3D SymbolDesigner

Manual

Copyright

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Introduction

3D SymbolDesigner enables customers to graphically author their symbols for plant design software like Intergraph® SmartPlant® 3D without programming knowledge. **3D SymbolDesigner** is designed to meet customer needs in symbol development activities including an interactive graphical design environment, import functionality from sources like Microstation DGN files and export to a variety of data formats (e.g. Visual Basic projects and Excel bulk load sheets for Intergraph SmartPlant 3D). **3D SymbolDesigner** is based on an open, scalable architecture. Symbol data and symbol variants are stored in Excel files and can be edited with Microsoft® Office or external automation software.

Installation

Setup

Requirements:

- Supported operating systems:
    - Microsoft Windows XP
    - Microsoft Windows Server 2003
    - Microsoft Windows Vista
    - Microsoft Windows 7 or later
- Microsoft Office XP or later (32-bit only)
- Microsoft .NET Framework 3.5 or later
- Microsoft Visual Basic 98 or Visual Basic 2010 and higher
- OpenGl supporting graphics card. Note: Virtual Machines might only emulate OpenGl and cause problems with the rendering, stability and performance of 3D SymbolDesigner.

Optional:

- Intergraph Smart 3D (to compile .NET symbols Smart 3D 2014.R1 or higher is needed)

Administrator rights are required on each computer to install CAXperts **3D SymbolDesigner**. “Run as” is not supported.

Uninstall

To uninstall the software, select **Control panel** from the start menu. Then on

- Windows 7-10: in large or small icon view, click **Programs and features**. If you're using category view, under **Programs**, click **Uninstall a program**.
- Windows Vista: in classic view, double-click **Programs and features**. In control panel home view, under **Programs**, click **Uninstall a program**.
- Windows XP/2000: (Double) click the **Add or remove programs** icon.

Select the program you want to remove, and click Uninstall/Remove. Alternatively, right-click the program and select **Uninstall**.

Setup command line (for administrators)

The following command line options are supported by the installer:

/S:<<optional ini file>>

Allow an install to be run in silent mode. As a result, no screens or dialogs will be shown.

This command line option also has an optional INI file that can be passed containing session variable values. For example:

"C:\output\setup.exe" "/S:C:\setupvars.ini"

This will cause the session variables in the INI file to be used for the setup. The INI file should be in the format:

[SetupValues]

%AppFolder%=C:\Program Files\MyProduct

/U:<<XML config file>>

This command line option must be used when calling the uninstall program from the command line. This command also has an optional XML file that can be passed containing session variable values. For example:

"C:\Program Files\MyProduct\uninstall.exe" "/U:C:\Program Files\MyProduct\irunin.xml"

Licence

CAXperts software supports two types of licences:

Site licence (local)

Domain based licences are restricted to machines within a 5 miles (8 kilometres) radius at a specific geographic location (building) for which the licence key file was issued for. There is no limitation regarding the number of users or machines.

CAXperts will need your **Current domain name** to issue a licence file (.lic).

The licence file has to be stored on a local or network location accessible by the machine running the CAXperts product; a licence server is not required.

The location of the licence file should be defined on every machine with the CAXperts product installed, which can be done

- Either by setting the environment variable CAXPERTS_LICENSE_FILE=C:\Program Files (x86)\CAXperts\Licensing\
- Or by setting the registry key HKEY_CURRENT_USER\Software\FLEXlm License Manager\CAXPERTS_LICENSE_FILE=C:\Program Files (x86)\CAXperts\Licensing\

Multiple licence key file locations should be separated by semicolons (";").

Note: If the licence key file location is not defined, “C:\Program Files (x86)\CAXperts\Licensing\” is used

Note: The licence key file may be renamed (including the extension). The CAXperts product will check the content of all files in the licence folder(s) for valid keys.

Note: Changes to the key path (in the environment variable or registry key) are read during the next start of the CAXperts product.

Floating (server) licence

Floating licences require a FlexNET server (lmadmin or lmgrd) accessible by the machine running the CAXperts product. The licence key file is typically located on the FlexNET server machine. The licence key file defines the maximum number of seats which can be used at the same time.

Every running instance of the CAXperts software product will require one seat, no matter if the application is running multiple times on the same or different machine(s).

New instances can only be started as long as seats are available and the FlexNET server is accessible.

The location of the licence server must be defined on every machine with the CAXperts product installed, which can be done

- Either by setting the environment variable
  CAXPERTS_LICENSE_FILE=@YourServerName
- Or by setting the registry key
  HKEY_CURRENT_USER\Software\FLEXlm License Manager\CAXPERTS_LICENSE_FILE=@YourServerName

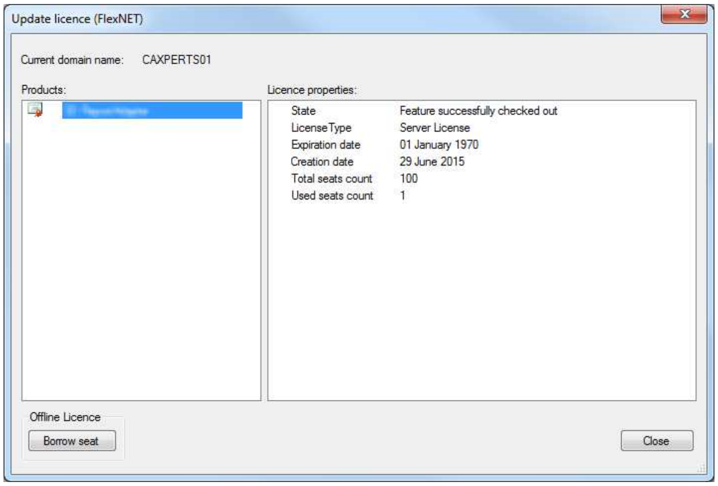
Every computer name must be preceded by the @ symbol. Multiple licence server locations should be separated by semicolons (“;”).

YourServerName is the Windows computer name of the machine running lmadmin (FlexNET server). If lmadmin is running on a non-default port, the port number should be defined like this: port@ YourServerName.

Note: Changes to the server path (in the environment variable or registry key) are read during the next start of the CAXperts product.

Borrowed licences

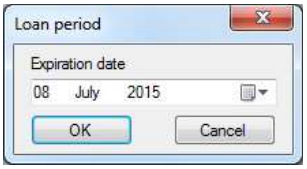
Licence seats can be borrowed for a period of time from the server and saved to the local machine. Once the seat has been borrowed the CAXperts application can be used without any connection to the FlexNET server.



Current domain name: CAXPERTS01

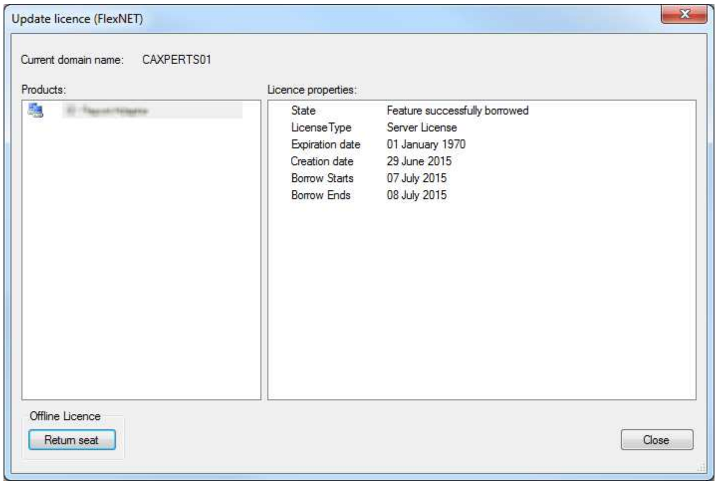
State	Feature successfully checked out
LicenseType	Server License
Expiration date	01 January 1970
Creation date	29 June 2015
Total seats count	100
Used seats count	1

To borrow a licence seat press the **Borrow seat** button, define the loan period (up to 7 days) and press OK. When the borrowed seat expires it gets automatically returned back to the FlexNET server.



Expiration date: 08 July 2015

The seat can be returned earlier by pressing the **Return borrowed seat** button.



Current domain name: CAXPERTS01

State	Feature successfully borrowed
LicenseType	Server License
Expiration date	01 January 1970
Creation date	29 June 2015
Borrow Starts	07 July 2015
Borrow Ends	08 July 2015

Note: Without a valid licence file the software will run in demo mode.

3D SymbolDesigner

3D SymbolDesigner is a high-level symbol definition modeller. Graphical primitives may be parameterised; dimensions, position and rotation in space can be defined by formulas. **3D SymbolDesigner** is case-sensitive, so be careful when typing names and formulas. All symbol data are stored in XML-structures which may also be exported.

Users may also define several variants of a symbol which can be stored in an Excel file together with the symbol geometry.

We recommend the user to read the tank-with-nozzles tutorial first even if he or she intends to build symbols for other disciplines.

> Note – attributes and their interfaces are stored in Config.xls in the data subdirectory of your **3D SymbolDesigner** installation. Add parameters that are not already included at the end of the **Attributes** tab of Config.xls. **3D SymbolDesigner** will check the parameter mapping (last line in the table of variants) against these attributes and will mark all spelling errors and missing attributes with red background.

Sample **3D SymbolDesigner** projects can be found in the Samples sub-folder of your **3D SymbolDesigner** program folder. These projects are included:

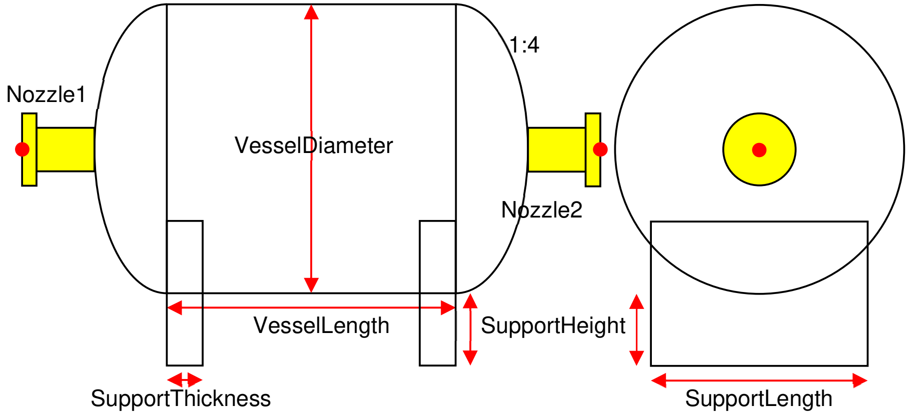
Project	Discipline	Level	Remarks
Angle	Piping (spec)	***	Includes manually created bulkload sheet examples
Compensator	Piping (spec)	****	No bulkload sheets available
CustomInstrument	Piping (custom instruments)	**	Sample bulkload sheets will be created by 3D SymbolDesigner (custom instrument tutorial)
GateValveHandWheel	Piping (spec)	***	Contains two projects, sample bulkload sheets included
Tank	Equipment	*	Sample bulkload sheets will be created by 3D SymbolDesigner (basic tutorial)
Tee	Piping (spec)	***	Includes manually created bulkload sheet examples and a SymbolIcon

Basic tutorial: tank with nozzles

This tutorial explains how to build and bulkload a storage tank symbol for **SmartPlant 3D**.

1. Find out which parameter names you need to parameterise the symbol in **SmartPlant 3D**. Standard names may be found on the **CustomInterfaces** tab of C:\Program Files\SmartPlant\3D\CatalogData\BulkLoad\Datafiles\Equipment.xls. You will find

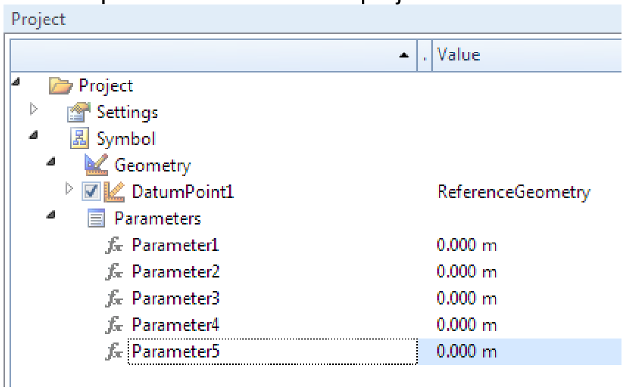
these names also on the Attributes tab of **3D SymbolDesigner's** Config.xls.



2. Open **3D SymbolDesigner**

3. Open a new symbol project (🗋 in the **File** menu)

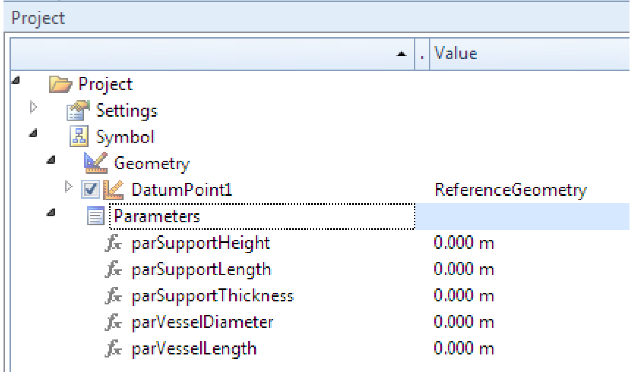
4. We need five parameters: *parVesselLength, parVesselDiameter, parSupportLength, parSupportHeight, parSupportThickness*. First of all you must select the Parameters item in the menu tree. Then press the **Parameter** button (*fx*) five times. This adds five new parameter items to the project tree:



Project

	Value
Project	
Settings	
Symbol	
Geometry	
☑ DatumPoint1	ReferenceGeometry
Parameters	
Parameter1	0.000 m
Parameter2	0.000 m
Parameter3	0.000 m
Parameter4	0.000 m
Parameter5	0.000 m

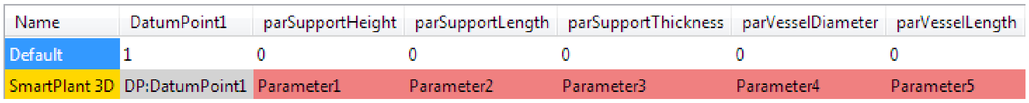
5. Rename the parameters: click on Parameter1 in the menu tree (press F2 if necessary), and enter **parVesselLength**. Repeat this for Parameter2 to Parameter5 with **parVesselDiameter** etc.:



Project

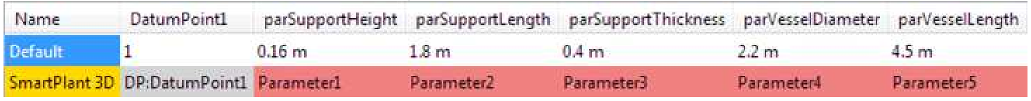
	Value
Project	
Settings	
Symbol	
Geometry	
☑ DatumPoint1	ReferenceGeometry
Parameters	
parSupportHeight	0.000 m
parSupportLength	0.000 m
parSupportThickness	0.000 m
parVesselDiameter	0.000 m
parVesselLength	0.000 m

6. The table of variants should now look like:



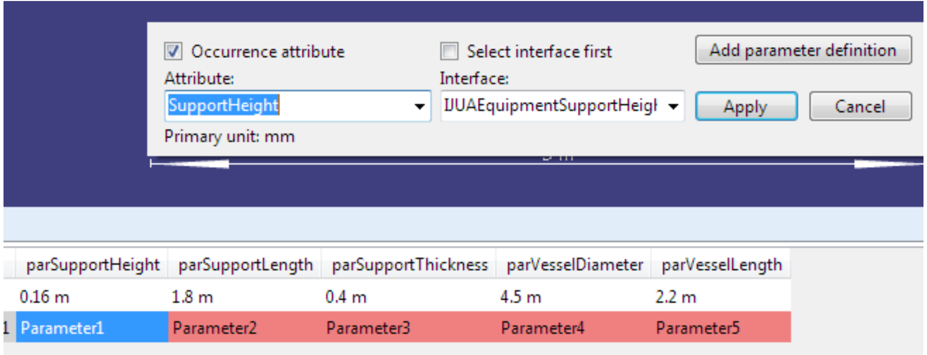
Name	DatumPoint1	parSupportHeight	parSupportLength	parSupportThickness	parVesselDiameter	parVesselLength
Default	1	0	0	0	0	0
SmartPlant 3D	DP:DatumPoint1	Parameter1	Parameter2	Parameter3	Parameter4	Parameter5

Now enter the default values for the parameters into the table:



Name	DatumPoint1	parSupportHeight	parSupportLength	parSupportThickness	parVesselDiameter	parVesselLength
Default	1	0.16 m	1.8 m	0.4 m	2.2 m	4.5 m
SmartPlant 3D	DP:DatumPoint1	Parameter1	Parameter2	Parameter3	Parameter4	Parameter5

7. Rename the “Default” variant and rename the SmartPlant 3D parameter mappings: select the Parameter1 cell and click the right mouse button. In the context menu select the **Set SmartPlant 3D attribute**. Choose the right attribute in the list box, check the **Occurrence attribute** and press the **Apply** button (add OA: in front of the parameter name, if the parameter is an occurrence attribute, i.e. an attribute which may be modified at runtime in SmartPlant 3D). Repeat this for Parameter2 to Parameter5. 3D SymbolDesigner checks the spelling.



☑ Occurrence attribute ☐ Select interface first

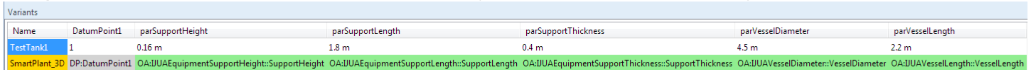
Attribute: SupportHeight

Interface: IJUAEquipmentSupportHeigl

Primary unit: mm

	parSupportHeight	parSupportLength	parSupportThickness	parVesselDiameter	parVesselLength
	0.16 m	1.8 m	0.4 m	4.5 m	2.2 m
1	Parameter1	Parameter2	Parameter3	Parameter4	Parameter5

8. The parameters now are valid and the background colour turned to green:

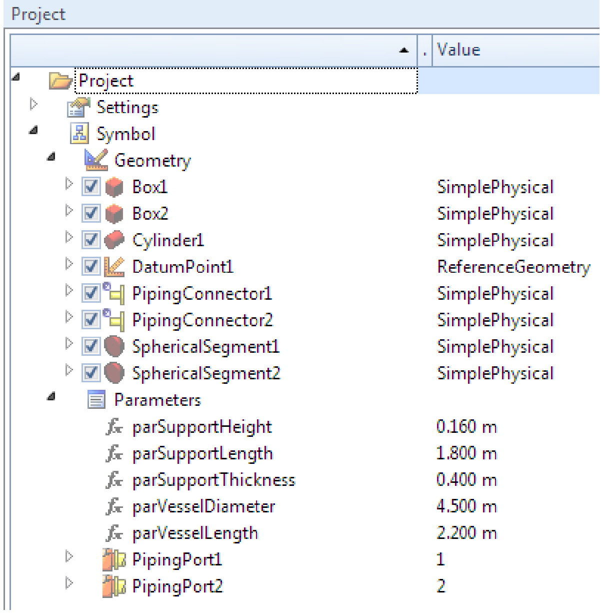


Variants

Name	DatumPoint1	parSupportHeight	parSupportLength	parSupportThickness	parVesselDiameter	parVesselLength
TestTank1	1	0.16 m	1.8 m	0.4 m	4.5 m	2.2 m
SmartPlant_3D	DP:DatumPoint1	OA:IJUAEquipmentSupportHeight::SupportHeight	OA:IJUAEquipmentSupportLength::SupportLength	OA:IJUAEquipmentSupportThickness::SupportThickness	OA:IJUAVesselDiameter::VesselDiameter	OA:IJUAVesselLength::VesselLength

9. Select the Project.Symbol.Parameters node and click twice on the **Add piping port (bolted preset)** toolbar icon () to add two pipe ports and twice on the **Add piping connector** button () to add two nozzles.

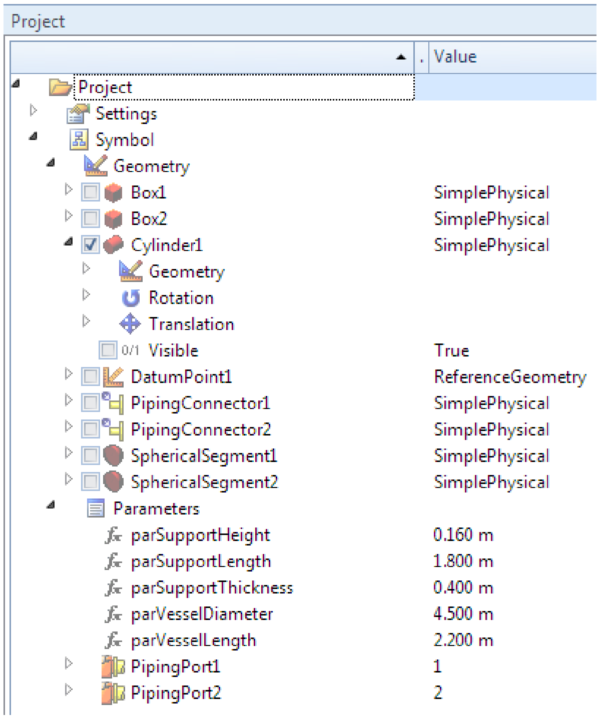
10. Click twice on the **Spherical Segment** button (), once on the **Cylinder** button () and twice on the **Box** button () to add the primitives for the tank geometry. The symbol tree should now look like:



Project

	Value
Project	
Settings	
Symbol	
Geometry	
☑ Box1	SimplePhysical
☑ Box2	SimplePhysical
☑ Cylinder1	SimplePhysical
☑ DatumPoint1	ReferenceGeometry
☑ PipingConnector1	SimplePhysical
☑ PipingConnector2	SimplePhysical
☑ SphericalSegment1	SimplePhysical
☑ SphericalSegment2	SimplePhysical
Parameters	
parSupportHeight	0.160 m
parSupportLength	1.800 m
parSupportThickness	0.400 m
parVesselDiameter	4.500 m
parVesselLength	2.200 m
PipingPort1	1
PipingPort2	2

11. Uncheck (i.e. hide) all primitives except Cylinder1 and expand the Cylinder1 node in the menu tree:



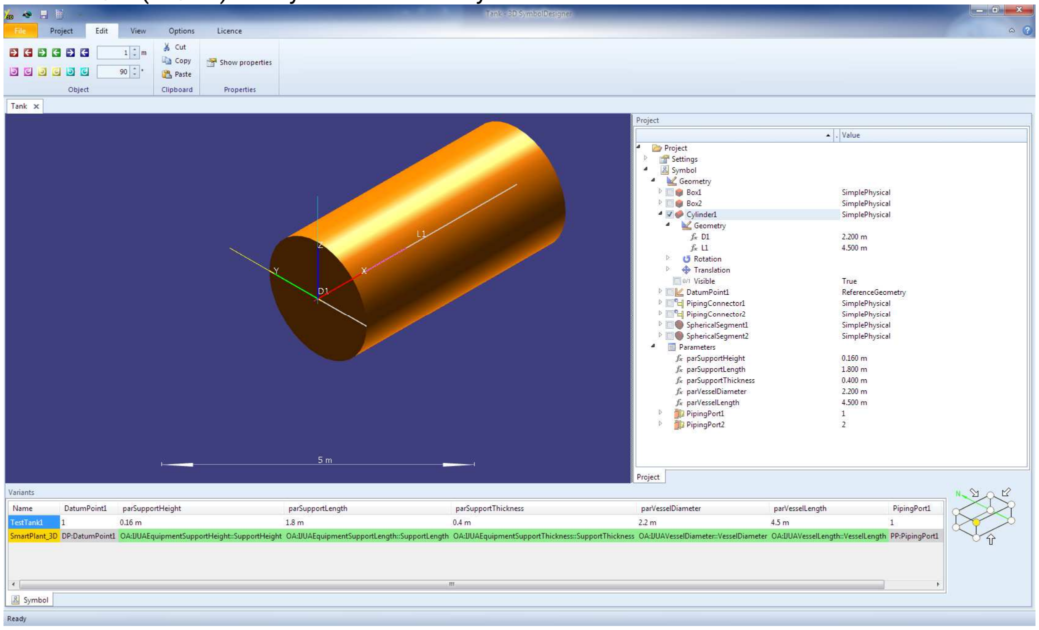
Project

	Value
Project	
Settings	
Symbol	
Geometry	
□ Box1	SimplePhysical
□ Box2	SimplePhysical
☑ Cylinder1	SimplePhysical
Geometry	
Rotation	
Translation	
□ 0/1 Visible	True
□ DatumPoint1	ReferenceGeometry
□ PipingConnector1	SimplePhysical
□ PipingConnector2	SimplePhysical
□ SphericalSegment1	SimplePhysical
□ SphericalSegment2	SimplePhysical
Parameters	
parSupportHeight	0.160 m
parSupportLength	1.800 m
parSupportThickness	0.400 m
parVesselDiameter	4.500 m
parVesselLength	2.200 m
PipingPort1	1
PipingPort2	2

12. Enter **parVesselLength** into the formula for the cylinder's length (L1)

13. Enter **parVesselDiameter** into D1.

14. Zoom out/in (🔍/🔍) until you see the full cylinder in the view:



Project

	Value
Project	
Settings	
Symbol	
Geometry	
□ Box1	SimplePhysical
□ Box2	SimplePhysical
☑ Cylinder1	SimplePhysical
Geometry	
D1	2.200 m
L1	4.500 m
Rotation	
Translation	
□ 0/1 Visible	True
□ DatumPoint1	ReferenceGeometry
□ PipingConnector1	SimplePhysical
□ PipingConnector2	SimplePhysical
□ SphericalSegment1	SimplePhysical
□ SphericalSegment2	SimplePhysical
Parameters	
parSupportHeight	0.160 m
parSupportLength	1.800 m
parSupportThickness	0.400 m
parVesselDiameter	2.200 m
parVesselLength	4.500 m
PipingPort1	1
PipingPort2	2

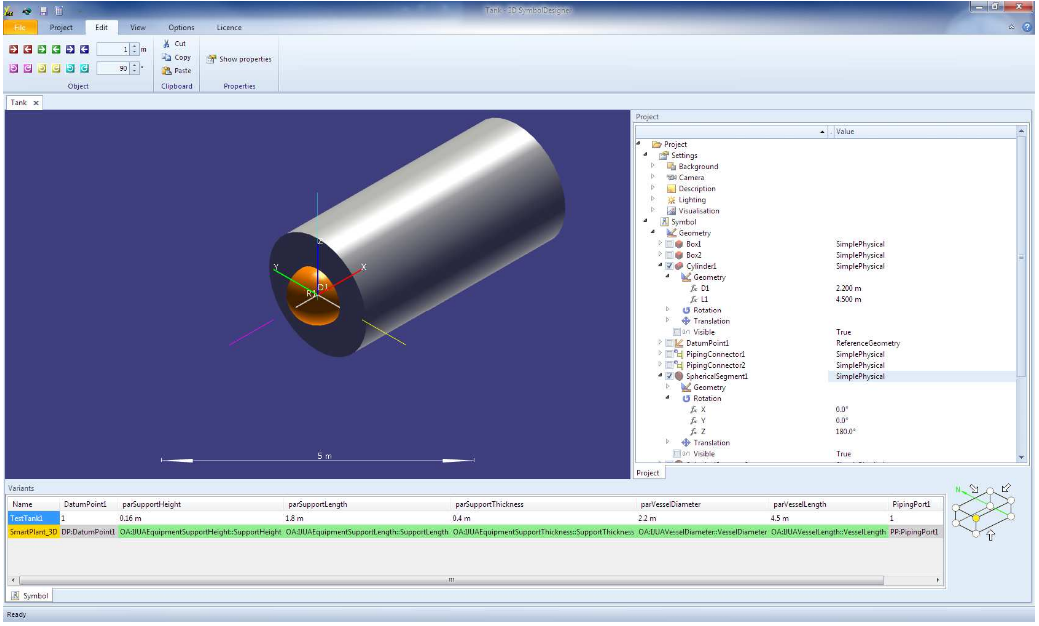
Project

Variants

Name	DatumPoint1	parSupportHeight	parSupportLength	parSupportThickness	parVesselDiameter	parVesselLength	PipingPort1
TestTank1	1	0.16 m	1.8 m	0.4 m	2.2 m	4.5 m	1
SmartPlant_3D	DP:DatumPoint1	OA:IJUAEquipmentSupportHeight::SupportHeight	OA:IJUAEquipmentSupportLength::SupportLength	OA:IJUAEquipmentSupportThickness::SupportThickness	OA:IJUAVesselDiameter::VesselDiameter	OA:IJUAVesselLength::VesselLength	PP:PipingPort1

Symbol

15. Check SphericalSegment1 and enter **180 deg** or **180°** into the formula of Rotation.Z: The semisphere is now visible on the left side of the cylinder:



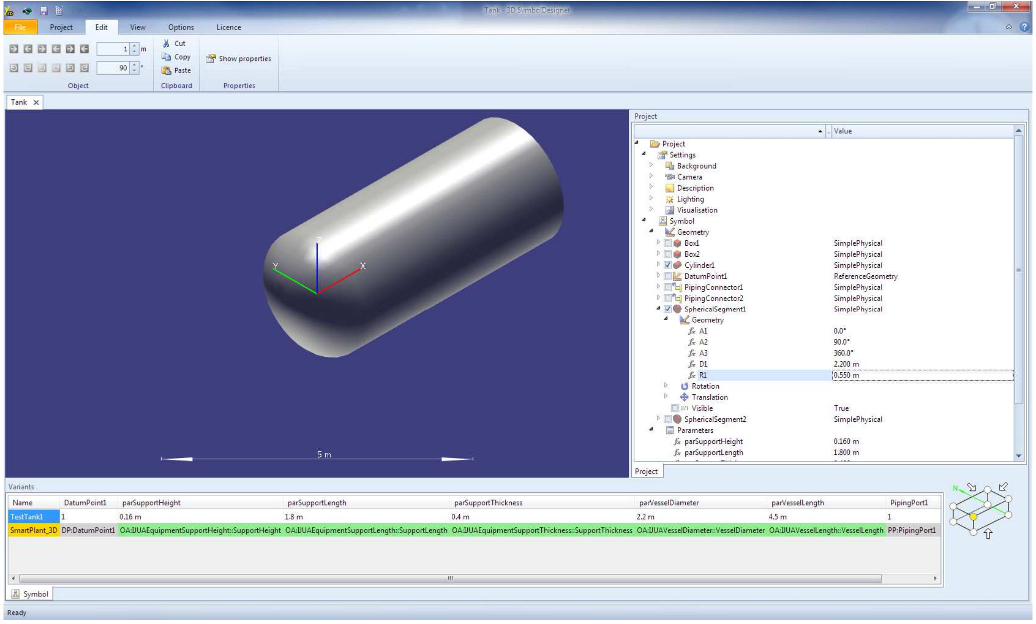
Project

	Value
Project	
Settings	
Background	
Camera	
Description	
Lighting	
Visualisation	
Symbol	
Geometry	
☐ Box1	SimplePhysical
☐ Box2	SimplePhysical
☑ Cylinder1	SimplePhysical
Geometry	
D1	2.200 m
L1	4.500 m
Rotation	
Translation	
Visible	True
☐ DatumPoint1	ReferenceGeometry
☐ PipingConnector1	SimplePhysical
☐ PipingConnector2	SimplePhysical
☑ SphericalSegment1	SimplePhysical
Geometry	
Rotation	
X	0.0°
Y	0.0°
Z	180.0°
Translation	
Visible	True

Variants

Name	DatumPoint1	parSupportHeight	parSupportLength	parSupportThickness	parVesselDiameter	parVesselLength	PipingPort1
TestTank1	1	0.16 m	1.8 m	0.4 m	2.2 m	4.5 m	1
SmartPlant_3D	DP:DatumPoint1	OA:IJUAEquipmentSupportHeight::SupportHeight	OA:IJUAEquipmentSupportLength::SupportLength	OA:IJUAEquipmentSupportThickness::SupportThickness	OA:IJUAVesselDiameter::VesselDiameter	OA:IJUAVesselLength::VesselLength	PP:PipingPort1

16. Enter **parVesselDiameter** into Geometry.D1 and **parVesselDiameter / 4** into Geometry.R1:



Project

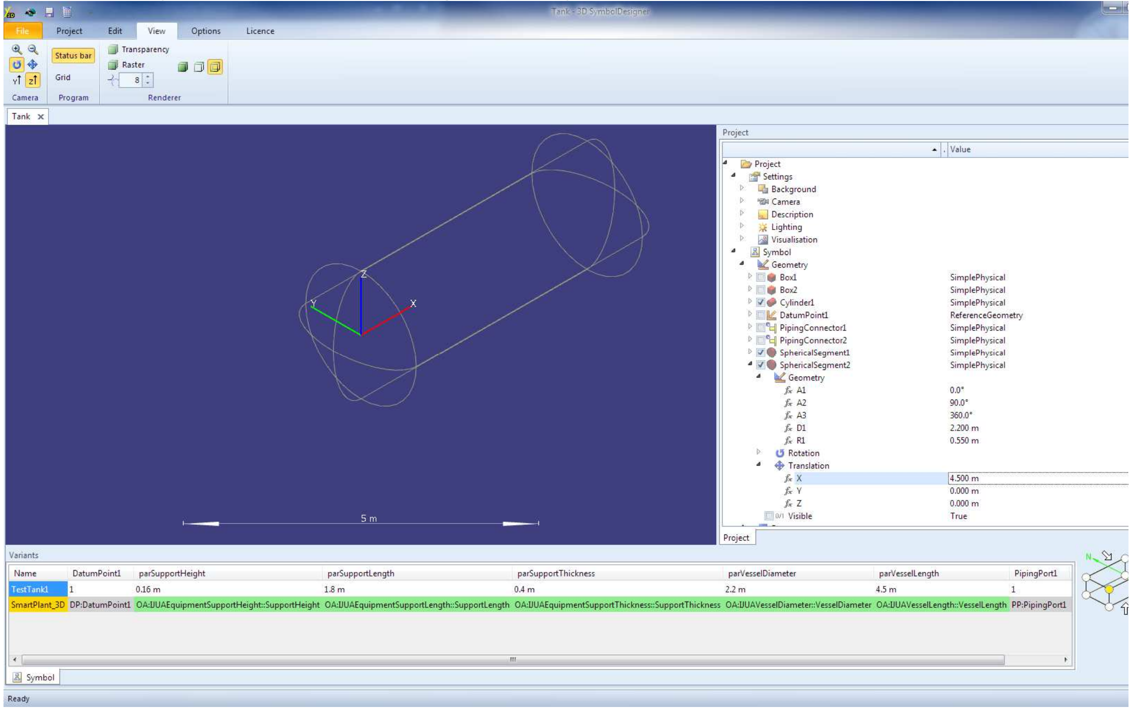
	Value
Project	
Settings	
Background	
Camera	
Description	
Lighting	
Visualisation	
Symbol	
Geometry	
☐ Box1	SimplePhysical
☐ Box2	SimplePhysical
☑ Cylinder1	SimplePhysical
☐ DatumPoint1	ReferenceGeometry
☐ PipingConnector1	SimplePhysical
☐ PipingConnector2	SimplePhysical
☑ SphericalSegment1	SimplePhysical
Geometry	
A1	0.0°
A2	90.0°
A3	360.0°
D1	2.200 m
R1	0.550 m
Rotation	
Translation	
Visible	True
☐ SphericalSegment2	SimplePhysical
Parameters	
parSupportHeight	0.160 m
parSupportLength	1.800 m

Variants

Name	DatumPoint1	parSupportHeight	parSupportLength	parSupportThickness	parVesselDiameter	parVesselLength	PipingPort1
TestTank1	1	0.16 m	1.8 m	0.4 m	2.2 m	4.5 m	1
SmartPlant_3D	DP:DatumPoint1	OA:IJUAEquipmentSupportHeight::SupportHeight	OA:IJUAEquipmentSupportLength::SupportLength	OA:IJUAEquipmentSupportThickness::SupportThickness	OA:IJUAVesselDiameter::VesselDiameter	OA:IJUAVesselLength::VesselLength	PP:PipingPort1

17. Switch to wireframe mode ( ) and tick the SphericalSegment2 node, enter **parVesselDiameter** into Geometry.D1, **parVesselDiameter / 4** into Geometry.R1 and

parVesselLength into Translation.X of SphericalSegment2:



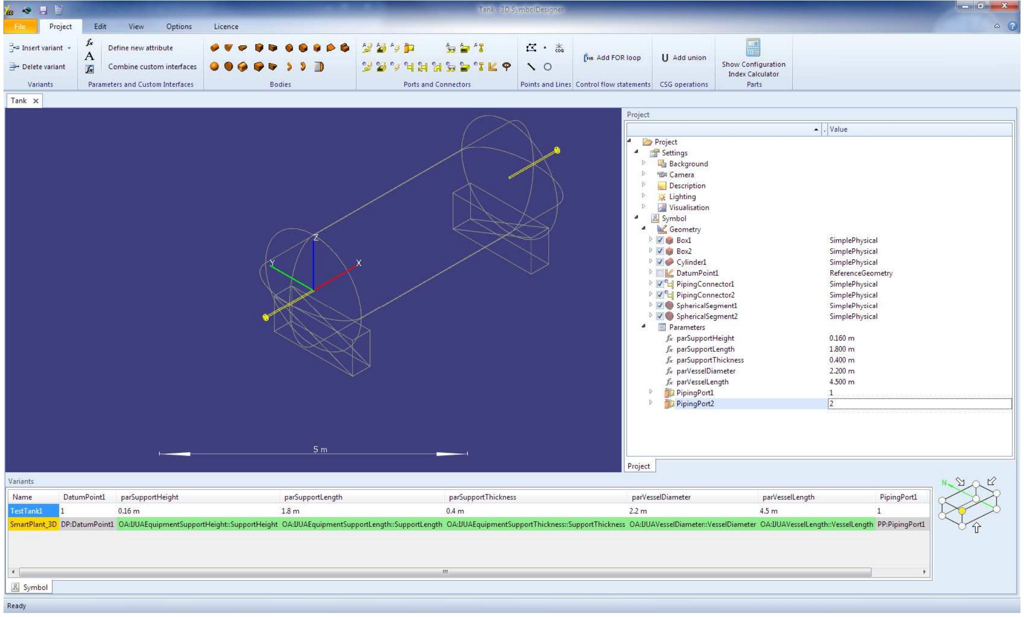
Project	Value
Project	
Settings	
Background	
Camera	
Description	
Lighting	
Visualisation	
Symbol	
Geometry	
☐ Box1	SimplePhysical
☐ Box2	SimplePhysical
☑ Cylinder1	SimplePhysical
☐ DatumPoint1	ReferenceGeometry
☐ PipingConnector1	SimplePhysical
☐ PipingConnector2	SimplePhysical
☑ SphericalSegment1	SimplePhysical
☑ SphericalSegment2	SimplePhysical
Geometry	
A1	0.0°
A2	90.0°
A3	360.0°
D1	2.200 m
R1	0.550 m
Rotation	
Translation	
X	4.500 m
Y	0.000 m
Z	0.000 m
Visible	True

Variants

Name	DatumPoint1	parSupportHeight	parSupportLength	parSupportThickness	parVesselDiameter	parVesselLength	PipingPort1
TestTank1	1	0.16 m	1.8 m	0.4 m	2.2 m	4.5 m	1
SmartPlant_3D	DP:DatumPoint1	OA:IJUAEquipmentSupportHeight::SupportHeight	OA:IJUAEquipmentSupportLength::SupportLength	OA:IJUAEquipmentSupportThickness::SupportThickness	OA:IJUAVesselDiameter::VesselDiameter	OA:IJUAVesselLength::VesselLength	PP:PipingPort1

18. Tick the Box1 and Box2 nodes and enter **parSupportThickness** into Geometry.L1 and **parSupportLength** into Geometry.L3 of both boxes. The supports should reach into the tank, so the formula for Geometry.L2 of both boxes is **parVesselDiameter / 4 + parSupportHeight**.
19. The formula for Translation.Z of both boxes is **- 3 * parVesselDiameter / 8 - parSupportHeight / 2**
20. Enter **parVesselLength** into Translation.X of Box2 to translate the box
21. Rotate Box2 by entering **180 deg** into its Rotation.Z
22. Tick PipingConnector1 and PipingConnector2. Rotate PipingConnector1 by entering **180 deg** into its Rotation.Z
23. Enter **- parVesselDiameter / 2** into Translation.X of PipingConnector1
24. Enter **parVesselLength + parVesselDiameter / 2** into Translation.X of PipingConnector2
25. Set Geometry.L1 of PipingConnector1 and PipingConnector2 to **parVesselDiameter / 2**

26. The modelling of the tank symbol is now finished:



Project

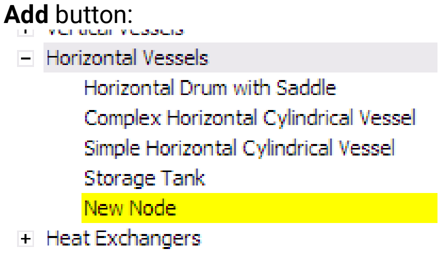
	Value
Project	
Settings	
Background	
Camera	
Description	
Lighting	
Visualisation	
Symbol	
Geometry	
☑ Box1	SimplePhysical
☑ Box2	SimplePhysical
☑ Cylinder1	SimplePhysical
□ DatumPoint1	ReferenceGeometry
☑ PipingConnector1	SimplePhysical
☑ PipingConnector2	SimplePhysical
☑ SphericalSegment1	SimplePhysical
☑ SphericalSegment2	SimplePhysical
Parameters	
parSupportHeight	0.160 m
parSupportLength	1.800 m
parSupportThickness	0.400 m
parVesselDiameter	2.200 m
parVesselLength	4.500 m
PipingPort1	1
PipingPort2	2

Variants

Name	DatumPoint1	parSupportHeight	parSupportLength	parSupportThickness	parVesselDiameter	parVesselLength	PipingPort1
TestTank1	1	0.16 m	1.8 m	0.4 m	2.2 m	4.5 m	1
SmartPlant_3D	DP:DatumPoint1	OA:IJUAEquipmentSupportHeight::SupportHeight	OA:IJUAEquipmentSupportLength::SupportLength	OA:IJUAEquipmentSupportThickness::SupportThickness	OA:IJUAVesselDiameter::VesselDiameter	OA:IJUAVesselLength::VesselLength	PP:PipingPort1

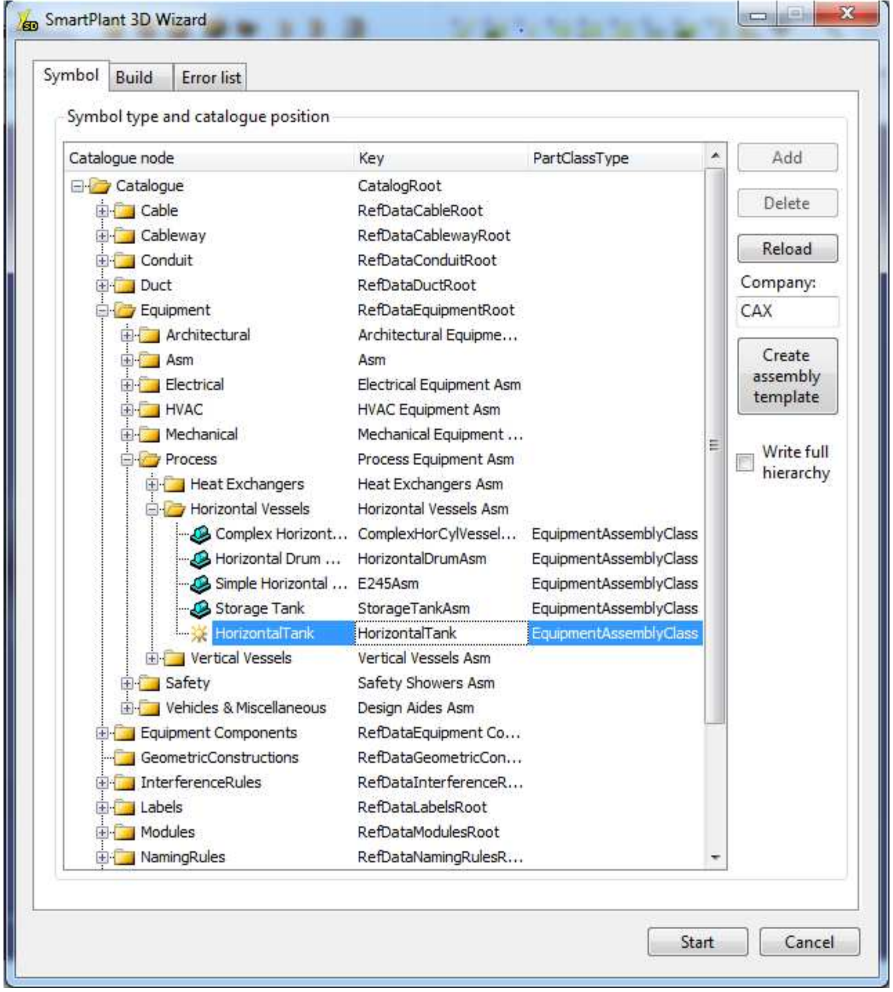
27. Press the toolbar button ( ) to export the symbol to SmartPlant 3D.

28. Select the parent node of the new symbol in the catalogue tree view on the first tab (if you see only a node named “Catalogue”, double click it to open the tree). Press the **Add** button:



- Vertical Vessels
- Horizontal Vessels
  - Horizontal Drum with Saddle
  - Complex Horizontal Cylindrical Vessel
  - Simple Horizontal Cylindrical Vessel
  - Storage Tank
  - New Node
- Heat Exchangers

29. Select the new node and enter the name in the **Catalogue node** column and description of the new symbol class in the **Key** column (e.g. HorizontalTank):



SmartPlant 3D Wizard

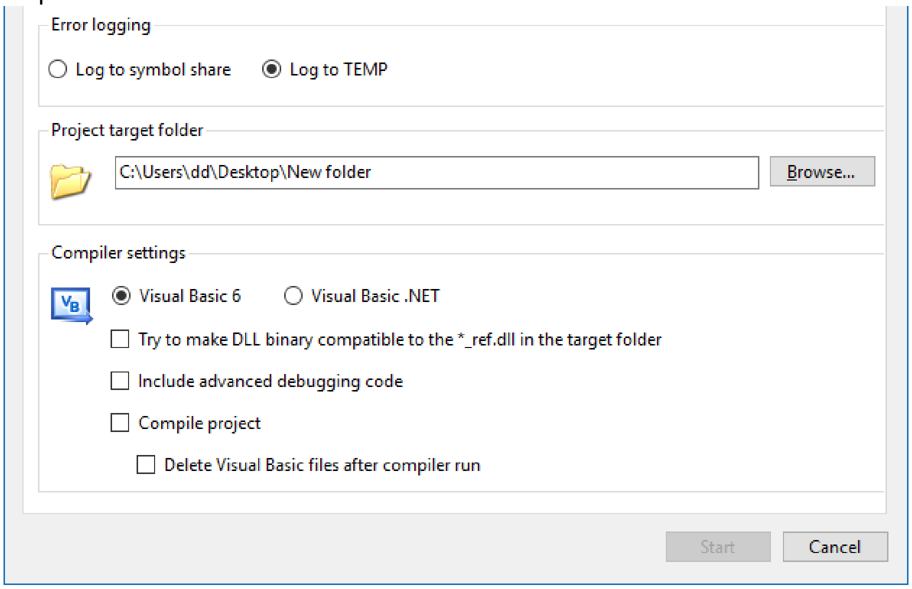
Symbol type and catalogue position

Catalogue node	Key	PartClassType
Catalogue	CatalogRoot	
Cable	RefDataCableRoot	
Cableway	RefDataCablewayRoot	
Conduit	RefDataConduitRoot	
Duct	RefDataDuctRoot	
Equipment	RefDataEquipmentRoot	
Architectural	Architectural Equipme…	
Asm	Asm	
Electrical	Electrical Equipment Asm	
HVAC	HVAC Equipment Asm	
Mechanical	Mechanical Equipment …	
Process	Process Equipment Asm	
Heat Exchangers	Heat Exchangers Asm	
Horizontal Vessels	Horizontal Vessels Asm	
Complex Horizont…	ComplexHorCylVessel…	EquipmentAssemblyClass
Horizontal Drum …	HorizontalDrumAsm	EquipmentAssemblyClass
Simple Horizontal …	E245Asm	EquipmentAssemblyClass
Storage Tank	StorageTankAsm	EquipmentAssemblyClass
HorizontalTank	HorizontalTank	EquipmentAssemblyClass
Vertical Vessels	Vertical Vessels Asm	
Safety	Safety Showers Asm	
Vehicles & Miscellaneous	Design Aides Asm	
Equipment Components	RefDataEquipment Co…	
GeometricConstructions	RefDataGeometricCon…	
InterferenceRules	RefDataInterferenceR…	
Labels	RefDataLabelsRoot	
Modules	RefDataModulesRoot	
NamingRules	RefDataNamingRulesR…	

Company: CAX

☐ Write full hierarchy

30. Keep this item selected and click on the **Build** tab:



Error logging

○ Log to symbol share ● Log to TEMP

Project target folder

C:\Users\dd\Desktop\New folder

Compiler settings

● Visual Basic 6 ○ Visual Basic .NET

☐ Try to make DLL binary compatible to the *_ref.dll in the target folder

☐ Include advanced debugging code

☐ Compile project

☐ Delete Visual Basic files after compiler run

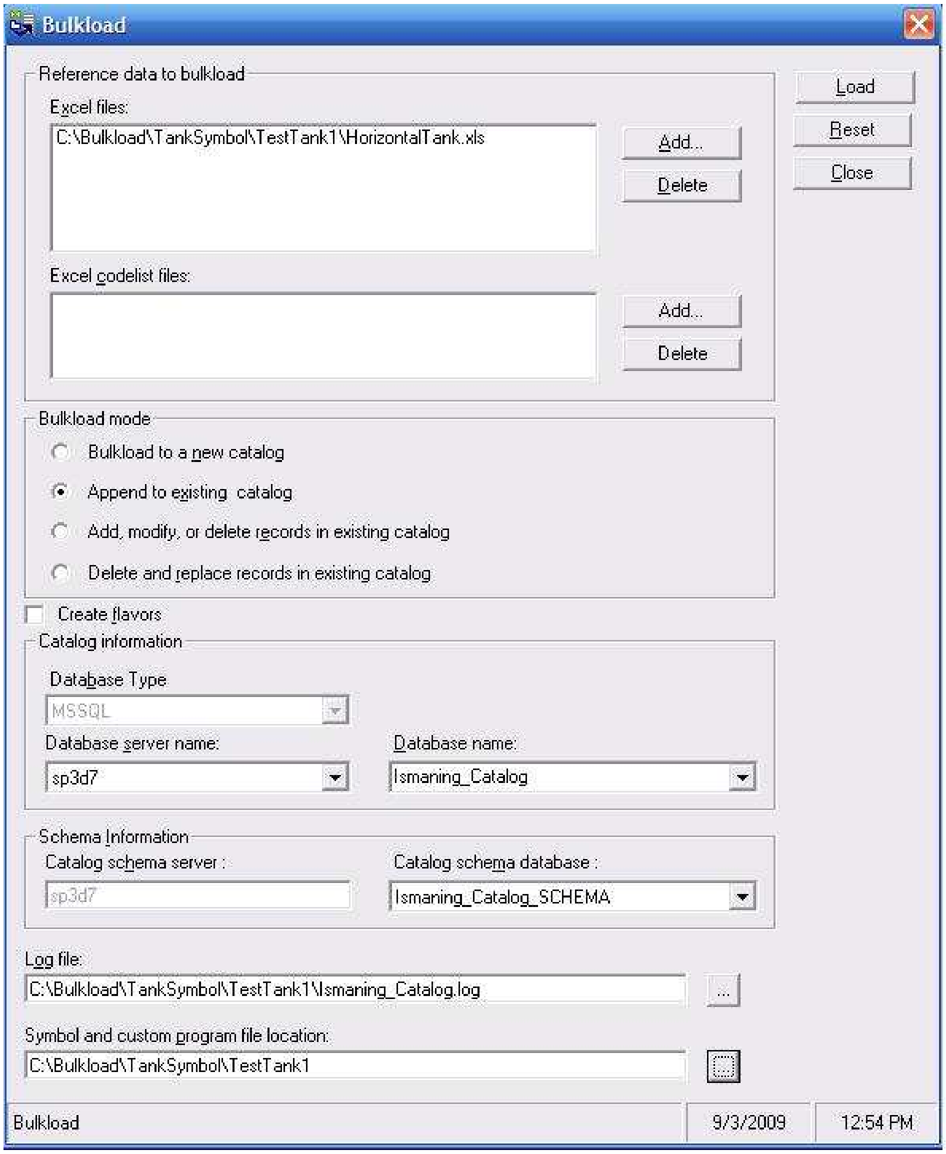
31. Click **Browse…** to select a target folder for the Visual Basic Project and the bulkload sheet.

32. Uncheck all items on the **Compiler settings** frame.

33. When Visual Basic 6 is installed on your machine: Tick **Compile project.**

34. Click on the **Start** button. Before the export starts, **3D SymbolDesigner** checks if the parameters and the used variant names are valid (see *0 Naming rules*). This will avoid afterwards errors during the bulkload process. The occurred errors are shown in the **Error list** tab. By pressing an item of the list the cursor will move to the corresponding cell in the table.
35. Optionally: Export of a 3D PDF datasheet (see: *Export of a 3D PDF datasheet*)

36. Press **OK** to close the **SmartPlant 3D Wizard window**. Now you may close the CAXperts **3D SymbolDesigner** program.
37. If Visual Basic or Visual Basic .NET was not available: Please compile the resulting Visual Basic project on a machine where Visual Basic is installed and "register" the DLL on the target system.
38. Save and bulkload the Excel file using the append mode of the **Bulkload** tool provided with SmartPlant 3D:


Bulkload

Reference data to bulkload

Excel files:

C:\Bulkload\TankSymbol\TestTank1\HorizontalTank.xls

Excel codelist files:

Bulkload mode

○ Bulkload to a new catalog

● Append to existing catalog

○ Add, modify, or delete records in existing catalog

○ Delete and replace records in existing catalog

□ Create flavors

Catalog information

Database Type: MSSQL

Database server name: sp3d7

Database name: Ismaning_Catalog

Schema Information

Catalog schema server : sp3d7

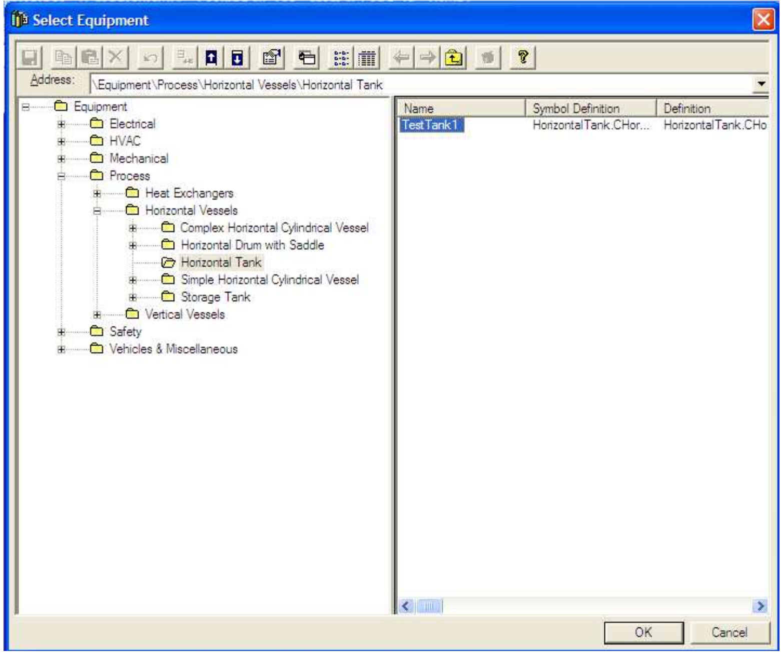
Catalog schema database : Ismaning_Catalog_SCHEMA

Log file: C:\Bulkload\TankSymbol\TestTank1\Ismaning_Catalog.log

Symbol and custom program file location: C:\Bulkload\TankSymbol\TestTank1

Bulkload | 9/3/2009 | 12:54 PM

39. After the bulkload the new symbol is available in the catalogue of SmartPlant 3D:

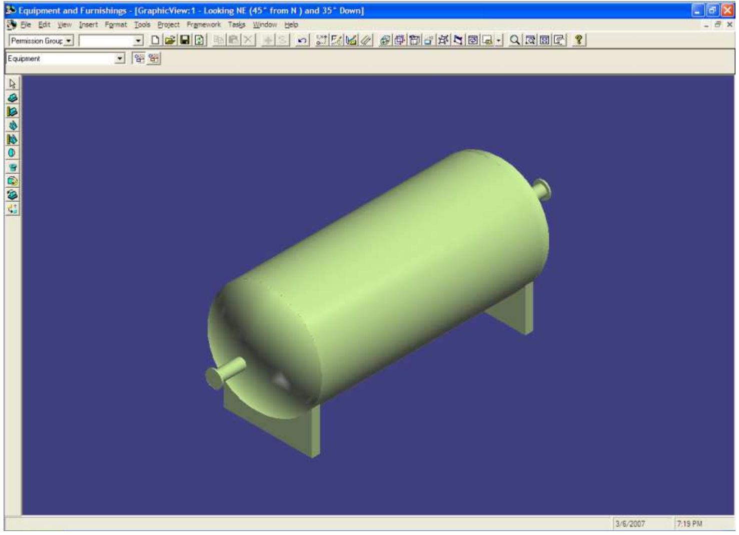


Address: \Equipment\Process\Horizontal Vessels\Horizontal Tank

- Equipment
  - Electrical
  - HVAC
  - Mechanical
  - Process
    - Heat Exchangers
    - Horizontal Vessels
      - Complex Horizontal Cylindrical Vessel
      - Horizontal Drum with Saddle
      - Horizontal Tank
      - Simple Horizontal Cylindrical Vessel
      - Storage Tank
    - Vertical Vessels
  - Safety
  - Vehicles & Miscellaneous

Name	Symbol Definition	Definition
TestTank1	HorizontalTank.CHor...	HorizontalTank.CHo

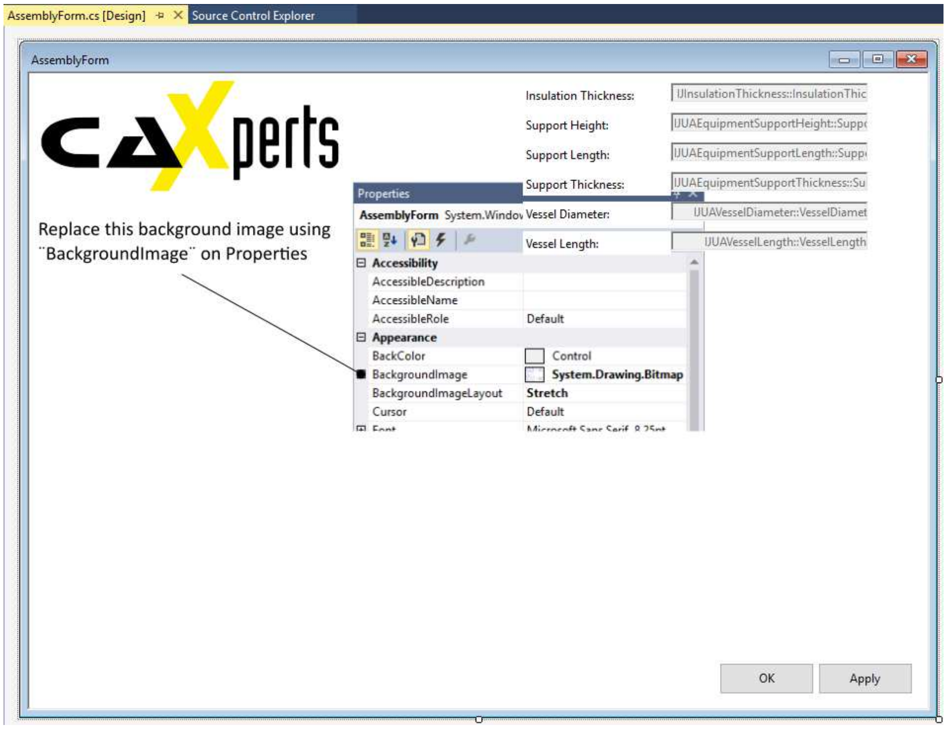
40. After placement, the symbol looks like:


Equipment and Furnishings - [GraphicView:1 - Looking NE (45° from N) and 35° Down]
File Edit View Insert Format Tools Project Framework Tasks Window Help
Permission Group
Equipment
3/6/2007
7:19 PM

Custom forms

Since version 07.00.1602.1704 **3D SymbolDesigner** creates a form definition project template in the export folder of the symbol. The solution/project file can be opened, modified and compiled with the current version of Microsoft C#.

The template lists all available attributes in text/drop-down boxes:



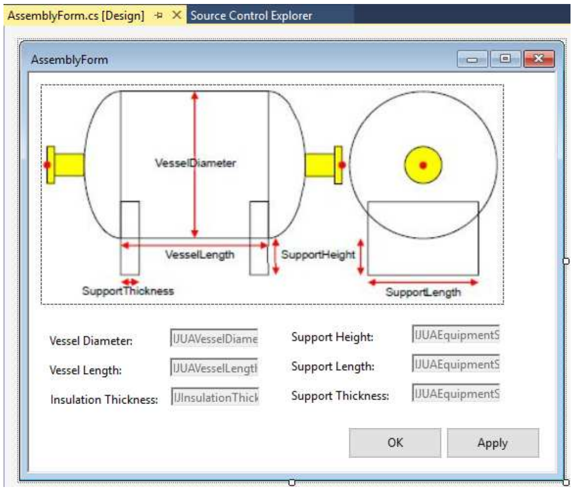
Replace this background image using ¨BackgroundImage¨ on Properties

Insulation Thickness: IJInsulationThickness::InsulationThic
Support Height: IJUAEquipmentSupportHeight::Suppc
Support Length: IJUAEquipmentSupportLength::Suppc
Support Thickness: IJUAEquipmentSupportThickness::Su
Vessel Diameter: IJUAVesselDiameter::VesselDiamet
Vessel Length: IJUAVesselLength::VesselLength

AssemblyForm System.Windov

⊟ **Accessibility**	
AccessibleDescription	
AccessibleName	
AccessibleRole	Default
⊟ **Appearance**	
BackColor	□ Control
BackgroundImage	□ **System.Drawing.Bitmap**
BackgroundImageLayout	**Stretch**
Cursor	Default
⊞ Font	Microsoft Sans Serif, 8.25pt

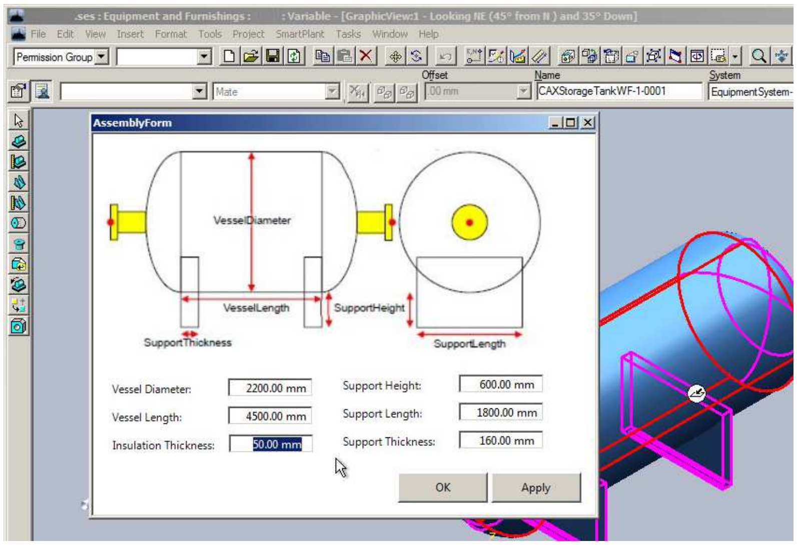
Use the form editing functions of Visual Studio to modify the template, e.g. replace the background image, rearrange the input boxes or change the font size:



Vessel Diameter: IJUAVesselDiame
Vessel Length: IJUAVesselLengtl
Insulation Thickness: IJInsulationThick
Support Height: IJUAEquipmentS
Support Length: IJUAEquipmentS
Support Thickness: IJUAEquipmentS

Build the DLL in Visual Studio, put it on the symbol share and run **Update Custom Symbol Configuration** in the **Smart 3D Project Management**.

Use the attribute **FormDefinition** on the bulkload file of the symbol to assign the form to the symbol. If the bulkload was successful, the custom form () can be used in Smart 3D:


.ses : Equipment and Furnishings : : Variable - [GraphicView:1 - Looking NE (45° from N) and 35° Down]
File Edit View Insert Format Tools Project SmartPlant Tasks Window Help
Permission Group
Mate
AssemblyForm
VesselDiameter
VesselLength
SupportHeight
SupportThickness
SupportLength
OK
Apply

Offset: 00 mm
Name: CAXStorageTankWF-1-0001
System: EquipmentSystem-

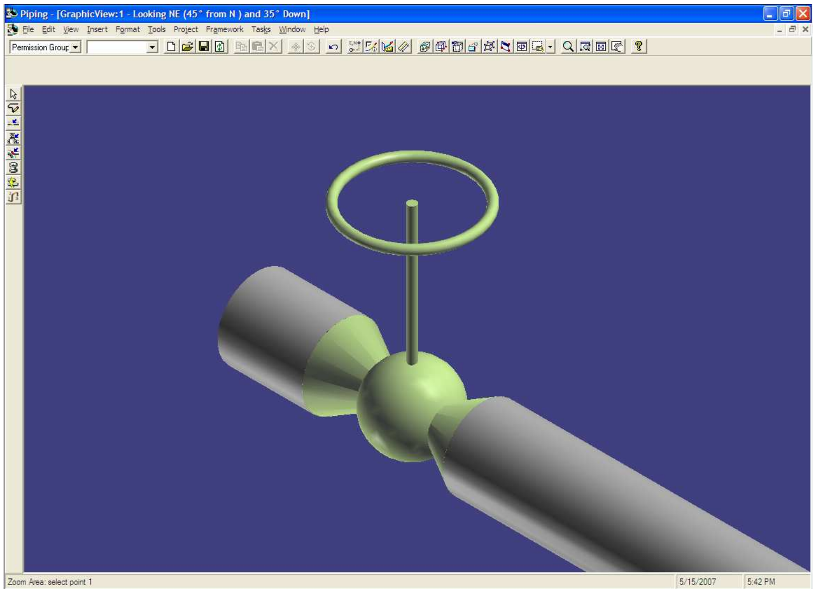
Vessel Diameter: 2200.00 mm
Vessel Length: 4500.00 mm
Insulation Thickness: 50.00 mm
Support Height: 600.00 mm
Support Length: 1800.00 mm
Support Thickness: 160.00 mm

Second tutorial: a simple custom instrument (piping)

Please read the tank tutorial first to learn and understand the basic functions of 3D SymbolDesigner, especially how to add, rename and edit nodes.

In this tutorial we will build a custom instrument part with two nozzles, a handwheel and insulation for the body part and the nozzles.

Note - piping symbols are using a right-handed coordinate system with y-axis up in SmartPlant 3D (there are exceptions from this rule: three-way-valves with integral operator).


Piping - [GraphicView:1 - Looking NE (45° from N) and 35° Down]
File Edit View Insert Format Tools Project Framework Tasks Window Help
Permission Group
Zoom Area: select point 1
5/15/2007
5:42 PM

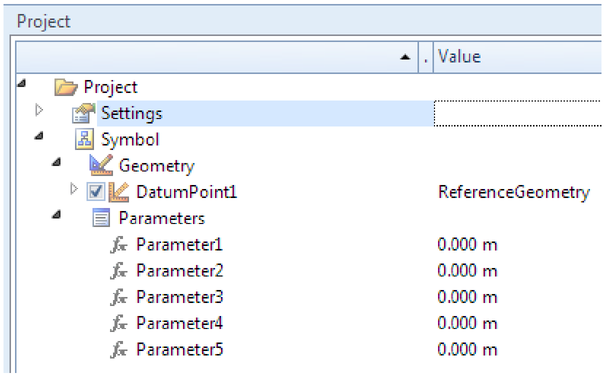
Create a new project

1. Click to create a new symbol project.

2. Change the coordinate system orientation by pressing the **Y-Axis up** button ().

Add parameters

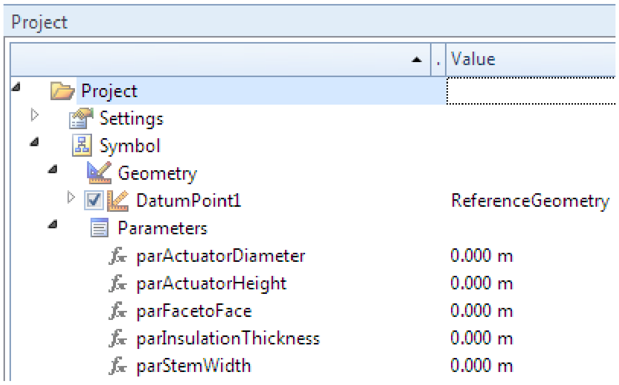
3. Select the Parameters item in the menu tree. Then click five times on the parameter button (fx).



Project

Project	Value
Project	
Settings	
Symbol	
Geometry	
☑ DatumPoint1	ReferenceGeometry
Parameters	
Parameter1	0.000 m
Parameter2	0.000 m
Parameter3	0.000 m
Parameter4	0.000 m
Parameter5	0.000 m

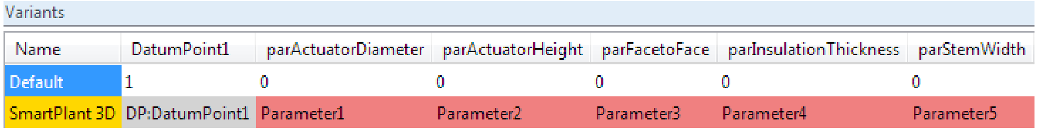
4. Rename the parameters: click on Parameter1 (press F2 if needed) and enter **parFacetoFace**. Repeat this for Parameter2 to Parameter5 with **parActuatorHeight, parActuatorDiameter, parStemWidth and parInsulationThickness**.



Project

Project	Value
Project	
Settings	
Symbol	
Geometry	
☑ DatumPoint1	ReferenceGeometry
Parameters	
parActuatorDiameter	0.000 m
parActuatorHeight	0.000 m
parFacetoFace	0.000 m
parInsulationThickness	0.000 m
parStemWidth	0.000 m

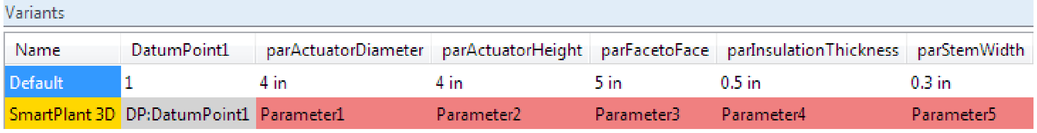
5. The table of variants should now look like:



Variants

Name	DatumPoint1	parActuatorDiameter	parActuatorHeight	parFacetoFace	parInsulationThickness	parStemWidth
Default	1	0	0	0	0	0
SmartPlant 3D	DP:DatumPoint1	Parameter1	Parameter2	Parameter3	Parameter4	Parameter5

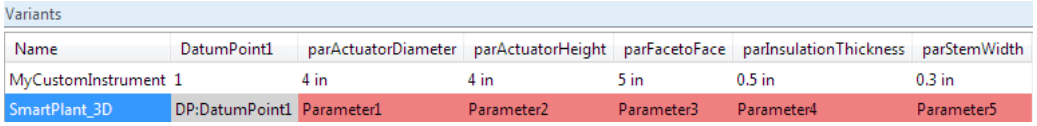
6. Enter now the default values for the parameters into the table:



Variants

Name	DatumPoint1	parActuatorDiameter	parActuatorHeight	parFacetoFace	parInsulationThickness	parStemWidth
Default	1	4 in	4 in	5 in	0.5 in	0.3 in
SmartPlant 3D	DP:DatumPoint1	Parameter1	Parameter2	Parameter3	Parameter4	Parameter5

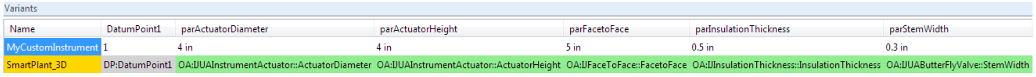
7. Rename the variant **Default** to **MyCustomInstrument**:



Variants

Name	DatumPoint1	parActuatorDiameter	parActuatorHeight	parFacetoFace	parInsulationThickness	parStemWidth
MyCustomInstrument	1	4 in	4 in	5 in	0.5 in	0.3 in
SmartPlant_3D	DP:DatumPoint1	Parameter1	Parameter2	Parameter3	Parameter4	Parameter5

8. Rename the SmartPlant 3D parameter mappings: select the Parameter1 cell and click right mouse button. In the context menu select the **Set SmartPlant 3D attribute**. Choose the right attribute in the list box, check the **Occurrence attribute** and press the **Apply** button (add OA: in front of the parameter name, if the parameter is an occurrence attribute, i.e. an attribute which may be modified at runtime in SmartPlant 3D). Repeat this for Parameter2 to Parameter5. **3D SymbolDesigner** checks the spelling. The parameters are now valid and the background colour turned to green:

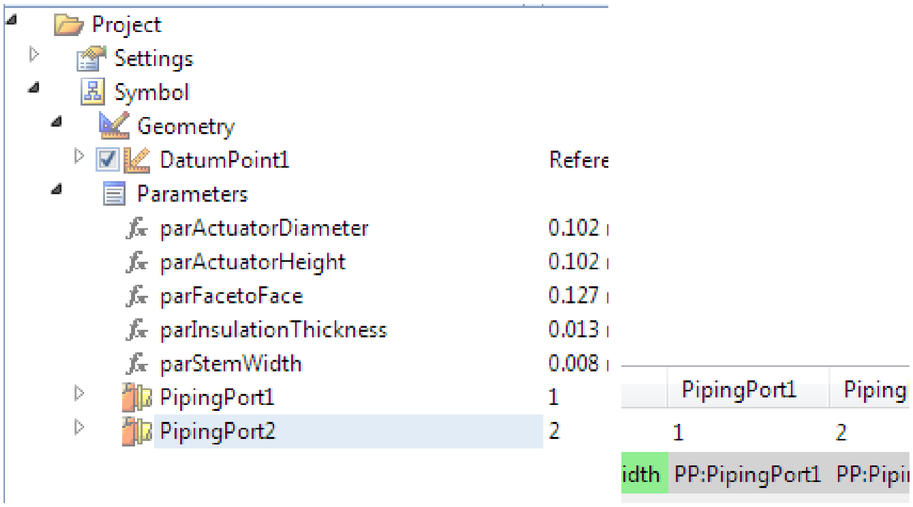


Variants

Name	DatumPoint1	parActuatorDiameter	parActuatorHeight	parFacetoFace	parInsulationThickness	parStemWidth
MyCustomInstrument	1	4 in	4 in	5 in	0.5 in	0.3 in
SmartPlant_3D	DP:DatumPoint1	OA:IJUAInstrumentActuator::ActuatorDiameter	OA:IJUAInstrumentActuator::ActuatorHeight	OA:IJFaceToFace::FacetoFace	OA:IJInsulationThickness::InsulationThickness	OA:IJUAButterFlyValve::StemWidth

Add PipingPorts

9. Expand the **PipingPort parameter collection** toolbar icon ( ) and click the **piping port (bolted preset)**. One PipingPort will be added to the treeview and the list of variants. Repeat the step once again to add a second one.



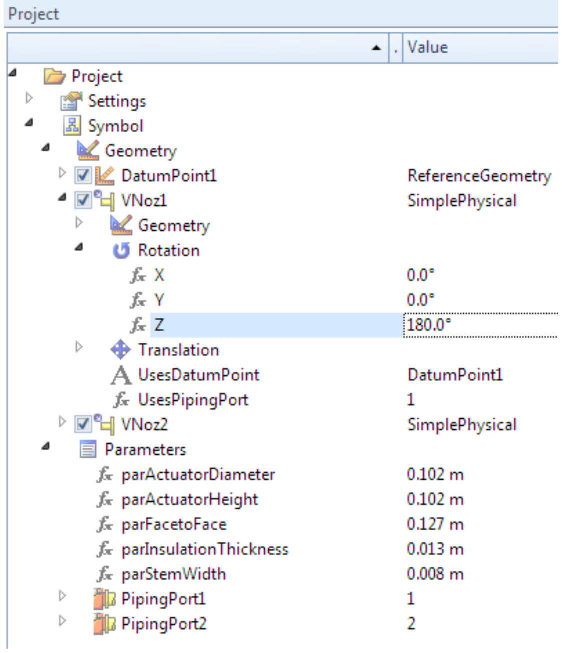
Project	
Settings	
Symbol	
Geometry	
DatumPoint1	Refere
Parameters	
parActuatorDiameter	0.102
parActuatorHeight	0.102
parFacetoFace	0.127
parInsulationThickness	0.013
parStemWidth	0.008
PipingPort1	1
PipingPort2	2

	PipingPort1	Piping
	1	2
idth	PP:PipingPort1	PP:Pipi

Add nozzles

10. Click twice on the button for piping connectors ( ). Press F2 to rename the first nozzle node to **VNoz1** and the second one to **VNoz2**.

11. Rotate **VNoz1** by 180 deg about the z axis.



Project

	Value
Project	
Settings	
Symbol	
Geometry	
DatumPoint1	ReferenceGeometry
VNoz1	SimplePhysical
Geometry	
Rotation	
X	0.0°
Y	0.0°
Z	180.0°
Translation	
UsesDatumPoint	DatumPoint1
UsesPipingPort	1
VNoz2	SimplePhysical
Parameters	
parActuatorDiameter	0.102 m
parActuatorHeight	0.102 m
parFacetoFace	0.127 m
parInsulationThickness	0.013 m
parStemWidth	0.008 m
PipingPort1	1
PipingPort2	2

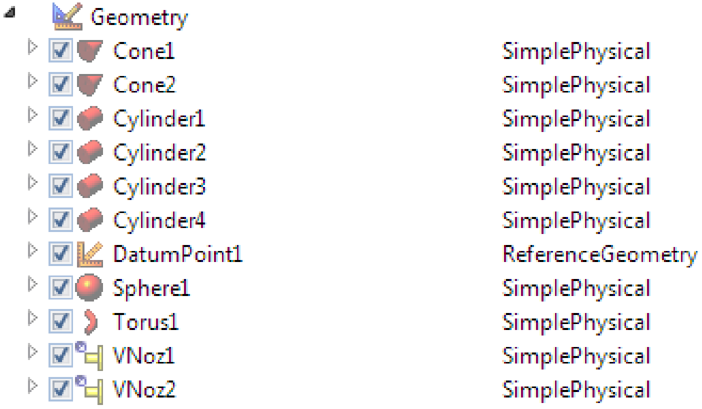
12. Move VNoz1 to the one end of the instrument by typing the following into its Translation.X subnode:
- parFacetoFace / 2 - PipingPort1.FlangeProjectionOrSocketOffset + PipingPort1.FlangeProjection + PipingPort1.SeatingOrGrooveOrSocketDepth

13. Move VNoz2 to the other end of the instrument by typing the following into its Translation.X subnode:

parFacetoFace / 2 + PipingPort2.FlangeProjectionOrSocketOffset - PipingPort2.FlangeProjection - PipingPort2.SeatingOrGrooveOrSocketDepth

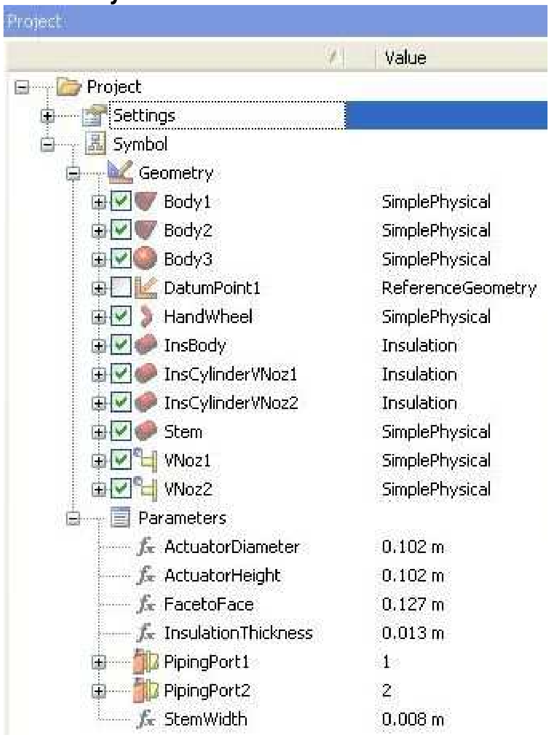
Add graphical primitives

14. Click twice on the cone button (), once on sphere (), once on torus ( ) and four times on cylinder ().



Geometry	
☑ Cone1	SimplePhysical
☑ Cone2	SimplePhysical
☑ Cylinder1	SimplePhysical
☑ Cylinder2	SimplePhysical
☑ Cylinder3	SimplePhysical
☑ Cylinder4	SimplePhysical
☑ DatumPoint1	ReferenceGeometry
☑ Sphere1	SimplePhysical
☑ Torus1	SimplePhysical
☑ VNoz1	SimplePhysical
☑ VNoz2	SimplePhysical

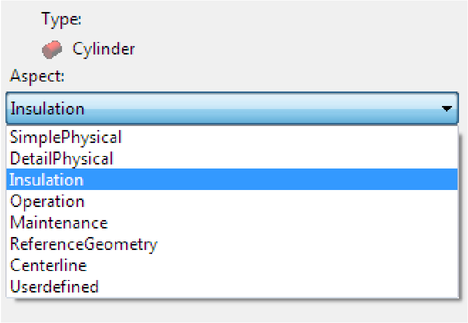
15. Rename Cone1 to **Body1**, Cone2 to **Body2**, Sphere1 to **Body3**, Torus1 to **HandWheel**, Cylinder1 to **Stem**, Cylinder2 to **InsBody**, Cylinder3 to **InsCylinderVNoz1** and Cylinder4 to **InsCylinderVNoz2**.



Project

	Value
Project	
Settings	
Symbol	
Geometry	
☑ Body1	SimplePhysical
☑ Body2	SimplePhysical
☑ Body3	SimplePhysical
☐ DatumPoint1	ReferenceGeometry
☑ HandWheel	SimplePhysical
☑ InsBody	Insulation
☑ InsCylinderVNoz1	Insulation
☑ InsCylinderVNoz2	Insulation
☑ Stem	SimplePhysical
☑ VNoz1	SimplePhysical
☑ VNoz2	SimplePhysical
Parameters	
ActuatorDiameter	0.102 m
ActuatorHeight	0.102 m
FacetoFace	0.127 m
InsulationThickness	0.013 m
PipingPort1	1
PipingPort2	2
StemWidth	0.008 m

16. Right click on the **InsBody** node, select properties from the context menu and change the aspect from **SimplePhysical** to **Insulation**. Repeat this for **InsCylinderVNoz1** and **InsCylinderVNoz2**.


Type:

Cylinder

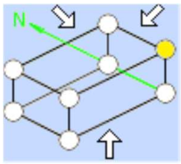
Aspect:

Insulation

- SimplePhysical
- DetailPhysical
- Insulation
- Operation
- Maintenance
- ReferenceGeometry
- Centerline
- Userdefined

17. Unselect all created primitives, except Body1 and Body2, using the checkbox in front of them.

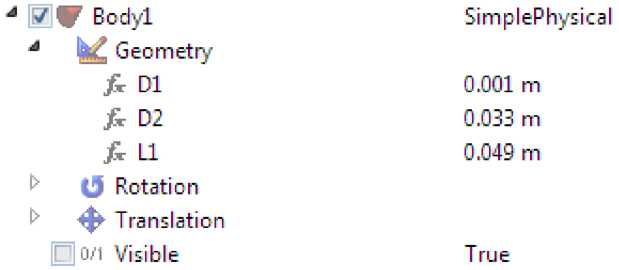
18. Change to S/E isometric view as shown on the picture below.



Parameterise the primitives

19. Expand the **Body1** node and the **Geometry** subnode and type in the following formula as value for the cone's length (L1) property:
    parFacetoFace / 2 - PipingPort1.FlangeOrHubThickness - PipingPort1.FlangeProjection

20. Change the value of the cone's first diameter (D1) of the same node to **0.001**. The value of a distance must not be zero, because SmartPlant 3D is not able to handle zero-distance values.



☑ Body1	SimplePhysical
Geometry	
D1	0.001 m
D2	0.033 m
L1	0.049 m
Rotation	
Translation	
□ 0/1 Visible	True

21. Type in the following as value for the D2 property:
    PipingPort1.PipingOutsideDiameter

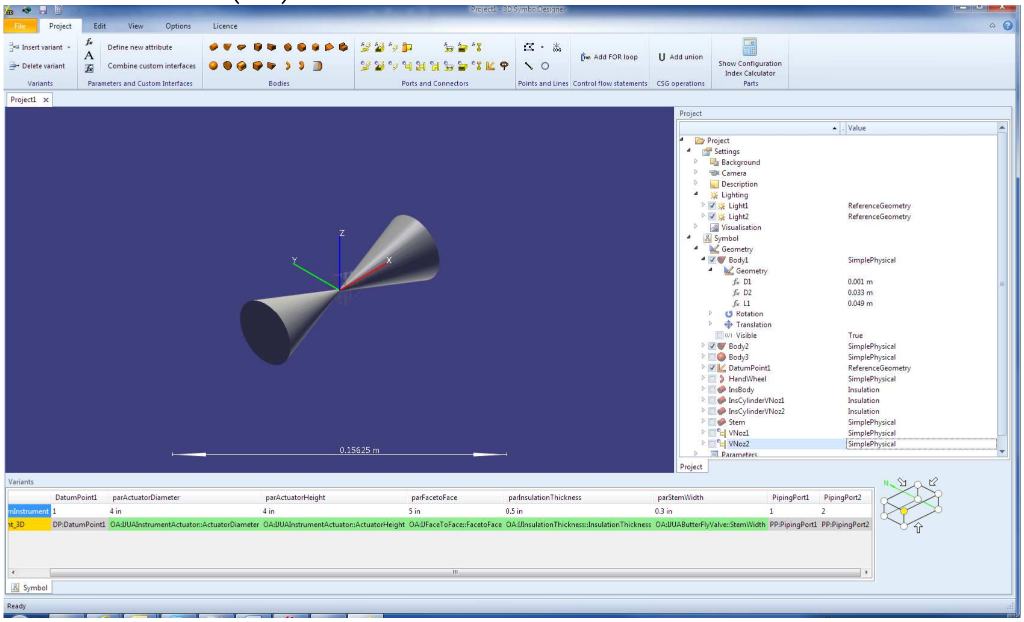
22. Expand the Body2 and underlying Geometry node and set the value of L1 to: **parFacetoFace / 2 - PipingPort2.FlangeOrHubThickness - PipingPort2.FlangeProjection**

23. Change the value of D1 to **0.001**.

24. Set the value of the cone's second diameter (D2) to **PipingPort2.PipingOutsideDiameter**.

25. Rotate Body2 by typing **180 deg** into its Rotation.Z property.

26. Use the zoom-in tool (🔍) until the two cones fit to the view. Now it looks like this:



Project

	Value
Project	
Settings	
Background	
Camera	
Description	
Lighting	
☑ Light1	ReferenceGeometry
☑ Light2	ReferenceGeometry
Visualisation	
Symbol	
Geometry	
☑ Body1	SimplePhysical
Geometry	
D1	0.001 m
D2	0.033 m
L1	0.049 m
Rotation	
Translation	
0/1 Visible	True
☑ Body2	SimplePhysical
□ Body3	SimplePhysical
☑ DatumPoint1	ReferenceGeometry
□ HandWheel	SimplePhysical
□ InsBody	Insulation
□ InsCylinderVNoz1	Insulation
□ InsCylinderVNoz2	Insulation
□ Stem	SimplePhysical
□ VNoz1	SimplePhysical
□ VNoz2	SimplePhysical
Parameters	

Variants

	DatumPoint1	parActuatorDiameter	parActuatorHeight	parFacetoFace	parInsulationThickness	parStemWidth	PipingPort1	PipingPort2
mInstrument	1	4 in	4 in	5 in	0.5 in	0.3 in	1	2
nt_3D	DP:DatumPoint1	OA:IJUAInstrumentActuator::ActuatorDiameter	OA:IJUAInstrumentActuator::ActuatorHeight	OA:IJFaceToFace::FacetoFace	OA:IJInsulationThickness::InsulationThickness	OA:IJUAButterFlyValve::StemWidth	PP:PipingPort1	PP:PipingPort2

27. Expand the Body3 and the appropriate Geometry subnode to change the diameter value (D1) to the average outside diameter of the pipe by typing: **(PipingPort1.PipingOutsideDiameter + PipingPort2.PipingOutsideDiameter) / 2**

28. Change the L1 value of the Stem primitive to **parActuatorHeight**.

29. Set the Stem's diameter (D1) to **parStemWidth**.

30. Rotate the Stem by assigning **90 deg** to its Rotation.Z property.

31. Change the Value of the Handwheel's D1 property to **parStemWidth**.

32. Type in the formula **(parActuatorDiameter - parStemWidth) / 2** for the Handwheel's radius (R1).

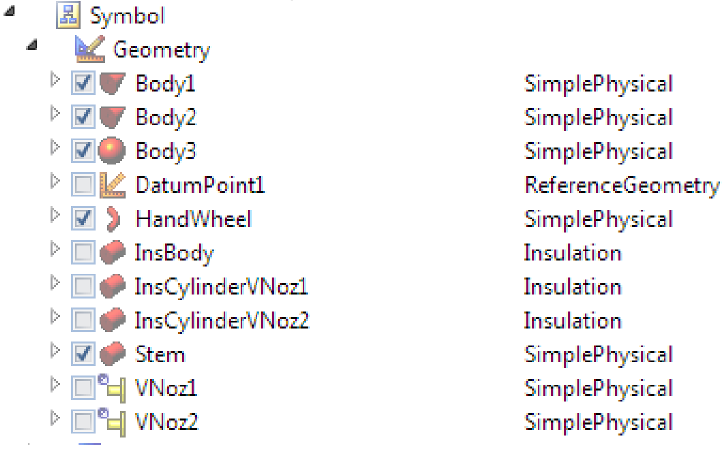
33. Set its angle (A1) property to **360 deg**.

34. Expand the Handwheel's Rotation subnode and set X to **90 deg**.

35. Open the Translation branch and type in **parActuatorHeight - parStemWidth / 2** for the Y value.

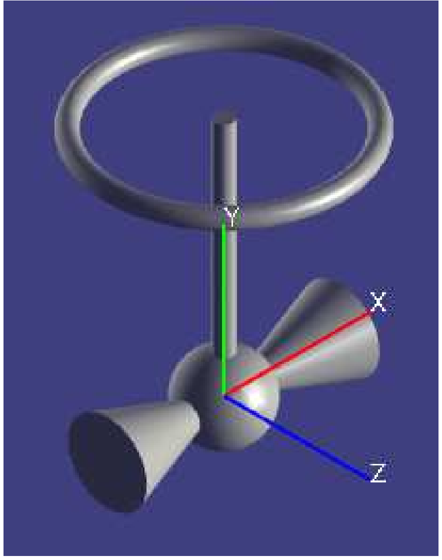
36. Set Z to **-Geometry.HandWheel.Geometry.R1**.

37. Switch on the checkboxes of Body3, Handwheel and Stem and zoom out until the instrument fits to the viewport.



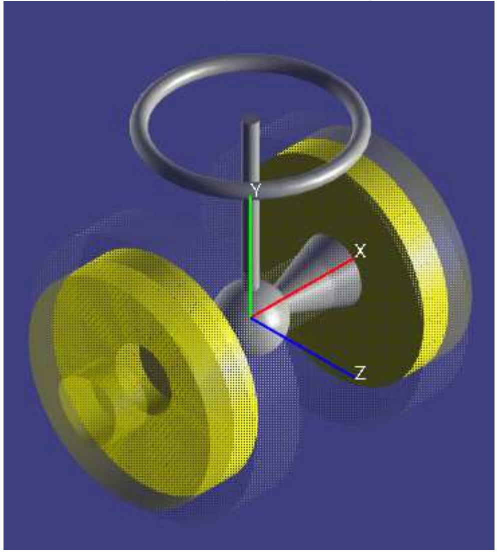
Symbol	
Geometry	
☑ Body1	SimplePhysical
☑ Body2	SimplePhysical
☑ Body3	SimplePhysical
□ DatumPoint1	ReferenceGeometry
☑ HandWheel	SimplePhysical
□ InsBody	Insulation
□ InsCylinderVNoz1	Insulation
□ InsCylinderVNoz2	Insulation
☑ Stem	SimplePhysical
□ VNoz1	SimplePhysical
□ VNoz2	SimplePhysical

Now you should see something like that:



38. Expand InsBody and its subnode Geometry to set its length L1 to: **Geometry.Body1.Geometry.L1 + Geometry.Body2.Geometry.L1**
39. Assign the formula **Max(Geometry.Body1.Geometry.D1, Geometry.Body2.Geometry.D1) + 2 * parInsulationThickness** to its D1 property.
40. Expand the Translation subnode and set X to **-Geometry.Body1.Geometry.L1**.
41. Change to the InsCylinderVNoz1 primitive and expand its subnode Geometry. Change the value of L1 to **PipingPort1.FlangeOrHubThickness + parInsulationThickness**.
42. Type the formula **PipingPort1.FlangeOrHubOutsideDiameter + 2 * parInsulationThickness** in D1.
43. Move this cylinder by changing its Translation.X property to **-parFacetoFace / 2 + PipingPort1.FlangeProjection**.
44. Expand the branch InsCylinderVNoz2 and the underlying Geometry node. Assign the formula **PipingPort2.FlangeOrHubThickness + parInsulationThickness** to the L1 value.
45. Set **PipingPort2.FlangeOrHubOutsideDiameter + 2 * parInsulationThickness** for the D1 property.
46. Move the cylinder by setting **Geometry.Body2.Geometry.L1 - parInsulationThickness** for X.

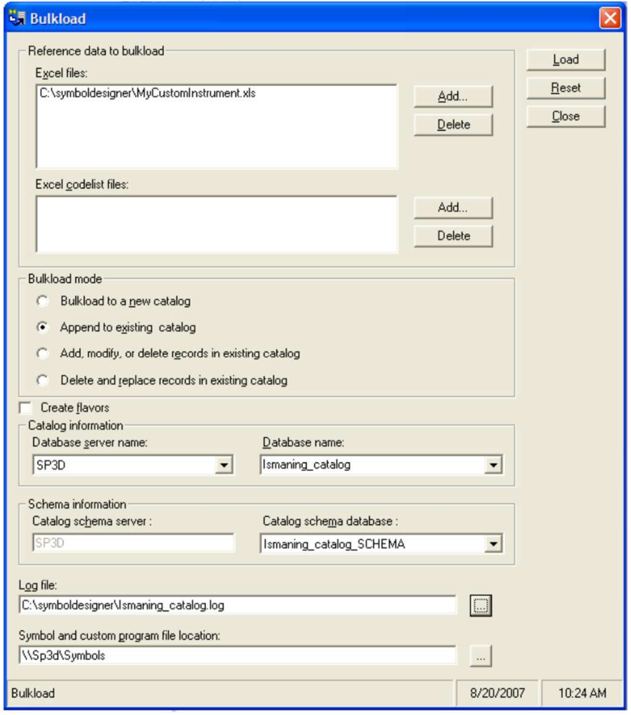
47. Tick all the remaining unchecked primitives. Now the viewport should look like this:



Export to SmartPlant 3D

48. The symbol is now ready to be exported to SmartPlant 3D. Save it first, and then click the toolbar button to export it.
49. Optionally: Press the Reload Button. The catalogue structure will be loaded from the SP3D database. This will only work if a valid SP3D database server is available and configured (see item 52).
50. Add a new node below the Catalogue-Piping-Custom Instruments node, select it, give it a decent key and description and select it again.
51. On the second tab (Build) choose your target directory. You also may tick the checkbox **Compile project** below the **Compiler settings** topic. This will only work if the necessary SP3D libraries (dll) are registered and VisualBasic 6 is installed on this machine.
52. Click on the **Start** button. Before the export starts, the **3D SymbolDesigner** checks if the parameters and the used variant names are valid (see *Naming rules*). This will avoid afterwards errors during the bulkload process. The occurred errors are shown in the **Error list** tab. By pressing an item of the list the cursor will move to the corresponding cell in the table.
53. Optionally: Export of a **3D PDF datasheet** (see: *Export of a 3D PDF datasheet*)

54. Start the Bulkload tool and load the DLL. Usually the option *Append to existing catalog* must be selected for this purpose.



Reference data to bulkload

Excel files: C:\symboldesigner\MyCustomInstrument.xls

Excel codelist files:

Bulkload mode

○ Bulkload to a new catalog

● Append to existing catalog

○ Add, modify, or delete records in existing catalog

○ Delete and replace records in existing catalog

□ Create flavors

Catalog information

Database server name: SP3D

Database name: Ismaning_catalog

Schema information

Catalog schema server : SP3D

Catalog schema database : Ismaning_catalog_SCHEMA

Log file: C:\symboldesigner\Ismaning_catalog.log

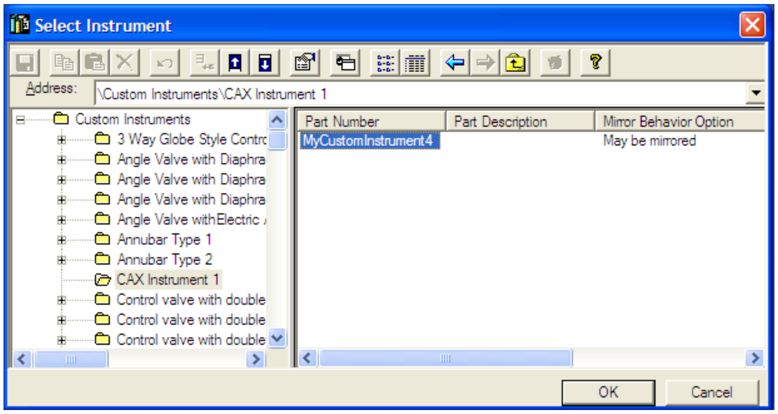
Symbol and custom program file location: \\Sp3d\Symbols

Bulkload | 8/20/2007 | 10:24 AM

55. Check the log file for critical errors

> Note: The warning *Failed to set the SymbolIcon property* is only an informative message it does not affect the usability of the symbol.

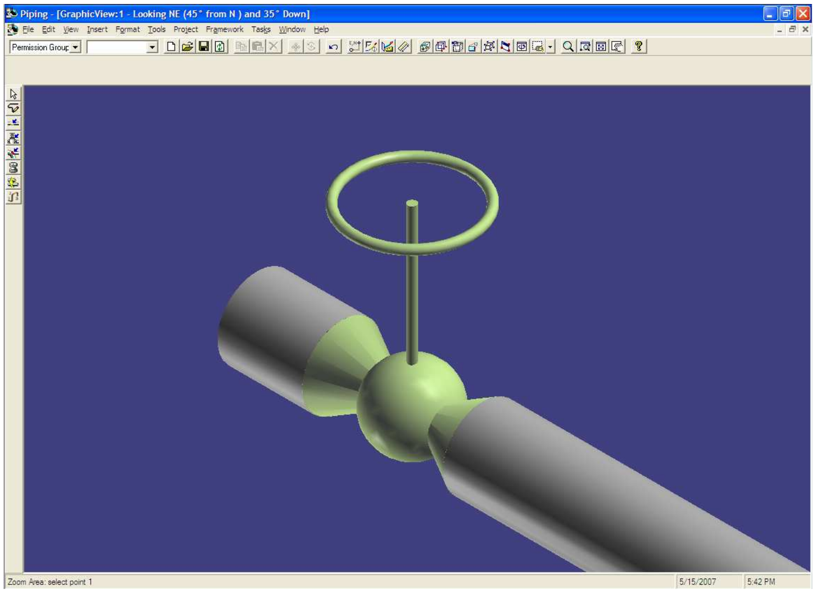
56. Now you are able to use the symbol in SmartPlant 3D. The example bulkload sheet defines the NPD at 4 in, so you will be able to place this symbol as a custom instrument in a 4 in pipe in SmartPlant 3D.



Address: \Custom Instruments\CAX Instrument 1

Custom Instruments
- 3 Way Globe Style Contro
- Angle Valve with Diaphra
- Angle Valve with Diaphra
- Angle Valve with Diaphra
- Angle Valve with Electric
- Annubar Type 1
- Annubar Type 2
- CAX Instrument 1
- Control valve with double
- Control valve with double
- Control valve with double

Part Number	Part Description	Mirror Behavior Option
MyCustomInstrument4		May be mirrored


Piping - [GraphicView:1 - Looking NE (45° from N) and 35° Down]
File Edit View Insert Format Tools Project Framework Tasks Window Help
Permission Group
Zoom Area: select point 1
5/15/2007
5:42 PM

Third tutorial: a piping spec part

Start with the symbol project built up in the second tutorial.

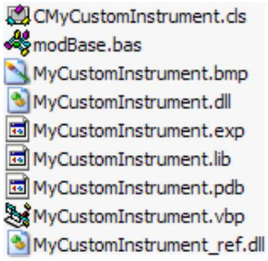
1. Change all parameter mappings from occurrence (OA) to standard. Simply remove the OA: prefix of all parameter mappings (except for InsulationThickness).

2. Click on the SP3D Export button () on the toolbar.

3. Select the **Piping** branch. This will produce a piping DLL.

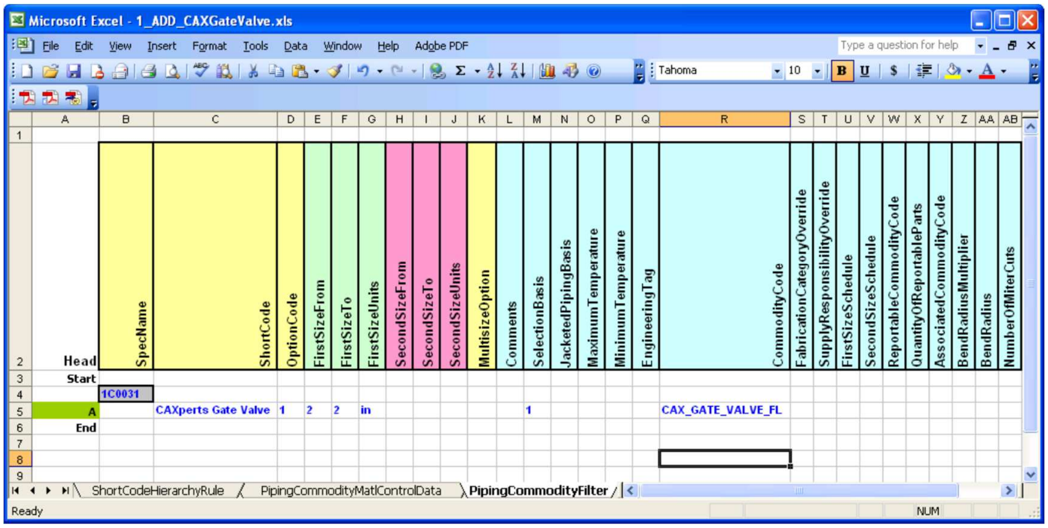
4. Choose your target directory on the second (Build) and adjust the database settings on the third (Bulkload) tab.

5. Press start. The project files will be written to the target directory.



CMyCustomInstrument.cls
modBase.bas
MyCustomInstrument.bmp
MyCustomInstrument.dll
MyCustomInstrument.exp
MyCustomInstrument.lib
MyCustomInstrument.pdb
MyCustomInstrument.vbp
MyCustomInstrument_ref.dll

6. The bulkload sheets (spec) have to be written manually for these parts. Samples for such bulkload sheets may be found in the 3D SymbolDesigner Sample folder. Operator symbols may be built up in the same way: (0, 0, 0) is the construction base for these symbols, do not include any nozzles or ports. The export target is also **Piping**. To place operators in spec parts, add the operator placeholder to the base parts. Additionally, add OA:IJSecOperOrient::Rotation to the attributes of this symbol. (see the CAXGateValve & CAXHandwheel projects in the Sample folder).



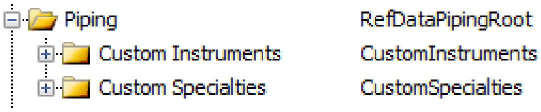
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB
1																												
2	Head	SpecName	ShortCode	OptionCode	FirstSizeFrom	FirstSizeTo	FirstSizeUnits	SecondSizeFrom	SecondSizeTo	SecondSizeUnits	MultisizeOption	Comments	SelectionBasis	JacketedPipingBasis	MaximumTemperature	MinimumTemperature	EngineeringTag	CommodityCode	FabricationCategoryOverride	SupplyResponsibilityOverride	FirstSizeSchedule	SecondSizeSchedule	ReportableCommodityCode	QuantityOfReportableParts	AssociatedCommodityCode	BendRadiusMultiplier	BendRadius	NumberOfMiterCuts
3	Start																											
4		1C0031																										
5	A		CAXperts Gate Valve	1	2	2	in						1					CAX_GATE_VALVE_FL										
6	End																											
7																												
8																												
9																												

ShortCodeHierarchyRule / PipingCommodityMatlControlData / **PipingCommodityFilter**

7. Bulkload the part as described in chapter 3.2, item 54 and the following.

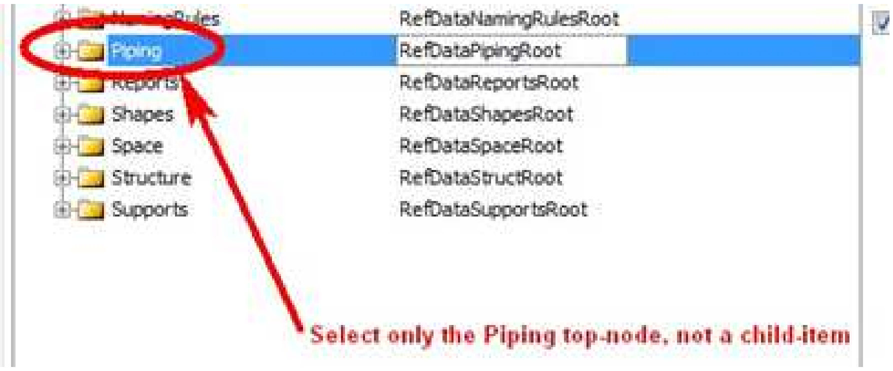
On-the-fly and stock parts

1. On-the-fly parts need ports that can be modified by the user after placement. The second tutorial (see above) shows how to create a piping instrument with these ports by adding a new sub-node to the “Custom Instruments” or “Custom Specialties” node.



Piping	RefDataPipingRoot
Custom Instruments	CustomInstruments
Custom Specialties	CustomSpecialties

2. All **non**-on-the-fly-parts (=stock) have to be exported by selecting the “Piping” node directly. This is valid for typical spec parts, operators, clamps and stock instrument class data and stock piping speciality class data (e.g. see already existing data in 'InstrumentClassData' and 'PipingSpecialtyClassData' sheets).

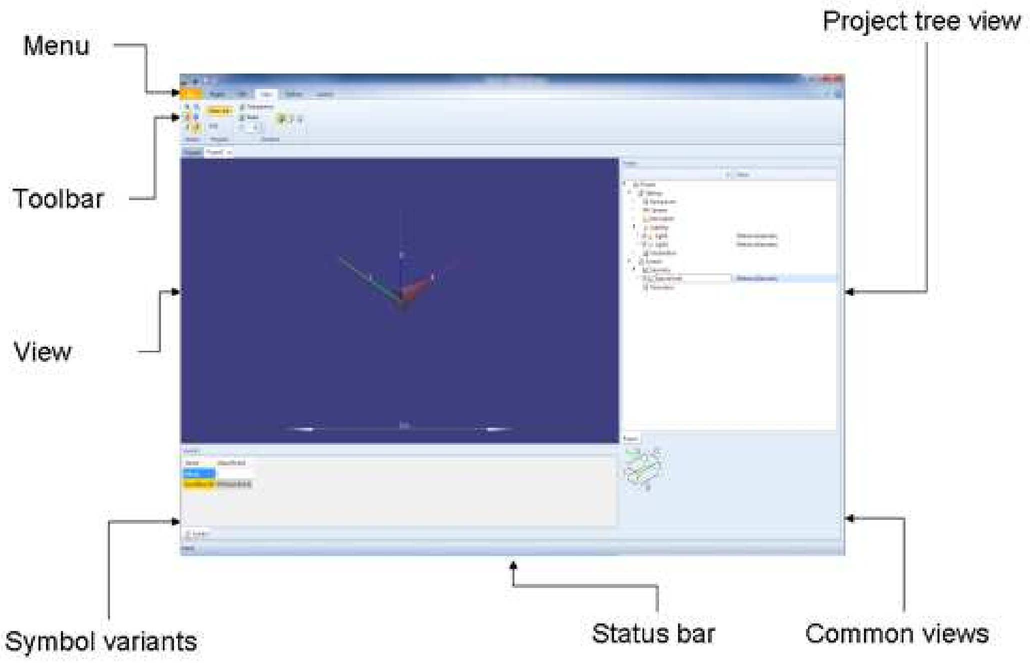


NamingRules	RefDataNamingRulesRoot
Piping	RefDataPipingRoot
Reports	RefDataReportsRoot
Shapes	RefDataShapesRoot
Space	RefDataSpaceRoot
Structure	RefDataStructRoot
Supports	RefDataSupportsRoot

Select only the Piping top-node, not a child-item

Note: you have to adapt the generated bulkload workbook after the 3D SymbolDesigner export. E.g. 'PipeComponentClass' has to be replaced by 'SpecialtyClass' in the header of the part class sheet.

Appendix (Graphical User Interface)



File

New

New () creates a new **3D SymbolDesigner** symbol project.

Open

Open () shows a file open dialogue. **3D SymbolDesigner** supports **3D SymbolDesigner** project files (.xlsx and .xls, Microsoft Excel files with symbol geometry data and variants; .xml 3D SymbolDesigner XML symbol geometry data).

Save

Save () stores the content of the active form. If the file name is unknown, a **Save As** dialogue is shown.

Save as

Save as opens a **Save As** dialogue where the filename to save the content of the active form to can be chosen.

Export to SmartPlant 3D

Export to SmartPlant 3D () shows a configuration dialogue (SmartPlant 3D Wizard) for the export to Intergraph SmartPlant 3D.

The dialogue shows two tabs for configuring the export to SmartPlant 3D.

Under ideal conditions, the Wizard will produce a Visual Basic project containing the symbol geometry, compile it, register the DLL, produce an Excel file for the catalogue bulk load and start the bulk load to the catalogue.

The **Symbol** tab provides a catalogue tree to select the target position in the SmartPlant 3D catalogue.

Discipline		Bulkload sheet
Equipment	Add/select a folder below Equipment Add/select a node below this folder	✓
Equipment component	Add/select a folder below Equipment Components Add/select a node below this folder	✓
Piping spec symbol/standard instrument/standard specialty	Select Piping	-
Piping custom instrument (on-the-fly)	Add/select a node below Piping-Custom Instruments	✓
Piping custom specialty (on-the-fly)	Add/select a node below Piping-Custom Specialties	✓
Hangers and supports	Select Supports	-
HVAC component	Add/select a folder below Duct Add/select a node below this folder	✓

When the **Piping** or **Supports** node is selected, **3D SymbolDesigner** will produce a Visual Basic project/DLL for a piping symbol (but no Excel bulk load file)**.**

> Note – A file called ComponentTree.xml is parsed in for this dialogue, which is generated by the **Reload** button and may be modified manually to represent the catalogue tree of the target system.
>
> The third column shows the PartClassType of the symbol. If none is selected, 3D SymbolDesigner will assume that the type is *PipeComponentClass*.

The checkbox **Write full hierarchy** allows the user in the case of a re-export to export the full R-Hierarchy in the bulkload file. Otherwise a re-export produces an empty R-Hierarchy sheet.

The **Build** tab shows the project settings from the project tree view and allows the configuration of the Visual Basic code output and compilation.

- Export details: this setting is useful for the measuring operations in **SmartPlant 3D** afterwards. With additional edges & points the measuring operations in the older versions of **SmartPlant 3D** are much easier. The standard value is Faces.
- Error logging: the log file goes here.
- Project target folder: the Visual Basic code goes here
- Output format: VB6 code or VB.NET (ALPHA, non-production use only)
- Make DLL binary compatible: Recommended to be switched on, when the Visual Basic code is not manually modified by the user.
- Include advanced debugging code: Recommended to be switched off, produces debugging code in the Visual Basic project that may slow down your system.

- Compile project: works only when Visual Basic 6.0 is installed and all Intergraph DLLs that are usually needed for SmartPlant 3D symbol development are available on the system. Starts Visual Basic and compiles the Visual Basic project.

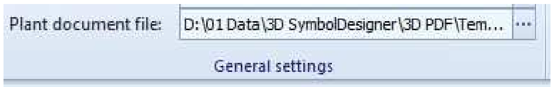
Note: To compile the Visual Basic 6 code the SmartPlant 3D 'Programming Resources' have to be installed.

- Delete Visual Basic files after compiler run: cleans up the target directory

The **Start** button executes the workflow defined on the **Symbol** and **Build** tabs. Before the export starts, the **3D SymbolDesigner** checks if the parameters and the used variant names are valid (see *0 Naming rules*). This will avoid errors during the bulkload process afterwards. Any errors will be shown on the **Error list** tab. Click on an item of the list to move the cursor to the corresponding cell of the table.

Export of a 3D PDF datasheet

For the 3D PDF datasheet export a **PlantDocumentDesigner** template file is necessary (Template.pdprj). A sample file is provided in the **Samples\3D PDF\Template** subdirectory of the **3D SymbolDesigner** installation folder. You can either edit the template file with an xml editor or much more comfortably (WYSIWYG) with the CAXperts **PlantDocumentDesigner**. To activate the **3D PDF** export the path to the Template.pdprj file has to be specified on the **Options** tab of **3DSymbolDesigner**:



Plant document file: D:\01 Data\3D SymbolDesigner\3D PDF\Tem...

If there is no path chosen or the path is incorrect no **3D PDF** export will occur. Otherwise a 3D PDF datasheet will be created in the same process whenever the **Export to SmartPlant 3D** occurs. Therefore you have to press the **Start** button of the **Export to SmartPlant 3D** configuration dialogue (SmartPlant 3D Wizard) to start the export. To deactivate the **3D PDF** export you can double click on the **Plant document file** text on the **Options** tab or you can delete the template file under the chosen path.

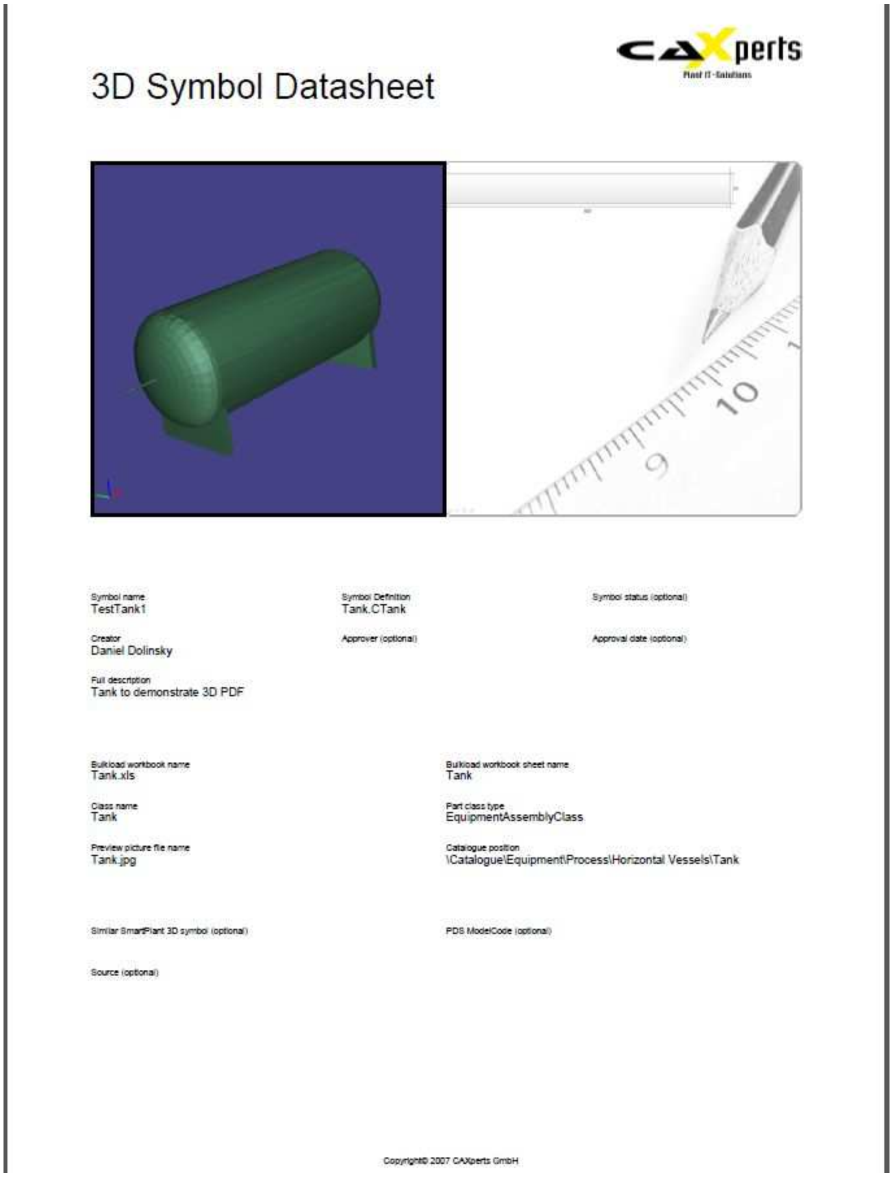
Optionally: it is possible to add a **company logo** (.jpg) and a **drawing** (.jpg) to the **3D PDF** datasheet and to fill the text items on the datasheet with values from an **ini**-file.

1. **Company logo**

   Define the path to your **company logo** (.jpg) in the Template.pdprj file by using an xml editor. Furthermore you can use the **PlantDocumentDesigner** to add your **company logo** to the Template.pdprj.

2. **Drawing**

   To add a **drawing** (.jpg) file to the **3D PDF** datasheet you must save your **drawing** in the project target folder that you have defined on the **Build** tab of the **Export to SmartPlant 3D** configuration dialogue (SmartPlant 3D Wizard). If the drawing file has the same name as the class name defined on the **Symbol** tab in the tree under the key column then the drawing will be added to the 3D PDF file. Otherwise, if there is no file with the same name as the class, **3D SymbolDesigner** will create a screenshot, save it in the target folder, and add it to the 3D PDF file.



3D Symbol Datasheet

Symbol name
TestTank1

Symbol Definition
Tank.CTank

Symbol status (optional)

Creator
Daniel Dolinsky

Approver (optional)

Approval date (optional)

Full description
Tank to demonstrate 3D PDF

Bulkload workbook name
Tank.xls

Bulkload workbook sheet name
Tank

Class name
Tank

Part class type
EquipmentAssemblyClass

Preview picture file name
Tank.jpg

Catalogue position
\Catalogue\Equipment\Process\Horizontal Vessels\Tank

Similar SmartPlant 3D symbol (optional)

PDS ModelCode (optional)

Source (optional)

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3. Ini file

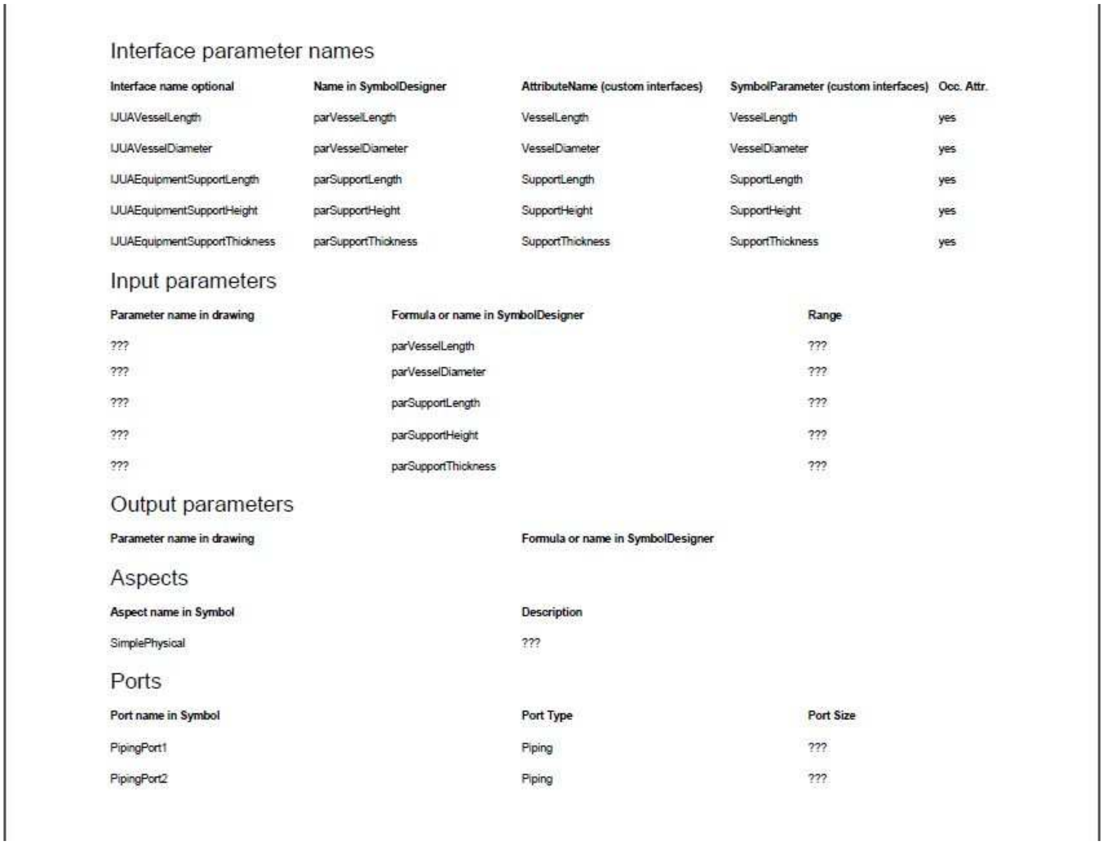
To fill out optional fields and overwrite fields on the first page of the 3D PDF file you can define some input values in an ini file. An ini example file is provided in the Samples\3D PDF\Ini subdirectory of your **3D SymbolDesigner** installation. You must save your ini file in the project target folder that you have defined on the **Build** tab of the **Export to SmartPlant 3D** configuration dialogue (SmartPlant 3D Wizard). If it has the same name as the class name defined on the **Symbol** tab in the tree under the key column then the input of the ini- file will be added to the 3D PDF file.

To define values in the ini file use this syntax:

###FullDescription###=Full description of the symbol

In the 3D PDF will appear "Full description of the symbol" in the "FullDescription" item (defined by setting its text to ###FullDescription### in the xml file). If there is no assignment in the ini- file the item will be empty or filled with automatic values by 3D SymbolDesigner.

On the second page of the **3D PDF** file interface parameter names, input parameters, output parameters, aspects and ports get listed. The items with “???” could not be filled by **3D SymbolDesigner** for some reason and can be edited (e.g. using Adobe Acrobat) manually.



Interface parameter names

Interface name optional	Name in SymbolDesigner	AttributeName (custom interfaces)	SymbolParameter (custom interfaces)	Occ. Attr.
IJUAVesselLength	parVesselLength	VesselLength	VesselLength	yes
IJUAVesselDiameter	parVesselDiameter	VesselDiameter	VesselDiameter	yes
IJUAEquipmentSupportLength	parSupportLength	SupportLength	SupportLength	yes
IJUAEquipmentSupportHeight	parSupportHeight	SupportHeight	SupportHeight	yes
IJUAEquipmentSupportThickness	parSupportThickness	SupportThickness	SupportThickness	yes

Input parameters

Parameter name in drawing	Formula or name in SymbolDesigner	Range
???	parVesselLength	???
???	parVesselDiameter	???
???	parSupportLength	???
???	parSupportHeight	???
???	parSupportThickness	???

Output parameters

Parameter name in drawing	Formula or name in SymbolDesigner

Aspects

Aspect name in Symbol	Description
SimplePhysical	???

Ports

Port name in Symbol	Port Type	Port Size
PipingPort1	Piping	???
PipingPort2	Piping	???

Distributing symbols

You have two options to distribute your symbols to client computers. You can have the software automatically distribute new and modified symbols to client computers by using CAB files. If you choose not to use CAB files to distribute Visual Basic symbols, then you must distribute and register the symbols manually.

Distributing symbols automatically

Use the Package & Deployment Wizard that comes with Microsoft Visual Basic to create a CAB file for the symbol. Then, put the CAB file on the Symbols share on the server. When a user on a client computer goes to place the symbol, one of the following happens:

- If the symbol is a new symbol, the software automatically pulls to the client computer the dll in the CAB file on the server, and then automatically registers the dll on the client computer.
- If the symbol dll already exists on the client computer, the software compares the version number of the dll on the client computer with the version number of the CAB file on the server. If the dll in the CAB file is newer, the software automatically pulls to the client computer the newer dll in the CAB file, and then automatically registers the dll on the client computer.

Note – Because of Microsoft operating system requirements, the user on the client computer must have Power User or Administrator access to the computer. If you do not

> allow users to have Power User or Administrator access to the client computer, then you must distribute symbols manually. For more information, see *Distributing Symbols Manually*.

1. On the computer where you have created the symbols, start the Package & Deployment Wizard that comes with Microsoft Visual Basic.
2. Select the VB project for the symbol using Browse.
3. Click Package.
4. For the Package Type, select Internet Package, and then click Next >.
5. For the Package Folder, specify the folder that you have shared (C:\Symbols), and then click Next >.
6. On the Included Files page, clear all the checkboxes to the left of the file names to remove them from the package except for the dll of your symbol. That is, the only file name that should have a check next to it is the name of your symbol dll. Then click Next >.
7. On the File Source page, verify that your symbol dll file is the only file listed, and then click Next >.
8. On the Safety Settings page, keep the default settings, and then click Next >.
9. Click Finish.
10. Put the CAB file on the server symbols share.
11. Open the Excel workbook that contains the symbol part and go to the part sheet.
12. Create a new column on the sheet called Codebase.
13. In the Codebase column, type %CAB_SERVER%\name.CAB where name is the name of the symbol CAB file.
14. Type an M in the first cell of the row and re-bulkload the workbook.

Distributing symbols manually

If the symbol being distributed is an existing symbol that has been modified, the major version number in the Visual Basic project properties must be increased by 1. Increasing the major version number by 1 forces the recomputation of existing symbol occurrences when the Synchronize Model With Catalog command in Project Management is run. If an existing symbol is modified and distributed, all the new symbol occurrences will use the new symbol (unless the new occurrence uses an existing entry of symbol's cache). If an existing symbol is modified and distributed, and an existing occurrence is recomputed, it will use the new symbol if the recomputation results in creation of a new entry in the symbol's cache.

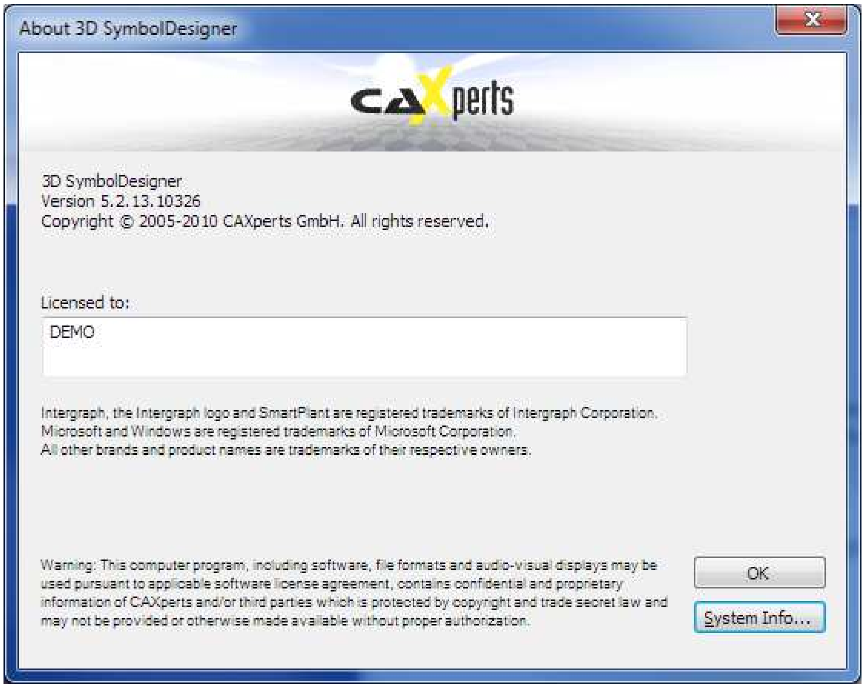
1. Place the dll for the new or modified symbol on the server's symbols share.
2. On a client machine, copy the dll from the server to the local [Product Directory]\CatalogData\Symbols\bin folder.
3. Register the new .dll by clicking Start > Run and typing: regsvr32 "[Product Directory]\CatalogData\Symbols\bin\<name of dll>".

Repeat steps 2 and 3 on each client machine.

Recent documents

The most recently used files are listed here.

About CAXperts 3D SymbolDesigner



3D SymbolDesigner
Version 5.2.13.10326
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DEMO

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About shows a dialogue with information about the software product and version, the **System Info** button starts Microsoft System Information which provides useful additional information about the hardware and software configuration of the computer system.

Exit

Exit ends CAXperts **3D SymbolDesigner.**

Project

Variants

A variant is a named group of parameter values which can be used for testing the parameterisation of a symbol. Variants are exported to SmartPlant 3D bulk load sheets.

Insert variant

Insert variant ( ) inserts a variant in the symbol project.

Delete variant

Delete variant ( ) deletes the selected variant from the symbol project.

Parameters

Add parameter

A **parameter** (*fx*) is an element of the symbol tree which consists of a name and a value. The name is unique in the whole symbol project and can be referenced by any formula. A parameter is mapped to a SmartPlant 3D parameter name by the SmartPlant 3D mapping row in the variants grid of the symbol project. If a lookup in Config.xls in the data subdirectory of 3D SymbolDesigner shows that this parameter name is there, the parameter mapping will get a green background; else it will stay red which means that this parameter will not be exported to SmartPlant 3D. The user can also change the mapping using the context menu (right click).

Add text parameter

A **text parameter** (A) is an element of the symbol tree which consists of a name and a text value. The name is unique in the whole symbol project and can be referenced by any formula. A text parameter is mapped to a SmartPlant 3D parameter name by the SmartPlant 3D mapping row in the variants grid of the symbol project. Text parameters may contain non-numeric values.

Bodies

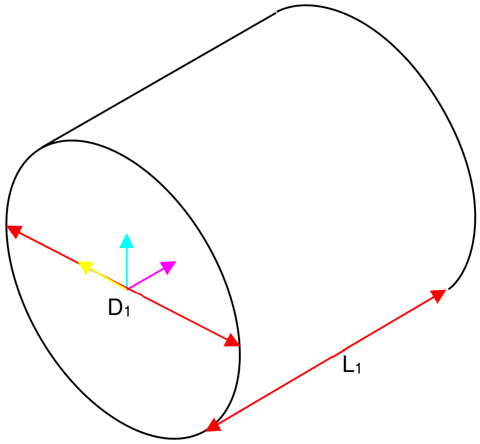
3D SymbolDesigner contains the full set of shapes known from Intergraph PDS.

These are the rules as to how geometric transformations to a shape are applied:

1. The shape is placed at the origin of the world coordinate system (i.e. the locale coordinate system of the shape matches the world coordinate system (marked red-green-blue).
2. The shape's geometry is scaled according to the values set in its **.Geometry** sub-tree.
3. The shape is rotated about the global X axis by the angle specified in its **.Rotation.X** item
4. The shape is rotated about the global Y axis by the angle specified in its **.Rotation.Y** item
5. The shape is rotated about the global Z axis by the angle specified in its **.Rotation.Z** item
6. The shape is translated by the distances specified in its **.Translation** subtree

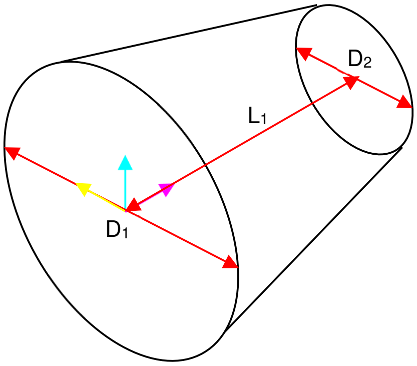
Shapes already included with **3D SymbolDesigner** are described below (the anchor of the shape is marked magenta-yellow-cyan)

Cylinder



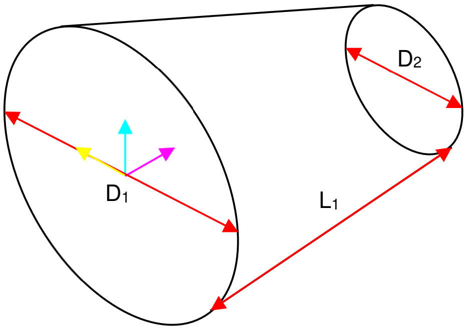
3D SymbolDesigner	PDS	Comment
Cylinder.	Right Circular Cylinder (1)	
.Translation.X	X	
.Translation.Y	Y	
.Translation.Z	EL	
.Geometry.L1	A	
.Geometry.D1	B	

Cone



3D SymbolDesigner	PDS	Comment
Cone.	Right Circular Cone (2)	
.Translation.X	X	
.Translation.Y	Y	
.Translation.Z	EL	
.Geometry.L1	A	
.Geometry.D1	B	
.Geometry.D2	C	

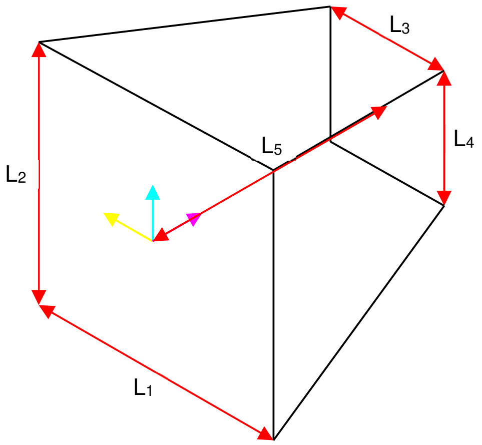
Eccentric circular cone



3D SymbolDesigner	PDS	Comment
EccentricCircularCone.	Eccentric Circular Cone (3)	
.Translation.X	X	
.Translation.Y	Y	
.Translation.Z	EL	
.Geometry.A1		Angle of the left face
.Geometry.A2		Angle of the right face
.Geometry.AR1		Aspect ratio of the left face

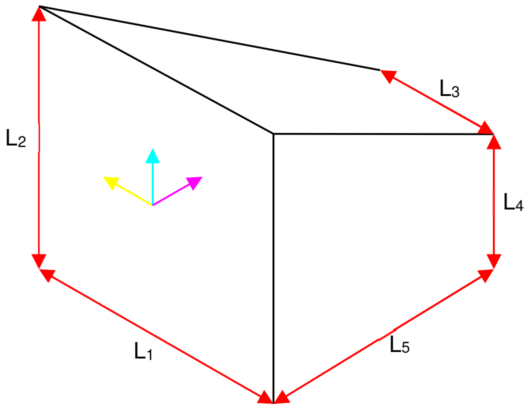
.Geometry.AR2		Aspect ratio of the right face
.Geometry.L1	A	
.Geometry.D1	B	
.Geometry.D2	C	

Truncated rectangular prism



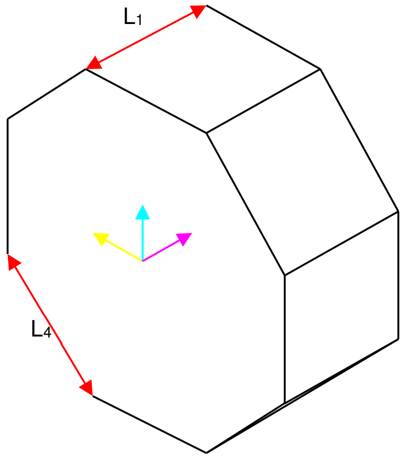
3D SymbolDesigner	**PDS**	**Comment**
TruncatedRectangularPrism.	Truncated Rectangular Prism (12)	
.Translation.X	X	
.Translation.Y	Y	
.Translation.Z	EL	
.Geometry.L1	A	
.Geometry.L2	B	
.Geometry.L3	C	
.Geometry.L4	D	
.Geometry.L5	E	

Eccentric rectangular prism



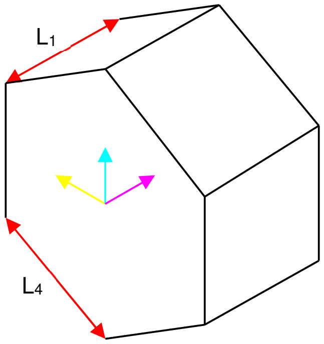
3D SymbolDesigner	PDS	Comment
EccentricRectangularPrism.	Eccentric Rectangular Prism (13)	
.Translation.X	X	
.Translation.Y	Y	
.Translation.Z	EL	
.Geometry.A1		Angle of the left face
.Geometry.A2		Angle of the right face
.Geometry.L1	A	
.Geometry.L2	B	
.Geometry.L3	C	
.Geometry.L4	D	
.Geometry.L5	E	

Octagonal solid



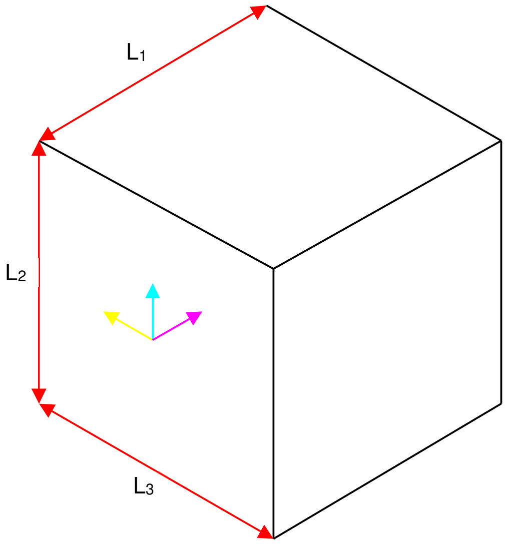
3D SymbolDesigner	PDS	Comment
OctagonalSolid.	Octagonal Solid (8)	
.Translation.X	X	
.Translation.Y	Y	
.Translation.Z	EL	
.Geometry.L1	A	
.Geometry.L2	B	Ignored
.Geometry.L3	C	
.Geometry.L4	D	

Hexagonal solid



3D SymbolDesigner	PDS	Comment
HexagonalSolid.	Hexagonal Solid (7)	
.Translation.X	X	
.Translation.Y	Y	
.Translation.Z	EL	
.Geometry.L1	A	
.Geometry.L2	B	Ignored
.Geometry.L3	C	
.Geometry.L4	D	

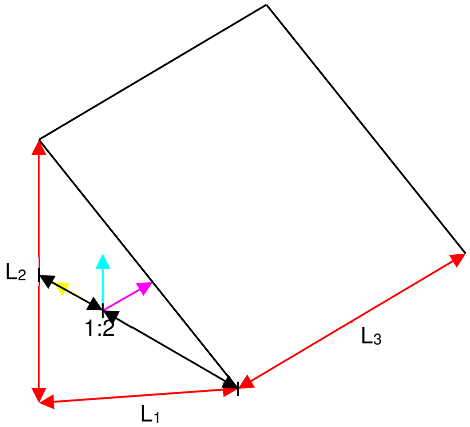
Box



3D SymbolDesigner	PDS	Comment
Box.	Rectangular Solid (6)	
.Translation.X	X	
.Translation.Y	Y	

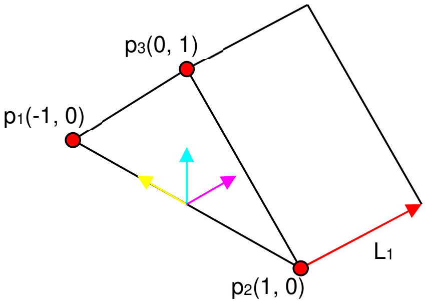
.Translation.Z	EL
.Geometry.L1	A
.Geometry.L2	B
.Geometry.L3	C

Triangular solid



3D SymbolDesigner	PDS	Comment
TriangularSolid.	Triangular Solid (5)	
.Translation.X	X	
.Translation.Y	Y	
.Translation.Z	EL	
.Geometry.L1	A	
.Geometry.L2	B	
.Geometry.L3	C	
.Geometry.A1	D	Ignored

Extruded solid

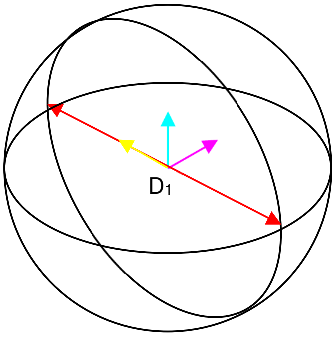


Additional UV points can be added by **Insert** → **Vertices** → **UV point**

3D SymbolDesigner	PDS	Comment
ExtrudedSolid.	User Projected Shape (9)	

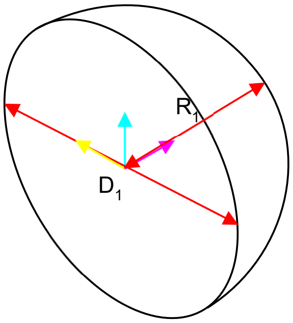
.Translation.X	X
.Translation.Y	Y
.Translation.Z	EL
.Geometry.L1	Projection
.Geometry.Vertices.UVVector1.U	1 X
.Geometry.Vertices.UVVector1.V	1 Y
…	…
.Geometry.Vertices.UVVector20.U	20 X
.Geometry.Vertices.UVVector20.V	20 Y

Sphere



3D SymbolDesigner	PDS	Comment
Sphere.	Sphere (17)	
.Translation.X	X	
.Translation.Y	Y	
.Translation.Z	EL	
.Geometry.D1	A	

Semisphere



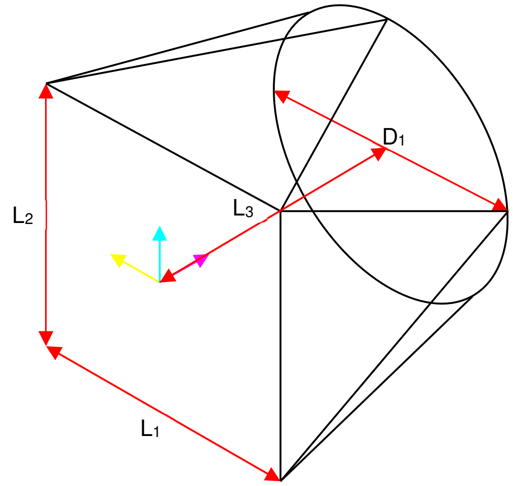
3D SymbolDesigner	PDS	Comment
Semisphere.	Semi-Elliptical Head (4)	

.Translation.X	X	
.Translation.Y	Y	
.Translation.Z	EL	
.Geometry.D1	A	
.Geometry.R1	B	

Rotational solid

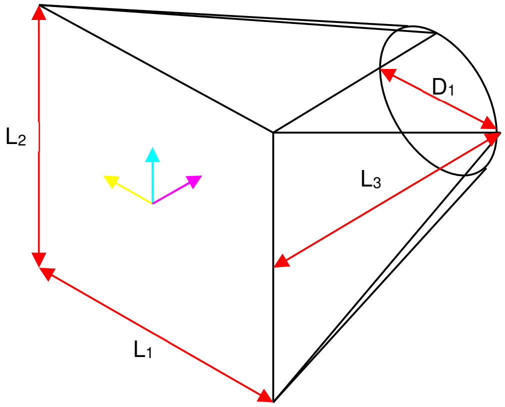
See extruded solid. There is no similar object in PDS.

Transition element



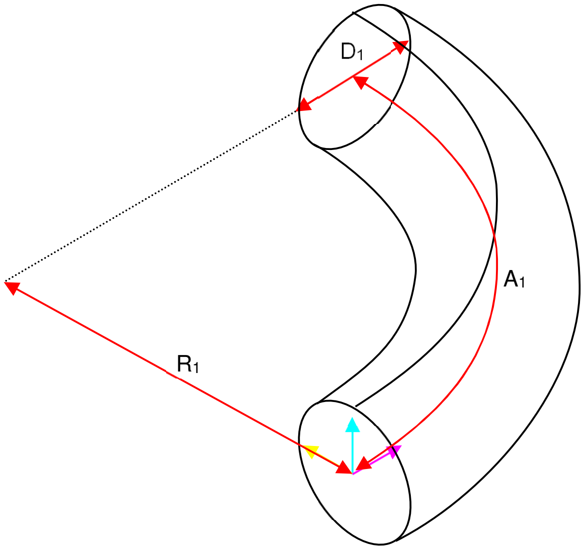
3D SymbolDesigner	PDS	Comment
TransitionElement.	Transition Element (15)	
.Translation.X	X	
.Translation.Y	Y	
.Translation.Z	EL	
.Geometry.L1	A	
.Geometry.L2	B	
.Geometry.L3	C	
.Geometry.D1	D	

Eccentric transition element



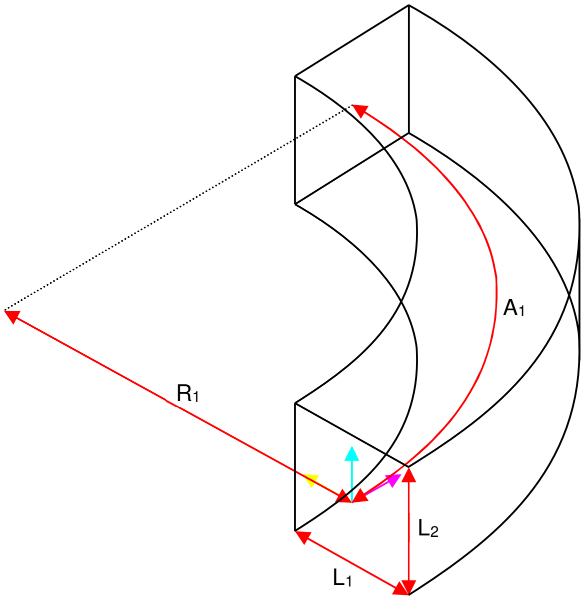
3D SymbolDesigner	PDS	Comment
EccentricTransitionElement.	Eccentric Transition Element (16)	
.Translation.X	X	
.Translation.Y	Y	
.Translation.Z	EL	
.Geometry.A1		Angle of the left face
.Geometry.A2		Angle of the right face
.Geometry.L1	A	
.Geometry.L2	B	
.Geometry.L3	C	
.Geometry.L4		1st offset of the right face
.Geometry.L5		2nd offset of the right face
.Geometry.D1	D	

Torus



3D SymbolDesigner	PDS	Comment
Torus.	Circular Torus (10)	
.Translation.X	X	
.Translation.Y	Y	
.Translation.Z	EL	
.Geometry.D1	A	
.Geometry.R1	B	
.Geometry.A1	C	

Rectangular torus



3D SymbolDesigner	PDS	Comment

RectangularTorus.	Rectangular Torus (11)
.Translation.X	X
.Translation.Y	Y
.Translation.Z	EL
.Geometry.L1	A
.Geometry.L2	B
.Geometry.R1	C
.Geometry.A1	D

Ports & connectors

A parameter collection (, , , , , ,)contains parameters which are usually provided by SmartPlant 3D for the placement and dimensioning of nozzles. The user can set values in this collection for testing purposes. The values are not exported, they will be provided at runtime by SmartPlant 3D. Each connector needs a parameter collection of its own. Parameter collections get mappings with grey background colour.

Cable connector

A **Cable connector** () symbolises the start position and direction of cables leading away from the symbol.

Cable tray connector

A **Cable tray connector** () symbolises the start position, direction and orientation of cable trays leading away from the symbol.

Conduit connector

A **Conduit connector** () symbolises the start position and direction of conduits leading away from the symbol.

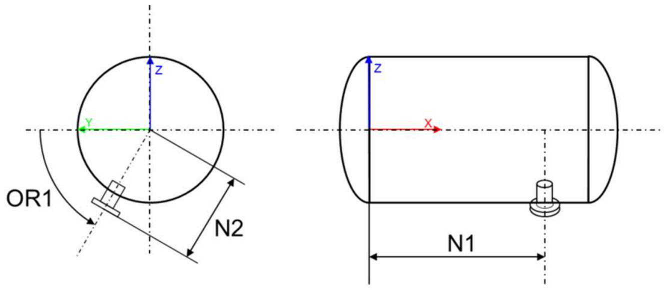
Piping connector

A **Piping connector** (, formerly **Variable nozzle**) symbolises the start position and direction of pipes leading away from the symbol.

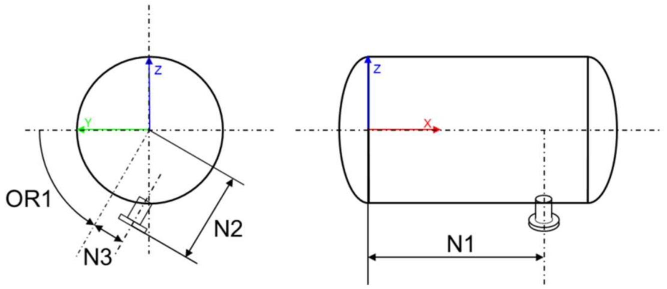
Smart piping connector for datum point based nozzles on equipment

Smart piping connectors () use N1, N2, N3, N5 and OR1 to specify their position in relation to a datum point. Therefore they can only be used within the Geometry subnode of a **DatumPoint** object and will work on equipment symbols only. The following PlacementType values are allowed:

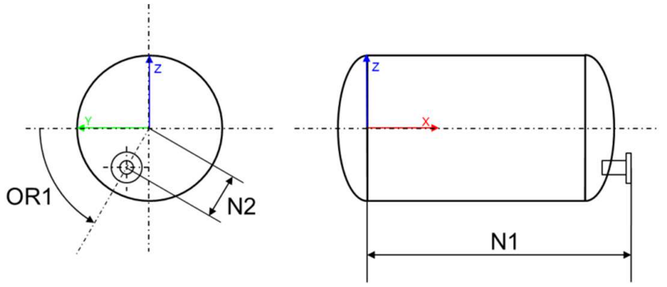
- Radial
- Tangential
- Axial
- Skew
- OffsetSkew



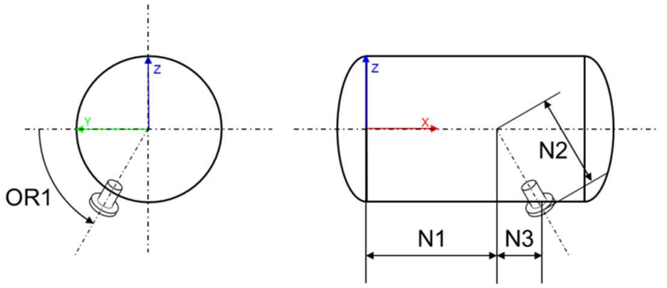
Radial



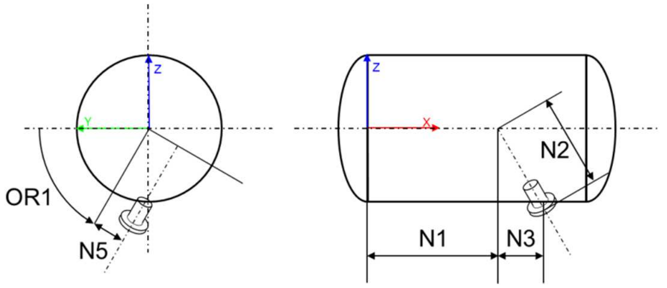
Tangential



Axial



Skew



Offset skew

Elbow piping connector

An **Elbow piping connector** () symbolises the start position and direction of pipes leading away from the symbol.

Foundation connector

A **Foundation connector** () symbolises the start position and direction of foundation connections.

HVAC connector

A **HVAC connector** () symbolises the start position and direction of HVAC pipes leading away from the symbol.

On the port, the following codelist numbers are available for the CrossSectionShape: 1 Rectangular, 3 Flat Oval, 4 Round

Hanger connector

A **Hanger connector** () symbolises the start position and direction of support/hanger connections.

Datum Point

A plain project has already one datum point (). To add additional ones, please use this button. Nozzles get always logically attached to DatumPoint1 as long as they don't belong to the Geometry subnode of another datum point.

Operator

An **Operator** () symbolises the position and direction of an external operator symbol.

> Note: To import easily the parameters of a port use the **Load node from file** function (see: **Load node from file**).

Points & lines

UV vectors can be added to **Extruded solid**s (select the .Geometry.Vertices subnode). An **UV vector** is a coordinate double representing a corner of the extruded two-dimensional shape.

A **ControlPoint** can be added to equipment symbols.

Control flow statements

Add FOR loop

For loops are useful when the user wants to builds symbols like ladders or stairs. Its Parameters subnode specifies from, to and step of the loop. All primitives in its Geometry subnode will be put into a "For … Next" loop in the Visual Basic code and should therefore be renamed to a SmartPlant 3D variable output name, i.e. "_"-ending.

CSG operations

Add union

A **union** can contain other nodes in its Geometry subnode. This might be helpful for complex symbols with many primitives. It is possible to place a **union** in a **union,** for this purpose use the drag & drop function after creating the **union.** Also to put geometry bodies in the **union** use the drag & drop function on the Union.Geometry node.

Parts

Configuration index calculator () opens a "clone" of the Intergraph Configuration Index Calculator.

Edit

Object

The Object menu item is used to rotate and translate an object that means to turn it around the axes X, Y or Z or to move it without rotating in X, Y or Z direction.

Clipboard

Cut

Cut ( ) cuts the selected item to the clipboard.

Copy

Copy () copies the selected item to the clipboard.

Paste

Paste () pastes the clipboard content to the selected item

Properties

Show properties

Show properties shows the properties dialogue.

Tree context menu

Save node to file

Save node to file ( ) allows the user to save the geometry data of a tree node (e.g.: cylinder, sphere, union, etc.) to an xml file.

Load node to file

Load node to file ( ) allows the user to load the geometry data from an xml file to the tree.

Copy formula

Copy formula ( ) allows the user to copy the selected parameter formula to the clipboard. Used on a rotation or translation node instead of a parameter, the x-, y-, and z- value will be copied.

Paste formula

Paste formula ( ) allows the user to paste the clipboard content to the selected parameter formula. When used on a rotation or translation node the x-, y-, and z- value will be pasted.

View

The **View** menu is for configuring the visual appearance of the **3D SymbolDesigner** Graphical User Interface (GUI) and of the open symbol project.

Camera

Zoom in

If **Zoom in** () is clicked, the distance between the camera and the object becomes shrunk (usually by factor 0.5).

Zoom out

If **Zoom out** () is clicked, the distance between the camera and the object becomes stretched (usually by factor 0.5)

Translate view

You use the **Translate view** () tool to translate the canvas non-destructively; it does not transform the image. Select the **Translate view** tool and click-drag in the image to translate.

Rotate view

You use the **Rotate view** (↻) tool to rotate the canvas non-destructively; it does not transform the image. Rotating the canvas can be useful for any number of reasons, including facilitating easier painting or drawing. Select the **Rotate view** tool and click-drag in the image to rotate.

Fit

If **Fit** ( ) is clicked, the coordinate system gets placed in the middle. The distance/magnification between the camera and the object remains unchanged.

Y-axis up

(Y↑) sets the Y axis = up axis (not recommended for non-piping symbols)

Z-axis up

(Z↑) sets the Z axis = up axis (recommended for all symbols)

Program

Status bar toggles the display of the status bar.

Grid toggles the display.

Renderer

The **Renderer** changes an image by means of computer programs.

Solid

( ) represents an image as a solid object

Wireframe

( ) shows wire frame view

Transparency

( ) sharp transmission of light through solid objects

Raster

( )

Level of detail

Numeric value from 1 to 42

Window

The items in the **Window** menu are for arranging the open **3D SymbolDesigner** sub forms.

Cascade

Cascade ( ) cascades all open **3D SymbolDesigner** sub windows.

Tile Horizontal

Tile Horizontal ( ) rearranges all open **3D SymbolDesigner** sub windows in rows.

Tile Vertical

Tile Vertical ( ) rearranges all open **3D SymbolDesigner** sub windows in columns.

Options

Configuration file

Open (📂) the selected configuration file.

Reload (↻) the selected configuration file (e.g. after changes in the configuration file)

> Note: Don’t forget to save the configuration file before **Reload**.

Level

A debugging level is the importance of a process step that has to be reached to generate a log file entry. These debugging levels are available:

- 0: Logs only critical errors
- 1: Logs all errors
- 2: Logs all errors and warnings
- 3: Logs all errors, warnings and major file operations
- 4: Logs all errors, warnings and minor file operations
- 5: Logs all errors, warnings and output operations
- 6: Logs almost everything (not recommended as it can slow down your system)

Log file folder

The log file folder is the folder where the **3D SymbolDesigner**.log goes to. Use **Browse…** to select a folder.

Database

The **Database** tab shows a dialogue for configuring the database connection.

Licence

See *0 Setup*.

Help

❓ shows the **3D SymbolDesigner** online help.

Appendix

Angles

Angles are interpreted in radians if they are not followed by a degree sign (°). You can type PI or 180° for an angle of 180°.

> Note – if you can’t find the degree sign on your keyboard, key in **dgn** instead, this will be automatically replaced by **°.**

Intrinsic math functions

SymbolDesigner includes a sophisticated parser for mathematical functions. These functions may be used in any parameter cell in the project tree view (parameter cells are marked with the fx symbol).

Example for a formula keyed-in by the user:

Sin (60°) * (10 * *Geometry.Cover.Geometry.L1* / 4 - 0.025 * *OperatorDiameter*)

The formula shows the referencing style to other nodes: Geometry.Cover.Geometry.L1 references to the value of the Geometry.L1 sub-node of a graphical primitive named *Cover* (e.g. a box). The colour/font style mark-up is automatically done by the parser:

Formula part	Font style:
Operators	Upright, blue
Numbers	Upright, black
Units	Upright, bold, black
Functions	Upright, purple
Variables	Italics, black

The parser also interprets several constants:

Constant	Value
Pi	3.1415…
None	0
Point	1
Line	2
Fill	3
Hidden	0
SimplePhysical	1
DetailPhysical	16
Insulation	32
Operation	64
Maintenance	128
ReferenceGeometry	256

> Note – the constants are not necessarily constants in a mathematical sense. You should use them as placeholders for the appropriate values which will be automatically filled in by 3D SymbolDesigner: If in software A *None* means 0 but in software B *None* means -1, **3D SymbolDesigner** will properly replace *None* according to the export target.

These are the pre-defined operators:

Operator	Operation
+	Addition

-	Subtraction
*****	Multiplication
/	Division
^	Power
(	Left bracket
)	Right bracket

These functions are supported by the parser:

Function	**Function name**	**Description**
Abs(*x*)	Absolute value	Returns the absolute value of *x*
Cos(*x*)	Cosine trigonometric function	
Exp(*x*)	Exponential function	
Fix(*x*)		Returns the integer portion of the operand. If *x* is negative, **Fix** returns the first negative integer greater than or equal to *x*
Int(*x*)		Returns the integer portion of the operand. If *x* is negative, **Int** returns the first negative integer less than or equal to *x*
Ln(*x*)	Natural logarithm	
Max(*x,y*)		Compares *x* and *y* and returns the greater operand
Min(*x,y*)		Compares *x* and *y* and returns the smaller operand Please note: min (lowercase) is the unit sign for minutes
Now(*x*)		Returns the date (in Visual Basic)
Rnd(*x*)		Returns a random number. x <0 The same number every time, using *x* as the seed. x=0 The most recently generated number. x>0 The next random number in the sequence.
Sgn(*x*)	Sign function	Returns the sign of *x*
Sin(*x*)	Sine trigonometric function	Returns the sine of *x* (in radians)
Sqrt(*x*)	Square root	Returns the square root of *x*
Tan(*x*)	Tangent trigonometric function	Returns the tangent of *x*
Time		Returns the seconds since midnight (in 3D SymbolDesigner) Returns the time (in Visual Basic)
Asin(*x*)	Inverse sine trigonometric function	Asin(*x*) = Atan(*x* / Sqrt (-*x* * *x* + 1))

Acos(x)	Inverse cosine trigonometric function	Acos(x) = Atan(-x / Sqrt (-x * x + 1)) + 2 * Atan(1)
Atan(x)	Inverse tangent trigonometric function	

Units are defined in the Config.xls in the data subdirectory of **3D SymbolDesigner**.

Derived math functions

The following non-intrinsic math functions can be derived from the intrinsic math functions. These functions are not yet included in **3D SymbolDesigner** but will be included in a future version of the software, so please regard the names of these functions as reserved:

Function	Function name	Derived equivalents
Sec(x)	Secant	Sec(x) = 1 / Cos(x)
CoSec(x)	Cosecant	CoSec(x) = 1 / Sin(x)
CoTan(x)	Cotangent	CoTan(x) = 1 / Tan(x)
ArcSec(x)	Inverse Secant	ArcSec(x) = ArcTan(x / Sqrt(x * x - 1)) + Sgn((x) -1) * (2 * ArcTan(1))
ArcCoSec(x)	Inverse Cosecant	ArcCoSec(x) = ArcTan(x / Sqrt(x * x - 1)) + (Sgn(x) - 1) * (2 * ArcTan(1))
ArcCoTan(x)	Inverse Cotangent	ArcCoTan(x) = ArcTan(x) + 2 * ArcTan(1)
HSin(x)	Hyperbolic Sine	HSin(x) = (Exp(x) - Exp(-x)) / 2
HCos(x)	Hyperbolic Cosine	HCos(x) = (Exp(x) + Exp(-x)) / 2
HTan(x)	Hyperbolic Tangent	HTan(x) = (Exp(x) - Exp(-x)) / (Exp(x) + Exp(-x))
HSec(x)	Hyperbolic Secant	HSec(x) = 2 / (Exp(x) + Exp(-x))
HCoSec(x)	Hyperbolic Cosecant	HCoSec(x) = 2 / (Exp(x) - Exp(-x))
HCoTan(x)	Hyperbolic Cotangent	HCoTan(x) = (Exp(x) + Exp(-x)) / (Exp(x) - Exp(-x))
HArcSin(x)	Inverse Hyperbolic Sine	HArcSin(x) = Log(x + Sqrt(x * x + 1))
HArcCos(x)	Inverse Hyperbolic Cosine	HArcCos(x) = Log(x + Sqrt(x * x - 1))
HArcTan(x)	Inverse Hyperbolic Tangent	HArcTan(x) = Log((1 + x) / (1 - x)) / 2
HArcSec(x)	Inverse Hyperbolic Secant	HArcSec(x) = Log((Sqrt(-x * x + 1) + 1) / x)
HArcCoSec(x)	Inverse Hyperbolic Cosecant	HArcCoSec(x) = Log((Sgn(x) * Sqrt(x * x + 1) +1) / x)
HArcCoTan(x)	Inverse Hyperbolic Cotangent	HArcCoTan(x) = Log((x + 1) / (x - 1)) / 2
	Logarithm to base N	LogN(x) = Log(x) / Log(N)

Naming rules

There are some basic rules for how parameters and objects may be named:

1. Inside the tree view, any combination of Latin characters and numbers is allowed for naming parameters and objects. The parameter name must not be a number, physical unit or reserved word and cannot contain: -, (,), *, /, ^, &, +. The reserved words are listed in the Config.xls in the worksheet **ReservedWords**.
2. Parameter mapping names must obey the limitations of Visual Basic (no reserved words, no names starting with numbers) and of the database used by SmartPlant 3D (name length). The used parameter mapping names must be unique.
3. Parameter mapping names must be carefully chosen; they are loaded into the catalogue and will remain there. Please ask the SmartPlant 3D catalogue administrator in your company which parameter names you should use.
4. Variant names must be shorter than 19 characters, no reserved words and no "Default" or "" value. The variant names must be unique and cannot be identical to the class name.

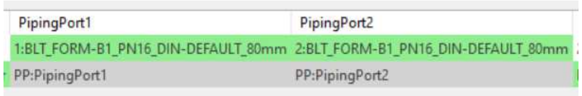
.NET symbols

1. Create the symbol as described in the tutorials above.
2. In Compiler Settings select **Visual Basic .NET** instead of **Visual Basic**.
   Only Smart 3D 2014 R1 or higher is supported for .NET output!
   Please note: The combination of .NET valves and .NET operators is not supported before Smart 3D 2016 (due to Intergraph TR-CP-282293).
3. Open the resulting .vbproj file in **Visual Studio**.
4. If **Visual Studio** shows a message, that it couldn't find the referenced Intergraph DLLs: Double click on **My Project** in the tree view**,** then on the **References** tab, then the **Reference Paths** button and add the path to the Intergraph DLLs there (usually something similar to C:\Program Files (x86)\Smart3D\Core\Container\Bin\Assemblies\Release\).
5. If you still get error messages, it might be that the Intergraph DLLs are bound to a different version of the .NET framework. Change the target framework of your symbol project in Visual Studio, e.g. with Smart 3D 2016 Hotfix 25 you need to select .NET Framework 4.5. If you can't select the necessary framework version, you might also need a newer version of Visual Studio.
6. Run **Build** -> **Rebuild**…
7. Copy the DLL from .\obj\Debug to the SymbolShare, e.g. to \\sp3d10\sharedcontent\Custom_Symbols
8. Go to the Intergraph **Project Management** and start **Update Custom Symbol Configuration** on the respective catalogue.
9. Bulkload and place the symbol as usual.

Appendix: Piping nozzles

Parameter value sets

Starting with version 8.0 of 3D SymbolDesigner, value sets of piping nozzle parameters can be defined in the Config.xls file. The sets can be used like this:



PipingPort1	PipingPort2
1:BLT_FORM-B1_PN16_DIN-DEFAULT_80mm	2:BLT_FORM-B1_PN16_DIN-DEFAULT_80mm
PP:PipingPort1	PP:PipingPort2

The following sheets are available to define the sets:

PipingPortsMale

Name	NPD	NPDUnitType	EndPreparation	EndStandard	PressureRating	ScheduleThickness	PipingOutsideDiameter	WallThickness
MAL_US-DEFAULT_0.125in	0,125	in		US-DEFAULT			0.405 in	
MAL_US-DEFAULT_0.25in	0,25	in		US-DEFAULT			0.54 in	

PipingPortsBolted

Name	NPD	NPDUnitType	EndPreparation	EndStandard	PressureRating	FlangeOutsideDiameter	FlangeThickness	RaisedFaceDiameter	FlangeFaceProjection	BodyOutsideDiameter	SeatingDepth	FlangeGrooveWidth
BLT_RFFE_150_US-DEFAULT_0.5in	0,5	in	RFFE	US-DEFAULT	150	3.5 in	0.378 in	1.38 in	0.06 in	0.84 in		
BLT_RFFE_150_US-DEFAULT_0.75in	0,75	in	RFFE	US-DEFAULT	150	3.875 in	0.44 in	1.69 in	0.06 in	1.05 in		

PipingPortsFemale

Name	NPD	NPDUnitType	EndPreparation	EndStandard	PressureRating	ScheduleThickness	HubOutsideDiameter	HubThickness	SocketDiameter	SocketOrThreadDepth	SocketOffset	BodyOutsideDiameter	SocketWallThickness
FEM_SWE_150_US-DEFAULT_0.125in	0,125	in	SWE	US-DEFAULT	150		0.69 in	0.438 in	0.486 in	0.375 in	0.063 in	0.44 in	
FEM_SWE_150_US-DEFAULT_0.25in	0,25	in	SWE	US-DEFAULT	150		0.873 in	0.438 in	0.635 in	0.375 in	0.063 in	0.623 in	

PipingPortsMechanical

Name	NPD	NPDUnitType	EndPreparation	EndStandard	PressureRating	GrooveDepth	GrooveWidth	GrooveSetback	PipingOutsideDiameter
MECH_MJBLE_250_US-DEFAULT_3in	3	in	MJBLE	US-DEFAULT	250	2.5 in	3.5 in	7.69 in	3.5 in
MECH_MJBLE_250_US-DEFAULT_4in	4	in	MJBLE	US-DEFAULT	250	2.5 in	3.5 in	9.12 in	4.5 in

PipingPortMapping

Parameter	Value	CodelistValue
EndPreparation		301
EndPreparation	BE	301
EndPreparation	PE	391
EndPreparation	MTE	331
EndPreparation	SWE	421
EndPreparation	FTE	441
EndPreparation	RFFE	21
EndPreparation	RFTBE	121
EndPreparation	FORM-B1	21
EndPreparation	FORM-B1-TBE	121
EndPreparation	MJBLE	542
EndStandard	US-DEFAULT	5
EndStandard	B16.47A	945
EndStandard	DIN-DEFAULT	100

Smart 3D

PipingGenericDataBolted

	Attribute	Remark	Must	Sketch
1	NominalPipingDiameter	Input	X	
2	NominalDiameterUnits	Input	X	
3	PressureRating	Input, Codelist	X	
(3a)	(RatingPractice)	Input, Codelist PressureRating, Parent of PressureRating	X	
4	EndPreparation	Input, Codelist	X	
(4a)	(TerminationSubClass)	Input, Codelist EndPreparation, Parent of EndPreparation	X	
(4b)	(TerminationClass)	Input, Codelist EndPreparation, Parent of TerminationSubClass	X	
5	EndStandard	Input, Codelist	X	
(5a)	(EndPractice)	Input, Codelist EndStandard, Parent of EndStandard	X	

6	FlangeOutsideDiameter	see sketch	X	A
7	FlangeThickness	see sketch	(X)	B
8	FlangeThicknessTolerance	is required for computing bolt length		
9	FlangeFaceProjection	see sketch		C
10	RaisedFaceDiameter	see sketch		D
11	FlangeGrooveWidth	see sketch		E
12	SeatingDepth	see sketch		F
13	BoltCircleDiameter	see sketch	(X)	G
14	QuantityOfBoltsRequired		(X)	
15	BoltDiameter		(X)	
16	BodyOutsideDiameter	see sketch	(X)	H
17	DrillingTemplatePattern	Codelist		
18	BoltPatternLength	used for not circular bolted ports		
19	BoltPatternWidth	used for not circular bolted ports		
20	GroovePitchDiameter	used for ring type joint flanged ends only		
21	LapThickness	used for lap joint flange without stub end (part) only		
22	CounterBoreDepth	used for Bolt Type="Cap screw, socket head, counter bore" only		
23	BoltPatternOffset	used for not circular bolted ports		

PipingGenericDataFemale

	Attribute	Remark	Must	Sketch
1	NominalPipingDiameter	Input	X	
2	NominalDiameterUnits	Input	X	
3	PressureRating	Input, Codelist		
(3a)	(RatingPractice)	Input, Codelist PressureRating, Parent of PressureRating		
4	Schedule	Input, Codelist ScheduleThickness		
(4a)	(ScheduleThicknessPractice)	Input, Codelist ScheduleThickness, Parent of Schedule		
5	EndPreparation	Input, Codelist	X	
(5a)	(TerminationSubClass)	Input, Codelist EndPreparation, Parent of EndPreparation	X	
(5b)	(TerminationClass)	Input, Codelist EndPreparation, Parent of TerminationSubClass	X	
6	EndStandard	Input, Codelist	X	
(6a)	(EndPractice)	Input, Codelist EndStandard, Parent of EndStandard	X	
7	SocketDiameter	see sketch	X	A
8	SocketDepth	see sketch		B
9	SocketOffset	see sketch		C
10	ThreadDepth	see sketch		D
11	HubOutsideDiameter	see sketch	(X)	E
12	HubThickness	see sketch	(X)	F
13	SocketWallThickness	see sketch		G
14	BodyOutsideDiameter	see sketch	(X)	H

PlainPipingGenericData

	Attribute	Remark	Must	Sketch
1	NominalPipingDiameter	Input	X	
2	NominalDiameterUnits	Input	X	
3	PressureRating	Input, Codelist		
(3a)	(RatingPractice)	Input, Codelist PressureRating, Parent of PressureRating		
4	Schedule	Input, Codelist ScheduleThickness		
(4a)	(ScheduleThicknessPractice)	Input, Codelist ScheduleThickness, Parent of Schedule		
5	EndStandard	Input, Codelist	X	
(5a)	(EndPractice)	Input, Codelist EndStandard, Parent of EndStandard	X	
6	PipingOutsideDiameter	see sketch	(X)	A
7	WallThickness	see sketch		B

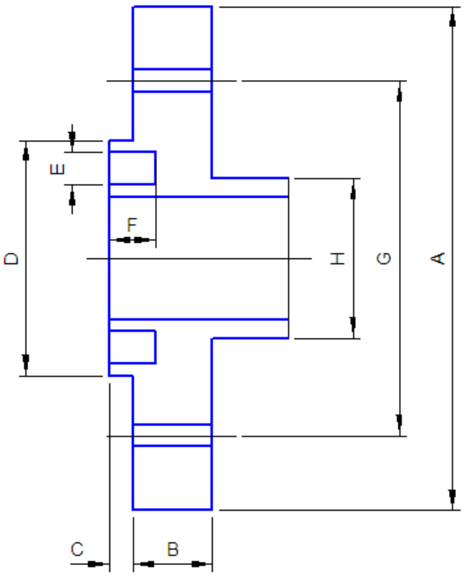
PipingGenericDataMechanical

	Attribute	Remark	Must	Sketch
1	NominalPipingDiameter	Input	X	
2	NominalDiameterUnits	Input	X	
3	PressureRating	Input, Codelist		
(3a)	(RatingPractice)	Input, Codelist PressureRating, Parent of PressureRating		
4	EndPreparation	Input, Codelist	X	
(4a)	(TerminationSubClass)	Input, Codelist EndPreparation, Parent of EndPreparation	X	
(4b)	(TerminationClass)	Input, Codelist EndPreparation, Parent of TerminationSubClass	X	
5	EndStandard	Input, Codelist	X	
(5a)	(EndPractice)	Input, Codelist EndStandard, Parent of EndStandard	X	
6	GrooveDepth	see sketch		A
7	GrooveWidth	see sketch		B
8	GrooveSetback	see sketch		C
(9)	Body/PipingOutsideDiameter	is used of PlainPipingGenericData		D

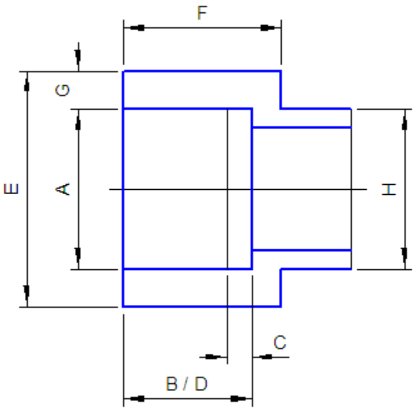
Port Attributes SymbolDesigner

	Attribute	Remark	Bolted	Female	Plain	Mech
1	NPD	Input	X	X	X	X
2	NPDUnitType	Input	X	X	X	X
3	PressureRating	Input, Codelist	X	X	X	X
4	RatingPractice	Input, Codelist PressureRating, Parent of PressureRating	X	X	X	X
5	ScheduleThickness	Input, Codelist		X	X	
6	SchedulePractice	Input, Codelist ScheduleThickness, Parent of Schedule		X	X	
7	EndPreparation	Input, Codelist	X	X		X
8	TerminationClass	Input, Codelist EndPreparation, Parent of EndPreparation	X	X		X
9	TerminationSubClass	Input, Codelist EndPreparation, Parent of TerminationSubClass	X	X		X
10	EndStandard	Input, Codelist	X	X	X	X
11	EndPractice	Input, Codelist EndStandard, Parent of EndStandard	X	X	X	X
12	PipingPointBasis	Input PartClass, Codelist PipingPointUsage	X	X	X	X
13	ID	Input PartClass	X	X	X	X
14	PortIndex	Input PartClass	X	X	X	X
15	FlowDirection	Input PartClass, Codelist	X	X	X	X
16	FlangeOrHubOutsideDiameter		X	X		
17	FlangeOrHubThickness		X	X		
18	FlangeOrMechanicalGrooveWidth		X			X
19	FlangeProjectionOrSocketOffset		X	X		
20	FlangeProjection	only for "Bolted"	X			
21	LinerThicknessAtFaceOfFlange	used according to LinerThicknessData- Sheet only	(X)			
22	LinerThicknessAtInsideDiameter	used according to LinerThicknessData- Sheet only			(X)	
23	PipingInsideDiameter	calculated in SP3D (PipingOutsideDiameter - 2 * WallThickness)			(X)	
24	PipingOutsideDiameter	attribute Body/PipingOutsideDiameter of GenericData	X	X	X	(X)
25	RaisedFaceOrSocketDiameter		X	X		
26	ReinforcedWallThickness	used according to DINWallThicknessData- Sheet only			X	
27	SeatingOrGrooveOrSocketDepth		X	X		X
28	SeatingDepth	only for "Bolted"	X			
29	WallThicknessOrGrooveSetback			X	X	X

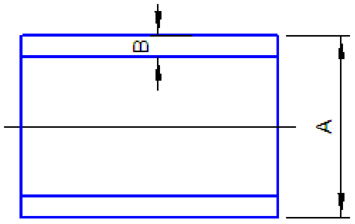
PipingGenericDataBolted



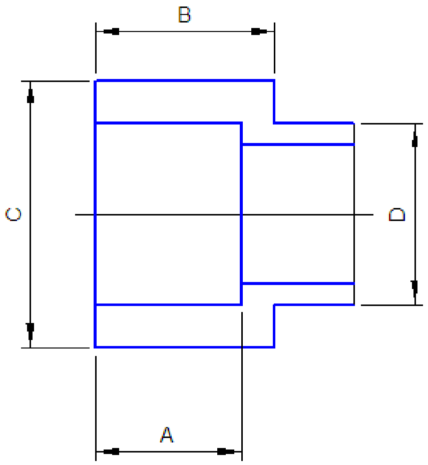
PipingGenericDataFemale



PlainPipingGenericData



PipingGenericDataMechanical



Contact

Contact CAXperts' support by email, online, or phone:

CAXperts GmbH
Carl-Zeiss-Ring 4
85737 Ismaning
Germany

https://www.caxperts.com/contact/
Phone: +49 (89) 969772-0
Email: info@caxperts.com

Helpdesk

Available Monday to Friday 08.00 a.m. – 5.00 pm (UTC +1)
Phone: +49 (89) 969772-250
support@caxperts.com