# Using QUDV model library

On this page

Description of the QUDV model library

This model library is designed in such a way that extensions to ISQ and SI can be represented, as well as any alternative systems of quantities and units.

The SysML 1.5 QUDV library:

- Complies with International Vocabulary of Metrology (VIM 3rd edition).
- Includes ISO/IEC 80000 definitions of base quantities and units to provide semantics for computer-based dimensional analysis.

The QUDV (Quantity Unit Dimension Value) library is introduced in OMG SysML Specification 1.5: **Annex E: Non-normative Extensions > E.5 Model Library for Quantities, Units, Dimensions, and Values (QUDV).**
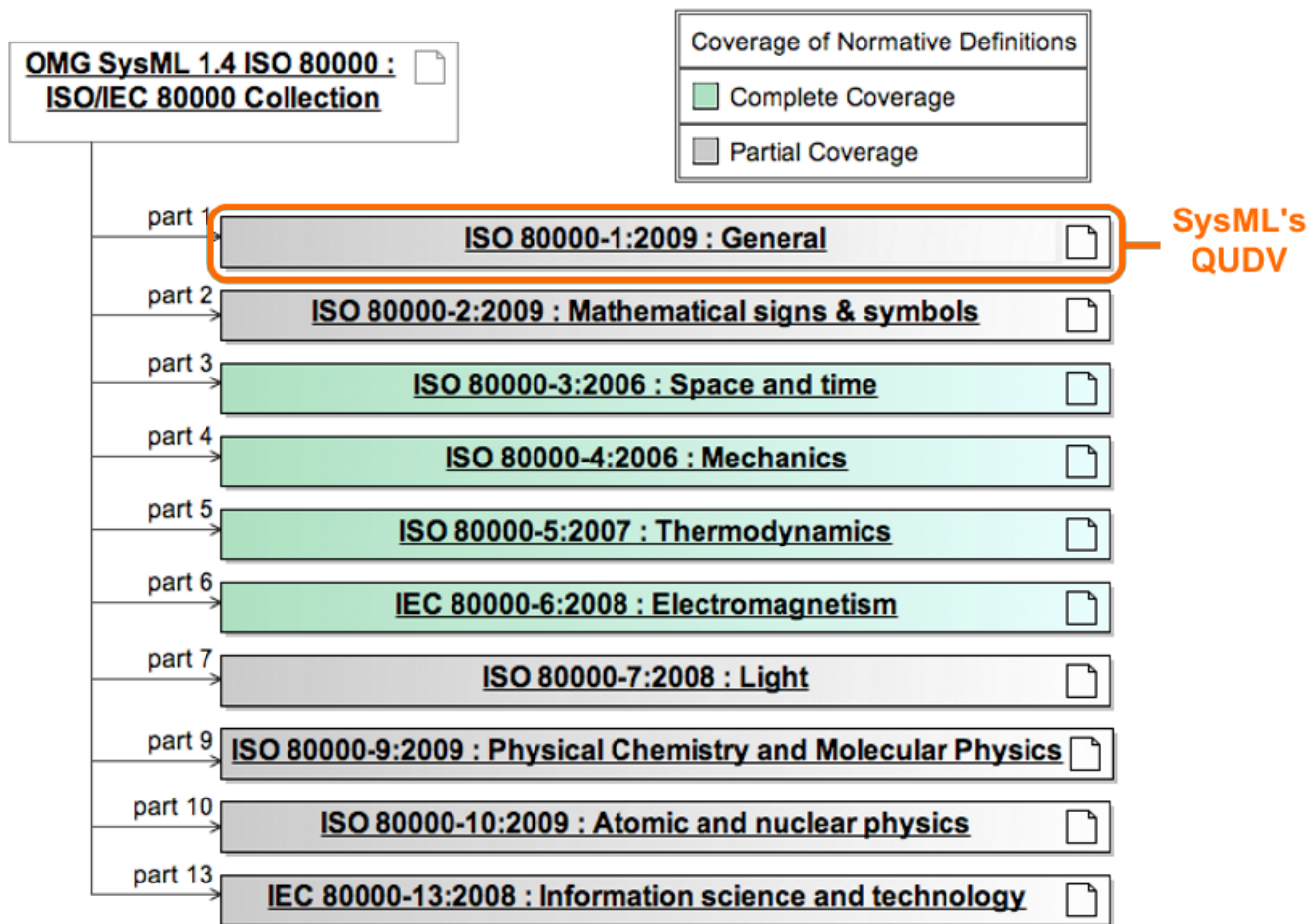
Description of sub-libraries

Sub-libraries are located in the *modelLibraries* folder in the installation directory of your modeling tool. The SysML plugin consists of those sub-libraries:

- **ISO-80000.mdzip**. ISO-80000 model library consists of specific quantities and units that are defined by ISO 80000. Full details of ISO-80000 Library Model definitions are available in OMG SysML Specification 1.5: **Annex E: Non-normative Extensions > E.6 Model Library of SysML Quantity Kinds and Units for ISO 80000.**

- **ISO-80000-Extension.mdzip**. The ISO-80000-Extension library extends the ISO-80000 library with the collection of imperial, nautical, and common units.
  - If you work with projects older than version 18.0, which use the QUDV library and SysML 1.3 library, the ISO-80000 library will not be

The ISO-80000-Extension library is loaded by default in the MagicGrid Blank and MagicGrid QuickStart projects.

- **QUDV.mdzip**. QUDV model library consists of main definitions of new units and quantity kinds system as specified in OMG SysML Specifications, for example, SimpleUnit, SimpleQuantityKind, DerivedUnit, DerivedQuantityKind, AffineConversionUnit, UnitFactor, QuantityKindFactor, and many more. Full details of ISO-80000 Library Model definitions are available in OMG SysML Specification 1.5: **Annex E: Non-normative Extensions** > **E.5 Model Library for Quantities, Units, Dimensions, and Values (QUDV)**.
- **SI Value Type Library.mdzip**. SysML Plugin provides a model library that contains predefined value types. You can use them for typing the Value Properties in your SysML model. These value types use the units and quantity kinds defined in the QUDV model library.

Name	Unit	Quantity Kind
A	ampere : SimpleUnit	electricCurrent : SimpleQuantityKind
A/m	amperePerMeter : DerivedUnit	magneticFieldStrength : DerivedQuantityKind
A/m²	amperePerSquareMeter : DerivedUnit	currentDensity : DerivedQuantityKind
Bq	becquerel : DerivedUnit	radionuclideActivity : DerivedQuantityKind
C	coulomb : DerivedUnit	electricCharge : DerivedQuantityKind
cd	candela : SimpleUnit	luminousIntensity : SimpleQuantityKind
cd/m²	candelaPerSquareMeter : DerivedUnit	luminance : DerivedQuantityKind
F	farad : DerivedUnit	capacitance : DerivedQuantityKind
Gy	gray : DerivedUnit	absorbedDose : DerivedQuantityKind
H	henry : DerivedUnit	inductance : DerivedQuantityKind
Hz	hertz : DerivedUnit	frequency : DerivedQuantityKind
J	joule : DerivedUnit	energy : DerivedQuantityKind
K	kelvin : SimpleUnit	thermodynamicTemperature : SimpleQuantityKind
kat	katal : DerivedUnit	catalyticActivity : DerivedQuantityKind
kg	kilogram : SimpleUnit	mass : SimpleQuantityKind
kg/m³	kilogramPerCubicMeter : DerivedUnit	massDensity : DerivedQuantityKind
lm	lumen : DerivedUnit	luminousFlux : DerivedQuantityKind
lx	lux : DerivedUnit	illuminance : DerivedQuantityKind
m	meter : SimpleUnit	length : SimpleQuantityKind
m/s	meterPerSecond : DerivedUnit	velocity : DerivedQuantityKind
m/s²	meterPerSecondSquared : DerivedUnit	acceleration : DerivedQuantityKind
mol	mole : SimpleUnit	amountOfSubstance : SimpleQuantityKind
mol/m³	molePerCubicMeter : DerivedUnit	amountOfSubstanceConcentration : DerivedQuantityKind
m²	squareMeter : DerivedUnit	area : DerivedQuantityKind
m³	cubicMeter : DerivedUnit	volume : DerivedQuantityKind
m³/kg	cubicMeterPerKilogram : DerivedUnit	specificVolume : DerivedQuantityKind
m¹	reciprocalMeter : DerivedUnit	waveNumber : DerivedQuantityKind
N	newton : DerivedUnit	force : DerivedQuantityKind
Pa	pascal : DerivedUnit	pressure : DerivedQuantityKind

rad	radian : DerivedUnit	planeAngle : DerivedQuantityKind
s	second : SimpleUnit	time : SimpleUnit
S	siemens : DerivedUnit	electricConductance : DerivedQuantityKind
sr	steradian : DerivedUnit	solidAngle : DerivedQuantityKind
Sv	sievert : DerivedUnit	doseEquivalent : DerivedQuantityKind
T	tesla : DerivedUnit	magneticFluxDensity : DerivedQuantityKind
V	volt : DerivedUnit	electricPotentialDifference : DerivedQuantityKind
W	watt : DerivedUnit	power : DerivedQuantityKind
Wb	weber : DerivedUnit	magneticFlux : DerivedQuantityKind
°C	celciusTemperature : AffineConversionUnit	celciusTemperature : DerivedQuantityKind
	ohm : DerivedUnit	electricResistance : DerivedQuantityKind

- **SIDefinitions.mdzip**. The SI Definitions library consists of predefined units and quantity kinds in QUDV system that you can use in your model. You can customize the units and value types.
- **SISpecializations.mdzip**. The SI Specializations library consists of a diagram (and Blocks). It demonstrates how to extend the current QUDV system.
- **SysML_SI_Definitions_Library.mdzip**.
- **QUDV_SysML1.4.mdzip**.

Loading the ISO 80000 library

If you want to use the full ISO 80000 library in your project, you can:

- Load it manually for a separate main projects.
- Set the ISO 80000 library usage options each time when opening the main project.

To load the full ISO 80000 library for a separate project, do either

- Select the value in Compartment area and click the **ISO** button on smart manipulator toolbar.
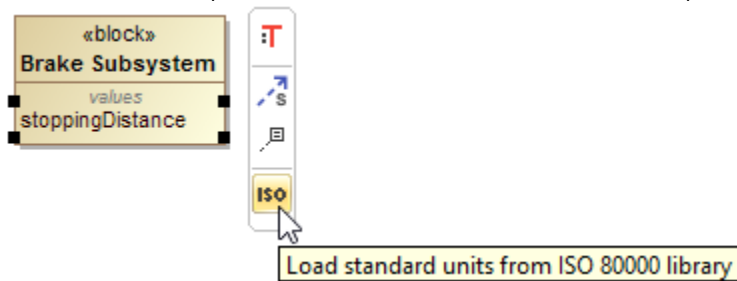
- Click in the Containment tree and select the **Show Auxiliary Resources** option. The **ISO-80000** package appears in the Containment tree. Right-click it and select **Project Usages** > **Load**.
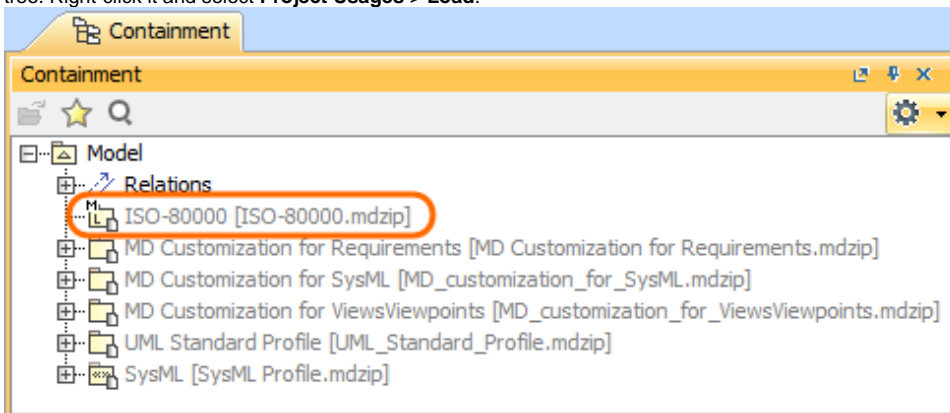
All standard units and value types are loaded.

To specify the ISO80000 library usage each time when opening the main project

1. On the main menu, select **Options** > **Project Usages**.
2. On the right side of the **Used Projects** dialog, select the **ISO-80000.mdzip** package.
3. On the left side of this dialog, in the **Load Mode** area, select desired mode:
   - **Always load** - the library is always loaded when the main project is opened.
   - **Autoload** - the library is not loaded when the main project is loaded. Modeling tool monitors user activities in the project and loads the particular used project on the demand by the project.
   - **Autoload with prompt** - this mode is similar to an **Autoload** mode. The difference is that modeling tool asks the user a confirmation before loading it.
   - **Manual load** - the library is not loaded when the main project is loaded. The model integrity is not broken, as all required elements of the used project exists, just simplified versions (that is, loaded as proxies) of the elements are used in the project. This load mode is recommended for all used projects that are stable or rarely modified.
4. Click **OK**.
5. Reload the main project.
   The **ISO-80000.mdzip** package is used in the main project according to the selected mode.

Loading the basic units from ISO 80000 library

You can load only the basic SI, US customary, naval and imperial units from the ISO-80000 and ISO-80000-Extension libraries instead of the whole library.

To load the basic units from ISO 80000 library

- When creating a new SysML project, set the **Use Basic Units Library** option value to true.
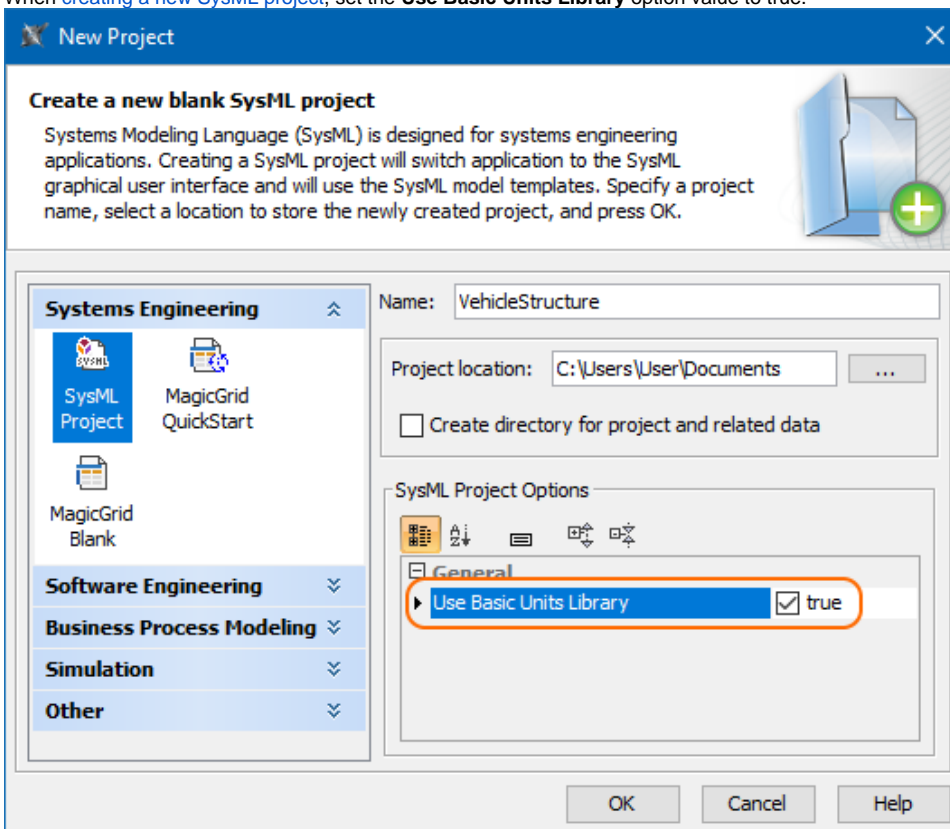
- Directly on Value Property symbol: select the Value Property symbol and click the **ISO** button on the smart manipulator toolbar.
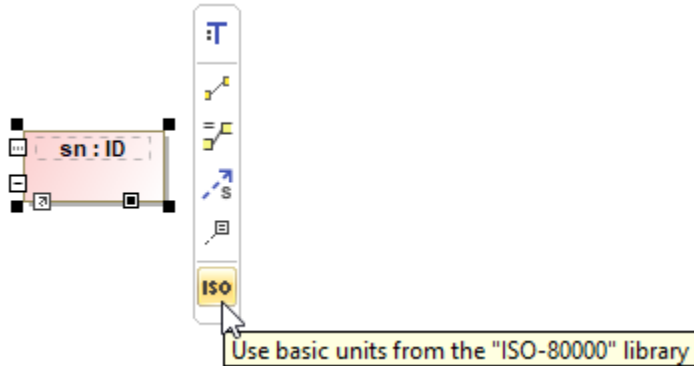
The basic units library is loaded including two *Basic Unit Categories* and *Basic Units* Dependency Matrices.
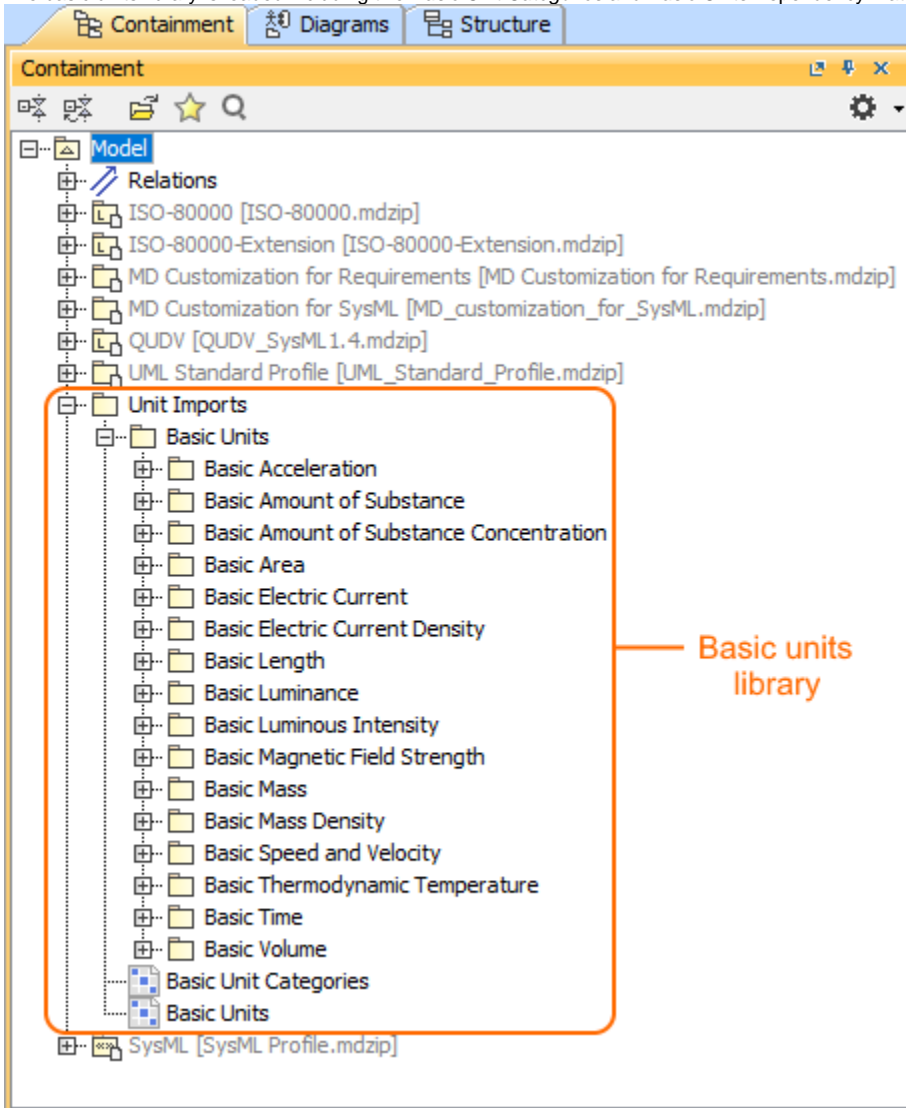
The *Basic Unit Categories* and *Basic Units* matrices, shown in the following figure, allow to manage imports for a project. You can create or delete the relationships in the matrices in order to include or remove the units you have to use. Learn how to modify a Dependency Matrix >>

Basic Units ✕

◀ ▶ | 🔡 | 📝 | 🗑 Delete | 🖳 Remove From Matrix | 🔲 Change Axes 🔳 Export | 🔄 | ⚙ ▾ | ▲ | 🔍

▷ ▾

Criteria

Row Element Type:	Value Type	...	Column Element Type:	Package	...
Row Scope:	ISO-80000-Extension,ISO-80000 {}ᴬᵧ	...	Column Scope:	Basic Units {}ᴬᵧ	...
Dependency Criteria:	Element Import	...	Direction: Column to row ⌄	Show Elements: With relations ⌄

Legend

↗ Element Import

Basic Units

Column headers (rotated):
Basic Acceleration, Basic Amount of Substance, Basic Amount of Substance Concentration, Basic Area, Basic Electric Current, Basic Electric Current Density, Basic Length, Basic Luminance, Basic Luminous Intensity, Basic Magnetic Field Strength, Basic Mass, Basic Mass Density, Basic Speed and Velocity, Basic Thermodynamic Temperature, Basic Time, Basic Volume

Row	Acc	AoS	AoSC	Area	ElecCur	ElecCurD	Length	Lumin	LumInt	MagFld	Mass	MassD	Speed	Temp	Time	Vol
⊟ ISO-80000	2	2	2	2	3	2	7	2	2	2	4	2	4	2	2	2
⊞ Quantities [ISO80000-3 Space and Time]	2			2			7						4		2	2
⊟ Quantities [ISO80000-4 Mechanics]											4	2				
⊟ mass											4					
V mass	1										↙					
V mass[gram]	1										↙					
V mass[kilogram]	1										↙					
V mass[milligram]	1										↙					
⊟ mass density												2				
V mass density	1											↙				
V mass density[kilogram per cubic metre]	1											↙				
⊟ Quantities [IEC80000-6 Electromagnetism]					3	2				2						
⊟ electric current					3											
V electric current	1				↙											
V electric current[ampere]	1				↙											
V electric current[milliampere]	1				↙											
⊟ electric current density						2										
V electric current density	1					↙										
V electric current density[ampere per square metre]	1					↙										
⊟ magnetic field strength										2						
V magnetic field strength	1									↙						
V magnetic field strength[ampere per metre]	1									↙						

Related pages

- Managing project usages