

Adaptation of ISO 15926-14

Demo implementation

based on a real but very limited use case

Purpose of the Demo

- The goal is to illustrate how to create a data set of an asset model to represent both the breakdown and the topology structure
 - Realized as correctly typed data objects and relations between those according to ISO15926-14 Reference Model
 - Such data set shall be possible to be created and modified in a programmatic way by independent software tools
-
- Just download and play with it 😊

Statements to avoid some confusions

- The use-case implementation is not indented to be complete
- Some concepts need further verification
- Domain specific types as examples and they are not clarified with domain experts

How does it look like for a machine

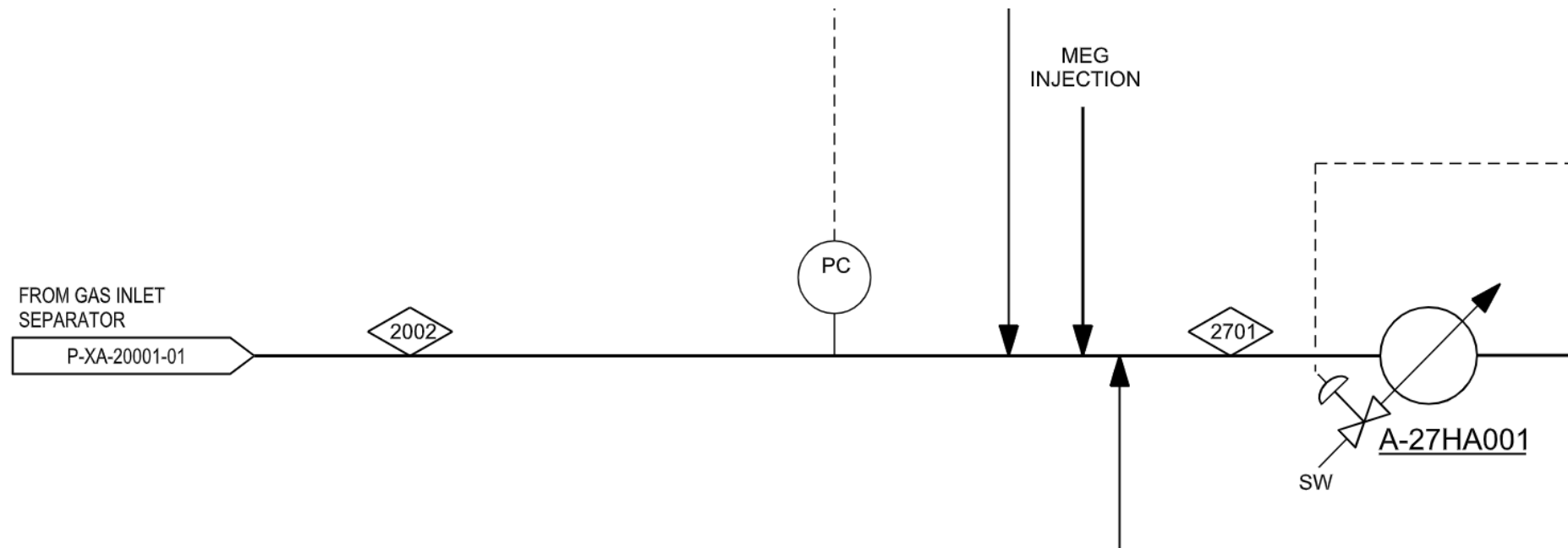
The following graphical illustration should not be confused with a machine interpreted data representation in real life

```
C:\> git > plm-rdl > plm-rdl > documents > demo > demo20220218 > asset-model > MEG-example-20220218.ttl
14 @prefix asset: <http://example.org/noaka-collab/MEG-demo/> .
15 @prefix xsd: <http://www.w3.org/2001/XMLSchema#> .
16
17 <http://rds.posccaesar.org/ontology/plm/ont/meg-example-20220218>
18   a owl:Ontology ;
19   rdfs:label "MEG Injection asset model demo, for Readi workshop 2022-02-18" ;
20   owl:imports <http://rds.posccaesar.org/ontology/plm/ont/temporary-rdl-extension>
21 ;
22
23 ## act v t f
24
25 asset:Askja923558 a owl:NamedIndividual , rdl:PCA_100000007 , rdl:PCA_100000003 ; rdfs:label "Gas Separating 01" .
26 asset:Askja227004 a owl:NamedIndividual , rdl:PCA_100000009 , rdl:PCA_100000003 ; rdfs:label "Gas Transporting 01" .
27 asset:Askja239723 a owl:NamedIndividual , rdl:PCA_100000005 , rdl:PCA_100000003 ; rdfs:label "Heat Exchanging 01" .
28 asset:Askja877752 a owl:NamedIndividual , rdl:tmp220855 ; rdfs:label "Gas Stream 1 Hydrate Control" .
29 asset:Askja500701 a owl:NamedIndividual , rdl:tmp161613 ; rdfs:label "MEG Injection 01" .
30 asset:Askja855521 a owl:NamedIndividual , rdl:tmp797310 ; rdfs:label "MEG Injection 01 open/close" ;
31   rdl:tmp360163 asset:Askja558626 .
32
33 ### streams
34 asset:Askja542639 a owl:NamedIndividual , rdl:tmp085512 ; rdfs:label "Gas stream 1" .
35 asset:Askja506509 a owl:NamedIndividual , rdl:tmp085512 ; rdfs:label "Gas stream 1 - part 2002" .
36 asset:Askja384466 a owl:NamedIndividual , rdl:tmp085512 ; rdfs:label "Gas stream 1 - part 2701" .
37 asset:Askja301588 a owl:NamedIndividual , rdl:tmp085512 ; rdfs:label "Gas stream 1 - Stream point 1" .
38 asset:Askja882526 a owl:NamedIndividual , rdl:tmp739447 , rdl:tmp145065 , rdl:tmp794611 ; rdfs:label "MEG stream 1" .
39 asset:Askja920841 a owl:NamedIndividual , rdl:tmp739447 ; rdfs:label "MEG stream 1 - Stream point 1" ;
40   lis:partOf asset:Askja882526 .
41
42 ### function(s)
43 asset:Askja974961 a owl:NamedIndividual , lis:Function ; rdfs:label "27 Gas Separator 1 function" ;
44   lis:realizedIn asset:Askja923558 .
45 asset:Askja462117 a owl:NamedIndividual , lis:Function ; rdfs:label "27 Gas Transport 1 function" ;
46   lis:realizedIn asset:Askja227004 .
47 asset:Askja663265 a owl:NamedIndividual , lis:Function ; rdfs:label "A-45 9999 open/close function" ;
48   lis:realizedIn asset:Askja855521 .
49 asset:Askja069629 a owl:NamedIndividual , lis:Function ; rdfs:label "A-27HAC01 Heat Exchanging function" ;
50   lis:realizedIn asset:Askja239723 .
51
52 ### systems
53 asset:Askja280415 a owl:NamedIndividual , rdl:tmp843683 ; rdfs:label "27 Gas separating system 1" .
54 asset:Askja013740 a owl:NamedIndividual , rdl:tmp447032 ; rdfs:label "45 MEG System 1" .
55 asset:Askja978289 a owl:NamedIndividual , rdl:tmp948737 ; rdfs:label "45.01 MEG Sub-System Injection to Askja-27" ;
56   lis:partOf asset:Askja013740 .
57 asset:Askja558626 a owl:NamedIndividual , rdl:tmp320047 ; rdfs:label "45.9999 valve system loop" ;
58   lis:partOf asset:Askja978289 ;
59   lis:hasFunction asset:Askja663265 .
60
61 ### equipment (and more)
62 asset:Askja517556 a owl:NamedIndividual , rdl:PCA_100001009 ; rdfs:label "27 Gas Separator 1" ;
63   lis:partOf asset:Askja280415 ; lis:hasFunction asset:Askja974961 .
64 asset:Askja759934 a owl:NamedIndividual , rdl:PCA_100001011 ; rdfs:label "27 Gas Transport 1" ;
```

The use-case we intend to demonstrate

Gas stream that flows from a separator to a heat exchanger. The stream is subject to injection of MEG (Mono Ethylene), a chemical injection that dehydrates the gas before it enters the heat exchanger.

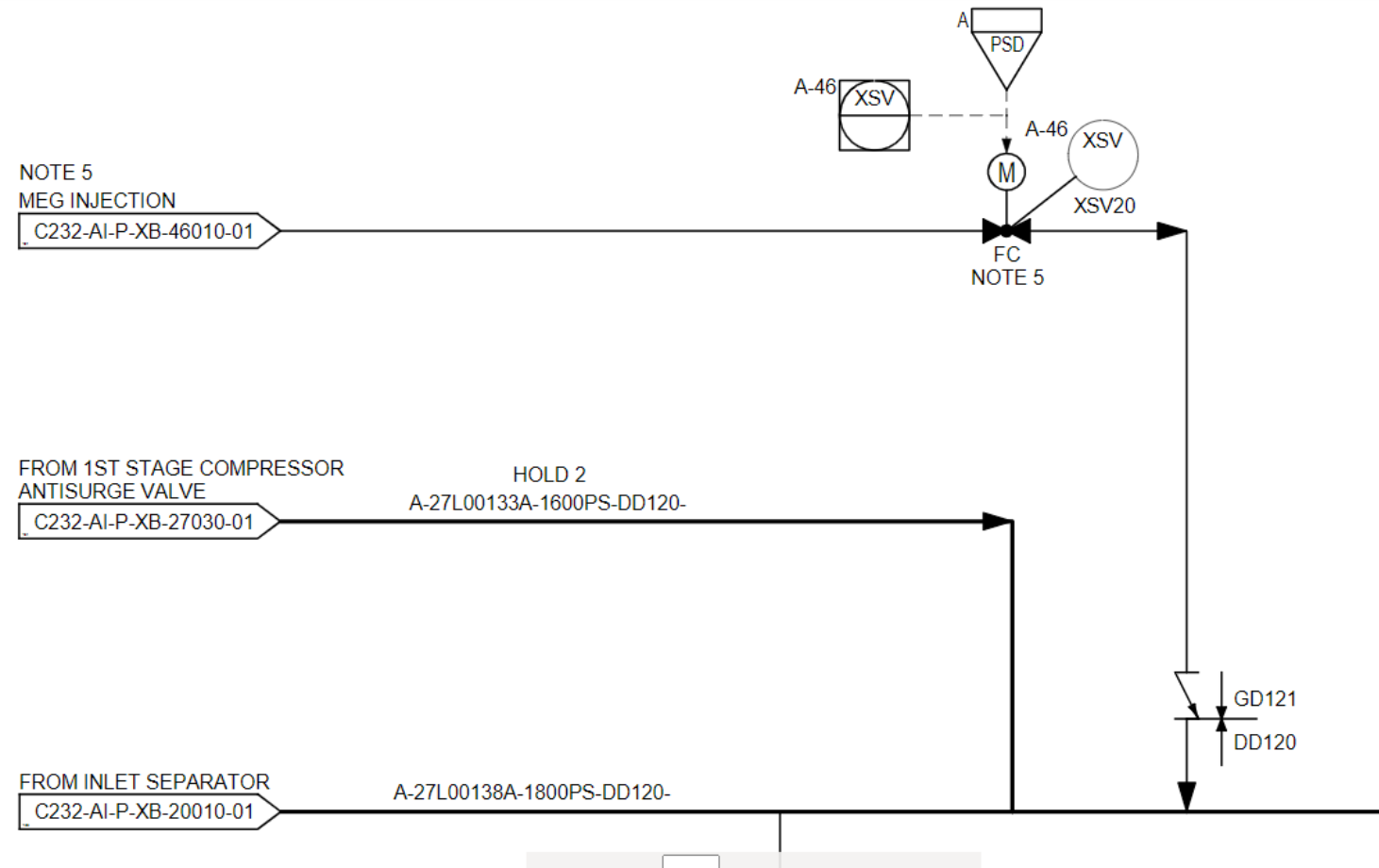
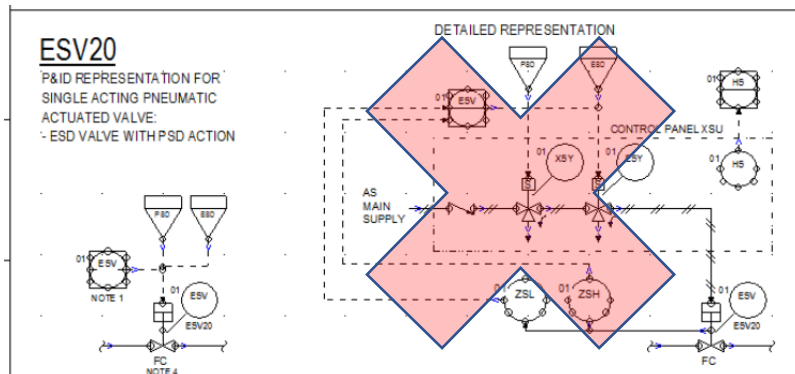
- Process Flow Diagram (PFD)



The use-case we intend to demonstrate

Topological representation and specifications of systems, subsystems, and equipment with and instrumentation.

- Piping & Instrumentation (P&ID)



The use-case we intend to demonstrate

Operating, design and technical parameters of a specific equipment

- Engineering data
NB. Not complete

Tag *	B-46XSV0012	MEG to Downstream Riser ESV Geitungen
		MEG til Geitungen stigerør BrRam H
Eq.Code (COR) *	BJBD	Block Valve, Pneumatic Actuator - NORSOK BJB - Instru
Design / Constr.	AIBEL / THAI	STID/TIPS

Details	References	Process DS	Dim & Weight	Utilities	Kits	Comments	System Status	Purchase Status	Are
Line References									
Line Id	B-46L00030A	B-46L00030A-0300CA-FD120							
Template									
Code	PR2-EXT	Document Reference							
Desc	Block Valve (Extended)	No	C152-AI-P-DS-4						
		Title	PROCESS DATA						

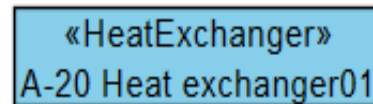
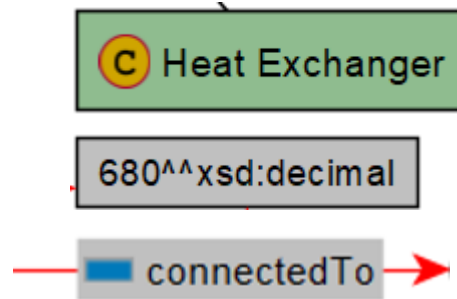
	Seq	Property	Unit	Data	Note Ref
1	00.000.0	BLOCK VALVE			
2	01.000.0	EQUIPMENT CONDITIONS			
▶	01.001.1	Line size in/out	in		
4	01.003.1	Flange rating in/out	lbs		
5	01.005.1	Design temperature minimum	°C	-10	
6	01.007.1	Design temperature maximum	°C	50	
7	01.009.1	Design pressure minimum	barg	-1	
8	01.011.1	Design pressure maximum	barg	238	
9	01.013.1	Material in/out	NA		
10	01.015.1	Fluid		CHEMICAL, GLYCOL/WATER	
11	01.017.1	Phase		Liquid	
12	01.019.1	Corrosive compounds	NA		
13	01.021.1	Operating case	NA		
14	01.023.1	Valve type	NA		
15	01.025.1	PED group		2	
16	01.027.1	PED category		SEP	
17	01.029.1	Sour service		N	
18	01.030.1	CO2 concentration	mole%	NA	
19	01.032.1	H2S concentration	ppm mole		
20	01.034.1	Sand concentration	ppm wt.	NA	
21	01.036.1	Methanol Concentration	%(Vol)	NA	
22	01.038.1	Other Corrosive compounds	%(Vol)	NA	
23	02.000.0	OPERATING CONDITIONS			
24	02.001.1	Temperature minimum	°C	-3	
25	02.002.1	Temperature normal	°C	8	
26	02.003.1	Temperature maximum	°C	22	
27	02.004.1	Inlet Pressure minimum	barg		
28	02.005.1	Inlet Pressure normal	barg	209	
29	02.006.1	Inlet Pressure maximum	barg	214	
30	03.000.0	SPECIAL CONDITIONS			
31	03.001.1	Failure action	NA		
32	03.002.1	Opening/closing time	s		
33	03.003.1	Maximum shut off diff_p	bar		
34	03.004.1	Torque/thrust req.			

Reference model basics 😊

- Classes/Types
- Data properties
- Relations

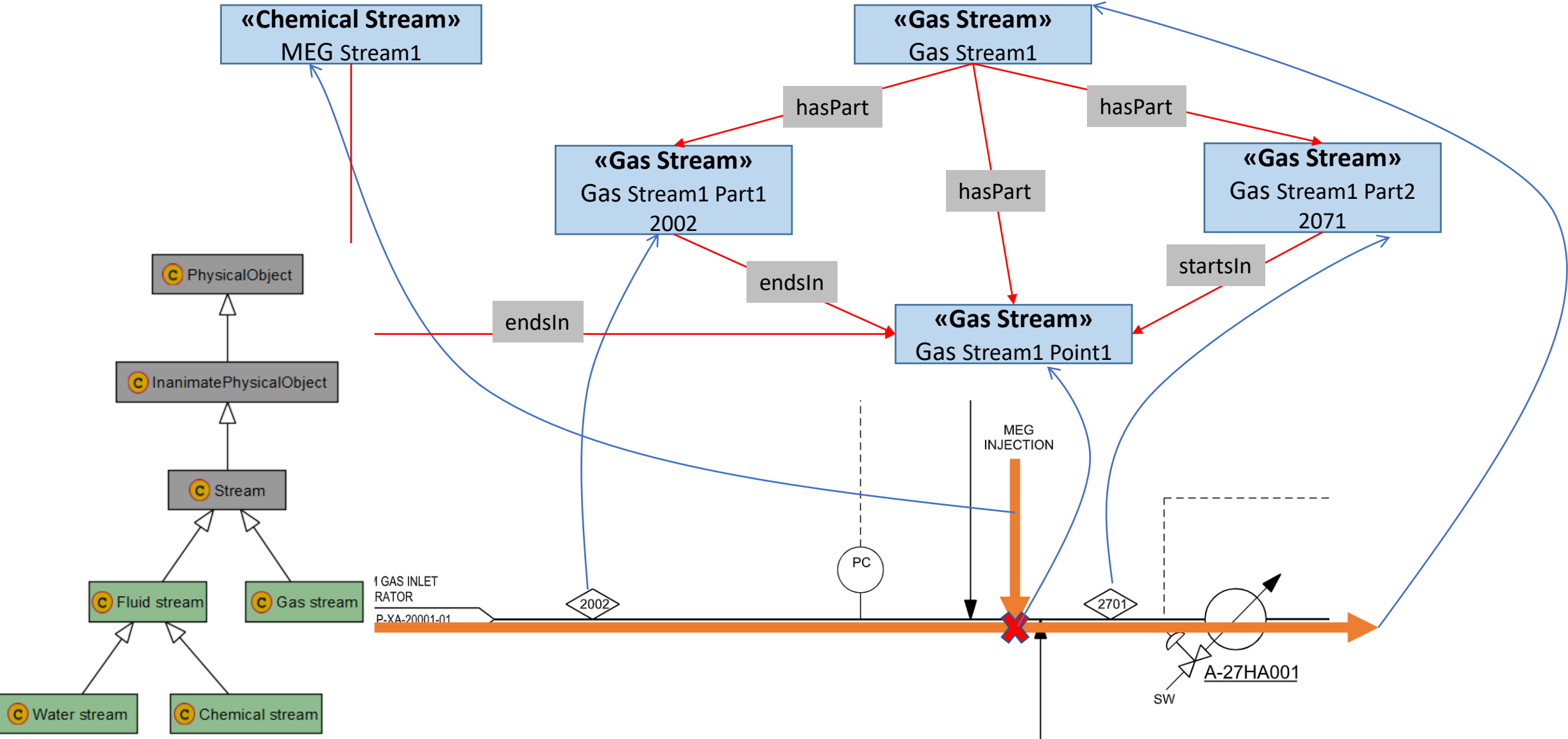
- Individuals / Instances

- IRI - Internationalized Resource Identifier
- Meta data

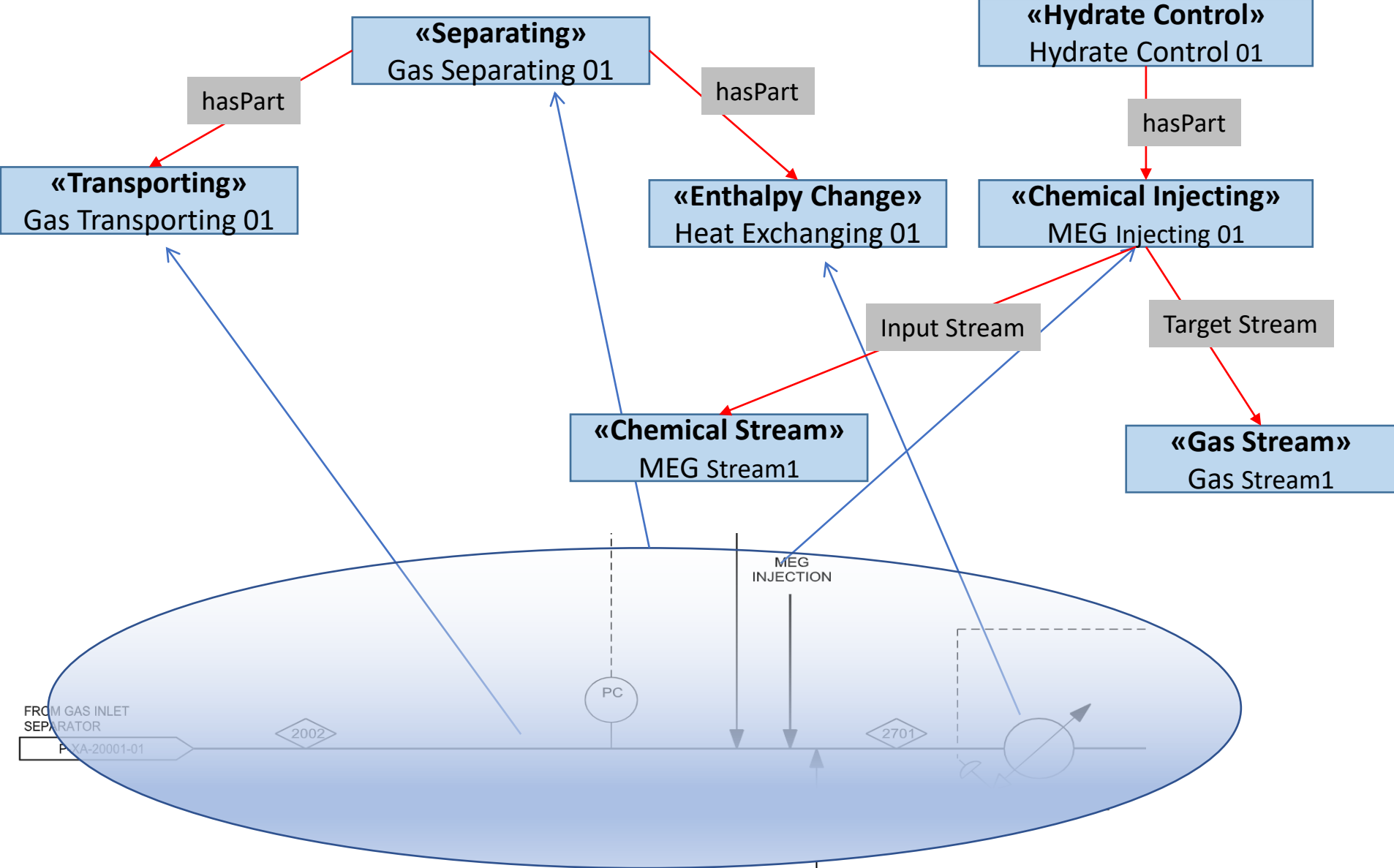


<http://example.org/noaka-collab/MEG-demo/Askja948383>

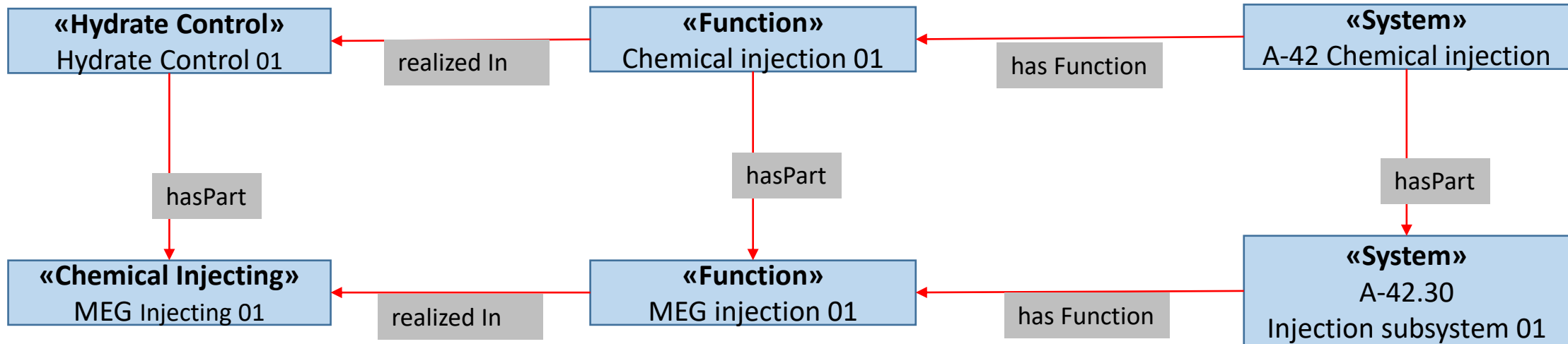
Lets design the Stream



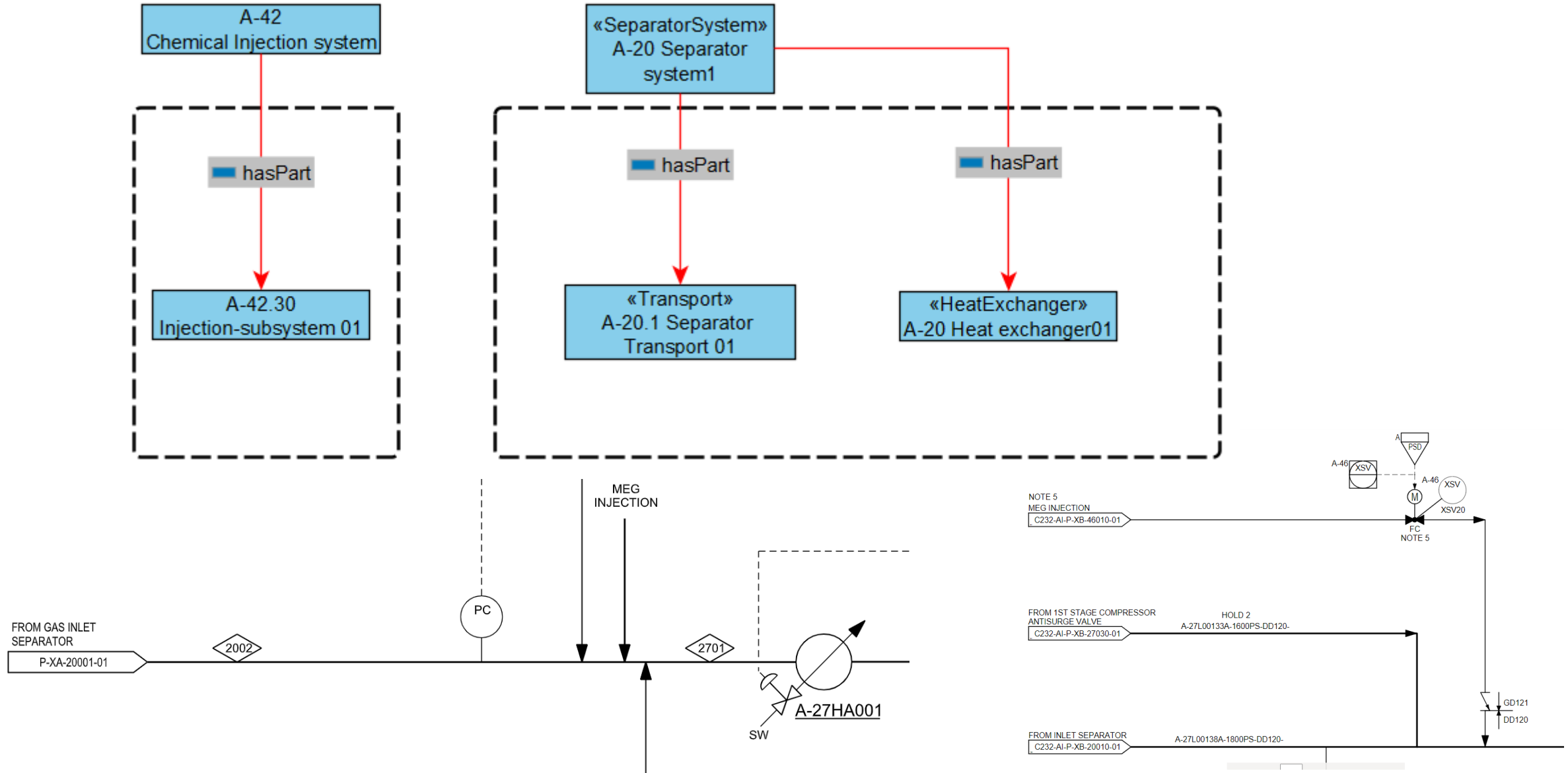
Design some process activities



Systems to realize the process activities

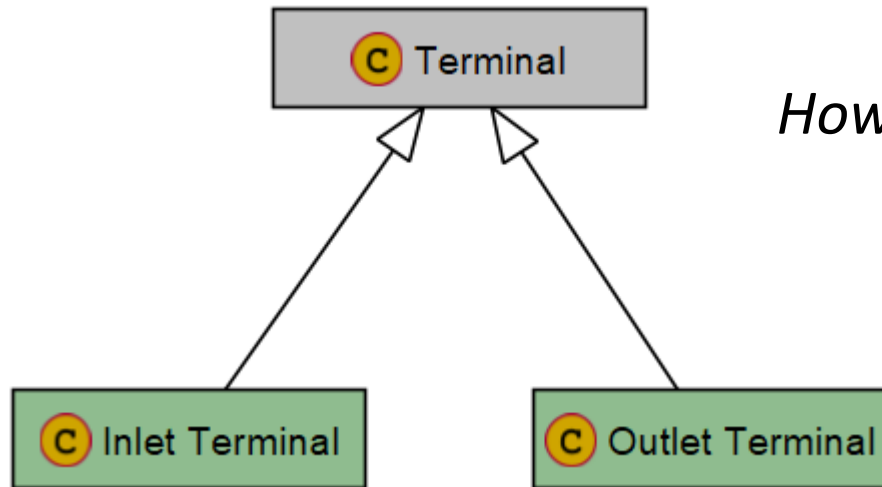


Identifying systems and sub-systems (breakdown)

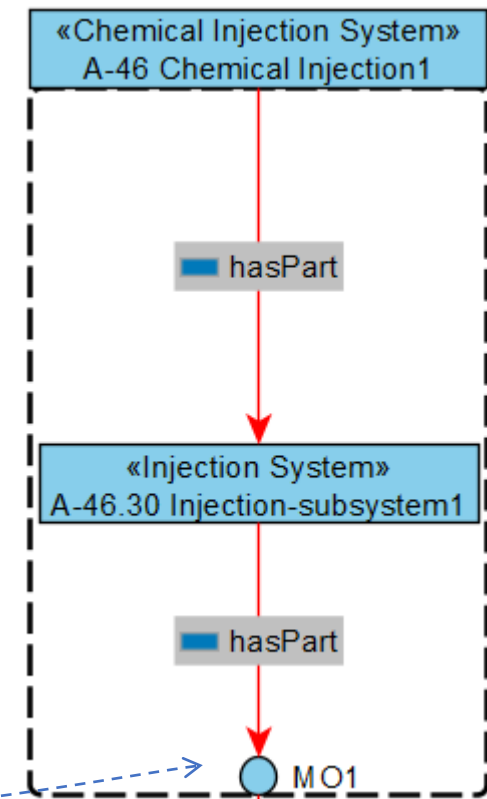


Introduction of the Terminals/Port/Interface

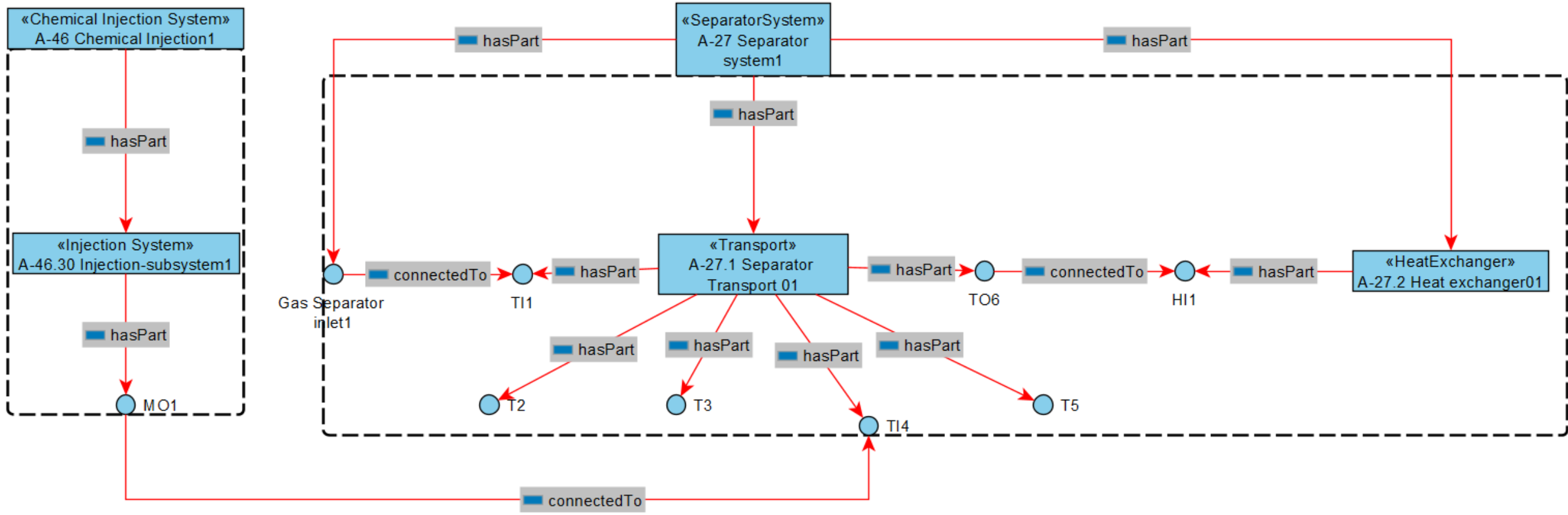
- What is a Terminal - Represents a connection between systems and equipment where a medium or energy flows through.



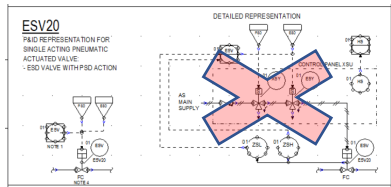
How does it work in the model?



How the systems are connected (topology)



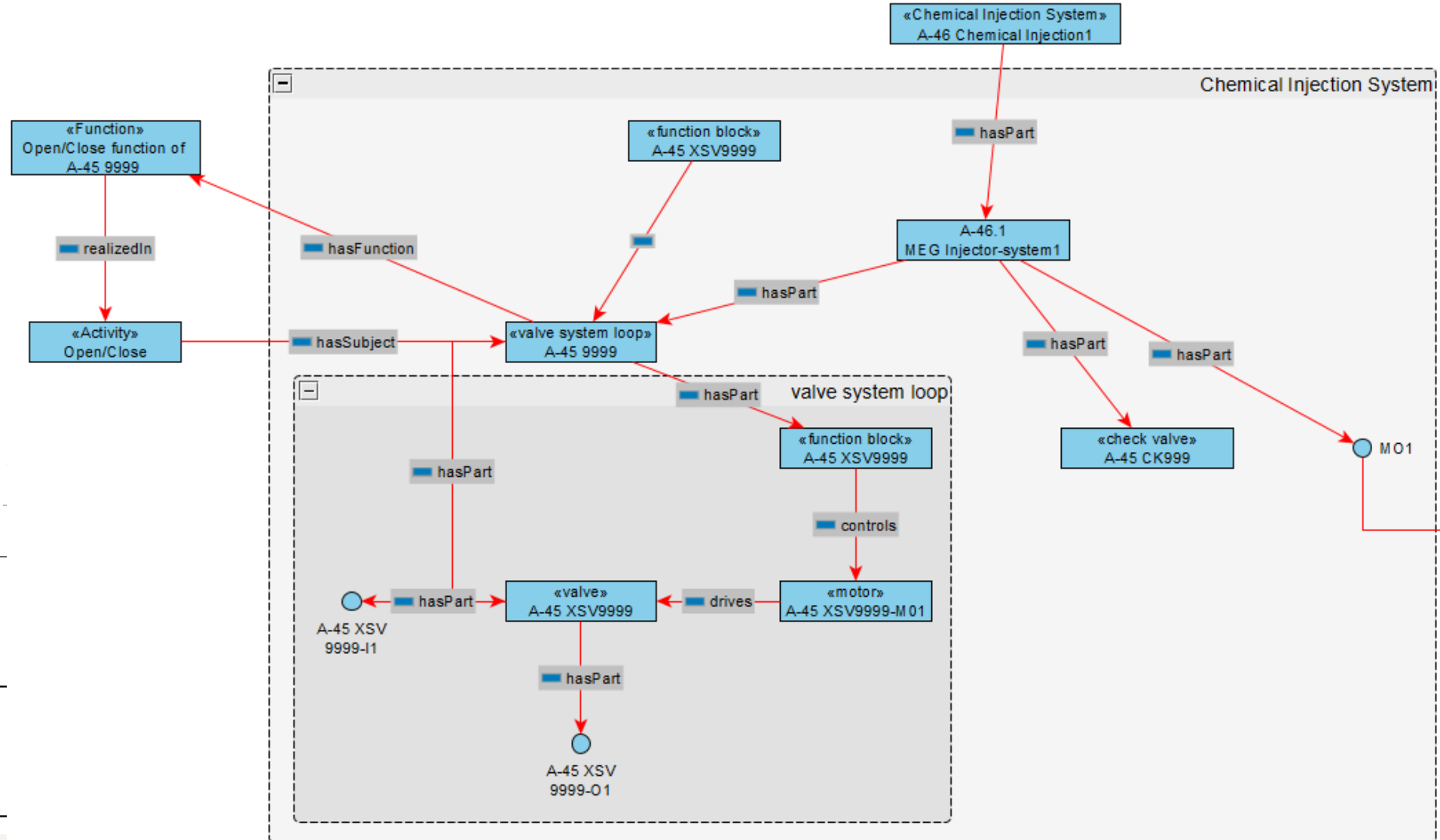
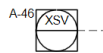
More detailed components from P&ID



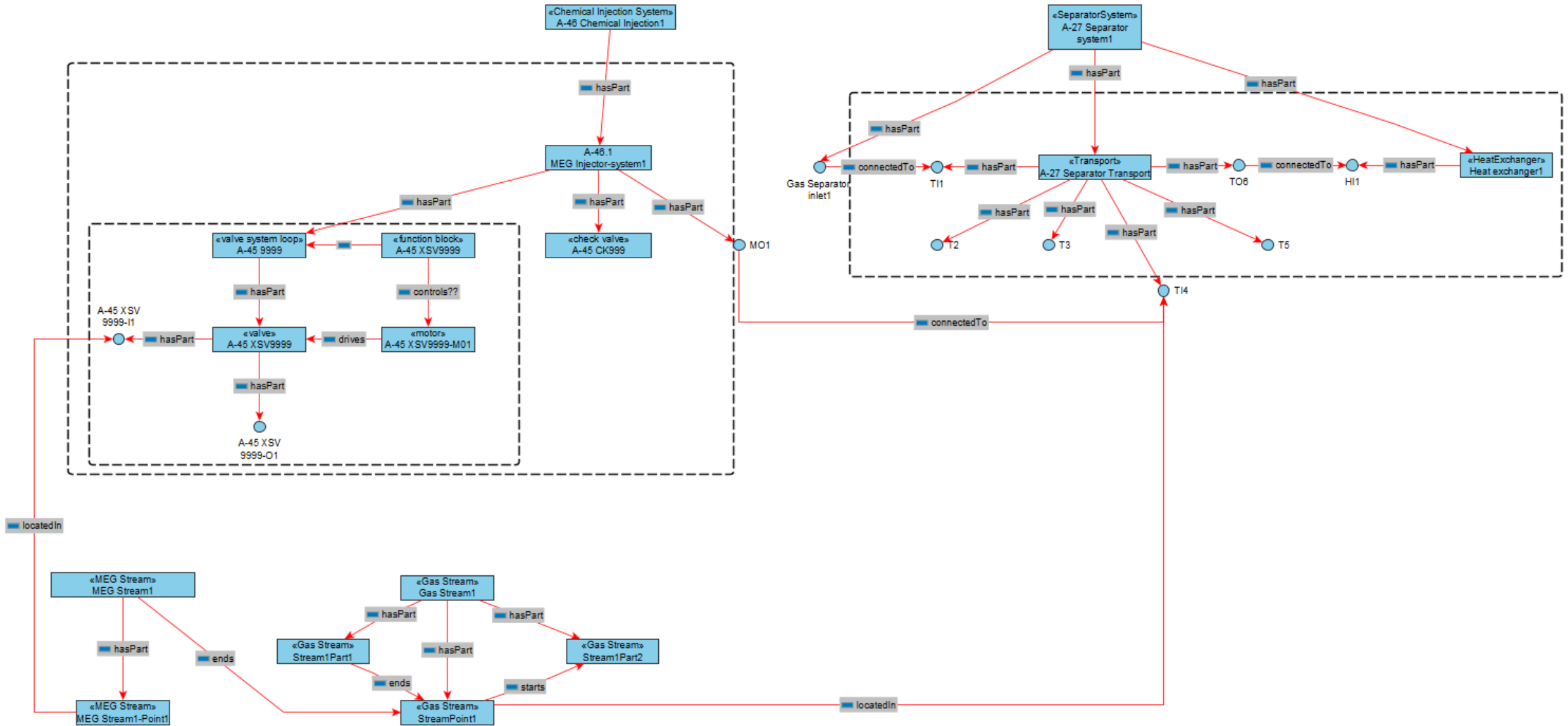
NOTE 5
 MEG INJECTION
 C232-AI-P-XB-46010-01

FROM 1ST STAGE COMPRESSOR HOLD 2
 ANTISURGE VALVE A-27L00133A-1600PS-DD120-
 C232-AI-P-XB-27030-01

FROM INLET SEPARATOR
 C232-AI-P-XB-20010-01

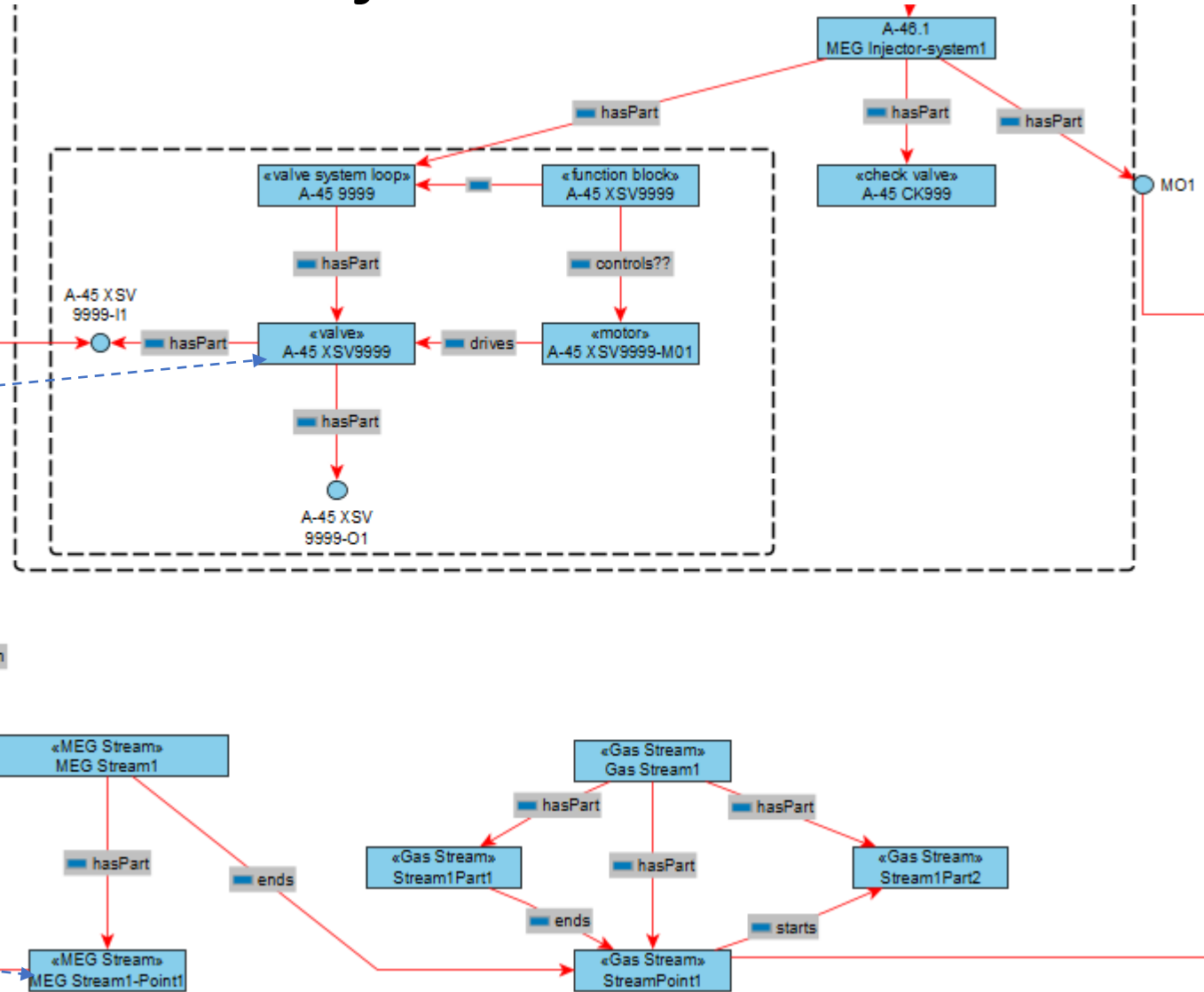


Connect the Systems to the Streams

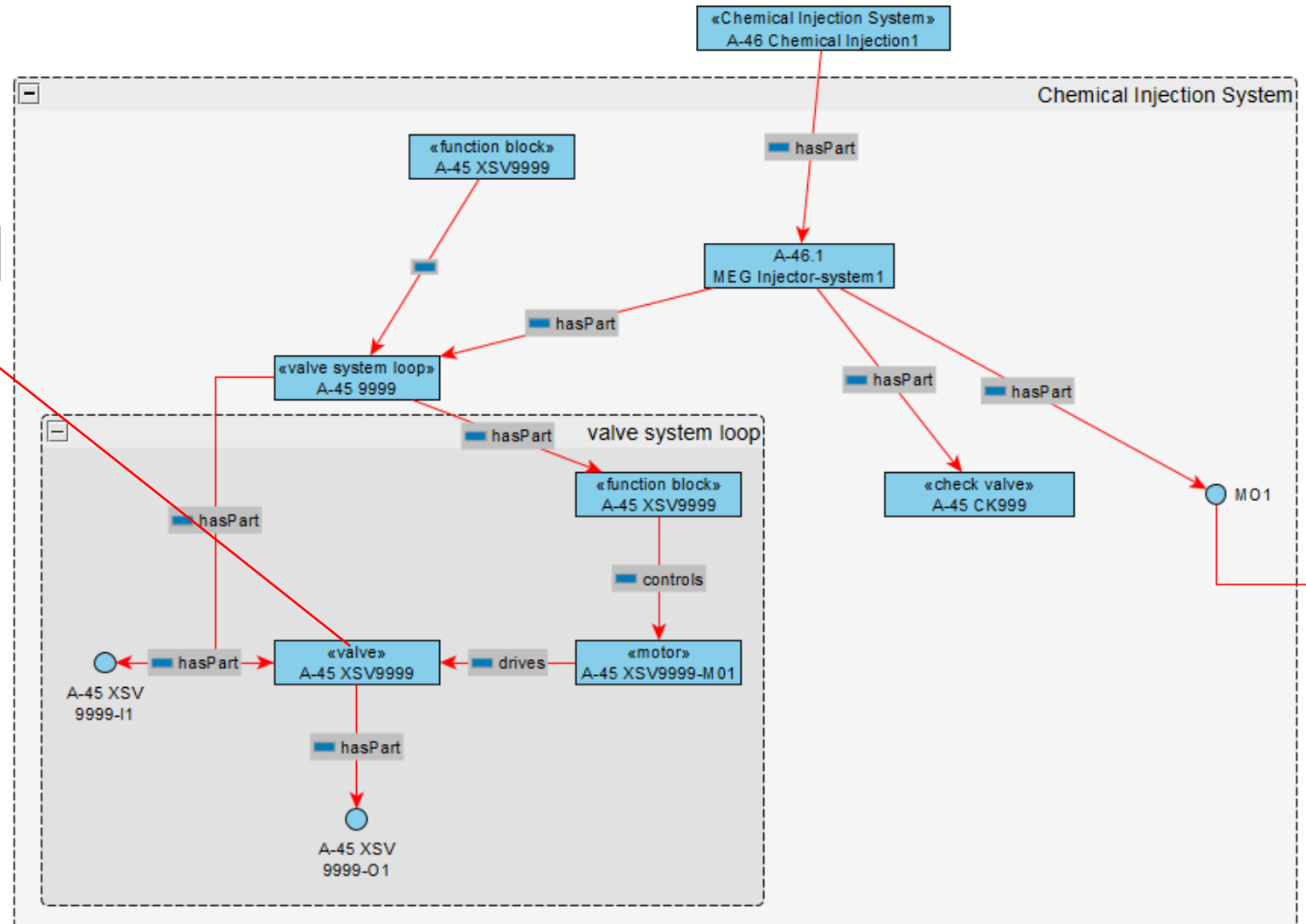
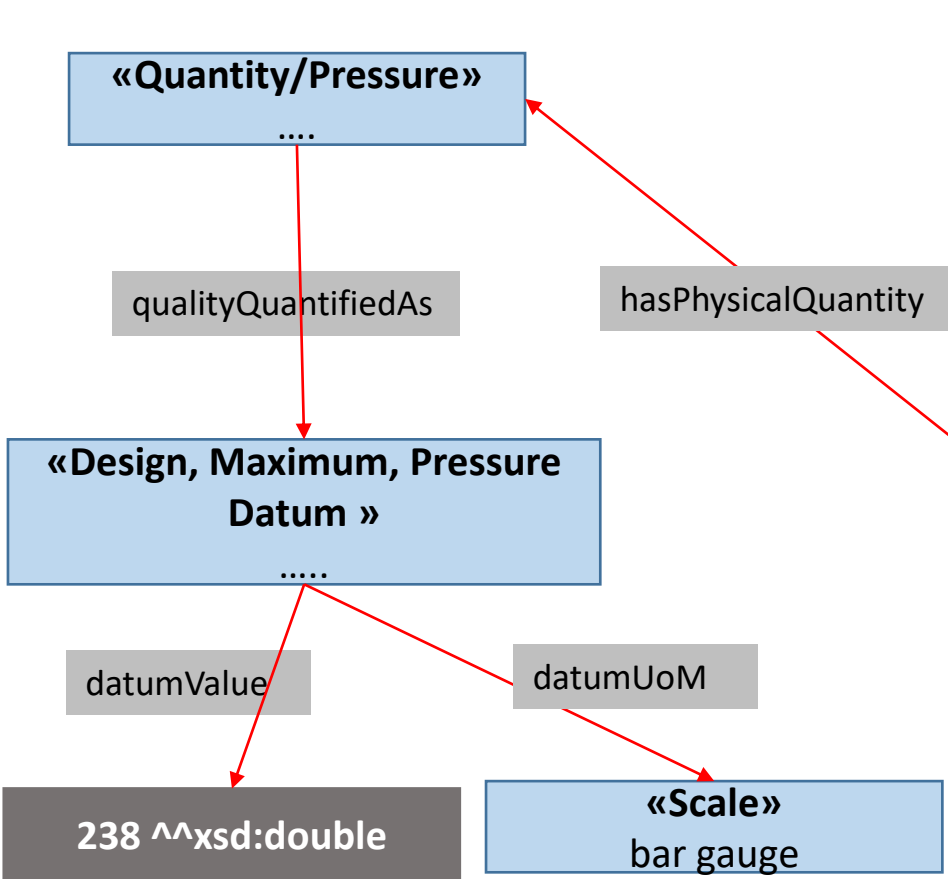


Adding parameters to the Objects

Tag *	B-46XSV0012		MEG to Downstream Riser ESV Geitungen	
Eq.Code (COR) *	BJBD		MEG til Geitungen stigeror BrRam H	
Design / Constr.	AIBEL	/	THAI	STD/TIPS
Details	References	Process DS	Dim & Weight	Utilities
Line References	Line Id B-46L00030A B-46L00030A-0300CA-FD120			
Code	PR2-EXT	Document Reference	No C152-AI-P-DS-4	
Desc	Block Valve (Extended)	Title	PROCESS DATA	
Seq	Property	Unit	Data	Note Ref
1	00.000.0 BLOCK VALVE			
2	01.000.0 EQUIPMENT CONDITONS			
01.001.1	Line size in/out	in		
01.003.1	Flange rating in/out	lbs		
01.005.1	Design temperature minimum	°C	-10	
01.007.1	Design temperature maximum	°C	50	
01.009.1	Design pressure minimum	barg	-1	
01.011.1	Design pressure maximum	barg	238	
01.013.1	Material in/out	NA		
01.015.1	Fluid		CHEMICAL, GLYCOL/WATER	
01.017.1	Phase		Liquid	
01.019.1	Corrosive compounds	NA		
01.021.1	Operating case	NA		
01.023.1	Valve type	NA		
01.025.1	PED group		2	
01.027.1	PED category		SEP	
01.029.1	Sour service		N	
01.030.1	CO2 concentration	mole%	NA	
01.032.1	H2S concentration	ppm mole		
01.034.1	Sand concentration	ppm wt.	NA	
01.036.1	Methanol Concentration	%(Vol)	NA	
01.038.1	Other Corrosive compounds	%(Vol)	NA	
23	02.000.0 OPERATING CONDITIONS			
02.001.1	Temperature minimum	°C	-3	
02.002.1	Temperature normal	°C	8	
02.003.1	Temperature maximum	°C	22	
02.004.1	Inlet Pressure minimum	barg		
02.005.1	Inlet Pressure normal	barg	209	
02.006.1	Inlet Pressure maximum	barg	214	
30	03.000.0 SPECIAL CONDITIONS			
03.001.1	Failure action	NA		
03.002.1	Opening/closing time	s		
03.003.1	Maximum shut off diff_p	bar		
03.004.1	Torque/thrust req.			

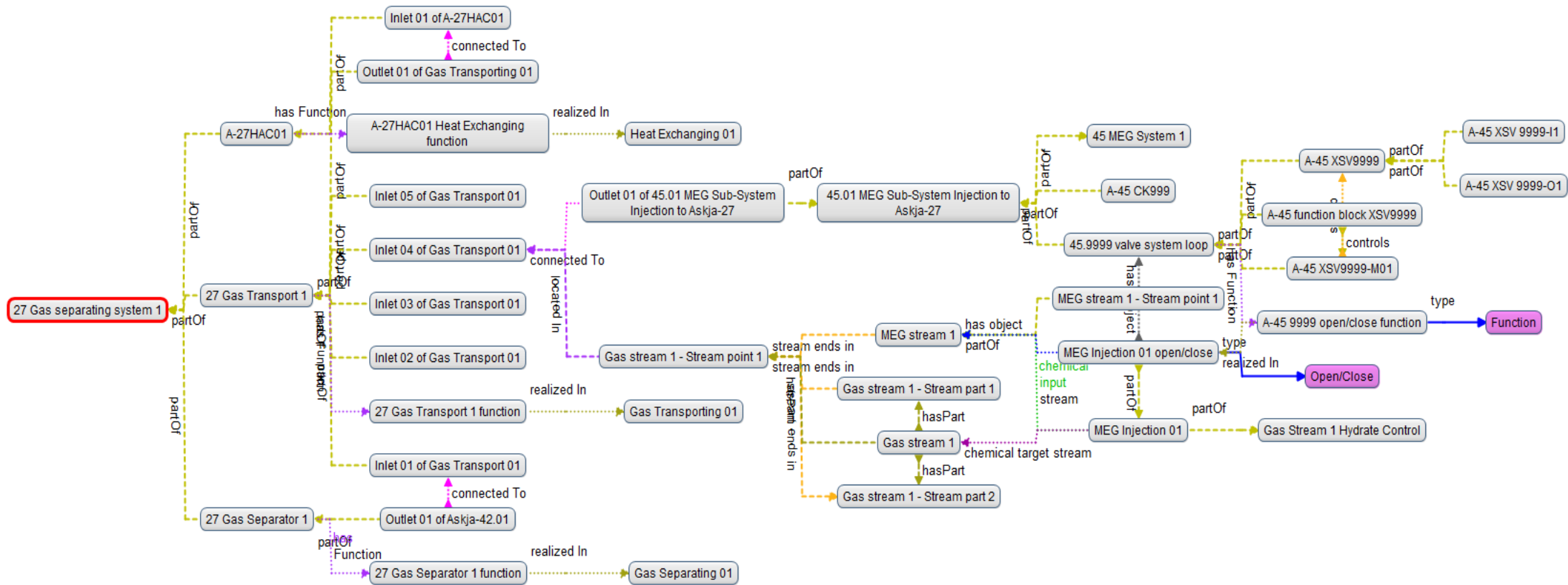
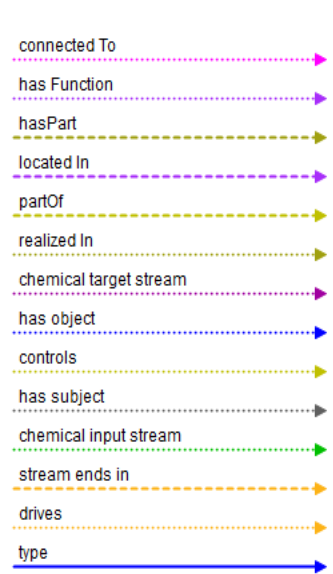


Standardized quantities and Unit of measure



7	01.009.1	Design pressure minimum	barg	-1
8	01.011.1	Design pressure maximum	barg	238

Asset model in a whole in a graphical view



Thank you for your attention

Questions?