



<AutomationML/>

**The Glue for Seamless
Automation Engineering**

**Application Recommendation:
Building Services Engineering**

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Automation Engineering

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Automation Engineering

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1 Introduction

A frequently occurring task within the planning process of production systems is the exchange of building services engineering data of the building in which the production system is. Data and information from suppliers such as OEMs, BIM managers, planners, architects, building physicists, and real estate suppliers are made available and processed during the building services engineering process. The output is schematics, 3D plans, bills of materials, documentation including calculation results, etc. This data is shared with the OEM, BIM manager and other planners. To avoid multiple engineering in the participating systems building services engineering systems need an interface for sharing this information.

This application recommendation describes the data for each area of the building services engineering process: heating, ventilation, air conditioning, and plumbing (HVAC), Electrical, and Sprinkler.

1.1 Basics

The data exchange format AutomationML which is standardising in the IEC 62714 standard is a neutral, free, and XML-based data format. It has been developed in order to support the data exchange between engineering tools in a heterogeneous tool landscape.

Due to the different aspects of AutomationML the IEC 62714 consists of different parts.

Table 1 - Overview of AutomationML parts

Part/ Document Identifier	Title	Description
Part 1 / WP Arch, V. 2.1.0	Architecture and General Requirements	This part specifies the general AutomationML architecture, the modelling of the engineering data, classes, instances, relations, references, hierarchies, basic AutomationML libraries and extended AutomationML concepts.
Part 2 / WP Lib, Ed. 2, V. 1.0.0	Semantic libraries	This part specifies additional AutomationML libraries.
Best Practice Recommendation / BPR refDes, V 1.0.0	Modelling of Reference Designations	This Whitepaper describes the handling of reference designations following IEC 81346-1:2009-07 with AutomationML.
Whitepaper / WP AutomationML and ECLASS integration, V 2.0.0	AutomationML and ECLASS integration	This Whitepaper describes handling the integration of attribute semantics via ECLASS with AutomationML.

Further parts may be added in the future in order to e.g. interconnect further data standards to AutomationML.

1.2 Scope

This application recommendation proposes a modelling method of building services engineering data by means of the engineering data from AutomationML. It will describe the recommended use of role, interface and attribute classes.

2 General notes regarding exchange of Building Services engineering data

The building services engineering process for the design of production systems in a hall or building includes specific design tasks for the areas of heating, ventilation, air conditioning, and plumbing (HVAC), electrical, and sprinkler systems, which are performed by different roles and generate specific inputs and outputs. The three domains perform their tasks in parallel and are interconnected through the provision and transfer of data between different roles such as BIM managers, architects, building physicists, and designers. During the processes, service phases 1-8 must be completed sequentially, followed by collision checking and various project coordination processes.

In the first area, the building services engineering planning for heating, air conditioning, ventilation and plumbing (HVAC) is performed. The required input data is provided by various suppliers, including clients (OEMs) and designers, including BIM data such as 2D and 3D plans and specifications, safety and space-related templates, and specific project requirements. This data is made available to the HVAC designer, who uses it to create layouts for heating, ventilation, and plumbing systems. The result is comprehensive 2D and 3D plans, including manufacturer data, operational documentation and calculations, and associated bill of materials. This data is then made available to the operator, technical managers, and factory planner.

The second area is electrical building services engineering planning. This is based on similar input data such as BIM requirements and layouts, supplemented by additional plans in 2D and 3D formats. The electrical building services engineering planner uses this input to develop detailed electrical layouts, including schematics, vendor data, bills of materials, and calculation-based documentation. The results are shared with operators, technology managers, and other planners, such as the HVAC planner or system layout planner.

Sprinkler design is performed in the third area. Input data includes layouts and diagrams for sprinkler systems, as well as associated 3D models, including manufacturer data. The building services engineering planner (Sprinkler) creates detailed layouts for the sprinkler systems, including technical diagrams, calculation results, documentation and parts lists. These results are distributed to operators, engineering managers, and other designers.

The aim of this application recommendation is to convert the various input data formats, such as PDF, Word, DGN or AML, into machine-readable and/or neutral data formats to enable standardized further processing and integration into digital systems.

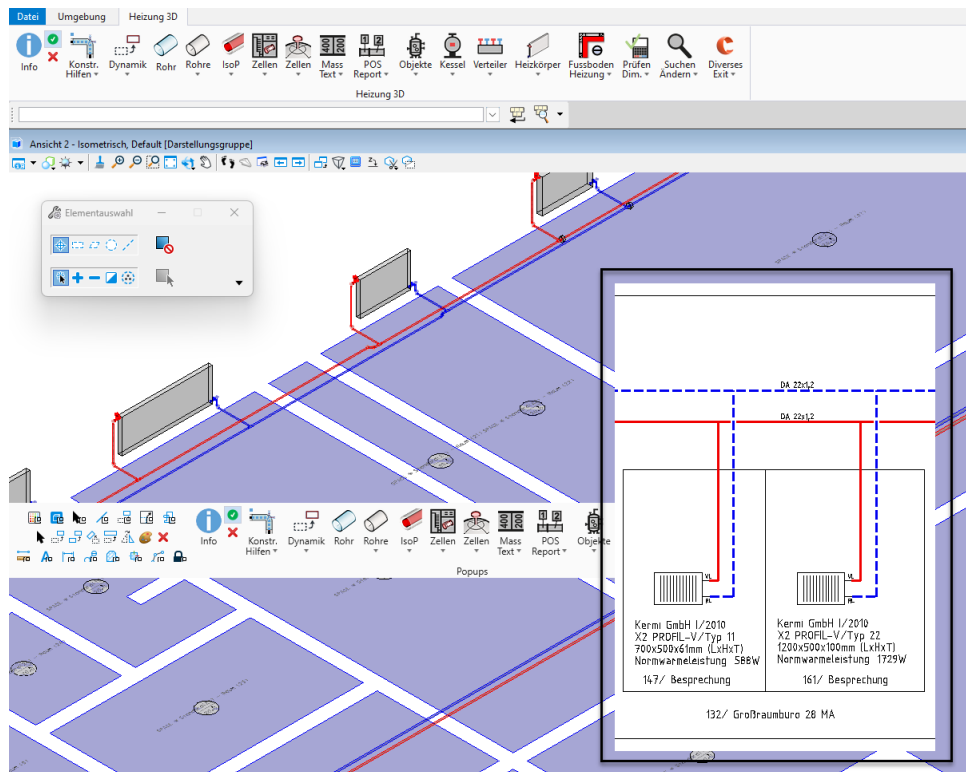


Figure 1 - CARF Radiator Line Diagram and 3D-Modelling

The figure shows rooms as areas with their room macros (shown as purple squares). Within each room there is a schematic plan showing the radiators (shown as grey squares) and the pipework. The pipework is represented by red lines for the hot flow and blue lines for the cold return. The diagram also shows the dimensions of the pipework, the size of the radiators and their power. Based on this schematic representation, the captured data can then be transferred directly into a 3D model, taking the design from a 2D level to a spatial, detailed representation.

3 Building Services Engineering data structures in AutomationML

In the following chapter a concept is defined how Building Services Engineering data can be represented in AutomationML.

3.1 Export from Building Services Engineering data to AutomationML

If the 3D modelling is generated from a CAD system that can model the building services engineering data, the export can be initiated via an AutomationML interface. This converts the building services engineering data from the 3D design into a standardised, machine-readable format, enabling seamless further processing and integration with other systems.

The following figures show the detailed export of Building Services Engineering data based on a CARF example:

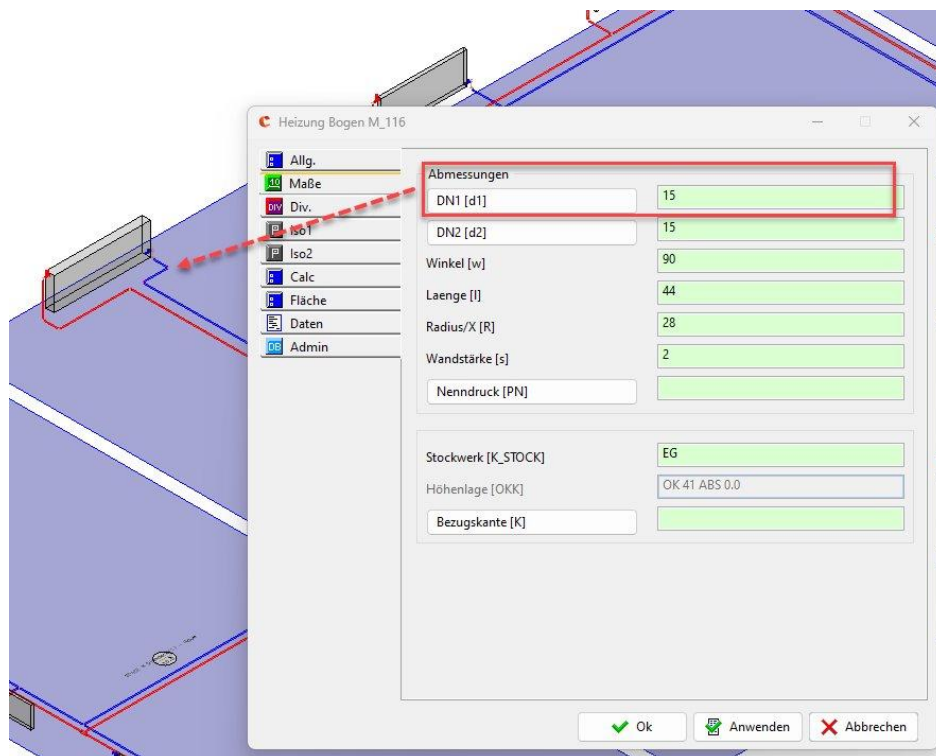


Figure 2 - CARF Datamask Heatingsystem

The figure shows a schematic representation of the 2D geometry, which must correspond exactly to the 3D geometry. In this example, the heating return is shown, with the dimension specified as nominal width dn15. When exporting to AutomationML, the corresponding component, "Bogen" (a fitting for implementing a change of direction), is transferred as such. In the associated attributes, the diameter dn1 is specified with a value of 15 mm.

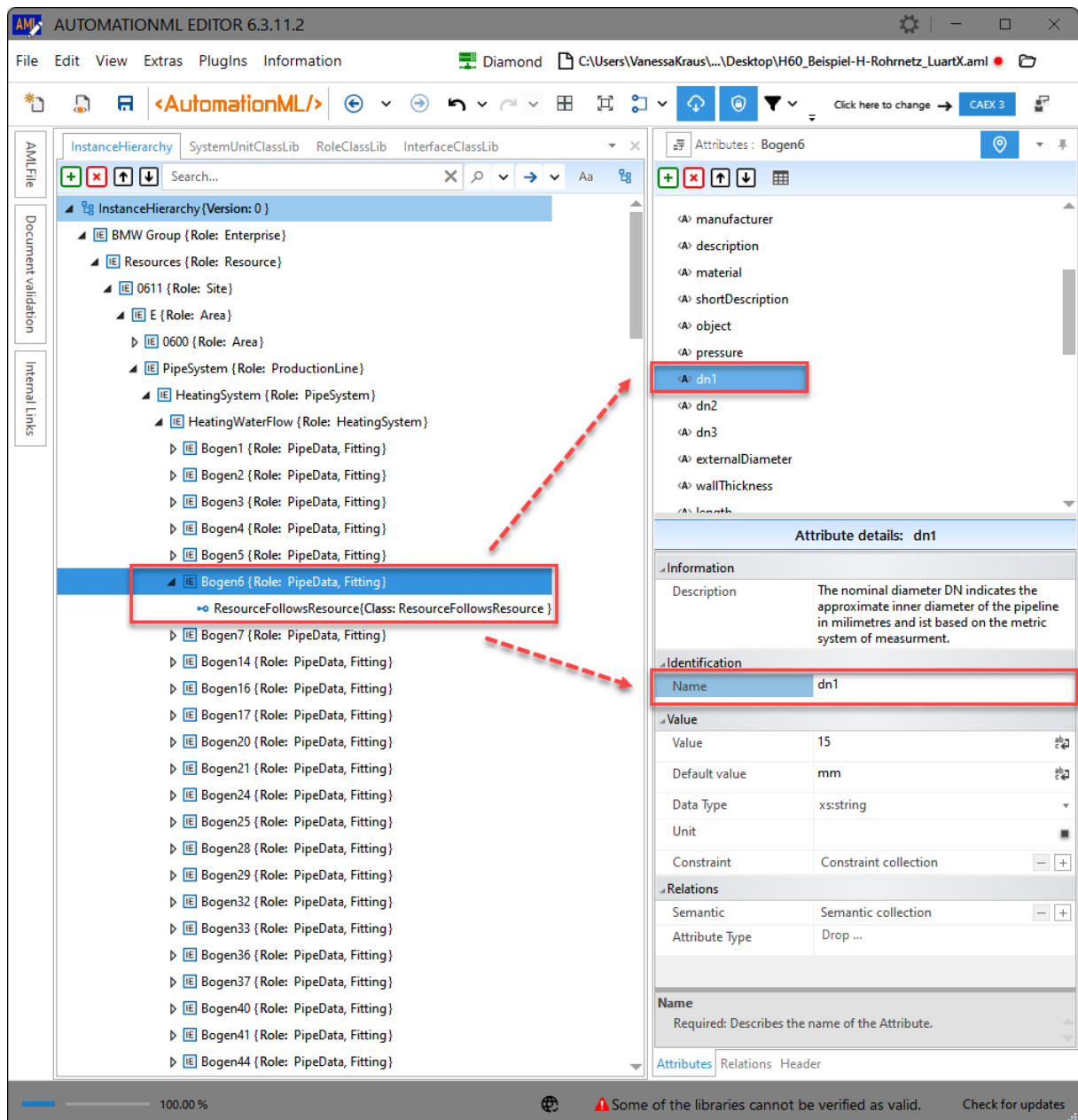


Figure 3 - AutomationML Editor View of the HeatingSystem

3.2 Contents of data exchange

Viewing the data handled in the Building Services Engineering domain showed that all data to be exchanged can be grouped in four major categories:

1. Building Services Engineering – Areas

Areas are the spatial and area-related assignments within a building. They include elements such as elevation, floor, room, etc. and structural components such as columns. As an important transfer point to other domains, the MediaTransferPoint plays a special role. These units are used for the geographic and logical structuring of building areas and form the basis for Building Services Engineering planning.

2. Building Services Engineering – Data

Building Services Engineering - Data describes the basic information used and managed in the building services engineering. This data is divided into several categories. ObjectData and SymbolData represent the elements and form the basis for the description of the utility network. This is supplemented by PipeData, which contains information about the lines and pipe systems, including parameters such as dimensions, materials, and connections within the utility network. The data is organized into logical groups according to purpose and structure, often hierarchically.

3. Building Services Engineering – Resources

Building Services Engineering - Resources includes the specific building parts and technical components used in building services engineering. These components are called resources and are used to implement the functional requirements within a building. Examples of such resources are diffusers used to distribute air, valves used to control and regulate liquid and gas flows, and smoke intakes used for smoke removal in safety systems. Resources are associated with their respective building services engineering systems and are often organized in a hierarchical directory that clearly defines their function and placement in the overall system.

4. Building Services Engineering – Structure

Building Services Engineering - Structure describes the systematic division of building services engineering into individual, specialized subsystems that are differentiated by purpose and medium. The central element is the pipe system, which in turn is subdivided into subsystems such as the drinking water system for drinking water supply or the heating system for heat generation, as well as other system networks. In addition to the piping systems, the ventilation system for air distribution and the electrical system for power supply and control are modeled in detail. The structure of the systems is presented in a clear, hierarchical form, allowing the different subsystems to be clearly assigned and managed.

3.3 Building Services Engineering data exchange data model

3.3.1 Building Services Engineering – Areas

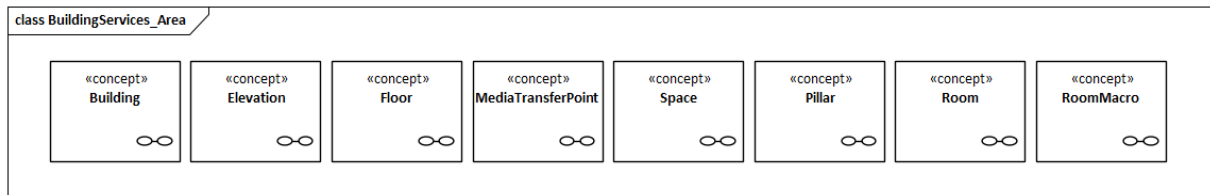


Figure 4 - Objects of the Building Services Engineering_Area

3.3.1.1 Building

The term building refers to a structured, often human-made construction that is inhabited or used for various purposes.

A building can serve different functions and vary in size, shape, and materials.

It can be used as a residential building, commercial building, industrial facility, or public structure.

The standard parameters of a Building object are listed below:

- ID (xs:int)
- GUID (xs:int)

3.3.1.2 Elevation

In geography or surveying, elevation refers to the height of a point above sea level.

The standard parameters of an Elevation object are listed below:

- ID (xs:int)
- GUID (xs:int)

3.3.1.3 Floor

A Floor describes the floor or level within a building.

The standard parameters of a Floor object are listed below:

- ID (xs:int)
- GUID (xs:int)

3.3.1.4 MediaTransferPoint

A MediaTransferPoint is the media handover point to the layout.

The standard parameters of a MediaTransferPoint object are listed below:

- ID (xs:int)
- GUID (xs:int)
- name (xs:string)
- nameOfSupplier (xs:string)
- medium (xs:string)
- plant (xs:string)
- nominalDiameter (xs:int)
- object (xs:string)
- description (xs:string)

3.3.1.5 Space

In architecture, space refers to an area or room within a building that is designated for a specific use or function.

The standard parameters of a Space object are listed below:

- ID (xs:int)
- GUID (xs:int)
- building (xs:string)
- floor (xs:string)
- roomNumber (xs:int)
- roomDescription (xs:string)
- area (xs:double)
- volume (xs:int)
- height (xs:double)

3.3.1.6 Pillar

A Pillar is a vertical, cylindrical or rectangular architectural element traditionally used as a support or load-bearing structure.

It is used to bear loads from overhead structures such as ceilings, arches, or roofs.

The standard parameters of a Pillar object are listed below:

- ID (xs:int)
- GUID (xs:int)

3.3.1.7 Room

Length, width, height: A room always has a specific extent in three dimensions.

In architecture, the room is defined by walls, floors, and ceilings, with these elements serving either a load-bearing function or simply acting as boundaries.

The standard parameters of a Room object are listed below:

- ID (xs:int)
- GUID (xs:int)
- height (xs:double)
- area (xs:double)
- roomId (xs:string)
- volume (xs:int)

3.3.1.8 RoomMacro

A RoomMacro is a term often used in the context of architecture, building technology, or CAD software, referring to a predefined collection of information or settings that describes or models a specific room or room type within a building.

The standard parameters of a RoomMacro object are listed below:

- ID (xs:int)
- GUID (xs:int)
- name (xs:string)
- building (xs:string)
- floor (xs:string)
- apartment (xs:string)
- roomNumber (xs:string)
- area (xs:double)
- height (xs:double)
- roomVolume (xs:double)
- normTemperature (xs:double)
- heatRequired (xs:double)
- power (xs:double)

3.3.2 Building Services Engineering – Data

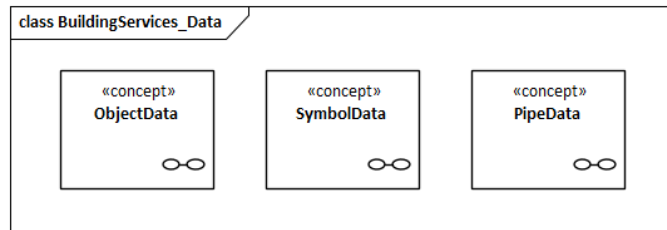


Figure 5 - Objects of the Building Services Engineering_Data

3.3.2.1 ObjectData

An `ObjectData` describes the objects, components, fittings, and other elements within a utility network. The standard parameter of an `ObjectData` object are listed below:

- GUID (xs:int)

3.3.2.2 SymbolData

A `SymbolData` describes the fittings and components within a utility network. The standard parameter of a `SymbolData` object are listed below:

- GUID (xs:int)

3.3.2.3 PipeData

A `PipeData` describes a utility network and its information, medium, dimensions, system, etc. The standard parameter of a `PipeData` object are listed below:

- GUID (xs:int)

3.3.3 Building Services Engineering – Resources

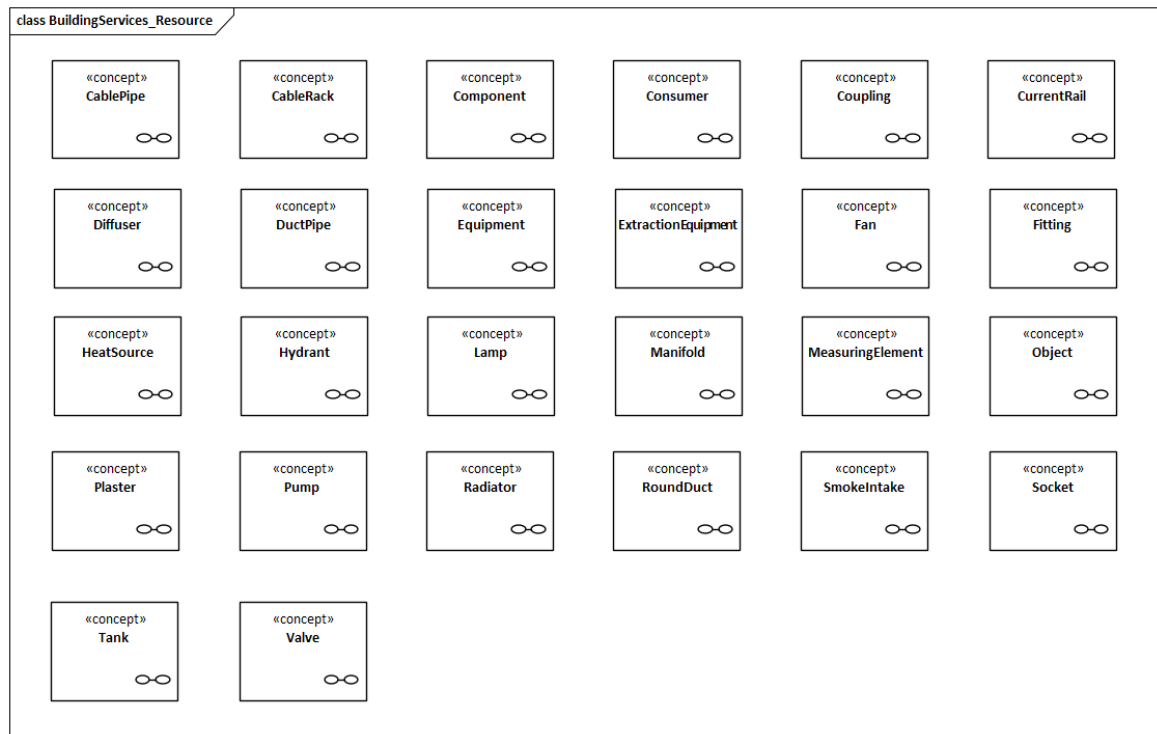


Figure 6 - Objects of the Building Services Engineering_Resource

3.3.3.1 CablePipe

A CablePipe is a protective conduit used to shield cables from mechanical damage, moisture, or other external influences.

The standard parameters of a CablePipe object are listed below:

- ID (xs:int)
- GUID (xs:int)
- plant (xs:string)
- medium (xs:string)
- nameOfSupplier(xs:string)
- length (xs:double)
- nominalDiameter (xs:int)
- floor (xs:string)

3.3.3.2 CableRack

Cable trays, BusWay, and installation channels are part of the electrical field. They include straight sections, branches, bends, and other components.

The standard parameters of a CableRack object are listed below:

- ID (xs:int)
- GUID (xs:int)
- plant (xs:string)
- track (xs:string)
- nameOfSupplier (xs:string)
- material (xs:string)
- object (xs:string)
- description (xs:string)
- length (xs:double)
- width (xs:double)
- height (xs:double)
- widthExit1 (xs:double)
- heightExit1 (xs:double)
- widthExit2 (xs:double)
- angle (xs:double)
- floor (xs:string)

3.3.3.3 Component

Depending on the building services engineering trade, the component serves to supply systems, buildings, or rooms.

Examples include ventilation fire dampers, sanitary washbasins, compensators, etc.

The standard parameters of a Component object are listed below:

- ID (xs:int)
- GUID (xs:int)
- plant (xs:string)
- medium (xs:string)
- drive (xs:int)
- object (xs:string)
- nameOfSupplier (xs:string)
- material (xs:string)
- description (xs:string)
- comment (xs:string)
- nominalDiameter (xs:int)
- dn1 (xs:int)
- dn2 (xs:int)
- dn3 (xs:int)
- length (xs:double)
- pressure (xs:int)
- couplingIn (xs:string)
- couplingOut (xs:string)
- width (xs:int)
- height (xs:int)
- externalDimensionA (xs:int)
- externalDimensionB (xs:int)

- frame (xs:string)
- isolation (xs:string)
- floor (xs:string)
- massFlowrate (xs:double)
- flowVelocity(xs:double)
- volumeFlowrate(xs:double)
- flowVelocityVentilation(xs:double)
- totalPressure(xs:double)
- airPressure(xs:double)
- throttlingPressure(xs:double)
- maxDrainageCapacity (xs:double)
- tgaKeyH60 (xs:string)
- tgaKeyS87 (xs:string)
- tgaKeyS90 (xs:string)

3.3.3.4 Consumer

A Consumer is a general consumer component, such as a dummy, fixed points, or universal consumers.

The standard parameters of a Consumer object are listed below:

- ID (xs:int)
- GUID (xs:int)
- plant (xs:string)
- medium (xs:string)
- nameOfSupplier (xs:string)
- material (xs:string)
- description (xs:string)
- object (xs:string)
- length (xs:double)
- height (xs:double)
- width (xs:double)
- nominalDiameter (xs:int)
- dn1 (xs:int)
- dn2 (xs:int)
- dn3 (xs:int)
- pressure (xs:int)
- volume (xs:int)
- couplingIn (xs:string)
- couplingOut (xs:string)
- floor (xs:string)
- massFlowrate (xs:string)
- tgaKeyH60 (xs:string)
- tgaKeyS87 (xs:string)
- tgaKeyS90 (xs:string)
- productRange (xs:string)

3.3.3.5 Coupling

Coupling describes the couplings for pipelines, sleeves, pipe clamps, hangers, etc.

The standard parameters of a Coupling object are listed below:

- ID (xs:int)
- GUID (xs:int)
- plant (xs:string)
- medium (xs:string)
- nameOfSupplier(xs:string)
- material (xs:string)
- description1 (xs:string)
- description2 (xs:string)
- object (xs:string)
- dn1 (xs:int)
- dn2 (xs:int)
- dn3 (xs:int)
- couplingIn (xs:string)
- couplingOut (xs:string)
- floor (xs:string)

3.3.3.6 CurrentRail

A CurrentRail includes the busbars, straight sections, bends, T-joints, etc.

The standard parameters of a CurrentRail object are listed below:

- ID (xs:int)
- GUID (xs:int)
- nameOfSupplier (xs:string)
- medium (xs:string)
- name (xs:string)
- comment (xs:int)
- description (xs:string)
- current (xs:double)
- ladder (xs:int)
- length1 (xs:double)
- length2 (xs:double)
- length3 (xs:double)
- length4 (xs:double)
- width (xs:double)
- height (xs:double)
- angle (xs:double)
- floor (xs:string)

3.3.3.7 Diffuser

Diffuser includes in ventilation the outlets (such as swirl outlets, slot outlets, diffuser outlets, etc.), grilles of all types, square and round, plate vents for exhaust and supply air, etc.

The standard parameters of a Diffuser object are listed below:

- ID (xs:int)
- GUID (xs:int)
- description (xs:string)
- plant (xs:string)
- typeOfAir (xs:string)
- nameOfSupplier (xs:string)
- material (xs:string)
- object(xs:string)
- width (xs:int)
- height (xs:int)
- nominalDiameter (xs:int)
- volumeFlowrate (xs:int)
- flowVelocityVentilation (xs:double)
- totalPressure(xs:double)
- airPressure(xs:double)
- throttlingPressure(xs:double)
- floor (xs:string)

3.3.3.8 DuctPipe

A DuctPipe describes the ventilation in square, round, and oval shapes. Includes straight ducts, fittings, special components, etc.

The standard parameters of a DuctPipe object are listed below:

- ID (xs:int)
- GUID (xs:int)
- plant (xs:string)
- description (xs:string)
- medium (xs:string)
- nameOfSupplier (xs:string)
- material (xs:string)
- length (xs:double)
- offset (xs:double)
- fittingLength (xs:double)
- width1 (xs:double)
- height1 (xs:double)
- width2 (xs:double)
- height2 (xs:double)
- width3 (xs:double)
- height3 (xs:double)
- width4 (xs:double)
- width5 (xs:double)
- radiant (xs:double)
- angle (xs:double)
- angleElbow (xs:double)
- angleEnd (xs:double)
- section (xs:double)
- nominalDiameter (xs:int)
- typeOfCoupling (xs:int)
- isolation (xs:string)
- flowVelocityVentilation (xs:double)
- volumeFlowrate (xs:double)
- floor (xs:string)

3.3.3.9 Equipment

Equipment includes the openings (ceiling, wall, core drilling, etc.) in all building services engineering areas, fire stops.

The standard parameters of an Equipment object are listed below:

- ID (xs:int)
- GUID (xs:int)
- plant (xs:string)
- medium (xs:string)
- material (xs:string)
- nameOfSupplier (xs:string)
- description (xs:string)
- nominalDiameter (xs:int)
- comment (xs:string)
- object (xs:string)
- length1 (xs:double)
- height1 (xs:double)
- width1 (xs:double)
- height2 (xs:double)
- length2 (xs:double)
- width2 (xs:double)
- height3 (xs:double)
- floor (xs:string)

3.3.3.10 ExtractionEquipment

An ExtractionEquipment is in ventilation, the deflector hood in square and round designs.

The standard parameters of an ExtractionEquipment object are listed below:

- ID (xs:int)
- GUID (xs:int)
- description (xs:string)
- plant (xs:string)
- medium (xs:string)
- nameOfSupplier (xs:string)
- material (xs:string)
- widthA (xs:double)
- heightB (xs:double)
- externalDimension1 (xs:double)
- externalDimension2 (xs:double)
- difference (xs:double)
- overallHeight (xs:double)
- frame (xs:string)
- nominalDiameter (xs:int)
- flowVelocityVentilation (xs:double)
- volumeFlowrate (xs:int)
- floor (xs:string)

3.3.3.11 Fan

Fan describes the fan for square ducts or round pipes. Fan design in axial, radial form, as well as roof fans.

The standard parameters of a Fan object are listed below:

- ID (xs:int)
- GUID (xs:int)
- plant (xs:string)
- medium (xs:string)
- material (xs:string)
- nameOfSupplier (xs:string)
- object (xs:string)
- description (xs:string)
- length (xs:double)
- aSquare (xs:int)
- bSquare (xs:int)
- externalDimensionA (xs:int)
- externalDimensionB (xs:int)
- baseLength (xs:double)
- baseThickness (xs:double)
- height (xs:double)
- dn1 (xs:int)
- nominalDiameter (xs:int)
- frame (xs:string)
- isolation (xs:string)
- floor (xs:string)
- volumeFlowrate (xs:double)
- flowVelocityVentilation (xs:double)

3.3.3.12 Fitting

Fittings and components for piping in all dimensions and materials, such as T-joints, reducers, elbows, flanges, seals.

The standard parameters of a Fitting object are listed below:

- ID (xs:int)
- GUID (xs:int)
- plant (xs:string)
- medium (xs:string)
- nameOfSupplier (xs:string)
- description (xs:string)
- material (xs:string)
- object (xs:string)
- pressure (xs:int)
- dn1 (xs:int)
- dn2 (xs:int)
- dn3 (xs:int)
- externalDiameter (xs:int)
- wallThickness (xs:int)
- length (xs:double)
- distanceLength (xs:double)
- lengthExit (xs:double)
- width (xs:double)
- height (xs:double)
- angle (xs:double)
- radiant (xs:double)
- isolation (xs:string)
- insulationThickness (xs:string)
- couplingIn (xs:string)
- couplingOut (xs:string)
- floor (xs:string)
- massFlowrate (xs:double)
- tgaKeyH60 (xs:string)
- tgaKeyS87 (xs:string)
- tgaKeyS90 (xs:string)
- pressureHot (xs:double)
- pressureCold (xs:double)

3.3.3.13 HeatSource

A HeatSource includes hot water boilers, heating boilers, heat exchangers, or general equipment.

The standard parameters of a HeatSource object are listed below:

- ID (xs:int)
- GUID (xs:int)
- plant (xs:string)
- description (xs:string)
- medium (xs:string)
- nameOfSupplier (xs:string)
- object (xs:string)
- material (xs:string)
- length (xs:double)
- height (xs:double)
- width1 (xs:double)
- width2 (xs:double)
- overallLength (xs:double)
- nominalDiameter (xs:int)
- pressure (xs:int)
- numberFeet (xs:int)
- volume (xs:int)
- boilerNumber (xs:int)
- dnVL (xs:int)
- dnRL (xs:int)
- exhaustConnection (xs:int)
- powerHeat (xs:int)
- powerCold (xs:int)
- floor (xs:string)
- productRange (xs:string)
- tgaKeyH60 (xs:string)

3.3.3.14 Hydrant

Hydrants in all designs, fire hose cabinets, and handheld fire extinguishers.

The standard parameters of a Hydrant object are listed below:

- ID (xs:int)
- GUID (xs:int)
- plant (xs:string)
- medium (xs:string)
- nameOfSupplier(xs:string)
- description (xs:string)
- length (xs:double)
- width (xs:int)
- height (xs:int)
- medium1 (xs:string)
- dn1 (xs:int)
- distanceFromFloor1 (xs:int)
- medium2 (xs:string)
- dn2 (xs:int)
- distanceFromFloor2 (xs:int)
- medium3 (xs:string)
- dn3 (xs:int)
- distanceFromFloor3 (xs:int)
- medium4 (xs:string)
- dn4 (xs:int)
- distanceFromFloor4 (xs:int)
- floor (xs:string)

3.3.3.15 Lamp

Lamps as freestanding, in single or double flame, LED, emergency lighting, office or mounted lights, spotlights, etc.

The standard parameters of a Lamp object are listed below:

- ID (xs:int)
- GUID (xs:int)
- description (xs:string)
- nameOfSupplier (xs:string)
- identifier (xs:int)
- circuit (xs:int)
- ipAddress (xs:int)
- power (xs:double)
- length (xs:double)
- width (xs:double)
- height (xs:double)
- floor (xs:string)

3.3.3.16 Manifold

Manifolds are electrical distribution panels such as transformers, switchboards, or heating and cooling distribution units, as well as sprinkler or plumbing systems.

The standard parameters of a Manifold object are listed below:

- ID (xs:int)
- GUID (xs:int)
- plant (xs:string)
- medium (xs:string)
- description (xs:string)
- nameOfSupplier (xs:string)
- material (xs:string)
- object (xs:string)
- overallLength (xs:double)
- cylinderLength (xs:double)
- nominalDiameter (xs:int)
- length1 (xs:double)
- width1 (xs:double)
- height1 (xs:double)
- switchCabinetNumber (xs:int)
- name (xs:string)
- circuit (xs:int)
- physicalAddress (xs:int)
- height2 (xs:double)
- width2 (xs:double)
- length2 (xs:double)
- depth2 (xs:double)
- width3 (xs:double)
- height3 (xs:double)
- baseHeight (xs:double)
- floor (xs:string)

3.3.3.17 MeasuringElement

Measuring points are thermometers, pressure gauges, sensors.

The standard parameters of a MeasuringElement object are listed below:

- ID (xs:int)
- GUID (xs:int)
- plant (xs:string)
- medium (xs:string)
- nameOfSupplier (xs:string)
- description (xs:string)
- object (xs:string)
- nominalDiameter (xs:int)
- couplingIn (xs:string)
- couplingOut (xs:string)
- floor (xs:string)

3.3.3.18 Object

Planning objects include actuators for motor-operated valves, sprinkler heads, separators, pipe separators, siphons for washbasins.

The standard parameters of an Object object are listed below:

- ID (xs:int)
- GUID (xs:int)
- name (xs:string)
- plant (xs:string)
- description (xs:string)
- medium (xs:string)
- nameOfSupplier (xs:string)
- object (xs:string)
- nominalDiameter (xs:int)
- width (xs:double)
- height (xs:double)
- length (xs:double)
- pressure (xs:int)
- kFactor (xs:int)
- norm (xs:int)
- fireHazardClass (xs:int)
- waterRequirement (xs:int)
- maxWallSpacing (xs:int)
- minWallSpacing (xs:int)
- sprinklerSpacing (xs:int)
- building (xs:string)
- floor (xs:string)
- apartment (xs:string)
- roomNumber (xs:string)
- roomVolume (xs:double)
- normTemperature (xs:double)
- heatRequired (xs:double)
- powerHeat (xs:double)
- powerCold (xs:double)
- productRange (xs:string)
- tgaKeyH60 (xs:string)
- tgaKeyS87 (xs:string)
- tgaKeyS90 (xs:string)

3.3.3.19 Plaster

Plaster pieces for rainwater or wastewater are specialized components or elements used to facilitate the transitions between different piping systems or discharge points.

The standard parameters of a Plaster object are listed below:

- ID (xs:int)
- GUID (xs:int)
- plant (xs:string)
- medium (xs:string)
- nameOfSupplier (xs:string)
- material (xs:string)
- description (xs:string)
- object (xs:string)
- nominalDiameter (xs:int)
- height (xs:int)
- floor (xs:string)
- productRange (xs:string)
- tgaKeyS87 (xs:string)
- maxDrainageCapacity (xs:double)

3.3.3.20 Pump

Pumps such as base pumps, pipeline pumps for various trades. Low-pressure or high-pressure pumps in flanged or screwed form.

The standard parameters of a Pump object are listed below:

- ID (xs:int)
- GUID (xs:int)
- plant (xs:string)
- medium (xs:string)
- nameOfSupplier (xs:string)
- material (xs:string)
- description (xs:string)
- suctionNozzleDN (xs:int)
- pressureNozzleDN (xs:int)
- pressure (xs:int)
- couplingIn (xs:string)
- couplingOut (xs:string)
- floor (xs:string)
- supplyTemperatureHeat (xs:double)
- returnTemperatureHeat (xs:double)
- supplyTemperatureCold (xs:double)
- returnTemperatureCold (xs:double)
- massFlowrate (xs:double)
- tgaKeyH60 (xs:string)
- tgaKeyS87 (xs:string)
- tgaKeyS90 (xs:string)
- productRange (xs:string)

3.3.3.21 Radiator

Radiators for various heating purposes, such as flat radiators, valve radiators, compact radiators in single-pipe or multi-pipe systems. Connection types include bottom, dual-side, single-side, etc.

The standard parameters of a Radiator object are listed below:

- ID (xs:int)
- GUID (xs:int)
- building (xs:string)
- storey (xs:string)
- nameOfSupplier (xs:string)
- length (xs:double)
- height (xs:int)
- width(xs:int)
- roomNumber (xs:string)
- hkNumberInRoom (xs:string)
- roomTemperature (xs:double)
- supplyTemperatureHeat (xs:double)
- returnTemperatureHeat (xs:double)
- supplyTemperatureCold (xs:double)
- returnTemperatureCold (xs:double)
- power (xs:double)
- floor (xs:string)
- tgaKeyH60 (xs:string)
- kv-ValueHeating (xs:double)
- kv-ValueCooling (xs:double)
- zetaValueHeat (xs:int)
- zetaValueCold (xs:int)
- productRange (xs:string)
- massFlowrate (xs: double)

3.3.3.22 RoundDuct

A round pipe refers to a pipe with a circular cross-sectional shape. It is used in the fields of heating, ventilation, and sanitation (HVS), in industry, as well as for cable installations and in water or wastewater systems.

The standard parameters of a RoundDuct object are listed below:

- ID (xs:int)
- GUID (xs:int)
- plant (xs:string)
- medium (xs:string)
- nameOfSupplier (xs:string)
- material (xs:string)
- description (xs:string)
- object (xs:string)
- gradientValue (xs:double)
- nominalDiameter (xs:int)
- externalDiameter (xs:int)
- wallThickness (xs:int)
- pressure (xs:int)
- length (xs:double)
- equivalentLength (xs:double)
- couplingIn (xs:string)
- couplingOut (xs:string)
- storey (xs:string)
- isolation (xs:string)
- insulationThickness (xs:string)
- floor (xs:string)
- massFlowrate (xs:string)
- pressureCold (xs:int)
- pressureHot (xs:int)
- tgaKeyH60 (xs:string)
- tgaKeyS87 (xs:string)
- tgaKeyS90 (xs:string)

3.3.3.23 SmokeIntake

A SmokeIntake is a description of the pipe suction system with straight pipe sections and fittings such as elbows, reducers, T-joints, end caps, etc.

The standard parameters of a SmokeIntake object are listed below:

- ID (xs:int)
- GUID (xs:int)
- plant (xs:string)
- track (xs:string)
- nameOfSupplier (xs:string)
- material (xs:string)
- object (xs:string)
- description (xs:string)
- dn1 (xs:int)
- dn2 (xs:int)
- angle (xs:double)
- length (xs:double)
- radiant (xs:double)
- floor (xs:string)

3.3.3.24 Socket

Sockets 230V, 16A, 32A, light switches, dimmers, blinds, data sockets, telephone connections, cold water connections, hot water connections for cooling of distribution panels, compressed air connections, gas connections, etc.

The standard parameters of a Socket object are listed below:

- ID (xs:int)
- GUID (xs:int)
- name (xs:string)
- description (xs:string)
- medium (xs:string)
- object (xs:int)
- comment (xs:int)
- floor (xs:string)

3.3.3.25 Tank

Sanitary area storage tanks for above-counter or under-counter, venting pipes in building services engineering for air traps.

The standard parameters of a Tank object are listed below:

- ID (xs:int)
- GUID (xs:int)
- plant (xs:string)
- medium (xs:string)
- nameOfSupplier (xs:string)
- object (xs:string)
- description (xs:string)
- name (xs:string)
- dn1 (xs:int)
- dn2 (xs:int)
- dn3 (xs:int)
- length (xs:double)
- pressure (xs:int)
- couplingIn (xs:string)
- couplingOut (xs:string)
- floor (xs:string)

3.3.3.26 Valve

Valves and shut-off fittings differ in terms of design, pressure rating, and dimensions. They can be flanged, screwed, or welded, motor-driven or manual, etc.

The standard parameters of a Valve object are listed below:

- ID (xs:int)
- GUID (xs:int)
- plant (xs:string)
- medium (xs:string)
- description (xs:string)
- nameOfSupplier (xs:string)
- material (xs:string)
- object (xs:string)
- nominalDiameter (xs:int)
- dn1 (xs:int)
- dn2 (xs:int)
- dn3 (xs:int)
- pressure (xs:int)
- pressureHot (xs:int)
- pressureCold (xs:int)
- minPressureHot (xs:int)
- minPressureCold (xs:int)
- length (xs:double)
- couplingIn (xs:string)
- couplingOut (xs:string)
- floor (xs:string)
- massFlowrate (xs:double)
- hotWaterFlowrate (xs:double)

- coldWaterFlowrate (xs:double)
- zetaValueHeat (xs:int)
- zetaValueCold (xs:int)
- tgaKeyH60 (xs:string)
- tgaKeyS87 (xs:string)
- tgaKeyS90 (xs:string)
- productRange (xs:string)

3.3.4 Building Services Engineering – Structure

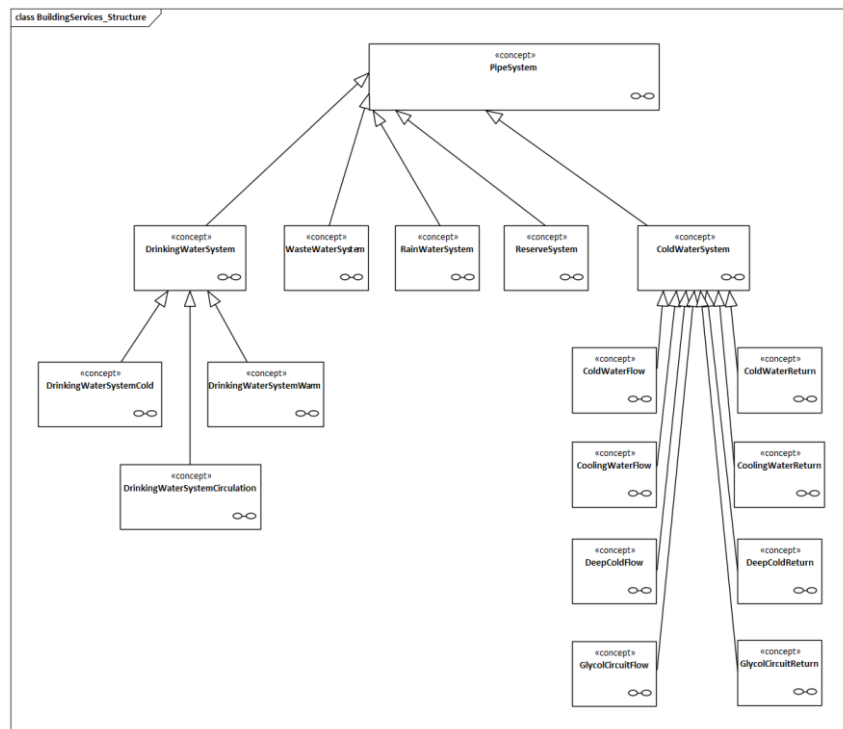


Figure 7 - Objects of the Building Services Engineering_Structure (Part 1)

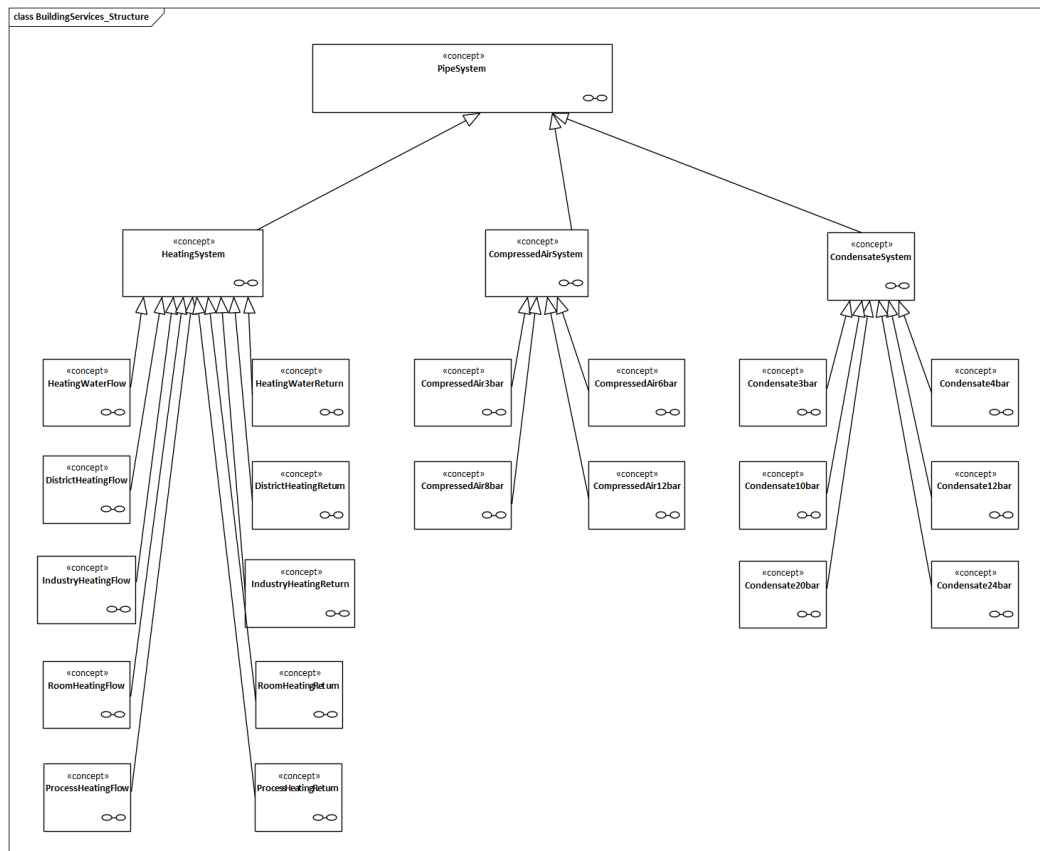


Figure 8 - Objects of the Building Services Engineering_Structure (Part 2)

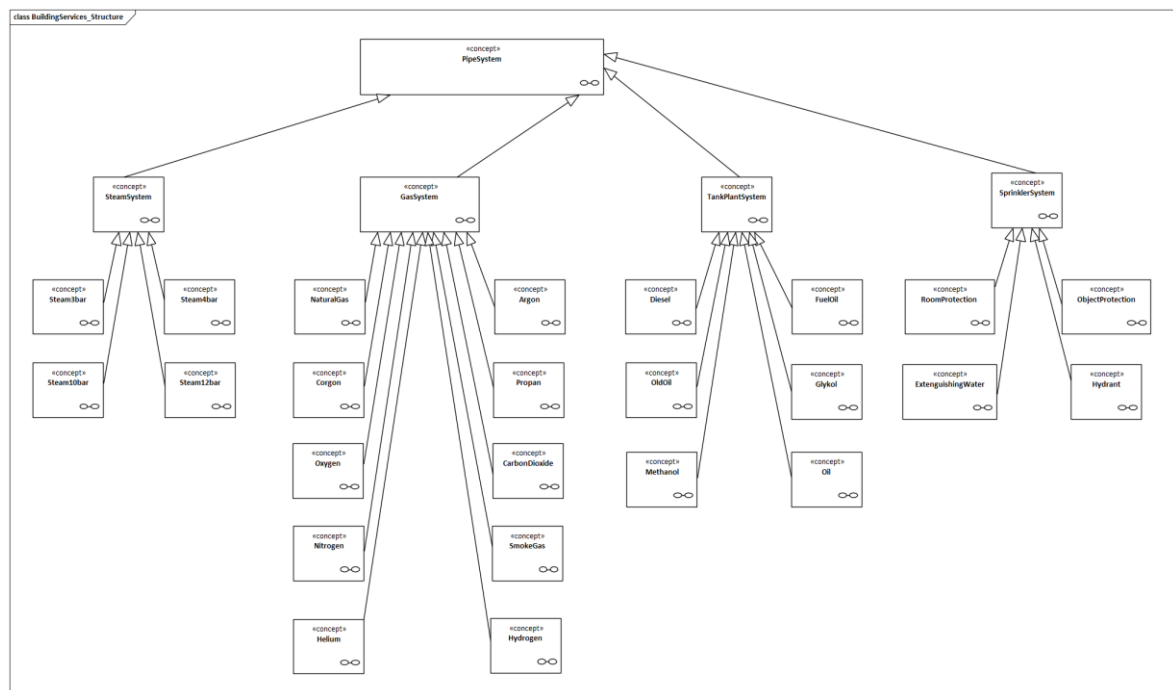


Figure 9 - Objects of the Building Services Engineering_Structure (Part 3)

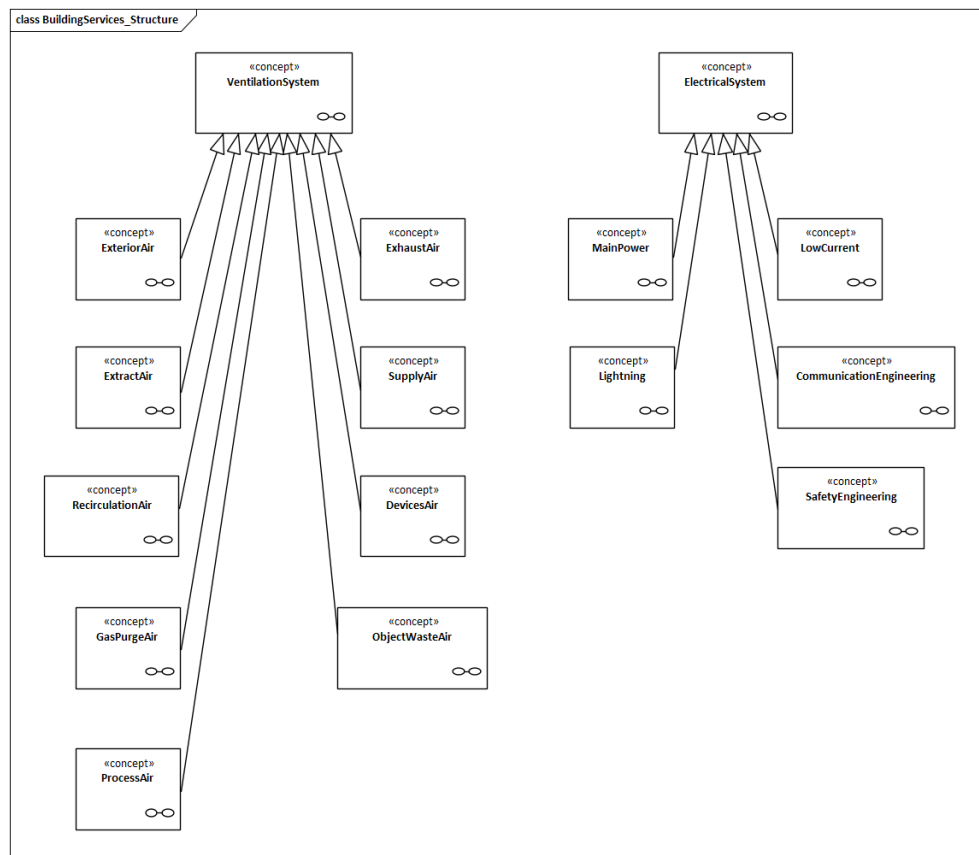


Figure 10 - Objects of the Building Services Engineering_Structure (Part 4)

3.3.4.1 PipeSystem

PipeSystem are used in the manufacturing and process industry to transport various substances, including water, gas, or air.

The standard parameter of a PipeSystem object is listed below:

- GUID (xs:int)

3.3.4.2 DrinkingWaterSystem

The drinking water system ensures that water is available in sufficient quantity and quality for daily use, such as drinking, cooking, washing, hygiene, and heating.

The standard parameter of a DrinkingWaterSystem object is listed below:

- GUID (xs:int)

3.3.4.3 DrinkingWaterSystemCold

The cold drinking water system in a building ensures the availability of safe, clean water for all daily needs, from drinking and cooking to bathing and cleaning.

The standard parameter of a DrinkingWaterSystemCold object is listed below:

- GUID (xs:int)

3.3.4.4 DrinkingWaterSystemWarm

A hot water system is an essential component of the drinking water supply in a building, ensuring that potable water is heated to the desired temperature.

It is crucial for the comfort of users and the functionality of various sanitary facilities, such as showers, sinks, kitchens, and heating systems.

The standard parameter of a DrinkingWaterSystemWarm object is listed below:

- GUID (xs:int)

3.3.4.5 DrinkingWaterSystemCirculation

A drinking water recirculation system plays a key role in enhancing user comfort by providing hot water quickly and efficiently.

It ensures a constant temperature and prevents the growth of harmful bacteria, such as Legionella.

The standard parameter of a DrinkingWaterSystemCirculation object is listed below:

- GUID (xs:int)

3.3.4.6 WasteWaterSystem

Wastewater is a term that is divided into two main categories: gray water and black water.

Gray water is a specific form of wastewater that originates from sanitary installations but is not contaminated with feces.

Black water is a type of wastewater that is contaminated with feces and urine.

The standard parameter of a WasteWaterSystem object is listed below:

- GUID (xs:int)

3.3.4.7 RainWaterSystem

A rainwater system is a system for collecting, storing, and utilizing rainwater.

Such systems are increasingly used in residential and commercial buildings.

The standard parameter of a RainWaterSystem object is listed below:

- GUID (xs:int)

3.3.4.8 ReserveSystem

A reserve type is a medium that is not occupied.

The standard parameter of a ReserveSystem object is listed below:

- GUID (xs:int)

3.3.4.9 ColdWaterSystem

In the building services engineering (TGA), the cold water system plays a central role in providing cooling water for various applications within a building.

Cold water is required for a wide range of purposes, particularly in areas such as heating, ventilation, and air conditioning (HVAC), sanitary facilities, fire protection systems, and the cooling of technical equipment.

The standard parameter of a ColdWaterSystem object is listed below:

- GUID (xs:int)

3.3.4.10 ColdWaterFlow

The cooling water supply is a central component in a cooling water system, as it transports the water to the equipment or processes to be cooled, where it absorbs heat.

The standard parameter of a ColdWaterFlow object is listed below:

- GUID (xs:int)

3.3.4.11 ColdWaterReturn

The cold water return is an important component of a cold water system, describing the path of the water that, after use or cooling, is returned to the starting point of the circuit.

In a typical system, cold water is first directed to the points of use (e.g., air conditioning units, cooling systems, or sanitary facilities), where it performs its cooling function or is used for other purposes.

The standard parameter of a ColdWaterReturn object is listed below:

- GUID (xs:int)

3.3.4.12 CoolingWaterFlow

The cooling water supply is a central component in a cooling water system, as it transports the water to the equipment or processes to be cooled, where it absorbs heat.

The standard parameter of a CoolingWaterFlow object is listed below:

- GUID (xs:int)

3.3.4.13 CoolingWaterReturn

The cooling water return is an essential component of an efficient cooling water system.

It is responsible for carrying heated water from the equipment being cooled back to the cooling tower or heat exchanger, where the heat is released and the water is cooled down.

The standard parameter of a CoolingWaterReturn object is listed below:

- GUID (xs:int)

3.3.4.14 DeepColdFlow

The cryogenic supply refers to the part of a cooling or cryogenic system where a very cold coolant (usually a special cryogenic fluid or gas) is fed into a machine, plant, or process to achieve extremely low temperatures (often below -100°C).

The standard parameter of a DeepColdFlow object is listed below:

- GUID (xs:int)

3.3.4.15 DeepColdReturn

The cryogenic return refers to the part of a cooling or cryogenic system where the cooled medium (often a cryogen such as liquid nitrogen, helium, or a special coolant) is returned after absorbing heat from the system or process being cooled, to either be reintroduced into the cycle or processed again in a special tank or evaporator.

The standard parameter of a DeepColdReturn object is listed below:

- GUID (xs:int)

3.3.4.16 GlycolCircuitFlow

The glycol supply refers to the section of a cooling system where a glycol-water mixture (often an antifreeze mixture) is introduced into the system as a cooling medium.

Glycol is primarily used in cooling systems to regulate temperature while protecting against freeze damage, as it does not freeze at low temperatures compared to pure water.

The standard parameter of a GlycolCircuitFlow object is listed below:

- GUID (xs:int)

3.3.4.17 GlycolCircuitReturn

The glycol return refers to the section of a cooling system where the heated glycol-water mixture, after absorbing heat from the system or process being cooled, is returned.

Once the glycol has absorbed heat and warmed up, it is directed back through the return line to the cooling system, where it is either cooled down again or reintroduced into the cycle.

The standard parameter of a GlycolCircuitReturn object is listed below:

- GUID (xs:int)

3.3.4.18 HeatingSystem

A static heater, also known as a radiator or convactor, is a heating system that releases heat through radiation and convection.

The standard parameter of a HeatingSystem object is listed below:

- GUID (xs:int)

3.3.4.19 HeatingWaterFlow

This is the temperature of the heating water that is pumped from the heating system into the radiators.

It is typically higher than the return temperature, which is the temperature of the water that flows back to the heating system after releasing its heat.

The standard parameter of a HeatingWaterFlow object is listed below:

- GUID (xs:int)

3.3.4.20 HeatingWaterReturn

This is the temperature of the water that is returned to the heating system after being heated by the radiators in the rooms.

The return is typically cooler than the flow, as the water has given off heat to the space during its passage through the radiators.

The standard parameter of a HeatingWaterReturn object is listed below:

- GUID (xs:int)

3.3.4.21 DistrictHeatingFlow

The term district heating flow refers to the water that is pumped from the central heating system or district heating plant into the connected buildings.

The standard parameter of a DistrictHeatingFlow object is listed below:

- GUID (xs:int)

3.3.4.22 DistrictHeatingReturn

This is the water that is returned to the central heating system or district heating plant after being used in the radiators or for domestic hot water preparation.

The standard parameter of a DistrictHeatingReturn object is listed below:

- GUID (xs:int)

3.3.4.23 IndustryHeatingFlow

This is the water or steam that is returned to a boiler or heat supply unit after being used in industrial applications.

The standard parameter of a IndustryHeatingFlow object is listed below:

- GUID (xs:int)

3.3.4.24 IndustryHeatingReturn

This is the heating water or steam that is delivered at a specific temperature from a heating source, such as a boiler or a heat supply unit, to the processes or heating systems in the industry.

The standard parameter of a IndustryHeatingReturn object is listed below:

- GUID (xs:int)

3.3.4.25 RoomHeatingFlow

This is the heating water that is supplied at a specific temperature from the heating system to the radiators or other heating systems to warm the rooms.

The standard parameter of a RoomHeatingFlow object is listed below:

- GUID (xs:int)

3.3.4.26 RoomHeatingReturn

This is the water that is returned to the heating system after releasing heat to the room.

It typically has a lower temperature than the heating water that is supplied to the radiators or heating system.

The standard parameter of a RoomHeatingReturn object is listed below:

- GUID (xs:int)

3.3.4.27 ProcessHeatingFlow

This is the heating water or steam that is supplied at a specific temperature from a heating source, such as a boiler or a heat supply unit, to the industrial processes or heating systems.

The standard parameter of a ProcessHeatingFlow object is listed below:

- GUID (xs:int)

3.3.4.28 ProcessHeatingReturn

This is the water or steam that is returned to a boiler or heat supply unit after being used in industrial applications.

The standard parameter of a ProcessHeatingReturn object is listed below:

- GUID (xs:int)

3.3.4.29 CompressedAirSystem

Compressed air is a versatile medium that plays a central role in building services engineering (TGA) and many industrial processes.

It is used for energy supply, regulation, control, and cleaning, and is an effective solution for a wide range of applications.

The standard parameter of a CompressedAirSystem object is listed below:

- GUID (xs:int)

3.3.4.30 CompressedAir3bar

Compressed air at 3 bar refers to air that has been compressed to a pressure of 3 bar, which is approximately three times the atmospheric pressure.

The standard parameter of a CompressedAir3bar object is listed below:

- GUID (xs:int)

3.3.4.31 CompressedAir6bar

Compressed air at 6 bar is a widely used, moderate to high-pressure solution in industrial and building services applications.

The standard parameter of a CompressedAir6bar object is listed below:

- GUID (xs:int)

3.3.4.32 CompressedAir8bar

Compressed air at 8 bar refers to air that has been compressed to a pressure of 8 bar, which is approximately eight times the atmospheric pressure.

The standard parameter of a CompressedAir8bar object is listed below:

- GUID (xs:int)

3.3.4.33 CompressedAir12bar

Compressed air at 12 bar refers to air that has been compressed to a pressure of 12 bar, which is approximately twelve times the atmospheric pressure.

The standard parameter of a CompressedAir12bar object is listed below:

- GUID (xs:int)

3.3.4.34 CondensateSystem

In building services engineering (TGA), the term condensate refers to the water that forms through the condensation process when a gas, usually water vapor, comes into contact with a cooler surface and changes into liquid form.

The standard parameter of a CondensateSystem object is listed below:

- GUID (xs:int)

3.3.4.35 Condensate3bar

Condensate at 3 bar is generated in steam systems, heating systems, and other technical processes that operate under steam pressure.

The condensation process at 3 bar occurs at a saturation temperature of approximately 133.5°C.

The standard parameter of a Condensate3bar object is listed below:

- GUID (xs:int)

3.3.4.36 Condensate4bar

Condensate at 4 bar is generated when steam at this pressure cools down and condenses into liquid form.

The saturation temperature for this steam is approximately 143.6°C.

The standard parameter of a Condensate4bar object is listed below:

- GUID (xs:int)

3.3.4.37 Condensate10bar

Condensate at 10 bar is generated when steam, at this higher pressure, cools down and condenses.

The saturation temperature for steam at 10 bar is approximately 180.4°C.

The standard parameter of a Condensate10bar object is listed below:

- GUID (xs:int)

3.3.4.38 Condensate12bar

Condensate at 12 bar is produced when steam at 12 bar pressure cools down and condenses.

The saturation temperature for steam at this pressure is approximately 188.8°C.

The standard parameter of a Condensate12bar object is listed below:

- GUID (xs:int)

3.3.4.39 Condensate20bar

Condensate at 20 bar is produced when steam, under a pressure of 20 bar, cools down and condenses.

The saturation temperature for steam at this pressure is about 212.4°C.

The standard parameter of a Condensate20bar object is listed below:

- GUID (xs:int)

3.3.4.40 Condensate24bar

Condensate at 24 bar is formed when steam at a pressure of 24 bar cools and condenses.

The saturation temperature at 24 bar is approximately 227.7°C.

The standard parameter of a Condensate24bar object is listed below:

- GUID (xs:int)

3.3.4.41 SteamSystem

Steam is the gaseous state of water that occurs when water is heated and evaporates.

It is an invisible gas that exists at higher temperatures and pressures.

Steam plays an important role in various applications, from energy generation to heating technology.

The standard parameter of a SteamSystem object is listed below:

- GUID (xs:int)

3.3.4.42 Steam3bar

Steam at 3 bar (approximately 300 kPa) refers to steam that is generated under a pressure of 3 bar above atmospheric pressure.

This corresponds to a saturation temperature of about 133 °C (271 °F).

The standard parameter of a Steam3bar object is listed below:

- GUID (xs:int)

3.3.4.43 Steam4bar

Steam at 4 bar (approximately 400 kPa) refers to steam that is generated under a pressure of 4 bar above atmospheric pressure.

This pressure corresponds to a saturation temperature of about 143 °C (289 °F).

The standard parameter of a Steam4bar object is listed below:

- GUID (xs:int)

3.3.4.44 Steam10bar

Steam at 10 bar (approximately 1,000 kPa) refers to steam generated under a pressure of 10 bar above atmospheric pressure.

This pressure corresponds to a saturation temperature of about 180 °C (356 °F).

The standard parameter of a Steam10bar object is listed below:

- GUID (xs:int)

3.3.4.45 Steam12bar

Steam at 12 bar (approximately 1,200 kPa) refers to steam generated under a pressure of 12 bar above atmospheric pressure.

This pressure corresponds to a saturation temperature of about 188 °C (370 °F).

The standard parameter of a Steam12bar object is listed below:

- GUID (xs:int)

3.3.4.46 GasSystem

Gases are material substances that exist in a state where their molecules are far apart and they evenly fill the entire space they occupy.

Gases have no fixed shape or volume, making them highly compressible.

The standard parameter of a GasSystem object is listed below:

- GUID (xs:int)

3.3.4.47 NaturalGas

Natural gas is often preferred due to its efficiency, availability, and environmental benefits.

The standard parameter of a NaturalGas object is listed below:

- GUID (xs:int)

3.3.4.48 Argon

In building services engineering (TGA), argon is primarily used in windows and ventilation systems, while in industry, it plays a key role as a shielding gas in welding, metal processing, the semiconductor industry, and glass manufacturing.

The standard parameter of a Argon object is listed below:

- GUID (xs:int)

3.3.4.49 Corgon

Corgon is not a widely recognized term in building services or gas technology.

It's possible you're referring to "Corgon" as a brand or a term used for a specific gas or product in certain countries or industries.

The standard parameter of a Corgon object is listed below:

- GUID (xs:int)

3.3.4.50 Propane

In building services engineering (TGA), propane is used as a fuel in various applications, particularly in heating, ventilation, and air conditioning (HVAC) systems.

Propane (C_3H_8) is an aliphatic, liquid hydrocarbon gas that is often stored as liquefied petroleum gas (LPG) and is used in numerous technical fields.

The standard parameter of a Propane object is listed below:

- GUID (xs:int)

3.3.4.51 Oxygen

In building services engineering (TGA), oxygen as a technical gas is an important component for various applications in medical, industrial, and scientific fields.

The documentation and planning include the design of central supply systems, the proper distribution and monitoring of oxygen, as well as compliance with all safety regulations.

The standard parameter of an Oxygen object is listed below:

- GUID (xs:int)

3.3.4.52 CarbonDioxide

In building services engineering (TGA), carbon dioxide is used as a versatile gas in various applications, particularly in air quality control, cooling technology, fire protection, and industry.

The standard parameter of a CarbonDioxide object is listed below:

- GUID (xs:int)

3.3.4.53 Nitrogen

As an inert gas, nitrogen plays an important role in systems that require a controlled atmosphere or in processes where a reaction with oxygen or other gases needs to be prevented.

The standard parameter of a Nitrogen object is listed below:

- GUID (xs:int)

3.3.4.54 SmokeGas

In building services engineering (TGA), carbon dioxide has a wide range of applications, from air quality control to fire protection and specialized industrial processes.

The planning and installation of CO₂ systems require precise coordination to meet specific requirements, ranging from cooling and chemical industries to food processing.

The standard parameter of a SmokeGas object is listed below:

- GUID (xs:int)

3.3.4.55 Helium

Helium (He) is a colorless, odorless, chemically inert, lightweight gas that plays a significant role in building services engineering (TGA) for various specialized applications.

In TGA, helium is primarily used in systems and installations that require specific gas properties.

The standard parameter of a Helium object is listed below:

- GUID (xs:int)

3.3.4.56 Hydrogen

Hydrogen is playing an increasingly important role in building services engineering (TGA), particularly in the areas of energy supply, sustainable heating systems, and cooling technology.

Through its use in fuel cells, as a raw material in industry, and in innovative technologies for reducing CO₂ emissions, hydrogen is a key element in modern TGA.

The standard parameter of a Hydrogen object is listed below:

- GUID (xs:int)

3.3.4.57 TankPlantSystem

Tank facilities are specialized installations used for the storage of liquids, typically in large quantities.

They are employed in various industries, including chemicals, food, oil, and wastewater management.

The standard parameter of a TankPlantSystem object is listed below:

- GUID (xs:int)

3.3.4.58 Diesel

The material diesel generally refers to the chemical and physical properties of diesel fuel.

Diesel fuel is a mixture of hydrocarbons that is refined from crude oil.

The standard parameter of a Diesel object is listed below:

- GUID (xs:int)

3.3.4.59 FuelOil

Gasoline is a liquid fuel primarily used in spark-ignition engines.

It is refined from crude oil and consists of a complex mixture of hydrocarbons.

The standard parameter of a FuelOil object is listed below:

- GUID (xs:int)

3.3.4.60 OldOil

Used oil is a term for oil that has been used or consumed during the operation of engines, machines, or other equipment.

It can include various types of lubricants, such as motor oil, transmission fluid, and hydraulic oil.

The standard parameter of an OldOil object is listed below:

- GUID (xs:int)

3.3.4.61 Glycol

Glycol is an organic compound that belongs to the group of alcohols.

There are various types of glycol, but the two most common are ethylene glycol and propylene glycol.

Among other uses, ethylene glycol is commonly used as an antifreeze in cooling systems and vehicle engines to prevent freezing and overheating.

The standard parameter of a Glycol object is listed below:

- GUID (xs:int)

3.3.4.62 Methanol

Methanol is a simple alcohol with the chemical formula CH_3OH . It is a colorless and odorless liquid that belongs to the group of alcohols.

In fuel applications, it is used as an alternative fuel in some vehicles and can also be used in the production of biodiesel.

The standard parameter of a Methanol object is listed below:

- GUID (xs:int)

3.3.4.63 Oil

Oil is a viscous liquid derived from natural sources, primarily consisting of hydrocarbons.

It plays a crucial role in various industries and applications.

The standard parameter of an Oil object is listed below:

- GUID (xs:int)

3.3.4.64 SprinklerSystem

Sprinkler technology in TGA (Technical Building Equipment) refers to the design, installation, and maintenance of sprinkler systems for fire suppression and prevention in buildings.

The standard parameter of a SprinklerSystem object is listed below:

- GUID (xs:int)

3.3.4.65 RoomProtection

These sprinkler systems are specifically designed to be activated only in areas where there is an actual fire risk, thus providing preventive fire suppression within designated protected zones.

The standard parameter of a RoomProtection object is listed below:

- GUID (xs:int)

3.3.4.66 ObjectProtection

Object protection sprinklers (also known as asset protection sprinklers) are a specialized type of sprinkler system designed to protect valuable objects, equipment, and materials within a building or on a premises.

These systems are deployed in areas where precious or sensitive items are stored, ensuring that any potential fire is quickly suppressed while minimizing water damage to the assets being protected.

The standard parameter of an ObjectProtection object is listed below:

- GUID (xs:int)

3.3.4.67 ExtengushingWater

Firefighting water has a cooling and smothering effect on the fire and is used to lower the temperature of the fire source and interrupt the chemical reactions that sustain the fire.

The standard parameter of an ExtengushingWater object is listed below:

- GUID (xs:int)

3.3.4.68 Hydrant

A hydrant system is a combination of a hydrant system and a sprinkler system, often used together in larger fire protection installations or in areas with an increased fire risk.

The standard parameter of a Hydrant object is listed below:

- GUID (xs:int)

3.3.4.69 VentilationSystem

A ventilation system is a crucial component in buildings, designed to control indoor air quality, temperature, and humidity.

It helps to circulate fresh air, remove stale air, and regulate environmental conditions.

The standard parameter of a VentilationSystem object is listed below:

- GUID (xs:int)

3.3.4.70 ExteriorAir

An exterior air system is designed to manage and improve the quality of air entering a building from the outside environment.

The standard parameter of an ExteriorAir object is listed below:

- GUID (xs:int)

3.3.4.71 ExhaustAir

An exhaust air system is designed to remove stale or contaminated air from a building and is a critical component of effective ventilation.

The standard parameter of an ExhaustAir object is listed below:

- GUID (xs:int)

3.3.4.72 ExtractAir

An extract air system, often referred to as an exhaust air system, is specifically designed to remove air from a building to maintain indoor air quality and comfort.

The standard parameter of an ExtractAir object is listed below:

- GUID (xs:int)

3.3.4.73 SupplyAir

A supply air system is designed to introduce fresh, conditioned air into a building, ensuring a comfortable and healthy indoor environment.

The standard parameter of a SupplyAir object is listed below:

- GUID (xs:int)

3.3.4.74 RecirculationAir

A recirculation air system is designed to improve indoor air quality and comfort by reusing a portion of the air within a building. This system is commonly found in heating, ventilation, and air conditioning (HVAC) setups.

The standard parameter of a RecirculationAir object is listed below:

- GUID (xs:int)

3.3.4.75 DevicesAir

A devices air system, often referred to as a localized or point-source air system, involves the use of individual devices or appliances to manage air quality, temperature, and ventilation in specific areas within a building.

The standard parameter of a DevicesAir object is listed below:

- GUID (xs:int)

3.3.4.76 GasPurgeAir

A gas purge air system is designed to remove unwanted gases or contaminants from a space by introducing clean air or an inert gas.

The standard parameter of a GasPurgeAir object is listed below:

- GUID (xs:int)

3.3.4.77 ObjectWasteAir

An object waste air system, often referred to in the context of industrial or commercial settings, is designed to manage and eliminate waste air generated during processes that involve the handling or processing of materials.

The standard parameter of an ObjectWasteAir object is listed below:

- GUID (xs:int)

3.3.4.78 ProcessAir

A process air system is designed to supply and manage air for specific industrial processes, ensuring optimal conditions for operations such as heating, cooling, drying, and chemical reactions.

The standard parameter of a ProcessAir object is listed below:

- GUID (xs:int)

3.3.4.79 ElectricalSystem

Electrical engineering plays a central role in modern technology and involves the generation, transmission, and utilization of electrical energy and systems.

It encompasses energy generation, energy transmission, electrical installation, automation technology, and electronics.

The standard parameter of an ElectricalSystem object is listed below:

- GUID (xs:int)

3.3.4.80 MainPower

High voltage refers to electrical currents with high voltages and power levels, typically above 1,000 volts (V) for alternating current or 1,500 V for direct current.

High voltage is primarily used in power transmission, industrial applications, and large machinery.

The standard parameter of a MainPower object is listed below:

- GUID (xs:int)

3.3.4.81 LowCurrent

Low voltage refers to electrical currents and voltages that are low compared to high voltage.

Typically, this involves voltages up to 1,000 volts (V) for alternating current and up to 1,500 V for direct current.

The standard parameter of a LowCurrent object is listed below:

- GUID (xs:int)

3.3.4.82 Lightning

Lighting in electrical engineering refers to the design, installation, and use of lighting systems that illuminate spaces, outdoor areas, or specific objects.

Lighting plays a crucial role in spatial design, safety, and functionality.

The standard parameter of a Lightning object is listed below:

- GUID (xs:int)

3.3.4.83 CommunicationEngineering

Communication technology is a subfield of electrical engineering that deals with the transmission, processing, and storage of information.

It plays a central role in telecommunications and encompasses various technologies and systems necessary for communication over long distances.

The standard parameter of a CommunicationEngineering object is listed below:

- GUID (xs:int)

3.3.4.84 SafetyEngineering

Safety technology in electrical engineering focuses on protecting people, systems, and information from hazards that can arise from electrical systems or devices.

It encompasses a variety of measures and technologies aimed at minimizing risks and ensuring safety.

The standard parameter of a SafetyEngineering object is listed below:

- GUID (xs:int)

4 Modelling of Building Services Engineering data with AutomationML

4.1 RoleClassLibrary

Basement of the modelling are the required role classes. Facing the required model elements there are role classes especially require for Building Services Engineering data modelling.

The following figures represent the defined role class library.

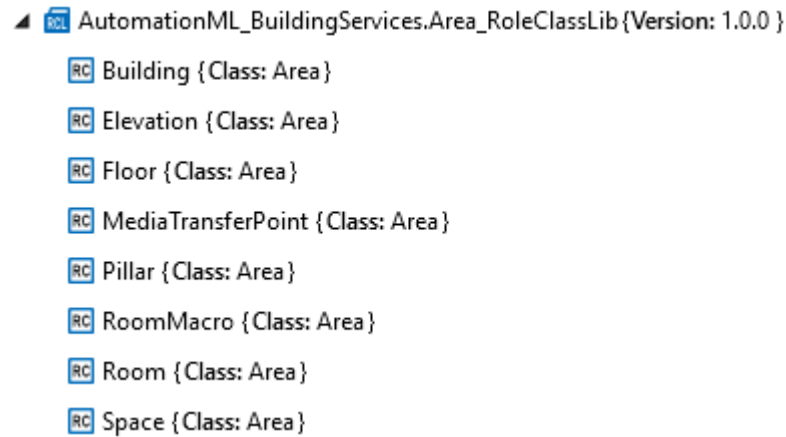


Figure 11 - AutomationML_BuildingServices.Area_RoleClassLib in AutomationML Editor view

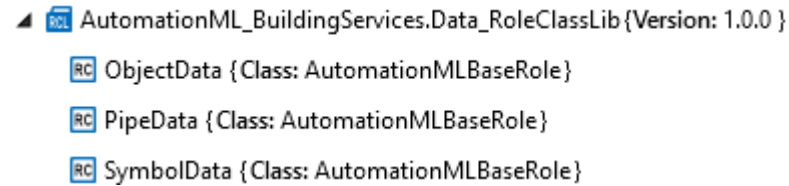


Figure 12 - AutomationML_BuildingServices.Data_RoleClassLib in AutomationML Editor view

- ▲  AutomationML_BuildingServices.Resource_RoleClassLib {Version: 1.1.0 }
 -  CablePipe {Class: Resource}
 -  CableRack {Class: Resource}
 -  Component {Class: Resource}
 -  Consumer {Class: Resource}
 -  Coupling {Class: Resource}
 -  CurrentRail {Class: Resource}
 -  Diffuser {Class: Resource}
 -  DuctPipe {Class: Resource}
 -  Equipment {Class: Resource}
 -  ExtractionEquipment {Class: Resource}
 -  Fan {Class: Resource}
 -  Fitting {Class: Resource}
 -  HeatSource {Class: Resource}
 -  Hydrant {Class: Resource}
 -  Lamp {Class: Resource}
 -  Manifold {Class: Resource}
 -  MeasuringElement {Class: Resource}
 -  Object {Class: Resource}
 -  Plaster {Class: Resource}
 -  Pump {Class: Resource}
 -  Radiator {Class: Resource}
 -  RoundDuct {Class: Resource}
 -  SmokeIntake {Class: Resource}
 -  Socket {Class: Resource}
 -  Tank {Class: Resource}
 -  Valve {Class: Resource}

Figure 13 - AutomationML_BuildingServices.Resource_RoleClassLib in AutomationML Editor view

AutomationML_BuildingServices.Structure_RoleClassLib {Version: 1.1.0 }

- RC PipeSystem {Class: ProductionLine}
- RC CommunicationEngineering {Class: ElectricalSystem}
- RC DevicesAir {Class: VentilationSystem}
- RC ElectricalSystem {Class: ProductionLine}
- RC ExhaustAir {Class: VentilationSystem}
- RC ExteriorAir {Class: VentilationSystem}
- RC ExtractAir {Class: VentilationSystem}
- RC GasPurgeAir {Class: VentilationSystem}
- RC Lightning {Class: ElectricalSystem}
- RC LowCurrent {Class: ElectricalSystem}
- RC MainPower {Class: ElectricalSystem}
- RC ObjectWasteAir {Class: VentilationSystem}
- RC ProcessAir {Class: VentilationSystem}
- RC RecirculationAir {Class: VentilationSystem}
- RC SafetyEngineering {Class: ElectricalSystem}
- RC SupplyAir {Class: VentilationSystem}
- RC VentilationSystem {Class: ProductionLine}
- RC GasSystem {Class: PipeSystem}
- RC ColdWaterSystem {Class: PipeSystem}
- RC CompressedAirSystem {Class: PipeSystem}
- RC CondensateSystem {Class: PipeSystem}
- RC TankPlantSystem {Class: PipeSystem}

RC HeatingSystem {Class: PipeSystem}
RC DrinkingWaterSystem {Class: PipeSystem}
RC SprinklerSystem {Class: PipeSystem}
RC RainWaterSystem {Class: PipeSystem}
RC ReserveSystem {Class: PipeSystem}
RC SteamSystem {Class: PipeSystem}
RC WasteWaterSystem {Class: PipeSystem}
RC Argon {Class: GasSystem}
RC CarbonDioxide {Class: GasSystem}
RC Corgon {Class: GasSystem}
RC Helium {Class: GasSystem}
RC Hydrogen {Class: GasSystem}
RC NaturalGas {Class: GasSystem}
RC Nitrogen {Class: GasSystem}
RC Oxygen {Class: GasSystem}
RC Propane {Class: GasSystem}
RC SmokeGas {Class: GasSystem}
RC ColdWaterFlow {Class: ColdWaterSystem}
RC ColdWaterReturn {Class: ColdWaterSystem}
RC CoolingWaterFlow {Class: ColdWaterSystem}
RC CoolingWaterReturn {Class: ColdWaterSystem}
RC DeepColdFlow {Class: ColdWaterSystem}
RC DeepColdReturn {Class: ColdWaterSystem}

RC GlycolCircuitFlow {Class: ColdWaterSystem}
RC GlycolCircuitReturn {Class: ColdWaterSystem}
RC CompressedAir12bar {Class: CompressedAirSystem}
RC CompressedAir3bar {Class: CompressedAirSystem}
RC CompressedAir6bar {Class: CompressedAirSystem}
RC CompressedAir8bar {Class: CompressedAirSystem}
RC Condensate10bar {Class: CondensateSystem}
RC Condensate12bar {Class: CondensateSystem}
RC Condensate20bar {Class: CondensateSystem}
RC Condensate24bar {Class: CondensateSystem}
RC Condensate3bar {Class: CondensateSystem}
RC Condensate4bar {Class: CondensateSystem}
RC Diesel {Class: TankPlantSystem}
RC FuelOil {Class: TankPlantSystem}
RC Glykol {Class: TankPlantSystem}
RC Methanol {Class: TankPlantSystem}
RC Oil {Class: TankPlantSystem}
RC OldOil {Class: TankPlantSystem}
RC DistrictHeatingFlow {Class: HeatingSystem}
RC DistrictHeatingReturn {Class: HeatingSystem}
RC HeatingWaterFlow {Class: HeatingSystem}
RC HeatingWaterReturn {Class: HeatingSystem}
RC IndustryHeatingFlow {Class: HeatingSystem}
RC IndustryHeatingReturn {Class: HeatingSystem}

RC ProcessHeatingFlow {Class: HeatingSystem}
RC ProcessHeatingReturn {Class: HeatingSystem}
RC RoomHeatingFlow {Class: HeatingSystem}
RC RoomHeatingReturn {Class: HeatingSystem}
RC DrinkingWaterSystemCirculation {Class: DrinkingWaterSystem}
RC DrinkingWaterSystemCold {Class: DrinkingWaterSystem}
RC DrinkingWaterSystemWarm {Class: DrinkingWaterSystem}
RC ExtinguishingWater {Class: SprinklerSystem}
RC Hydrant {Class: SprinklerSystem}
RC ObjectProtection {Class: SprinklerSystem}
RC RoomProtection {Class: SprinklerSystem}
RC Steam10bar {Class: SteamSystem}
RC Steam12bar {Class: SteamSystem}
RC Steam3bar {Class: SteamSystem}
RC Steam4bar {Class: SteamSystem}

Figure 14 - AutomationML_BuildingServices.Structure_RoleClassLib in AutomationML Editor view

```

<RoleClassLib Name="AutomationML_BuildingServices.Area_RoleClassLib">
  <Description>Structure of the instance hierarchy according to the role class structure based on the building structure.</Description>
  <Version>1.0.0</Version>
  <RoleClass Name="Building" ID="96aaae27-2b0d-4511-81b9-1741b23aaec1" RefBaseClassPath="AutomationML_DiscreteManufacturing_RoleClassLib_Extension@AutomationMLExtendedRoleClassLib/Area">
    <Description>The term "building" refers to a structured, often human-made construction that is inhabited or used for various purposes. A building can serve different functions and vary in size, shape, and materials. It can be used as a residential building, commercial building, industrial facility, or public structure.</Description>
    <Version>1.0.0</Version>
    <Attribute Name="carfid" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/carfid">
      <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Description>
    </Attribute>
    <Attribute Name="guid" AttributeDataType="xs:int" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid">
      <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.</Description>
    </Attribute>
  </RoleClass>
  <RoleClass Name="Elevation" ID="2460c875-33e9-44b4-aa31-cb71ef754067" RefBaseClassPath="AutomationML_DiscreteManufacturing_RoleClassLib_Extension@AutomationMLExtendedRoleClassLib/Area">
    <Description>In geography or surveying, "elevation" refers to the height of a point above sea level.</Description>
    <Version>1.0.0</Version>
    <Attribute Name="carfid" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/carfid">
      <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Description>
    </Attribute>
    <Attribute Name="guid" AttributeDataType="xs:int" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid">
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    </Attribute>
  </RoleClass>
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    <Description>It describes the floor or level within a building.</Description>
    <Version>1.0.0</Version>
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    </Attribute>
    <Attribute Name="guid" AttributeDataType="xs:int" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid">
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    </Attribute>
  </RoleClass>
  <RoleClass Name="MediaTransferPoint" ID="ec23f160-5a4f-4cb4-b123-d787d5eae835" RefBaseClassPath="AutomationML_DiscreteManufacturing_RoleClassLib_Extension@AutomationMLExtendedRoleClassLib/Area">
    <Description>The media handover point to the layout.</Description>
    <Version>1.0.0</Version>
    <Attribute Name="name" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/name">
      <Description>Designation of the object</Description>
    </Attribute>
    <Attribute Name="plant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/plant" AttributeDataType="xs:string">
      <Description>Definition of the system name. or the system number.</Description>
    </Attribute>
    <Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" AttributeDataType="xs:string">
      <Description>Describes the components.</Description>
    </Attribute>
  </RoleClass>

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</Attribute>
<Attribute Name="medium" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/medium">
  <Description>Designation of medium or air type name</Description>
</Attribute>
<Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nameOfSupplier">
  <Description>Name of supplier which provides the customer with a product or a service</Description>
  <RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
</Attribute>
<Attribute Name="object" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/object" AttributeDataType="xs:string">
  <Description>Describes the CARF object</Description>
</Attribute>
<Attribute Name="nominalDiameter" Unit="mm" AttributeDataType="xs:double" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter">
  <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement</Description>
</Attribute>
<Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID">
  <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Description>
</Attribute>
<Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid">
  <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.</Description>
</Attribute>
</RoleClass>
<RoleClass Name="Pillar" ID="4f012aa1-9d2d-42fe-ab3b-43137234f6ce" RefBaseClassPath="AutomationML_DiscreteManufacturing_RoleClassLib_Extension@AutomationMLExtendedRoleClassLib/Area">
  <Description>A pillar is a vertical, cylindrical or rectangular architectural element traditionally used as a support or load-bearing structure. It is used to bear loads from overhead structures such as ceilings, arches, or roofs.</Description>
  <Version>1.0.0</Version>
  <Attribute Name="carfID" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/carfID">
    <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Description>
  </Attribute>
  <Attribute Name="guid" AttributeDataType="xs:int" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid">
    <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.</Description>
  </Attribute>
</RoleClass>
<RoleClass Name="RoomMacro" ID="ac8e9939-3d1f-4299-a11e-791809200cdf" RefBaseClassPath="AutomationML_DiscreteManufacturing_RoleClassLib_Extension@AutomationMLExtendedRoleClassLib/Area">
  <Description>A room macro is a term often used in the context of architecture, building technology, or CAD software, referring to a predefined collection of information or settings that describes or models a specific room or room type within a building.</Description>
  <Version>1.0.0</Version>
  <Attribute Name="name" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/name">
    <Description>Designation of the object</Description>
  </Attribute>
  <Attribute Name="building" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/building" AttributeDataType="xs:string">
    <Description>A building is a structure that encloses rooms</Description>
  </Attribute>
  <Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataType="xs:string">
    <Description>The indication of the floor</Description>
  </Attribute>
  <Attribute Name="apartment" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/building" AttributeDataType="xs:string">
    <Description>Housing is all rooms that are deprived of general accessibility by spatial isolation</Description>
  </Attribute>
  <Attribute Name="roomNumber" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/room" AttributeDataType="xs:int">

```

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    <Description>The room number is preferably a combination of a two-
    digit number preceded by the floor number of the building</Description>
  </Attribute>
  <Attribute Name="area" Unit="m^2" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/area" AttributeDataType="xs:double">
    <Description>The floor area of a building is, in the original sense, the area with which a building touches the ground</Description>
  </Attribute>
  <Attribute Name="height" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/height" Unit="mm" AttributeDataType="xs:double">
    <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
  </Attribute>
  <Attribute Name="roomVolume" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/volume" Unit="m^3" AttributeDataType="xs:double">
    <Description>The volume indicates how much space a body takes up</Description>
  </Attribute>
  <Attribute Name="normTemperature" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/temperature" Unit="°C" AttributeDataType="xs:int">
    <Description>The degree Celsius is a unit of temperature</Description>
  </Attribute>
  <Attribute Name="heatRequired" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/power" Unit="W" AttributeDataType="xs:int">
    <Description>The specific heat requirement describes the amount of heat energy required to heat one cubic meter of room air by one degree Celsius</Description>
  </Attribute>
  <Attribute Name="power" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/power" Unit="W" AttributeDataType="xs:int">
    <Description>The watt is the SI unit of power (energy turnover per period of time)</Description>
  </Attribute>
  <Attribute Name="carfID" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/carfID">
    <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Description>
  </Attribute>
  <Attribute Name="guid" AttributeDataType="xs:int" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid">
    <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.</Description>
  </Attribute>
</RoleClass>
<RoleClass Name="Room" ID="f0cab859-b952-4b54-be68-a1b1a1d7401a" RefBaseClassPath="AutomationML_DiscreteManufacturing_RoleClassLib_Extension@AutomationMLExtendedRoleClassLib/Area">
  <Description>Length, width, height: A room always has a specific extent in three dimensions. In architecture, the room is defined by walls, floors, and ceilings, with these elements serving either a load-bearing function or simply acting as boundaries.</Description>
  <Version>1.0.0</Version>
  <Attribute Name="height" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/height" Unit="mm" AttributeDataType="xs:double">
    <Description>The ceiling height is the vertical distance between the floor and the ceiling of a room.</Description>
  </Attribute>
  <Attribute Name="area" Unit="m^2" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/area" AttributeDataType="xs:double">
    <Description>It is the floor area of a room, meaning the section of the floor enclosed by the walls. It is measured in square meters m².</Description>
  </Attribute>
  <Attribute Name="volume" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/volume" Unit="m^3" AttributeDataType="xs:int">
    <Description>The room volume is the measure of the three-dimensional space enclosed by the boundaries of a room (walls, floor, and ceiling) and is expressed in cubic meters m³.</Description>
  </Attribute>
  <Attribute Name="roomId" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/room" AttributeDataType="xs:string">
    <Description>It is the unique identification number of the room.</Description>
  </Attribute>
  <Attribute Name="carfID" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/carfID">
    <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Description>
  </Attribute>

```

```

<Attribute Name="guid" AttributeDataType="xs:int" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid">
  <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
  s to identify information without the need for a central authority or registry.</Description>
</Attribute>
</RoleClass>
<RoleClass Name="Space" ID="adedac04-2af4-4f51-8a4b-
d1ca5afa98ca" RefBaseClassPath="AutomationML_DiscreteManufacturing_RoleClassLib_Extension@AutomationMLExtended
RoleClassLib/Area">
  <Description>In architecture, space refers to an area or room within a building that is designated for a specific use or functio
  n.</Description>
  <Version>1.0.0</Version>
  <Attribute Name="building" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/building" AttributeDa
  taType="xs:string">
    <Description>A building is a structure that encloses rooms</Description>
  </Attribute>
  <Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataType
  ="xs:string">
    <Description>The indication of the floor
    The indication of the floor</Description>
  </Attribute>
  <Attribute Name="roomNumber" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/room" Attribute
  DataType="xs:int">
    <Description>The room number is preferably a combination of a two-
    digit number preceded by the floor number of the building.</Description>
  </Attribute>
  <Attribute Name="roomDescription" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/room" Attrib
  uteDataType="xs:string">
    <Description>room name or room designation</Description>
  </Attribute>
  <Attribute Name="area" Unit="m^2" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/area" Attrib
  uteDataType="xs:double">
    <Description>The floor area of a building is, in the original sense, the area with which a building touches the ground
    The floor area of a building is, in the original sense, the area with which a building touches the ground</Description>
  </Attribute>
  <Attribute Name="volume" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/volume" Unit="m^3"
  AttributeDataType="xs:int">
    <Description>The volume indicates how much space a body takes up</Description>
  </Attribute>
  <Attribute Name="height" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/height" Unit="mm" Attr
  ibuteDataType="xs:double">
    <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
  </Attribute>
  <Attribute Name="guid" AttributeDataType="xs:int" RefAttributeType="AutomationML_BuildingServices.Base_AttributeType
  Lib/guid">
    <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
    s to identify information without the need for a central authority or registry.</Description>
  </Attribute>
  <Attribute Name="carflID" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices.Base_Attribute
  TypeLib/carflID">
    <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Descri
    ption>
  </Attribute>
</RoleClass>
</RoleClassLib>

```

Figure 15 - AutomationML_BuildingServices.Area_RoleClassLib as XML representation

```

<RoleClassLib Name="AutomationML_BuildingServices.Data_RoleClassLib">
  <Description>End-to-
end relationship of pipes to PipeData, fittings and components to ObjectData, and elements to SymbolData.</Description>
  <Version>1.0.0</Version>
  <RoleClass Name="ObjectData" ID="49e0d1ed-9a65-4336-82ed-
aa0e978257ce" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRol
e">
    <Description>Describes the objects, components, fittings, and other elements within a utility network.</Description>
    <Version>1.0.0</Version>
    <Attribute Name="guid" AttributeDataType="xs:int" RefAttributeType="AutomationML_BuildingServices.Base_AttributeType
Lib/guid">
      <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
s to identify information without the need for a central authority or registry.</Description>
    </Attribute>
  </RoleClass>
  <RoleClass Name="PipeData" ID="15e2647b-f2fb-42e3-80bb-
b821ec245057" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRol
e">
    <Description>Describes a utility network and its information, medium, dimensions, system, etc.</Description>
    <Version>1.0.0</Version>
    <Attribute Name="guid" AttributeDataType="xs:int" RefAttributeType="AutomationML_BuildingServices.Base_AttributeType
Lib/guid">
      <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
s to identify information without the need for a central authority or registry.</Description>
    </Attribute>
  </RoleClass>
  <RoleClass Name="SymbolData" ID="ae33ca88-6782-4848-a49d-
dbf393d7f5aa" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRole
">
    <Description>Describes the fittings and components within a utility network.</Description>
    <Version>1.0.0</Version>
    <Attribute Name="guid" AttributeDataType="xs:int" RefAttributeType="AutomationML_BuildingServices.Base_AttributeType
Lib/guid">
      <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
s to identify information without the need for a central authority or registry.</Description>
    </Attribute>
  </RoleClass>
</RoleClassLib>

```

Figure 16 - AutomationML_BuildingServices.Data_RoleClassLib as XML representation

```

<RoleClassLib Name="AutomationML_BuildingServices.Resource_RoleClassLib">
  <Description>Role classes from the modules Heating, Ventilation, Sanitary, Sprinkler, Electrical.</Description>
  <Version>1.1.0</Version>
  <RoleClass Name="CablePipe" ID="45381d61-6d20-4574-8c67-
f19eca20dda8" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRole
/Resource">
    <Description>A cable pipe is a protective conduit used to shield cables from mechanical damage, moisture, or other external
influences.</Description>
    <Version>1.0.0</Version>
    <Attribute Name="plant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/plant" AttributeDataTyp
e="xs:string">
      <Description>Definition of the system name
or the system number</Description>
    </Attribute>
    <Attribute Name="medium" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTyp
eLib/medium">
      <Description>Designation of medium name</Description>
    </Attribute>
    <Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_Attri
buteTypeLib/nameOfSupplier">
      <Description>Name of supplier which provides the customer with a product or a service</Description>
      <RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
    </Attribute>
    <Attribute Name="length" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" Attr
ibuteDataType="xs:double">
      <Description>Description of a length of the object, component, route, pipe, duct.
A length is the distance between two points.</Description>
    </Attribute>
    <Attribute Name="nominalDiameter" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter
" Unit="mm" AttributeDataType="xs:int">
      <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is base
d on the metric system of measurement</Description>
    </Attribute>
    <Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataTyp
e="xs:string">
      <Description>The indication of the floor</Description>
    </Attribute>
    <Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID" AttributeD
ataType="xs:int">
      <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Descri
ption>
    </Attribute>
    <Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataTyp
e="xs:int">
      <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
s to identify information without the need for a central authority or registry.</Description>
    </Attribute>
  </RoleClass>
  <RoleClass Name="CableRack" ID="0c16a877-bc16-4e3c-814b-
e3dd3612491e" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRol
e/Resource">
    <Description>Cable trays, BusWay, and installation channels are part of the electrical field. 1/2
They include straight sections, branches, bends, and other components. 2/2</Description>
    <Version>1.0.0</Version>
    <Attribute Name="plant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/plant" AttributeDataTyp
e="xs:string">
      <Description>Definition of the system name
or the system number</Description>
    </Attribute>
    <Attribute Name="track" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib
/medium">
      <Description>Designation of medium name</Description>
    </Attribute>
    <Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_Attri
buteTypeLib/nameOfSupplier">
      <Description>Name of supplier which provides the customer with a product or a service</Description>
      <RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
    </Attribute>
    <Attribute Name="material" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/material" AttributeD
ataType="xs:string">
      <Description>Designation of material name</Description>
    </Attribute>
  </RoleClass>

```

```

    <Attribute Name="object" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/object" AttributeDataT
ype="xs:string">
    <Description>Describes the CARF object</Description>
    </Attribute>
    <Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" Attrib
uteDataType="xs:string">
    <Description>Describes the components.</Description>
    </Attribute>
    <Attribute Name="length" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" Attr
ibuteDataType="xs:double">
    <Description>Description of a length of the object, component, route, pipe, duct.
A length is the distance between two points</Description>
    </Attribute>
    <Attribute Name="width" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/width" Unit="mm" Attrib
uteDataType="xs:double">
    <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length
</Description>
    </Attribute>
    <Attribute Name="height" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/height" Unit="mm" Attr
ibuteDataType="xs:double">
    <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
    </Attribute>
    <Attribute Name="widthExit1" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm"
AttributeDataType="xs:double">
    <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length
</Description>
    </Attribute>
    <Attribute Name="heightExit1" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm
" AttributeDataType="xs:double">
    <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
    </Attribute>
    <Attribute Name="widthExit2" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm"
AttributeDataType="xs:double">
    <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length
</Description>
    </Attribute>
    <Attribute Name="angle" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/angle" Unit="rad" Attrib
uteDataType="xs:double">
    <Description>An angle is formed when two straight lines or rays meet at a common endpoint</Description>
    </Attribute>
    <Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataType
="xs:string">
    <Description>The indication of the floor</Description>
    </Attribute>
    <Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID" AttributeD
ataType="xs:int">
    <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Descr
iption>
    </Attribute>
    <Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataType
="xs:int">
    <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
s to identify information without the need for a central authority or registry.</Description>
    </Attribute>
</RoleClass>
<RoleClass Name="Component" ID="16617cd1-0fb3-44e1-96df-
65744e61cbd4" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRol
e/Resource">
    <Description>Depending on the building services (TGA) trade, the component serves to supply systems, buildings, or rooms
. 1/2
Examples include ventilation fire dampers, sanitary washbasins, compensators, etc. 2/2</Description>
    <Version>1.0.0</Version>
    <Attribute Name="plant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/plant" AttributeDataTyp
e="xs:string">
    <Description>Definition of the system name.
or the system number.</Description>
    </Attribute>
    <Attribute Name="medium" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTyp
eLib/medium">
    <Description>Designation of medium or air type name</Description>
    </Attribute>

```

```

    <Attribute Name="drive" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/comment" AttributeDat
aType="xs:string">
    <Description>Description of the engine for the component</Description>
    </Attribute>
    <Attribute Name="object" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/object" AttributeDataT
ype="xs:string">
    <Description>Describes the CARF object</Description>
    </Attribute>
    <Attribute Name="material" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/material" AttributeD
ataType="xs:string">
    <Description>Supplier of components, fittings, pipelines, channels or routes
    Name of supplier which provides the customer with a product or a service
    Name of supplier which provides the customer with a product or a service</Description>
    </Attribute>
    <Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" Attrib
uteDataType="xs:string">
    <Description>Describes the components.</Description>
    </Attribute>
    <Attribute Name="comment" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/comment" Attribute
DataType="xs:string">
    <Description>Note or comment on the component</Description>
    </Attribute>
    <Attribute Name="nominalDiameter" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter
" Unit="mm" AttributeDataType="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is base
d on the metric system of measurement</Description>
    </Attribute>
    <Attribute Name="dn1" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm"
AttributeDataType="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is base
d on the metric system of measurement</Description>
    </Attribute>
    <Attribute Name="dn2" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm"
AttributeDataType="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is base
d on the metric system of measurement</Description>
    </Attribute>
    <Attribute Name="dn3" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm"
AttributeDataType="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is base
d on the metric system of measurement</Description>
    </Attribute>
    <Attribute Name="length" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" Attr
ibuteDataType="xs:double">
    <Description>Description of a length of the object, component, route, pipe, duct.
    A length is the distance between two points.</Description>
    </Attribute>
    <Attribute Name="pressure" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/pressure" Unit="PN
" AttributeDataType="xs:int">
    <Description>The nominal pressure level PN indicates the maximum permissible pressure with which a fluid may load the
pipeline for a pipeline with internal pressure</Description>
    </Attribute>
    <Attribute Name="width" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/width" Unit="mm" Attrib
uteDataType="xs:double">
    <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length
</Description>
    </Attribute>
    <Attribute Name="height" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/height" Unit="mm" Attr
ibuteDataType="xs:double">
    <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
    </Attribute>
    <Attribute Name="externalDimensionA" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length"
Unit="mm" AttributeDataType="xs:double">
    <Description>Dimensions (D) for the inlet are external dimensions</Description>
    </Attribute>
    <Attribute Name="externalDimensionB" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length"
Unit="mm" AttributeDataType="xs:double">
    <Description>Dimensions (D) for the inlet are external dimensions</Description>
    </Attribute>
    <Attribute Name="frame" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/comment" AttributeDat
aType="xs:string">
    <Description>A channel frame is a profile or corner for square duct</Description>

```

```

</Attribute>
<Attribute Name="isolation" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/isolation" AttributeD
ataType="xs:string">
  <Description>Insulation material of the pipe or duct</Description>
</Attribute>
<Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeData
Type="xs:string">
  <Description>indication of the floor</Description>
</Attribute>
<Attribute Name="volumeFlowrate" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/volumeFlowrate"
Unit="m^3/h" AttributeDataTypes="xs:double">
  <Description>The volume flow (or inaccurate flow rate and flow volume)
The volume flow rate in a duct network describes the amount of fluid (e.g., air or water) that flows through the network per unit o
f time.</Description>
</Attribute>
<Attribute Name="tgaKeyH60" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyH60" AttributeD
ataType="xs:string">
  <Description>Unique key for the calculation</Description>
</Attribute>
<Attribute Name="tgaKeyS87" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyS87" AttributeD
ataType="xs:string">
  <Description>Unique key for the calculation</Description>
</Attribute>
<Attribute Name="tgaKeyS90" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyS90" AttributeD
ataType="xs:string">
  <Description>Unique key for the calculation</Description>
</Attribute>
<Attribute Name="massFlowrate" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/massFlowrate" Unit
="kg/h" AttributeDataTypes="xs:double">
  <Description>Mass flow in heating refers to the mass flow of heating medium (such as water or another heat transfer fluid)
through a heating system.</Description>
  <RefSemantic CorrespondingAttributePath="VDI-ID://44.700.00.5." />
</Attribute>
<Attribute Name="flowVelocity" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/flowVelocity" Unit="m/
s" AttributeDataTypes="xs:double">
  <Description>The flow velocity (also called flow speed) describes how fast a fluid (liquid or gas) moves through a pipe or a
n open channel.</Description>
</Attribute>
<Attribute Name="flowVelocityVentilation" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/flowVelocity
Ventilation" Unit="m/s" AttributeDataTypes="xs:double">
  <Description>The flow velocity (also called flow speed) describes how fast a fluid (liquid or gas) moves through a pipe or a
n open channel.</Description>
</Attribute>
<Attribute Name="totalPressure" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/totalPressure" Unit="
Pa" AttributeDataTypes="xs:double">
  <Description>The total pressure loss in ventilation technology describes the overall pressure drop that occurs within a venti
lation system.
It is caused by friction losses in the air ducts, resistances in fittings (bends, branches), filters, heat exchangers, silencers, and ot
her components.</Description>
  <RefSemantic CorrespondingAttributePath="VDI-ID://05.710.06.5." />
</Attribute>
<Attribute Name="airPressure" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/airPressure" Unit="Pa"
AttributeDataTypes="xs:double">
  <Description>Pressure loss in ventilation describes the resistance that air encounters as it flows through a ventilation syste
m.
It is caused by friction along duct walls, fittings, as well as by filters, heat exchangers, and other components.
High pressure loss requires greater fan performance to achieve the desired air volume flow.</Description>
  <RefSemantic CorrespondingAttributePath="VDI-ID://35.700.00.19." />
</Attribute>
<Attribute Name="throttlingPressure" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/throttlingPressur
e" Unit="Pa" AttributeDataTypes="xs:double">
  <Description>It refers to the pressure loss that occurs when an airflow is restricted by a throttling element, such as a throttl
e valve or a valve.
These components limit the airflow and increase resistance, leading to a pressure drop.</Description>
</Attribute>
<Attribute Name="maxDrainageCapacity" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/maxDrainag
eCapacity" Unit="l/s" AttributeDataTypes="xs:double">
  <Description>The maximum drainage capacity refers to the highest volume of liquid that a drainage system can handle wit
hin a given time without causing overflow or backup.</Description>
  <RefSemantic CorrespondingAttributePath="VDI-ID://45.700.00.10." />
</Attribute>

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<Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataType="xs:int">
  <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
  s to identify information without the need for a central authority or registry.</Description>
</Attribute>
<Attribute Name="couplingIn" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/couplingIn">
  <Description>Connection type such as flange, welded, threaded, grooved, etc.</Description>
</Attribute>
<Attribute Name="couplingOut" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/couplingOut">
  <Description>Connection type such as flange, welded, threaded, grooved, etc.</Description>
</Attribute>
<Attribute Name="carfID" AttributeDataType="xs:int" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID">
  <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Description>
</Attribute>
<Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nameOfSupplier">
  <Description>Name of supplier which provides the customer with a product or a service</Description>
  <RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
</Attribute>
</RoleClass>
<RoleClass Name="Consumer" ID="e683adfc-57bc-4dca-97a7-6c8df5e55536" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRole/Resource">
  <Description>It is a general consumer component, such as a dummy, fixed points, or universal consumers.</Description>
  <Version>1.0.0</Version>
  <Attribute Name="plant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/plant" AttributeDataType="xs:string">
    <Description>Definition of the system name.
    or the system number.</Description>
  </Attribute>
  <Attribute Name="medium" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/medium">
    <Description>Designation of medium name</Description>
  </Attribute>
  <Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nameOfSupplier">
    <Description>Name of supplier which provides the customer with a product or a service</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
  </Attribute>
  <Attribute Name="material" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/material" AttributeDataType="xs:string">
    <Description>Designation of material name</Description>
  </Attribute>
  <Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" AttributeDataType="xs:string">
    <Description>Describes the components.</Description>
  </Attribute>
  <Attribute Name="object" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/object" AttributeDataType="xs:string">
    <Description>Describes the CARF object</Description>
  </Attribute>
  <Attribute Name="length" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
    <Description>Description of a length of the object, component, route, pipe, duct.
    A length is the distance between two points.</Description>
  </Attribute>
  <Attribute Name="height" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/height" Unit="mm" AttributeDataType="xs:double">
    <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
  </Attribute>
  <Attribute Name="width" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/width" Unit="mm" AttributeDataType="xs:double">
    <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length
    </Description>
  </Attribute>
  <Attribute Name="nominalDiameter" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm" AttributeDataType="xs:int">

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    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement</Description>
  </Attribute>
  <Attribute Name="dn1" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm" AttributeDataType="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement</Description>
  </Attribute>
  <Attribute Name="dn2" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm" AttributeDataType="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement</Description>
  </Attribute>
  <Attribute Name="dn3" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm" AttributeDataType="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement</Description>
  </Attribute>
  <Attribute Name="pressure" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/pressure" Unit="PN" AttributeDataType="xs:int">
    <Description>The nominal pressure level PN indicates the maximum permissible pressure with which a fluid may load the pipeline for a pipeline with internal pressure</Description>
  </Attribute>
  <Attribute Name="volume" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/volume" Unit="m^3" AttributeDataType="xs:double">
    <Description>The volume flow (or inaccurate flow rate and flow volume)</Description>
  </Attribute>
  <Attribute Name="tgaKeyH60" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyH60" AttributeDataType="xs:string">
    <Description>Unique key for the calculation</Description>
  </Attribute>
  <Attribute Name="tgaKeyS87" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyS87" AttributeDataType="xs:string">
    <Description>Unique key for the calculation</Description>
  </Attribute>
  <Attribute Name="tgaKeyS90" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyS90" AttributeDataType="xs:string">
    <Description>Unique key for the calculation</Description>
  </Attribute>
  <Attribute Name="massFlowrate" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/massFlowrate" Unit="kg/h" AttributeDataType="xs:double">
    <Description>Mass flow in heating refers to the mass flow of heating medium (such as water or another heat transfer fluid) through a heating system.</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://44.700.00.5." />
  </Attribute>
  <Attribute Name="productRange" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/productRange" AttributeDataType="xs:string">
    <Description>A product range description provides an overview of the entire product assortment of a company or brand.</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://38.110.00.4." />
    <RefSemantic CorrespondingAttributePath="VDI-ID://40.110.00.4." />
    <RefSemantic CorrespondingAttributePath="VDI-ID://20.100.00.4." />
    <RefSemantic CorrespondingAttributePath="VDI-ID://44.110.00.4." />
  </Attribute>
  <Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataType="xs:string">
    <Description>The indication of the floor</Description>
  </Attribute>
  <Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID" AttributeDataType="xs:int">
    <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Description>
  </Attribute>
  <Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataType="xs:int">
    <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.</Description>
  </Attribute>
</RoleClass>
<RoleClass Name="Coupling" ID="2abeedce-78c2-4041-9fa9-5cda1571c3b6" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRoleResource">

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<Description>Describes the couplings for pipelines, sleeves, pipe clamps, hangers, etc.</Description>
<Version>1.0.0</Version>
<Attribute Name="plant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/plant" AttributeDataTyp
e="xs:string">
  <Description>Definition of the system name.
or the system number.</Description>
</Attribute>
<Attribute Name="medium" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTyp
eLib/medium">
  <Description>Designation of medium name</Description>
</Attribute>
<Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_Attri
buteTypeLib/nameOfSupplier">
  <Description>Name of supplier which provides the customer with a product or a service</Description>
<RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
</Attribute>
<Attribute Name="material" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/material" AttributeD
ataType="xs:string">
  <Description>Designation of material name</Description>
</Attribute>
<Attribute Name="description1" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" Attri
buteDataType="xs:string">
  <Description>Describes the components, fittings, pipelines, channels or routes</Description>
</Attribute>
<Attribute Name="description2" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" Attri
buteDataType="xs:string">
  <Description>Describes the components, fittings, pipelines, channels or routes</Description>
</Attribute>
<Attribute Name="object" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/object" AttributeDataT
ype="xs:string">
  <Description>Describes the CARF object</Description>
</Attribute>
<Attribute Name="dn1" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm"
AttributeDataType="xs:int">
  <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is base
d on the metric system of measurement</Description>
</Attribute>
<Attribute Name="dn2" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm"
AttributeDataType="xs:int">
  <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is base
d on the metric system of measurement</Description>
</Attribute>
<Attribute Name="dn3" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm"
AttributeDataType="xs:int">
  <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is base
d on the metric system of measurement</Description>
</Attribute>
<Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataType
="xs:string">
  <Description>The indication of the floor</Description>
</Attribute>
<Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID" AttributeD
ataType="xs:int">
  <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Descri
ption>
</Attribute>
<Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataType
="xs:int">
  <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
s to identify information without the need for a central authority or registry.</Description>
</Attribute>
<Attribute Name="couplingIn" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices.Base_Attrib
uteTypeLib/couplingIn">
  <Description>Connection type such as flange, welded, threaded, grooved, etc.</Description>
</Attribute>
<Attribute Name="couplingOut" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices.Base_Attr
ibuteTypeLib/couplingOut">
  <Description>Connection type such as flange, welded, threaded, grooved, etc.</Description>
</Attribute>
</RoleClass>

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<RoleClass Name="CurrentRail" ID="e3731ee5-cc8a-4ba0-b3c1-
a4ef497556bd" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRol
e/Resource">
  <Description>Includes the busbars, straight sections, bends, T-joints, etc.</Description>
  <Version>1.0.0</Version>
  <Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_Attri
buteTypeLib/nameOfSupplier">
    <Description>Name of supplier which provides the customer with a product or a service</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
  </Attribute>
  <Attribute Name="name" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLi
b/name">
    <Description>Designation of the object</Description>
  </Attribute>
  <Attribute Name="medium" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTyp
eLib/medium">
    <Description>Designation of the system application</Description>
  </Attribute>
  <Attribute Name="comment" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/comment" Attribute
DataType="xs:string">
    <Description>Describes the CARF object</Description>
  </Attribute>
  <Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" Attrib
uteDataType="xs:string">
    <Description>Describes the components</Description>
  </Attribute>
  <Attribute Name="current" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/comment" AttributeD
ataType="xs:string">
    <Description>The electric current, symbol , is a measure of the electric charge that flows through a conductor cross-
section per second</Description>
  </Attribute>
  <Attribute Name="ladder" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/comment" AttributeDa
taType="xs:string">
    <Description>An electrical conductor is a body that conducts electrical current well</Description>
  </Attribute>
  <Attribute Name="length1" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" At
tributeDataType="xs:double">
    <Description>Description of a length of the object, component, route, pipe, duct.
A length is the distance between two points.</Description>
  </Attribute>
  <Attribute Name="length2" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" At
tributeDataType="xs:double">
    <Description>Description of a length of the object, component, route, pipe, duct.
A length is the distance between two points.</Description>
  </Attribute>
  <Attribute Name="length3" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" At
tributeDataType="xs:double">
    <Description>Description of a length of the object, component, route, pipe, duct.
A length is the distance between two points.</Description>
  </Attribute>
  <Attribute Name="length4" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" At
tributeDataType="xs:double">
    <Description>Description of a length of the object, component, route, pipe, duct.
A length is the distance between two points.</Description>
  </Attribute>
  <Attribute Name="width" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/width" Unit="mm" Attrib
uteDataType="xs:double">
    <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length
</Description>
  </Attribute>
  <Attribute Name="height" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/height" Unit="mm" Attr
ibuteDataType="xs:double">
    <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
  </Attribute>
  <Attribute Name="angle" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/angle" Unit="rad" Attrib
uteDataType="xs:double">
    <Description>An angle is formed when two straight lines or rays meet at a common endpoint</Description>
  </Attribute>
  <Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataType
="xs:string">
    <Description>The indication of the floor</Description>
  </Attribute>

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    <Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID" AttributeD
ataType="xs:int">
    <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Descri
ption>
    </Attribute>
    <Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataType
="xs:int">
    <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
s to identify information without the need for a central authority or registry.</Description>
    </Attribute>
    </RoleClass>
    <RoleClass Name="Diffuser" ID="377e586a-d28f-4842-93ce-
4c5908c10910" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRol
e/Resource">
    <Description>Includes in ventilation the outlets (such as swirl outlets, slot outlets, diffuser outlets, etc.), grilles of all types, sq
uare and round, plate vents for exhaust and supply air, etc.</Description>
    <Version>1.0.0</Version>
    <Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" Attrib
uteDataType="xs:string">
    <Description>Describes the components.</Description>
    </Attribute>
    <Attribute Name="plant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/plant" AttributeDataTyp
e="xs:string">
    <Description>Definition of the system name.
or the system number.</Description>
    </Attribute>
    <Attribute Name="typeOfAir" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTy
peLib/medium">
    <Description>Designation of medium or air type name</Description>
    </Attribute>
    <Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_Attri
buteTypeLib/nameOfSupplier">
    <Description>Name of supplier which provides the customer with a product or a service</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
    </Attribute>
    <Attribute Name="material" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/material" AttributeD
ataType="xs:string">
    <Description>Designation of material name</Description>
    </Attribute>
    <Attribute Name="object" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/object" AttributeDataT
ype="xs:string">
    <Description>Describes the CARF object</Description>
    </Attribute>
    <Attribute Name="width" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/width" Unit="mm" Attrib
uteDataType="xs:double">
    <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length
</Description>
    </Attribute>
    <Attribute Name="height" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/height" Unit="mm" Attr
ibuteDataType="xs:double">
    <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
    </Attribute>
    <Attribute Name="nominalDiameter" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter
" Unit="mm" AttributeDataType="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is base
d on the metric system of measurement</Description>
    </Attribute>
    <Attribute Name="volumeFlowrate" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/volumeFlowrate"
Unit="m^3/h" AttributeDataType="xs:double">
    <Description>The volume flow (or inaccurate flow rate and flow volume)</Description>
    </Attribute>
    <Attribute Name="flowVelocityVentilation" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/flowVelocity
Ventilation" Unit="m/s" AttributeDataType="xs:double">
    <Description>The flow velocity (also called flow speed) describes how fast a fluid (liquid or gas) moves through a pipe or a
n open channel.</Description>
    </Attribute>
    <Attribute Name="totalPressure" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/totalPressure" Unit="
Pa" AttributeDataType="xs:double">
    <Description>The total pressure loss in ventilation technology describes the overall pressure drop that occurs within a venti
lation system.
It is caused by friction losses in the air ducts, resistances in fittings (bends, branches), filters, heat exchangers, silencers, and ot
her components.</Description>

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    <RefSemantic CorrespondingAttributePath="VDI-ID://05.710.06.5." />
  </Attribute>
  <Attribute Name="airPressure" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/airPressure" Unit="Pa"
AttributeDataType="xs:double">
    <Description>Pressure loss in ventilation describes the resistance that air encounters as it flows through a ventilation syste
m.
It is caused by friction along duct walls, fittings, as well as by filters, heat exchangers, and other components.
High pressure loss requires greater fan performance to achieve the desired air volume flow.</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://35.700.00.19." />
  </Attribute>
  <Attribute Name="throttlingPressure" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/throttlingPressur
e" Unit="Pa" AttributeDataType="xs:double">
    <Description>It refers to the pressure loss that occurs when an airflow is restricted by a throttling element, such as a throttl
e valve or a valve.
These components limit the airflow and increase resistance, leading to a pressure drop.</Description>
  </Attribute>
  <Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataTyp
e="xs:string">
    <Description>The indication of the floor</Description>
  </Attribute>
  <Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID" AttributeD
ataType="xs:int">
    <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Descri
ption>
  </Attribute>
  <Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataTyp
e="xs:int">
    <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
s to identify information without the need for a central authority or registry.</Description>
  </Attribute>
</RoleClass>
<RoleClass Name="DuctPipe" ID="c76a72a0-dd68-459b-b153-
ffba1881d49c" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRole/
Resource">
  <Description>Describes the ventilation in square, round, and oval shapes. Includes straight ducts, fittings, special componen
ts, etc.</Description>
  <Version>1.0.0</Version>
  <Attribute Name="plant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/plant" AttributeDataTyp
e="xs:string">
    <Description>Definition of the system name.
or the system number.</Description>
  </Attribute>
  <Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" Attrib
uteDataType="xs:string">
    <Description>Describes the components.</Description>
  </Attribute>
  <Attribute Name="medium" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTyp
eLib/medium">
    <Description>Designation of medium or air type name</Description>
  </Attribute>
  <Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_Attri
buteTypeLib/nameOfSupplier">
    <Description>Name of supplier which provides the customer with a product or a service</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
  </Attribute>
  <Attribute Name="material" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/material" AttributeD
ataType="xs:string">
    <Description>Designation of material name</Description>
  </Attribute>
  <Attribute Name="length" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" Attr
ibuteDataType="xs:double">
    <Description>Description of a length of the object, component, route, pipe, duct.
A length is the distance between two points.</Description>
  </Attribute>
  <Attribute Name="offset" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" Attri
buteDataType="xs:double">
    <Description>An offset is when the direction changes</Description>
  </Attribute>
  <Attribute Name="fittingLength" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="m
m" AttributeDataType="xs:double">
    <Description>A pipe/duct part is 500mm long in the model, but should be ordered 700mm long and cut to size on site (to fit
length)</Description>

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</Attribute>
<Attribute Name="width1" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeData
AttributeDataType="xs:double">
  <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length
</Description>
</Attribute>
<Attribute Name="height1" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeData
AttributeDataType="xs:double">
  <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
</Attribute>
<Attribute Name="width2" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeData
AttributeDataType="xs:double">
  <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length
</Description>
</Attribute>
<Attribute Name="height2" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeData
AttributeDataType="xs:double">
  <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
</Attribute>
<Attribute Name="width3" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeData
AttributeDataType="xs:double">
  <Description>An offset is when the direction changes</Description>
</Attribute>
<Attribute Name="height3" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeData
AttributeDataType="xs:double">
  <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
</Attribute>
<Attribute Name="width4" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeData
AttributeDataType="xs:double">
  <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length
</Description>
</Attribute>
<Attribute Name="width5" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeData
AttributeDataType="xs:double">
  <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length
</Description>
</Attribute>
<Attribute Name="radiant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/radiant" Unit="rad" AttributeData
AttributeDataType="xs:int">
  <Description>the distance from a centerline or point to an axis of rotation</Description>
</Attribute>
<Attribute Name="angle" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/angle" Unit="rad" AttributeData
AttributeDataType="xs:int">
  <Description>An angle is formed when two straight lines or rays meet at a common endpoint</Description>
</Attribute>
<Attribute Name="angleElbow" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/angle" Unit="rad" AttributeData
AttributeDataType="xs:int">
  <Description>An angle is formed when two straight lines or rays meet at a common endpoint</Description>
</Attribute>
<Attribute Name="angleEnd" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/angle" Unit="rad" AttributeData
AttributeDataType="xs:int">
  <Description>An angle is formed when two straight lines or rays meet at a common endpoint</Description>
</Attribute>
<Attribute Name="nominalDiameter" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm" AttributeData
AttributeDataType="xs:int">
  <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement</Description>
</Attribute>
<Attribute Name="typeOfCoupling" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/comment" AttributeData
AttributeDataType="xs:string">
  <Description>A duct frame is a structural component used to connect and stabilize air ducts in ventilation and air conditioning systems. It ensures secure attachment of the ducts, provides a tight connection, and contributes to the structural integrity of the duct system.</Description>
</Attribute>
<Attribute Name="isolation" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/isolation" AttributeData
AttributeDataType="xs:string">
  <Description>Insulation material of the pipe or duct</Description>
</Attribute>
<Attribute Name="flowVelocityVentilation" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/flowVelocityVentilation" Unit="m/s" AttributeData
AttributeDataType="xs:double">
  <Description>Describes the duct speed</Description>

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</Attribute>
<Attribute Name="volumeFlowrate" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/volumeFlowrate"
Unit="m^3" AttributeDataType="xs:double">
  <Description>The volume flow (or inaccurate flow rate and flow volume)</Description>
</Attribute>
<Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataType
="xs:string">
  <Description>indicationOfTheFloor</Description>
</Attribute>
<Attribute Name="carlID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carlID" AttributeD
ataType="xs:int">
  <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Descri
ption>
</Attribute>
<Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataType
="xs:int">
  <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
s to identify information without the need for a central authority or registry.</Description>
</Attribute>
</RoleClass>
<RoleClass Name="Equipment" ID="f607f61e-c6e6-4346-a371-
eec03f3e9601" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRole
/Resource">
  <Description>Includes the openings (ceiling, wall, core drilling, etc.) in all building services (TGA) areas, fire stops.</Descript
ion>
  <Version>1.0.0</Version>
  <Attribute Name="plant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/plant" AttributeDataTyp
e="xs:string">
    <Description>Definition of the system name.
or the system number.</Description>
  </Attribute>
  <Attribute Name="medium" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTyp
eLib/medium">
    <Description>Designation of medium name
Designation of medium name</Description>
  </Attribute>
  <Attribute Name="material" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/material" AttributeD
ataType="xs:string">
    <Description>Designation of material name</Description>
  </Attribute>
  <Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_Attri
buteTypeLib/nameOfSupplier">
    <Description>Name of supplier which provides the customer with a product or a service</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
  </Attribute>
  <Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" Attrib
uteDataType="xs:string">
    <Description>Description of a length of the object, component, route, pipe, duct.
A length is the distance between two points.</Description>
  </Attribute>
  <Attribute Name="nominalDiameter" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter
" Unit="mm" AttributeDataType="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is base
d on the metric system of measurement</Description>
  </Attribute>
  <Attribute Name="comment" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/comment" Attribute
DataType="xs:string">
    <Description>text description</Description>
  </Attribute>
  <Attribute Name="object" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/object" AttributeDataT
ype="xs:string">
    <Description>Refers to the type of opening, whether rectangular, round, and the specific type of opening, such as core drilli
ng in the ceiling or wall, etc.</Description>
  </Attribute>
  <Attribute Name="length1" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" At
tributeDataType="xs:double">
    <Description>Description of a length of the object, component, route, pipe, duct.
A length is the distance between two points.</Description>
  </Attribute>
  <Attribute Name="height1" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" At
tributeDataType="xs:double">
    <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>

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</Attribute>
<Attribute Name="width1" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
  <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length
</Description>
</Attribute>
<Attribute Name="height2" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
  <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
</Attribute>
<Attribute Name="length2" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
  <Description>Description of a length of the object, component, route, pipe, duct.
  A length is the distance between two points-</Description>
</Attribute>
<Attribute Name="width2" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
  <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length
</Description>
</Attribute>
<Attribute Name="height3" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
  <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
</Attribute>
<Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataType="xs:string">
  <Description>The indication of the floor</Description>
</Attribute>
<Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID" AttributeDataType="xs:int">
  <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Description>
</Attribute>
<Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataType="xs:int">
  <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.</Description>
</Attribute>
</RoleClass>
<RoleClass Name="ExtractionEquipment" ID="17eb8b71-fcaf-4255-9697-829b801c3f4b" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRole/Resource">
  <Description>In ventilation, the deflector hood in square and round designs.</Description>
  <Version>1.0.0</Version>
  <Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" AttributeDataType="xs:string">
    <Description>Describes the components.</Description>
  </Attribute>
  <Attribute Name="plant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/plant" AttributeDataType="xs:string">
    <Description>Definition of the system name.
    or the system number.</Description>
  </Attribute>
  <Attribute Name="medium" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/medium">
    <Description>Designation of air type name</Description>
  </Attribute>
  <Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nameOfSupplier">
    <Description>Name of supplier which provides the customer with a product or a service</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
  </Attribute>
  <Attribute Name="material" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/material" AttributeDataType="xs:string">
    <Description>Designation of material name</Description>
  </Attribute>
  <Attribute Name="widthA" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
    <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length
  </Description>
  </Attribute>

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    <Attribute Name="heightB" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
      <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
    </Attribute>
    <Attribute Name="externalDimension1" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
      <Description>It is the measurement of the component's external dimensions.</Description>
    </Attribute>
    <Attribute Name="externalDimension2" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
      <Description>It is the measurement of the component's external dimensions.</Description>
    </Attribute>
    <Attribute Name="difference" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
      <Description>It is the difference between the external and internal dimensions of components.</Description>
    </Attribute>
    <Attribute Name="overallHeight" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
      <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
    </Attribute>
    <Attribute Name="frame" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/comment" AttributeDataType="xs:string">
      <Description>A channel frame is a profile or corner for square duct</Description>
    </Attribute>
    <Attribute Name="nominalDiameter" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm" AttributeDataType="xs:int">
      <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement</Description>
    </Attribute>
    <Attribute Name="volumeFlowrate" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/volumeFlowrate" Unit="m^3/h" AttributeDataType="xs:double">
      <Description>The volume flow (or inaccurate flow rate and flow volume)</Description>
    </Attribute>
    <Attribute Name="flowVelocityVentilation" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/flowVelocityVentilation" Unit="m/s" AttributeDataType="xs:double">
      <Description>The flow velocity (also called flow speed) describes how fast a fluid (liquid or gas) moves through a pipe or an open channel.</Description>
    </Attribute>
    <Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataType="xs:string">
      <Description>The indication of the floor</Description>
    </Attribute>
    <Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID" AttributeDataType="xs:int">
      <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Description>
    </Attribute>
    <Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataType="xs:int">
      <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.</Description>
    </Attribute>
    </RoleClass>
    <RoleClass Name="Fan" ID="c1421141-a823-4be2-b605-b5e0663f8dc9" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRoleLib/Resource">
      <Description>Describes the fan for square ducts or round pipes. Fan design in axial, radial form, as well as roof fans.</Description>
      <Version>1.0.0</Version>
      <Attribute Name="plant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/plant" AttributeDataType="xs:string">
        <Description>Definition of the system name. or the system number.</Description>
      </Attribute>
      <Attribute Name="medium" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/medium">
        <Description>Designation of medium or air type name</Description>
      </Attribute>
      <Attribute Name="material" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/material" AttributeDataType="xs:string">
        <Description>Designation of material name</Description>
      </Attribute>

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    <Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nameOfSupplier">
      <Description>Name of supplier which provides the customer with a product or a service</Description>
      <RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
    </Attribute>
    <Attribute Name="object" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/object" AttributeDataType="xs:string">
      <Description>Describes the CARF object</Description>
    </Attribute>
    <Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" AttributeDataType="xs:string">
      <Description>Describes the components.</Description>
    </Attribute>
    <Attribute Name="length" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
      <Description>Description of a length of the object, component, route, pipe, duct.
      A length is the distance between two points.</Description>
    </Attribute>
    <Attribute Name="aSquare" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
      <Description>Describes the components width or dimensions</Description>
    </Attribute>
    <Attribute Name="bSquare" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
      <Description>Describes the components height or dimensions</Description>
    </Attribute>
    <Attribute Name="externalDimensionA" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
      <Description>Dimensions (D) for the inlet are external dimensions</Description>
    </Attribute>
    <Attribute Name="externalDimensionB" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
      <Description>Dimensions (D) for the inlet are external dimensions</Description>
    </Attribute>
    <Attribute Name="baseLength" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
      <Description>Base length of the fan</Description>
    </Attribute>
    <Attribute Name="baseThickness" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
      <Description>Base Thickness of the fan</Description>
    </Attribute>
    <Attribute Name="height" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/height" Unit="mm" AttributeDataType="xs:double">
      <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
    </Attribute>
    <Attribute Name="dn1" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm" AttributeDataType="xs:int">
      <Description>Dimension of the fan connection</Description>
    </Attribute>
    <Attribute Name="nominalDiameter" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm" AttributeDataType="xs:int">
      <Description>Dimension of the fan housing</Description>
    </Attribute>
    <Attribute Name="frame" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/comment" AttributeDataType="xs:string">
      <Description>A channel frame is a profile or corner for square duct</Description>
    </Attribute>
    <Attribute Name="isolation" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/isolation" AttributeDataType="xs:string">
      <Description>Insulation material of the pipe or duct</Description>
    </Attribute>
    <Attribute Name="volumeFlowrate" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/volumeFlowrate" Unit="m^3/h" AttributeDataType="xs:double">
      <Description>The volume flow (or inaccurate flow rate and flow volume)</Description>
    </Attribute>
    <Attribute Name="flowVelocityVentilation" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/flowVelocityVentilation" Unit="m/s" AttributeDataType="xs:double">
      <Description>The flow velocity (also called flow speed) describes how fast a fluid (liquid or gas) moves through a pipe or an open channel.</Description>
    </Attribute>

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<Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataType="xs:string">
  <Description>The indication of the floor</Description>
</Attribute>
<Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID" AttributeDataType="xs:int">
  <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Description>
</Attribute>
<Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataType="xs:int">
  <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system s to identify information without the need for a central authority or registry.</Description>
</Attribute>
</RoleClass>
<RoleClass Name="Fitting" ID="4df8ef99-72cb-4882-8003-0d4a706efe04" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRole/Resource">
  <Description>Fittings and components for piping in all dimensions and materials, such as T-joints, reducers, elbows, flanges, seals.</Description>
  <Version>1.0.0</Version>
  <Attribute Name="plant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/plant" AttributeDataType="xs:string">
    <Description>Definition of the system name.
    or the system number.</Description>
  </Attribute>
  <Attribute Name="medium" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/medium">
    <Description>Designation of medium or air type name
    Designation of medium or air type name</Description>
  </Attribute>
  <Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nameOfSupplier">
    <Description>Name of supplier which provides the customer with a product or a service</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
  </Attribute>
  <Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" AttributeDataType="xs:string">
    <Description>Describes the components.</Description>
  </Attribute>
  <Attribute Name="material" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/material" AttributeDataType="xs:string">
    <Description>Designation of material name</Description>
  </Attribute>
  <Attribute Name="object" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/object" AttributeDataType="xs:string">
    <Description>Describes the CARF object</Description>
  </Attribute>
  <Attribute Name="pressure" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/pressure" AttributeDataType="xs:int">
    <Description>The nominal pressure level PN indicates the maximum permissible pressure with which a fluid may load the pipeline for a pipeline with internal pressure</Description>
  </Attribute>
  <Attribute Name="dn1" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm" AttributeDataType="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement</Description>
  </Attribute>
  <Attribute Name="dn2" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm" AttributeDataType="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement</Description>
  </Attribute>
  <Attribute Name="dn3" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm" AttributeDataType="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement</Description>
  </Attribute>
  <Attribute Name="externalDiameter" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
    <Description>The external Diameter DA indicates the approximate outer diameter of the pipeline in millimetres</Description>
  </Attribute>

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</Attribute>
<Attribute Name="wallThickness" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="
mm" AttributeDataType="xs:double">
  <Description>The wall thickness indicates the approximate thickness of the pipe in millimeters</Description>
</Attribute>
<Attribute Name="length" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" Attr
ibuteDataType="xs:double">
  <Description>Description of a length of the object, component, route, pipe, duct.
A length is the distance between two points.
Description of a length of the object, component, route, pipe, duct.
A length is the distance between two points.</Description>
</Attribute>
<Attribute Name="distanceLength" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit=
"mm" AttributeDataType="xs:double">
  <Description>T-piece pipe distance from branch to pipe axis</Description>
</Attribute>
<Attribute Name="lengthExit" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm"
AttributeDataType="xs:double">
  <Description>T-piece pipe distance from branch to pipe axis</Description>
</Attribute>
<Attribute Name="width" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/width" Unit="mm" Attrib
uteDataType="xs:double">
  <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length
</Description>
</Attribute>
<Attribute Name="height" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/height" Unit="mm" Attr
ibuteDataType="xs:double">
  <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
</Attribute>
<Attribute Name="angle" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/angle" Unit="rad" Attrib
uteDataType="xs:double">
  <Description>An angle is formed when two straight lines or rays meet at a common endpoint</Description>
</Attribute>
<Attribute Name="radian" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/radian" Unit="rad" At
tributeDataType="xs:double">
  <Description>the distance from a centerline or point to an axis of rotation</Description>
</Attribute>
<Attribute Name="isolation" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/isolation" AttributeD
ataType="xs:string">
  <Description>Insulation material of the pipe or duct</Description>
</Attribute>
<Attribute Name="insulationThickness" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/insulatio
nThickness" Unit="mm" AttributeDataType="xs:double">
  <Description>Packing thickness of insulation</Description>
</Attribute>
<Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataType
="xs:string">
  <Description>The indication of the floor</Description>
</Attribute>
<Attribute Name="tgaKeyH60" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyH60" AttributeD
ataType="xs:string">
  <Description>Unique key for the calculation</Description>
</Attribute>
<Attribute Name="tgaKeyS87" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyS87" AttributeD
ataType="xs:string">
  <Description>Unique key for the calculation</Description>
</Attribute>
<Attribute Name="tgaKeyS90" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyS90" AttributeD
ataType="xs:string">
  <Description>Unique key for the calculation</Description>
</Attribute>
<Attribute Name="pressureCold" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/pressureCold" Unit="
kPa" AttributeDataType="xs:double">
  <Description>A pressure drop in a cooling system refers to the reduction in pressure as the coolant flows through pipes, he
at exchangers, valves, and other system components.</Description>
  <RefSemantic CorrespondingAttributePath="VDI-ID://20.710.12.5." />
</Attribute>
<Attribute Name="pressureHot" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/pressureHot" Unit="k
Pa" AttributeDataType="xs:double">
  <Description>In a hot water system, pressure is essential for ensuring proper water flow and distribution throughout the sys
tem.

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The pressure is influenced by factors such as pump performance, pipe resistance, temperature changes, and system design.</

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Description>
  <RefSemantic CorrespondingAttributePath="VDI-ID://20.710.09.12." />
</Attribute>
  <Attribute Name="massFlowrate" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/massFlowrate" Unit
="kg/h" AttributeDataType="xs:double">
  <Description>Mass flow in heating refers to the mass flow of heating medium (such as water or another heat transfer fluid)
through a heating system.</Description>
  <RefSemantic CorrespondingAttributePath="VDI-ID://44.700.00.5." />
</Attribute>
  <Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID" AttributeD
ataType="xs:int">
  <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Descr
ption>
</Attribute>
  <Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataType
="xs:int">
  <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
s to identify information without the need for a central authority or registry.</Description>
</Attribute>
  <Attribute Name="couplingIn" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices.Base_Attrib
uteTypeLib/couplingIn">
  <Description>Connection type such as flange, welded, threaded, grooved, etc.</Description>
</Attribute>
  <Attribute Name="couplingOut" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices.Base_Attr
ibuteTypeLib/couplingOut">
  <Description>Connection type such as flange, welded, threaded, grooved, etc.</Description>
</Attribute>
</RoleClass>
  <RoleClass Name="HeatSource" ID="7688873d-e49f-43a3-9be1-
bae2388357f1" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRol
e/Resource">
  <Description>These include hot water boilers, heating boilers, heat exchangers, or general equipment.</Description>
  <Version>1.0.0</Version>
  <Attribute Name="plant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/plant" AttributeDataTyp
e="xs:string">
  <Description>Definition of the system name.
or the system number.</Description>
</Attribute>
  <Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" Attrib
uteDataType="xs:string">
  <Description>Describes the components.</Description>
</Attribute>
  <Attribute Name="medium" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTyp
eLib/medium">
  <Description>Designation of medium name</Description>
</Attribute>
  <Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_Attri
buteTypeLib/nameOfSupplier">
  <Description>Name of supplier which provides the customer with a product or a service</Description>
  <RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
</Attribute>
  <Attribute Name="object" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/object" AttributeDataT
ype="xs:string">
  <Description>Describes the CARF object</Description>
</Attribute>
  <Attribute Name="material" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/material" AttributeD
ataType="xs:string">
  <Description>Designation of material name</Description>
</Attribute>
  <Attribute Name="length" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" Attr
ibuteDataType="xs:double">
  <Description>Description of a length of the object, component, route, pipe, duct.
A length is the distance between two points.</Description>
</Attribute>
  <Attribute Name="height" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/height" Unit="mm" Attr
ibuteDataType="xs:double">
  <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
</Attribute>
  <Attribute Name="width1" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" Att
ributeDataType="xs:double">

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    <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length
</Description>
  </Attribute>
  <Attribute Name="width2" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
    <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length
  </Description>
  </Attribute>
  <Attribute Name="overallLength" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
    <Description>It is the total length of all measurements of the boiler or burner.</Description>
  </Attribute>
  <Attribute Name="nominalDiameter" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm" AttributeDataType="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement</Description>
  </Attribute>
  <Attribute Name="pressure" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/pressure" Unit="PN" AttributeDataType="xs:int">
    <Description>The nominal pressure level PN indicates the maximum permissible pressure with which a fluid may load the pipeline for a pipeline with internal pressure</Description>
  </Attribute>
  <Attribute Name="numberFeet" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/comment" AttributeDataType="xs:string">
    <Description>Number of feet on the boiler</Description>
  </Attribute>
  <Attribute Name="volume" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/volume" Unit="m^3" AttributeDataType="xs:double">
    <Description>The volume flow (or inaccurate flow rate and flow volume)</Description>
  </Attribute>
  <Attribute Name="boilerNumber" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/comment" AttributeDataType="xs:string">
    <Description>Numbering of the boiler</Description>
  </Attribute>
  <Attribute Name="dnVL" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm" AttributeDataType="xs:int">
    <Description>Connection dimension flow</Description>
  </Attribute>
  <Attribute Name="dnRL" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm" AttributeDataType="xs:int">
    <Description>Connection dimension return</Description>
  </Attribute>
  <Attribute Name="exhaustConnection" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm" AttributeDataType="xs:int">
    <Description>Exhaust connection dimension</Description>
  </Attribute>
  <Attribute Name="powerHeat" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/powerHeat" Unit="kW" AttributeDataType="xs:double">
    <Description>The watt is the SI unit of power (energy turnover per period of time)</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://06.710.02.3." />
  </Attribute>
  <Attribute Name="powerCold" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/powerCold" Unit="W" AttributeDataType="xs:double">
    <Description>The watt is the SI unit of power (energy turnover per period of time)</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://06.710.02.14." />
  </Attribute>
  <Attribute Name="tgaKeyH60" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyH60" AttributeDataType="xs:string">
    <Description>Unique key for the calculation</Description>
  </Attribute>
  <Attribute Name="massFlowrate" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/massFlowrate" Unit="kg/h" AttributeDataType="xs:double">
    <Description>Mass flow in heating refers to the mass flow of heating medium (such as water or another heat transfer fluid) through a heating system.</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://44.700.00.5." />
  </Attribute>
  <Attribute Name="productRange" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/productRange" AttributeDataType="xs:string">
    <Description>A product range description provides an overview of the entire product assortment of a company or brand.</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://44.110.00.4." />
  </Attribute>

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<Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataType="xs:string">
  <Description>The indication of the floor</Description>
</Attribute>
<Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID" AttributeDataType="xs:int">
  <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Description>
</Attribute>
<Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataType="xs:int">
  <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.</Description>
</Attribute>
</RoleClass>
<RoleClass Name="Hydrant" ID="17b5ad3f-a15d-4c36-927b-ee802f6a1a93" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRole/Resource">
  <Description>Hydrants in all designs, fire hose cabinets, and handheld fire extinguishers.</Description>
  <Version>1.0.0</Version>
  <Attribute Name="plant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/plant" AttributeDataType="xs:string">
    <Description>Definition of the system name.
    or the system number.</Description>
  </Attribute>
  <Attribute Name="medium" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/medium">
    <Description>Designation of medium name</Description>
  </Attribute>
  <Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nameOfSupplier">
    <Description>Name of supplier which provides the customer with a product or a service</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
  </Attribute>
  <Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" AttributeDataType="xs:string">
    <Description>Describes the components.</Description>
  </Attribute>
  <Attribute Name="length" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
    <Description>Description of a length of the object, component, route, pipe, duct.
    A length is the distance between two points.</Description>
  </Attribute>
  <Attribute Name="width" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/width" Unit="mm" AttributeDataType="xs:double">
    <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length</Description>
  </Attribute>
  <Attribute Name="height" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/height" Unit="mm" AttributeDataType="xs:double">
    <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
  </Attribute>
  <Attribute Name="medium1" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/medium">
    <Description>Designation of medium name</Description>
  </Attribute>
  <Attribute Name="dn1" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm" AttributeDataType="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement</Description>
  </Attribute>
  <Attribute Name="distanceFromFloor1" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
    <Description>Indication distance from the ground</Description>
  </Attribute>
  <Attribute Name="medium2" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/medium">
    <Description>Designation of medium name</Description>
  </Attribute>
  <Attribute Name="dn2" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm" AttributeDataType="xs:int">

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<Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is base
d on the metric system of measurement</Description>
</Attribute>
<Attribute Name="distanceFromFloor2" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length"
Unit="mm" AttributeDataType="xs:double">
  <Description>Indication distance from the ground</Description>
</Attribute>
<Attribute Name="medium3" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTy
peLib/medium">
  <Description>Designation of medium name</Description>
</Attribute>
<Attribute Name="dn3" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm"
AttributeDataType="xs:int">
  <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is base
d on the metric system of measurement</Description>
</Attribute>
<Attribute Name="distanceFromFloor3" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length"
Unit="mm" AttributeDataType="xs:double">
  <Description>Indication distance from the ground</Description>
</Attribute>
<Attribute Name="medium4" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTy
peLib/medium">
  <Description>Designation of medium name</Description>
</Attribute>
<Attribute Name="dn4" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm"
AttributeDataType="xs:int">
  <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is base
d on the metric system of measurement</Description>
</Attribute>
<Attribute Name="distanceFromFloor4" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length"
Unit="mm" AttributeDataType="xs:double">
  <Description>Indication distance from the ground</Description>
</Attribute>
<Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeType
="xs:string">
  <Description>The indication of the floor</Description>
</Attribute>
<Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID" AttributeD
ataType="xs:int">
  <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Descri
ption>
</Attribute>
<Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataType
="xs:int">
  <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
s to identify information without the need for a central authority or registry.</Description>
</Attribute>
</RoleClass>
<RoleClass Name="Lamp" ID="18990ea0-a628-4225-82dd-
24029a31f0fe" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRole
/Resource">
  <Description>Lamps as freestanding, in single or double flame, LED, emergency lighting, office or mounted lights, spotlights
, etc.</Description>
  <Version>1.0.0</Version>
  <Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" Attrib
uteDataType="xs:string">
    <Description>Describes the components</Description>
  </Attribute>
  <Attribute Name="nameofSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_Attrib
uteTypeLib/nameOfSupplier">
    <Description>Name of supplier which provides the customer with a product or a service</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
  </Attribute>
  <Attribute Name="identifier" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/comment" Attribute
DataType="xs:string">
    <Description>The lamp type describes the specific category or design of a light source, including details such as shape, fu
nction, technology, and application.
    Lamp types are categorized on factors such as types and applications.</Description>
  </Attribute>
  <Attribute Name="circuit" RefAttributeType="CARF_Base_AttributeTypeLib@CARF_Measurement_AttributeTypeLib/numbe
r" AttributeDataType="xs:int">
    <Description>Marking in electrical engineering for electrical circuit, electric circuit, integrated circuit</Description>

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</Attribute>
<Attribute Name="IpAddress" RefAttributeType="CARF_Base_AttributeTypeLib@CARF_Measurement_AttributeTypeLib/nu
mber" AttributeDataType="xs:int">
  <Description>The DALI line addresses devices by triggering a random component on each device that generates a large 3
-byte number</Description>
</Attribute>
<Attribute Name="power" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/power" Unit="W" Attr
ibuteDataType="xs:int">
  <Description>The watt is the SI unit of power (energy turnover per period of time)</Description>
</Attribute>
<Attribute Name="length" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" Attr
ibuteDataType="xs:double">
  <Description>Description of a length of the object, component, route, pipe, duct.
A length is the distance between two points.</Description>
</Attribute>
<Attribute Name="width" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/width" Unit="mm" Attr
ibuteDataType="xs:double">
  <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length
</Description>
</Attribute>
<Attribute Name="height" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/height" Unit="mm" Attr
ibuteDataType="xs:double">
  <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
</Attribute>
<Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataType
="xs:string">
  <Description>indicationOfTheFloor</Description>
</Attribute>
<Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID" AttributeD
ataType="xs:int">
  <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Descri
ption>
</Attribute>
<Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataType
="xs:int">
  <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
s to identify information without the need for a central authority or registry.</Description>
</Attribute>
</RoleClass>
<RoleClass Name="Manifold" ID="765b25dd-c851-42ca-8457-
501ca47e23b7" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRol
e/Resource">
  <Description>Electrical distribution panels such as transformers, switchboards, or heating and cooling distribution units, as
well as sprinkler or plumbing systems.</Description>
<Version>1.0.0</Version>
<Attribute Name="plant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/plant" AttributeDataTyp
e="xs:string">
  <Description>Definition of the system name.
or the system number.</Description>
</Attribute>
<Attribute Name="medium" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTyp
eLib/medium">
  <Description>Designation of medium name</Description>
</Attribute>
<Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" Attr
ibuteDataType="xs:string">
  <Description>Describes the components.</Description>
</Attribute>
<Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_Attri
buteTypeLib/nameOfSupplier">
  <Description>Name of supplier which provides the customer with a product or a service</Description>
<RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
</Attribute>
<Attribute Name="material" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/material" AttributeD
ataType="xs:string">
  <Description>Designation of material name</Description>
</Attribute>
<Attribute Name="object" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/object" AttributeDataT
ype="xs:string">
  <Description>Describes the CARF object</Description>
</Attribute>

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    <Attribute Name="overallLength" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="
mm" AttributeDataType="xs:double">
    <Description>Description of a length of the object, component, route, pipe, duct.
A length is the distance between two points.</Description>
    </Attribute>
    <Attribute Name="cylinderLength" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="
mm" AttributeDataType="xs:double">
    <Description>A cylinder length spacer is a component inserted between two cylinders or pipe elements to extend or conne
ct the length of a system.</Description>
    </Attribute>
    <Attribute Name="nominalDiameter" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter
" Unit="mm" AttributeDataType="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is base
d on the metric system of measurement</Description>
    </Attribute>
    <Attribute Name="length1" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" At
tributeDataType="xs:double">
    <Description>Description of a length of the object, component, route, pipe, duct.
A length is the distance between two points.</Description>
    </Attribute>
    <Attribute Name="width1" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" Att
ributeDataType="xs:double">
    <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length
</Description>
    </Attribute>
    <Attribute Name="height1" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" At
tributeDataType="xs:double">
    <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
    </Attribute>
    <Attribute Name="switchCabinetNumber" RefAttributeType="CARF_Base_AttributeTypeLib@CARF_Measurement_Attribut
eTypeLib/number" AttributeDataType="xs:int">
    <Description>Labeling of control cabinets</Description>
    </Attribute>
    <Attribute Name="name" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLi
b/name">
    <Description>Describes the CARF Object</Description>
    </Attribute>
    <Attribute Name="circuit" RefAttributeType="CARF_Base_AttributeTypeLib@CARF_Measurement_AttributeTypeLib/numbe
r" AttributeDataType="xs:int">
    <Description>Marking in electrical engineering for electrical circuit, electric circuit, integrated circuit</Description>
    </Attribute>
    <Attribute Name="physicalAdress" RefAttributeType="CARF_Base_AttributeTypeLib@CARF_Measurement_AttributeTypeL
ib/number" AttributeDataType="xs:int">
    <Description>It is a unique device address by which each bus participant is identified</Description>
    </Attribute>
    <Attribute Name="height2" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" At
tributeDataType="xs:double">
    <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
    </Attribute>
    <Attribute Name="width2" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" Att
ributeDataType="xs:double">
    <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length
</Description>
    </Attribute>
    <Attribute Name="length2" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" At
tributeDataType="xs:double">
    <Description>Description of a length of the object, component, route, pipe, duct.
A length is the distance between two points.</Description>
    </Attribute>
    <Attribute Name="depth2" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" Att
ributeDataType="xs:double">
    <Description>It describes the depth or width of the distributor, transformer, or control cabinet.</Description>
    </Attribute>
    <Attribute Name="width3" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" Att
ributeDataType="xs:double">
    <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length
</Description>
    </Attribute>
    <Attribute Name="height3" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" At
tributeDataType="xs:double">
    <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
    </Attribute>

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<Attribute Name="baseHeight" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="m" AttributeDataType="xs:double">
  <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
</Attribute>
<Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataType="xs:string">
  <Description>The indication of the floor</Description>
</Attribute>
<Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID" AttributeDataType="xs:int">
  <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Description>
</Attribute>
<Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataType="xs:int">
  <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.</Description>
</Attribute>
</RoleClass>
<RoleClass Name="MeasuringElement" ID="bb805c00-20f3-4b9a-9cc7-0d4d5bcfb7ec" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRole/Resource">
  <Description>Measuring points are thermometers, pressure gauges, sensors.</Description>
  <Version>1.0.0</Version>
  <Attribute Name="plant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/plant" AttributeDataType="xs:string">
    <Description>Definition of the system name or the system number</Description>
  </Attribute>
  <Attribute Name="medium" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/medium">
    <Description>Designation of medium name</Description>
  </Attribute>
  <Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nameOfSupplier">
    <Description>Name of supplier which provides the customer with a product or a service</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
  </Attribute>
  <Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" AttributeDataType="xs:string">
    <Description>Describes the components.</Description>
  </Attribute>
  <Attribute Name="object" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/object" AttributeDataType="xs:string">
    <Description>Defines the object type of the measuring instrument in a pipeline.</Description>
  </Attribute>
  <Attribute Name="nominalDiameter" Unit="mm" AttributeDataType="xs:double" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement</Description>
  </Attribute>
  <Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataType="xs:string">
    <Description>indicationOfTheFloor</Description>
  </Attribute>
  <Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID" AttributeDataType="xs:int">
    <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Description>
  </Attribute>
  <Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataType="xs:int">
    <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.</Description>
  </Attribute>
  <Attribute Name="couplingOut" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/couplingOut">
    <Description>Connection type such as flange, welded, threaded, grooved, etc.</Description>
  </Attribute>
  <Attribute Name="couplingIn" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/couplingIn">
    <Description>Connection type such as flange, welded, threaded, grooved, etc.</Description>
  </Attribute>

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</Attribute>
</RoleClass>
<RoleClass Name="Object" ID="44413d7b-3368-4ee9-8926-
bbdd71f25550" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRol
e/Resource">
  <Description>Planning objects include actuators for motor-
operated valves, sprinkler heads, separators, pipe separators, siphons for washbasins.</Description>
  <Version>1.0.0</Version>
  <Attribute Name="name" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLi
b/name">
    <Description>Designation of the object</Description>
  </Attribute>
  <Attribute Name="plant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/plant" AttributeDataTyp
e="xs:string">
    <Description>Definition of the system name.
or the system number.</Description>
  </Attribute>
  <Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" Attrib
uteDataType="xs:string">
    <Description>Describes the components.
Describes the components.</Description>
  </Attribute>
  <Attribute Name="medium" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTyp
eLib/medium">
    <Description>Designation of medium or air type name</Description>
  </Attribute>
  <Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_Attri
buteTypeLib/nameOfSupplier">
    <Description>Name of supplier which provides the customer with a product or a service</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
  </Attribute>
  <Attribute Name="object" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/object" AttributeDataT
ype="xs:string">
    <Description>Describes the CARF object</Description>
  </Attribute>
  <Attribute Name="nominalDiameter" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter
" Unit="mm" AttributeDataType="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is base
d on the metric system of measurement</Description>
  </Attribute>
  <Attribute Name="width" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/width" Unit="mm" Attrib
uteDataType="xs:double">
    <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length
</Description>
  </Attribute>
  <Attribute Name="height" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/height" Unit="mm" Attr
ibuteDataType="xs:double">
    <Description>The geometric height is the distance at right angles to a base line or base area of an object
The geometric height is the distance at right angles to a base line or base area of an object</Description>
  </Attribute>
  <Attribute Name="length" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" Attr
ibuteDataType="xs:double">
    <Description>Description of a length of the object, component, route, pipe, duct.
A length is the distance between two points.</Description>
  </Attribute>
  <Attribute Name="pressure" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/pressure" Unit="PN
" AttributeDataType="xs:int">
    <Description>The nominal pressure level PN indicates the maximum permissible pressure with which a fluid may load the
pipeline for a pipeline with internal pressure</Description>
  </Attribute>
  <Attribute Name="kFactor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/comment" AttributeD
ataType="xs:string">
    <Description>The K-factor can be used to calculate the discharge rate of sprinkler heads</Description>
  </Attribute>
  <Attribute Name="norm" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/comment" AttributeDat
aType="xs:string">
    <Description>The german industry standard</Description>
  </Attribute>
  <Attribute Name="fireHazardClass" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/comment" A
ttributeDataType="xs:string">
    <Description>The risk assessment</Description>
  </Attribute>

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<Attribute Name="waterRequirement" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/volume"
Unit="l" AttributeDataType="xs:double">
  <Description>The minimum water requirement for sprinklers refers to the minimum amount of water that must be provided
  by a sprinkler system to ensure effective fire suppression.</Description>
</Attribute>
<Attribute Name="maxWallSpacing" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit
="mm" AttributeDataType="xs:double">
  <Description>The maximum wall distance for sprinklers refers to the maximum distance a sprinkler head can be from a wal
  l in a sprinkler system to ensure effective coverage and fire suppression.</Description>
</Attribute>
<Attribute Name="minWallSpacing" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit
="mm" AttributeDataType="xs:double">
  <Description>The minimum wall distance for sprinklers refers to the minimum distance a sprinkler head must have from a
  wall in a sprinkler system to ensure even water distribution and effective fire suppression.</Description>
</Attribute>
<Attribute Name="sprinklerSpacing" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit
="mm" AttributeDataType="xs:double">
  <Description>The maximum sprinkler distance refers to the maximum distance allowed between sprinkler heads in a sprink
  ler system to ensure complete and effective coverage of the area for fire suppression.</Description>
</Attribute>
<Attribute Name="building" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/building" AttributeDa
taType="xs:string">
  <Description>A building is a structure that encloses rooms</Description>
</Attribute>
<Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataType
="xs:string">
  <Description>The indication of the floor</Description>
</Attribute>
<Attribute Name="apartment" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/building" Attribute
DataType="xs:string">
  <Description>Housing is all rooms that are deprived of general accessibility by spatial isolation</Description>
</Attribute>
<Attribute Name="roomNumber" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/number" Attrib
uteDataType="xs:string">
  <Description>The room number is preferably a combination of a two-
  digit number preceded by the floor number of the building</Description>
</Attribute>
<Attribute Name="roomVolume" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/volume" Unit="
m^3" AttributeDataType="xs:double">
  <Description>The volume indicates how much space a body takes up</Description>
</Attribute>
<Attribute Name="normTemperature" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/temperatu
re" Unit="°C" AttributeDataType="xs:double">
  <Description>The degree Celsius is a unit of temperature</Description>
</Attribute>
<Attribute Name="heatRequired" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/power" Unit="
W" AttributeDataType="xs:double">
  <Description>The specific heat requirement describes the amount of heat energy required to heat one cubic meter of room
  air by one degree Celsius</Description>
</Attribute>
<Attribute Name="powerHeat" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/powerHeat" Unit="W"
AttributeDataType="xs:double">
  <Description>The watt is the SI unit of power (energy turnover per period of time)</Description>
  <RefSemantic CorrespondingAttributePath="VDI-ID://06.710.02.3." />
</Attribute>
<Attribute Name="powerCold" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/powerCold" Unit="W" A
tributeDataType="xs:double">
  <Description>The watt is the SI unit of power (energy turnover per period of time)</Description>
  <RefSemantic CorrespondingAttributePath="VDI-ID://06.710.02.14." />
</Attribute>
<Attribute Name="tgaKeyH60" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyH60" AttributeD
ataType="xs:string">
  <Description>Unique key for the calculation</Description>
</Attribute>
<Attribute Name="tgaKeyS87" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyS87" AttributeD
ataType="xs:string">
  <Description>Unique key for the calculation</Description>
</Attribute>
<Attribute Name="tgaKeyS90" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyS90" AttributeD
ataType="xs:string">
  <Description>Unique key for the calculation</Description>
</Attribute>

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    <Attribute Name="productRange" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/productRange" AttributeDataType="xs:string">
      <Description>A product range description provides an overview of the entire product assortment of a company or brand.</Description>
    </Attribute>
    <Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID" AttributeDataType="xs:int">
      <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Description>
    </Attribute>
    <Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataType="xs:int">
      <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.</Description>
    </Attribute>
    <RoleClass Name="Plaster" ID="3cc7070b-baca-458a-b5e1-f3bada0621b2" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRole/Resource">
      <Description>Plaster pieces for rainwater or wastewater are specialized components or elements used to facilitate the transitions between different piping systems or discharge points.</Description>
      <Version>1.0.0</Version>
      <Attribute Name="plant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/plant" AttributeDataType="xs:string">
        <Description>Definition of the system name.
        or the system number.</Description>
      </Attribute>
      <Attribute Name="medium" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/medium">
        <Description>Designation of medium name</Description>
      </Attribute>
      <Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nameOfSupplier">
        <Description>Name of supplier which provides the customer with a product or a service</Description>
        <RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
      </Attribute>
      <Attribute Name="material" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/material" AttributeDataType="xs:string">
        <Description>Designation of material name</Description>
      </Attribute>
      <Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" AttributeDataType="xs:string">
        <Description>Describes the components.</Description>
      </Attribute>
      <Attribute Name="object" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/object" AttributeDataType="xs:string">
        <Description>Describes the CARF object</Description>
      </Attribute>
      <Attribute Name="nominalDiameter" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm" AttributeDataType="xs:int">
        <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement</Description>
      </Attribute>
      <Attribute Name="height" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/height" Unit="mm" AttributeDataType="xs:double">
        <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
      </Attribute>
      <Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataType="xs:string">
        <Description>The indication of the floor</Description>
      </Attribute>
      <Attribute Name="tgaKeyS87" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyS87" AttributeDataType="xs:string">
        <Description>Unique key for the calculation</Description>
      </Attribute>
      <Attribute Name="maxDrainageCapacity" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/maxDrainageCapacity" Unit="l/s" AttributeDataType="xs:double">

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<Description>The maximum drainage capacity refers to the highest volume of liquid that a drainage system can handle within a given time without causing overflow or backup.</Description>
<RefSemantic CorrespondingAttributePath="VDI-ID://45.700.00.10." />
</Attribute>
<Attribute Name="productRange" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/productRange" AttributeDataType="xs:string">
  <Description>A product range description provides an overview of the entire product assortment of a company or brand.</Description>
</Attribute>
<RefSemantic CorrespondingAttributePath="VDI-ID://38.110.00.4." />
</Attribute>
<Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID" AttributeDataType="xs:int">
  <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Description>
</Attribute>
<Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataType="xs:int">
  <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.</Description>
</Attribute>
</RoleClass>
<RoleClass Name="Pump" ID="bf9ea422-aedd-442c-8d63-b189ce2bedad" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRole/Resource">
  <Description>Pumps such as base pumps, pipeline pumps for various trades. Low-pressure or high-pressure pumps in flanged or screwed form.</Description>
  <Version>1.0.0</Version>
  <Attribute Name="plant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/plant" AttributeDataType="xs:string">
    <Description>Definition of the system name.
    or the system number.</Description>
  </Attribute>
  <Attribute Name="medium" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/medium">
    <Description>Designation of medium name</Description>
  </Attribute>
  <Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nameOfSupplier">
    <Description>Name of supplier which provides the customer with a product or a service</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
  </Attribute>
  <Attribute Name="material" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/material" AttributeDataType="xs:string">
    <Description>Designation of material name</Description>
  </Attribute>
  <Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" AttributeDataType="xs:string">
    <Description>Describes the components.</Description>
  </Attribute>
  <Attribute Name="suctionNozzleDN" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm" AttributeDataType="xs:int">
    <Description>The nominal diameter of the suction port on the pump</Description>
  </Attribute>
  <Attribute Name="pressureNozzleDN" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm" AttributeDataType="xs:int">
    <Description>The nominal diameter at the pressure port on the pump</Description>
  </Attribute>
  <Attribute Name="pressure" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/pressure" Unit="PN" AttributeDataType="xs:int">
    <Description>The nominal pressure level PN indicates the maximum permissible pressure with which a fluid may load the pipeline for a pipeline with internal pressure</Description>
  </Attribute>
  <Attribute Name="tgaKeyH60" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyH60" AttributeDataType="xs:string">
    <Description>Unique key for the calculation</Description>
  </Attribute>
  <Attribute Name="tgaKeyS87" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyS87" AttributeDataType="xs:string">
    <Description>Unique key for the calculation</Description>
  </Attribute>
  <Attribute Name="tgaKeyS90" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyS90" AttributeDataType="xs:string">

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    <Description>Unique key for the calculation</Description>
  </Attribute>
  <Attribute Name="supplyTemperatureHeat" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/supplyTemperatureHeat" Unit="°C" AttributeDataType="xs:double">
    <Description>The flow temperature in degrees Celsius refers to the temperature of the water that is circulated from the heat generator (e.g., boiler, heat pump, or solar system) to the radiators or underfloor heating in a heating system (such as a central heating or hot water system).</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://06.700.00.30." />
  </Attribute>
  <Attribute Name="returnTemperatureHeat" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/returnTemperatureHeat" Unit="°C" AttributeDataType="xs:double">
    <Description>The return temperature in degrees Celsius refers to the temperature of the water that flows back to the heat generator (e.g., boiler, heat pump, or solar system) after releasing heat to the radiators or underfloor heating.</Description>
  </Attribute>
  <Attribute Name="returnTemperatureCold" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/returnTemperatureCold" Unit="°C" AttributeDataType="xs:double">
    <Description>The return temperature in degrees Celsius refers to the temperature of the water that flows back to the heat generator (e.g., boiler, heat pump, or solar system) after releasing heat to the radiators or underfloor heating.</Description>
  </Attribute>
  <Attribute Name="supplyTemperatureCold" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/supplyTemperatureCold" Unit="°C" AttributeDataType="xs:double">
    <Description>The flow temperature in degrees Celsius refers to the temperature of the water that is circulated from the heat generator (e.g., boiler, heat pump, or solar system) to the radiators or underfloor heating in a heating system (such as a central heating or hot water system).</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://06.700.00.31." />
  </Attribute>
  <Attribute Name="massFlowrate" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/massFlowrate" Unit="kg/h" AttributeDataType="xs:double">
    <Description>Mass flow in heating refers to the mass flow of heating medium (such as water or another heat transfer fluid) through a heating system.</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://44.700.00.5." />
  </Attribute>
  <Attribute Name="productRange" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/productRange" AttributeDataType="xs:string">
    <Description>A product range description provides an overview of the entire product assortment of a company or brand.</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://38.110.00.4." />
    <RefSemantic CorrespondingAttributePath="VDI-ID://40.110.00.4." />
    <RefSemantic CorrespondingAttributePath="VDI-ID://17.100.00.4." />
    <RefSemantic CorrespondingAttributePath="VDI-ID://20.100.00.4." />
    <RefSemantic CorrespondingAttributePath="VDI-ID://06.110.00.4." />
    <RefSemantic CorrespondingAttributePath="VDI-ID://44.110.00.4." />
  </Attribute>
  <Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataType="xs:string">
    <Description>The indication of the floor</Description>
  </Attribute>
  <Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID" AttributeDataType="xs:int">
    <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Description>
  </Attribute>
  <Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataType="xs:int">
    <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.</Description>
  </Attribute>
  <Attribute Name="couplingIn" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/couplingIn">
    <Description>Connection type such as flange, welded, threaded, grooved, etc.</Description>
  </Attribute>
  <Attribute Name="couplingOut" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/couplingOut">
    <Description>Connection type such as flange, welded, threaded, grooved, etc.</Description>
  </Attribute>
</RoleClass>
<RoleClass Name="Radiator" ID="a5799514-e57b-4ea2-88b6-d841f026290d" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRole/Resource">

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<Description>Radiators for various heating purposes, such as flat radiators, valve radiators, compact radiators in single-pipe or multi-pipe systems. Connection types include bottom, dual-side, single-side, etc.</Description>

<Version>1.0.0</Version>

<Attribute Name="building" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/building" AttributeDataType="xs:string">

<Description>A building is a structure that encloses rooms</Description>

</Attribute>

<Attribute Name="storey" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/storey" AttributeDataType="xs:string">

<Description>A floor refers to a single, horizontally divided level within a building, defined by ceilings and floors.</Description>

</Attribute>

<Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nameOfSupplier">

<Description>Name of supplier which provides the customer with a product or a service</Description>

<RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />

</Attribute>

<Attribute Name="length" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">

<Description>Description of a length of the object, component, route, pipe, duct.
A length is the distance between two points.</Description>

</Attribute>

<Attribute Name="height" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/height" Unit="mm" AttributeDataType="xs:double">

<Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>

</Attribute>

<Attribute Name="width" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/width" Unit="mm" AttributeDataType="xs:double">

<Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length</Description>

</Attribute>

<Attribute Name="roomNumber" RefAttributeType="CARF_Base_AttributeTypeLib@CARF_Measurement_AttributeTypeLib/number" AttributeDataType="xs:int">

<Description>The room number is preferably a combination of a two-digit number preceded by the floor number of the building.</Description>

</Attribute>

<Attribute Name="hkNumberInRoom" RefAttributeType="CARF_Base_AttributeTypeLib@CARF_Measurement_AttributeTypeLib/number" AttributeDataType="xs:int">

<Description>It is the identification number of a radiator between the 3D plan and the schematic.</Description>

</Attribute>

<Attribute Name="roomTemperature" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/temperature" Unit="°C" AttributeDataType="xs:double">

<Description>The room temperature in degrees Celsius refers to the temperature of a room or enclosed space.
It is an important parameter for the comfort of the occupants and the functionality of devices and systems that are temperature-dependent, such as heaters, air conditioners, or cooling units.</Description>

</Attribute>

<Attribute Name="supplyTemperatureHeat" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/supplyTemperatureHeat" Unit="°C" AttributeDataType="xs:double">

<Description>The flow temperature in degrees Celsius refers to the temperature of the water that is circulated from the heat generator (e.g., boiler, heat pump, or solar system)
to the radiators or underfloor heating in a heating system (such as a central heating or hot water system).</Description>

<RefSemantic CorrespondingAttributePath="VDI-ID://06.700.00.30." />

</Attribute>

<Attribute Name="returnTemperatureHeat" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/returnTemperatureHeat" Unit="°C" AttributeDataType="xs:double">

<Description>The return temperature in degrees Celsius refers to the temperature of the water that flows back to the heat generator (e.g., boiler, heat pump, or solar system)
after releasing heat to the radiators or underfloor heating.</Description>

</Attribute>

<Attribute Name="returnTemperatureCold" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/returnTemperatureCold" Unit="°C" AttributeDataType="xs:double">

<Description>The return temperature in degrees Celsius refers to the temperature of the water that flows back to the heat generator (e.g., boiler, heat pump, or solar system)
after releasing heat to the radiators or underfloor heating.</Description>

</Attribute>

<Attribute Name="supplyTemperatureCold" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/supplyTemperatureCold" Unit="°C" AttributeDataType="xs:double">

<Description>The flow temperature in degrees Celsius refers to the temperature of the water that is circulated from the heat generator (e.g., boiler, heat pump, or solar system)
to the radiators or underfloor heating in a heating system (such as a central heating or hot water system).</Description>

<RefSemantic CorrespondingAttributePath="VDI-ID://06.700.00.31." />

</Attribute>

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    <Attribute Name="power" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/power" Unit="W" AttributeData
    <Description>The watt is the SI unit of power (energy turnover per period of time)</Description>
    </Attribute>
    <Attribute Name="tgaKeyH60" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyH60" AttributeData
    <Description>Unique key for the calculation</Description>
    </Attribute>
    <Attribute Name="kv-ValueHeating" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/kv-
    ValueHeating" Unit="m^3/h" AttributeDataTypes="xs:double">
    <Description>The KV value (flow coefficient) describes the amount of water (or another medium) that flows through a valve
    or fitting when a pressure difference of 1 bar is applied.</Description>
    </Attribute>
    <Attribute Name="kv-ValueCooling" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/kv-
    ValueCooling" Unit="m^3/h" AttributeDataTypes="xs:double">
    <Description>The KV value (flow coefficient) indicates the amount of liquid (e.g., water or refrigerant) that flows through a v
    alve or fitting in a cooling circuit when a pressure difference of 1 bar is applied.</Description>
    </Attribute>
    <Attribute Name="massFlowrate" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/massFlowrate" Unit
    ="kg/h" AttributeDataTypes="xs:double">
    <Description>Mass flow in heating refers to the mass flow of heating medium (such as water or another heat transfer fluid)
    through a heating system.</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://44.700.00.5." />
    </Attribute>
    <Attribute Name="zetaValueHeat" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/zetaValueHeat" Att
    ributeDataTypes="xs:int">
    <Description>The Zeta value (ζ-
    value) describes the resistance coefficient causing pressure loss in flow systems, particularly in heating technology.</Descriptio
    n>
    </Attribute>
    <Attribute Name="zetaValueCold" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/zetaValueCold" Attr
    ibuteDataTypes="xs:int">
    <Description>The Zeta value (ζ-
    value) describes the resistance coefficient causing pressure loss in flow systems, particularly in cooling technology.</Descriptio
    n>
    </Attribute>
    <Attribute Name="productRange" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/productRange" Attri
    buteDataTypes="xs:string">
    <Description>A product range description provides an overview of the entire product assortment of a company or brand.</
    Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://38.110.00.4." />
    <RefSemantic CorrespondingAttributePath="VDI-ID://40.110.00.4." />
    <RefSemantic CorrespondingAttributePath="VDI-ID://17.100.00.4." />
    <RefSemantic CorrespondingAttributePath="VDI-ID://20.100.00.4." />
    <RefSemantic CorrespondingAttributePath="VDI-ID://06.110.00.4." />
    <RefSemantic CorrespondingAttributePath="VDI-ID://44.110.00.4." />
    </Attribute>
    <Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataTypes
    ="xs:string">
    <Description>The indication of the floor</Description>
    </Attribute>
    <Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID" AttributeD
    ataTypes="xs:int">
    <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Descr
    iption>
    </Attribute>
    <Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataTypes
    ="xs:int">
    <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
    s to identify information without the need for a central authority or registry.</Description>
    </Attribute>
    </RoleClass>
    <RoleClass Name="RoundDuct" ID="95813e30-2889-4822-a77d-
    b9c6752c096e" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRol
    e/Resource">
    <Description>A round pipe refers to a pipe with a circular cross-
    sectional shape. It is used in the fields of heating, ventilation, and sanitation (HVS), in industry, as well as for cable installations
    and in water or wastewater systems. 1/2
    It comes in various materials, wall thicknesses, connection types, etc.</Description>
    <Version>1.0.0</Version>
    <Attribute Name="plant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/plant" AttributeDataTypes
    ="xs:string">

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<Description>Definition of the system name or the system number</Description>
 </Attribute>
 <Attribute Name="medium" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/medium">
 <Description>Designation of medium name</Description>
 </Attribute>
 <Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nameOfSupplier">
 <Description>Name of supplier which provides the customer with a product or a service</Description>
 <RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
 </Attribute>
 <Attribute Name="material" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/material" AttributeDataType="xs:string">
 <Description>Designation of material name</Description>
 </Attribute>
 <Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" AttributeDataType="xs:string">
 <Description>Describes the components, fittings, pipelines, channels or routes</Description>
 </Attribute>
 <Attribute Name="object" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/object" AttributeDataType="xs:string">
 <Description>Describes the CARF object</Description>
 </Attribute>
 <Attribute Name="gradientValue" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/gradientValue" Unit="%" AttributeDataType="xs:double">
 <Description>Indicates the inclination of the pipe</Description>
 </Attribute>
 <Attribute Name="nominalDiameter" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm" AttributeDataType="xs:int">
 <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement</Description>
 </Attribute>
 <Attribute Name="externalDiameter" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm" AttributeDataType="xs:int">
 <Description>The external Diameter DA indicates the approximate outer diameter of the pipeline in millimetres</Description>
 </Attribute>
 <Attribute Name="wallThickness" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/wallThickness" Unit="mm" AttributeDataType="xs:int">
 <Description>The wall thickness indicates the approximate thickness of the pipe in millimeters</Description>
 </Attribute>
 <Attribute Name="pressure" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/pressure" Unit="PN" AttributeDataType="xs:int">
 <Description>The nominal pressure level PN indicates the maximum permissible pressure with which a fluid may load the pipeline for a pipeline with internal pressure</Description>
 </Attribute>
 <Attribute Name="length" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
 <Description>Description of a length of the object, component, route, pipe, duct.
 A length is the distance between two points.</Description>
 </Attribute>
 <Attribute Name="equivalentLength" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">
 <Description>The term equivalent length refers to a length that represents the pressure loss in a pipeline caused by an obstacle, such as a valve, bend, or fitting.</Description>
 </Attribute>
 <Attribute Name="storey" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/storey" AttributeDataType="xs:string" />
 <Attribute Name="isolation" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/isolation" AttributeDataType="xs:string">
 <Description>Insulation material of the pipe or duct</Description>
 </Attribute>
 <Attribute Name="insulationThickness" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/insulationThickness" Unit="mm" AttributeDataType="xs:int">
 <Description>Packing thickness of insulation</Description>
 </Attribute>
 <Attribute Name="tgaKeyH60" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyH60" AttributeDataType="xs:string">
 <Description>Unique key for the calculation</Description>
 </Attribute>

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    <Attribute Name="tgaKeyS87" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyS87" AttributeD
ataType="xs:string">
    <Description>Unique key for the calculation</Description>
    </Attribute>
    <Attribute Name="tgaKeyS90" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyS90" AttributeD
ataType="xs:string">
    <Description>Unique key for the calculation</Description>
    </Attribute>
    <Attribute Name="pressureCold" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/pressureCold" Unit="
kPa" AttributeDataType="xs:double">
    <Description>A pressure drop in a cooling system refers to the reduction in pressure as the coolant flows through pipes, he
at exchangers, valves, and other system components.</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://20.710.12.5." />
    </Attribute>
    <Attribute Name="pressureHot" Unit="kPa" AttributeDataType="xs:double" RefAttributeType="AutomationML_BuildingServi
ces_AttributeTypeLib/pressureHot">
    <Description>In a hot water system, pressure is essential for ensuring proper water flow and distribution throughout the sys
tem.
The pressure is influenced by factors such as pump performance, pipe resistance, temperature changes, and system design.</
Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://20.710.09.12." />
    <RefSemantic CorrespondingAttributePath="" />
    </Attribute>
    <Attribute Name="massFlowrate" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/massFlowrate" Unit
="kg/h" AttributeDataType="xs:double">
    <Description>Mass flow in heating refers to the mass flow of heating medium (such as water or another heat transfer fluid)
through a heating system.</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://44.700.00.5." />
    </Attribute>
    <Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataTy
pe="xs:string">
    <Description>The indication of the floor</Description>
    </Attribute>
    <Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID" AttributeD
ataType="xs:int">
    <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Descri
ption>
    </Attribute>
    <Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataTy
pe="xs:int">
    <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
s to identify information without the need for a central authority or registry.</Description>
    </Attribute>
    <Attribute Name="couplingIn" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices.Base_Attrib
uteTypeLib/couplingIn">
    <Description>Connection type such as flange, welded, threaded, grooved, etc.</Description>
    </Attribute>
    <Attribute Name="couplingOut" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices.Base_Attr
ibuteTypeLib/couplingOut">
    <Description>Connection type such as flange, welded, threaded, grooved, etc.</Description>
    </Attribute>
</RoleClass>
<RoleClass Name="SmokeIntake" ID="f1eb760e-1526-4ae0-9057-
da0ea94d829b" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRol
e/Resource">
    <Description>Description of the pipe suction system with straight pipe sections and fittings such as elbows, reducers, T-
joints, end caps, etc.</Description>
    <Version>1.0.0</Version>
    <Attribute Name="plant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/plant" AttributeDataTy
pe="xs:string">
    <Description>Definition of the system name.
or the system number.</Description>
    </Attribute>
    <Attribute Name="track" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib
/medium">
    <Description>Designation of medium name</Description>
    </Attribute>
    <Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_Attri
buteTypeLib/nameOfSupplier">
    <Description>Name of supplier which provides the customer with a product or a service</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
    </Attribute>

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    <Attribute Name="material" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/material" AttributeData
ataType="xs:string">
    <Description>Designation of material name</Description>
    </Attribute>
    <Attribute Name="object" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/object" AttributeDataT
ype="xs:string">
    <Description>Describes the CARF object</Description>
    </Attribute>
    <Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" Attrib
uteDataType="xs:string">
    <Description>Describes the components</Description>
    </Attribute>
    <Attribute Name="dn1" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm"
AttributeDataType="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is base
d on the metric system of measurement</Description>
    </Attribute>
    <Attribute Name="dn2" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm"
AttributeDataType="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is base
d on the metric system of measurement</Description>
    </Attribute>
    <Attribute Name="angle" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/angle" Unit="rad" Attrib
uteDataType="xs:double">
    <Description>An angle is formed when two straight lines or rays meet at a common endpoint</Description>
    </Attribute>
    <Attribute Name="length" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" Attr
ibuteDataType="xs:double">
    <Description>Description of a length of the object, component, route, pipe, duct.
A length is the distance between two points.</Description>
    </Attribute>
    <Attribute Name="radiant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/radiant" Unit="rad" At
tributeDataType="xs:double">
    <Description>the distance from a centerline or point to an axis of rotation</Description>
    </Attribute>
    <Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataT
ype="xs:string">
    <Description>The indication of the floor</Description>
    </Attribute>
    <Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID" AttributeD
ataType="xs:int">
    <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Descri
ption>
    </Attribute>
    <Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataT
ype="xs:int">
    <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
s to identify information without the need for a central authority or registry.</Description>
    </Attribute>
    </RoleClass>
    <RoleClass Name="Socket" ID="4a49be33-2266-465a-82d1-
104acd598bec" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRol
e/Resource">
    <Description>Sockets 230V, 16A, 32A, light switches, dimmers, blinds, data sockets, telephone connections, cold water con
nections, hot water connections for cooling of distribution panels, compressed air connections, gas connections, etc.</Descripti
on>
    <Version>1.0.0</Version>
    <Attribute Name="name" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLi
b/name">
    <Description>Designation of the object</Description>
    </Attribute>
    <Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" Attrib
uteDataType="xs:string">
    <Description>Describes the components.</Description>
    </Attribute>
    <Attribute Name="medium" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTyp
eLib/medium">
    <Description>Designation of medium name</Description>
    </Attribute>
    <Attribute Name="object" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/object" AttributeDataT
ype="xs:string">
    <Description>Common characteristics and subdivision, classification</Description>

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</Attribute>
<Attribute Name="comment" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/comment" Attribute
Data Type="xs:string">
  <Description>A feature is generally a recognizable property</Description>
</Attribute>
<Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeData Type
="xs:string">
  <Description>The indication of the floor</Description>
</Attribute>
<Attribute Name="carlID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carlID" AttributeD
ata Type="xs:int">
  <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Descri
ption>
</Attribute>
<Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeData Type
="xs:int">
  <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
s to identify information without the need for a central authority or registry.</Description>
</Attribute>
</RoleClass>
<RoleClass Name="Tank" ID="f9e45f57-48bc-469f-b89f-
7ab362e74c2b" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRol
e/Resource">
  <Description>Sanitary area storage tanks for above-counter or under-
counter, venting pipes in building services for air traps.</Description>
  <Version>1.0.0</Version>
  <Attribute Name="plant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/plant" AttributeData Typ
e="xs:string">
    <Description>Definition of the system name.
or the system number.</Description>
  </Attribute>
  <Attribute Name="medium" AttributeData Type="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTyp
eLib/medium">
    <Description>Designation of medium name</Description>
  </Attribute>
  <Attribute Name="nameOfSupplier" AttributeData Type="xs:string" RefAttributeType="AutomationML_BuildingServices_Attri
buteTypeLib/nameOfSupplier">
    <Description>Name of supplier which provides the customer with a product or a service</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
  </Attribute>
  <Attribute Name="object" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/object" AttributeDataT
ype="xs:string">
    <Description>Describes the CARF object</Description>
  </Attribute>
  <Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" Attrib
uteData Type="xs:string">
    <Description>Describes the components.</Description>
  </Attribute>
  <Attribute Name="name" AttributeData Type="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLi
b/name">
    <Description>Designation of the object</Description>
  </Attribute>
  <Attribute Name="dn1" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm"
AttributeData Type="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is base
d on the metric system of measurement</Description>
  </Attribute>
  <Attribute Name="dn2" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm"
AttributeData Type="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is base
d on the metric system of measurement</Description>
  </Attribute>
  <Attribute Name="dn3" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm"
AttributeData Type="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is base
d on the metric system of measurement</Description>
  </Attribute>
  <Attribute Name="length" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" Attr
ibuteData Type="xs:double">
    <Description>Description of a length of the object, component, route, pipe, duct.
A length is the distance between two points.</Description>
  </Attribute>

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<Attribute Name="pressure" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/pressure" Unit="PN"
AttributeDataType="xs:int">
  <Description>The nominal pressure level PN indicates the maximum permissible pressure with which a fluid may load the
  pipeline for a pipeline with internal pressure</Description>
</Attribute>
<Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeDataType
="xs:string">
  <Description>The indication of the floor</Description>
</Attribute>
<Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID" AttributeD
ataType="xs:int">
  <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Descri
ption>
</Attribute>
<Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeDataType
="xs:int">
  <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
s to identify information without the need for a central authority or registry.</Description>
</Attribute>
<Attribute Name="couplingOut" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices.Base_Attr
ibuteTypeLib/couplingOut">
  <Description>Connection type such as flange, welded, threaded, grooved, etc.</Description>
</Attribute>
<Attribute Name="couplingIn" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices.Base_Attrib
uteTypeLib/couplingIn">
  <Description>Connection type such as flange, welded, threaded, grooved, etc.</Description>
</Attribute>
</RoleClass>
<RoleClass Name="Valve" ID="420617e4-7a2f-405c-b574-053f088c5483" RefBaseClassPath="AutomationML_Base_Libraries@AutomationMLBaseRoleClassLib/AutomationMLBaseRole
/Resource">
  <Description>Valves and shut-off fittings differ in terms of design, pressure rating, and dimensions. 1/2
  They can be flanged, screwed, or welded, motor-driven or manual, etc. 2/2</Description>
  <Version>1.0.0</Version>
  <Attribute Name="plant" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/plant" AttributeDataTyp
e="xs:string">
    <Description>Definition of the system name.
    or the system number.</Description>
  </Attribute>
  <Attribute Name="medium" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_AttributeTyp
eLib/medium">
    <Description>Designation of medium name</Description>
  </Attribute>
  <Attribute Name="description" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/description" Attrib
uteDataType="xs:string">
    <Description>Describes the components.</Description>
  </Attribute>
  <Attribute Name="nameOfSupplier" AttributeDataType="xs:string" RefAttributeType="AutomationML_BuildingServices_Attri
buteTypeLib/nameOfSupplier">
    <Description>Name of supplier which provides the customer with a product or a service</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
  </Attribute>
  <Attribute Name="material" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/material" AttributeD
ataType="xs:string">
    <Description>Designation of material name</Description>
  </Attribute>
  <Attribute Name="object" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/object" AttributeDataT
ype="xs:string">
    <Description>Describes the CARF object</Description>
  </Attribute>
  <Attribute Name="nominalDiameter" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter
" Unit="mm" AttributeDataType="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is base
    d on the metric system of measurement</Description>
  </Attribute>
  <Attribute Name="dn1" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm"
  AttributeDataType="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is base
    d on the metric system of measurement</Description>
  </Attribute>
  <Attribute Name="dn2" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm"
  AttributeDataType="xs:int">

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<Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement</Description>

</Attribute>

<Attribute Name="dn3" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter" Unit="mm" AttributeDataType="xs:int">

<Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement</Description>

</Attribute>

<Attribute Name="pressure" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/pressure" Unit="PN" AttributeDataType="xs:int">

<Description>The nominal pressure level PN indicates the maximum permissible pressure with which a fluid may load the pipeline for a pipeline with internal pressure</Description>

</Attribute>

<Attribute Name="length" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/length" Unit="mm" AttributeDataType="xs:double">

<Description>Description of a length of the object, component, route, pipe, duct.
A length is the distance between two points.</Description>

</Attribute>

<Attribute Name="tgaKeyH60" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyH60" AttributeDataType="xs:string">

<Description>Unique key for the calculation</Description>

</Attribute>

<Attribute Name="tgaKeyS87" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyS87" AttributeDataType="xs:string">

<Description>Unique key for the calculation</Description>

</Attribute>

<Attribute Name="tgaKeyS90" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/tgaKeyS90" AttributeDataType="xs:string">

<Description>Unique key for the calculation</Description>

</Attribute>

<Attribute Name="pressureHot" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/pressureHot" Unit="kPa" AttributeDataType="xs:double">

<Description>In a hot water system, pressure is essential for ensuring proper water flow and distribution throughout the system.
The pressure is influenced by factors such as pump performance, pipe resistance, temperature changes, and system design.</Description>

<RefSemantic CorrespondingAttributePath="VDI-ID://20.710.09.12." />

</Attribute>

<Attribute Name="pressureCold" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/pressureCold" Unit="kPa" AttributeDataType="xs:double">

<Description>A pressure drop in a cooling system refers to the reduction in pressure as the coolant flows through pipes, heat exchangers, valves, and other system components.</Description>

<RefSemantic CorrespondingAttributePath="VDI-ID://20.710.12.5." />

</Attribute>

<Attribute Name="minPressureHot" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/minPressureHot" Unit="Pa" AttributeDataType="xs:int">

<Description>In a hot water system, pressure is essential for ensuring proper water flow and distribution throughout the system. The pressure is influenced by factors such as pump performance, pipe resistance, temperature changes, and system design.</Description>

<RefSemantic CorrespondingAttributePath="VDI-ID://17.710.02.13." />

</Attribute>

<Attribute Name="minPressureCold" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/minPressureCold" Unit="Pa" AttributeDataType="xs:int">

<Description>In a hot water system, pressure is essential for ensuring proper water flow and distribution throughout the system. The pressure is influenced by factors such as pump performance, pipe resistance, temperature changes, and system design.</Description>

<RefSemantic CorrespondingAttributePath="VDI-ID://17.710.02.12." />

</Attribute>

<Attribute Name="massFlowrate" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/massFlowrate" Unit="kg/h" AttributeDataType="xs:double">

<Description>Mass flow in heating refers to the mass flow of heating medium (such as water or another heat transfer fluid) through a heating system.</Description>

<RefSemantic CorrespondingAttributePath="VDI-ID://44.700.00.5." />

</Attribute>

<Attribute Name="hotWaterFlowrate" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/hotWaterFlowrate" Unit="l/s" AttributeDataType="xs:double">

<Description>The hot water flow rate refers to the volume of hot water passing through a pipe, faucet, or heating system per unit of time.</Description>

<RefSemantic CorrespondingAttributePath="VDI-ID://17.710.02.26." />

</Attribute>

<Attribute Name="coldWaterFlowrate" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/coldWaterFlowrate" Unit="l/s" AttributeDataType="xs:double">

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<Description>The cold water flow rate refers to the volume of cold water passing through a pipe, faucet, or system per unit
of time.</Description>
<RefSemantic CorrespondingAttributePath="VDI-ID://17.710.02.15." />
</Attribute>
<Attribute Name="zetaValueHeat" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/zetaValueHeat" AttributeData
Type="xs:int">
<Description>The Zeta value (ζ-
value) describes the resistance coefficient causing pressure loss in flow systems, particularly in heating technology.</Description
n>
</Attribute>
<Attribute Name="zetaValueCold" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/zetaValueCold" AttributeData
Type="xs:int">
<Description>The Zeta value (ζ-
value) describes the resistance coefficient causing pressure loss in flow systems, particularly in cooling technology.</Description
n>
</Attribute>
<Attribute Name="productRange" RefAttributeType="AutomationML_BuildingServices_AttributeTypeLib/productRange" AttributeData
Type="xs:string">
<Description>A product range description provides an overview of the entire product assortment of a company or brand.</Description>
<RefSemantic CorrespondingAttributePath="VDI-ID://38.110.00.4." />
<RefSemantic CorrespondingAttributePath="VDI-ID://17.100.00.4." />
</Attribute>
<Attribute Name="carfID" RefAttributeType="CARF_Base_AttributeTypeLib@LAX_Carf_AttributeTypeLib/carfID" AttributeData
Type="xs:int">
<Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Description>
</Attribute>
<Attribute Name="guid" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid" AttributeData
Type="xs:int">
<Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
s to identify information without the need for a central authority or registry.</Description>
</Attribute>
<Attribute Name="couplingOut" AttributeData="xs:string" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/couplingOut">
<Description>Connection type such as flange, welded, threaded, grooved, etc.</Description>
</Attribute>
<Attribute Name="couplingIn" AttributeData="xs:string" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/couplingIn">
<Description>Connection type such as flange, welded, threaded, grooved, etc.</Description>
</Attribute>
<Attribute Name="floor" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/floor" AttributeData
Type="xs:string">
<Description>indication of the floor</Description>
</Attribute>
</RoleClass>
</RoleClassLib>

```

Figure 17 - AutomationML_BuildingServices.Resource_RoleClassLib as XML representation

```

<RoleClassLib Name="AutomationML_BuildingServices.Structure_RoleClassLib">
  <Description>Role classes from the modules Heating, Ventilation, Sanitary, Sprinkler, Electrical.</Description>
  <Version>1.1.0</Version>
  <RoleClass Name="PipeSystem" ID="65124c26-5b7f-4977-8b34-8639b4e7424a" RefBaseClassPath="AutomationML_DiscreteManufacturing_RoleClassLib_Extension@AutomationMLExtendedRoleClassLib/ProductionLine">
    <Description>PipesSystem are used in the manufacturing and process industry to transport various substances, including water, gas, or air.</Description>
    <Version>1.0.0</Version>
    <Attribute Name="guid" AttributeDataType="xs:int" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid">
      <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.</Description>
    </Attribute>
  </RoleClass>
  <RoleClass Name="CommunicationEngineering" ID="a7de1ed0-2d63-47a8-9aa2-ed6b7d988a8c" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/ElectricalSystem">
    <Description>Communication technology is a subfield of electrical engineering that deals with the transmission, processing, and storage of information. It plays a central role in telecommunications and encompasses various technologies and systems necessary for communication over long distances.</Description>
    <Version>1.0.0</Version>
    <Attribute Name="guid" AttributeDataType="xs:int" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid">
      <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.</Description>
    </Attribute>
  </RoleClass>
  <RoleClass Name="DevicesAir" ID="469ff832-07e2-4719-97a7-2281dbdb0968" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/VentilationSystem">
    <Description>A devices air system, often referred to as a localized or point-source air system, involves the use of individual devices or appliances to manage air quality, temperature, and ventilation in specific areas within a building.</Description>
    <Version>1.0.0</Version>
    <Attribute Name="guid" AttributeDataType="xs:int" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid">
      <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.</Description>
    </Attribute>
  </RoleClass>
  <RoleClass Name="ElectricalSystem" ID="652c4027-18b1-4564-832f-4f25ea47286e" RefBaseClassPath="AutomationML_DiscreteManufacturing_RoleClassLib_Extension@AutomationMLExtendedRoleClassLib/ProductionLine">
    <Description>Electrical engineering plays a central role in modern technology and involves the generation, transmission, and utilization of electrical energy and systems. It encompasses energy generation, energy transmission, electrical installation, automation technology, and electronics.</Description>
    <Version>1.0.0</Version>
    <Attribute Name="guid" AttributeDataType="xs:int" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid">
      <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.</Description>
    </Attribute>
  </RoleClass>
  <RoleClass Name="ExhaustAir" ID="eb3d13ff-b235-4330-90d7-e09202c92f2a" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/VentilationSystem">
    <Description>An exhaust air system is designed to remove stale or contaminated air from a building and is a critical component of effective ventilation.</Description>
    <Version>1.0.0</Version>
    <Attribute Name="guid" AttributeDataType="xs:int" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid">
      <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.</Description>
    </Attribute>
  </RoleClass>
  <RoleClass Name="ExteriorAir" ID="47e88594-9638-45d1-968a-fc622a3fed2a" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/VentilationSystem">
    <Description>An exterior air system is designed to manage and improve the quality of air entering a building from the outside environment.</Description>
    <Version>1.0.0</Version>
    <Attribute Name="guid" AttributeDataType="xs:int" RefAttributeType="AutomationML_BuildingServices.Base_AttributeTypeLib/guid">

```

<Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system s to identify information without the need for a central authority or registry.</Description>
</Attribute>
</RoleClass>
<RoleClass Name="ExtractAir" ID="d62efebf-1870-4f9f-954b-3db0576eb718" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/VentilationSystem">
<Description>An extract air system, often referred to as an exhaust air system, is specifically designed to remove air from a building to maintain indoor air quality and comfort</Description>
<Version>1.0.0</Version>
<Attribute Name="guid" AttributeDataType="xs:int" RefAttributeType="AutomationML_BuildingServices.Base_AttributeType Lib/guid">
<Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system s to identify information without the need for a central authority or registry.</Description>
</Attribute>
</RoleClass>
<RoleClass Name="GasPurgeAir" ID="1de797f-6d10-42dc-9d81-dc500b529f2f" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/VentilationSystem">
<Description>A gas purge air system is designed to remove unwanted gases or contaminants from a space by introducing clean air or an inert gas</Description>
<Version>1.0.0</Version>
<Attribute Name="guid" AttributeDataType="xs:int" RefAttributeType="AutomationML_BuildingServices.Base_AttributeType Lib/guid">
<Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system s to identify information without the need for a central authority or registry.</Description>
</Attribute>
</RoleClass>
<RoleClass Name="Lightning" ID="6359f975-7260-41bb-8abc-3f3113cc1369" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/ElectricalSystem">
<Description>Lighting in electrical engineering refers to the design, installation, and use of lighting systems that illuminate spaces, outdoor areas, or specific objects. Lighting plays a crucial role in spatial design safety, and functionality.</Description>
<Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="LowCurrent" ID="b731ab90-ffcc-4fbd-a5e3-4965d00a3931" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/ElectricalSystem">
<Description>Low voltage refers to electrical currents and voltages that are low compared to high voltage. Typically, this involves voltages up to 1,000 volts (V) for alternating current and up to 1,500 V for direct current</Description>
<Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="MainPower" ID="29e3974d-4d3d-48a1-a36c-c7816d771e53" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/ElectricalSystem">
<Description>High voltage refers to electrical currents with high voltages and power levels, typically above 1,000 volts (V) for alternating current or 1,500 V for direct current. High voltage is primarily used in power transmission, industrial applications, and large machinery.</Description>
<Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="ObjectWasteAir" ID="5e3ea089-d2eb-4951-ab70-49d703c8517c" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/VentilationSystem">
<Description>An object waste air system, often referred to in the context of industrial or commercial settings, is designed to manage and eliminate waste air generated during processes that involve the handling or processing of materials</Description>
<Version>1.0.0</Version>
<Attribute Name="guid" AttributeDataType="xs:int" RefAttributeType="AutomationML_BuildingServices.Base_AttributeType Lib/guid">
<Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system s to identify information without the need for a central authority or registry.</Description>
</Attribute>
</RoleClass>
<RoleClass Name="ProcessAir" ID="8f477ba2-8d8d-4a22-aeda-5b7995c1d506" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/VentilationSystem">
<Description>A process air system is designed to supply and manage air for specific industrial processes, ensuring optimal conditions for operations such as heating, cooling, drying, and chemical reactions</Description>
<Version>1.0.0</Version>
<Attribute Name="guid" AttributeDataType="xs:int" RefAttributeType="AutomationML_BuildingServices.Base_AttributeType Lib/guid">
<Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system s to identify information without the need for a central authority or registry.</Description>
</Attribute>
</RoleClass>
<RoleClass Name="RecirculationAir" ID="488511bd-3372-4159-971e-10076f062d50" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/VentilationSystem">
<Description>A recirculation air system is designed to improve indoor air quality and comfort by reusing a portion of the air within a building. This system is commonly found in heating, ventilation, and air conditioning (HVAC) setups</Description>
<Version>1.0.0</Version>

```

<Attribute Name="guid" AttributeDataType="xs:int" RefAttributeType="AutomationML_BuildingServices.Base_AttributeType
Lib/guid">
  <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
s to identify information without the need for a central authority or registry.</Description>
</Attribute>
</RoleClass>
<RoleClass Name="SafetyEngineering" ID="372277ab-1244-4b0f-a652-
c4a6aee9fa2c" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/ElectricalSystem">
  <Description>Safety technology in electrical engineering focuses on protecting people, systems, and information from hazar
ds that can arise from electrical systems or devices.
It encompasses a variety of measures and technologies aimed at minimizing risks and ensuring safety.</Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="SupplyAir" ID="b4e52317-1b76-4b60-84e6-
65a35308e84f" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/VentilationSystem">
  <Description>A supply air system is designed to introduce fresh, conditioned air into a building, ensuring a comfortable and
healthy indoor environment</Description>
  <Version>1.0.0</Version>
  <Attribute Name="guid" AttributeDataType="xs:int" RefAttributeType="AutomationML_BuildingServices.Base_AttributeType
Lib/guid">
    <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
s to identify information without the need for a central authority or registry.</Description>
    </Attribute>
  </RoleClass>
  <RoleClass Name="VentilationSystem" ID="edb97ed3-d036-4dff-8f9d-
c834b64e9cf8" RefBaseClassPath="AutomationML_DiscreteManufacturing_RoleClassLib_Extension@AutomationMLExtended
RoleClassLib/ProductionLine">
    <Description>A ventilation system is a crucial component in buildings, designed to control indoor air quality, temperature, an
d humidity.
It helps to circulate fresh air, remove stale air, and regulate environmental conditions.</Description>
    <Version>1.0.0</Version>
    <Attribute Name="guid" AttributeDataType="xs:int" RefAttributeType="AutomationML_BuildingServices.Base_AttributeType
Lib/guid">
      <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and system
s to identify information without the need for a central authority or registry.</Description>
      </Attribute>
    </RoleClass>
    <RoleClass Name="GasSystem" ID="79fdb29a-bf76-48bb-9478-
5ee6030bf8ea" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem">
      <Description>Gases are material substances that exist in a state where their molecules are far apart and they evenly fill the
entire space they occupy. 1/2
Gases have no fixed shape or volume, making them highly compressible. 2/2</Description>
      <Version>1.0.0</Version>
    </RoleClass>
    <RoleClass Name="ColdWaterSystem" ID="b0a49779-31df-4c21-84e3-
668b347e40e2" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem">
      <Description>In the building services engineering (TGA), the cold water system plays a central role in providing cooling wate
r for various applications within a building. Cold water is required for a wide range of purposes, particularly in areas such as heat
ing, ventilation, and air conditioning (HVAC), sanitary facilities, fire protection systems, and the cooling of technical equipment.</
Description>
      <Version>1.0.0</Version>
    </RoleClass>
    <RoleClass Name="CompressedAirSystem" ID="d40185ae-1fda-4717-8b73-
abc941529bcd" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem">
      <Description>Compressed air is a versatile medium that plays a central role in building services engineering (TGA) and man
y industrial processes.It is used for energy supply, regulation, control, and cleaning, and is an effective solution for a wide range
of applications.</Description>
      <Version>1.0.0</Version>
    </RoleClass>
    <RoleClass Name="CondensateSystem" ID="5b9a60c3-15c6-477b-9216-
d217704df36e" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem">
      <Description>In building services engineering (TGA), the term condensate refers to the water that forms through the conden
sation process when a gas, usually water vapor, comes into contact with a cooler surface and changes into liquid form.</Descrip
tion>
      <Version>1.0.0</Version>
    </RoleClass>
    <RoleClass Name="TankPlantSystem" ID="09939e92-22d7-4fbf-b061-
a4fb85705e80" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem">
      <Description>Tank facilities are specialized installations used for the storage of liquids, typically in large quantities. They are
employed in various industries, including chemicals, food, oil, and wastewater management.</Description>
      <Version>1.0.0</Version>
    </RoleClass>

```

```

<RoleClass Name="HeatingSystem" ID="373c75ec-e1bd-4ef8-aaba-
14a5a5ef4d55" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem">
  <Description>A static heater, also known as a radiator or convector, is a heating system that releases heat through radiation
  and convection. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="DrinkingWaterSystem" ID="83de2573-4038-4014-8cf8-
db9f968195c7" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem">
  <Description>The drinking water system ensures that water is available in sufficient quantity and quality for daily use, such a
  s drinking, cooking, washing, hygiene, and heating.</Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="SprinklerSystem" ID="07a2a04a-b126-4f18-83f2-
4b7d4cc4f026" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem">
  <Description>Sprinkler technology in TGA (Technical Building Equipment) refers to the design, installation, and maintenanc
  e of sprinkler systems for fire suppression and prevention in buildings.</Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="RainWaterSystem" ID="4bf45ac1-8cbd-44a7-b0d2-
454556f4df6c" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem">
  <Description>A rainwater system is a system for collecting, storing, and utilizing rainwater. Such systems are increasingly us
  ed in residential and commercial buildings </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="ReserveSystem" ID="16c421f4-f29b-4ed5-a290-
8c5b92d0a739" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem">
  <Description>A reserve type is a medium that is not occupied</Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="SteamSystem" ID="26116bd3-0194-477f-a93b-
2c3478010725" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem">
  <Description>Steam is the gaseous state of water that occurs when water is heated and evaporates. It is an invisible gas th
  at exists at higher temperatures and pressures. Steam plays an important role in various applications, from energy generation to
  heating technology.</Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="WasteWaterSystem" ID="1395293e-de1c-43f6-9565-
6cd732db6694" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem">
  <Description>Wastewater is a term that is divided into two main categories: gray water and black water. Gray water is a spe
  cific form of wastewater that originates from sanitary installations but is not contaminated with feces. Black water is a type of wa
  stewater that is contaminated with feces and urine. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="Argon" ID="032e3ebf-3ac9-4d2e-adfb-
b04f9a4e7c31" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/GasSystem">
  <Description>In building services engineering (TGA), argon is primarily used in windows and ventilation systems, while in in
  dustry, it plays a key role as a shielding gas in welding, metal processing, the semiconductor industry, and glass manufacturing.
  </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="CarbonDioxide" ID="2117d0cd-8268-49c9-ad80-
9c913ede705b" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/GasSystem">
  <Description>In building services engineering (TGA), carbon dioxide is used as a versatile gas in various applications, partic
  ularly in air quality control, cooling technology, fire protection, and industry.</Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="Corgon" ID="0599e3ab-ea52-4a62-9041-
b35cf9375aaa" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/GasSystem">
  <Description>Corgon is not a widely recognized term in building services or gas technology. It's possible you're referring to "
  Corgon" as a brand or a term used for a specific gas or product in certain countries or industries.</Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="Helium" ID="1dd9f77b-509c-4d70-96b3-
00007b41363d" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/GasSystem">
  <Description>Helium (He) is a colorless, odorless, chemically inert, lightweight gas that plays a significant role in building ser
  vices engineering (TGA) for various specialized applications. In TGA, helium is primarily used in systems and installations that r
  equire specific gas properties. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="Hydrogen" ID="54a5fdf7-805d-4ba1-8e7e-
2a770e5d139a" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/GasSystem">

```

<Description>Hydrogen is playing an increasingly important role in building services engineering (TGA), particularly in the areas of energy supply, sustainable heating systems, and cooling technology. Through its use in fuel cells, as a raw material in industry, and in innovative technologies for reducing CO₂ emissions, hydrogen is a key element in modern TGA. </Description>

<Version>1.0.0</Version>

</RoleClass>

<RoleClass Name="NaturalGas" ID="b43affa0-ce9f-4682-8af3-

0a5df7890f45" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/GasSystem">

<Description>Natural gas is often preferred due to its efficiency, availability, and environmental benefits. </Description>

<Version>1.0.0</Version>

</RoleClass>

<RoleClass Name="Nitrogen" ID="60992698-3cf0-435a-acb6-

d13153b65c40" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/GasSystem">

<Description>As an inert gas, nitrogen plays an important role in systems that require a controlled atmosphere or in processes where a reaction with oxygen or other gases needs to be prevented. </Description>

<Version>1.0.0</Version>

</RoleClass>

<RoleClass Name="Oxygen" ID="df8d2e08-dc7a-4c14-95ce-

224b6cd41418" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/GasSystem">

<Description>In building services engineering (TGA), oxygen as a technical gas is an important component for various applications in medical, industrial, and scientific fields.

The documentation and planning include the design of central supply systems, the proper distribution and monitoring of oxygen, as well as compliance with all safety regulations. </Description>

<Version>1.0.0</Version>

</RoleClass>

<RoleClass Name="Propane" ID="2dde9dfc-5d70-4638-9f9b-

bee777ff0c22" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/GasSystem">

<Description>In building services engineering (TGA), propane is used as a fuel in various applications, particularly in heating, ventilation, and air conditioning (HVAC) systems. Propane (C₃H₈) is an aliphatic, liquid hydrocarbon gas that is often stored as a liquefied petroleum gas (LPG) and is used in numerous technical fields. </Description>

<Version>1.0.0</Version>

</RoleClass>

<RoleClass Name="SmokeGas" ID="87054e3c-f746-4292-ba64-

bf6bd2ce9370" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/GasSystem">

<Description>In building services engineering (TGA), carbon dioxide has a wide range of applications, from air quality control to fire protection and specialized industrial processes. The planning and installation of CO₂ systems require precise coordination to meet specific requirements, ranging from cooling and chemical industries to food processing. </Description>

<Version>1.0.0</Version>

</RoleClass>

<RoleClass Name="ColdWaterFlow" ID="8d49dead-17cf-4db9-a6b4-

575021e2ff07" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/ColdWaterSystem">

<Description>The cooling water supply is a central component in a cooling water system, as it transports the water to the equipment or processes to be cooled, where it absorbs heat. </Description>

<Version>1.0.0</Version>

</RoleClass>

<RoleClass Name="ColdWaterReturn" ID="e8c9aff5-e0f3-465a-8e5c-

537062984c6e" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/ColdWaterSystem">

<Description>The cold water return is an important component of a cold water system, describing the path of the water that, after use or cooling, is returned to the starting point of the circuit. 1/2

In a typical system, cold water is first directed to the points of use (e.g., air conditioning units, cooling systems, or sanitary facilities), where it performs its cooling function or is used for other purposes. 2/2 </Description>

<Version>1.0.0</Version>

</RoleClass>

<RoleClass Name="CoolingWaterFlow" ID="c2b0c540-f0fc-404a-8b0a-

a94550eb83e1" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/ColdWaterSystem">

<Description>The cooling water supply is a central component in a cooling water system, as it transports the water to the equipment or processes to be cooled, where it absorbs heat. </Description>

<Version>1.0.0</Version>

</RoleClass>

<RoleClass Name="CoolingWaterReturn" ID="0388d435-5290-4c9a-81e8-

1dd0b7d81b02" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/ColdWaterSystem">

<Description>The cooling water return is an essential component of an efficient cooling water system. It is responsible for carrying heated water from the equipment being cooled back to the cooling tower or heat exchanger, where the heat is released and the water is cooled down. </Description>

<Version>1.0.0</Version>

</RoleClass>

<RoleClass Name="DeepColdFlow" ID="e9f81ab6-79a3-48bf-a97d-

1d607622e8b3" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/ColdWaterSystem">

<Description>The cryogenic supply refers to the part of a cooling or cryogenic system where a very cold coolant (usually a special cryogenic fluid or gas) is fed into a machine, plant, or process to achieve extremely low temperatures (often below -100°C). </Description>

<Version>1.0.0</Version>

</RoleClass>

```

<RoleClass Name="DeepColdReturn" ID="373b8697-1eaa-437d-a854-494c5b66f1e1" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/ColdWaterSystem">
  <Description>The cryogenic return refers to the part of a cooling or cryogenic system where the cooled medium (often a cryogenic such as liquid nitrogen, helium, or a special coolant) is returned after absorbing heat from the system or process being cooled, to either be reintroduced into the cycle or processed again in a special tank or evaporator. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="GlycolCircuitFlow" ID="fb3ec8b1-d805-46e0-b100-33bd6e06300a" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/ColdWaterSystem">
  <Description>The glycol supply refers to the section of a cooling system where a glycol-water mixture (often an antifreeze mixture) is introduced into the system as a cooling medium. Glycol is primarily used in cooling systems to regulate temperature while protecting against freeze damage, as it does not freeze at low temperatures compared to pure water. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="GlycolCircuitReturn" ID="bf543a8b-565e-4e4f-a3ab-60200e2ca4d3" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/ColdWaterSystem">
  <Description>The glycol return refers to the section of a cooling system where the heated glycol-water mixture, after absorbing heat from the system or process being cooled, is returned. Once the glycol has absorbed heat and warmed up, it is directed back through the return line to the cooling system, where it is either cooled down again or reintroduced into the cycle. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="CompressedAir12bar" ID="94bbf772-6e6c-4304-b39b-3c1f33fc27d0" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/CompressedAirSystem">
  <Description>Compressed air at 12 bar refers to air that has been compressed to a pressure of 12 bar, which is approximately twelve times the atmospheric pressure. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="CompressedAir3bar" ID="8d255168-ee13-48f5-9f41-0c3ee42517a1" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/CompressedAirSystem">
  <Description>Compressed air at 3 bar refers to air that has been compressed to a pressure of 3 bar, which is approximately three times the atmospheric pressure. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="CompressedAir6bar" ID="d05985cf-5d1a-4f27-b5cd-ec1d626ecea8" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/CompressedAirSystem">
  <Description>Compressed air at 6 bar is a widely used, moderate to high-pressure solution in industrial and building services applications. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="CompressedAir8bar" ID="491e5f5b-86e3-4f61-95c6-1538ea0d65ca" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/CompressedAirSystem">
  <Description>Compressed air at 8 bar refers to air that has been compressed to a pressure of 8 bar, which is approximately eight times the atmospheric pressure. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="Condensate10bar" ID="1b2af672-a05d-4562-8b48-17699a1f4524" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/CondensateSystem">
  <Description>Condensate at 10 bar is generated when steam, at this higher pressure, cools down and condenses. The saturation temperature for steam at 10 bar is approximately 180.4°C. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="Condensate12bar" ID="35834b1b-a990-43ce-be13-2c9941cd9397" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/CondensateSystem">
  <Description>Condensate at 12 bar is produced when steam at 12 bar pressure cools down and condenses. The saturation temperature for steam at this pressure is approximately 188.8°C. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="Condensate20bar" ID="57a0d7f5-db0d-41c9-a49a-e4d33cf9ef2e" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/CondensateSystem">
  <Description>Condensate at 20 bar is produced when steam, under a pressure of 20 bar, cools down and condenses. The saturation temperature for steam at this pressure is about 212.4°C. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="Condensate24bar" ID="f583d733-be2b-4415-8bf6-180f0a27a314" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/CondensateSystem">
  <Description>Condensate at 24 bar is formed when steam at a pressure of 24 bar cools and condenses. The saturation temperature at 24 bar is approximately 227.7°C. </Description>
  <Version>1.0.0</Version>
</RoleClass>

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<RoleClass Name="Condensate3bar" ID="1ef16ccf-158b-441b-93da-5be5a7d7de75" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/CondensateSystem">
  <Description>Condensate at 3 bar is generated in steam systems, heating systems, and other technical processes that operate under steam pressure. The condensation process at 3 bar occurs at a saturation temperature of approximately 133.5°C. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="Condensate4bar" ID="343b5053-ada1-4e68-8084-80a77973f95c" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/CondensateSystem">
  <Description>Condensate at 4 bar is generated when steam at this pressure cools down and condenses into liquid form. The saturation temperature for this steam is approximately 143.6°C. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="Diesel" ID="3aaf17b8-8a40-49a6-bdb1-c5190d4a81bb" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/TankPlantSystem">
  <Description>The material diesel generally refers to the chemical and physical properties of diesel fuel. Diesel fuel is a mixture of hydrocarbons that is refined from crude oil. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="FuelOil" ID="80ce1775-d0bb-4b60-b6a6-1abee84b3e1d" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/TankPlantSystem">
  <Description>Gasoline is a liquid fuel primarily used in spark-ignition engines. It is refined from crude oil and consists of a complex mixture of hydrocarbons. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="Glykol" ID="5a2aaf36-f088-447b-bd63-88730f0d2a04" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/TankPlantSystem">
  <Description>Glycol is an organic compound that belongs to the group of alcohols. There are various types of glycol, but the two most common are ethylene glycol and propylene glycol. Among other uses, ethylene glycol is commonly used as an antifreeze in cooling systems and vehicle engines to prevent freezing and overheating </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="Methanol" ID="922a555f-d0a8-4ca4-8e00-aed5fc55e05a" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/TankPlantSystem">
  <Description>Methanol is a simple alcohol with the chemical formula CH3OH. It is a colorless and odorless liquid that belongs to the group of alcohols. In fuel applications, it is used as an alternative fuel in some vehicles and can also be used in the production of biodiesel. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="Oil" ID="7434afd2-f773-4e75-bb8c-8e11188fbc85" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/TankPlantSystem">
  <Description>Oil is a viscous liquid derived from natural sources, primarily consisting of hydrocarbons. It plays a crucial role in various industries and applications. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="OldOil" ID="bc523d69-535e-4aef-bd0e-3e9fdbb37ec7" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/TankPlantSystem">
  <Description>Used oil is a term for oil that has been used or consumed during the operation of engines, machines, or other equipment. It can include various types of lubricants, such as motor oil, transmission fluid, and hydraulic oil. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="DistrictHeatingFlow" ID="84e1a093-5bb7-4239-ae22-a0318adf7d6b" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/HeatingSystem">
  <Description>The term "district heating flow" refers to the water that is pumped from the central heating system or district heating plant into the connected buildings. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="DistrictHeatingReturn" ID="44aea27b-385e-4263-9562-1497d26423ed" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/HeatingSystem">
  <Description>This is the water that is returned to the central heating system or district heating plant after being used in the radiators or for domestic hot water preparation. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="HeatingWaterFlow" ID="c69f4cfe-7fda-49d2-85e8-17321cb02500" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/HeatingSystem">
  <Description>This is the temperature of the heating water that is pumped from the heating system into the radiators. It is typically higher than the return temperature, which is the temperature of the water that flows back to the heating system after releasing its heat. </Description>
  <Version>1.0.0</Version>
</RoleClass>

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<RoleClass Name="HeatingWaterReturn" ID="9408f39b-5854-4ecc-9325-6346e9effb09" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/HeatingSystem">
  <Description>This is the temperature of the water that is returned to the heating system after being heated by the radiators i
n the rooms. The return is typically cooler than the flow, as the water has given off heat to the space during its passage through
the radiators. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="IndustryHeatingFlow" ID="a0a4417d-591e-4907-8d9c-1db20fd0753c" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/HeatingSystem">
  <Description>This is the water or steam that is returned to a boiler or heat supply unit after being used in industrial applicatio
ns. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="IndustryHeatingReturn" ID="f61b3170-0812-4f2b-8f90-1e58f1de95f0" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/HeatingSystem">
  <Description>This is the heating water or steam that is delivered at a specific temperature from a heating source, such as a
boiler or a heat supply unit, to the processes or heating systems in the industry. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="ProcessHeatingFlow" ID="eb38875d-4ebb-4f5e-8e6c-63d2624d5f8a" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/HeatingSystem">
  <Description>This is the heating water or steam that is supplied at a specific temperature from a heating source, such as a b
oiler or a heat supply unit, to the industrial processes or heating systems. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="ProcessHeatingReturn" ID="be5a900b-0ff1-441f-9958-55576ccee034" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/HeatingSystem">
  <Description>This is the water or steam that is returned to a boiler or heat supply unit after being used in industrial applicatio
ns. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="RoomHeatingFlow" ID="b2885325-f01f-4a85-be0b-f992b0289415" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/HeatingSystem">
  <Description>This is the heating water that is supplied at a specific temperature from the heating system to the radiators or
other heating systems to warm the rooms. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="RoomHeatingReturn" ID="4654390a-bc56-453c-b5d1-14274809970" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/HeatingSystem">
  <Description>This is the water that is returned to the heating system after releasing heat to the room. It typically has a lower
temperature than the heating water that is supplied to the radiators or heating system. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="DrinkingWaterSystemCirculation" ID="19b3aa82-9f26-4729-a502-5d05a8ebb277" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/DrinkingWaterSystem">
  <Description>A drinking water recirculation system plays a key role in enhancing user comfort by providing hot water quickly
and efficiently. It ensures a constant temperature and prevents the growth of harmful bacteria, such as Legionella. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="DrinkingWaterSystemCold" ID="562da7e0-9635-41fc-babb-c20b4e08c8b0" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/DrinkingWaterSystem">
  <Description>The cold drinking water system in a building ensures the availability of safe, clean water for all daily needs, fro
m drinking and cooking to bathing and cleaning. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="DrinkingWaterSystemWarm" ID="417847d0-3862-42e4-9f8b-bc72def26f65" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/DrinkingWaterSystem">
  <Description>A hot water system is an essential component of the drinking water supply in a building, ensuring that potable
water is heated to the desired temperature. It is crucial for the comfort of users and the functionality of various sanitary facilities,
such as showers, sinks, kitchens, and heating systems. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="ExstinguishingWater" ID="d41a5fb2-f9e1-441d-bfa6-fb83275e2f26" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/SprinklerSystem">
  <Description>Firefighting water has a cooling and smothering effect on the fire and is used to lower the temperature of the fi
re source and interrupt the chemical reactions that sustain the fire. </Description>
  <Version>1.0.0</Version>
</RoleClass>
<RoleClass Name="Hydrant" ID="d259fead-8437-4366-92ec-f3adcbbee0c3" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/SprinklerSystem">

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<Description>A hydrant system is a combination of a hydrant system and a sprinkler system, often used together in larger fire protection installations or in areas with an increased fire risk. </Description>

<Version>1.0.0</Version>

</RoleClass>

<RoleClass Name="ObjectProtection" ID="2671a4ba-1c28-4596-8954-77256914834b" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/SprinklerSystem">

<Description>Object protection sprinklers (also known as asset protection sprinklers) are a specialized type of sprinkler system designed to protect valuable objects, equipment, and materials within a building or on a premises. These systems are deployed in areas where precious or sensitive items are stored, ensuring that any potential fire is quickly suppressed while minimizing water damage to the assets being protected. </Description>

<Version>1.0.0</Version>

</RoleClass>

<RoleClass Name="RoomProtection" ID="fc122f0d-9bdb-4a4b-be09-7891e99ed5d4" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/SprinklerSystem">

<Description>These sprinkler systems are specifically designed to be activated only in areas where there is an actual fire risk, thus providing preventive fire suppression within designated protected zones. </Description>

<Version>1.0.0</Version>

</RoleClass>

<RoleClass Name="Steam10bar" ID="4f8b48dd-5e6d-4987-8dfb-b177598b2121" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/SteamSystem">

<Description>Steam at 10 bar (approximately 1,000 kPa) refers to steam generated under a pressure of 10 bar above atmospheric pressure.

This pressure corresponds to a saturation temperature of about 180 °C (356 °F). </Description>

<Version>1.0.0</Version>

</RoleClass>

<RoleClass Name="Steam12bar" ID="3ed6168f-fba5-4efc-81ef-effba3ae629c" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/SteamSystem">

<Description>Steam at 12 bar (approximately 1,200 kPa) refers to steam generated under a pressure of 12 bar above atmospheric pressure.

This pressure corresponds to a saturation temperature of about 188 °C (370 °F). </Description>

<Version>1.0.0</Version>

</RoleClass>

<RoleClass Name="Steam3bar" ID="6aa142ff-abab-45d8-8658-3845663067aa" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/SteamSystem">

<Description>Steam at 3 bar (approximately 300 kPa) refers to steam that is generated under a pressure of 3 bar above atmospheric pressure.

This corresponds to a saturation temperature of about 133 °C (271 °F). </Description>

<Version>1.0.0</Version>

</RoleClass>

<RoleClass Name="Steam4bar" ID="7d7bc9b9-d323-4be5-b68c-08e641a11592" RefBaseClassPath="AutomationML_BuildingServices.Structure_RoleClassLib/SteamSystem">

<Description>Steam at 4 bar (approximately 400 kPa) refers to steam that is generated under a pressure of 4 bar above atmospheric pressure.

This pressure corresponds to a saturation temperature of about 143 °C (289 °F). </Description>

<Version>1.0.0</Version>

</RoleClass>

</RoleClassLib>

Figure 18 - AutomationML_BuildingServices.Structure_RoleClassLib as XML representation

4.1.1 BuildingServicesEngineering Area RoleClassLib

Table 2 - Definition BuildingServices Area RoleClassLib

Class name	AutomationML_BuildingServices.Area_RoleClassLib
Description	Structure of the instance hierarchy according to the role class structure based on the building structure.
Version	1.0.0

4.1.1.1 Building

A „**Building**“ is derived from an “Area” according to AutomationML Whitepaper – Semantic Libraries. It is defined as follows.

Table 3 - Definition Building

Class name	Building	
Description	The term "building" refers to a structured, often human-made construction that is inhabited or used for various purposes. A building can serve different functions and vary in size, shape, and materials. It can be used as a residential building, commercial building, industrial facility, or public structure.	
Parent class	AutomationMLDiscreteManufacturingRoleClassLibAMLEd22_7_1@AutomationMLExtendedRoleClassLib/Area	
Path for element reference	AutomationML_BuildingServices.Area_RoleClassLib/Building	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.1.2 Elevation

A „**Elevation**“ is derived from an “Area” according to AutomationML Whitepaper – Semantic Libraries. It is defined as follows.

Table 4 - Definition Elevation

Class name	Elevation	
Description	In geography or surveying, "elevation" refers to the height of a point above sea level.	
Parent class	AutomationMLDiscreteManufacturingRoleClassLibAMLEd22_7_1@AutomationMLExtendedRoleClassLib/Area	
Path for element reference	AutomationML_BuildingServices.Area_RoleClassLib/Elevation	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.1.3 Floor

A „**Floor**“ is derived from an “Area” according to AutomationML Whitepaper – Semantic Libraries. It is defined as follows.

Table 5 - Definition Floor

Class name	Floor	
Description	It describes the floor or level within a building.	
Parent class	AutomationMLDiscreteManufacturingRoleClassLibAMLEd22_7_1@AutomationMLExtendedRoleClassLib/Area	
Path for element reference	AutomationML_BuildingServices.Area_RoleClassLib/Floor	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.1.4 MediaTransferPoint

A „**MediaTransferPoint**“ is derived from an “Area” according to AutomationML Whitepaper – Semantic Libraries. It is defined as follows.

Table 6 - Definition MediaTransferPoint

Class name	MediaTransferPoint	
Description	The media handover point to the layout.	
Parent class	AutomationMLDiscreteManufacturingRoleClassLibAMLEd22_7_1@AutomationMLExtendedRoleClassLib/Area	
Path for element reference	AutomationML_BuildingServices.Area_RoleClassLib/MediaTransferPoint	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	name (xs:string) Derived from: name	Designation of the object
	nameOfSupplier (xs: string) Derived from: nameOfSupplier	Name of supplier which provides the customer with a product or a service
	medium (xs: string) Derived from: medium	Designation of medium or air type name
	plant (xs: string) Derived from: plant	Definition of the system name
	nominalDiameter (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
	object (xs: string) Derived from: object	Describes the CARF object
	description (xs: string) Derived from: description	Describes the components
Interfaces	None	

4.1.1.5 Space

A „**Space**“ is derived from an “Area” according to AutomationML Whitepaper – Semantic Libraries. It is defined as follows.

Table 7 - Definition Space

Class name	Space	
Description	In architecture, space refers to an area or room within a building that is designated for a specific use or function.	
Parent class	AutomationMLDiscreteManufacturingRoleClassLibAMLEd22_7_1@AutomationMLExtendedRoleClassLib/Area	
Path for element reference	AutomationML_BuildingServices.Area_RoleClassLib/Space	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	building (xs:string) Derived from: building	A building is a structure that encloses rooms
	floor (xs:string) Derived from: floor	The indication of the floor The indication of the floor
	roomNumber (xs:int) Derived from: room	The room number is preferably a combination of a two-digit number preceded by the floor number of the building.
	roomDescription (xs:string) Derived from: room	room name or room designation
	area (xs:double) Derived from: area	The floor area of a building is, in the original sense, the area with which a building touches the ground The floor area of a building is, in the original sense, the area with which a building touches the ground
	volume (xs:int) Derived from: volume	The volume indicates how much space a body takes up
	height (xs:double) Derived from: height	The geometric height is the distance at right angles to a base line or base area of an object
Interfaces	None	

4.1.1.6 Pillar

A „**Pillar**“ is derived from an “Area” according to AutomationML Whitepaper – Semantic Libraries. It is defined as follows.

Table 8 - Definition Pillar

Class name	Pillar	
Description	A pillar is a vertical, cylindrical or rectangular architectural element traditionally used as a support or load-bearing structure. It is used to bear loads from overhead structures such as ceilings, arches, or roofs.	
Parent class	AutomationMLDiscreteManufacturingRoleClassLibAMLEd22_7_1@AutomationMLExtendedRoleClassLib/Area	
Path for element reference	AutomationML_BuildingServices.Area_RoleClassLib/Pillar	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.1.7 Room

A „**Room**“ is derived from an “Area” according to AutomationML Whitepaper – Semantic Libraries. It is defined as follows.

Table 9 - Definition Room

Class name	Room	
Description	Length, width, height: A room always has a specific extent in three dimensions. In architecture, the room is defined by walls, floors, and ceilings, with these elements serving either a load-bearing function or simply acting as boundaries.	
Parent class	AutomationMLDiscreteManufacturingRoleClassLibAMLEd22_7_1@AutomationMLExtendedRoleClassLib/Area	
Path for element reference	AutomationML_BuildingServices.Area_RoleClassLib/Room	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	height (xs:double) Derived from: height	The ceiling height is the vertical distance between the floor and the ceiling of a room.
	area (xs:double) Derived from: area	It is the floor area of a room, meaning the section of the floor enclosed by the walls. It is measured in square meters m ² .
	roomId (xs:string) Derived from: room	It is the unique identification number of the room.
	volume (xs:int) Derived from: volume	The room volume is the measure of the three-dimensional space enclosed by the boundaries of a room (walls, floor, and ceiling) and is expressed in cubic meters m ³ .
Interfaces	None	

4.1.1.8 RoomMacro

A „**RoomMacro**“ is derived from an “Area” according to AutomationML Whitepaper – Semantic Libraries. It is defined as follows.

Table 10 - Definition RoomMacro

Class name	RoomMacro	
Description	A room macro is a term often used in the context of architecture, building technology, or CAD software, referring to a predefined collection of information or settings that describes or models a specific room or room type within a building.	
Parent class	AutomationMLDiscreteManufacturingRoleClassLibAMLEd22_7_1@AutomationMLExtendedRoleClassLib/Area	
Path for element reference	AutomationML_BuildingServices.Area_RoleClassLib/RoomMacro	
Attributes	name (xs:string) Derived from: name	Designation of the object
	building (xs:string) Derived from: building	A building is a structure that encloses rooms
	floor (xs:string) Derived from: floor	The indication of the floor
	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	apartment (xs:string) Derived from: building	Housing is all rooms that are deprived of general accessibility by spatial isolation
	roomNumber (xs:string) Derived from: room	The room number is preferably a combination of a two-digit number preceded by the floor number of the building
	area (xs:double) Derived from: area	The floor area of a building is, in the original sense, the area with which a building touches the ground
	height (xs:double) Derived from: height	The geometric height is the distance at right angles to a base line or base area of an object
	roomVolume (xs:double) Derived from: volume	The volume indicates how much space a body takes up
	normTemperature (xs:double)	The degree Celsius is a unit of temperature

	Derived from: temperature	
	heatRequired (xs:double) Derived from: power	The specific heat requirement describes the amount of heat energy required to heat one cubic meter of room air by one degree Celsius
	power (xs:double) Derived from: power	The watt is the SI unit of power (energy turnover per period of time)
Interfaces	None	

4.1.2 BuildingServicesEngineering Data RoleClassLib

Table 11 - Definition BuildingServices Data RoleClassLib

Class name	AutomationML_BuildingServices.Data_RoleClassLib
Description	End-to-end relationship of pipes to PipeData, fittings and components to ObjectData, and elements to SymbolData.
Version	1.0.0

4.1.2.1 PipeData

A „**PipeData**“ is derived from an “AutomationMLBaseRole” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 12 - Definition PipeData

Class name	PipeData
Description	Describes a utility network and its information, medium, dimensions, system, etc.
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib /AutomationMLBaseRole
Path for element reference	AutomationML_BuildingServices.Data_RoleClassLib/PipeData
Attributes	GUID (xs:int) Derived from: GUID A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None

4.1.2.2 SymbolData

A „**SymbolData**“ is derived from an “AutomationMLBaseRole” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 13 - Definition SymbolData

Class name	SymbolData	
Description	Describes the fittings and components within a utility network.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib /AutomationMLBaseRole	
Path for element reference	AutomationML_BuildingServices.Data_RoleClassLib/SymbolData	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.2.3 ObjectData

A „**ObjectData**“ is derived from an “AutomationMLBaseRole” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 14 - Definition ObjectData

Class name	ObjectData	
Description	Describes the objects, components, fittings, and other elements within a utility network.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib /AutomationMLBaseRole	
Path for element reference	AutomationML_BuildingServices.Data_RoleClassLib/ObjectData	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.3 BuildingServicesEngineering Resources RoleClassLib

Table 15 - Definition BuildingServices Resources RoleClassLib

Class name	AutomationML_BuildingServices.Resources_RoleClassLib
Description	Role classes from the modules Heating, Ventilation, Sanitary, Sprinkler, Electrical.
Version	1.0.0

4.1.3.1 CablePipe

A „**CablePipe**“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 16 - Definition CablePipe

Class name	CablePipe	
Description	A cable pipe is a protective conduit used to shield cables from mechanical damage, moisture, or other external influences.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/CablePipe	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	plant (xs:string) Derived from: plant	Definition of the system name or the system number
	medium (xs:string) Derived from: medium	Designation of medium name
	nameOfSupplier(xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	length (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
	nominalDiameter (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.

	floor (xs:string) Derived from: floor	The indication of the floor
Interfaces	None	

4.1.3.2 CableRack

A „**CableRack**“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 17 - Definition CableRack

Class name	CableRack	
Description	Cable trays, BusWay, and installation channels are part of the electrical field. They include straight sections, branches, bends, and other components.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/CableRack	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	plant (xs:string) Derived from: plant	Definition of the system name or the system number
	track (xs:string) Derived from: medium	Designation of medium name
	nameOfSupplier (xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	material (xs:string) Derived from: material	Designation of material name
	object (xs:string) Derived from: object	Describes the object
	description (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes

	length (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
	width (xs:double) Derived from: width	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.
	height (xs:double) Derived from: height	The geometric height is the distance at right angles to a base line or base area of an object.
	widthExit1 (xs:double) Derived from: length	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.
	heightExit1 (xs:double) Derived from: length	The geometric height is the distance at right angles to a base line or base area of an object.
	widthExit2 (xs:double) Derived from: length	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.
	angle (xs:double) Derived from: angle	An angle is formed when two straight lines or rays meet at a common endpoint.
	floor (xs:string) Derived from: floor	The indication of the floor
Interfaces	None	

4.1.3.3 Component

A „**Component**“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 18 - Definition Component

Class name	Component	
Description	Depending on the building services trade, the component serves to supply systems, buildings, or rooms. Examples include ventilation fire dampers, sanitary washbasins, compensators, etc.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/Component	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	plant (xs:string) Derived from: plant	Definition of the system name or the system number
	medium (xs:string) Derived from: medium	Designation of medium or air type name
	drive (xs:int) Derived from: comment	Description of the engine for the component
	object (xs:string) Derived from: object	Describes the object
	nameOfSupplier (xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	material (xs:string) Derived from: material	Designation of material name
	description (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes
	comment (xs:string) Derived from: comment	Note or comment on the component
	nominalDiameter (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in

		millimetres and is based on the metric system of measurement
dn1 (xs:int) Derived from: nominalDiameter		The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
dn2 (xs:int) Derived from: nominalDiameter		The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
dn3 (xs:int) Derived from: nominalDiameter		The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
length (xs:double) Derived from: length		Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
pressure (xs:int) Derived from: pressure		The nominal pressure level PN indicates the maximum permissible pressure with which a fluid may load the pipeline for a pipeline with internal pressure.
couplingIn (xs:string) Derived from: couplingIn		Connection type such as flange, welded, threaded, grooved, etc.
couplingOut (xs:string) Derived from: couplingOut		Connection type such as flange, welded, threaded, grooved, etc.
width (xs:int) Derived from: width		The width is a size indication of the extension often in the horizontal direction and often in relation to a length.
height (xs:int) Derived from: height		The geometric height is the distance at right angles to a base line or base area of an object.
externalDimensionA (xs:int) Derived from: length		Dimensions (D) for the inlet are external dimensions
externalDimensionB (xs:int) Derived from: length		Dimensions (D) for the inlet are external dimensions
frame (xs:string) Derived from: comment		A channel frame is a profile or corner for square duct
isolation (xs:string) Derived from: isolation		Insulation material of the pipe or duct
floor (xs:string) Derived from: floor		indication of the floor

	massFlowrate (xs:double) Derived from: massFlowrate	Mass flow in heating refers to the mass flow of heating medium (such as water or another heat transfer fluid) through a heating system.
	flowVelocity (xs:double) Derived from: flowVelocity	The flow velocity (also called flow speed) describes how fast a fluid (liquid or gas) moves through a pipe or an open channel.
	volumeFlowrate (xs:double) Derived from: volumeFlowrate	The flow velocity (also called flow speed) describes how fast a fluid (liquid or gas) moves through a pipe or an open channel.
	flowVelocityVentilation (xs:double) Derived from: flowVelocityVentilation	The flow velocity (also called flow speed) describes how fast a fluid (liquid or gas) moves through a pipe or an open channel.
	totalPressure (xs:double) Derived from: totalPressure	The total pressure loss in ventilation technology describes the overall pressure drop that occurs within a ventilation system. It is caused by friction losses in the air ducts, resistances in fittings (bends, branches), filters, heat exchangers, silencers, and other components.
	airPressure (xs:double) Derived from: airPressure	Pressure loss in ventilation describes the resistance that air encounters as it flows through a ventilation system. It is caused by friction along duct walls, fittings, as well as by filters, heat exchangers, and other components. High pressure loss requires greater fan performance to achieve the desired air volume flow.
	throttlingPressure (xs:double) Derived from: throttlingPressure	It refers to the pressure loss that occurs when an airflow is restricted by a throttling element, such as a throttle valve or a valve. These components limit the airflow and increase resistance, leading to a pressure drop.
	maxDrainageCapacity (xs:double) Derived from: maxDrainageCapacity	The maximum drainage capacity refers to the highest volume of liquid that a drainage system can handle within a given time without causing overflow or backup.
	tgaKeyH60 (xs:string) Derived from: tgaKeyH60	Unique key for the calculation
	tgaKeyS87 (xs:string) Derived from: tgaKeyS87	Unique key for the calculation
	tgaKeyS90 (xs:string) Derived from: tgaKeyS90	Unique key for the calculation
Interfaces	None	

4.1.3.4 Consumer

A „**Consumer**“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 19 - Definition Consumer

Class name	Consumer	
Description	It is a general consumer component, such as a dummy, fixed points, or universal consumers.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/Consumer	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	plant (xs:string) Derived from: plant	Definition of the system name or the system number
	medium (xs:string) Derived from: medium	Designation of medium name
	nameOfSupplier (xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	material (xs:string) Derived from: material	Designation of material name
	description (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes
	object (xs:string) Derived from: object	Describes the object
	length (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
	height (xs:double) Derived from: height	The geometric height is the distance at right angles to a base line or base area of an object.
	width (xs:double) Derived from: width	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.

	nominalDiameter (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
	dn1 (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
	dn2 (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
	dn3 (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
	pressure (xs:int) Derived from: pressure	The nominal pressure level PN indicates the maximum permissible pressure with which a fluid may load the pipeline for a pipeline with internal pressure.
	volume (xs:int) Derived from: volume	The volume flow (or inaccurate flow rate and flow volume)
	couplingIn (xs:string) Derived from: couplingIn	Connection type such as flange, welded, threaded, grooved, etc.
	couplingOut (xs:string) Derived from: couplingOut	Connection type such as flange, welded, threaded, grooved, etc.
	floor (xs:string) Derived from: floor	The indication of the floor
	massFlowrate (xs:string) Derived from: massFlowrate	Mass flow in heating refers to the mass flow of heating medium (such as water or another heat transfer fluid) through a heating system.
	tgaKeyH60 (xs:string) Derived from: tgaKeyH60	Unique key for the calculation
	tgaKeyS87 (xs:string) Derived from: tgaKeyS87	Unique key for the calculation
	tgaKeyS90 (xs:string) Derived from: tgaKeyS90	Unique key for the calculation
	productRange (xs:string) Derived from: productRange	A product range description provides an overview of the entire product assortment of a company or brand.
Interfaces	None	

4.1.3.5 Coupling

A „**Coupling**“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 20 - Definition Coupling

Class name	Coupling	
Description	Describes the couplings for pipelines, sleeves, pipe clamps, hangers, etc.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/Coupling	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	plant (xs:string) Derived from: plant	Definition of the system name or the system number
	medium (xs:string) Derived from: medium	Designation of medium name
	nameOfSupplier(xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	material (xs:string) Derived from: material	Designation of material name
	description1 (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes
	description2 (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes
	object (xs:string) Derived from: object	Describes the object
	dn1 (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
	dn2 (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in

		millimetres and is based on the metric system of measurement.
	dn3 (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
	couplingIn (xs:string) Derived from: couplingIn	Connection type such as flange, welded, threaded, grooved, etc.
	couplingOut (xs:string) Derived from: couplingOut	Connection type such as flange, welded, threaded, grooved, etc.
	floor (xs:string) Derived from: floor	The indication of the floor
Interfaces	None	

4.1.3.6 CurrentRail

A „CurrentRail“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 21 - Definition CurrentRail

Class name	CurrentRail	
Description	Includes the busbars, straight sections, bends, T-joints, etc.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/CurrentRail	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	nameOfSupplier (xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	medium (xs:string) Derived from: medium	Designation of the system application
	name (xs:string) Derived from: name	Designation of the object
	comment (xs:int) Derived from: comment	Describes the object
	description (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes
	current (xs:double) Derived from: comment	The electric current, symbol , is a measure of the electric charge that flows through a conductor cross-section per second.
	ladder (xs:int) Derived from: comment	An electrical conductor is a body that conducts electrical current well.
	length1 (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
	length2 (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.

	length3 (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
	length4 (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
	width (xs:double) Derived from: width	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.
	height (xs:double) Derived from: height	The geometric height is the distance at right angles to a base line or base area of an object.
	angle (xs:double) Derived from: angle	An angle is formed when two straight lines or rays meet at a common endpoint.
	floor (xs:string) Derived from: floor	The indication of the floor
Interfaces	None	

4.1.3.7 Diffuser

A „Diffuser“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 22 - Definition Diffuser

Class name	Diffuser	
Description	Includes in ventilation the outlets (such as swirl outlets, slot outlets, diffuser outlets, etc.), grilles of all types, square and round, plate vents for exhaust and supply air, etc.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/Diffuser	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	description (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes
	plant (xs:string) Derived from: plant	Definition of the system name or the system number
	typeOfAir (xs:string) Derived from: medium	Designation of medium or air type name
	nameOfSupplier (xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	material (xs:string) Derived from: material	Designation of material name
	object(xs:string) Derived from: object	Describes the object
	width (xs:int) Derived from: width	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.
	height (xs:int) Derived from: height	The geometric height is the distance at right angles to a base line or base area of an object.
	nominalDiameter (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in

		millimetres and is based on the metric system of measurement.
	volumeFlowrate (xs:int) Derived from: volumeFlowrate	The volume flow (or inaccurate flow rate and flow volume)
	flowVelocityVentilation (xs:double) Derived from: flowVelocityVentilation	The flow velocity (also called flow speed) describes how fast a fluid (liquid or gas) moves through a pipe or an open channel.
	totalPressure(xs:double) Derived from: totalPressure	The total pressure loss in ventilation technology describes the overall pressure drop that occurs within a ventilation system. It is caused by friction losses in the air ducts, resistances in fittings (bends, branches), filters, heat exchangers, silencers, and other components.
	airPressure(xs:double) Derived from: airPressure	Pressure loss in ventilation describes the resistance that air encounters as it flows through a ventilation system. It is caused by friction along duct walls, fittings, as well as by filters, heat exchangers, and other components. High pressure loss requires greater fan performance to achieve the desired air volume flow.
	throttlingPressure(xs:double) Derived from: throttlingPressure	The maximum drainage capacity refers to the highest volume of liquid that a drainage system can handle within a given time without causing overflow or backup.
	floor (xs:string) Derived from: floor	The indication of the floor
Interfaces	None	

4.1.3.8 DuctPipe

A „DuctPipe“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 23 - Definition DuctPipe

Class name	DuctPipe	
Description	Describes the ventilation in square, round, and oval shapes. Includes straight ducts, fittings, special components, etc.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/DuctPipe	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	plant (xs:string) Derived from: plant	Definition of the system name or the system number
	description (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes
	medium (xs:string) Derived from: medium	Designation of medium or air type name
	nameOfSupplier (xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	material (xs:string) Derived from: material	Designation of material name
	length (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
	offset (xs:double) Derived from: length	An offset is when the direction changes
	fittingLength (xs:double) Derived from: length	A pipe/duct part is 500mm long in the model, but should be ordered 700mm long and cut to size on site (to fit length).
	width1 (xs:double) Derived from: length	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.

height1 (xs:double) Derived from: length	The geometric height is the distance at right angles to a base line or base area of an object.
width2 (xs:double) Derived from: length	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.
height2 (xs:double) Derived from: length	The geometric height is the distance at right angles to a base line or base area of an object.
width3 (xs:double) Derived from: length	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.
height3 (xs:double) Derived from: length	The geometric height is the distance at right angles to a base line or base area of an object.
width4 (xs:double) Derived from: length	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.
width5 (xs:double) Derived from: length	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.
radiant (xs:double) Derived from: radiant	the distance from a centerline or point to an axis of rotation
angle (xs:double) Derived from: angle	An angle is formed when two straight lines or rays meet at a common endpoint.
angleElbow (xs:double) Derived from: angle	An angle is formed when two straight lines or rays meet at a common endpoint.
angleEnd (xs:double) Derived from: angle	An angle is formed when two straight lines or rays meet at a common endpoint.
nominalDiameter (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
typeOfCoupling (xs:int) Derived from: comment	A duct frame is a structural component used to connect and stabilize air ducts in ventilation and air conditioning systems. It ensures secure attachment of the ducts, provides a tight connection, and contributes to the structural integrity of the duct system.
isolation (xs:string) Derived from: isolation	Insulation material of the pipe or duct
flowVelocityVentilation (xs:double) Derived from: flowVelocityVentilation	The flow velocity (also called flow speed) describes how fast a fluid (liquid or gas) moves through a pipe or an open channel.

	volumeFlowrate (xs:double) Derived from: volumeFlowrate	The volume flow (or inaccurate flow rate and flow volume)
	floor (xs:string) Derived from: floor	indicationOfTheFloor
Interfaces	None	

4.1.3.9 Equipment

An „**Equipment**“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 24 - Definition Equipment

Class name	Equipment	
Description	Includes the openings (ceiling, wall, core drilling, etc.) in all building services areas, fire stops.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/Equipment	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	plant (xs:string) Derived from: plant	Definition of the system name or the system number
	medium (xs:string) Derived from: medium	Designation of medium name
	material (xs:string) Derived from: material	Designation of material name
	nameOfSupplier (xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	description (xs:string) Derived from: description	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
	nominalDiameter (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
	comment (xs:string) Derived from: comment	text description
	object (xs:string) Derived from: object	Refers to the type of opening, whether rectangular, round, and the specific type of opening, such as core drilling in the ceiling or wall, etc.

	length1 (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
	height1 (xs:double) Derived from: length	The geometric height is the distance at right angles to a base line or base area of an object.
	width1 (xs:double) Derived from: length	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.
	height2 (xs:double) Derived from: length	The geometric height is the distance at right angles to a base line or base area of an object.
	length2 (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
	width2 (xs:double) Derived from: length	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.
	height3 (xs:double) Derived from: length	The geometric height is the distance at right angles to a base line or base area of an object.
	floor (xs:string) Derived from: floor	The indication of the floor
Interfaces	None	

4.1.3.10 ExtractionEquipment

An „**ExtractionEquipment**“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 25 - Definition ExtractionEquipment

Class name	ExtractionEquipment	
Description	In ventilation, the deflector hood in square and round designs.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/ExtractionEquipment	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	description (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes
	plant (xs:string) Derived from: plant	Definition of the system name or the system number
	medium (xs:string) Derived from: medium	Designation of air type name
	nameOfSupplier (xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	material (xs:string) Derived from: material	Designation of material name
	widthA (xs:double) Derived from: length	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.
	heightB (xs:double) Derived from: length	The geometric height is the distance at right angles to a base line or base area of an object.
	externalDimension1 (xs:double) Derived from: length	It is the measurement of the component's external dimensions.
	externalDimension2 (xs:double) Derived from: length	It is the measurement of the component's external dimensions.

	difference (xs:double) Derived from: length	It is the difference between the external and internal dimensions of components.
	overallHeight (xs:double) Derived from: length	The geometric height is the distance at right angles to a base line or base area of an object.
	frame (xs:string) Derived from: comment	A channel frame is a profile or corner for square duct.
	nominalDiameter (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
	flowVelocityVentilation (xs:double) Derived from: flowVelocityVentilation	The flow velocity (also called flow speed) describes how fast a fluid (liquid or gas) moves through a pipe or an open channel.
	volumeFlowrate (xs:int) Derived from: volumeFlowrate	The volume flow (or inaccurate flow rate and flow volume)
	floor (xs:string) Derived from: floor	The indication of the floor
Interfaces	None	

4.1.3.11 Fan

A „Fan“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 26 - Definition Fan

Class name	Fan	
Description	Describes the fan for square ducts or round pipes. Fan design in axial, radial form, as well as roof fans.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/Fan	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	plant (xs:string) Derived from: plant	Definition of the system name or the system number
	medium (xs:string) Derived from: medium	Designation of medium or air type name
	material (xs:string) Derived from: material	Designation of material name
	nameOfSupplier (xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	object (xs:string) Derived from: object	Describes the object
	description (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes
	length (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
	aSquare (xs:int) Derived from: length	Describes the components width or dimensions
	bSquare (xs:int) Derived from: length	Describes the components height or dimensions

	externalDimensionA (xs:int) Derived from: length	Dimensions (D) for the inlet are external dimensions
	externalDimensionB (xs:int) Derived from: length	Dimensions (D) for the inlet are external dimensions
	baseLength (xs:double) Derived from: length	Base length of the fan
	baseThickness (xs:double) Derived from: length	Base Thickness of the fan
	height (xs:double) Derived from: height	The geometric height is the distance at right angles to a base line or base area of an object.
	dn1 (xs:int) Derived from: nominalDiameter	Dimension of the fan connection
	nominalDiameter (xs:int) Derived from: nominalDiameter	Dimension of the fan housing
	frame (xs:string) Derived from: comment	A channel frame is a profile or corner for square duct.
	isolation (xs:string) Derived from: isolation	Insulation material of the pipe or duct
	floor (xs:string) Derived from: floor	The indication of the floor
	volumeFlowrate (xs:double) Derived from: volumeFlowrate	The flow velocity (also called flow speed) describes how fast a fluid (liquid or gas) moves through a pipe or an open channel.
	flowVelocityVentilation (xs:double) Derived from: flowVelocityVentilation	The flow velocity (also called flow speed) describes how fast a fluid (liquid or gas) moves through a pipe or an open channel.
Interfaces	None	

4.1.3.12 Fitting

A „Fitting“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 27 - Definition Fitting

Class name	Fitting	
Description	Fittings and components for piping in all dimensions and materials, such as T-joints, reducers, elbows, flanges, seals.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/Fitting	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	plant (xs:string) Derived from: plant	Definition of the system name or the system number
	medium (xs:string) Derived from: medium	Designation of medium name
	nameOfSupplier (xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	description (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes
	material (xs:string) Derived from: material	Designation of material name
	object (xs:string) Derived from: object	Describes the CARF object
	pressure (xs:int) Derived from: pressure	The nominal pressure level PN indicates the maximum permissible pressure with which a fluid may load the pipeline for a pipeline with internal pressure.
	dn1 (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.

dn2 (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
dn3 (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
externalDiameter (xs:int) Derived from: length	The external Diameter DA indicates the approximate outer diameter of the pipeline in millimetres.
wallThickness (xs:int) Derived from: length	The wall thickness indicates the approximate thickness of the pipe in millimetres.
length (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
distanceLength (xs:double) Derived from: length	T-piece pipe distance from branch to pipe axis
lengthExit (xs:double) Derived from: length	T-piece pipe distance from branch to pipe axis
width (xs:double) Derived from: width	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.
height (xs:double) Derived from: height	The geometric height is the distance at right angles to a base line or base area of an object.
angle (xs:double) Derived from: angle	An angle is formed when two straight lines or rays meet at a common endpoint.
radiant (xs:double) Derived from: radiant	the distance from a centerline or point to an axis of rotation
isolation (xs:string) Derived from: isolation	Insulation material of the pipe or duct
insulationThickness (xs:string) Derived from: insulationThickness	Packing thickness of insulation
couplingIn (xs:string) Derived from: couplingIn	Connection type such as flange, welded, threaded, grooved, etc.
couplingOut (xs:string) Derived from: couplingOut	Connection type such as flange, welded, threaded, grooved, etc.
floor (xs:string) Derived from: floor	The indication of the floor

	massFlowrate (xs:double) Derived from: massFlowrate	Mass flow in heating refers to the mass flow of heating medium (such as water or another heat transfer fluid) through a heating system.
	tgaKeyH60 (xs:string) Derived from: tgaKeyH60	Unique key for the calculation
	tgaKeyS87 (xs:string) Derived from: tgaKeyS87	Unique key for the calculation
	tgaKeyS90 (xs:string) Derived from: tgaKeyS90	Unique key for the calculation
	pressureHot (xs:double) Derived from: pressureHot	In a hot water system, pressure is essential for ensuring proper water flow and distribution throughout the system. The pressure is influenced by factors such as pump performance, pipe resistance, temperature changes, and system design.
	pressureCold (xs:double) Derived from: pressureCold	A pressure drop in a cooling system refers to the reduction in pressure as the coolant flows through pipes, heat exchangers, valves, and other system components.
Interfaces	None	

4.1.3.13 HeatSource

A „**HeatSource**“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 28 - Definition HeatSource

Class name	HeatSource	
Description	These include hot water boilers, heating boilers, heat exchangers, or general equipment.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/HeatSource	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.

	plant (xs:string) Derived from: plant	Definition of the system name or the system number
	description (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes
	medium (xs:string) Derived from: medium	Designation of medium name
	nameOfSupplier (xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	object (xs:string) Derived from: object	Describes the object
	material (xs:string) Derived from: material	Designation of material name
	length (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
	height (xs:double) Derived from: height	The geometric height is the distance at right angles to a base line or base area of an object.
	width1 (xs:double) Derived from: length	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.
	width2 (xs:double) Derived from: length	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.
	overallLength (xs:double) Derived from: length	It is the total length of all measurements of the boiler or burner.
	nominalDiameter (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
	pressure (xs:int) Derived from: pressure	The nominal pressure level PN indicates the maximum permissible pressure with which a fluid may load the pipeline for a pipeline with internal pressure.
	numberFeet (xs:int) Derived from: comment	Number of feet on the boiler
	volume (xs:int) Derived from: volume	The volume flow (or inaccurate flow rate and flow volume)
	boilerNumber (xs:int) Derived from: comment	Numbering of the boiler

	dnVL (xs:int) Derived from: nominalDiameter	Connection dimension flow
	dnRL (xs:int) Derived from: nominalDiameter	Connection dimension return
	exhaustConnection (xs:int) Derived from: nominalDiameter	Exhaust connection dimension
	powerHeat (xs:int) Derived from: powerHeat	The watt is the SI unit of power (energy turnover per period of time).
	powerCold (xs:int) Derived from: powerCold	The watt is the SI unit of power (energy turnover per period of time).
	massFlowrate (xs:double) Derived from: massFlowrate	Mass flow in heating refers to the mass flow of heating medium (such as water or another heat transfer fluid) through a heating system.
	floor (xs:string) Derived from: floor	The indication of the floor
	productRange (xs:string) Derived from: productRange	A product range description provides an overview of the entire product assortment of a company or brand.
	tgaKeyH60 (xs:string) Derived from: tgaKeyH60	Unique key for the calculation
Interfaces	None	

4.1.3.14 Hydrant

A „**Hydrant**“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 29 - Definition Hydrant

Class name	Hydrant	
Description	Hydrants in all designs, fire hose cabinets, and handheld fire extinguishers.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/Hydrant	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	plant (xs:string) Derived from: plant	Definition of the system name or the system number.
	medium (xs:string) Derived from: medium	Designation of medium name
	nameOfSupplier(xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	description (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes
	length (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
	width (xs:int) Derived from: width	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.
	height (xs:int) Derived from: height	The geometric height is the distance at right angles to a base line or base area of an object.
	medium1 (xs:string) Derived from: medium	Designation of medium name
	dn1 (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.

	distanceFromFloor1 (xs:int) Derived from: length	Indication distance from the ground
	medium2 (xs:string) Derived from: medium	Designation of medium name
	dn2 (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
	distanceFromFloor2 (xs:int) Derived from: length	Indication distance from the ground
	medium3 (xs:string) Derived from: medium	Designation of medium name
	dn3 (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
	distanceFromFloor3 (xs:int) Derived from: length	Indication distance from the ground
	medium4 (xs:string) Derived from: medium	Designation of medium name
	dn4 (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
	distanceFromFloor4 (xs:int) Derived from: length	Indication distance from the ground
	floor (xs:string) Derived from: floor	The indication of the floor
Interfaces	None	

4.1.3.15 Lamp

A „**Lamp**“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 30 - Definition Lamp

Class name	Lamp	
Description	Lamps as freestanding, in single or double flame, LED, emergency lighting, office or mounted lights, spotlights, etc.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/Lamp	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	description (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes
	nameOfSupplier (xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	identifier (xs:int) Derived from: comment	The lamp type describes the specific category or design of a light source, which can include details such as its shape, function, technology, and application. Lamp types are categorized based on factors such as types and applications.
	circuit (xs:int) Derived from: number	Marking in electrical engineering for electrical circuit, electric circuit, integrated circuit
	ipAddress (xs:int) Derived from: number	The DALI line addresses devices by triggering a random component on each device that generates a large 3-byte number.
	power (xs:double) Derived from: power	The watt is the SI unit of power (energy turnover per period of time)
	length (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.

	width (xs:double) Derived from: width	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.
	height (xs:double) Derived from: height	The geometric height is the distance at right angles to a base line or base area of an object.
	floor (xs:string) Derived from: floor	indicationOfTheFloor
Interfaces	None	

4.1.3.16 Manifold

A „**Manifold**“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 31 - Definition Manifold

Class name	Manifold	
Description	Electrical distribution panels such as transformers, switchboards, or heating and cooling distribution units, as well as sprinkler or plumbing systems.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/Manifold	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	plant (xs:string) Derived from: plant	Definition of the system name or the system number.
	medium (xs:string) Derived from: medium	Designation of medium name
	description (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes
	nameOfSupplier (xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	material (xs:string)	Designation of material name

	Derived from: material	
	object (xs:string) Derived from: object	Describes the object
	overallLength (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
	cylinderLength (xs:double) Derived from: length	A cylinder length spacer is a component inserted between two cylinders or pipe elements to extend or connect the length of a system.
	nominalDiameter (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
	length1 (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
	width1 (xs:double) Derived from: length	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.
	height1 (xs:double) Derived from: length	The geometric height is the distance at right angles to a base line or base area of an object.
	switchCabinetNumber (xs:int) Derived from: number	Labeling of control cabinets
	name (xs:string) Derived from: name	Describes the Object
	circuit (xs:int) Derived from: number	Marking in electrical engineering for electrical circuit, electric circuit, integrated circuit.
	physicalAdress (xs:int) Derived from: number	It is a unique device address by which each bus participant is identified.
	height2 (xs:double) Derived from: length	The geometric height is the distance at right angles to a base line or base area of an object.
	width2 (xs:double) Derived from: length	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.
	length2 (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
	depth2 (xs:double) Derived from: length	It describes the depth or width of the distributor, transformer, or control cabinet.

	width3 (xs:double) Derived from: length	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.
	height3 (xs:double) Derived from: length	The geometric height is the distance at right angles to a base line or base area of an object.
	baseHeight (xs:double) Derived from: length	The geometric height is the distance at right angles to a base line or base area of an object.
	floor (xs:string) Derived from: floor	The indication of the floor
Interfaces	None	

4.1.3.17 MeasuringElement

A „**MeasuringElement**“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 32 - Definition MeasuringElement

Class name	MeasuringElement	
Description	Measuring points are thermometers, pressure gauges, sensors.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/MeasuringElement	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	plant (xs:string) Derived from: plant	Definition of the system name or the system number
	medium (xs:string) Derived from: medium	Designation of medium name
	nameOfSupplier (xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	description (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes
	object (xs:string) Derived from: object	Defines the object type of the measuring instrument in a pipeline.
	nominalDiameter (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
	couplingIn (xs:string) Derived from: couplingIn	Connection type such as flange, welded, threaded, grooved, etc.
	couplingOut (xs:string) Derived from: couplingOut	Connection type such as flange, welded, threaded, grooved, etc.
	floor (xs:string) Derived from: floor	Indication of the floor

Interfaces	None
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4.1.3.18 Object

An „**Object**“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 33 - Definition Object

Class name	Object	
Description	Planning objects include actuators for motor-operated valves, sprinkler heads, separators, pipe separators, siphons for washbasins.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/Object	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	name (xs:string) Derived from: name	Designation of the object
	plant (xs:string) Derived from: plant	Definition of the system name or the system number
	description (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes
	medium (xs:string) Derived from: medium	Designation of medium or air type name
	nameOfSupplier (xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	object (xs:string) Derived from: object	Describes the CARF object
	nominalDiameter (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.

	width (xs:double) Derived from: width	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.
	height (xs:double) Derived from: height	The geometric height is the distance at right angles to a base line or base area of an object The geometric height is the distance at right angles to a base line or base area of an object.
	length (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
	pressure (xs:int) Derived from: pressure	The nominal pressure level PN indicates the maximum permissible pressure with which a fluid may load the pipeline for a pipeline with internal pressure.
	kFactor (xs:int) Derived from: comment	The K-factor can be used to calculate the discharge rate of sprinkler heads.
	norm (xs:int) Derived from: comment	The german industry standard
	fireHazardClass (xs:int) Derived from: comment	The risk assessment
	waterRequirement (xs:int) Derived from: volume	The minimum water requirement for sprinklers refers to the minimum amount of water that must be provided by a sprinkler system to ensure effective fire suppression.
	maxWallSpacing (xs:int) Derived from: length	The maximum wall distance for sprinklers refers to the maximum distance a sprinkler head can be from a wall in a sprinkler system to ensure effective coverage and fire suppression.
	minWallSpacing (xs:int) Derived from: length	The minimum wall distance for sprinklers refers to the minimum distance a sprinkler head must have from a wall in a sprinkler system to ensure even water distribution and effective fire suppression.
	sprinklerSpacing (xs:int) Derived from: length	The maximum sprinkler distance refers to the maximum distance allowed between sprinkler heads in a sprinkler system to ensure complete and effective coverage of the area for fire suppression.
	building (xs:string) Derived from: building	A building is a structure that encloses rooms
	floor (xs:string) Derived from: floor	The indication of the floor
	apartment (xs:string)	Housing is all rooms that are deprived of general accessibility by spatial isolation.

	Derived from: building	
	roomNumber (xs:string) Derived from: number	The room number is preferably a combination of a two-digit number preceded by the floor number of the building.
	roomVolume (xs:double) Derived from: volume	The volume indicates how much space a body takes up.
	normTemperature (xs:double) Derived from: temperature	The degree Celsius is a unit of temperature
	heatRequired (xs:double) Derived from: power	The specific heat requirement describes the amount of heat energy required to heat one cubic meter of room air by one degree Celsius.
	powerHeat (xs:double) Derived from: powerHeat	The watt is the SI unit of power (energy turnover per period of time).
	powerCold (xs:double) Derived from: powerCold	The watt is the SI unit of power (energy turnover per period of time).
	productRange (xs:string) Derived from: productRange	A product range description provides an overview of the entire product assortment of a company or brand.
	tgaKeyH60 (xs:string) Derived from: tgaKeyH60	Unique key for the calculation
	tgaKeyS87 (xs:string) Derived from: tgaKeyS87	Unique key for the calculation
	tgaKeyS90 (xs:string) Derived from: tgaKeyS90	Unique key for the calculation
Interfaces	None	

4.1.3.19 Plaster

A „**Plaster**“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 34 - Definition Plaster

Class name	Plaster	
Description	Plaster pieces for rainwater or wastewater are specialized components or elements used to facilitate the transitions between different piping systems or discharge points.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/Plaster	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	plant (xs:string) Derived from: plant	Definition of the system name or the system number.
	medium (xs:string) Derived from: medium	Designation of medium name
	nameOfSupplier (xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	material (xs:string) Derived from: material	Designation of material name
	description (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes
	object (xs:string) Derived from: object	Describes the object
	nominalDiameter (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
	height (xs:int) Derived from: height	The geometric height is the distance at right angles to a base line or base area of an object.
	floor (xs:string)	The indication of the floor

	Derived from: floor	
	productRange (xs:string) Derived from: productRange	A product range description provides an overview of the entire product assortment of a company or brand.
	tgaKeyS87 (xs:string) Derived from: tgaKeyS87	Unique key for the calculation
	maxDrainageCapacity (xs:double) Derived from: maxDrainageCapacity	The maximum drainage capacity refers to the highest volume of liquid that a drainage system can handle within a given time without causing overflow or backup.
Interfaces	None	

4.1.3.20 Pump

A „**Pump**“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 35 - Definition Pump

Class name	Pump	
Description	Pumps such as base pumps, pipeline pumps for various trades. Low-pressure or high-pressure pumps in flanged or screwed form.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/Pump	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	plant (xs:string) Derived from: plant	Definition of the system name or the system number
	medium (xs:string) Derived from: medium	Designation of medium name
	nameOfSupplier (xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	material (xs:string) Derived from: material	Designation of material name
	description (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes
	suctionNozzleDN (xs:int) Derived from: nominalDiameter	The nominal diameter of the suction port on the pump
	pressureNozzleDN (xs:int) Derived from: nominalDiameter	The nominal diameter at the pressure port on the pump
	pressure (xs:int) Derived from: pressure	The nominal pressure level PN indicates the maximum permissible pressure with which a fluid may load the pipeline for a pipeline with internal pressure.
	couplingIn (xs:string) Derived from: couplingIn	Connection type such as flange, welded, threaded, grooved, etc.

	couplingOut (xs:string) Derived from: couplingOut	Connection type such as flange, welded, threaded, grooved, etc.
	floor (xs:string) Derived from: floor	The indication of the floor
	supplyTemperatureHeat (xs:double) Derived from: supplyTemperatureHeat	The flow temperature in degrees Celsius refers to the temperature of the water that is circulated from the heat generator (e.g., boiler, heat pump, or solar system) to the radiators or underfloor heating in a heating system (such as a central heating or hot water system).
	returnTemperatureHeat (xs:double) Derived from: returnTemperatureHeat	The return temperature in degrees Celsius refers to the temperature of the water that flows back to the heat generator (e.g., boiler, heat pump, or solar system) after releasing heat to the radiators or underfloor heating.
	supplyTemperatureCold (xs:double) Derived from: supplyTemperatureCold	The flow temperature in degrees Celsius refers to the temperature of the water that is circulated from the heat generator (e.g., boiler, heat pump, or solar system) to the radiators or underfloor heating in a heating system (such as a central heating or hot water system).
	returnTemperatureCold (xs:double) Derived from: returnTemperatureCold	The return temperature in degrees Celsius refers to the temperature of the water that flows back to the heat generator (e.g., boiler, heat pump, or solar system) after releasing heat to the radiators or underfloor heating.
	massFlowrate (xs:double) Derived from: massFlowrate	Mass flow in heating refers to the mass flow of heating medium (such as water or another heat transfer fluid) through a heating system.
	tgaKeyH60 (xs:string) Derived from: tgaKeyH60	Unique key for the calculation
	tgaKeyS87 (xs:string) Derived from: tgaKeyS87	Unique key for the calculation
	tgaKeyS90 (xs:string) Derived from: tgaKeyS90	Unique key for the calculation
	productRange (xs:string) Derived from: productRange	A product range description provides an overview of the entire product assortment of a company or brand.
Interfaces	None	

4.1.3.21 Radiator

A „**Radiator**“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 36 - Definition Radiator

Class name	Radiator	
Description	Radiators for various heating purposes, such as flat radiators, valve radiators, compact radiators in single-pipe or multi-pipe systems. Connection types include bottom, dual-side, single-side, etc.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/Radiator	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	building (xs:string) Derived from: building	A building is a structure that encloses rooms.
	storey (xs:string) Derived from: storey	A floor refers to a single, horizontally divided level within a building, defined by ceilings and floors.
	nameOfSupplier (xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	length (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
	height (xs:int) Derived from: height	The height is a size indication of the extension often in the horizontal direction and often in relation to a length.
	width(xs:int) Derived from: width	The width is a size indication of the extension often in the horizontal direction and often in relation to a length.
	roomNumber (xs:string) Derived from: number	The room number is preferably a combination of a two-digit number preceded by the floor number of the building.
	hkNumberInRoom (xs:string) Derived from: number	It is the identification number of a radiator between the 3D plan and the schematic.

roomTemperature (xs:double) Derived from: temperature	The room temperature in degrees Celsius refers to the temperature of a room or enclosed space. It is an important parameter for the comfort of the occupants and the functionality of devices and systems that are temperature-dependent, such as heaters, air conditioners, or cooling units.
supplyTemperatureHeat (xs:double) Derived from: supplyTemperatureHeat	The flow temperature in degrees Celsius refers to the temperature of the water that is circulated from the heat generator (e.g., boiler, heat pump, or solar system) to the radiators or underfloor heating in a heating system (such as a central heating or hot water system).
returnTemperatureHeat (xs:double) Derived from: returnTemperatureHeat	The return temperature in degrees Celsius refers to the temperature of the water that flows back to the heat generator (e.g., boiler, heat pump, or solar system) after releasing heat to the radiators or underfloor heating.
supplyTemperatureCold (xs:double) Derived from: supplyTemperatureCold	The flow temperature in degrees Celsius refers to the temperature of the water that is circulated from the heat generator (e.g., boiler, heat pump, or solar system) to the radiators or underfloor heating in a heating system (such as a central heating or hot water system).
returnTemperatureCold (xs:double) Derived from: returnTemperatureCold	The return temperature in degrees Celsius refers to the temperature of the water that flows back to the heat generator (e.g., boiler, heat pump, or solar system) after releasing heat to the radiators or underfloor heating.
power (xs:double) Derived from: power	The watt is the SI unit of power (energy turnover per period of time)
floor (xs:string) Derived from: floor	The indication of the floor
tgaKeyH60 (xs:string) Derived from: tgaKeyH60	Unique key for the calculation
kv-ValueHeating (xs:double) Derived from: kv-ValueHeating	The KV value (flow coefficient) describes the amount of water (or another medium) that flows through a valve or fitting when a pressure difference of 1 bar is applied.
kv-ValueCooling (xs:double) Derived from: kv- ValueCooling	The KV value (flow coefficient) indicates the amount of liquid (e.g., water or refrigerant) that flows through a valve or fitting in a cooling circuit when a pressure difference of 1 bar is applied.
zetaValueHeat (xs:int)	The Zeta value (ζ -value) describes the resistance coefficient causing pressure loss

	Derived from: zetaValueHeat	in flow systems, particularly in heating technology.
	zetaValueCold (xs:int) Derived from: zetaValueCold	The Zeta value (ζ -value) describes the resistance coefficient causing pressure loss in flow systems, particularly in heating technology.
	productRange (xs:string) Derived from: productRange	A product range description provides an overview of the entire product assortment of a company or brand.
	massFlowrate (xs: double) Derived from: massFlowrate	Mass flow in heating refers to the mass flow of heating medium (such as water or another heat transfer fluid) through a heating system.
Interfaces	None	

4.1.3.22 RoundDuct

A „**RoundDuct**“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 37 - Definition RoundDuct

Class name	RoundDuct	
Description	A round pipe refers to a pipe with a circular cross-sectional shape. It is used in the fields of heating, ventilation, and sanitation (HVS), in industry, as well as for cable installations and in water or wastewater systems. It comes in various materials, wall thicknesses, connection types, etc.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/RoundDuct	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	plant (xs:string) Derived from: plant	Definition of the system name or the system number
	medium (xs:string) Derived from: medium	Designation of medium name
	nameOfSupplier (xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	material (xs:string) Derived from: material	Designation of material name
	description (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes
	object (xs:string) Derived from: object	Describes the object
	gradientValue (xs:double) Derived from: gradientValue	Indicates the inclination of the pipe
	nominalDiameter (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.

externalDiameter (xs:int) Derived from: nominalDiameter	The external Diameter DA indicates the approximate outer diameter of the pipeline in millimetres.
wallThickness (xs:int) Derived from: wallThickness	The wall thickness indicates the approximate thickness of the pipe in millimetres.
pressure (xs:int) Derived from: pressure	The nominal pressure level PN indicates the maximum permissible pressure with which a fluid may load the pipeline for a pipeline with internal pressure.
length (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
equivalentLength (xs:double) Derived from: length	The term "equivalent length" refers to a length that represents the pressure loss in a pipeline caused by an obstacle, such as a valve, bend, or fitting.
couplingIn (xs:string) Derived from: couplingIn	Connection type such as flange, welded, threaded, grooved, etc.
couplingOut (xs:string) Derived from: couplingOut	Connection type such as flange, welded, threaded, grooved, etc.
storey (xs:string) Derived from: storey	Connection types of pipes: w=welded, s=screwed, fl=flanged, gk=coupled, cl=clamped
isolation (xs:string) Derived from: isolation	Insulation material of the pipe or duct
insulationThickness (xs:string) Derived from: insulationThickness	Packing thickness of insulation
floor (xs:string) Derived from: floor	The indication of the floor
massFlowrate (xs:string) Derived from: massFlowrate	Mass flow in heating refers to the mass flow of heating medium (such as water or another heat transfer fluid) through a heating system.
pressureCold (xs:int) Derived from: pressureCold	A pressure drop in a cooling system refers to the reduction in pressure as the coolant flows through pipes, heat exchangers, valves, and other system components.
pressureHot (xs:int) Derived from: pressureHot	In a hot water system, pressure is essential for ensuring proper water flow and distribution throughout the system. The pressure is influenced by factors such as pump performance, pipe resistance, temperature changes, and system design.
tgaKeyH60 (xs:string)	Unique key for the calculation

	Derived from: tgaKeyH60	
	tgaKeyS87 (xs:string) Derived from: tgaKeyS87	Unique key for the calculation
	tgaKeyS90 (xs:string) Derived from: tgaKeyS90	Unique key for the calculation
Interfaces	None	

4.1.3.23 SmokeIntake

A „**SmokeIntake**“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 38 - Definition SmokeIntake

Class name	SmokeIntake	
Description	Description of the pipe suction system with straight pipe sections and fittings such as elbows, reducers, T-joints, end caps, etc.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/SmokeIntake	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	plant (xs:string) Derived from: plant	Definition of the system name or the system number
	track (xs:string) Derived from: medium	Designation of medium name
	nameOfSupplier (xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	material (xs:string) Derived from: material	Designation of material name
	object (xs:string) Derived from: object	Describes the object
	description (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes
	dn1 (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
	dn2 (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.

	angle (xs:double) Derived from: angle	An angle is formed when two straight lines or rays meet at a common endpoint.
	length (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
	radiant (xs:double) Derived from: radiant	the distance from a centerline or point to an axis of rotation
	floor (xs:string) Derived from: floor	The indication of the floor
Interfaces	None	

4.1.3.24 Socket

A „**Socket**“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 39 - Definition Socket

Class name	Socket	
Description	Sockets 230V, 16A, 32A, light switches, dimmers, blinds, data sockets, telephone connections, cold water connections, hot water connections for cooling of distribution panels, compressed air connections, gas connections, etc.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/Socket	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	name (xs:string) Derived from: name	Designation of the object
	description (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes
	medium (xs:string) Derived from: medium	Designation of medium name
	object (xs:int) Derived from: object	Common characteristics and subdivision, classification
	comment (xs:int) Derived from: comment	A feature is generally a recognizable property.
	floor (xs:string) Derived from: floor	The indication of the floor
Interfaces	None	

4.1.3.25 Tank

A „**Tank**“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 40 - Definition Tank

Class name	Tank	
Description	Sanitary area storage tanks for above-counter or under-counter, venting pipes in building services for air traps.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/Tank	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	plant (xs:string) Derived from: plant	Definition of the system name or the system number
	medium (xs:string) Derived from: medium	Designation of medium name
	nameOfSupplier (xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	object (xs:string) Derived from: object	Describes the object
	description (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes
	name (xs:string) Derived from: name	Designation of the object
	dn1 (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
	dn2 (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
	dn3 (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in

		millimetres and is based on the metric system of measurement.
	length (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
	pressure (xs:int) Derived from: pressure	The nominal pressure level PN indicates the maximum permissible pressure with which a fluid may load the pipeline for a pipeline with internal pressure.
	couplingIn (xs:string) Derived from: couplingIn	Connection type such as flange, welded, threaded, grooved, etc.
	couplingOut (xs:string) Derived from: couplingOut	Connection type such as flange, welded, threaded, grooved, etc.
	floor (xs:string) Derived from: floor	The indication of the floor
Interfaces	None	

4.1.3.26 Valve

A „**Valve**“ is derived from a “Resource” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 41 - Definition Valve

Class name	Valve	
Description	Valves and shut-off fittings differ in terms of design, pressure rating, and dimensions. They can be flanged, screwed, or welded, motor-driven or manual, etc.	
Parent class	AutomationMLBaseLibrariesAMLEd22_10_0@AutomationMLBaseRoleClassLib/ AutomationMLBaseRole/Resource	
Path for element reference	AutomationML_BuildingServices.Resources_RoleClassLib/Valve	
Attributes	ID (xs:int) Derived from: ID	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
	plant (xs:string) Derived from: plant	Definition of the system name or the system number
	medium (xs:string) Derived from: medium	Designation of medium name
	description (xs:string) Derived from: description	Describes the components, fittings, pipelines, channels or routes
	nameOfSupplier (xs:string) Derived from: nameOfSupplier	Supplier of components, fittings, pipelines, channels or routes
	material (xs:string) Derived from: material	Designation of material name
	object (xs:string) Derived from: object	Describes the CARF object
	nominalDiameter (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
	dn1 (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.

dn2 (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
dn3 (xs:int) Derived from: nominalDiameter	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
pressure (xs:int) Derived from: pressure	The nominal pressure level PN indicates the maximum permissible pressure with which a fluid may load the pipeline for a pipeline with internal pressure.
pressureHot (xs:int) Derived from: pressureHot	In a hot water system, pressure is essential for ensuring proper water flow and distribution throughout the system. The pressure is influenced by factors such as pump performance, pipe resistance, temperature changes, and system design.
pressureCold (xs:int) Derived from: pressureCold	In a hot water system, pressure is essential for ensuring proper water flow and distribution throughout the system. The pressure is influenced by factors such as pump performance, pipe resistance, temperature changes, and system design.
minPressureHot (xs:int) Derived from: minPressureHot	In a hot water system, pressure is essential for ensuring proper water flow and distribution throughout the system. The pressure is influenced by factors such as pump performance, pipe resistance, temperature changes, and system design.
minPressureCold (xs:int) Derived from: minPressureCold	In a hot water system, pressure is essential for ensuring proper water flow and distribution throughout the system. The pressure is influenced by factors such as pump performance, pipe resistance, temperature changes, and system design.
length (xs:double) Derived from: length	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points.
couplingIn (xs:string) Derived from: couplingIn	Connection type such as flange, welded, threaded, grooved, etc.
couplingOut (xs:string) Derived from: couplingOut	Connection type such as flange, welded, threaded, grooved, etc.
floor (xs:string) Derived from: floor	The indication of the floor
massFlowrate (xs:double)	Mass flow in heating refers to the mass flow of heating medium (such as water or

	Derived from: massFlowrate	another heat transfer fluid) through a heating system.
	hotWaterFlowrate (xs:double) Derived from: hotWaterFlowrate	The hot water flow rate refers to the volume of hot water passing through a pipe, faucet, or heating system per unit of time.
	coldWaterFlowrate (xs:double) Derived from: coldWaterFlowrate	The cold water flow rate refers to the volume of hot water passing through a pipe, faucet, or heating system per unit of time.
	zetaValueHeat (xs:int) Derived from: zetaValueHeat	The Zeta value (ζ -value) describes the resistance coefficient causing pressure loss in flow systems, particularly in heating technology.
	zetaValueCold (xs:int) Derived from: zetaValueCold	The Zeta value (ζ -value) describes the resistance coefficient causing pressure loss in flow systems, particularly in heating technology.
	tgaKeyH60 (xs:string) Derived from: tgaKeyH60	Unique key for the calculation
	tgaKeyS87 (xs:string) Derived from: tgaKeyS87	Unique key for the calculation
	tgaKeyS90 (xs:string) Derived from: tgaKeyS90	Unique key for the calculation
	productRange (xs:string) Derived from: productRange	A product range description provides an overview of the entire product assortment of a company or brand.
Interfaces	None	

4.1.4 BuildingServicesEngineering Structure RoleClassLib*Table 42 - Definition BuildingServices Structure RoleClassLib*

Class name	AutomationML_BuildingServices.Structure_RoleClassLib
Description	Structure of the role classes according to the modules Heating, Ventilation, Sanitary, Sprinkler, and Electrical.
Version	1.0.0

4.1.4.1 PipeSystem

A „**PipeSystem**“ is derived from a “ProductionLine” according to AutomationML Whitepaper – Semantic Libraries. It is defined as follows.

Table 43 - Defintion PipeSystem

Class name	PipeSystem
Description	PipesSystem are used in the manufacturing and process industry to transport various substances, including water, gas, or air.
Parent class	AutomationMLDiscreteManufacturingRoleClassLibAMLEd22_7_1@AutomationMLExtendedRoleClassLib/ProductionLine
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem
Attributes	GUID (xs:int) Derived from: GUID A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None

4.1.4.2 ElectricalSystem

A „**ElectricalSystem**“ is derived from a “ProductionLine” according to AutomationML Whitepaper – Semantic Libraries. It is defined as follows.

Table 44 - Definition ElectricalSystem

Class name	ElectricalSystem	
Description	Electrical engineering plays a central role in modern technology and involves the generation, transmission, and utilization of electrical energy and systems. It encompasses energy generation, energy transmission, electrical installation, automation technology, and electronics.	
Parent class	AutomationMLDiscreteManufacturingRoleClassLibAMLEd22_7_1@AutomationMLExtendedRoleClassLib/ProductionLine	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/ElectricalSystem	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.3 VentilationSystem

A „**VentilationSystem**“ is derived from a “ProductionLine” according to AutomationML Whitepaper – Semantic Libraries. It is defined as follows.

Table 45 - Definition VentialtionSystem

Class name	VentilationSystem	
Description	A ventilation system is a crucial component in buildings, designed to control indoor air quality, temperature, and humidity. It helps to circulate fresh air, remove stale air, and regulate environmental conditions.	
Parent class	AutomationMLDiscreteManufacturingRoleClassLibAMLEd22_7_1@AutomationMLExtendedRoleClassLib/ProductionLine	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/VentilationSystem	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.4 GasSystem

A „**GasSystem**“ is derived from “PipeSystem”. It is defined as follows.

Table 46 - Definition GasSystem

Class name	GasSystem	
Description	Gases are material substances that exist in a state where their molecules are far apart and they evenly fill the entire space they occupy. Gases have no fixed shape or volume, making them highly compressible.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/GasSystem	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.5 ColdWaterSystem

A „**ColdWaterSystem**“ is derived from “PipeSystem”. It is defined as follows.

Table 47 - Definition ColdWaterSystem

Class name	ColdWaterSystem	
Description	In the building services engineering the cold water system plays a central role in providing cooling water for various applications within a building. Cold water is required for a wide range of purposes, particularly in areas such as heating, ventilation, and air conditioning (HVAC), sanitary facilities, fire protection system, and the cooling of technical equipment.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/ColdWaterSystem	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.6 CompressedAirSystem

A „**CompressedAirSystem**“ is derived from “PipeSystem”. It is defined as follows.

Table 48 - Definition CompressedAirSystem

Class name	CompressedAirSystem	
Description	Compressed air is a versatile medium that plays a central role in building services engineering and many industrial processes. It is used for energy supply, regulation, control, and cleaning, and is an effective solution for a wide range of applications.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/CompressedAirSystem	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.7 CondensateSystem

A „**CondensateSystem**“ is derived from “PipeSystem”. It is defined as follows.

Table 49 - Definition CondensateSystem

Class name	CondensateSystem	
Description	In building services engineering the term condensate refers to the water that forms through the condensation process when a gas, usually water vapor, comes into contact with a cooler surface and changes into liquid form.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/CondensateSystem	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.8 TankPlantSystem

A „TankPlantSystem“ is derived from “PipeSystem”. It is defined as follows.

Table 50 - Definition TankPlantSystem

Class name	TankPlantSystem	
Description	Tank facilities are specialized installations used for the storage of liquids, typically in large quantities. They are employed in various industries, including chemicals, food, oil, and wastewater management.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/TankPlantSystem	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.9 HeatingSystem

A „HeatingSystem“ is derived from “PipeSystem”. It is defined as follows.

Table 51 - Definition HeatingSystem

Class name	HeatingSystem	
Description	A static heater, also known as a radiator or convector, is a heating system that releases heat through radiation and convection. It typically operates by circulating hot water or steam through pipes within the heating unit.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/HeatingSystem	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.10 DrinkingWaterSystem

A „**DrinkingWaterSystem**“ is derived from “PipeSystem”. It is defined as follows.

Table 52 - Definition DrinkingWaterSystem

Class name	DrinkingWaterSystem	
Description	The drinking water system ensures that water is available in sufficient quantity and quality for daily use, such as drinking, cooking, washing, hygiene, and heating.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/DrinkingWaterSystem	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.11 SprinklerSystem

A „**SprinklerSystem**“ is derived from “PipeSystem”. It is defined as follows.

Table 53 - Definition SprinklerSystem

Class name	SprinklerSystem	
Description	Sprinkler technology in Technical Building Equipment refers to the design, installation, and maintenance of sprinkler systems for fire suppression and prevention in buildings.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/SprinklerSystem	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.12 RainWaterSystem

A „RainWaterSystem“ is derived from “PipeSystem”. It is defined as follows.

Table 54 - Definition RainWaterSystem

Class name	RainWaterSystem	
Description	A rainwater system is a system for collecting, storing, and utilizing rainwater. Such systems are increasingly used in residential and commercial buildings.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/RainWaterSystem	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.13 ReserveSystem

A „ReserveSystem“ is derived from “PipeSystem”. It is defined as follows.

Table 55 - Definition ReserveSystem

Class name	ReserveSystem	
Description	A reserve type is a medium that is not occupied.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/ReserveSystem	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.14 SteamSystem

A „**SteamSystem**“ is derived from “PipeSystem”. It is defined as follows.

Table 56 - Definition SteamSystem

Class name	SteamSystem	
Description	Steam is the gaseous state of water that occurs when water is heated and evaporates. It is an invisible gas that exists at higher temperatures and pressures. Steam plays an important role in various applications, from energy generation to heating technology.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/SteamSystem	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.15 WasteWaterSystem

A „**WasteWaterSystem**“ is derived from “PipeSystem”. It is defined as follows.

Table 57 - Definition WasteWaterSystem

Class name	WasteWaterSystem	
Description	Wastewater is a term that is divided into two main categories: gray water and black water. Gray water is a specific form of wastewater that originates from sanitary installations but is not contaminated with feces. Black water is a type of wastewater that is contaminated with feces and urine.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/WasteWaterSystem	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.16 Argon

„Argon“ is derived from “GasSystem”. It is defined as follows.

Table 58 - Definition Argon

Class name	Argon	
Description	In building services engineering argon is primarily used in windows and ventilation systems, while in industry, it plays a key role as a shielding gas in welding, metal processing, the semiconductor industry, and glass manufacturing.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/GasSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/Argon	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.17 CarbonDioxide

„CarbonDioxide“ is derived from “GasSystem”. It is defined as follows.

Table 59 - Definition CarbonDioxide

Class name	CarbonDioxide	
Description	In building services engineering carbon dioxide is used as a versatile gas in various applications, particularly in air quality control, cooling technology, fire protection, and industry.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/GasSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/CarbonDioxide	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.18 Corgon

„Corgon“ is derived from “GasSystem”. It is defined as follows.

Table 60 - Definition Corgon

Class name	Corgon	
Description	Corgon is not a widely recognized term in building services or gas technology. It's possible you're referring to "Corgon" as a brand or a term used for a specific gas or product in certain countries or industries.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/GasSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/Corgon	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.19 Helium

„Helium“ is derived from “GasSystem”. It is defined as follows.

Table 61 - Definition Helium

Class name	Helium	
Description	Helium (He) is a colorless, odorless, chemically inert, lightweight gas that plays a significant role in building services engineering for various specialized applications. In TGA, helium is primarily used in systems and installations that require specific gas properties.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/GasSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/Helium	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.20 Hydrogen

„Hydrogen“ is derived from “GasSystem”. It is defined as follows.

Table 62 - Definition Hydrogen

Class name	Hydrogen	
Description	Hydrogen is playing an increasingly important role in building services engineering, particularly in the areas of energy supply, sustainable heating systems, and cooling technology. Through its use in fuel cells, as a raw material in industry, and in innovative technologies for reducing CO ₂ emissions, hydrogen is a key element in modern TGA.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/GasSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/Hydrogen	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.21 NaturalGas

„NaturalGas“ is derived from “GasSystem”. It is defined as follows.

Table 63 - Definition NaturalGas

Class name	NaturalGas	
Description	In building services engineering natural gas is primarily used as an energy source for heating, ventilation, and air conditioning systems, as well as for power generation and water heating. Natural gas is often preferred due to its efficiency, availability, and environmental benefits.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/GasSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/NaturalGas	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.22 Nitrogen

„Nitrogen“ is derived from “GasSystem”. It is defined as follows.

Table 64 - Definition Nitrogen

Class name	Nitrogen	
Description	As an inert gas, nitrogen plays an important role in systems that require a controlled atmosphere or in processes where a reaction with oxygen or other gases needs to be prevented.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/GasSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/Nitrogen	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.23 Oxygen

„Oxygen“ is derived from “GasSystem”. It is defined as follows.

Table 65 - Definition Oxygen

Class name	Oxygen	
Description	In building services engineering oxygen as a technical gas is an important component for various applications in medical, industrial, and scientific fields. The documentation and planning include the design of central supply systems, the proper distribution and monitoring of oxygen, as well as compliance with all safety regulations.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/GasSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/Oxygen	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.24 Propane

„Propane“ is derived from “GasSystem”. It is defined as follows.

Table 66 - Definition Propane

Class name	Propane	
Description	In building services engineering propane is used as a fuel in various applications, particularly in heating, ventilation, and air conditioning (HVAC) systems. Propane (C ₃ H ₈) is an aliphatic, liquid hydrocarbon gas that is often stored as liquefied petroleum gas (LPG) and is used in numerous technical fields.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/GasSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/Propane	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.25 SmokeGas

„SmokeGas“ is derived from “GasSystem”. It is defined as follows.

Table 67 - Definition SmokeGas

Class name	SmokeGas	
Description	In building services engineering carbon dioxide has a wide range of applications, from air quality control to fire protection and specialized industrial processes. The planning and installation of CO ₂ systems require precise coordination to meet specific requirements, ranging from cooling and chemical industries to food processing.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/GasSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/SmokeGas	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.26 DevicesAir

„DevicesAir“ is derived from “VentilationSystem”. It is defined as follows.

Table 68 - Definition DevicesAir

Class name	DevicesAir	
Description	A devices air system, often referred to as a localized or point-source air system, involves the use of individual devices or appliances to manage air quality, temperature, and ventilation in specific areas within a building.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/VentilationSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/DevicesAir	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.27 ExhaustAir

„ExhaustAir“ is derived from “VentilationSystem”. It is defined as follows.

Table 69 - Definition ExhaustAir

Class name	ExhaustAir	
Description	An exhaust air system is designed to remove stale or contaminated air from a building and is a critical component of effective ventilation.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/VentilationSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/ExhaustAir	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.28 ExteriorAir

„**ExteriorAir**“ is derived from “VentilationSystem”. It is defined as follows.

Table 70 - Definition ExteriorAir

Class name	ExteriorAir	
Description	An exterior air system is designed to manage and improve the quality of air entering a building from the outside environment.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/VentilationSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/ExteriorAir	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.29 ExtractAir

„**ExtractAir**“ is derived from “VentilationSystem”. It is defined as follows.

Table 71 - Definition ExtractAir

Class name	ExtractAir	
Description	An extract air system, often referred to as an exhaust air system, is specifically designed to remove air from a building to maintain indoor air quality and comfort.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/VentilationSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/ExtractAir	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.30 GasPurgeAir

„GasPurgeAir“ is derived from “VentilationSystem”. It is defined as follows.

Table 72 - Definition GasPurgeAir

Class name	GasPurgeAir	
Description	A gas purge air system is designed to remove unwanted gases or contaminants from a space by introducing clean air or an inert gas.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/VentilationSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/GasPurgeAir	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.31 ObjectWasteAir

„ObjectWasteAir“ is derived from “VentilationSystem”. It is defined as follows.

Table 73 - Definition ObjectWasteAir

Class name	ObjectWasteAir	
Description	An object waste air system, often referred to in the context of industrial or commercial settings, is designed to manage and eliminate waste air generated during processes that involve the handling or processing of materials.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/VentilationSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/ObjectWasteAir	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.32 ProcessAir

„**ProcessAir**“ is derived from “VentilationSystem”. It is defined as follows.

Table 74 - Definition ProcessAir

Class name	ProcessAir	
Description	A process air system is designed to supply and manage air for specific industrial processes, ensuring optimal conditions for operations such as heating, cooling, drying, and chemical reactions.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/VentilationSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/ProcessAir	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.33 RecirculationAir

„**RecirculationAir**“ is derived from “VentilationSystem”. It is defined as follows.

Table 75 - Definition RecirculationAir

Class name	RecirculationAir	
Description	A recirculation air system is designed to improve indoor air quality and comfort by reusing a portion of the air within a building. This system is commonly found in heating, ventilation, and air conditioning (HVAC) setups.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/VentilationSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/RecirculationAir	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.34 SupplyAir

„SupplyAir“ is derived from “VentilationSystem”. It is defined as follows.

Table 76 - Definition SupplyAir

Class name	SupplyAir	
Description	A supply air system is designed to introduce fresh, conditioned air into a building, ensuring a comfortable and healthy indoor environment.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/VentilationSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/SupplyAir	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.35 CommunicationEngineering

„CommunicationEngineering“ is derived from “ElectricalSystem”. It is defined as follows.

Table 77 - Definition CommunicationEngineering

Class name	CommunicationEngineering	
Description	Communication technology is a subfield of electrical engineering that deals with the transmission, processing, and storage of information. It plays a central role in telecommunications and encompasses various technologies and systems necessary for communication over long distances.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/ElectricalSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/CommunicationEngineering	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.36 Lightning

„**Lightning**“ is derived from “ElectricalSystem”. It is defined as follows.

Table 78 - Definition Lightning

Class name	Lightning	
Description	Lightning in electrical engineering refers to the design, installation, and use of lighting systems that illuminate spaces, outdoor areas, or specific objects. Lighting plays a crucial role in spatial design, safety, and functionality.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/ElectricalSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/Lightning	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.37 LowCurrent

„**LowCurrent**“ is derived from “ElectricalSystem”. It is defined as follows.

Table 79 - Definition LowCurrent

Class name	LowCurrent	
Description	Low voltage refers to electrical currents and voltages that are low compared to high voltage. Typically, this involves voltages up to 1,000 volts (V) for alternating current and up to 1,500 V for direct current.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/ElectricalSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/LowCurrent	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.38 MainPower

„MainPower“ is derived from “ElectricalSystem”. It is defined as follows.

Table 80 - Definition MainPower

Class name	MainPower	
Description	High voltage refers to electrical currents with high voltages and power levels, typically above 1,000 volts (V) for alternating current or 1,500 V for direct current. High voltage is primarily used in power transmission, industrial applications, and large machinery.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/ElectricalSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/MainPower	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.39 SafetyEngineering

„SafetyEngineering“ is derived from “ElectricalSystem”. It is defined as follows.

Table 81 - Definition SafetyEngineering

Class name	SafetyEngineering	
Description	Safety technology in electrical engineering focuses on protecting people, systems, and information from hazards that can arise from electrical systems or devices. It encompasses a variety of measures and technologies aimed at minimizing risks and ensuring safety.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/ElectricalSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/SafetyEngineering	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.40 ColdWaterFlow

„ColdWaterFlow“ is derived from “ColdWaterSystem”. It is defined as follows.

Table 82 - Definition ColdWaterFlow

Class name	ColdWaterFlow	
Description	The cooling water supply is a central component in a cooling water system, as it transports the water to the equipment or processes to be cooled, where it absorbs heat.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/ColdWaterSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/ColdWaterFlow	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.41 ColdWaterReturn

„ColdWaterReturn“ is derived from “ColdWaterSystem”. It is defined as follows.

Table 83 - Definition ColdWaterReturn

Class name	ColdWaterReturn	
Description	The cold water return is an important component of a cold water system, describing the path of the water that, after use or cooling, is returned to the starting point of the circuit. In a typical system, cold water is first directed to the points of use (e.g., air conditioning units, cooling systems, or sanitary facilities), where it performs its cooling function or is used for other purposes.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/ColdWaterSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/ColdWaterReturn	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.42 CoolingWaterFlow

„CoolingWaterFlow“ is derived from “ColdWaterSystem”. It is defined as follows.

Table 84 - Definition CoolingWaterFlow

Class name	CoolingWaterFlow	
Description	The cooling water supply is a central component in a cooling water system, as it transports the water to the equipment or processes to be cooled, where it absorbs heat.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/ColdWaterSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/CoolingWaterFlow	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.43 CoolingWaterReturn

„CoolingWaterReturn“ is derived from “ColdWaterSystem”. It is defined as follows.

Table 85 - Definition CoolingWaterReturn

Class name	CoolingWaterReturn	
Description	The cooling water return is an essential component of an efficient cooling water system. It is responsible for carrying heated water from the equipment being cooled back to the cooling tower or heat exchanger, where the heat is released and the water is cooled down.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/ColdWaterSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/CoolingWaterReturn	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.44 DeepColdFlow

„DeepColdFlow“ is derived from “ColdWaterSystem”. It is defined as follows.

Table 86 - Definition DeepColdFlow

Class name	DeepColdFlow	
Description	The cryogenic supply refers to the part of a cooling or cryogenic system where a very cold coolant (usually a special cryogenic fluid or gas) is fed into a machine, plant, or process to achieve extremely low temperatures (often below -100°C).	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/ColdWaterSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/DeepColdFlow	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.45 DeepColdReturn

„DeepColdReturn“ is derived from “ColdWaterSystem”. It is defined as follows.

Table 87 - Definition DeepColdReturn

Class name	DeepColdReturn	
Description	The cryogenic return refers to the part of a cooling or cryogenic system where the cooled medium (often a cryogen such as liquid nitrogen, helium, or a special coolant) is returned after absorbing heat from the system or process being cooled, to either be reintroduced into the cycle or processed again in a special tank or evaporator.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/ColdWaterSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/DeepColdReturn	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.46 GlycolCircuitFlow

„GlycolCircuitFlow“ is derived from “ColdWaterSystem”. It is defined as follows.

Table 88 - Definition GlycolCircuitFlow

Class name	GlycolCircuitFlow	
Description	The glycol supply refers to the section of a cooling system where a glycol-water mixture (often an antifreeze mixture) is introduced into the system as a cooling medium. Glycol is primarily used in cooling systems to regulate temperature while protecting against freeze damage, as it does not freeze at low temperatures compared to pure water.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/ColdWaterSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/GlycolCircuitFlow	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.47 GlycolCircuitReturn

„GlycolCircuitReturn“ is derived from “ColdWaterSystem”. It is defined as follows.

Table 89 - Definition GlycolCircuitReturn

Class name	GlycolCircuitReturn	
Description	The glycol return refers to the section of a cooling system where the heated glycol-water mixture, after absorbing heat from the system or process being cooled, is returned. Once the glycol has absorbed heat and warmed up, it is directed back through the return line to the cooling system, where it is either cooled down again or reintroduced into the cycle.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/ColdWaterSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/GlycolCircuitReturn	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.48 CompressedAir12bar

„CompressedAir12bar“ is derived from “CompressedAirSystem”. It is defined as follows.

Table 90 - Definition CompressedAir12bar

Class name	CompressedAir12bar	
Description	Compressed air at 12 bar refers to air that has been compressed to a pressure of 12 bar, which is approximately twelve times the atmospheric pressure.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/CompressedAirSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/CompressedAir12bar	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.49 CompressedAir3bar

„CompressedAir3bar“ is derived from “CompressedAirSystem”. It is defined as follows.

Table 91 - Definition CompressedAir3bar

Class name	CompressedAir3bar	
Description	Compressed air at 3 bar refers to air that has been compressed to a pressure of 3 bar, which is approximately three times the atmospheric pressure.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/CompressedAirSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/CompressedAir3bar	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.50 CompressedAir6bar

„CompressedAir6bar“ is derived from “CompressedAirSystem”. It is defined as follows.

Table 92 - Definition CompressedAir6bar

Class name	CompressedAir6bar	
Description	Compressed air at 6 bar is a widely used, moderate to high-pressure solution in industrial and building services applications.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/CompressedAirSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/CompressedAir6bar	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.51 CompressedAir8bar

„CompressedAir8bar“ is derived from “CompressedAirSystem”. It is defined as follows.

Table 93 - Definition CompressedAir8bar

Class name	CompressedAir8bar	
Description	Compressed air at 8 bar refers to air that has been compressed to a pressure of 8 bar, which is approximately eight times the atmospheric pressure.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/CompressedAirSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/CompressedAir8bar	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.52 Condensate10bar

„Condensate10bar“ is derived from “CondensateSystem”. It is defined as follows.

Table 94 - Definition Condensate10bar

Class name	Condensate10bar	
Description	Condensate at 10 bar is generated when steam, at this higher pressure, cools down and condenses. The saturation temperature for steam at 10 bar is approximately 180.4°C.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/CondensateSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/Condensate10bar	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.53 Condensate12bar

„Condensate12bar“ is derived from “CondensateSystem”. It is defined as follows.

Table 95 - Definition Condensate12bar

Class name	Condensate12bar	
Description	Condensate at 12 bar is produced when steam at 12 bar pressure cools down and condenses. The saturation temperature for steam at this pressure is approximately 188.8°C.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/CondensateSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/Condensate12bar	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.54 Condensate20bar

„Condensate20bar“ is derived from “CondensateSystem”. It is defined as follows.

Table 96 - Definition Condensate20bar

Class name	Condensate20bar	
Description	Condensate at 20 bar is produced when steam, under a pressure of 20 bar, cools down and condenses. The saturation temperature for steam at this pressure is about 212.4°C.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/CondensateSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/Condensate20bar	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.55 Condensate24bar

„Condensate24bar“ is derived from “CondensateSystem”. It is defined as follows.

Table 97 - Definition Condensate24bar

Class name	Condensate24bar	
Description	Condensate at 24 bar is formed when steam at a pressure of 24 bar cools and condenses. The saturation temperature at 24 bar is approximately 227.7°C.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/CondensateSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/Condensate24bar	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.56 Condensate3bar

„Condensate3bar“ is derived from “CondensateSystem”. It is defined as follows.

Table 98 - Definition Condensate3bar

Class name	Condensate3bar	
Description	Condensate at 3 bar is generated in steam systems, heating systems, and other technical processes that operate under steam pressure. The condensation process at 3 bar occurs at a saturation temperature of approximately 133.5°C.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/CondensateSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/Condensate3bar	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.57 Condensate4bar

„Condensate4bar“ is derived from “CondensateSystem”. It is defined as follows.

Table 99 - Definition Condensate4bar

Class name	Condensate4bar	
Description	Condensate at 4 bar is generated when steam at this pressure cools down and condenses into liquid form. The saturation temperature for this steam is approximately 143.6°C.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/CondensateSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/Condensate4bar	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.58 Diesel

„Diesel“ is derived from “TankPlantSystem”. It is defined as follows.

Table 100 - Definition Diesel

Class name	Diesel	
Description	The material diesel generally refers to the chemical and physical properties of diesel fuel. Diesel fuel is a mixture of hydrocarbons that is refined from crude oil.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/TankPlantSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/Diesel	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.59 FuelOil

„FuelOil“ is derived from “TankPlantSystem”. It is defined as follows.

Table 101 - Definition FuelOil

Class name	FuelOil	
Description	Gasoline is a liquid fuel primarily used in spark-ignition engines. It is refined from crude oil and consists of a complex mixture of hydrocarbons.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/TankPlantSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/FuelOil	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.60 Glycol

„Glycol“ is derived from “TankPlantSystem”. It is defined as follows.

Table 102 - Definition Glycol

Class name	Glycol	
Description	Glycol is an organic compound that belongs to the group of alcohols. There are various types of glycol, but the two most common are ethylene glycol and propylene glycol. Among other uses, ethylene glycol is commonly used as an antifreeze in cooling systems and vehicle engines to prevent freezing and overheating.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/TankPlantSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/Glycol	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.61 Methanol

„Methanol“ is derived from “TankPlantSystem”. It is defined as follows.

Table 103 - Definition Methanol

Class name	Methanol	
Description	Methanol is a simple alcohol with the chemical formula CH ₃ OH. It is a colorless and odorless liquid that belongs to the group of alcohols. In fuel applications, it is used as an alternative fuel in some vehicles and can also be used in the production of biodiesel.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/TankPlantSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/Methanol	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.62 Oil

„Oil“ is derived from “TankPlantSystem”. It is defined as follows.

Table 104 - Definition Oil

Class name	Oil	
Description	Oil is a viscous liquid derived from natural sources, primarily consisting of hydrocarbons. It plays a crucial role in various industries and applications.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/TankPlantSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/Oil	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.63 OldOil

„OldOil“ is derived from “TankPlantSystem”. It is defined as follows.

Table 105 - Definition OldOil

Class name	OldOil	
Description	Used oil is a term for oil that has been used or consumed during the operation of engines, machines, or other equipment. It can include various types of lubricants, such as motor oil, transmission fluid, and hydraulic oil.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/TankPlantSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/OldOil	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.64 DistrictHeatingFlow

„DistrictHeatingFlow“ is derived from “HeatingSystem”. It is defined as follows.

Table 106 - Definition DistrictHeatingFlow

Class name	DistrictHeatingFlow	
Description	The term district heating flow refers to the water that is pumped from the central heating system or district heating plant into the connected buildings.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/HeatingSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/DistrictHeatingFlow	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.65 DistrictHeatingReturn

„DistrictHeatingReturn“ is derived from “HeatingSystem”. It is defined as follows.

Table 107 - Definition DistrictHeatingReturn

Class name	DistrictHeatingReturn	
Description	This is the water that is returned to the central heating system or district heating plant after being used in the radiators or for domestic hot water preparation.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/HeatingSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/DistrictHeatingReturn	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.66 HeatingWaterFlow

„HeatingWaterFlow“ is derived from “HeatingSystem”. It is defined as follows.

Table 108 - Definition HeatingWaterFlow

Class name	HeatingWaterFlow	
Description	This is the temperature of the heating water that is pumped from the heating system into the radiators. It is typically higher than the return temperature, which is the temperature of the water that flows back to the heating system after releasing its heat.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/HeatingSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/HeatingWaterFlow	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.67 HeatingWaterReturn

„HeatingWaterReturn“ is derived from “HeatingSystem”. It is defined as follows.

Table 109 - Definition HeatingWaterReturn

Class name	HeatingWaterReturn	
Description	This is the temperature of the water that is returned to the heating system after being heated by the radiators in the rooms. The return is typically cooler than the flow, as the water has given off heat to the space during its passage through the radiators.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/HeatingSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/HeatingWaterReturn	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.68 IndustryHeatingFlow

„IndustryHeatingFlow“ is derived from “HeatingSystem”. It is defined as follows.

Table 110 - Definition IndustryHeatingFlow

Class name	IndustryHeatingFlow	
Description	This is the water or steam that is returned to a boiler or heat supply unit after being used in industrial applications.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/HeatingSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/IndustryHeatingFlow	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.69 IndustryHeatingReturn

„IndustryHeatingReturn“ is derived from “HeatingSystem”. It is defined as follows.

Table 111 - Definition IndustryHeatingReturn

Class name	IndustryHeatingReturn	
Description	This is the heating water or steam that is delivered at a specific temperature from a heating source, such as a boiler or a heat supply unit, to the processes or heating systems in the industry.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/HeatingSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/IndustryHeatingReturn	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.70 ProcessHeatingFlow

„ProcessHeatingFlow“ is derived from “HeatingSystem”. It is defined as follows.

Table 112 - Definition ProcessHeatingFlow

Class name	ProcessHeatingFlow	
Description	This is the heating water or steam that is supplied at a specific temperature from a heating source, such as a boiler or a heat supply unit, to the industrial processes or heating systems.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/HeatingSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/ProcessHeatingFlow	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.71 ProcessHeatingReturn

„ProcessHeatingReturn“ is derived from “HeatingSystem”. It is defined as follows.

Table 113 - Definition ProcessHeatingReturn

Class name	ProcessHeatingReturn	
Description	This is the water or steam that is returned to a boiler or heat supply unit after being used in industrial applications.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/HeatingSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/ProcessHeatingReturn	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.72 RoomHeatingFlow

„RoomHeatingFlow“ is derived from “HeatingSystem”. It is defined as follows.

Table 114 - Definition RoomHeatingFlow

Class name	RoomHeatingFlow	
Description	This is the heating water that is supplied at a specific temperature from the heating system to the radiators or other heating systems to warm the rooms.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/HeatingSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/RoomHeatingFlow	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.73 RoomHeatingReturn

„RoomHeatingReturn“ is derived from “HeatingSystem”. It is defined as follows.

Table 115 - Definition RoomHeatingReturn

Class name	RoomHeatingReturn	
Description	This is the water that is returned to the heating system after releasing heat to the room. It typically has a lower temperature than the heating water that is supplied to the radiators or heating system.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/HeatingSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/RoomHeatingReturn	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.74 DrinkingWaterSystemCirculation

„DrinkingWaterSystemCirculation“ is derived from “DrinkingWaterSystem”. It is defined as follows.

Table 116 - Definition DrinkingWaterSystemCirculation

Class name	DrinkingWaterSystemCirculation	
Description	A drinking water recirculation system plays a key role in enhancing user comfort by providing hot water quickly and efficiently. It ensures a constant temperature and prevents the growth of harmful bacteria, such as Legionella.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/DrinkingWaterSystem	
Path element for reference	AutomationML_BuildingServices.Structure_RoleClassLib/DrinkingWaterSystemCirculation	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.75 DrinkingWaterSystemCold

„DrinkingWaterSystemCold“ is derived from “DrinkingWaterSystem”. It is defined as follows.

Table 117 - Definition DrinkingWaterSystemCold

Class name	DrinkingWaterSystemCold	
Description	The cold drinking water system in a building ensures the availability of safe, clean water for all daily needs, from drinking and cooking to bathing and cleaning.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/DrinkingWaterSystem	
Path element for reference	AutomationML_BuildingServices.Structure_RoleClassLib/DrinkingWaterSystemCold	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.76 DrinkingWaterSystemWarm

„DrinkingWaterSystemWarm“ is derived from “DrinkingWaterSystem”. It is defined as follows.

Table 118 - Definition DrinkingWaterSystemWarm

Class name	DrinkingWaterSystemWarm	
Description	A hot water system is an essential component of the drinking water supply in a building, ensuring that potable water is heated to the desired temperature. It is crucial for the comfort of users and the functionality of various sanitary facilities, such as showers, sinks, kitchens, and heating systems.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/DrinkingWaterSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/DrinkingWaterSystemWarm	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.77 ExstinguishingWater

„ExstinguishingWater“ is derived from “SprinklerSystem”. It is defined as follows.

Table 119 - Definition ExstinguishingWater

Class name	ExstinguishingWater	
Description	Firefighting water has a cooling and smothering effect on the fire and is used to lower the temperature of the fire source and interrupt the chemical reactions that sustain the fire.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/SprinklerSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/ExstinguishingWater	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.78 Hydrant

„Hydrant“ is derived from “SprinklerSystem”. It is defined as follows.

Table 120 - Definition Hydrant

Class name	Hydrant	
Description	A hydrant system is a combination of a hydrant system and a sprinkler system, often used together in larger fire protection installations or in areas with an increased fire risk.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/SprinklerSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/Hydrant	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.79 ObjectProtection

„ObjectProtection“ is derived from “SprinklerSystem”. It is defined as follows.

Table 121 - Definition ObjectProtection

Class name	ObjectProtection	
Description	Object protection sprinklers (also known as asset protection sprinklers) are a specialized type of sprinkler system designed to protect valuable objects, equipment, and materials within a building or on a premises. These systems are deployed in areas where precious or sensitive items are stored, ensuring that any potential fire is quickly suppressed while minimizing water damage to the assets being protected.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/SprinklerSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/ObjectProtection	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.80 RoomProtection

„RoomProtection“ is derived from “SprinklerSystem”. It is defined as follows.

Table 122 - Definition RoomProtection

Class name	RoomProtection	
Description	These sprinkler systems are specifically designed to be activated only in areas where there is an actual fire risk, thus providing preventive fire suppression within designated protected zones.	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/SprinklerSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/RoomProtection	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.81 Steam10bar

„Steam10bar“ is derived from “SteamSystem”. It is defined as follows.

Table 123 - Definition Steam10bar

Class name	Steam10bar	
Description	Steam at 10 bar (approximately 1,000 kPa) refers to steam generated under a pressure of 10 bar above atmospheric pressure. This pressure corresponds to a saturation temperature of about 180 °C (356 °F).	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/SteamSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/Steam10bar	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.82 Steam12bar

„**Steam12bar**“ is derived from “SteamSystem”. It is defined as follows.

Table 124 - Definition Steam12bar

Class name	Steam12bar	
Description	Steam at 12 bar (approximately 1,200 kPa) refers to steam generated under a pressure of 12 bar above atmospheric pressure. This pressure corresponds to a saturation temperature of about 188 °C (370 °F).	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/SteamSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/Steam12bar	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.83 Steam3bar

„**Steam3bar**“ is derived from “SteamSystem”. It is defined as follows.

Table 125 - Definition Steam3bar

Class name	Steam3bar	
Description	Steam at 3 bar (approximately 300 kPa) refers to steam that is generated under a pressure of 3 bar above atmospheric pressure. This corresponds to a saturation temperature of about 133 °C (271 °F).	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/SteamSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/Steam3bar	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.1.4.84 Steam4bar

„**Steam4bar**“ is derived from “SteamSystem”. It is defined as follows.

Table 126 - Definition Steam4bar

Class name	Steam4bar	
Description	Steam at 4 bar (approximately 400 kPa) refers to steam that is generated under a pressure of 4 bar above atmospheric pressure. This pressure corresponds to a saturation temperature of about 143 °C (289 °F).	
Parent class	AutomationML_BuildingServices.Structure_RoleClassLib/PipeSystem/SteamSystem	
Path for element reference	AutomationML_BuildingServices.Structure_RoleClassLib/Steam4bar	
Attributes	GUID (xs:int) Derived from: GUID	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Interfaces	None	

4.2 InterfaceClassLibrary

Second main basement of the modelling are the required interface classes.

The following figures represent the interface class library.

```

▲ [IC] AutomationML_BuildingServices_InterfaceClassLib {Version: 1.0.0 }
  [IC] ColdWaterSystemAssignedToMediaTransferPoint {Class: FunctionAssignedToMediaTransferPoint}
  [IC] CompressedAirSystemAssignedToMediaTransferPoint {Class: FunctionAssignedToMediaTransferPoint}
  [IC] CondensateSystemAssignedToMediaTransferPoint {Class: FunctionAssignedToMediaTransferPoint}
  [IC] CoolingWaterSystemAssignedToMediaTransferPoint {Class: FunctionAssignedToMediaTransferPoint}
  [IC] DrinkingWaterSystemAssignedToMediaTransferPoint {Class: FunctionAssignedToMediaTransferPoint}
  [IC] ElectricalSystemAssignedToMediaTransferPoint {Class: FunctionAssignedToMediaTransferPoint}
  [IC] FunctionAssignedToMediaTransferPoint {Class: AutomationMLBaseInterface}
  [IC] GasSystemAssignedToMediaTransferPoint {Class: FunctionAssignedToMediaTransferPoint}
  [IC] HeatingSystemAssignedToMediaTransferPoint {Class: FunctionAssignedToMediaTransferPoint}
  [IC] RainWaterSystemAssignedToMediaTransferPoint {Class: FunctionAssignedToMediaTransferPoint}
  [IC] ReserveSystemAssignedToMediaTransferPoint {Class: FunctionAssignedToMediaTransferPoint}
  [IC] ResourceAssignedToColdWaterSystem {Class: ResourceAssignedToFunction}
  [IC] ResourceAssignedToCompressedAirSystem {Class: ResourceAssignedToFunction}
  [IC] ResourceAssignedToCondensateSystem {Class: ResourceAssignedToFunction}
  [IC] ResourceAssignedToCoolingWaterSystem {Class: ResourceAssignedToFunction}
  [IC] ResourceAssignedToDrinkingWaterSystem {Class: ResourceAssignedToFunction}
  [IC] ResourceAssignedToElectricalSystem {Class: ResourceAssignedToFunction}
  [IC] ResourceAssignedToFunction {Class: AutomationMLBaseInterface}
  [IC] ResourceAssignedToGasSystem {Class: ResourceAssignedToFunction}
  [IC] ResourceAssignedToHeatingSystem {Class: ResourceAssignedToFunction}
  [IC] ResourceAssignedToRainWaterSystem {Class: ResourceAssignedToFunction}
  [IC] ResourceAssignedToReserveSystem {Class: ResourceAssignedToFunction}
  [IC] ResourceAssignedToSpaceSystem {Class: ResourceAssignedToFunction}
  [IC] ResourceAssignedToSprinklerSystem {Class: ResourceAssignedToFunction}
  [IC] ResourceAssignedToSteamSystem {Class: ResourceAssignedToFunction}
  [IC] ResourceAssignedToTankPlantSystem {Class: ResourceAssignedToFunction}
  [IC] ResourceAssignedToVentilationSystem {Class: ResourceAssignedToFunction}
  [IC] ResourceAssignedToWasteWaterSystem {Class: ResourceAssignedToFunction}
  [IC] ResourceFollowsResource {Class: AutomationMLBaseInterface}
  [IC] SpaceSystemAssignedToMediaTransferPoint {Class: FunctionAssignedToMediaTransferPoint}
  [IC] SprinklerSystemAssignedToMediaTransferPoint {Class: FunctionAssignedToMediaTransferPoint}
  [IC] SteamSystemAssignedToMediaTransferPoint {Class: FunctionAssignedToMediaTransferPoint}
  [IC] TankPlantSystemAssignedToMediaTransferPoint {Class: FunctionAssignedToMediaTransferPoint}
  [IC] VentilationSystemAssignedToMediaTransferPoint {Class: FunctionAssignedToMediaTransferPoint}
  [IC] WasteWaterSystemAssignedToMediaTransferPoint {Class: FunctionAssignedToMediaTransferPoint}

```

```

[IC] SteamSystemAssignedToMediaTransferPoint { Class: FunctionAssignedToMediaTransferPoint}
[IC] TankPlantSystemAssignedToMediaTransferPoint { Class: FunctionAssignedToMediaTransferPoint}
[IC] VentilationSystemAssignedToMediaTransferPoint { Class: FunctionAssignedToMediaTransferPoint}
[IC] WasteWaterSystemAssignedToMediaTransferPoint { Class: FunctionAssignedToMediaTransferPoint}

```

Figure 19 - AutomationML_BuildingServices_InterfaceClassLib in AutomationML Editor view

```

<InterfaceClassLib
Name="AutomationML_BuildingServices_InterfaceClassLib">
<Description>Description: Second main basement of the modelling are the required interface classes</Description>
<Version>1.1.0</Version>
<InterfaceClass
Name="ColdWaterSystemAssignedToMediaTransferPoint"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//FunctionAssignedToMediaTransferPoint">
<Description>The media handover point to the layout.</Description>
</InterfaceClass>
<InterfaceClass
Name="CompressedAirSystemAssignedToMediaTransferPoint"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//FunctionAssignedToMediaTransferPoint">
<Description>The media handover point to the layout.</Description>
</InterfaceClass>
<InterfaceClass
Name="CondensateSystemAssignedToMediaTransferPoint"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//FunctionAssignedToMediaTransferPoint">
<Description>The media handover point to the layout.</Description>
</InterfaceClass>
<InterfaceClass
Name="CoolingWaterSystemAssignedToMediaTransferPoint"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//FunctionAssignedToMediaTransferPoint">
<Description>The media handover point to the layout.</Description>
</InterfaceClass>
<InterfaceClass
Name="DrinkingWaterSystemAssignedToMediaTransferPoint"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//FunctionAssignedToMediaTransferPoint">
<Description>The media handover point to the layout.</Description>
</InterfaceClass>
<InterfaceClass
Name="ElectricalSystemAssignedToMediaTransferPoint"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//FunctionAssignedToMediaTransferPoint">
<Description>The media handover point to the layout.</Description>
</InterfaceClass>
<InterfaceClass
Name="FunctionAssignedToMediaTransferPoint"
RefBaseClassPath="AutomationMLInterfaceClassLib@AutomationMLInterfaceClassLib/AutomationMLBaseInterface">
<Description>Describes the dependence of the functionality on the object.</Description>
</InterfaceClass>
<InterfaceClass
Name="GasSystemAssignedToMediaTransferPoint"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//FunctionAssignedToMediaTransferPoint">
<Description>The media handover point to the layout.</Description>
</InterfaceClass>
<InterfaceClass
Name="HeatingSystemAssignedToMediaTransferPoint"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//FunctionAssignedToMediaTransferPoint">
<Description>The media handover point to the layout.</Description>
</InterfaceClass>
<InterfaceClass
Name="RainWaterSystemAssignedToMediaTransferPoint"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//FunctionAssignedToMediaTransferPoint">
<Description>The media handover point to the layout.</Description>
</InterfaceClass>
<InterfaceClass
Name="ReserveSystemAssignedToMediaTransferPoint"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//FunctionAssignedToMediaTransferPoint">
<Description>The media handover point to the layout.</Description>
</InterfaceClass>

```

```

<InterfaceClass
Name="ResourceAssignedToColdWaterSystem"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//ResourceAssignedToFunction">
  <Description>It is a type of dependency from resources to utility data</Description>
</InterfaceClass>
<InterfaceClass
Name="ResourceAssignedToCompressedAirSystem"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//ResourceAssignedToFunction">
  <Description>It is a type of dependency from resources to utility data</Description>
</InterfaceClass>
<InterfaceClass
Name="ResourceAssignedToCondensateSystem"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//ResourceAssignedToFunction">
  <Description>It is a type of dependency from resources to utility data</Description>
</InterfaceClass>
<InterfaceClass
Name="ResourceAssignedToCoolingWaterSystem"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//ResourceAssignedToFunction">
  <Description>It is a type of dependency from resources to utility data</Description>
</InterfaceClass>
<InterfaceClass
Name="ResourceAssignedToDrinkingWaterSystem"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//ResourceAssignedToFunction">
  <Description>It is a type of dependency from resources to utility data</Description>
</InterfaceClass>
<InterfaceClass
Name="ResourceAssignedToElectricalSystem"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//ResourceAssignedToFunction">
  <Description>It is a type of dependency from resources to utility data</Description>
</InterfaceClass>
<InterfaceClass
Name="ResourceAssignedToFunction"
RefBaseClassPath="AutomationMLInterfaceClassLib@AutomationMLInterfaceClassLib/AutomationMLBaseInterface">
  <Description>Describes the dependence of the functionality on the object.</Description>
</InterfaceClass>
<InterfaceClass
Name="ResourceAssignedToGasSystem"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//ResourceAssignedToFunction">
  <Description>It is a type of dependency from resources to utility data</Description>
</InterfaceClass>
<InterfaceClass
Name="ResourceAssignedToHeatingSystem"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//ResourceAssignedToFunction">
  <Description>It is a type of dependency from resources to utility data</Description>
</InterfaceClass>
<InterfaceClass
Name="ResourceAssignedToRainWaterSystem"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//ResourceAssignedToFunction">
  <Description>It is a type of dependency from resources to utility data</Description>
</InterfaceClass>
<InterfaceClass
Name="ResourceAssignedToReserveSystem"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//ResourceAssignedToFunction">
  <Description>It is a type of dependency from resources to utility data</Description>
</InterfaceClass>
<InterfaceClass
Name="ResourceAssignedToSpaceSystem"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//ResourceAssignedToFunction">
  <Description>It is a type of dependency from resources to utility data</Description>
</InterfaceClass>
<InterfaceClass
Name="ResourceAssignedToSprinklerSystem"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//ResourceAssignedToFunction">
  <Description>It is a type of dependency from resources to utility data</Description>
</InterfaceClass>
<InterfaceClass
Name="ResourceAssignedToSteamSystem"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//ResourceAssignedToFunction">
  <Description>It is a type of dependency from resources to utility data</Description>
</InterfaceClass>
<InterfaceClass
Name="ResourceAssignedToTankPlantSystem"

```

```

RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//ResourceAssignedToFunction">
  <Description>It is a type of dependency from resources to utility data</Description>
</InterfaceClass>
<InterfaceClass
Name="ResourceAssignedToVentilationSystem"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//ResourceAssignedToFunction">
  <Description>It is a type of dependency from resources to utility data</Description>
</InterfaceClass>
<InterfaceClass
Name="ResourceAssignedToWasteWaterSystem"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//ResourceAssignedToFunction">
  <Description>It is a type of dependency from resources to utility data</Description>
</InterfaceClass>
<InterfaceClass
Name="ResourceFollowsResource"
RefBaseClassPath="AutomationMLInterfaceClassLib@AutomationMLInterfaceClassLib/AutomationMLBaseInterface">
  <Description>It is a type of dependency where access to one resource is only possible after the availability or use of another
resource.</Description>
</InterfaceClass>
<InterfaceClass
Name="SpaceSystemAssignedToMediaTransferPoint"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//FunctionAssignedToMediaTransferPoint">
  <Description>The location of the media handover point describes where the medium (e.g., water, gas, electricity) is transferr
ed to the layout or system.</Description>
</InterfaceClass>
<InterfaceClass
Name="SprinklerSystemAssignedToMediaTransferPoint"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//FunctionAssignedToMediaTransferPoint">
  <Description>The media handover point to the layout.</Description>
</InterfaceClass>
<InterfaceClass
Name="SteamSystemAssignedToMediaTransferPoint"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//FunctionAssignedToMediaTransferPoint">
  <Description>The media handover point to the layout.</Description>
</InterfaceClass>
<InterfaceClass
Name="TankPlantSystemAssignedToMediaTransferPoint"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//FunctionAssignedToMediaTransferPoint">
  <Description>The media handover point to the layout.</Description>
</InterfaceClass>
<InterfaceClass
Name="VentilationSystemAssignedToMediaTransferPoint"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//FunctionAssignedToMediaTransferPoint">
  <Description>The media handover point to the layout.</Description>
</InterfaceClass>
<InterfaceClass
Name="WasteWaterSystemAssignedToMediaTransferPoint"
RefBaseClassPath="AutomationML_BuildingServices_InterfaceClassLib//FunctionAssignedToMediaTransferPoint">
  <Description>The media handover point to the layout.</Description>
</InterfaceClass>
</InterfaceClassLib>

```

Figure 20 - AutomationML_BuildingServices_InterfaceClassLib as XML representation

4.2.1 BuildingServicesEngineering InterfaceClassLib

Table 127 - Definition AutomationML_BuildingServices_InterfaceClassLib

Class name	AutomationML_BuildingServices_InterfaceClassLib
Description	Second main basement of the modelling are the required interface classes
Version	1.0.0

4.2.1.1 ResourceFollowsResource

„ResourceFollowsResource“ is derived from an “AutomationMLBaseInterface” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 128 - Definition ResourceFollowsResource

Class name	ResourceFollowsResource
Description	It is a type of dependency where access to one resource is only possible after the availability or use of another resource.
Parent class	AutomationMLInterfaceClassLib@AutomationMLInterfaceClassLib/AutomationMLBaseInterface
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ResourceFollowsResource
Attributes	None
Interfaces	None

4.2.1.2 ResourceAssignedToFunction

„ResourceAssignedToFunction“ is derived from an “AutomationMLBaseInterface” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 129 - Definition ResourceAssignedToFunction

Class name	ResourceAssignedToFunction
Description	Describes the dependence of the functionality on the object.
Parent class	AutomationMLInterfaceClassLib@AutomationMLInterfaceClassLib/AutomationMLBaseInterface
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToFunction
Attributes	None
Interfaces	None

4.2.1.3 FunctionAssignedToMediaTransferPoint

„FunctionAssignedToMediaTransferPoint“ is derived from an “AutomationMLBaseInterface” according to AutomationML Whitepaper – Architecture and General Requirements. It is defined as follows.

Table 130 - Definition FunctionAssignedToMediaTransferPoint

Class name	FunctionAssignedToMediaTransferPoint
Description	Describes the dependence of the functionality on the object.
Parent class	AutomationMLInterfaceClassLib@AutomationMLInterfaceClassLib/AutomationMLBaseInterface
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/FunctionAssignedToMediaTransferPoint
Attributes	None
Interfaces	None

4.2.1.4 ColdWaterSystemAssignedToMediaTransferPoint

„ColdWaterSystemAssignedToMediaTransferPoint“ is derived from “FunctionAssignedToMediaTransferPoint”. It is defined as follows.

Table 131 - Definition ColdWaterSystemAssignedToMediaTransferPoint

Class name	ColdWaterSystemAssignedToMediaTransferPoint
Description	The media handover point to the layout.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/FunctionAssignedToMediaTransferPoint
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ ColdWaterSystemAssignedToMediaTransferPoint
Attributes	None
Interfaces	None

4.2.1.5 CompressedAirSystemAssignedToMediaTransferPoint

„CompressedAirSystemAssignedToMediaTransferPoint“ is derived from “FunctionAssignedToMediaTransferPoint”. It is defined as follows.

Table 132 - Definition CompressedAirSystemAssignedToMediaTransferPoint

Class name	CompressedAirSystemAssignedToMediaTransferPoint
Description	The media handover point to the layout.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/FunctionAssignedToMediaTransferPoint
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ CompressedAirSystemAssignedToMediaTransferPoint
Attributes	None
Interfaces	None

4.2.1.6 CondensateSystemAssignedToMediaTransferPoint

„CondensateSystemAssignedToMediaTransferPoint“ is derived from “FunctionAssignedToMediaTransferPoint”. It is defined as follows.

Table 133 - Definition CondensateSystemAssignedToMediaTransferPoint

Class name	CondensateSystemAssignedToMediaTransferPoint
Description	The media handover point to the layout.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/FunctionAssignedToMediaTransferPoint
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ CondensateSystemAssignedToMediaTransferPoint
Attributes	None
Interfaces	None

4.2.1.7 CoolingWaterSystemAssignedToMediaTransferPoint

„CoolingWaterSystemAssignedToMediaTransferPoint“ is derived from “FunctionAssignedToMediaTransferPoint”. It is defined as follows.

Table 134 - Definition CoolingWaterSystemAssignedToMediaTransferPoint

Class name	CoolingWaterSystemAssignedToMediaTransferPoint
Description	The media handover point to the layout.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/FunctionAssignedToMediaTransferPoint
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ CoolingWaterSystemAssignedToMediaTransferPoint
Attributes	None
Interfaces	None

4.2.1.8 DrinkingWaterSystemAssignedToMediaTransferPoint

„DrinkingWaterSystemAssignedToMediaTransferPoint“ is derived from “FunctionAssignedToMediaTransferPoint”. It is defined as follows.

Table 135 - Definition DrinkingWaterSystemAssignedToMediaTransferPoint

Class name	DrinkingWaterSystemAssignedToMediaTransferPoint
Description	The media handover point to the layout.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/FunctionAssignedToMediaTransferPoint
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ DrinkingWaterSystemAssignedToMediaTransferPoint
Attributes	None
Interfaces	None

4.2.1.9 ElectricalSystemAssignedToMediaTransferPoint

„**ElectricalSystemAssignedToMediaTransferPoint**“ is derived from “FunctionAssignedToMediaTransferPoint”. It is defined as follows.

Table 136 - Definition ElectricalSystemAssignedToMediaTransferPoint

Class name	ElectricalSystemAssignedToMediaTransferPoint
Description	The media handover point to the layout.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/FunctionAssignedToMediaTransferPoint
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ ElectricalSystemAssignedToMediaTransferPoint
Attributes	None
Interfaces	None

4.2.1.10 GasSystemAssignedToMediaTransferPoint

„**GasSystemAssignedToMediaTransferPoint**“ is derived from “FunctionAssignedToMediaTransferPoint”. It is defined as follows.

Table 137 - Definition GasSystemAssignedToMediaTransferPoint

Class name	GasSystemAssignedToMediaTransferPoint
Description	The media handover point to the layout.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/FunctionAssignedToMediaTransferPoint
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ GasSystemAssignedToMediaTransferPoint
Attributes	None
Interfaces	None

4.2.1.11 HeatingSystemAssignedToMediaTransferPoint

„HeatingSystemAssignedToMediaTransferPoint“ is derived from “FunctionAssignedToMediaTransferPoint”. It is defined as follows.

Table 138 - Definition HeatingSystemAssignedToMediaTransferPoint

Class name	HeatingSystemAssignedToMediaTransferPoint
Description	The media handover point to the layout.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/FunctionAssignedToMediaTransferPoint
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ HeatingSystemAssignedToMediaTransferPoint
Attributes	None
Interfaces	None

4.2.1.12 RainWaterSystemAssignedToMediaTransferPoint

„RainWaterSystemAssignedToMediaTransferPoint“ is derived from “FunctionAssignedToMediaTransferPoint”. It is defined as follows.

Table 139 - Definition RainWaterSystemAssignedToMediaTransferPoint

Class name	RainWaterSystemAssignedToMediaTransferPoint
Description	The media handover point to the layout.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/FunctionAssignedToMediaTransferPoint
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ RainWaterSystemAssignedToMediaTransferPoint
Attributes	None
Interfaces	None

4.2.1.13 ReserveSystemAssignedToMediaTransferPoint

„**ReserveSystemAssignedToMediaTransferPoint**“ is derived from “FunctionAssignedToMediaTransferPoint”. It is defined as follows.

Table 140 - Definition ReserveSystemAssignedToMediaTransferPoint

Class name	ReserveSystemAssignedToMediaTransferPoint
Description	The media handover point to the layout.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/FunctionAssignedToMediaTransferPoint
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ ReserveSystemAssignedToMediaTransferPoint
Attributes	None
Interfaces	None

4.2.1.14 ResourceAssignedToColdWaterSystem

„**ResourceAssignedToColdWaterSystem**“ is derived from “ResourceAssignedToFunction”. It is defined as follows.

Table 141 - Definition ResourceAssignedToColdWaterSystem

Class name	ResourceAssignedToColdWaterSystem
Description	It is a type of dependency from resources to utility data.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToFunction
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToColdWaterSystem
Attributes	None
Interfaces	None

4.2.1.15 ResourceAssignedToCompressedAirSystem

„ResourceAssignedToCompressedAirSystem“ is derived from “ResourceAssignedToFunction”. It is defined as follows.

Table 142 - Definition ResourceAssignedToCompressedAirSystem

Class name	ResourceAssignedToCompressedAirSystem
Description	It is a type of dependency from resources to utility data.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToFunction
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ ResourceAssignedToCompressedAirSystem
Attributes	None
Interfaces	None

4.2.1.16 ResourceAssignedToCondensateSystem

„ResourceAssignedToCondensateSystem“ is derived from “ResourceAssignedToFunction”. It is defined as follows.

Table 143 - Definition ResourceAssignedToCondensateSystem

Class name	ResourceAssignedToCondensateSystem
Description	It is a type of dependency from resources to utility data.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToFunction
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToCondensateSystem
Attributes	None
Interfaces	None

4.2.1.17 ResourceAssignedToCoolingWaterSystem

„ResourceAssignedToCoolingWaterSystem“ is derived from “ResourceAssignedToFunction”. It is defined as follows.

Table 144 - Definition ResourceAssignedToCoolingWaterSystem

Class name	ResourceAssignedToCoolingWaterSystem
Description	It is a type of dependency from resources to utility data.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToFunction
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToCoolingWaterSystem
Attributes	None
Interfaces	None

4.2.1.18 ResourceAssignedToDrinkingWaterSystem

„ResourceAssignedToDrinkingWaterSystem“ is derived from “ResourceAssignedToFunction”. It is defined as follows.

Table 145 - Definition ResourceAssignedToDrinkingWaterSystem

Class name	ResourceAssignedToDrinkingWaterSystem
Description	It is a type of dependency from resources to utility data.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToFunction
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToDrinkingWaterSystem
Attributes	None
Interfaces	None

4.2.1.19 ResourceAssignedToElectricalSystem

„ResourceAssignedToElectricalSystem“ is derived from “ResourceAssignedToFunction”. It is defined as follows.

Table 146 - Definition ResourceAssignedToElectricalSystem

Class name	ResourceAssignedToElectricalSystem
Description	It is a type of dependency from resources to utility data.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToFunction
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToElectricalSystem
Attributes	None
Interfaces	None

4.2.1.20 ResourceAssignedToGasSystem

„ResourceAssignedToGasSystem“ is derived from “ResourceAssignedToFunction”. It is defined as follows.

Table 147 - Definition ResourceAssignedToGasSystem

Class name	ResourceAssignedToGasSystem
Description	It is a type of dependency from resources to utility data.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToFunction
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToGasSystem
Attributes	None
Interfaces	None

4.2.1.21 ResourceAssignedToHeatingSystem

„ResourceAssignedToHeatingSystem“ is derived from “ResourceAssignedToFunction”. It is defined as follows.

Table 148 - Definition ResourceAssignedToHeatingSystem

Class name	ResourceAssignedToHeatingSystem
Description	It is a type of dependency from resources to utility data.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToFunction
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToHeatingSystem
Attributes	None
Interfaces	None

4.2.1.22 ResourceAssignedToRainWaterSystem

„ResourceAssignedToRainWaterSystem“ is derived from “ResourceAssignedToFunction”. It is defined as follows.

Table 149 - Definition ResourceAssignedToRainWaterSystem

Class name	ResourceAssignedToRainWaterSystem
Description	It is a type of dependency from resources to utility data.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToFunction
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToRainWaterSystem
Attributes	None
Interfaces	None

4.2.1.23 ResourceAssignedToReserveSystem

„ResourceAssignedToReserveSystem“ is derived from “ResourceAssignedToFunction”. It is defined as follows.

Table 150 - Definition ResourceAssignedToReserveSystem

Class name	ResourceAssignedToReserveSystem
Description	It is a type of dependency from resources to utility data.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToFunction
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToReserveSystem
Attributes	None
Interfaces	None

4.2.1.24 ResourceAssignedToSpaceSystem

„ResourceAssignedToSpaceSystem“ is derived from “ResourceAssignedToFunction”. It is defined as follows.

Table 151 - Definition ResourceAssignedToSpaceSystem

Class name	ResourceAssignedToSpaceSystem
Description	It is a type of dependency from resources to utility data.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToFunction
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToSpaceSystem
Attributes	None
Interfaces	None

4.2.1.25 ResourceAssignedToSprinklerSystem

„ResourceAssignedToSprinklerSystem“ is derived from “ResourceAssignedToFunction”. It is defined as follows.

Table 152 - Definition ResourceAssignedToSprinklerSystem

Class name	ResourceAssignedToSprinklerSystem
Description	It is a type of dependency from resources to utility data.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToFunction
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToSprinklerSystem
Attributes	None
Interfaces	None

4.2.1.26 ResourceAssignedToSteamSystem

„ResourceAssignedToSteamSystem“ is derived from “ResourceAssignedToFunction”. It is defined as follows.

Table 153 - Definition ResourceAssignedToSteamSystem

Class name	ResourceAssignedToSteamSystem
Description	It is a type of dependency from resources to utility data.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToFunction
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToSteamSystem
Attributes	None
Interfaces	None

4.2.1.27 ResourceAssignedToTankPlantSystem

„ResourceAssignedToTankPlantSystem“ is derived from “ResourceAssignedToFunction”. It is defined as follows.

Table 154 - Definition ResourceAssignedToTankPlantSystem

Class name	ResourceAssignedToTankPlantSystem
Description	It is a type of dependency from resources to utility data.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToFunction
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToTankPlantSystem
Attributes	None
Interfaces	None

4.2.1.28 ResourceAssignedToVentilationSystem

„ResourceAssignedToVentilationSystem“ is derived from “ResourceAssignedToFunction”. It is defined as follows.

Table 155 - Definition ResourceAssignedToVentilationSystem

Class name	ResourceAssignedToVentilationSystem
Description	It is a type of dependency from resources to utility data.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToFunction
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToVentilationSystem
Attributes	None
Interfaces	None

4.2.1.29 ResourceAssignedToWasteWaterSystem

„ResourceAssignedToWasteWaterSystem“ is derived from “ResourceAssignedToFunction”. It is defined as follows.

Table 156 - Definition ResourceAssignedToWasteWaterSystem

Class name	ResourceAssignedToWasteWaterSystem
Description	It is a type of dependency from resources to utility data.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToFunction
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ResourceAssignedToWasteWaterSystem
Attributes	None
Interfaces	None

4.2.1.30 SpaceSystemAssignedToMediaTransferPoint

„SpaceSystemAssignedToMediaTransferPoint“ is derived from “FunctionAssignedToMediaTransfer Point”. It is defined as follows.

Table 157 - Definition SpaceSystemAssignedToMediaTransferPoint

Class name	SpaceSystemAssignedToMediaTransferPoint
Description	The location of the media handover point describes where the medium (e.g., water, gas, electricity) is transferred to the layout or system.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/FunctionAssignedToMediaTransferPoint
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ SpaceSystemAssignedToMediaTransferPoint
Attributes	None
Interfaces	None

4.2.1.31 SprinklerSystemAssignedToMediaTransferPoint

„**SprinklerSystemAssignedToMediaTransferPoint**“ is derived from “FunctionAssignedToMediaTransferPoint”. It is defined as follows.

Table 158 - Definition SprinklerSystemAssignedToMediaTransferPoint

Class name	SprinklerSystemAssignedToMediaTransferPoint
Description	The media handover point to the layout.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/FunctionAssignedToMediaTransferPoint
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ SprinklerSystemAssignedToMediaTransferPoint
Attributes	None
Interfaces	None

4.2.1.32 SteamSystemAssignedToMediaTransferPoint

„**SteamSystemAssignedToMediaTransferPoint**“ is derived from “FunctionAssignedToMediaTransferPoint”. It is defined as follows.

Table 159 - Definition SteamSystemAssignedToMediaTransferPoint

Class name	SteamSystemAssignedToMediaTransferPoint
Description	The media handover point to the layout.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/FunctionAssignedToMediaTransferPoint
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ SteamSystemAssignedToMediaTransferPoint
Attributes	None
Interfaces	None

4.2.1.33 TankPlantSystemAssignedToMediaTransferPoint

„TankPlantSystemAssignedToMediaTransferPoint“ is derived from “FunctionAssignedToMediaTransferPoint”. It is defined as follows.

Table 160 - Definition TankPlantSystemAssignedToMediaTransferPoint

Class name	TankPlantSystemAssignedToMediaTransferPoint
Description	The media handover point to the layout.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/FunctionAssignedToMediaTransferPoint
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ TankPlantSystemAssignedToMediaTransferPoint
Attributes	None
Interfaces	None

4.2.1.34 VentilationSystemAssignedToMediaTransferPoint

„VentilationSystemAssignedToMediaTransferPoint“ is derived from “FunctionAssignedToMediaTransferPoint”. It is defined as follows.

Table 161 - Definition VentilationSystemAssignedToMediaTransferPoint

Class name	VentilationSystemAssignedToMediaTransferPoint
Description	The media handover point to the layout.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/FunctionAssignedToMediaTransferPoint
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ VentilationSystemAssignedToMediaTransferPoint
Attributes	None
Interfaces	None

4.2.1.35 WasteWaterSystemAssignedToMediaTransferPoint

„WasteWaterSystemAssignedToMediaTransferPoint“ is derived from “FunctionAssignedToMediaTransferPoint”. It is defined as follows.

Table 162 - Definition WasteWaterSystemAssignedToMediaTransferPoint

Class name	WasteWaterSystemAssignedToMediaTransferPoint
Description	The media handover point to the layout.
Parent class	AutomationML_BuildingServices_InterfaceClassLib/FunctionAssignedToMediaTransferPoint
Path for element reference	AutomationML_BuildingServices_InterfaceClassLib/ WasteWaterSystemAssignedToMediaTransferPoint
Attributes	None
Interfaces	None

4.3 AttributeTypeLibrary

Third main basement of the modelling are the required attribute types.

The following figures represent the attribute type library.

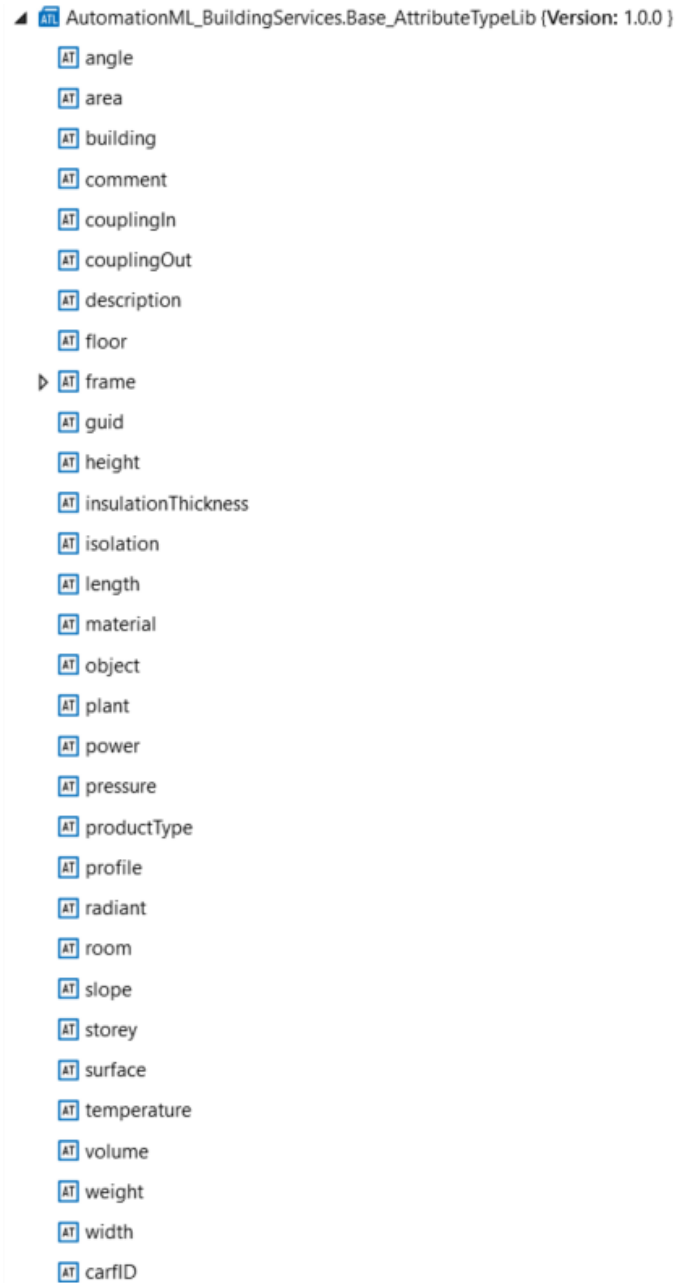


Figure 21 - AutomationML_BuildingServices.BaseAttributeTypeLib in AutomationML Editor view

```

<AttributeTypeLib Name="AutomationML_BuildingServices.Base_AttributeTypeLib">
  <Description>Base Role classes from the modules Heating, Ventilation, Sanitary, Sprinkler, Electrical, Layout, Steel, Material
  Handling, etc.</Description>
  <Version>1.0.0</Version>
  <AttributeType Name="angle" ID="2c6bcf6b-8607-46e6-8d7d-7ce33bff45f3" Unit="rad" AttributeDataType="xs:double">
    <Description>An angle is formed when two straight lines or rays meet at a common endpoint</Description>
    <Version>1.0.0</Version>
  </AttributeType>
  <AttributeType Name="area" ID="1e61d93d-d25a-4f09-be33-d8f4c6f002e2" Unit="m^2" AttributeDataType="xs:double">
    <Description>The floor area of a building is, in the original sense, the area with which a building touches the ground</Descri
    ption>
    <Version>1.0.0</Version>
  </AttributeType>
  <AttributeType Name="building" ID="869a34e1-5cd8-4974-84d4-0fd7dcd82b0f" AttributeDataType="xs:string">
    <Description>A building is a structure that encloses rooms</Description>
    <Version>1.0.0</Version>
  </AttributeType>
  <AttributeType Name="comment" ID="fad5518f-4c6e-4c8b-b4d3-e3381d760b49" AttributeDataType="xs:string">
    <Description>A feature is generally a recognizable property</Description>
    <Version>1.0.0</Version>
  </AttributeType>
  <AttributeType Name="couplingIn" ID="9dbf9fe4-181a-4549-b9f7-a14559a1997c" AttributeDataType="xs:string">
    <Description>Connection type such as flange, welded, threaded, grooved, etc.</Description>
    <Version>1.0.0</Version>
  </AttributeType>
  <AttributeType Name="couplingOut" ID="b61032be-0165-480b-be59-7dc916301e02" AttributeDataType="xs:string">
    <Description>Connection type such as flange, welded, threaded, grooved, etc.</Description>
    <Version>1.0.0</Version>
  </AttributeType>
  <AttributeType Name="description" ID="5c235527-68c7-4d13-94b9-4c052765ab71" AttributeDataType="xs:string">
    <Description>Describes the components</Description>
    <Version>1.0.0</Version>
  </AttributeType>
  <AttributeType Name="floor" ID="15345a6d-31da-4c88-8bab-ae0218d7e90c" AttributeDataType="xs:string">
    <Description>The indication of the floor
    The indication of the floor</Description>
    <Version>1.0.0</Version>
  </AttributeType>
  <AttributeType Name="frame" ID="7f3fff13-f33e-4a6f-bb2a-b297d8004876">
    <Description>The frame coordinates describe the x- and y-coordinates (starting point) as well as its width, height, and z-
    height. Rotations are also defined for each position and size.</Description>
    <Version>1.0.0</Version>
    <Attribute Name="x" AttributeDataType="xs:double" />
    <Attribute Name="y" AttributeDataType="xs:double" />
    <Attribute Name="z" AttributeDataType="xs:double" />
    <Attribute Name="rx" AttributeDataType="xs:double" />
    <Attribute Name="ry" AttributeDataType="xs:double" />
    <Attribute Name="rz" AttributeDataType="xs:double" />
  </AttributeType>
  <AttributeType Name="guid" ID="44e9a040-8f7a-4f27-9d7e-cb8fb2676a31" AttributeDataType="xs:int">
    <Description>A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems
    to identify information without the need for a central authority or registry.</Description>
    <Version>1.0.0</Version>
  </AttributeType>
  <AttributeType Name="height" ID="57317354-0399-45e8-af46-cdc3f06d8378" Unit="mm" AttributeDataType="xs:double">
    <Description>The geometric height is the distance at right angles to a base line or base area of an object</Description>
    <Version>1.0.0</Version>
  </AttributeType>
  <AttributeType Name="insulationThickness" ID="f4906844-11c2-4042-9c59-baed93760fc3" AttributeDataType="xs:string">
    <Description>Packing thickness of insulation</Description>
    <Version>1.0.0</Version>
  </AttributeType>
  <AttributeType Name="isolation" ID="065d7742-3809-47bd-9b51-15358b96157f" AttributeDataType="xs:string">
    <Description>Insulation material of the pipe or duct
    Insulation material of the pipe or duct</Description>
    <Version>1.0.0</Version>
  </AttributeType>
  <AttributeType Name="length" ID="84cea3f6-c5bf-448b-b297-e7899d5ae51c" Unit="mm" AttributeDataType="xs:double">
    <Description>Description of a length of the object, component, route, pipe, duct.
    A length is the distance between two points</Description>
    <Version>1.0.0</Version>
  </AttributeType>

```

```

<AttributeType Name="material" ID="5258a563-d85d-47b4-a83c-d7400c784a59" AttributeDataType="xs:string">
  <Description>Designation of material name</Description>
  <Version>1.0.0</Version>
</AttributeType>
<AttributeType Name="object" ID="607bc131-0757-41e5-a034-a7d9b8ea526a" AttributeDataType="xs:string">
  <Description>Describes the object</Description>
  <Version>1.0.0</Version>
</AttributeType>
<AttributeType Name="plant" ID="819716c0-5ce3-4d57-9ca4-aa4e708fe3ae" AttributeDataType="xs:string">
  <Description>Definition of the system name.
or the system number.</Description>
  <Version>1.0.0</Version>
</AttributeType>
<AttributeType Name="power" ID="414ed0e5-74e5-49b4-bf40-5d4e40cfacea" AttributeDataType="xs:string">
  <Description>The watt is the SI unit of power (energy turnover per period of time)</Description>
  <Version>1.0.0</Version>
</AttributeType>
<AttributeType Name="pressure" ID="f9eec1da-e275-49c9-8104-a222f3447356" Unit="Pa" AttributeDataType="xs:int">
  <Description>The nominal pressure level PN indicates the maximum permissible pressure with which a fluid may load the pi
pipeline for a pipeline with internal pressure</Description>
  <Version>1.0.0</Version>
</AttributeType>
<AttributeType Name="productType" ID="c01045ff-cbe9-4bff-9855-22b2899069c1" AttributeDataType="xs:string">
  <Description>Characteristic to differentiate between different products of a product family or special variants</Description>
  <Version>1.0.0</Version>
  <RefSemantic CorrespondingAttributePath="IRDI-PATH://0173-1#02-AAO057#004" />
</AttributeType>
<AttributeType Name="profile" ID="763267b0-dd3e-4d3e-8b9b-46d51b09f817" AttributeDataType="xs:string">
  <Description>The shape or cross-sectional design of a component</Description>
  <Version>1.0.0</Version>
</AttributeType>
<AttributeType Name="radiant" ID="43441c6d-b0c5-4b28-b67f-844109188616" Unit="rad" AttributeDataType="xs:double">
  <Description>the distance from a centerline or point to an axis of rotation</Description>
  <Version>1.0.0</Version>
</AttributeType>
<AttributeType Name="room" ID="5469c46c-2abb-46ee-a6f0-a666d624efd4" AttributeDataType="xs:string">
  <Description>The room number is preferably a combination of a two-
digit number preceded by the floor number of the building</Description>
  <Version>1.0.0</Version>
</AttributeType>
<AttributeType Name="slope" ID="b95382e0-6a01-4a86-a2f5-30e7f2065451" Unit="%" AttributeDataType="xs:double">
  <Description>The incline or steepness of a surface</Description>
  <Version>1.0.0</Version>
</AttributeType>
<AttributeType Name="storey" ID="975db552-4d0d-41cd-a2c7-2a72d07ef206" AttributeDataType="xs:string">
  <Description>A floor refers to a single, horizontally divided level within a building, defined by ceilings and floors.</Descriptio
n>
  <Version>1.0.0</Version>
</AttributeType>
<AttributeType Name="surface" ID="2f19df2d-476d-4b90-8fda-0d0d4b911e5d" Unit="m^2" AttributeDataType="xs:double">
  <Description>The total area of the exterior surface of an object, measured in square meters
The total area of the exterior surface of an object, measured in square meters</Description>
  <Version>1.0.0</Version>
</AttributeType>
<AttributeType Name="temperature" ID="13914e03-5b15-4ce1-8775-
20a5c8dc3856" Unit="°C" AttributeDataType="xs:double">
  <Description>The degree Celsius is a unit of temperature</Description>
  <Version>1.0.0</Version>
</AttributeType>
<AttributeType Name="volume" ID="acf8f110-109a-41e3-9273-703685170db5" Unit="dm^3" AttributeDataType="xs:double">
  <Description>The amount of space occupied by an object, measured in cubic decimeters</Description>
  <Version>1.0.0</Version>
</AttributeType>
<AttributeType Name="weight" ID="dfa43ce9-afde-4cab-aa97-efb89e74ee20" Unit="kg" AttributeDataType="xs:double">
  <Description>The combined mass of all components or elements within a structure</Description>
  <Version>1.0.0</Version>
</AttributeType>
<AttributeType Name="width" ID="d638dbbb-c5fd-4c1d-abf9-678cdac2cb45" Unit="mm" AttributeDataType="xs:double">
  <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length</
Description>
  <Version>1.0.0</Version>
</AttributeType>

```

```
<AttributeType Name="carflID" ID="e3ef1a80-0a24-42f1-a9b0-a2ae9b3e8915" AttributeDataType="xs:string">
  <Description>The ID (short for identification or identity number) is a unique identifier used to distinguish an object.</Descripti
on>
  <Version>1.0.0</Version>
</AttributeType>
</AttributeTypeLib>
```

Figure 22 - AutomationML_BuildingServices.Base_AttributeTypeLib as XML representation

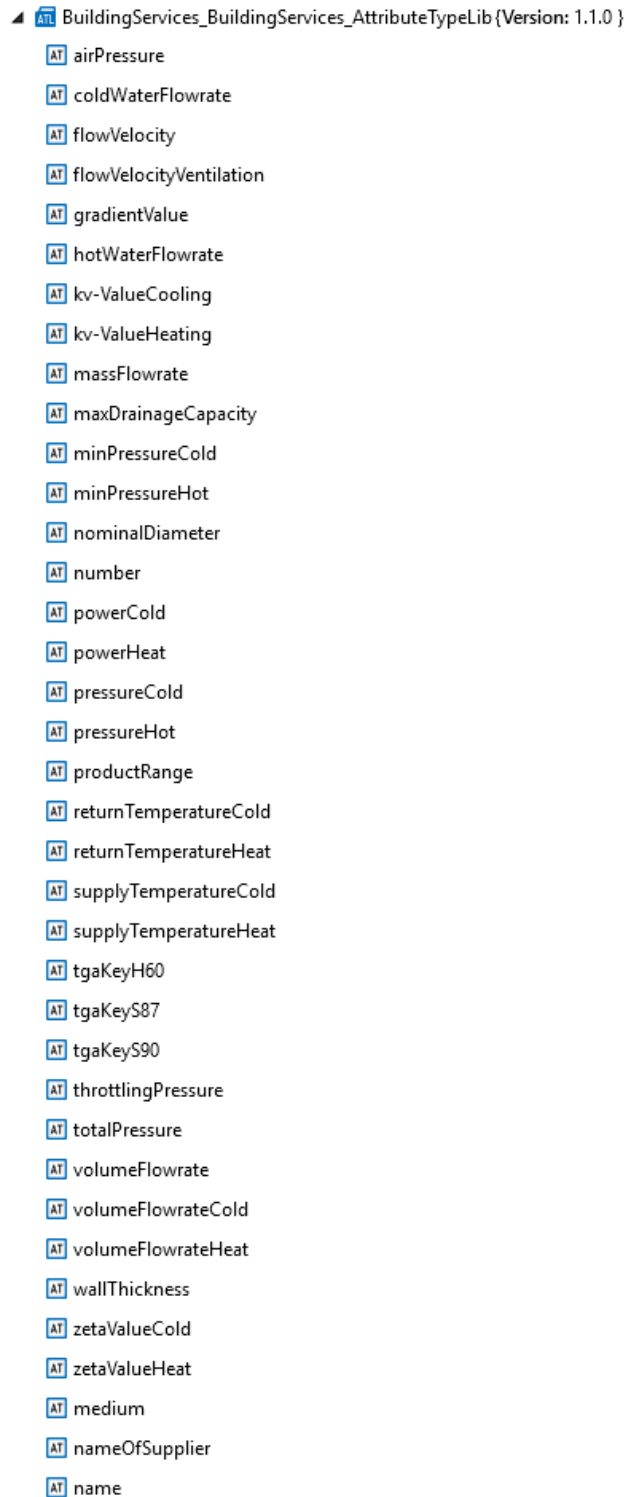


Figure 23 - BuildingServices_AttributeTypeLib in AutomationML Editor view

```

<AttributeTypeLib Name="AutomationML_BuildingServices_AttributeTypeLib">
  <Description>Role classes from the modules Heating, Ventilation, Sanitary, Sprinkler, Electrical.</Description>
  <Version>1.1.0</Version>
  <AttributeType Name="airPressure" Unit="Pa" AttributeDataType="xs:double">
    <Description>Pressure loss in ventilation describes the resistance that air encounters as it flows through a ventilation syste
    m.
    It is caused by friction along duct walls, fittings, as well as by filters, heat exchangers, and other components.
    High pressure loss requires greater fan performance to achieve the desired air volume flow.</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://35.700.00.19." />
  </AttributeType>
  <AttributeType Name="coldWaterFlowrate" Unit="l/s" AttributeDataType="xs:double">
    <Description>The cold water flow rate refers to the volume of cold water passing through a pipe, faucet, or system per unit o
    f time.</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://17.710.02.15." />
  </AttributeType>
  <AttributeType Name="flowVelocity" Unit="m/s" AttributeDataType="xs:double">
    <Description>The flow velocity (also called flow speed) describes how fast a fluid (liquid or gas) moves through a pipe or an
    open channel.</Description>
  </AttributeType>
  <AttributeType Name="flowVelocityVentilation" Unit="m/s" AttributeDataType="xs:double">
    <Description>The flow velocity (also called flow speed) describes how fast a fluid (liquid or gas) moves through a pipe or an
    open channel.</Description>
  </AttributeType>
  <AttributeType Name="gradientValue" Unit="%" AttributeDataType="xs:double">
    <Description>Describes the components</Description>
  </AttributeType>
  <AttributeType Name="hotWaterFlowrate" Unit="l/s" AttributeDataType="xs:double">
    <Description>The hot water flow rate refers to the volume of hot water passing through a pipe, faucet, or heating system per
    unit of time.</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://17.710.02.26." />
  </AttributeType>
  <AttributeType Name="kv-ValueCooling" Unit="m^3/h" AttributeDataType="xs:double">
    <Description>The KV value (flow coefficient) indicates the amount of liquid (e.g., water or refrigerant) that flows through a va
    lve or fitting in a cooling circuit when a pressure difference of 1 bar is applied.</Description>
  </AttributeType>
  <AttributeType Name="kv-ValueHeating" Unit="m^3/h" AttributeDataType="xs:double">
    <Description>The KV value (flow coefficient) describes the amount of water (or another medium) that flows through a valve
    or fitting when a pressure difference of 1 bar is applied.</Description>
  </AttributeType>
  <AttributeType Name="massFlowrate" Unit="kg/h" AttributeDataType="xs:double">
    <Description>Mass flow in heating refers to the mass flow of heating medium (such as water or another heat transfer fluid) t
    hrough a heating system.</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://44.700.00.5." />
  </AttributeType>
  <AttributeType Name="maxDrainageCapacity" Unit="l/s" AttributeDataType="xs:double">
    <Description>The maximum drainage capacity refers to the highest volume of liquid that a drainage system can handle withi
    n a given time without causing overflow or backup.</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://45.700.00.10." />
  </AttributeType>
  <AttributeType Name="minPressureCold" Unit="Pa" AttributeDataType="xs:int">
    <Description>In a hot water system, pressure is essential for ensuring proper water flow and distribution throughout the syst
    em. The pressure is influenced by factors such as pump performance, pipe resistance, temperature changes, and system design
    .</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://17.710.02.12." />
  </AttributeType>
  <AttributeType Name="minPressureHot" Unit="Pa" AttributeDataType="xs:int">
    <Description>In a hot water system, pressure is essential for ensuring proper water flow and distribution throughout the syst
    em. The pressure is influenced by factors such as pump performance, pipe resistance, temperature changes, and system design
    .</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://17.710.02.13." />
  </AttributeType>
  <AttributeType Name="nominalDiameter" Unit="mm" AttributeDataType="xs:int">
    <Description>The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based
    on the metric system of measurement</Description>
  </AttributeType>
  <AttributeType Name="number" Unit="mm" AttributeDataType="xs:int">
    <Description>It is a unique device address by which each bus participant is identified</Description>
  </AttributeType>
  <AttributeType Name="powerCold" Unit="W" AttributeDataType="xs:double">
    <Description>The watt is the SI unit of power (energy turnover per period of time)</Description>
    <RefSemantic CorrespondingAttributePath="VDI-ID://06.710.02.14." />
  </AttributeType>

```

```

<AttributeType Name="powerHeat" Unit="W" AttributeDataType="xs:double">
  <Description>The watt is the SI unit of power (energy turnover per period of time)</Description>
  <RefSemantic CorrespondingAttributePath="VDI-ID://06.710.02.3." />
</AttributeType>
<AttributeType Name="pressureCold" Unit="kPa" AttributeDataType="xs:double">
  <Description>A pressure drop in a cooling system refers to the reduction in pressure as the coolant flows through pipes, heat exchangers, valves, and other system components.</Description>
  <RefSemantic CorrespondingAttributePath="VDI-ID://20.710.12.5." />
</AttributeType>
<AttributeType Name="pressureHot" Unit="kPa" AttributeDataType="xs:double">
  <Description>In a hot water system, pressure is essential for ensuring proper water flow and distribution throughout the system.
  The pressure is influenced by factors such as pump performance, pipe resistance, temperature changes, and system design.</Description>
  <RefSemantic CorrespondingAttributePath="VDI-ID://20.710.09.12." />
</AttributeType>
<AttributeType Name="productRange" AttributeDataType="xs:string">
  <Description>A product range description provides an overview of the entire product assortment of a company or brand.</Description>
  <RefSemantic CorrespondingAttributePath="VDI-ID://38.110.00.4." />
  <RefSemantic CorrespondingAttributePath="VDI-ID://40.110.00.4." />
  <RefSemantic CorrespondingAttributePath="VDI-ID://17.100.00.4." />
  <RefSemantic CorrespondingAttributePath="VDI-ID://20.100.00.4." />
  <RefSemantic CorrespondingAttributePath="VDI-ID://06.110.00.4." />
  <RefSemantic CorrespondingAttributePath="VDI-ID://44.110.00.4." />
</AttributeType>
<AttributeType Name="returnTemperatureCold" Unit="°C" AttributeDataType="xs:double">
  <Description>The return temperature in degrees Celsius refers to the temperature of the water that flows back to the heat generator (e.g., boiler, heat pump, or solar system) after releasing heat to the radiators or underfloor heating.</Description>
</AttributeType>
<AttributeType Name="returnTemperatureHeat" Unit="°C" AttributeDataType="xs:double">
  <Description>The return temperature in degrees Celsius refers to the temperature of the water that flows back to the heat generator (e.g., boiler, heat pump, or solar system) after releasing heat to the radiators or underfloor heating.</Description>
</AttributeType>
<AttributeType Name="supplyTemperatureCold" Unit="°C" AttributeDataType="xs:double">
  <Description>The flow temperature in degrees Celsius refers to the temperature of the water that is circulated from the heat generator (e.g., boiler, heat pump, or solar system) to the radiators or underfloor heating in a heating system (such as a central heating or hot water system).</Description>
  <RefSemantic CorrespondingAttributePath="VDI-ID://06.700.00.31." />
</AttributeType>
<AttributeType Name="supplyTemperatureHeat" Unit="°C" AttributeDataType="xs:double">
  <Description>The flow temperature in degrees Celsius refers to the temperature of the water that is circulated from the heat generator (e.g., boiler, heat pump, or solar system) to the radiators or underfloor heating in a heating system (such as a central heating or hot water system).</Description>
  <RefSemantic CorrespondingAttributePath="VDI-ID://06.700.00.30." />
</AttributeType>
<AttributeType Name="tgaKeyH60" AttributeDataType="xs:string">
  <Description>Unique key for the calculation</Description>
</AttributeType>
<AttributeType Name="tgaKeyS87" AttributeDataType="xs:string">
  <Description>Unique key for the calculation</Description>
</AttributeType>
<AttributeType Name="tgaKeyS90" AttributeDataType="xs:string">
  <Description>Unique key for the calculation</Description>
</AttributeType>
<AttributeType Name="throttlingPressure" Unit="Pa" AttributeDataType="xs:double">
  <Description>It refers to the pressure loss that occurs when an airflow is restricted by a throttling element, such as a throttle valve or a valve.
  These components limit the airflow and increase resistance, leading to a pressure drop.</Description>
</AttributeType>
<AttributeType Name="totalPressure" Unit="Pa" AttributeDataType="xs:double">
  <Description>The total pressure loss in ventilation technology describes the overall pressure drop that occurs within a ventilation system.
  It is caused by friction losses in the air ducts, resistances in fittings (bends, branches), filters, heat exchangers, silencers, and other components.</Description>
  <RefSemantic CorrespondingAttributePath="VDI-ID://05.710.06.5." />
</AttributeType>
<AttributeType Name="volumeFlowrate" Unit="m³/h" AttributeDataType="xs:double">
  <Description>The volume flow rate in a duct network describes the amount of fluid (e.g., air or water) that flows through the network per unit of time.</Description>

```

```

</AttributeType>
<AttributeType Name="volumeFlowrateCold" Unit="m^3/h" AttributeDataType="xs:double">
  <Description>The volume flow (or inaccurate flow rate and flow volume)</Description>
</AttributeType>
<AttributeType Name="volumeFlowrateHeat" Unit="m^3/h" AttributeDataType="xs:double">
  <Description>The volume flow (or inaccurate flow rate and flow volume)</Description>
</AttributeType>
<AttributeType Name="wallThickness" Unit="mm" AttributeDataType="xs:int">
  <Description>The wall thickness indicates the approximate thickness of the pipe in millimeters</Description>
</AttributeType>
<AttributeType Name="zetaValueCold" AttributeDataType="xs:int">
  <Description>The Zeta value ( $\zeta$ -
value) describes the resistance coefficient causing pressure loss in flow systems, particularly in cooling technology.</Description>
</AttributeType>
<AttributeType Name="zetaValueHeat" AttributeDataType="xs:int">
  <Description>The Zeta value ( $\zeta$ -
value) describes the resistance coefficient causing pressure loss in flow systems, particularly in heating technology.</Description>
</AttributeType>
<AttributeType Name="medium" AttributeDataType="xs:string">
  <Description>Designation of medium or air type name</Description>
</AttributeType>
<AttributeType Name="nameOfSupplier" AttributeDataType="xs:string">
  <Description>The width is a size indication of the extension often in the horizontal direction and often in relation to a length
The geometric height is the distance at right angles to a base line or base area of an object
Name of supplier which provides the customer with a product or a service</Description>
<RefSemantic CorrespondingAttributePath="VDI-ID://xx.010.00.4." />
</AttributeType>
<AttributeType Name="name" AttributeDataType="xs:string">
  <Description>Designation of the object</Description>
</AttributeType>
</AttributeTypeLib>

```

Figure 24 - BuildingServices_AttributeTypeLib as XML representation

4.3.1 BuildingServicesEngineering Base AttributeTypeLib

Table 163 – Definition AutomationML_BuildingServices.Base_AttributeTypeLib

Class name	AutomationML_BuildingServices.Base_AttributeTypeLib
Description	An attribute type library for building services is a standardized collection of attribute types used to describe components and systems in digital building planning.
Version	1.0.0

4.3.1.1 angle

„angle“ is a basic attribute class without derivation. It is defined as follows.

Table 164 - Definition angle

Class name	angle
Description	An angle is formed when two straight lines or rays meet at a common endpoint
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/angle
Attributes	None

4.3.1.2 area

„area“ is a basic attribute class without derivation. It is defined as follows.

Table 165 - Definition area

Class name	area
Description	The floor area of a building is, in the original sense, the area with which a building touches the ground
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/area
Attributes	None

4.3.1.3 building

„building“ is a basic attribute class without derivation. It is defined as follows.

Table 166 - Definition building

Class name	building
Description	A building is a structure that encloses rooms
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/building
Attributes	None

4.3.1.4 comment

„comment“ is a basic attribute class without derivation. It is defined as follows.

Table 167 - Definition comment

Class name	comment
Description	A feature is generally a recognizable property
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/comment
Attributes	None

4.3.1.5 couplingIn

„couplingIn“ is a basic attribute class without derivation. It is defined as follows.

Table 168 - Definition couplingIn

Class name	couplingIn
Description	Connection type such as flange, welded, threaded, grooved, etc.
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/couplingIn
Attributes	None

4.3.1.6 couplingOut

„couplingOut“ is a basic attribute class without derivation. It is defined as follows.

Table 169 - Definition couplingOut

Class name	couplingOut
Description	Connection type such as flange, welded, threaded, grooved, etc.
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/couplingOut
Attributes	None

4.3.1.7 description

„description“ is a basic attribute class without derivation. It is defined as follows.

Table 170 - Definition description

Class name	description
Description	Describes the components
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/description
Attributes	None

4.3.1.8 floor

„floor“ is a basic attribute class without derivation. It is defined as follows.

Table 171 - Definition floor

Class name	floor
Description	The indication of the floor
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/floor
Attributes	None

4.3.1.9 frame

„**frame**“ is a basic attribute class without derivation. It is defined as follows.

Table 172 - Definition frame

Class name	frame	
Description	The frame coordinates describe the x- and y-coordinates (starting point) as well as its width, height, and z-height. Rotations are also defined for each position and size.	
Parent class		
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/frame	
Attributes	x (xs:double)	
	y (xs:double)	
	z (xs:double)	
	rx (xs:double)	
	ry (xs:double)	
	rz (xs:double)	

4.3.1.10 guid

„**guid**“ is a basic attribute class without derivation. It is defined as follows.

Table 173 - Definition guid

Class name	guid
Description	A GUID (Globally Unique Identifier) is a unique reference number used in software development and systems to identify information without the need for a central authority or registry.
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/guid
Attributes	None

4.3.1.11 height

„height“ is a basic attribute class without derivation. It is defined as follows.

Table 174 - Definition height

Class name	height
Description	The geometric height is the distance at right angles to a base line or base area of an object.
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/height
Attributes	None

4.3.1.12 insulationThickness

„insulationThickness“ is a basic attribute class without derivation. It is defined as follows.

Table 175 - Definition insulationThickness

Class name	insulationThickness
Description	Connection types of pipes: w=welded, s=screwed, fl=flanged, gk=coupled, cl=clamped
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/insulationThickness
Attributes	None

4.3.1.13 isolation

„isolation“ is a basic attribute class without derivation. It is defined as follows.

Table 176 - Definition isolation

Class name	isolation
Description	Insulation material of the pipe or duct
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/isolation
Attributes	None

4.3.1.14 length

„length“ is a basic attribute class without derivation. It is defined as follows.

Table 177 - Definition length

Class name	length
Description	Description of a length of the object, component, route, pipe, duct. A length is the distance between two points
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/length
Attributes	None

4.3.1.15 material

„material“ is a basic attribute class without derivation. It is defined as follows.

Table 178 - Definition material

Class name	material
Description	Designation of material name
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/material
Attributes	None

4.3.1.16 object

„object“ is a basic attribute class without derivation. It is defined as follows.

Table 179 - Definition object

Class name	object
Description	Describes the object
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/object
Attributes	None

4.3.1.17 plant

„plant“ is a basic attribute class without derivation. It is defined as follows.

Table 180 - Definition plant

Class name	plant
Description	Definition of the system name. or the system number.
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/plant
Attributes	None

4.3.1.18 power

„power“ is a basic attribute class without derivation. It is defined as follows.

Table 181 - Definition power

Class name	power
Description	The watt is the SI unit of power (energy turnover per period of time)
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/power
Attributes	None

4.3.1.19 pressure

„pressure“ is a basic attribute class without derivation. It is defined as follows.

Table 182 - Definition pressure

Class name	pressure
Description	The nominal pressure level PN indicates the maximum permissible pressure with which a fluid may load the pipeline for a pipeline with internal pressure
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/pressure
Attributes	None

4.3.1.20 productType

„**productType**“ is a basic attribute class without derivation. It is defined as follows.

Table 183 - Definition productType

Class name	productType
Description	Characteristic to differentiate between different products of a product family or special variants
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/productType
Attributes	None

4.3.1.21 profile

„**profile**“ is a basic attribute class without derivation. It is defined as follows.

Table 184 - Definition profile

Class name	profile
Description	The shape or cross-sectional design of a component
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/profile
Attributes	None

4.3.1.22 radiant

„**radiant**“ is a basic attribute class without derivation. It is defined as follows.

Table 185 - Definition radiant

Class name	radiant
Description	the distance from a centerline or point to an axis of rotation
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/radiant
Attributes	None

4.3.1.23 room

„room“ is a basic attribute class without derivation. It is defined as follows.

Table 186 - Definition room

Class name	room
Description	The room number is preferably a combination of a two-digit number preceded by the floor number of the building
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/room
Attributes	None

4.3.1.24 slope

„slope“ is a basic attribute class without derivation. It is defined as follows.

Table 187 - Definition slope

Class name	slope
Description	The incline or steepness of a surface
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/slope
Attributes	None

4.3.1.25 storey

„storey“ is a basic attribute class without derivation. It is defined as follows.

Table 188 - Definition storey

Class name	storey
Description	Connection types of pipes: w=welded, s=screwed, fl=flanged, gk=coupled, cl=clamped
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/storey
Attributes	None

4.3.1.26 surface

„**surface**“ is a basic attribute class without derivation. It is defined as follows.

Table 189 - Definition surface

Class name	surface
Description	The total area of the exterior surface of an object, measured in square meters The total area of the exterior surface of an object, measured in square meters
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/surface
Attributes	None

4.3.1.27 temperature

„**temperature**“ is a basic attribute class without derivation. It is defined as follows.

Table 190 - Definition temperature

Class name	temperature
Description	The degree Celsius is a unit of temperature
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/temperature
Attributes	None

4.3.1.28 volume

„**volume**“ is a basic attribute class without derivation. It is defined as follows.

Table 191 - Definition volume

Class name	volume
Description	The amount of space occupied by an object, measured in cubic decimeters The amount of space occupied by an object, measured in cubic decimeters
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/volume
Attributes	None

4.3.1.29 weight

„weight“ is a basic attribute class without derivation. It is defined as follows.

Table 192 - Definition weight

Class name	weight
Description	The combined mass of all components or elements within a structure
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/weight
Attributes	None

4.3.1.30 width

„width“ is a basic attribute class without derivation. It is defined as follows.

Table 193 - Definition width

Class name	width
Description	The width is a size indication of the extension often in the horizontal direction and often in relation to a length
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/width
Attributes	None

4.3.1.31 carflD

„carflD“ is a basic attribute class without derivation. It is defined as follows.

Table 194 - Definition carflD

Class name	carflD
Description	The ID (short for identification or identity number) is a unique identifier used to distinguish an object.
Parent class	
Path for element reference	AutomationML_BuildingServices.Base_AttributeTypeLib/carflD
Attributes	None

4.3.2 BuildingServicesEngineering AttributeTypeLib

Table 195 - Definition AutomationML_BuildingServices_AttributeTypeLib

Class name	AutomationML_BuildingServices_AttributeTypeLib
Description	An attribute type library for building services is a standardized collection of attribute types used to describe components and systems in digital building planning.
Version	1.0.0

4.3.2.1 airPressure

“airPressure” is a basic attribute class without derivation. It is defined as follows.

Table 196 - Definition airPressure

Class name	airPressure
Description	Pressure loss in ventilation describes the resistance that air encounters as it flows through a ventilation system. It is caused by friction along duct walls, fittings, as well as by filters, heat exchangers, and other components. High pressure loss requires greater fan performance to achieve the desired air volume flow.
Parent class	
Standard Reference	VDI-ID://35.700.00.19.
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/ airPressure
Attributes	None

4.3.2.2 coldWaterFlowrate

„coldWaterFlowrate“ is a basic attribute class without derivation. It is defined as follows.

Table 197 - Definition coldWaterFlowrate

Class name	coldWaterFlowrate
Description	Cold Water flow rate is the volume of water that passes through a given point in a system per unit of time. It is typically measured in liters per second (L/s), cubic meters per hour (m³/h) depending on the application.
Parent class	
Standard Reference	VDI3805-ID://17.710.02.15.
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/coldWaterFlowrate
Attributes	None

4.3.2.3 flowVelocity

„flowVelocity“ is a basic attribute class without derivation. It is defined as follows.

Table 198 - Definition flowVelocity

Class name	flowVelocity
Description	The flow velocity (also called flow speed) describes how fast a fluid (liquid or gas) moves through a pipe or an open channel.
Parent class	
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/flowVelocity
Attributes	None

4.3.2.4 flowVelocityVentilation

„flowVelocityVentilation“ is a basic attribute class without derivation. It is defined as follows.

Table 199 - Definition flowVelocityVentilation

Class name	flowVelocityVentilation
Description	The flow velocity (also called flow speed) describes how fast a fluid (liquid or gas) moves through a pipe or an open channel.
Parent class	
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/flowVelocityVentilation
Attributes	None

4.3.2.5 gradientValue

„gradientValue“ is a basic attribute class without derivation. It is defined as follows.

Table 200 - Definition gradientValue

Class name	gradientValue
Description	Describes the components
Parent class	
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/gradientValue
Attributes	None

4.3.2.6 hotWaterFlowrate

„hotWaterFlowrate“ is a basic attribute class without derivation. It is defined as follows.

Table 201 - Definition hotWaterFlowrate

Class name	hotWaterFlowrate
Description	Hot Water flow rate is the volume of water that passes through a given point in a system per unit of time. It is typically measured in liters per second (L/s), cubic meters per hour (m³/h) depending on the application.
Parent class	
Standard Reference	VDI-ID://17.710.02.26.
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/hotWaterFlowrate
Attributes	None

4.3.2.7 kv-ValueCooling

„kv-ValueCooling“ is a basic attribute class without derivation. It is defined as follows.

Table 202 - Definition ValueCooling

Class name	kv-ValueCooling
Description	The KV value (flow coefficient) indicates the amount of liquid (e.g., water or refrigerant) that flows through a valve or fitting in a cooling circuit when a pressure difference of 1 bar is applied.
Parent class	
Standard Reference	VDI-ID://06.710.03.7.
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/kv-ValueCooling
Attributes	None

4.3.2.8 kv-ValueHeating

„kv-ValueHeating“ is a basic attribute class without derivation. It is defined as follows.

Table 203 - Definition ValueHeating

Class name	kv-ValueHeating
Description	The KV value (flow coefficient) describes the amount of water (or another medium) that flows through a valve or fitting when a pressure difference of 1 bar is applied.
Parent class	
Standard Reference	VDI-ID://06.710.03.7.
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/kv-ValueHeating
Attributes	None

4.3.2.9 massFlowrate

„massFlowrate“ is a basic attribute class without derivation. It is defined as follows.

Table 204 - Definition massFlowrate

Class name	massFlowrate
Description	Mass flow in heating refers to the mass flow of heating medium (such as water or another heat transfer fluid) through a heating system.
Parent class	
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/massFlowrate
Attributes	None

4.3.2.10 maxDrainageCapacity

„maxDrainageCapacity“ is a basic attribute class without derivation. It is defined as follows.

Table 205 - Definition maxDrainageCapacity

Class name	maxDrainageCapacity
Description	Drainage capacity refers to the ability of a system to collect, transport, and discharge water efficiently, preventing flooding or water accumulation. It is a critical factor in designing wastewater systems, and building drainage solutions.
Parent class	
Standard Reference	VDI-ID://45.700.00.10.
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/maxDrainageCapacity
Attributes	

4.3.2.11 minPressureCold

„minPressureCold“ is a basic attribute class without derivation. It is defined as follows.

Table 206 - Definition minPressureCold

Class name	minPressureCold
Description	The minimum pressure for cold water refers to the lowest water pressure required to ensure proper operation of a plumbing system or appliance. It is a critical factor in maintaining consistent water flow, system efficiency, and user comfort.
Parent class	
Reference Standard	VDI-ID://17.710.02.12.
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/minPressureCold
Attributes	None

4.3.2.12 minPressureHot

„minPressureHot“ is a basic attribute class without derivation. It is defined as follows.

Table 207 - Definition minPressureHoz

Class name	minPressureHot
Description	The minimum pressure for hot water refers to the lowest water pressure required to ensure proper operation of hot water systems, including boilers, water heaters, and taps. Maintaining adequate pressure is essential for consistent flow, efficient heating, and user comfort.
Parent class	
Standard Reference	VDI-ID://17.710.02.13.
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/minPressureHot
Attributes	None

4.3.2.13 nominalDiameter

„nominalDiameter“ is a basic attribute class without derivation. It is defined as follows.

Table 208 - Definition nominalDiameter

Class name	nominalDiameter
Description	The nominal diameter DN indicates the approximate inner diameter of the pipeline in millimetres and is based on the metric system of measurement.
Parent class	
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/nominalDiameter
Attributes	None

4.3.2.14 number

„number“ is a basic attribute class without derivation. It is defined as follows.

Table 209 - Definition number

Class name	number
Description	It is a unique device address by which each bus participant is identified
Parent class	
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/number
Attributes	None

4.3.2.15 powerCold

„powerCold“ is a basic attribute class without derivation. It is defined as follows.

Table 210 - Definition powerCold

Class name	powerCold
Description	The watt is the SI unit of power (energy turnover per period of time).
Parent class	
Standard Reference	VDI-ID://06.710.02.14.
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/powerCold
Attributes	None

4.3.2.16 powerHeat

„**powerHeat**“ is a basic attribute class without derivation. It is defined as follows.

Table 211 - Definition powerHeat

Class name	powerHeat
Description	The watt is the SI unit of power (energy turnover per period of time).
Parent class	
Standard Reference	VDI-ID://06.710.02.3.
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/powerHeat
Attributes	None

4.3.2.17 pressureCold

„**pressureCold**“ is a basic attribute class without derivation. It is defined as follows.

Table 212 - Definition pressureCold

Class name	pressureCold
Description	A pressure drop in a cooling system refers to the reduction in pressure as the coolant flows through pipes, heat exchangers, valves, and other system components.
Parent class	
Standard Reference	VDI-ID://20.710.12.5.
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/pressureCold
Attributes	None

4.3.2.18 pressureHot

„**pressureHot**“ is a basic attribute class without derivation. It is defined as follows.

Table 213 - Definition pressureHot

Class name	pressureHot
Description	In a hot water system, pressure is essential for ensuring proper water flow and distribution throughout the system. The pressure is influenced by factors such as pump performance, pipe resistance, temperature changes, and system design.
Parent class	
Standard Referene	VDI-ID://20.710.09.12.
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/pressureHot
Attributes	None

4.3.2.19 productRange

„**productRange**“ is a basic attribute class without derivation. It is defined as follows.

Table 214 - Definition productRange

Class name	productRange
Description	Manufacturer-specific product range for heating, sanitary, ventilation, and wastewater systems.
Parent class	
Standard Reference	VDI-ID://38.110.00.4. VDI-ID://40.110.00.4. VDI-ID://17.100.00.4. VDI-ID://20.100.00.4. VDI-ID://06.110.00.4. VDI-ID://44.110.00.4.
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/productRange
Attributes	None

4.3.2.20 returnTemperatureCold

„returnTemperatureCold“ is a basic attribute class without derivation. It is defined as follows.

Table 215 - Definition returnTemperatureCold

Class name	returnTemperatureCold
Description	The return temperature in degrees Celsius refers to the temperature of the water that flows back to the heat generator (e.g., boiler, heat pump, or solar system) after releasing heat to the radiators or underfloor heating.
Parent class	
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/returnTemperatureCold
Attributes	None

4.3.2.21 returnTemperatureHeat

„returnTemperatureHeat“ is a basic attribute class without derivation. It is defined as follows.

Table 216 - Definition returnTemperatureHeat

Class name	returnTemperatureHeat
Description	The return temperature in degrees Celsius refers to the temperature of the water that flows back to the heat generator (e.g., boiler, heat pump, or solar system) after releasing heat to the radiators or underfloor heating.
Parent class	
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/returnTemperatureHeat
Attributes	None

4.3.2.22 supplyTemperatureCold

„supplyTemperatureCold“ is a basic attribute class without derivation. It is defined as follows.

Table 217 - Definition supplyTemperatureCold

Class name	supplyTemperatureCold
Description	The flow temperature in degrees Celsius refers to the temperature of the water that is circulated from the heat generator (e.g., boiler, heat pump, or solar system) to the radiators or underfloor heating in a heating system (such as a central heating or hot water system).
Parent class	
Standard Reference	VDI-ID://06.700.00.30.
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/supplyTemperatureCold
Attributes	None

4.3.2.23 supplyTemperatureHeat

„supplyTemperatureHeat“ is a basic attribute class without derivation. It is defined as follows.

Table 218 - Definition supplyTemperatureHeat

Class name	supplyTemperatureHeat
Description	The flow temperature in degrees Celsius refers to the temperature of the water that is circulated from the heat generator (e.g., boiler, heat pump, or solar system) to the radiators or underfloor heating in a heating system (such as a central heating or hot water system).
Parent class	
Standard Reference	VDI-ID://06.700.00.31.
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/supplyTemperatureHeat
Attributes	None

4.3.2.24 tgaKeyH60

„tgaKeyH60“ is a basic attribute class without derivation. It is defined as follows.

Table 219 - Definition tgaKeyH60

Class name	tgaKeyH60
Description	Unique key for the calculation
Parent class	
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/tgaKeyH60
Attributes	None

4.3.2.25 TgaKeyS87

„tgaKeyS87“ is a basic attribute class without derivation. It is defined as follows.

Table 220 - Definition tgaKeyS87

Class name	tgaKeyS87
Description	Unique key for the calculation
Parent class	
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/tgaKeyS87
Attributes	None

4.3.2.26 tgaKeyS90

„tgaKeyS90“ is a basic attribute class without derivation. It is defined as follows.

Table 221 - Definition tgaKeyS90

Class name	tgaKeyS90
Description	Unique key for the calculation
Parent class	
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/tgaKeyS90
Attributes	None

4.3.2.27 throttlingPressure

„**throttlingPressure**“ is a basic attribute class without derivation. It is defined as follows.

Table 222 - Definition throttlingPressure

Class name	throttlingPressure
Description	It refers to the pressure loss that occurs when an airflow is restricted by a throttling element, such as a throttle valve or a valve. These components limit the airflow and increase resistance, leading to a pressure drop.
Parent class	
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/throttlingPressure
Attributes	None

4.3.2.28 totalPressure

„**totalPressure**“ is a basic attribute class without derivation. It is defined as follows.

Table 223 - Definition totalPressure

Class name	totalPressure
Description	The total pressure loss in ventilation technology describes the overall pressure drop that occurs within a ventilation system. It is caused by friction losses in the air ducts, resistances in fittings (bends, branches), filters, heat exchangers, silencers, and other components.
Parent class	
Standard Reference	VDI-ID://05.710.06.5.
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/totalPressure
Attributes	None

4.3.2.29 volumeFlowrate

„volumeFlowrate“ is a basic attribute class without derivation. It is defined as follows.

Table 224 - Definition volumeFlowrate

Class name	volumeFlowrate
Description	The volume flow rate in a duct network describes the amount of fluid (e.g., air or water) that flows through the network per unit of time.
Parent class	
Standard Reference	VDI-ID://05.710.05.7. VDI-ID://35.700.00.11.
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/volumeFlowrate
Attributes	None

4.3.2.30 volumeFlowrateCold

„volumeFlowrateCold“ is a basic attribute class without derivation. It is defined as follows.

Table 225 - Definition volumeFlowrateCold

Class name	volumeFlowrateCold
Description	The volume flow (or inaccurate flow rate and flow volume)
Parent class	
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/volumeFlowrateCold
Attributes	None

4.3.2.31 volumeFlowrateHeat

„**volumeFlowrateHeat**“ is a basic attribute class without derivation. It is defined as follows.

Table 226 - Definition volumeFlowrateHeat

Class name	volumeFlowrateHeat
Description	The volume flow (or inaccurate flow rate and flow volume)
Parent class	
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/volumeFlowrateHeat
Attributes	None

4.3.2.32 wallThickness

„**wallThickness**“ is a basic attribute class without derivation. It is defined as follows.

Table 227 - Definition wallThickness

Class name	wallThickness
Description	The wall thickness indicates the approximate thickness of the pipe in millimetres.
Parent class	
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/wallThickness
Attributes	None

4.3.2.33 zetaValueHeat

„**zetaValueHeat**“ is a basic attribute class without derivation. It is defined as follows.

Table 228 - Definition zetaValueHeat

Class name	zetaValuHeat
Description	The Zeta value (ζ -value) describes the resistance coefficient causing pressure loss in flow systems, particularly in heating technology.
Parent class	
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/zetaValueHeat
Attributes	None

4.3.2.34 zetaValueCold

„zetaValueCold“ is a basic attribute class without derivation. It is defined as follows.

Table 229 - Definition zetaValueCold

Class name	zetaValueCold
Description	The Zeta value (ζ -value) describes the resistance coefficient causing pressure loss in flow systems, particularly in cooling technology.
Parent class	
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/zetaValueCold
Attributes	None

4.3.2.35 medium

„medium“ is a basic attribute class without derivation. It is defined as follows.

Table 230 - Definition medium

Class name	medium
Description	Designation of medium or air type name
Parent class	
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/medium
Attributes	None

4.3.2.36 nameOfSupplier

„nameOfSupplier“ is a basic attribute class without derivation. It is defined as follows.

Table 231 - Definition nameOfSupplier

Class name	nameOfSupplier
Description	The width is a size indication of the extension often in the horizontal direction and often in relation to a length The geometric height is the distance at right angles to a base line or base area of an object Name of supplier which provides the customer with a product or a service
Parent class	
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/nameOfSupplier
Attributes	None

4.3.2.37 name

„name“ is a basic attribute class without derivation. It is defined as follows.

Table 232 - Definition name

Class name	name
Description	Designation of the object
Parent class	
Path for element reference	AutomationML_BuildingServices_AttributeTypeLib/name
Attributes	None

4.3.3 Integration of attribute semantics

In addition, a unique semantic of attributes can be defined. The AutomationML top level format CAEX includes a concept to reference a semantic definition for attributes. This concept shall be used to define the semantics of AutomationML attributes by using property catalogues like ECLASS, Common Data dictionary or VDI 3805 properties. The RefSemantics structure defined in the white paper “AutomationML and ECLASS integration” should therefore be used.

Attribute semantics via property catalogues

For the definitions of attribute semantics via property catalogues, the following provisions apply:

- The CAEX schema element “RefSemantic” shall be used for the semantic definition for a single attribute, see Figure 25.
- The reference indicators shall be used as defined within their respective standard specification.

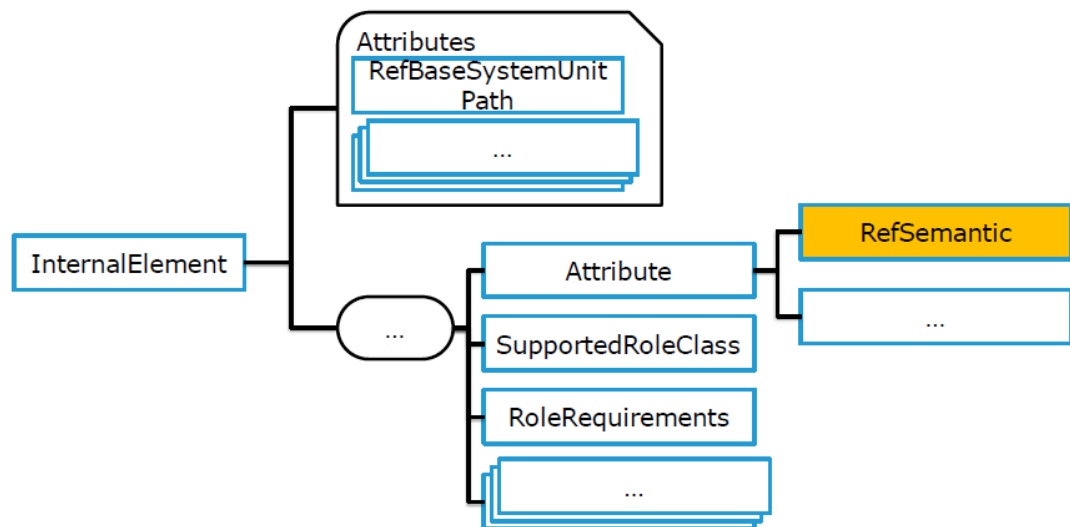


Figure 25 - Application means for semantic reference for a single attribute

The value of the XML attribute “CorrespondingAttributePath” of the CAEX schema element “RefSemantic” element shall be assembled as the following string:

Name of standard://unique_identifier

For example:

- Name of Supplier in eClass: IRDI://0173-1#02-AAO735#005
- Temperature in CDD: IRDI://0112/2///61360_4#AAE685
- Name of Supplier in VDI 3805: VDI3805-ID://xx.010.00.4.

5 References

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

Extensible Markup Language (XML) 1.0:2004, W3C Recommendation

(available at <https://www.w3.org/TR/2004/REC-xml-20040204/>)

Whitepaper AutomationML Part 1 – Architecture and General Requirements, December 2024

Whitepaper AutomationML Part 2 – Semantic Libraries, December 2024

Best Practice Recommendation Modelling of Reference Designations, December 2024

Whitepaper AutomationML and ECLASS integration, November 2021



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