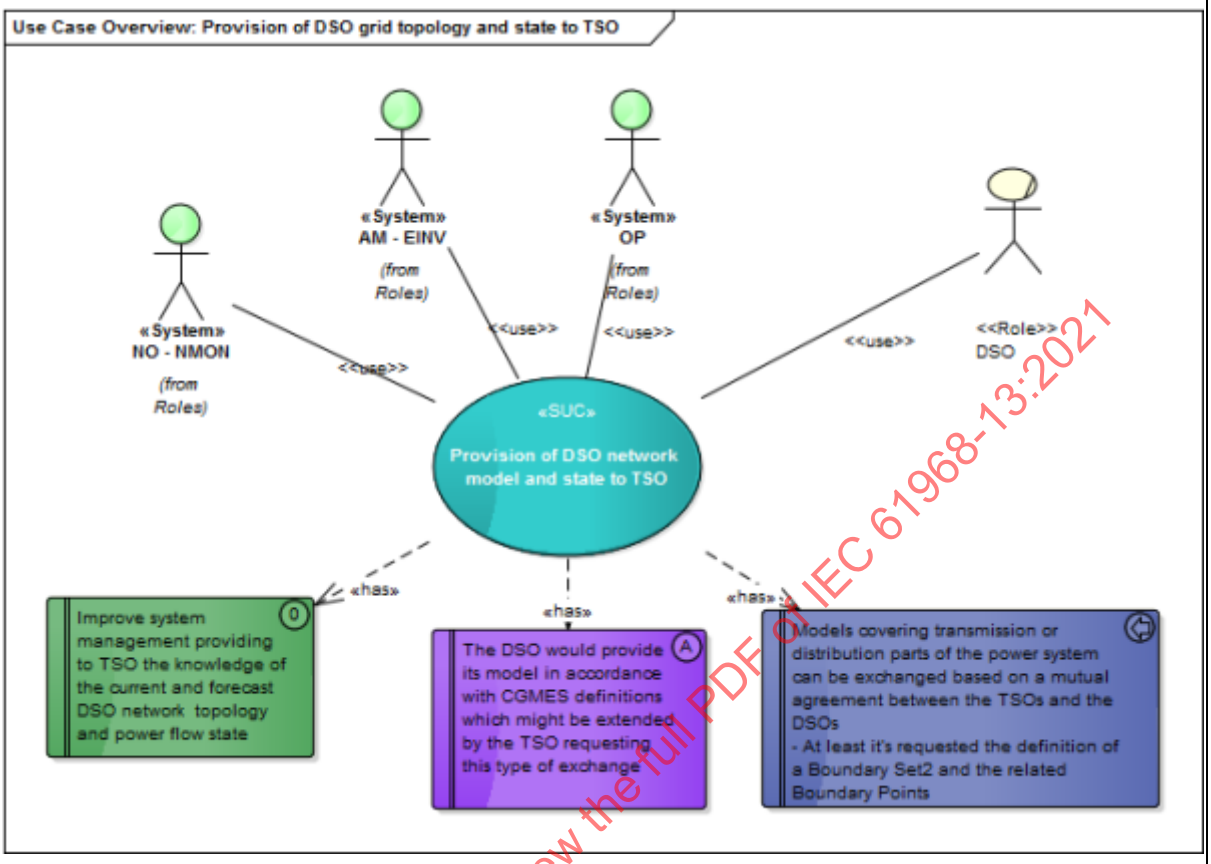
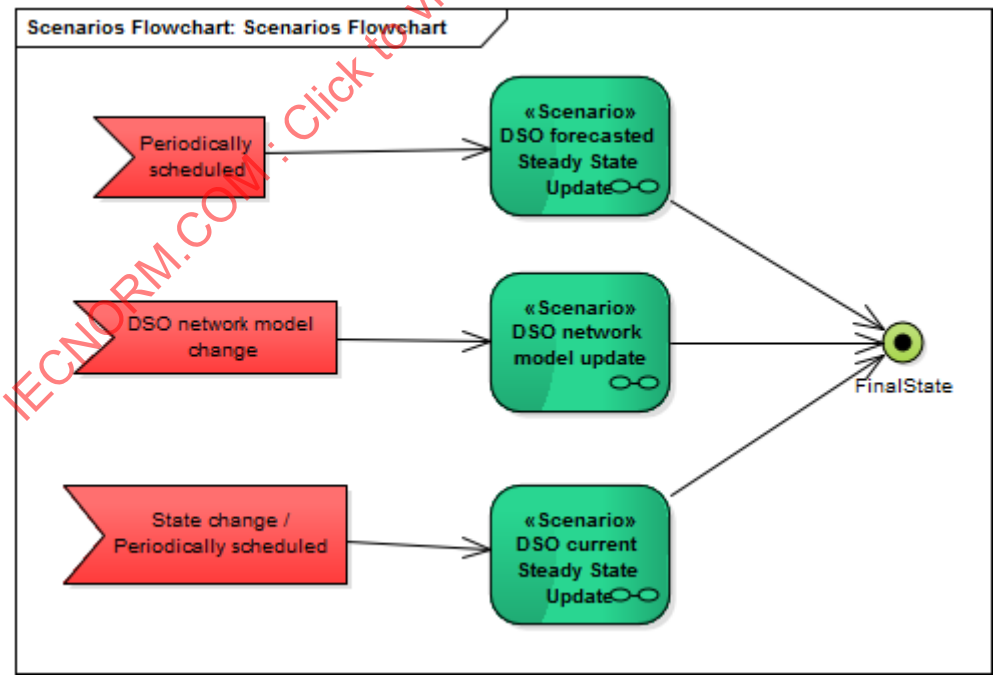
A.2.2 Diagrams of use case

Diagram(s) of use case





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A.2.3 Technical details

A.2.3.1 Actors

Actors			
Grouping (e.g. domains, zones)		***Group description***	
Actor name	***Actor type***	***Actor description***	***Further information specific to this use case***
NO – NMON	System	Network operation – Network operation monitoring	
OP	System	**Operational planning and optimisation (OP)**	
AM – EINV	System	**Records and asset management (AM)** Substation and network inventory (AM-EINV)	
DSO	Role	Entity responsible for the planning, operation and maintenance of the electricity distribution network. (role equivalent to "Distribution Network Operator" and "Distribution Grid Operator" from "IEC TC8 WG6 role model")	

A.2.3.2 References

References						
No.	***Reference Type***	***Reference***	***Status***	***Impact on use case***	***Originator / organisation***	***Link***
1	Standard	IEC 61968-1:2012	Withdrawn		IEC	
2	Standard	IEC 62559-2			IEC	
3	National technical rule	Allegato A.70			TERNA TSO	
4	Standard	IEC SRD 62913 (all parts)			IEC	

A.2.4 Step by step analysis of use case

A.2.4.1 Overview of scenarios

Scenario conditions						
No.	***Scenario name***	***Scenario description***	***Primary actor***	***Triggering event***	***Pre-condition***	***Post-condition***
1	DSO current Steady State Update	Current DSO Steady State is periodically sent to TSO	NO – NMON	State change / Periodically scheduled		
2	DSO forecasted Steady State Update	Forecasted DSO Steady State is periodically sent to TSO	OP	Periodically scheduled		
3	DSO network model update	DSO power system model change is notified to TSO	AM – EINV	DSO network model change		

A.2.4.2 Steps – Scenarios

A.2.4.2.1 DSO current Steady State Update

Current DSO Steady State is periodically sent to TSO.

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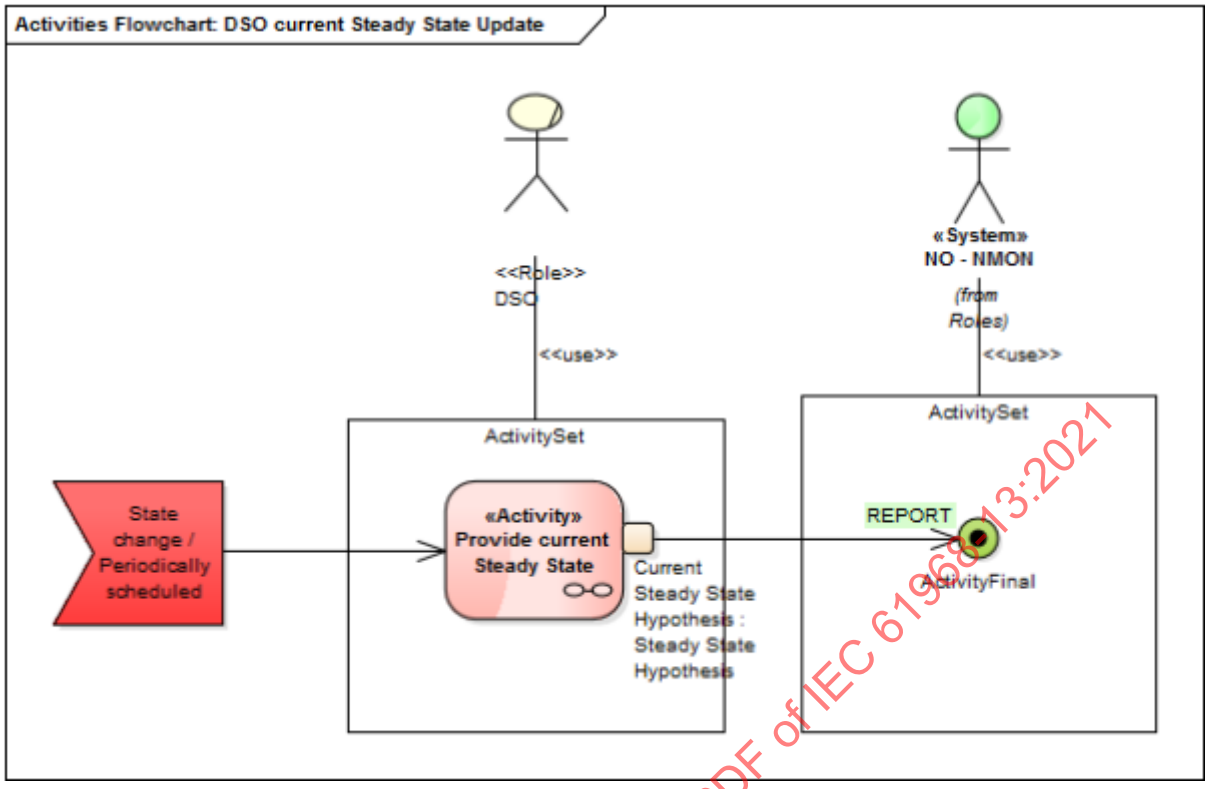

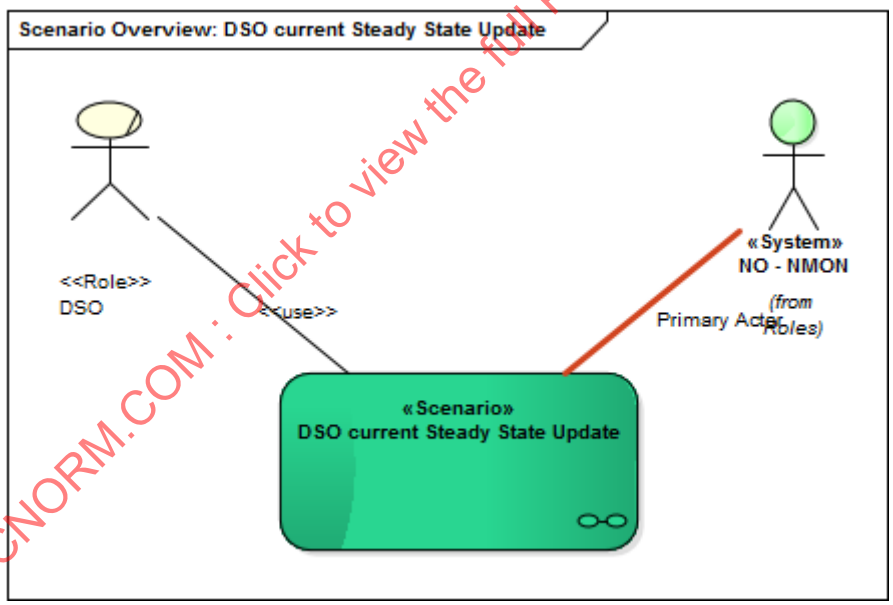

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Scenario step by step analysis

Scenario								
Scenario name		DSO current Steady State Update						
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**
1.1		Provide current Steady State	The current DSO topology and aggregated Power Flow related to loads and any kind of DER is periodically sent to TSO	REPORT	DSO		Info1-Current Steady State Hypothesis	

A.2.4.2.2 DSO forecasted Steady State Update

Forecasted DSO Steady State is periodically sent to TSO.

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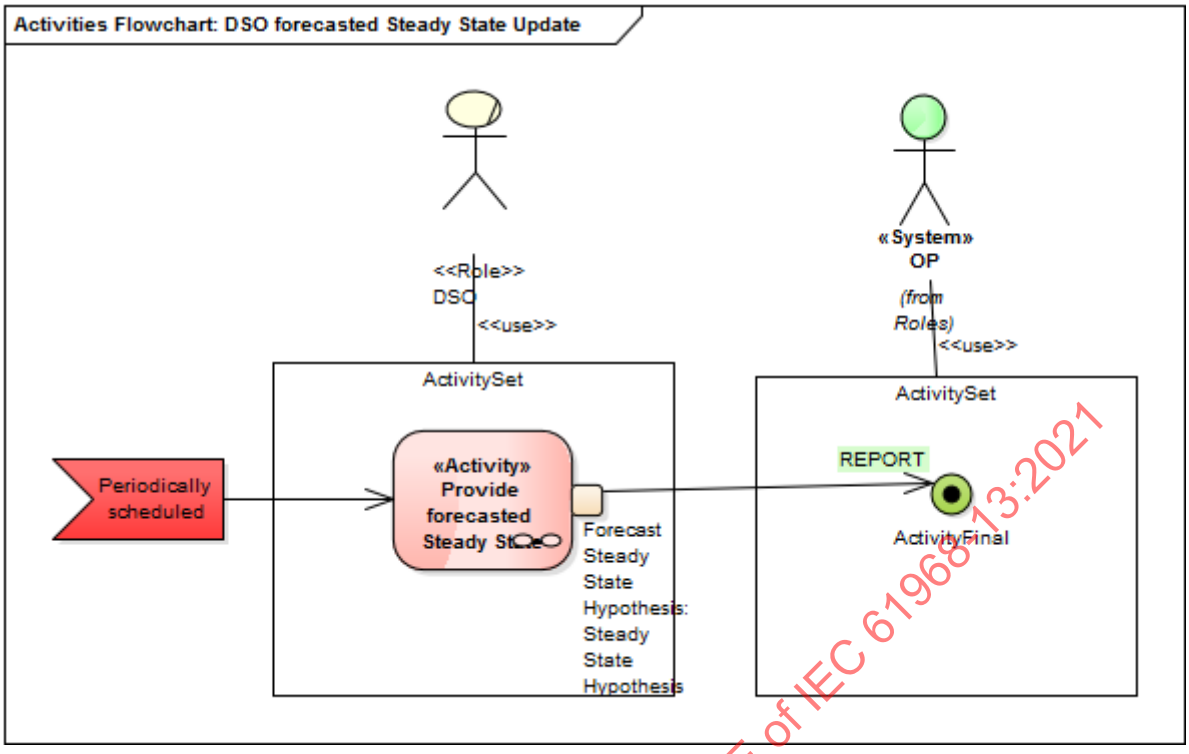

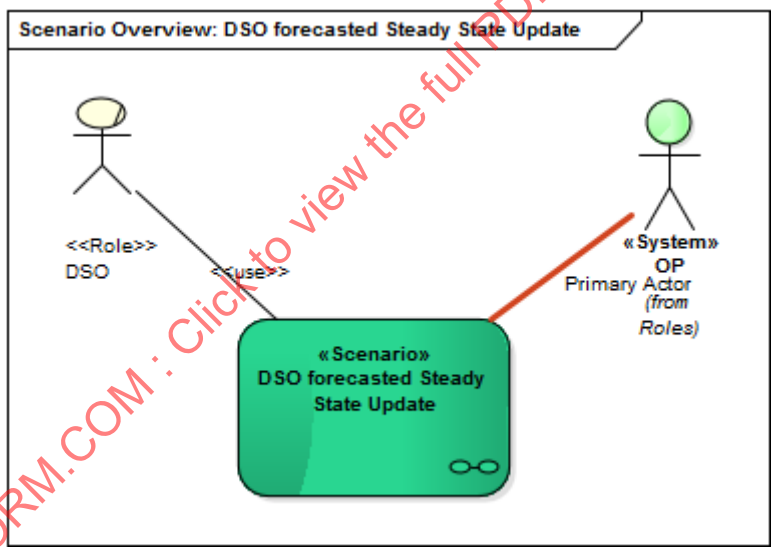

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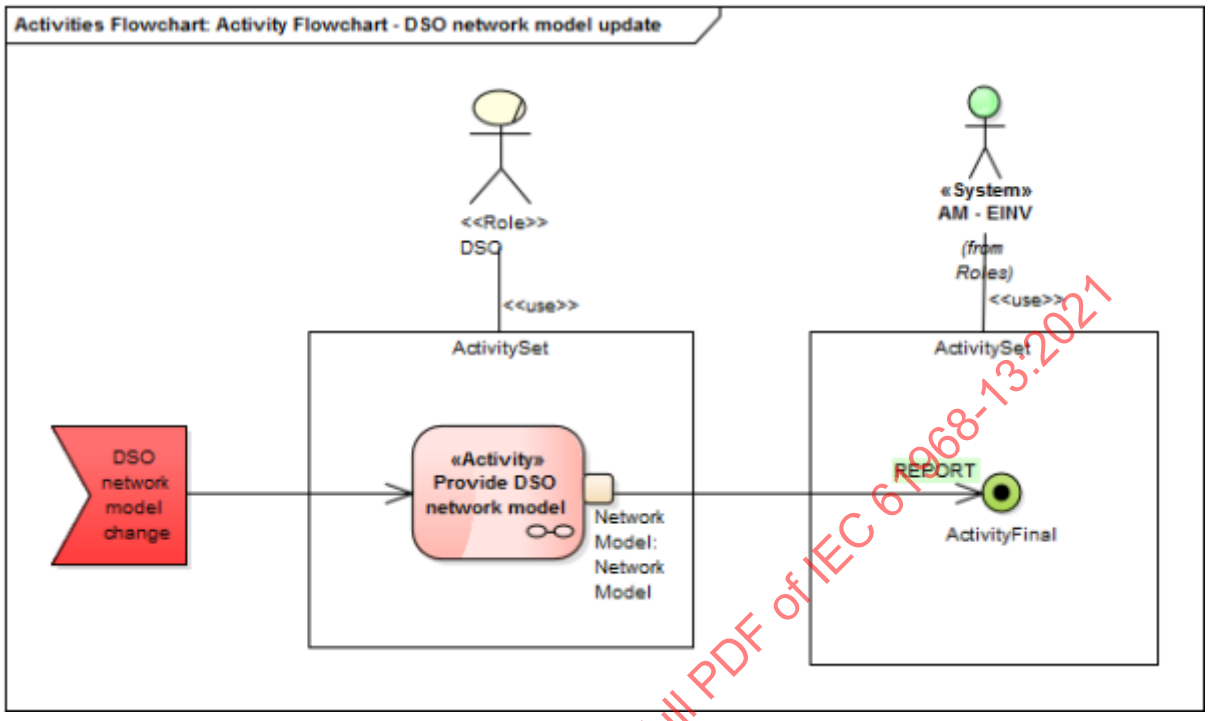
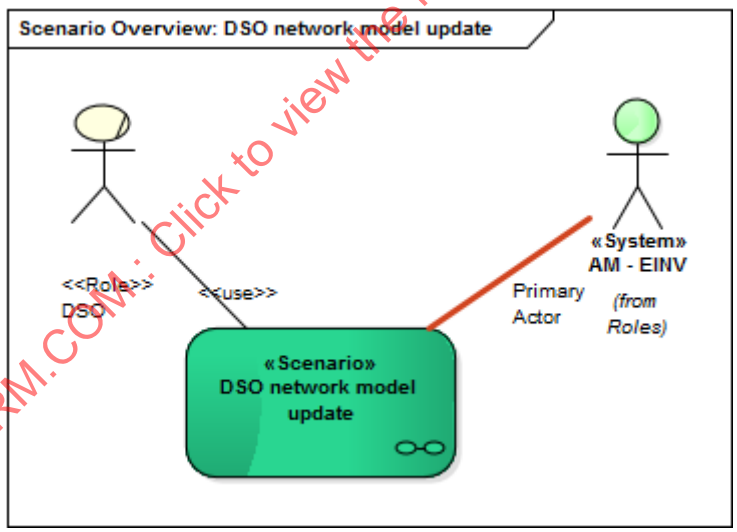
Scenario step by step analysis

Scenario								
Scenario name	DSO forecasted Steady State Update							
Step No	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged (IDs)**	**Requirement, R-IDs**
2.1		Provide forecasted Steady State	The forecasted DSO topology and aggregated Power Flow related to loads and any kind of DER is periodically sent to TSO	REPORT	DSO		Info2-Forecast Steady State Hypothesis	

A.2.4.2.3 DSO network model update

DSO power system model change is notified to TSO.





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Scenario step by step analysis

Scenario								
Scenario name	DSO network model update							
Step No	***Event***	***Name of process/activity***	***Description of process/activity***	***Service***	***Information producer (actor)***	***Information receiver (actor)***	***Information exchanged (IDs)***	***Requirement, R-IDs***
3.1		Provide DSO network model	DSO network model change is notified to TSO	REPORT	DSO		Info3-Network Model	

A.2.5 Information exchanged

Information exchanged			
Information exchanged, ID	***Name of information***	***Description of information exchanged***	***Requirement, R-IDs***
Info1	Current Steady State Hypothesis	CIM SSH profile **Business object:** Steady State Hypothesis CIM SSH profile	Req1, Req2
Info2	Forecast Steady State Hypothesis	CIM SSH profile **Business object:** Steady State Hypothesis CIM SSH profile	Req1, Req2
Info3	Network Model	CIM Functional and Electrical Properties Profiles to conform to CDPSM Profiles **Business object:** Network Model CIM EQ profile	Req1, Req2

A.2.6 Requirements (optional)

Requirements (optional)		
Categories ID	***Category name for requirements***	***Category description***
Requirement R-ID	***Requirement name***	***Requirement description***
Req1	SynInt1	Syntactic interoperability
Req2	SemInt-1	(i.e. The exchanged datasets shall conform to CDPSM Version x.y)

A.2.7 Common terms and definitions

Common terms and definitions	
Term	***Definition***

A.2.8 Custom information (optional)

Custom information (optional)		
Key	***Value***	***Refers to section***

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Annex B
(informative)

Extensions and proposals

B.1 Package Functional

B.1.1 Package Standard

B.1.1.1 (abstract) ACDCConverter

A unit with valves for three phases, together with unit control equipment, essential protective and switching devices, DC storage capacitors, phase reactors and auxiliaries, if any, used for conversion.

Table B.1 shows all attributes of ACDCConverter.

Table B.1 – Attributes of Standard::ACDCConverter

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.2 shows all association ends of ACDCConverter with other classes.

Table B.2 – Association ends of Standard::ACDCConverter with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.2 ACLineSegment

A wire or combination of wires, with consistent electrical characteristics, building a single electrical system, used to carry alternating current between points in the power system.

For symmetrical, transposed 3ph lines, it is sufficient to use ACLineSegment attributes, which describe sequence impedances and admittances for the entire length of the segment.

If per lenght impedance data is available from a library of standard types, impedances and admittances can be calculated in one of the following ways:

– Calculate electrical parameters from asset data, using associated ConductorInfo, with values then multiplied by Conductor.length to produce a matrix model.
– Calculate unbalanced electrical parameters from associated PerLengthPhaseImpedance, then multiplied by Conductor.length to produce a matrix model.
– Calculate transposed electrical parameters from associated PerLengthSequenceImpedance, then multiplied by Conductor.length to produce a sequence model.

Table B.3 shows all attributes of ACLineSegment.

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Table B.3 – Attributes of Standard::ACLineSegment

name	mult	type	description
highNumberOfCircuitInSamePole	0..1	Integer	(NEKno) The sequence number for the segment in the line. Fist segment has number 1.
lengthWithMultipleCircuitInSamePole	0..1	Length	(NEKno)
numberOfDistributionCircuitInSamePole	0..1	Integer	(NEKno) The sequence number for the segment in the line. Fist segment has number 1.
sequenceCode	0..1	String	(NEKno) The sequence code inform the order of the segment in the line and if it is in parallel with other segment. First segment has number 1. If it is in parallel it will be 1.1, etc.
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.4 shows all association ends of ACLineSegment with other classes.

Table B.4 – Association ends of Standard::ACLineSegment with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.3 (abstract) AuxiliaryEquipment

AuxiliaryEquipment describe equipment that is not performing any primary functions but support for the equipment performing the primary function.

AuxiliaryEquipment is attached to primary eqipment via an association with Terminal.

Table B.5 shows all attributes of AuxiliaryEquipment.

Table B.5 – Attributes of Standard::AuxiliaryEquipment

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.6 shows all association ends of AuxiliaryEquipment with other classes.

Table B.6 – Association ends of Standard::AuxiliaryEquipment with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.4 Bay

A collection of power system resources (within a given substation) including conducting equipment, protection relays, measurements, and telemetry.

Table B.7 shows all attributes of Bay.

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Table B.7 – Attributes of Standard::Bay

name	mult	type	description
grid	0..1	GridKind	(NEKno) Allocate the bay an all equipment located in the bay to a given grid type.

Table B.8 shows all association ends of Bay with other classes.

Table B.8 – Association ends of Standard::Bay with other classes

mult from	name	mult to	type	description
0..*	WeatherStation	0..*	WeatherStation	inherited from: EquipmentContainer

B.1.1.5 Breaker

A mechanical switching device capable of making, carrying, and breaking currents under normal circuit conditions and also making, carrying for a specified time, and breaking currents under specified abnormal circuit conditions e.g. those of short circuit.

Table B.9 shows all attributes of Breaker.

Table B.9 – Attributes of Standard::Breaker

name	mult	type	description
remoteControlled	0..1	Boolean	(MSITE) inherited from: ProtectedSwitch
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.10 shows all association ends of Breaker with other classes.

Table B.10 – Association ends of Standard::Breaker with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.6 BusbarSection

A conductor, or group of conductors, with negligible impedance, that serve to connect other conducting equipment within a single substation.

Voltage measurements are typically obtained from VoltageTransformers that are connected to busbar sections. A bus bar section may have many physical terminals but for analysis is modelled with exactly one logical terminal.

Table B.11 shows all attributes of BusbarSection.

Table B.11 – Attributes of Standard::BusbarSection

name	mult	type	description
isTransferBus	0..1	Boolean	(NEKno) (default=false)
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

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Table B.12 shows all association ends of BusbarSection with other classes.

Table B.12 – Association ends of Standard::BusbarSection with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.7 Clamp

A Clamp is a galvanic connection at a line segment where other equipment is connected. A Clamp does not cut the line segment.

A Clamp is ConductingEquipment and has one Terminal with an associated ConnectivityNode. Any other ConductingEquipment can be connected to the Clamp ConnectivityNode.

Table B.13 shows all attributes of Clamp.

Table B.13 – Attributes of Standard::Clamp

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.14 shows all association ends of Clamp with other classes.

Table B.14 – Association ends of Standard::Clamp with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.8 (abstract) ConductingEquipment

The parts of the power system that are designed to carry current or that are conductively connected therewith. ConductingEquipment is contained within an EquipmentContainer that may be a Substation, or a VoltageLevel or a Bay within a Substation.

Table B.15 shows all attributes of ConductingEquipment.

Table B.15 – Attributes of Standard::ConductingEquipment

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.16 shows all association ends of ConductingEquipment with other classes.

Table B.16 – Association ends of Standard::ConductingEquipment with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

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B.1.1.9 (abstract) Conductor

Combination of conducting material with consistent electrical characteristics, building a single electrical system, used to carry current between points in the power system.

Table B.17 shows all attributes of Conductor.

Table B.17 – Attributes of Standard::Conductor

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.18 shows all association ends of Conductor with other classes.

Table B.18 – Association ends of Standard::Conductor with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.10 ConformLoad

ConformLoad represent loads that follow a daily load change pattern where the pattern can be used to scale the load with a system load.

Table B.19 shows all attributes of ConformLoad.

Table B.19 – Attributes of Standard::ConformLoad

name	mult	type	description
specialNeed	0..1	String	(MSITE) inherited from: EnergyConsumer
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.20 shows all association ends of ConformLoad with other classes.

Table B.20 – Association ends of Standard::ConformLoad with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.11 (abstract) Connector

A conductor, or group of conductors, with negligible impedance, that serve to connect other conducting equipment within a single substation and are modelled with a single logical terminal.

Table B.21 shows all attributes of Connector.

Table B.21 – Attributes of Standard::Connector

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

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Table B.22 shows all association ends of Connector with other classes.

Table B.22 – Association ends of Standard::Connector with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.12 CsConverter

DC side of the current source converter (CSC).

Table B.23 shows all attributes of CsConverter.

Table B.23 – Attributes of Standard::CsConverter

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.24 shows all association ends of CsConverter with other classes.

Table B.24 – Association ends of Standard::CsConverter with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.13 CurrentTransformer

Instrument transformer used to measure electrical qualities of the circuit that is being protected and/or monitored. Typically used as current transducer for the purpose of metering or protection. A typical secondary current rating would be 5 A.

Table B.25 shows all attributes of CurrentTransformer.

Table B.25 – Attributes of Standard::CurrentTransformer

name	mult	type	description
ratedCurrent	0..1	CurrentFlow	(NEKno) Rated current on the primary side.
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.26 shows all association ends of CurrentTransformer with other classes.

Table B.26 – Association ends of Standard::CurrentTransformer with other classes

mult from	name	mul t to	type	description
1..1	CurrentTransformerPhase	0..*	CurrentTransformerPhase	
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

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B.1.1.14 Cut

A cut separates a line segment into two parts. The cut appears as a switch inserted between these two parts and connects them together. As the cut is normally open there is no galvanic connection between the two line segment parts. But it is possible to close the cut to get galvanic connection.

The cut terminals are oriented towards the line segment terminals with the same sequence number. Hence the cut terminal with sequence number equal to 1 is oriented to the line segment's terminal with sequence number equal to 1.

The cut terminals also act as connection points for jumpers and other equipment, e.g. a mobile generator. To enable this, connectivity nodes are placed at the cut terminals. Once the connectivity nodes are in place any conducting equipment can be connected at them.

Table B.27 shows all attributes of Cut.

Table B.27 – Attributes of Standard::Cut

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.28 shows all association ends of Cut with other classes.

Table B.28 – Association ends of Standard::Cut with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.15 Disconnector

A manually operated or motor operated mechanical switching device used for changing the connections in a circuit, or for isolating a circuit or equipment from a source of power. It is required to open or close circuits when negligible current is broken or made.

Table B.29 shows all attributes of Disconnector.

Table B.29 – Attributes of Standard::Disconnector

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.30 shows all association ends of Disconnector with other classes.

Table B.30 – Association ends of Standard::Disconnector with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

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B.1.1.16 (abstract) EarthFaultCompensator

A conducting equipment used to represent a connection to ground which is typically used to compensate earth faults. An earth fault compensator device modeled with a single terminal implies a second terminal solidly connected to ground. If two terminals are modeled, the ground is not assumed and normal connection rules apply.

Table B.31 shows all attributes of EarthFaultCompensator.

Table B.31 – Attributes of Standard::EarthFaultCompensator

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.32 shows all association ends of EarthFaultCompensator with other classes.

Table B.32 – Association ends of Standard::EarthFaultCompensator with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.17 EnergyConsumer

Generic user of energy – a point of consumption on the power system model.

Table B.33 shows all attributes of EnergyConsumer.

Table B.33 – Attributes of Standard::EnergyConsumer

name	mult	type	description
specialNeed	0..1	String	(MSITE) Special service needs for the person (contact) are described; examples include life support, etc.
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.34 shows all association ends of EnergyConsumer with other classes.

Table B.34 – Association ends of Standard::EnergyConsumer with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.18 EnergySource

A generic equivalent for an energy supplier on a transmission or distribution voltage level.

Table B.35 shows all attributes of EnergySource.

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Table B.35 – Attributes of Standard::EnergySource

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.36 shows all association ends of EnergySource with other classes.

Table B.36 – Association ends of Standard::EnergySource with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.19 (abstract) Equipment

The parts of a power system that are physical devices, electronic or mechanical.

Table B.37 shows all attributes of Equipment.

Table B.37 – Attributes of Standard::Equipment

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) A flag indicating that the equipment (model/class) does not reflect the corresponding assets. It is included to create an equivalent model that support necessary analytic, e.g. power flow calculation.

Table B.38 shows all association ends of Equipment with other classes.

Table B.38 – Association ends of Standard::Equipment with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	

B.1.1.20 (abstract) EquipmentContainer

A modeling construct to provide a root class for containing equipment.

Table B.39 shows all association ends of EquipmentContainer with other classes.

Table B.39 – Association ends of Standard::EquipmentContainer with other classes

mult from	name	mult to	type	description
0..*	WeatherStation	0..*	WeatherStation	

B.1.1.21 (abstract) EquivalentEquipment

The class represents equivalent objects that are the result of a network reduction. The class is the base for equivalent objects of different types.

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Table B.40 shows all attributes of EquivalentEquipment.

Table B.40 – Attributes of Standard::EquivalentEquipment

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.41 shows all association ends of EquivalentEquipment with other classes.

Table B.41 – Association ends of Standard::EquivalentEquipment with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.22 EquivalentInjection

This class represents equivalent injections (generation or load). Voltage regulation is allowed only at the point of connection.

Table B.42 shows all attributes of EquivalentInjection.

Table B.42 – Attributes of Standard::EquivalentInjection

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.43 shows all association ends of EquivalentInjection with other classes.

Table B.43 – Association ends of Standard::EquivalentInjection with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.23 ExternalNetworkInjection

This class represents external network and it is used for IEC 60909 calculations.

Table B.44 shows all attributes of ExternalNetworkInjection.

Table B.44 – Attributes of Standard::ExternalNetworkInjection

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.45 shows all association ends of ExternalNetworkInjection with other classes.

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Table B.45 – Association ends of Standard::ExternalNetworkInjection with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.24 FaultIndicator

A FaultIndicator is typically only an indicator (which may or may not be remotely monitored), and not a piece of equipment that actually initiates a protection event. It is used for FLISR (Fault Location, Isolation and Restoration) purposes, assisting with the dispatch of crews to "most likely" part of the network (i.e. assists with determining circuit section where the fault most likely happened).

Table B.46 shows all attributes of FaultIndicator.

Table B.46 – Attributes of Standard::FaultIndicator

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.47 shows all association ends of FaultIndicator with other classes.

Table B.47 – Association ends of Standard::FaultIndicator with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.25 Feeder

Table B.48 shows all attributes of Feeder.

Table B.48 – Attributes of Standard::Feeder

name	mult	type	description
productionFeeder	0..1	Boolean	(NEKno) Flag indicating that the feeder include power production.

Table B.49 shows all association ends of Feeder with other classes.

Table B.49 – Association ends of Standard::Feeder with other classes

mult from	name	mult to	type	description
0..*	ToBay	0..1	Bay	
0..*	FromBay	0..1	Bay	
0..*	WeatherStation	0..*	WeatherStation	inherited from: EquipmentContainer

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B.1.1.26 Fuse

An overcurrent protective device with a circuit opening fusible part that is heated and severed by the passage of overcurrent through it. A fuse is considered a switching device because it breaks current.

Table B.50 shows all attributes of Fuse.

Table B.50 – Attributes of Standard::Fuse

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.51 shows all association ends of Fuse with other classes.

Table B.51 – Association ends of Standard::Fuse with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.27 GeneratingUnit

A single or set of synchronous machines for converting mechanical power into alternating-current power. For example, individual machines within a set may be defined for scheduling purposes while a single control signal is derived for the set. In this case there would be a GeneratingUnit for each member of the set and an additional GeneratingUnit corresponding to the set.

Table B.52 shows all attributes of GeneratingUnit.

Table B.52 – Attributes of Standard::GeneratingUnit

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.53 shows all association ends of GeneratingUnit with other classes.

Table B.53 – Association ends of Standard::GeneratingUnit with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.28 Ground

A common point for connecting grounded conducting equipment such as shunt capacitors. The power system model can have more than one ground.

Table B.54 shows all attributes of Ground.

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Table B.54 – Attributes of Standard::Ground

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.55 shows all association ends of Ground with other classes.

Table B.55 – Association ends of Standard::Ground with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.29 GroundDisconnector

A manually operated or motor operated mechanical switching device used for isolating a circuit or equipment from ground.

Table B.56 shows all attributes of GroundDisconnector.

Table B.56 – Attributes of Standard::GroundDisconnector

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.57 shows all association ends of GroundDisconnector with other classes.

Table B.57 – Association ends of Standard::GroundDisconnector with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.30 GroundingImpedance

A fixed impedance device used for grounding.

Table B.58 shows all attributes of GroundingImpedance.

Table B.58 – Attributes of Standard::GroundingImpedance

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.59 shows all association ends of GroundingImpedance with other classes.

Table B.59 – Association ends of Standard::GroundingImpedance with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

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B.1.1.31 HydroGeneratingUnit

A generating unit whose prime mover is a hydraulic turbine (e.g., Francis, Pelton, Kaplan).

Table B.60 shows all attributes of HydroGeneratingUnit.

Table B.60 – Attributes of Standard::HydroGeneratingUnit

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.61 shows all association ends of HydroGeneratingUnit with other classes.

Table B.61 – Association ends of Standard::HydroGeneratingUnit with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.32 HydroPump

A synchronous motor-driven pump, typically associated with a pumped storage plant.

Table B.62 shows all attributes of HydroPump.

Table B.62 – Attributes of Standard::HydroPump

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.63 shows all association ends of HydroPump with other classes.

Table B.63 – Association ends of Standard::HydroPump with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.33 Jumper

A short section of conductor with negligible impedance which can be manually removed and replaced if the circuit is de-energized. Note that zero-impedance branches can be modelled by an ACLineSegment with a zero impedance ConductorType.

Table B.64 shows all attributes of Jumper.

Table B.64 – Attributes of Standard::Jumper

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

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Table B.65 shows all association ends of Jumper with other classes.

Table B.65 – Association ends of Standard::Jumper with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.34 Junction

A point where one or more conducting equipments are connected with zero resistance.

Table B.66 shows all attributes of Junction.

Table B.66 – Attributes of Standard::Junction

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.67 shows all association ends of Junction with other classes.

Table B.67 – Association ends of Standard::Junction with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.35 Line

Contains equipment beyond a substation belonging to a power transmission line.

Table B.68 shows all attributes of Line.

Table B.68 – Attributes of Standard::Line

name	mult	type	description
sourceGrounding	0..1	SourceForLineValues	(NEKno) Indicate how the values for the capacity to ground is derived.
sourceNullValues	0..1	SourceForLineValues	(NEKno) Indicate how the values for the null system is derived.
sourcePlusValues	0..1	SourceForLineValues	(NEKno) Indicate how the values for the plus system is derived.
sourceSusceptance	0..1	SourceForLineValues	(NEKno) Indicate how the values for the susceptance is derived.

Table B.69 shows all association ends of Line with other classes.

Table B.69 – Association ends of Standard::Line with other classes

mult from	name	mult to	type	description
0..*	WeatherStation	0..*	WeatherStation	inherited from: EquipmentContainer

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B.1.1.36 LinearShuntCompensator

A linear shunt compensator has banks or sections with equal admittance values.

Table B.70 shows all attributes of LinearShuntCompensator.

Table B.70 – Attributes of Standard::LinearShuntCompensator

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.71 shows all association ends of LinearShuntCompensator with other classes.

Table B.71 – Association ends of Standard::LinearShuntCompensator with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.37 LoadBreakSwitch

A mechanical switching device capable of making, carrying, and breaking currents under normal operating conditions.

Table B.72 shows all attributes of LoadBreakSwitch.

Table B.72 – Attributes of Standard::LoadBreakSwitch

name	mult	type	description
remoteControlled	0..1	Boolean	(MSITE) inherited from: ProtectedSwitch
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.73 shows all association ends of LoadBreakSwitch with other classes.

Table B.73 – Association ends of Standard::LoadBreakSwitch with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.38 NonConformLoad

NonConformLoad represent loads that do not follow a daily load change pattern and changes are not correlated with the daily load change pattern.

Table B.74 shows all attributes of NonConformLoad.

Table B.74 – Attributes of Standard::NonConformLoad

name	mult	type	description
specialNeed	0..1	String	(MSITE) inherited from: EnergyConsumer
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

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Table B.75 shows all association ends of NonConformLoad with other classes.

Table B.75 – Association ends of Standard::NonConformLoad with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.39 NonlinearShuntCompensator

A non linear shunt compensator has bank or section admittance values that differs.

Table B.76 shows all attributes of NonlinearShuntCompensator.

Table B.76 – Attributes of Standard::NonlinearShuntCompensator

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.77 shows all association ends of NonlinearShuntCompensator with other classes.

Table B.77 – Association ends of Standard::NonlinearShuntCompensator with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.40 OperationalLimitSet

A set of limits associated with equipment. Sets of limits might apply to a specific temperature, or season for example. A set of limits may contain different severities of limit levels that would apply to the same equipment. The set may contain limits of different types such as apparent power and current limits or high and low voltage limits that are logically applied together as a set.

Table B.78 shows all association ends of OperationalLimitSet with other classes.

Table B.78 – Association ends of Standard::OperationalLimitSet with other classes

mult from	name	mult to	type	description
1..*	RateTemperature	0..1	RateTemperature	A rate temperature may be associated with a limit set.

B.1.1.41 OperationalLimitType

The operational meaning of a category of limits.

Table B.79 shows all attributes of OperationalLimitType.

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Table B.79 – Attributes of Standard::OperationalLimitType

name	mult	type	description
limitType	0..1	LimitTypeKind	(Entsoe) Types of limits defined in the ENTSO-E Operational Handbook Policy 3.

B.1.1.42 PetersenCoil

A tunable impedance device normally used to offset line charging during single line faults in an ungrounded section of network.

Table B.80 shows all attributes of PetersenCoil.

Table B.80 – Attributes of Standard::PetersenCoil

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.81 shows all association ends of PetersenCoil with other classes.

Table B.81 – Association ends of Standard::PetersenCoil with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.43 ProtectionEquipment

An electrical device designed to respond to input conditions in a prescribed manner and after specified conditions are met to cause contact operation or similar abrupt change in associated electric control circuits, or simply to display the detected condition. Protection equipment are associated with conducting equipment and usually operate circuit breakers.

Table B.82 shows all attributes of ProtectionEquipment.

Table B.82 – Attributes of Standard::ProtectionEquipment

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.83 shows all association ends of ProtectionEquipment with other classes.

Table B.83 – Association ends of Standard::ProtectionEquipment with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.44 PostLineSensor

A sensor used mainly in overhead distribution networks as the source of both current and voltage measurements.

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Table B.84 shows all attributes of PostLineSensor.

Table B.84 – Attributes of Standard::PostLineSensor

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.85 shows all association ends of PostLineSensor with other classes.

Table B.85 – Association ends of Standard::PostLineSensor with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.45 PotentialTransformer

Instrument transformer (also known as Voltage Transformer) used to measure electrical qualities of the circuit that is being protected and/or monitored. Typically used as voltage transducer for the purpose of metering, protection, or sometimes auxiliary substation supply. A typical secondary voltage rating would be 120 V.

Table B.86 shows all attributes of PotentialTransformer.

Table B.86 – Attributes of Standard::PotentialTransformer

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.87 shows all association ends of PotentialTransformer with other classes.

Table B.87 – Association ends of Standard::PotentialTransformer with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.46 PowerTransformer

An electrical device consisting of two or more coupled windings, with or without a magnetic core, for introducing mutual coupling between electric circuits. Transformers can be used to control voltage and phase shift (active power flow).

A power transformer may be composed of separate transformer tanks that need not be identical.

The same power transformer can be modelled in two ways, namely with and without tanks:

1) The power transformer that uses power transformer ends directly (without tanks) is suitable for balanced three-phase models. This is typical for transmission and sub-transmission network modelling. Such a transformer will require one power transformer end for each physical winding. There must be a one-to-one association between PowerTransformerEnd and Core::Terminal.

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2) The power transformer that uses transformer tanks is suitable for an unbalanced transformer, a balanced transformer within a single tank, or a balanced transformer made up of three tanks. This is typical for distribution network modelling and the only choice when modelling an unbalanced transformer, or a transformer that has more than three windings. Power transformer modelled with tanks will require for each tank, one transformer tank end per physical winding in the tank. There may be one, two, or three phases in the transformer tank end. Examples: 3 phases for 3-phase delta or wye connected windings, 2 for one phase-to-phase winding, and 1 for a phase-to-neutral or phase-to-ground winding. With 1 or 2 phases, more than one transformer tank end may be associated to the same 3-phase Core::Terminal instance, while with 3 phases there should be a one-to-one association.

This power transformer model is flexible in order to support different kinds of data exchange requirements. There are 5 possible ways to combine available classes and their attributes:

1) Instance parameters – Use the r, x, r0, x0, b, b0, g, and g0 attributes on PowerTransformerEnd and ignore related TransformerStarImpedance, TransformerMeshImpedance, or TransformerCoreAdmittance. This option assumes a star connection of the series impedances. It is suitable for typical transmission, balanced three-phase transformer models, for transformers with 2 or three windings.
2) Star instance parameters by association – Instead of the r, x, r0, x0, b, b0, g, and g0 attributes, use associations to TransformerStarImpedance and TransformerCoreAdmitance. This option is suitable in same scenarios as option 1, but when catalogue data is available for transformers.
3) Mesh instance parameters by association: Instead of the r, x, r0, x0, b, b0, g, and g0 attributes, use associations to TransformerMeshImpedance and TransformerCoreAdmittance. This option supports transformers with more than three windings.
4) Catalog mesh parameters by association – Instead of attributes r, x, r0, x0, b, b0, g, and g0 and associations to TransformerStarImpedance, TransformerMeshImpedance, or TransformerCoreAdmittance, use the association to TransformerEndInfo. The TransformerEnd.endNumber should match the corresponding TransformerEndInfo.endNumber, following the IEC standard convention of numbering from the highest voltage ends to the lowest, starting at 1. This matching supports higher-level use of a catalog, through just one association between TransformerTank and TransformerTankInfo, with simpler exchanges and incremental updates. The associated TransformerEndInfo will have associations to TransformerMeshImpedance and TransformerCoreAdmittance. This option supports unbalanced transformer, with more than three windings and is suitable whenever the transformer test data has been converted to an electrical model.
5) Catalog test data by association – This is the same as option 4, except TransformerEndInfo will have associations to AssetModels::TransformerTest decendents, instead of to TransformerMeshImpedance and TransformerCoreAdmittance. This option is suitable when the test data is available, and the receiving application is able to interpret the test data.

Every profile should specify which one or more of these options are supported.

Table B.88 shows all attributes of PowerTransformer.

Table B.88 – Attributes of Standard::PowerTransformer

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.89 shows all association ends of PowerTransformer with other classes.

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Table B.89 – Association ends of Standard::PowerTransformer with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.47 (abstract) ProtectedSwitch

A ProtectedSwitch is a switching device that can be operated by ProtectionEquipment.

Table B.90 shows all attributes of ProtectedSwitch.

Table B.90 – Attributes of Standard::ProtectedSwitch

name	mult	type	description
remoteControlled	0..1	Boolean	(MSITE) Tell if the switch is remote controlled. A shortcut to express what should otherwise be through Control, remoteControl, RemoteUnit
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.91 shows all association ends of ProtectedSwitch with other classes.

Table B.91 – Association ends of Standard::ProtectedSwitch with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.48 Recloser

Pole-mounted fault interrupter with built-in phase and ground relays, current transformer (CT), and supplemental controls.

Table B.92 shows all attributes of Recloser.

Table B.92 – Attributes of Standard::Recloser

name	mult	type	description
remoteControlled	0..1	Boolean	(MSITE) inherited from: ProtectedSwitch
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.93 shows all association ends of Recloser with other classes.

Table B.93 – Association ends of Standard::Recloser with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

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B.1.1.49 (abstract) RegulatingCondEq

A type of conducting equipment that can regulate a quanity (i.e. voltage or flow) at a specific point in the network.

Table B.94 shows all attributes of RegulatingCondEq.

Table B.94 – Attributes of Standard::RegulatingCondEq

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.95 shows all association ends of RegulatingCondEq with other classes.

Table B.95 – Association ends of Standard::RegulatingCondEq with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.50 (abstract) RotatingMachine

A rotating machine which may be used as a generator or motor.

Table B.96 shows all attributes of RotatingMachine.

Table B.96 – Attributes of Standard::RotatingMachine

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.97 shows all association ends of RotatingMachine with other classes.

Table B.97 – Association ends of Standard::RotatingMachine with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.51 Sectionaliser

Automatic switch that will lock open to isolate a faulted section. It may, or may not, have load breaking capability. Its primary purpose is to provide fault sectionalising at locations where the fault current is either too high, or too low, for proper coordination of fuses.

Table B.98 shows all attributes of Sectionaliser.

Table B.98 – Attributes of Standard::Sectionaliser

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

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Table B.99 shows all association ends of Sectionaliser with other classes.

Table B.99 – Association ends of Standard::Sectionaliser with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.52 (abstract) Sensor

This class describe devices that transform a measured quantity into signals that can be presented at displays, used in control or be recorded.

Table B.100 shows all attributes of Sensor.

Table B.100 – Attributes of Standard::Sensor

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.101 shows all association ends of Sensor with other classes.

Table B.101 – Association ends of Standard::Sensor with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.53 (abstract) ShuntCompensator

A shunt capacitor or reactor or switchable bank of shunt capacitors or reactors. A section of a shunt compensator is an individual capacitor or reactor. A negative value for reactivePerSection indicates that the compensator is a reactor. ShuntCompensator is a single terminal device. Ground is implied.

Table B.102 shows all attributes of ShuntCompensator.

Table B.102 – Attributes of Standard::ShuntCompensator

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.103 shows all association ends of ShuntCompensator with other classes.

Table B.103 – Association ends of Standard::ShuntCompensator with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

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B.1.1.54 SolarGeneratingUnit

A solar thermal generating unit.

Table B.104 shows all attributes of SolarGeneratingUnit.

Table B.104 – Attributes of Standard::SolarGeneratingUnit

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.105 shows all association ends of SolarGeneratingUnit with other classes.

Table B.105 – Association ends of Standard::SolarGeneratingUnit with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.55 StaticVarCompensator

A facility for providing variable and controllable shunt reactive power. The SVC typically consists of a stepdown transformer, filter, thyristor-controlled reactor, and thyristor-switched capacitor arms.

The SVC may operate in fixed MVar output mode or in voltage control mode. When in voltage control mode, the output of the SVC will be proportional to the deviation of voltage at the controlled bus from the voltage setpoint. The SVC characteristic slope defines the proportion. If the voltage at the controlled bus is equal to the voltage setpoint, the SVC MVar output is zero.

Table B.106 shows all attributes of StaticVarCompensator.

Table B.106 – Attributes of Standard::StaticVarCompensator

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.107 shows all association ends of StaticVarCompensator with other classes.

Table B.107 – Association ends of Standard::StaticVarCompensator with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.56 StationSupply

Station supply with load derived from the station output.

Table B.108 shows all attributes of StationSupply.

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Table B.108 – Attributes of Standard::StationSupply

name	mult	type	description
specialNeed	0..1	String	(MSITE) inherited from: EnergyConsumer
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.109 shows all association ends of StationSupply with other classes.

Table B.109 – Association ends of Standard::StationSupply with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.57 Substation

A collection of equipment for purposes other than generation or utilization, through which electric energy in bulk is passed for the purposes of switching or modifying its characteristics.

Table B.110 shows all attributes of Substation.

Table B.110 – Attributes of Standard::Substation

name	mult	type	description
blackStartEnable	0..1	Boolean	(NEKno) True if one or more of the connected generating units are able to support black start, being able to start up power production without relying on the external electric power transmission network.
emergencyClass	0..1	EmergencyClassKind	(NEKno)
kind	0..1	SubstationKind	(NEKno)
totalWinterP	0..1	ActivePower	(NEKno) Total expected available winter active power capacity connected to the substation. The value take expected network configuration, type of generation and operational condition into account.

Table B.111 shows all association ends of Substation with other classes.

Table B.111 – Association ends of Standard::Substation with other classes

mult from	name	mult to	type	description
0..*	SupplyingStation	0..1	Station	
0..*	Station	0..1	Station	Member of station
0..*	WeatherStation	0..*	WeatherStation	inherited from: EquipmentContainer

B.1.1.58 SurgeArrester

Shunt device, installed on the network, usually in the proximity of electrical equipment in order to protect the said equipment against transient voltage transients caused by lightning or switching activity.

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Table B.112 shows all attributes of SurgeArrester.

Table B.112 – Attributes of Standard::SurgeArrester

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.113 shows all association ends of SurgeArrester with other classes.

Table B.113 – Association ends of Standard::SurgeArrester with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.59 Switch

A generic device designed to close, or open, or both, one or more electric circuits.

Table B.114 shows all attributes of Switch.

Table B.114 – Attributes of Standard::Switch

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.115 shows all association ends of Switch with other classes.

Table B.115 – Association ends of Standard::Switch with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.60 SynchronousMachine

An electromechanical device that operates with shaft rotating synchronously with the network. It is a single machine operating either as a generator or synchronous condenser or pump.

Table B.116 shows all attributes of SynchronousMachine.

Table B.116 – Attributes of Standard::SynchronousMachine

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.117 shows all association ends of SynchronousMachine with other classes.

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Table B.117 – Association ends of Standard::SynchronousMachine with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.61 ThermalGeneratingUnit

A generating unit whose prime mover could be a steam turbine, combustion turbine, or diesel engine.

Table B.118 shows all attributes of ThermalGeneratingUnit.

Table B.118 – Attributes of Standard::ThermalGeneratingUnit

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.119 shows all association ends of ThermalGeneratingUnit with other classes.

Table B.119 – Association ends of Standard::ThermalGeneratingUnit with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.62 VoltageLevel

A collection of equipment at one common system voltage forming a switchgear. The equipment typically consist of breakers, busbars, instrumentation, control, regulation and protection devices as well as assemblies of all these.

Table B.120 shows all attributes of VoltageLevel.

Table B.120 – Attributes of Standard::VoltageLevel

name	mult	type	description
busConfiguration	0..1	BusbarConfigurationKind	(NEKno)

Table B.121 shows all association ends of VoltageLevel with other classes.

Table B.121 – Association ends of Standard::VoltageLevel with other classes

mult from	name	mult to	type	description
0..*	WeatherStation	0..*	WeatherStation	inherited from: EquipmentContainer

B.1.1.63 VsConverter

DC side of the voltage source converter (VSC).

Table B.122 shows all attributes of VsConverter.

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Table B.122 – Attributes of Standard::VsConverter

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.123 shows all association ends of VsConverter with other classes.

Table B.123 – Association ends of Standard::VsConverter with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.64 WaveTrap

Line traps are devices that impede high frequency power line carrier signals yet present a negligible impedance at the main power frequency.

Table B.124 shows all attributes of WaveTrap.

Table B.124 – Attributes of Standard::WaveTrap

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.125 shows all association ends of WaveTrap with other classes.

Table B.125 – Association ends of Standard::WaveTrap with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.1.65 WindGeneratingUnit

A wind driven generating unit. May be used to represent a single turbine or an aggregation.

Table B.126 shows all attributes of WindGeneratingUnit.

Table B.126 – Attributes of Standard::WindGeneratingUnit

name	mult	type	description
isModelCompensation	0..1	Boolean	(NEKno) inherited from: Equipment

Table B.127 shows all association ends of WindGeneratingUnit with other classes.

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Table B.127 – Association ends of Standard::WindGeneratingUnit with other classes

mult from	name	mult to	type	description
0..*	AggregatedEquipment	0..1	Equipment	inherited from: Equipment

B.1.2 Package (Informative) InfIEC61970

B.1.2.1 General

See Figure B.1.

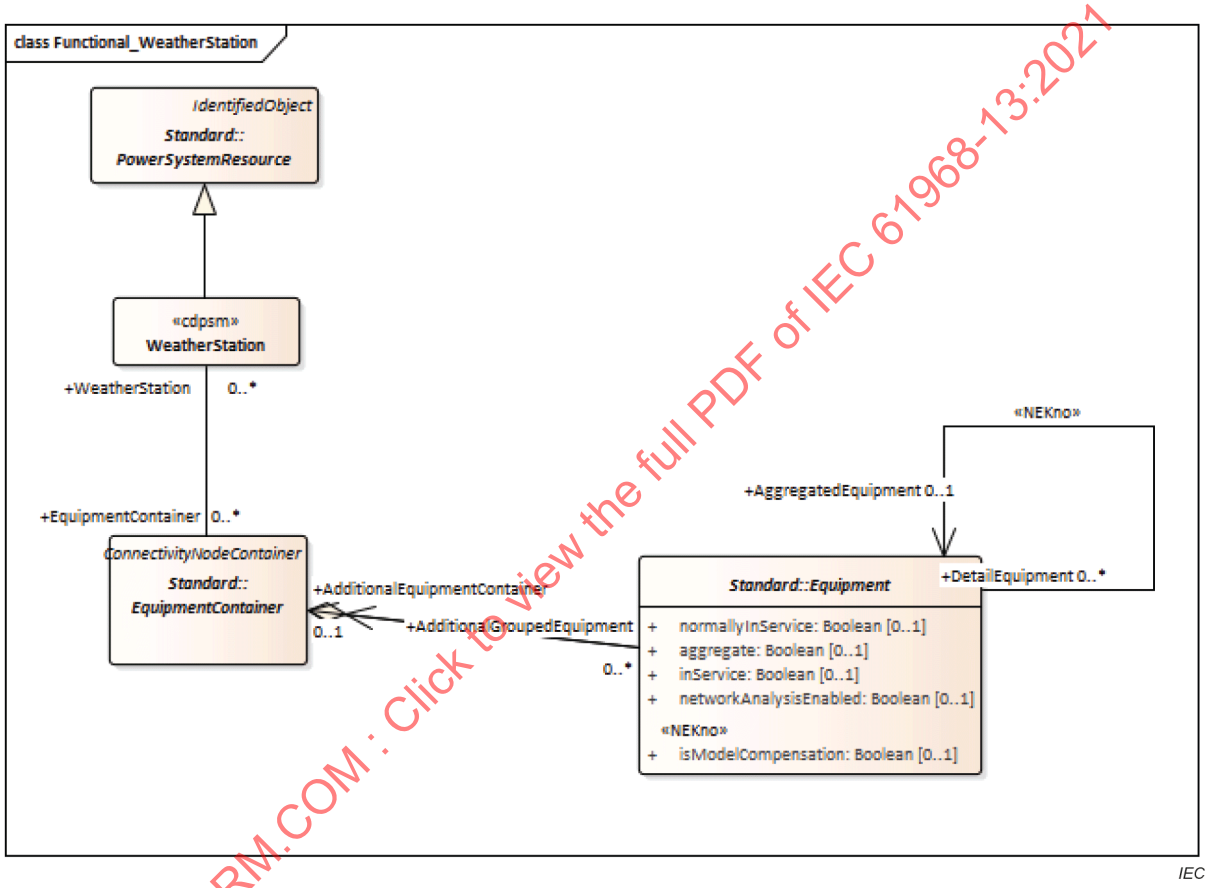

Figure B.1 – Class diagram (Informative) InfIEC61970::Functional_WeatherStation

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B.1.2.2 (cdpsm) WeatherStation

This represents a source of ambient temperature.

Table B.128 shows all attributes of WeatherStation.

Table B.128 – Attributes of (Informative) InfIEC61970::WeatherStation

name	mult	type	description
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table B.129 shows all association ends of WeatherStation with other classes.

Table B.129 – Association ends of (Informative) InfIEC61970:: WeatherStation with other classes

mult from	name	mult to	type	description
0..*	EquipmentContainer	0..*	EquipmentContainer	
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

B.1.3 Package (Informative) InfExtensions

B.1.3.1 Package (Informative) InfNEKExtensions

B.1.3.1.1 General

See Figure B.2 toFigure B.4.

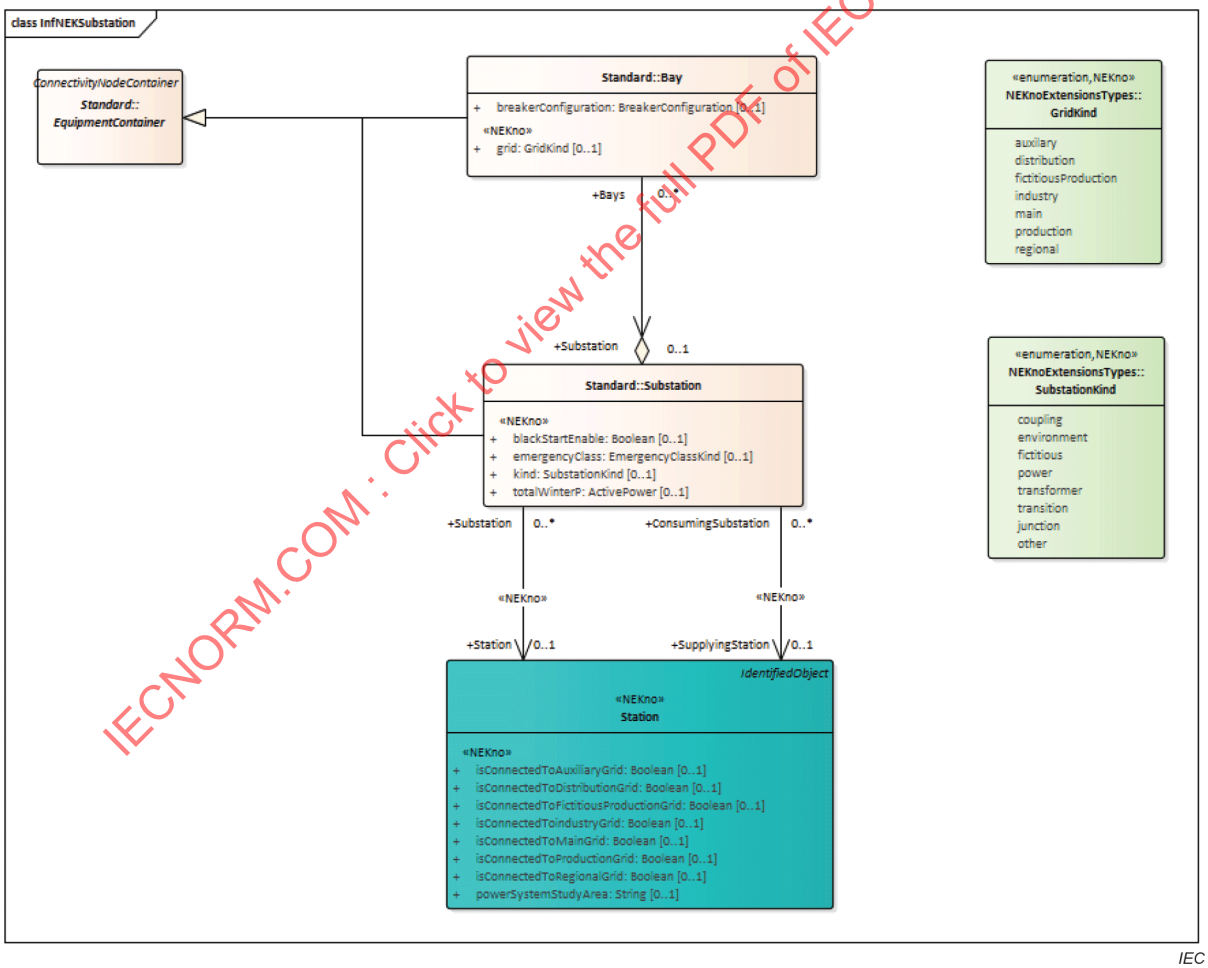

Figure B.2 – Class diagram (Informative) InfNEKExtensions::InfNEKSubstation

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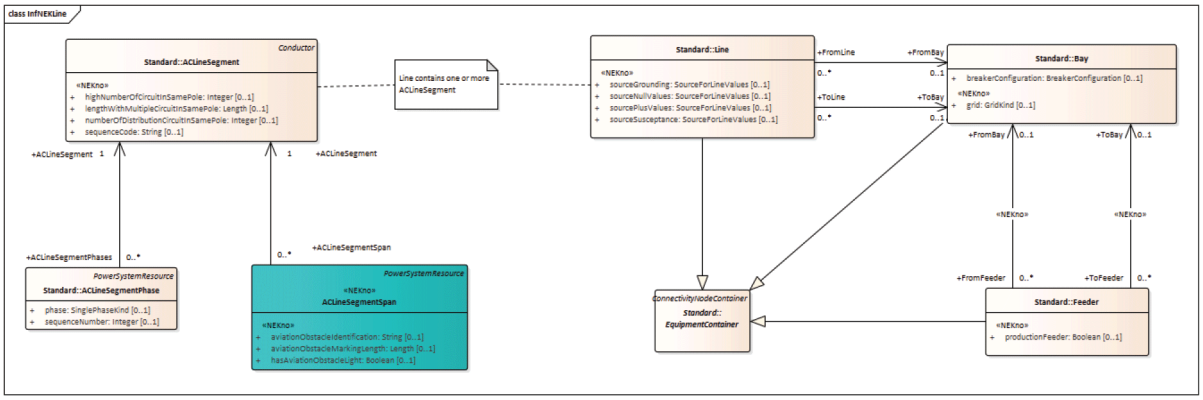

Figure B.3 – Class diagram (Informative) InfNEKExtensions::InfNEKLine

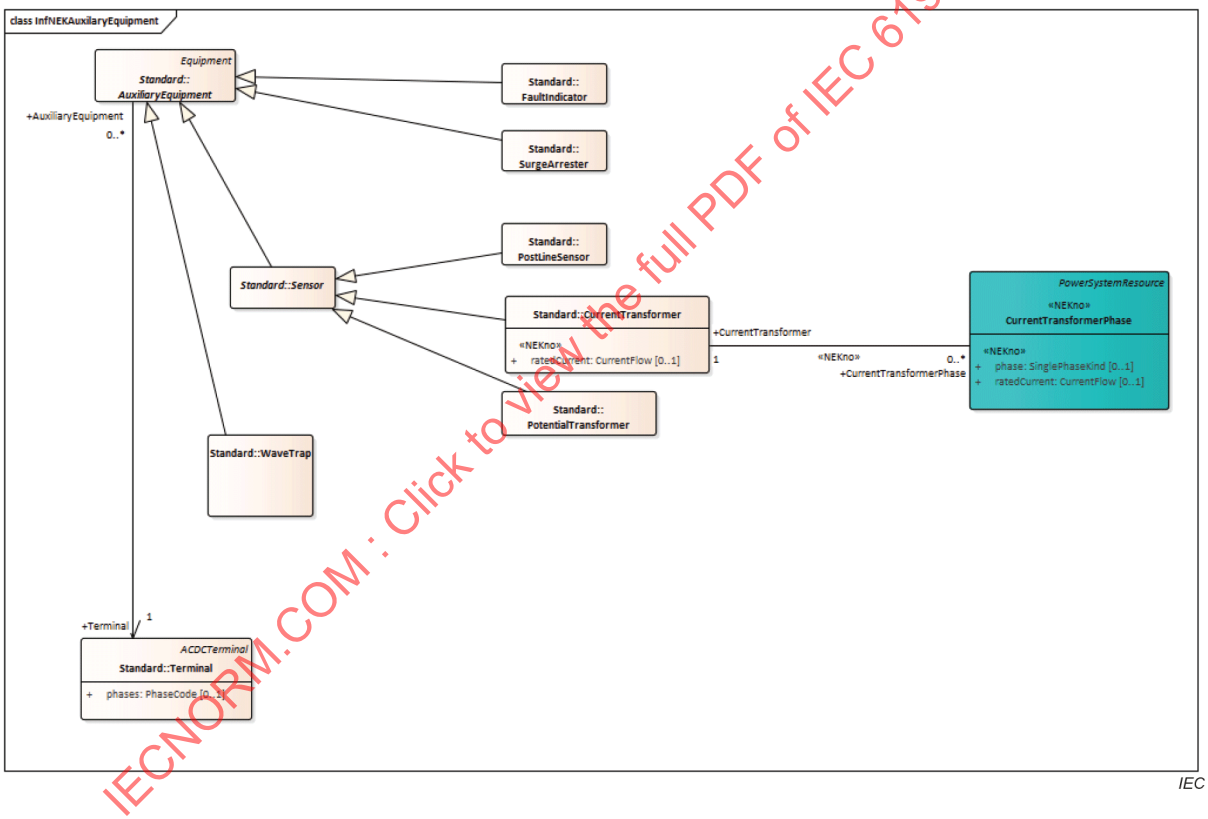

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Figure B.4 – Class diagram (Informative) InfNEKExtensions::InfNEKAuxilaryEquipment

B.1.3.1.2 (NEKno) ACLineSegmentSpan

The part of a segment line between two consecutive points of support.

Table B.130 shows all attributes of ACLineSegmentSpan.

Table B.130 – Attributes of (Informative) InfNEKExtensions::ACLineSegmentSpan

name	mult	type	description
aviationObstacleIdentification	0..1	String	(NEKno) The identification of the aviation obstacle, e.g. NRL-ID (Nasjonalt register over luftfartshindre ID) for Norway.
aviationObstacleMarkingLength	0..1	Length	(NEKno) The length of the span that include marking of aviation obstacle.
hasAviationObstacleLight	0..1	Boolean	(NEKno) True if the span include automatic light for the aviation obstacle.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table B.131 shows all association ends of ACLineSegmentSpan with other classes.

Table B.131 – Association ends of (Informative) InfNEKExtensions:: ACLineSegmentSpan with other classes

mult from	name	mult to	type	description
0..*	ACLineSegment	1..1	ACLineSegment	
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

B.1.3.1.3 (NEKno) CurrentTransformerPhase

Single phase of a multi-phase instrument transformer when its attributes might be different per phase.

Table B.132 shows all attributes of CurrentTransformerPhase.

Table B.132 – Attributes of (Informative) InfNEKExtensions::CurrentTransformerPhase

name	mult	type	description
phase	0..1	SinglePhaseKind	(NEKno) Phase of the CurrentTransformerPhase.
ratedCurrent	0..1	CurrentFlow	(NEKno) Rated current on the primary side.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table B.133 shows all association ends of CurrentTransformerPhase with other classes.

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Table B.133 – Association ends of (Informative) InfNEKExtensions::CurrentTransformerPhase with other classes

mult from	name	mult to	type	description
0..*	CurrentTransformer	1..1	CurrentTransformer	
0..*	AssetDatasheet	0..1	AssetInfo	inherited from: PowerSystemResource
0..*	PSRType	0..1	PSRType	inherited from: PowerSystemResource

B.1.3.1.4 (NEKno) Station

Station is a collection of substation that is connected to the same power system study area.

Table B.134 shows all attributes of Station.

Table B.134 – Attributes of (Informative) InfNEKExtensions::Station

name	mult	type	description
isConnectedToAuxiliaryGrid	0..1	Boolean	(NEKno) The Station has connection to the auxiliary grid.
isConnectedToDistributionGrid	0..1	Boolean	(NEKno) The Station has connection to the distribution grid.
isConnectedToFictitiousProductionGrid	0..1	Boolean	(NEKno) The Station has connection to the fictitious production grid.
isConnectedToindustryGrid	0..1	Boolean	(NEKno) The Station has connection to the industry grid.
isConnectedToMainGrid	0..1	Boolean	(NEKno) The Station has connection to the main grid.
isConnectedToProductionGrid	0..1	Boolean	(NEKno) The Station has connection to the production grid.
isConnectedToRegionalGrid	0..1	Boolean	(NEKno) The Station has connection to the regional grid.
powerSystemStudyArea	0..1	String	(NEKno) Power System Study Area represent the network model for a given geographical area.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

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B.1.3.2 Package (Informative) InfEntsoeExtensions

B.1.3.2.1 General

See Figure B.5.

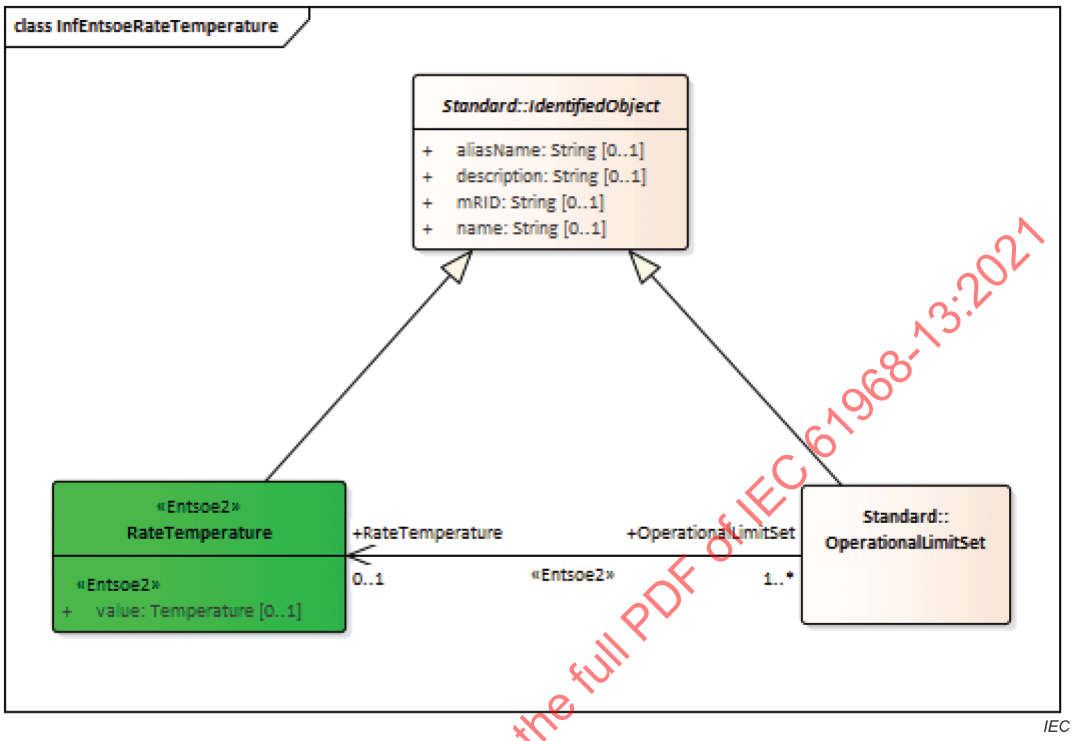

Figure B.5 – Class diagram (Informative) InfEntsoeExtensions::InfEntsoeRateTemperature

B.1.3.2.2 (Entsoe2) RateTemperature

Discrete temperatures that are used for calculation temperature dependent limits. Normal value are 20 degree Celsius.

Table B.135 shows all attributes of RateTemperature.

Table B.135 – Attributes of (Informative) InfEntsoeExtensions::RateTemperature

name	mult	type	description
value	0..1	Temperature	(Entsoe2) Temperature value.
name	0..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

B.2 Package ElectricalProperties

B.2.1 General

There is no illustrative figure in the UML model.

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B.2.2 Package Standard

B.2.2.1 (Description) ACLineSegmentPhase

Represents a single wire of an alternating current line segment.

B.2.2.2 Attributes of ACLineSegmentPhase

Table B.136 shows all attributes of ACLineSegmentPhase.

Table B.136 – Attributes of Standard::ACLineSegmentPhase

name	mult	type	description
b0ch	0..1	Susceptance	(NEKno) Zero sequence shunt (charging) susceptance, uniformly distributed, of the entire line section.
bch	0..1	Susceptance	(NEKno) Positive sequence shunt (charging) susceptance, uniformly distributed, of the entire line section. This value represents the full charging over the full length of the line.
r	0..1	Resistance	(NEKno) Positive sequence series resistance of the entire line section.
r0	0..1	Resistance	(NEKno) Zero sequence series resistance of the entire line section.
x	0..1	Reactance	(NEKno) Positive sequence series reactance of the entire line section.
x0	0..1	Reactance	(NEKno) Zero sequence series reactance of the entire line section.

B.3 Package Assets

B.3.1 Package Standard

B.3.1.1 Organisation

Organisation that might have roles as utility, contractor, supplier, manufacturer, customer, etc.

B.3.1.2 Attributes of Organisation

Table B.137 shows all attributes of Organisation.

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Table B.137 – Attributes of Standard::Organisation

name	mult	type	description
globalLocationNumber	0..1	String	(CDPSM2) Global Location Number (GLN) is part of the GS1 location number system of standards. It is a location number that unique identify trading partner. This could be a legal entity, role in a trading transaction (e.g. buyer, seller, invoice recipient, delivery recipient), or a physical location (e.g. delivery address, store branches). GLN consist of 13 digit and are primarily used in e-commerce and transport planning. The 13-digit number structured include GS1 Company Prefix, Location Reference (N1-N12) and Check Digit (N13). GS1 is a neutral, not-for-profit, international organisation that develops and maintains standards for supply and demand chains across multiple sectors.
organisationCode	0..1	String	(CDPSM2) The organisation code identifies the legal entity.

B.3.2 Package (Informative) InfIEC61968

B.3.2.1 Package (Informative) InfAssets

B.3.2.1.1 General

There is no illustrative figure in the UML model.

B.3.2.1.2 (cdpsm) UndergroundStructure

Underground structure.

Table B.138 shows all attributes of UndergroundStructure.

Table B.138 – Attributes of (Informative) InfAssets::UndergroundStructure

name	mult	type	description
hasTemperatureMeasurement	0..1	Boolean	(NEKno) True of underground structure include temperature measurement.
material	0..1	String	Primary material of underground structure.
undergroundKind	0..1	UndergroundStructureKind	True if vault is ventilating.
height	0..1	Length	inherited from: Structure
materialKind	0..1	StructureMaterialKind	inherited from: Structure
type	0..1	String	inherited from: Asset
lotNumber	0..1	String	inherited from: Asset
lifecycleDate	0..1	LifecycleDate	inherited from: Asset
baselineCondition	0..1	String	inherited from: Asset
baselineLossOfLife	0..1	PerCent	inherited from: Asset
critical	0..1	Boolean	inherited from: Asset
electronicAddress	0..1	ElectronicAddress	inherited from: Asset
inUseDate	0..1	InUseDate	inherited from: Asset
inUseState	0..1	InUseStateKind	inherited from: Asset
kind	0..1	AssetKind	inherited from: Asset

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name	mult	type	description
lifecycleState	0..1	AssetLifecycleStateKind	inherited from: Asset
position	0..1	String	inherited from: Asset
purchasePrice	0..1	Money	inherited from: Asset
retiredReason	0..1	RetiredReasonKind	inherited from: Asset
status	0..1	Status	inherited from: Asset
utcNumber	0..1	String	inherited from: Asset
serialNumber	0..1	String	inherited from: Asset
acceptanceTest	0..1	AcceptanceTest	inherited from: Asset
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table B.139 shows all association ends of UndergroundStructure with other classes.

Table B.139 – Association ends of (Informative) InfAssets:: UndergroundStructure with other classes

mult from	name	mult to	type	description
1..1	AssetDeployment	0..1	AssetDeployment	inherited from: Asset
0..*	PowerSystemResources	0..*	PowerSystemResource	inherited from: Asset
0..*	AssetInfo	0..1	AssetInfo	inherited from: Asset

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B.3.3 Package (Informative) InfExtensions

B.3.3.1 Package (Informative) InfCDPSMExtensions

B.3.3.1.1 General

See Figure B.6.

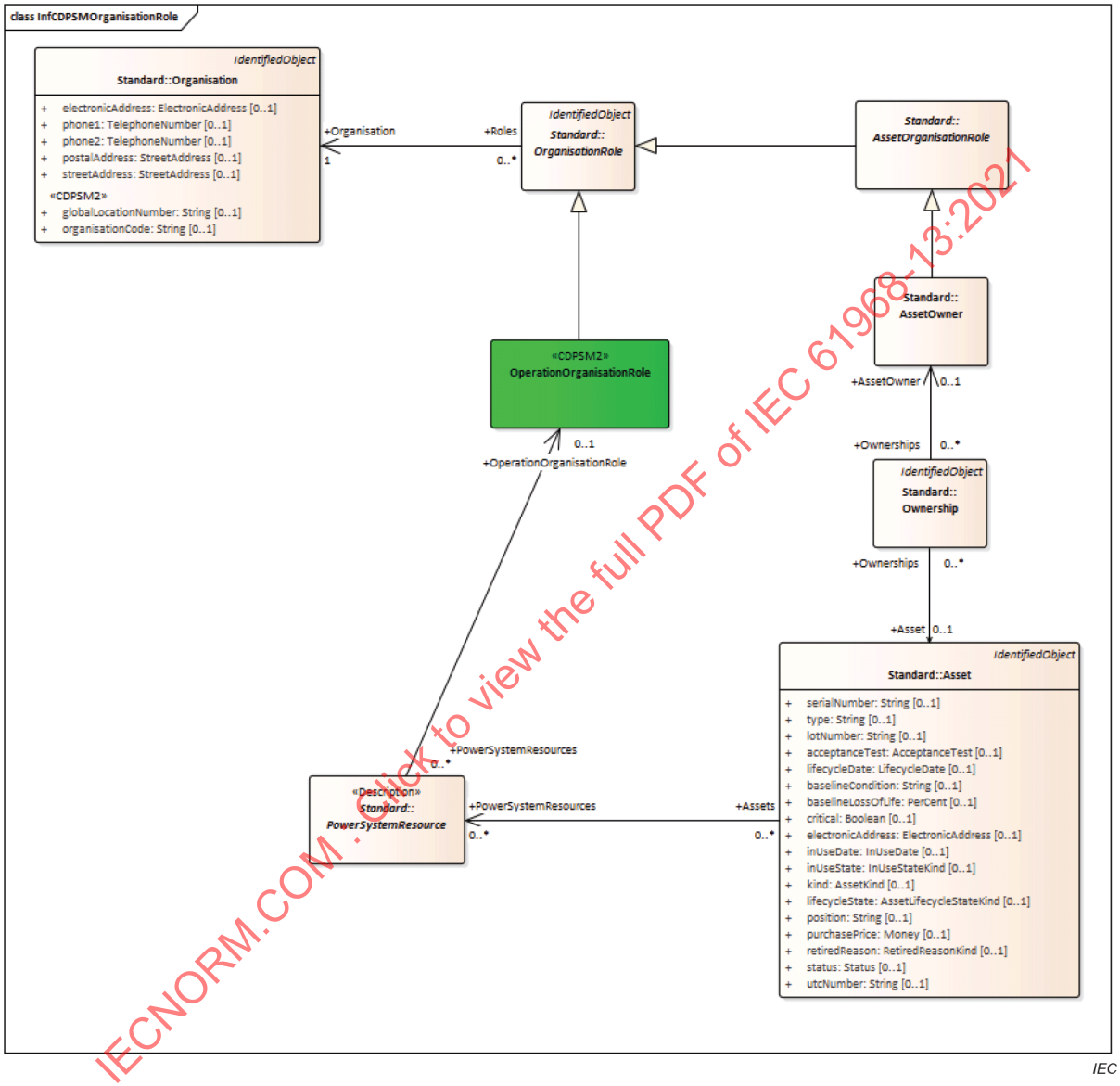

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Figure B.6 – Class diagram (Informative)
InfCDPSMExtensions::InfCDPSMOrganisationRole

B.3.3.1.2 (CDPSM2) OperationOrganisationRole

Role an organisation plays with respect to power system resource.

Table B.140 shows all attributes of OperationOrganisationRole.

Table B.140 – Attributes of (Informative) InfCDPSMExtensions::OperationOrganisationRole

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table B.141 shows all association ends of OperationOrganisationRole with other classes.

Table B.141 – Association ends of (Informative) InfCDPSMExtensions::OperationOrganisationRole with other classes

mult from	name	mult to	type	description
0..*	Organisation	1..1	Organisation	inherited from: OrganisationRole

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B.3.3.2 Package (Informative) InfNEKExtensions

B.3.3.2.1 General

See Figure B.7.

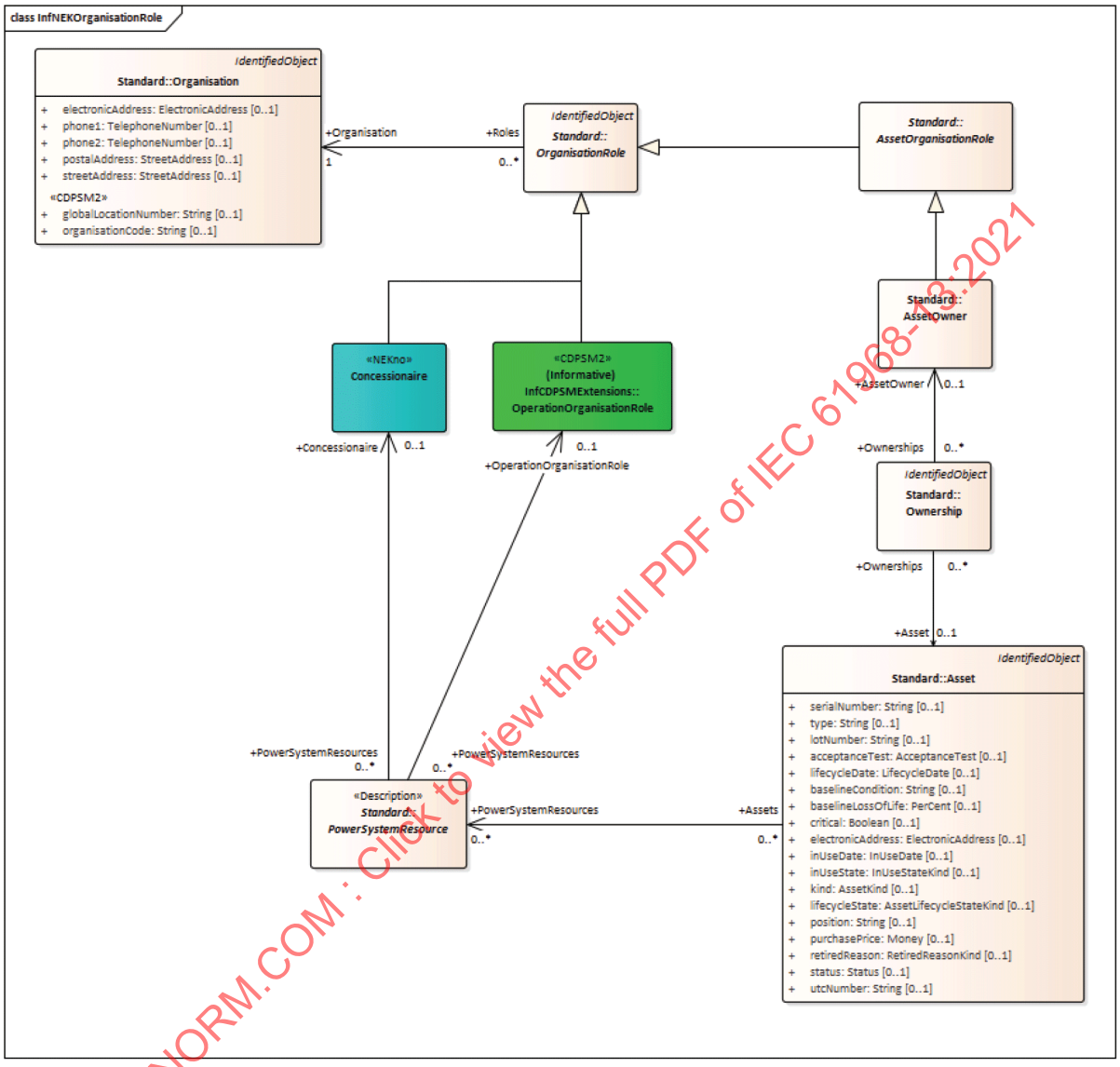

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Figure B.7 – Class diagram (Informative) InfNEKExtensions::InfNEKOrganisationRole

B.3.3.2.2 (NEKno) Concessionaire

An organisation that has granted the rights and obligation to operate as a party.

Table B.142 shows all attributes of Concessionaire.

Table B.142 – Attributes of (Informative) InfNEKExtensions::Concessionaire

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table B.143 shows all association ends of Concessionaire with other classes.

Table B.143 – Association ends of (Informative) InfNEKExtensions:: Concessionaire with other classes

mult from	name	mult to	type	description
0..*	Organisation	1..1	Organisation	inherited from: OrganisationRole

B.4 Package AssetCatalog

B.4.1 Package Standard

B.4.1.1 CableInfo

Cable data.

Table B.144 shows all attributes of CableInfo.

Table B.144 – Attributes of Standard::CableInfo

name	mult	type	description
isSubmarine	0..1	Boolean	(NEKno) Flag to indicate if this is a submarine cable.
ratedOverloadCurrent	0..1	CurrentFlow	(NEKno) inherited from: WireInfo
ratedVoltage	0..1	Voltage	(CDPSM2) inherited from: WireInfo

Table B.145 shows all association ends of CableInfo with other classes.

Table B.145 – Association ends of Standard::CableInfo with other classes

mult from	name	mult to	type	description
0..*	WireInfoType	0..1	WireInfoType	inherited from: WireInfo

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B.4.1.2 CatalogAssetType

Assets that may be used for planning, work or design purposes.

Table B.146 shows all association ends of CatalogAssetType with other classes.

Table B.146 – Association ends of Standard::CatalogAssetType with other classes

mult from	name	mult to	type	description
0..*	TypeAssetCatalogue	0..1	TypeAssetCatalogue	

B.4.1.3 CurrentTransformerInfo

Properties of current transformer asset.

Table B.147 shows all attributes of CurrentTransformerInfo.

Table B.147 – Attributes of Standard::CurrentTransformerInfo

name	mult	type	description
ratedOverloadCurrent	0..1	CurrentFlow	(NEKno) Rated overload current.
ratedShortCircuitCurrent	0..1	CurrentFlow	(NEKno) Rated short-circuit withstand current during interrupting time without damage.
ratedShortTermOverloadCurrent	0..1	CurrentFlow	(NEKno) Rated short-term overload current.
ratedVoltage	0..1	Voltage	(NEKno) Rated voltage.

B.4.1.4 Organisation

Organisation that might have roles as utility, contractor, supplier, manufacturer, customer, etc.

Table B.148 shows all attributes of Organisation.

Table B.148 – Attributes of Standard::Organisation

name	mult	type	description
globalLocationNumber	0..1	String	(CDPSM2) Global Location Number (GLN) is part of the GS1 location number system of standards. It is a location number that unique identify trading partner. This could be a legal entity, role in a trading transaction (e.g. buyer, seller, invoice recipient, delivery recipient), or a physical location (e.g. delivery address, store branches). GLN consist of 13 digit and are primarily used in e-commerce and transport planning. The 13-digit number structured include GS1 Company Prefix, Location Reference (N1-N12) and Check Digit (N13). GS1 is a neutral, not-for-profit, international organisation that develops and maintains standards for supply and demand chains across multiple sectors.
organisationCode	0..1	String	(CDPSM2) The organisation code identifies the legal entity.

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B.4.1.5 OverheadWireInfo

Overhead wire data.

Table B.149 shows all attributes of OverheadWireInfo.

Table B.149 – Attributes of Standard::OverheadWireInfo

name	mult	type	description
nominalTemperature	0..1	Temperature	(NEKno) Maximum nominal design operating temperature.
ratedOverloadCurrent	0..1	CurrentFlow	(NEKno) inherited from: WireInfo
ratedVoltage	0..1	Voltage	(CDPSM2) inherited from: WireInfo

Table B.150 shows all association ends of OverheadWireInfo with other classes.

Table B.150 – Association ends of Standard::OverheadWireInfo with other classes

mult from	name	mult to	type	description
0..*	WireInfoType	0..1	WireInfoType	inherited from: WireInfo

B.4.1.6 ParentOrganization

Table B.151 shows all attributes of ParentOrganization.

Table B.151 – Attributes of Standard::ParentOrganization

name	mult	type	description
globalLocationNumber	0..1	String	(CDPSM2) inherited from: Organisation
organisationCode	0..1	String	(CDPSM2) inherited from: Organisation

B.4.1.7 PowerTransformerInfo

Set of power transformer data, from an equipment library.

Table B.152 shows all attributes of PowerTransformerInfo.

Table B.152 – Attributes of Standard::PowerTransformerInfo

name	mult	type	description
integratedFuse	0..1	Boolean	(CDPSM2)

B.4.1.8 ShuntCompensatorInfo

Properties of shunt capacitor, shunt reactor or switchable bank of shunt capacitor or reactor assets.

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Table B.153 shows all association ends of ShuntCompensatorInfo with other classes.

Table B.153 – Association ends of Standard::ShuntCompensatorInfo with other classes

mult from	name	mult to	type	description
1..1	ShuntCompensatorControl	0..1	ShuntCompensatorControl	

B.4.1.9 SwitchInfo

Switch data.

Table B.154 shows all attributes of SwitchInfo.

Table B.154 – Attributes of Standard::SwitchInfo

name	mult	type	description
ratedOverloadCurrent	0..1	CurrentFlow	(NEKno) Rated overload current.
ratedShortCircuitCurrent	0..1	CurrentFlow	(NEKno) Rated short-circuit withstand current during interrupting time without damage.

B.4.1.10 TransformerEndInfo

Transformer end data.

Table B.155 shows all association ends of TransformerEndInfo with other classes.

Table B.155 – Association ends of Standard::TransformerEndInfo with other classes

mult from	name	mult to	type	description
0..*	PowerTransformerInfo	0..1	PowerTransformerInfo	

B.4.1.11 WireAssemblyInfo

Table B.156 shows all attributes of WireAssemblyInfo.

Table B.156 – Attributes of Standard::WireAssemblyInfo

name	mult	type	description
cableConfigurationKind	0..1	CableConfigurationKind	(NEKno) The configuration of the cable.

B.4.1.12 (abstract) WireInfo

Wire data that can be specified per line segment phase, or for the line segment as a whole in case its phases all have the same wire characteristics.

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Table B.157 shows all attributes of WireInfo.

Table B.157 – Attributes of Standard::WireInfo

name	mult	type	description
ratedOverloadCurrent	0..1	CurrentFlow	(NEKno) Rated overload current.
ratedVoltage	0..1	Voltage	(CDPSM2)

Table B.158 shows all association ends of WireInfo with other classes.

Table B.158 – Association ends of Standard::WireInfo with other classes

mult from	name	mult to	type	description
0..*	WireInfoType	0..1	WireInfoType	

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B.4.2 Package (Informative) InfIEC61968

B.4.2.1 General

See Figure B.8 and Figure B.9.

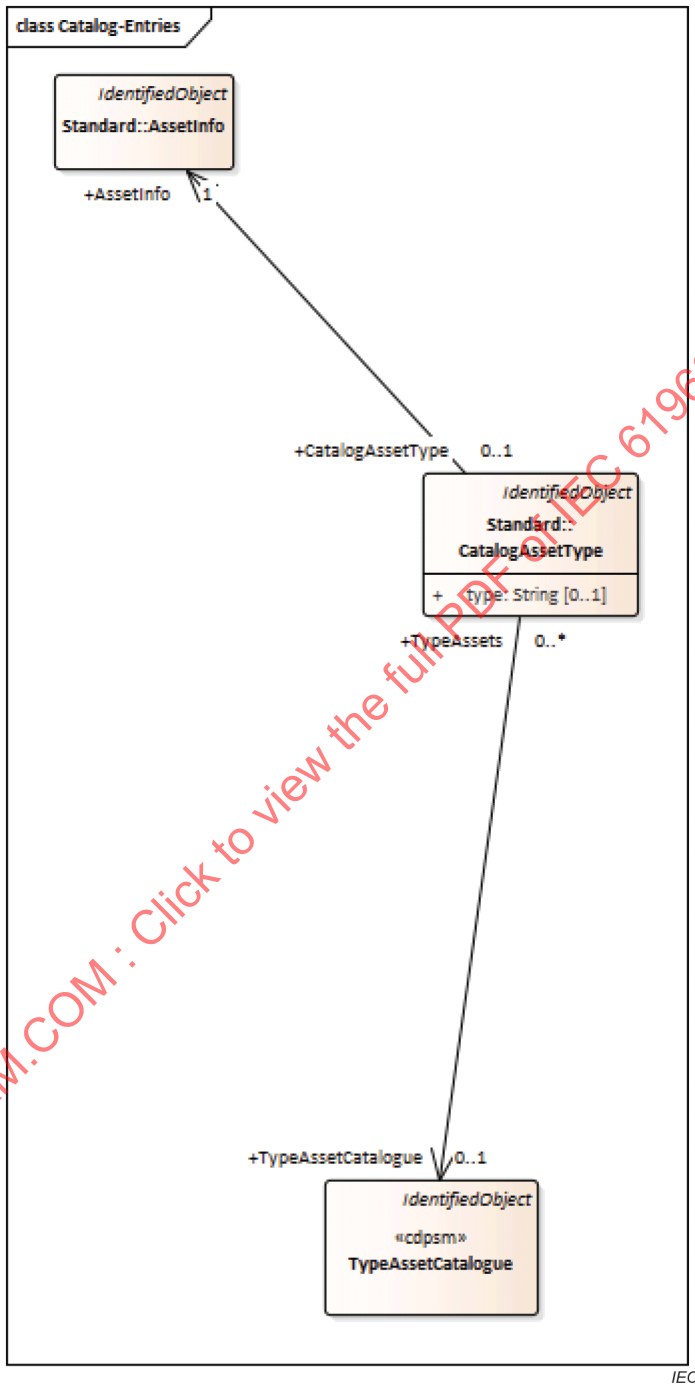

Figure B.8 – Class diagram (Informative) InfIEC61968::Catalog-Entries

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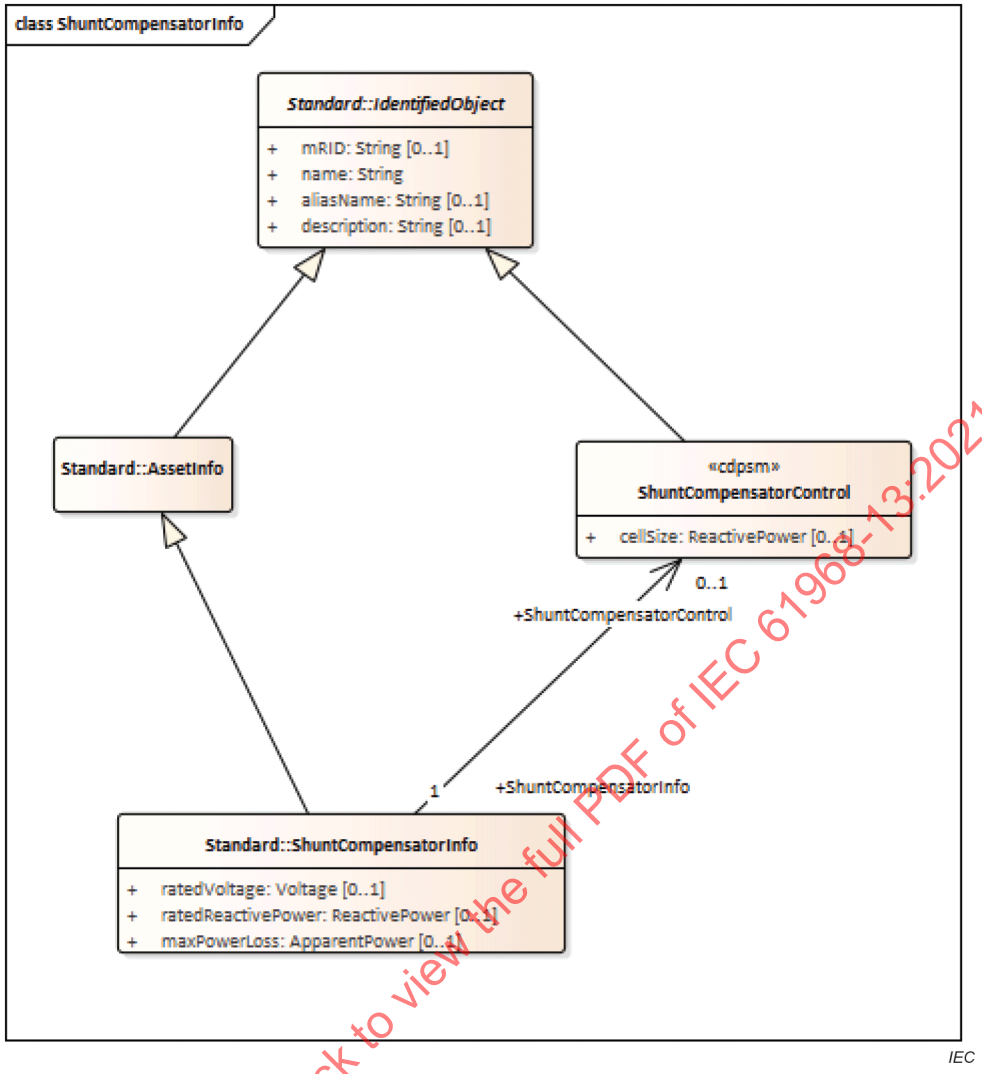

Figure B.9 – Class diagram (Informative) InfIEC61968::ShuntCompensatorInfo

B.4.2.2 (cdpsm) ShuntCompensatorControl

Distribution capacitor bank control settings.

Table B.159 shows all attributes of ShuntCompensatorControl.

Table B.159 – Attributes of (Informative) InfIEC61968::ShuntCompensatorControl

name	mult	type	description
cellSize	0..1	ReactivePower	The size of the individual units that make up the bank.
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

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B.4.2.3 (cdpsm) TypeAssetCatalogue

Catalogue of generic types of assets (TypeAsset) that may be used for design purposes. It is not associated with a particular manufacturer.

Table B.160 shows all attributes of TypeAssetCatalogue.

Table B.160 – Attributes of (Informative) InfIEC61968::TypeAssetCatalogue

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

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B.4.3 Package (Informative) InfExtensions

B.4.3.1 Package (Informative) InfCDPSMExtensions

B.4.3.1.1 General

See Figure B.10.

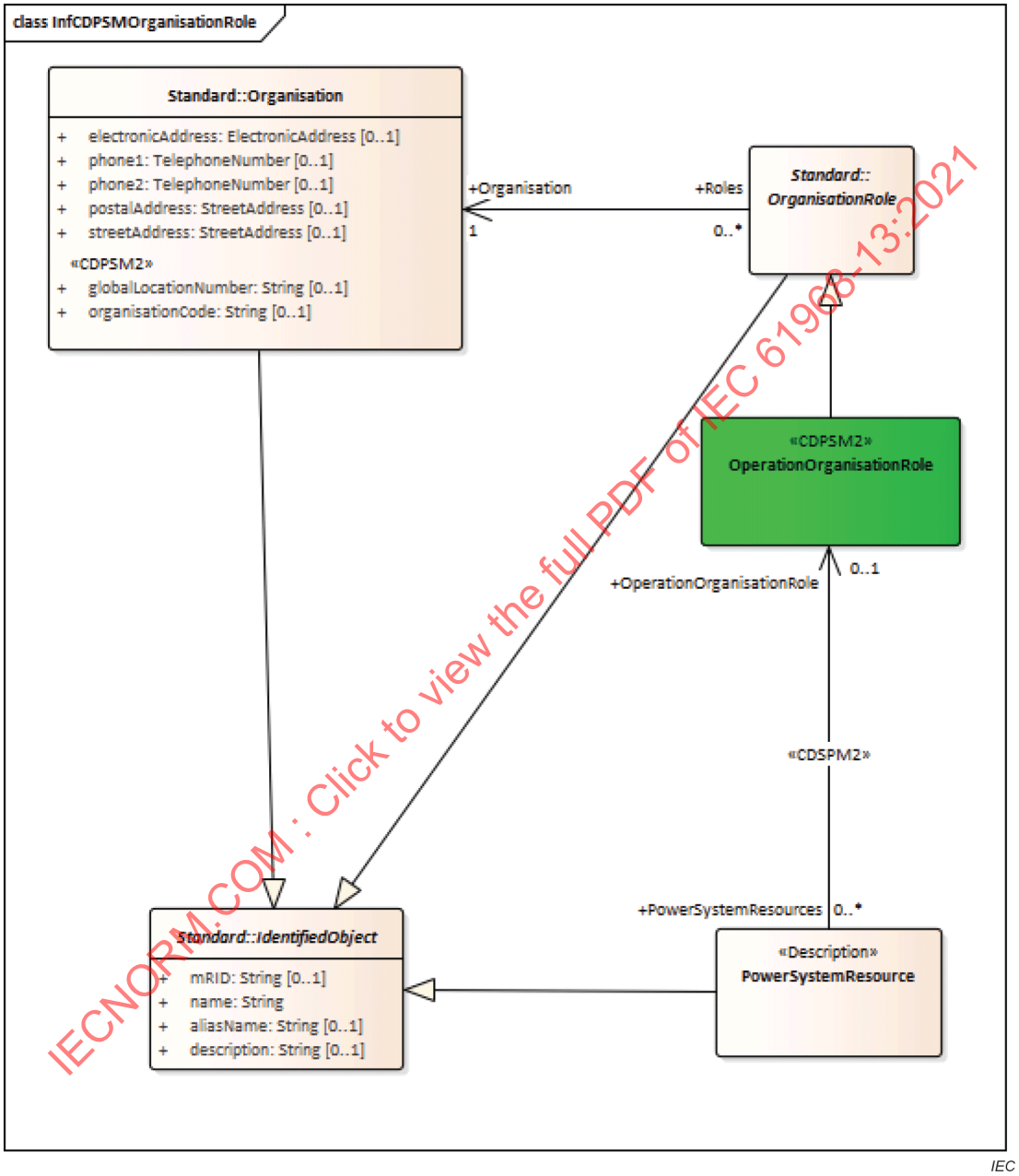

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Figure B.10 – Class diagram (Informative) InfCDPSMExtensions::InfCDPSMOrganisationRole

B.4.3.1.2 (CDPSM2) OperationOrganisationRole

Role an organisation plays with respect to power system resource.

Table B.161 shows all attributes of OperationOrganisationRole.

Table B.161 – Attributes of (Informative) InfCDPSMExtensions::OperationOrganisationRole

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table B.162 shows all association ends of OperationOrganisationRole with other classes.

Table B.162 – Association ends of (Informative) InfCDPSMExtensions::OperationOrganisationRole with other classes

mult from	name	mult to	type	description
0..*	Organisation	1..1	Organisation	inherited from: OrganisationRole

B.4.3.1.3 (abstract) PowerSystemResource

A power system resource can be an item of equipment such as a Switch, an EquipmentContainer containing many individual items of equipment such as a Substation, or an organisational entity such as Company or SubControlArea. This provides for the nesting of collections of PowerSystemResources within other PowerSystemResources. For example, a Switch could be a member of a Substation and a Substation could be a member of a division of a Company.

Table B.163 shows all association ends of PowerSystemResource with other classes.

Table B.163 – Association ends of (Informative) InfCDPSMExtensions::PowerSystemResource with other classes

mult from	name	mult to	type	description
0..*	OperationOrganisationRole	0..1	OperationOrganisationRole	

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B.4.3.2 Package (Informative) InfNEKExtensions

B.4.3.2.1 General

See Figure B.11 and Figure B.12.

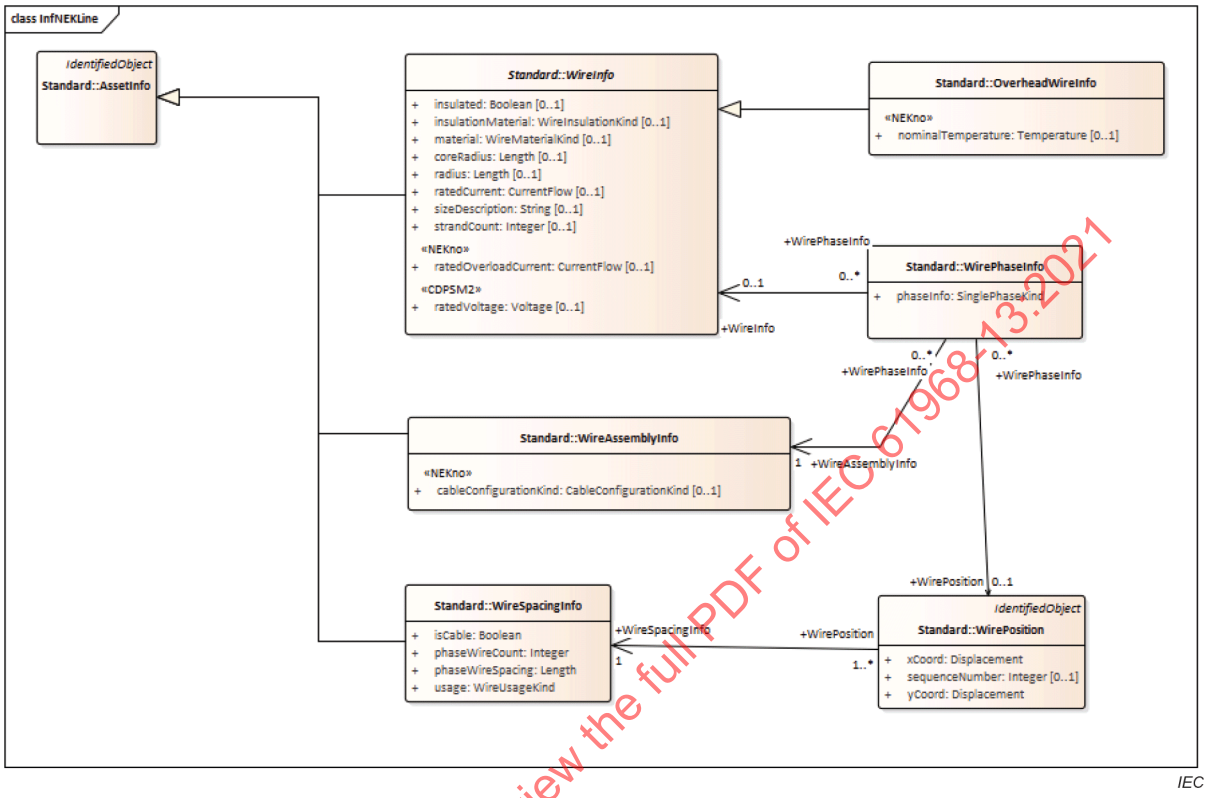

Figure B.11 – Class diagram (Informative) InfNEKExtensions::InfNEKLine

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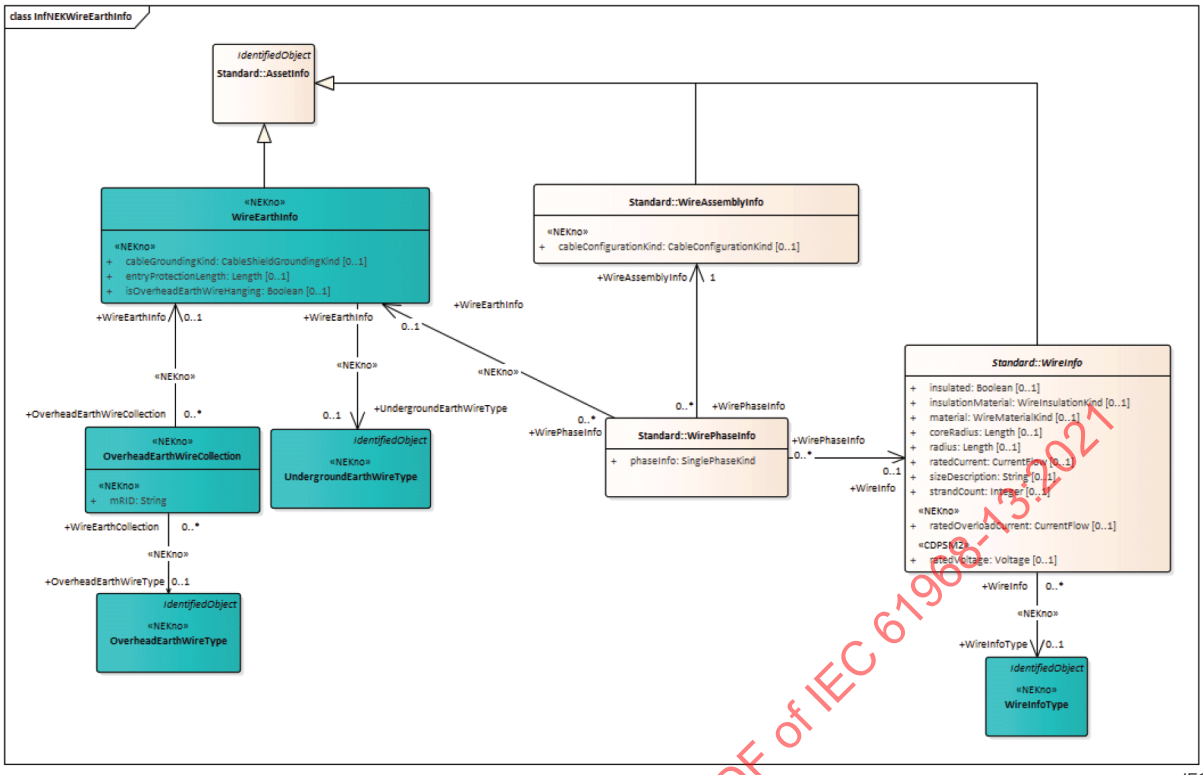

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Figure B.12 – Class diagram (Informative) InfNEKExtensions::InfNEKWireEarthInfo

B.4.3.2.2 (NEKno) OverheadEarthWireCollection root class

A collection of OverheadEarthWireType connected to the same WireEarthInfo.

Table B.164 shows all attributes of OverheadEarthWireCollection.

Table B.164 – Attributes of (Informative) InfNEKExtensions::OverheadEarthWireCollection

name	mult	type	description
mRID	1..1	String	(NEKno)

Table B.165 shows all association ends of OverheadEarthWireCollection with other classes.

Table B.165 – Association ends of (Informative) InfNEKExtensions::OverheadEarthWireCollection with other classes

mult from	name	mult to	type	description
0..*	OverheadEarthWireType	0..1	OverheadEarthWireType	
0..*	WireEarthInfo	0..1	WireEarthInfo	

B.4.3.2.3 (NEKno) OverheadEarthWireType

Lookup class with all the relevant overhead earth wired types.

Table B.166 shows all attributes of OverheadEarthWireType.

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Table B.166 – Attributes of (Informative) InfNEKExtensions::OverheadEarthWireType

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

B.4.3.2.4 (NEKno) UndergroundEarthWireType

Lookup class with all the relevant underground earth wired types.

Table B.167 shows all attributes of UndergroundEarthWireType.

Table B.167 – Attributes of (Informative) InfNEKExtensions::UndergroundEarthWireType

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

B.4.3.2.5 (NEKno) WireEarthInfo

Protection and grounding of the wire.

Table B.168 shows all attributes of WireEarthInfo.

Table B.168 – Attributes of (Informative) InfNEKExtensions::WireEarthInfo

name	mult	type	description
cableGroundingKind	0..1	CableShieldGroundingKind	(NEKno) The type of ground used for the cable.
entryProtectionLength	0..1	Length	(NEKno) The length on the entry protection.
isOverheadEarthWireHanging	0..1	Boolean	(NEKno) True if the overhead earth wire is hanging rather than being a top line.
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

Table B.169 shows all association ends of WireEarthInfo with other classes.

Table B.169 – Association ends of (Informative) InfNEKExtensions:: WireEarthInfo with other classes

mult from	name	mult to	type	description
0..*	UndergroundEarthWireType	0..1	UndergroundEarthWireType	

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B.4.3.2.6 (NEKno) WireInfoType

Lookup class with all the relevant wired types.

Table B.170 shows all attributes of WireInfoType.

Table B.170 – Attributes of (Informative) InfNEKExtensions::WireInfoType

name	mult	type	description
name	1..1	String	inherited from: IdentifiedObject
aliasName	0..1	String	inherited from: IdentifiedObject
description	0..1	String	inherited from: IdentifiedObject
mRID	0..1	String	inherited from: IdentifiedObject

B.5 Package Customers – Package Standard – PricingStructure

Grouping of pricing components and prices used in the creation of customer charges and the eligibility criteria under which these terms may be offered to a customer. The reasons for grouping include state, customer classification, site characteristics, classification (i.e. fee price structure, deposit price structure, electric service price structure, etc.) and accounting requirements.

Table B.171 shows all attributes of PricingStructure.

Table B.171 – Attributes of Standard::PricingStructure

name	mult	type	description
usageMultiplier	0..1	UnitMultiplier	(CDPSM2) Multiplier for the different dailyXxxUsage values.
usageUnit	0..1	UnitSymbol	(CDPSM2) Unit for the different dailyXxxxUsage values.

B.6 Top package DataTypes

B.6.1 Package EntsoeExtensionsTypes

B.6.1.1 (Entsoe) LimitTypeKind enumeration

The enumeration defines the kinds of the limit types.

B.6.1.2 Literals of LimitTypeKind

Table B.172 shows all literals of LimitTypeKind.

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Table B.172 – Literals of EntsoeExtensionsTypes::LimitTypeKind

literal	value	description
patl		(enum, Entsoe) The Permanent Admissible Transmission Loading (PATL) is the loading in Amps, MVA or MW that can be accepted by a network branch for an unlimited duration without any risk for the material. The duration attribute is not used and shall be excluded for the PATL limit type. Hence only one limit value exists for the PATL type.
patlt		(enum, Entsoe) Permanent Admissible Transmission Loading Threshold (PATLT) is a value in engineering units defined for PATL and calculated using percentage less than 100 of the PATL type intended to alert operators of an arising condition. The percentage should be given in the name of the OperationalLimitSet. The aceptableDuration is another way to express the severity of the limit.
tatl		(enum, Entsoe) Temporarily Admissible Transmission Loading (TATL) which is the loading in Amps, MVA or MW that can be accepted by a branch for a certain limited duration. The TATL can be defined in different ways: – as a fixed percentage of the PATL for a given time (for example, 115 % of the PATL that can be accepted during 15 minutes), pairs of TATL type and Duration calculated for each line taking into account its particular configuration and conditions of functioning (for example, it can define a TATL acceptable during 20 minutes and another one acceptable during 10 minutes). Such a definition of TATL can depend on the initial operating conditions of the network element (sag situation of a line). The duration attribute can be used define several TATL limit types. Hence multiple TATL limit values may exist having different durations.
tc		(enum, Entsoe) Tripping Current (TC) is the ultimate intensity without any delay. It is defined as the threshold the line will trip without any possible remedial actions. The tripping of the network element is ordered by protections against short circuits or by overload protections, but in any case, the activation delay of these protections is not compatible with the reaction delay of an operator (less than one minute). The duration is always zero and the duration attribute may be left out. Hence only one limit value exists for the TC type.
tct		(enum, Entsoe) Tripping Current Threshold (TCT) is a value in engineering units defined for TC and calculated using percentage less than 100 of the TC type intended to alert operators of an arising condition. The percentage should be given in the name of the OperationalLimitSet. The aceptableDuration is another way to express the severity of the limit.
highVoltage		(enum, Entsoe) Referring to the rating of the equipments, a voltage too high can lead to accelerated ageing or the destruction of the equipment. This limit type may or may not have duration.

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literal	value	description
lowVoltage		(enum, Entsoe) A too low voltage can disturb the normal operation of some protections and transformer equipped with on-load tap changers, electronic power devices or can affect the behaviour of the auxiliaries of generation units. This limit type may or may not have duration.
operationalVoltageLimit		(enum, Entsoe2) Operational voltage limit.
alarmVoltage		(enum, Entsoe2) Voltage alarm.
warningVoltage		(enum, Entsoe2) Voltage warning.
stability		(enum, Entsoe2) Stability.

B.6.2 Package NEKnoExtensionsTypes

B.6.2.1 (NEKno) BusbarConfigurationKind enumeration

Table B.173 shows all literals of BusbarConfigurationKind.

Table B.173 – Literals of NEKnoExtensionsTypes::BusbarConfigurationKind

literal	value	description
single		(enum) Single busbar system.
singleWithSection		(enum) Single busbar with sectionaliser system with a circuit breaker and isolators in between the adjoining sections.
singleAndTransfer		(enum) Single busbar and transfer bus system where all the feeders are normally on the main busbar. The transfer bus can, when required, be used for particular feeders.
double		(enum) Double busbar main bus system.
doubleWithSection		(enum) Double busbar main bus with sectionaliser system with a circuit breaker and isolators in between the adjoining sections.
doubleAndTransfer		(enum) Double busbar main bus and transfer bus system where all the feeders are normally on the main busbars. The transfer bus can when required be used for particular feeders.
doubleAndTransferWithSection		(enum) Double busbar main bus and transfer bus system with sectionaliser system.
ring		(enum) Busbar sections configured in a mesh ring layout.
other		(enum) None of the defined values are relevant. Other is also used in the case were the attributes is mandatory and additional attributes is added for handling extension.

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B.6.2.2 (NEKno) CableConfigurationKind enumeration

Underground configuration.

Table B.174 shows all literals of CableConfigurationKind.

Table B.174 – Literals of NEKnoExtensionsTypes::CableConfigurationKind

literal	value	description
flat		(enum)
triangular		(enum)

B.6.2.3 (NEKno) CableShieldGroundingKind enumeration

Cable shield grounding kind.

Table B.175 shows all literals of CableShieldGroundingKind.

Table B.175 – Literals of NEKnoExtensionsTypes::CableShieldGroundingKind

literal	value	description
closed		(enum) Both side are grounded.
open		(enum) One side is grounded.
crosslinked		(enum) Grounding is crosslinked.

B.6.2.4 (NEKno) SubstationKind enumeration

Table B.176 shows all literals of SubstationKind.

Table B.176 – Literals of NEKnoExtensionsTypes::SubstationKind

literal	value	description
coupling		(enum)
environment		(enum)
fictitious		(enum)
power		(enum)
transformer		(enum)
transition		(enum)
junction		(enum) Substation that connect two or more line segment without including any switching. Primarily used for T-junction.
other		(enum) None of the defined values are relevant. Other is also used in the case were the attributes is mandatory and additional attributes is added for handling extension.

B.6.2.5 (NEKno) GridKind enumeration

Table B.177 shows all literals of GridKind.

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Table B.177 – Literals of NEKnoExtensionsTypes::GridKind

literal	value	description
auxilary		Defines grid that contains only auxiliary equipment.
distribution		Defines the distribution grid or other.
fictitiousProduction		Defines grid that contains only fictitious production units. (the unites are not on the correct base voltage.)
industry		Defines grid that contains only industry – NonConformLoad.
main		Identifies the main grid.
production		Defines grid that contains only production units.
regional		Defines the regional grid.

B.6.2.6 (NEKno) EmergencyClassKind enumeration

Table B.178 shows all literals of EmergencyClassKind.

Table B.178 – Literals of NEKnoExtensionsTypes::EmergencyClassKind

literal	value	description
notClassified		(enum) No emergency class is defined.
class1		(enum) Highest classification.
class2		(enum) Second highest classification.
class3		(enum) Lowest classification.
other		(enum) None of the defined values are relevant. Other is also used in the case were the attributes is mandatory and additional attributes is added for handling extension.

B.6.2.7 (NEKno) SourceForLineValues enumeration

Table B.179 shows all literals of SourceForLineValues.

Table B.179 – Literals of NEKnoExtensionsTypes::SourceForLineValues

literal	value	description
measured		(enum) Values are measured.
tabelStandard		(enum) Value are taken from standard tables.
systemStandard		(enum) Standard values managed by the tool.
estimated		(enum) Values are estimated based on type of wire and configuration.

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Annex C
(informative)

CDPSM MV/LV urban and rural network

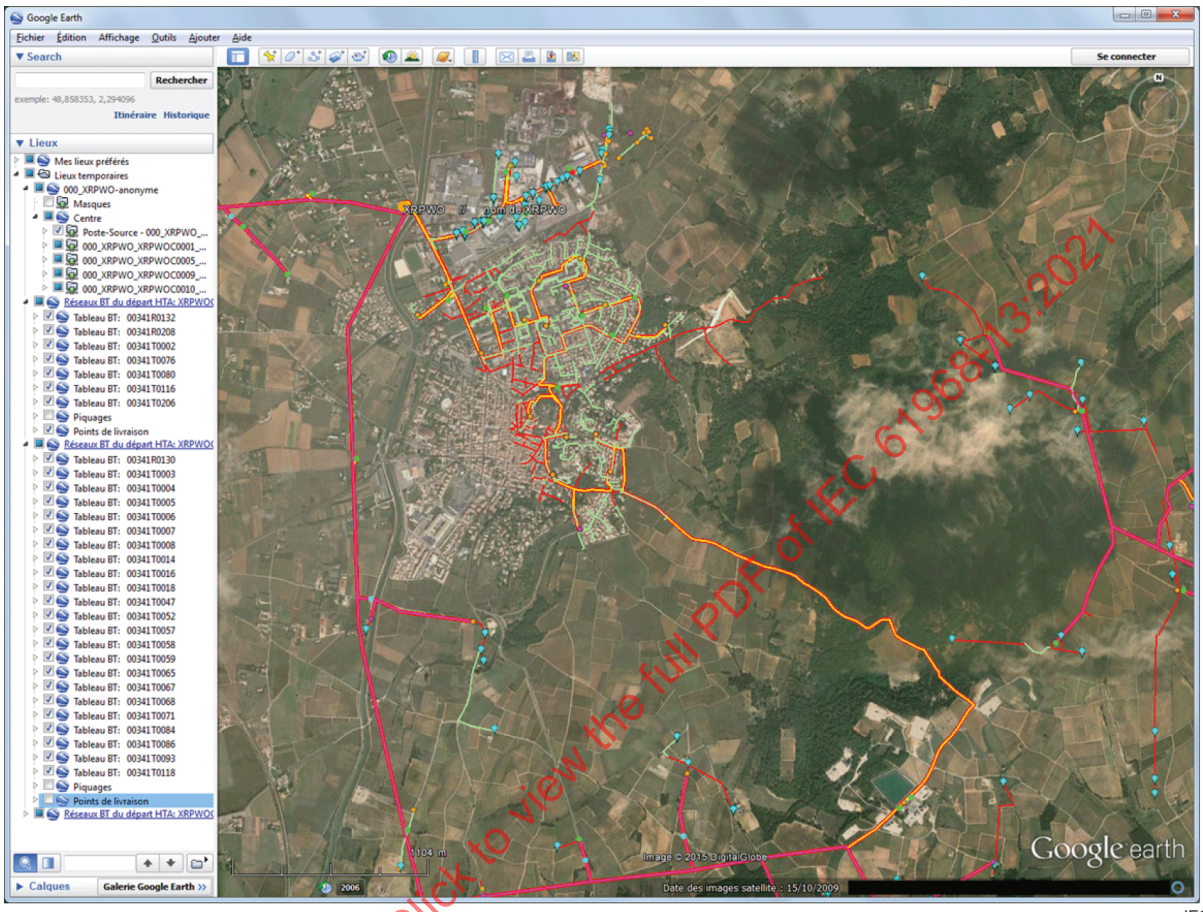

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Figure C.1 – MV/LV urban and rural network on satellite map

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Annex D
(informative)

CDPSM MV/LV urban network

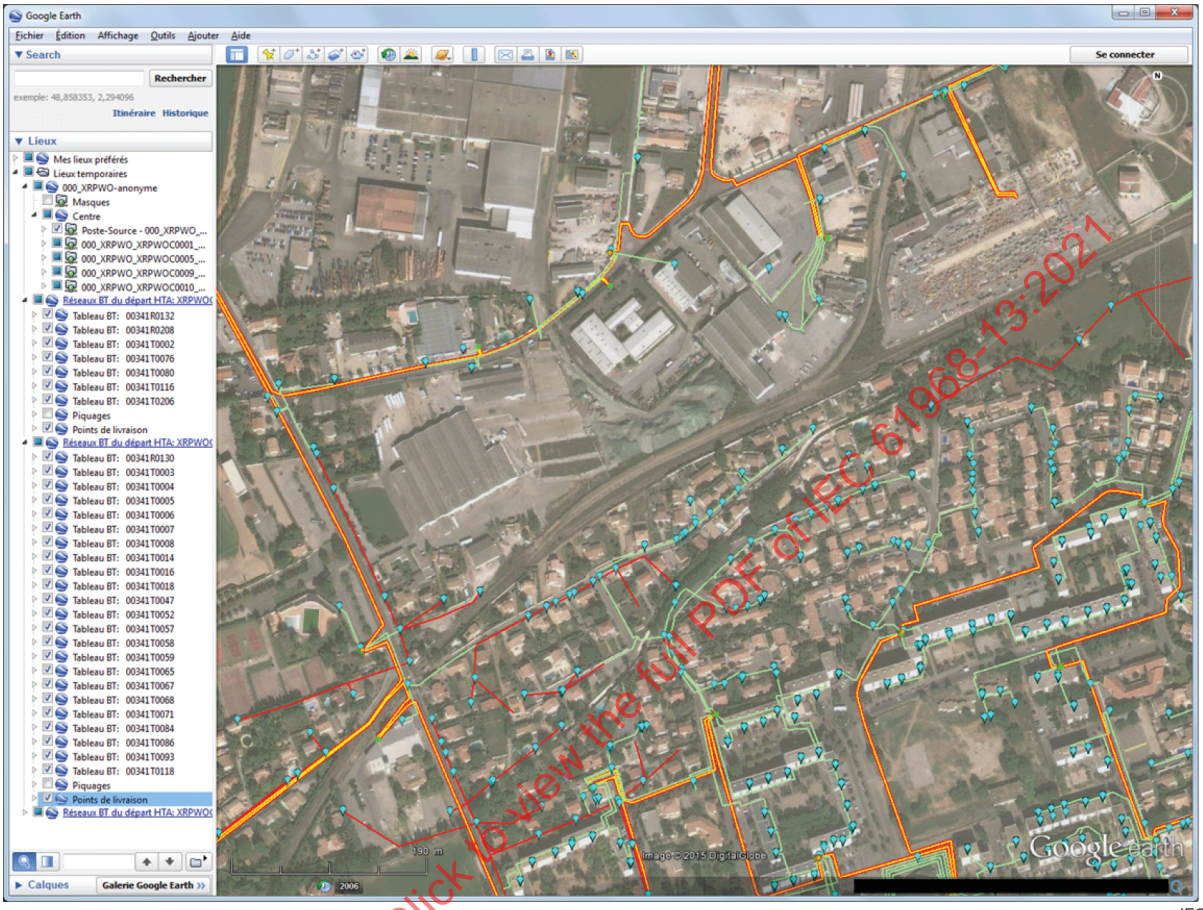

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Figure D.1 – MV/LV urban network on satellite map

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Annex E
(informative)

CDPSM MV urban and rural network

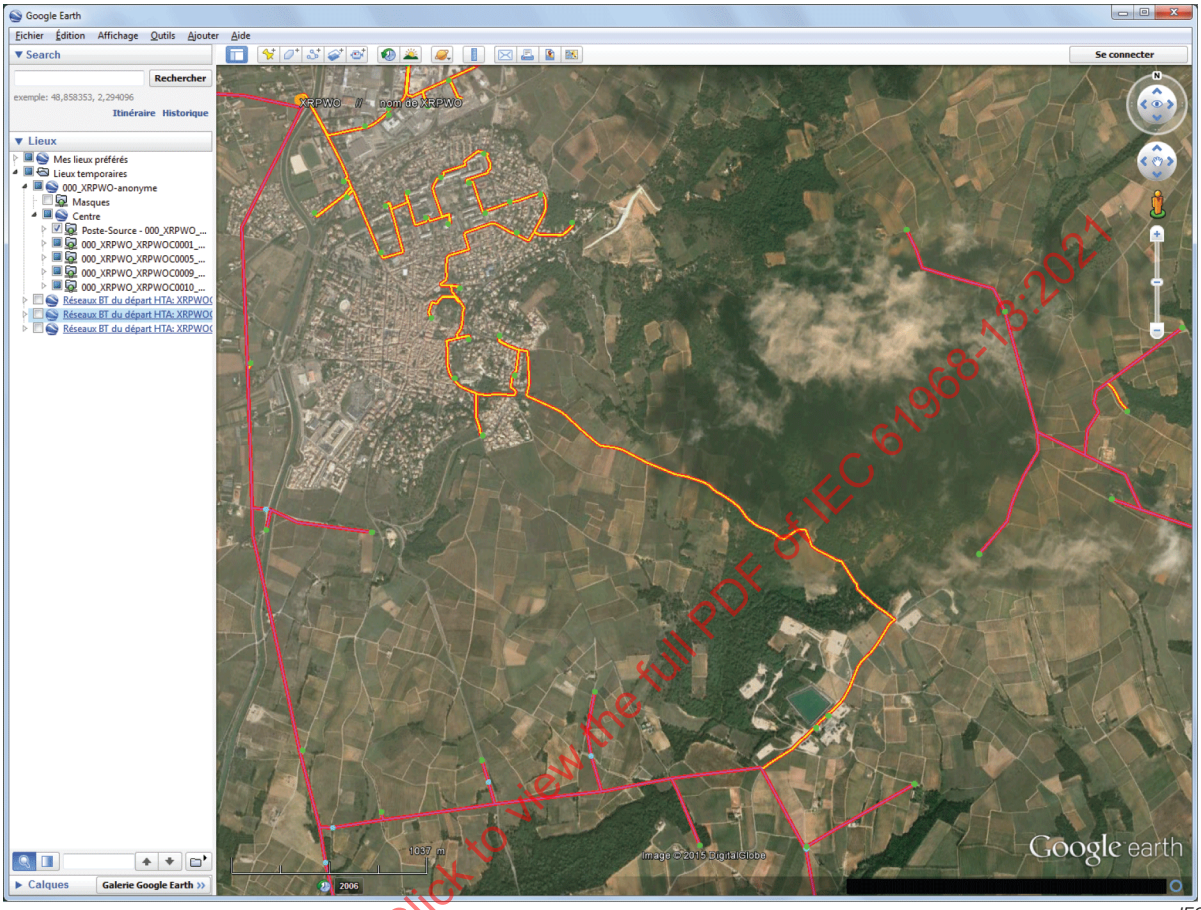

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Figure E.1 – MV urban and rural network on satellite map

RiseClipse validation: CDPSM file

BEGIN EDF-Validator-Servlet
INFO: Loading file
INFO: CDPSM 2.0 – Thu Mar 28 16:37:22 CET 2019

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Statistics:

```
INFO: Loaded classes                    (number):
INFO: . ACLineSegment                   (383)
INFO: . Analog                          (5)
INFO: . Asset                           (1471)
INFO: . AssetInfo                       (34)
INFO: . AssetOwner                      (1)
INFO: . BaseVoltage                     (154)
INFO: . Bay                             (408)
INFO: . Breaker                         (27)
INFO: . BusbarSection                   (157)
INFO: . BusbarSectionInfo               (3)
INFO: . CableInfo                       (174)
INFO: . CatalogAssetType                (12)
INFO: . ConnectivityNode                (906)
INFO: . CoordinateSystem                (2)
INFO: . Disconnector                    (3)
INFO: . EnergyConsumer                  (148)
INFO: . EnergySource                    (1)
INFO: . FaultIndicator                  (11)
INFO: . Feeder                          (19)
INFO: . GeneratingUnit                  (1)
INFO: . GeographicalRegion              (2)
INFO: . Jumper                          (229)
INFO: . Junction                        (161)
INFO: . Line                            (2)
INFO: . LinearShuntCompensator          (2)
INFO: . LoadBreakSwitch                 (159)
INFO: . Location                        (1198)
INFO: . Manufacturer                    (19)
INFO: . NameTypeAuthority               (1)
INFO: . OperatingParticipant            (4)
INFO: . OperatingShare                  (1240)
INFO: . Organisation                    (24)
INFO: . OverheadWireInfo                (7)
INFO: . PSREvent                        (2)
INFO: . PSRType                         (104)
INFO: . ParentOrganization              (2)
INFO: . PerLengthSequenceImpedance      (18)
INFO: . PositionPoint                   (2552)
INFO: . PowerTransformerEnd             (254)
INFO: . PowerTransformer                (127)
INFO: . PowerTransformerInfo            (23)
INFO: . ProductAssetModel               (66)
INFO: . RatioTapChanger                 (124)
INFO: . ShuntCompensatorInfo            (19)
INFO: . SubGeographicalRegion           (360)
INFO: . Substation                      (383)
INFO: . SurgeArrester                   (107)
INFO: . SwitchInfo                      (15)
INFO: . SynchronousMachine              (1)
INFO: . Terminal                        (2306)
INFO: . TransformerEndInfo              (46)
INFO: . TransformerTankInfo             (23)
INFO: . VoltageLevel                    (162)
INFO: . WireAssemblyInfo                (18)
INFO: . WirePhaseInfo                   (54)
INFO: Total objects/errors: 13734
```

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Annex F
(informative)

CDPSM usage in H2020 TDX-ASSIST

TDX-ASSIST project, Coordination of **T**ransmission and **D**istribution data e**X**changes for renewables integration in the European marketplace through **A**dvanced, **S**calable and **S**ecure **I**CT **S**ystems and **T**ools, has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 774500.

This project aims to design and develop novel Information and Communication Technology (ICT) tools and techniques that facilitate scalable and secure information systems and data exchange between Transmission System Operator (TSO) and Distribution System Operator (DSO). The three novel aspects of ICT tools and techniques to be developed in the project are: scalability – ability to deal with new users and increasingly larger volumes of information and data; security – protection against external threats and attacks; and interoperability – information exchange and communications based on existing and emerging international smart grid ICT standards.

The project focuses on TSO-DSO interoperability. While TSO-TSO interoperability is currently well established by ENTSO-E through implementation of the Common Grid Model Exchange System, TSO-DSO interoperability will also benefit future TSO-TSO interoperability. In this context, the project will also consider DSO to other Market-participants (DSOs, Aggregators, Distributed Energy Resource Operators, Micro-grid Operators) and information or data access portals that enable business processes involving relevant actors in the electrical power sector.

EDF R&D provides CDPSM (Common Distribution Power System Model) data sets for MV and if needed LV networks. These files are CIM compliant and aligned with "CIM100" version. "CIM100" was stabilized mid-2018 and refers to CIM UML Model:

iec61970cim17v24_iec61968cim13v11_iec62325cim03v14.eap.

EDF R&D used MODSARUS® tool(Entreprise Architect Add-in) to define CDPSM profiles. EDF R&D is using DisNetSimPl network study tool which is CGMES, CDPSM compliant. EDF R&D is using RiseClipse to validate CGMES, CDPSM network data sets. Figure F.1 represents the tool-set and Data sets used by EDF R&D.

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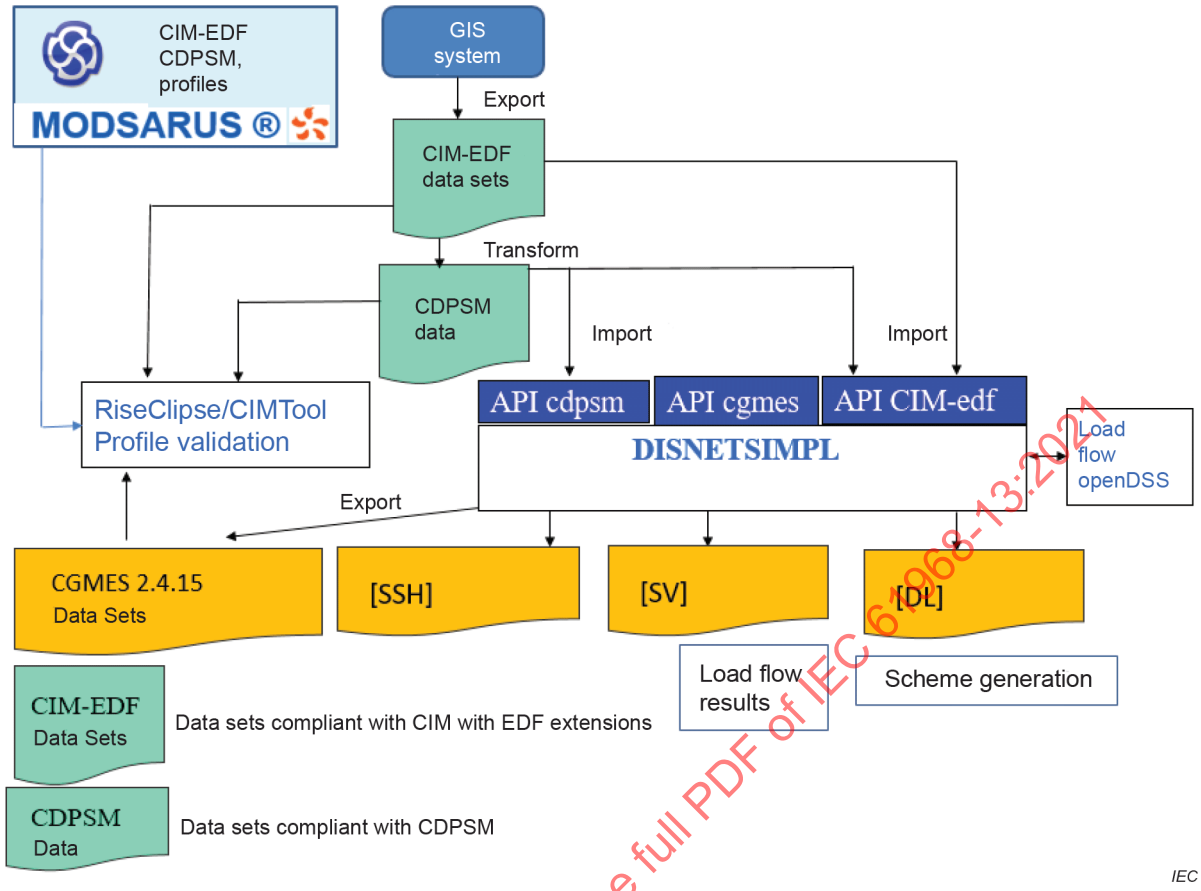

Figure F.1 – Tool-set and Data sets used by EDF R&D

Data sets used by EDF are Distribution data sets, exported by a Geographical Information System. These Data Sets are CIM compliant with some EDF extensions. These Data Sets can be converted to CDPSM profiles or directly imported into the EDF network study tool DisNetSimPl.

DisNetSimPl is able to import CIM-EDF data sets, CDPSM data sets or CGMES data sets. Currently, it exports files compliant with CGMES profiles (2.4.15 version). DisNetSimPl allows for several model reductions. DisNetSimPl allows for the the aggregation of Loads at several Network Nodes. It is illustrated by Figure F.2 to Figure F.6, for aggregation of download network.

Figure F.2 illustrates a Network which has not been fully reduced:

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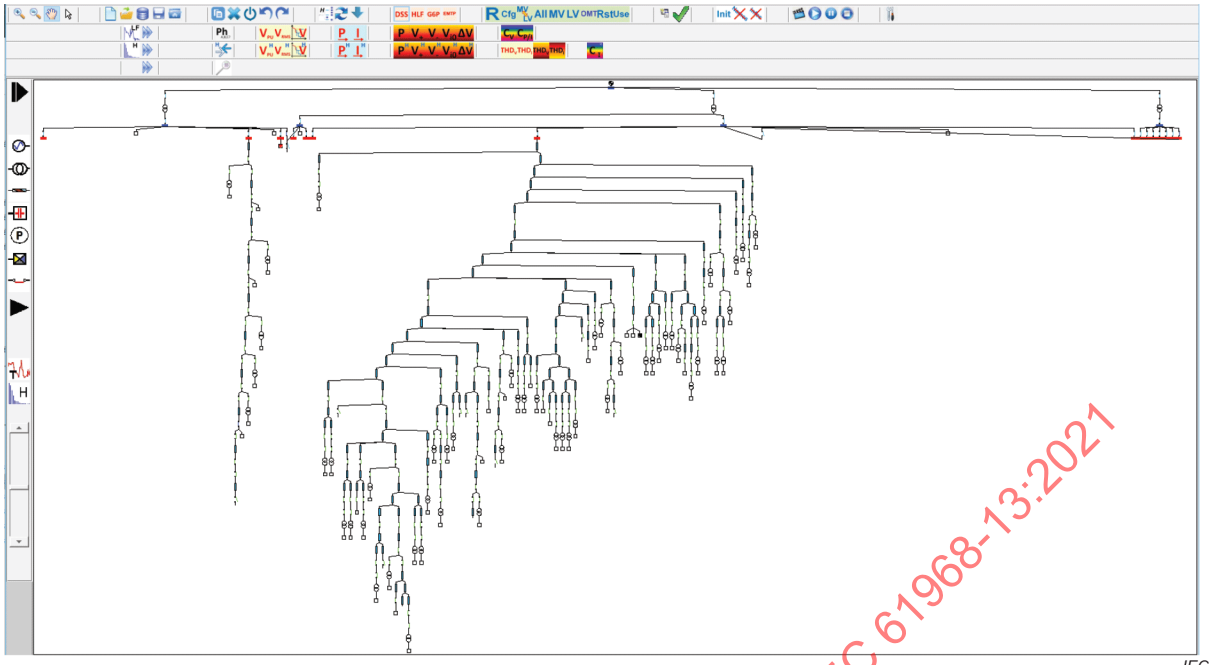

Figure F.2 – Network Data Set layout without model reductions

Figure F.3 illustrates the Aggregation of downstream network that can be done with DisNetSimpl:

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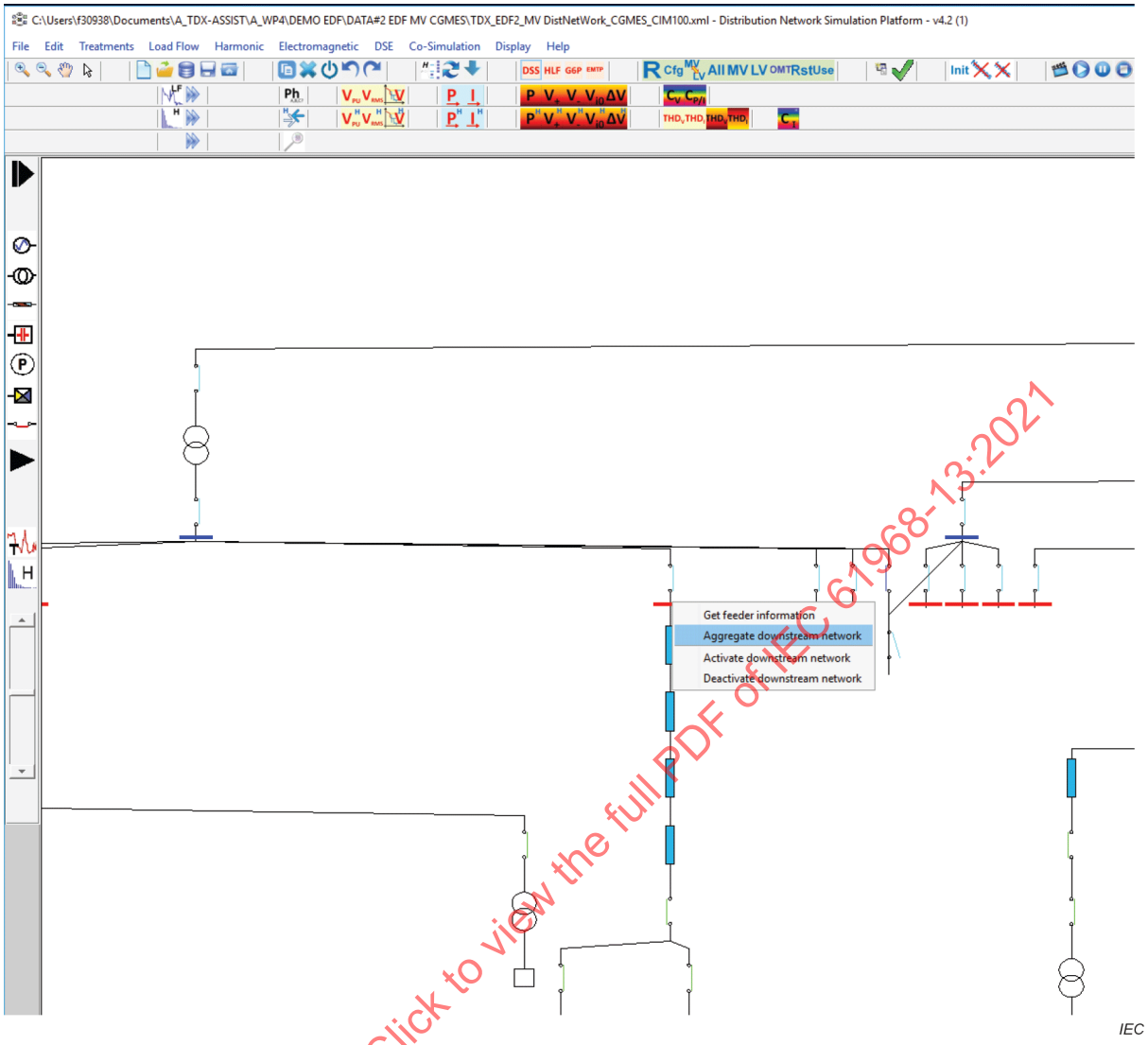

Figure F.3 – Aggregation of a downstream network

After some downstream network reductions, the equivalent network display is illustrated by Figure F.4.

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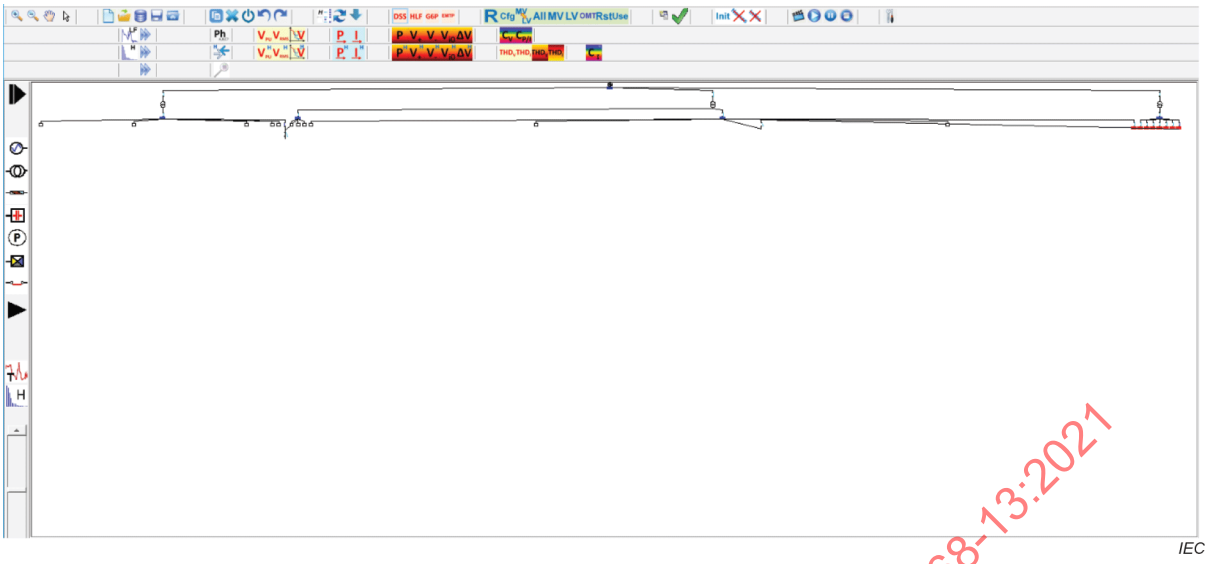

Figure F.4 – Result of several aggregations

Figure F.5 illustrates other model reductions that can be done by DisNetSimPl:

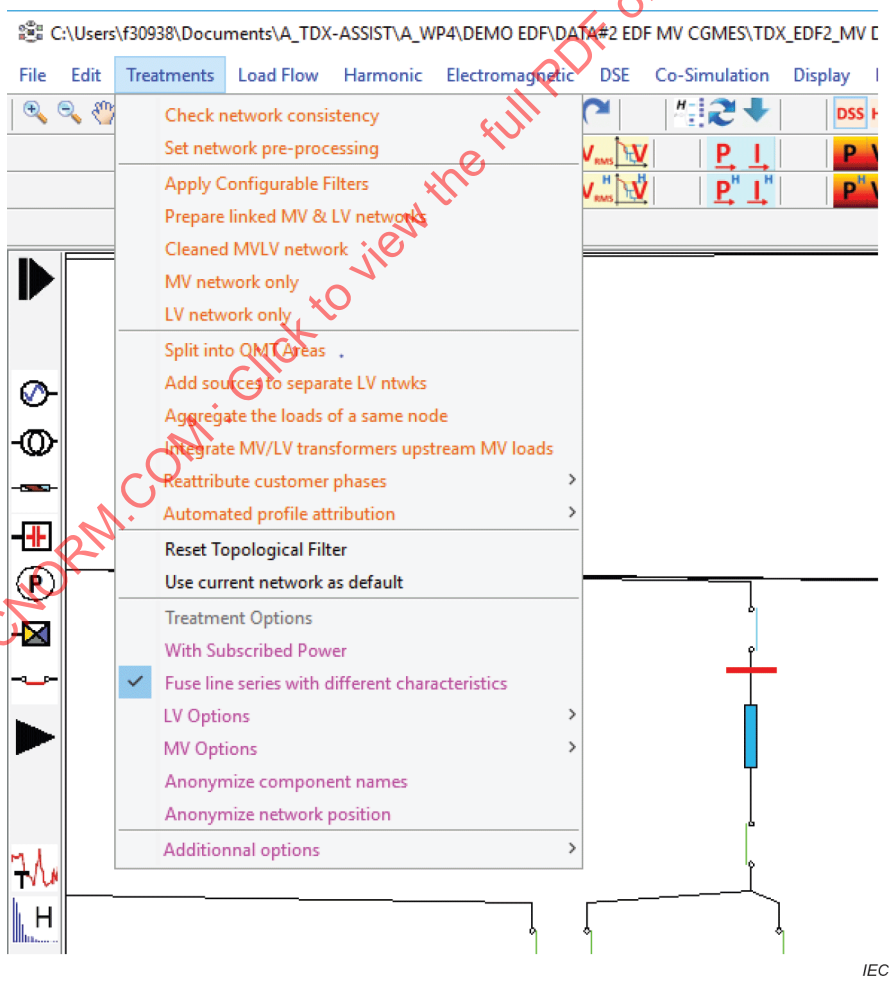

Figure F.5 – DisNetSimpl Model reductions and other options examples

DisNetSimpl allows for some "reductions" as illustrated in Figure F.6, where Line in series have been aggregated:

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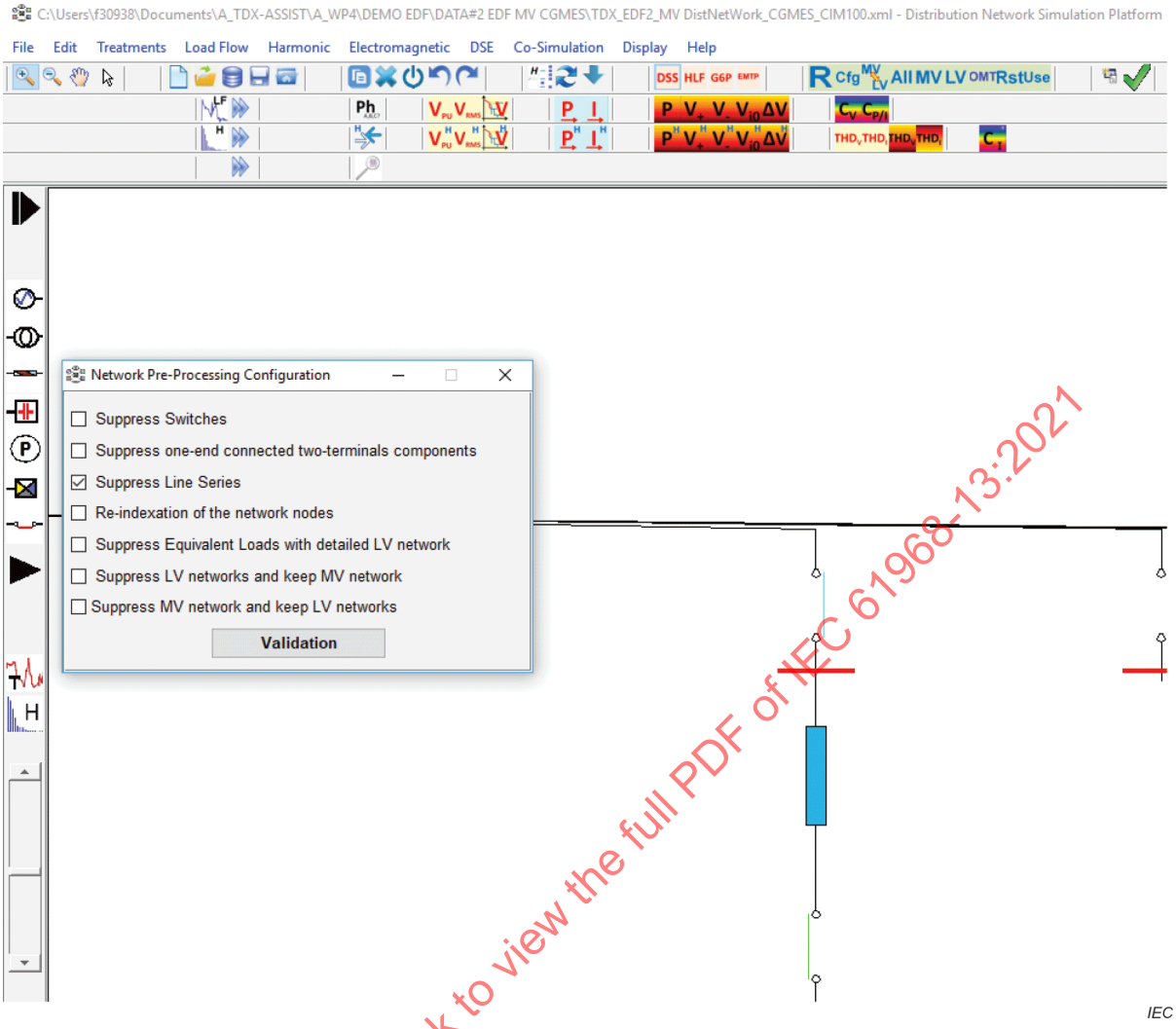

Figure F.6 – Network Pre-processing configuration Menu

The Data Set imported and processed with some network reductions can be saved in different file formats. Some CIM compliant profiles can be used as export format and could be used to export some "reduced" networks to third parties.

Reference documents are [2] and [3] and can be found at: www.tdx-assist.eu. All TDX-ASSIST deliverables can also be found on [16].

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Annex G
(informative)

Nuclear distribution network

Several voltage levels need to be managed such as:

6,6 KV AC
380 V AC
230 V DC
220 V AC
125 V DC
48 V DC
30 V DC
24 V DC

Figure G.1 illustrates a nuclear network:

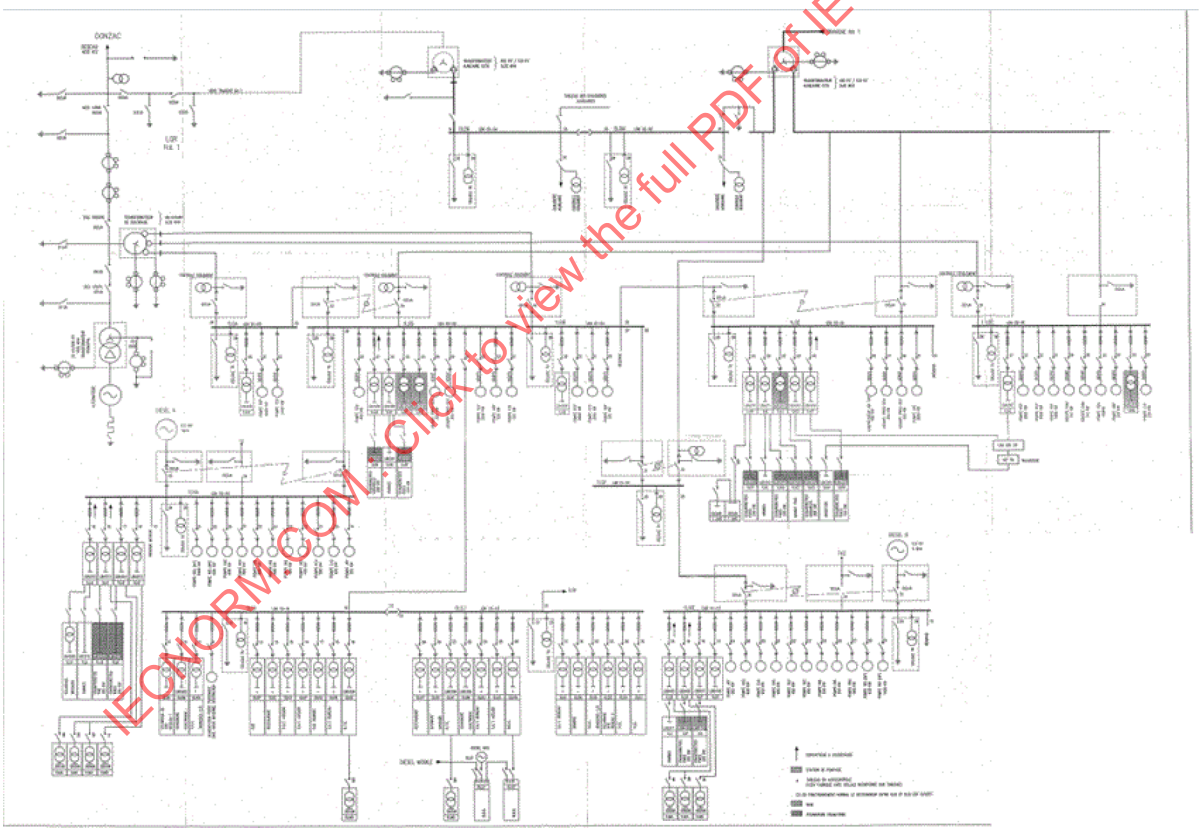

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Figure G.1 – Nuclear distribution network

CDPSM profiles were used as a starting point to model internal nuclear distribution networks.

This usage of CIM has been presented during UCA CIMUg in 2016 (Amsterdam location) [4].

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Annex H
(informative)

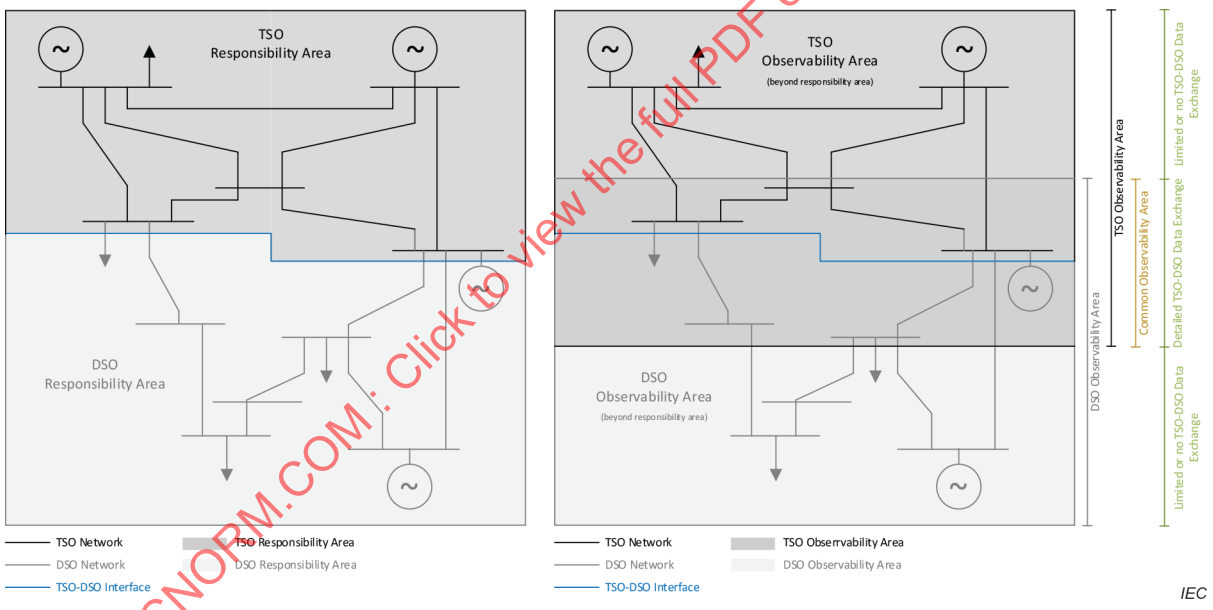
Observability Area concept

In the process of TSO-DSO data exchange, the concept of observability area arises as a fundamental one. TSOs and DSOs came up with a joint definition of observability area in [5]:

> *"Each system operator is responsible for its own grid, also called 'responsibility area'. To operate this grid properly, it is important to also know what is happening in part of the surrounding grids. The responsibility area together with this part of surrounding grids that can affect the responsibility area is called the 'observability area'."* [5]

This means that defining adequate observability areas for both TSOs and DSOs implies exchanging data with each other regarding their own networks, but as well concerning SGUs that may have an impact on the responsibility area of either DSOs and TSOs regardless of being directly connected to their grids or not.

Surrounding grids affecting the responsibility area of TSOs and DSOs are the ones electrically closer to the TSO-DSO physical interface regarding which more intense TSO-DSO data exchange may be needed. The concept is illustrated in Figure H.1.



SOURCE: Adapted from [5], [7]

Figure H.1 – Concept of observability area

The exchange of adequate levels of data with SGUs is also a very relevant aspect to both TSOs and DSOs in ensuring appropriate levels of observability to fulfil their responsibilities [5]. In this regard, a particular need of TSOs is to have sufficient visibility over distribution-connected SGUs to fulfil their legal tasks. Although TSOs and DSOs recognize that is the responsibility of DSOs to provide relevant data to TSOs concerning distribution-connected SGUs [5], TSOs and DSOs also highlight different possibilities for TSOs to have access to distribution-connected SGUs, as represented in Figure H.1 and Figure H.2.

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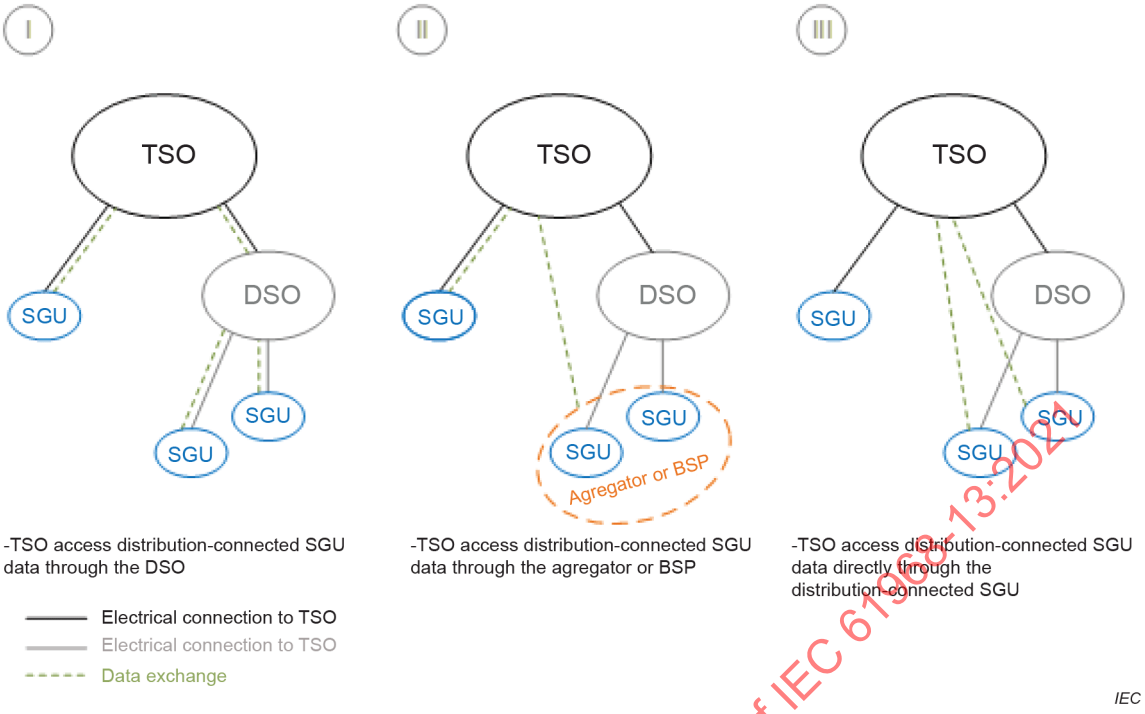

SOURCE: Adapted from [5].

Figure H.2 – Possibilities for TSOs data exchange with distribution-connected SGUs

In current European regulations, the most adequate scheme for exchange of information of TSOs and DSOs with SGUs is not explicitly mentioned. Nevertheless, depending on the type of information to be exchanged and its purposes (e.g. system balancing or congestion management purposes) different arrangements to exchange information with SGUs, as represented in Figure H.2, may be the most appropriate to adopt as long as the DSO role as distribution system technical validator is not compromised by such arrangements.

TSOs and DSOs understand the importance of working in close cooperation with National Regulatory Authorities (NRAs) to define adequate levels of visibility over their networks, collaborating on the definition of necessary observability areas from both TSOs and DSOs perspectives [5].

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Annex I
(informative)

CDPSM to CGMES conversion

Figure I.1 illustrates the "concept" of CDPSM profiles, as used in Distribution environement.

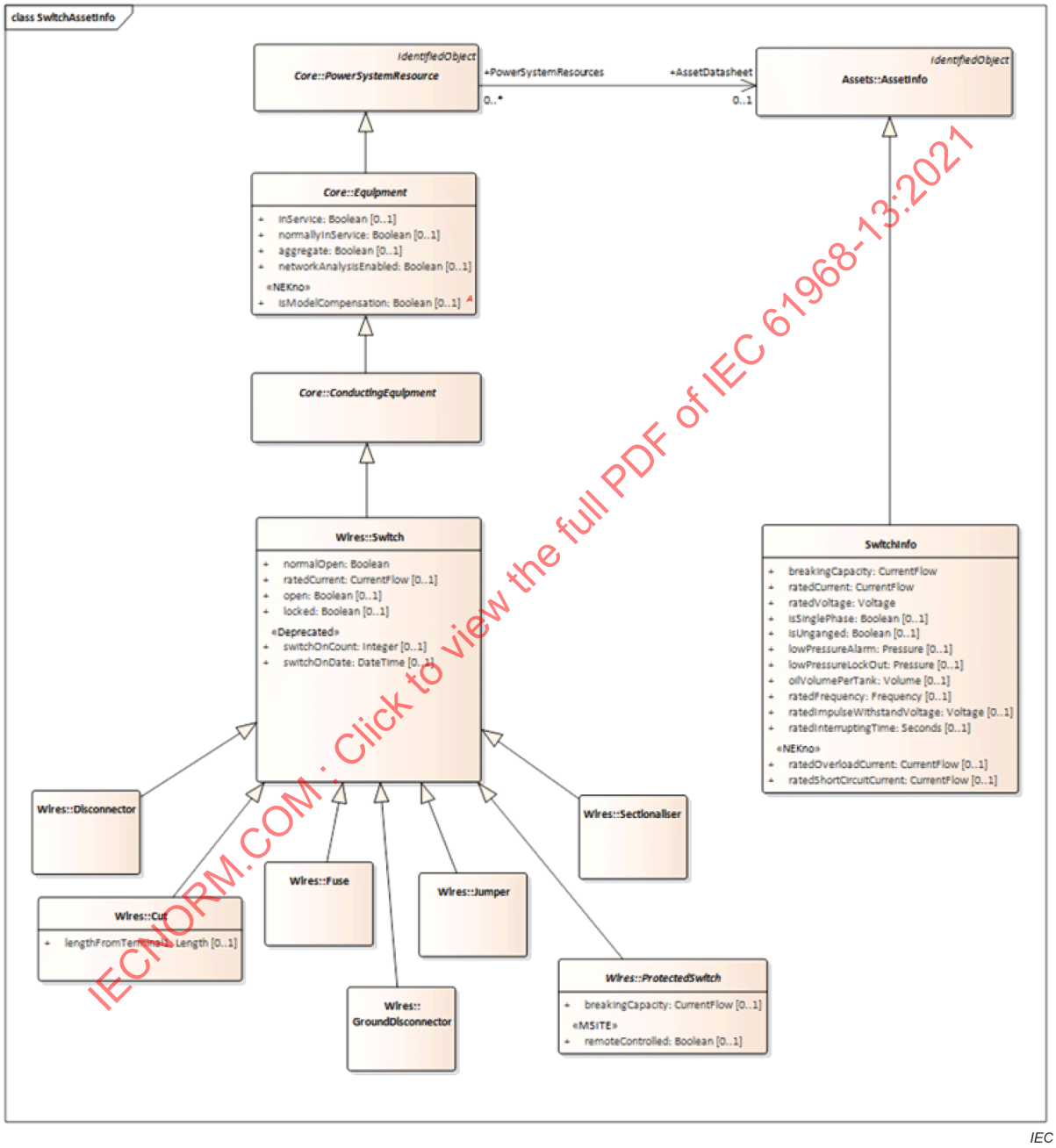

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Figure I.1 – Principle of PSR related class and Asset related class for CDPSM

Figure I.1 shows that Switch class inherits from PowerSystemResource and that an AssetInfo can be associated to a PowerSystemResource. It shows also that SwitchInfo inherits from AssetInfo.

In the profile ratedCurrent, ("The maximum continuous current carrying capacity in amperes governed by the device material and construction.") of a Switch, will be managed in ElectricalProperties profile. This value will be managed by ratedCurrent of SwitchInfo. Open attribute ("The attribute tells if the switch is considered open when used as input to topology processing") of Switch will be in Functional profile.

In IEC 61970-452 (CPSM), and in IEC 61970-600-2 (CGMES 3.0.0), Switch is managed in EquipmentProfile.

The property ratedCurrent has a CurrentFlow datatype.

Figure I.2 illustrates how CDSPM data sets could be transformed in CGMES data sets.

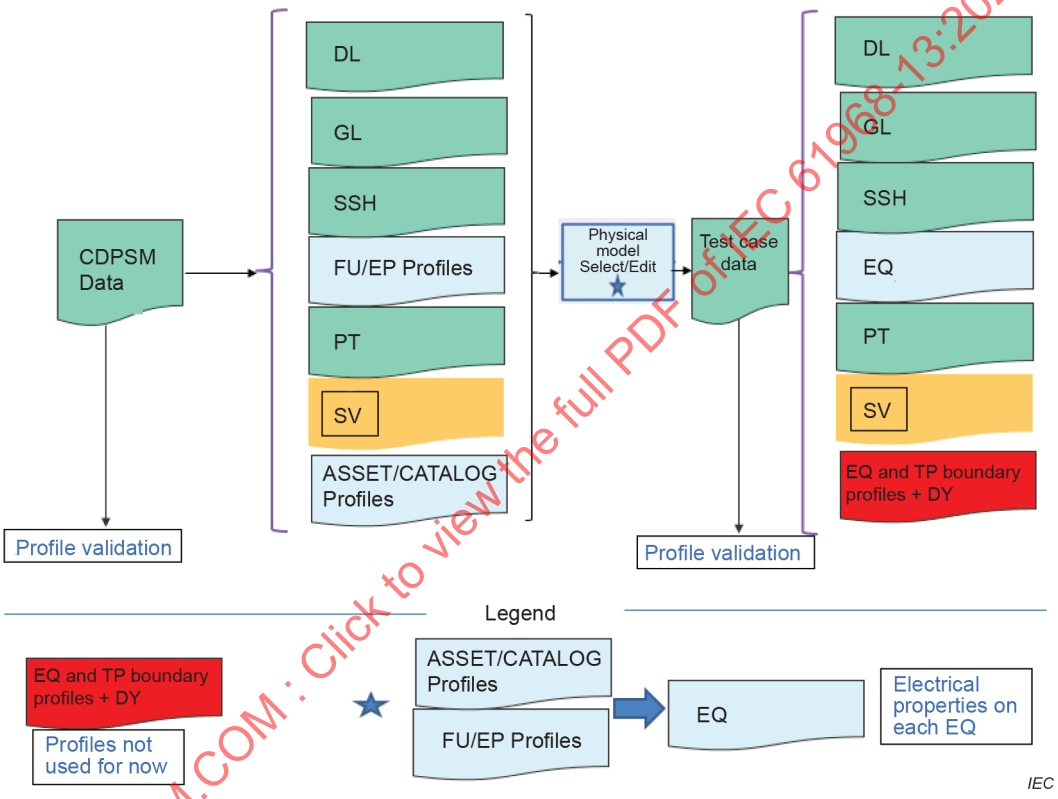

Figure I.2 – Data Set transformation between CDSPM and CGMES

CDSPM Data Sets have equipment (based on FU profile) and electrical properties (based on EP profile) which can be provided by catalogue data (based on CA profile). The conversion sets every electrical property on every Power System Resource used by CGMES (EQ profile).

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Annex J
(informative)

Norwegian Electrotechnical Committee (NEK) CDPSM Use Cases

J.1 General

Norwegian proposed extensions will be discussed in TC 57 and eventually will be part of future CIM information model releases.

J.2 Provision of Network Operator asset model to System Operator and Regulator

The Norwegian Regulation for system operator responsibility, "Forskrift om systemansvaret i kraftsystemet (FOS)" defines the regulation that is guiding the Norwegian Autofos project. The regulatory requirement for the project is defined in:

"§ 14a.Rapportering av anleggsdata ved idriftsettelse

Konsesjonær for anlegg i eller tilknyttet regional- eller sentralnettet, samt konsesjonær for produksjonsenheter tilknyttet distribusjonsnett, plikter skriftlig å rapportere til systemansvarlig senest fire uker før nye anlegg, eller endringer i eksisterende anlegg, skal settes i drift. Rapporteringen skal omfatte opplysninger som angitt på den systemansvarliges internettside.

Systemansvarlig skal fortløpende skriftlig rapportere til Norges vassdrags- og energidirektorat opplysninger innrapportert etter første ledd, etter de krav Norges vassdrags- og energidirektorat setter."

A non-official translation into English would be:

"§ 14a. Reporting of power system asset data due commissioning

Concessionaires for electricity power system installations and plants in or associated with the regional or central grid, as well as licensees for production units connected to distribution networks, are obliged to report in writing to the system operator no later than four weeks before new facilities, or changes to existing facilities, are to be put into operation. The reporting shall include information as specified on the system operator's website.

The Transmission System Operator (TSO) shall report in writing to the Norwegian Water Resources and Energy Directorate (NVE) information reported in accordance with the first paragraph, in accordance with the requirements set by the Norwegian Water Resources and Energy Directorate."

This means that as the Norwegian TSO, one of the responsibilities of Statnett set by the regulator is to collect relevant technical asset data for equipment in voltage levels > 30 kV from Distributed Network Operators, Transmission Grid Owners and Significant Grid Users ("concessionaires").

On their side, the concessionaires must comply with this same requirement, by reporting these data to Statnett.

Currently, all concessionaires must meet this requirement by manually entering data in the web portal Fosweb. This means that all concessionaires must maintain these data both in their internal systems, and in Fosweb. For the larger utilities, this is a very time-consuming task due to their large amounts of data.

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Therefore, the larger Distributed Network Operators, Transmission Grid Owners and Significant Grid Users requested that Statnett set up an automated solution for reporting these data, and the Autofos project was started. The goal of Autofos is to create an automatic exchange of relevant technical asset data as being maintained in the Fosweb application.

A pilot implementation is in progress as a cooperation between Statnett and a limited number of concessionaires and suppliers, and the goal was to have a first version of Autofos up and running by the end of 2019.

Autofos decided to use the IEC Common Information Model (CIM) standard defined in this second edition of IEC 61968-13, Common Distribution Power System Model (CDPSM) profiles, for defining the payload. The main reason for this were:

– The need to exchange the same information to other parties and internal systems, it therefore needs to be an international standard.
– The data needs to be connected to the power system model defined in IEC 61970 (all parts), and in particular the Common Grid Model Exchange Specification (CGMES) that is required to be used for fulfilling the European Network Code.
– Support at a later stage, a tighter integration with the FLISR (Fault Location, Isolation, and Service Restoration) reporting done through the FASIT project (FASIT = Feil- og AvbruddsStatistikk I Totalnettet (Norwegian) (Fault and outage statistic in the full grid). FASIT messages are inspired by IEC 61968-3, but not fully based on them.
– Possibility to extend the standard to support national requirements.

It has also been decided to include the CGMES (2.5) Interoperability (IOP) 2016, CGMES Sixth IOP, Manifest profile to include meta-data about the transferred data to include validation, including the possibility to exchange incomplete information, and associated supporting document to relevant technical asset data. This accommodates the exchange of the specific rules related to the business process.

The extension defined in the Autofos project is managed by the Norwegian Electrotechnical Committee (NEK) and is located to NEK.no namespace: http://NEK.no/NK57/CIM/CIM100-Extension/1/0#

NEK, The Norwegian Electrotechnical Committee, was founded in 1912. NEK became the 21st member of IEC, The International Electrotechnical Commission. NEK is an independent and neutral organisation promoting electrotechnical standardisation and the use of standards at the national, regional and international levels.

The organisation is a founding member and national committee of the European CENELEC.

NEK is recognized as the national body responsible for standardisation in the electrotechnical field. It's organisational structure simply mirrors that of the IEC in the standardisation domain.

The project will together with other national initiatives give input to a national working group initiative that will evaluate different existing projects and information models to come up with a common national approach for use of different standards and information models in different scenarios.

As part of mapping the existing internal information model for Fosweb (this model consists of the data required by different department at Statnett and by NVE) to CDPSM, we faced the following challenges:

a) The internal Fosweb structure is more unnormalized. So, in many cases additional classes and association needed to be created and maintained due to the high level of normal form in CIM by using inheritance and association. This gives more identification that is not yet taken into use, e.g. catalog data references.

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b) Some structure difference to address shared operation of station, needed to add an extension for Station that is linked to cim:Substation.

c) How normalized should the extension be? Only cover the current need or address changes into the future?

d) High level of complexity. Need to discuss with a range of experts to get the complete understanding of the elements. However, the Fosweb application has a very good user guide, but this is only created in Norwegian.

e) Needed to support exchanging of information without having a connectivity model in the source system. This is many times the case in GIS or ERP system, or other system that is not doing any analysing. Asset management is typically done in these types of system for larger utility that does not have hybrid systems that handling assets and functional management in a common system.

f) Some extension where addressing short coming in CIM particularly on parts that are new in CIM 100.

The Autofos project will have an agile implementation of the information being exchanged. Version 1 will address the following prioritized components:

1) Station including Substation, Voltage Level and Bay
2) Switch
3) Current Transformer
4) Line

The next version will address the following components:

1) Busbar Section
2) Power Transformer
3) Generating Unit
4) Shunt Compensators
5) Static Var Compensator
6) Grounding Impedance
7) Cut and clamp for looping
8) Auxiliary Equipment

It has not yet been decided if the following areas shall be addressed in the same way:

1) Protection Equipment
2) System Protecting Scheme
3) Marked information
4) Transient Stability models

Most of the extension belongs to Line, however the following areas have been extended:

- Auxiliary Equipment
- Equipment
- Busbar Section
- Generation
- Line
- Location
- Names
- Organisation

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- Substation
- Switch

We expect that there will be additional extensions when the next set of components are analysed and implemented.

It has been decided that the Autofos Profile combines the 5 profiles into 1 profile that includes all the relevant data. Not all data is relevant for the different concessionaires. The option to create a profile that is utility specific has been considered. This is, however, easier to address when the pilot is being evaluated.

Use case overview table

Name of Use Case	*Short description*	*Actors*	*General remarks*
Network Operator Concession report existing asset to System Operator	The Business Use Case describes how the Network Operator and Significant Grid Users (SGU) shall act to conform to the regulatory requirements to report technical power system asset information on already commissioned equipment to System Operator and Regulator.	System Operator (SO/TSO) Network Operator (TNO/DNO) Significant Grid Users (SGU)	This is an initial use case to create a base line for handling changes. It can also be used for synchronising the datasets.

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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INTÉGRATION D'APPLICATIONS POUR LES SERVICES ÉLECTRIQUES – INTERFACES SYSTÈME POUR LA GESTION DE LA DISTRIBUTION –

Partie 13: Profils de modèle commun de système électrique de distribution

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La Norme internationale IEC 61968-13 a été établie par le comité d'études 57 de l'IEC: Gestion des systèmes de puissance et échanges d'informations associés.

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Cette deuxième édition annule et remplace la première édition parue en 2008. Cette édition constitue une révision technique. Cette édition a été soumise à un préessai pendant les essais d'interopérabilité de l'ENTSO-E en 2016 [1][1]. Le rapport d'essai d'interopérabilité mentionne: "Certains vendeurs ont démontré que la transformation entre le réseau de distribution et la spécification d'échange de modèle de réseau commun (CGMES – *common grid model exchange specification*) est possible. Il s'agit de la première étape de l'intégration entre la CGMES et les profils d'échange de données de distribution (CDPSM)."

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) Alignement sur la version UML "CIM100" corrigée en juillet 2018: iec61970cim17v24_iec61968cim13v05_iec62325cim03v14.eap
Le namespace (espace de noms) associé à cette version était: http://iec.ch/TC57/2017/CIM-schema-cim100#

b) Essai des jeux de données par rapport à la version "CIM100" donnée en a).

c) Essai des jeux de données par rapport à une nouvelle version de "CIM100" datant de mai 2019: iec61970cim17v34_iec61968cim13v12_iec62325cim03v17a.eap
Le namespace associé à cette version était: http://iec.ch/TC57/CIM100#

d) Alignement sur le "CIM100" après l'étape CDV afin d'aligner l'IEC 61968-13 sur la dernière version du CIM iec61970cim17v38_iec61968cim13v12_iec62325cim03v17a. Un nouvel alignement a été effectué en mars/avril 2020 sur un nouveau CIM100: iec61970cim17v38_iec62968cim13v13_iec62325cim03v17a.eap. Ce document a été correctement mis à jour avec les derniers développements afin de réduire le plus possible le besoin de toute convergence.

e) Validation des essais des jeux de données par rapport aux profils dérivés de ces deux nouvelles versions du CIM100 afin de garantir la cohérence. La validation comprend la validation de la syntaxe et le calcul du flux de charge.

f) Ajout d'extensions informatives (NEK, EDF) fondées sur des besoins utilitaires, qui doivent être examinées et qui sont destinées à être intégrées dans le modèle CIM de l'IEC. Ces extensions ont été placées dans une annexe dédiée. Elles sont destinées à être examinées par le comité d'études 57 de l'IEC et seront intégrées, à terme, au modèle CIM officiel. Ces extensions sont gérées par des espaces de noms spécifiques et ne bloquent aucun essai d'interopérabilité. Les amendements à l'IEC 61968-13 ou les nouvelles parties de l'IEC 61968-13 traiteront potentiellement de ces "extensions" dans un avenir proche (lorsqu'elles seront intégrées dans le modèle CIM de l'IEC).

g) Namespace et URI modifié associé.

h) Utilisation de la dernière modélisation du départ de CIM (modèle d'information commun) et des artéfacts de modélisation des réseaux déséquilibrés.

i) Nouvelle annexe présentant l'utilisation de CDPSM par EDF dans le projet européen H2020 TDX-ASSIST.

j) Nouvelle annexe présentant l'utilisation de CDPSM par le projet norvégien AutoFOS. L'extension est gouvernée par le Comité national norvégien (NEK).

k) Nouvel alinéa et nouvelle annexe présentant le concept de zone d'observabilité.

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[1] Les chiffres entre crochets se réfèrent à la bibliographie.

l) Les outils utilisés sont MODSARUS®[2] (Copyright © 2019, EDF R&D contact: modsarus@edf.fr) pour la définition du cas d'utilisation (selon la méthodologie de l'IEC 62559-2 et de l'IEC SRD 62913-1) et le profilage UML CDPSM. L'outil Riseclipse a été utilisé pour la validation des jeux de données (RiseClipse Web https://rise-clipse.pam-retd.fr/ Rise Clipse Code: https://wdi.supelec.fr/software/RiseClipse/). CIMTool (https://wiki.cimtool.org/) a également été utilisé pour vérifier la compatibilité des outils (profilage et validation des jeux de données). Une version modifiée de JcleanCIM (http://www.tanjakostic.org/jCleanCim/) a été utilisée pour générer la présente documentation. Il est possible d'utiliser d'autres outils comme CimConteXtor et CimSyntaxGen pour produire les profils et la documentation. (https://www.cimcontextor.net/).

m) Remplacement de la Figure 6 sur la gestion des modèles de réseau. Introduction d'une nouvelle annexe informative sur la conversion du CDPSM au CGMES, remplaçant la Figure 7 du document CDV.

Le texte de cette Norme internationale est issu des documents suivants:

FDIS	Rapport de vote
57/2311/FDIS	57/2336/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette Norme internationale.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2.

Une liste de toutes les parties de la série IEC 61968, publiées sous le titre général *Intégration d'applications pour les services électriques – Interfaces système pour la gestion de la distribution*, peut être consultée sur le site web de l'IEC.

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INTRODUCTION

L'organisation de l'IEC 61968-13 est décrite dans le Tableau 1.

Tableau 1 – Vue d'ensemble de l'IEC 61968-13

Article	Titre	Objectif
1	Domaine d'application	Domaine d'application de l'IEC 61968-13.
2	Références normatives	Définition des références normatives dont dépend le document.
3	Termes et définitions	Définition des termes et définitions utilisés dans le document.
4	Liste des cas d'utilisation	Cas d'utilisation relatifs à CDPSM
5	Modélisation du réseau de distribution et problèmes relatif au CIM résolus	Modélisation du départ Modélisation des dispositifs à phases partielles Gestion des câbles BT dans le catalogue
6	Profils de modèle statique de réseau de distribution du CIM	
Annexe A Informative	Cas d'utilisation	
Annexe C Informative	Exemple de réseau rural et urbain européen CDPSM MT/BT	Utilisation CDPSM et image satellite associée.
Annexe D Informative	Exemple de réseau urbain européen CDPSM MT/BT	Utilisation CDPSM et image satellite associée.
Annexe E Informative	Exemple de réseau rural et urbain européen CDPSM MT	Utilisation CDPSM et image satellite associée.
Annexe F Informative	Exemple d'utilisation CDPSM dans le projet H2020 TDX-ASSIST	Utilisation du CDPSM dans le projet européen H2020 TDX-ASSIST.
Annexe G Informative	Exemple d'un réseau de distribution nucléaire	Le CDPSM a été optimisé pour modéliser le réseau de distribution interne d'une centrale nucléaire.
Annexe H Informative	Concept de zone d'observabilité	Il convient que la modélisation CIM puisse représenter le concept de zone d'observabilité.
Annexe I Informative	Conversion du CDPSM au CGMES	Présente la manière dont les jeux de données CDSPM peuvent être transformés en jeux de données CGMES.
Annexe J Informative	Cas d'utilisation relatifs à CDPSM du Comité électrotechnique norvégien (NEK)	Décrire l'utilisation du CDPSM dans les projets Autofos.

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INTÉGRATION D'APPLICATIONS POUR LES SERVICES ÉLECTRIQUES – INTERFACES SYSTÈME POUR LA GESTION DE LA DISTRIBUTION –

Partie 13: Profils de modèle commun de système électrique de distribution

1 Domaine d'application

La présente partie de l'IEC 61968 spécifie les profils pouvant être utilisés pour échanger des modèles de réseau chez un fournisseur ou entre un fournisseur et des applications qui lui sont externes. Le présent document fournit une liste de profils qui permettent de modéliser des réseaux de distribution équilibrés et déséquilibrés afin d'effectuer une analyse réseau (calcul du flux de puissance). Par conséquent elle optimise les profils existants (IEC 61970-45x fondée sur l'IEC 61970-301 (base CIM) ou les profils fournis fondés sur l'IEC 61968-11 Extensions du CIM pour la distribution). Le présent document réutilise certains profils sans changement, ou finit par les étendre ou les restreindre. De plus, il propose d'autres profils qui reflètent les besoins de distribution.

L'utilisation du CIM dans la distribution n'est pas un sujet nouveau. Plusieurs documents peuvent être intéressants [13][17][18][19][20]. Le présent document inclut des parties informatives, comme des extensions de modèle CIM, qui peuvent être intégrées dans les versions futures de modèle CIM de l'IEC. Ces extensions ont été utilisées par certains fournisseurs pour les cas d'utilisation d'échange d'informations interne et pour soutenir les échanges d'informations entre les différents acteurs du marché comme les gestionnaires de réseau de transport (GRT), les gestionnaires de réseau de distribution (GRD), les exploitants de réseau de distribution (ERD) et les utilisateurs significatifs du réseau (USR), y compris les générateurs et l'industrie (voir l'Annexe J pour un exemple).

2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC TS 61968-2, *Application integration at electric utilities – System interfaces for distribution management – Part 2: Glossary (*disponible en anglais seulement)

IEC 61968-11:2013, *Intégration d'applications pour les services électriques – Interfaces système pour la gestion de distribution – Partie 11: Extensions du modèle d'information commun (CIM) pour la distribution*

IEC 61970-301:2020, *Interface de programmation d'application pour système de gestion d'énergie (EMS-API) – Partie 301: Base de modèle d'information commun (CIM)*

IEC 61970-452, *Interface de programmation d'application pour système de gestion d'énergie (EMS-API) – Partie 452: Profils du modèle de réseau de transport statique CIM*

IEC 61970-501:2006, *Energy management system application program interface (EMS-API) – Part 501: Common Information Model Resource Description Framework (CIM RDF) schema* (disponible en anglais seulement)

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IEC 61970-552:2016, *Interface de programmation d'application pour système de gestion d'énergie (EMS-API) – Partie 552: Format d'échange de modèle CIMXML*

IEC 62325-301, *Cadre pour les communications pour le marché de l'énergie – Partie 301: Extensions du modèle d'information commun (CIM) pour les marchés*

3 Termes, définitions et termes abrégés

Pour les besoins du présent document, les termes et définitions suivants s'appliquent.

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes:

- IEC Electropedia: disponible à l'adresse http://www.electropedia.org/
- ISO Online browsing platform: disponible à l'adresse http://www.iso.org/obp

Lorsqu'il existe une différence entre les définitions du présent document et celles des autres normes IEC référencées, les définitions de l'IEC TS 61968-2 doivent prévaloir, et les définitions de l'IEC 61968-13 doivent prévaloir sur celles de l'IEC TS 61968-2.

3.1 Termes et définitions

3.1.1
DMS
système de gestion de distribution
au sens de l'IEC 61968, système composé de plusieurs applications distribuées qui permettent à l'entreprise de distribution de gérer des réseaux électriques

Note 1 à l'article: Ses fonctions incluent la surveillance et la commande des équipements de fourniture d'énergie, les processus de gestion qui assurent la fiabilité du système, la gestion de la tension, la maitrise de la demande d'énergie, la gestion des interruptions de service, la gestion des travaux, la cartographie automatisée et la gestion des équipements. Des interfaces normalisées sont définies pour chaque classe d'applications identifiée dans le modèle d'interface de référence (IRM), qui est décrit dans la Partie 1: Architecture des interfaces et recommandations générales.

Note 2 à l'article: L'abréviation "DMS" est dérivée du terme anglais développé correspondant "*distribution management system*".

Note 3 à l'article: L'abréviation "IRM" est dérivée du terme anglais développé correspondant "*interface reference model*".

3.1.2
profil
sous-ensemble convenu ou dérivé d'une spécification

Note 1 à l'article: Un profil commun est exigé pour réaliser l'interopérabilité, en particulier dans les cas où une spécification peut avoir plus d'une interprétation et où il existe probablement de nombreuses caractéristiques facultatives

Note 2 à l'article: Un profil peut être plus restrictif que le CIM, mais pas moins restrictif

[SOURCE: IEC TR 62361-103:2018, 3.11, modifiée – La Note 2 à l'article a été ajoutée.]

3.1.3
cas d'utilisation
spécification d'un ensemble d'actions effectuées par un système, qui produit un résultat observable qui a typiquement un intérêt pour un ou plusieurs acteurs ou parties prenantes du système

Note 1 à l'article: Il existe deux types de cas d'utilisation:

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– Les cas d'utilisation métier qui décrivent la façon dont les rôles opérationnels interagissent pour exécuter un processus opérationnel. Ces processus sont dérivés des services, c'est-à-dire des transactions commerciales, qui ont été identifiés précédemment.

– Les cas d'utilisation système qui décrivent la façon dont les rôles système et/ou opérationnels d'un système donné interagissent pour effectuer une fonction de réseau intelligent exigée pour permettre/faciliter les processus opérationnels décrits dans les cas d'utilisation métier. Leur objectif est de détailler l'exécution de ces processus du point de vue du système d'information.

Note 2 à l'article: Étant donné qu'une fonction de réseau intelligent peut être utilisée pour permettre/faciliter plusieurs processus opérationnels, un cas d'utilisation système peut être lié à plusieurs cas d'utilisation métier.

[SOURCE: IEC SRD 62913-1:2019, 3.1.22, modifiée – Le Tableau 1 a été supprimé de la Note 2 à l'article.]

3.2 Termes abrégés

BT	Basse tension
BUC	Business Use Case (Use case) (Cas d'utilisation métier (Cas d'utilisation))
CGMES	Common Grid Model Exchange Standard (Norme d'échange de modèle de réseau commun)
CIM	Common Information Model (Modèle d'information commun)
DER	Distributed Energy Resource(s) (Ressources énergétiques distribuées)
DERMS	Distributed Energy Resources Management System (Système de gestion des ressources énergétiques distribuées)
DL	Diagram Layout (Disposition de diagramme)
DMS	Distribution Management System (Système de gestion de distribution)
EMS-API	Energy Management System Application Program Interface (Interface de programmation d'application pour système de gestion d'énergie)
EQ	Équipement
ERD	Exploitant de réseau de distribution
GRD	Gestionnaire de réseau de distribution. En général, un GRD gère un réseau MT/BT
GRT	Gestionnaire de réseau de transport. En général, un GRT gère un réseau THT/HT
HT	Haute tension
IEC	International Electrotechnical Commission (Commission électrotechnique internationale)
MT	Moyenne tension
RDF	Resource Description Framework (Cadre de description des ressources)
SSH	Steady State Hypothesis (Hypothèse en régime établi)
SUC	System Use Case (Cas d'utilisation système) (cas d'utilisation)
SV	State Variable (Variable d'état)
USR	utilisateur significatif du réseau
THT	Très haute tension
TP	Topology (Topologie)
UML	Unified modelling language (Langage de modélisation unifié)
UUID	Universally unique identifier (Identifiant unique universel)
XML	eXtended Markup Language (Langage de balisage étendu)
XSD	XML Schema Definition (Définition de schéma XML)

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4 Liste des cas d'utilisation

4.1 Cas d'utilisation relatifs aux profils de modèle commun de système électrique de distribution

Les processus opérationnels et les interactions associées entre les rôles opérationnels (dans et hors d'un domaine donné) peuvent être décrits comme des cas d'utilisation métier. Les fonctions de réseau intelligent et les interactions associées entre les rôles (rôles opérationnels et/ou système) peuvent être décrits dans des cas d'utilisation système selon la série IEC SRD 62913. L'IEC TR 62357-2 fait référence aux cas d'utilisation présentés dans le présent document.

La définition de la norme de profils de modèle commun de système électrique de distribution (CDPSM – *common distribution power system model profiles*) se fonde principalement sur l'identification des cas d'utilisation métier et système relatifs et de leur description à l'aide du formulaire type de modèle de cas d'utilisation de l'IEC 62559-2.

Dans le but d'identifier les cas d'utilisation métier d'intérêt pour les objectifs CDPSM, la collecte des cas d'utilisation métier spécifiée dans l'IEC SRD 62913-2-1:2019 (voir le Tableau 2 – Cas d'utilisation métier générique du domaine identifiés) a d'abord été analysée.

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Tableau 2 – Cas d'utilisation métier identifiés

Cas d'utilisation métier identifiés	Brève description
Élaborer le schéma directeur pluriannuel du réseau de distribution	Le cas d'utilisation métier décrit la façon dont le gestionnaire de réseau HT et MT/BT élabore le schéma directeur pluriannuel du réseau en simulant des contraintes qui peuvent se produire et en hiérarchisant les investissements réseau. *Ce cas d'utilisation métier est générique et s'applique à l'Europe*
Optimiser les opérations réseau dans la planification opérationnelle à partir d'un programme	Le cas d'utilisation opérationnelle décrit la façon dont le gestionnaire de réseau HT et MT/BT anticipe/optimise les opérations réseau de la planification opérationnelle à moyen terme (au mois et à la semaine) et à court terme (au jour et entre les jours). Cela consiste à: – anticiper les points opérationnels fondés sur des charges locales et des prévisions de production, identifier et qualifier les risques des contraintes sur le réseau (poste primaire, réseau MT, et réseau HT si géré par le gestionnaire de réseau HT et MT/BT), – définir la configuration du réseau afin de satisfaire aux engagements contractuels, à l'aide de plusieurs leviers d'optimisation qui ont pour objectif de résoudre les contraintes détectées au prix le plus bas, – prendre en considération les programmes de travail de toutes les périodes, – prendre en considération les contraintes du réseau en temps réel (défaillances, limites ou interruption de transmission, transferts de charge), et évaluer l'impact sur les points opérationnels. *Ce cas d'utilisation métier est générique et s'applique à l'Europe*
Optimiser les programmes de travail (des gestionnaires de réseau THT et HT, producteurs, et gestionnaires de réseau HT et MT/BT)	Le cas d'utilisation métier décrit la façon dont le gestionnaire de réseau HT et MT/BT optimise les programmes de travail sur les réseaux HT et MT, c'est-à-dire les programmes pour les opérations relatives à la création, à la maintenance et à la réparation des actifs des réseaux – y compris les travaux déterminés par le gestionnaire de réseau THT et HT, les producteurs HT et/ou MT, et le gestionnaire de réseau MT/BT – afin de réduire le plus possible leur impact sur le système et d'augmenter le plus possible les énergies renouvelables. *Ce cas d'utilisation métier est générique et s'applique à l'Europe*
Décider du renouvellement des priorités des actifs et optimiser les programmes de maintenance	Le cas d'utilisation métier décrit la façon dont le gestionnaire de réseau décide du renouvellement des priorités des actifs et optimise les programmes de maintenance lors de la phase de planification, à partir de l'analyse des actifs du réseau et du développement des modèles de prédiction des défaillances et de maintenance fondés sur les conditions. *Ce cas d'utilisation métier est générique et s'applique à l'Europe*
Décider d'effectuer des opérations urgentes de maintenance	Le cas d'utilisation métier décrit la façon dont le gestionnaire de réseau HT et MT/BT analyse les indices de santé des actifs du réseau à l'aide des données archivées (utilisation des actifs, opérations de maintenance, défaillances, amplitudes de tension …) et de la surveillance des données en temps réel. À partir de ces informations, le gestionnaire de réseau HT et MT/BT évalue le risque de défaillance et décide d'effectuer des opérations urgentes de maintenance afin d'empêcher les défaillances. *Ce cas d'utilisation métier est générique et s'applique à l'Europe*
Faire fonctionner le réseau MT en temps réel de façon optimisée à l'aide de fonctions d'automatisation et de fonctions avancées	Le cas d'utilisation métier décrit la façon dont le gestionnaire de réseau MT/BT gère le réseau MT en temps réel en optimisant la configuration du réseau, tout en assurant la coordination avec le gestionnaire de réseau THT/HT en maintenant le profil de tension dans des limites acceptables, en évitant des situations graves grâce à des leviers d'urgence, et en rétablissant l'alimentation en cas de défaillance. *Ce cas d'utilisation métier est générique et s'applique à l'Europe*

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Cas d'utilisation métier identifiés	Brève description
Surveiller et gérer le réseau BT	Le cas d'utilisation métier décrit la façon dont le gestionnaire de réseau MT/BT gère le réseau BT en temps réel dans des conditions normales et en cas de défaillance, afin de maintenir la qualité et la continuité de l'alimentation, à l'aide par exemple de données des compteurs intelligents et d'autres équipements installés sur le réseau. *Ce cas d'utilisation métier est générique et s'applique à l'Europe*
Optimiser les conditions de fonctionnement du réseau à l'aide des leviers disponibles (optimisation de l'équilibre de phase à BT et changeurs de prises MT/BT hors ligne)	Le cas d'utilisation métier décrit la façon dont le gestionnaire de réseau HT et MT/BT effectue des calculs de flux de charge à partir des données de réseau et de météo mesurées archivées, et optimise: – la valeur de consigne des changeurs de prises MT/BT hors ligne, – les exigences de connexion réseau, – la phase de connexion réseau des compteurs monophasés qui sont déjà connectés ou qui doivent être connectés au réseau BT. Cela permet au gestionnaire de réseau HT et MT/BT d'empêcher les contraintes réseau et d'augmenter la capacité du réseau. *Ce cas d'utilisation métier est générique et s'applique à l'Europe*
Gestion des données électriques dans les centrales nucléaires	Les données électriques des centrales nucléaires doivent être gérées, des études techniques au fonctionnement et à la maintenance. Le réseau de distribution électrique d'une centrale nucléaire est important et doit être géré avec prudence pour des raisons de sécurité. Les centrales nucléaires doivent être interrompues régulièrement pour être réapprovisionnées et pour la maintenance (interruption de l'unité) L'objectif des installations nucléaires est que ces interruptions soient les plus courtes possible, afin d'optimiser le facteur de disponibilité de l'énergie. Les interruptions de l'unité doivent donc être planifiées avec précision. Un travail important doit être effectué en parallèle, tandis que certains circuits de refroidissement nécessitent d'être préservés pour des raisons de sécurité nucléaire. Dans ce contexte, il est très important d'être capable de connaître (et de simuler) l'équipement qui est touché par l'indisponibilité d'un tableau de commande de distribution: pendant la planification, afin d'optimiser le travail de maintenance, et pendant l'interruption de l'unité elle-même afin de faire face aux événements non prévus. De plus, les équipes techniques doivent exécuter des simulations pour les calculs de l'équilibre de puissance et pour d'autres analyses de réseau.

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La déclaration ci-dessus "Ce cas d'utilisation métier est générique et s'applique à l'Europe" est extraite de l'IEC SRD 62913-2-1. Cela signifie qu'en Europe au moins, un tel cas d'utilisation est mis en œuvre, mais qu'il n'est pas spécifique à l'Europe. Les cas d'utilisation ci-dessus indiquent qu'il est nécessaire de gérer et potentiellement d'échanger la totalité ou une partie de certains modèles de réseau. Ces modèles de réseau peuvent inclure des informations relatives aux actifs.

À partir de cette liste, les cas d'utilisation métier principalement pris en considération pour la définition du CDPSM sont:

- optimiser les opérations réseau dans la planification opérationnelle à partir d'un programme,
- optimiser le fonctionnement du réseau en temps réel de façon optimisée à l'aide de fonctions d'automatisation et de fonctions avancées.

Le CDPSM doit soutenir les exigences suivantes extraites des cas d'utilisation métier répertoriés dans le Tableau 3.

Tableau 3 – Exigences identifiées

Brève description de l'exigence
Le gestionnaire de réseau MT/BT, en coordination avec le gestionnaire de réseau THT/HT, le producteur et le consommateur, doit avoir optimisé la configuration du réseau avant le temps réel en utilisant des outils de planification opérationnelle et des prévisions de charge et de génération au niveau du poste primaire.
Le gestionnaire de réseau MT/BT, en coordination avec le gestionnaire de réseau THT/HT, le producteur et le consommateur, doit avoir pris en compte les travaux planifiés sur le réseau MT/BT et les programmes de production des générateurs distribués connectés au réseau MT si disponible.
Les échanges système FLISR avancés avec le gestionnaire de réseau MT: • données topologiques et conditions de fonctionnement en temps réel, • charge sur les actifs de réseau et les flux de puissance, • informations de contexte, • plan de protection et contraintes de réseau en temps réel.
La fonction d'estimation d'état doit intégrer dans ses calculs la topologie du réseau en temps réel (position des commutateurs) et les impédances.
En cas d'un plan de rétablissement exigeant un transfert de charge, d'un poste primaire à l'autre, supérieur à un certain seuil, le gestionnaire de réseau MT échange des informations avec le gestionnaire de réseau THT/HT, conformément au contrat de fonctionnement du réseau en vigueur entre les deux parties.
Plusieurs niveaux de tension mélangeant les réseaux en courant continu et en courant alternatif doivent être gérés (cas d'un réseau de distribution nucléaire).

4.2 Tableau de présentation du cas d'utilisation

Des cas d'utilisation métier relatifs au domaine d'application du CDPSM sont consignés dans le Tableau 4.

Tableau 4 – Cas d'utilisation métier relatif au CDPSM

Nom du cas d'utilisation	Courte description	Acteurs	Remarques générales
Le GRD fournit ses modèles de système de puissance au GRT	Dans le but de calculer le flux de puissance du GRT, le GRD fournit au GRT une vue agrégée de son modèle de système de puissance, incluant les états relatifs et les mesurages.	GRT GRD	
Un client fournit au GRD des modèles de système de centrale nucléaire DER	Une demande de connexion DER au réseau de distribution est soutenue par la description d'une vue agrégée du modèle de système de centrale nucléaire DER.	GRD DER	
GRD1 et GRD2 échangent mutuellement leurs modèles de système de puissance	GRD1 et GRD2 échangent mutuellement leurs modèles de système de puissance afin de gérer le réseau en cas d'interruption sur un départ de limite.	GRD1 GRD2	
GRT et GRD fournissent leurs modèles de système de puissance à une partie tierce	Le GRT et le GRD fournissent leurs modèles de système de puissance à une partie tierce afin d'effectuer une analyse a posteriori d'un problème de qualité de puissance (c'est-à-dire des creux de tension).	GRT GRD Autorité	
Échange d'informations internes de GRD/ERD	Un GRD/ERD échange différentes informations ou données entre des systèmes différents dans l'entreprise.	GRD ou ERD	
Les ERD fournissent leurs modèles de système de puissance au GRD	Dans le but d'effectuer la planification du réseau, les différentes analyses, la gestion des interruptions, etc., du réseau de distribution entier, le GRD a besoin des modèles de système de puissance des réseaux des ERD subordonnés.	GRD ERD	Les ERD possèdent et font fonctionner une partie du réseau de distribution entier auquel le GRD est responsable.

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Dans le but de soutenir la définition de l'exigence de données CDPSM relative à un scénario concret, l'Article A.2 définit un cas d'utilisation système (SUC) relatif à l'échange d'informations GRT-GRD soutenant le premier BUC du Tableau 4.

Cela soutient également le même cas d'utilisation pour un EMS: simulations de flux de charge (SV, SSH), transfert de la topologie détaillée au modèle de branche de bus (profil TP).

Il doit être souligné que le cas d'utilisation système soutenant le BUC impliquant les rôles du GRD et du GRT définis à l'Article A.2 peut également être appliqué au BUC impliquant d'autres rôles (GRD/GRD, GRD/Gestionnaire de micro réseau, etc.) puisque les exigences de profils sont équivalentes. Les cas d'utilisation de microréseaux sont étudiés par le comité d'études 8 de l'IEC (système de gestion de l'énergie des microréseaux) et fournissent des cas d'utilisation pertinents pour le présent document.

5 Spécificités de modélisation du réseau de distribution et problèmes relatif au CIM résolus

5.1 Modélisation du départ

Le modèle du départ a pour besoin/l'objectif qu'une construction du départ soutienne la dénomination, la navigation de l'utilisateur et la traçabilité.

Contrairement aux autres conteneurs CIM, qui exigent que les objets soient contenus dans un seul conteneur, le départ est un conteneur qui peut contenir à la fois l'équipement et d'autres conteneurs.

Dans le but de couvrir les cas d'utilisation comme la gestion des interruptions dans un départ (déterminer à partir de quel départ la charge peut être transférée), il est nécessaire de modéliser le départ avec le CIM.

Pour effectuer ceci avec la version actuelle du CIM, il est nécessaire de traiter la connectivité du réseau, en commençant par le disjoncteur dans le poste primaire, et en suivant la chaîne de connectivité (équipement conducteur, bornes, et nœuds de connectivité) jusqu'au commutateur suivant. Des ensembles de règles différentes, qui dépendent des installations, sont appliqués afin de définir la partie exploitable du réseau concernée par le traitement de la connectivité.

Cela est typique des réseaux de distribution, dans lesquels les réseaux peuvent être gérés comme un radial.

- En général, un commutateur alimente une partie du réseau.
- Les commutateurs ouverts servent de limite aux autres parties du réseau (utilisés comme sauvetage lorsqu'un commutateur de départ est hors service).
- Dans le but de satisfaire aux différentes applications de niveau détaillées, il convient qu'il soit possible d'exprimer la composition du départ à deux niveaux de détail: Les conteneurs et l'équipement élémentaire.
  - Conteneurs: Substation, Line, VoltageLevel pour la définition non détaillée.
  - Équipement conducteur ou nœuds de connectivité pour la définition détaillée.
- Les départs peuvent être divisés de façon hiérarchique (par exemple un départ MT alimente/inclut plusieurs sous-réseaux BT).

Un poste primaire ayant trois départs et cinq postes secondaires est représenté à la Figure 1.

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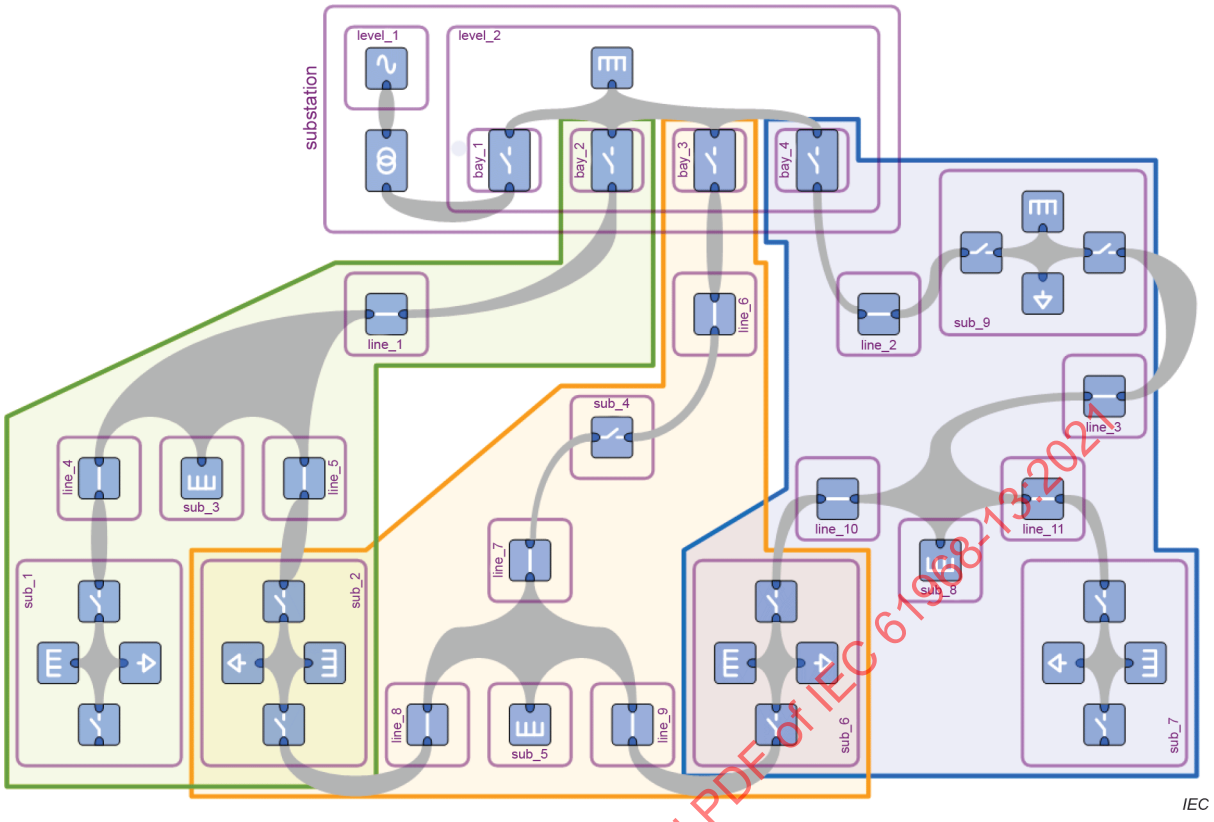

Figure 1 – Principes de confinement du départ

Dans la figure ci-dessus, Substation et Sub_x utilisent CIM:Substation, Line_x utilise CIM:Line, Niveau utilise CIM:Voltage_Level, Bay_x utilise CIM:Bay. Les différents départs sont des groupes utilisant un code de couleur (vert, jaune, bleu). Cette figure représente un réseau MT/BT, que ce document peut mettre en œuvre.

Le modèle du départ CIM UML a été inclus dans la dernière version du modèle CIM. Voir les normes associées IEC 61970-301:2020, 4.5.16 et IEC 61970-301:2020, Figure 68.

Les jeux de données d'essai fournis à l'Annexe C, à l'Annexe D, à l'Annexe E et à l'Annexe F ont validé cette proposition de modèle. Cette proposition de modèle doit être consolidée par d'autres jeux de données.

5.2 Modélisation des dispositifs à phases partielles

L'IEC 61970-301 et l'IEC 61968-11 ont déjà une prise en charge pour les dispositifs conducteurs à phases partielles par le biais de l'énumération PhaseCode (phase-code) qui peut être une combinaison quelconque de tout ou partie des lettres A, B, C et N. En général, un dispositif conducteur à phases partielles peut être vu comme un dispositif complètement triphasé avec un certain nombre de phases absentes.

Impédances des dispositifs déséquilibrés et à phases partielles:

L'IEC 61970-301 spécifie l'impédance des dispositifs conducteurs en fonction des impédances réelle et réactive directes et homopolaires. Malheureusement, cela est seulement valide pour les réseaux triphasés parfaitement symétriques dans lesquels les trois phases ont toutes la même valeur d'impédance propre et la même valeur d'impédance mutuelle.

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L'impédance de dispositifs conducteurs triphasés déséquilibrés comme les segments conducteurs triphasés doit être spécifiée sous la forme d'une matrice cube (trois lignes, trois colonnes) complexe dans laquelle les termes diagonaux spécifient l'impédance propre de chaque phase tandis que les termes non diagonaux spécifient l'impédance mutuelle de chaque paire de phases. Ces valeurs peuvent être calculées à l'aide des équations de Carson en se fondant sur le rayon géométrique moyen, la résistance linéaire et la disposition géométrique des trois phases sur le poteau. Pour les dispositifs à deux phases, la matrice d'impédance est carrée (deux lignes, deux colonnes) et pour les dispositifs monophasés, il s'agit d'un scalaire complexe spécifiant l'impédance propre du conducteur monophasé.

Se reporter à l'IEC 61968-11:2013, 4.4.3 (Concepts et exemples de modélisation de réseau) et à l'IEC 61970-301 pour des concepts de modélisation plus précis, y compris les concepts de modélisation du déséquilibre.

5.3 Gestion des câbles BT dans le catalogue

Les câbles BT sont généralement conçus dans un actif unique de conducteurs avec des caractéristiques différentes: trois conducteurs identiques pour les phases, un conducteur différent pour le neutre.

Dans le but de les gérer dans le catalogue, associé à AssetModel, il est nécessaire de régler un sous-type assetinfo qui permet de décrire ces assemblages:

- caractéristiques (WireInfo) de chacun des différents types de conducteurs,
- leurs grandeurs respectives ou affectation aux phases/neutre,
- impédances.

(Les grandeurs ou les affectations phases/neutre sont nécessaires pour identifier quelles utilisations de phase peuvent être effectuées et quelles WireInfo affectent quelle colonne si PhaseImpedance en utilisant uniquement les objets de niveau "catalogue" sans recourir à un lien ACLineSegmentPhase).

Cela s'applique aux câbles souterrains ou aux câbles torsadés aériens, mais cela est également utile pour les câbles aériens avec des conducteurs uniques. Les bonnes pratiques de montage de plusieurs installations permettent de limiter les possibilités d'assemblages de câbles et de positions. Il est alors plus simple et concis de gérer un catalogue d'assemblages prédéfinis, de les associer avec ACLineSegments, sans avoir besoin de déclarer à répétition ACLineSegmentPhase pour distinguer les deux WireInfo différentes nécessaires.

La Figure 2 décrit une solution dont les extensions informatives seront nécessairement examinées par le comité d'études 57 de l'IEC.

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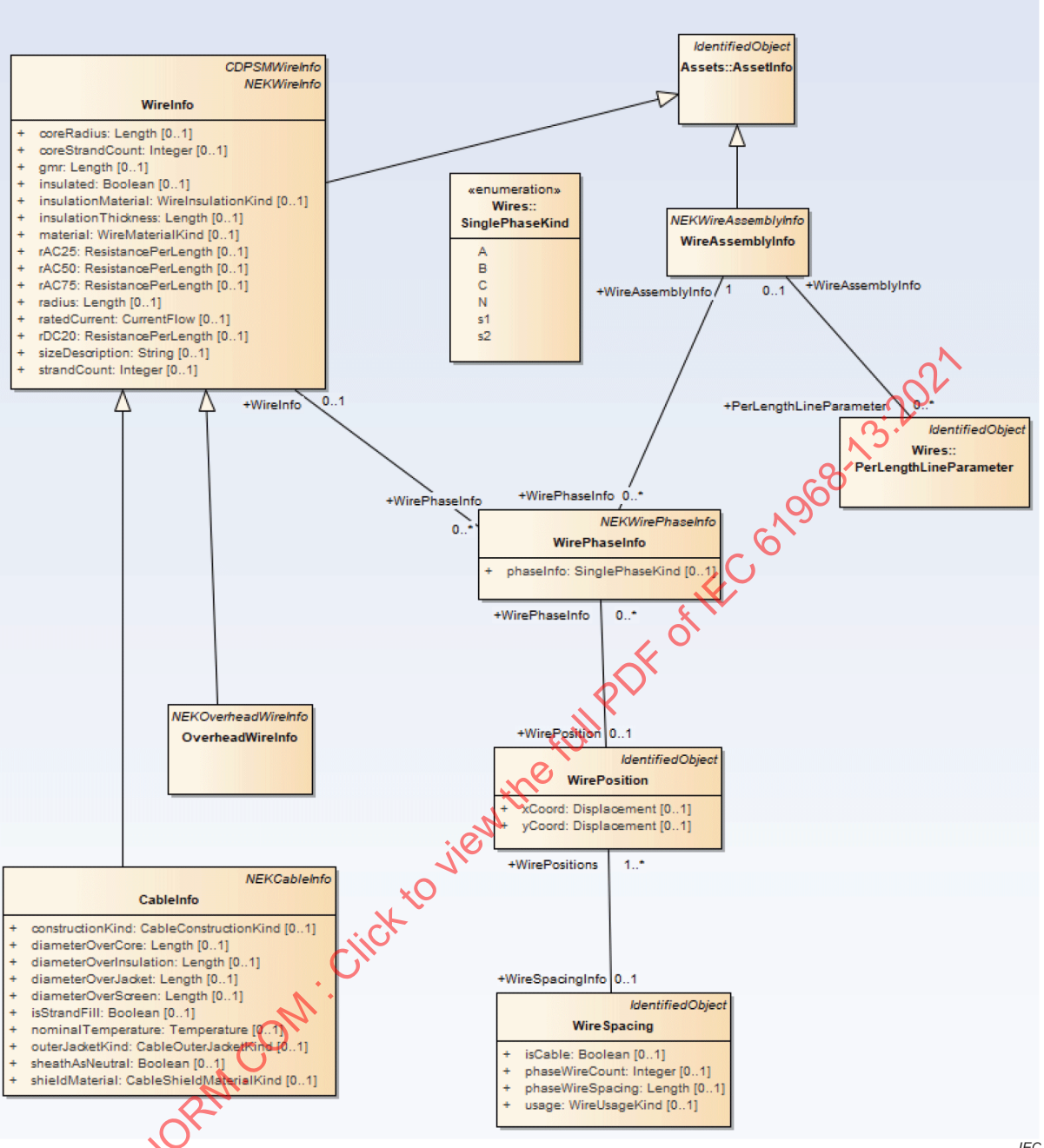

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Figure 2 – Arrangement de câble UML (informative)

Voir l'Annexe J informative pour des informations générales sur les extensions proposées.

5.4 Zone d'observabilité (informatif)

Comme expliqué en [3], selon [5], "*chaque gestionnaire de réseau est responsable de son propre réseau, également appelé 'zone de responsabilité'. Pour faire fonctionner correctement ce réseau, il est important de savoir également ce qui se passe en partie dans les réseaux environnants. La zone de responsabilité avec ces parties de réseaux environnants qui peuvent affecter la zone de responsabilité est appelée zone d'observabilité*".

Le concept de zone d'observabilité pour chaque gestionnaire de réseau est la partie d'un réseau relative au réseau d'un gestionnaire spécifique qui affecte les flux du réseau d'un autre opérateur [6] [7]. Cela s'applique aux réseaux en maille puisque les réseaux connectés radialement n'affectent les réseaux de connexion qu'à la limite. Selon cette référence, "la zone d'observabilité est le propre système de transmission, les parties appropriées des réseaux de distribution et les systèmes de transmission des GRT voisins, sur lesquels le GRT met en œuvre une surveillance et une modélisation en temps réel afin d'assurer une sécurité opérationnelle dans sa zone de responsabilité". Cependant, le document mentionné ne reflète que le point de vue des GRT, ce qui signifie que du point de vue d'un GRD ou d'une partie tierce, il est également nécessaire de prendre en considération le système de distribution pour ce concept.

En général, un échange de données structurelles programmé et en temps réel est nécessaire puisque la zone d'observabilité est un élément clé de la gestion du fonctionnement du réseau. Plusieurs éléments des gestionnaires de réseau doivent être échangés afin d'assurer la sécurité des opérations qui affectent la limite d'un gestionnaire de réseau. L'échange d'informations entre les GRT, les GRD et les autres participants du marché peut être inclus de l'Article 40 à l'Article 53 des lignes directrices de la gestion de réseau.

Voir l'Annexe H pour des informations supplémentaires relatives au concept de zone d'observabilité.

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6 Profils de modèle de système électrique de distribution CIM

6.1 Généralités

Le 6.1 énumère les profils qui sont utilisés pour l'échange de données et les classes, attributs et associations qui font partie de chaque profil. Sont incluses toutes les classes qu'il est attendu qu'un consommateur de données reconnaisse parmi les données consommées. Des classes supplémentaires sont également référencées dans le présent article lorsque les classes à échanger héritent d'attributs ou d'associations.

Les principales étapes du profilage CDPSM avec CIM sont représentées à la Figure 3.

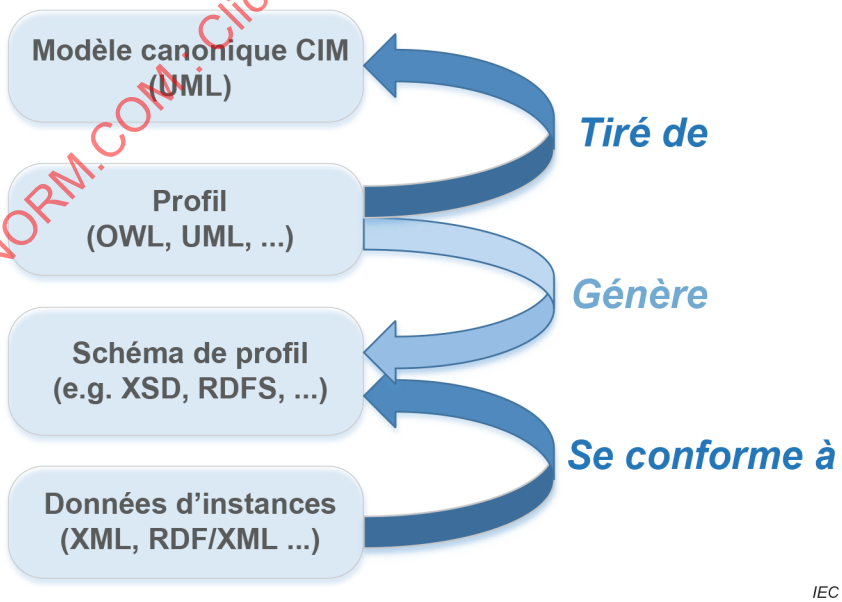

Figure 3 – Étapes principales du profilage CIM

Les profils CDPSM décrits de 6.2 à 7.5 sont dérivés du modèle CIM (IEC 61970-301, IEC 61968-11) comme décrit à la Figure 3.

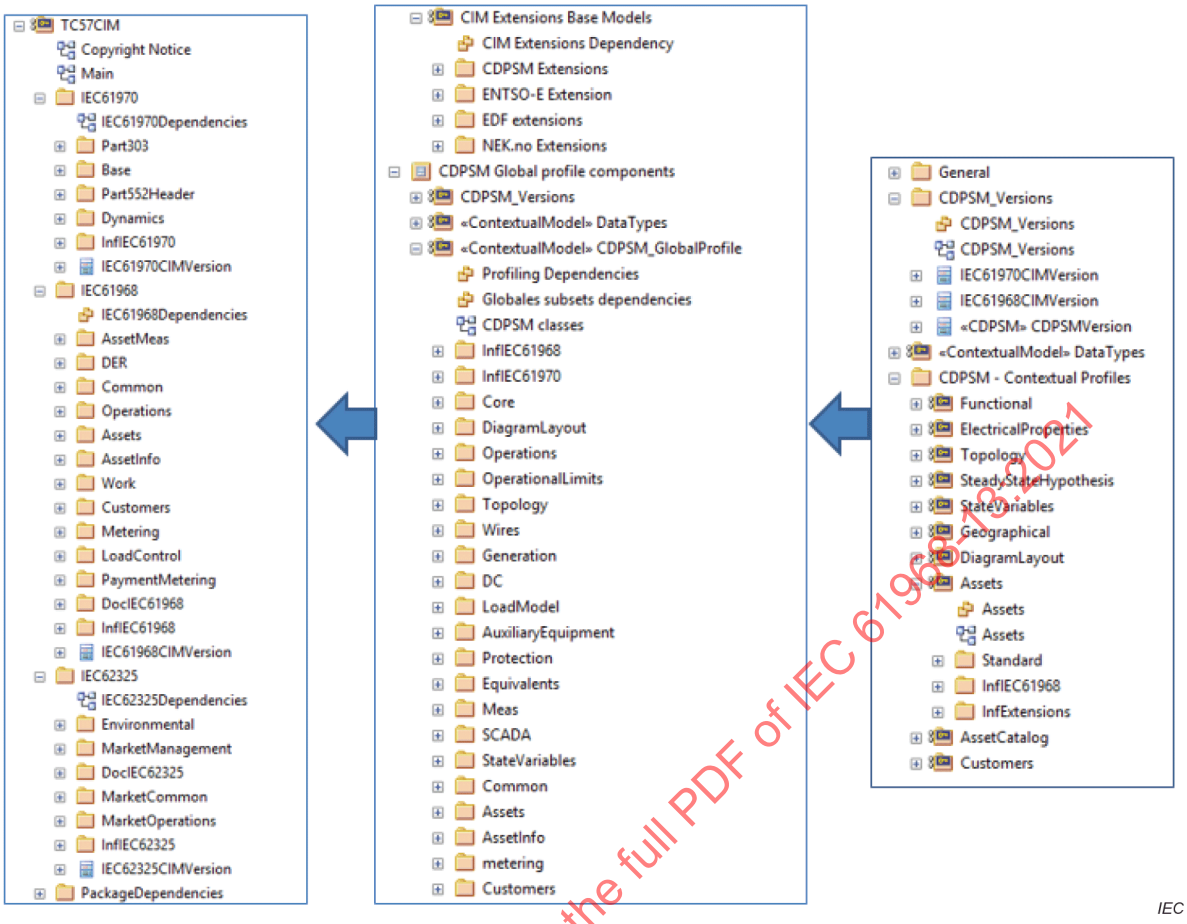

Figure 4 – Profils UML CDPSM (informative)

La Figure 4 représente la manière dont le groupe de profils CDPSM est géré et comment les profils sont ensuite dérivés du groupe de profils CDPSM. Le groupe de profils CDPSM est un sous-ensemble du modèle CIM du comité d'études 57 de l'IEC. Un groupe de profils donne lieu à un fichier de profil associé. Un groupe de profils peut être divisé en plusieurs profils, chaque profil étant associé à un fichier. Dans le cas des profils, il peut exister des références croisées entre eux. Les extensions sont exportées à l'Annexe B informative.

Certaines extensions doivent être prises en considération lors de leur intégration officielle dans le modèle CIM de l'IEC (IEC 61970-301, IEC 61968-11, IEC 62325-301) à l'avenir.

La version UML du CIM était: iec61970cim17v24_iec61968cim13v11_iec62325cim03v14.eap. Elle a été identifiée comme CIM100 en juin 2018. Ce document a ensuite été mis à jour et aligné sur les versions plus récentes du CIM100: iec61970cim17v38_iec61968cim13v12_iec62325cim03v17a (fin 2019) et iec61970cim17v38_iec61968cim13v13_iec62325cim03v17a.eap (mars 2020).

Comme cela est mentionné dans l'avant-propos, les jeux de données ont également été soumis à l'essai par rapport aux versions du CIM100 fournies depuis juin 2018. Les jeux de données sont conformes à l'IEC 61970-501 et à l'IEC 61970-552.

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Une convergence se produit entre CDPSM 2.0 et la version consolidée de CGMES [8][9][10][11] fondée sur le CIM17/CIM100. Les profils suivants évoluent selon les processus de convergence. L'IEC 61970-452 évolue également pour inclure les préoccupations relatives aux réseaux de distribution (et sera renommée). Les profils et URI associés (namespace) sont énumérés ci-dessous:

Norme CIM

Base UML CIM	"http://iec.ch/TC57/ CIM100#"
DataTypes	"http://iec.ch/TC57/CIM100#"

Packages informatifs dans le CIM

InfIEC61970	"http://iec.ch/TC57/CIM100-info#"
InfIEC61968	"http://iec.ch/TC57/CIM100-info#"

Extensions (informatives)

Entsoe_Extensions_3.1	"http://entsoe.eu/CIM/SchemaExtension/3/1#"
Entsoe_Extensions_3.2	"http://entsoe.eu/CIM/SchemaExtension/3/2#"
CDPSM_Extensions_1.0	"http://iec.ch/TC57/CIM/CDPSM/SchemaExtension/1/0#"
CDPSM_Extensions_2.0	"http://iec.ch/TC57/CIM/CDPSM/SchemaExtension/2/0#"
MSITE_Extensions_3.1.a	"http://der.edf.fr/mire/MSite-v3.1.a#"
NEK_Extensions_1.0	"http://NEK.no/NK57/CIM/CIM100-Extension/1/0#"

Groupe de profils pour CDPSM2.0

GlobalProfile	"http://iec.ch/TC57/CIM/CDPSM/GlobalProfile/2/0"

Profils CDPSM 2.0

Functional	"http://iec.ch/TC57/CIM/Functional/2/0"
ElectricalProperties	"http://iec.ch/TC57/CIM/ElectricalProperties/2/0"
Geographical	"http://iec.ch/TC57/CIM/Geographical/2/0"
Assets	"http://iec.ch/TC57/CIM/Asset/2/0"
AssetCatalog	"http://iec.ch/TC57/CIM/AssetCatalogue/2/0"
SteadyStateHypothesis	"http://iec.ch/TC57/CIM/SteadyStateHypothesis/2/0"
Topology	"http://iec.ch/TC57/CIM/Topology/2/0"
Customers	"http://iec.ch/TC57/CIM/Customers/2/0"

Profiles Functional, ElectricalProperties, Asset, AssetCatalog et Customers sont spécifiques à CDPSM 2.0. Functional et ElectricalProperties sont fondés sur l'IEC 61970-452. Assets, AssetCatalog sont fondés sur l'IEC 61968-4 [22] et Customers est fondé sur l'IEC 61968-8 [23]. Néanmoins, ils peuvent utiliser des classes, des attributs, des relations qui ne sont pas répertoriés dans ces documents associés, mais qui sont au moins dans le modèle CIM de l'IEC 61970-301, de l'IEC 61968-11 et de l'IEC 62325-325.

Profiles Topology, Geographical, et SteadyStateHypothesis ne sont pas identiques aux profils CGMES, ils sont par conséquent inclus dans CDPSM 2.0. Après la convergence CDPSM et CGMES, ces profils peuvent être uniques.

Profils communs à CDPSM 2.0 et CGMES

StateVariables [14]	"http://entsoe.eu/CIM/StateVariables/4/1"
DiagramLayout [15]	"http://entsoe.eu/CIM/DiagramLayout/3/1"

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La Figure 5 représente l'usage d'interopérabilité de CDPSM entre deux ou plusieurs applications pouvant être hébergées par une installation (GIS/SCADA/systèmes d'opération de réseau) ou par deux installations (GRT-GRD, GRD-GRD, GRD-USR). Cela permet une gestion de la synchronisation des données entre des systèmes. Deux systèmes peuvent échanger des données fondées sur les profils CDPSM pour aligner leurs bases de données, puis échanger des messages fondés sur ces données de référence qui sont stockées dans des bases de données. Cette figure représente la complémentarité de l'IEC 61968-13 avec les autres normes IEC 61968-X, qui sont fondées sur des messages.

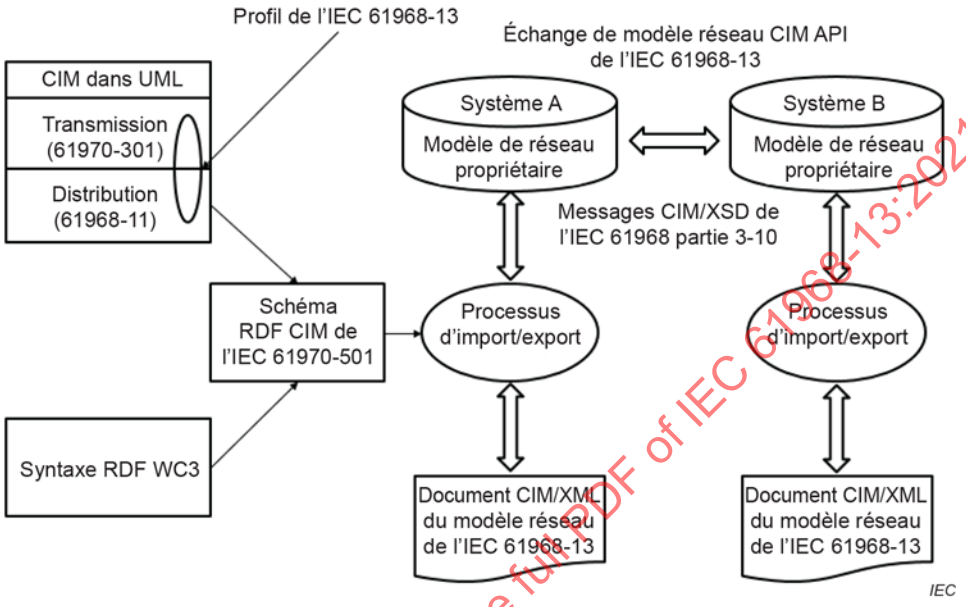

Figure 5 – Schéma d'interopérabilité CDPSM

La Figure 6 représente la façon dont les profils relatifs à CDPSM peuvent être utilisés dans un environnement d'installation et par un système de gestion des modèles de réseau.

La gestion des modèles de réseau [21] gère les ressources de système de puissance et leurs propriétés électriques. Les propriétés sont des valeurs par défaut ou des valeurs calculées retenues sur les ressources du système de puissance, généralement dérivées de sources de données externes, telles que les fiches techniques des actifs provenant soit de catalogues d'actifs, soit d'actifs réels. Les profils liés au CDPSM peuvent être fournis par un système GIS ou équivalent à un système de gestion des modèles de réseau.

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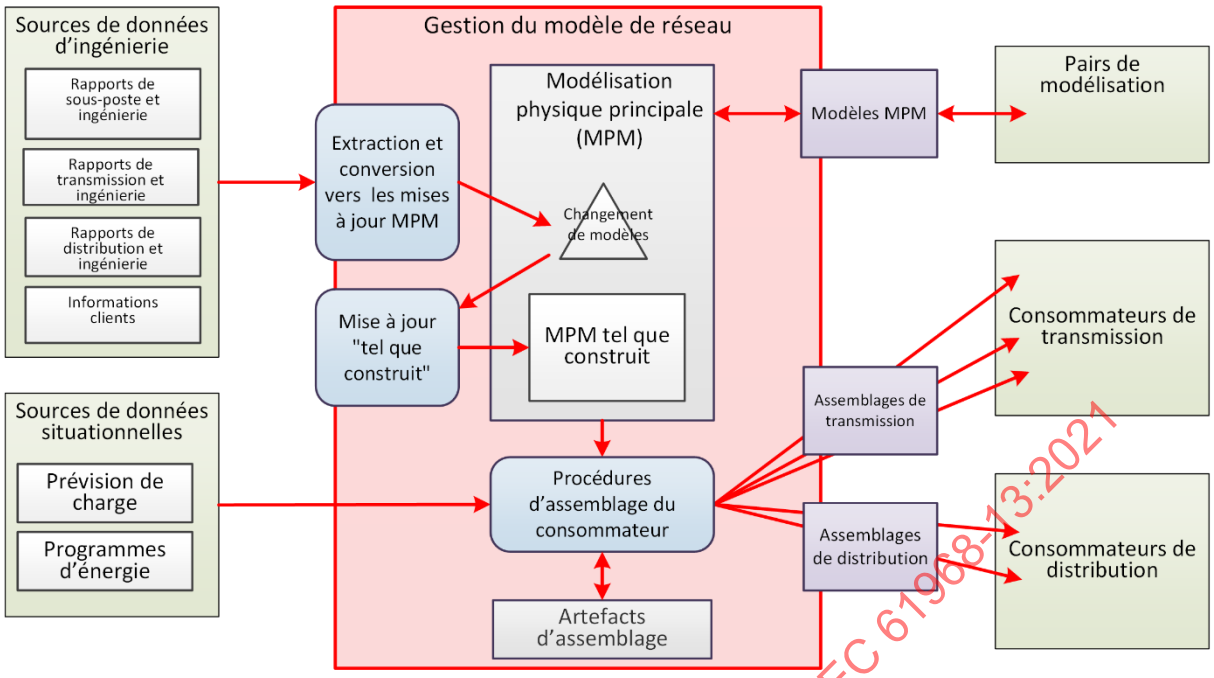

Figure 6 – Vue d'ensemble de la gestion des modèles de réseau

Comme certaines propriétés électriques peuvent être gérées par un catalogue et par AssetInfo, si une topologie ou un algorithme de solution réseau exige des propriétés pour chaque classe relative à un équipement, alors le cas réseau individuel est exporté de la gestion des modèles de réseau avec un traitement sur les jeux de données, afin d'être au format exigé et d'avoir chaque propriété électrique sur chaque équipement.

En Europe, ENTSO-E a défini une norme d'échange de modèle de réseau commun (CGMES) associée à l'IEC 61970-600-1 et à l'IEC 61970-600-2 qui définit l'interface entre le logiciel des membres ENTSO-E afin d'échanger les informations de modélisation du système de puissance comme exigé par l'ENTSO-E et les processus opérationnels du GRT. Certains profils définis par ENTSO-E ne sont pas utilisés par les GRD. Cela n'empêche pas un jeu de données de distribution de réseau de GRD conforme aux profils CDPSM d'exploiter les profils CGMES mis en œuvre par le produit d'un fournisseur. L'Annexe I présente ce processus.

Quelques exemples de schémas de réseau sont donnés à l'Annexe B, à l'Annexe C, à l'Annexe D, à l'Annexe E, et à l'Annexe F.

L'Annexe B décrit les extensions du CDPSM (informative).

La Figure C.1 de l'Annexe C décrit un exemple de réseau urbain européen CDPSM MT/BT.

La Figure D.1 de l'Annexe D décrit un exemple de réseau rural et urbain européen CDPSM MT.

La Figure E.1 de l'Annexe E décrit un exemple d'utilisation CDPSM dans le projet européen H2020 TDX-ASSIST.

La Figure F.1 de l'Annexe F décrit un exemple d'un réseau de distribution nucléaire.

6.2 Paquetage supérieur General

La Figure 7 décrit les profils CDPSM.

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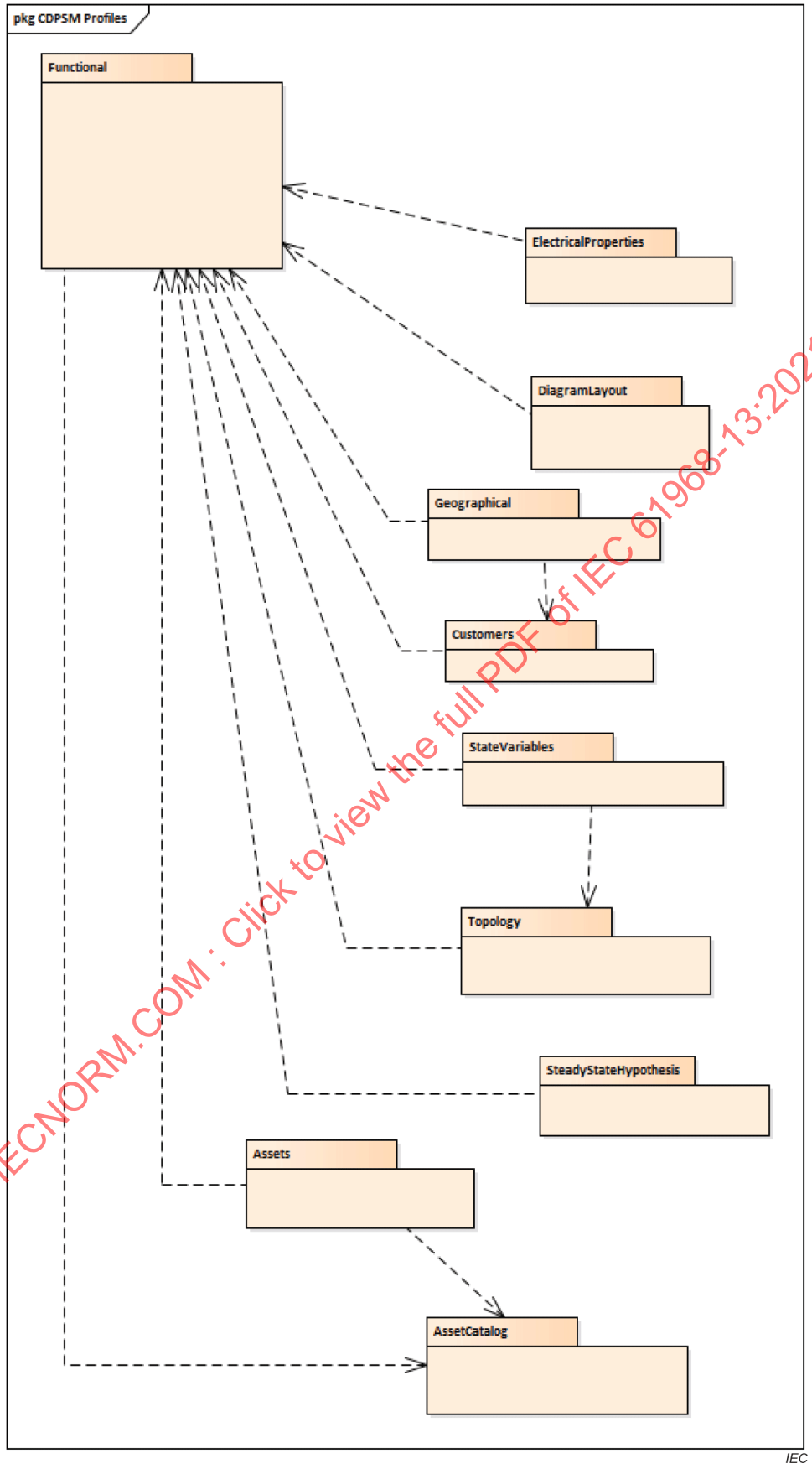

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Figure 7 – Diagramme des paquetages General::CDPSM Profiles

6.3 Paquetage Functional

6.3.1 Généralités

Voir la Figure 8 pour le diagramme des paquetages Functional et de la Figure 9 à la Figure 28 pour les différents diagrammes de classe Functional.

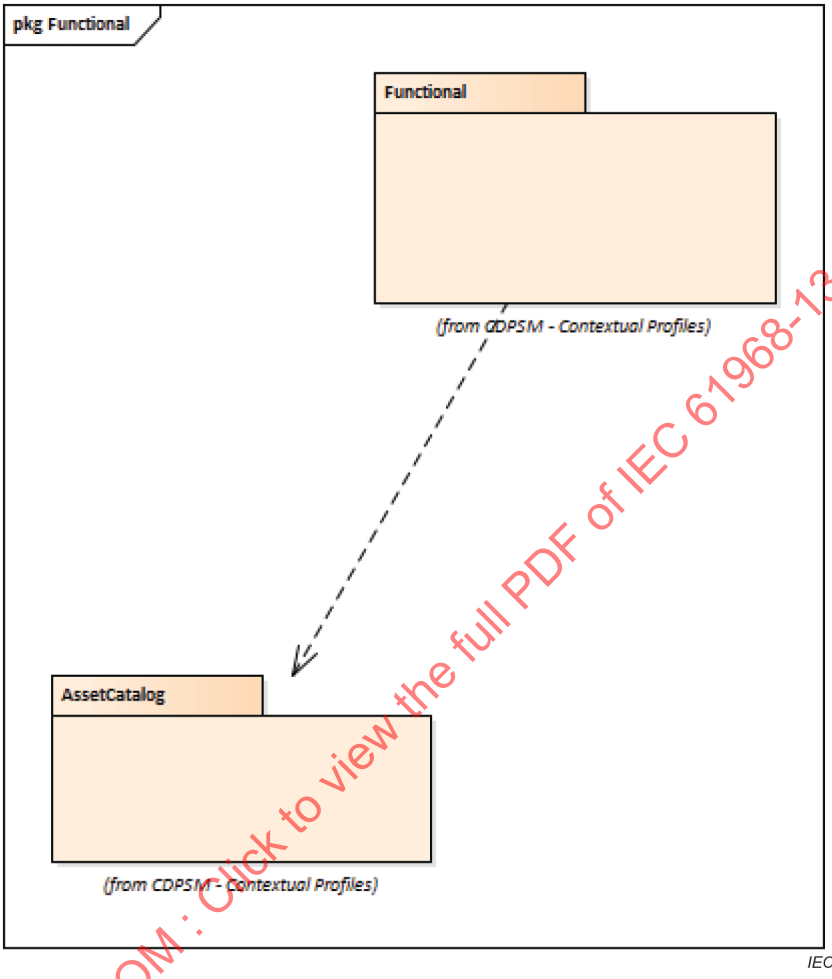

Figure 8 – Diagramme des paquetages Functional::Functional

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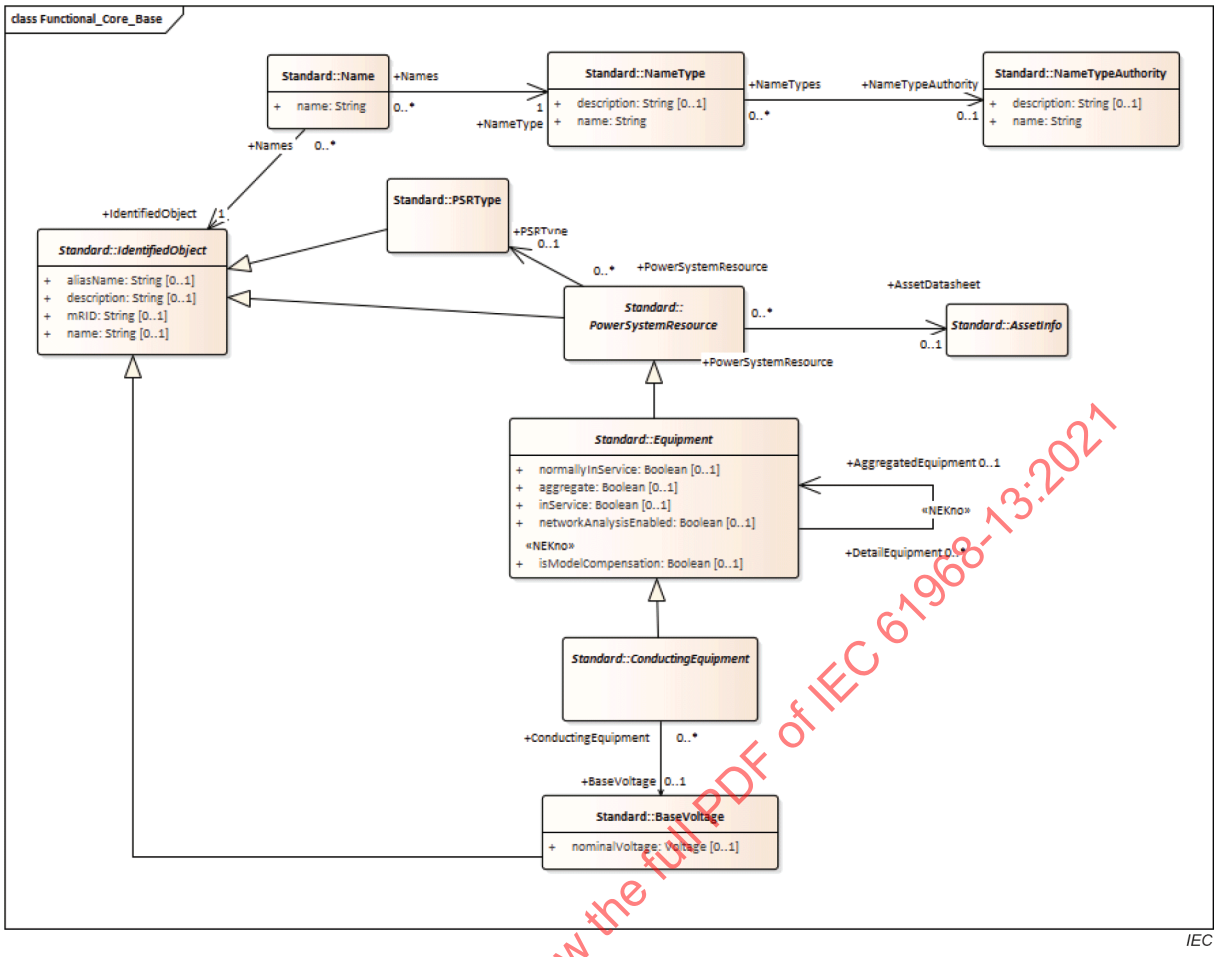

Figure 9 – Diagramme de classe Functional::Functional_Core_Base

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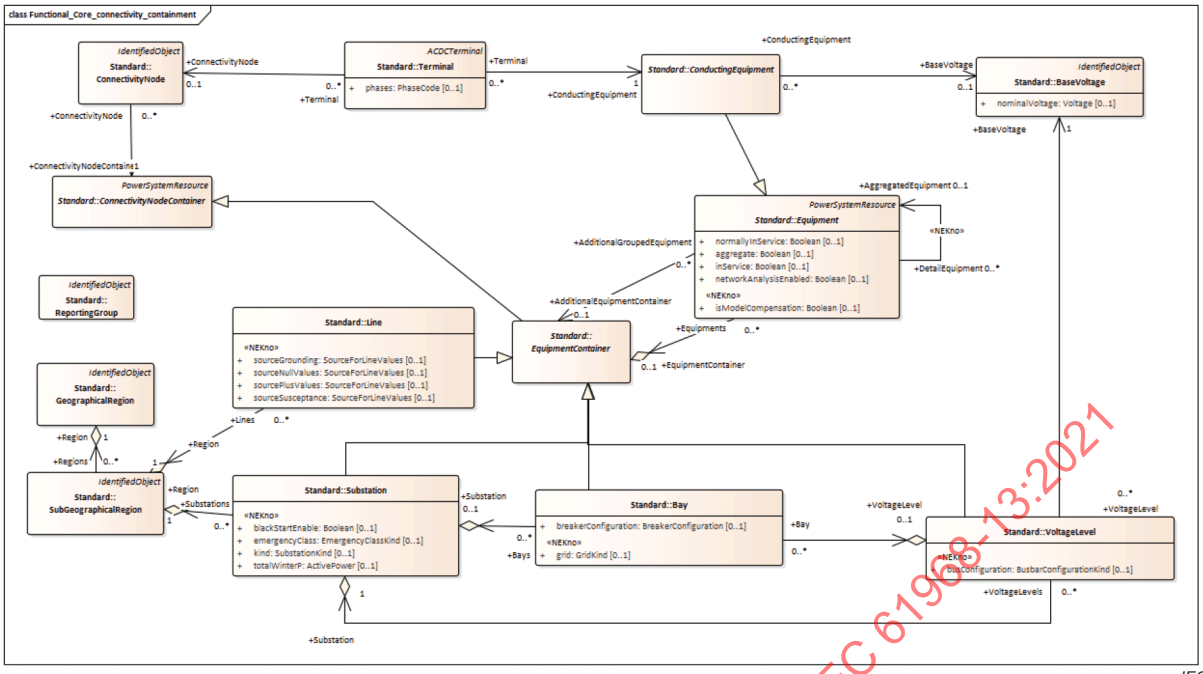

Figure 10 – Diagramme de classe Functional::Functional_Core_connectivity_containment

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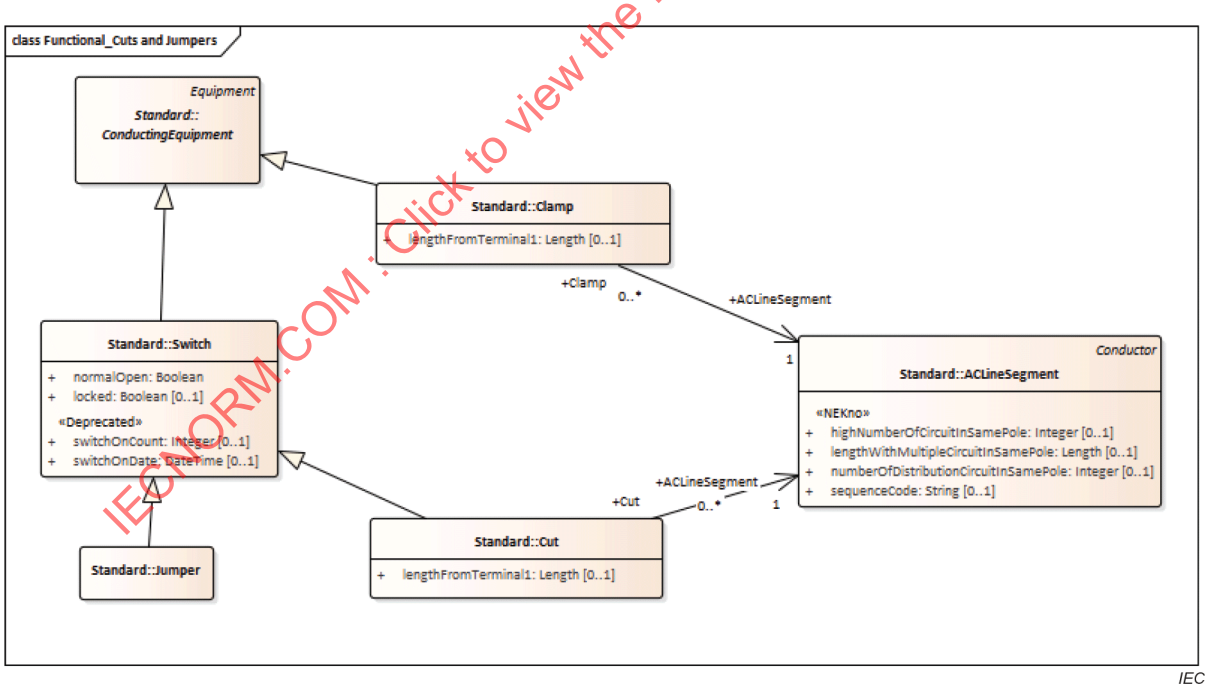

Figure 11 – Diagramme de classe Functional::Functional_Cuts and Jumpers

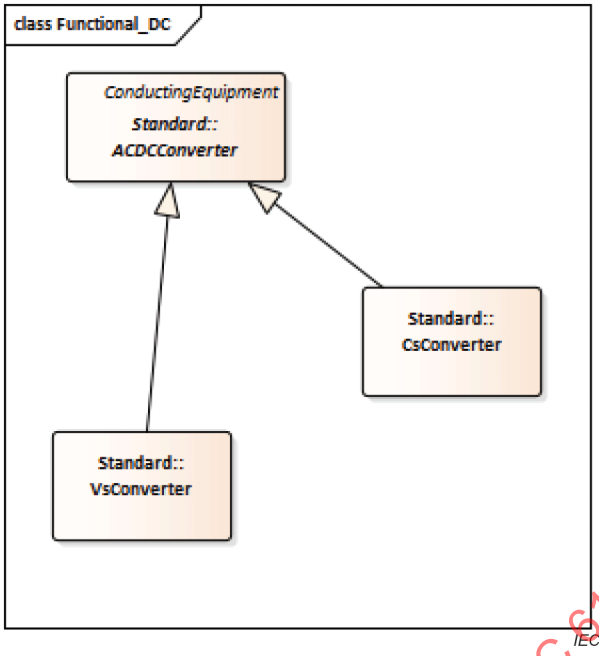

Figure 12 – Diagramme de classe Functional::Functional_DC

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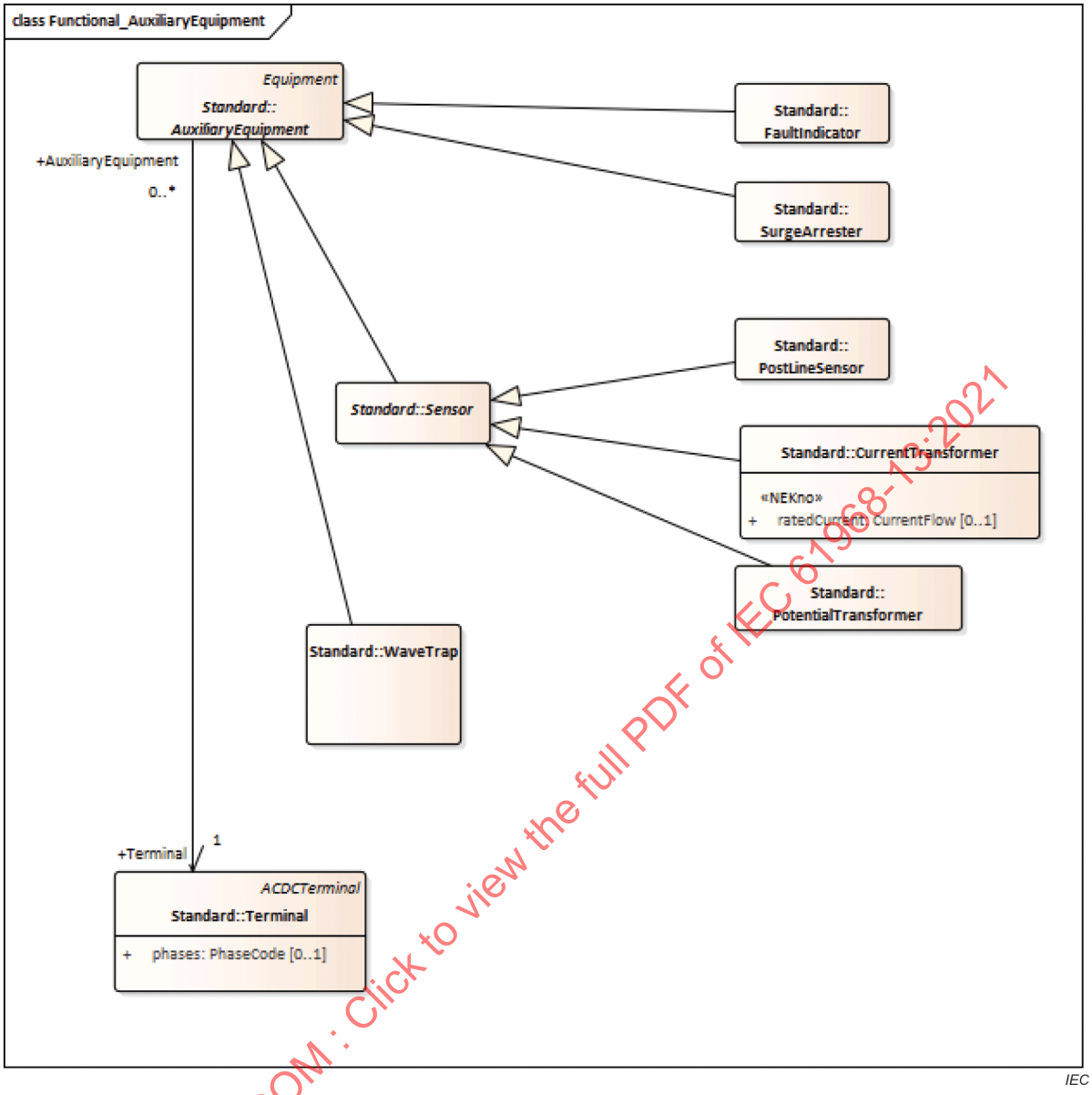

Figure 13 – Diagramme de classe Functional::Functional_AuxiliaryEquipment

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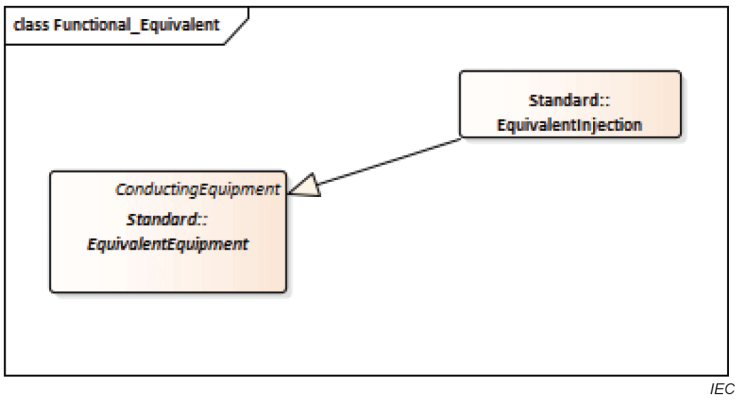

Figure 14 – Diagramme de classe Functional::Functional_Equivalent

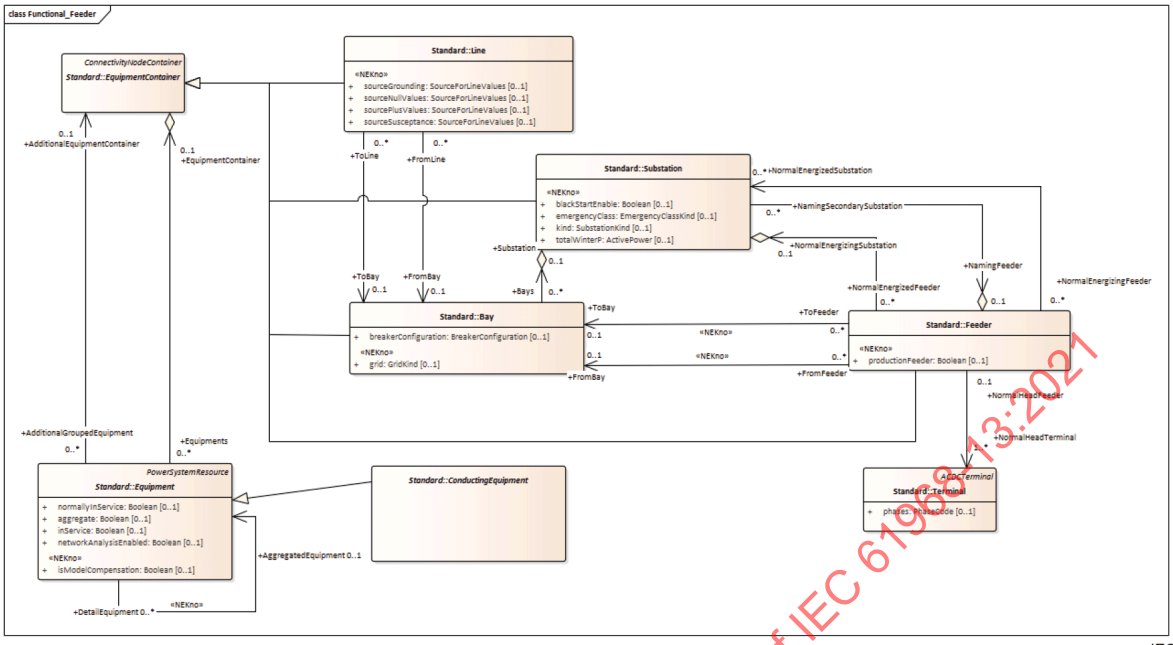

Figure 15 – Diagramme de classe Functional::Functional_Feeder

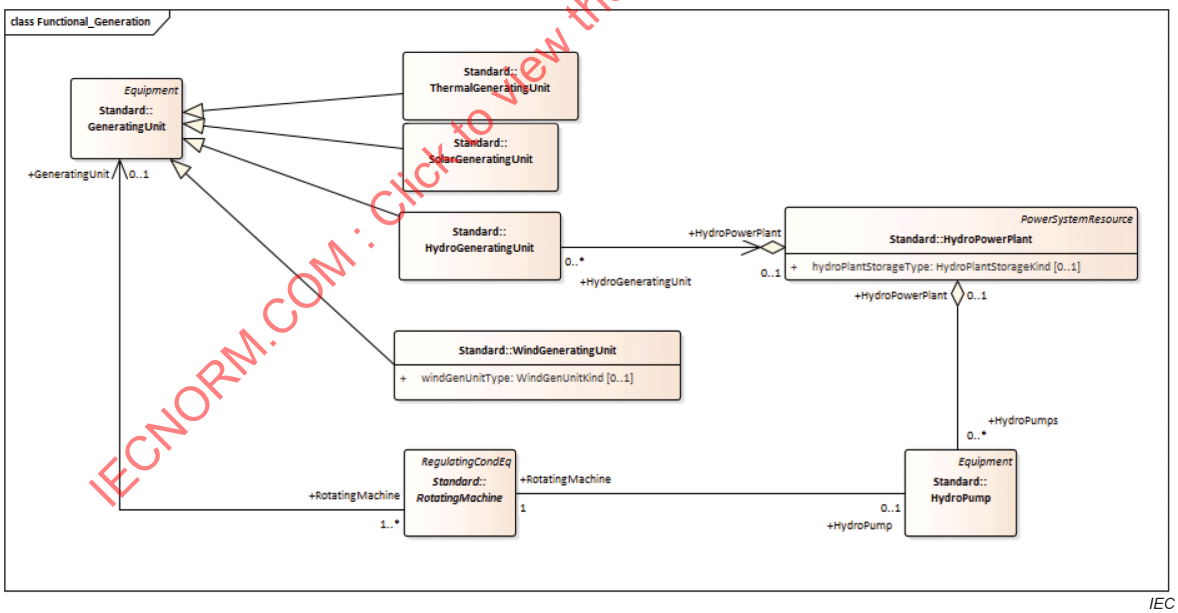

Figure 16 – Diagramme de classe Functional::Functional_Generation

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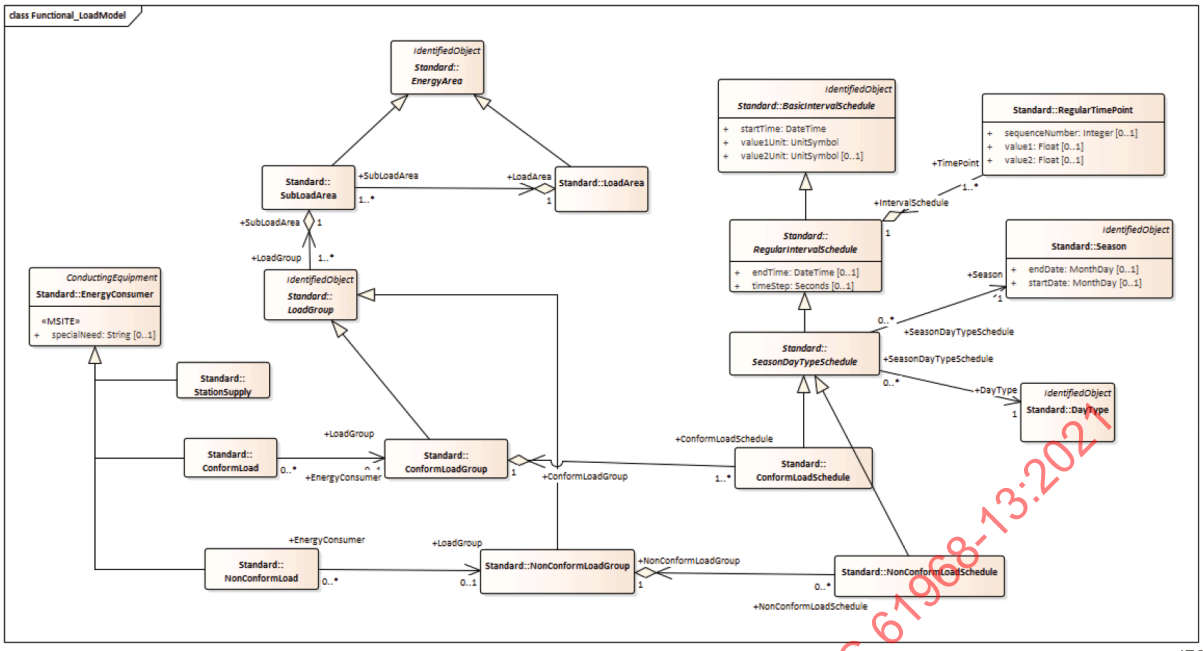

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Figure 17 – Diagramme de classe Functional::Functional_LoadModel

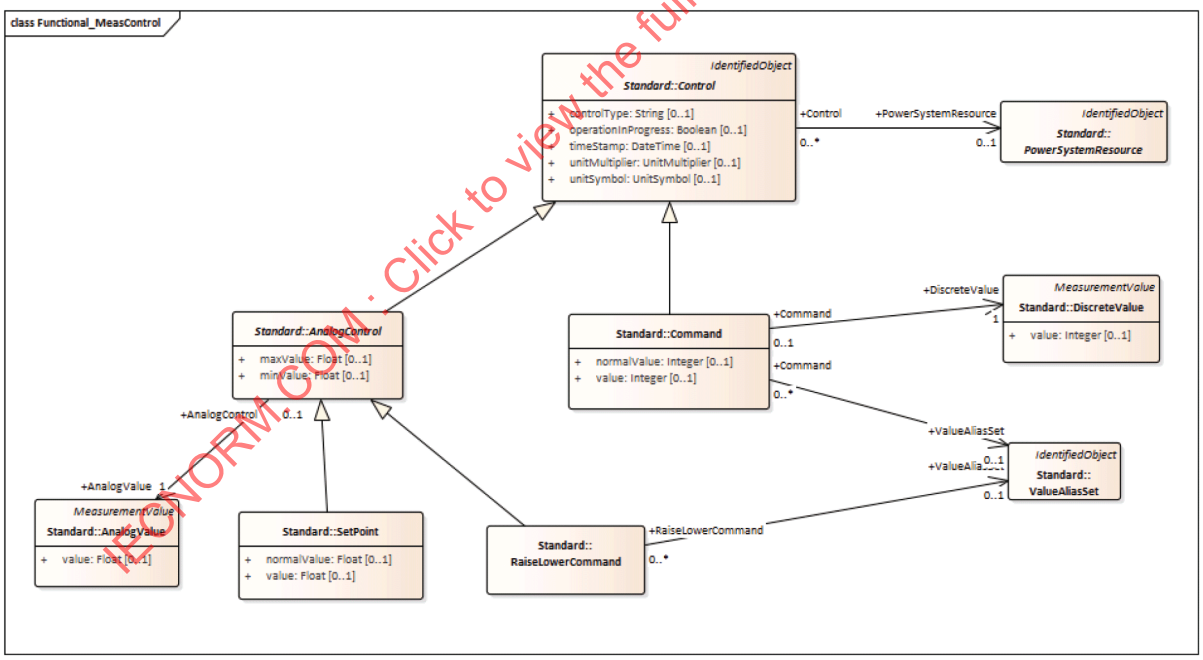

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Figure 18 – Diagramme de classe Functional::Functional_MeasControl

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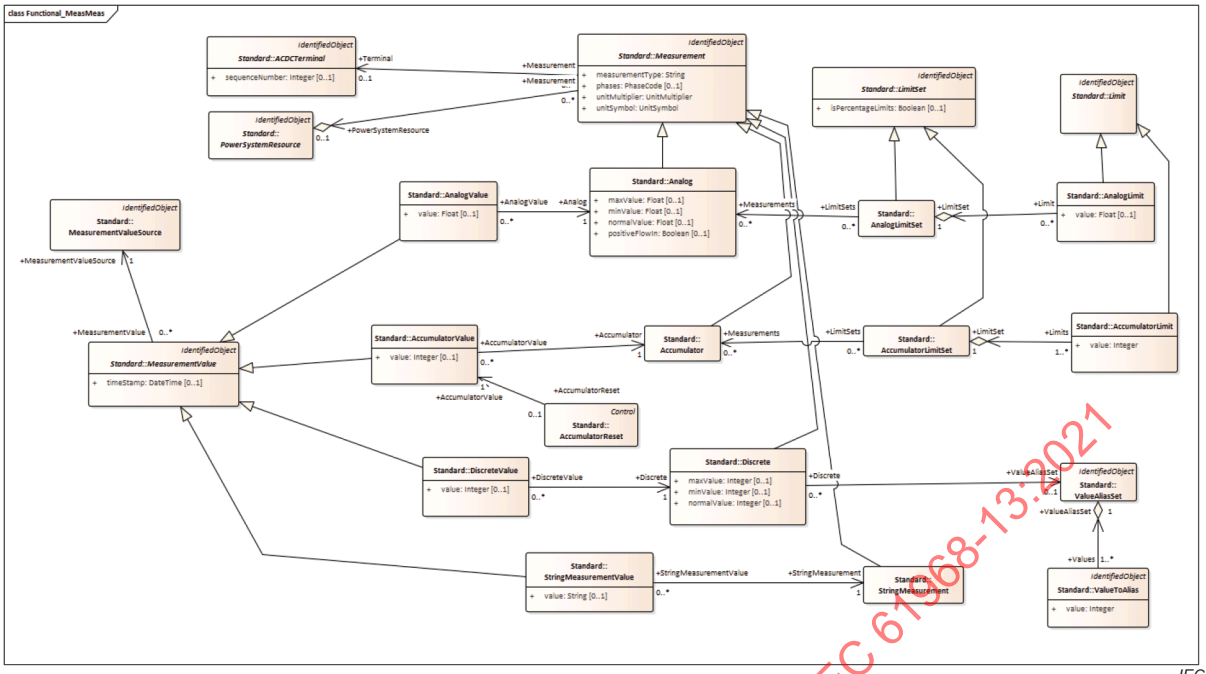

Figure 19 – Diagramme de classe Functional::Functional_MeasMeas

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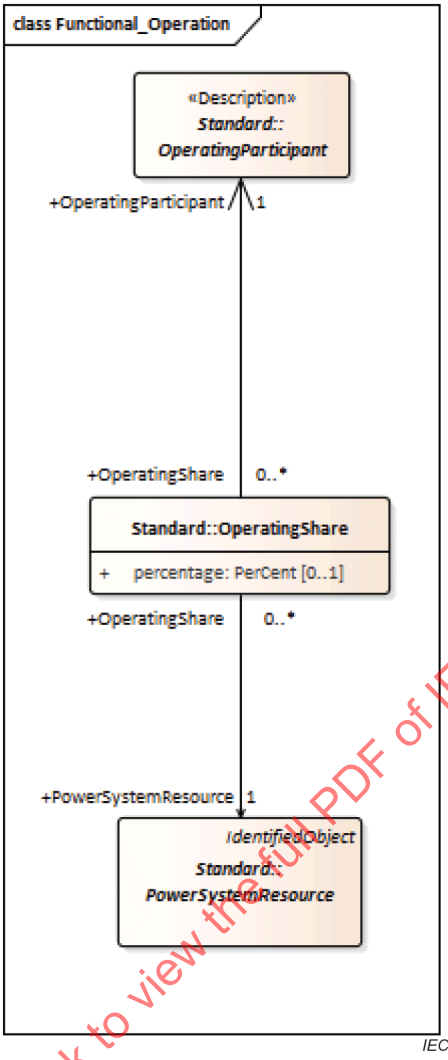

Figure 20 – Diagramme de classe Functional::Functional_Operation

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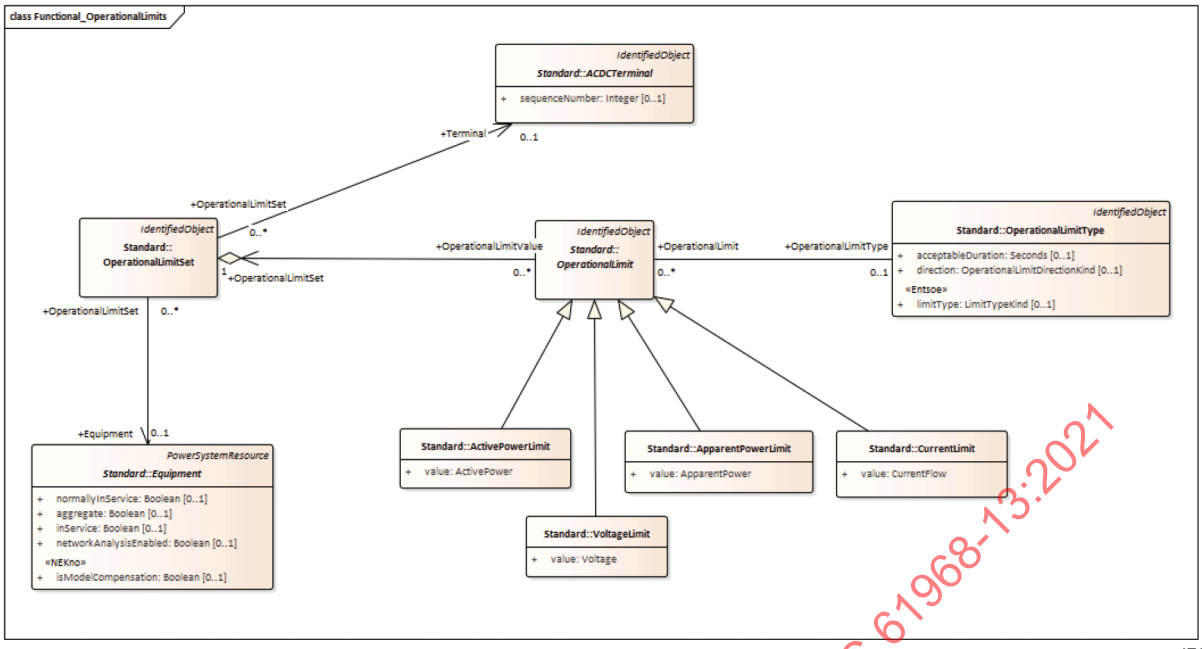

Figure 21 – Diagramme de classe Functional::Functional_OperationalLimits

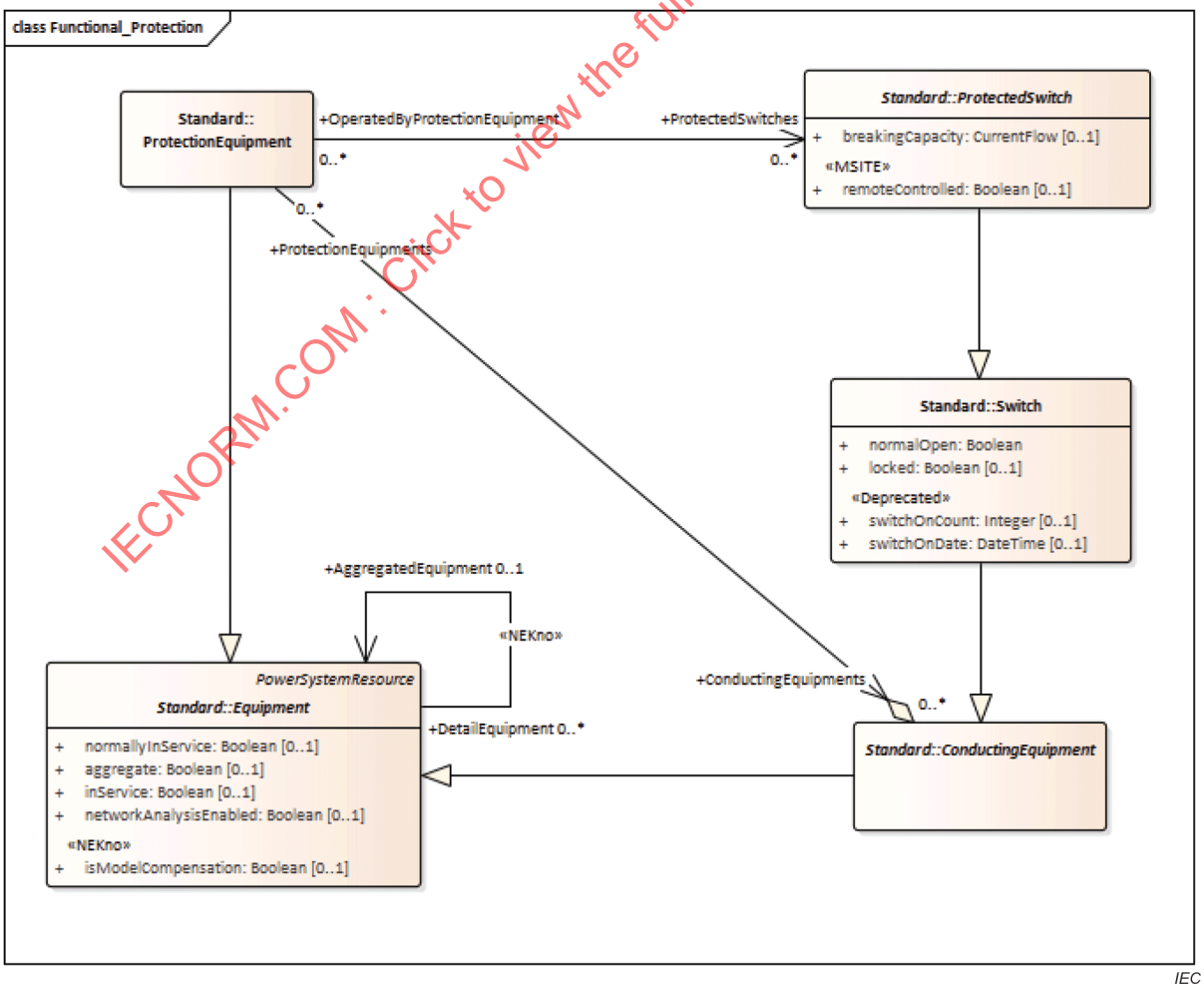

Figure 22 – Diagramme de classe Functional::Functional_Protection

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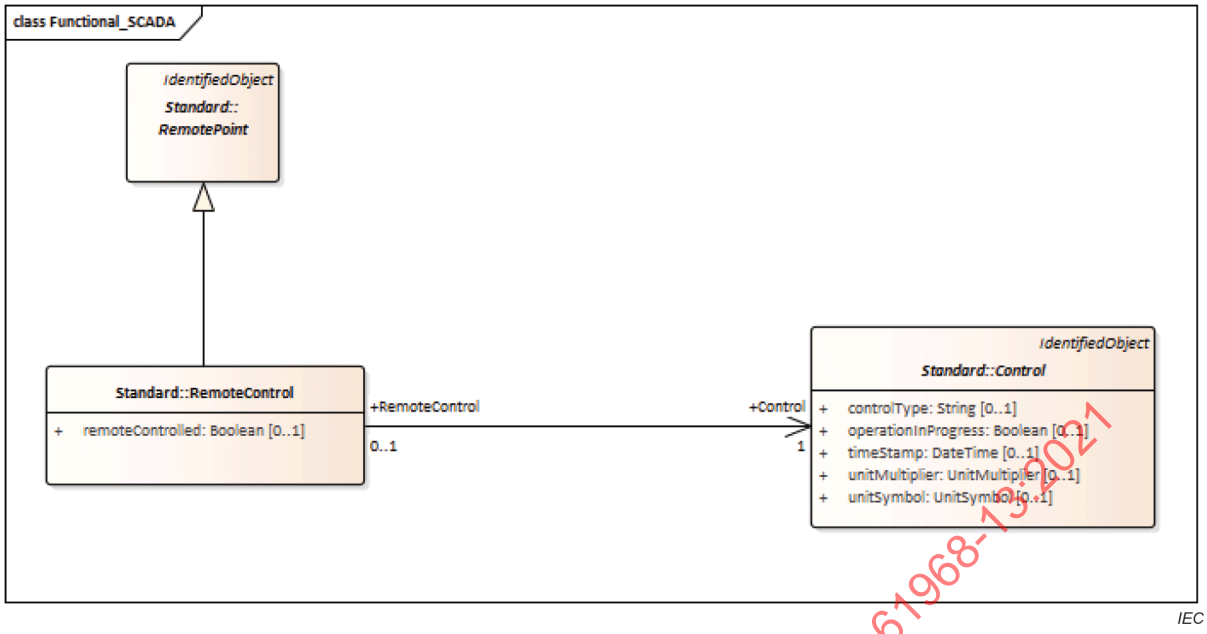

Figure 23 – Diagramme de classe Functional::Functional_SCADA

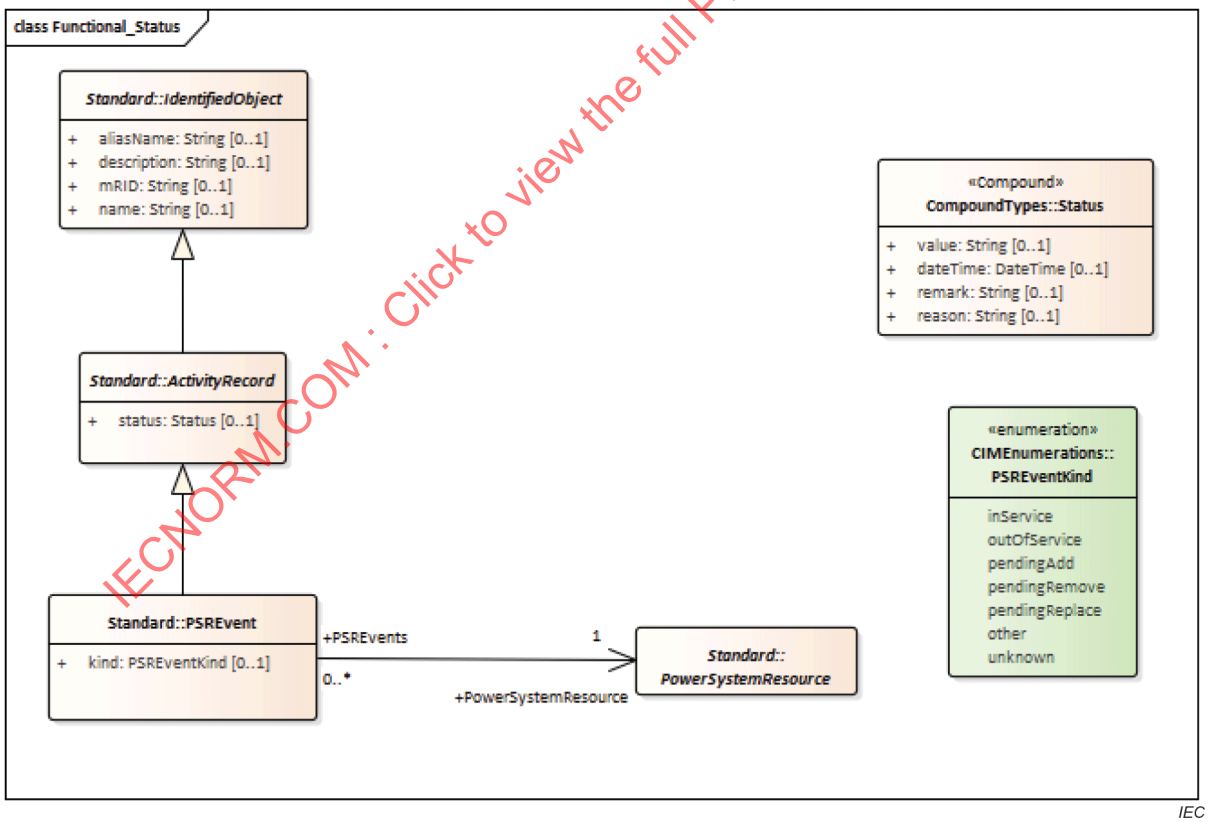

Figure 24 – Diagramme de classe Functional::Functional_Status

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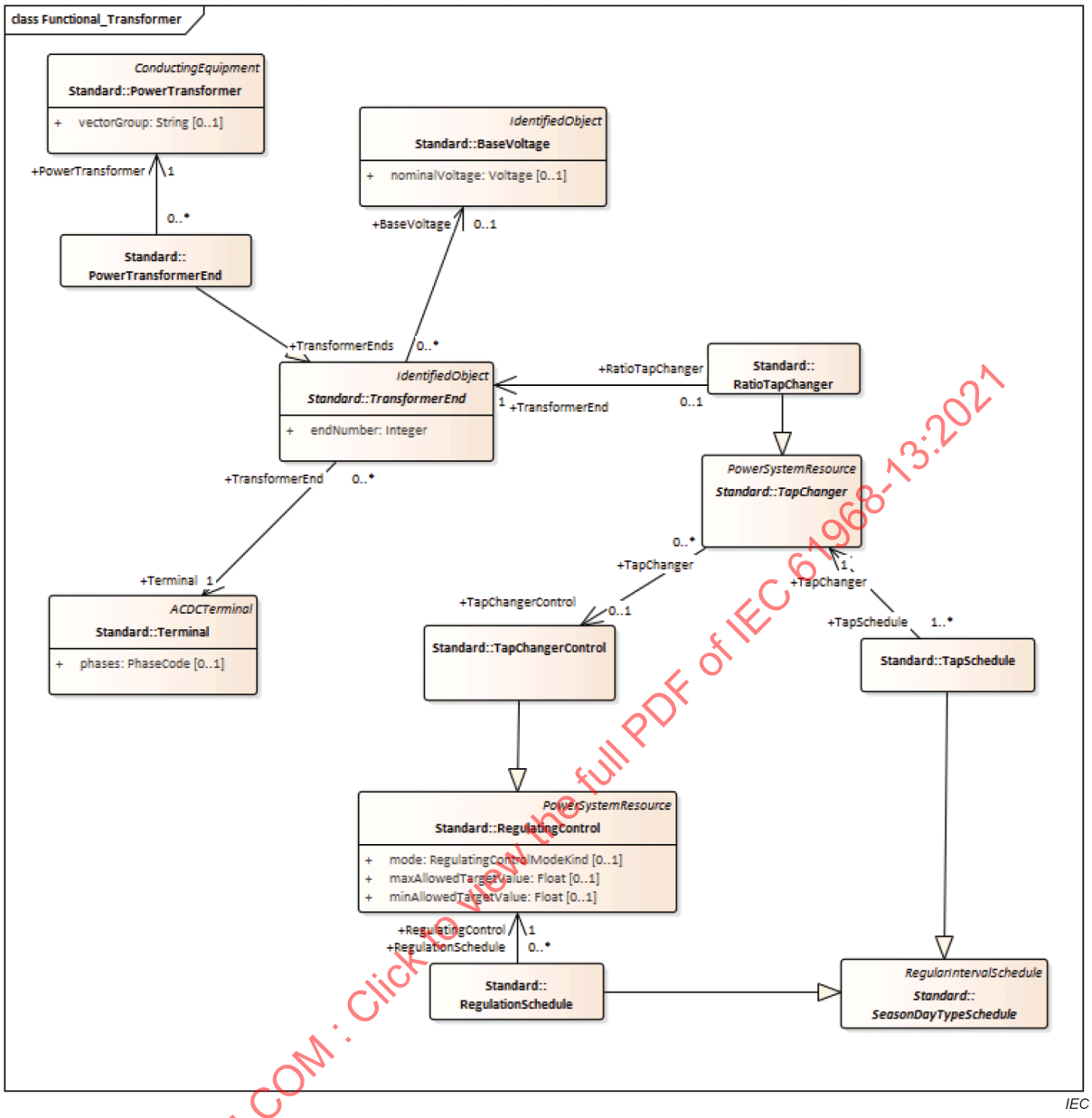

Figure 25 – Diagramme de classe Functional::Functional_Transformer

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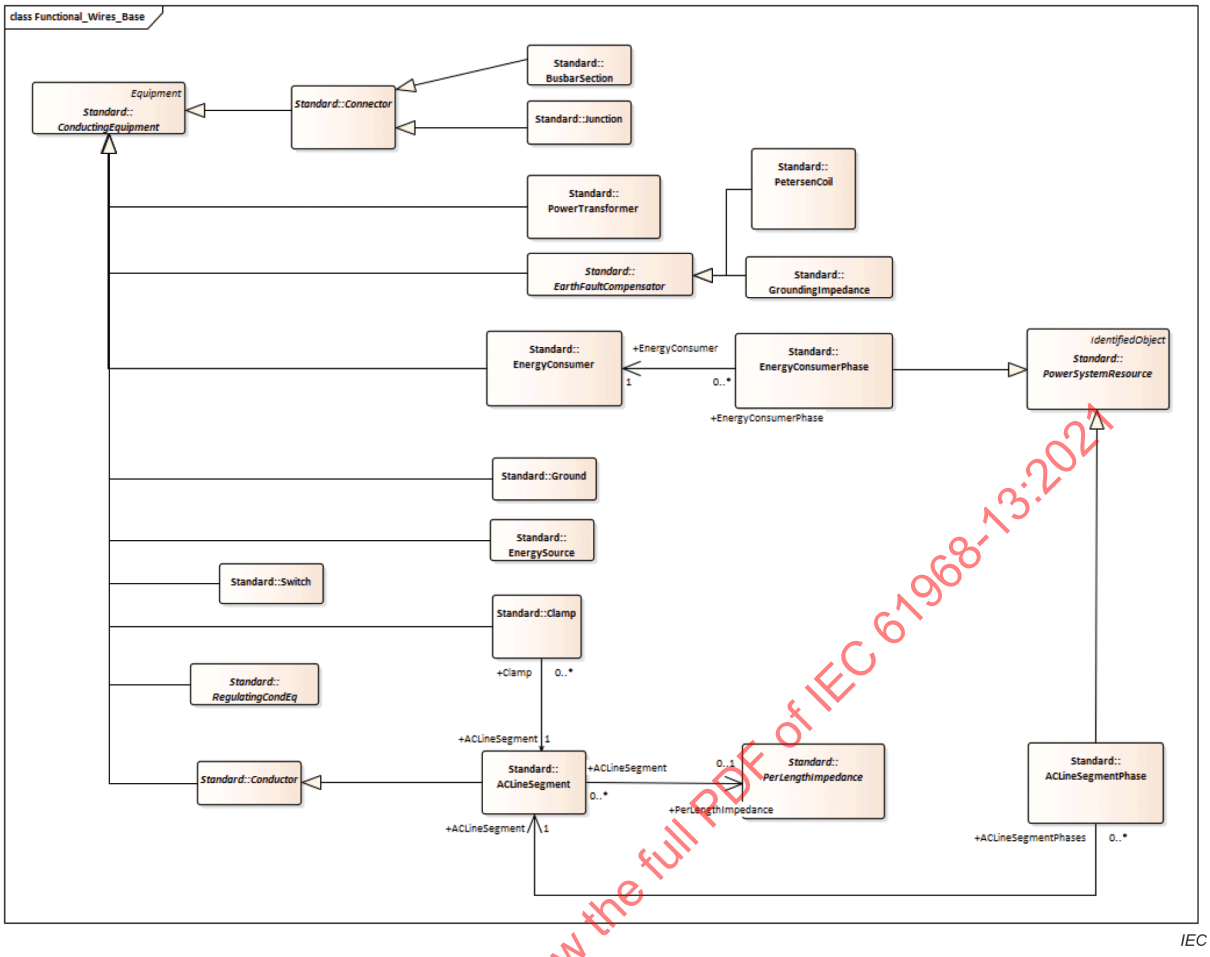

Figure 26 – Diagramme de classe Functional::Functional_Wires_Base

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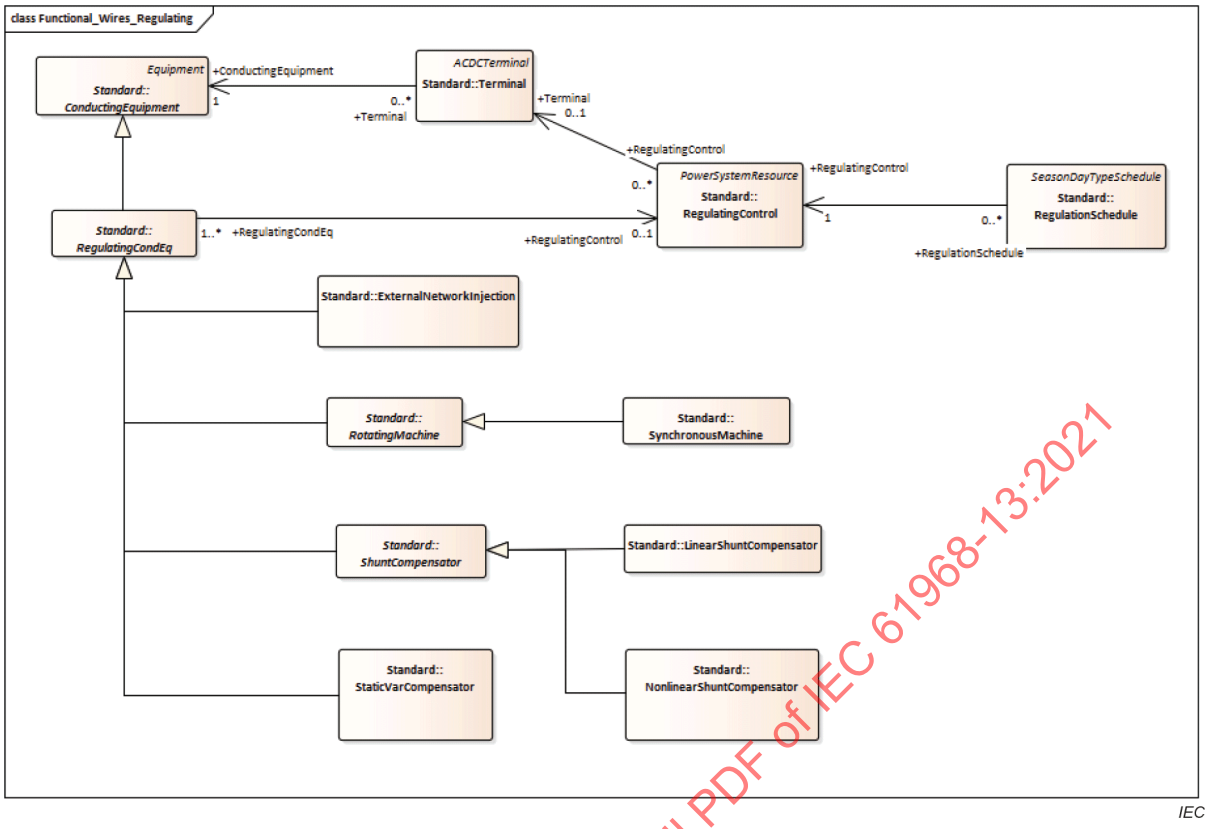

Figure 27 – Diagramme de classe Functional::Functional_Wires_Regulating

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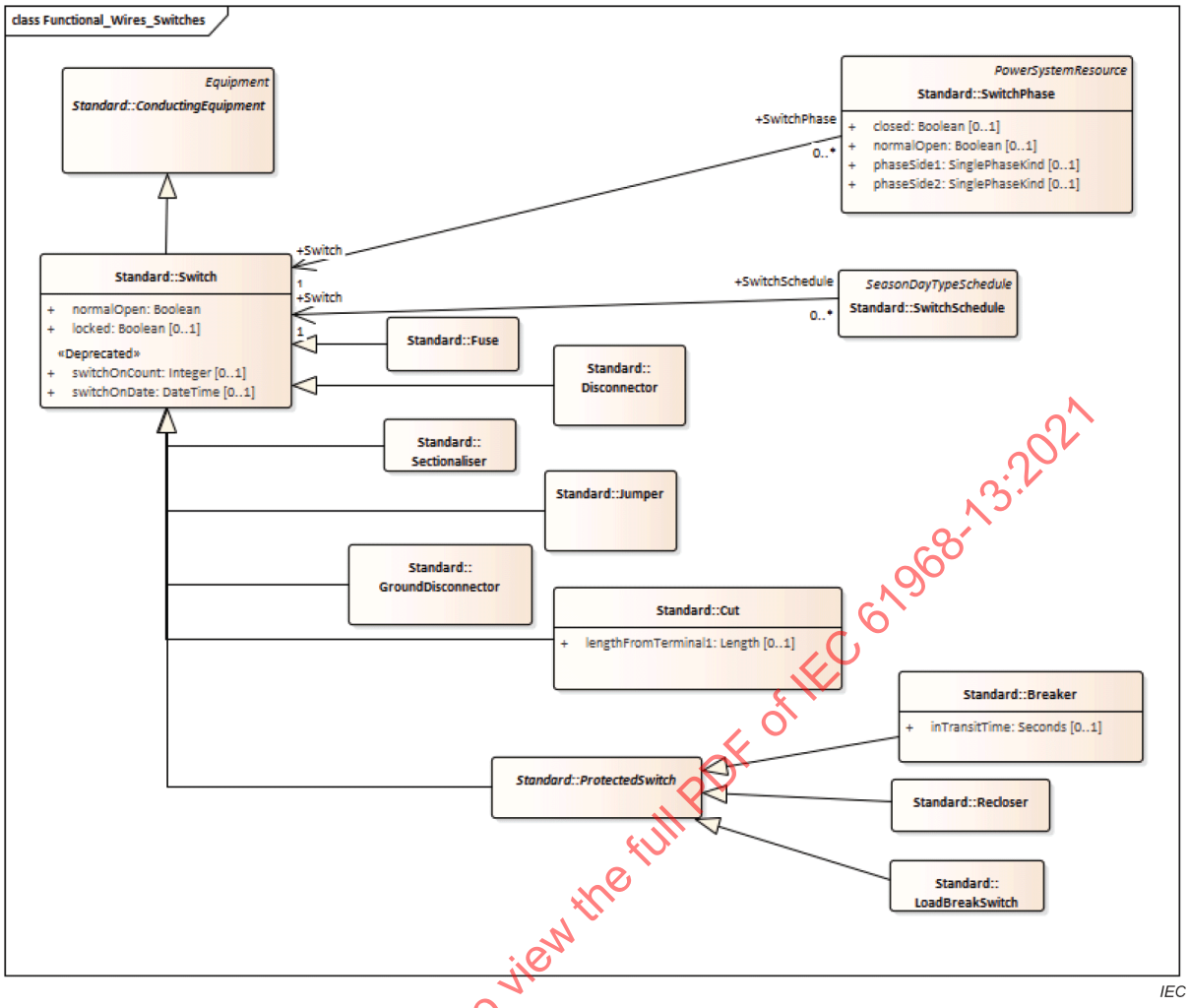

Figure 28 – Diagramme de classe Functional::Functional_Wires_Switches

6.3.2 Paquetage Standard

6.3.2.1 Accumulator

Accumulator (accumulateur) représente un Measurement cumulé (compté), par exemple une valeur d'énergie.

Le Tableau 5 présente tous les attributs de Accumulator.

Tableau 5 – Attributs de Standard::Accumulator

nom	mult	type	description
unitSymbol	1..1	UnitSymbol	hérité de: Measurement
measurementType	1..1	String	hérité de: Measurement
phases	0..1	PhaseCode	hérité de: Measurement
unitMultiplier	1..1	UnitMultiplier	hérité de: Measurement
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

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Le Tableau 6 présente toutes les extrémités d'association d'Accumulator avec d'autres classes.

Tableau 6 – Extrémités d'association de Standard::Accumulator avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Terminal	0..1	ACDCTerminal	hérité de: Measurement
0..*	PowerSystemResource	0..1	PowerSystemResource	hérité de: Measurement

6.3.2.2 AccumulatorLimit

Valeurs limites pour les mesurages de Accumulator.

Le Tableau 7 présente tous les attributs de AccumulatorLimit.

Tableau 7 – Attributs de Standard::AccumulatorLimit

nom	mult	type	description
value	1..1	Integer	Valeur à ne pas dépasser. La valeur est positive.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 8 présente toutes les extrémités d'association de AccumulatorLimit avec d'autres classes.

Tableau 8 – Extrémités d'association de Standard::AccumulatorLimit avec d'autres classes

mult à partir de	nom	mult vers	type	description
1..*	LimitSet	1..1	AccumulatorLimitSet	Ensemble de limites.

6.3.2.3 AccumulatorLimitSet

Un AccumulatorLimitSet spécifie un ensemble de Limits (limites) qui sont associées à un mesurage de Accumulator.

Le Tableau 9 présente tous les attributs de AccumulatorLimitSet.

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Tableau 9 – Attributs de Standard::AccumulatorLimitSet

nom	mult	type	description
isPercentageLimits	0..1	Boolean	hérité de: LimitSet
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 10 présente toutes les extrémités d'association de AccumulatorLimitSet avec d'autres classes.

Tableau 10 – Extrémités d'association de Standard::AccumulatorLimitSet avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Measurements	0..*	Accumulator	Measurements utilisant le LimitSet.

6.3.2.4 AccumulatorReset

Cette commande redéfinit la valeur du compteur sur zéro.

Le Tableau 11 présente tous les attributs de AccumulatorReset.

Tableau 11 – Attributs de Standard::AccumulatorReset

nom	mult	type	description
unitSymbol	0..1	UnitSymbol	hérité de: Control
controlType	0..1	String	hérité de: Control
operationInProgress	0..1	Boolean	hérité de: Control
timeStamp	0..1	DateTime	hérité de: Control
unitMultiplier	0..1	UnitMultiplier	hérité de: Control
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 12 présente toutes les extrémités d'association de AccumulatorReset avec d'autres classes.

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Tableau 12 – Extrémités d'association de Standard::AccumulatorReset avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..1	AccumulatorValue	1..1	AccumulatorValue	Valeur de l'accumulateur redéfinie par la commande.
0..*	PowerSystemResource	0..1	PowerSystemResource	hérité de: Control

6.3.2.5 AccumulatorValue

AccumulatorValue représente une MeasurementValue accumulée (comptée).

Le Tableau 13 présente tous les attributs de AccumulatorValue.

Tableau 13 – Attributs de Standard::AccumulatorValue

nom	mult	type	description
value	0..1	Integer	Valeur à surveiller. La valeur est positive.
timeStamp	0..1	DateTime	hérité de: MeasurementValue
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 14 présente toutes les extrémités d'association de AccumulatorValue avec d'autres classes.

Tableau 14 – Extrémités d'association de Standard::AccumulatorValue avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Accumulator	1..1	Accumulator	Measurement auquel cette valeur est connectée.
0..*	MeasurementValueSource	1..1	MeasurementValueSource	hérité de: MeasurementValue

6.3.2.6 (extrait) ACDCConverter

Unité comportant des valves pour trois phases, associées à un équipement de commande, des appareils essentiels de protection et de commutation, des condensateurs de stockage en courant continu, des composants réactifs et des auxiliaires, le cas échéant, utilisés pour la conversion.

Le Tableau 15 présente tous les attributs de ACDCConverter.

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Tableau 15 – Attributs de Standard::ACDCConverter

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 16 présente toutes les extrémités d'association de ACDCConverter avec d'autres classes.

Tableau 16 – Extrémités d'association de Standard::ACDCConverter avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.7 (extrait) ACDCTerminal

Point de connexion électrique (à courant alternatif ou à courant continu) à une partie d'un équipement conducteur. Les Terminals (bornes) sont connectées sur des points de connexion physiques appelés noeuds de connectivité (ConnectivityNode).

Le Tableau 17 présente tous les attributs d'ACDCTerminal.

Tableau 17 – Attributs de Standard::ACDCTerminal

nom	mult	type	description
sequenceNumber	0..1	Integer	Orientation des connexions de bornes pour un équipement conducteur à plusieurs bornes. La numérotation séquentielle commence à 1 et il convient que les bornes supplémentaires suivent l'ordre croissant. La première borne est le "point de départ" d'une branche à deux bornes.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

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6.3.2.8 ACLineSegment

Fil ou combinaison de fils ayant des caractéristiques électriques cohérentes, et formant un seul système de puissance, utilisé pour transporter du courant alternatif entre des points du réseau.

Pour les lignes triphasées transposées symétriques, il suffit d'utiliser les attributs du segment de ligne qui décrivent les impédances et les admittances pour la longueur totale du segment.

Si les données d'impédance par longueur sont disponibles dans une bibliothèque de types de normes, les impédances et les admittances peuvent être calculées par l'une des façons suivantes:

– Calculer les paramètres électriques à partir des données d'actif, en utilisant ConductorInfo associé, avec les valeurs multipliées ensuite par Conductor.length, afin de produire un modèle de matrice.
– Calculer les paramètres électriques déséquilibrés à partir de PerLengthPhaseImpedance associé, puis multiplier par Conductor.length pour produire un modèle de matrice.
– Calculer les paramètres électriques transposés à partir de PerLengthSequenceImpedance associé, puis multiplier par Conductor.length pour produire un modèle de séquence.

Le Tableau 18 présente tous les attributs d'ACLineSegment.

Tableau 18 – Attributs de Standard::ACLineSegment

nom	mult	type	description
length	0..1	Length	hérité de: Conductor
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 19 présente toutes les extrémités d'association d'ACLineSegment avec d'autres classes.

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Tableau 19 – Extrémités d'association de Standard::ACLineSegment avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	PerLengthImpedance	0..1	PerLengthImpedance	Impédance par unité de longueur pour ce segment de ligne.
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.9 ACLineSegmentPhase

Représente un fil unique sur un segment de ligne à courant alternatif.

Le Tableau 20 présente tous les attributs de ACLineSegmentPhase.

Tableau 20 – Attributs de Standard::ACLineSegmentPhase

nom	mult	type	description
phase	0..1	SinglePhaseKind	Connexion de phase du fil aux deux extrémités
sequenceNumber	0..1	Integer	Désignation du numéro de cette phase de segment de ligne. Il convient que chaque phase d'un segment de ligne ait un numéro d'ordre unique. Pour la modélisation déséquilibrée, cela sert à relier le modèle mathématique (PhaseImpedanceData de PerLengthPhaseImpedance) au modèle de connectivité (cette classe) et au modèle physique (WirePosition) sans couplage étroit.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

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Le Tableau 21 présente toutes les extrémités d'association de ACLineSegmentPhase avec d'autres classes.

Tableau 21 – Extrémités d'association de Standard::ACLineSegmentPhase avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	ACLineSegment	1..1	ACLineSegment	Segment de ligne auquel appartient la phase.
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.10 ActivePowerLimit

Limite sur le flux de puissance active.

Le Tableau 22 présente tous les attributs de ActivePowerLimit.

Tableau 22 – Attributs de Standard::ActivePowerLimit

nom	mult	type	description
value	1..1	ActivePower	Valeur de la limite de puissance active.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 23 présente toutes les extrémités d'association de ActivePowerLimit avec d'autres classes.

Tableau 23 – Extrémités d'association de Standard::ActivePowerLimit avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	OperationalLimitType	0..1	OperationalLimitType	hérité de: OperationalLimit
0..*	OperationalLimitSet	1..1	OperationalLimitSet	hérité de: OperationalLimit

6.3.2.11 (extrait) ActivityRecord

Enregistre l'activité d'une entité à un moment donné; l'activité peut être pour un événement passé ou pour une activité planifiée.

Le Tableau 24 présente tous les attributs de ActivityRecord.

Tableau 24 – Attributs de Standard::ActivityRecord

nom	mult	type	description
status	0..1	Status	Informations sur les conséquences de l'événement résultant sur cet enregistrement de l'activité
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

6.3.2.12 Analog

Analog (analogique) représente un Measurement analogique.

Le Tableau 25 présente tous les attributs de Analog.

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Tableau 25 – Attributs de Standard::Analog

nom	mult	type	description
positiveFlowIn	0..1	Boolean	Si true (vrai), ce Measurement est une puissance active, une puissance réactive ou un courant selon le principe qu'une valeur positive mesurée sur la Terminal indique que le courant pénètre dans le PowerSystemResource (ressource de système de puissance) correspondant.
maxValue	0..1	Float	Maximum de plage de la valeur normale pour les MeasurementValue.values. Utilisé pour la mise à l'échelle, par exemple dans des graphiques à barres ou pour des valeurs brutes obtenues par télémesure.
minValue	0..1	Float	Minimum de plage de la valeur normale pour les MeasurementValue.values. Utilisé pour la mise à l'échelle, par exemple dans des graphiques à barres ou pour des valeurs brutes obtenues par télémesure.
normalValue	0..1	Float	Valeur de mesure normale, par exemple utilisée pour des calculs de pourcentages.
unitSymbol	1..1	UnitSymbol	hérité de: Measurement
measurementType	1..1	String	hérité de: Measurement
phases	0..1	PhaseCode	hérité de: Measurement
unitMultiplier	1..1	UnitMultiplier	hérité de: Measurement
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 26 présente toutes les extrémités d'association de Analog avec d'autres classes.

Tableau 26 – Extrémités d'association de Standard::Analog avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Terminal	0..1	ACDCTerminal	hérité de: Measurement
0..*	PowerSystemResource	0..1	PowerSystemResource	hérité de: Measurement

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6.3.2.13 (extrait) AnalogControl

Commande analogique utilisée pour la commande de surveillance.

Le Tableau 27 présente tous les attributs de AnalogControl.

Tableau 27 – Attributs de Standard::AnalogControl

nom	mult	type	description
minValue	0..1	Float	Minimum de plage de la valeur normale pour les Control.values. Utilisé pour la mise à l'échelle, par exemple dans des graphiques à barres.
maxValue	0..1	Float	Maximum de plage de la valeur normale pour les Control.values. Utilisé pour la mise à l'échelle, par exemple dans des graphiques à barres.

nom	mult	type	description
unitSymbol	0..1	UnitSymbol	hérité de: Control
controlType	0..1	String	hérité de: Control
operationInProgress	0..1	Boolean	hérité de: Control
timeStamp	0..1	DateTime	hérité de: Control
unitMultiplier	0..1	UnitMultiplier	hérité de: Control
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 28 présente toutes les extrémités d'association de AnalogControl avec d'autres classes.

Tableau 28 – Extrémités d'association de Standard::AnalogControl avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..1	AnalogValue	1..1	AnalogValue	MeasurementValue qui est commandée.
0..*	PowerSystemResource	0..1	PowerSystemResource	hérité de: Control

6.3.2.14 AnalogLimit

Valeurs limites pour les Measurements Analog (analogiques).

Le Tableau 29 présente tous les attributs de AnalogLimit.

Tableau 29 – Attributs de Standard::AnalogLimit

nom	mult	type	description
value	0..1	Float	Valeur à ne pas dépasser.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 30 présente toutes les extrémités d'association de AnalogLimit avec d'autres classes.

Tableau 30 – Extrémités d'association de Standard::AnalogLimit avec d'autres classes

mult à partir de	name	mult vers	type	description
0..*	LimitSet	1..1	AnalogLimitSet	Ensemble de limites.

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6.3.2.15 AnalogLimitSet

Un AnalogLimitSet spécifie un ensemble de Limits (limites) qui sont associées à un Measurement Analog (analogique).

Le Tableau 31 présente tous les attributs d'AnalogLimitSet.

Tableau 31 – Attributs de Standard::AnalogLimitSet

nom	mult	type	description
isPercentageLimits	0..1	Boolean	hérité de: LimitSet
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 32 présente toutes les extrémités d'association de AnalogLimitSet avec d'autres classes.

Tableau 32 – Extrémités d'association de Standard::AnalogLimitSet avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Measurements	0..*	Analog	Measurements utilisant le LimitSet.

6.3.2.16 AnalogValue

AnalogValue représente une MeasurementValue analogique.

Le Tableau 33 présente tous les attributs de AnalogValue.

Tableau 33 – Attributs de Standard::AnalogValue

nom	mult	type	description
value	0..1	Float	Valeur à surveiller.
timeStamp	0..1	DateTime	hérité de: MeasurementValue
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 34 présente toutes les extrémités d'association de AnalogValue avec d'autres classes.

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Tableau 34 – Extrémités d'association de Standard::AnalogValue avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Analog	1..1	Analog	Measurement auquel cette valeur est connectée.
0..*	MeasurementValueSource	1..1	MeasurementValueSource	hérité de: MeasurementValue

6.3.2.17 ApparentPowerLimit

Limite de puissance apparente.

Le Tableau 35 présente tous les attributs de ApparentPowerLimit.

Tableau 35 – Attributs de Standard::ApparentPowerLimit

nom	mult	type	description
value	1..1	ApparentPower	Limite de puissance apparente.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 36 présente toutes les extrémités d'association de ApparentPowerLimit avec d'autres classes.

Tableau 36 – Extrémités d'association de Standard::ApparentPowerLimit avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	OperationalLimitType	0..1	OperationalLimitType	hérité de: OperationalLimit
0..*	OperationalLimitSet	1..1	OperationalLimitSet	hérité de: OperationalLimit

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6.3.2.18 (abstract) classe racine AssetInfo

Ensemble d'attributs d'un actif, représentant les informations de la fiche technique typique d'un dispositif physique, qui peut être instancié et partagé dans différents contextes d'échange de données:

– en tant qu'attributs d'une instance d'actif (installé ou en stock),
– en tant qu'attributs d'un modèle d'actif (produit par un fabricant),
– en tant qu'attributs d'un actif type (type générique d'un actif tel qu'utilisé dans la planification de conception/d'extension).

6.3.2.19 (extrait) AuxiliaryEquipment

AuxiliaryEquipment décrit un équipement qui ne remplit aucune fonction primaire mais contribue à ce que l'équipement remplisse la fonction primaire.

AuxiliaryEquipment est lié à l'équipement primaire par une association à Terminal.

Le Tableau 37 présente tous les attributs de AuxiliaryEquipment.

Tableau 37 – Attributs de Standard::AuxiliaryEquipment

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
nom	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 38 présente toutes les extrémités d'association de AuxiliaryEquipment avec d'autres classes.

Tableau 38 – Extrémités d'association de Standard::AuxiliaryEquipment avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Terminal	1..1	Terminal	Borne de l'équipement auquel l'AuxiliaryEquipment est joint.
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.20 BaseVoltage

Définit une tension de base du système qui est référencée.

Le Tableau 39 présente tous les attributs de BaseVoltage.

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Tableau 39 – Attributs de Standard::BaseVoltage

nom	mult	type	description
nominalVoltage	0..1	Voltage	Tension de base des ressources du système de puissance.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

6.3.2.21 (extrait) BasicIntervalSchedule

Programme de valeurs à des instants donnés.

Le Tableau 40 présente tous les attributs de BasicIntervalSchedule.

Tableau 40 – Attributs de Standard::BasicIntervalSchedule

nom	mult	type	description
value2Unit	0..1	UnitSymbol	Unités de mesure pour Value2.
startTime	1..1	DateTime	Heure pour le premier TimePoint.
value1Unit	1..1	UnitSymbol	Unités de mesure pour Value1.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

6.3.2.22 Bay

Ensemble des ressources du système de puissance (au sein d'un poste donné) comprenant équipement conducteur, relais de protection, mesurages et télémesure.

Le Tableau 41 présente tous les attributs de Bay.

Tableau 41 – Attributs de Standard::Bay

nom	mult	type	description
breakerConfiguration	0..1	BreakerConfiguration	Configuration du disjoncteur.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 42 présente toutes les extrémités d'association de Bay avec d'autres classes.

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Tableau 42 – Extrémités d'association de Standard::Bay avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	VoltageLevel	0..1	VoltageLevel	Niveau de tension qui contient cette cellule.
0..*	Substation	0..1	Substation	Poste qui contient la cellule.
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.23 Breaker

Appareil de commutation mécanique capable d'établir, de transporter et d'interrompre des courants dans des conditions normales de circuit et aussi d'établir, de transporter pendant une durée déterminée et d'interrompre des courants dans des conditions anormales spécifiées de circuit, par exemple celles d'un court-circuit.

Le Tableau 43 présente tous les attributs de Breaker.

Tableau 43 – Attributs de Standard::Breaker

nom	mult	type	description
inTransitTime	0..1	Seconds	Délai de transition de l'état ouvert à l'état fermé.
breakingCapacity	0..1	CurrentFlow	hérité de: ProtectedSwitch
normalOpen	1..1	Boolean	hérité de: Switch
locked	0..1	Boolean	hérité de: Switch
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject
switchOnCount	0..1	Integer	(Déconseillé) hérité de: Switch
switchOnDate	0..1	DateTime	(Déconseillé) hérité de: Switch

Le Tableau 44 présente toutes les extrémités d'association de Breaker avec d'autres classes.

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Tableau 44 – Extrémités d'association de Standard::Breaker avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.24 BusbarSection

Conducteur, ou groupe de conducteurs, ayant une impédance négligeable, servant à connecter un autre équipement conducteur au sein d'un seul poste

Les mesurages de tension sont habituellement obtenus à partir de VoltageTransformers (transformateurs de tension) connectés à des sections de jeux de barres. Un tronçon de jeu de barres peut avoir un grand nombre de bornes physiques mais, pour l'analyse, il est modélisé avec une seule borne logique.

Le Tableau 45 présente tous les attributs de BusbarSection.

Tableau 45 – Attributs de Standard::BusbarSection

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 46 présente toutes les extrémités d'association de BusbarSection avec d'autres classes.

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Tableau 46 – Extrémités d'association de Standard::BusbarSection avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.25 Clamp

Un Clamp (serre-fil) est une connexion galvanique à un segment de ligne où est connecté l'autre équipement. Un Clamp ne coupe pas le segment de ligne.

Un Clamp est un ConductingEquipment et a une borne (Terminal) comportant un ConnectivityNode. Tout autre ConductingEquipment peut être connecté au Clamp ConnectivityNode.

Le Tableau 47 présente tous les attributs de Clamp.

Tableau 47 – Attributs de Standard::Clamp

nom	mult	type	description
lengthFromTerminal1	0..1	Length	Longueur jusqu'à l'emplacement du serre-fil à partir du premier côté du segment de ligne, c'est-à-dire la borne du segment de ligne dont le numéro d'ordre est égal à 1.
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 48 présente toutes les extrémités d'association de Clamp avec d'autres classes.

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Tableau 48 – Extrémités d'association de Standard::Clamp avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	ACLineSegment	1..1	ACLineSegment	Segment de ligne auquel est connecté le serre-fil.
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.26 Command

Une Command est une commande discrète utilisée pour la commande de surveillance.

Le Tableau 49 présente tous les attributs de Command.

Tableau 49 – Attributs de Standard::Command

nom	mult	type	description
value	0..1	Integer	Valeur qui représente la sortie de l'actionneur.
normalValue	0..1	Integer	Valeur normale de Control.value, utilisée par exemple pour la mise à l'échelle en pourcentage.
unitSymbol	0..1	UnitSymbol	hérité de: Control
controlType	0..1	String	hérité de: Control
operationInProgress	0..1	Boolean	hérité de: Control
timeStamp	0..1	DateTime	hérité de: Control
unitMultiplier	0..1	UnitMultiplier	hérité de: Control
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

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Le Tableau 50 présente toutes les extrémités d'association de Command avec d'autres classes.

Tableau 50 – Extrémités d'association de Standard::Command avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..1	DiscreteValue	1..1	DiscreteValue	MeasurementValue qui est commandée.
0..*	ValueAliasSet	0..1	ValueAliasSet	ValueAliasSet utilisé pour traduire une valeur de Control en un nom.
0..*	PowerSystemResource	0..1	PowerSystemResource	hérité de: Control

6.3.2.27 (extrait) ConductingEquipment

Parties du système de puissance à courant alternatif conçues pour transporter du courant ou connectées par des bornes de façon à assurer la conduction. ConductingEquipment est contenu dans un EquipmentContainer qui peut être un Substation, un VoltageLevel ou une Bay dans un Substation.

Le Tableau 51 présente tous les attributs de ConductingEquipment.

Tableau 51 – Attributs de Standard::ConductingEquipment

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 52 présente toutes les extrémités d'association de ConductingEquipment avec d'autres classes.

Tableau 52 – Extrémités d'association de Standard::ConductingEquipment avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	Tension de base pour cet équipement conducteur. À n'utiliser que lorsqu'aucun conteneur de niveau de tension n'est utilisé et qu'une seule tension de base s'applique. Par exemple, n'est pas utilisée pour des transformateurs.
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.28 (extrait) Conductor

Combinaison de matériau conducteur ayant des caractéristiques électriques cohérentes et formant un seul système de puissance, utilisé pour transporter du courant entre des points dans le système de puissance.

Le Tableau 53 présente tous les attributs de Conductor.

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Tableau 53 – Attributs de Standard::Conductor

nom	mult	type	description
length	0..1	Length	Longueur du segment pour calculer les capacités d'une section de ligne.
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 54 présente toutes les extrémités d'association de Conductor avec d'autres classes.

Tableau 54 – Extrémités d'association de Standard::Conductor avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.29 ConformLoad

Les charges conformes ConformLoad représentent les charges qui suivent un profil de modification quotidienne, ce profil pouvant être utilisé pour mettre à l'échelle la charge avec un système de charge.

Le Tableau 55 présente tous les attributs de ConformLoad.

Tableau 55 – Attributs de Standard::ConformLoad

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

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Le Tableau 56 présente toutes les extrémités d'association de ConformLoad avec d'autres classes.

Tableau 56 – Extrémités d'association de Standard::ConformLoad avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	LoadGroup	0..1	ConformLoadGroup	Groupe de cette ConformLoad.
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.30 ConformLoadGroup

Groupe de charges qui se conforment à un modèle d'attribution.

Le Tableau 57 présente tous les attributs de ConformLoadGroup.

Tableau 57 – Attributs de Standard::ConformLoadGroup

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 58 présente toutes les extrémités d'association de ConformLoadGroup avec d'autres classes.

Tableau 58 – Extrémités d'association de Standard::ConformLoadGroup avec d'autres classes

mult à partir de	nom	mult vers	type	description
1..*	SubLoadArea	1..1	SubLoadArea	hérité de: LoadGroup

6.3.2.31 ConformLoadSchedule

Courbe de la charge en fonction du temps (axe X) indiquant les valeurs de puissance active (axe Y1) et de puissance réactive (axe Y2) de chaque unité de la période couverte. Cette courbe représente un modèle de charge classique pour une période sur un type de jour et une saison donnés.

Le Tableau 59 présente tous les attributs de ConformLoadSchedule.

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Tableau 59 – Attributs de Standard::ConformLoadSchedule

nom	mult	type	description
timeStep	0..1	Seconds	hérité de: RegularIntervalSchedule
endTime	0..1	DateTime	hérité de: RegularIntervalSchedule
value2Unit	0..1	UnitSymbol	hérité de: BasicIntervalSchedule
startTime	1..1	DateTime	hérité de: BasicIntervalSchedule
value1Unit	1..1	UnitSymbol	hérité de: BasicIntervalSchedule
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 60 présente toutes les extrémités d'association de ConformLoadSchedule avec d'autres classes.

Tableau 60 – Extrémités d'association de Standard::ConformLoadSchedule avec d'autres classes

mult à partir de	nom	mult vers	type	description
1..*	ConformLoadGroup	1..1	ConformLoadGroup	ConformLoadGroup auquel le ConformLoadSchedule appartient.
0..*	DayType	1..1	DayType	hérité de: SeasonDayTypeSchedule
0..*	Season	1..1	Season	hérité de: SeasonDayTypeSchedule

6.3.2.32 ConnectivityNode

Les Connectivity nodes (noeuds de connectivité) sont des points auxquels les bornes d'un équipement conducteur sont raccordées ensemble avec une impédance nulle.

Le Tableau 61 présente tous les attributs de ConnectivityNode.

Tableau 61 – Attributs de Standard::ConnectivityNode

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 62 présente toutes les extrémités d'association de ConnectivityNode avec d'autres classes.

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Tableau 62 – Extrémités d'association de Standard::ConnectivityNode avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	ConnectivityNodeContainer	1..1	ConnectivityNodeContainer	Conteneur de ce nœud de connectivité.

6.3.2.33 (extrait) ConnectivityNodeContainer

Classe de base pour tous les objets qui peuvent contenir des nœuds de connectivité ou des nœuds topologiques.

Le Tableau 63 présente tous les attributs de ConnectivityNodeContainer.

Tableau 63 – Attributs de Standard::ConnectivityNodeContainer

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 64 présente toutes les extrémités d'association de ConnectivityNodeContainer avec d'autres classes.

Tableau 64 – Extrémités d'association de Standard::ConnectivityNodeContainer avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.34 (extrait) Connector

Conducteur, ou groupe de conducteurs, d'une impédance négligeable, servant à connecter un autre équipement conducteur au sein d'un seul poste et qui sont modélisés avec une seule borne logique.

Le Tableau 65 présente tous les attributs de Connector.

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Tableau 65 – Attributs de Standard::Connector

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 66 présente toutes les extrémités d'association de Connector avec d'autres classes.

Tableau 66 – Extrémités d'association de Standard::Connector avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.35 (extrait) Control

Control est utilisée pour assurer la commande des appareils de surveillance. Elle représente les sorties de commande qui sont utilisées pour changer l'état du processus, par exemple ouvrir ou fermer un disjoncteur, une valeur de point de consigne, ou une commande augmente/diminue ("raise/lower command").

Le Tableau 67 présente tous les attributs de Control.

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Tableau 67 – Attributs de Standard::Control

nom	mult	type	description
unitSymbol	0..1	UnitSymbol	Unité de mesure de la grandeur commandée.
controlType	0..1	String	Spécifie le type de Control, par exemple BreakerOn/Off (disjoncteur en service/hors service), GeneratorVoltageSetPoint (point de consigne de tension du générateur), TieLineFlow (flux de ligne d'interconnexion), etc. Le ControlType.name décrit le type et doit être unique parmi tous les types spécifiés.
operationInProgress	0..1	Boolean	Indique que le client est en train d'émettre des commandes de contrôle et que cette action n'est pas terminée.
timeStamp	0..1	DateTime	Date et heure de la dernière commande émise.
unitMultiplier	0..1	UnitMultiplier	Multiplicateur d'unité de la grandeur commandée.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 68 présente toutes les extrémités d'association de Control avec d'autres classes.

Tableau 68 – Extrémités d'association de Standard::Control avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	PowerSystemResource	0..1	PowerSystemResource	Appareil de régulation régi par cette sortie de commande.

6.3.2.36 CsConverter

Côté courant continu du convertisseur de source de courant.

Le Tableau 69 présente tous les attributs de CsConverter.

Tableau 69 – Attributs de Standard::CsConverter

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

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Le Tableau 70 présente toutes les extrémités d'association de CsConverter avec d'autres classes.

Tableau 70 – Extrémités d'association de Standard::CsConverter avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.37 CurrentLimit

Limite opérationnelle sur le courant.

Le Tableau 71 présente tous les attributs de CurrentLimit.

Tableau 71 – Attributs de Standard::CurrentLimit

nom	mult	type	description
value	1..1	CurrentFlow	Limite sur le flux de courant.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 72 présente toutes les extrémités d'association de CurrentLimit avec d'autres classes.

Tableau 72 – Extrémités d'association de Standard::CurrentLimit avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	OperationalLimitType	0..1	OperationalLimitType	hérité de: OperationalLimit
0..*	OperationalLimitSet	1..1	OperationalLimitSet	hérité de: OperationalLimit

6.3.2.38 CurrentTransformer

Transformateur de mesure utilisé pour mesurer des qualités électriques du circuit qui est protégé et/ou surveillé. Généralement utilisé comme transducteur de courant à des fins de comptage ou de protection. Une valeur assignée type du courant secondaire est de 5 A.

Le Tableau 73 présente tous les attributs de CurrentTransformer.

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Tableau 73 – Attributs de Standard::CurrentTransformer

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 74 présente toutes les extrémités d'association de CurrentTransformer avec d'autres classes.

Tableau 74 – Extrémités d'association de Standard::CurrentTransformer avec d'autres classes

mult à partir de	nom	mult vers	type	description
1..1	CurrentTransformerPhase	0..*	CurrentTransformerPhase	
0..*	Terminal	1..1	Terminal	hérité de: AuxiliaryEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

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6.3.2.39 Cut

Un cut sépare en deux parties un segment de ligne. Le cut se présente comme un commutateur qui est inséré entre ces deux parties et les connecte l'une à l'autre. Comme le cut est normalement ouvert, il n'y a pas de connexion galvanique entre les deux parties du segment de ligne. Il est cependant possible de fermer le cut pour obtenir une connexion galvanique.

Les bornes du cut sont orientées vers les bornes du segment de ligne qui ont le même numéro d'ordre. La borne de cut dont le numéro d'ordre est égal à 1 est, par conséquent, orientée vers la borne du segment de ligne dont le numéro d'ordre est égal à 1.

Les bornes du cut ont aussi une fonction de point de connexion pour des cavaliers et d'autres équipements, par exemple un générateur mobile. Pour y parvenir, des nœuds de connectivité sont placés aux bornes du cut. Dès lors que les nœuds de connectivité sont en place, il est possible d'y connecter n'importe quel équipement.

Le Tableau 75 présente tous les attributs de Cut.

Tableau 75 – Attributs de Standard::Cut

nom	mult	type	description
lengthFromTerminal1	0..1	Length	Longueur jusqu'à l'emplacement du cut à partir du premier côté du segment de ligne du cut, c'est-à-dire la borne du segment de ligne dont le numéro d'ordre est égal à 1.
normalOpen	1..1	Boolean	hérité de: Switch
locked	0..1	Boolean	hérité de: Switch
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject
switchOnCount	0..1	Integer	(Déconseillé) hérité de: Switch
switchOnDate	0..1	DateTime	(Déconseillé) hérité de: Switch

Le Tableau 76 présente toutes les extrémités d'association de Cut avec d'autres classes.

Tableau 76 – Extrémités d'association de Standard::Cut avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	ACLineSegment	1..1	ACLineSegment	Segment de ligne auquel est appliqué le cut.
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

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6.3.2.40 DayType

Groupe de jours similaires. Par exemple, il peut être utilisé pour représenter les jours de la semaine, le week-end ou les vacances.

Le Tableau 77 présente tous les attributs de DayType.

Tableau 77 – Attributs de Standard::DayType

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

6.3.2.41 Disconnector

Appareil de commutation mécanique exploité manuellement ou par un moteur utilisé pour modifier les connexions dans un circuit ou pour isoler un circuit ou un équipement d'une source d'électricité. Les circuits doivent être ouverts ou fermés lorsqu'un courant négligeable est interrompu ou produit.

Le Tableau 78 présente tous les attributs de Disconnector.

Tableau 78 – Attributs de Standard::Disconnector

nom	mult	type	description
normalOpen	1..1	Boolean	hérité de: Switch
locked	0..1	Boolean	hérité de: Switch
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject
switchOnCount	0..1	Integer	(Déconseillé) hérité de: Switch
switchOnDate	0..1	DateTime	(Déconseillé) hérité de: Switch

Le Tableau 79 présente toutes les extrémités d'association de Disconnector avec d'autres classes.

Tableau 79 – Extrémités d'association de Standard::Disconnector avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

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6.3.2.42 Discrete

Discrete représente un Measurement discret, c'est-à-dire un Measurement représentant des valeurs discrètes, par exemple une position de Breaker (disjoncteur).

Le Tableau 80 présente tous les attributs de Discrete.

Tableau 80 – Attributs de Standard::Discrete

nom	mult	type	description
normalValue	0..1	Integer	Valeur de mesure normale, par exemple utilisée pour des calculs de pourcentages.
maxValue	0..1	Integer	Maximum de plage de la valeur normale pour les MeasurementValue.values. Utilisé pour la mise à l'échelle, par exemple dans des graphiques à barres ou pour des valeurs brutes obtenues par télémesure.
minValue	0..1	Integer	Minimum de plage de la valeur normale pour les MeasurementValue.values. Utilisé pour la mise à l'échelle, par exemple dans des graphiques à barres ou pour des valeurs brutes obtenues par télémesure.
unitSymbol	1..1	UnitSymbol	hérité de: Measurement
measurementType	1..1	String	hérité de: Measurement
phases	0..1	PhaseCode	hérité de: Measurement
unitMultiplier	1..1	UnitMultiplier	hérité de: Measurement
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 81 présente toutes les extrémités d'association de Discrete avec d'autres classes.

Tableau 81 – Extrémités d'association de Standard::Discrete avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	ValueAliasSet	0..1	ValueAliasSet	ValueAliasSet utilisé pour traduire une MeasurementValue.value en un nom.
0..*	Terminal	0..1	ACDCTerminal	hérité de: Measurement
0..*	PowerSystemResource	0..1	PowerSystemResource	hérité de: Measurement

6.3.2.43 DiscreteValue

DiscreteValue représente une MeasurementValue discrète.

Le Tableau 82 présente tous les attributs de DiscreteValue.

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Tableau 82 – Attributs de Standard::DiscreteValue

nom	mult	type	description
value	0..1	Integer	Valeur à surveiller.
timeStamp	0..1	DateTime	hérité de: MeasurementValue
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 83 présente toutes les extrémités d'association de DiscreteValue avec d'autres classes.

Tableau 83 – Extrémités d'association de Standard::DiscreteValue avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Discrete	1..1	Discrete	Measurement auquel cette valeur est connectée.
0..*	MeasurementValueSource	1..1	MeasurementValueSource	hérité de: MeasurementValue

6.3.2.44 (extrait) EarthFaultCompensator

Équipement conducteur utilisé pour représenter une connexion qui est généralement utilisée pour compenser les défauts de terre. Un appareil de compensation de défaut de terre modélisé avec une seule borne implique une deuxième borne solidement raccordée à la terre. Si deux bornes sont modélisées, la terre n'est pas prise pour hypothèse et les règles de connexion normale s'appliquent.

Le Tableau 84 présente tous les attributs de EarthFaultCompensator.

Tableau 84 – Attributs de Standard::EarthFaultCompensator

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 85 présente toutes les extrémités d'association de EarthFaultCompensator avec d'autres classes.

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Tableau 85 – Extrémités d'association de Standard::EarthFaultCompensator avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.45 (extrait) EnergyArea

Décrit une zone comportant la production ou la consommation d'énergie. Les spécialisations visent à prendre en charge la fonction d'attribution de charge comme cela est généralement exigé dans les systèmes de gestion d'énergie ou les études de planification pour attribuer des niveaux hypothétiques de charge aux points individuels de charge pour l'analyse du flux de charge. La zone d'énergie peut souvent être liée aux niveaux de charge mesurés et prévus.

Le Tableau 86 présente tous les attributs de EnergyArea.

Tableau 86 – Attributs de Standard::EnergyArea

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

6.3.2.46 EnergyConsumer

Consommateur générique d'énergie – point de consommation sur le modèle de système de puissance.

Le Tableau 87 présente tous les attributs de EnergyConsumer.

Tableau 87 – Attributs de Standard::EnergyConsumer

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

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Le Tableau 88 présente toutes les extrémités d'association de EnergyConsumer avec d'autres classes.

Tableau 88 – Extrémités d'association de Standard::EnergyConsumer avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.47 EnergyConsumerPhase

Le Tableau 89 présente tous les attributs de EnergyConsumerPhase.

Tableau 89 – Attributs de Standard::EnergyConsumerPhase

nom	mult	type	description
phase	0..1	SinglePhaseKind	Phase de ce composant consommateur d'énergie. Si le consommateur d'énergie est connecté en étoile, la connexion va de la phase indiquée à la terre centrale ou au point neutre. Si le consommateur d'énergie est connecté en triangle, la phase indique qu'un consommateur d'énergie est connecté de la phase indiquée à la phase logique suivante non neutre.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 90 présente toutes les extrémités d'association de EnergyConsumerPhase avec d'autres classes.

Tableau 90 – Extrémités d'association de Standard::EnergyConsumerPhase avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	EnergyConsumer	1..1	EnergyConsumer	Consommateur d'énergie auquel appartient cette phase.
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

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6.3.2.48 EnergySource

Équivalent générique pour un fournisseur d'énergie sur un niveau de tension de transport ou de distribution.

Le Tableau 91 présente tous les attributs de EnergySource.

Tableau 91 – Attributs de Standard::EnergySource

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 92 présente toutes les extrémités d'association de EnergySource avec d'autres classes.

Tableau 92 – Extrémités d'association de Standard::EnergySource avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.49 (extrait) Equipment

Éléments d'un système de puissance qui sont des appareils matériels, électroniques ou mécaniques.

Le Tableau 93 présente tous les attributs de Equipment.

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Tableau 93 – Attributs de Standard::Equipment

nom	mult	type	description
normallyInService	0..1	Boolean	Si true (vrai), l'équipement est normalement en service.
aggregate	0..1	Boolean	L'instance unique de l'équipement représente plusieurs éléments d'équipement qui ont été modélisés ensemble comme un agrégat. Des exemples sont les transformateurs de puissance ou les machines synchrones fonctionnant en parallèle, modélisés comme un seul agrégat de transformateur de puissance ou agrégat de machine synchrone. Ne doit pas être utilisé pour indiquer un équipement qui fait partie intégrante d'un groupe d'équipements interdépendants produits par un programme de production de réseau.
inService	0..1	Boolean	Si true (vrai), l'équipement est en service.
networkAnalysisEnabled	0..1	Boolean	L'équipement est autorisé à participer à l'analyse du réseau. Si cela n'est pas spécifié, la valeur est considérée par hypothèse comme true (vrai).
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 94 présente toutes les extrémités d'association de Equipment avec d'autres classes.

Tableau 94 – Extrémités d'association de Standard::Equipment avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	AggregatedEquipment	0..1	Equipment	
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	Conteneur de l'équipement supplémentaire au-delà du conteneur de l'équipement primaire. L'équipement est contenu dans le conteneur d'un autre équipement, mais également regroupé avec ce conteneur d'équipement.
0..*	EquipmentContainer	0..1	EquipmentContainer	Conteneur de cet équipement.
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

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6.3.2.50 (extrait) EquipmentContainer

Un choix de modélisation pour proposer une classe racine qui regroupe des équipements.

Le Tableau 95 présente tous les attributs de EquipmentContainer.

Tableau 95 – Attributs de Standard::EquipmentContainer

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 96 présente toutes les extrémités d'association de EquipmentContainer avec d'autres classes.

Tableau 96 – Extrémités d'association de Standard::EquipmentContainer avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	WeatherStation	0..*	WeatherStation	
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.51 (extrait) EquivalentEquipment

La classe représente les objets équivalents qui sont le résultat d'une réduction de réseau. La classe est la base pour les objets équivalents de types différents.

Le Tableau 97 présente tous les attributs de EquivalentEquipment.

Tableau 97 – Attributs de Standard::EquivalentEquipment

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 98 présente toutes les extrémités d'association de EquivalentEquipment avec d'autres classes.

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Tableau 98 – Extrémités d'association de Standard::EquivalentEquipment avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.52 EquivalentInjection

Cette classe représente des injections équivalentes (production ou charge). La régulation de tension est admise seulement au point de connexion.

Le Tableau 99 présente tous les attributs de EquivalentInjection.

Tableau 99 – Attributs de Standard::EquivalentInjection

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 100 présente toutes les extrémités d'association de EquivalentInjection avec d'autres classes.

Tableau 100 – Extrémités d'association de Standard::EquivalentInjection avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

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6.3.2.53 ExternalNetworkInjection

Cette classe représente le réseau externe et est utilisée pour les calculs de l'IEC 60909.

Le Tableau 101 présente tous les attributs de ExternalNetworkInjection.

Tableau 101 – Attributs de Standard::ExternalNetworkInjection

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 102 présente toutes les extrémités d'association de ExternalNetworkInjection avec d'autres classes.

Tableau 102 – Extrémités d'association de Standard::ExternalNetworkInjection avec d'autres classes

mult à partir de	nom	mult vers	type	description
1..*	RegulatingControl	0..1	RegulatingControl	hérité de: RegulatingCondEq
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.54 FaultIndicator

En règle générale, un FaultIndicator est uniquement un indicateur (qui peut ou peut ne pas être surveillé à distance) et non un équipement qui déclenche effectivement un événement de protection. Il est utilisé à des fins de FLISR (Fault Location, Isolation and Supply Restoration – localisation, isolation de pannes et rétablissement de l'alimentation), en portant assistance avec le détachement d'équipes à la partie "la plus vraisemblable" du réseau (c'est-à-dire qu'il aide à déterminer la section de circuit dans laquelle la panne s'est le plus vraisemblablement produite).

Le Tableau 103 présente tous les attributs de FaultIndicator.

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Tableau 103 – Attributs de Standard::FaultIndicator

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 104 présente toutes les extrémités d'association de FaultIndicator avec d'autres classes.

Tableau 104 – Extrémités d'association de Standard::FaultIndicator avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Terminal	1..1	Terminal	hérité de: AuxiliaryEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.55 Feeder

Le Tableau 105 présente tous les attributs de Feeder.

Tableau 105 – Attributs de Standard::Feeder

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 106 présente toutes les extrémités d'association de Feeder avec d'autres classes.

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Tableau 106 – Extrémités d'association de Standard::Feeder avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	ToBay	0..1	Bay	
0..*	FromBay	0..1	Bay	
0..1	NormalHeadTerminal	1..*	Terminal	La borne de tête normale ou les bornes du départ.
0..*	NormalEnergizingSubstation	0..1	Substation	Le poste qui alimente nominalement le départ. Également utilisé à des fins de dénomination.
0..*	NormalEnergizedSubstation	0..*	Substation	Les postes qui sont normalement alimentés par le départ.
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.56 Fuse

Appareil de protection contre les surintensités avec un fusible à ouverture de circuit qui est chauffé et rompu lorsqu'une surintensité le traverse. Un fusible est considéré comme un dispositif de commutation parce qu'il interrompt le courant.

Le Tableau 107 présente tous les attributs de Fuse.

Tableau 107 – Attributs de Standard::Fuse

nom	mult	type	description
normalOpen	1..1	Boolean	hérité de: Switch
locked	0..1	Boolean	hérité de: Switch
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject
switchOnCount	0..1	Integer	(Déconseillé) hérité de: Switch
switchOnDate	0..1	DateTime	(Déconseillé) hérité de: Switch

Le Tableau 108 présente toutes les extrémités d'association de Fuse avec d'autres classes.

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Tableau 108 – Extrémités d'association de Standard::Fuse avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.57 GeneratingUnit

Une seule machine synchrone ou un ensemble de machines synchrones pour la conversion de la puissance mécanique en puissance à courant alternatif. Des machines individuelles dans un ensemble peuvent être, par exemple, définies dans un but de programmation alors qu'un seul signal de contrôle est dérivé pour l'ensemble. Dans ce cas, une GeneratingUnit (unité de production) pour chaque membre de l'ensemble et une GeneratingUnit supplémentaire correspondant à l'ensemble sont définies.

Le Tableau 109 présente tous les attributs de GeneratingUnit.

Tableau 109 – Attributs de Standard::GeneratingUnit

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 110 présente toutes les extrémités d'association de GeneratingUnit avec d'autres classes.

Tableau 110 – Extrémités d'association de Standard::GeneratingUnit avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

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6.3.2.58 GeographicalRegion

Région géographique d'un modèle de réseau de système de puissance.

Le Tableau 111 présente tous les attributs de GeographicalRegion.

Tableau 111 – Attributs de Standard::GeographicalRegion

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

6.3.2.59 Ground

Point au niveau duquel le système est mis à la terre pour raccorder l'équipement conducteur à la terre. Le modèle de système de puissance peut avoir un nombre quelconque de terres.

Le Tableau 112 présente tous les attributs de Ground.

Tableau 112 – Attributs de Standard::Ground

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 113 présente toutes les extrémités d'association de Ground avec d'autres classes.

Tableau 113 – Extrémités d'association de Standard::Ground avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

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6.3.2.60 GroundDisconnector

Appareil mécanique de commutation, exploité manuellement ou par un moteur, utilisé pour isoler un circuit ou un équipement de la terre.

Le Tableau 114 présente tous les attributs de GroundDisconnector.

Tableau 114 – Attributs de Standard::GroundDisconnector

nom	mult	type	description
normalOpen	1..1	Boolean	hérité de: Switch
locked	0..1	Boolean	hérité de: Switch
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject
switchOnCount	0..1	Integer	(Déconseillé) hérité de: Switch
switchOnDate	0..1	DateTime	(Déconseillé) hérité de: Switch

Le Tableau 115 présente toutes les extrémités d'association de GroundDisconnector avec d'autres classes.

Tableau 115 – Extrémités d'association de Standard::GroundDisconnector avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

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6.3.2.61 GroundingImpedance

Appareil à impédance fixe utilisé pour la mise à la terre.

Le Tableau 116 présente tous les attributs de GroundingImpedance.

Tableau 116 – Attributs de Standard::GroundingImpedance

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 117 présente toutes les extrémités d'association de GroundingImpedance avec d'autres classes.

Tableau 117 – Extrémités d'association de Standard::GroundingImpedance avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.62 HydroGeneratingUnit

Unité de production dont la machine motrice est une turbine hydraulique (par exemple, Francis, Pelton, Kaplan).

Le Tableau 118 présente tous les attributs de HydroGeneratingUnit.

Tableau 118 – Attributs de Standard::HydroGeneratingUnit

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

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Le Tableau 119 présente toutes les extrémités d'association de HydroGeneratingUnit avec d'autres classes.

Tableau 119 – Extrémités d'association de Standard::HydroGeneratingUnit avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	HydroPowerPlant	0..1	HydroPowerPlant	L'unité de production hydraulique appartient à une centrale hydroélectrique.
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.63 HydroPowerPlant

Centrale hydroélectrique de production ou de pompage. Pour la production, les turbines génératrices reçoivent l'eau d'un réservoir supérieur. Pour le pompage, les pompes reçoivent l'eau d'un réservoir inférieur.

Le Tableau 120 présente tous les attributs de HydroPowerPlant.

Tableau 120 – Attributs de Standard::HydroPowerPlant

nom	mult	type	description
hydroPlantStorageType	0..1	HydroPlantStorageKind	Type de stockage d'eau dans une centrale hydroélectrique.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 121 présente toutes les extrémités d'association de HydroPowerPlant avec d'autres classes.

Tableau 121 – Extrémités d'association de Standard::HydroPowerPlant avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..1	HydroPumps	0..*	HydroPump	La pompe hydraulique peut être un membre de la centrale d'accumulation par pompage ou une pompe de distribution d'eau.
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

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6.3.2.64 HydroPump

Pompe synchrone entraînée par moteur, généralement associée à une centrale de pompage.

Le Tableau 122 présente tous les attributs de HydroPump.

Tableau 122 – Attributs de Standard::HydroPump

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 123 présente toutes les extrémités d'association de HydroPump avec d'autres classes.

Tableau 123 – Extrémités d'association de Standard::HydroPump avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	HydroPowerPlant	0..1	HydroPowerPlant	La pompe hydraulique peut être un membre de la centrale d'accumulation par pompage ou une pompe de distribution d'eau.
0..1	RotatingMachine	1..1	RotatingMachine	La machine synchrone entraîne la turbine qui déplace l'eau de bas en haut. Le sens de rotation de la machine pour le pompage peut ou peut ne pas être identique à celui utilisé pour la production.
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

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6.3.2.65 (extrait) classe racine IdentifiedObject

Il s'agit d'une classe racine qui fournit une identification commune pour toutes les classes nécessitant des attributs d'identification et de dénomination.

Le Tableau 124 présente tous les attributs de IdentifiedObject.

Tableau 124 – Attributs de Standard::IdentifiedObject

nom	mult	type	description
name	0..1	String	Le nom est un texte lisible par l'homme et, si possible, non unique, qui nomme l'objet.
aliasName	0..1	String	L'aliasName est un nom de l'objet en texte lisible par l'homme en remplacement de IdentifiedObject.name. Elle peut ne pas être unique et peut ne pas se corréler à une hiérarchie de dénomination. L'attribut aliasName a été retenu parce qu'il est compatible avec les précédentes versions du CIM. Il est cependant recommandé de remplacer aliasName par la classe Name puisqu'il est prévu de supprimer aliasName à l'avenir.
description	0..1	String	La description est un texte lisible par l'homme qui décrit ou nomme l'objet. Elle peut ne pas être unique et peut ne pas se corréler à une hiérarchie de dénomination.
mRID	0..1	String	Identificateur Master resource publié par une autorité de modèle. Le mRID (identificateur Master resource) est globalement unique dans un contexte d'échange. Il est facile d'obtenir une unicité globale en utilisant un UUID tel que spécifié dans la RFC 4122 pour le mRID. L'utilisation d'un UUID est fortement recommandée. Pour des fichiers de données CIMXML en syntaxe RDF, conformément à l'IEC 61970-552 Edition 1, le mRID est mis en correspondance avec les attributs rdf:ID ou rdf:about qui identifient les éléments d'objet du CIM.

6.3.2.66 Jumper

Courte section de conducteur avec une impédance négligeable pouvant être enlevée et remplacée manuellement si le circuit n'est plus alimenté. Noter que les branches à impédance nulle peuvent être potentiellement modélisées par un ACLineSegment avec un ConductorType à impédance nulle.

Le Tableau 125 présente tous les attributs de Jumper.

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Tableau 125 – Attributs de Standard::Jumper

nom	mult	type	description
normalOpen	1..1	Boolean	hérité de: Switch
locked	0..1	Boolean	hérité de: Switch
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject
switchOnCount	0..1	Integer	(Déconseillé) hérité de: Switch
switchOnDate	0..1	DateTime	(Déconseillé) hérité de: Switch

Le Tableau 126 présente toutes les extrémités d'association de Jumper avec d'autres classes.

Tableau 126 – Extrémités d'association de Standard::Jumper avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.67 Junction

Point auquel un ou plusieurs équipements conducteurs sont connectés avec une résistance homopolaire.

Le Tableau 127 présente tous les attributs de Junction.

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Tableau 127 – Attributs de Standard::Junction

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 128 présente toutes les extrémités d'association de Junction avec d'autres classes.

Tableau 128 – Extrémités d'association de Standard::Junction avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.68 (extrait) Limit

Spécifie une valeur limite pour un Measurement (mesurage). Un Measurement a généralement plusieurs limites qui sont regroupées dans la classe LimitSet. La signification précise et l'usage de l'instance d'un objet Limit ne sont pas donnés par la classe Limit (c'est-à-dire, s'il s'agit d'une alarme, d'un avertissement ou bien d'une limite haute ou basse). Cependant, le nom donné à une instance de Limit peut indiquer à la fois ce qu'elle signifie et son usage.

Le Tableau 129 présente tous les attributs de Limit.

Tableau 129 – Attributs de Standard::Limit

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

6.3.2.69 (extrait) LimitSet

Spécifie un ensemble d'objets Limit qui sont associés à un objet Measurement. Un objet Measurement peut avoir plusieurs LimitSets correspondant à des conditions de changement liées aux saisons ou autres. La condition est traduite dans les attributs name et description. Le même objet LimitSet peut être partagé entre plusieurs Measurements. En particulier, les limites en pourcentage sont utilisées de cette manière.

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Le Tableau 130 présente tous les attributs de LimitSet.

Tableau 130 – Attributs de Standard::LimitSet

nom	mult	type	description
isPercentageLimits	0..1	Boolean	Indique si les valeurs limites sont données en pourcentage de normalValue (valeur normale) ou en Unit (unité) spécifiée pour Measurements et Controls.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

6.3.2.70 Line

Contient des équipements au-delà du poste appartenant à une ligne de transport d'énergie électrique.

Le Tableau 131 présente tous les attributs de Line.

Tableau 131 – Attributs de Standard::Line

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 132 présente toutes les extrémités d'association de Line avec d'autres classes.

Tableau 132 – Extrémités d'association de Standard::Line avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	FromBay	0..1	Bay	
0..*	ToBay	0..1	Bay	
0..*	Region	1..1	SubGeographicalRegion	La sous-région géographique de la ligne.
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.71 LinearShuntCompensator

Le compensateur shunt linéaire a des batteries ou des sections ayant des valeurs égales d'admittance.

Le Tableau 133 présente tous les attributs de LinearShuntCompensator.

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Tableau 133 – Attributs de Standard::LinearShuntCompensator

nom	mult	type	description
maximumSections	0..1	Integer	hérité de: ShuntCompensator
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 134 présente toutes les extrémités d'association de LinearShuntCompensator avec d'autres classes.

Tableau 134 – Extrémités d'association de Standard::LinearShuntCompensator avec d'autres classes

mult à partir de	nom	mult vers	type	description
1..*	RegulatingControl	0..1	RegulatingControl	hérité de: RegulatingCondEq
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.72 LoadArea

La classe est la racine ou le premier niveau dans une structure hiérarchique pour regrouper des charges à des fins de mise à l'échelle des charges du flux de charge.

Le Tableau 135 présente tous les attributs de LoadArea.

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Tableau 135 – Attributs de Standard::LoadArea

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

6.3.2.73 LoadBreakSwitch

Dispositif de commutation mécanique capable de produire, transporter et interrompre des courants en conditions normales de fonctionnement.

Le Tableau 136 présente tous les attributs de LoadBreakSwitch.

Tableau 136 – Attributs de Standard::LoadBreakSwitch

nom	mult	type	description
breakingCapacity	0..1	CurrentFlow	hérité de: ProtectedSwitch
normalOpen	1..1	Boolean	hérité de: Switch
locked	0..1	Boolean	hérité de: Switch
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject
switchOnCount	0..1	Integer	(Déconseillé) hérité de: Switch
switchOnDate	0..1	DateTime	(Déconseillé) hérité de: Switch

Le Tableau 137 présente toutes les extrémités d'association de LoadBreakSwitch avec d'autres classes.

Tableau 137 – Extrémités d'association de Standard::LoadBreakSwitch avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

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6.3.2.74 (extrait) LoadGroup

La classe est le troisième niveau dans une structure hiérarchique pour regrouper des charges à des fins de mise à l'échelle des charges du flux de charge.

Le Tableau 138 présente tous les attributs de LoadGroup.

Tableau 138 – Attributs de Standard::LoadGroup

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 139 présente toutes les extrémités d'association de LoadGroup avec d'autres classes.

Tableau 139 – Extrémités d'association de Standard::LoadGroup avec d'autres classes

mult à partir de	nom	mult vers	type	description
1..*	SubLoadArea	1..1	SubLoadArea	SubLoadArea à laquelle le Loadgroup appartient.

6.3.2.75 (extrait) Measurement

Un objet Measurement représente n'importe quelle grandeur mesurée, calculée ou non mesurée non calculée. N'importe quel équipement peut contenir des Measurements, par exemple: un poste peut avoir des mesures de température et des indicateurs d'ouverture de porte, un transformateur peut avoir un mesurage de la température d'huile et de la pression de la cuve, une cellule peut contenir un certain nombre de Measurements de flux de puissance ("powerflow") et un Breaker (disjoncteur) peut contenir un mesurage de la position du commutateur.

L'association PSR (*power system resource* – ressource de système de puissance) – Measurement est destinée à traduire cet usage de Measurement et est incluse dans la hiérarchie de dénomination ("naming hierarchy") fondée sur EquipmentContainer. La hiérarchie de dénomination ("naming hierarchy") a généralement des Measurements comme sous-classes, par exemple Substation-VoltageLevel-Bay-Switch-Measurement.

Certains Measurements représentent des grandeurs relatives à l'emplacement particulier d'un capteur dans le réseau, par exemple un transformateur de tension (PT) sur un jeu de barres ou un transformateur de courant (CT) sur une barre entre un disjoncteur et un isolateur. La localisation du Measurement n'est pas traduite par l'association PSR–Measurement. À l'inverse, elle est traduite dans l'association Measurement–Terminal, qui est utilisée pour définir l'emplacement du capteur dans la topologie du réseau. L'emplacement est défini par le point de connexion entre la Terminal (borne) et le ConductingEquipment (équipement conducteur).

Deux chemins différents existent:

1) Measurement-Terminal- ConnectivityNode-Terminal-ConductingEquipment
2) Measurement-Terminal-ConductingEquipment

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La version 2 est la seule dont l'utilisation est admise.

Lorsque l'emplacement du capteur est nécessaire, les associations Measurement–PSR et Measurement–Terminal sont utilisées toutes les deux. L'association Measurement-Terminal n'est jamais utilisée seule.

Le Tableau 140 présente tous les attributs de Measurement.

Tableau 140 – Attributs de Standard::Measurement

nom	mult	type	description
unitSymbol	1..1	UnitSymbol	Unité de mesure de la grandeur mesurée.
measurementType	1..1	String	Spécifie le type de Measurement. Il spécifie par exemple si le Measurement représente une température intérieure, une température extérieure, la tension de barre, le flux de la ligne, etc.
phases	0..1	PhaseCode	Indique à quelles phases s'applique le Measurement et évite la nécessité d'utiliser 'measurementType' pour coder aussi les informations de phase (ce qui multiplie les types). Comme Control a des associations avec Measurement, ils peuvent gérer chaque phase. Les informations de phase dans Measurement, conjointement avec 'measurementType' et 'phaseConnection', définissent de façon unique un Measurement pour un appareil, à partir de la phase normale du réseau. Leur signification ne change pas lorsque le phasage d'excitation calculé est modifié à cause de cavaliers ou pour d'autres raisons.
unitMultiplier	1..1	UnitMultiplier	Multiplicateur d'unité de la grandeur mesurée.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 141 représente toutes les extrémités d'association de Measurement avec d'autres classes.

Tableau 141 – Extrémités d'association de Standard::Measurement avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Terminal	0..1	ACDCTerminal	Un ou plusieurs Measurements peuvent être associés à une borne du réseau.
0..*	PowerSystemResource	0..1	PowerSystemResource	Ressource du système de puissance qui contient le Measurement

6.3.2.76 (extrait) MeasurementValue

État courant d'un Measurement. La valeur de l'état est une instance d'un Measurement provenant d'une source spécifique. Les objets Measurements peuvent être associés à de nombreuses valeurs d'état, chacune représentant une source différente pour le Measurement.

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Le Tableau 142 présente tous les attributs de MeasurementValue.

Tableau 142 – Attributs de Standard::MeasurementValue

nom	mult	type	description
timeStamp	0..1	DateTime	Date et heure de la dernière mise à jour de la valeur
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 143 représente toutes les extrémités d'association de MeasurementValue avec d'autres classes.

Tableau 143 – Extrémités d'association de Standard::MeasurementValue avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	MeasurementValueSource	1..1	MeasurementValueSource	Référence au type de source qui met à jour la valeur de mesure (MeasurementValue), par exemple SCADA, CCLink, manuelle, etc. Les conventions d'utilisateur pour les noms des sources sont contenues dans l'introduction à l'IEC 61970-301.

6.3.2.77 MeasurementValueSource

MeasurementValueSource décrit les sources alternatives pour mettre à jour une MeasurementValue. Les conventions d'utilisateur sur la manière d'utiliser les attributs de MeasurementValueSource sont décrites dans l'introduction à l'IEC 61970-301.

Le Tableau 144 présente tous les attributs de MeasurementValueSource.

Tableau 144 – Attributs de Standard::MeasurementValueSource

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

6.3.2.78 Classe racine Name

La classe Name fournit les moyens de définir un nombre quelconque de noms lisibles par l'homme pour un objet. Un nom ne doit pas être utilisé pour définir des relations entre objets. Utiliser plutôt l'identification d'objet 'mRID' pour les relations entre objets.

Le Tableau 145 présente tous les attributs de Name.

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Tableau 145 – Attributs de Standard::Name

nom	mult	type	description
name	1..1	String	Tout texte libre qui désigne l'objet.

Le Tableau 146 présente toutes les extrémités d'association de Name avec d'autres classes.

Tableau 146 – Extrémités d'association de Standard::Name avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	IdentifiedObject	1..1	IdentifiedObject	Objet identifié que désigne ce nom.
0..*	NameType	1..1	NameType	Type de ce nom.

6.3.2.79 Classe racine NameType

Type de nom. Les valeurs possibles pour l'attribut 'name' dépendent de la mise en œuvre mais des profils normatifs peuvent spécifier des types. Une entreprise peut avoir plusieurs systèmes informatiques dont chacun a son propre nom local pour le même objet, par exemple un système de planification peut utiliser d'autres noms qu'un système de gestion de l'énergie (EMS - *energy management system*). Un objet peut aussi avoir des noms différents dans le même système informatique, par exemple localName tel que le définit le CIM version 14. La définition du CIM14 est

Le localName (nom local) est un nom de l'objet lisible par l'homme. Il n'est utilisé qu'avec les objets organisés dans une hiérarchie de dénomination. localName: C'est un nom en texte libre se trouvant à un nœud dans une hiérarchie de dénomination similaire à une structure de répertoire de fichiers. Une hiérarchie de dénomination relative à un système de puissance peut être la suivante: Substation, VoltageLevel, Equipment etc. Dans une telle hiérarchie, les enfants du même parent ont des noms qui sont généralement uniques les uns par rapport aux autres. aliasName: Un nom alternatif en texte libre typiquement utilisé dans les rapports tabulaires dans lesquels la largeur des colonnes est limitée.

Le Tableau 147 présente tous les attributs de NameType.

Tableau 147 – Attributs de Standard::NameType

nom	mult	type	description
name	1..1	String	Nom du type de nom.
description	0..1	String	Description du type de nom.

Le Tableau 148 présente toutes les extrémités d'association de NameType avec d'autres classes.

Tableau 148 – Extrémités d'association de Standard:: NameType avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	NameTypeAuthority	0..1	NameTypeAuthority	Autorité responsable de la gestion des noms de ce type.

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6.3.2.80 Classe racine NameTypeAuthority

Autorité responsable de créer et de gérer les noms d'un type donné. Il s'agit en général d'une organisation ou d'un système d'entreprise.

Le Tableau 149 présente tous les attributs de NameTypeAuthority.

Tableau 149 – Attributs de Standard::NameTypeAuthority

nom	mult	type	description
name	1..1	String	Nom de l'autorité pour le type de nom.
description	0..1	String	Description de l'autorité pour le type de nom.

6.3.2.81 NonConformLoad

Les charges non conformes NonConformLoad représentent des charges qui ne suivent pas un profil de variation quotidienne de charge et les variations ne sont pas corrélées au profil de variation de charge quotidienne.

Le Tableau 150 présente tous les attributs de NonConformLoad.

Tableau 150 – Attributs de Standard::NonConformLoad

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 151 présente toutes les extrémités d'association de NonConformLoad avec d'autres classes.

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Tableau 151 – Extrémités d'association de Standard::NonConformLoad avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	LoadGroup	0..1	NonConformLoadGroup	Groupe de cette ConformLoad.
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.82 NonConformLoadGroup

Charges qui ne suivent pas un profil de variation quotidienne et saisonnière de charge.

Le Tableau 152 présente tous les attributs de NonConformLoadGroup.

Tableau 152 – Attributs de Standard::NonConformLoadGroup

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 153 présente toutes les extrémités d'association de NonConformLoadGroup avec d'autres classes.

Tableau 153 – Extrémités d'association de Standard::NonConformLoadGroup avec d'autres classes

mult à partir de	nom	mult vers	type	description
1..*	SubLoadArea	1..1	SubLoadArea	hérité de: LoadGroup

6.3.2.83 NonConformLoadSchedule

Programme (courbes) de puissance active (axe Y1) et de puissance réactive (axe Y2) en fonction du temps (axe X) pour les charges non conformes, par exemple charge industrielle significative ou utilisation de centrale électrique (si modélisée).

Le Tableau 154 présente tous les attributs de NonConformLoadSchedule.

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Tableau 154 – Attributs de Standard::NonConformLoadSchedule

nom	mult	type	description
timeStep	0..1	Seconds	hérité de: RegularIntervalSchedule
endTime	0..1	DateTime	hérité de: RegularIntervalSchedule
value2Unit	0..1	UnitSymbol	hérité de: BasicIntervalSchedule
startTime	1..1	DateTime	hérité de: BasicIntervalSchedule
value1Unit	1..1	UnitSymbol	hérité de: BasicIntervalSchedule
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 155 présente toutes les extrémités d'association de NonConformLoadSchedule avec d'autres classes.

Tableau 155 – Extrémités d'association de Standard::NonConformLoadSchedule avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	NonConformLoadGroup	1..1	NonConformLoadGroup	NonConformLoadGroup auquel le NonConformLoadSchedule appartient.
0..*	DayType	1..1	DayType	hérité de: SeasonDayTypeSchedule
0..*	Season	1..1	Season	hérité de: SeasonDayTypeSchedule

6.3.2.84 NonlinearShuntCompensator

Un compensateur shunt non linéaire a des valeurs d'admittance de batterie ou de section qui diffèrent.

Le Tableau 156 présente tous les attributs de NonlinearShuntCompensator.

Tableau 156 – Attributs de Standard::NonlinearShuntCompensator

nom	mult	type	description
maximumSections	0..1	Integer	hérité de: ShuntCompensator
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

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Le Tableau 157 présente toutes les extrémités d'association de NonlinearShuntCompensator avec d'autres classes.

Tableau 157 – Extrémités d'association de Standard::NonlinearShuntCompensator avec d'autres classes

mult à partir de	nom	mult vers	type	description
1..*	RegulatingControl	0..1	RegulatingControl	hérité de: RegulatingCondEq
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.85 (extrait) classe racine OperatingParticipant

Opérateur de plusieurs objets de ressources de systèmes de puissance. Noter que plusieurs participants opérateurs peuvent exploiter le même objet de ressource de système de puissance. Cela peut être utilisé pour modéliser des unités détenues en copropriété dans lesquelles chaque propriétaire agit selon une quote-part contractuelle.

6.3.2.86 Classe racine OperatingShare

Spécifie les relations contractuelles d'exploitation entre une ressource de système de puissance et un participant au contrat.

Le Tableau 158 présente tous les attributs de OperatingShare.

Tableau 158 – Attributs de Standard::OperatingShare

nom	mult	type	description
percentage	0..1	PerCent	Pourcentage de possession opérationnelle de la paire (ressource de système de puissance et participant opérateur) associée à cette quotepart. Il convient que la possession totale en pourcentage d'une ressource de système de puissance soit égale à 100 %.

Le Tableau 159 présente toutes les extrémités d'association de OperatingShare avec d'autres classes.

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Tableau 159 – Extrémités d'association de Standard::OperatingShare avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	OperatingParticipant	1..1	OperatingParticipant	Participant opérateur qui a cette quotepart avec la ressource de système de puissance associée.
0..*	PowerSystemResource	1..1	PowerSystemResource	Ressource de système de puissance à laquelle s'applique cette quote-part.

6.3.2.87 (extrait) OperationalLimit

Valeur associée à une sorte spécifique de limite.

L'attribut de valeur de sous-classe doit être positif.

L'attribut de valeur de sous-classe est inversement proportionnel à OperationalLimitType.acceptableDuration (acceptableDuration en abrégé). value_x et acceptableDuration_x sont reliés l'un à l'autre comme suit:

– si value_1 > value_2 > value_3 >... alors
– acceptableDuration_1 < acceptableDuration_2 < acceptableDuration_3 < ...

Une valeur value_x avec direction="high" doit être supérieure à une valeur value_y avec direction="low".

Le Tableau 160 présente tous les attributs de OperationalLimit.

Tableau 160 – Attributs de Standard::OperationalLimit

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 161 présente toutes les extrémités d'association de OperationalLimit avec d'autres classes.

Tableau 161 – Extrémités d'association de Standard::OperationalLimit avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	OperationalLimitType	0..1	OperationalLimitType	Le type de limite associé à cette limite.
0..*	OperationalLimitSet	1..1	OperationalLimitSet	Jeu de limites auquel les valeurs limites appartiennent.

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6.3.2.88 OperationalLimitSet

Jeu de limites associées à un équipement. Les jeux de limites peuvent s'appliquer à une température spécifique, ou à une saison, par exemple. Un jeu de limites peut contenir des sévérités différentes pour les niveaux limites qui s'appliquent au même équipement. Le jeu peut contenir des limites de types différents telles que limites de puissance apparente et limites de courant ou bien limites de tension haute et basse qui sont logiquement appliquées ensemble comme un jeu.

Le Tableau 162 présente tous les attributs de OperationalLimitSet.

Tableau 162 – Attributs de Standard::OperationalLimitSet

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 163 présente toutes les extrémités d'association de OperationalLimitSet avec d'autres classes.

Tableau 163 – Extrémités d'association de Standard::OperationalLimitSet avec d'autres classes

mult à partir de	nom	mult vers	type	description
1..*	RateTemperature	0..1	RateTemperature	Une température assignée peut être associée à un jeu de limites.
0..*	Terminal	0..1	ACDCTerminal	
0..*	Equipment	0..1	Equipment	Équipement auquel le jeu de limites s'applique.

6.3.2.89 OperationalLimitType

Signification opérationnelle d'une catégorie de limites.

Le Tableau 164 présente tous les attributs de OperationalLimitType.

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Tableau 164 – Attributs de Standard::OperationalLimitType

nom	mult	type	description
acceptableDuration	0..1	Seconds	Durée acceptable nominale de la limite. Les limites sont communément exprimées en matière de limites temporelles pour lesquelles la limite est normalement acceptable. La durée acceptable réelle d'une limite spécifique peut dépendre d'autres facteurs locaux tels que la température ou la vitesse du vent.
direction	0..1	OperationalLimitDirectionKind	Sens de la limite.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 165 présente toutes les extrémités d'association de OperationalLimitType avec d'autres classes.

Tableau 165 – Extrémités d'association de Standard::OperationalLimitType avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..1	OperationalLimit	0..*	OperationalLimit	Limites opérationnelles associées à ce type de limite.

6.3.2.90 (extrait) classe racine PerLengthImpedance

Type commun pour des catalogues électriques d'impédance par unité de longueur.

6.3.2.91 PetersenCoil

Appareil à impédance accordable normalement utilisé pour décaler le chargement de la ligne au cours des défauts uniques de la ligne dans une section non mise à la terre du réseau.

Le Tableau 166 présente tous les attributs de PetersenCoil.

Tableau 166 – Attributs de Standard::PetersenCoil

nom	mult	type	description
mode	0..1	PetersenCoilModeKind	Mode de fonctionnement de la bobine Petersen.
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

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Le Tableau 167 présente toutes les extrémités d'association de PetersenCoil avec d'autres classes.

Tableau 167 – Extrémités d'association de Standard::PetersenCoil avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.92 ProtectionEquipment

Appareil électrique visant à répondre de façon déterminée aux conditions d'entrée à condition de remplir les conditions spécifiées entraînant une opération de contact ou une modification extrême équivalente dans les circuits de commande électrique associés, ou visant simplement à afficher la condition détectée. Les équipements de protection sont associés à l'équipement conducteur et font généralement fonctionner les disjoncteurs.

Le Tableau 168 présente tous les attributs de ProtectionEquipment.

Tableau 168 – Attributs de Standard::ProtectionEquipment

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

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Le Tableau 169 présente toutes les extrémités d'association de ProtectionEquipment avec d'autres classes.

Tableau 169 – Extrémités d'association de Standard::ProtectionEquipment avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	ProtectedSwitches	0..*	ProtectedSwitch	Commutateurs protégés actionnés par ce ProtectionEquipment (équipement de protection).
0..*	ConductingEquipments	0..*	ConductingEquipment	L'équipement de protection peut être utilisé pour protéger un équipement conducteur spécifique.
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.93 PSRType

Instances de classification de la même classe, par exemple, ACLineSegments (segments de ligne en courant alternatif) aériens et souterrains. Ce mécanisme de classification est destiné à procurer de la flexibilité au-delà du domaine de la présente norme, c'est-à-dire à apporter une personnalisation qui n'est pas dans la norme.

Le Tableau 170 présente tous les attributs de PSRType.

Tableau 170 – Attributs de Standard::PSRType

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

6.3.2.94 PostLineSensor

Capteur principalement utilisé dans les réseaux de distribution aériens pour mesurer à la fois le courant et la tension.

Le Tableau 171 présente tous les attributs de PostLineSensor.

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Tableau 171 – Attributs de Standard::PostLineSensor

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 172 présente toutes les extrémités d'association de PostLineSensor avec d'autres classes.

Tableau 172 – Extrémités d'association de Standard::PostLineSensor avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Terminal	1..1	Terminal	hérité de: AuxiliaryEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.95 PotentialTransformer

Transformateur de mesure (également appelé "Transformateur de tension") utilisé pour mesurer des qualités électriques du circuit qui est protégé et/ou surveillé. Généralement utilisé comme transducteur de tension à des fins de comptage ou de protection, ou parfois comme alimentation de poste auxiliaire. Une valeur assignée type de la tension secondaire est de 120 V.

Le Tableau 173 présente tous les attributs de PotentialTransformer.

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Tableau 173 – Attributs de Standard::PotentialTransformer

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 174 présente toutes les extrémités d'association de PotentialTransformer avec d'autres classes.

Tableau 174 – Extrémités d'association de Standard::PotentialTransformer avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Terminal	1..1	Terminal	hérité de: AuxiliaryEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.96 (extrait) PowerSystemResource

Une ressource de système de puissance peut être un équipement tel qu'un Switch, un EquipmentContainer contenant de nombreux équipements individuels tel qu'un Substation ou une entité opérationnelle telle qu'une Company ou SubControlArea. Cela permet la collecte de PowerSystemResources dans d'autres PowerSystemResources. Par exemple, un Switch peut être membre d'un Substation et un Substation peut être membre d'une division d'une Company.

Le Tableau 175 présente tous les attributs de PowerSystemResource.

Tableau 175 – Attributs de Standard::PowerSystemResource

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 176 présente toutes les extrémités d'association de PowerSystemResource avec d'autres classes.

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Tableau 176 – Extrémités d'association de Standard::PowerSystemResource avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	AssetDatasheet	0..1	AssetInfo	Informations de la fiche technique de cette ressource de système de puissance.
0..*	PSRType	0..1	PSRType	Classification personnalisée de cette ressource de système de puissance.

6.3.2.97 PowerTransformer

Appareil électrique constitué de deux enroulements couplés ou plus, avec ou sans noyau magnétique, destiné à introduire un couplage mutuel entre les circuits électriques. Les transformateurs peuvent être utilisés pour commander la tension et le déplacement de phase (flux de puissance active).

Un transformateur de puissance peut être composé de cuves distinctes de transformateur qui ne sont pas nécessairement identiques.

Un même transformateur de puissance peut être modélisé avec ou sans cuve:

1) Le transformateur de puissance qui utilise des extrémités directement (sans cuve) est approprié aux modèles équilibrés triphasés. Cela est typique pour la modélisation de réseau de transfert et de sous-transfert. Un tel transformateur doit avoir une extrémité à chaque enroulement physique. Il doit y avoir une association entre PowerTransformerEnd et Core::Terminal.
2) Le transformateur de puissance qui utilise des cuves est adapté à un transformateur non équilibré, à un transformateur équilibré dans une cuve unique, ou un transformateur équilibré constitué de trois cuves. Cela est typique pour une modélisation de réseau de distribution et est le seul choix lors de la modélisation d'un transformateur non équilibré, ou un transformateur qui possède plus de trois enroulements. Le transformateur de puissance modélisé avec des cuves doit avoir pour chaque cuve une extrémité de cuve par enroulement physique. Il peut y avoir une, deux ou trois phases dans l'extrémité de la cuve du transformateur. Exemples: Trois phases pour les enroulements triphasés connectés en étoile ou en triangle, deux phases pour les enroulements entre phases, et une phase pour un enroulement phase-neutre ou phase-terre. Avec une ou deux phases, plus d'une extrémité de cuve de transformateur peut être associée à la même instance triphasée Core::Terminal, tandis qu'avec trois phases, il convient d'avoir une association une à une.

Ce modèle de transformateur de puissance est flexible afin de soutenir différents types d'exigences d'échange de données. Il existe cinq façons différentes de combiner des classes disponibles et leurs attributs:

1) Paramètres d'instance – Utiliser les attributs r, x, r0, x0, b, b0, g, et g0 sur PowerTransformerEnd et ignorer TransformerStarImpedance, TransformerMeshImpedance, ou TransformerCoreAdmittance relatifs. Cette option prend pour hypothèse une connexion en étoile des impédances en série. Elle est adaptée au transfert typique, aux modèles de transformateurs triphasés équilibrés, aux transformateurs possédant deux ou trois enroulements.
2) Paramètres d'instance en étoile par association – À la place des attributs r, x, r0, x0, b, b0, g, et g0, utiliser les associations de TransformerStarImpedance et TransformerCoreAdmitance. Cette option est adaptée à des scénarios identiques à l'option 1, lorsque les données de catalogue sont disponibles pour les transformateurs.

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3) Paramètres d'instance en maille par association: À la place des attributs r, x, r0, x0, b, b0, g, et g0, utiliser les associations de TransformerMeshImpedance et TransformerCoreAdmittance. Cette option soutient les transformateurs possédant plus de trois enroulements.

4) Paramètres en maille de catalogue par association – À la place des attributs r, x, r0, x0, b, b0, g, et g0 et des associations de TransformerStarImpedance, TransformerMeshImpedance, ou TransformerCoreAdmittance, utiliser les associations de TransformerEndInfo. Il convient que le TransformerEnd.endNumber corresponde au TransformerEndInfo.endNumber correspondant, en suivant la norme de convention de numérotation de l'IEC, des extrémités de tension les plus élevées aux plus basses, en commençant à 1. Cette correspondance soutient l'utilisation à haut niveau du catalogue, par l'intermédiaire d'une seule association entre TransformerTank et TransformerTankInfo, avec des échanges plus simples et des mises à jour graduelles. Le TransformerEndInfo associé possède des associations de TransformerMeshImpedance et TransformerCoreAdmittance. Cette option soutient le transformateur non équilibré possédant plus de trois enroulements et est adaptée lorsque les données d'essai du transformateur ont été converties en modèle électrique.

5) Données d'essai du catalogue par association - Cette option est identique à l'option 4, sauf que TransformerEndInfo possède des associations vers les descendants de AssetModels::TransformerTest, à la place de TransformerMeshImpedance et de TransformerCoreAdmittance. Cette option est adaptée lorsque les données d'essai sont disponibles, et l'application réceptrice est capable d'interpréter les données d'essai.

Il convient que chaque profil spécifie quelles options sont supportées.

Le Tableau 177 présente tous les attributs de PowerTransformer.

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Tableau 177 – Attributs de Standard::PowerTransformer

nom	mult	type	description
vectorGroup	0..1	String	Groupe vectoriel du transformateur pour le relayage protecteur, par exemple Dyn1. Pour les transformateurs déséquilibrés, cela peut ne pas être déterminé simplement à partir des connexions constitutives d'enroulements et des déplacements d'angle de phase. La chaîne vectorGroup comporte les composants suivants dans l'ordre de l'énumération: connexion d'enroulement haute tension, connexion d'enroulement moyenne tension (pour des transformateurs à trois enroulements), numéro de position de déphasage de 0 à 11, connexion d'enroulement basse tension numéro de position de déphasage de 0 à 11 (position d'horloge). Les connexions d'enroulement sont D (triangle), Y (étoile), YN (étoile avec neutre), Z (zigzag), ZN (zigzag avec neutre), A (autotransformateur). Les majuscules indiquent la haute tension, les minuscules la basse ou moyenne tension. L'enroulement haute tension a toujours pour position 0. Il n'est pas compris dans la chaîne de groupe vectoriel. Quelques exemples: YNy0 (deux enroulements étoile à étoile, sans déphasage), YNd11 (deux enroulements étoile à triangle avec un déphasage de 330 degrés), YNyn0d5 (trois enroulements transformateurs étoile à haute tension neutre, étoile à moyenne tension neutre sans déphasage, triangle basse tension à déphasage de 150 degrés). Le déphasage est défini comme l'écart angulaire entre les phaseurs représentant les tensions entre le point neutre (réel ou fictif) et les bornes homologues de deux enroulements lorsqu'un système de tension direct est appliqué aux bornes de l'enroulement à haute tension dans l'ordre de séquence alphabétique de ces bornes si elles sont repérées par des lettres, ou dans leur ordre de séquence numérique si elles sont repérées par des chiffres: les phaseurs sont réputés tourner en sens inverse des aiguilles d'une montre.
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

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Le Tableau 178 présente toutes les extrémités d'association de PowerTransformer avec d'autres classes.

Tableau 178 – Extrémités d'association de Standard::PowerTransformer avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.98 PowerTransformerEnd

Un PowerTransformerEnd est associé à chaque Terminal d'un PowerTransformer.

Les valeurs d'impédance r, r0, x et x0 d'une PowerTransformerEnd représentent un équivalent étoile de la manière suivante:

1) Pour un PowerTransformer à deux Terminals (bornes), le PowerTransformerEnd haute tension a des valeurs non nulles pour r, r0, x et x0 tandis que le PowerTransformerEnd basse tension a des valeurs nulles pour r, r0, x et x0.
2) Pour un PowerTransformer à trois Terminals (bornes), les trois PowerTransformerEnds représentent un équivalent étoile dont chaque branche de l'étoile est représentée par r, r0, x et des valeurs x0.
3) Pour un PowerTransformer à plus de trois Terminals (bornes), les valeurs d'impédance de PowerTransformerEnd ne peuvent pas être utilisées. Utiliser dans ce cas TransformerMeshImpedance ou diviser le transformateur en plusieurs PowerTransformers.

Le Tableau 179 présente tous les attributs de PowerTransformerEnd.

Tableau 179 – Attributs de Standard::PowerTransformerEnd

nom	mult	type	description
endNumber	1..1	Integer	hérité de: TransformerEnd
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 180 présente toutes les extrémités d'association de PowerTransformerEnd avec d'autres classes.

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Tableau 180 – Extrémités d'association de Standard::PowerTransformerEnd avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	PowerTransformer	1..1	PowerTransformer	Transformateur de puissance de cette extrémité de transformateur de puissance.
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: TransformerEnd
0..*	Terminal	1..1	Terminal	hérité de: TransformerEnd

6.3.2.99 (extrait) ProtectedSwitch

Un ProtectedSwitch (commutateur protégé) est un dispositif de commutation qui peut être actionné par un ProtectionEquipment (équipement de protection).

Le Tableau 181 présente tous les attributs de ProtectedSwitch.

Tableau 181 – Attributs de Standard::ProtectedSwitch

nom	mult	type	description
breakingCapacity	0..1	CurrentFlow	Courant de défaut maximal auquel un dispositif de coupure peut fonctionner en toute sécurité dans les conditions d'utilisation spécifiées.
normalOpen	1..1	Boolean	hérité de: Switch
locked	0..1	Boolean	hérité de: Switch
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject
switchOnCount	0..1	Integer	(Déconseillé) hérité de: Switch
switchOnDate	0..1	DateTime	(Déconseillé) hérité de: Switch

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Le Tableau 182 présente toutes les extrémités d'association de ProtectedSwitch avec d'autres classes.

Tableau 182 – Extrémités d'association de Standard::ProtectedSwitch avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.100 PSREvent

Événement qui enregistre les modifications du statut opérationnel d'une ressource de système de puissance; peut servir pour un événement qui s'est déjà produit ou pour une activité planifiée.

Le Tableau 183 présente tous les attributs de PSREvent.

Tableau 183 – Attributs de Standard::PSREvent

nom	mult	type	description
kind	0..1	PSREventKind	Type d'événement.
status	0..1	Status	hérité de: ActivityRecord
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 184 présente toutes les extrémités d'association de PSREvent avec d'autres classes.

Tableau 184 – Extrémités d'association de Standard::PSREvent avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	PowerSystemResource	1..1	PowerSystemResource	Ressource de système de puissance ayant généré cet événement.

6.3.2.101 RaiseLowerCommand

Commande analogique qui augmente ou diminue une valeur de point de consigne avec des impulsions.

Le Tableau 185 présente tous les attributs de RaiseLowerCommand.

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Tableau 185 – Attributs de Standard::RaiseLowerCommand

nom	mult	type	description
minValue	0..1	Float	hérité de: AnalogControl
maxValue	0..1	Float	hérité de: AnalogControl
unitSymbol	0..1	UnitSymbol	hérité de: Control
controlType	0..1	String	hérité de: Control
operationInProgress	0..1	Boolean	hérité de: Control
timeStamp	0..1	DateTime	hérité de: Control
unitMultiplier	0..1	UnitMultiplier	hérité de: Control
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 186 présente toutes les extrémités d'association de RaiseLowerCommand avec d'autres classes.

Tableau 186 – Extrémités d'association de Standard::RaiseLowerCommand avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	ValueAliasSet	0..1	ValueAliasSet	ValueAliasSet utilisé pour traduire une valeur de Control en un nom.
0..1	AnalogValue	1..1	AnalogValue	hérité de: AnalogControl
0..*	PowerSystemResource	0..1	PowerSystemResource	hérité de: Control

6.3.2.102 RatioTapChanger

Changeur de prises qui change le rapport de tensions ayant un impact sur la valeur de la tension, mais pas sur l'angle de phase aux bornes du transformateur.

Le Tableau 187 présente tous les attributs de RatioTapChanger.

Tableau 187 – Attributs de Standard::RatioTapChanger

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 188 présente toutes les extrémités d'association de RatioTapChanger avec d'autres classes.

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Tableau 188 – Extrémités d'association de Standard::RatioTapChanger avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..1	TransformerEnd	1..1	TransformerEnd	Extrémité de transformateur à laquelle appartient ce changeur de rapport de prise
0..*	TapChangerControl	0..1	TapChangerControl	hérité de: TapChanger
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.103 Recloser

Interrupteur de défaut monté sur poteau, à relais intégrés de phase et de mise à la terre, transformateur de courant (CT) et commandes supplémentaires.

Le Tableau 189 présente tous les attributs de Recloser.

Tableau 189 – Attributs de Standard::Recloser

nom	mult	type	description
breakingCapacity	0..1	CurrentFlow	hérité de: ProtectedSwitch
normalOpen	1..1	Boolean	hérité de: Switch
locked	0..1	Boolean	hérité de: Switch
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject
switchOnCount	0..1	Integer	(Déconseillé) hérité de: Switch
switchOnDate	0..1	DateTime	(Déconseillé) hérité de: Switch

Le Tableau 190 présente toutes les extrémités d'association de Recloser avec d'autres classes.

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Tableau 190 – Extrémités d'association de Standard::Recloser avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.104 (extrait) RegularIntervalSchedule

Le programme comporte plusieurs instants entre lesquels le temps est constant.

Le Tableau 191 présente tous les attributs de RegularIntervalSchedule.

Tableau 191 – Attributs de Standard::RegularIntervalSchedule

nom	mult	type	description
timeStep	0..1	Seconds	Temps entre chaque paire d'instants réguliers ultérieurs, en ordre séquentiel.
endTime	0..1	DateTime	Heure du dernier instant (Time Point).
value2Unit	0..1	UnitSymbol	hérité de: BasicIntervalSchedule
startTime	1..1	DateTime	hérité de: BasicIntervalSchedule
value1Unit	1..1	UnitSymbol	hérité de: BasicIntervalSchedule
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

6.3.2.105 Classe racine RegularTimePoint

Instant pour un programme, l'intervalle de temps entre les instants consécutifs étant constant.

Le Tableau 192 présente tous les attributs de RegularTimePoint.

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Tableau 192 – Attributs de Standard::RegularTimePoint

nom	mult	type	description
value2	0..1	Float	Deuxième valeur au temps indiqué. La signification de cette valeur est définie par le type dérivé du programme associé.
sequenceNumber	0..1	Integer	Position du RegularTimePoint dans cette séquence. Noter que les Time Point ne doivent pas nécessairement être séquentiels, c'est-à-dire que des Time Point peuvent être omis. La durée réelle pour un RegularTimePoint est calculée en multipliant le pas de temps associé du programme à intervalle régulier par le numéro d'ordre de l'instant de l'intervalle régulier et en ajoutant l'heure de départ des programmes associés.
value1	0..1	Float	Première valeur au temps indiqué. La signification de cette valeur est définie par le type dérivé du programme associé.

Le Tableau 193 présente toutes les extrémités d'association de RegularTimePoint avec d'autres classes.

Tableau 193 – Extrémités d'association de Standard::RegularTimePoint avec d'autres classes

mult à partir de	nom	mult vers	type	description
1..*	IntervalSchedule	1..1	RegularIntervalSchedule	Programme d'intervalle régulier contenant cet instant.

6.3.2.106 (extrait) RegulatingCondEq

Type d'équipement conducteur qui peut réguler une grandeur (c'est-à-dire une tension ou un flux) en un point spécifique du réseau.

Le Tableau 194 présente tous les attributs de RegulatingCondEq.

Tableau 194 – Attributs de Standard::RegulatingCondEq

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 195 présente toutes les extrémités d'association de RegulatingCondEq avec d'autres classes.

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Tableau 195 – Extrémités d'association de Standard::RegulatingCondEq avec d'autres classes

mult à partir de	nom	mult vers	type	description
1..*	RegulatingControl	0..1	RegulatingControl	Plan de commande de régulation auquel cet équipement participe.
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.107 RegulatingControl

Spécifie un ensemble d'équipements qui fonctionnent ensemble pour réguler une grandeur de système de puissance telle que la tension ou le flux.

Il est possible de régler la tension du bus à distance en spécifiant la borne commandée située à un emplacement éloigné de l'équipement de commande.

En cas d'équipements multiples, de différents types, qui commandent la même borne, il ne doit y avoir qu'une seule RegulatingControl (commande de régulation) à chaque borne. Le sous-type le plus spécifique de RegulatingControl doit être utilisé lorsque de tels équipements participent à la commande, par exemple TapChangerControl pour les changeurs de prises.

La convention de signe charge est utilisée pour la commande du flux, c'est-à-dire que le signe positif signifie un flux à partir d'un TopologicalNode (bus) vers l'équipement conducteur.

Le Tableau 196 présente tous les attributs de RegulatingControl.

Tableau 196 – Attributs de Standard::RegulatingControl

nom	mult	type	description
mode	0..1	RegulatingControlModeKind	Mode de commande de régulation actuellement disponible. La présente spécification permet de déterminer le genre de régulation sans la nécessité d'obtenir les unités à partir d'un programme.
maxAllowedTargetValue	0..1	Float	Valeur cible maximale permise (RegulatingControl.targetValue).
minAllowedTargetValue	0..1	Float	Valeur cible minimale permise (RegulatingControl.targetValue).
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 197 présente toutes les extrémités d'association de RegulatingControl avec d'autres classes.

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Tableau 197 – Extrémités d'association de Standard::RegulatingControl avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Terminal	0..1	Terminal	Borne associée à cette commande de régulation. La borne est associée au lieu d'un nœud, puisque la borne peut êtreconnectée soit à un nœud topologique ou à un nœud de connectivité. Il est quelquefois utile de modéliser la régulation à une borne d'un objet jeu de barres.
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.108 RegulationSchedule

Modèle prédéfini sur une longue durée pour une variable commandée, par exemple la tension du jeu de barres.

Le Tableau 198 présente tous les attributs de RegulationSchedule.

Tableau 198 – Attributs de Standard::RegulationSchedule

nom	mult	type	description
timeStep	0..1	Seconds	hérité de: RegularIntervalSchedule
endTime	0..1	DateTime	hérité de: RegularIntervalSchedule
value2Unit	0..1	UnitSymbol	hérité de: BasicIntervalSchedule
startTime	1..1	DateTime	hérité de: BasicIntervalSchedule
value1Unit	1..1	UnitSymbol	hérité de: BasicIntervalSchedule
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 199 présente toutes les extrémités d'association de RegulationSchedule avec d'autres classes.

Tableau 199 – Extrémités d'association de Standard::RegulationSchedule avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	RegulatingControl	1..1	RegulatingControl	Commandes de régulation qui ont ce programme.
0..*	DayType	1..1	DayType	hérité de: SeasonDayTypeSchedule
0..*	Season	1..1	Season	hérité de: SeasonDayTypeSchedule

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6.3.2.109 RemoteControl

Les commandes distantes sont des sorties envoyées par l'unité distante à des actionneurs dans le processus.

Le Tableau 200 présente tous les attributs de RemoteControl.

Tableau 200 – Attributs de Standard::RemoteControl

nom	mult	type	description
remoteControlled	0..1	Boolean	Défini sur true (vrai) si l'actionneur est commandé à distance.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 201 présente toutes les extrémités d'association de RemoteControl avec d'autres classes.

Tableau 201 – Extrémités d'association de Standard::RemoteControl avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..1	Control	1..1	Control	Control (commande) pour le point RemoteControl (commande à distance).

6.3.2.110 (extrait) RemotePoint

Pour une RTU, les points distants correspondent à des valeurs télémesurées ou sorties de commande. D'autres unités (par exemple, centres de conduite) aussi contiennent habituellement des valeurs calculées.

Le Tableau 202 présente tous les attributs de RemotePoint.

Tableau 202 – Attributs de Standard::RemotePoint

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

6.3.2.111 ReportingGroup

Un groupe de rapport est utilisé pour des groupements ad hoc différents utilisés pour le rapport.

Le Tableau 203 présente tous les attributs de ReportingGroup.

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Tableau 203 – Attributs de Standard::ReportingGroup

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

6.3.2.112 (extrait) RotatingMachine

Machine tournante qui peut être utilisée comme générateur ou comme moteur.

Le Tableau 204 présente tous les attributs de RotatingMachine.

Tableau 204 – Attributs de Standard::RotatingMachine

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 205 présente toutes les extrémités d'association de RotatingMachine avec d'autres classes.

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Tableau 205 – Extrémités d'association de Standard::RotatingMachine avec d'autres classes

mult à partir de	nom	mult vers	type	description
1..1	HydroPump	0..1	HydroPump	La machine synchrone entraîne la turbine qui déplace l'eau de bas en haut. Le sens de rotation de la machine pour le pompage peut ou peut ne pas être identique à celui utilisé pour la production.
1..*	GeneratingUnit	0..1	GeneratingUnit	Une machine synchrone peut fonctionner comme générateur et devenir par conséquent un élément de l'unité de production.
1..*	RegulatingControl	0..1	RegulatingControl	hérité de: RegulatingCondEq
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.113 Season

Période spécifiée de l'année.

Le Tableau 206 présente tous les attributs de Season.

Tableau 206 – Attributs de Standard::Season

nom	mult	type	description
startDate	0..1	MonthDay	Date de début de la saison.
endDate	0..1	MonthDay	Date de fin de la saison.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

6.3.2.114 (extrait) SeasonDayTypeSchedule

Programme horaire qui couvre une durée de 24 heures, assortie de données de courbe pour un type spécifique de saison ou de jour.

Le Tableau 207 présente tous les attributs de SeasonDayTypeSchedule.

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Tableau 207 – Attributs de Standard::SeasonDayTypeSchedule

nom	mult	type	description
timeStep	0..1	Seconds	hérité de: RegularIntervalSchedule
endTime	0..1	DateTime	hérité de: RegularIntervalSchedule
value2Unit	0..1	UnitSymbol	hérité de: BasicIntervalSchedule
startTime	1..1	DateTime	hérité de: BasicIntervalSchedule
value1Unit	1..1	UnitSymbol	hérité de: BasicIntervalSchedule
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 208 présente toutes les extrémités d'association de SeasonDayTypeSchedule avec d'autres classes.

Tableau 208 – Extrémités d'association de Standard::SeasonDayTypeSchedule avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	DayType	1..1	DayType	DayType (type de jour) pour le programme (Schedule).
0..*	Season	1..1	Season	Season (saison) pour le programme (Schedule).

6.3.2.115 Sectionaliser

Commutateur automatique capable de se verrouiller en position ouverte pour isoler une section défectueuse. Il peut ou peut ne pas comporter une capacité de coupure de charge. Il a pour rôle premier de fournir un sectionnement de défaut à des emplacements dans lesquels le courant de défaut est soit trop élevé soit trop faible pour coordonner correctement les fusibles.

Le Tableau 209 présente tous les attributs de Sectionaliser.

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Tableau 209 – Attributs de Standard::Sectionaliser

nom	mult	type	description
normalOpen	1..1	Boolean	hérité de: Switch
locked	0..1	Boolean	hérité de: Switch
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject
switchOnCount	0..1	Integer	(Déconseillé) hérité de: Switch
switchOnDate	0..1	DateTime	(Déconseillé) hérité de: Switch

Le Tableau 210 présente toutes les extrémités d'association de Sectionaliser avec d'autres classes.

Tableau 210 – Extrémités d'association de Standard::Sectionaliser avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.116 (extrait) Sensor

Cette classe décrit des appareils qui transforment une grandeur mesurée en signaux qui peuvent s'afficher sur un écran, être utilisés pour la commande ou être enregistrés.

Le Tableau 211 présente tous les attributs de Sensor.

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Tableau 211 – Attributs de Standard::Sensor

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 212 présente toutes les extrémités d'association de Sensor avec d'autres classes.

Tableau 212 – Extrémités d'association de Standard::Sensor avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Terminal	1..1	Terminal	hérité de: AuxiliaryEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.117 SetPoint

Commande analogique qui émet une valeur de point de consigne.

Le Tableau 213 présente tous les attributs de SetPoint.

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Tableau 213 – Attributs de Standard::SetPoint

nom	mult	type	description
value	0..1	Float	Valeur qui représente la sortie de l'actionneur.
normalValue	0..1	Float	Valeur normale de Control.value, utilisée par exemple pour la mise à l'échelle en pourcentage.
minValue	0..1	Float	hérité de: AnalogControl
maxValue	0..1	Float	hérité de: AnalogControl
unitSymbol	0..1	UnitSymbol	hérité de: Control
controlType	0..1	String	hérité de: Control
operationInProgress	0..1	Boolean	hérité de: Control
timeStamp	0..1	DateTime	hérité de: Control
unitMultiplier	0..1	UnitMultiplier	hérité de: Control
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 214 présente toutes les extrémités d'association de SetPoint avec d'autres classes.

Tableau 214 – Extrémités d'association de Standard::SetPoint avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..1	AnalogValue	1..1	AnalogValue	hérité de: AnalogControl
0..*	PowerSystemResource	0..1	PowerSystemResource	hérité de: Control

6.3.2.118 (extrait) ShuntCompensator

Condensateur shunt ou inductance ou batterie commutable de condensateurs-shunts ou d'inductances. Une section d'un compensateur shunt est un condensateur individuel ou une inductance individuelle. Une valeur négative pour reactivePerSection indique que le compensateur est une inductance. ShuntCompensator est un appareil à une seule borne. La terre est impliquée.

Le Tableau 215 présente tous les attributs de ShuntCompensator.

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Tableau 215 – Attributs de Standard::ShuntCompensator

nom	mult	type	description
maximumSections	0..1	Integer	Nombre maximal de sections qui peuvent être mises en service.
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 216 présente toutes les extrémités d'association de ShuntCompensator avec d'autres classes.

Tableau 216 – Extrémités d'association de Standard::ShuntCompensator avec d'autres classes

mult à partir de	nom	mult vers	type	description
1..*	RegulatingControl	0..1	RegulatingControl	hérité de: RegulatingCondEq
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.119 SolarGeneratingUnit

Centrale solaire.

Le Tableau 217 présente tous les attributs de SolarGeneratingUnit.

Tableau 217 – Attributs de Standard::SolarGeneratingUnit

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

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Le Tableau 218 présente toutes les extrémités d'association de SolarGeneratingUnit avec d'autres classes.

Tableau 218 – Extrémités d'association de Standard::SolarGeneratingUnit avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.120 StaticVarCompensator

Installation proposant une puissance réactive de shunt variable et modulable. Le SVC consiste généralement en un transformateur abaisseur, un filtre, une inductance commandée par thyristor et des bras de condensateur commutés par thyristor.

Le SVC peut fonctionner dans le mode de sortie MVar fixe ou dans le mode de commande de tension. Dans le mode de commande de tension, la sortie du SVC est proportionnelle à l'écart de tension au niveau du bus commandé par rapport au point de consigne de la tension. La pente caractéristique du SVC définit la proportion. Si la tension au niveau du bus commandé est égale au point de consigne de la tension, la sortie MVar du SVC est nulle.

Le Tableau 219 présente tous les attributs de StaticVarCompensator.

Tableau 219 – Attributs de Standard::StaticVarCompensator

nom	mult	type	description
sVCControlMode	0..1	SVCControlMode	Mode de commande du SVC.
voltageSetPoint	0..1	Voltage	La sortie de puissance réactive du SVC est proportionnelle à la différence entre la tension régulée du bus et le point de consigne de la tension (voltage set point). Lorsque la tension régulée du bus est égale au point de consigne de la tension, la sortie de puissance réactive est nulle.
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 220 présente toutes les extrémités d'association de StaticVarCompensator avec d'autres classes.

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Tableau 220 – Extrémités d'association de Standard::StaticVarCompensator avec d'autres classes

mult à partir de	nom	mult vers	type	description
1..*	RegulatingControl	0..1	RegulatingControl	hérité de: RegulatingCondEq
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.121 StationSupply

Approvisionnement du poste avec une charge dérivée de la sortie de poste.

Le Tableau 221 présente tous les attributs de StationSupply.

Tableau 221 – Attributs de Standard::StationSupply

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 222 présente toutes les extrémités d'association de StationSupply avec d'autres classes.

Tableau 222 – Extrémités d'association de Standard::StationSupply avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

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6.3.2.122 StringMeasurement

StringMeasurement représente un Measurement avec des valeurs de chaîne de type.

Le Tableau 223 présente tous les attributs de StringMeasurement.

Tableau 223 – Attributs de Standard::StringMeasurement

nom	mult	type	description
unitSymbol	1..1	UnitSymbol	hérité de: Measurement
measurementType	1..1	String	hérité de: Measurement
phases	0..1	PhaseCode	hérité de: Measurement
unitMultiplier	1..1	UnitMultiplier	hérité de: Measurement
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 224 présente toutes les extrémités d'association de StringMeasurement avec d'autres classes.

Tableau 224 – Extrémités d'association de Standard::StringMeasurement avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Terminal	0..1	ACDCTerminal	hérité de: Measurement
0..*	PowerSystemResource	0..1	PowerSystemResource	hérité de: Measurement

6.3.2.123 StringMeasurementValue

StringMeasurementValue représente une valeur de mesure de chaîne de type.

Le Tableau 225 présente tous les attributs de StringMeasurementValue.

Tableau 225 – Attributs de Standard::StringMeasurementValue

nom	mult	type	description
value	0..1	String	Valeur à surveiller.
timeStamp	0..1	DateTime	hérité de: MeasurementValue
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 226 présente toutes les extrémités d'association de StringMeasurementValue avec d'autres classes.

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Tableau 226 – Extrémités d'association de Standard::StringMeasurementValue avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	StringMeasurement	1..1	StringMeasurement	Measurement auquel cette valeur est connectée.
0..*	MeasurementValueSource	1..1	MeasurementValueSource	hérité de: MeasurementValue

6.3.2.124 SubGeographicalRegion

Sous-ensemble d'une région géographique d'un modèle de réseau de système de puissance.

Le Tableau 227 présente tous les attributs de SubGeographicalRegion.

Tableau 227 – Attributs de Standard::SubGeographicalRegion

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 228 présente toutes les extrémités d'association de SubGeographicalRegion avec d'autres classes.

Tableau 228 – Extrémités d'association de Standard::SubGeographicalRegion avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Region	1..1	GeographicalRegion	La région géographique dans laquelle se trouve cette sous-région.

6.3.2.125 SubLoadArea

La classe est le deuxième niveau dans une structure hiérarchique pour regrouper des charges à des fins de mise à l'échelle des charges du flux de charge.

Le Tableau 229 présente tous les attributs de SubLoadArea.

Tableau 229 – Attributs de Standard::SubLoadArea

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

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Le Tableau 230 présente toutes les extrémités d'association de SubLoadArea avec d'autres classes.

Tableau 230 – Extrémités d'association de Standard::SubLoadArea avec d'autres classes

mult à partir de	nom	mult vers	type	description
1..*	LoadArea	1..1	LoadArea	LoadArea à laquelle la SubLoadArea appartient.

6.3.2.126 Substation

Ensemble d'équipements dans d'autres buts que la production ou l'utilisation, à travers lesquels passe de l'énergie électrique en vrac dans le but de commuter ou de modifier ses caractéristiques.

Le Tableau 231 présente tous les attributs de Substation.

Tableau 231 – Attributs de Standard::Substation

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 232 présente toutes les extrémités d'association de Substation avec d'autres classes.

Tableau 232 – Extrémités d'association de Standard::Substation avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	NamingFeeder	0..1	Feeder	Le départ primaire qui alimente normalement le poste secondaire. Utilisé à des fins de dénomination. Il convient d'utiliser cette association ou le poste de la sous-région géographique pour des spécifications de confinement hiérarchique.
0..*	SupplyingStation	0..1	Station	
0..*	Station	0..1	Station	Membre d'un poste.
0..*	Region	1..1	SubGeographicalRegion	La SubGeographicalRegion contenant le poste.
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

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6.3.2.127 SurgeArrester

Appareil shunt, installé sur le réseau, habituellement à proximité de l'équipement électrique, afin de protéger ledit équipement contre les tensions transitoires dues à la foudre ou aux manœuvres.

Le Tableau 233 présente tous les attributs de SurgeArrester.

Tableau 233 – Attributs de Standard::SurgeArrester

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 234 présente toutes les extrémités d'association de SurgeArrester avec d'autres classes.

Tableau 234 – Extrémités d'association de Standard::SurgeArrester avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Terminal	1..1	Terminal	hérité de: AuxiliaryEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

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6.3.2.128 Switch

Appareil générique visant à établir ou à interrompre le courant, ou les deux, dans un ou plusieurs circuits électriques.

Le Tableau 235 présente tous les attributs de Switch.

Tableau 235 – Attributs de Standard::Switch

nom	mult	type	description
normalOpen	1..1	Boolean	L'attribut est utilisé dans des cas où aucun Measurement (mesurage) pour la valeur de statut n'est présent. Si le Switch a un Measurement de statut, alors la valeur Discrete.normalValue est réputée correspondre au Switch.normalOpen.
locked	0..1	Boolean	Si true (vrai), le commutateur est verrouillé. L'état d'interrupteur qui en résulte est une combinaison des attributs locked et Switch.open comme suit: – locked=true et Switch.open=true. L'état qui en résulte est ouvert et verrouillé; – locked=false et Switch.open=true. L'état qui en résulte est ouvert; – locked=false et Switch.open=false. L'état qui en résulte est fermé.
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject
switchOnCount	0..1	Integer	(Déconseillé) Compteur de mise en route depuis la dernière initialisation ou réinitialisation du commutateur.
switchOnDate	0..1	DateTime	(Déconseillé) Date et heure de la dernière mise en route du commutateur.

Le Tableau 236 présente toutes les extrémités d'association de Switch avec d'autres classes.

Tableau 236 – Extrémités d'association de Standard::Switch avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

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6.3.2.129 SwitchPhase

Phase unique d'un commutateur polyphasé lorsqu'il est possible que ses attributs soient différents pour chaque phase.

Le Tableau 237 présente tous les attributs de SwitchPhase.

Tableau 237 – Attributs de Standard::SwitchPhase

nom	mult	type	description
closed	0..1	Boolean	L'attribut indique si le commutateur est considéré comme fermé lorsqu'il est utilisé comme entrée de traitement de topologie.
normalOpen	0..1	Boolean	Utilisé dans des cas où aucun Measurement (mesurage) pour la valeur de statut n'est présent. Si la SwitchPhase a un Measurement de statut, alors Discrete.normalValue est réputé correspondre à cette valeur.
phaseSide1	0..1	SinglePhaseKind	Phase de cette SwitchPhase sur le côté dont le numéro d'ordre de borne est égal à 1. Il convient que ce soit une phase contenue dans cet attribut de phase de borne.
phaseSide2	0..1	SinglePhaseKind	Phase de cette SwitchPhase sur le côté dont le numéro d'ordre de borne est égal à 2. Il convient que ce soit une phase contenue dans cet attribut de phase Terminal.phases.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 238 présente toutes les extrémités d'association de SwitchPhase avec d'autres classes.

Tableau 238 – Extrémités d'association de Standard::SwitchPhase avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Switch	1..1	Switch	Commutateur de la phase de commutateur.
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.130 SwitchSchedule

Programme des positions de commutateur. Si RegularTimePoint.value1 est égale à 0, le commutateur est ouvert. Si 1, le commutateur est fermé.

Le Tableau 239 présente tous les attributs de SwitchSchedule.

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Tableau 239 – Attributs de Standard::SwitchSchedule

nom	mult	type	description
timeStep	0..1	Seconds	hérité de: RegularIntervalSchedule
endTime	0..1	DateTime	hérité de: RegularIntervalSchedule
value2Unit	0..1	UnitSymbol	hérité de: BasicIntervalSchedule
startTime	1..1	DateTime	hérité de: BasicIntervalSchedule
value1Unit	1..1	UnitSymbol	hérité de: BasicIntervalSchedule
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 240 présente toutes les extrémités d'association de SwitchSchedule avec d'autres classes.

Tableau 240 – Extrémités d'association de Standard::SwitchSchedule avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Switch	1..1	Switch	Un SwitchSchedule est associé à un Switch.
0..*	DayType	1..1	DayType	hérité de: SeasonDayTypeSchedule
0..*	Season	1..1	Season	hérité de: SeasonDayTypeSchedule

6.3.2.131 SynchronousMachine

Appareil électromécanique fonctionnant par rotation synchrone d'un arbre avec le réseau. Il s'agit d'une machine unique opérant comme un générateur, comme un condensateur synchrone ou comme une pompe.

Le Tableau 241 présente tous les attributs de SynchronousMachine.

Tableau 241 – Attributs de Standard::SynchronousMachine

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

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Le Tableau 242 présente toutes les extrémités d'association de SynchronousMachine avec d'autres classes.

Tableau 242 – Extrémités d'association de Standard::SynchronousMachine avec d'autres classes

mult à partir de	nom	mult vers	type	description
1..1	HydroPump	0..1	HydroPump	hérité de: RotatingMachine
1..*	GeneratingUnit	0..1	GeneratingUnit	hérité de: RotatingMachine
1..*	RegulatingControl	0..1	RegulatingControl	hérité de: RegulatingCondEq
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.132 (extrait) TapChanger

Mécanisme de modification des positions des prises d'enroulement du transformateur.

Le Tableau 243 présente tous les attributs de TapChanger.

Tableau 243 – Attributs de Standard::TapChanger

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 244 présente toutes les extrémités d'association de TapChanger avec d'autres classes.

Tableau 244 – Extrémités d'association de Standard::TapChanger avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	TapChangerControl	0..1	TapChangerControl	Plan de commande de régulation auquel ce changeur de prises participe.
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.133 TapChangerControl

Décrit le comportement spécifique aux changeurs de prises, par exemple la manière dont la tension à l'extrémité d'une ligne varie avec le niveau de charge et la compensation de la chute de tension lors de l'ajustement de la prise.

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Le Tableau 245 présente tous les attributs de TapChangerControl.

Tableau 245 – Attributs de Standard::TapChangerControl

nom	mult	type	description
mode	0..1	RegulatingControlModeKind	hérité de: RegulatingControl
maxAllowedTargetValue	0..1	Float	hérité de: RegulatingControl
minAllowedTargetValue	0..1	Float	hérité de: RegulatingControl
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 246 présente toutes les extrémités d'association de TapChangerControl avec d'autres classes.

Tableau 246 – Extrémités d'association de Standard::TapChangerControl avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Terminal	0..1	Terminal	hérité de: RegulatingControl
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.134 TapSchedule

Modèle prédéfini sur une durée pour un échelon de prise.

Le Tableau 247 présente tous les attributs de TapSchedule.

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Tableau 247 – Attributs de Standard::TapSchedule

nom	mult	type	description
timeStep	0..1	Seconds	hérité de: RegularIntervalSchedule
endTime	0..1	DateTime	hérité de: RegularIntervalSchedule
value2Unit	0..1	UnitSymbol	hérité de: BasicIntervalSchedule
startTime	1..1	DateTime	hérité de: BasicIntervalSchedule
value1Unit	1..1	UnitSymbol	hérité de: BasicIntervalSchedule
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 248 présente toutes les extrémités d'association de TapSchedule avec d'autres classes.

Tableau 248 – Extrémités d'association de Standard::TapSchedule avec d'autres classes

mult à partir de	nom	mult vers	type	description
1..*	TapChanger	1..1	TapChanger	Un TapSchedule (programme de prise) est associé à un TapChanger (changeur de prises).
0..*	DayType	1..1	DayType	hérité de: SeasonDayTypeSchedule
0..*	Season	1..1	Season	hérité de: SeasonDayTypeSchedule

6.3.2.135 Terminal

Point de connexion électrique à une partie d'un équipement conducteur. Les Terminals (bornes) sont connectées sur des points de connexion physiques appelés nœuds de connectivité (ConnectivityNode).

Le Tableau 249 présente tous les attributs de Terminal.

Tableau 249 – Attributs de Standard::Terminal

nom	mult	type	description
phases	0..1	PhaseCode	Représente la condition de phase normale du réseau.
sequenceNumber	0..1	Integer	hérité de: ACDCTerminal
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 250 présente toutes les extrémités d'association de Terminal avec d'autres classes.

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Tableau 250 – Extrémités d'association de Standard::Terminal avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	ConductingEquipment	1..1	ConductingEquipment	Équipement conducteur de la borne. L'équipement conducteur a des bornes qui peuvent être connectées à d'autres bornes d'un équipement conducteur à l'aide de nœuds de connectivité ou de nœuds topologiques.
0..*	ConnectivityNode	0..1	ConnectivityNode	Nœud de connectivité auquel cette borne est connectée à impédance zéro.

6.3.2.136 ThermalGeneratingUnit

Unité de production ayant pour machine motrice, par exemple, une turbine à vapeur, une turbine à combustion ou un moteur diesel.

Le Tableau 251 présente tous les attributs de ThermalGeneratingUnit.

Tableau 251 – Attributs de Standard::ThermalGeneratingUnit

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 252 présente toutes les extrémités d'association de ThermalGeneratingUnit avec d'autres classes.

Tableau 252 – Extrémités d'association de Standard::ThermalGeneratingUnit avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.137 (extrait) TransformerEnd

Point de connexion conductrice d'un transformateur de puissance. Il correspond à une borne d'enroulement physique du transformateur. Dans les versions antérieures du CIM, la classe

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TransformerWinding avait un but comparable. Cette classe TransformerEnd est plus souple et présente des différences importantes avec TransformerWinding.

Le Tableau 253 présente tous les attributs de TransformerEnd.

Tableau 253 – Attributs de Standard::TransformerEnd

nom	mult	type	description
endNumber	1..1	Integer	Numéro pour cette extrémité de transformateur, qui correspond à l'ordre des extrémités dans l'attribut PowerTransformer.vectorGroup. Il convient que l'enroulement de tension maximum soit de 1.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 254 présente toutes les extrémités d'association de TransformerEnd avec d'autres classes.

Tableau 254 – Extrémités d'association de Standard::TransformerEnd avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	Tension de base de l'extrémité du transformateur. Elle est primordiale pour calculer le PU.
0..*	Terminal	1..1	Terminal	Borne du transformateur de puissance à laquelle appartient cette extrémité de transformateur.

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6.3.2.138 ValueAliasSet

Décrit la traduction d'un ensemble de valeurs en un nom et est réputé faciliter les traductions personnalisées. Chaque ValueAliasSet a un nom, une description, etc. Un Measurement spécifique peut représenter un état discret comme Open, Closed, Intermediate, etc. Ceci exige une traduction de la valeur numérique MeasurementValue.value en chaîne, par exemple 0->"Invalid", 1->"Open", 2->"Closed", 3->"Intermediate". Chaque membre ValueToAlias de ValueAliasSet.Value décrit une correspondance entre une valeur particulière et un nom.

Le Tableau 255 présente tous les attributs de ValueAliasSet.

Tableau 255 – Attributs de Standard::ValueAliasSet

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

6.3.2.139 ValueToAlias

Décrit la traduction d'une valeur particulière en un nom, par exemple 1 pour "Open".

Le Tableau 256 présente tous les attributs de ValueToAlias.

Tableau 256 – Attributs de Standard::ValueToAlias

nom	mult	type	description
value	1..1	Integer	Valeur mise en correspondance.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 257 présente toutes les extrémités d'association de ValueToAlias avec d'autres classes.

Tableau 257 – Extrémités d'association de Standard::ValueToAlias avec d'autres classes

mult à partir de	nom	mult vers	type	description
1..*	ValueAliasSet	1..1	ValueAliasSet	ValueAliasSet ayant les correspondances de ValueToAlias.

6.3.2.140 VoltageLevel

Ensemble d'équipements à un même niveau de tension, constituant un appareillage de connexion. L'équipement consiste généralement en disjoncteurs, jeux de barre, appareils d'instrumentation, de commande, de régulation et de protection, de même que des regroupements de ce type de constituants.

Le Tableau 258 présente tous les attributs de VoltageLevel.

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Tableau 258 – Attributs de Standard::VoltageLevel

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 259 présente toutes les extrémités d'association de VoltageLevel avec d'autres classes.

Tableau 259 – Extrémités d'association de Standard::VoltageLevel avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	1..1	BaseVoltage	Tension de base utilisée pour tout l'équipement dans le niveau de tension.
0..*	Substation	1..1	Substation	Poste du niveau de tension.
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.141 VoltageLimit

Limite opérationnelle appliquée à la tension.

Le Tableau 260 présente tous les attributs de VoltageLimit.

Tableau 260 – Attributs de Standard::VoltageLimit

nom	mult	type	description
value	1..1	Voltage	Limite sur la tension. La nature basse ou haute de la limite dépend des propriétés du type de limite opérationnelle.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 261 présente toutes les extrémités d'association de VoltageLimit avec d'autres classes.

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Tableau 261 – Extrémités d'association de Standard::VoltageLimit avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	OperationalLimitType	0..1	OperationalLimitType	hérité de: OperationalLimit
0..*	OperationalLimitSet	1..1	OperationalLimitSet	hérité de: OperationalLimit

6.3.2.142 VsConverter

Côté courant continu du convertisseur de source de tension.

Le Tableau 262 présente tous les attributs de VsConverter.

Tableau 262 – Attributs de Standard::VsConverter

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 263 présente toutes les extrémités d'association de VsConverter avec d'autres classes.

Tableau 263 – Extrémités d'association de Standard::VsConverter avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	hérité de: ConductingEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.143 WaveTrap

Les circuits-bouchons sont des appareils qui entravent les signaux porteurs de la ligne électrique haute fréquence tout en présentant une impédance négligeable à la fréquence industrielle principale.

Le Tableau 264 présente tous les attributs de WaveTrap.

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Tableau 264 – Attributs de Standard::WaveTrap

nom	mult	type	description
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 265 présente toutes les extrémités d'association de WaveTrap avec d'autres classes.

Tableau 265 – Extrémités d'association de Standard::WaveTrap avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Terminal	1..1	Terminal	hérité de: AuxiliaryEquipment
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.3.2.144 WindGeneratingUnit

Bloc générateur éolien. Peut être utilisé pour représenter une turbine simple ou une agrégation.

Le Tableau 266 présente tous les attributs de WindGeneratingUnit.

Tableau 266 – Attributs de Standard::WindGeneratingUnit

nom	mult	type	description
windGenUnitType	0..1	WindGenUnitKind	Genre de générateur éolien.
normallyInService	0..1	Boolean	hérité de: Equipment
aggregate	0..1	Boolean	hérité de: Equipment
inService	0..1	Boolean	hérité de: Equipment
networkAnalysisEnabled	0..1	Boolean	hérité de: Equipment
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

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Le Tableau 267 présente toutes les extrémités d'association de WindGeneratingUnit avec d'autres classes.

Tableau 267 – Extrémités d'association de Standard::WindGeneratingUnit avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	AggregatedEquipment	0..1	Equipment	hérité de: Equipment
0..*	AdditionalEquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	EquipmentContainer	0..1	EquipmentContainer	hérité de: Equipment
0..*	AssetDatasheet	0..1	AssetInfo	hérité de: PowerSystemResource
0..*	PSRType	0..1	PSRType	hérité de: PowerSystemResource

6.4 Paquetage ElectricalProperties

6.4.1 Généralités

Voir la Figure 29, la Figure 30 et la Figure 31.

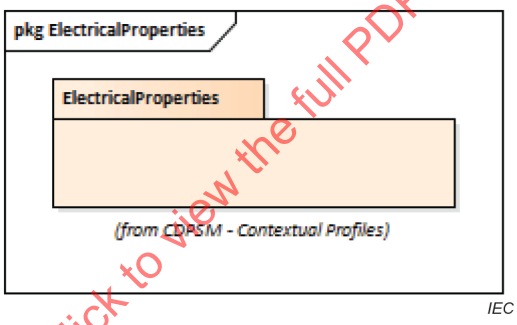

Figure 29 – Diagramme de paquetage ElectricalProperties::ElectricalProperties

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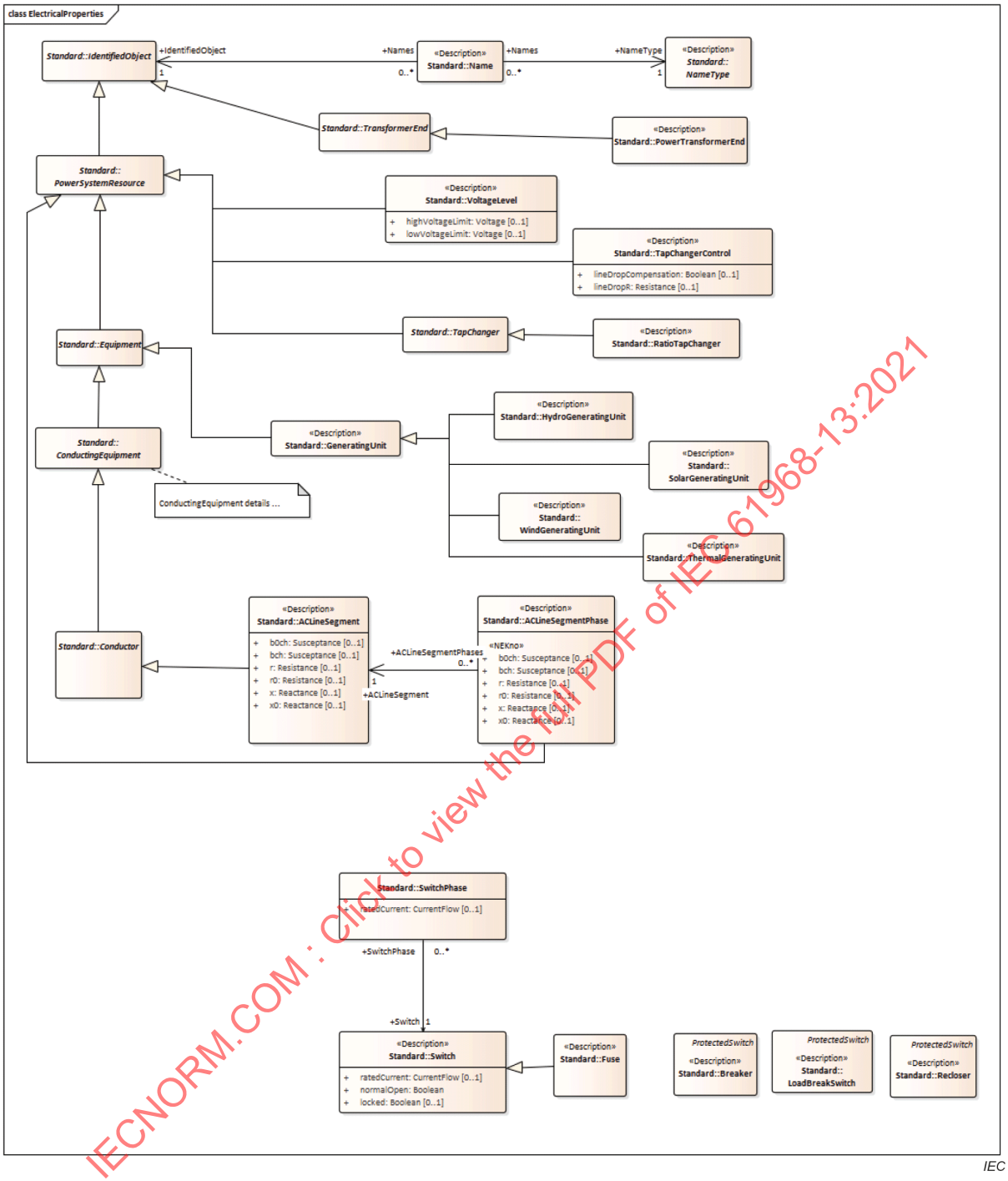

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Figure 30 – Diagramme de classe ElectricalProperties::ElectricalProperties

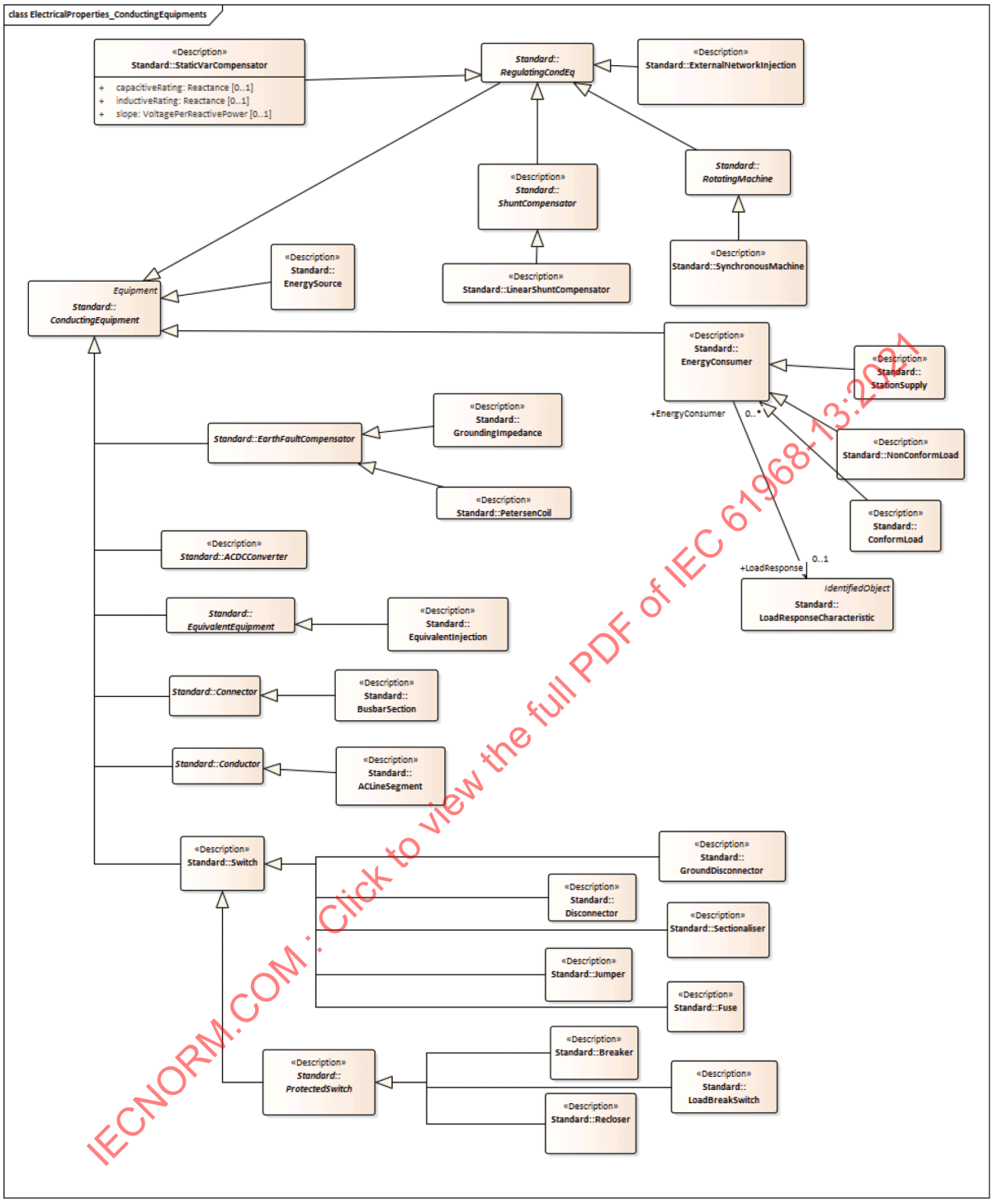

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Figure 31 – Diagramme de classe ElectricalProperties::ElectricalProperties_ConductingEquipments

6.4.2 Paquetage Standard

6.4.2.1 Généralités

Voir la Figure 32.

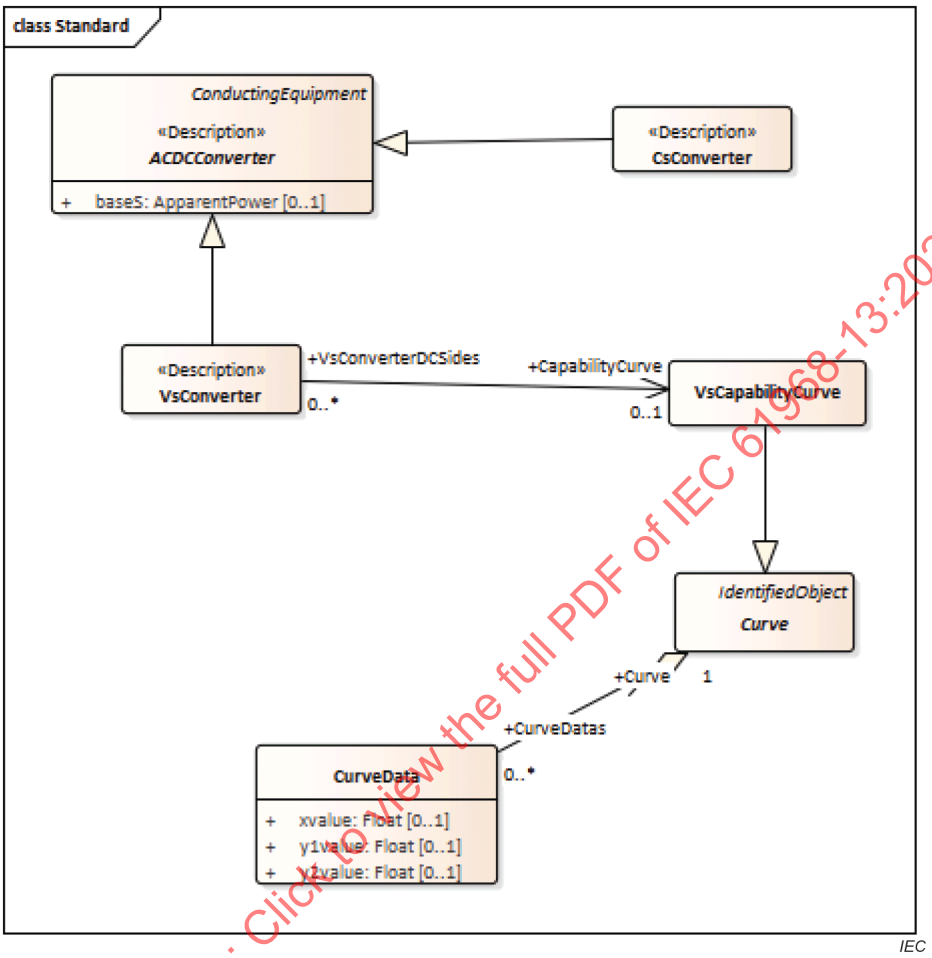

Figure 32 – Diagramme de classe Standard::Standard

6.4.2.2 (extrait) ACDCConverter

Unité comportant des valves pour trois phases, associées à un équipement de commande, des appareils essentiels de protection et de commutation, des condensateurs de stockage en courant continu, des composants réactifs et des auxiliaires, le cas échéant, utilisés pour la conversion.

Le Tableau 268 présente tous les attributs de ACDCConverter.

Tableau 268 – Attributs de Standard::ACDCConverter

nom	mult	type	description
baseS	0..1	ApparentPower	Puissance de base apparente du pôle de convertisseur.
name	0..1	String	hérité de: IdentifiedObject

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6.4.2.3 (Description) ACLineSegment

Fil ou combinaison de fils ayant des caractéristiques électriques cohérentes, et formant un seul système de puissance, utilisé pour transporter du courant alternatif entre des points du réseau.

Pour les lignes triphasées transposées symétriques, il suffit d'utiliser les attributs du segment de ligne qui décrivent les impédances et les admittances pour la longueur totale du segment.

Si les données d'impédance par longueur sont disponibles dans une bibliothèque de types de normes, les impédances et les admittances peuvent être calculées par l'une des façons suivantes:

– Calculer les paramètres électriques à partir des données d'actif, en utilisant ConductorInfo associé, avec les valeurs multipliées ensuite par Conductor.length, afin de produire un modèle de matrice.
– Calculer les paramètres électriques déséquilibrés à partir de PerLengthPhaseImpedance associé, puis multiplier par Conductor.length pour produire un modèle de matrice.
– Calculer les paramètres électriques transposés à partir de PerLengthSequenceImpedance associé, puis multiplier par Conductor.length pour produire un modèle de séquence.

Le Tableau 269 présente tous les attributs d'ACLineSegment.

Tableau 269 – Attributs de Standard::ACLineSegment

nom	mult	type	description
b0ch	0..1	Susceptance	Susceptance shunt homopolaire (de chargement), uniformément répartie, de la section de ligne complète.
bch	0..1	Susceptance	Susceptance shunt directe (de chargement), uniformément répartie, de la section de ligne complète. Cette valeur représente le chargement total sur la longueur totale de la ligne.
r	0..1	Resistance	Résistance série directe de la section de ligne complète.
r0	0..1	Resistance	Résistance série homopolaire de la section de ligne complète.
x	0..1	Reactance	Réactance série directe de la section de ligne complète.
x0	0..1	Reactance	Réactance série homopolaire de la section de ligne complète.
name	0..1	String	hérité de: IdentifiedObject

6.4.2.4 (Description) ACLineSegmentPhase

Représente un fil unique sur un segment de ligne à courant alternatif.

Le Tableau 270 présente tous les attributs de ACLineSegmentPhase.

Tableau 270 – Attributs de Standard::ACLineSegmentPhase

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject

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Le Tableau 271 présente toutes les extrémités d'association de ACLineSegmentPhase avec d'autres classes.

Tableau 271 – Extrémités d'association de Standard::ACLineSegmentPhase avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	ACLineSegment	1..1	ACLineSegment	Segment de ligne auquel appartient la phase.

6.4.2.5 (Description) Breaker

Appareil de commutation mécanique capable d'établir, de transporter et d'interrompre des courants dans des conditions normales de circuit et aussi d'établir, de transporter pendant une durée déterminée et d'interrompre des courants dans des conditions anormales spécifiées de circuit, par exemple celles d'un court-circuit.

Le Tableau 272 présente tous les attributs de Breaker.

Tableau 272 – Attributs de Standard::Breaker

nom	mult	type	description
breakingCapacity	1..1	CurrentFlow	hérité de: ProtectedSwitch
ratedCurrent	0..1	CurrentFlow	hérité de: Switch
normalOpen	1..1	Boolean	hérité de: Switch
locked	0..1	Boolean	hérité de: Switch
name	0..1	String	hérité de: IdentifiedObject

6.4.2.6 (Description) BusbarSection

Conducteur, ou groupe de conducteurs, ayant une impédance négligeable, servant à connecter un autre équipement conducteur au sein d'un seul poste

Les mesurages de tension sont habituellement obtenus à partir de VoltageTransformers (transformateurs de tension) connectés à des sections de jeux de barres. Un tronçon de jeu de barres peut avoir un grand nombre de bornes physiques mais, pour l'analyse, il est modélisé avec une seule borne logique.

Le Tableau 273 présente tous les attributs de BusbarSection.

Tableau 273 – Attributs de Standard::BusbarSection

nom	mult	type	description
ipMax	0..1	CurrentFlow	Valeur de crête maximale admissible du courant de court-circuit du jeu de barres (Ipmax dans l'IEC 60909-0). Limite mécanique du jeu de barres dans le poste lui-même. Utilisé pour l'échange de données relatives à un court-circuit, conformément à l'IEC 60909.
name	0..1	String	hérité de: IdentifiedObject

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6.4.2.7 (extrait) ConductingEquipment

Parties du système de puissance à courant alternatif conçues pour transporter du courant ou connectées par des bornes de façon à assurer la conduction. ConductingEquipment est contenu dans un EquipmentContainer qui peut être un Substation, un VoltageLevel ou une Bay dans un Substation.

Le Tableau 274 présente tous les attributs de ConductingEquipment.

Tableau 274 – Attributs de Standard::ConductingEquipment

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject

6.4.2.8 (extrait) Conductor

Combinaison de matériau conducteur ayant des caractéristiques électriques cohérentes et formant un seul système de puissance, utilisé pour transporter du courant entre des points dans le système de puissance.

Le Tableau 275 présente tous les attributs de Conductor.

Tableau 275 – Attributs de Standard::Conductor

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject

6.4.2.9 (Description) ConformLoad

Les charges conformes ConformLoad représentent les charges qui suivent un profil de modification quotidienne, ce profil pouvant être utilisé pour mettre à l'échelle la charge avec un système de charge.

Le Tableau 276 présente tous les attributs de ConformLoad.

Tableau 276 – Attributs de Standard::ConformLoad

nom	mult	type	description
customerCount	0..1	Integer	hérité de: EnergyConsumer
pfixed	0..1	ActivePower	hérité de: EnergyConsumer
pfixedPct	0..1	PerCent	hérité de: EnergyConsumer
qfixed	0..1	ReactivePower	hérité de: EnergyConsumer
qfixedPct	0..1	PerCent	hérité de: EnergyConsumer
name	0..1	String	hérité de: IdentifiedObject

Le Tableau 277 présente toutes les extrémités d'association de ConformLoad avec d'autres classes.

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Tableau 277 – Extrémités d'association de Standard::ConformLoad avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	LoadResponse	0..1	LoadResponseCharacteristic	hérité de: EnergyConsumer

6.4.2.10 (extrait) Connector

Conducteur, ou groupe de conducteurs, d'une impédance négligeable, servant à connecter un autre équipement conducteur au sein d'un seul poste et qui sont modélisés avec une seule borne logique.

Le Tableau 278 présente tous les attributs de Connector.

Tableau 278 – Attributs de Standard::Connector

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject

6.4.2.11 (Description) CsConverter

Côté courant continu du convertisseur de source de courant.

Le Tableau 279 présente tous les attributs de CsConverter.

Tableau 279 – Attributs de Standard::CsConverter

nom	mult	type	description
baseS	0..1	ApparentPower	hérité de: ACDCConverter
name	0..1	String	hérité de: IdentifiedObject

6.4.2.12 (extrait) Curve

Courbe d'usage général ou relation fonctionnelle entre une variable indépendante (axe X) et des variables dépendantes (axe Y).

Le Tableau 280 présente tous les attributs de Curve.

Tableau 280 – Attributs de Standard::Curve

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject

6.4.2.13 Classe racine CurveData

Points de données d'usage général pour définir une courbe. L'utilisation de cette classe générique est déconseillée si une classe plus spécifique peut être utilisée pour spécifier les valeurs des axes X et Y ainsi que leurs types de données spécifiques.

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Le Tableau 281 présente tous les attributs de CurveData.

Tableau 281 – Attributs de Standard::CurveData

nom	mult	type	description
xvalue	0..1	Float	Valeur de données de la variable de l'axe X, en fonction des unités de l'axe X.
y1value	0..1	Float	Valeur de données de la première variable de l'axe Y, en fonction des unités de l'axe Y.
y2value	0..1	Float	Valeur de données de la deuxième variable de l'axe Y (s'il y en a une), en fonction des unités de l'axe Y.

Le Tableau 282 présente toutes les extrémités d'association de CurveData avec d'autres classes.

Tableau 282 – Extrémités d'association de Standard::CurveData avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Curve	1..1	Curve	Courbe de ce point de données de courbe.

6.4.2.14 (Description) Disconnector

Appareil de commutation mécanique exploité manuellement ou par un moteur utilisé pour modifier les connexions dans un circuit ou pour isoler un circuit ou un équipement d'une source d'électricité. Les circuits doivent être ouverts ou fermés lorsqu'un courant négligeable est interrompu ou produit.

Le Tableau 283 présente tous les attributs de Disconnector.

Tableau 283 – Attributs de Standard::Disconnector

nom	mult	type	description
ratedCurrent	0..1	CurrentFlow	hérité de: Switch
normalOpen	1..1	Boolean	hérité de: Switch
locked	0..1	Boolean	hérité de: Switch
name	0..1	String	hérité de: IdentifiedObject

6.4.2.15 (extrait) EarthFaultCompensator

Équipement conducteur utilisé pour représenter une connexion qui est généralement utilisée pour compenser les défauts de terre. Un appareil de compensation de défaut de terre modélisé avec une seule borne implique une deuxième borne solidement raccordée à la terre. Si deux bornes sont modélisées, la terre n'est pas prise pour hypothèse et les règles de connexion normale s'appliquent.

Le Tableau 284 présente tous les attributs de EarthFaultCompensator.

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Tableau 284 – Attributs de Standard::EarthFaultCompensator

nom	mult	type	description
r	0..1	Resistance	Résistance nominale de l'appareil.
name	0..1	String	hérité de: IdentifiedObject

6.4.2.16 (Description) EnergyConsumer

Consommateur générique d'énergie – point de consommation sur le modèle de système de puissance.

Le Tableau 285 présente tous les attributs de EnergyConsumer.

Tableau 285 – Attributs de Standard::EnergyConsumer

nom	mult	type	description
customerCount	0..1	Integer	Nombre de clients individuels représentés par cette demande.
pfixed	0..1	ActivePower	Puissance active de la charge dont la grandeur est fixe. La convention de signe charge est utilisée, c'est-à-dire que le signe positif signifie un flux à partir d'un nœud.
pfixedPct	0..1	PerCent	Puissance active fixe exprimée en pourcentage de la puissance active fixe du groupe de charge. La convention de signe charge est utilisée, c'est-à-dire que le signe positif signifie un flux à partir d'un nœud.
qfixed	0..1	ReactivePower	Puissance réactive de la charge dont la grandeur est fixe. La convention de signe charge est utilisée, c'est-à-dire que le signe positif signifie un flux à partir d'un nœud.
qfixedPct	0..1	PerCent	Puissance réactive fixe exprimée en pourcentage de la puissance réactive fixe du groupe de charge. La convention de signe charge est utilisée, c'est-à-dire que le signe positif signifie un flux à partir d'un nœud.
name	0..1	String	hérité de: IdentifiedObject

Le Tableau 286 présente toutes les extrémités d'association de EnergyConsumer avec d'autres classes.

Tableau 286 – Extrémités d'association de Standard::EnergyConsumer avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	LoadResponse	0..1	LoadResponseCharacteristic	Caractéristique de réponse de charge pour cette charge. Si elle manque, cette charge est considérée par hypothèse comme une puissance constante.

6.4.2.17 (Description) EnergySource

Équivalent générique pour un fournisseur d'énergie sur un niveau de tension de transport ou de distribution.

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Le Tableau 287 présente tous les attributs de EnergySource.

Tableau 287 – Attributs de Standard::EnergySource

nom	mult	type	description
reactivePower	0..1	ReactivePower	Injection réactive de source haute tension. La convention de signe charge est utilisée, c'est-à-dire que le signe positif signifie un flux à partir d'un nœud. Valeur de départ pour des solutions en régime établi.
voltageAngle	0..1	AngleRadians	Angle de phase d'un circuit à phase ouvert.
voltageMagnitude	0..1	Voltage	Valeur de la tension phase à phase d'un circuit ouvert.
x	0..1	Reactance	Réactance directe de Thevenin.
activePower	0..1	ActivePower	Injection active de source haute tension. La convention de signe charge est utilisée, c'est-à-dire que le signe positif signifie un flux à partir d'un nœud. Valeur de départ pour des solutions en régime établi.
nominalVoltage	0..1	Voltage	Tension nominale phase à phase.
r	0..1	Resistance	Résistance directe de Thevenin.
name	0..1	String	hérité de: IdentifiedObject

6.4.2.18 (extrait) Equipment

Éléments d'un système de puissance qui sont des appareils matériels, électroniques ou mécaniques.

Le Tableau 288 présente tous les attributs de Equipment.

Tableau 288 – Attributs de Standard::Equipment

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject

6.4.2.19 (extrait) EquivalentEquipment

La classe représente les objets équivalents qui sont le résultat d'une réduction de réseau. La classe est la base pour les objets équivalents de types différents.

Le Tableau 289 présente tous les attributs de EquivalentEquipment.

Tableau 289 – Attributs de Standard::EquivalentEquipment

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject

6.4.2.20 (Description) EquivalentInjection

Cette classe représente des injections équivalentes (production ou charge). La régulation de tension est admise seulement au point de connexion.

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Le Tableau 290 présente tous les attributs de EquivalentInjection.

Tableau 290 – Attributs de Standard::EquivalentInjection

nom	mult	type	description
x	1..1	Reactance	Réactance directe. Utilisée pour représenter Extended-Ward (IEC 60909). Utilisation: Extended-Ward est le résultat d'une réduction du réseau préalable à l'échange de données.
maxP	0..1	ActivePower	Puissance active maximale de l'injection.
maxQ	0..1	ReactivePower	Utilisé pour la modélisation d'alimentation pour l'échange de flux de charge. Pas utilisé pour la modélisation de courts-circuits. Si maxQ et minQ ne sont pas utilisés, ReactiveCapabilityCurve peut être utilisée.
r	1..1	Resistance	Résistance directe Utilisée pour représenter Extended-Ward (IEC 60909). Utilisation: Extended-Ward est le résultat d'une réduction du réseau préalable à l'échange de données.
name	0..1	String	hérité de: IdentifiedObject

6.4.2.21 (Description) ExternalNetworkInjection

Cette classe représente le réseau externe et est utilisée pour les calculs de l'IEC 60909.

Le Tableau 291 présente tous les attributs de ExternalNetworkInjection.

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Tableau 291 – Attributs de Standard::ExternalNetworkInjection

nom	mult	type	description
minQ	1..1	ReactivePower	Pas pour la modélisation de courts-circuits. Utilisé pour la modélisation d'alimentation pour l'échange de flux de charge. Si maxQ et minQ ne sont pas utilisés, ReactiveCapabilityCurve peut être utilisée.
governorSCD	1..1	ActivePowerPerFrequency	Polarisation de la fréquence industrielle. Il s'agit de la variation de l'injection de puissance divisée par la variation de la fréquence et changée de signe. Une valeur positive de la polarisation de la fréquence industrielle fournit une injection de puissance additive par suite d'une chute de fréquence.
maxInitialSymShCCurrent	1..1	CurrentFlow	Courants maximaux de court-circuit initiaux symétriques (Ik" max), en Ampères (Ik" =Sk"/(SQRT(3) Un)). Utilisé pour l'échange de données relatives à un court-circuit, conformément à l'IEC 60909.
maxP	1..1	ActivePower	Puissance active maximale de l'injection.
maxQ	1..1	ReactivePower	Pas pour la modélisation de courts-circuits. Utilisé pour la modélisation d'alimentation pour l'échange de flux de charge. Si maxQ et minQ ne sont pas utilisés, ReactiveCapabilityCurve peut être utilisée.
minP	1..1	ActivePower	Puissance active minimale de l'injection.
name	0..1	String	hérité de: IdentifiedObject

6.4.2.22 (Description) Fuse

Appareil de protection contre les surintensités avec un fusible à ouverture de circuit qui est chauffé et rompu lorsqu'une surintensité le traverse. Un fusible est considéré comme un dispositif de commutation parce qu'il interrompt le courant.

Le Tableau 292 présente tous les attributs de Fuse.

Tableau 292 – Attributs de Standard::Fuse

nom	mult	type	description
ratedCurrent	0..1	CurrentFlow	hérité de: Switch
normalOpen	1..1	Boolean	hérité de: Switch
locked	0..1	Boolean	hérité de: Switch
name	0..1	String	hérité de: IdentifiedObject

6.4.2.23 (Description) GeneratingUnit

Une seule machine synchrone ou un ensemble de machines synchrones pour la conversion de la puissance mécanique en puissance à courant alternatif. Des machines individuelles dans un ensemble peuvent être, par exemple, définies dans un but de programmation alors qu'un seul signal de contrôle est dérivé pour l'ensemble. Dans ce cas, une GeneratingUnit (unité de production) pour chaque membre de l'ensemble et une GeneratingUnit supplémentaire correspondant à l'ensemble sont définies.

Le Tableau 293 présente tous les attributs de GeneratingUnit.

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Tableau 293 – Attributs de Standard::GeneratingUnit

nom	mult	type	description
totalEfficiency	0..1	PerCent	Efficacité de l'unité à convertir le combustible en énergie électrique.
genControlSource	0..1	GeneratorControlSource	Source de commandes pour une unité de production.
initialP	0..1	ActivePower	Valeur initiale par défaut de la puissance active, permettant d'enregistrer un résultat de flux de puissance pour la valeur initiale de puissance active de cette unité, pour cette configuration réseau.
ratedNetMaxP	0..1	ActivePower	Capacité maximale nette nominale obtenue en soustrayant la puissance auxiliaire utilisée pour faire fonctionner les machines internes de la centrale de la capacité maximale brute nominale.
baseP	0..1	ActivePower	Pour les unités commandables, cette valeur représente le point de fonctionnement économique de base en puissance active alors que pour les unités non commandables, cette valeur correspond à la valeur fixe de production. La valeur doit être comprise entre les points haut et bas des limites de fonctionnement.
governorSCD	0..1	PerCent	Statisme du changeur de vitesse du régulateur. Il s'agit de la variation de puissance de sortie du générateur divisée par la variation de fréquence normalisée par la puissance nominale du générateur et la fréquence nominale et exprimée en pourcentage et changée de signe. Une valeur positive du statisme de changement de vitesse fournit une sortie additive du générateur par suite d'une chute de fréquence.
maxOperatingP	1..1	ActivePower	Limite maximale de puissance active de fonctionnement pouvant être entrée dans l'unité par le répartiteur.
minOperatingP	1..1	ActivePower	Limite minimale de puissance active de fonctionnement pouvant être entrée dans l'unité par le répartiteur
nominalP	0..1	ActivePower	Puissance nominale de l'unité de production. Utilisée pour donner une signification précise à des attributs fondés sur le pourcentage tels que le statisme de changement de vitesse du régulateur (attribut govenorSCD). L'attribut doit être une valeur positive inférieure ou égale à RotatingMachine.ratedS.
normalPF	0..1	Float	Facteur de participation économique de l'unité de production.
ratedGrossMaxP	0..1	ActivePower	Capacité maximale brute nominale de l'unité (valeur comptable).
ratedGrossMinP	0..1	ActivePower	Niveau de production minimal brut nominal avec lequel l'unité peut fonctionner sans risques en fournissant de l'énergie à la grille de transport.
shortPF	0..1	Float	Facteur de participation économique à court terme de l'unité de production.
name	0..1	String	hérité de: IdentifiedObject

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6.4.2.24 (Description) GroundDisconnector

Appareil mécanique de commutation, exploité manuellement ou par un moteur, utilisé pour isoler un circuit ou un équipement de la terre.

Le Tableau 294 présente tous les attributs de GroundDisconnector.

Tableau 294 – Attributs de Standard::GroundDisconnector

nom	mult	type	description
ratedCurrent	0..1	CurrentFlow	hérité de: Switch
normalOpen	1..1	Boolean	hérité de: Switch
locked	0..1	Boolean	hérité de: Switch
name	0..1	String	hérité de: IdentifiedObject

6.4.2.25 (Description) GroundingImpedance

Appareil à impédance fixe utilisé pour la mise à la terre.

Le Tableau 295 présente tous les attributs de GroundingImpedance.

Tableau 295 – Attributs de Standard::GroundingImpedance

nom	mult	type	description
x	1..1	Reactance	Réactance de l'appareil.
r	0..1	Resistance	hérité de: EarthFaultCompensator
name	0..1	String	hérité de: IdentifiedObject

6.4.2.26 (Description) HydroGeneratingUnit

Unité de production dont la machine motrice est une turbine hydraulique (par exemple, Francis, Pelton, Kaplan).

Le Tableau 296 présente tous les attributs de HydroGeneratingUnit.

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Tableau 296 – Attributs de Standard::HydroGeneratingUnit

nom	mult	type	description
totalEfficiency	0..1	PerCent	hérité de: GeneratingUnit
genControlSource	0..1	GeneratorControlSource	hérité de: GeneratingUnit
initialP	0..1	ActivePower	hérité de: GeneratingUnit
ratedNetMaxP	0..1	ActivePower	hérité de: GeneratingUnit
baseP	0..1	ActivePower	hérité de: GeneratingUnit
governorSCD	0..1	PerCent	hérité de: GeneratingUnit
maxOperatingP	1..1	ActivePower	hérité de: GeneratingUnit
minOperatingP	1..1	ActivePower	hérité de: GeneratingUnit
nominalP	0..1	ActivePower	hérité de: GeneratingUnit
normalPF	0..1	Float	hérité de: GeneratingUnit
ratedGrossMaxP	0..1	ActivePower	hérité de: GeneratingUnit
ratedGrossMinP	0..1	ActivePower	hérité de: GeneratingUnit
shortPF	0..1	Float	hérité de: GeneratingUnit
name	0..1	String	hérité de: IdentifiedObject

6.4.2.27 (extrait) classe racine IdentifiedObject

Il s'agit d'une classe racine qui fournit une identification commune pour toutes les classes nécessitant des attributs d'identification et de dénomination.

Le Tableau 297 présente tous les attributs de IdentifiedObject.

Tableau 297 – Attributs de Standard::IdentifiedObject

nom	mult	type	description
name	0..1	String	Le nom est un texte lisible par l'homme et, si possible, non unique, qui nomme l'objet.

6.4.2.28 (Description) Jumper

Courte section de conducteur avec une impédance négligeable pouvant être enlevée et remplacée manuellement si le circuit n'est plus alimenté. Noter que les branches à impédance nulle peuvent être potentiellement modélisées par un ACLineSegment avec un ConductorType à impédance nulle.

Le Tableau 298 présente tous les attributs de Jumper.

Tableau 298 – Attributs de Standard::Jumper

nom	mult	type	description
ratedCurrent	0..1	CurrentFlow	hérité de: Switch
normalOpen	1..1	Boolean	hérité de: Switch
locked	0..1	Boolean	hérité de: Switch
name	0..1	String	hérité de: IdentifiedObject

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6.4.2.29 (Description) LinearShuntCompensator

Le compensateur shunt linéaire a des batteries ou des sections ayant des valeurs égales d'admittance.

Le Tableau 299 présente tous les attributs de LinearShuntCompensator.

Tableau 299 – Attributs de Standard::LinearShuntCompensator

nom	mult	type	description
bPerSection	0..1	Susceptance	Susceptance directe (de chargement) par section
gPerSection	0..1	Conductance	Conductance directe (de chargement) par section
normalSections	1..1	Integer	hérité de: ShuntCompensator
aVRDelay	0..1	Seconds	hérité de: ShuntCompensator
nomU	0..1	Voltage	hérité de: ShuntCompensator
name	0..1	String	hérité de: IdentifiedObject

6.4.2.30 (Description) LoadBreakSwitch

Dispositif de commutation mécanique capable de produire, transporter et interrompre des courants en conditions normales de fonctionnement.

Le Tableau 300 présente tous les attributs de LoadBreakSwitch.

Tableau 300 – Attributs de Standard::LoadBreakSwitch

nom	mult	type	description
breakingCapacity	1..1	CurrentFlow	hérité de: ProtectedSwitch
ratedCurrent	0..1	CurrentFlow	hérité de: Switch
normalOpen	1..1	Boolean	hérité de: Switch
locked	0..1	Boolean	hérité de: Switch
name	0..1	String	hérité de: IdentifiedObject

6.4.2.31 LoadResponseCharacteristic

Modélise la réponse caractéristique de la demande de charge due aux variations des conditions du système telles que la tension et la fréquence. Elle n'est pas liée à la réponse à la demande.

Si LoadResponseCharacteristic.exponentModel est True (vrai), les exposants de la tension sont spécifiés et utilisés pour calculer:

– Active power component (Composante de la puissance active) = Pnominal * (Voltage/cim:BaseVoltage.nominalVoltage) ** cim:LoadResponseCharacteristic.pVoltageExponent

– Reactive power component (Composante de la puissance réactive) = Qnominal * (Voltage/cim:BaseVoltage.nominalVoltage) ** cim:LoadResponseCharacteristic.qVoltageExponent

où * signifie "multiplier" et ** "à la puissance".

Le Tableau 301 présente tous les attributs de LoadResponseCharacteristic.

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Tableau 301 – Attributs de Standard::LoadResponseCharacteristic

nom	mult	type	description
qVoltageExponent	0..1	Float	Exposant de la tension par unité émettant une puissance réactive. Ce modèle est utilisé seulement lorsque “useExponentModel” est true (vrai).
exponentModel	1..1	Boolean	Indique que le modèle de dépendance exponentielle de la tension pVoltateExponent et qVoltageExponent) doit être utilisé. Si false (faux), le modèle de coefficient (constitué de pConstantImpedance, pConstantCurrent, pConstantPower, qConstantImpedance, qConstantCurrent, et qConstantPower) doit être utilisé.
pConstantCurrent	0..1	Float	Partie de la charge de puissance active modélisée comme courant constant. Utilisé uniquement si useExponentModel est false (faux). Cette valeur est normalisée par rapport à la somme de pZ, pI, et pP.
pConstantImpedance	0..1	Float	Partie de la charge de puissance active modélisée comme impédance constante. Utilisé uniquement si useExponentModel est false (faux). Cette valeur est normalisée par rapport à la somme de pZ, pI, et pP.
pConstantPower	0..1	Float	Partie de la charge de puissance active modélisée comme puissance constante. Utilisé uniquement si useExponentModel est false (faux). Cette valeur est normalisée par rapport à la somme de pZ, pI, et pP.
pFrequencyExponent	0..1	Float	Exposant de la fréquence par unité émettant une puissance active.
pVoltageExponent	0..1	Float	Exposant de la tension par unité émettant une puissance réelle. Ce modèle est utilisé seulement lorsque “useExponentModel” est true (vrai).
qConstantCurrent	0..1	Float	Partie de la charge de puissance réactive modélisée comme courant constant. Utilisé uniquement si useExponentModel est false (faux). Cette valeur est normalisée par rapport à la somme de qZ, qI, et qP.
qConstantImpedance	0..1	Float	Partie de la charge de puissance réactive modélisée comme impédance constante. Utilisé uniquement si useExponentModel est false (faux). Cette valeur est normalisée par rapport à la somme de qZ, qI, et qP.
qConstantPower	0..1	Float	Partie de la charge de puissance réactive modélisée comme puissance constante. Utilisé uniquement si useExponentModel est false (faux). Cette valeur est normalisée par rapport à la somme de qZ, qI, et qP.
qFrequencyExponent	0..1	Float	Exposant de la fréquence par unité émettant une puissance réactive.
name	0..1	String	hérité de: IdentifiedObject

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6.4.2.32 (extrait) classe racine Name

La classe Name fournit les moyens de définir un nombre quelconque de noms lisibles par l'homme pour un objet. Un nom ne doit pas être utilisé pour définir des relations entre objets. Utiliser plutôt l’identification d’objet 'mRID' pour les relations entre objets.

Le Tableau 302 présente tous les attributs de Name.

Tableau 302 – Attributs de Standard::Name

nom	mult	type	description
name	1..1	String	Tout texte libre qui désigne l'objet.

Le Tableau 303 présente toutes les extrémités d'association de Name avec d'autres classes.

Tableau 303 – Extrémités d'association de Standard::Name avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	IdentifiedObject	1..1	IdentifiedObject	Objet identifié que désigne ce nom.
0..*	NameType	1..1	NameType	Type de ce nom.

6.4.2.33 (extrait) classe racine NameType

Type de nom. Les valeurs possibles pour l'attribut 'name' dépendent de la mise en œuvre mais des profils normatifs peuvent spécifier des types. Une entreprise peut avoir plusieurs systèmes informatiques dont chacun a son propre nom local pour le même objet, par exemple un système de planification peut utiliser d'autres noms qu'un système de gestion de l'énergie (EMS). Un objet peut aussi avoir des noms différents dans le même système informatique, par exemple localName tel que le définit le CIM version 14. La définition du CIM14 est

Le localName (nom local) est un nom de l'objet lisible par l'homme. Il n'est utilisé qu'avec les objets organisés dans une hiérarchie de dénomination. localName: C'est un nom en texte libre se trouvant à un nœud dans une hiérarchie de dénomination similaire à une structure de répertoire de fichiers. Une hiérarchie de dénomination relative à un système de puissance peut être la suivante: Substation, VoltageLevel, Equipment etc. Dans une telle hiérarchie, les enfants du même parent ont des noms qui sont généralement uniques les uns par rapport aux autres.

aliasName: Un nom alternatif en texte libre typiquement utilisé dans les rapports tabulaires dans lesquels la largeur des colonnes est limitée.

6.4.2.34 (Description) NonConformLoad

Les charges non conformes NonConformLoad représentent des charges qui ne suivent pas un profil de variation quotidienne de charge et les variations ne sont pas corrélées au profil de variation de charge quotidienne.

Le Tableau 304 présente tous les attributs de NonConformLoad.

Tableau 304 – Attributs de Standard::NonConformLoad

nom	mult	type	description
customerCount	0..1	Integer	hérité de: EnergyConsumer
pfixed	0..1	ActivePower	hérité de: EnergyConsumer
pfixedPct	0..1	PerCent	hérité de: EnergyConsumer
qfixed	0..1	ReactivePower	hérité de: EnergyConsumer
qfixedPct	0..1	PerCent	hérité de: EnergyConsumer
name	0..1	String	hérité de: IdentifiedObject

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Le Tableau 305 présente toutes les extrémités d'association de NonConformLoad avec d'autres classes.

Tableau 305 – Extrémités d'association de Standard::NonConformLoad avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	LoadResponse	0..1	LoadResponseCharacteristic	hérité de: EnergyConsumer

6.4.2.35 (extrait) PowerSystemResource

Une ressource de système de puissance peut être un équipement tel qu'un Switch, un EquipmentContainer contenant de nombreux équipements individuels tel qu'un Substation ou une entité opérationnelle telle qu'une Company ou SubControlArea. Cela permet la collecte de PowerSystemResources dans d'autres PowerSystemResources. Par exemple, un Switch peut être membre d'un Substation et un Substation peut être membre d'une division d'une Company.

Le Tableau 306 présente tous les attributs de PowerSystemResource.

Tableau 306 – Attributs de Standard::PowerSystemResource

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject

6.4.2.36 (Description) PetersenCoil

Appareil à impédance accordable normalement utilisé pour décaler le chargement de la ligne au cours des défauts uniques de la ligne dans une section non mise à la terre du réseau.

Le Tableau 307 présente tous les attributs de PetersenCoil.

Tableau 307 – Attributs de Standard::PetersenCoil

nom	mult	type	description
nominalU	0..1	Voltage	Tension nominale pour laquelle la bobine a été conçue.
offsetCurrent	0..1	CurrentFlow	Le courant décalé que le régulateur de la bobine Petersen fait fonctionner à partir du point de résonance. Il s'agit normalement d'une grandeur fixe pour laquelle le régulateur est configuré et peut être positive ou négative. Généralement entre 0 A et 60 A selon la tension et les conditions de résonance.
xGroundMax	0..1	Reactance	Réactance maximale.
xGroundMin	0..1	Reactance	Réactance minimale.
xGroundNominal	0..1	Reactance	Réactance nominale. Il s'agit du point de fonctionnement (normalement pendant la compensation) qui est défini d'après le point de résonance en conditions saines du réseau. L'impédance est calculée d'après la tension nominale divisée par le courant de position.
r	0..1	Resistance	hérité de: EarthFaultCompensator
name	0..1	String	hérité de: IdentifiedObject

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6.4.2.37 (Description) PowerTransformerEnd

Un PowerTransformerEnd est associé à chaque Terminal d'un PowerTransformer.

Les valeurs d'impédance r, r0, x et x0 d'une PowerTransformerEnd représentent un équivalent étoile de la manière suivante:

1) Pour un PowerTransformer à deux Terminals (bornes), le PowerTransformerEnd haute tension a des valeurs non nulles pour r, r0, x et x0 tandis que le PowerTransformerEnd basse tension a des valeurs nulles pour r, r0, x et x0.
2) Pour un PowerTransformer à trois Terminals (bornes), les trois PowerTransformerEnds représentent un équivalent étoile dont chaque branche de l'étoile est représentée par r, r0, x et des valeurs x0.
3) Pour un PowerTransformer à plus de trois Terminals (bornes), les valeurs d'impédance de PowerTransformerEnd ne peuvent pas être utilisées. Utiliser dans ce cas TransformerMeshImpedance ou diviser le transformateur en plusieurs PowerTransformers.

Le Tableau 308 présente tous les attributs de PowerTransformerEnd.

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Tableau 308 – Attributs de Standard::PowerTransformerEnd

nom	mult	type	description
b	0..1	Susceptance	Susceptance de branche magnétique (B mag). La valeur peut être positive ou négative.
connectionKind	0..1	WindingConnection	Sorte de connexion.
g	0..1	Conductance	Conductance de la branche magnétisante.
r	0..1	Resistance	Résistance (modèle en étoile) de l'extrémité du transformateur. L'attribut doit être supérieur ou égal à zéro pour les transformateurs non équivalents.
ratedS	0..1	ApparentPower	Valeur assignée de puissance apparente normale. L'attribut doit être une valeur positive. Pour un transformateur à deux enroulements, les valeurs pour les côtés haute et basse tension doivent être identiques.
ratedU	0..1	Voltage	Tension assignée: entre phases pour les enroulements triphasés, et soit entre phases, soit entre phase et neutre pour les enroulements monophasés. Un côté haute tension, comme dans le cas de TransformerEnd.endNumber, doit avoir un ratedU supérieur ou égal au ratedU pour les côtés de tension inférieure.
x	0..1	Reactance	Réactance série directe (modèle en étoile) de l'extrémité du transformateur.
phaseAngleClock	0..1	Integer	Déplacement de l'angle de phase de tension aux bornes où les heures d'une horloge représentent les 360 degrés. Les valeurs valides vont de 0 à 11. Par exemple pour l'extrémité côté secondaire d'un transformateur dont le code de groupe vectoriel est 'Dyn11', spécifier le type de connexion sous forme étoile avec neutre et spécifier l'angle de phase 11 d'après l'horloge. La valeur de position pour le numéro d'extrémité spécifié 1 du transformateur est réputée être zéro. Noter que le numéro d'extrémité du transformateur n'est pas réputé être identique au numéro d'ordre de la borne.
grounded	1..1	Boolean	hérité de: TransformerEnd
rground	0..1	Resistance	hérité de: TransformerEnd
xground	0..1	Reactance	hérité de: TransformerEnd
name	0..1	String	hérité de: IdentifiedObject

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6.4.2.38 (extrait) ProtectedSwitch

Un ProtectedSwitch (commutateur protégé) est un dispositif de commutation qui peut être actionné par un ProtectionEquipment (équipement de protection).

Le Tableau 309 présente tous les attributs de ProtectedSwitch.

Tableau 309 – Attributs de Standard::ProtectedSwitch

nom	mult	type	description
breakingCapacity	1..1	CurrentFlow	Courant de défaut maximal auquel un dispositif de coupure peut fonctionner en toute sécurité dans les conditions d'utilisation spécifiées.
ratedCurrent	0..1	CurrentFlow	hérité de: Switch
normalOpen	1..1	Boolean	hérité de: Switch
locked	0..1	Boolean	hérité de: Switch
name	0..1	String	hérité de: IdentifiedObject

6.4.2.39 (Description) RatioTapChanger

Changeur de prises qui change le rapport de tensions ayant un impact sur la valeur de la tension, mais pas sur l'angle de phase aux bornes du transformateur.

Le Tableau 310 présente tous les attributs de RatioTapChanger.

Tableau 310 – Attributs de Standard::RatioTapChanger

nom	mult	type	description
stepVoltageIncrement	1..1	PerCent	Augmentation d'un pas de prise du changeur, exprimée en pourcentage de la tension nominale, par position de régleur. Pour un PhaseTapChanger symétrique, le stepVoltageIncrement est utlisé dans la formule de calcul de l'angle de phase. Pour un PhaseTapChanger symétrique, l'amplitude de tension ne change pas avec l'échelon de prise.
tculControlMode	1..1	TransformerControlMode	Spécifie le mode de commande de régulation (tension ou puissance réactive) du RatioTapChanger.
highStep	1..1	Integer	hérité de: TapChanger
lowStep	1..1	Integer	hérité de: TapChanger
neutralStep	1..1	Integer	hérité de: TapChanger
neutralU	1..1	Voltage	hérité de: TapChanger
normalStep	1..1	Integer	hérité de: TapChanger
controlEnabled	0..1	Boolean	hérité de: TapChanger
step	0..1	Float	hérité de: TapChanger
initialDelay	0..1	Seconds	hérité de: TapChanger
ltcFlag	0..1	Boolean	hérité de: TapChanger
subsequentDelay	0..1	Seconds	hérité de: TapChanger
name	0..1	String	hérité de: IdentifiedObject

6.4.2.40 (Description) Recloser

Interrupteur de défaut monté sur poteau, à relais intégrés de phase et de mise à la terre, transformateur de courant (CT) et commandes supplémentaires.

Le Tableau 311 présente tous les attributs de Recloser.

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Tableau 311 – Attributs de Standard::Recloser

nom	mult	type	description
breakingCapacity	1..1	CurrentFlow	hérité de: ProtectedSwitch
ratedCurrent	0..1	CurrentFlow	hérité de: Switch
normalOpen	1..1	Boolean	hérité de: Switch
locked	0..1	Boolean	hérité de: Switch
name	0..1	String	hérité de: IdentifiedObject

6.4.2.41 (extrait) RegulatingCondEq

Type d'équipement conducteur qui peut réguler une grandeur (c'est-à-dire une tension ou un flux) en un point spécifique du réseau.

Le Tableau 312 présente tous les attributs de RegulatingCondEq.

Tableau 312 – Attributs de Standard::RegulatingCondEq

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject

6.4.2.42 (extrait) RotatingMachine

Machine tournante qui peut être utilisée comme générateur ou comme moteur.

Le Tableau 313 présente tous les attributs de RotatingMachine.

Tableau 313 – Attributs de Standard::RotatingMachine

nom	mult	type	description
ratedU	0..1	Voltage	Tension assignée (données constructeur, Ur dans l'IEC 60909-0). Utilisé principalement pour l'échange de données relatives à un court-circuit, conformément à l'IEC 60909.
ratedPowerFactor	0..1	Float	Facteur de puissance (données constructeur). Utilisé principalement pour l'échange de données relatives à un court-circuit, conformément à l'IEC 60909.
ratedS	0..1	ApparentPower	Puissance assignée apparente (données constructeur) de l'unité. L'attribut doit avoir une valeur positive.
name	0..1	String	hérité de: IdentifiedObject

6.4.2.43 (Description) Sectionaliser

Commutateur automatique capable de se verrouiller en position ouverte pour isoler une section défectueuse. Il peut ou peut ne pas comporter une capacité de coupure de charge. Il a pour rôle premier de fournir un sectionnement de défaut à des emplacements dans lesquels le courant de défaut est soit trop élevé soit trop faible pour coordonner correctement les fusibles.

Le Tableau 314 présente tous les attributs de Sectionaliser.

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Tableau 314 – Attributs de Standard::Sectionaliser

nom	mult	type	description
ratedCurrent	0..1	CurrentFlow	hérité de: Switch
normalOpen	1..1	Boolean	hérité de: Switch
locked	0..1	Boolean	hérité de: Switch
name	0..1	String	hérité de: IdentifiedObject

6.4.2.44 (extrait) ShuntCompensator

Condensateur shunt ou inductance ou batterie commutable de condensateurs-shunts ou d'inductances. Une section d'un compensateur shunt est un condensateur individuel ou une inductance individuelle. Une valeur négative pour reactivePerSection indique que le compensateur est une inductance. ShuntCompensator est un appareil à une seule borne. La terre est impliquée.

Le Tableau 315 présente tous les attributs de ShuntCompensator.

Tableau 315 – Attributs de Standard::ShuntCompensator

nom	mult	type	description
normalSections	1..1	Integer	Nombre normal de sections mises en service pour une batterie de condensateurs.
aVRDelay	0..1	Seconds	Un retard de régulation automatique de la tension (AVRDelay) qui est le délai entre un changement de tension et le moment auquel il est admis que le condensateur change d'état. Cela permet de filtrer les variations temporaires de tension.
nomU	0..1	Voltage	Tension à laquelle peut être calculée la puissance réactive nominale. Il convient qu'elle soit normalement différente d'au plus 10 % de la tension à laquelle le condensateur est connecté au réseau.
name	0..1	String	hérité de: IdentifiedObject

6.4.2.45 (Description) SolarGeneratingUnit

Centrale solaire.

Le Tableau 316 présente tous les attributs de SolarGeneratingUnit.

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Tableau 316 – Attributs de Standard::SolarGeneratingUnit

nom	mult	type	description
totalEfficiency	0..1	PerCent	hérité de: GeneratingUnit
genControlSource	0..1	GeneratorControlSource	hérité de: GeneratingUnit
initialP	0..1	ActivePower	hérité de: GeneratingUnit
ratedNetMaxP	0..1	ActivePower	hérité de: GeneratingUnit
baseP	0..1	ActivePower	hérité de: GeneratingUnit
governorSCD	0..1	PerCent	hérité de: GeneratingUnit
maxOperatingP	1..1	ActivePower	hérité de: GeneratingUnit
minOperatingP	1..1	ActivePower	hérité de: GeneratingUnit
nominalP	0..1	ActivePower	hérité de: GeneratingUnit
normalPF	0..1	Float	hérité de: GeneratingUnit
ratedGrossMaxP	0..1	ActivePower	hérité de: GeneratingUnit
ratedGrossMinP	0..1	ActivePower	hérité de: GeneratingUnit
shortPF	0..1	Float	hérité de: GeneratingUnit
name	0..1	String	hérité de: IdentifiedObject

6.4.2.46 (Description) StaticVarCompensator

Installation proposant une puissance réactive de shunt variable et modulable. Le SVC consiste généralement en un transformateur abaisseur, un filtre, une inductance commandée par thyristor et des bras de condensateur commutés par thyristor.

Le SVC peut fonctionner dans le mode de sortie MVar fixe ou dans le mode de commande de tension. Dans le mode de commande de tension, la sortie du SVC est proportionnelle à l'écart de tension au niveau du bus commandé par rapport au point de consigne de la tension. La pente caractéristique du SVC définit la proportion. Si la tension au niveau du bus commandé est égale au point de consigne de la tension, la sortie MVar du SVC est nulle.

Le Tableau 317 présente tous les attributs de StaticVarCompensator.

Tableau 317 – Attributs de Standard::StaticVarCompensator

nom	mult	type	description
capacitiveRating	0..1	Reactance	Maximum de réactance capacitive disponible.
inductiveRating	0..1	Reactance	Maximum de réactance inductive disponible.
slope	0..1	VoltagePerReactivePower	La pente de la caractéristique d'un SVC définit la façon dont la sortie de puissance réactive change proportionnellement à la différence entre la tension régulée du bus et le point de consigne de la tension.
name	0..1	String	hérité de: IdentifiedObject

6.4.2.47 (Description) StationSupply

Approvisionnement du poste avec une charge dérivée de la sortie de poste.

Le Tableau 318 présente tous les attributs de StationSupply.

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Tableau 318 – Attributs de Standard::StationSupply

nom	mult	type	description
customerCount	0..1	Integer	hérité de: EnergyConsumer
pfixed	0..1	ActivePower	hérité de: EnergyConsumer
pfixedPct	0..1	PerCent	hérité de: EnergyConsumer
qfixed	0..1	ReactivePower	hérité de: EnergyConsumer
qfixedPct	0..1	PerCent	hérité de: EnergyConsumer
name	0..1	String	hérité de: IdentifiedObject

Le Tableau 319 présente toutes les extrémités d'association de StationSupply avec d'autres classes.

Tableau 319 – Extrémités d'association de Standard::StationSupply avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	LoadResponse	0..1	LoadResponseCharacteristic	hérité de: EnergyConsumer

6.4.2.48 (extrait) Switch

Appareil générique visant à établir ou à interrompre le courant, ou les deux, dans un ou plusieurs circuits électriques.

Le Tableau 320 présente tous les attributs de Switch.

Tableau 320 – Attributs de Standard::Switch

nom	mult	type	description
ratedCurrent	0..1	CurrentFlow	Capacité de transport maximale du courant continu en ampères d'après le matériau et la construction de l'appareil.
normalOpen	1..1	Boolean	L'attribut est utilisé dans des cas où aucun Measurement (mesurage) pour la valeur de statut n'est présent. Si le Switch a un Measurement de statut, alors la valeur Discrete.normalValue est réputée correspondre au Switch.normalOpen.
locked	0..1	Boolean	Si true (vrai), le commutateur est verrouillé. L'état d'interrupteur qui en résulte est une combinaison des attributs locked et Switch.open comme suit: - locked=true et Switch.open=true. L'état qui en résulte est ouvert et verrouillé; - locked=false et Switch.open=true. L'état qui en résulte est ouvert; - locked=false et Switch.open=false. L'état qui en résulte est fermé.
name	0..1	String	hérité de: IdentifiedObject

6.4.2.49 (Description) SwitchPhase

Phase unique d'un commutateur polyphasé lorsqu'il est possible que ses attributs soient différents pour chaque phase.

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Le Tableau 321 présente tous les attributs de SwitchPhase.

Tableau 321 – Attributs de Standard::SwitchPhase

nom	mult	type	description
ratedCurrent	0..1	CurrentFlow	Capacité de transport maximale du courant continu en ampères d'après le matériau et la construction de l'appareil.
name	0..1	String	hérité de: IdentifiedObject

Le Tableau 322 présente toutes les extrémités d'association de SwitchPhase avec d'autres classes.

Tableau 322 – Extrémités d'association de Standard::SwitchPhase avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Switch	1..1	Switch	Commutateur de la phase de commutateur.

6.4.2.50 (Description) SynchronousMachine

Appareil électromécanique fonctionnant par rotation synchrone d'un arbre avec le réseau. Il s'agit d'une machine unique opérant comme un générateur, comme un condensateur synchrone ou comme une pompe.

Le Tableau 323 présente tous les attributs de SynchronousMachine.

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Tableau 323 – Attributs de Standard::SynchronousMachine

nom	mult	type	description
r	1..1	Resistance	Résistance équivalente (RG) du générateur. RG est prise en considération pour le calcul de tous les courants, à l'exception du calcul du courant de crête, ip. Utilisé pour l'échange de données relatives à un court-circuit, conformément à l'IEC 60909.
maxQ	0..1	ReactivePower	Limite maximale de la puissance réactive. Il s'agit de la limite maximale (constructeur) de l'unité.
minQ	0..1	ReactivePower	Limite de puissance réactive minimale de l'unité.
operatingMode	1..1	SynchronousMachine OperatingMode	Mode de fonctionnement courant.
type	1..1	SynchronousMachineKind	Modes dans lesquels cette machine synchrone peut fonctionner.
baseQ	1..1	ReactivePower	Valeur par défaut de la puissance réactive de base. Cette valeur représente la puissance réactive initiale pouvant être utilisée par toute fonction d'application.
ratedU	0..1	Voltage	hérité de: RotatingMachine
ratedPowerFactor	0..1	Float	hérité de: RotatingMachine
ratedS	0..1	ApparentPower	hérité de: RotatingMachine
name	0..1	String	hérité de: IdentifiedObject

6.4.2.51 (extrait) TapChanger

Mécanisme de modification des positions des prises d'enroulement du transformateur.

Le Tableau 324 présente tous les attributs de TapChanger.

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Tableau 324 – Attributs de Standard::TapChanger

nom	mult	type	description
highStep	1..1	Integer	Position la plus élevée possible du régleur de prise en partant de neutre.
lowStep	1..1	Integer	Position la plus basse possible du régleur de prise retardée à neutre.
neutralStep	1..1	Integer	Position neutre du régleur de prise pour cet enroulement.
neutralU	1..1	Voltage	Tension à laquelle l'enroulement fonctionne au réglage de la prise neutre.
normalStep	1..1	Integer	Position du régleur de prise utilisée en fonctionnement "normal" du réseau pour cet enroulement. Régleur "Fixed" (fixe) indique le réglage matériel actuel.
controlEnabled	0..1	Boolean	Spécifie le statut de régulation de l'équipement. True (vrai), il régule. False (faux), il ne régule pas.
step	0..1	Float	Position du changeur de prises. Échelon de départ pour une solution en régime établi. Aucune valeur entière n'est admise pour prendre en charge des variables continues de prise. La valeur continue sert à appuyer les cas d'études dans lesquels aucun changeur de prises discret n'a encore été conçu, une solution pour laquelle la bande étroite de tension force le régleur de prise à osciller ou à s'ajuster pour obtenir une solution continue comme entrée. L'attribut doit être supérieur ou égal à lowStep et inférieur ou égal à highStep.
initialDelay	0..1	Seconds	Pour un LTC (*load tap changing* – changement de prises de chargement), le délai pour le fonctionnement initial du changeur de prises (premier changement d'étape).
ltcFlag	0..1	Boolean	Spécifie si un TapChanger a ou non des capacités de changement de prises de chargement.
subsequentDelay	0..1	Seconds	Pour un LTC, le délai pour le fonctionnement suivant du changeur de prises (deuxième et dernier changements d'étape).
name	0..1	String	hérité de: IdentifiedObject

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6.4.2.52 (Description) TapChangerControl

Décrit le comportement spécifique aux changeurs de prises, par exemple la manière dont la tension à l'extrémité d'une ligne varie avec le niveau de charge et la compensation de la chute de tension lors de l'ajustement de la prise.

Le Tableau 325 présente tous les attributs de TapChangerControl.

Tableau 325 – Attributs de Standard::TapChangerControl

nom	mult	type	description
lineDropCompensation	0..1	Boolean	Si true (vrai), la compensation de perte de ligne doit être appliquée.
lineDropR	0..1	Resistance	Réglage de la résistance de compensation de perte de ligne pour le flux de puissance normal (direct).
name	0..1	String	hérité de: IdentifiedObject

6.4.2.53 (Description) ThermalGeneratingUnit

Unité de production ayant pour machine motrice, par exemple, une turbine à vapeur, une turbine à combustion ou un moteur diesel.

Le Tableau 326 présente tous les attributs de ThermalGeneratingUnit.

Tableau 326 – Attributs de Standard::ThermalGeneratingUnit

nom	mult	type	description
totalEfficiency	0..1	PerCent	hérité de: GeneratingUnit
genControlSource	0..1	GeneratorControlSource	hérité de: GeneratingUnit
initialP	0..1	ActivePower	hérité de: GeneratingUnit
ratedNetMaxP	0..1	ActivePower	hérité de: GeneratingUnit
baseP	0..1	ActivePower	hérité de: GeneratingUnit
governorSCD	0..1	PerCent	hérité de: GeneratingUnit
maxOperatingP	1..1	ActivePower	hérité de: GeneratingUnit
minOperatingP	1..1	ActivePower	hérité de: GeneratingUnit
nominalP	0..1	ActivePower	hérité de: GeneratingUnit
normalPF	0..1	Float	hérité de: GeneratingUnit
ratedGrossMaxP	0..1	ActivePower	hérité de: GeneratingUnit
ratedGrossMinP	0..1	ActivePower	hérité de: GeneratingUnit
shortPF	0..1	Float	hérité de: GeneratingUnit
name	0..1	String	hérité de: IdentifiedObject

6.4.2.54 (extrait) TransformerEnd

Point de connexion conductrice d'un transformateur de puissance. Il correspond à une borne d'enroulement physique du transformateur. Dans les versions antérieures du CIM, la classe TransformerWinding avait un but comparable. Cette classe TransformerEnd est plus souple et présente des différences importantes avec TransformerWinding.

Le Tableau 327 présente tous les attributs de TransformerEnd.

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Tableau 327 – Attributs de Standard::TransformerEnd

nom	mult	type	description
grounded	1..1	Boolean	pour les connexions Yn et Zn) True (vrai) si le neutre est mis à la terre solidement.
rground	0..1	Resistance	pour les connexions Yn et Zn) Partie résistive de l'impédance neutre lorsque "grounded" (mis à la terre) est true (vrai).
xground	0..1	Reactance	(pour les connexions Yn et Zn) Partie réactive de l'impédance neutre lorsque "grounded" (mis à la terre) est true (vrai).
name	0..1	String	hérité de: IdentifiedObject

6.4.2.55 (Description) VoltageLevel

Ensemble d'équipements à un même niveau de tension, constituant un appareillage de connexion. L'équipement consiste généralement en disjoncteurs, jeux de barre, appareils d'instrumentation, de commande, de régulation et de protection, de même que des regroupements de ce type de constituants.

Le Tableau 328 présente tous les attributs de VoltageLevel.

Tableau 328 – Attributs de Standard::VoltageLevel

nom	mult	type	description
highVoltageLimit	0..1	Voltage	Limite de tension haute du jeu de barres
lowVoltageLimit	0..1	Voltage	Limite de tension basse du jeu de barres
name	0..1	String	hérité de: IdentifiedObject

6.4.2.56 (Description) VsConverter

Côté courant continu du convertisseur de source de tension.

Le Tableau 329 présente tous les attributs de VsConverter.

Tableau 329 – Attributs de Standard::VsConverter

nom	mult	type	description
baseS	0..1	ApparentPower	hérité de: ACDCConverter
name	0..1	String	hérité de: IdentifiedObject

Le Tableau 330 présente toutes les extrémités d'association de VsConverter avec d'autres classes.

Tableau 330 – Extrémités d'association de Standard::VsConverter avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	CapabilityCurve	0..1	VsCapabilityCurve	Courbe de capacité de ce convertisseur.

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6.4.2.57 VsCapabilityCurve

Courbe de capacité P-Q pour un convertisseur de source de tension, avec P sur l'axe X et Qmin et Qmax sur les axes Y1 et Y2.

Le Tableau 331 présente tous les attributs de VsCapabilityCurve.

Tableau 331 – Attributs de Standard::VsCapabilityCurve

nom	mult	type	description
name	0..1	String	hérité de: IdentifiedObject

6.4.2.58 (Description) WindGeneratingUnit

Bloc générateur éolien. Peut être utilisé pour représenter une turbine simple ou une agrégation.

Le Tableau 332 présente tous les attributs de WindGeneratingUnit.

Tableau 332 – Attributs de Standard::WindGeneratingUnit

nom	mult	type	description
totalEfficiency	0..1	PerCent	hérité de: GeneratingUnit
genControlSource	0..1	GeneratorControlSource	hérité de: GeneratingUnit
initialP	0..1	ActivePower	hérité de: GeneratingUnit
ratedNetMaxP	0..1	ActivePower	hérité de: GeneratingUnit
baseP	0..1	ActivePower	hérité de: GeneratingUnit
governorSCD	0..1	PerCent	hérité de: GeneratingUnit
maxOperatingP	1..1	ActivePower	hérité de: GeneratingUnit
minOperatingP	1..1	ActivePower	hérité de: GeneratingUnit
nominalP	0..1	ActivePower	hérité de: GeneratingUnit
normalPF	0..1	Float	hérité de: GeneratingUnit
ratedGrossMaxP	0..1	ActivePower	hérité de: GeneratingUnit
ratedGrossMinP	0..1	ActivePower	hérité de: GeneratingUnit
shortPF	0..1	Float	hérité de: GeneratingUnit
name	0..1	String	hérité de: IdentifiedObject

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6.5 Paquetage Topology

6.5.1 Généralités

Voir la Figure 33 et la Figure 34.

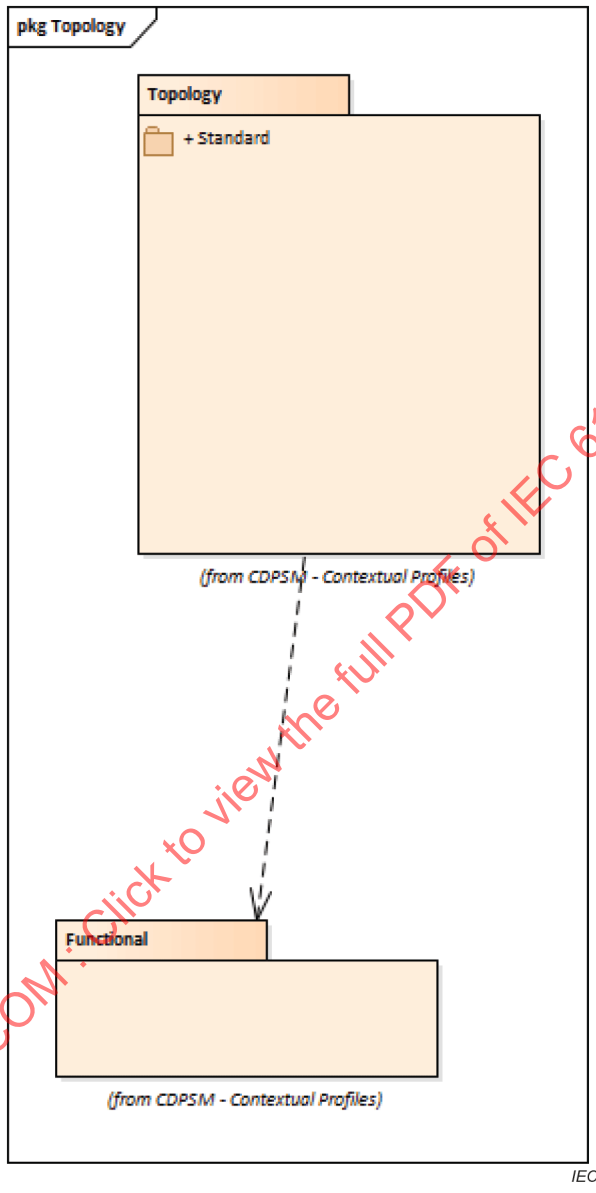

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Figure 33 – Diagramme de paquetage Topology::Topology

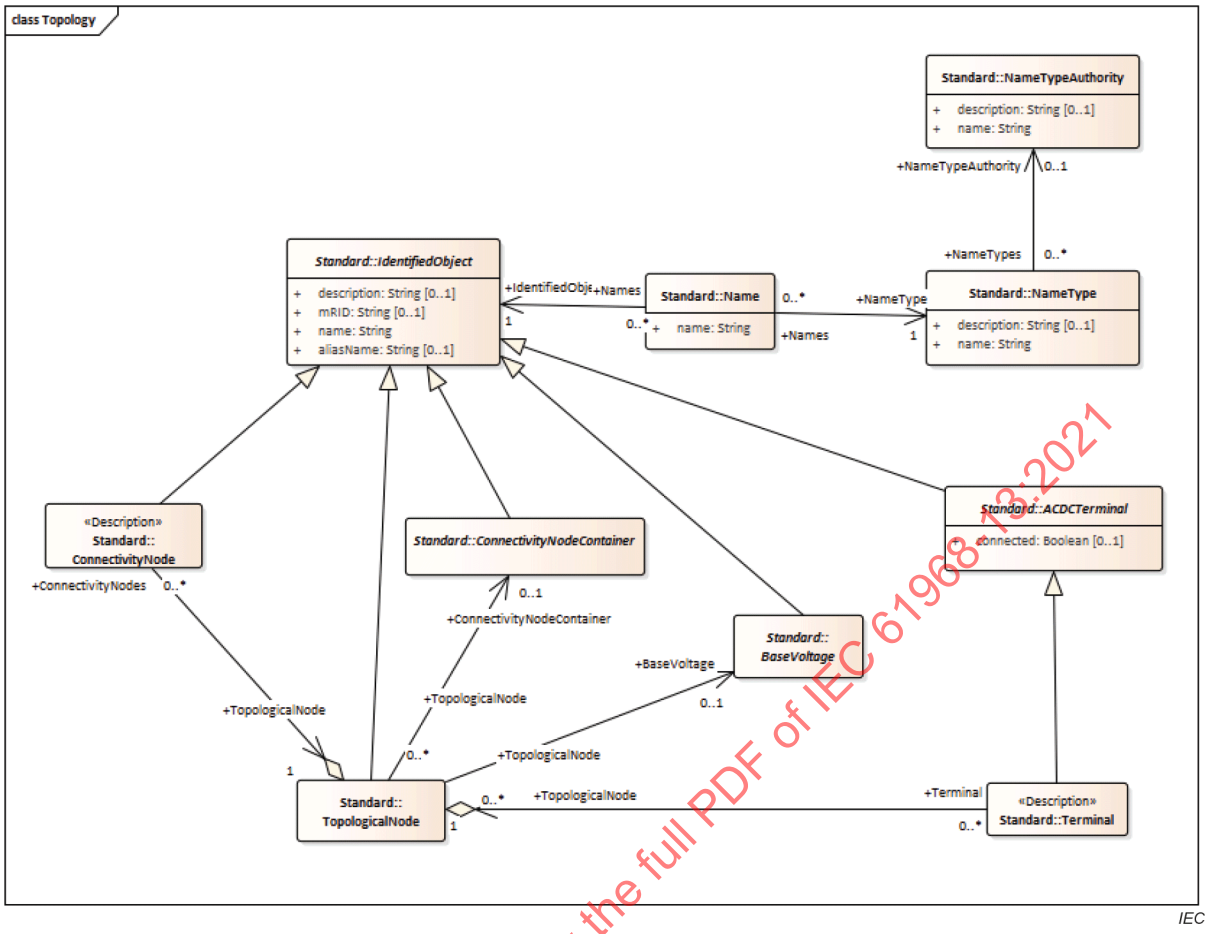

Figure 34 – Diagramme de classe Topology::Topology

6.5.2 Paquetage Standard

6.5.2.1 (extrait) ACDCTerminal

Point de connexion électrique (à courant alternatif ou à courant continu) à une partie d'un équipement conducteur. Les Terminals (bornes) sont connectées sur des points de connexion physiques appelés noeuds de connectivité (ConnectivityNode).

Le Tableau 333 présente tous les attributs d'ACDCTerminal.

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Tableau 333 – Attributs de Standard::ACDCTerminal

nom	mult	type	description
connected	0..1	Boolean	Le statut "connected" (connecté) est relatif à un modèle de topologie nodale et à la relation nœud topologique-borne. "True" (vrai) implique que la borne est connectée au nœud topologique connexe et "false" (faux) implique qu'elle ne l'est pas. Dans un modèle de topologie nodale, le statut "connected" (connecté) est utilisé pour indiquer si l'équipement est déconnecté sans devoir changer la connectivité décrite par la relation nœud topologique-borne. Un cas valide est lorsque l'équipement conducteur peut être connecté à une extrémité et ouvert à l'autre. C'est un cas approprié, en particulier pour un segment de ligne de courant alternatif où la charge de ligne réactive peut être significative.
name	1..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

6.5.2.2 (extrait) BaseVoltage

Définit une tension de base du système qui est référencée.

Le Tableau 334 présente tous les attributs de BaseVoltage.

Tableau 334 – Attributs de Standard::BaseVoltage

nom	mult	type	description
name	1..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

6.5.2.3 (Description) ConnectivityNode

Les Connectivity nodes (nœuds de connectivité) sont des points auxquels les bornes d'un équipement conducteur sont raccordées ensemble avec une impédance nulle.

Le Tableau 335 présente tous les attributs de ConnectivityNode.

Tableau 335 – Attributs de Standard::ConnectivityNode

nom	mult	type	description
name	1..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

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Le Tableau 336 présente toutes les extrémités d'association de ConnectivityNode avec d'autres classes.

Tableau 336 – Extrémités d'association de Standard::ConnectivityNode avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	TopologicalNode	1..1	TopologicalNode	Nœud topologique auquel est affecté ce nœud de connectivité. Peut dépendre de l'état courant des commutateurs dans le réseau.

6.5.2.4 (extrait) ConnectivityNodeContainer

Classe de base pour tous les objets qui peuvent contenir des noeuds de connectivité ou des nœuds topologiques.

Le Tableau 337 présente tous les attributs de ConnectivityNodeContainer.

Tableau 337 – Attributs de Standard::ConnectivityNodeContainer

nom	mult	type	description
name	1..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

6.5.2.5 (extrait) classe racine IdentifiedObject

Il s'agit d'une classe racine qui fournit une identification commune pour toutes les classes nécessitant des attributs d'identification et de dénomination.

Le Tableau 338 présente tous les attributs de IdentifiedObject.

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Tableau 338 – Attributs de Standard::IdentifiedObject

nom	mult	type	description
name	1..1	String	Le nom est un texte lisible par l'homme et, si possible, non unique, qui nomme l'objet.
aliasName	0..1	String	L'aliasName est un nom de l'objet en texte lisible par l'homme en remplacement de IdentifiedObject.name. Elle peut ne pas être unique et peut ne pas se corréler à une hiérarchie de dénomination. L'attribut aliasName a été retenu parce qu'il st compatible avec les précédentes versions du CIM. Il est cependant recommandé de remplacer aliasName par la classe Name puisqu'il est prévu de supprimer aliasName à l'avenir.
description	0..1	String	La description est un texte lisible par l'homme qui décrit ou nomme l'objet. Elle peut ne pas être unique et peut ne pas se corréler à une hiérarchie de dénomination.
mRID	0..1	String	Identificateur Master resource publié par une autorité de modèle. Le mRID (identificateur Master resource) est globalement unique dans un contexte d'échange. Il est facile d'obtenir une unicité globale en utilisant un UUID tel que spécifié dans la RFC 4122 pour le mRID. L'utilisation d'un UUID est fortement recommandée. Pour des fichiers de données CIMXML en syntaxe RDF, conformément à l'IEC 61970-552 Édition 1, le mRID est mis en correspondance avec les attributs rdf:ID ou rdf:about qui identifient les éléments d'objet du CIM.

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6.5.2.6 Classe racine Name

La classe Name fournit les moyens de définir un nombre quelconque de noms lisibles par l'homme pour un objet. Un nom ne doit pas être utilisé pour définir des relations entre objets. Utiliser plutôt l'identification d'objet 'mRID' pour les relations entre objets.

Le Tableau 339 présente tous les attributs de Name.

Tableau 339 – Attributs de Standard::Name

nom	mult	type	description
name	1..1	String	Tout texte libre qui désigne l'objet.

Le Tableau 340 présente toutes les extrémités d'association de Name avec d'autres classes.

Tableau 340 – Extrémités d'association de Standard::Name avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	IdentifiedObject	1..1	IdentifiedObject	Objet identifié que désigne ce nom.
0..*	NameType	1..1	NameType	Type de ce nom.

6.5.2.7 Classe racine NameType

Type de nom. Les valeurs possibles pour l'attribut 'name' dépendent de la mise en œuvre mais des profils normatifs peuvent spécifier des types. Une entreprise peut avoir plusieurs systèmes informatiques dont chacun a son propre nom local pour le même objet, par exemple un système de planification peut utiliser d'autres noms qu'un système de gestion de l'énergie (EMS). Un objet peut aussi avoir des noms différents dans le même système informatique, par exemple localName tel que le définit le CIM version 14. La définition du CIM14 est

Le localName (nom local) est un nom de l'objet lisible par l'homme. Il n'est utilisé qu'avec les objets organisés dans une hiérarchie de dénomination. localName: C'est un nom en texte libre se trouvant à un nœud dans une hiérarchie de dénomination similaire à une structure de répertoire de fichiers. Une hiérarchie de dénomination relative à un système de puissance peut être la suivante: Substation, VoltageLevel, Equipment etc. Dans une telle hiérarchie, les enfants du même parent ont des noms qui sont généralement uniques les uns par rapport aux autres.

aliasName: Un nom alternatif en texte libre typiquement utilisé dans les rapports tabulaires dans lesquels la largeur des colonnes est limitée.

Le Tableau 341 présente tous les attributs de NameType.

Tableau 341 – Attributs de Standard::NameType

nom	mult	type	description
name	1..1	String	Nom du type de nom.
description	0..1	String	Description du type de nom.

Le Tableau 342 présente toutes les extrémités d'association de NameType avec d'autres classes.

Tableau 342 – Extrémités d'association de Standard:: NameType avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	NameTypeAuthority	0..1	NameTypeAuthority	Autorité responsable de la gestion des noms de ce type.

6.5.2.8 Classe racine NameTypeAuthority

Autorité responsable de créer et de gérer les noms d'un type donné. Il s'agit en général d'une organisation ou d'un système d'entreprise.

Le Tableau 343 présente tous les attributs de NameTypeAuthority.

Tableau 343 – Attributs de Standard::NameTypeAuthority

nom	mult	type	description
name	1..1	String	Nom de l'autorité pour le type de nom.
description	0..1	String	Description de l'autorité pour le type de nom.

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6.5.2.9 (Description) Terminal

Point de connexion électrique à une partie d'un équipement conducteur. Les Terminals (bornes) sont connectées sur des points de connexion physiques appelés nœuds de connectivité (ConnectivityNode).

Le Tableau 344 présente tous les attributs de Terminal.

Tableau 344 – Attributs de Standard::Terminal

nom	mult	type	description
connected	0..1	Boolean	hérité de: ACDCTerminal
name	1..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 345 présente toutes les extrémités d'association de Terminal avec d'autres classes.

Tableau 345 – Extrémités d'association de Standard::Terminal avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	TopologicalNode	1..1	TopologicalNode	Le nœud topologique associé à la borne. Il peut être utilisé comme remplacement d'un chemin de nœuds de connectivité allant jusqu'au nœud topologique, éliminant donc la nécessité de modéliser les nœuds de connectivité dans certains cas. Noter que si les nœuds de connectivité sont présents dans le modèle, cette association n'est probablement pas utilisée comme spécification d'entrée.

6.5.2.10 TopologicalNode

Pour un modèle de poste détaillé, un nœud topologique est un ensemble de nœuds de connectivité qui, dans l'état courant du réseau, sont reliés ensemble par une sorte quelconque de commutateurs fermés, y compris des cavaliers. Les nœuds topologiques changent en même temps que l'état du réseau change (c'est-à-dire que des commutateurs, des disjoncteurs, etc., modifient l'état).

Pour un modèle de planification, les états des commutateurs ne sont pas utilisés pour former des nœuds topologiques. Au contraire, ils sont créés ou supprimés manuellement dans un outil constructeur de modèle. Les nœuds topologiques conservés de cette manière sont également appelés "bus".

Le Tableau 346 présente tous les attributs de TopologicalNode.

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Tableau 346 – Attributs de Standard::TopologicalNode

nom	mult	type	description
name	1..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 347 présente toutes les extrémités d'association de TopologicalNode avec d'autres classes.

Tableau 347 – Extrémités d'association de Standard::TopologicalNode avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	BaseVoltage	0..1	BaseVoltage	Tension de base du nœud topologique.
0..*	ConnectivityNodeContainer	0..1	ConnectivityNodeContainer	Conteneur de nœuds de connectivité auquel le nœud topologique appartient.

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6.6 Paquetage SteadyStateHypothesis

6.6.1 Généralités

Voir la Figure 35 et la Figure 36.

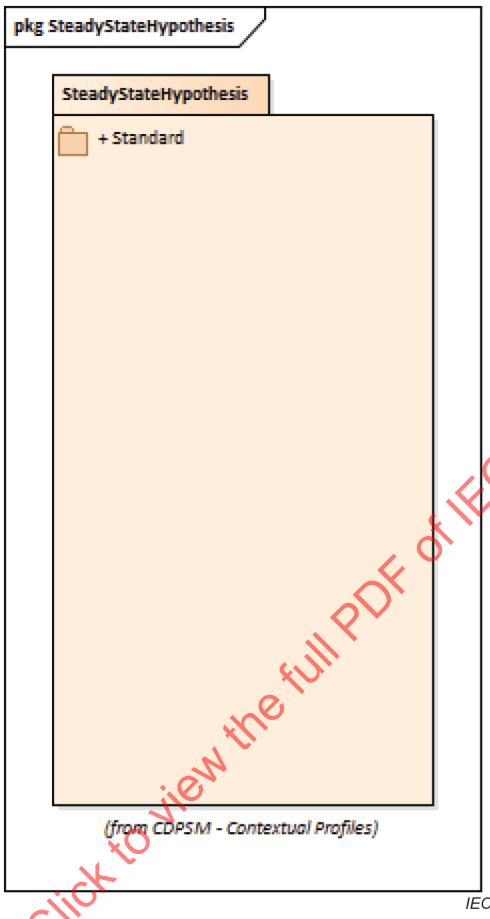

Figure 35 – Diagramme de paquetage SteadyStateHypothesis::SteadyStateHypothesis

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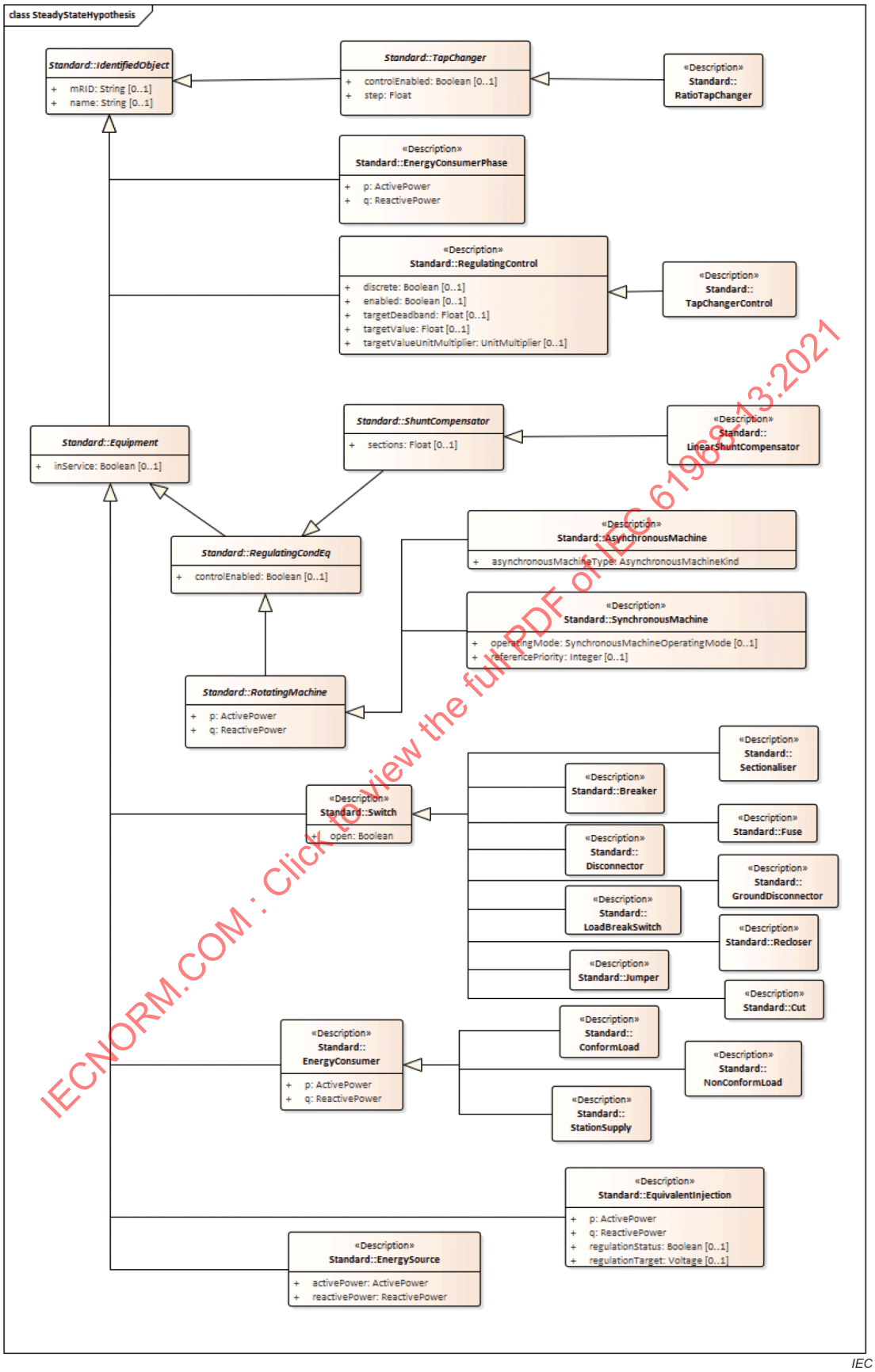

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Figure 36 – Diagramme de classe SteadyStateHypothesis::SteadyStateHypothesis

6.6.2 Paquetage Standard

6.6.2.1 (Description) AsynchronousMachine

Machine tournante dont l'arbre tourne de manière asynchrone par rapport au champ électrique. Aussi appelée machine à induction sans connexion externe aux enroulements du rotor, par exemple une machine à induction à cage d'écureuil.

Le Tableau 348 présente tous les attributs de AsynchronousMachine.

Tableau 348 – Attributs de Standard::AsynchronousMachine

nom	mult	type	description
asynchronousMachineType	1..1	AsynchronousMachineKind	Indique le type de machine asynchrone (moteur ou générateur).
p	1..1	ActivePower	hérité de: RotatingMachine
q	1..1	ReactivePower	hérité de: RotatingMachine
controlEnabled	0..1	Boolean	hérité de: RegulatingCondEq
inService	0..1	Boolean	hérité de: Equipment
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

6.6.2.2 (Description) Breaker

Appareil de commutation mécanique capable d'établir, de transporter et d'interrompre des courants dans des conditions normales de circuit et aussi d'établir, de transporter pendant une durée déterminée et d'interrompre des courants dans des conditions anormales spécifiées de circuit, par exemple celles d'un court-circuit.

Le Tableau 349 présente tous les attributs de Breaker.

Tableau 349 – Attributs de Standard::Breaker

nom	mult	type	description
open	1..1	Boolean	hérité de: Switch
inService	0..1	Boolean	hérité de: Equipment
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

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6.6.2.3 (Description) ConformLoad

Les charges conformes ConformLoad représentent les charges qui suivent un profil de modification quotidienne, ce profil pouvant être utilisé pour mettre à l'échelle la charge avec un système de charge.

Le Tableau 350 présente tous les attributs de ConformLoad.

Tableau 350 – Attributs de Standard::ConformLoad

nom	mult	type	description
p	1..1	ActivePower	hérité de: EnergyConsumer
q	1..1	ReactivePower	hérité de: EnergyConsumer
inService	0..1	Boolean	hérité de: Equipment
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

6.6.2.4 (Description) Cut

Un cut sépare en deux parties un segment de ligne. Le cut se présente comme un commutateur qui est inséré entre ces deux parties et les connecte l'une à l'autre. Comme le cut est normalement ouvert, il n'y a pas de connexion galvanique entre les deux parties du segment de ligne. Il est cependant possible de fermer le cut pour obtenir une connexion galvanique.

Les bornes du cut sont orientées vers les bornes du segment de ligne qui ont le même numéro d'ordre. La borne de cut dont le numéro d'ordre est égal à 1 est, par conséquent, orientée vers la borne du segment de ligne dont le numéro d'ordre est égal à 1.

Les bornes du cut ont aussi une fonction de point de connexion pour des cavaliers et d'autres équipements, par exemple un générateur mobile. Pour y parvenir, des nœuds de connectivité sont placés aux bornes du cut. Dès lors que les nœuds de connectivité sont en place, il est possible d'y connecter n'importe quel équipement.

Le Tableau 351 présente tous les attributs de Cut.

Tableau 351 – Attributs de Standard::Cut

nom	mult	type	description
open	1..1	Boolean	hérité de: Switch
inService	0..1	Boolean	hérité de: Equipment
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

6.6.2.5 (Description) Disconnector

Appareil de commutation mécanique exploité manuellement ou par un moteur utilisé pour modifier les connexions dans un circuit ou pour isoler un circuit ou un équipement d'une source d'électricité. Les circuits doivent être ouverts ou fermés lorsqu'un courant négligeable est interrompu ou produit.

Le Tableau 352 présente tous les attributs de Disconnector.

Tableau 352 – Attributs de Standard::Disconnector

nom	mult	type	description
open	1..1	Boolean	hérité de: Switch
inService	0..1	Boolean	hérité de: Equipment
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

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6.6.2.6 (Description) EnergyConsumer

Consommateur générique d'énergie – point de consommation sur le modèle de système de puissance.

Le Tableau 353 présente tous les attributs de EnergyConsumer.

Tableau 353 – Attributs de Standard::EnergyConsumer

nom	mult	type	description
p	1..1	ActivePower	Puissance active de la charge. La convention de signe charge est utilisée, c'est-à-dire que le signe positif signifie un flux à partir d'un nœud. Pour les charges qui dépendent de la tension, la valeur est celle de la tension assignée. Valeur de départ pour une solution en régime établi.
q	1..1	ReactivePower	Puissance réactive de la charge. La convention de signe charge est utilisée, c'est-à-dire que le signe positif signifie un flux à partir d'un nœud. Pour les charges qui dépendent de la tension, la valeur est celle de la tension assignée. Valeur de départ pour une solution en régime établi.
inService	0..1	Boolean	hérité de: Equipment
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

6.6.2.7 (Description) EnergyConsumerPhase

Le Tableau 354 présente tous les attributs de EnergyConsumerPhase.

Tableau 354 – Attributs de Standard::EnergyConsumerPhase

nom	mult	type	description
p	1..1	ActivePower	Puissance active de la charge. La convention de signe charge est utilisée, c'est-à-dire que le signe positif signifie un flux à partir d'un nœud. Pour les charges qui dépendent de la tension, la valeur est celle de la tension assignée. Valeur de départ pour une solution en régime établi.
q	1..1	ReactivePower	Puissance réactive de la charge. La convention de signe charge est utilisée, c'est-à-dire que le signe positif signifie un flux à partir d'un nœud. Pour les charges qui dépendent de la tension, la valeur est celle de la tension assignée. Valeur de départ pour une solution en régime établi.
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

6.6.2.8 (Description) EnergySource

Équivalent générique pour un fournisseur d'énergie sur un niveau de tension de transport ou de distribution.

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Le Tableau 355 présente tous les attributs de EnergySource.

Tableau 355 – Attributs de Standard::EnergySource

nom	mult	type	description
activePower	1..1	ActivePower	Injection active de source haute tension. La convention de signe charge est utilisée, c'est-à-dire que le signe positif signifie un flux à partir d'un nœud. Valeur de départ pour des solutions en régime établi.
reactivePower	1..1	ReactivePower	Injection réactive de source haute tension. La convention de signe charge est utilisée, c'est-à-dire que le signe positif signifie un flux à partir d'un nœud. Valeur de départ pour des solutions en régime établi.
inService	0..1	Boolean	hérité de: Equipment
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

6.6.2.9 (extrait) Equipment

Éléments d'un système de puissance qui sont des appareils matériels, électroniques ou mécaniques.

Le Tableau 356 présente tous les attributs de Equipment.

Tableau 356 – Attributs de Standard::Equipment

nom	mult	type	description
inService	0..1	Boolean	Si true (vrai), l'équipement est en service.
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

6.6.2.10 (Description) EquivalentInjection

Cette classe représente des injections équivalentes (production ou charge). La régulation de tension est admise seulement au point de connexion.

Le Tableau 357 présente tous les attributs de EquivalentInjection.

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Tableau 357 – Attributs de Standard::EquivalentInjection

nom	mult	type	description
p	1..1	ActivePower	Injection équivalente de puissance active. La convention de signe charge est utilisée, c'est-à-dire que le signe positif signifie un flux à partir d'un nœud. Valeur de départ pour des solutions en régime établi.
q	1..1	ReactivePower	Injection équivalente de puissance réactive. La convention de signe charge est utilisée, c'est-à-dire que le signe positif signifie un flux à partir d'un nœud. Valeur de départ pour des solutions en régime établi.
regulationStatus	0..1	Boolean	Spécifie le statut de régulation par défaut de l'EquivalentInjection. True (vrai), il régule. False (faux), il ne régule pas.
regulationTarget	0..1	Voltage	Tension cible pour la régulation de tension.
inService	0..1	Boolean	hérité de: Equipment
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

6.6.2.11 (Description) Fuse

Appareil de protection contre les surintensités avec un fusible à ouverture de circuit qui est chauffé et rompu lorsqu'une surintensité le traverse. Un fusible est considéré comme un dispositif de commutation parce qu'il interrompt le courant.

Le Tableau 358 présente tous les attributs de Fuse.

Tableau 358 – Attributs de Standard::Fuse

nom	mult	type	description
open	1..1	Boolean	hérité de: Switch
inService	0..1	Boolean	hérité de: Equipment
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

6.6.2.12 (Description) GroundDisconnector

Appareil mécanique de commutation, exploité manuellement ou par un moteur, utilisé pour isoler un circuit ou un équipement de la terre.

Le Tableau 359 présente tous les attributs de GroundDisconnector.

Tableau 359 – Attributs de Standard::GroundDisconnector

nom	mult	type	description
open	1..1	Boolean	hérité de: Switch
inService	0..1	Boolean	hérité de: Equipment
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

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6.6.2.13 (extrait) classe racine IdentifiedObject

Il s'agit d'une classe racine qui fournit une identification commune pour toutes les classes nécessitant des attributs d'identification et de dénomination.

Le Tableau 360 présente tous les attributs de IdentifiedObject.

Tableau 360 – Attributs de Standard::IdentifiedObject

nom	mult	type	description
mRID	0..1	String	Identificateur Master resource publié par une autorité de modèle. Le mRID (identificateur Master resource) est globalement unique dans un contexte d'échange. Il est facile d'obtenir une unicité globale en utilisant un UUID tel que spécifié dans la RFC 4122 pour le mRID. L'utilisation d'un UUID est fortement recommandée. Pour des fichiers de données CIMXML en syntaxe RDF, conformément à l'IEC 61970-552 Édition 1, le mRID est mis en correspondance avec les attributs rdf:ID ou rdf:about qui identifient les éléments d'objet du CIM.
name	0..1	String	Le nom est un texte lisible par l'homme et, si possible, non unique, qui nomme l'objet.

6.6.2.14 (Description) Jumper

Courte section de conducteur avec une impédance négligeable pouvant être enlevée et remplacée manuellement si le circuit n'est plus alimenté. Noter que les branches à impédance nulle peuvent être potentiellement modélisées par un ACLineSegment avec un ConductorType à impédance nulle.

Le Tableau 361 présente tous les attributs de Jumper.

Tableau 361 – Attributs de Standard::Jumper

nom	mult	type	description
open	1..1	Boolean	hérité de: Switch
inService	0..1	Boolean	hérité de: Equipment
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

6.6.2.15 (Description) LinearShuntCompensator

Le compensateur shunt linéaire a des batteries ou des sections ayant des valeurs égales d'admittance.

Le Tableau 362 présente tous les attributs de LinearShuntCompensator.

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Tableau 362 – Attributs de Standard::LinearShuntCompensator

nom	mult	type	description
sections	0..1	Float	hérité de: ShuntCompensator
controlEnabled	0..1	Boolean	hérité de: RegulatingCondEq
inService	0..1	Boolean	hérité de: Equipment
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

6.6.2.16 (Description) LoadBreakSwitch

Dispositif de commutation mécanique capable de produire, transporter et interrompre des courants en conditions normales de fonctionnement.

Le Tableau 363 présente tous les attributs de LoadBreakSwitch.

Tableau 363 – Attributs de Standard::LoadBreakSwitch

nom	mult	type	description
open	1..1	Boolean	hérité de: Switch
inService	0..1	Boolean	hérité de: Equipment
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

6.6.2.17 (Description) NonConformLoad

Les charges non conformes NonConformLoad représentent des charges qui ne suivent pas un profil de variation quotidienne de charge et les variations ne sont pas corrélées au profil de variation de charge quotidienne.

Le Tableau 364 présente tous les attributs de NonConformLoad.

Tableau 364 – Attributs de Standard::NonConformLoad

nom	mult	type	description
p	1..1	ActivePower	hérité de: EnergyConsumer
q	1..1	ReactivePower	hérité de: EnergyConsumer
inService	0..1	Boolean	hérité de: Equipment
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

6.6.2.18 (Description) RatioTapChanger

Changeur de prises qui change le rapport de tensions ayant un impact sur la valeur de la tension, mais pas sur l'angle de phase aux bornes du transformateur.

Le Tableau 365 présente tous les attributs de RatioTapChanger.

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Tableau 365 – Attributs de Standard::RatioTapChanger

nom	mult	type	description
controlEnabled	0..1	Boolean	hérité de: TapChanger
step	1..1	Float	hérité de: TapChanger
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

6.6.2.19 (Description) Recloser

Interrupteur de défaut monté sur poteau, à relais intégrés de phase et de mise à la terre, transformateur de courant (CT) et commandes supplémentaires.

Le Tableau 366 présente tous les attributs de Recloser.

Tableau 366 – Attributs de Standard::Recloser

nom	mult	type	description
open	1..1	Boolean	hérité de: Switch
inService	0..1	Boolean	hérité de: Equipment
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

6.6.2.20 (extrait) RegulatingCondEq

Type d'équipement conducteur qui peut réguler une grandeur (c'est-à-dire une tension ou un flux) en un point spécifique du réseau.

Le Tableau 367 présente tous les attributs de RegulatingCondEq.

Tableau 367 – Attributs de Standard::RegulatingCondEq

nom	mult	type	description
controlEnabled	0..1	Boolean	Spécifie le statut de régulation de l'équipement. True (vrai), il régule. False (faux), il ne régule pas.
inService	0..1	Boolean	hérité de: Equipment
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

6.6.2.21 (Description) RegulatingControl

Spécifie un ensemble d'équipements qui fonctionnent ensemble pour réguler une grandeur de système de puissance telle que la tension ou le flux.

Il est possible de régler la tension du bus à distance en spécifiant la borne commandée située à un emplacement éloigné de l'équipement de commande.

En cas d'équipements multiples, de différents types, qui commandent la même borne, il ne doit y avoir qu'une seule RegulatingControl (commande de régulation) à chaque borne. Le sous-type le plus spécifique de RegulatingControl doit être utilisé lorsque de tels équipements participent à la commande, par exemple TapChangerControl pour les changeurs de prises.

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La convention de signe charge est utilisée pour la commande du flux, c'est-à-dire que le signe positif signifie un flux à partir d'un TopologicalNode (bus) vers l'équipement conducteur.

Le Tableau 368 présente tous les attributs de RegulatingControl.

Tableau 368 – Attributs de Standard::RegulatingControl

nom	mult	type	description
discrete	0..1	Boolean	La régulation est effectuée dans un mode discret. Elle s'applique à l'équipement avec une commande discrète, par exemple changeurs de prises et compensateurs shunt.
enabled	0..1	Boolean	L'indicateur indique si la régulation est activée.
targetDeadband	0..1	Float	Il s'agit d'une bande morte utilisée avec une commande discrète afin d'éviter une mise à jour excessive des commandes comme les changeurs de prises et les batteries de compensateurs shunt pendant la régulation. Unités pour ceux qui sont appropriés pour ce mode.
targetValue	0..1	Float	Valeur cible spécifiée pour "case input". Cette valeur peut être utilisée pour la valeur cible sans utilisation de programmes. Cette valeur a les unités appropriées à l'attribut de mode.
targetValueUnitMultiplier	0..1	UnitMultiplier	Spécifier le multiplicateur utilisé pour targetValue.
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

6.6.2.22 (extrait) RotatingMachine

Machine tournante qui peut être utilisée comme générateur ou comme moteur.

Le Tableau 369 présente tous les attributs de RotatingMachine.

Tableau 369 – Attributs de Standard::RotatingMachine

nom	mult	type	description
p	1..1	ActivePower	Injection de puissance active. La convention de signe charge est utilisée, c'est-à-dire que le signe positif signifie un flux à partir d'un nœud. Valeur de départ pour une solution en régime établi.
q	1..1	ReactivePower	Injection de puissance réactive. La convention de signe charge est utilisée, c'est-à-dire que le signe positif signifie un flux à partir d'un nœud. Valeur de départ pour une solution en régime établi.
controlEnabled	0..1	Boolean	hérité de: RegulatingCondEq
inService	0..1	Boolean	hérité de: Equipment
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

6.6.2.23 (Description) Sectionaliser

Commutateur automatique capable de se verrouiller en position ouverte pour isoler une section défectueuse. Il peut ou peut ne pas comporter une capacité de coupure de charge. Il a pour

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rôle premier de fournir un sectionnement de défaut à des emplacements dans lesquels le courant de défaut est soit trop élevé soit trop faible pour coordonner correctement les fusibles.

Le Tableau 370 présente tous les attributs de Sectionaliser.

Tableau 370 – Attributs de Standard::Sectionaliser

nom	mult	type	description
open	1..1	Boolean	hérité de: Switch
inService	0..1	Boolean	hérité de: Equipment
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

6.6.2.24 (extrait) ShuntCompensator

Condensateur shunt ou inductance ou batterie commutable de condensateurs-shunts ou d'inductances. Une section d'un compensateur shunt est un condensateur individuel ou une inductance individuelle. Une valeur négative pour reactivePerSection indique que le compensateur est une inductance. ShuntCompensator est un appareil à une seule borne. La terre est impliquée.

Le Tableau 371 présente tous les attributs de ShuntCompensator.

Tableau 371 – Attributs de Standard::ShuntCompensator

nom	mult	type	description
sections	0..1	Float	Sections de compensateurs shunt en cours d'utilisation. Valeur de départ pour une solution en régime établi. Aucune valeur entière n'est admise pour prendre en charge des variables continues. La valeur continue sert à appuyer les cas d'études dans lesquels aucun compensateur shunt discret n'a encore été conçu, une solution pour laquelle la bande étroite de tension force les sections à osciller ou à s'ajuster pour obtenir une solution continue comme entrée.
controlEnabled	0..1	Boolean	hérité de: RegulatingCondEq
inService	0..1	Boolean	hérité de: Equipment
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

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6.6.2.25 (Description) StationSupply

Approvisionnement du poste avec une charge dérivée de la sortie de poste.

Le Tableau 372 présente tous les attributs de StationSupply.

Tableau 372 – Attributs de Standard::StationSupply

nom	mult	type	description
p	1..1	ActivePower	hérité de: EnergyConsumer
q	1..1	ReactivePower	hérité de: EnergyConsumer
inService	0..1	Boolean	hérité de: Equipment

nom	mult	type	description
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

6.6.2.26 (Description) Switch

Appareil générique visant à établir ou à interrompre le courant, ou les deux, dans un ou plusieurs circuits électriques.

Le Tableau 373 présente tous les attributs de Switch.

Tableau 373 – Attributs de Standard::Switch

nom	mult	type	description
open	1..1	Boolean	L'attribut indique si le commutateur est considéré comme ouvert lorsqu'il est utilisé comme entrée de traitement de topologie.
inService	0..1	Boolean	hérité de: Equipment
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

6.6.2.27 (Description) SynchronousMachine

Appareil électromécanique fonctionnant par rotation synchrone d'un arbre avec le réseau. Il s'agit d'une machine unique opérant comme un générateur, comme un condensateur synchrone ou comme une pompe.

Le Tableau 374 présente tous les attributs de SynchronousMachine.

Tableau 374 – Attributs de Standard::SynchronousMachine

nom	mult	type	description
operatingMode	0..1	SynchronousMachineOperatingMode	Mode de fonctionnement courant.
referencePriority	0..1	Integer	Priorité de l'unité pour une utilisation comme sélection de bus de référence pour l'angle de phase de la tension du flux de puissance. 0 = don't care (peu importe, valeur par défaut) 1 = plus haute priorité. 2 est moins que 1 et ainsi de suite.
p	1..1	ActivePower	hérité de: RotatingMachine
q	1..1	ReactivePower	hérité de: RotatingMachine
controlEnabled	0..1	Boolean	hérité de: RegulatingCondEq
inService	0..1	Boolean	hérité de: Equipment
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

6.6.2.28 (extrait) TapChanger

Mécanisme de modification des positions des prises d'enroulement du transformateur.

Le Tableau 375 présente tous les attributs de TapChanger.

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Tableau 375 – Attributs de Standard::TapChanger

nom	mult	type	description
controlEnabled	0..1	Boolean	Spécifie le statut de régulation de l'équipement. True (vrai), il régule. False (faux), il ne régule pas.
step	1..1	Float	Position du changeur de prises. Échelon de départ pour une solution en régime établi. Aucune valeur entière n'est admise pour prendre en charge des variables continues de prise. La valeur continue sert à appuyer les cas d'études dans lesquels aucun changeur de prises discret n'a encore été conçu, une solution pour laquelle la bande étroite de tension force le régleur de prise à osciller ou à s'ajuster pour obtenir une solution continue comme entrée. L'attribut doit être supérieur ou égal à lowStep et inférieur ou égal à highStep.
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

6.6.2.29 (Description) TapChangerControl

Décrit le comportement spécifique aux changeurs de prises, par exemple la manière dont la tension à l'extrémité d'une ligne varie avec le niveau de charge et la compensation de la chute de tension lors de l'ajustement de la prise.

Le Tableau 376 présente tous les attributs de TapChangerControl.

Tableau 376 – Attributs de Standard::TapChangerControl

nom	mult	type	description
discrete	0..1	Boolean	hérité de: RegulatingControl
enabled	0..1	Boolean	hérité de: RegulatingControl
targetDeadband	0..1	Float	hérité de: RegulatingControl
targetValue	0..1	Float	hérité de: RegulatingControl
targetValueUnitMultiplier	0..1	UnitMultiplier	hérité de: RegulatingControl
mRID	0..1	String	hérité de: IdentifiedObject
name	0..1	String	hérité de: IdentifiedObject

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6.7 Paquetage StateVariables

6.7.1 Généralités

Voir la Figure 37, la Figure 38 et la Figure 39.

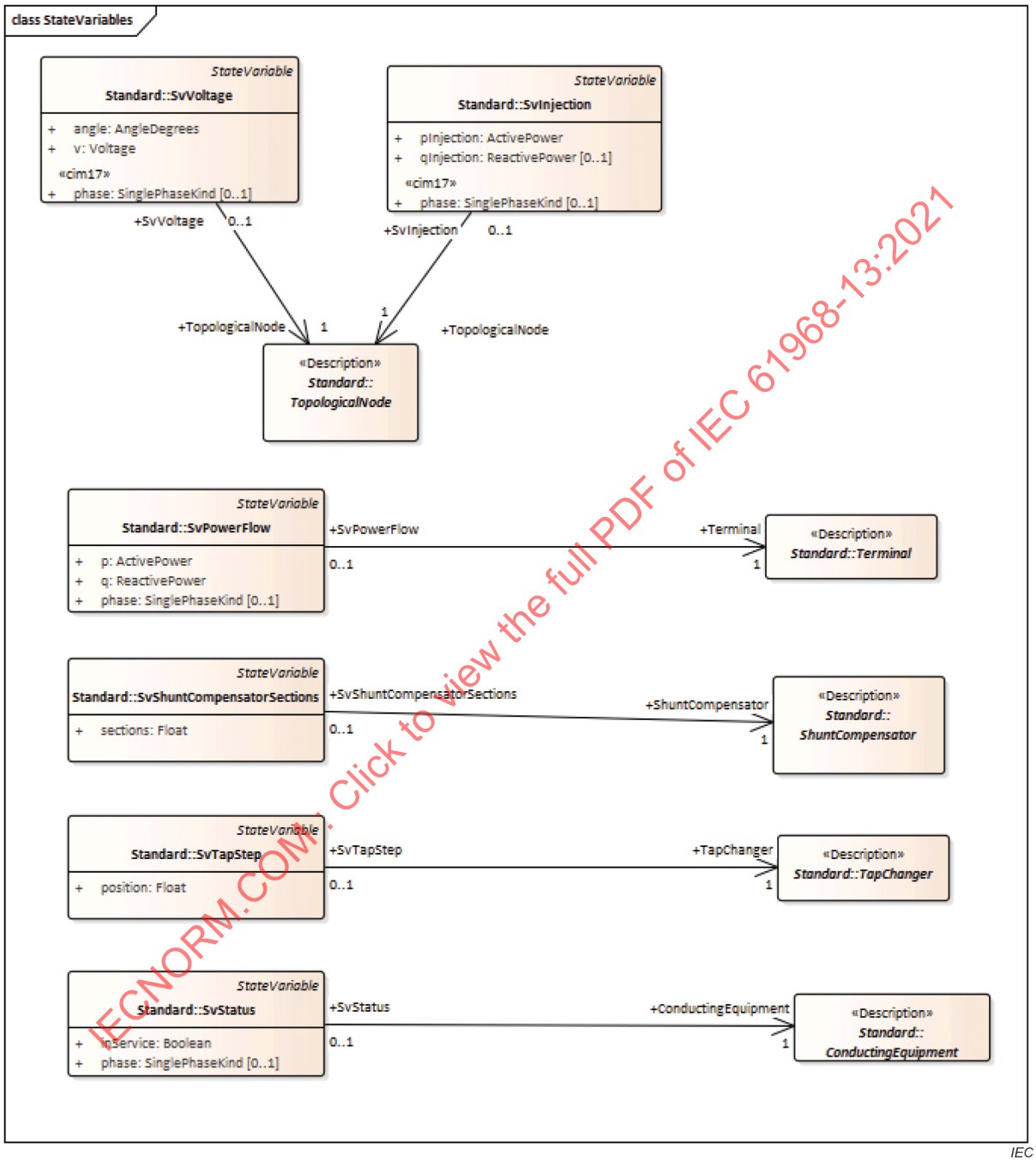

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Figure 37 – Diagramme de classe StateVariables::StateVariables

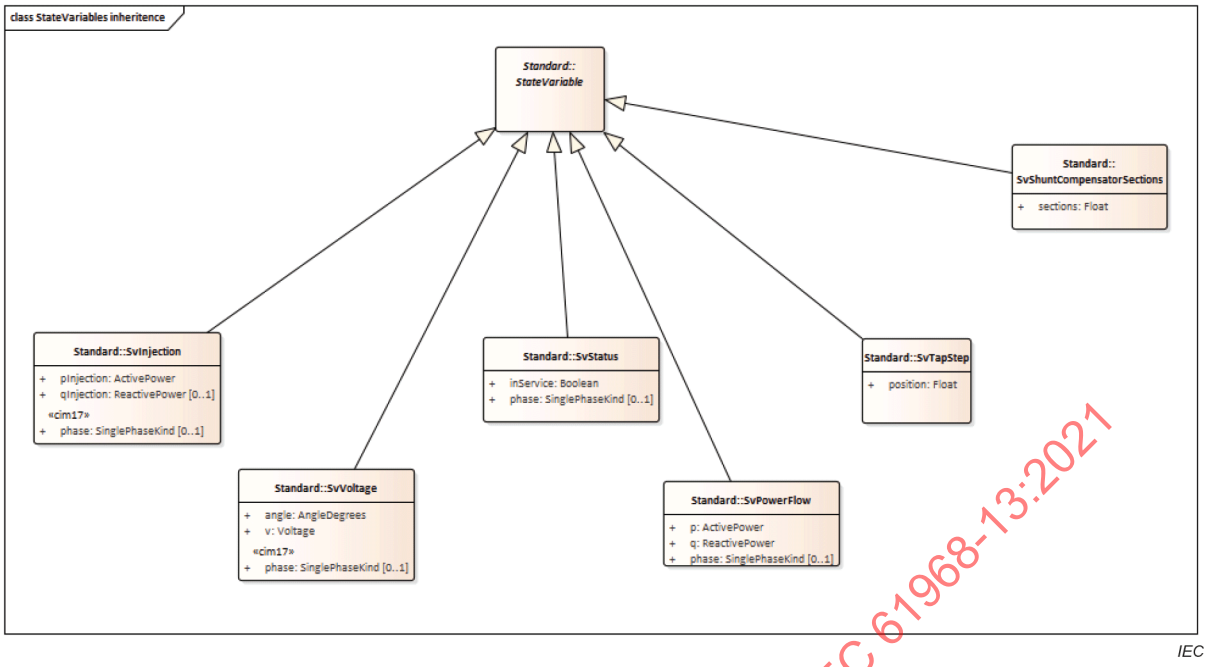

Figure 38 – Diagramme de classe StateVariables::StateVariables inheritence

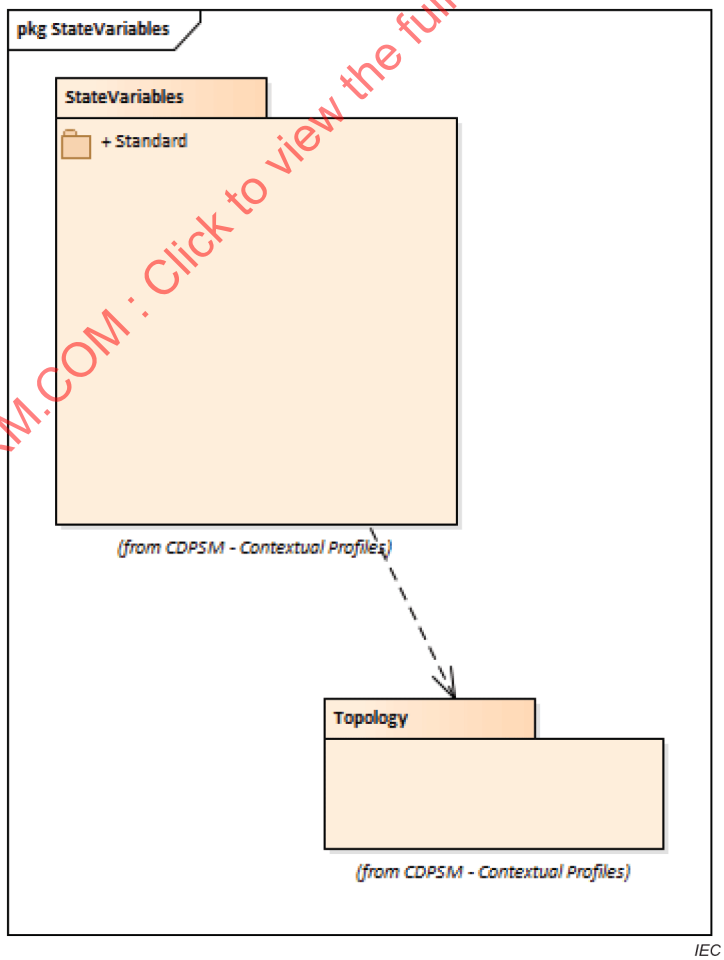

Figure 39 – Diagramme de paquetage StateVariables::StateVariables

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6.7.2 Paquetage Standard

6.7.2.1 (extrait) classe racine ConductingEquipment

Parties du système de puissance à courant alternatif conçues pour transporter du courant ou connectées par des bornes de façon à assurer la conduction. ConductingEquipment est contenu dans un EquipmentContainer qui peut être un Substation, un VoltageLevel ou une Bay dans un Substation.

6.7.2.2 (extrait) classe racine ShuntCompensator

Condensateur shunt ou inductance ou batterie commutable de condensateurs-shunts ou d'inductances. Une section d'un compensateur shunt est un condensateur individuel ou une inductance individuelle. Une valeur négative pour reactivePerSection indique que le compensateur est une inductance. ShuntCompensator est un appareil à une seule borne. La terre est impliquée.

6.7.2.3 (extrait) classe racine StateVariable

Une classe abstraite pour les variables d'état.

6.7.2.4 SvInjection

Variable d'état d'injection. Un signe positif signifie que le flux est entré dans le TopologicalNode.

Le Tableau 377 présente tous les attributs de SvInjection.

Tableau 377 – Attributs de Standard::SvInjection

nom	mult	type	description
qInjection	0..1	ReactivePower	La puissance réactive injectée dans le bus à cet endroit. Un signe positif signifie que le flux est entré dans le bus.
pInjection	1..1	ActivePower	La puissance active injectée dans le bus à cet endroit. Un signe positif signifie que le flux est entré dans le bus.

Le Tableau 378 représente toutes les extrémités d'association de SvInjection avec d'autres classes.

Tableau 378 – Extrémités d'association de Standard::SvInjection avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..1	TopologicalNode	1..1	TopologicalNode	Le nœud topologique associé à la variable d'état d'injection du flux.

6.7.2.5 SvPowerFlow

Variable d'état pour le flux de puissance. La convention de charge est utilisée pour la direction du flux. Cela signifie que le flux sortant du TopologicalNode vers l'équipement est positif.

Le Tableau 379 présente tous les attributs de SvPowerFlow.

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Tableau 379 – Attributs de Standard::SvPowerFlow

nom	mult	type	description
q	1..1	ReactivePower	Le flux de puissance réactive. La convention de signe charge est utilisée, c'est-à-dire que le signe positif signifie un flux à partir d'un nœud.
phase	0..1	SinglePhaseKind	La phase individuelle du flux. Si elle n'est pas précisée, elle est alors considérée par hypothèse comme équilibrée entre les phases.
p	1..1	ActivePower	Le flux de puissance active. La convention de signe charge est utilisée, c'est-à-dire que le signe positif signifie un flux à partir d'un nœud.

Le Tableau 380 représente toutes les extrémités d'association de SvPowerFlow avec d'autres classes.

Tableau 380 – Extrémités d'association de Standard::SvPowerFlow avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..1	Terminal	1..1	Terminal	La borne associée à la variable d'état du flux de puissance.

6.7.2.6 SvShuntCompensatorSections

Variable d'état pour le nombre de sections en service pour un compensateur shunt.

Le Tableau 381 présente tous les attributs de SvShuntCompensatorSections.

Tableau 381 – Attributs de Standard::SvShuntCompensatorSections

nom	mult	type	description
sections	1..1	Float	Le nombre de sections en service comme variable continue. Pour obtenir l'échelle des valeurs entières avec ShuntCompensator.bPerSection.

Le Tableau 382 représente toutes les extrémités d'association de SvShuntCompensatorSections avec d'autres classes.

Tableau 382 – Extrémités d'association de Standard::SvShuntCompensatorSections avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..1	ShuntCompensator	1..1	ShuntCompensator	Le compensateur shunt pour lequel l'état s'applique.

6.7.2.7 SvStatus

Variable d'état pour le statut.

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Le Tableau 383 présente tous les attributs de SvStatus.

Tableau 383 – Attributs de Standard::SvStatus

nom	mult	type	description
inService	1..1	Boolean	L'état de service résultant du traitement de la topologie.
phase	0..1	SinglePhaseKind	Le statut de la phase individuelle. Si l'attribut n'est pas spécifié, un modèle à trois phases est alors pris pour hypothèse.

Le Tableau 384 représente toutes les extrémités d'association de SvStatus avec d'autres classes.

Tableau 384 – Extrémités d'association de Standard::SvStatus avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..1	ConductingEquipment	1..1	ConductingEquipment	L'équipement conducteur associé à la variable d'état.

6.7.2.8 SvTapStep

Variable d'état pour le régleur de prise du transformateur. Cette classe doit être utilisée pour les prises des transformateurs LTC (changement de prises de chargement), et non pour les transformateurs à prises fixes. Normalement, un profil ne spécifie qu'un seul des attributs "position" ou "tapRatio".

Le Tableau 385 présente tous les attributs de SvTapStep.

Tableau 385 – Attributs de Standard::SvTapStep

nom	mult	type	description
position	1..1	Float	La position de la prise à virgule flottante. Pour obtenir une échelle de valeurs entières avec plage et arrondi.

Le Tableau 386 représente toutes les extrémités d'association de SvTapStep avec d'autres classes.

Tableau 386 – Extrémités d'association de Standard::SvTapStep avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..1	TapChanger	1..1	TapChanger	Le changeur de prises associé à l'état du régleur de prise.

6.7.2.9 SvVoltage

Variable d'état pour la tension.

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Le Tableau 387 présente tous les attributs de SvVoltage.

Tableau 387 – Attributs de Standard::SvVoltage

nom	mult	type	description
v	1..1	Voltage	L'amplitude de tension du nœud topologique.
angle	1..1	AngleDegrees	L'angle de tension en radians du nœud topologique.

Le Tableau 388 représente toutes les extrémités d'association de SvVoltage avec d'autres classes.

Tableau 388 – Extrémités d'association de Standard::SvVoltage avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..1	TopologicalNode	1..1	TopologicalNode	Le nœud topologique associé à l'état de tension.

6.7.2.10 (extrait) classe racine TapChanger

Mécanisme de modification des positions des prises d'enroulement du transformateur.

6.7.2.11 (extrait) classe racine Terminal

Point de connexion électrique à une partie d'un équipement conducteur. Les Terminals (bornes) sont connectées sur des points de connexion physiques appelés nœuds de connectivité (ConnectivityNode).

6.7.2.12 (extrait) classe racine TopologicalNode

Pour un modèle de poste détaillé, un nœud topologique est un ensemble de nœuds de connectivité qui, dans l'état courant du réseau, sont reliés ensemble par une sorte quelconque de commutateurs fermés, y compris des cavaliers. Les nœuds topologiques changent en même temps que l'état du réseau change (c'est-à-dire que des commutateurs, des disjoncteurs, etc., modifient l'état).

Pour un modèle de planification, les états des commutateurs ne sont pas utilisés pour former des nœuds topologiques. Au contraire, ils sont créés ou supprimés manuellement dans un outil constructeur de modèle. Les nœuds topologiques conservés de cette manière sont également appelés "bus".

6.8 Paquetage Geographical

6.8.1 Généralités

Voir la Figure 40 et la Figure 41.

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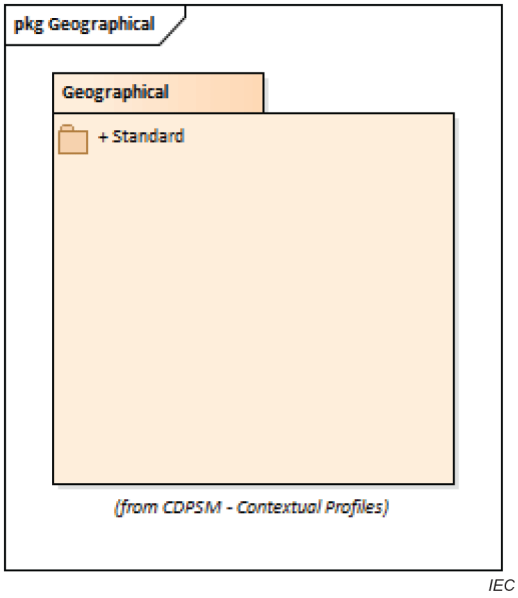

Figure 40 – Diagramme de paquetage Geographical::Geographical

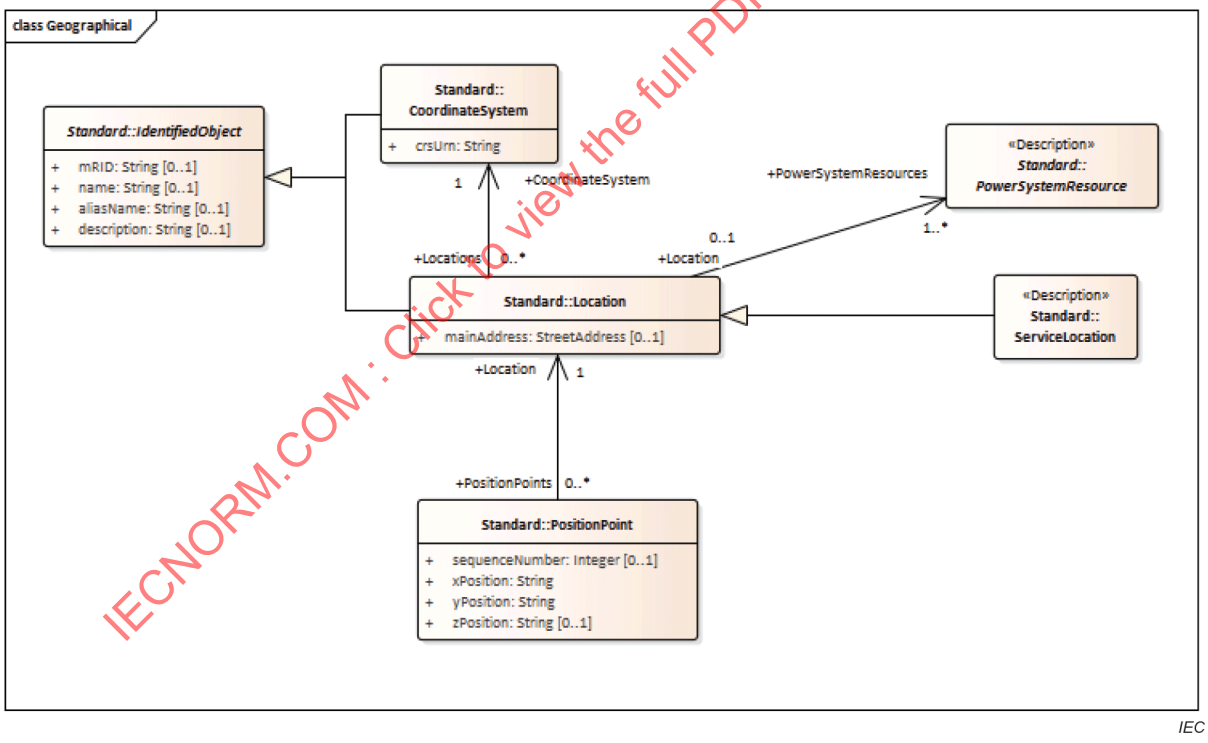

Figure 41 – Diagramme de classe Geographical::Geographical

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6.8.2 Paquetage Standard

6.8.2.1 CoordinateSystem

Système de référence de coordonnées.

Le Tableau 389 présente tous les attributs de CoordinateSystem.

Tableau 389 – Attributs de Standard::CoordinateSystem

nom	mult	type	description
crsUrn	1..1	String	Un Nom de ressource uniforme (URN – *uniform resource name*) pour le système de référence de coordonnées (crs - *coordinate reference system*) utilisé pour définir les 'Location.PositionPoints'. Un exemple est le code du European Petroleum Survey Group (EPSG) pour un système de référence de coordonnées, défini dans le URN dans le cadre de l'espace de noms (namespace) du Open Geospatial Consortium (OGC) comme: urn:ogc:def:uom:EPSG::XXXX, où XXXX est un code EPSG (une liste complète des codes peut être consultée sur le site web du EPSG Registry à l'adresse http://www.epsg-registry.org/). Pour définir le système de coordonnées comme étant WGS84 (latitude, longitude) avec un EPSG OGC, cet attribut est urn:ogc:def:uom:EPSG::4236. Il convient qu'un profil limite ce code à un ensemble de URN admis, convenu par toutes les parties émettrices et réceptrices.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

6.8.2.2 (extrait) classe racine IdentifiedObject

Il s'agit d'une classe racine qui fournit une identification commune pour toutes les classes nécessitant des attributs d'identification et de dénomination.

Le Tableau 390 présente tous les attributs de IdentifiedObject.

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Tableau 390 – Attributs de Standard::IdentifiedObject

nom	mult	type	description
name	0..1	String	Le nom est un texte lisible par l'homme et, si possible, non unique, qui nomme l'objet.
aliasName	0..1	String	L'aliasName est un nom de l'objet en texte lisible par l'homme en remplacement de IdentifiedObject.name. Elle peut ne pas être unique et peut ne pas se corréler à une hiérarchie de dénomination. L'attribut aliasName a été retenu parce qu'il est compatible avec les précédentes versions du CIM. Il est cependant recommandé de remplacer aliasName par la classe Name puisqu'il est prévu de supprimer aliasName à l'avenir.
description	0..1	String	La description est un texte lisible par l'homme qui décrit ou nomme l'objet. Elle peut ne pas être unique et peut ne pas se corréler à une hiérarchie de dénomination.
mRID	0..1	String	Identificateur Master resource publié par une autorité de modèle. Le mRID (identificateur Master resource) est globalement unique dans un contexte d'échange. Il est facile d'obtenir une unicité globale en utilisant un UUID tel que spécifié dans la RFC 4122 pour le mRID. L'utilisation d'un UUID est fortement recommandée. Pour des fichiers de données CIMXML en syntaxe RDF, conformément à l'IEC 61970-552 Édition 1, le mRID est mis en correspondance avec les attributs rdf:ID ou rdf:about qui identifient les éléments d'objet du CIM.

6.8.2.3 Location

L'endroit, le lieu ou le point de quelque chose où s'est trouvé, se trouve et/ou se trouvera quelqu'un ou quelque chose à un instant donné. Il est défini avec un ou plusieurs points de position (coordonnées) dans un système de coordonnées donné.

Le Tableau 391 présente tous les attributs de Location.

Tableau 391 – Attributs de Standard::Location

nom	mult	type	description
mainAddress	0..1	StreetAddress	Adresse principale de l'emplacement.
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 392 présente toutes les extrémités d'association de Location avec d'autres classes.

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Tableau 392 – Extrémités d'association de Standard::Location avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..1	PowerSystemResources	1..*	PowerSystemResource	Toutes les ressources du système de puissance à cet emplacement.
0..*	CoordinateSystem	1..1	CoordinateSystem	Système de coordonnées utilisé pour décrire les points de position de cet emplacement.

6.8.2.4 Classe racine PositionPoint

Jeu de coordonnées spatiales qui déterminent un point défini dans le système de coordonnées spécifié dans 'Location.CoordinateSystem'. Utiliser une seule instance de point de position pour décrire un emplacement ponctuel. Utiliser une séquence de points de position pour décrire un objet orienté ligne (emplacement physique d'objets non ponctuels tels que câbles ou lignes), ou zone d'un objet (comme un poste ou une zone géographique – dans ce cas, ils ont les premiers et derniers points de position avec les mêmes valeurs).

Le Tableau 393 présente tous les attributs de PositionPoint.

Tableau 393 – Attributs de Standard::PositionPoint

nom	mult	type	description
zPosition	0..1	String	(si applicable) Position sur l'axe Z.
sequenceNumber	0..1	Integer	Numéro d'ordre par rapport à zéro de ce point dans une série de points.
xPosition	1..1	String	Position sur l'axe X.
yPosition	1..1	String	Position sur l'axe Y.

Le Tableau 394 présente toutes les extrémités d'association de PositionPoint avec d'autres classes.

Tableau 394 – Extrémités d'association de Standard::PositionPoint avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Location	1..1	Location	Emplacement décrit par ce point de position.

6.8.2.5 (extrait) classe racine PowerSystemResource

Une ressource de système de puissance peut être un équipement tel qu'un Switch, un EquipmentContainer contenant de nombreux équipements individuels tel qu'un Substation ou une entité opérationnelle telle qu'une Company ou SubControlArea. Cela permet la collecte de PowerSystemResources dans d'autres PowerSystemResources. Par exemple, un Switch peut être membre d'un Substation et un Substation peut être membre d'une division d'une Company.

6.8.2.6 ServiceLocation

Emplacement immobilier communément appelé local.

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Le Tableau 395 présente tous les attributs de ServiceLocation.

Tableau 395 – Attributs de Standard::ServiceLocation

nom	mult	type	description
mainAddress	0..1	StreetAddress	hérité de: Location
name	0..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 396 présente toutes les extrémités d'association de ServiceLocation avec d'autres classes.

Tableau 396 – Extrémités d'association de Standard::ServiceLocation avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..1	PowerSystemResources	1..*	PowerSystemResource	hérité de: Location
0..*	CoordinateSystem	1..1	CoordinateSystem	hérité de: Location

6.9 Paquetage DiagramLayout

6.9.1 Généralités

Voir la Figure 42 et la Figure 43.

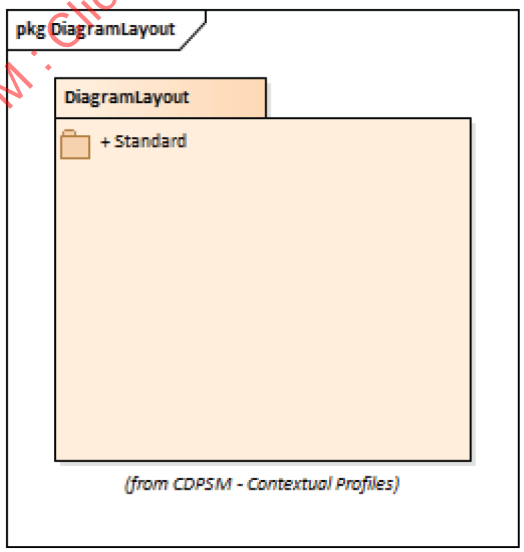

Figure 42 – Diagramme de paquetage DiagramLayout::DiagramLayout

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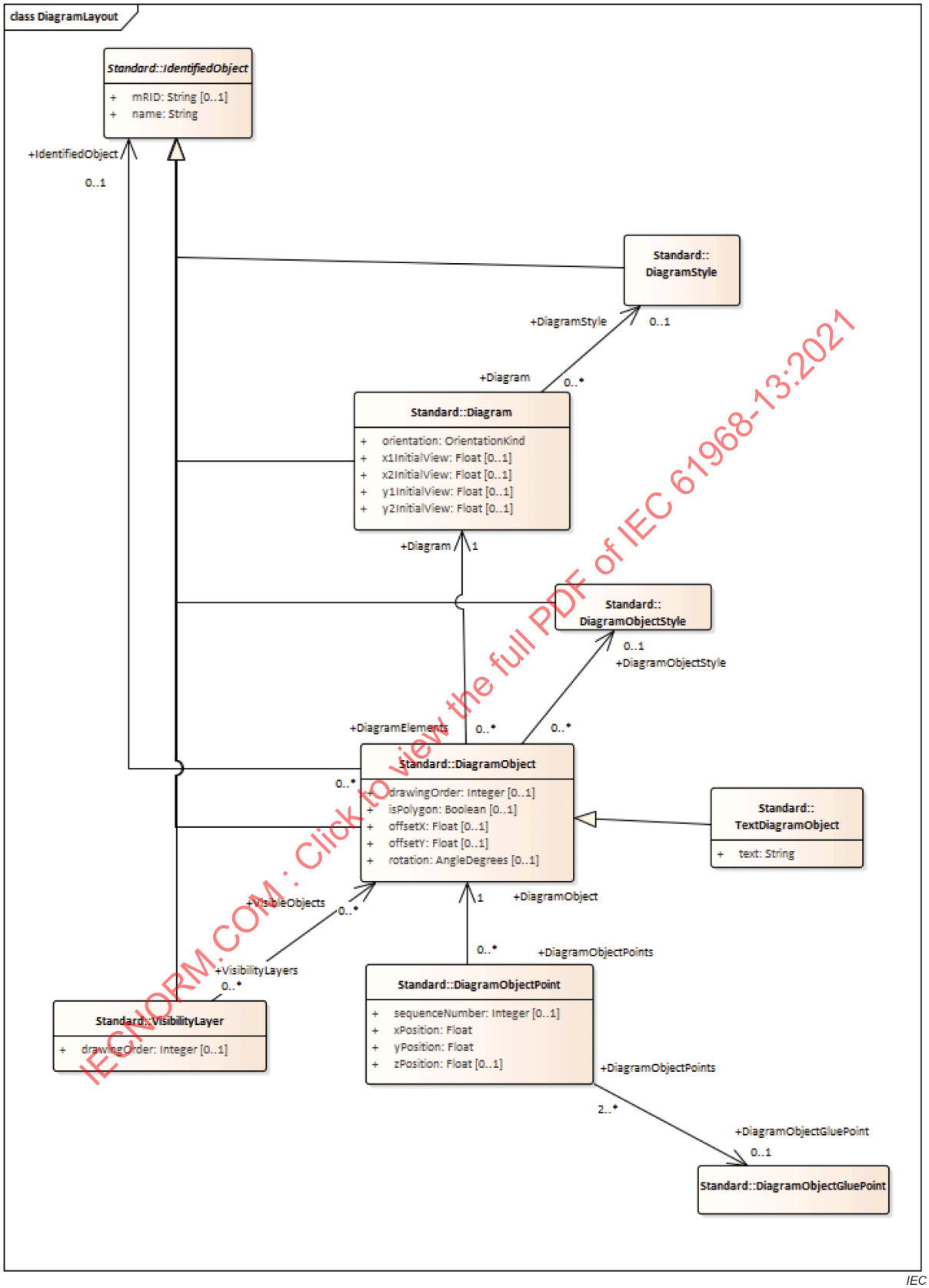

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Figure 43 – Diagramme de classe DiagramLayout::DiagramLayout

6.9.2 Paquetage Standard

6.9.2.1 Diagram

Le diagramme échangé. Le système de coordonnées est un système de coordonnées cartésiennes normalisé et l'attribut orientation définit l'orientation.

Le Tableau 397 présente tous les attributs de Diagram.

Tableau 397 – Attributs de Standard::Diagram

nom	mult	type	description
orientation	1..1	OrientationKind	Orientation du système de coordonnées du diagramme.
x1InitialView	0..1	Float	Coordonnée X du premier coin de la vue initiale.
x2InitialView	0..1	Float	Coordonnée X du deuxième coin de la vue initiale.
y1InitialView	0..1	Float	Coordonnée Y du premier coin de la vue initiale.
y2InitialView	0..1	Float	Coordonnée Y du deuxième coin de la vue initiale.
mRID	0..1	String	hérité de: IdentifiedObject
name	1..1	String	hérité de: IdentifiedObject

Le Tableau 398 représente toutes les extrémités d'association de Diagram avec d'autres classes.

Tableau 398 – Extrémités d'association de Standard::Diagram avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	DiagramStyle	0..1	DiagramStyle	Un diagramme peut avoir un DiagramStyle.

6.9.2.2 DiagramObject

Un objet qui définit un ou plusieurs points dans un espace donné. Cet objet peut être associé à tout ce qui spécialise IdentifiedObject. Pour les schémas unifilaires, ces objets comprennent généralement des éléments tels que les valeurs analogiques, les disjoncteurs, les sectionneurs, les transformateurs de puissance et les lignes de transmission.

Le Tableau 399 présente tous les attributs de DiagramObject.

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Tableau 399 – Attributs de Standard::DiagramObject

nom	mult	type	description
drawingOrder	0..1	Integer	Ordre de dessin de cet élément. Plus le nombre est élevé, plus l'élément est dessiné tard dans la séquence. Cela permet d'assurer que les éléments qui se chevauchent sont rendus dans le bon ordre.
isPolygon	0..1	Boolean	Définit si les points des objets du diagramme définissent ou non les limites d'un polygone ou l'acheminement d'une polyligne. Si cette valeur est true (vraie), il convient que la demande prenne en considération le premier et le dernier point à relier.
offsetX	0..1	Float	Décalage dans la direction X. Cette fonction permet de définir le décalage par rapport au centre pour le rendu d'une icône (par défaut, un seul point indique le centre de l'icône). Le décalage est exprimé par unité, 0 indique qu'il n'y a pas de décalage à partir du centre horizontal de l'icône. -0,5 indique que le décalage est de 50 % vers la gauche et 0,5 indique un décalage de 50 % vers la droite.
offsetY	0..1	Float	Décalage dans la direction Y. Cette fonction permet de définir le décalage par rapport au centre pour le rendu d'une icône (par défaut, un seul point indique le centre de l'icône). Le décalage est exprimé par unité, 0 indique qu'il n'y a pas de décalage à partir du centre vertical de l'icône. La direction du décalage dépend de l'orientation du diagramme, -0,5 et 0,5 indiquent un décalage de ±50 % sur l'axe vertical.
rotation	0..1	AngleDegrees	Définit l'angle de rotation de l'objet du diagramme. Les degrés zéro pointent vers le haut du diagramme. La rotation se fait dans le sens des aiguilles d'une montre.
mRID	0..1	String	hérité de: IdentifiedObject
name	1..1	String	hérité de: IdentifiedObject

Le Tableau 400 représente toutes les extrémités d'association de DiagramObject avec d'autres classes.

Tableau 400 – Extrémités d'association de Standard::DiagramObject avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Schéma	1..1	Schéma	Un objet de diagramme fait partie d'un diagramme.
0..*	DiagramObjectStyle	0..1	DiagramObjectStyle	Un objet de diagramme a un style associé qui fournit une référence pour le style utilisé dans le système d'origine.
0..*	IdentifiedObject	0..1	IdentifiedObject	L'objet de domaine auquel cet objet de diagramme est associé.

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6.9.2.3 Classe racine DiagramObjectGluePoint

Elle est utilisée pour regrouper les points des différents objets du diagramme qui sont considérés comme étant indissociables l'un de l'autre ("collés") dans un diagramme même s'ils ne se trouvent pas exactement aux mêmes coordonnées.

6.9.2.4 Classe racine DiagramObjectPoint

Un point dans un espace donné défini par 3 coordonnées et associé à un objet de diagramme. Les coordonnées peuvent être positives ou négatives car l'origine ne doit pas nécessairement se trouver dans le coin d'un diagramme.

Le Tableau 401 présente tous les attributs de DiagramObjectPoint.

Tableau 401 – Attributs de Standard::DiagramObjectPoint

nom	mult	type	description
sequenceNumber	0..1	Integer	La position séquentielle du point, utilisée pour définir l'ordre des points pour les objets de diagramme agissant comme une polyligne ou un polygone avec plus d'un point.
xPosition	1..1	Float	La coordonnée X de ce point.
yPosition	1..1	Float	La coordonnée Y de ce point.
zPosition	0..1	Float	La coordonnée Z de ce point.

Le Tableau 402 représente toutes les extrémités d'association de DiagramObjectPoint avec d'autres classes.

Tableau 402 – Extrémités d'association de Standard::DiagramObjectPoint avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	DiagramObject	1..1	DiagramObject	L'objet de diagramme auquel les points sont associés.
2..*	DiagramObjectGluePoint	0..1	DiagramObjectGluePoint	Le point de "colle" auquel ce point est associé.

6.9.2.5 DiagramObjectStyle

Une référence à un style utilisé par le système d'origine pour un objet de diagramme. Un style d'objet de diagramme décrit des informations telles que l'épaisseur des lignes, la forme (cercle, rectangle, etc.) et la couleur.

Le Tableau 403 présente tous les attributs de DiagramObjectStyle.

Tableau 403 – Attributs de Standard::DiagramObjectStyle

nom	mult	type	description
mRID	0..1	String	hérité de: IdentifiedObject
name	1..1	String	hérité de: IdentifiedObject

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6.9.2.6 DiagramStyle

Le style de diagramme se réfère à un style utilisé par le système d'origine pour un diagramme. Un style de diagramme décrit des informations telles que des informations schématiques, géographiques, de topologie nodale, etc.

Le Tableau 404 présente tous les attributs de DiagramStyle.

Tableau 404 – Attributs de Standard::DiagramStyle

nom	mult	type	description
mRID	0..1	String	hérité de: IdentifiedObject
name	1..1	String	hérité de: IdentifiedObject

6.9.2.7 (extrait) classe racine IdentifiedObject

Il s'agit d'une classe racine qui fournit une identification commune pour toutes les classes nécessitant des attributs d'identification et de dénomination.

Le Tableau 405 présente tous les attributs de IdentifiedObject.

Tableau 405 – Attributs de Standard::IdentifiedObject

nom	mult	type	description
mRID	0..1	String	Identificateur Master resource publié par une autorité de modèle. Le mRID (identificateur Master resource) est globalement unique dans un contexte d'échange. Il est facile d'obtenir une unicité globale en utilisant un UUID tel que spécifié dans la RFC 4122 pour le mRID. L'utilisation d'un UUID est fortement recommandée. Pour des fichiers de données CIMXML en syntaxe RDF, conformément à l'IEC 61970-552 Édition 1, le mRID est mis en correspondance avec les attributs rdf:ID ou rdf:about qui identifient les éléments d'objet du CIM.
name	1..1	String	Le nom est un texte lisible par l'homme et, si possible, non unique, qui nomme l'objet.

6.9.2.8 TextDiagramObject

Un objet de diagramme pour placer du texte libre ou du texte dérivé d'un objet de domaine associé.

Le Tableau 406 présente tous les attributs de TextDiagramObject.

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Tableau 406 – Attributs de Standard::TextDiagramObject

nom	mult	type	description
text	1..1	String	Le texte qui est affiché par cet objet de diagramme de texte.
drawingOrder	0..1	Integer	hérité de: DiagramObject
isPolygon	0..1	Boolean	hérité de: DiagramObject
offsetX	0..1	Float	hérité de: DiagramObject
offsetY	0..1	Float	hérité de: DiagramObject
rotation	0..1	AngleDegrees	hérité de: DiagramObject
mRID	0..1	String	hérité de: IdentifiedObject
name	1..1	String	hérité de: IdentifiedObject

Le Tableau 407 représente toutes les extrémités d'association de TextDiagramObject avec d'autres classes.

Tableau 407 – Extrémités d'association de Standard::TextDiagramObject avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Diagram	1..1	Diagram	hérité de: DiagramObject
0..*	DiagramObjectStyle	0..1	DiagramObjectStyle	hérité de: DiagramObject
0..*	IdentifiedObject	0..1	IdentifiedObject	hérité de: DiagramObject

6.9.2.9 VisibilityLayer

Les couches sont généralement utilisées pour regrouper les objets du diagramme d'après des thèmes et des échelles. Les thèmes sont utilisés pour afficher ou masquer certaines informations (par exemple des lacs, des frontières), tandis que les échelles sont utilisées pour masquer ou afficher des informations en fonction du niveau de zoom actuel (masquer le texte quand il est trop petit pour être lisible, ou quand il dépasse la taille de l'écran). Cela s'appelle aussi la mise au net.

L'échange de graphiques fondé sur le CIM prend en charge une relation m:n entre les objets et les couches du diagramme. Il incombe au système d'importation de convertir un cas m:n en une représentation 1:n appropriée si le système d'importation ne prend pas en charge le m:n.

Le Tableau 408 présente tous les attributs de VisibilityLayer.

Tableau 408 – Attributs de Standard::VisibilityLayer

nom	mult	type	description
drawingOrder	0..1	Integer	Ordre de dessin de cette couche. Plus le nombre est élevé, plus la couche et les objets qu'elle contient sont rendus tardivement.
mRID	0..1	String	hérité de: IdentifiedObject
name	1..1	String	hérité de: IdentifiedObject

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Le Tableau 409 représente toutes les extrémités d'association de VisibilityLayer avec d'autres classes.

Tableau 409 – Extrémités d'association de Standard::VisibilityLayer avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	VisibleObjects	0..*	DiagramObject	Une couche de visibilité peut contenir un ou plusieurs objets de diagramme.

6.10 Paquetage Assets

6.10.1 Généralités

Voir la Figure 44 et la Figure 45.

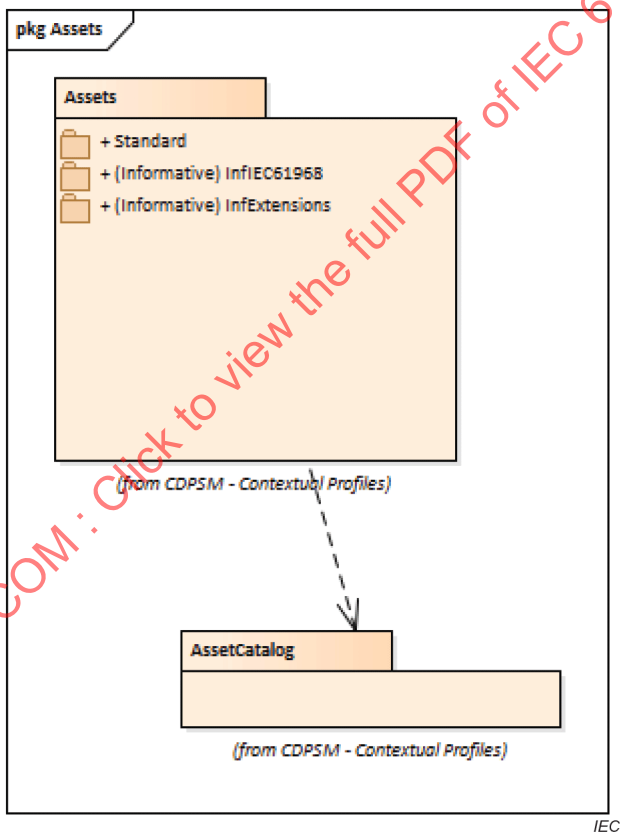

Figure 44 – Diagramme de paquetage Assets::Assets

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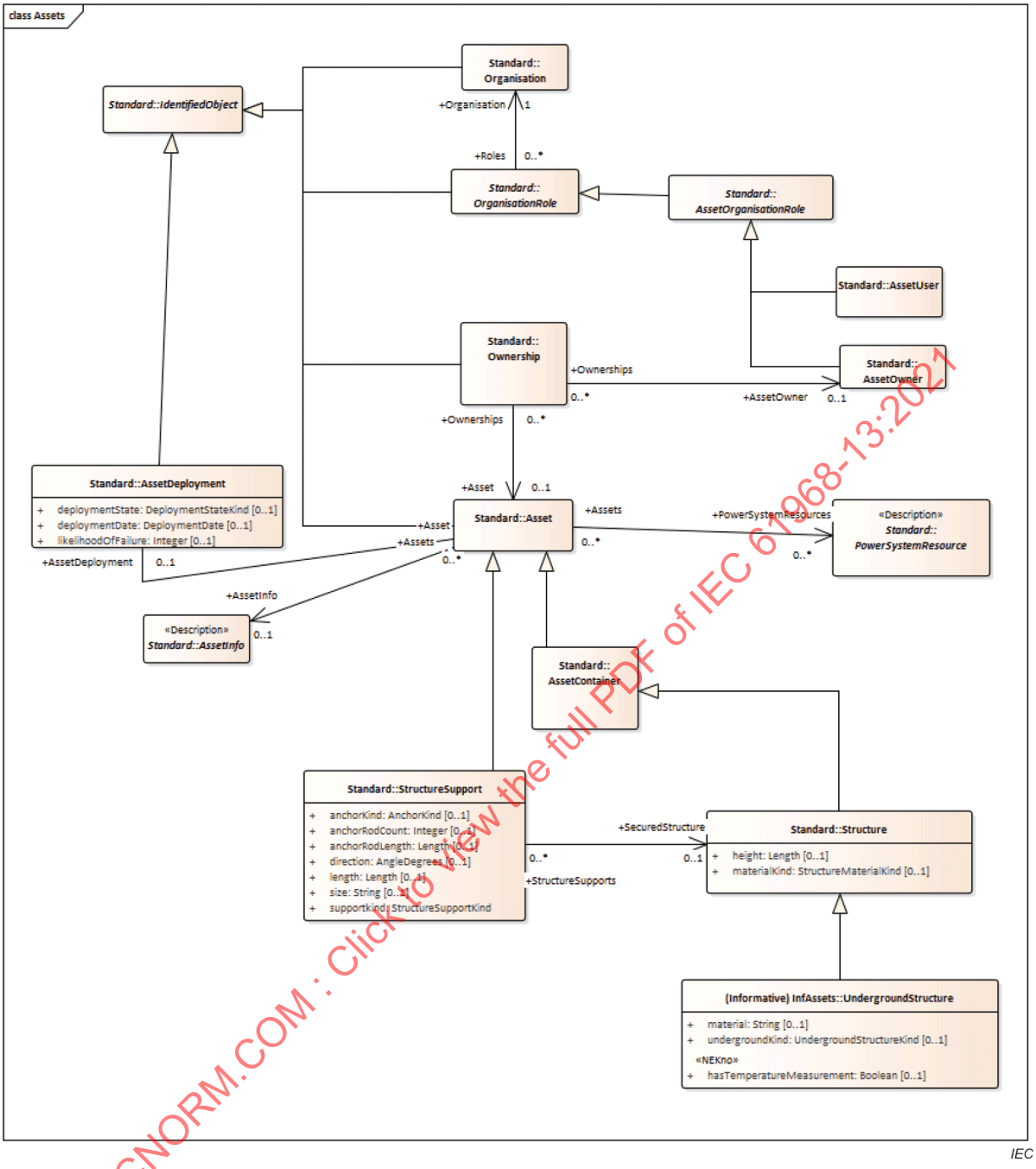

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Figure 45 – Diagramme de classe Assets::Assets

6.10.2 Paquetage Standard

6.10.2.1 Asset

Ressource tangible du service public, y compris l'équipement du système électrique, les divers dispositifs finaux, les armoires, les bâtiments, etc. Pour l'équipement du réseau électrique, le rôle du bien est défini par le truchement de PowerSystemResource et de ses sous-classes, définies principalement dans le modèle Wires (se référer à l'IEC 61970-301 et au paquetage de modèle IEC61970::Wires). La description de l'actif met l'accent sur les caractéristiques physiques de l'équipement remplissant le rôle en question.

Le Tableau 410 présente tous les attributs de Asset.

Tableau 410 – Attributs de Standard::Asset

nom	mult	type	description
type	0..1	String	Catégorisation spécifique aux entreprises de service public de Asset et de ses sous-types, en fonction de leurs normes d'entreprise, de leurs pratiques et de leurs systèmes TI existants (par exemple, pour la gestion des biens, de la maintenance, des travaux, des interruptions de service, des clients, etc.)
lotNumber	0..1	String	Numéro de lot de cet actif. Même pour le même modèle et le même numéro de version, de nombreux actifs sont fabriqués par lots.
lifecycleDate	0..1	LifecycleDate	<avant lifecycle> Dates de durées de vie de cet actif.
baselineCondition	0..1	String	Condition de l'actif lors de la dernière version de référence. Des exemples comprennent la nouveauté, la reconstruction, l'exigence de réorganisation, autre. Se référer aux données d'inspection pour des informations relatives à la condition la plus courante de l'actif.
baselineLossOfLife	0..1	PerCent	Pourcentage de l'espérance de vie initiale qui a été perdue à la dernière version de référence de l'espérance de vie. Représente: (espérance de vie initiale - espérance de vie actuelle) / espérance de vie initiale.
critical	0..1	Boolean	True (vrai) si l'actif est considéré comme essentiel pour une certaine raison (par exemple, un poteau avec des fixations essentielles).
electronicAddress	0..1	ElectronicAddress	Adresse électronique.
inUseDate	0..1	InUseDate	Dates d'utilisation de cet actif.
inUseState	0..1	InUseStateKind	Indique si l'actif est actuellement déployé (utilisé), prêt à être utilisé ou non disponible à l'utilisation.
kind	0..1	AssetKind	Type d'actif. Utilisé dans la description des composants de l'actif dans les formulaires d'instance d'actif.
lifecycleState	0..1	AssetLifecycleStateKind	État de durée de vie actuel de l'actif.
position	0..1	String	Position de l'actif ou du composant de l'actif. Peut souvent être en relation avec les autres actifs ou composants.
purchasePrice	0..1	Money	Prix d'achat de l'actif.
retiredReason	0..1	RetiredReasonKind	Raison pour laquelle l'actif a été retiré.
status	0..1	Status	Statut de cet actif.
utcNumber	0..1	String	Numéro de Uniquely Tracked Commodity (UTC, c'est-à-dire marchandise localisée de manière unique).
serialNumber	0..1	String	Numéro de série de cet actif.
acceptanceTest	0..1	AcceptanceTest	Informations sur l'essai d'acceptation.
name	1..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 411 présente toutes les extrémités d'association de Asset avec d'autres classes.

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Tableau 411 – Extrémités d'association de Standard::Asset avec d'autres classes

mult à partir de	nom	mult vers	type	description
1..1	AssetDeployment	0..1	AssetDeployment	Le déploiement de cet actif.
0..*	PowerSystemResources	0..*	PowerSystemResource	Toutes les ressources du système de puissance utilisées pour modéliser électriquement cet actif. Par exemple, l'actif transformateur est modélisé électriquement avec un transformateur et ses enroulements et changeur de prise.
0..*	AssetInfo	0..1	AssetInfo	Données applicables à cet actif.

6.10.2.2 AssetContainer

Actif qui est le regroupement d'autres actifs tels que conducteurs, transformateurs, dispositifs de commutation, terrain, clôtures, bâtiments, équipements, véhicules, etc.

Le Tableau 412 présente tous les attributs de AssetContainer.

Tableau 412 – Attributs de Standard::AssetContainer

nom	mult	type	description
type	0..1	String	hérité de: Asset
lotNumber	0..1	String	hérité de: Asset
lifecycleDate	0..1	LifecycleDate	hérité de: Asset
baselineCondition	0..1	String	hérité de: Asset
baselineLossOfLife	0..1	PerCent	hérité de: Asset
critical	0..1	Boolean	hérité de: Asset
electronicAddress	0..1	ElectronicAddress	hérité de: Asset
inUseDate	0..1	InUseDate	hérité de: Asset
inUseState	0..1	InUseStateKind	hérité de: Asset
kind	0..1	AssetKind	hérité de: Asset
lifecycleState	0..1	AssetLifecycleStateKind	hérité de: Asset
position	0..1	String	hérité de: Asset
purchasePrice	0..1	Money	hérité de: Asset
retiredReason	0..1	RetiredReasonKind	hérité de: Asset
status	0..1	Status	hérité de: Asset
utcNumber	0..1	String	hérité de: Asset
serialNumber	0..1	String	hérité de: Asset
acceptanceTest	0..1	AcceptanceTest	hérité de: Asset
name	1..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

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Le Tableau 413 présente toutes les extrémités d'association de AssetContainer avec d'autres classes.

Tableau 413 – Extrémités d'association de Standard::AssetContainer avec d'autres classes

mult à partir de	nom	mult vers	type	description
1..1	AssetDeployment	0..1	AssetDeployment	hérité de: Asset
0..*	PowerSystemResources	0..*	PowerSystemResource	hérité de: Asset
0..*	AssetInfo	0..1	AssetInfo	hérité de: Asset

6.10.2.3 AssetDeployment

Déploiement d'actifs dans un rôle de ressource du système de puissance.

Le Tableau 414 présente tous les attributs de AssetDeployment.

Tableau 414 – Attributs de Standard::AssetDeployment

nom	mult	type	description
deploymentState	0..1	DeploymentStateKind	État de déploiement actuel de l'actif.
deploymentDate	0..1	DeploymentDate	Dates de déploiement de l'actif.
likelihoodOfFailure	0..1	Integer	Probabilité de défaillance des actifs sur une échelle de 1 (faible) à 100 (élevée).
name	1..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 415 représente toutes les extrémités d'association de AssetDeployment avec d'autres classes.

Tableau 415 – Extrémités d'association de Standard::AssetDeployment avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..1	Asset	1..1	Asset	Actif dans ce déploiement.

6.10.2.4 (abstract) classe racine AssetInfo

Ensemble d'attributs d'un actif, représentant les informations de la fiche technique typique d'un dispositif physique qui peut être instancié et partagé dans différents contextes d'échange de données:

– en tant qu'attributs d'une instance d'actif (installé ou en stock);
– en tant qu'attributs d'un modèle d'actif (produit par un fabricant);

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– en tant qu'attributs d'un actif type (type générique d'un actif tel qu'utilisé dans la planification de conception/d'extension).

6.10.2.5 (extrait) AssetOrganisationRole

Rôle que joue une organisation par rapport à l'actif.

Le Tableau 416 présente tous les attributs de AssetOrganisationRole.

Tableau 416 – Attributs de Standard::AssetOrganisationRole

nom	mult	type	description
name	1..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 417 présente toutes les extrémités d'association de AssetOrganisationRole avec d'autres classes.

Tableau 417 – Extrémités d'association de Standard::AssetOrganisationRole avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Organisation	1..1	Organisation	hérité de: OrganisationRole

6.10.2.6 AssetOwner

Propriétaire de l'actif.

Le Tableau 418 présente tous les attributs de AssetOwner.

Tableau 418 – Attributs de Standard::AssetOwner

nom	mult	type	description
name	1..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

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Le Tableau 419 présente toutes les extrémités d'association de AssetOwner avec d'autres classes.

Tableau 419 – Extrémités d'association de Standard::AssetOwner avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Organisation	1..1	Organisation	hérité de: OrganisationRole

6.10.2.7 AssetUser

Organisation qui utilise l'actif.

Le Tableau 420 présente tous les attributs de AssetUser.

Tableau 420 – Attributs de Standard::AssetUser

nom	mult	type	description
name	1..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 421 présente toutes les extrémités d'association de AssetUser avec d'autres classes.

Tableau 421 – Extrémités d'association de Standard::AssetUser avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Organisation	1..1	Organisation	hérité de: OrganisationRole

6.10.2.8 (extrait) classe racine IdentifiedObject

Il s'agit d'une classe racine qui fournit une identification commune pour toutes les classes nécessitant des attributs d'identification et de dénomination.

Le Tableau 422 présente tous les attributs de IdentifiedObject.

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Tableau 422 – Attributs de Standard::IdentifiedObject

nom	mult	type	description
name	1..1	String	Le nom est un texte lisible par l'homme et, si possible, non unique, qui nomme l'objet.
aliasName	0..1	String	L'aliasName est un nom de l'objet en texte lisible par l'homme en remplacement de IdentifiedObject.name. Elle peut ne pas être unique et peut ne pas se corréler à une hiérarchie de dénomination. L'attribut aliasName a été retenu parce qu'il est compatible avec les précédentes versions du CIM. Il est cependant recommandé de remplacer aliasName par la classe Name puisqu'il est prévu de supprimer aliasName à l'avenir.
description	0..1	String	La description est un texte lisible par l'homme qui décrit ou nomme l'objet. Elle peut ne pas être unique et peut ne pas se corréler à une hiérarchie de dénomination.
mRID	0..1	String	Identificateur Master resource publié par une autorité de modèle. Le mRID (identificateur Master resource) est globalement unique dans un contexte d'échange. Il est facile d'obtenir une unicité globale en utilisant un UUID tel que spécifié dans la RFC 4122 pour le mRID. L'utilisation d'un UUID est fortement recommandée. Pour des fichiers de données CIMXML en syntaxe RDF, conformément à l'IEC 61970-552 Édition 1, le mRID est mis en correspondance avec les attributs rdf:ID ou rdf:about qui identifient les éléments d'objet du CIM.

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6.10.2.9 Organisation

Organisation susceptible d'avoir des rôles comme entreprise de service public, entrepreneur, fournisseur, producteur, client, etc.

Le Tableau 423 présente tous les attributs de Organisation.

Tableau 423 – Attributs de Standard::Organisation

nom	mult	type	description
electronicAddress	0..1	ElectronicAddress	Adresse électronique.
phone1	0..1	TelephoneNumber	Numéro de téléphone.
phone2	0..1	TelephoneNumber	Numéro de téléphone supplémentaire.
postalAddress	0..1	StreetAddress	Adresse postale, potentiellement différente de 'streetAddress' (par exemple, une autre ville).
streetAddress	0..1	StreetAddress	Adresse de rue.
name	1..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

6.10.2.10 (extrait) OrganisationRole

Identifie un moyen permettant à une organisation de participer aux activités d'une entreprise de services publics (par exemple, client, producteur, etc.).

Le Tableau 424 présente tous les attributs de OrganisationRole.

Tableau 424 – Attributs de Standard::OrganisationRole

nom	mult	type	description
name	1..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 425 présente toutes les extrémités d'association de OrganisationRole avec d'autres classes.

Tableau 425 – Extrémités d'association de Standard::OrganisationRole avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Organisation	1..1	Organisation	Organisation ayant ce rôle.

6.10.2.11 Ownership

Propriétaire d'un actif par exemple.

Le Tableau 426 présente tous les attributs de Ownership.

Tableau 426 – Attributs de Standard::Ownership

nom	mult	type	description
name	1..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 427 présente toutes les extrémités d'association de Ownership avec d'autres classes.

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Tableau 427 – Extrémités d'association de Standard::Ownership avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	Asset	0..1	Asset	Actif objet de cette propriété.
0..*	AssetOwner	0..1	AssetOwner	Propriétaire de l'actif dont il est sujet dans cette propriété.

6.10.2.12 (extrait) classe racine PowerSystemResource

Une ressource de système de puissance peut être un équipement tel qu'un Switch, un EquipmentContainer contenant de nombreux équipements individuels tel qu'un Substation ou une entité opérationnelle telle qu'une Company ou SubControlArea. Cela permet la collecte de PowerSystemResources dans d'autres PowerSystemResources. Par exemple, un Switch peut être membre d'un Substation et un Substation peut être membre d'une division d'une Company.

Le Tableau 428 présente toutes les extrémités d'association de PowerSystemResource avec d'autres classes.

Tableau 428 – Extrémités d'association de Standard::PowerSystemResource avec d'autres classes

mult à partir de	nom	mult vers	type	description
0..*	OperationOrganisationRole	0..1	OperationOrganisationRole	
0..*	Concessionaire	0..1	Concessionaire	

6.10.2.13 Structure

Construction contenant des actifs comme des conducteurs, des transformateurs, des appareils de commutation, etc. Lorsque cela est applicable, un nombre de conducteurs peut être dérivé du nombre d'instances d'espacement du câble associé.

Le Tableau 429 présente tous les attributs de Structure.

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Tableau 429 – Attributs de Standard::Structure

nom	mult	type	description
height	0..1	Length	Hauteur visible de la structure au-dessus du sol pour les constructions aériennes (par exemple, un poteau ou une tour) ou sous le niveau du sol pour une voûte souterraine, une bouche d'égout, etc. Se référer aux DimensionPropertiesInfo associées pour d'autres types de dimensions.
materialKind	0..1	StructureMaterialKind	Matériau qui compose la structure.
type	0..1	String	hérité de: Asset
lotNumber	0..1	String	hérité de: Asset
lifecycleDate	0..1	LifecycleDate	hérité de: Asset
baselineCondition	0..1	String	hérité de: Asset
baselineLossOfLife	0..1	PerCent	hérité de: Asset
critical	0..1	Boolean	hérité de: Asset
electronicAddress	0..1	ElectronicAddress	hérité de: Asset
inUseDate	0..1	InUseDate	hérité de: Asset
inUseState	0..1	InUseStateKind	hérité de: Asset
kind	0..1	AssetKind	hérité de: Asset
lifecycleState	0..1	AssetLifecycleStateKind	hérité de: Asset
position	0..1	String	hérité de: Asset
purchasePrice	0..1	Money	hérité de: Asset
retiredReason	0..1	RetiredReasonKind	hérité de: Asset
status	0..1	Status	hérité de: Asset
utcNumber	0..1	String	hérité de: Asset
serialNumber	0..1	String	hérité de: Asset
acceptanceTest	0..1	AcceptanceTest	hérité de: Asset
name	1..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

Le Tableau 430 présente toutes les extrémités d'association de Structure avec d'autres classes.

Tableau 430 – Extrémités d'association de Standard::Structure avec d'autres classes

mult à partir de	nom	mult vers	type	description
1..1	AssetDeployment	0..1	AssetDeployment	hérité de: Asset
0..*	PowerSystemResources	0..*	PowerSystemResource	hérité de: Asset
0..*	AssetInfo	0..1	AssetInfo	hérité de: Asset

6.10.2.14 StructureSupport

Support des actifs de structure.

Le Tableau 431 présente tous les attributs de StructureSupport.

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Tableau 431 – Attributs de Standard::StructureSupport

nom	mult	type	description
anchorKind	0..1	AnchorKind	(si ancrage) Type d'ancrage.
anchorRodCount	0..1	Integer	(si ancrage) Nombre de piquets utilisés.
anchorRodLength	0..1	Length	(si ancrage) Longueur du piquet utilisé.
direction	0..1	AngleDegrees	Direction de cette structure de support.
length	0..1	Length	Longueur de cette structure de support.
size	0..1	String	Dimension de cette structure de support.
supportkind	1..1	StructureSupportKind	
type	0..1	String	hérité de: Asset
lotNumber	0..1	String	hérité de: Asset
lifecycleDate	0..1	LifecycleDate	hérité de: Asset
baselineCondition	0..1	String	hérité de: Asset
baselineLossOfLife	0..1	PerCent	hérité de: Asset
critical	0..1	Boolean	hérité de: Asset
electronicAddress	0..1	ElectronicAddress	hérité de: Asset
inUseDate	0..1	InUseDate	hérité de: Asset
inUseState	0..1	InUseStateKind	hérité de: Asset
kind	0..1	AssetKind	hérité de: Asset
lifecycleState	0..1	AssetLifecycleStateKind	hérité de: Asset
position	0..1	String	hérité de: Asset
purchasePrice	0..1	Money	hérité de: Asset
retiredReason	0..1	RetiredReasonKind	hérité de: Asset
status	0..1	Status	hérité de: Asset
utcNumber	0..1	String	hérité de: Asset
serialNumber	0..1	String	hérité de: Asset
acceptanceTest	0..1	AcceptanceTest	hérité de: Asset
name	1..1	String	hérité de: IdentifiedObject
aliasName	0..1	String	hérité de: IdentifiedObject
description	0..1	String	hérité de: IdentifiedObject
mRID	0..1	String	hérité de: IdentifiedObject

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Le Tableau 432 présente toutes les extrémités d'association de StructureSupport avec d'autres classes.

Tableau 432 – Extrémités d'association de Standard::StructureSupport avec d'autres classes

mult à partir de	Nom	mult vers	type	description
0..*	SecuredStructure	0..1	Structure	
1..1	AssetDeployment	0..1	AssetDeployment	hérité de: Asset
0..*	PowerSystemResources	0..*	PowerSystemResource	hérité de: Asset
0..*	AssetInfo	0..1	AssetInfo	hérité de: Asset

6.11 Paquetage AssetCatalog

6.11.1 Généralités

Voir de la Figure 46 à la Figure 51.

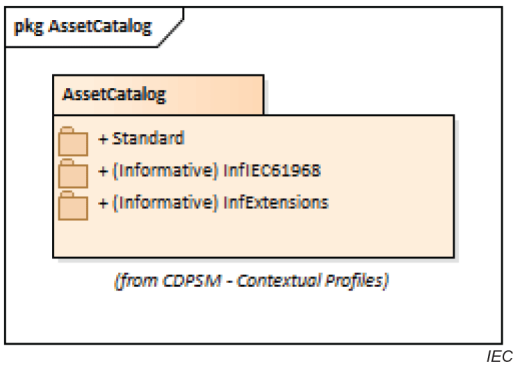

Figure 46 – Diagramme de paquetage AssetCatalog::AssetCatalog

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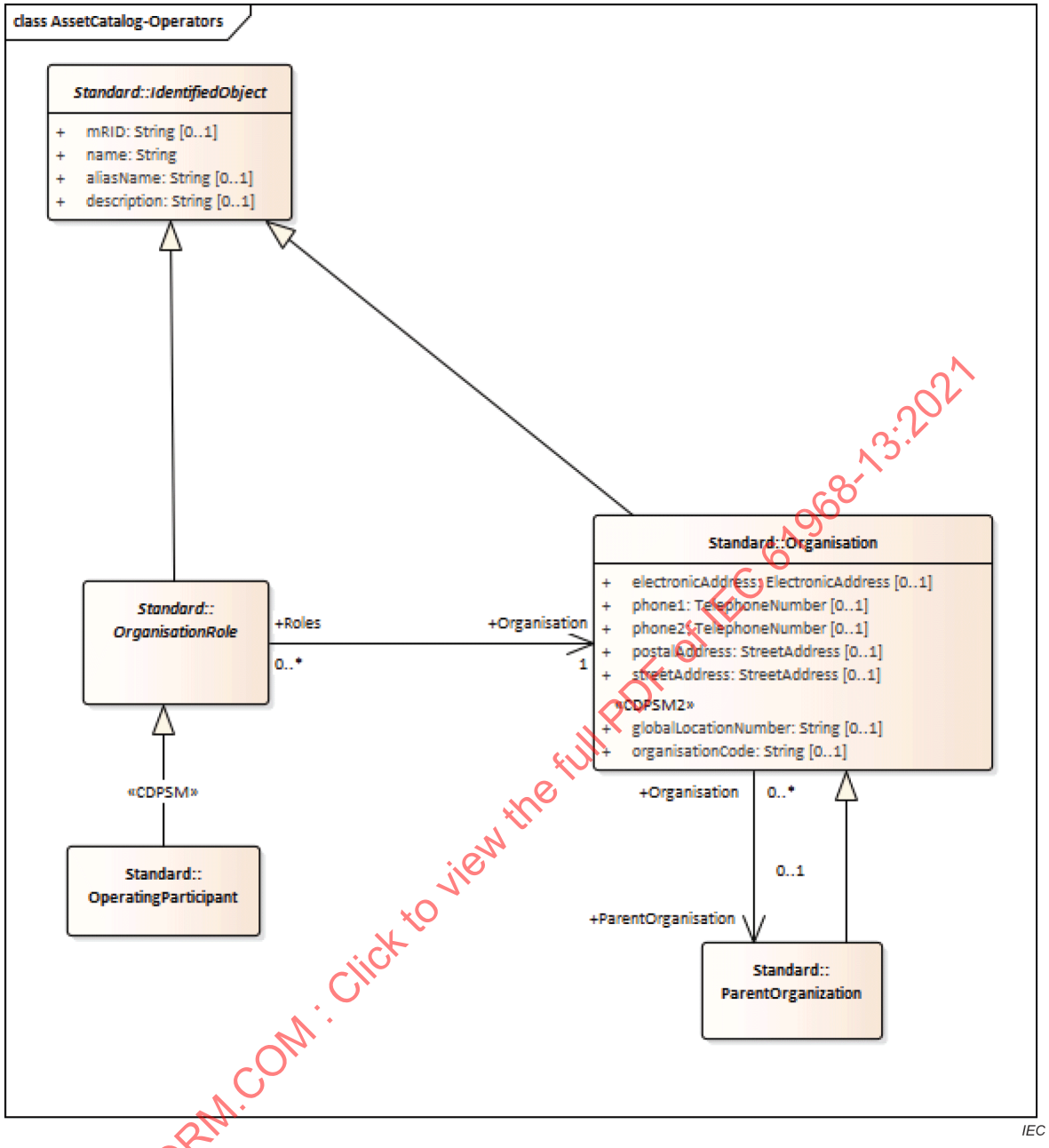

Figure 47 – Diagramme de classe AssetCatalog::AssetCatalog-Operators

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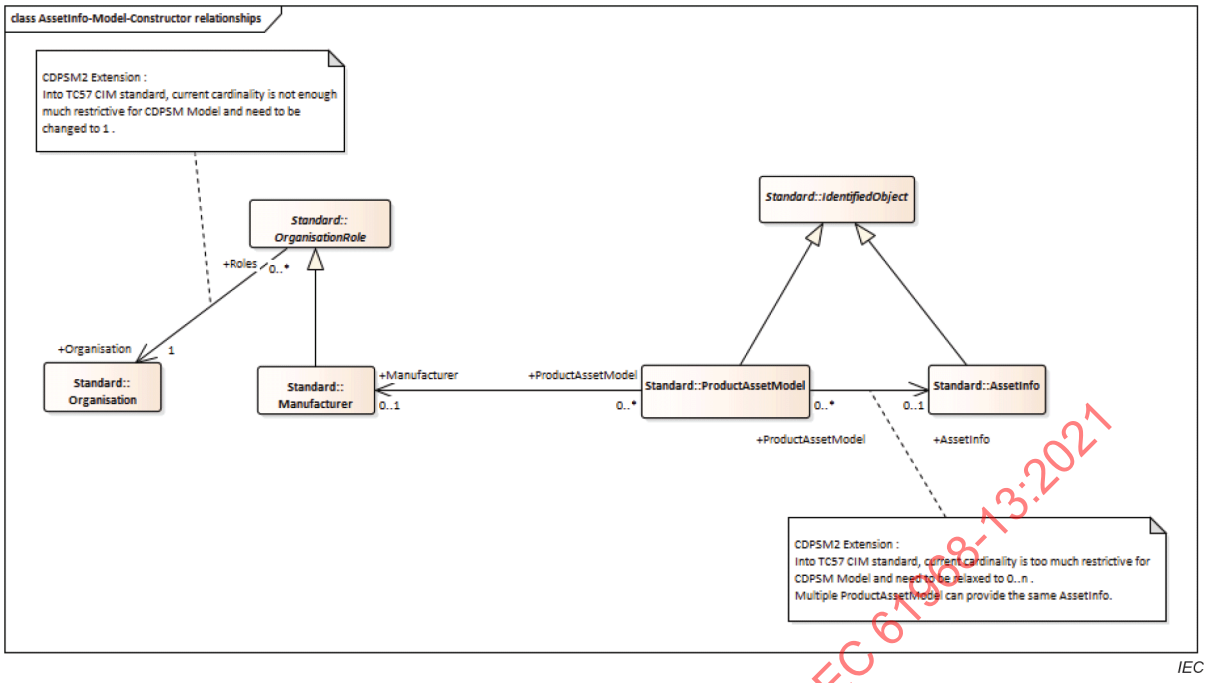

Figure 48 – Diagramme de classe AssetCatalog:: AssetInfo-Model-Constructor relationships

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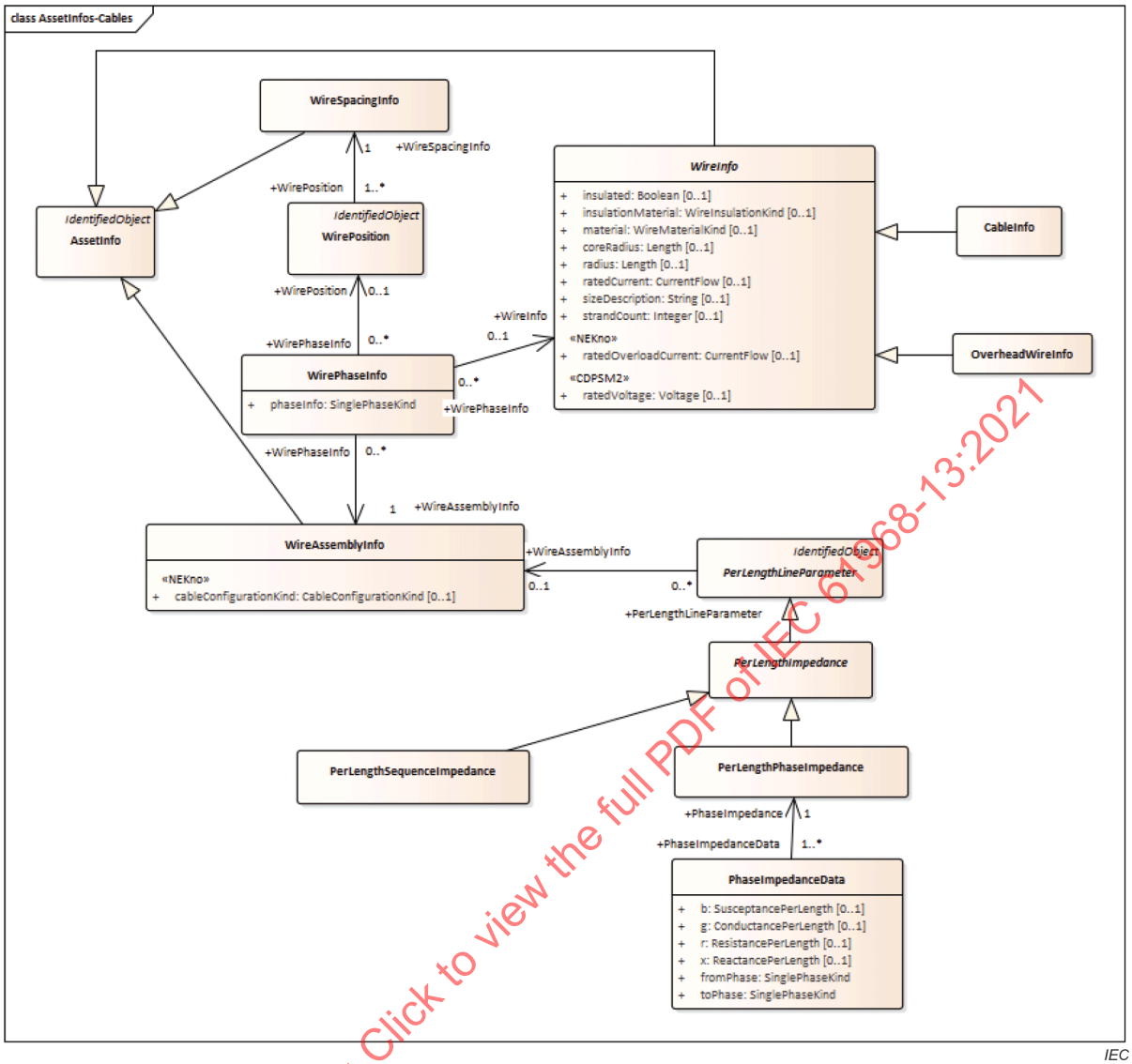

Figure 49 – Diagramme de classe AssetCatalog::AssetInfos-Cables

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