PD2CII™ - Plant Design-to-CAESAR II Translator
# (for Aveva's PDMS)

1.0 Installing Program

To install PD2CII on Windows OS, load the product CD supplied by InfoPlant and execute the following steps:

1. Browse the CD, and run the program "SETUP.EXE" and follow the instructions as they appear on the screen.

2. Add the path of the installed directory to the "pmllib" path of the PDMS as shown below.

   SET PMLLIB = d:\lplant\PD2CII %1\pmllib (assuming PD2CII is installed in the directory d:\lplant\PD2CII)

3. The environment variables required by PDMS are also required for PD2CII. The PDMS environment must exist as outlined in the appropriate PDMS Installation Guide.

4. Load PDMS and enter into the Lexicon Module as a user who has Read-Write access to DICT Database and run the datal file PDMS2CII.DAT, to create the UDA: SUPCODE for ATTA elements and UDA: TRUNION for ELBO / BEND to transfer support details from PDMS to CAESAR II.

2.0 Neutral File Extraction

1. Add the ZONE/PIPES/BRANCHES you want to transfer to CAESAR II in the form, using "Add CE" or "CE Members" button.

2. Branches selected for transfer need to be checked for:

   - TEMP, PRES attributes of the BRAN element.

   - Each branch should have a valid PH OD.

   - It is recommended to perform "DATA CONSISTENCY CHECK" for all Pipes/Branches selected for Transfer.

   - Each branch in the network should have a valid HSTU.

   - Each branch should have a component.

3. To use Plant Design to CAESAR II translator, type "show !!PD2CII" in the PDMS command line to invoke the translator. The following form appears,
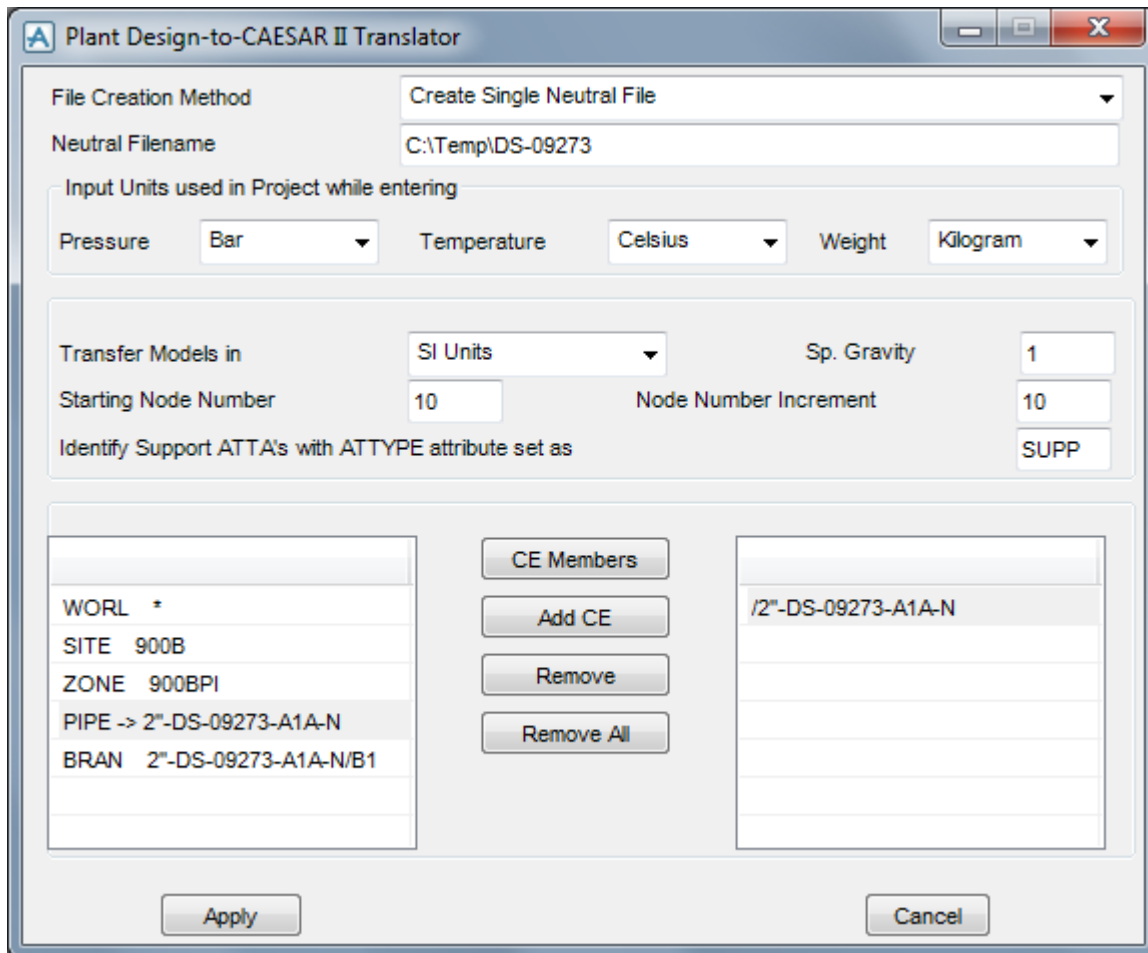
4. Fill up the form and press the "Apply" button in the form.

5. Selecting the option "Create Multiple Neutral Files" creates a set of files in the specified directory. The names of the files are identical to the name of the pipe(s). If Pipes are included in the selection dialog, then the translator creates a neutral file identical to the name of each pipe and includes the details of components from all the branches (which are interconnected / not connected with welding tees, etc.) that are available in that pipe hierarchy.

6. Secondly, selecting the option "Create Single Neutral File" creates one neutral file for all the items added in the selection dialog box in the specified neutral file name.

7. Select the Input units used in Project while entering "Pressure", "Temperatures" and "Weight" using the options as shown in the figure above. Please note, selecting wrong input units used in project will results in incorrect output.

8. Selecting the option "SI Units" transfers the Pipes/Branches details in SI units i.e. Length related dimensions such as OD, Nominal Size etc in mm, Temperature in Deg C, Pressure in bar, Weight

in Kg, Density in Kg/m3, Translational Stiffness in N/mm, Rotational stiffness in N-m/deg to the neutral file.

9. Similarly Selecting the option "ENGLISH Units" transfers Pipes/Branches details in ENGLISH units i.e. Length related dimensions such as OD, Nominal Size etc in Inch, Temperature in Deg F, Pressure in psi, Weight in lb, Density in lb/in3, Translational Stiffness in lb/in, Rotational Stiffness in lb-in/deg to the neutral file

10. Enter the Starting Node number and Node increment value in the appropriate field. By default, the Starting Node number and Node increment are set to 10 and 10 respectively.

11. The Specific Gravity of the fluid (with respect to water) is set to 1.0 by default. User can change Specific Gravity by entering the appropriate value in text box.

12. When the "Identify Support ATTA's with ATTYPE attribute set as" is entered with a Keyword, then it will transfer support locations and its information from PDMS, only when the attribute "ATTYPE" is filled with the string that matches the Keyword entered in the form. On the other hand, leaving this text box empty (unfilled) will transfer all the ATTA from the PDMS for the selected Pipes/Branches without checking its "ATTYPE" attribute. For example, if the Keyword is specified as "SUPP" then the program will include ATTA's for transfer, only when the ATTYPE attribute is filled with the same Keyword "SUPP", otherwise, it excludes them from transfer.

3.0 Limitations

1. Corrosion allowance and Mill tolerance are not transferred to CAESAR II at this time even though the provision is available in the Neutral File.

2. Lining Density and Lining Thickness are not transferred to CAESAR II at this time.

3. Since the Wall thickness of the Piping components is generally not available in PDMS, they are not transferred to Neutral file. At the same time, the Product reads Wall Thickness corresponding to the specified Nominal Size of the component from the Mapping DB.

4.0 Reference

Loads

Temperature and Pressure values entered at Pipe/Branch level via TEMP and PRES attribute shall be transferred to CAESAR II. Hence, user should fill these attributes with appropriate values depending upon the Units of transfer. I.e., If you wish to transfer the model in SI units, then the values to be entered for Temperature and Pressure should be in Deg C and bar respectively. On the other hand, if you wish to transfer the model in English Units, then the Temperature and Pressure values shall be entered in Deg F and psi respectively.

Fluid Density

Even though the provision is available in PDMS Propcon Database to enter the Fluid density, most of the users do not use such facility. Hence, provision is given to specify the Specific Gravity of the fluid (with respect to water) during the transfer of the model.

Weight

The weights of Valves, Instruments, Flanges, etc. are extracted from the Propcon Database through the "Cweight" attribute. If defined/available in the Propcon Database, the program extracts the information and writes the same to neutral file; otherwise, it shall be written as 0.0. Care should be taken while filling the "Cweight" attribute in Propcon. I.e., the values should be specified in Kg, if you to wish to transfer the same in SI units; otherwise, in lb for English units.

OD and Nominal Size

OD and Nominal Size are extracted from the Paragon Database of PDMS. For reducers, the arrive OD and Thickness shall be transferred to OD and Thickness of the element auxiliary block in CAESAR II and the leave OD and Thickness shall be transferred as OD and Thickness of the reducer auxiliary block in CAESAR II.

Boundary Conditions

In the current version, the program will "Anchor" the Pipe Ends only when they are connected to a Nozzle; otherwise, it leaves them as open. On the other hand, if one end of the pipe is connected to another Branch and if that Branch is not included as the part of the Stress model, then the program will also anchor that end automatically.

For more clarity, consider the following examples. If one end of the pipe is connected to a Pump Nozzle and the other end is not connected to any equipment nozzle/object, then the program will anchor the first end and leave the other end as free (i.e., do not create any support). On the other hand, if one end of the

pipe is connected to a Nozzle and the other end is connected to another Branch and that Branch is not included in the Stress model, then the program will anchor both the ends automatically.

Supports

Support locations and their information are included for transfer from PDMS when the following conditions are met.

Define ATTA and fill the attribute "ATTYPE" with an appropriate Keyword. Use the same Keyword in the text box "Identify Support ATTA's with ATTYPE attribute set as" (as shown in figure above). Mismatching of Keywords will exclude the ATTA's from transfer (or) fill the attribute "ATTYPE" with an appropriate Keyword and leave the text box "Identify Support ATTA's with ATTYPE attribute set as" empty (unfilled) to include all ATTA's for Transfer.

Secondly, the translator performs the following for transferring the support details to CAESAR II.

a. Checks user defined attribute (UDA) ":SUPCODE". If available, then reads the details of support from this attribute and write them to the neutral file.

b. If not available, then checks for user defined attribute ":KPSUPCODE". If available, then reads the details from this attribute and writes the same to the neutral file. Please note, this feature is included for PDMS-to-CAEPIPE users to avoid reentering of support details to transfer to CAESAR II. i.e., If you are using the PDMS-to-CAEPIPE translator, you can use the same user defined attribute ":KPSUPCODE" to transfer the support details to both CAEPIPE and CAESAR II, without reentering the values.

c. If both the attributes are not available in PDMS, then the program will read the support details from the "STEXT" attribute of ATTA and transfer the same to CAESAR II. This can be used in situations where, the users do not have write access to Dictionary Database of PDMS to create the User Defined attribute.

d. Lastly, Trunion type support can be defined and transferred to CAESAR II as mentioned in Section 6.0 of this manual.

Any of the attribute defined above should be set a value as given in the field #1 of the access db "SupportType.mdb", if you are planning to use Mapping DB for transferring the support details to CAESAR II. Otherwise, the attribute should be filled with values as specified in Appendix E of PD2CII Translator User's Manual.

Material

Material description entered at XTEXT attribute of SMTE is extracted from the Paragon Database and written to the neutral file. The CAESAR II Material Index is then transferred to CAESAR II by obtaining the same through Mapping DB defined by the user.

5.0 Specifying Wall Thickness

This section explains how to extract the wall thickness for PDMS piping components. To specify the wall thickness for piping components like Pipe, Olet, Tee, Elbow, Reducer and Cross, navigate to "PDMS2CII" installed path and locate the folder "Setup". Navigate to the folder "Objects" and then open the corresponding .pml object files in which the thickness need to be specified.

Locate the variables "!This.WallThickness[1] and "!This.WallThickness[2]" in the file and modify the values to suit the project requirement. By default these variables are assigned to '0.00'.

Catalogue Parameter

If wall thickness is defined using Catalogue Parameter of SCOM in PDMS, then the variable can be modified to read the value from Catalogue Parameter. For example, if the Wall Thickness is specified in Catalogue Parameter 3, modify the lines as follows.

> !This.WallThickness[1] = !DbRef.catref.Param[3].String()
> !This.WallThickness[2] = !DbRef.catref.Param[3].String()

Design Parameter

If Design Parameter (DESPARAM) is used to specify the Wall Thickness, then the variable can be modified to read the value from Design Parameter. For example, if the Wall Thickness is specified in Design Parameter 3, modify the lines as follows.

> !This.WallThickness[1] = !DbRef.spref.Desparam[3].String()
> !This.WallThickness[2] = !DbRef.spref.Desparam[3].String()

User Defined Attributes (UDA) at Specification component

If User Defined Attribute is used to specify the Wall thickness of the piping component at SPCO level, modify the variable listed below to read the value from UDA. For example, if the Wall Thickness is specified in the variable "WallThickness" of SPCO element, modify the lines as follows.

> !This.WallThickness[1] = !DbRef.Spref.:WallThickness.string()
> !This.WallThickness[2] = !DbRef.Spref.:WallThickness.string()

User Defined Attributes (UDA) at Piping Component

If User Defined Attribute is used to specify the Wall thickness at piping component, modify the variable listed below to read the value from UDA. For example, if the Wall Thickness is specified in the variable "WallThickness" of piping element, modify the lines as follows.

> !This.WallThickness[1] = !DbRef.:WallThickness.string()

> !This.WallThickness[2] = !DbRef.:WallThickness.string()

6.0 Modelling and transferring Trunnion Supports from PDMS

To explain the concept and to get the Trunnion configuration as expected in CAESAR II, The following were performed.

Routed 4 new pipelines in PDMS 12.1 Sample project corresponding to different Trunnion configuration that is generally used. The datal file for the same is available in the "PD2CII_Installation_Directory\Setup" folder. The guidelines that were followed to model Trunnion support are given below. We suggest the user to upload the same with Sample project of PDMS 12.1 for better understanding.

1. **Vertical-up Trunnion on Vertical Elbow or Bend (refer to Pipeline "Trun-VertUP")**

   a. Created ATTA 1 after ELBO 2 and named the ATTA as TVP-A1. Connected the created ATTA with ELBO 2 far end face using the command "CONN" in PDMS to maintain the flow direction.

   b. Created ATTA 2 after ATTA TVP-A1 and connected the same again with ELBO 2 far end face using the command "CONN" in PDMS to force create a Node at ELBO 2 far face & Pipe junction so that when it is transferred to CAESAR II, it will have a common node at this junction mathematically sharing the stiffness.

   c. Positioned the ATTA TVP-A1 at Trunnion location using the command "MOVE BY U 500" in PDMS.

   d. Filled the attributes "ATTYPE" and "STEXT" of ATTA TVP-A1 as "SUPP" and "X;Z" respectively to generate the Restraint in CAESAR II.

   e. Launched PD2CII using the command "show !!PD2CII". Selected the Pipeline with name "Trun-VertUP" and generated the neutral file.

   f. Transferred the same to CAESAR II by specifying starting node number as 10 and transfer support option as " without using mapping DB".

2. **Horizontal Trunnion on Vertical Elbow or Bend (refer to Pipeline "Trun-HoriSide1")**
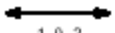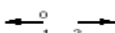
   a. Navigated to branch /TRUN-SIDE-1.

   b. Created ATTA 1 as the first member and connected the same to the ELBO 1 near face using the command "CONN TO NEXT" to maintain the flow direction.

c. Created ATTA 2 after the ATTA 1 and named it as THS1-A1. Connected the ATTA created to ELBO 1 near face using the command "CONN TO NEXT " to force create a Node at ELBO 1 near face and Pipe junction so that when it is transferred to CAESAR II, it will have a common node at this junction mathematically sharing the stiffness.

d. Positioned the ATTA THS1-A1 at Trunnion location using the command "MOVE BY E 500" in PDMS.

e. Filled the attributes "ATTYPE" and "STEXT" of ATTA THS1-A1 as "SUPP" and "Y;Z" respectively to generate the Restraint in CAESAR II.

f. If you wish to see the node numbering generated in a specific order then do NOT include the Pipe /Trun-HoriSide1 and instead select the branches one-by-one in the order in which you wish to have the node numbering generated. For example, select Branch 2 and then branch /TRUN-SIDE-1 of the Pipe "Trun-HoriSide1" to generate the starting node number from HPOS of branch 1(i.e., node 10 at HPOS of Branch 2).

g. Launched PD2CII using the command "show !!PD2CII". Selected the branches in the order in which the node numbers were to be generated.

h. Transferred the same to CAESAR II by specifying starting node number as 10 and transfer support option as "without using mapping DB".
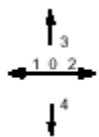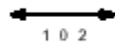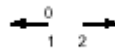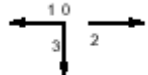
3. **Vertical-Down Trunion on Vertical Elbow or Bend (refer branch "TRUN-DOWN")**

a. Navigated to branch /TRUN-DOWN

b. Created ATTA 1 after ELBO 2 and connected the same to the ELBO 3 near face using the command "CONN TO NEXT" to maintain the flow direction.

c. Created ATTA 2 after the ATTA 1 and name it as TVD-A1. Connected the created ATTA to ELBO 3 near face using the command "CONN TO NEXT " to force create a Node at ELBO 3 near face and Pipe junction so that when it is transferred to CAESAR II, it will have a common node at this junction mathematically sharing the stiffness.

d. Positioned the ATTA TVD-A1 at Trunnion location using the command "MOVE BY D 500" in PDMS.

e. Filled the attributes "ATTYPE" and "STEXT" for ATTA TVD-A1 as "SUPP" and "Y;Z" respectively to generate the Restraint in CAESAR II.

f. Launched PD2CII using the command "show !!PD2CII". Selected the Pipeline with name "Trun-VertDown" and generated the neutral file.

g. Transferred the same to CAESAR II by specifying starting node number as 10 and transfer support option as "without using mapping DB".

4. **Horizontal-Side Trunion on Vertical Elbow or Bend (refer Pipeline "Trun-HoriSide2")**

a. Created ATTA 1 after ELBO 1 and named it as THS2-A1.Connect the created ATTA THS2-A1 with ELBO 1 far end face using the command "CONN" in PDMS to maintain the flow direction.

b. Created ATTA 2 after ATTA THS2-A1 and connected the same again with ELBO 1 far end face using the command "CONN" in PDMS to force create a Node at ELBO 1 far face & Pipe junction so that when it is transferred to CAESAR II, it will have a common node at this junction mathematically sharing the stiffness.

c. Positioned the ATTA THS2-A1 at Trunnion location using the command "MOVE BY E 500" in PDMS.

d. Filled the attributes "ATTYPE" and "STEXT" of ATTA THS2-A1 as "SUPP" and "X;Z" respectively to generate the Restraint in CAESAR II.

f. Launched PD2CII using the command "show !!PD2CII". Selected the Pipeline with name "Trun-HoriSide2" and generated neutral file.

G. Transferred the same to CAESAR II by specifying starting node number as 10 and transfer support option as "without using mapping DB".
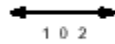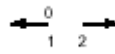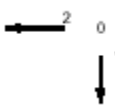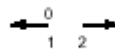
To see the problems that may arise from improper modelling of trunnion configuration in PDMS, we suggest you to perform the following.
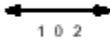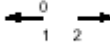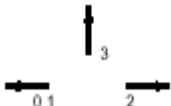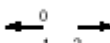
1. Select the Pipeline /Trun-HoriSide1 instead of selecting branches and transfer the model to CAESAR II. You will observe that the resulting node numbers will NOT be in the order in which it is expected (i.e., the starting node number will be at the tee junction). On the other hand selecting the branches as mentioned in Point 2.f above will generate the node numbers as expected.

2. Delete ATTA 1 or ATTA 2 that is NOT representing the trunnion support from each pipeline and transfer the same to CAESAR II. From the resulting model you may notice that the trunnion support will NOT be transferred properly i.e., for models 01 and 04 above, the restraints will at the bend junction. Whereas in models 02 and 03, trunnions will be generated without having a common node connecting the junction of ELBO and PIPE. In other words, the pipe will not be mathematically connected to face of the elbo at trunnion configuration.
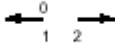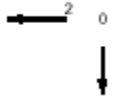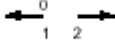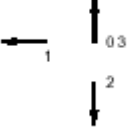
7.0 Plant Design to CAESAR II Component Mapping

The types of components available in Plant Design are mapped with CAESAR II component types and PD2CII translator transfers the component available in Plant Design to CAESAR II as tabulated below
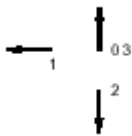
Plant Design Software Component Description	Connection Points	CAESAR II Component	Keyword used in Neutral File
Cap			
Butt weld		Rigid Element	RB
Cap compression		Rigid Element	RB
Cap Screwed		Rigid Element	RB
Cap Socket Weld		Rigid Element	RB
Closure			
Pipe Block		Rigid Element	RB
Pipe Block Variable Length		Rigid Element	RB
Coupling			
Nipple – Screwed, Coupling Compression, Coupling Screwed, Coupling Socket weld, Butt weld Elbolet, Socket Weld Elbolet, Screwed Elbolet		Reducer Concentric	RD
Cross			
Butt Weld, Socket Weld, Compression, Flanged, Screwed		Four Pipes with SIF & TEE	CR
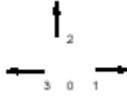
Plant Design Software Component Description	Connection Points	CAESAR II Component	Keyword used in Neutral File
Set on, Set on Reinforced		Four Pipes with SIF & TEE	CR
Blind Flange			
Flange – Blind		Rigid Element	FL
Flange - Reducing Concentric		Rigid Element	FL
Flange Reducing Eccentric		NA	NA
Fixed Length Tube			
Fixed length Pipe with Flanged ends and without Flanged ends.		Pipe	PI
Lap Joint and Stub End			
Lap Joint Ring Loose		Rigid Element	FL
Lap Joint Stub End Loose		Rigid Element	FL
PCOMponent			
Block – Angle		Pipe	PI
Expansion Bellows, Flame Trap, Flexible Hose, Hose Coupling, Non – Category item, Restrictor Plate, Tundish		Pipe	PI

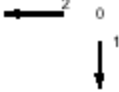| Plant Design Software Component Description	Connection Points	CAESAR II Component	Keyword used in Neutral File
Plug		Pipe	PI
Sight Glass		Pipe	PI
Slip Plate, Slip Ring, Spectacle Blind		Pipe	PI
Reducer Concentric			
Reducer Concentric Butt Weld, Fabricated from Plate, Swaged from Pipe, Compression, Flanged, Fabricated from Plate Flanged, Swaged from Pipe Flanged, Nipple, Screwed, Socket Weld Bush, Socket Weld & Special Reducing Flange		Reducer Concentric	RD
Reducer Concentric with a Butt Weld Connection, Fabricated Plate Connection, Connection Swaged from Pipe, Connection Flanged, Connection Fabricated from Plate Flanged, Connection Swaged from Pipe Flanged, Screwed Connection and Connection Socket Weld		Reducer Concentric	RD
Reducer Eccentric			
Reducer eccentric Butt weld, Fabricated from Plate and Swaged from Pipe.		Reducer Eccentric	ER
Reducer Eccentric with a Connection Butt	NA	NA	NA
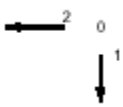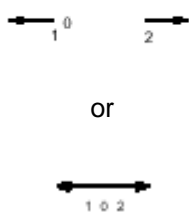
Plant Design Software Component Description	Connection Points	CAESAR II Component	Keyword used in Neutral File
Weld, Connection Fabricated from Plate, Connection Swaged from Pipe, Connection Flanged, Connection fabricated from Plate Flanged and Connection Swaged from Pipe Flanged			
Eccentric Screwed, Flanged, Fabricated from Plate Flanged and Swaged from Pipe Flanged		Reducer Eccentric	ER
TRAP			
Trap – In Line		Pipe	PI
Trap – Angle		Pipe	PI
Trap – Offset, Trap – Return	NA	NA	NA
UNION			
Union – Screwed, Socket Weld		Pipe	PI
TEE or OLET			
Olet - Half Coupling, Nipolet (Screwed, Plain Ended), Sockolet, Thredolet, Weldolet, Tee- Set-on, Set-on Reinforced and Tee Pulled		Pipe(s) with SIF & TEE	TU/TW/TF/TO
Olet – Latrolet (Butt Weld, Screwed & Socket Weld)		Pipe(s) with SIF & TEE	TU/TW/TF/TO

Plant Design Software Component Description	Connection Points	CAESAR II Component	Keyword used in Neutral File
Olet – Instrument Flanged, Tee – Butt Weld, Compression, Flanged, Screwed, Socket Weld, Swept Branch Butt Weld, Swept Branch Flanged, Swept Branch Compression and Swept Branch Socket Weld		Pipe(s) with SIF & TEE	TU/TW/TF/TO
Valve			
Valve – Angle (Pressure Reducing, Relief/Vent,		Rigid Element	VA
Valve – Ball, Basic, Butterfly, Cock, Diaphragm, Gate, Globe, Needle, Plug, Pressure Reducing, Relief/Vent and Slide		Rigid Element	VA
Valve – Check		Rigid Element	VA
VENT			
Rupture Disk		Rigid Element	RB
Four Way Valve			
Valve – 4 Way		Four Rigid Elements	4W
Three Way Valve			

Plant Design Software Component Description	Connection Points	CAESAR II Component	Keyword used in Neutral File
Valve – 3 Way		Three Rigid Elements	3W
INSTRUMENT			
Instrument, Orifice Plate, Restrictor Plate and Rupture Disk		Rigid Element	RB
Instrument Angle		Rigid Element	RB
Instrument Dial and Dial Flanged		Rigid Element	RB
Valve – Angle Relief/Vent, Angle Pressure Reducing, Angle Control, Angle Control Square Indicator, Angle Control Motorised Indicator, Angle Control Hand Indicator		Rigid Element	RB
Control, Control Square Indicator, Control Motorised Indicator, Hand Indicator, Pressure Reducing and Relief/Vent		Rigid Element	RB
3 Way Control, 3 Way Control Square, 3 Way Control Motorised Indicator and 3 Way Control Hand Indicator		Three Rigid Elements	3W

Plant Design Software Component Description	Connection Points	CAESAR II Component	Keyword used in Neutral File
4 Way Control Square Indicator, 4 Way Control, 4 Way Control Motorised Indicator, 4 Way Control Hand Indicator		Four Rigid Elements	4W
ELBOW or BEND			
Elbow – Butt Weld (90 and 45 Deg), Screwed with Female Ends, Elbow Compression, Screwed with Male Ends, Elbow Socket Weld, Elbow Reducing, Bend – Mitre, Lobster Back Butt weld and Lobster Back Bend and Pulled		Bend	EL
Butt Weld with a Connection, Compression with a Connection, Screwed Female with a Connection, Socket Weld with a Connection, Bend Flanged with a Connection, Bend – Mitre with a Connection Flanged, Butt Weld Bend – Mitre with a Connection, Lobster Back with a Connection and Pulled with a Connection		Pipes with SIF & TEE	TW
Butt Weld 180 Deg Return, Flanged 180 Deg Return and Pulled 180 Deg Return		Bend	EL
FILTER			
Filter/Strainer- Straight Through		Rigid Element	RB

Plant Design Software Component Description	Connection Points	CAESAR II Component	Keyword used in Neutral File
Filter / Strainer Angle		Rigid Element	RB
Flange			
Flange Blind, Flared/Loose Backing, Flange Backing, Flange Reducing Concentric, Screwed, Slip On, Slip On with 'J' Type Weld, Socket Weld and Weld Neck	or	Rigid Element	FL