Restrictor

In[88]:=
```
<< C:\\Hopsan\Compgen\CompgenNG.mx
```

In[89]:=
```
path = ToFileName[{"C:", "Users", "petkr14", "Dropbox",
     "HopsanComponents", "PneumaticDevelop", "PneumaticComponents"}];
```

In[90]:=
```
path = ToFileName[{"H:", "PettersDropbox", "Dropbox",
     "HopsanComponents", "PneumaticDevelop", "PneumaticComponents"}];

domain = "Pneumatic";
displayName = "Restrictor";
brief = "Pneumatic restrictor";
componentType = "ComponentQ";
author = "Petter Krus*<petter.krus@liu.se>,
     Victor Juliano De Negri** <victor.de.negri@ufsc.br>";
affiliation = "*IEI/Flumes, Linköping University, **Universidade
     Federal de Santa Catarina";
SetFilenames[path, domain, displayName];
ResetComponentVariables[];
Date[]
```

Component description

This is a simple fixed pneumatic restrictor with two ports.

In[101]:=
```
inputParameters = {
    {Bf, .528, double, "", "B, ISO critical pressure ratio"},
    {Cf, 1. × 10^-14, double, "", "C, ISO flow coefficient"},
    {p0, 100000., double, "Pa", "Nominal pressure"},
    {T0, 297., double, "K", "Nominal temperature"},
    {R, 287., double, "J/Kg K", "Gas constant"},
    {cv, 718, double, "J/Kg K", "heatcoeff"},
    {eps, 0.02, double, "", "Linearisation coeff"}
   };
```

In[102]:=
```
outputVariables = {
    {qmP, 0., double, "kg/s", "Internal variable"},
    {qmN, 0., double, "kg/s", "Internal variable"}
   };
```

In[103]:=
```
nodeConnections = {
    PneumaticQnode[1, 100000., "fluid port 1 "],
    PneumaticQnode[2, 100000., "fluid port 2 "]
  };
```

The system of equations

The input signal is limited between 0 and 1.

In[104]:=
```
Cfe = Cf ;
```

The flow at inlet and outlet are equal but with opposite sign.

In[105]:=
```
qm1e = -qm2;
```

In[106]:=
$$\text{NgPos} := \left(\text{signedSquareL}\left[1 - \frac{\left(\frac{p2}{p1} - Bf\right)^2}{(1 - Bf)^2}, \text{eps}\right]\right)$$

In[107]:=
$$\text{NgNeg} := \left(\text{signedSquareL}\left[1 - \frac{\left(\frac{p1}{p2} - Bf\right)^2}{(1 - Bf)^2}, \text{eps}\right]\right)$$

In[108]:=
$$\text{Ng} := \text{onPositive}[p1 - p2]\left(\text{onPositive}\left[\frac{p2}{p1} - Bf\right]\text{NgPos} + \text{onNegative}\left[\frac{p2}{p1} - Bf\right]\right) + \text{onNegative}[p1 - p2]\left(\text{onPositive}\left[\frac{p1}{p2} - Bf\right]\text{NgNeg} + \text{onNegative}\left[\frac{p1}{p2} - Bf\right]\right);$$

Expressions that are evaluated before the system equations

In[109]:=
```
localExpressions = {
    cp == cv + R
  };
```

The system of equations

In[110]:=
$$\text{systemEquationsDA} = \text{Simplify}\left[\left\{\text{qmP} == \text{Cfe}\ p1\ p0\sqrt{\frac{T0}{T1}}\ \text{Ng},\ \text{qmN} == \text{Cfe}\ p2\ p0\sqrt{\frac{T0}{T2}}\ \text{Ng},\ \text{qm2} == \left(\text{onPositive}[p1 - p2]\ \text{qmP} - \text{onNegative}[p1 - p2]\ \text{qmN}\right),\ \text{dE1} == \text{qm1e}\ \text{cp}\left(\text{onNegative}[\text{qm1e}]\ T1 + \text{onPositive}[\text{qm1e}]\ T2\right),\ \text{dE2} == \text{qm2}\ \text{cp}\left(\text{onNegative}[\text{qm2}]\ T2 + \text{onPositive}[\text{qm2}]\ T1\right)\right\}\right];$$

Boundaries

In[111]:=
```
systemBoundaryEquations = {
    p1 == (c1 + Zc1 dE1),
    p2 == (c2 + Zc2 dE2)
  };
```

Independent Variables

In[112]:=
```
systemVariables = {qmP, qmN, qm2, dE1, dE2, p1, p2};
```

Expressions

The inlet flow is calculated as the outlet flow with reversed sign.

In[113]:=
```
expressions = {
    qm1 == -qm2
  };
```

In[114]:=

In[115]:=
```
Compgen[file]
```