Ackumulator

```
domain = "Hydraulic";
displayName = "Ackumulator";
brief = "This is piston with an inertia load";
componentType = "ComponentQ";
author = "Petter Krus <petter.krus@liu.se>";
affiliation = "Division of Fluid and Mechatronic Systems, Linköping University";
SetFilenames[path, domain, displayName];
ResetComponentVariables[];
```

Component description

A general ackumulator. This model does not have any thermodynamic losses. The process is considered to be adiabatic.

Variables and parameters

```
Bp = .; Ap = .; p0 = .;
```

```
inputParameters = {
    {V0, 0.001, double, "m^3", "Ackumulator Volume"},
    {Kca, 1. × 10^-8, double, "m^3/(s Pa)", "Ack. inlet coeff."},
    {kappa, 1.2, double, "", "polytropic exp. of gas"},
    {p0, 1. * 10^7, double, "N/m^2", "Preload pressure"}
  };
```

```
outputVariables = {
    {Va, 1. * 10^-3, double, "m^3", "Momentary gas volume"},
    {pa, 1. * 10^7, double, "Pa", "Ackumulator oil pressure"},
    {xmp, 0., double, "m", "State of charge"},
    {vmp, 0., double, "m", "State of charge speed"}
  };
```

```
nodeConnections = {
      HydraulicQnode[1, 1. * 10^5, "hydraulic node 1"]};
```

The system of equations

Using the equations for piston ackumulator by setting stroke to one.

```
SL = 1;
```

```
Ap = V0 / SL;
```

The restriction in the inlet is recalculated as a viscous friction on the “piston”.

$$Bp = \frac{Ap^2}{Kca};$$

The generated force on the "piston"

```
fg = Ap p1 - Ap pa;

systemEquationsDA := {
  Bp der[xmp] == fg ,
  Bp vmp  == fg,
  q1 == - Ap vmp,
  pa ((SL - xmp) Ap)^kappa  == p0 (SL Ap) ^ kappa
    }

expressions =
  {Va == (SL - xmp) Ap};
```

Limitatons

```
variable2Limits = {{xmp, vmp, 0., SL}};
```

The boundarys

```
systemBoundaryEquations = {
   p1 == c1e + Zc1e q1
  };
```

The vector of independent variables of the system are

```
systemVariables = {xmp, vmp, q1, pa, p1};

Compgen[file]

Bp =.; Ap =.; SL =.;
```