

European MEPcontent Standard

version 3.0

European MEPcontent Standard (EMCS)

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Introduction

Welcome to the European MEPcontent Standard, from now on referred to as EMCS. This document has been prepared by Stabiplan to provide MEP engineers throughout Europe with a clear understanding of the need for high quality and uniform content, i.e. graphical article information like it is present on Stabiplan's content platform MEPcontent.eu. This document also represents Stabiplan's vision for the future. Preparing the best content for MEP projects still has a long way to go, especially because the leading BIM platform Revit is still evolving. We want to share our knowledge on MEP and content for MEP because we know that MEP is a dedicated business that deserves its own standard, and that this should be done on a European level, reflecting the current state of our industry in which boundaries between countries fade away.

MEP families have to comply with a set of rules. These rules guarantee that the families are consistent, will behave correctly in a Revit project and contain the relevant information.

The rules are the guiding principle when families are created in MEPcontent's content factory. They are also used to check if families delivered from external parties are suitable to publish on MEPcontent. Every family that is published in accordance with EMCS can be used in Revit 2014 and later, but also in applications that run on top of the Revit platform, like Stabicad.

The following main parts are described in this document:

- Naming conventions
- Rules about the main properties of a family (Revit category, host)
- Rules about using parameters
- Rules about creating the geometry/representation
- Rules about connectors
- Rules about classification data and supporting external standards

EMCS complies as much as possible with existing standards and guidelines, both from Autodesk (Autodesk Content Style Guide) and Dutch and European standardization organizations (e.g. ETIM, COBie, RVB BIM, VDI 3805, ISO 16757). We use the families in the Revit MEP Content Library (the family library that's included in a Revit MEP installation) as a source of knowledge on how to build high quality families.

Not all content currently on MEPcontent is yet compliant to all details of this standard, but together with manufacturers and engineers we are continuously improving it.

We believe EMCS itself can still be improved. Therefore you, as a reader of this document, are invited to provide us with feedback on this document – together we can reach our common goal: delivering better building services by means of the best content available in the world. We value transparency so we want to be completely clear and open on the way we work. Your openness and willingness to contribute to this document are greatly appreciated. Contact us at +31 172 630023 or info@mecontent.eu.

We kindly thank the following people who have provided us with valuable feedback on EMCS: Bene Braad Ajilon Engineering, Julien Drouet Autodesk, Erik Koele Croonwolter&dros, Michiel van Wijk Deerns, Wesley van der Ree ENGIE, Nico Verdonck and Marcus Christensen Fich Grundfos, Frits Cornelius and Paul Wijgengangs I-Commit, Jos van der Heijden Inteco, Gerard de Mol Iv-Bouw, Jelle de Boer Kovo, Rutger Heil Nathan, Frank Wolbertus and Hayo Meijs TBI, Michel Kragten Tekenbureau M. Kragten, Kenneth Verlinden Victaulic.

Change notes

Version 2.1 - 3.0

General	Images have been updated throughout the document and new ones have been added.
1.1	<ul style="list-style-type: none">- System Building (BU) has been replaced by Architecture (A)- System Flue Gas (FG) has been added- System order has been changed to alphabetical- <i>Series/type</i> is not required for generic families- <i>Info</i> component has been added in the family name- Addition to rules: do not use special characters- Family name examples have been updated
1.2	<ul style="list-style-type: none">- Addition to rules: dimension types can be separated with an <i>x</i>- Family type name examples have been updated
2.2	<ul style="list-style-type: none">- Explanations for the different hosting choices has been added- Note about using only the face-based hosting type has been added
3	<ul style="list-style-type: none">- Chapter about specific parameters for electrical families has been removed
3.3	<ul style="list-style-type: none">- Explanation and examples for the basic parameters have been added- Note about using the proper parameter type has been added- Grouping chapter has been updated to explain that basic parameters go in the Identity data group, while discipline specific parameters go in the more specific parameter groups.
3.4	<ul style="list-style-type: none">- Addition to rules: for fitting families used in routing preferences, the dimensions can be set to <i>shared instance</i>- Addition to rules: use the Size parameter type in parameter definition
3.6	<ul style="list-style-type: none">- URL values have been updated- Exception for autorouting fittings has been added
4.2	<ul style="list-style-type: none">- Chapter was renamed to Symbolic representations and additions- Paragraph has been rewritten, new rules and explanations have been added- A table containing the relation between view type, detail level and representation has been added- Family type possibilities have been updated- Family type name examples have been added
4.3	<ul style="list-style-type: none">- Subcategories are not required- Name of subcategories for service and operation area has been added
4.4	<ul style="list-style-type: none">- Rule for insertion point of elements placed against the wall has been updated- Paragraph with rules for default orientations has been added
4.5	New
4.7	<ul style="list-style-type: none">- Example situation about Electrical families has been updated
4.8	<ul style="list-style-type: none">- Reasons when to use materials have been updated- Addition to rules: RGB numbers always have three characters
4.9	<ul style="list-style-type: none">- Addition to rules: for face based ceiling elements, the preview is from the bottom- Note about hiding reference lines has been added
5.1	<ul style="list-style-type: none">- System type example has been updated- Addition to rules: if the <i>Flow configuration</i> is <i>Preset</i>, it is required to include a system classification
5.2	<ul style="list-style-type: none">- Addition to rules: for connectors with a combined function, both are included in the description
6.2	<ul style="list-style-type: none">- ClassificationCode parameter and explanation have been added- Note about what parameters are added in EMCS has been added- Note about compliance to UK BIM Level 2 has been added
6.3	<ul style="list-style-type: none">- Change in parameter type of IFC parameters: shared instead of not shared- IFC2x3 has been updated to IFC4 and an explanation of its structure has been added- Examples of categories and their IFC parameters have been added
6.4	New

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1 Naming

1.1 Family name

Rules

The structure of the family name is:

<System>_<Category>_<Subcategory>_<Host>_MEPcontent_<Manufacturer>_<Series/Type>_<Info>

- Within a field, do not use underscores but use spaces to make the name more clear, if needed.
- Every field starts with a capital.
- Italic fields are optional. When irrelevant, they are skipped to keep the family names short.
- Do not use the following special characters in family names: ' " ; : / ? \ | ! @ # \$ % ^ & * < > [] { }
Although some of them are allowed in Revit, these characters can give problems in viewing or coordination software such as Navisworks.

System	Short list of predefined codes to distinguish between the main disciplines. <ul style="list-style-type: none">→ A Architecture→ E Electrical→ FG Flue Gas→ HC Heating/Cooling→ M Mechanical (for other than one of the specific systems)→ SA Sanitary/Sewerage→ SP Sprinkler→ VE Ventilation
Category	Main functional group. The available categories are defined in a list with standardized English names.
Subcategory (optional)	Functional subgroup, only included when useful. The available subcategories are defined in a list with standardized English names.
Host (optional)	For a hosted family, one letter code is used to specify the host type. The code is skipped for unhosted families. On MEPcontent, we only use the host type <i>face based</i> for hosted families. The code in the family name is <i>F</i> .
MEPcontent	Fixed code to recognize the family as a MEPcontent family.
Manufacturer	Name of the manufacturer of the product that is modeled by the family. When it's a generic product (not manufacturer specific), use <i>Generic</i> .
Series/Type	Description of the series or type of the product as specified in the manufacturer documentation, including spaces and special characters like '-'. As specific as possible, but should be applicable to all types the family contains. If a family only contains a part of the products in a series, this field is extended with a specification of the included products. Not required for generic products.
Info	Additional info, for example to indicate that it's a highly detailed, large family. Only use this to specify additional information that cannot be put in the other fields.

Motivation

- When families are sorted based on name (e.g. in a content browser, Revit family tree, Navisworks/Solibri, Windows Explorer), the order is logical, so that related families are grouped together.
- The name gives relevant information about what the family is.
- The name makes visible it's a family from MEPcontent.
- The name gives information about the host, so when needed, you know how to place it.
- This naming closely follows the rules in the Autodesk Content Style Guide.

Family names are not intended to be used as a description in schedules. For that, the family parameters are used.

Examples

- HC_Boiler_Round_MEPcontent_Nefit_ProLine HRC 30-CW5.rfa
- VE_Fire Damper_Round_MEPcontent_Trox_FKR-03-NEN 315-500.rfa
- M_Pump_Circulation_MEPcontent_Speck Pompen_BADU Resort.rfa
- E_Flush-fit Box_MEPcontent_Spelsberg_IBTronic XL Drillbox.rfa
- E_Light Fixture_F_MEPcontent_Philips_FWC110.rfa

1.2 Family type name

Rules

The structure of a family type name is:

<TypeParameter1Value>_<TypeParameter2Value>_<TypeParameter3Value>_....

Normally, one or two parameter values are enough to define the type name.

- When a family only has one type, the type name is equal to the value of the Article Type parameter.
- Family types are named as specified in the manufacturer documentation. Within a type name, spaces and special characters as '-' are allowed.
- When the type name contains a combination of dimension parameters, like length or width, these parameters may be separated by an 'x' instead of an '_', for example 500x400.
- The family name and parts of the family name are not duplicated in the family type names, except in some cases for the *Series/type* part. Examples of exceptions:
 - When manufacturers include the series name in the name of a product.
 - When the series/type field in the family name contains information about the included products from the series.
- The type name only shows values of the key type parameters that make a type unique. It doesn't include values of type parameters that are not relevant for selecting a type.
- Parts of the family type name are separated with underscores.
- Language dependent type names are avoided as much as possible.

Motivation

- The family type name together with the family name gives a unique identification of the product.
- The type name gives the proper information to make the correct selection when selecting a family type in Revit.

Family type names are not intended to be used as a description in schedules. For that, the family parameters are used.

Example

In this example the family type name only consists of the parameter *Article Type*, that stores the type of the boiler.

Family: M_Boiler_Circulation_MEPcontent_IthoDaalderop_Electric.rfa

Family type names: Mono 30L
Mono 50L
Mono-Plus 80L
Mono-Plus 120L
...

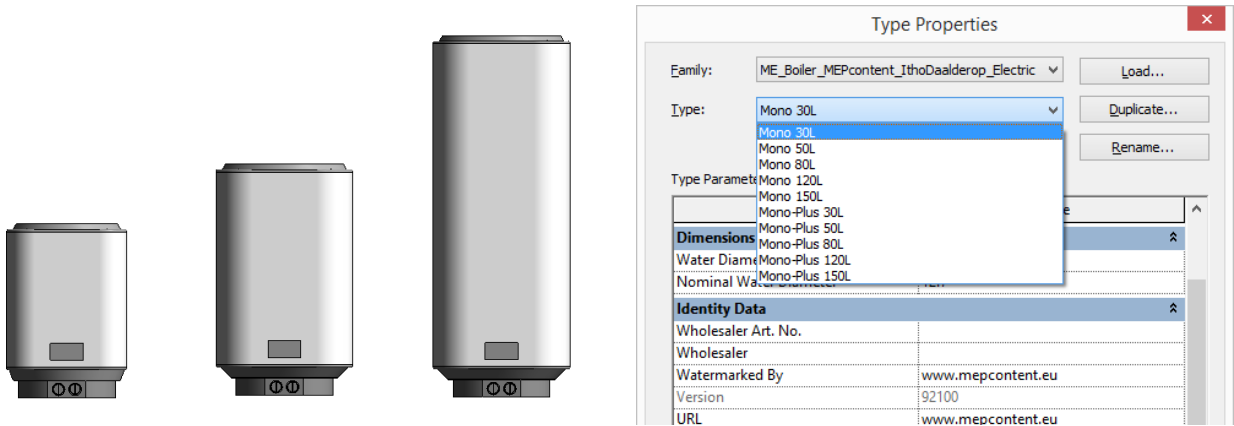


Figure 1: Examples of types

2 Main family properties

2.1 Revit category / part type

- The Revit category and part type are assigned so that the behavior of the family is correct, for example when you place an element in a pipe or when you do calculations.
- The rules given in the Revit Model Content Style Guide from Autodesk are followed.
- The way categories and part types are assigned normally follows the Revit MEP Content Library that comes with each Revit MEP installation.
- When needed, classification models are applied to be able to assign the right category and part type to a family.

2.2 Host

- Families should only be hosted when placing the family in free space is not useful, since non-hosted families have the most flexible placing possibilities.
- If hosting is used, it should only be *face-based*, since this is the only type that can be used in combination with linked models.
- Families that are normally placed on a sloped plane should be non-hosted and *workplane-based*. This way they adopt the orientation of the plane on which they are placed.
- In general, Mechanical families are non-hosted. Most often, they are placed in pipe systems or on the floor, where it doesn't make sense to make them hosted.
- Electrical families are created in both a *free* and a *face-based* variant to support both users that prefer working with hosted families and those that prefer the free variant.
- For nested families, also the hosting type *line-based* may be used. That can be easy for families that are repeated on a line in a main family.

3 Parameters

3.1 Parameter names

Rules

- Parameter names are in English.
- Use clear names, especially for parameters that are specified in product documentation. Preferably adopt parameter names that are used in dimension sketches from manufacturers.
- Use spaces to separate parts of a parameter name.
- For parameters that are related to connectors (dimensions, lengths), sequence numbers that correspond to the sequence number of the connector are used.
- For other parameters, usage of sequence numbers is avoided, instead it is described to what a parameter refers. When the parameter refers to a part of the family, first the name of the part is mentioned, then what the parameter describes. A valve with a motor does not contain *Diameter Motor* but *Motor Diameter*.
- Use short names for parameters that are only used in formulas to minimize the formula length.
- When the parameter relates to the family as a whole, the family name is not included in the parameter name. So not *Valve Pressure Stage*, but *Pressure Stage*.
- Parameters follow Revit parameter capitalization: the first character of nouns and adjectives is capitalized, short prepositions like *on*, *with* or *of* are lowercase.
- Parameter names do not show it's a parameter for a MEPcontent family.

Goal

- The meaning of a parameter name, as shown in the Revit property editor, is clear for the user.
- Similar parameters in different families have the same name. This is especially important for shared parameters, in order to restrict the number of columns in schedules.

3.2 Parameter groups

A MEPcontent family contains several groups of parameters:

- Article parameters, defining the product properties (descriptions, main dimensions, main technical properties)
- Dimension parameters that are needed to define the geometry
- Engineering parameters, saying something about behavior in a system (circuit of a light fixture, flow of an air terminal)
- Specific MEPcontent parameters, like version

3.3 Article parameters

Basic article parameters

A family always contains the following basic article parameters:

- Product Line: name of the manufacturer and if relevant a product range, e.g. Dyka PVC Sewerage, Legrand GWO 6 Wall gutters
- Article Type: at least describes the series, e.g. Fig. 1619, Aqua-Max DV CW4 HR Combi
- Article Description: at least describes the category, e.g. Fire valve, Combi boiler, Lighting fixture
- Manufacturer Art. No.: article number in the manufacturer's product documentation
- GTIN: Global Trade Item Number, a unique article identifier, delivered by the manufacturer
- Wholesaler: not preset, the user can specify the wholesaler where the product is ordered
- Wholesaler Art. No.: not preset, the user can specify the article number defined by the wholesaler
- Internal Art. No.: not preset, the user can specify an article number that is internally defined in the company
- Manufacturer URL: link to the web page containing the product documentation

The basic parameters uniquely describe a product. They are defined as shared type parameters, which means:

- Every product corresponds to a separate family type.
- You can include the article parameters in schedules.

Revit built-in article parameters

The following Revit built-in article parameters are filled in so that important article properties of a MEPcontent article are also shown in schedules containing only standard Revit parameters.

- Manufacturer
- Model (equals the value of the *Article Type* parameter)
- Description (equals the value of the *Article Description* parameter)

Additional article parameters

Depending on the specific category of a family, additional article parameters are defined, for example technical properties related to capacity or performance. When possible, Revit built-in parameters are used. When creating your own parameters, the proper type (e.g. *Flow*, *Temperature*, *Power*) available in Revit in order to assign the correct units. Examples:

- The radiation of a radiator
- The power of a boiler
- The power of a light fixture

Classification models for the additional parameters are applied.

Revit group

The basic article parameters are grouped under the parameter group *Identity data*. Additional discipline or category specific parameters should be placed in the proper specific parameter group. Especially for parameters that describe Mechanical or Electrical behavior and performance, the available Mechanical and Electrical parameter groups should be used, for example *Electrical - Loads* for the power of a light fixture and *Mechanical - Loads* for the radiation of a radiator.

3.4 Dimension parameters

The dimension parameters describe the geometry and the positions of the connectors of a family.

Dimension parameters are defined following these rules:

- They are defined as type parameters because the values are specific for a product or family type.
- They are only defined as shared parameter when it is useful to include them in a schedule, like the diameter of a fitting or a valve.
- Main dimensions that are used to identify a product are defined in the Revit group *Dimensions*, for example *Width*, *Length*, *Height* or *Diameter*. These parameters are shared.
- Dimension properties that are only used in the representation of the geometry are grouped under *Other*.
- For connection diameters of fittings and equipment, shared parameters D1, D2, etc. are used.
- In the parameter definition, it's good practice to use the *Size* parameter types that are available, for example *Duct Size* or *Pipe Size*. This way the unit of these parameters can be set independently of the unit of the generic *Length* parameter type.
- For fitting families that can be used in routing preferences, it is also allowed to define the dimension parameters as shared instance parameters, as fitting families can only adopt the diameters of the connected pipes when using instance parameters. In that case, the dependent article parameters (lengths, article number, GTIN) and the *Custom* parameter are also defined as instance parameter. The values are set using lookup tables or formulas, to prevent wrong combinations.

3.5 Engineering parameters

The engineering parameters describe the properties and behavior of a family that are only known when it is used in a real project or system. The values of these parameters can vary in different occurrences of the same product (family type).

Examples:

- The panel and circuit of a light fixture
- The flow of an air terminal
- The control setting of a control valve

Engineering parameters are defined according to the following rules:

- They are defined as instance parameters since every instance of a family type can have its own values.
- They are defined as shared parameters since you should be able to include them in a schedule.
- When there is a Revit built-in parameter for an engineering property, that one is used.
- When a parameter has a specific unit, the corresponding parameter type available in Revit is used. When changing the units setting in a Revit project, the values are converted automatically.
- They are grouped under a specific parameter group for mechanical or electrical.

Classification models for the relevant engineering parameters are applied.

3.6 Specific MEPcontent parameters

Every MEPcontent family has a set of basic parameters to identify it as a MEPcontent family, for version control, copyrights, etc. The following basic parameters are defined:

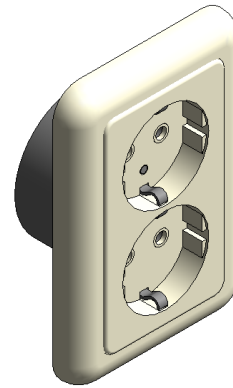
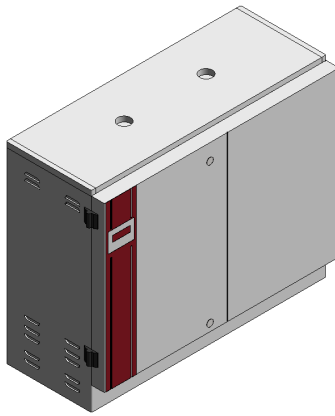
- Copyright – to set the copyrights (value: © Stabiplan International BV).
- URL (standard Revit parameter) – to set the URL (value: www.stabiplan.com).
- Content Supplier URL – to set the link of the creator of the content (value: www.mepcontent.eu)
- Watermarked By – to identify the owner of the family (value: www.stabiplan.com).
- EMCS Version – to store the EMCS version the family complies with (value: e.g. 3.0).
- Family Version – the version of the family to keep track of family revisions (value: e.g. 10.10).
- Revit Version – the Revit version in which the family is created (value: e.g. 2016).
- Custom – to indicate if it's a catalog product or a customized product.

Except for the *Custom* parameter, all parameters are set with a formula and are family type parameters, defined in the group *Identity data*. *Custom* is a shared type parameter, so you can indicate in a schedule if an element is custom or not. An exception is made for autorouting fittings, here it is a shared instance parameter.

3.7 Shared parameter definitions

In MEPcontent families, shared parameters are defined using the Stabiplan shared parameter definitions. We provide tools to add shared parameters and the corresponding values according to other (local) standards.

3.8 Examples



Type Properties

Family: M_Humidifier_MEPcontent_Interland Technik_ Load...

Type: LE60P Duplicate... Rename...

Type Parameters

Parameter	Value
Materials and Finishes	
Hinge Material	Color RGB 050-050-050
Panel Material	Color RAL 3004
Humidifier Material	Color RAL 7038
Buttons Material	Color RGB 189-187-185
Electrical Engineering	
Number of Poles	3
Electrical - Loads	
Voltage	400.00 V
Dimensions	
Width	990.0
Height	810.0
Depth	415.0
Steam Diameter	54.0
Drain Diameter	35.0
Domestic Cold Water Nominal Diam	19.1
Identity Data	
Article Description	Electric steam humidifier
Article Type	LE60P
Manufacturer	Interland Technik
Manufacturer URL	http://shop.interlandtechnik.nl/CatD
Product Line	Interland Technik
Manufacturer Art. No.	LE60P
GTIN	
Description	Electric steam humidifier
Model	LE60P
Wholesaler	
Wholesaler Art. No.	
Internal Art. No.	
EMCS Version	3.0
Revit Version	2014
CB-NL Class	
ETIM Article Class	EC011628
Stabu Code	
Custom	<input type="checkbox"/>
URL	www.mepcontent.eu
Watermarked By	www.mepcontent.eu
Copyright	© MEPcontent.eu
Content Supplier URL	www.mepcontent.eu
Type Image	
Keynote	
Type Comments	
Assembly Code	

<< Preview OK Cancel Apply

Type Properties

Family: E_Wall Socket_Double_MEPcontent_ABB_Doubl Load...

Type: 302EUIT-212 Duplicate... Rename...

Type Parameters

Parameter	Value
Materials and Finishes	
Gray	Color RGB 120-120-120
Cream White	Color RAL 1013
Electrical Engineering	
Current	16.00 A
Electrical - Loads	
Voltage	250.00 V
Dimensions	
Width	81.0
Height	120.0
Depth	40.0
Identity Data	
Article Description	Wall outlet double deep recessed
Article Type	302EUIT-212
Manufacturer	Busch-Jaeger
Manufacturer URL	http://www.abbconnect.nl/Details/In
Product Line	Busch-Jaeger
Manufacturer Art. No.	
GTIN	6438199003627
Description	Wall outlet double deep recessed
Model	302EUIT-212
Wholesaler	ABB
Wholesaler Art. No.	2TKA00002003
Internal Art. No.	
EMCS Version	3.0
Revit Version	2014
Function Code	E6222
CB-NL Class	
ETIM Article Class	EC000125
Stabu Code	
Custom	<input type="checkbox"/>
URL	www.mepcontent.eu
Watermarked By	www.mepcontent.eu
Copyright	© MEPcontent.eu
Content Supplier URL	www.mepcontent.eu
Category	EL_POWERCONSUMER
App ID	EL_MODELPARTSYSTEM_MC
Type Image	
Keynote	
Type Comments	
Assembly Code	
Cost	
Assembly Description	

<< Preview OK Cancel Apply

Figure 2: Examples of family parameters organized in groups

4 Geometry

4.1 Detail levels

In many cases, a MEPcontent family contains more than one detail level. This means that the detail level in which a family is shown is dependent on the detail level of the active view. In *Coarse* and *Medium* views, more global representations are defined, improving performance and giving 'cleaner' views. Only in *Fine* views all details for a realistic representation are shown.

In defining the detail levels, the behavior (when switching the detail level of a view) of the system families in Revit and of the Revit MEP Content Library included in the Revit MEP installation is followed.

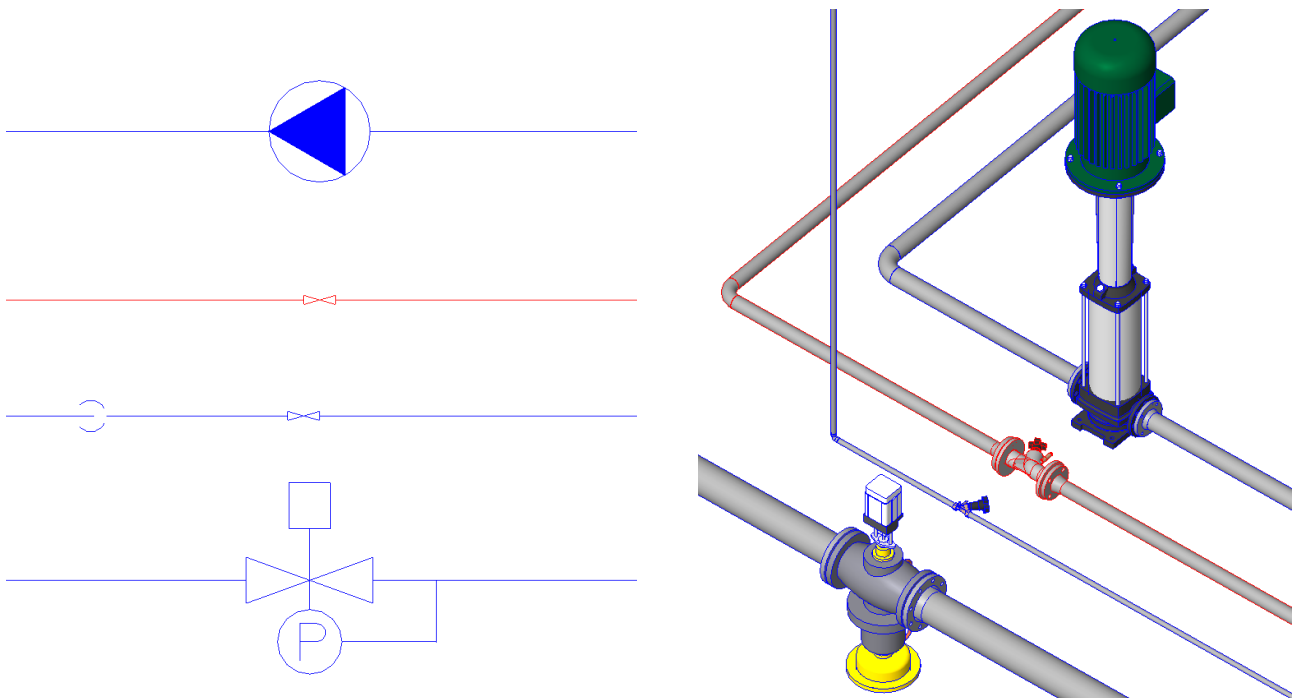


Figure 3: Representation of mechanical equipment in different detail levels

4.2 Symbolic representations and additions

It is common for many installation elements to represent them with a symbolic representation in views with a low detail level. These symbolic representations are described in branch standards, for example ISO, NEN, VDI or DIN. When there is a standard symbolic representation, it is included in a MEPcontent family. Furthermore, for some installation elements, there is a symbolic addition in the 3D representation, for example for a fire valve.

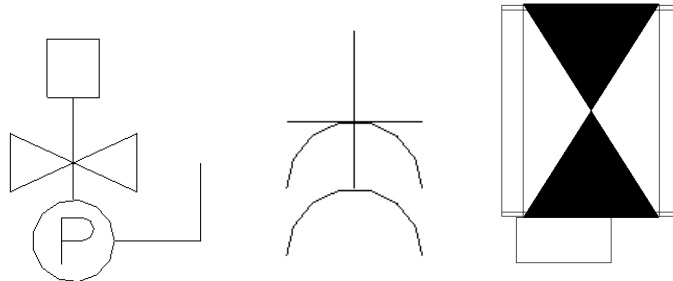


Figure 4: Symbolic representations and additions

In the table below, the relation between view type, detail level and representation is shown.

		Floor Plan			Left/Right			Front/Back			3D		
		Coarse	Medium	Fine	Coarse	Medium	Fine	Coarse	Medium	Fine	Coarse	Medium	Fine
Ventilation	Symbolic	x						x			x		
	3D Geometry		x	x		x	x		x	x		x	x
	Symbolic additions		x	x					x	x			
Piping	Symbolic	x	x					x	x		x	x	
	3D Geometry			x			x			x			x
	Symbolic additions			x						x			
Electrical	Symbolic	x	x	x									
	3D Geometry				x	x	x	x	x	x	x	x	x

Figure 5: Relation between view type, detail level and representation

There are differences between the disciplines:

- ➔ In Ventilation, the symbolic representation is only shown in the Coarse detail level, in Piping in both Coarse and Medium. This is because of the behaviour of Revit.
- ➔ In Electrical, the symbolic representation is always shown in a Floor Plan, as that is commonly used. If a 3D geometry representation is needed in a top view, a 3D top view can be created.

For the symbolic representation, one or more nested families are added to the main family.

- ➔ For Electrical families, a nested Generic Annotation family is added in the Floor Plan.
- ➔ For Mechanical families, a nested Detail Item family is added to both the Floor Plan and the Front View. The scale is 1:50. Furthermore, a nested family with the same category as the main family is added with the symbol drawn with Model Lines. In the *Visibility Settings*, the visibility of the nested families is configured according to the table above. The reason Detail Item families are used for Mechanical families, is that they, as opposed to Generic Annotations, remain visible if the element is rotated in 3D.

In the main family, an offset parameter is defined, which can be used to give the symbolic representation an offset compared to the 3D representation. For Electrical symbols, this is both an X and Y offset. For Mechanical symbols, only an X offset is defined, as it's only useful to be able to move them in the direction of the pipe in which they are contained.

The name of the nested families for symbolic representations is:

<Discipline>_<Category>_<Subcategory>_Symbol_<Family type>

Possibilities for <Family type> are:

- GA for a Generic Annotation family
- DI for a Detail Item family
- PA/DA for a Pipe/Duct Accessory
- GM for a Generic Model family

Examples: E_Socket_1F with Earth_Symbol_GA
M_Valve_Butterfly_Symbol_DI

4.3 Subcategories

Subcategories can be assigned to elements in families when:

- The graphical properties (object styles) should be configurable for a part of a family: color, line style.
- It is useful to have more control over the visibility of parts of the family geometry and/or family details, not only by switching detail level of the view.

For nested families, normally the same subcategory name(s) as for the main family is used. Examples of usage of subcategories:

- When a service area or operation area is defined in a family, the geometry defining these areas is assigned a separate subcategory, so that it can be switched off while the main element is still visible. The subcategory names are *Service Area* and *Operation Area*. These areas are only visible in views showing the 3D geometry of the family.
- When an element contains center lines, they have a separate subcategory, so that the line pattern and color of the center line can be configured separately from the graphical appearance of the main family.
- When a family contains many 3D details, these details can be assigned a subcategory so that they can be switched off, even in a detail view level, to improve performance. The normal subcategory for the geometry is extended with *detail*, for example *Accessories detail*.
- When a family contains a symbolic representation, the symbol geometry can be assigned a separate subcategory. The normal subcategory for the geometry is extended with *symbol*, for example *Accessories symbol*.

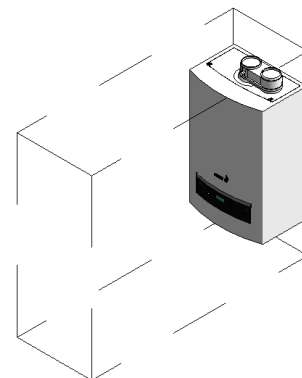


Figure 6: Operation area of a boiler

Revit by default already contains some predefined subcategories. When possible, those subcategories are used, otherwise additional ones are defined. An example of a standard Revit subcategory is the one defined for center lines.

4.4 Insertion point and orientation

The insertion point of a family is the reference point that is used when placing or replacing a family. The insertion point is carefully defined so that:

- The user can easily place families by specifying the most logical point or position.
- They are defined in a consistent way, so that when you change a family to one of a similar category, you don't get unexpected results.

In most cases applied rules for insertion points are:

- Elements placed in pipes: at the intersection of the center lines of the connectors.
- Elements placed against the wall: on the bottom-center, center-center or top-center of the rear side.
- Elements placed against the wall on the floor: on the bottom-center of the rear side.
- Elements placed on the floor in a corner of a room: on the bottom side on the point that will be positioned in the corner.

For the default orientation of a MEPcontent family, the same applies: it is defined in the 3D view that is most common in a plan view, often a top or front view, so that in most cases the view doesn't have to be changed when placing it. When replacing a family with another family of a similar category, the orientation is not changed, since orientations are defined consequently.

Applied rules for orientations are:

- Families are oriented along the X-axis. For pipe and duct accessories, this is the orientation they have in a pipe or duct along the X-axis. For elements placed before a wall, this is how they are oriented before a wall along the X-axis.
- For pipe and duct accessories, the control or motor is oriented in the positive Z-axis.
- For hosted families, the side connected to the host is always pointing in the negative Z-direction. For example a family that is normally placed in a ceiling, is oriented upside down.
- For non hosted families, the default orientation is how it is placed in a building: the floor is the XY-plane and the front side is oriented at the positive Y-axis.

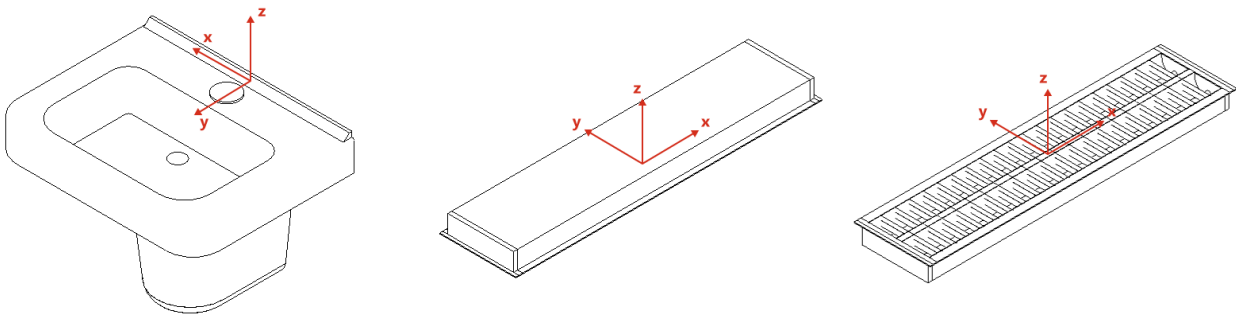


Figure 7: Insertion points and axes in different types of equipment

4.5 Reference planes and lines

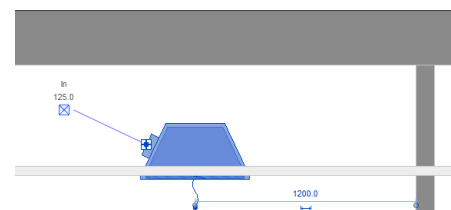
Reference planes should be drawn from bottom left to top right.

The *Is Reference* property of a reference plane or line should only be set to *Strong reference* or *Weak reference* if it is useful to snap to it or to dimension from it. Examples are the connector positions and base points of fittings and equipment, and the sides of large equipment, like boilers.

4.6 Room calculation point

In families defined in Revit 2013 and later, a room calculation point can be defined to make sure that the family is counted in the correct room. This is required for families that are placed on the boundary of a room with an insertion point that can be outside or on the boundary of the room or space definition, for example air terminals, sanitary equipment and lighting fixtures.

The room calculation point is defined on a position so that we are sure that the point is always inside the corresponding room or space.



**Figure 8:
Room calculation point
of an air terminal**

4.7 Nested families

The use of nested shared families is restricted: they should only be used when it is necessary to schedule the sub components separately.

Nested not-shared families are used in several situations:

- For adding a symbolic representation as an annotation or detail family.
- When there are repeated parts in a family.
- When a part of a family should be handled as a kind of group, for example to set the rotation.
- To be able to switch between different 3D representations, based on a family type or parameter value.

When the nested family only defines a part of the geometry, name it with a short name that makes clear what it represents. When there is a nested family for the complete 3D geometry, name it as:

<Discipline>_<Category>_<Subcategory>_Geometry

Example: SA_Wash Basin_Cold and Hot_Geometry

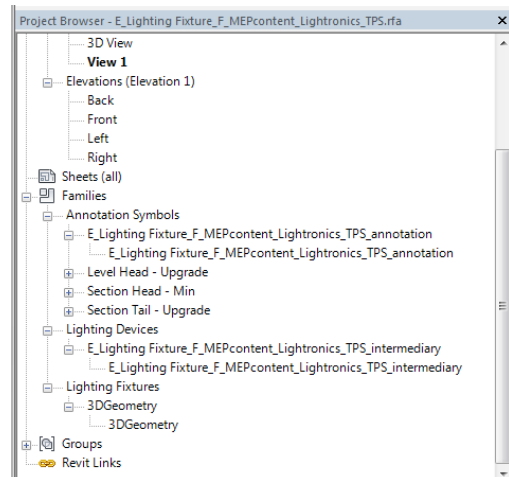


Figure 9: Nested families

4.8 Materials

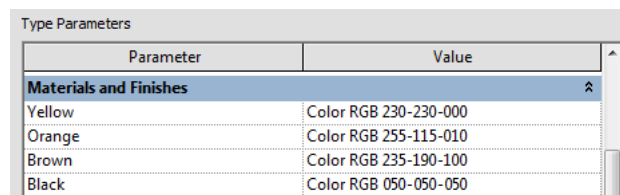
Materials can be used to:

- Define a material with all its properties. To do this, don't define new materials in the family, but use the material definitions that are default available in Revit.
- Show realistic, manufacturer-specific colors in a family. In that case the material is defined in the family, and it is named as follows:

Color RAL <number> or Color RGB <number1>-<number2>-<number3>

RGB numbers always have three characters. If needed, leading zeros are added.

In the example the parameters have a name that reflects the color that will be assigned. It is also allowed to give a name describing the part of the geometry the parameter refers to.



Parameter	Value
Materials and Finishes	
Yellow	Color RGB 230-230-000
Orange	Color RGB 255-115-010
Brown	Color RGB 235-190-100
Black	Color RGB 050-050-050

Figure 10: Material assignment

4.9 Preview

Families are saved in the view that is shown in the preview on MEPcontent.eu. Normally this is the isometric 3D view with view direction top-front-right. Face-based ceiling elements are displayed seen from the bottom. When for some reason another preview is more useful, this is also allowed. Reference lines and should be hidden, especially for tags and detail elements.

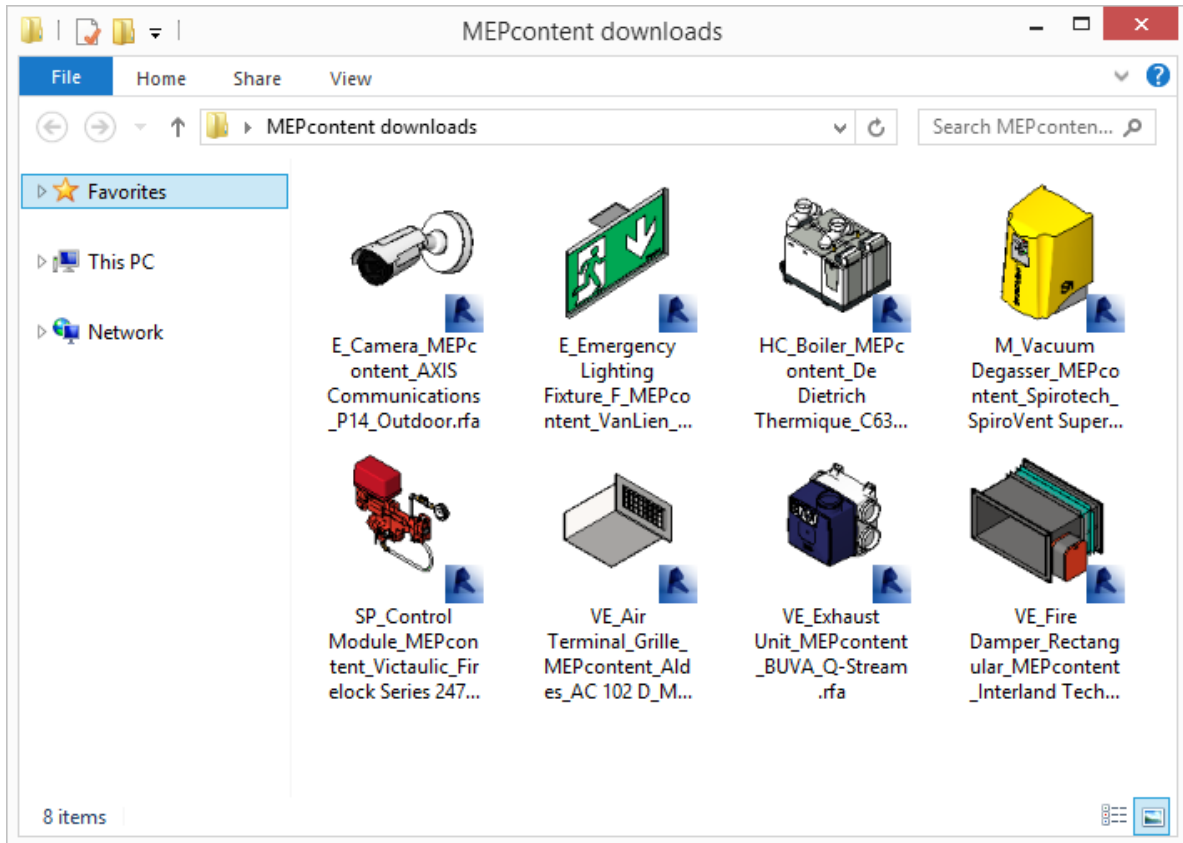


Figure 11: Previews in Windows Explorer

5 Connectors

5.1 Configuration of connector properties

Connectors are an important concept in Revit MEP families. It is essential to configure them correctly to ensure the right behavior in calculations. The rules described in the Revit MEP documentation and Revit MEP Content Style guide are applied.

The most important rules for mechanical connectors are:

- *Flow configuration* is set to:
 - *Preset* for connectors of elements that have a fixed flow, mainly consumers
 - *Calculated* when the flow should be propagated through the connector
 - *System* when we want to distribute the flow with factors
- If the *Flow configuration* is *Preset*, it is required to include a system classification in the connector. It can be necessary to create variants of families for the different system classifications, for example supply and return Air Terminals.
- A fixed system type is only assigned when it is known beforehand, otherwise it is set to *Global*. The system type of a cold water connector of a sink for example has system type *Cold water* and the system type of the connectors of a control valve is set to *Fitting*.

For electrical connectors, *System type* is filled with the value corresponding to the main family.

5.2 Connector descriptions

When needed, a connector can have a description to clarify its function. When the function is obvious, the description may be skipped. When there are more connectors of the same type, a description is also needed to clarify which parameters are linked to which connectors. The applied rules are:

- For fittings and pipe equipment without a specific system type, the description is the sequence number of the connector. This corresponds with the sequence number of the parameters that are linked to the connector.
- When the connector has a preset system type, the description contains the name of the system type, for example *Return Air*. The available names are defined in a standard list.
- When a connector has a combined function, for example heating and cooling, both are included in the description: *Heating, Cooling*.

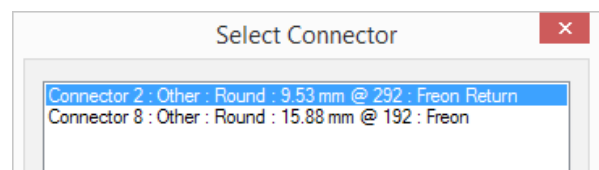


Figure 12: Connector names

5.3 Connection types for mechanical families

Revit connectors don't have a connection type as property. For this reason, the family parameters *Connection type <Connection number>* are added to families that are placed in pipe or duct systems, for example *Connection type 2*.

Connection number is 1 for the primary connector, 2 for the outgoing connector and 3 and 4 for branch connectors. The value of the parameters is a number that maps to a connection type, the same numbers as in the PLS's on MEPcontent.eu.

6 Classifications & standards

6.1 Built-in classification parameters

Revit contains some built-in parameters meant for storing classification information. Only the *Omni-class* parameter is filled with classification values that are default available in Revit MEP. The *Assembly code* and *Keynote* parameters are left empty, so that users can fill them themselves depending on the specifications of the project.

6.2 European building information standards

MEPcontent families have a number of additional classification parameters, specifically for the Dutch/European market:

- MEPcontent Class – A code for the MEPcontent classification.
- ETIM Article Class – ETIM classification.
- Function Code – SfB code. Since this has a similar meaning as the system type property, it is only added for Revit categories that do not have a built-in *System type* parameter, for example for Electrical categories and for Mechanical equipment that's not system dependent.
- CB-NL Class – Classification according to CB-NL. Not yet filled in, due to not being available.
- Stabu Code – Left empty, can be filled in by users.
- ClassificationCode – can be filled with a full 4-character NL-SfB classification and description in the format *[NL-SfB]xx.xx:Description*, for example *[NL-SfB]57.01:luchtbehandeling toevoer*. This parameter, in this format, results in an IFC output as prescribed in the Dutch RVB BIM norm (1 and 2), and is meant for a clear classification of the objects of a BIM project in tools like Navisworks or Solibri.

The Function Code and ClassificationCode are shared instance parameters. The value is directly filled, without a formula. The other parameters are shared type parameters, and the parameter values are set with a formula. The ClassificationCode is categorized in the group *IFC parameters*, the others in group *Identity data*.

There are several European standards for describing product information. Well-known standards are COBie, VDI 3805 and ISO 16757 (under development). These standards usually have long lists of product properties, containing all properties manufacturers describe in their product documentation. From the data duplication and family size point of view, it is not desirable to include all this information in a family. EMCS only includes the parameters that are useful during design and on delivery of a project

and/or that are needed to uniquely identify objects/products. When on delivery of a project a specific standard is requested, the needed information according to that standard can be added with tools.

Since EMCS families include the relevant product properties, a Revit project with EMCS families is prepared to deliver a project complying with the UK BIM Level 2.

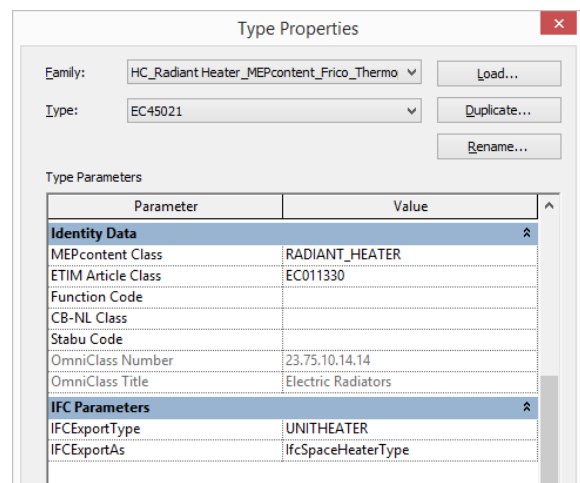


Figure 13: Classification parameters

6.3 IFC parameters

For a correct IFC export, two parameters are filled in:

- IFCExportAs: specifies to which IFC entity the family is exported.
- IFCExportType: specifies to which enumeration value, available within the IFC entity, the family is exported.

Both are defined in the group *IFC Parameters*. *IFCExportAs* is a shared type parameter, *IFCExportType* is a shared instance parameter.

The values of these parameters are filled in according to the IFC4 standard. The definition of the IFC4 classes can be found on <http://www.buildingsmart-tech.org/ifc/IFC4/final/html/>. In the menu, the link *7. Domain Schemas*, contains an overview of all parts of the IFC definitions. For MEP, the most relevant schemas are *HVAC Domain*, *Plumbing FireProtection Domain*, *Electrical Domain* and *Building Controls Domain*. Each domain has a list of *Types* and *Entities*. The *Entities* are the classes to be used for the *IfcExportAs* parameter. The *Enumerated Item Definitions* in the *Types* are the values for the *IfcExportType* parameter.

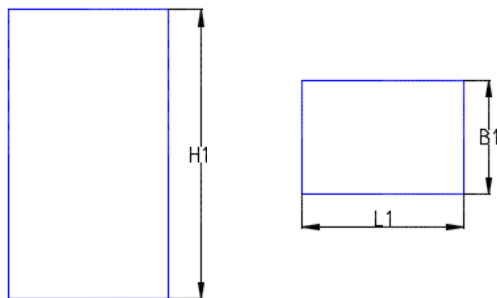
For the *IFCExportAs* parameter, the *Type* classes (e.g. *IfcPumpType*) are used. In the Export to IFC function in Revit, you can do an export both to IFC2x3 and IFC4. Both exports work correctly with the parameters filled in this way. For IFC4 classes that are not available in IFC2x3, the export will fall back to a default IFC class.

Some examples:

- Circulation pump: *IfcPumpType*, CIRCULATOR
- Perforated air terminal: *IfcAirTerminalType*, DIFFUSER
- Combi boiler: *IfcBoilerType*, WATER
- Light fixture: *IfcLightFixtureType*, POINTSOURCE or DIRECTIONSOURCE
- Socket: *IfcOutlet*, POWEROUTLET
- Switch: *IfcSwitchingDevice*, TOGGLESWITCH

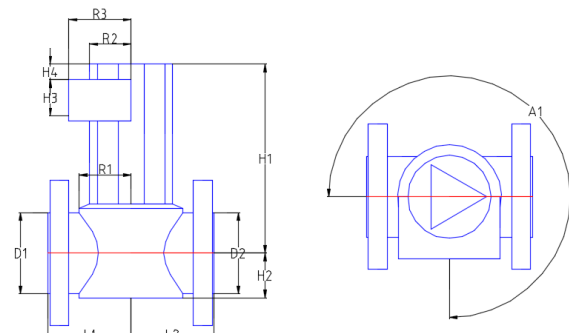
6.4 Examples of classification mapping

Boiler



EMCS	ETIM	COBie
Manufacturer	Merk	Manufacturer
Article Type	Serie	Product Model Number
Article Description		
Manufacturer URL	Deeplink	Product Literature
GTIN	GTIN	
OmniClass Number		
Nominal Power	Nom. vermogen 80-60 grC	Rated Output
Voltage	Aansluitspanning	Voltage
CW Label	CW label	
Width	Breedte	Overall Width
Height	Hoogte	Overall Height
Depth	Diepte	Overall Length
Sanitary Diameter		
Hydronic Supply Diameter	Draadmaat / Uitw. buisdiameter aanvoer	Flow and Return Connection Size
Hydronic Return Diameter	Draadmaat /Uitw. buisdiameter retour	Flow and Return Connection Size
Gas Diameter	Draadmaat / Uitw. buisdiameter brandstof	Fuel Connection Size
Domestic Hot Water Diameter	Draadmaat / Uitw. buisdiameter warm tapwater	
Domestic Cold Water Diameter	Draadmaat / Uitw. buisdiameter koud tapwater	
CH Overflow Drain Diameter		Drain Connection Size
Flue Gas Diameter	Nom. kanaaldiameter rookgasafvoer	Flue Connection Size
Supply Air Diameter	Nom. kanaaldiameter luchttoevoer	Air Inlet Connection Size

Pump



EMCS	ETIM	COBie
Manufacturer	Merk	Manufacturer
Article Type	Serie	Product Model Number
Article Description		
Manufacturer URL	Deeplink	Product Literature
GTIN	GTIN	
OmniClass Number		
Discharge head	Opvoerhoogte bij nom. debiet	Head
Number of Revolutions	Toerental	Frequency
Pressure Stage	Druktrap flens	PN Rating
Voltage	Aansluitspanning	Voltage
Motor Power	Motorvermogen	Maximum Motor Power Rating
Nominal Current	Nom. Stroom	Full Load Current
Nominal Flow	Nom. Debiet	Flow
Number of Poles		Number of Poles
Connection type		
Diameter (D1)	DN1	
Length 1 (L1)	Z1	
Length 2 (L2)	Z2	
Distance axis bottom (H1)	Le5	
Height above axis (H2)	Le2	
Fan radius (R1)	HD	
Motor radius (R2)	DM	
Control radius (R3)	Le7	
Control angle (A1)	a3	
Control width (B3)	Le8	
Control height (H3)	Le3	
Control width offset (B4)		
Control height offset (H4)	Le6, Le3, Le2	

On MEPcontent.eu, the BIM library for engineers, you find content from (among others) these manufacturers:



