UOB CONTENT GUIDE

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Author Laurens G.M. Oude Lashof
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PURPOSES OF THIS DOCUMENT

This document is written in English, due to the international mindset of Techniek Nederland; the Dutch owner of the document. This document's main purpose is providing a uniform and clear definition on how UOB (Uniforme Objecten Bibliotheek, as Uniform Object Library) families should be built for proper use within Revit. This document is an in-depth guidance. The methodology of modelling and parametrization is built on the know-how and experiences of the CIC team. CIC is partner of the RSF and has great willingness to implement the Revit standard DRS 2.5.2. Anyone creating content for UOB should use this Model-Guide.

1 INTRODUCTION

Techniek Nederland is the largest branch organization for installers in The Netherlands. Many of its members have been applying BIM-workflows with Revit for multiple years. They have been using several Revit Add-Ins to speed up the modeling process for design and engineering. The biggest concerns they faced is the incompatibility between 3D components at interchange. In order to overcome that problem, many of those Dutch installers, associating the same BIM-communities, initiated the plan UOB. The main goals are:

- Maximum interchange while preserving specifications
- Supporting generic to specific
- Native Revit usage

Fundamentals of UOB should be based on existing methodologies in their business processes and a common ground in workflows. Being able to respond to the above mentioned BIM-demand, the following definitions have been defined:

I. ETIM-classification method being used as a basis.
II. Covering 80% of the most common elements being part of an installation and therefore used in 2D and 3D communication.
III. Create Model-Classes (MC) for each of the ETIM-classes.
IV. Create a Techniek Nederland toolbox being able to support the BIM-workflow of designers and installers for the selection.

The 3D objects for Revit, generated by the toolbox (also named as UOB Configurator), should meet the specifications from the RSF.

REVIT STANDARDS FOUNDATION

Collaborative BIM-workflows in the Dutch building industry started during the period 2008-2009. Initiated by open minded architects, structural- & building engineers and building contractors together with the support of their software suppliers, started to share ideas, and digital information for common-interest. This lead to Best Practices for using Autodesk Revit.
These Best Practices evolved into the Dutch Revit Standards, which became the Revit Standards Foundation. The RSF is mainly a technical oriented guidance to achieve optimum results in collaborative workflows. It covers in-depth how library-components should be built, including MEP connections, as well as naming conventions. All of this resulting in a set of valuable digital assets.

Although the RSF prescribes many details, it also has topics which are not absolute. This Model-Guide is intended to be as detailed as possible on both technical Revit-issues as well as conventions. All parameters and conventions of RSF which are applicable will be applied. This would secure a maximum uniformity. There might however be some deviation. Anyone creating content for UOB should use this Model-Guide. The RSF is aware of possible deviations, and will afterwards decide if to adopt (or partially) these new insights, which might lead to an update of the RSF.

2 GENERAL NOTES

The basics of the RSF, in-fact: DRS 2.5.2 dd 26/02/2016, are being taken as the starting point. New insights for existing guidelines, as well as additional are marked.

2.1 GENERIC TO SPECIFIC

A design, even for MEP, is generally drafted in a generic fashion. From preliminary, generic design the process then proceeds towards a more specific, execution ready design. In other words: a Revit Family can be generic or Manufacturer and Model specific.

The UOB (or Uniform Object Library) content will seamlessly connect with the rest of the design process. This enables Revit users to swap generic families with Manufacturer specific families, thus enabling a progressive design process. The UOB content is a library of product-models, named as Modeling Classes (MC); an MC belongs to an ETIM-classified product-type. Since the world of products for the MEP-industry is massive, 80% of those elements, which are created in both 2D and 3D documents for communication of designs, have been selected for the creation of a Modeling Class. All UOB components are based on ETIM MC product-models and the geometry will be driven by ETIM MC-data. The data is being extracted from the webservice "2ba-unifeed" which will be supplied to the user by an Add-In (named as UOB-toolbox). The data-itself is being supplied by the manufacturers of MEP-industry products. The only way to properly implement this is to agree on common standards for both generic and specific Revit content libraries.

2.2 BROAD HORIZONS

The main principle of BIM is accommodating information exchange between different members of the design, build and maintenance lifecycle of a building. A Revit component library should support this information exchange. The concept of the UOB Object Library is well suitable for international implementation due to multilingual ETIM data-model as well as the technical concept of the RSF (which support automatic language switching based on "shared parameters").

There are different UOB families suitable for different project stages. The stages progress from Conceptual to Generic, and finally to Specific. To achieve this, every Family should be constructed not only in a way that information contained by that Family can be passed on throughout the BIM process, but also to make it easy to interchange families when the project progresses through the three stages.

2.3 NATIVE REVIT

A Revit library needs to be built from native Revit components (solids and lines). There are several urging reasons for this:

1. Using other file formats, such as IFC or (3D) dwg means losing critical Revit functionality.
2. 3D dwgs are often imported in a Revit Family after which the Family is saved as "native" Revit. This method however puts a disproportionate strain on hardware and software resources, which severely affects Model performance. Besides this, the project is contaminated with all sorts of Linestyles, layers and such from the dwg. And finally, this can make exporting to IFC nearly impossible.
3. IFC's cannot currently be converted into Revit Families in a proficiently reliable manner, let alone retain all viable information and constraints during this process. Having said this, we do realize this is more of an implementation issue then and not a fundamental weakness of IFC or Revit. Therefore we are open to being proved otherwise. Any manufacturer that can provide with a tested and validated workflow that converts IFC Families into Revit Families, while maintaining compliance with these Standards, is more than welcome to simply share IFC-based libraries.
4. It is very well possible to automatically create Revit families based on a generic template file in combination with Manufacturer created databases containing product information. Most Manufacturers already have these kinds of databases for marketing, documentation or production purposes. In other words, Manufacturers can reuse datasets they already have, negating the need to build these from scratch.

5. A Revit Library doesn't necessarily require a great amount of geometrical detail. Even more so, most of the time it's better to use a simplified form to prevent Project files from becoming too large and unmanageable. Geometry created in Manufacturing software (such as Inventor and Solidworks) is usually too complicated for immediate use in Revit.

For non-Revit users however, the UOB-toolbox will provide the ability to (batch) download the same objects in IFC format. The geometrical parametricity however is not provided.

2.4 ENGINEERING BASICS

Because design, engineering and construction detailing are more tight together in BIM workflows, it is a must to specific a common ground for technical referencing. In CAD workflows, mechanical engineers calculate with nominal sizes for ducting and piping. For ductwork, the nominal dimensions are reflected in the industry as default. For piping however, this is a big difference. MEP contractors or installers most often translate nominal into trading sizes of their preferred products.
With the use of Revit, which has size-configuration with nominal-, inside- and outside dimension, this is an important consideration. While working in Revit with pipes, the selected diameter is the nominal diameter. So when replacing pipes or even complete pipe-networks, Revit will use the nominal size as the interchange-key. If Revit cannot find the specified diameter of the new designated pipes & fittings, it will place the larger diameter. In practice, with native Revit, when working with OD as nominal, replacing plastic pipes for copper, Revit will place much larger copper pipes than needed and might error on connections with equipment.
So in order to achieve seamless workflows and therefore maximum interchange throughout the complete project lifecycle, piping connections must be in nominal diameters. The ETIM MC model is already prepared for the use of DN (nominal diameters).

3 GENERAL FAMILY SPECIFICATIONS

3.1 LEVEL OF INFORMATION

Before getting into Revit details, it is important to have an overview of the metadata being applied.

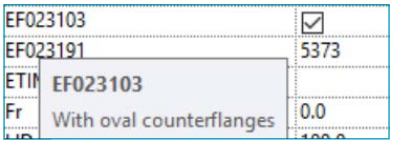
		Concept (LOD200)	Generic (LOD350)	Specific (LOD400)
1	MEP specification	v	v	v
2	Boundingbox size	v	v	v
3	Connection size (mechanical) Connection type (electrical)		v	v
4	Revit connector-specification		v	v
5	Applicable ETIM-Class features		v	v
6	Applicable ETIM-MC drawing codes		v	v
7	Material & color		v	v
8	Product / Article details of manufacturer			v

1. System type, intended flow, power, pressure
   - Descriptive system type only in Concept,
   - Main specifications by NLRS parameters
   - Applicable NLRS parameter linked with connector in Generic + Specific
2. Boundingbox as defined by maximum of 3 dimensions (LxBxH) Concerns simplified main body.
3. Nominal connection size for mechanical connections Type of physical connection for electrical connectivity.
4. MEP-details other than 3.1.1.
   Such as connection-size and -type
   - Either in A-type data such as EF023191 and EF025225 (requires smart handling of the value)
   - Or in numerical values
5. In general terms the ETIM-class information will be pushed by the UOB Configurator into a single (new) parameter NLRS_C_ETIM_klasse_kenmerken. It reflects immediately the ETIM-website information.

Materiaal: EV0000 72 - Aluminium

1) EF002169 - Materiaal : EV000072 - Aluminium
2) EF022754 - Zonder plenum : Nee
3) EF022923 - Nom. kanaaldiameter aansluiting : 125 mm
4) EF023796 - Voor modulair systeemplafond : EV021346 - 600 x 600 mm
5) EF000443 - Aansluiting : EV020338 - Steekeind
6) EF010976 - Vorm plenum : EV000220 - Rechthoekig
7) EF001140 - Frontvorm : EV000220 - Rechthoekig
8) EF022772 - Frontlengte : 600 mm
9) EF022764 - Frontbreedte : 600 mm
10) EF022765 - Frontdiameter : 0 mm
11) EF000332 - Inbouwhoogte : 325 mm
12) EF000007 - Kleur : EV021871 - Materiaal eigen kleur
13) EF000116 - RAL-nummer : 0

	Code	Description	Type
1	EF002169	Materiaal	A
2	EF022754	Zonder plenum	L
3	EF022923	Nom. kanaaldiameter aansluiting	N
4	EF023796	Voor modulair systeemplafond	A
5	EF000443	Aansluiting	A
6	EF010976	Vorm plenum	A
7	EF001140	Frontvorm	A
8	EF022772	Frontlengte	N
9	EF022764	Frontbreedte	N
10	EF022765	Frontdiameter	N
11	EF000332	Inbouwhoogte	N
12	EF000007	Kleur	A
13	EF000116	RAL-nummer	N
14	EF022769	Met afdekrand	L
15	EF023803	Luchtpatroon	A
16	EF023802	Luchtpatroon instelbaar	L



Those MC's that have logical ETIM-class features with geometry impact must be included as Family-parameter and drive the visibility of the designated solids.

ETIM-class features of type A (String) must be implemented.

6. Most MC's should have all MC-parameters (drawing codes) as family-parameter included. For those MC's that have many optional parameters, or configurations, it is recommended to implement only a limited set of parameters to drive the geometry and the connections sample of panel radiator has 4 main MC-drawingcodes and 10 smart interpretations instead of having 118 parameters.
7. Material concerns the material-description and color of the main body; it is a ETIM-class feature (EF002169), color if applicable (EF000007), either trading color-name or RAL-number (EF000116) which will be relayed to NLRS_C_materiaal_kleur.
8. Product and/or article details such as
   - Product min-max range
     - Pressure / size / flow
   - Product GTIN
   - Product trading name
   - Product assortment
   - Manufcturer GLN

3.2 REVIT FUNDAMENTALS

The following should be taken into consideration for Revit MEP families:

1. Revit 2016 is the base platform for all families to be created to assure compatibility to all Revit platforms.
   - If Revit versions higher than Revit 2016 do facilitate significant improvements, those MC-families which will be affected should be updated or recreated.
   - Therefore the parameter NLRS_C_revit_versie will contain the Revit version of creation.
   - Because the scale of improvements cannot be foreseen, CIC will accept execution of updates only after commissioning.
2. The families should all be Level-based; known as Unhosted.
3. Families must be designated to the appropriate Revit Category.
   - Always have the core-function of the element as appropriate category.
   - Possible Categories for all MEP-related Content are listed in Appendix: "160222__NLRSv2.5.2__MEP FamilyGuide_Bijlagen" of the RSF Fundamentals.
4. The material parameter of all Solids (except for Zoning) must be parametrized; the primary solid by NLRS_C_materiaal, additional solids to the increased number.
5. The OmniClass Number must be applied.

Further basics are described below.

3.3 SUBCATEGORIES

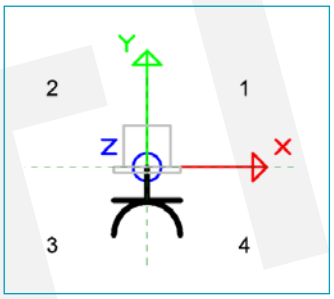
1. All solids should be designated to the proper Subcategory (can be found in Appendix 1 of the NLRS MEP Family Guide.)
2. Fittings-families must contain a model-line on subcategory Center Line
   - Which should fit exactly between the connector-positions
   - Visibility further detailed in Chapter 6.3
3. Accessories-families must contain model-lines on subcategory of the (main) Category to support Revit's Annotation Scale
   - Visibility further detailed in Chapter 6.3

3.4 ZONING OR CLASH VOLUMES

The NLRS requires the use of subcategories for clash zones to be present in every Family if applicable. Although zoning is not standardized in ETIM MC, each family which has any form of manual operation must contain an Operation Zone. All equipment and fixtures must also contain a space-occupation volume (allocated subcategory Boundingbox) for detail level: coarse. It must have the visibility parameter (Instance) NLRS_C_clashvolume. All equipment that would require such zoning is listed in Appendix B: *the content of Appendix B is Under Construction and needs input of members UOB Expertgroep.*

Function	Subcategory	Visibility (Y/N)	Comments
Main space occupation	Boundingbox	N	
Free space for daily operation or minimum space due to product requirements	Operation Zones	Y	
Service space	Maintenance Zones	Y	Needs clarification by UOB experts

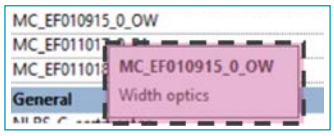
3.5 ANNOTATION SYMBOLS

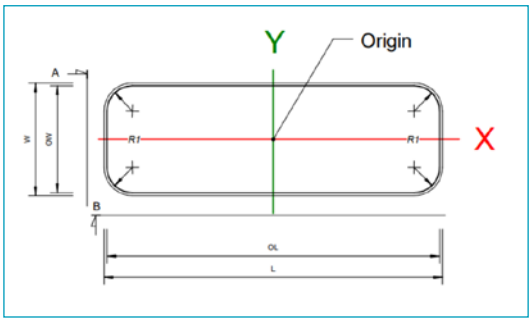


For mechanical components, symbolization will be established by Model Lines and can be found in 5.4.2 For Electrical components, symbols should be made as Generic Annotation. Since E-symbols are a national matter, the size and symbol should meet the national guidelines. In order to support dynamic symbolization, the Generic Annotation family should be parametrized by the (new) Family-Type parameter NLRS 60_symbool within the model-family. The orientation of the symbol must match the orientation of the component. For a receptacle, in ETIM MC the model is upright, and so is the family, the symbol should therefore be created in quadrants 3 and 4. Components which are to be built in floors and or ceilings, the symbol is of course centralized and created in all applicable quadrants. To support unlimited combinations, the visibility of a nested symbol must be parametrized by (new) parameter NLRS_00_symbool_zichtbaarheid (only for components which can be inserted in into a universal casing). Symbols as Generic Annotation must be able to re-position by (new parameters) NLRS_C_symboolafstand_host and NLRS_C_symboolafstand_midden
All parameters intended for symbolization, (mechanical as well as electrical), either by Generic Annotation and/or by Detail Items, must be grouped in **Graphics**.

3.6 PARAMETERS

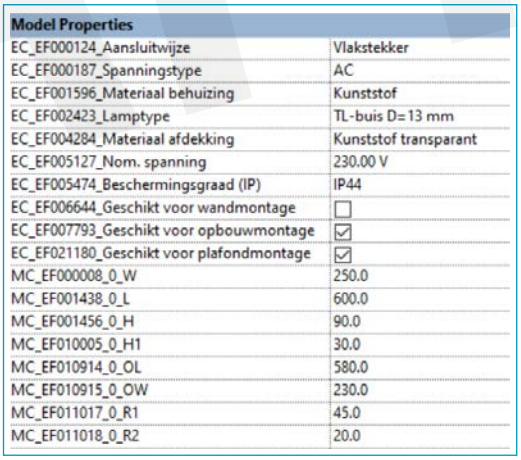
1. All ETIM-MC parameters must be (non-shared) family parameters
   - It concerns the codes of product-model on the ETIM-drawingsheets.
   - Although the MC parameter has a feature-code EFxxxxxx, the Drawing Code should be included to reflect the code on the drawing sheet according the naming format:
     MC '_' **Featurecode** '_' **Port Nr** '_' **Drawingcode** as in e..g. **MC_EF020279_1_IL1**
   - Only the MC – features of Type = Length are formatted this way.
   - It should have a tooltip displaying the ETIM-English translation of the ETIM-feature.





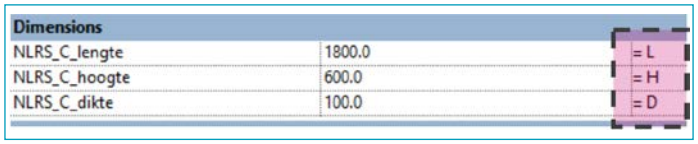
2. All ETIM-class feature parameters and ETIM-MC parameters must be grouped in **Model Properties**.
3. All EC parameters, not being used as MC parameters, that do influence the use of the family (Yes / No) and those parameters that are mandated by the NLRS (connector specific), must be defined as individual parameters as well.
4. The format of the EC-parameter naming is EC '_' Featurecode '_' feature description **in DutchNL**.
5. Bijv. ☐ EC_EF000187_Spanningstype.
6. The ETIM-class feature parameters (EFxxxxx) should have a tooltip displaying the ETIM-English translation of the ETIM-feature.

7. All families must contain NLRS parameters for boundingbox geometry, MEP-connectors and metadata such as manufacturer product code & - name as well as technical content-information.

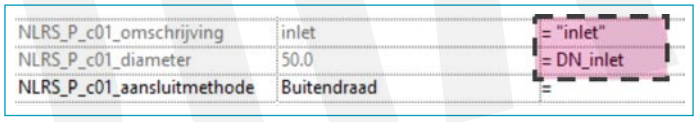


8. Since NLRS parameters are Shared Parameters, those parameters make a generic to specific transition possible, as well as structured information for a Bill Of Material. Find the list of mandatory parameters in 6.2.1.
9. All connector parameters must be parametrized by NLRS parameters.

10. Since there are a lot of MC's, so there are differences in Drawing Codes being applied (although identical purposes are likely being handled by the same Drawing Code. All MC's have a boundingbox, and so NLRS parameters meant for this basic geometry purposes must:
    - Must have a relay, either a single ETIM-MC parameter-name (dependent on MC).



    - Or a mathematical formula based on the ETIM-MC parameters (H1+H2) if applicable.
    - Must be located in parameter-group **Dimensions**.
11. For Electrical NLRS parameters intended for the Electrical System of Revit:
    - Must be located in parameter-group **Electrical**.
    - Apparent Power parameter for Electrical Fixtures to be known as common consumers must be Instance, all other fixtures have Apparent Power as Type.
12. For Mechanical NLRS parameters (both HVAC and piping) intended for the HVAC and/or Piping System of Revit:
    - Must be located in parameter-group **Mechanical**.
    - Descriptive parameters for connection-type must be used and grouped in **Generic**.
    - Pressure Drop - and Flow parameters must be Instance.
    - Product-typical functions, such as deflectors, which will not demand different product-configurations must be driven by Instance parameters.
    - All other parameters are Type-driven.
13. All descriptive product parameters (including article numbers, GLN and GTIN) must be grouped in **General**, except those for material colours, which should be in **Materials and Finishes**.
    - Descriptive values in NLRS parameters should be linked to an ETIM Feature.



14. All parameters needed for geometry not mentioned above (to assure correct geometry behaviour) must be grouped in **Other**.
15. Overview of parameter Groups to be applied.

Groupname	Description
Graphics	Everything concerning added symbols; annotation
Materials and Finishes	Revit material and material-name & -colour
Electrical	Engineering specifications for electrical MEP systems
Mechanical	Engineering specifications for mechanical MEP systems
Dimensions	Boundingbox and angles of either placement or
IFC Parameters	IFC-classification and the relevant IfcPropertySets
Model Properties	For ETIM parameters only
General	For NLRS parameters only

3.6.1 Values for native Revit (system) parameters

From the native parameters in parameter group Identity Data, only the Assembly Code should be aligned with the code as <pos1> of the filename. Those elements that most often are being used in multiple classifications, such as pipework components, must be left blank.

For NL, the coding must be 4 digits accordingly RSF.

Identity Data	
Assembly Code	56.11
Cost	
Description	
Keynote	
Manufacturer	
Model	
Type Comments	
Type Image	
URL	

4 NAMING CONVENTIONS

The naming convention for the UOB library components is configured by UOB Configurator. This Content Guide is focussed on modelling guidelines: to create the best possible library-component. Although the resulting families which will be saved as a basic MC012345 – description (variant).rfa. Below we will propose an improved naming convention which will be used by UOB Configurator. Generating a filename by UOB Configurator allows it to be multilingual and easy to configure for future conventions.

4.1 MC FAMILIES

While the intention is to be able to make UOB an international platform, the name of the MC families should follow a universal convention.

	Description
<pos1>	Classification code
<pos2>	Abbreviation for the Family Category
<pos3>	Family description (including expansion codes)
<pos4>	*optional: Shared and Host-type*
<uob>	UOB as aggregated value

'_' (underscore) to be used as attribute separator

The first implementation will be for The Netherlands and therefor the next chapter has the Dutch implementation. Other implementations, with Germany for example, only have different values. This example can be found in **Appendix B: outside The Netherlands.**

4.1.1 For The Netherlands

The MC families should contain the most important attributes (positions) of the NLRS that do matter for Revit-user:

Considerations **not** to use the original attributes:

- Instead of using the prefix NLRS, it should be better transferred into a parameter for RSF_certificates. A mixture of RSen, NLRS and/or other prefixes would only be helpful for sorting purposes.
- The Family Placement code is redundant since all MC families are in-fact class UN (unhosted). Although Nested families often are host-dependent, those are being covered by the 5th optional attribute.

<pos1>

The Classification to be used is the 2-digit code from NL-SfB. Those families that have no strict NL-SfB code, i.e. it depends on the use, then the higher / aggregated level should be used; such as a pipefitting for heating(56) and cooling (55), which should be coded to 5-.

<pos2>

The family-abbreviation such as described in the RSF Fundamentals.

<pos3>

The description must intentionally be the Dutch translation of the ETIM-class. In order to prevent undesirable naming, we should initiate & keep a list of the names being used. This (public shared excel) list should only be moderated by a fixed group of persons.

This list also contains optional name-expansion due to Revit-specific demands based upon connector-properties. Example values: (un) for union-type fittings, (Dsp) for supply air, (bi) for bidirectional connection.

<pos4>

Optional attribute for shared families; example 'SH WPB' for shared, workplane based family. Since shared (nested) families should be identified. It must always be used including the host-type coding found in RSF Fundamentals.

Other rules that apply for the filename:

1. Uppercase must be used for <pos2>. The field for descriptions <pos3> must be in lowercase. The name of the manufacturer should be written as known in the market (best limited to 10 characters).
2. An underscore '_' must be used as attribute separator.
3. Spaces can be used as punctuation marks in <pos3>. To avoid confusion underscores may not be used within the positions. Minus signs are allowed only to subdivide the description.

4.2 FAMILY-TYPES IN LOADABLE FAMILIES

The naming-syntax will also be handled by UOB Configurator, making it compliant for multiple standards. Below is the UOB type-name configuration (and therefore renewal for RSF).

	Description
<pos1>	Manufacturer
<pos2>	Model
<pos3>	Dimensions
<pos4>	*Limitations (optional)*

<pos1>

For library components other than Fittings, the only first 3 characters of manufacturer name must be applied. If generic, it must be 'gen'¬ in lowercase to avoid conflict with manufacturers that also start with GEN.

<pos2>

Either a specific product-codename such as a trading name or valve-type (not meaning butterfly- or ball valve), as being used in the Model-parameter, equally written as in Model-parameter.

<pos3>

The typical dimensions for the product. For Fitting families, which are fully Instance-driven, it should contain it's size or size-range such as DN10-DN100 to support the interchange process; without a range the user might not be aware of such size limitations and get errors.

<pos4>

The limitations would be most applicable for Fitting families.

Other rules that apply

1. Uppercase must be used in **<pos1>**
2. An underscore '_' must be used as attribute separator

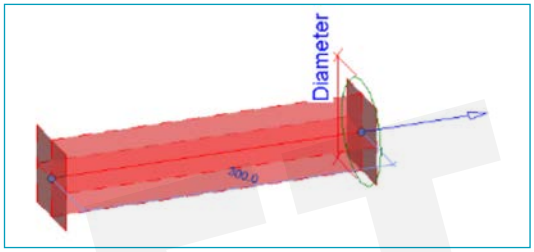
5 MODELLING GUIDELINES

5.1 INSERTION POINT

The ETIM Model Class drawings should be referenced at all times to determine the orientation. The basics of the ETIM MC are in-fact compatible with Revit except for system families (but these must not be modeled.)

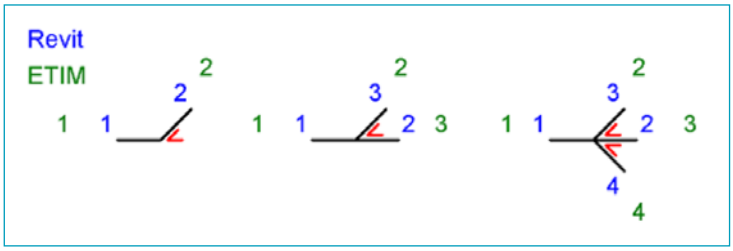
5.2 CONNECTORS

Any Family that has some sort of connection to any MEP system needs to have proper Connectors. These Connectors need to be placed geometrically at that exact position where connecting starts.
For those objects that have a connection which might "rotate" from either a plan or elevation view, the connector must be hosted by end-planes of a Reference Line to be able to support such properly.

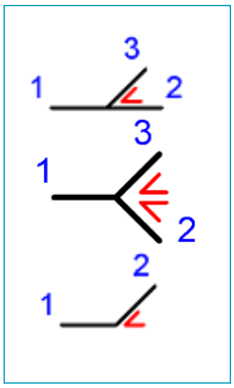


5.2.1 Conventions & parameters

1. Connector naming: c<number>_<description>.
2. Connector numbering will be done clockwise, starting with the primary connector.
3. The primary connector must be connector 1.
4. The parametrization of connectors must match with the connector running number, but within a plausible interpretation:
   1. If the connectors 1 - 4 are used for piping, connector 5 for duct and connector 6 as electrical it should be:
      i. NLRS_P_c01_xxxx
      ii. NLRS_P_c02_xxxx
      iii. NLRS_P_c03_xxxx
      iv. NLRS_P_c04_xxxx
      v.NLRS_M_c01_xxxx
      vi. NLRS_E_c01_xxxx
5. Connector description must contain the local/national abbreviation including a flow-direction. See Appendix 3 RSF for a list with abbreviations, derived from the commonly used ISSO standard. Flow direction can be:
   i. **inlet**, **outlet** or **inlet/outlet** (for bidirectional ports).
   ii. if multiple instances of the same system-type exist, they must be indexed such as heating outlet 01.
6. Missing abbreviations can be requested through the website www.revitstandards.org.
7. The way to identify the appropriate system connector is being displayed in **Attachment A**.
8. For Fittings (and so the Fitting connectors) to make sure that they can be interchanged, not only the orientation is important but also the order in which connectors are placed. Please refer to the following diagram. Connector number 2 in Revit (blue) can be defined as number 3 in ETIM (green), and the other way around.



9. The parametrization of Dimension and Angle however must be according to ETIM with the following interpretation:
    1. The angle-parameter must be parametrized with NLRS_x_c01_hoek
        i. For both connector 1 and 2 in case of a bend
        ii. For connector 3 in case of a tee
        iii. For connector 2 and 3 in case of a symmetrical Y-piece (duct-fitting round / oval and cast-in rectangular)
    2. For rectangular Y-piece large sizes, NLRS_M_c02_hoek and NLRS_M_c03_hoek must be used instead of using c01.



10. Connectors in fitting families which must adapt to pipes, ducts, conduits or cable-trays must be Instance.
    1. For bends and tees or crosses with equal running sizes **connector 2** must be equally parametrized as **connector 1**.
    2. The "receiving data" of the primary connector makes that the equally configured connectors will force the size of their connection to be equal as to the first connection.
    3. For other fitting families with multiple ports which should not adapt to pipes, ducts, conduits or cable-trays, but have a parameter-driven size, the parameter itself must be Type.
11. Global connectors for all non-passive components that are part of a mechanical system and are located between source/feed and target/consumer.
    1. All dimensional parameters of connectors must be parametrized to their respective following order as written in 6.2.1 pt.4.
    2. The connection-size of a Global parameter must be set as Type to make sure that connecting elements adapt to that size; if set to Instance, the family will read the size of the connected element.
12. In case of a duct- or pipe-connector with system-type other than Fitting, the Flow parameter (Mechanical) of related connectors must to be parametrized by the appropriate parameter NLRS_M_cxx_debiet or NLRS_P cxx_volumestroom.
    1. For global connectors it must be Instance-driven
        i. for those components that have 2 connectors linked, only 1 connector must be used, which is likely to be the inlet (lowest nr).
    2. Air Terminals have only 1 connector, the configuration is:

System	Supply Air	Return Air	Exhaust Air
Flow Direction	In	Out	Out

    3. Equipment that services fixtures or terminals have often multiple connectors in which the direction is opposite to that from the fixture or terminal. They also might have additional connectors (such as an AHU).
13. The Pressure Loss parameter must be used according:
    1. For valves, strainers and filters:
        i. the Loss Method must be Specific Loss.
        ii. Pressure Drop must be parametrized by a pressure loss static parameter such as NLRS_P_c01_drukverlies_statisch.
    2. For duct-silencers, -heaters or VAV-boxes:
        i. the Loss Method must be Specific Loss.
        ii. Pressure Drop must be parametrized by a pressure loss static parameter such as NLRS_M_c01_drukverlies_statisch.
    3. For pumps and AHU's the Pressure Drop must not be parametrized (leave as 0/ zero).
    4. AHU's or other service-equipment, must have a Calculated Configuration, with a direction OUT for the connector towards consumers (Supply Air for the side towards spaces, and Hydronic Supply fixture/ equipment).
    5. The (consumer) receiving side of AHU's or other service-equipment also needs to be set to Calculated with Direction IN.

14. Each port should also have NLRS parameters for connector type, which contain the EV value for the connector type; the value will be fed by UOB Configurator.
15. The Description parameter for CableTray – Conduit connectors must not be used in Fitting families; they may only be used in families other than CableTrayFitting or ConduitFitting.

5.2.2 Additional connector guidelines

The pipes, counduits, cabletrays and ducts that are connected to the fitting can drive the behavior of the conceptual and generic fitting families. Instance parameters of connector will always read the size of the connected system-component, regardless whether or not the value is a calculation. Please keep the following guidelines in mind:

1. All connectors that always have an identical size, should be connected to the same parameter. For instance, in the case of an equal branch or tee, all three connectors refer to the same parameter for their size.
2. Both connectors of a bend should have their Angle property linked to the same parameter. In the case of a branch or cross, only the branching ports should have their angle linked to a parameter (the same if the branch angles are always equal).
3. In the case of a 45 degree branch, 135 degrees should also be read as 45 degrees. Same for 60 degrees and 120 degrees etc. (Common rule: if angle > 90, then it should be read as 180 – angle).
4. In the case of waste water systems, the evaluation of an angle should have a tolerance according to factory specifications (default ≤ 3 degrees).
5. In the case of fittings, all parameters that are attached to a connector should be instance parameters. Since UOB configurator creates types for each different configuration in a system that's already dimensioned, in the case of Generic and Specific fittings these will be type parameters.
6. If a pipe has a diameter different from that of a connector driven by either a type parameter or being set to the properties of the primary-connector, Revit will attempt to place a transition fitting (which is the preferred behavior in the case of Pipe Accessories, and terminal connectors such as devices and plumbing fixtures).
7. Connectors can have very specific properties that are important for the behavior of a system.
   - The connectors in a Fitting should be of type Fitting.
   - The connectors in an Accessory should be of type Global.
   - The connectors in a terminal device drive the system name and behavior, and should be set according to best practices.

In the UOB content all parameters that are linked to the connectors deliberately are NLRS parameters. Non-Fitting families must relay the value of the MC-port parameter to the respective NLRS parameter. This should facilitate a process where users can read these properties as the minimum desired configuration of the product, to better select an applicable product in the UOB configurator database.

5.3 DETAIL LEVEL & VISIBILITY/GRAPHICS

In Revit, there are 3 levels of detail, for MEP the detail levels and visibility should be implemented as well as symbolic representation. Exceptions to be made for those components, like sprinklers, which should always be visualized with a 2D symbol in floorplan views due to national standards.

5.3.1 Mechanical

	Equipment	Description
Coarse	Only the symbol[*1]	Only the symbol[*2]
Medium	Main object geometry, not showing details that have no influence on the space occupied by the component (such as flanges).	Pipework: Only the symbol Ductwork: main object geometry, no connection details
Fine	Full object geometry, including details.	Full object geometry, no symbol

5.3.2 Electrical

	Equipment	Devices	Fixtures
Coarse	Only the symbol*1 (as Detail Component)	Only the symbol*3	Only the symbol*4
Medium	The symbol and main object geometry without details	The symbol and main object geometry without details	The symbol and main object geometry without details
Fine	Full object geometry, no symbol	Full object geometry, no symbol	Full object geometry, no symbol

5.3.3 Fittings

	Pipe Fittings	Duct Fittings	Cabletray- & Conduit Fittings
Coarse	Only the Center Line	Only the Center Line	Only the Center Line
Medium	Center Line, only a symbol*2 for reducers and flanges	Center Line and Main object geometry, no connection details	For Cabletray: Center Line and main object geometry, no connection details For Conduit: Center Line only
Fine	Full object geometry and Center Line	Full object geometry and Center Line, no Center Line for rectangular Fittings	Full object geometry and Center Line

*1 symbols are:
- symbolic lines meant for FloorPlan projection.
- have the same subcategory as the solids of the main geometry.
- should meet the bounding box geometry.
- if fill-patterns are required for equipment, model-lines should not be applied. Therefore it is needed to include a Detail Item which should be parametrized by FamilyType parameter NLRS_DI_symbool. The Detail Item family itself should be parametrized by Instance parameters on length and visibility with NLRS parameters.

*2 Piping symbols for P&ID written in 5.4.2.

*3 created as Annotation Symbol.

*4 symbols for EC001957 and EC002892, resp. MC000161-MC000162 and MC000206//MC000210, should be a Detail Item, all others should have a Annotation Symbol; refer to Symbols for Electrical modeling for detailed instructions and explanation.

5.4 SYMBOLS

Components must be fitted with 2D symbolic representations in compliance with applicable building codes, rules and regulations. For the Dutch MEP sector these are, amongst others, NEN 5152, NEN 2322, NEN-EN 3048 and NEN 3157.

5.4.1 Symbols for Electrical modeling

Fixtures for Electrical engineering must have a Generic Annotation as a symbol. It should be exchangeable by FamilyType-parameter NLRS_60_symbool.

5.4.2 Symbols for Mechanical modeling

1. P&ID Symbols
   - Symbolic-Lines for Floorplan/RCP and Front/Back projection.
   - for (pipe) accessories must be created.
   - total width at / between the connector point.
   - which must NOT be on any subcategories, only main category is allowed for Annotation Scale functionality.
     - ISO/DIN P&ID symbols can be found on
       - https://www.edrawsoft.com/pid/images/pid-legend.pdf
   - For UOB fittings: symbols are restricted to Reducers and Caps or Plugs.
   - Only flange connection types must have symbolic representation, no other connection-types will be represented by symbols.
2. Symbols for active Ductwork components
   - Must either be built with Model Lines or.
   - A Detail Item family.
   - It must reflect the size from the corresponding boundingbox.

5.5 NESTED FAMILIES

5.5.1 General rule of thumb

Revit can nest one Family into another Family. There are two use cases:

1. Components that are sort of separate parts of a Family, such as mounting racks or signage, can be nested in the Family they belong to, but must be set to Shared so that they can be scheduled and tagged separately. This should only be applied when the nested family is essential for the function of the main family and has its own ETIM Model Class.
2. Integrated parts of a Family (which cannot be used separately) that are modelled as nested components for more efficient Family modelling (often happens with repetitive components). These components are not Shared. For these components, modelling rules are the same as for the main Family.
   However there is a great necessity to implement the connection-types as a Shared (nested) component due to repetition over multiple families. The best solution in here is to implement the connection-types as a Fitting component (PipeFitting / DuctFitting).

- Do not to implement “physical” connectors (pipe-, duct-, conduit- or cabletray-connectors) in shared nested families because of one simple reason: the only way to use such a connector is by ‘connect-into’ which will create a connection to project-origin instead of the desired element. Therefore only electrical connectors are allowed.
- Be aware that nested families cannot contain Mechanical System information such as System Name and System Type; those are often configured with a color-identification.

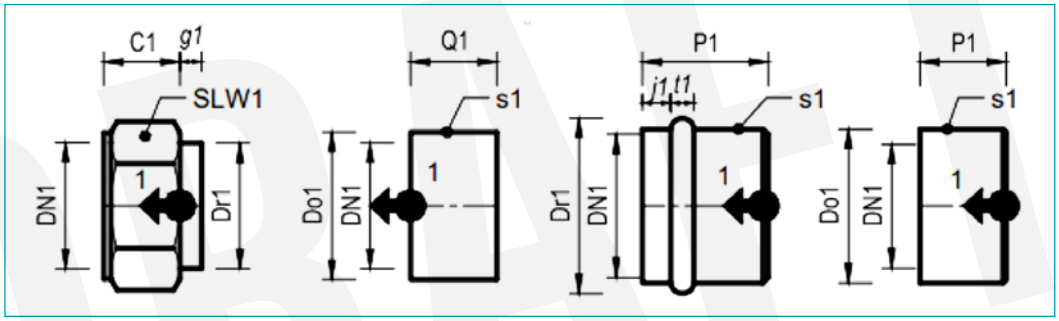
5.5.2 Automated selection of nested families

In many occasions, a port can have several different connection types. Nested Families / Shared Nested Families are a suitable option to deal with these scenarios. Each (shared) nested Family must use the same origin, direction and Reference Plane functions (IsReference parameter)

1. In all cases, they should follow the same rules for naming conventions and category / subcategory as the host family.

2. The activated connection-type must be driven by a Family-Type parameter.
   a. The value must be driven by a formula.
   b. The formula should evaluate the ETIM-feature of the connection-type for that port (such as EF000321 / Connection 1).
   c. Since the ETIM-feature itself is a text (such as EV020241), this should best be used as an integer (➜20241).
   d. The textual description would need to be extracted from an embedded lookup table for connection_types and also be linked / transferred with NLRS_P_c01_aansluitmethode.
   e. All connection-type families being used must have the same input parameters which are being linked to parameters of the main family.
   f. The input parameters therefore must be Instance.
   g. Since the geometrical handling can be considered port-independent (it should work for both) the input parameters are as: (example without Flanged connection).

C	Do	Dr	j	g
P	Q	s	SLW	t



   h. The available family-types must be configured as Type-parameter and should best be a Shared Hidden parameter so they cannot be (accidentally) changed at user-level.
3. When it is likely that this nested family will be shared among many model classes, it should best be a shared nested family. This is for the sake of file size, performance and maintainability.

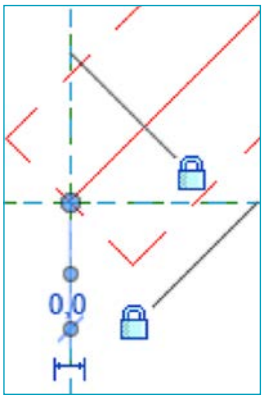
5.6 REFERENCE PLANES AND REFERENCE LINES

Reference Planes **nor** Reference Lines must be set to any subcategories.

5.6.1 Reference planes

1. To determine the insertion point of the family (default reference planes present in each family).
2. To determine the bounding box of the main geometry, if it has properties describing the total Length, Width and/or Height. Reference Planes must be set to its functional position (Left / Right / Front / Back / Bottom / Top) to enable intuitive temporary dimensioning within projects.
3. As a Workplane for a nested family within the family. In this case, the reference plane must be set to 'Not a Reference', and its name must reflect the purpose of the element that's hosted on it.
4. To constrain a variable position of an element. When the plane does not determine the bounding box (total Length, Width or Height) then it should be set to 'Not a Reference'.
5. When an instance parameter is attached to a reference plane set to other than 'Not a Reference', it produces a grip arrow when selected in a project's plan- or section view.
   a. Since the value of the parameter is determined by UOB configurator, this should always be avoided.
   b. If a grip arrow can't be avoided otherwise, it should be attached to a reference plane that's set to 'Not a Reference' which is then constrained to the appropriate insertion point/bounding box reference.

5.6.2 Reference lines



Reference lines are useful to control the position and/or orientation of elements on a fixed plane.

1. By default, connectors should be hosted on the end of a reference line.
2. When a reference line is reasonably expected to rotate, its axis of rotation should be set by making a relation (padlocks) between an end point and two reference planes.
3. When a reference line is always perpendicular to a reference plane that determines an insertion point, a relation should be made between the two references lines (either by a simple dimension or a parameter).
4. If a Reference Line is hosting a connector, then its length should be determined by the appropriate Z_calculated* value.

   * Z-normally sets the distance from component-origin to connection-type, dependent on the connection-type the connector-position, and thus the length of the hosting Reference Line must be calculated.

5.7 THUMBNAIL PREVIEW

A plan view named as **uob preview** should be set as Thumbnail. An effort should be made to replicate the different views of the MC drawing in the family, including all visible parameters so that their meaning is obvious and unambiguous.

5.8 IFC

To make the content generated by UOB available for other parties who are not working with Revit, it will be exported to the currently being used IFC standard. The specifications being applied are fully supported by Ifc2x3 and Ifc4; they are being written below.

5.8.1 IfcClassification

The parameters IfcExportAs (IfcType) and IfcExportType (IfcTypeEnum), together they form the classification, must be filled with the most appropriate data from the BuildingSmart website.

5.8.2 IfcPropertySets

Each library-component should contain all IfcProperties applicable for its IfcClassification . For each Classification (Type and Enumeration) the respective property-sets must be applied. IfcProperties that do not have a reference in ETIM, cannot be fed with values until it is implemented at ETIM-level. Expansion of UOB Configurator at some point is therefore plausible.

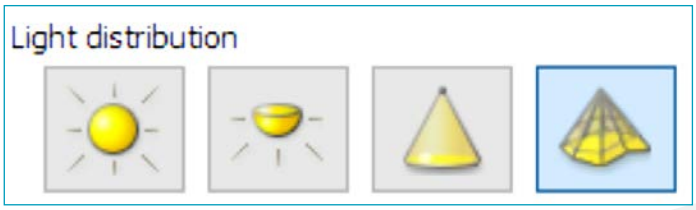
5.8.3 3rd Party Tools

In some cases, it can be convenient to work with so-called 'container families' that contain exclusively products from model classes that are modelled earlier. If a family has connectors, then it should also contain geometry (a half-sphere is satisfying), otherwise other software that use the exported IFC will not be able to work with these objects.

5.9 ADDITIONAL FAMILY MATTERS

5.9.1 Lighting Fixtures

Lighting Fixtures must be configured as Light Source. The Light Source Definition must be set as Photometric Web. The manufacturer specific .ies files (lighting characteristics) cannot be driven by UOB Configurator, and thus must be configured manually by the Revit user. In The defaut value for Photometric Web File must be set to generic.ies. Revit will seek for .ies files in the IES-specified folder from Revit.ini as **IESFileLocation**, normally is set to [ProgramData]\Autodesk\RVT 20xx\IES\.



6 PARAMETERS

There are several parameters every Family requires to function properly. The chapter partially overlaps with the *3.6 General Family Specifications / Parameters*. The minimal set of parameters are listed in this chapter. This however does not mean the parameters listed in this chapter are limitative.

6.1 IMPLEMENTATION & INTERPRETATION

For parameters, the following needs to be covered:

1. Model Class parameters are created as family parameter. All properties that should be scheduled must be included as NLRS parameter.
2. If a parameter value for a certain parameter is derived from an external condition this parameter must to be an instance parameter (e.g. the diameter or angle of a Fitting, which is derived from the system-family host of which the Fitting is attached to in a project).
3. When the product concerns a PipeFitting (EC003023, EC003024, EC003025, EC003026), then a lookup-table should be applied containing all the dimensions of the configurations on which the fitting is available. Alphanumeric parameters (like article number and manufacturer) will have to be filled using the Revit formulas for lookup-tables. Therefore PipeFitting families must contain algorithms to drive its geometry based upon lookup-tables.
4. ETIM MC parameters take priority over ETIM features at basic ETIM-class level (to prevent any contradictions).
5. All ETIM-class features will be collected in a single (new) parameter NLRS_C_code_ETIM_klasse_kenmerken The content of the parameter should be the list of all features and their respective (multilingual) values. When hovering with the cursor over the value of that field, it will pop-out in a screen such as below:

6. NLRS parameters that describe the geometry in a way that's not covered in the MC or as EF parameter should be included, as well as NLRS-parameters that describe the bounding box and connector properties.
7. Any new shared parameters should follow the NLRS naming scheme. These parameters will be proposed for inclusion in the NLRS following the protocol described in the NLRS MEP Family Guide (v2.5.2).
8. For UOB configurator, none of the MC parameters should be restricted by formulas; values will be filled by the UOB configurator.
9. Custom parameters to allow a family to offset from its host is not allowed. For those families that naturally have offset-distances, this is already taken into account within the ETIM drawing sheets for that MC; for instance the pendant length for a light fixture or wall distance of a panel radiator.
10. UOB configurator adds parameter sets depending on applicable standards, to be chosen from the settings defined in UOB configurator. For this reason, NLRS parameters that are not essential to define either the functionality and/or the geometry are not included. A full overview of NLRS parameters required by the NLRS in each family is listed under 7.2 Generic parameters.

6.2 GENERIC PARAMETERS

In accordance with NLRS, each family should contain at the minimum the list of parameters below. Due to the nature of UOB content, not all parameters are applicable. It has also been elected that NLRS parameters should be omitted when they are duplicates of Built-in parameters.

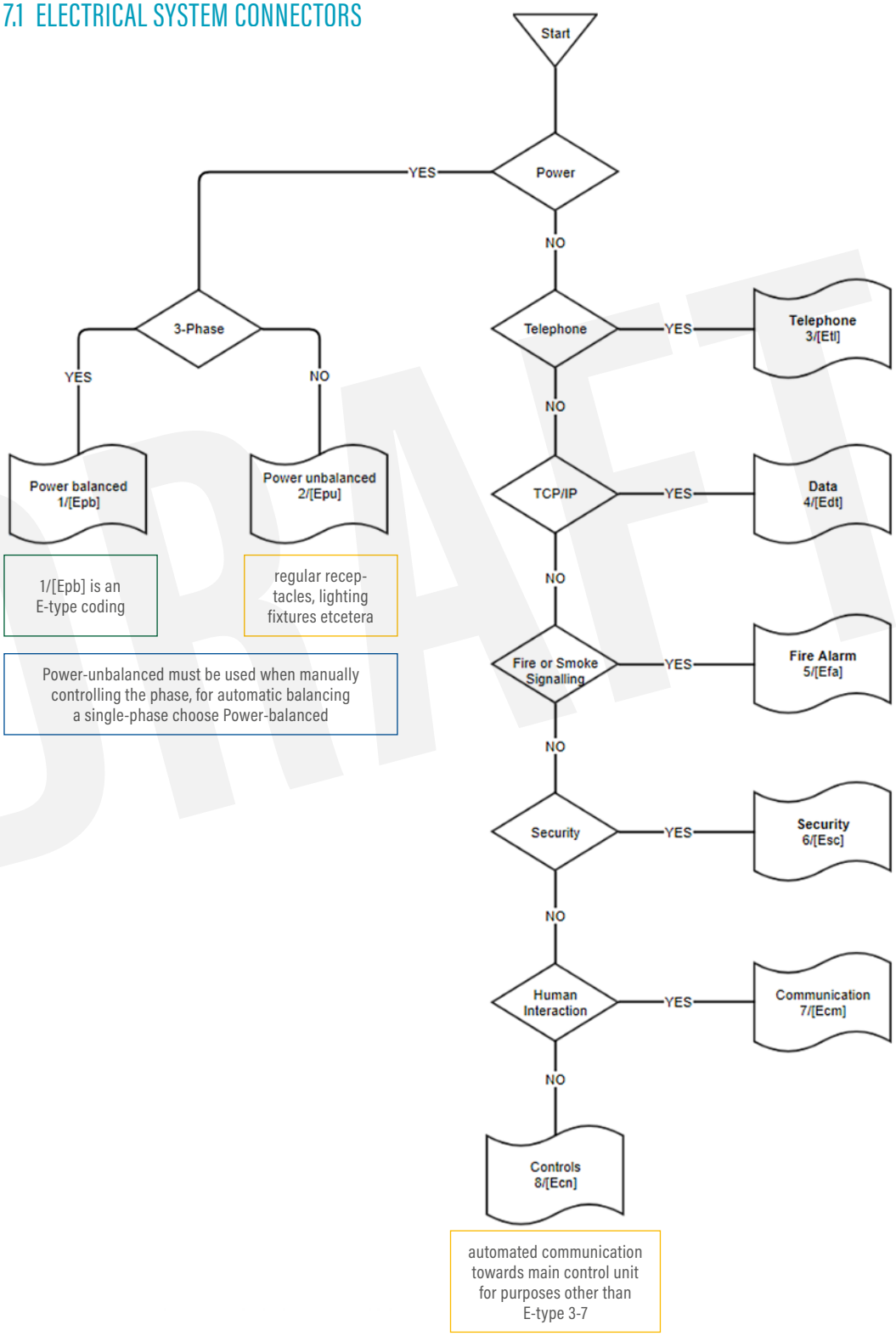
6.2.1 Overview of parameters

Parametername	Mandatory	By UOB Configurator	Description / purpose
Assembly Code	X		Intentionally left blank for those elements that can be used for multiple classifications (such as pipes), in all other scenarios: 4 digits of NL-SfB for NL, according RSF ; it should be aligned with the familyname
Description		X	It should **only** contain the English description of the ETIM Class
Manufacturer		X	For Generic version = "generic"
Model			It should refer to the product-model **as known in the market**. It might be driven by formulas in case of multiple family-types
Type Comments			Intentionally left blank
URL		X	When the modelling object is not generic this should contain the deep link of the product at the website of the manufacturer
IfcExportAs	X		Ifc Type mapping for the modelling object
IfcExportType	X		Ifc Enumeration for the Ifc Type
NLRS_C_code_CBNL		X	All ETIM Dutch synonyms of the ETIM Class (not the MC)
NLRS_C_code_ETIM	X		EC001234; EC code which belongs to the MC of the family
NLRS_C_code_ETIM_klasse_kenmerken		X	Contains all ETIM-class features
NLRS_C_code_ETIM_MC	X		The ModelClass of the family, example "MC012345" by formula
NLRS_C_code_ETIM_url	X		Pointing to the EC URL, English international page
NLRS_C_code fabrikant_GLN		X	The Global Location Number of the manufacturer (by GS1)
NLRS_C_code_fabrikant_product		X	Product specific article number/code from the manufacturer
NLRS_C_code_gtin		X	Global Trade Item Number of the product, if applicable
NLRS_C_code_SfB_tabel1	X		SfB-code of the modelling object, when applicable, according to the latest version of table 1 from the NL-SfB
NLRS_C_certificaten			(new) For approval by RSF
NLRS_C_content_creator	X		CIC, or others creating content for UOB
NLRS_C_content_datum_gewijzigd	X		The modification date of the content
NLRS_C_content_provider	X		as (string) formula "UOB"
NLRS_C_breedte			Width; inherits from MC parameter if applicable
NLRS_C_diameter			Diameter; inherits from MC parameter if applicable

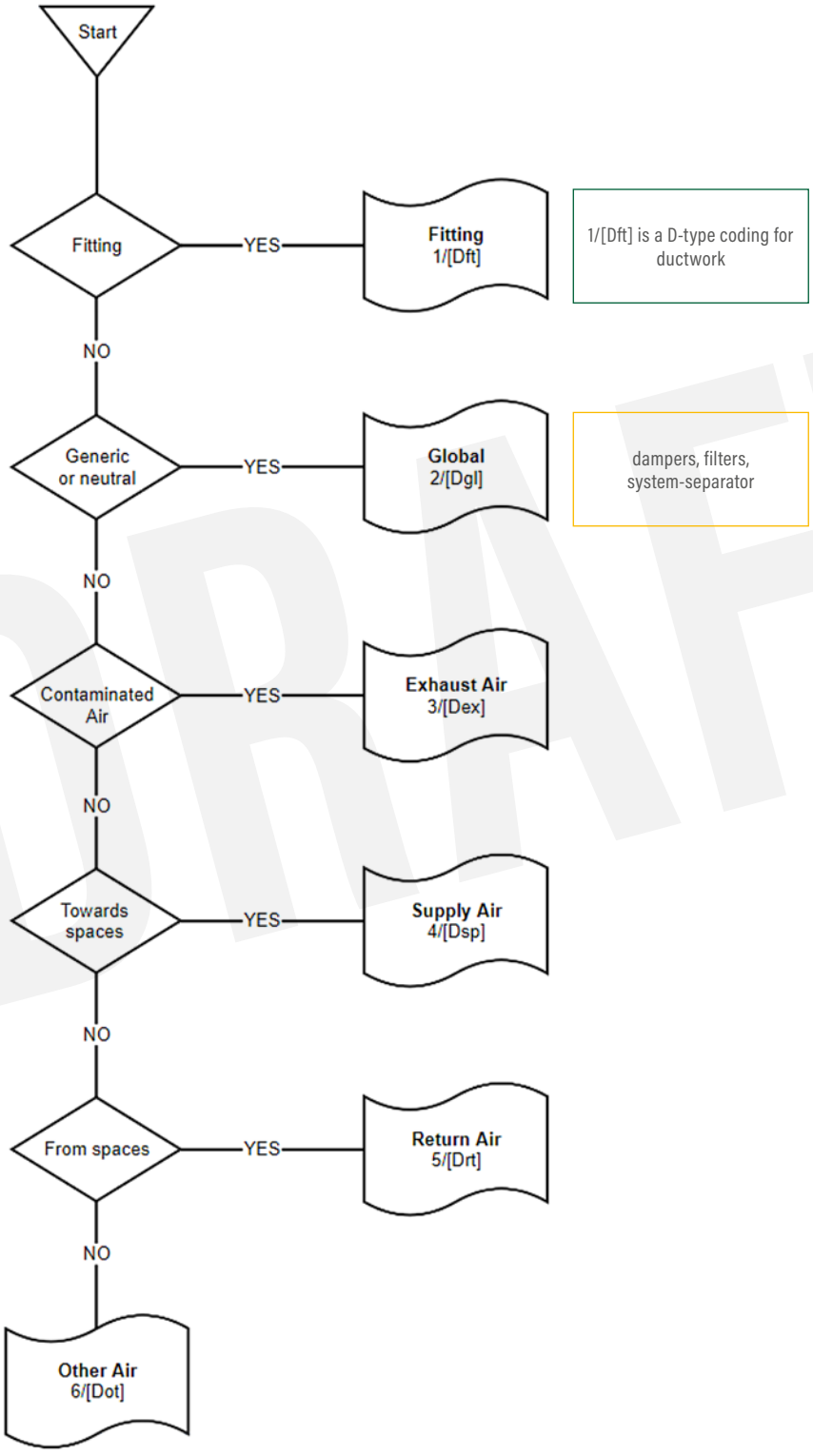
NLRS_C_diepte			Depth; inherits from MC parameter if applicable
NLRS_C_dikte			Thickness, inherits from MC parameter if applicable
NLRS_C_hoogte			Height; inherits from MC parameter if applicable
NLRS_C_ISO_country_code	X		New parameter, for Netherlands: “NLRS”
NLRS_C_lengte			Length; inherits from MC parameter if applicable
NLRS_C_materiaal	X		Main specific material for the modelling object
NLRS_C_materiaal_kleur		X	Combination of ETIM material + colour
NLRS_C_omschrijving		X	Instance parameter for product description
NLRS_C_toepassingsdoel	X		New parameter, for product application
NLRS_C_Revit_versie	X		The Revit version which was used to create

7 APPENDIX A: SYSTEM CONNECTORS

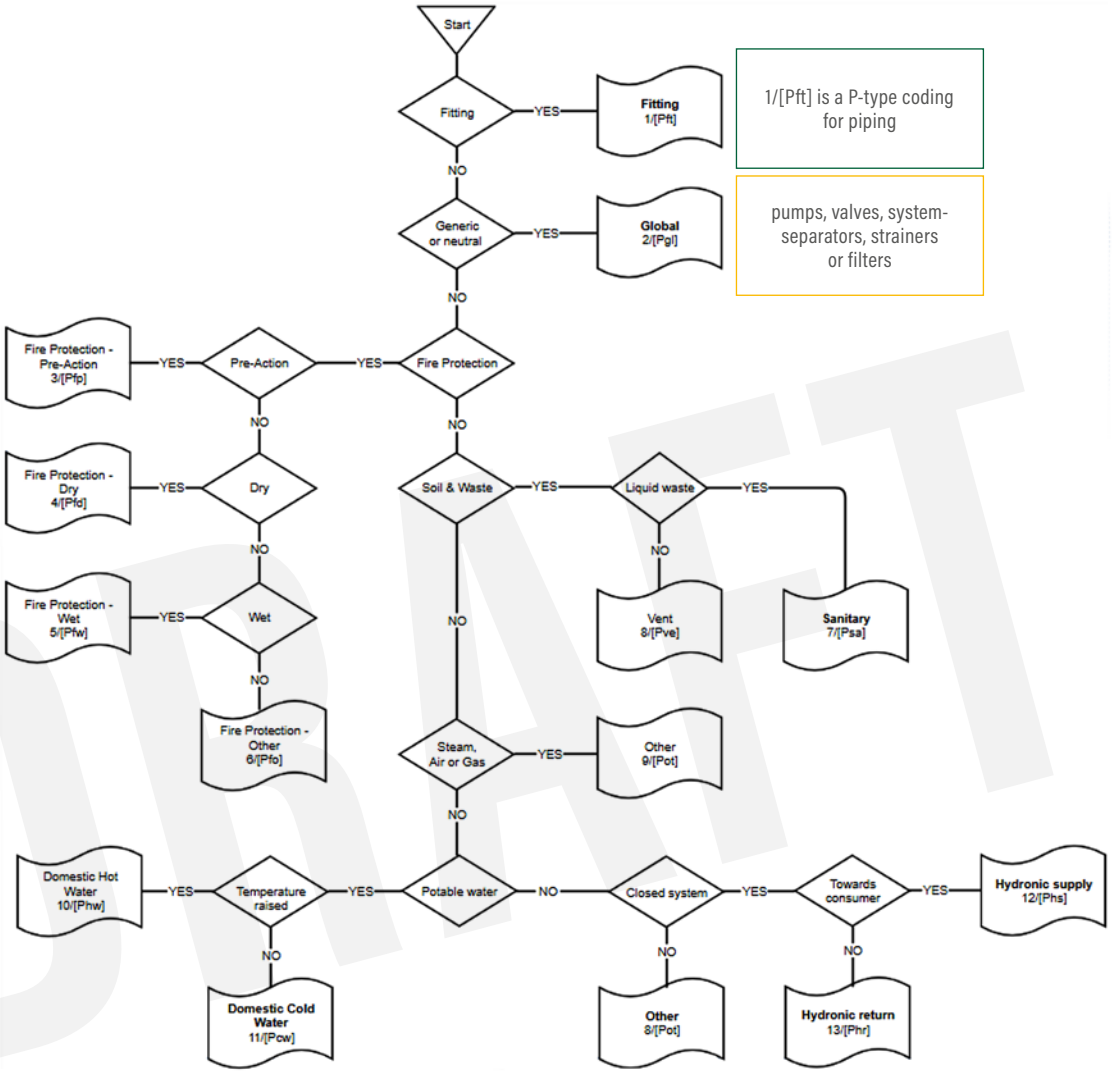
7.1 ELECTRICAL SYSTEM CONNECTORS



7.2 DUCTWORK SYSTEM CONNECTORS

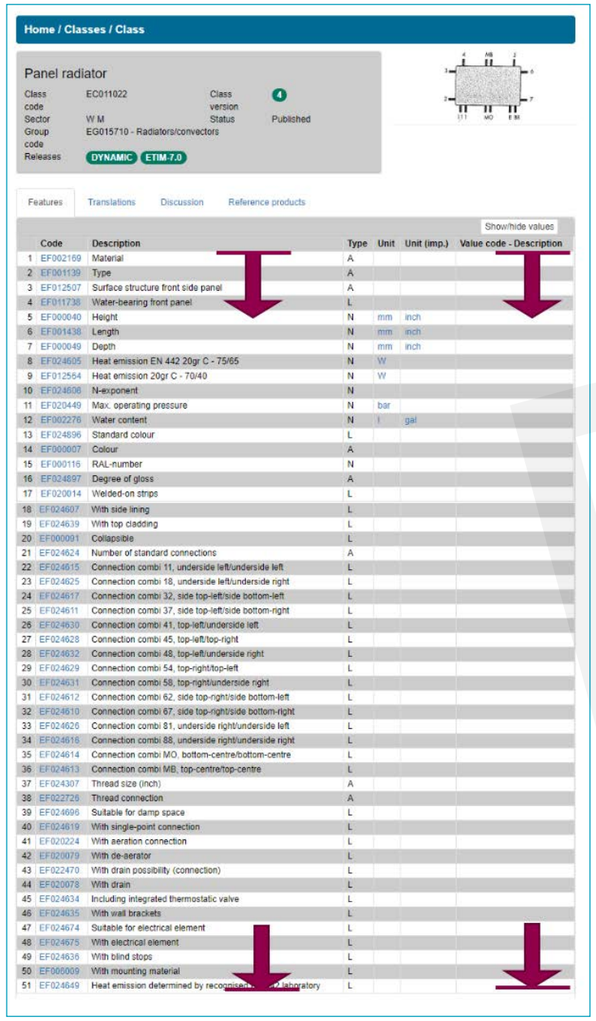


7.3 PIPEWORK SYSTEM CONNECTORS



8 APPENDIX MVP

8.1 MC000176-PANEELRADIATOR (INLET-OUTLET)



Home / Classes / Class

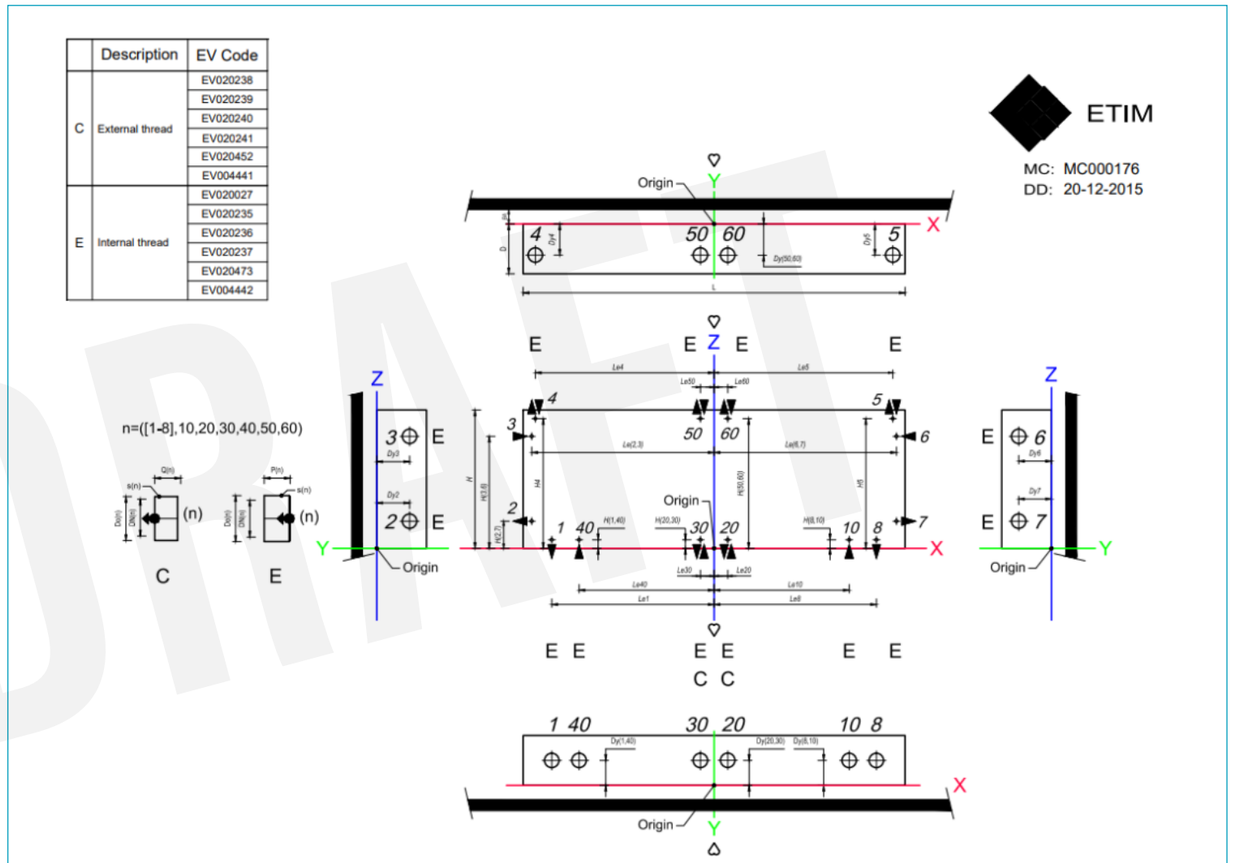
Panel radiator

Class code: EC011022 | Class version: 4
Sector: W M | Status: Published
Group code: EG015710 - Radiators/convectors
Releases: DYNAMIC ETIM-7.0

Features | Translations | Discussion | Reference products

Show/hide values

	Code	Description	Type	Unit	Unit (imp.)	Value code - Description
1	EF002169	Material	A			
2	EF001139	Type	A			
3	EF012507	Surface structure front side panel	A			
4	EF011738	Water-bearing front panel	L			
5	EF000040	Height	N	mm	inch	
6	EF001438	Length	N	mm	inch	
7	EF000049	Depth	N	mm	inch	
8	EF024605	Heat emission EN 442 20gr C - 75/65	N	W		
9	EF012564	Heat emission 20gr C - 70/40	N	W		
10	EF024606	N-exponent	N			
11	EF020449	Max. operating pressure	N	bar		
12	EF002276	Water content	N	l	gal	
13	EF024896	Standard colour	L			
14	EF000007	Colour	A			
15	EF000116	RAL-number	N			
16	EF024897	Degree of gloss	A			
17	EF020014	Welded-on strips	L			
18	EF024607	With side lining	L			
19	EF024639	With top cladding	L			
20	EF000091	Collapsible	L			
21	EF024624	Number of standard connections	A			
22	EF024615	Connection combi 11, underside left/underside left	L			
23	EF024625	Connection combi 18, underside left/underside right	L			
24	EF024617	Connection combi 32, side top-left/side bottom-left	L			
25	EF024611	Connection combi 37, side top-left/side bottom-right	L			
26	EF024630	Connection combi 41, top-left/underside left	L			
27	EF024628	Connection combi 45, top-left/top-right	L			
28	EF024632	Connection combi 48, top-left/underside right	L			
29	EF024629	Connection combi 54, top-right/top-left	L			
30	EF024631	Connection combi 58, top-right/underside right	L			
31	EF024612	Connection combi 62, side top-right/side bottom-left	L			
32	EF024610	Connection combi 67, side top-right/side bottom-right	L			
33	EF024626	Connection combi 81, underside right/underside left	L			
34	EF024616	Connection combi 88, underside right/underside right	L			
35	EF024614	Connection combi MO, bottom-centre/bottom-centre	L			
36	EF024613	Connection combi MB, top-centre/top-centre	L			
37	EF024307	Thread size (inch)	A			
38	EF022726	Thread connection	A			
39	EF024696	Suitable for damp space	L			
40	EF024619	With single-point connection	L			
41	EF020224	With aeration connection	L			
42	EF020079	With de-aerator	L			
43	EF022470	With drain possibility (connection)	L			
44	EF020078	With drain	L			
45	EF024634	Including integrated thermostatic valve	L			
46	EF024635	With wall brackets	L			
47	EF024674	Suitable for electrical element	L			
48	EF024675	With electrical element	L			
49	EF024636	With blind stops	L			
50	EF000009	With mounting material	L			
51	EF024649	Heat emission determined by recognised test laboratory	L			



ETIM-class with 51 features

The MC Drawing Sheet has 14 connection configurations; only 2 are applicable. To specify the connection-position Lex and Hx should be used. The result is that for each port to be used (2 in total) it is needed to know

a. connection-type (line 38) and -size (line 37)
b. which connector positions (line 22 - 36)
c. connection-positions

Because the 4, 50, 60, 5, 20, 30 and 40 are not strictly inlet or outlet, 2 MC-families must be created:

1. MC000176-paneelradiator (inlet_outlet)
2. MC000176-paneelradiator (bi-directional)

	Code	Port	Drawing code	Description	Type	Unit
1	EF010822	0	BA	Bracket distance	N	mm
2	EF000049	0	D	Depth	N	mm
3	EF023191	1	DN1	Nominal inner diameter	A	
4	EF023191	2	DN2	Nominal inner diameter	A	
5	EF023191	3	DN3	Nominal inner diameter	A	
6	EF023191	4	DN4	Nominal inner diameter	A	
7	EF023191	5	DN5	Nominal inner diameter	A	
8	EF023191	6	DN6	Nominal inner diameter	A	
9	EF023191	7	DN7	Nominal inner diameter	A	
10	EF023191	8	DN8	Nominal inner diameter	A	
11	EF023191	10	DN10	Nominal inner diameter	A	
12	EF023191	20	DN20	Nominal inner diameter	A	
13	EF023191	30	DN30	Nominal inner diameter	A	
14	EF023191	40	DN40	Nominal inner diameter	A	
15	EF023191	50	DN50	Nominal inner diameter	A	
16	EF023191	60	DN60	Nominal inner diameter	A	
17	EF020208	1	Do1	Outer pipe diameter connection	N	mm
18	EF020208	2	Do2	Outer pipe diameter connection	N	mm
19	EF020208	3	Do3	Outer pipe diameter connection	N	mm
20	EF020208	4	Do4	Outer pipe diameter connection	N	mm
21	EF020208	5	Do5	Outer pipe diameter connection	N	mm
22	EF020208	6	Do6	Outer pipe diameter connection	N	mm
23	EF020208	7	Do7	Outer pipe diameter connection	N	mm
24	EF020208	8	Do8	Outer pipe diameter connection	N	mm
25	EF020208	10	Do10	Outer pipe diameter connection	N	mm
26	EF020208	20	Do20	Outer pipe diameter connection	N	mm
27	EF020208	30	Do30	Outer pipe diameter connection	N	mm
28	EF020208	40	Do40	Outer pipe diameter connection	N	mm
29	EF020208	50	Do50	Outer pipe diameter connection	N	mm
30	EF020208	60	Do60	Outer pipe diameter connection	N	mm
31	EF010819	1	Dy1	Width to connection	N	mm
32	EF010819	2	Dy2	Width to connection	N	mm
33	EF010819	3	Dy3	Width to connection	N	mm
81	EF010520	7	P7	Sleeve length	N	mm
82	EF010520	8	P8	Sleeve length	N	mm
83	EF010520	10	P10	Sleeve length	N	mm
84	EF010520	20	P20	Sleeve length	N	mm
85	EF010520	30	P30	Sleeve length	N	mm
86	EF010520	40	P40	Sleeve length	N	mm
87	EF010520	50	P50	Sleeve length	N	mm
88	EF010520	60	P60	Sleeve length	N	mm
89	EF010521	20	Q20	Length gusset/thread	N	mm
90	EF010521	30	Q30	Length gusset/thread	N	mm
91	EF010546	1	s1	Wall thickness connection	N	mm
92	EF010546	2	s2	Wall thickness connection	N	mm
93	EF010546	3	s3	Wall thickness connection	N	mm
94	EF010546	4	s4	Wall thickness connection	N	mm
95	EF010546	5	s5	Wall thickness connection	N	mm
96	EF010546	6	s6	Wall thickness connection	N	mm
97	EF010546	7	s7	Wall thickness connection	N	mm
98	EF010546	8	s8	Wall thickness connection	N	mm
99	EF010546	10	s10	Wall thickness connection	N	mm
100	EF010546	20	s20	Wall thickness connection	N	mm
101	EF010546	30	s30	Wall thickness connection	N	mm
102	EF010546	40	s40	Wall thickness connection	N	mm
103	EF010546	50	s50	Wall thickness connection	N	mm
104	EF010546	60	s60	Wall thickness connection	N	mm
105	EF000443	1		Connection	A	
106	EF000443	2		Connection	A	
107	EF000443	3		Connection	A	
108	EF000443	4		Connection	A	
109	EF000443	5		Connection	A	
110	EF000443	6		Connection	A	
111	EF000443	7		Connection	A	
112	EF000443	8		Connection	A	
113	EF000443	10		Connection	A	
114	EF000443	20		Connection	A	
115	EF000443	30		Connection	A	
116	EF000443	40		Connection	A	
117	EF000443	50		Connection	A	
118	EF000443	60		Connection	A	

ETIM-MC with 118 features

Since EF023191 is a feature which is being set as piping-connection, it replaces the ETIM-class features EF024307 + EF022726.

Manufacturers need to fill out the scheme, since most panel-radiators have a limited set of connection-positions, the user is only able to select from the supplied/available positions. The UOB Configurator will need to transfer the Dyx (distance from front-back) as well as the selected position-numbers and their respective Hx and Lex for both connection-positions.

ETIM-class features
1 Material + Colour (EF002169 and EF000007+EF000116)
2 Heating power (chosen either HighTemp: EF02405, or LowTemp: EF012564)
ETIM MC features
3 Size (both have same size: EF023191)
4 BA (for wall/host distance: EF010822)
5 L (for Length: EF001438)
6 H (for height: EF000040)
7 D (for width: EF000049)
For Inlet position:
8 H (EF010721 from chosen port)
9 Le (EF010818 from chosen port)
For Outlet position:
10 H (EF010721 from chosen port)
11 Le (EF010818 from chosen port)
For both positions:
12 Dy (always symmetrical) (EF010819 from chosen port)
Chosen Inlet port number
Chosen Outlet port number

Model Properties	
EF002169_000007	Staal, wit RAL 9001
EF023191	4591
EF024605	2800.00 W
DN_inlet	15.0
DN_outlet	15.0
BA	50.0
L	1800.0
H	600.0
D	100.0
H_inlet	550.0
Le_inlet	850.0
Dy_inlet	50.0
Dy_outlet	50.0
H_outlet	50.0
Le_outlet	850.0
Inlet	3
Outlet	2

EV004591 1/2 inch
EV003502 3/4 inch
EV021819 1/2 inch / 3/4 inch

implemented formula

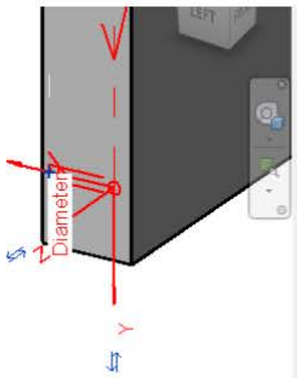
Parameter	Value	For
Graphics		
NLRS_DI_symbool<Detail Items>	NLRS_56_DI_radiator : LxD	=
Materials and Finishes		
NLRS_C_materiaal	NLRS_h2_staal_RAL9001	=
NLRS_C_materiaal_kleur	Staal, wit RAL 9001	= EF002169_0000(
Mechanical		
NLRS_M_afgifte_verwarming	2800.00 W	= EF024605
NLRS_P_c01_drukverlies_statisch (d	50.00 Pa	=
NLRS_P_c01_volumestroom (defau	1.60 L/s	=
NLRS_P_c02_volumestroom (defau	1.60 L/s	= NLRS_P_c01_vo
Dimensions		
NLRS_C_lengte	1800.0	= L
NLRS_C_hoogte	600.0	= H
NLRS_C_dikte	100.0	= D

Information feeding the IfcPropertySets, metadata, geometry and the MEP system

IFC Parameters		
IfcExportAs	IfcSpaceHeaterType	= "IfcSpaceHea
IfcExportType	RADIATOR	= "RADIATOR"
BodyMass	18.600 kg	=
EnergySource	UNSET	=
HeatTransferMedium	WATER	= "WATER"
HeatTransferDimension	SURFACE	= "SURFACE"
NumberOfPanels	2	=
NumberOfSections	12	=
OutputCapacity	2800.00 W	= EF024605
PlacementType	WALL	= "WALL"
RadiatorType	PANEL	= "PANEL"
Status	UNSET	=
TemperatureClassification	UNSET	=
ThermalEfficiency	1.000000	=
ThermalMassHeatCapacit	0.000000	=
TubingLength	0.0	=
WaterContent	0.000 kg	=

General		
NLRS_C_ISO_country_code	NLRS	= "NL
NLRS_C_product_toepassing	space heating, human occupation	= "spa
NLRS_C_code_ETIM	EC011022	= "EC
NLRS_C_code_ETIM_MC	MC000176	= "MC
NLRS_C_code_ETIM_klasse_kenm	1) Material: Steel	=
NLRS_C_code_ETIM_url	https://prod.etim-international.c	=
NLRS_C_code_SfB_tabel1	56	=
NLRS_C_code_fabrikant_gln	GS1 uitgifte 7-13 cijferige waarde	=
NLRS_C_code_fabrikant_product	artikel nummer	=
NLRS_C_code_gtin	GS1 uitgifte 13/14 cijferige waarde	=
NLRS_C_content_creator	CIC	= "CIC
NLRS_C_content_datum_gewijzig		=
NLRS_C_content_datum_uitgifte		=
NLRS_C_content_provider	UOB	= "UO
NLRS_C_omschrijving	artikel benaming	=
NLRS_P_c01_omschrijving	inlet	= "inl
NLRS_P_c01_diameter	15.0	= DN_
NLRS_P_c01_aansluitmethode	Buitendraad	=
NLRS_P_c02_omschrijving	outlet	= "out
NLRS_P_c02_diameter	15.0	= DN_
NLRS_P_c02_aansluitmethode	Bu	

Other		
c1_bottom	☐	= or(Inlet = 1, Inlet = 40, Inlet = 30,
c1_left	☑	= or(Inlet = 2, Inlet = 3)
c1_right	☐	= or(Inlet = 6, Inlet = 7)
c1_top	☐	= or(Inlet = 4, Inlet = 50, Inlet = 60,
c1a	180.000°	= if(c1_top, 90°, if(c1_left, 180°, if(c
c1d	50.0	= Dy_inlet
c1ex	550.0	= if(or(Inlet = 3, Inlet = 6), H_inlet,
c1ey	900.0	= if(or(Inlet = 3, Inlet = 6), L / 2, L /
c1l	850.0	= if(or(Inlet = 3, Inlet = 6), Le_inlet,
c2_bottom	☐	= or(Outlet = 1, Outlet = 40, Outlet
c2_left	☑	= or(Outlet = 2, Outlet = 3)
c2_right	☐	= or(Outlet = 6, Outlet = 7)
c2_top	☐	= or(Outlet = 4, Outlet = 50, Outlet
c2a (default)	180.000°	= if(c2_top, 90°, if(c2_left, 180°, if(c
c2d	50.0	= Dy_outlet
c2ex	50.0	= if(or(Outlet = 2, Outlet = 7), H_o
c2ey	900.0	= if(or(Outlet = 2, Outlet = 7), L / 2,
c2l	850.0	= if(or(Outlet = 2, Outlet = 7), Le_o



Connector Element (1)	Edit Type
Mechanical	
K Coefficient	0.000000
Flow Factor	0.000000
Flow Configuration	Preset
Flow Direction	Out
Loss Method	Specific Loss
Allow Slope Adjustments	☐
System Classification	Hydronic Return
Mechanical - Flow	
Flow	1.60 L/s
Pressure Drop	50.00 Pa
Dimensions	
Diameter	15.0
Identity Data	
Utility	☐
Connector Description	outlet

1) Material: Steel
2) Type: 22
3) Surface structure front side panel: Flat smooth
4) Water-bearing front panel: Yes
5) Height: (mm) 600
6) Length: (mm) 1800
7) Depth: (mm) 100
8) Heat emission EN 442 20gr C - 75/65: (W) 800
9) Heat emission 20gr C - 70/40: (W) 720
10) N-exponent: 2.3
11) Max. operating pressure: (bar) 10
12) Water content: (L) 10.6
13) Standard colour: Yes
14) Colour: White
15) RAL-number: 9001
16) Degree of gloss: Glossy
17) Welded-on strips: No
18) With side lining: Yes
19) With top cladding: Yes
20) Collapsible: No
21) Number of standard connections: 8
22) Connection combi 11, underside left/underside left: No
23) Connection combi 18, underside left/underside right: No
24) Connection combi 32, side top-left/side bottom-left: Yes
25) Connection combi 37, side top-left/side bottom-right: No
26) Connection combi 41, top-left/underside left: No
27) Connection combi 45, top-left/top-right: No
28) Connection combi 48, top-left/underside right: No
29) Connection combi 54, top-right/top-left: No
30) Connection combi 58, top-right/underside right: No
31) Connection combi 62, side top-right/side bottom-left: No
32) Connection combi 67, side top-right/side bottom-right: No
33) Connection combi 81, underside right/underside left: No
34) Connection combi 88, underside right/underside right: No
35) Connection combi MO, bottom-centre/bottom-centre: No
36) Connection combi MB, top-centre/top-centre: No
37) Thread size (inch) : 1/2 inch
38) Thread connection: External thread
39) Suitable for damp space: No
40) With single-point connection: No
41) With aeration connection: Yes
42) With de-aerator: Yes
43) With drain possibility (connection) : Yes
44) With drain: Yes
45) Including integrated thermostatic valve: Yes
46) With wall brackets: Yes
47) Suitable for electrical element: No
48) With electrical element: No
49) With blind stops: Yes
50) With mounting material: Yes
51) Heat emission determined by recognised EN 442 laboratory: Yes

Features | Translations | Discussion | Reference products

	Code	Description	Type	Unit
1	EF002189	Material	A	
2	EF001139	Type	A	
3	EF012507	Surface structure front side panel	A	
4	EF011730	Water-bearing front panel	L	
5	EF000040	Height	N	mm
6	EF001438	Length	N	mm
7	EF000049	Depth	N	mm
8	EF024605	Heat emission EN 442 20gr C - 75/65	N	W
9	EF012684	Heat emission 20gr C - 70/40	N	W
10	EF002636	N-exponent	N	
11	EF000649	Max. operating pressure	N	bar
12	EF002855	Water content	N	l
13	EF024896	Standard colour	L	
14	EF000057	Colour	A	
15	EF000118	RAL-number	N	
16	EF024697	Degree of gloss	A	
17	EF020014	Welded-on strips	L	
18	EF024622	With side lining	L	
19	EF024628	With top cladding	L	
20	EF000091	Collapsible	L	
21	EF024624	Number of standard connections	A	
22	EF024676	Connection combi 11, underside left/underside left	L	
23	EF024625	Connection combi 18, underside left/underside right	L	
24	EF024617	Connection combi 32, side top-left/side bottom-left	L	
25	EF024631	Connection combi 37, side top-left/side bottom-right	L	
26	EF024636	Connection combi 41, top-left/underside left	L	
27	EF024628	Connection combi 45, top-left/top-right	L	
28	EF024632	Connection combi 48, top-left/underside right	L	
29	EF024629	Connection combi 54, top-right/top-left	L	
30	EF024631	Connection combi 58, top-right/underside right	L	
31	EF024613	Connection combi 62, side top-right/side bottom-left	L	
32	EF024614	Connection combi 67, side top-right/side bottom-right	L	
33	EF024626	Connection combi 81, underside right/underside left	L	
34	EF024618	Connection combi 88, underside right/underside right	L	
35	EF024614	Connection combi MO, bottom-centre/bottom-centre	L	
36	EF024613	Connection combi MB, top-centre/top-centre	L	
37	EF016307	Thread size (inch)	A	
38	EF002726	Thread connection	A	
39	EF024696	Suitable for damp space	L	
40	EF024679	With single-point connection	L	
41	EF020224	With aeration connection	L	
42	EF000374	With de-aerator	L	
43	EF020470	With drain possibility (connection)	L	
44	EF000378	With drain	L	
45	EF024634	Including integrated thermostatic valve	L	
46	EF024635	With wall brackets	L	
47	EF024674	Suitable for electrical element	L	
48	EF024675	With electrical element	L	
49	EF024636	With blind stops	L	
50	EF024638	With mounting material	L	
51	EF024648	Heat emission determined by recognised EN 442 laboratory	L	

9 APPENDIX CONNECTION TYPES

Parametric Connection-types are applicable for pipework and ductwork. Since Electrical connections are fixed per type they do not have any size-dependency such as pipes and ducts have.

9.1 PIPE CONNECTION-TYPES

	EV##other##feet	NL_name##other##	connection_index## number##-feet
Bayonet	3701	Bajonet	1
Clamp	137	Klem	2
Compression ring	20242	Knelring	3
Electro welded sleeve	20068	Elektrolasmof	4
Euroconus	12754	Euroconus	5
Flange	106	Flens	6
Glue end	20084	Lijmeind	7
Glued sleeve	20001	Lijmmof	8
Groove	8045	Groef	9
Hose pillar	20020	Slangpilaar	10
Inner thread conical (NPT)	20237	Binnendraad conisch (NPT)	11
Inner thread flare (UNF)	20473	Binnendraad flare (UNF)	12
Inner thread gas conical (BSPT)	20027	Binnendraad gas conisch (BSPT)	13
Inner thread gas cylindrical (BSPP)	20235	Binnendraad gas cilindrisch (BSPP)	14
Inner thread metric	20236	Binnendraad metrisch	15
Insert	3747	Insteek	16
Laminate	20088	Lamineer	17
Other	154	Overig	18
Outer thread conical (NPT)	20241	Buitendraad conisch (NPT)	19
Outer thread flare (UNF)	20452	Buitendraad flare (UNF)	20
Outer thread gas conical (BSPT)	20238	Buitendraad gas conisch (BSPT)	21
Outer thread gas cylindrical (BSPP)	20239	Buitendraad gas cilindrisch (BSPP)	22
Outer thread metric	20240	Buitendraad metrisch	23
Plastic welded end	20085	Kunststoflaseind	24
Plastic welded sleeve	20312	Kunststoflasmof	25
Pressure sleeve	20067	Persmof	26
Reducing sleeve	20376	Krimpmof	27
Ribbing groove (groove coupling)	13242	Rilgroef (groefkoppeling)	28
Sleeve	20784	Schuifmof	29
Slide end	20777	Schuifeind	30
Soldered end	20287	Soldeereind	31
Soldered sleeve	20288	Soldeermof	32
Spigot	13175	Verjongspie	33
Union nut	20311	Wartelmoer	34
Weld	5758	Las	35

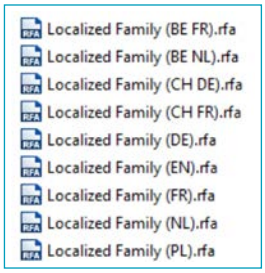
9.2 DUCT CONNECTION-TYPES

	EV## other##feet	NL_name## other##	connection_ index## number##-feet
Insert end	20339	Kanaaleind	1
Duct end	20338	Steekeind	2
Duct connection profile	20340	Gekraalde rand	3
Beaded edge	106	Flens	4
Flange	20687	Kanaalverbindingsprofiel	5
Angle profile	20341	Hoeklijn	6
Sleeve	450	Mof	7
Sleeve with seal	20298	Mof met afdichting	8
Shrink end	21522	Krimpeind	9
Snapper mounting	8273	Klikbevestiging	10
Bayonet	3701	Bajonet	11
Collar	21539	Collar	12
Glue end	20084	Lijmeind	13
Glued sleeve	20001	Lijmmof	14

10 APPENDIX B: OUTSIDE THE NETHERLANDS

Since Revit is multilingual as well as the use of shared parameters by RSF, users outside the NLRS region must:

- Use the appropriate localized version of the Localized Family (xxxx).rfa as listed.
- The files listed are equipped with translations *1 of all NLRS parameters (both common and connectors), and have all Subcategories as needed according the NLRS Family Guide 2.5.2.
- The files listed should be inserted in the project (or template) only once in order to ensure the multilingual adoption.
- The files should be loaded prior to the UOB content.



*1 : the translations have been done by:

CODE	primary	secondary	check	comments
BE FR	Wim Tas (Thorbiq / Witas)			
BE NL	-			
CH DE	Laurens Oude Lashof (Itannex)	Martijn Landeweerd (Itannex)	Mr. Graack (Dräger)	
CH FR	Wim Tas (Thorbiq / Witas)			
DE	Laurens Oude Lashof (Itannex)	Martijn Landeweerd (Itannex)	Mr. Graack (Dräger)	
EN	Martijn Landeweerd (Itannex)	Wim Tas (Thorbiq / Witas)	Laurens Oude Lashof (Itannex)	
FR	Wim Tas (Thorbiq / Witas)			
PL	Adam Krug (Wavin PL)			Only common parameters

The naming conventions remain the same:

	Description
<pos1>	Classification code
<pos2>	Abbreviation for the Family Category
<pos3>	Family description (including expansion codes)
<pos4>	*optional: Shared and Host-type*
<uob>	UOB as aggregated value

'_' (underscore) to be used as attribute separator

<pos1>

Example of DIN276-1 as Classification code in 10.1 DIN276-1 Kostenermittlung.

<pos2>

In German Revit versions it would respectively as in 10.2 Example Abbreviations for Germany.

<pos3>

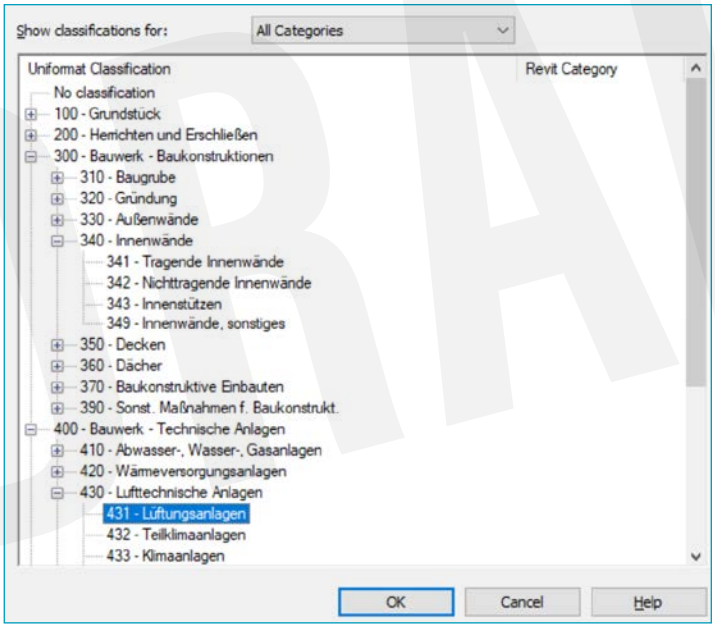
The description must intentionally be the respective translation of the ETIM-class. In order to prevent undesirable naming, we should initiate & keep a list of the names being used. This (public shared excel) list should only be moderated by a fixed group of persons.

This list also contains optional name-expansion due to Revit-specific demands based upon connector-properties. Example values: (un) for union-type fittings, (Dsp) for supply air, (bi) for bidirectional connection.

<pos4>

Optional attribute for shared families; example 'SH WPB' for shared, workplane based family, or: 'AG AEB' for Gemeinsam genutzt, Arbeitsebenebasiert for German speaking regions. Since shared (nested) families should be identified. It must always be used including the host-type coding found in RSF Fundamentals.

10.1 DIN276-1 KOSTENERMITTLUNG



10.2 Example Abbreviations for Germany

Category	Abbr.	Kategorie	Kurz
Air Terminal	AIR	Luftdurchlässe	LUD
Cable Tray Fittings	CTF	Kabeltrassenformteile	KAF
Communication Devices	COM	Kommunikationsgeräte	KG
Conduit Fittings	COF	Leerrohrformteil	LEF
Data Devices	DD	Datengeräte	DG
Duct Accessories	DUA	Luftkanalzubehör	LUZ
Duct Fittings	DUF	Luftkanalformteile	LUF
Electrical Equipment	EE	Elektrische Ausstattung	EA
Electrical Fixtures	EF	Elektroinstallationen	EI
Fire Alarm Devices	FAD	Brandmelder	BM
Generic Model	GM	Allgemeines Modell	AM
Lighting Devices	LD	Lichtschalter	LS
Lighting Fixtures	LF	Leuchten	LEU
Mechanical Equipment	ME	HLS-Bauteile	HLS
Pipe Accessories	PIA	Rohrzubehör	ROZ
Pipe Fittings	PIF	Rohrformteile	ROF
Plumbing Fixtures	PF	Sanitärinstallationen	SI
Security Devices	SD	Sichterheitsgeräte	SG