1 Export: 15.06.2023

Evaluation '179852: 230510_fullsystem_8stages.moseva'

Description: Simulation 1 stage with energy balance
Equation System: 179620: 230502_fullsystem.moseqs
IndexSpecification: e[0]179620.NC = 3
e[0]179620.Nst = 8

Variable Specification: 179850: varspec_230510_fullsystem_8stages.mosvar
Differential variable bounds: Lower value=0.0 Upper value=1.0 Parameter Specification: 179807: parspec_230508_-fullsystem_1stage.mosvar
Results Specification: none.

Hierarchical view of equations:

Equation System: 179620: 230502_fullsystem.moseqs

Description: EQS fullsystem DAE heat

Connected EQ-Systems:

- 179606: 230502_condenser_DAE_heat_controller.moseqs
- 179619: 230502_stage_DAE_heat.moseqs
- 179440: 230426_reboiler_DAE_heat_safetyvalve.moseqs

Connection Level (1) – EQ-Systems connected to 179620: 230502_fullsystem.moseqs:

Equation System: 179606: 230502_condenser_DAE_heat_controller.moseqs

Description: EQS condenser full system

Connected Equations:

- Eq: 179531: condenser_diracactivation_liquid.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: dirac activation liquid Parameter List: 178893: parameterlist.mospar

$$\sigma_{st=0}^{dirac,L} = \exp(-\frac{(\sum_{i=1}^{NC} x_{st=0,i} - 1)^2}{2 \cdot (Param_{sharp}^{L,dirac})^2})$$

Connected EQ-Systems:

- 179592: EQS_condenser_liquid_flowrate.moseqs
- 179587: EQS_condenser_midfunction.moseqs
- 179586: EQS_condenser_equilibrium.moseqs
- 179585: EQS_condenser_energybalance.moseqs
- 179591: EQS_condenser_volume.moseqs
- 179603: EQS_condenser_vapor_flowrate.moseqs
- 179584: EQS_condenser_massbalance.moseqs
- 179590: EQS_condenser_density.moseqs

Connection Level (2) – EQ-Systems connected to 179606: 230502_condenser_DAE_heat_controller.moseqs:

Equation System: 179592: EQS_condenser_liquid_flowrate.moseqs

Description: EQS condenser liquid flow

Connected Equations:

- Eq: 179532: condenser_liquid_flowrate_reflux.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: liquid flow rate Parameter List: 178893: parameterlist.mospar

$$F^{L}_{st=0} = F^{L}_{Cond} \cdot \sigma^{R}$$

- Eq: 179790: condenser_liquid_filmthickness.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: film thickness Parameter List: 178893: parameterlist.mospar

$$\delta_{st=0} = \frac{V^{L}_{st=0}}{V^{tot}_{st=0} \cdot a_{Cond}}$$

- Eq: 179792: condenser_liquid_flowrate_activation_helper.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: sigmoidal function activation of liquid flow Parameter List: 178893: parameterlist.mospar

$$aux^{L}_{st=0} = V^{L}_{st=0} - V^{L,spec}_{correlation,st=0} \cdot V^{tot}_{st=0}$$

- Eq: 179791: condenser_liquid_flowrate_activation.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: sigmoidal function activation of liquid flow Parameter List: 178893: parameterlist.mospar

$$\sigma^{L}_{st=0} = \frac{aux^{L}_{st=0} + ((aux^{L}_{st=0})^2 + (Param^{L,sig}_{sharp})^2)^{0.5}}{2 \cdot ((aux^{L}_{st=0})^2 + (Param^{L,sig}_{sharp})^2)^{0.5}}$$

- Eq: 179789: condenser_liquid_filmflowrate.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Liquid flow on condenser Parameter List: 178893: parameterlist.mospar

$$F^{L}_{film,st=0} = \frac{g \cdot (\delta_{st=0})^3 \cdot (\rho^{L}_{st=0})^2}{3 \cdot \eta^{L}_{st=0} \cdot M^{L}_{st=0}} \cdot L_{film,st=0} \cdot (10)^{-3}$$

- Eq: 179666: condenser_liquid_flowrate_product.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: liquid flow rate product Parameter List: 178893: parameterlist.mospar

$$F^{P}_{st=0} = F^{L}_{Cond} \cdot (1 - \sigma^{R})$$

- Eq: 179530: condenser_liquid_flowrate.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: liquid flow rate Parameter List: 178893: parameterlist.mospar

$$F^{L}_{Cond} = F^{L}_{film,st=0} \cdot \sigma^{L}_{st=0}$$

Equation System: 179587: EQS_condenser_midfunction.moseqs

Description: EQS condenser mid function

Connected Equations:

- Eq: 179510: condenser_closed_summation.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Closed summation Parameter List: 178893: parameterlist.mospar

$$\zeta_{st=0} = \sum_{i=1}^{NC} x_{st=0,i} - \sum_{i=1}^{NC} y_{st=0,i}$$

- Eq: 179512: condenser_liquid_quality.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: liquid Quality Parameter List: 178893: parameterlist.mospar

$$\chi_{inv,st=0} = \chi_{st=0} - 1$$

- Eq: 179514: condenser_midfunction_helpermin.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: midfun helper min(zea, chi, chiinv) = min(zeta,chiinv) Parameter List: 178893: parameterlist.mospar

$$aux^{mid}_{min,st=0} = \frac{\zeta_{st=0} + \chi_{inv,st=0} - ((\zeta_{st=0} - \chi_{inv,st=0})^2 + (Param^{mid}_{sharp})^2)^{0.5}}{2}$$

- Eq: 179516: condenser_midfunction_residual.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: midfun residual Parameter List: 178893: parameterlist.mospar

$$res_{st=0} = 0$$

- Eq: 179511: condenser_vapor_quality.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Vapor Quality Parameter List: 178893: parameterlist.mospar

$$\chi_{st=0} \cdot (HU^{L}_{st=0} + HU^{V}_{st=0}) = HU^{V}_{st=0}$$

- Eq: 179513: condenser_midfunction_helpermax.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: midfun helper max(zea, chi, chiinv) = max(zeta,chi) Parameter List: 178893: parameterlist.mospar

$$aux^{mid}_{max,st=0} = \frac{\zeta_{st=0} + \chi_{st=0} + ((\zeta_{st=0} - \chi_{st=0})^2 + (Param^{mid}_{sharp})^2)^{0.5}}{2}$$

- Eq: 179515: condenser_midfunction.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: midfun Parameter List: 178893: parameterlist.mospar

$$res_{st=0} = \chi_{inv,st=0} + \chi_{st=0} + \zeta_{st=0} - aux^{mid}_{max,st=0} - aux^{mid}_{min,st=0}$$

Equation System: 179586: EQS_condenser_equilibrium.moseqs

Description: EQS condenser equilibrium

Connected Equations:

- Eq: 179507: condenser_equilibrium.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: equilibrium Parameter List: 178893: parameterlist.mospar

$$y_{st=0,i} = K_{st=0,i} \cdot x_{st=0,i}$$

- Eq: 179508: condenser_equilibriumconstant1.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Equilibrium constant Parameter List: 178893: parameterlist.mospar

$$K_{st=0,i=1} = \frac{P^{LV}_{st=0,i=1}}{P_{st=0}} \cdot \gamma_{st=0,i=1}$$

- Eq: 179509: condenser_equilibriumconstant2.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Equilibrium constant Parameter List: 178893: parameterlist.mospar

$$K_{st=0,i=2} = \frac{P^{LV}_{st=0,i=2}}{P_{st=0}} \cdot \gamma_{st=0,i=2}$$

Applied Functions:

- Fun: 168170: Dampfdruck.mosfun (using Nota: 168167: NotationVDI.mosnot) Desc.: VDI Wärmeatlas Stoffdaten D3.1 Dampfdruck p in unit of pc T in K

  Uses Param List: 168168: ParameterListVDI.mospar

$$p_s = \mathbf{f}\,(T)$$

  with

$$\mathbf{f} = p_c \cdot \exp(\frac{T_c}{T} \cdot (A^{vdi2} \cdot (1 - \frac{T}{T_c}) + B^{vdi2} \cdot (1 - \frac{T}{T_c})^{1.5} + C^{vdi2} \cdot (1 - \frac{T}{T_c})^{2.5} + D^{vdi2} \cdot (1 - \frac{T}{T_c})^5))$$

  applied as

$$\begin{aligned} P^{LV}_{st=Nst+1,i=2} &= \mathbf{f}(T_{st=Nst+1}) \\ P^{LV}_{st=0,i=2} &= \mathbf{f}(T_{st=0}) \\ P^{LV}_{st,i=1} &= \mathbf{f}(T_{st}) \\ P^{LV}_{st=0,i=1} &= \mathbf{f}(T_{st=0}) \\ P^{LV}_{st,i=2} &= \mathbf{f}(T_{st}) \\ P^{LV}_{st=Nst+1,i=1} &= \mathbf{f}(T_{st=Nst+1}) \end{aligned}$$

Equation System: 179585: EQS_condenser_energybalance.moseqs

Description: EQS condenser energybalance

Connected Equations:

- Eq: 179504: condenser_enthalpy_definition.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: enthalpy definition in condenser Parameter List: 178893: parameterlist.mospar

$$H_{st=0} = U_{st=0} + P_{st=0} \cdot V^{tot}_{st=0}$$

- Eq: 179503: condenser_enthalpy.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: enthalpy in condenser Parameter List: 178893: parameterlist.mospar

$$H_{st=0} = HU^{L}_{st=0} \cdot h^{L}_{st=0} + HU^{V}_{st=0} \cdot h^{V}_{st=0}$$

- Eq: 179506: condenser_enthalpy_vapor.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: enthalpy mixture vapor Parameter List: 178893: parameterlist.mospar

$$h^{V}_{st=0} = \sum_{i=1}^{NC} y_{st=0,i} \cdot (h^{L}_{st=0,i} + h^{LV}_{st=0,i})$$

- Eq: 179505: condenser_enthalpy_liquid_mix.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: enthalpy mixture liquid Parameter List: 178893: parameterlist.mospar

$$h^{L}_{st=0} = \sum_{i=1}^{NC} x_{st=0,i} \cdot h^{L}_{st=0,i}$$

- Eq: 179502: condenser_energybalance.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Energy balance in condenser Parameter List: 178893: parameterlist.mospar

$$\frac{\mathrm{d}U_{st=0}}{\mathrm{d}t} = F^{V}_{st=1} \cdot h^{V}_{st=1} - F^{V}_{st=0} \cdot h^{V}_{st=0} - F^{L}_{st=0} \cdot h^{L}_{st=0} - F^{P}_{st=0} \cdot h^{L}_{st=0} + Q_{st=0}$$

Applied Functions:

- Fun: 179299: polynomial4.mosfun (using Nota: 178892: notation.mosnot) Desc.: polynomial of order 4 used for thermoproperties

  Uses Param List: 178893: parameterlist.mospar

$$val = \mathbf{f}\,(T)$$

  with

$$\mathbf{f} = Param^{poly4}_{A} + Param^{poly4}_{B} \cdot T + Param^{poly4}_{C} \cdot (T)^2 + Param^{poly4}_{D} \cdot (T)^3 + Param^{poly4}_{E} \cdot (T)^4$$

  applied as

$$h^{LV}_{st=Nst+1,i} = \mathbf{f}(T_{st=Nst+1})$$
$$h^{LV}_{st=0,i} = \mathbf{f}(T_{st=0})$$

$$h^{F}_{st=Nst+1,i} = \mathbf{f}(T^{F}_{st=Nst+1})$$
$$h^{LV}_{st,i} = \mathbf{f}(T_{st})$$
$$h^{L}_{st=Nst+1,i} = \mathbf{f}(T_{st=Nst+1})$$
$$h^{LV,N2}_{st=Nst+1,i} = \mathbf{f}(T^{N2}_{st=Nst+1})$$
$$h^{L,N2}_{st=Nst+1,i} = \mathbf{f}(T^{N2}_{st=Nst+1})$$
$$h^{L}_{st=0,i} = \mathbf{f}(T_{st=0})$$
$$h^{L}_{st,i} = \mathbf{f}(T_{st})$$

Equation System: 179591: EQS_condenser_volume.moseqs

Description: EQS condenser volume

Connected Equations:

- Eq: 179522: condenser_vapor_volume.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: vapor volume Parameter List: 178893: parameterlist.mospar

$$V^{V}_{st=0} = \frac{HU^{V}_{st=0} \cdot R \cdot T_{st=0}}{P_{st=0} \cdot (10)^{5}}$$

- Eq: 179520: condenser_liquid_volume.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: liquid volume Parameter List: 178893: parameterlist.mospar

$$V^{L}_{st=0} = \frac{HU^{L}_{st=0}}{\rho^{L}_{st=0}}$$

- Eq: 179521: condenser_total_volume.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: total volume Parameter List: 178893: parameterlist.mospar

$$V^{tot}_{st=0} = V^{L}_{st=0} + V^{V}_{st=0}$$

Equation System: 179603: EQS_condenser_vapor_flowrate.moseqs

Description: EQS condenser vapor flow

Connected Equations:

- Eq: 179604: condenser_vapor_flowrate_controller_helper.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: helper variable Pressure control Parameter List: 178893: parameterlist.mospar

$$aux^{PC}_{st=0} = P_{st=0} - P^{SP}$$

- Eq: 179526: condenser_vapor_flowrate.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: vapor flow rate Parameter List: 178893: parameterlist.mospar

$$F^{V}_{Cond} = c^{V}_{st=0} \cdot g^{V}_{b,st=0} \cdot g^{V}_{c,st=0}$$

- Eq: 179535: condenser_vapor_flowrate_controlled.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: liquid flow rate Parameter List: 178893: parameterlist.mospar

$$F^{V}_{st=0} = \sigma^{PC}_{Cond} \cdot F^{V}_{Cond}$$

- Eq: 179605: condenser_vapor_flowrate_controller.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: sigmoidal function Pressure control Parameter List: 178893: parameterlist.mospar

$$\sigma^{PC}_{Cond} = \frac{aux^{PC}_{st=0} + ((aux^{PC}_{st=0})^2 + (Param^{PC,sig}_{sharp})^2)^{0.5}}{2 \cdot ((aux^{PC}_{st=0})^2 + (Param^{PC,sig}_{sharp})^2)^{0.5}}$$

- Eq: 179523: condenser_vapor_blockingvalve.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: condenser blocking valve vapor Parameter List: 178893: parameterlist.mospar

$$g^{V}_{b,st=0} = \frac{V^{V}_{min,st=0} + V^{V}_{st=0} - ((V^{V}_{min,st=0} - V^{V}_{st=0})^2 + (Param^{min,V}_{sharp})^2)^{0.5}}{2}$$

- Eq: 179524: condenser_vapor_checkvalve.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: check valve, Vapor max(0,aux) Parameter List: 178893: parameterlist.mospar

$$g^{V}_{c,st=0} = (\frac{aux^{V}_{c,st=0} + ((aux^{V}_{c,st=0})^2 + (Param^{max,V}_{sharp})^2)^{0.5}}{2})^{0.5}$$

- Eq: 179525: condenser_vapor_checkvalve_helper.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: check valve, liquid, helper function (bar) Parameter List: 178893: parameterlist.mospar

$$aux^{V}_{c,st=0} = P_{st=0} - P^{amb}$$

Equation System: 179584: EQS_condenser_massbalance.moseqs

Description: EQS condenser massbalance

Connected Equations:

- Eq: 179500: condenser_mass_holdup.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Holdup Parameter List: 178893: parameterlist.mospar

$$HU_{st=0,i} = HU^{L}_{st=0} \cdot x_{st=0,i} + HU^{V}_{st=0} \cdot y_{st=0,i}$$

- Eq: 179499: condenser_massbalance.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Component mass balance for condenser Parameter List: 178893: parameterlist.mospar

$$\frac{\mathrm{d}HU_{st=0,i}}{\mathrm{d}t} = F^{V}_{st=1} \cdot y_{st=1,i} - F^{V}_{st=0} \cdot y_{st=0,i} - F^{L}_{st=0} \cdot x_{st=0,i} - F^{P}_{st=0} \cdot x_{st=0,i}$$

- Eq: 179501: condenser_mass_holdup_total.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: total holdup in condenser Parameter List: 178893: parameterlist.mospar

$$\sum_{i=1}^{NC} HU_{st=0,i} = HU^{L}_{st=0} + HU^{V}_{st=0}$$

Equation System: 179590: EQS_condenser_density.moseqs

Description: EQS condenser density

Connected Equations:

- Eq: 179518: condenser_liquid_density_mix_mass.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: liquid mass density Parameter List: 178893: parameterlist.mospar

$$\rho^{L,mass}_{st=0} = \rho^{L}_{st=0} \cdot M^{L}_{st=0}$$

- Eq: 179517: condenser_liquid_density_mix.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: actual liquid density Parameter List: 178893: parameterlist.mospar

$$\rho^{L}_{st=0} = \rho^{L,dummy} + \sigma^{dirac,L}_{st=0} \cdot (\frac{1}{\sum_{i=1}^{NC} \frac{x_{st=0,i}}{\rho_{st=0,i}}} - \rho^{L,dummy})$$

- Eq: 179519: condenser_liquid_molarmass.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Molar mass liquid Parameter List: 178893: parameterlist.mospar

$$M^{L}_{st=0} = ((\sum_{i=1}^{NC} x_{st=0,i} \cdot M_i)^2 + Param^{L,abs}_{sharp})^{0.5}$$

Equation System: 179619: 230502_stage_DAE_heat.moseqs

Description: EQS stage DAE

Connected Equations:

- Eq: 179635: stage_pressuredrop.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Pressure drop stage Parameter List: 178893: parameterlist.mospar

$$P_{st} = P_{st-1} + \Delta P_{st-1}$$

- Eq: 179216: stage_diracactivation_liquid.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: dirac activation liquid Parameter List: 178893: parameterlist.mospar

$$\sigma_{st}^{dirac,L} = \exp(-\frac{(\sum_{i=1}^{NC} x_{st,i} - 1)^2}{2 \cdot (Param_{sharp}^{L,dirac})^2})$$

Connected EQ-Systems:

- 179617: EQS_stage_liquid_density.moseqs
- 178905: EQS_stage_vapor_flowrate.moseqs
- 179397: EQS_stage_massbalance.moseqs
- 178907: EQS_stage_midfunction.moseqs
- 179345: EQS_stage_volume.moseqs
- 179342: EQS_stage_equilibrium.moseqs
- 179300: EQS_stage_energybalance.moseqs
- 178903: EQS_stage_liquid_flowrate.moseqs

Connection Level (2) – EQ-Systems connected to 179619: 230502_stage_DAE_heat.moseqs:

Equation System: 179617: EQS_stage_liquid_density.moseqs

Description: EQS stage density

Connected Equations:

- Eq: 179614: stage_liquid_density_mix.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: actual liquid density Parameter List: 178893: parameterlist.mospar

$$\rho_{st}^{L} = \rho^{L,dummy} + \sigma_{st}^{dirac,L} \cdot (\frac{1}{\sum_{i=1}^{NC} \frac{x_{st,i}}{\rho_{st,i}}} - \rho^{L,dummy})$$

- Eq: 179615: stage_liquid_density_mix_mass.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: liquid mass density Parameter List: 178893: parameterlist.mospar

$$\rho_{st}^{L,mass} = \rho_{st}^{L} \cdot M_{st}^{L}$$

- Eq: 179616: stage_liquid_molarmass.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Molar mass liquid Parameter List: 178893: parameterlist.mospar

$$M_{st}^{L} = ((\sum_{i=1}^{NC} x_{st,i} \cdot M_i)^2 + Param_{sharp}^{L,abs})^{0.5}$$

Equation System: 178905: EQS_stage_vapor_flowrate.moseqs

Description: EQS flowrate nitrogen

Connected Equations:

- Eq: 178884: stage_vapor_blockingvalve.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: liquid blocking valve vapor Parameter List: 178893: parameterlist.mospar

$$g^V_{b,st} = \frac{V^V_{min,st} + V^V_{st} - ((V^V_{min,st} - V^V_{st})^2 + (Param^{min,V}_{sharp})^2)^{0.5}}{2}$$

- Eq: 178885: stage_vapor_checkvalve_helper.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: check valve, liquid, helper function (bar) Parameter List: 178893: parameterlist.mospar

$$aux^V_{c,st} = P_{st} - P_{st-1}$$

- Eq: 178883: stage_vapor_flowrate.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: vapor flow rate Parameter List: 178893: parameterlist.mospar

$$F^V_{st} = c^V_{st} \cdot g^V_{b,st} \cdot g^V_{c,st}$$

- Eq: 178886: stage_vapor_checkvalve.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: check valve, Vapor Parameter List: 178893: parameterlist.mospar

$$g^V_{c,st} = (\frac{aux^V_{c,st} + ((aux^V_{c,st})^2 + (Param^{max,V}_{sharp})^2)^{0.5}}{2})^{0.5}$$

Equation System: 179397: EQS_stage_massbalance.moseqs

Description: Mass balance related equations

Connected Equations:

- Eq: 178828: stage_mass_holdup.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Holdup Parameter List: 178893: parameterlist.mospar

$$HU_{st,i} = HU^L_{st} \cdot x_{st,i} + HU^V_{st} \cdot y_{st,i}$$

- Eq: 178829: stage_mass_holdup_total.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: total holdup Parameter List: 178893: parameterlist.mospar

$$\sum_{i=1}^{NC} HU_{st,i} = HU^L_{st} + HU^V_{st}$$

- Eq: 179395: stage_mass_balance.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Component mass balance for generic stage Parameter List: 178893: parameterlist.mospar

$$\frac{\mathrm{d}HU_{st,i}}{\mathrm{d}t} = F^V_{st+1} \cdot y_{st+1,i} - F^V_{st} \cdot y_{st,i} + F^L_{st-1} \cdot x_{st-1,i} - F^L_{st} \cdot x_{st,i}$$

Equation System: 178907: EQS_stage_midfunction.moseqs

Description: EQS midfunction

Connected Equations:

- Eq: 178832: stage_vapor_quality.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Vapor Quality Parameter List: 178893: parameterlist.mospar

$$\chi_{st} \cdot (HU^L_{st} + HU^V_{st}) = HU^V_{st}$$

- Eq: 178834: stage_midfunction_residual.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: midfun residual Parameter List: 178893: parameterlist.mospar

$$res_{st} = 0$$

- Eq: 178833: stage_liquid_quality.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: liquid Quality Parameter List: 178893: parameterlist.mospar

$$\chi_{inv,st} = \chi_{st} - 1$$

- Eq: 178831: stage_closed_summation.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Closed summation Parameter List: 178893: parameterlist.mospar

$$\zeta_{st} = \sum_{i=1}^{NC} x_{st,i} - \sum_{i=1}^{NC} y_{st,i}$$

- Eq: 179613: stage_midfunction.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: midfun Parameter List: 178893: parameterlist.mospar

$$res_{st} = \chi_{inv,st} + \chi_{st} + \zeta_{st} - aux^{mid}_{max,st} - aux^{mid}_{min,st}$$

- Eq: 179611: stage_midfunction_helpermax.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: midfun helper max(zea, chi, chiinv) = max(zeta,chi) Parameter List: 178893: parameterlist.mospar

$$aux^{mid}_{max,st} = \frac{\zeta_{st} + \chi_{st} + ((\zeta_{st} - \chi_{st})^2 + (Param^{mid}_{sharp})^2)^{0.5}}{2}$$

- Eq: 179612: stage_midfunction_helpermin.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: midfun helper min(zea, chi, chiinv) = min(zeta,chiinv) Parameter List: 178893: parameterlist.mospar

$$aux^{mid}_{min,st} = \frac{\zeta_{st} + \chi_{inv,st} - ((\zeta_{st} - \chi_{inv,st})^2 + (Param^{mid}_{sharp})^2)^{0.5}}{2}$$

Equation System: 179345: EQS_stage_volume.moseqs

Description: Volume related equations

Connected Equations:

- Eq: 178837: stage_liquid_volume.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: liquid volume Parameter List: 178893: parameterlist.mospar

$$V_{st}^{L} = \frac{HU_{st}^{L}}{\rho_{st}^{L}}$$

- Eq: 178838: stage_vapor_volume.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: vapor volume Parameter List: 178893: parameterlist.mospar

$$V_{st}^{V} = \frac{HU_{st}^{V} \cdot R \cdot T_{st}}{P_{st} \cdot (10)^{5}}$$

- Eq: 178836: stage_total_volume.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: total volume Parameter List: 178893: parameterlist.mospar

$$V_{st}^{tot} = V_{st}^{L} + V_{st}^{V}$$

Equation System: 179342: EQS_stage_equilibrium.moseqs

Description: equilibrium

Connected Equations:

- Eq: 178830: stage_equilibrium.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: equilibrium Parameter List: 178893: parameterlist.mospar

$$y_{st,i} = K_{st,i} \cdot x_{st,i}$$

- Eq: 178896: stage_equilibriumconstant1.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Equilibrium constant Parameter List: 178893: parameterlist.mospar

$$K_{st,i=1} = \frac{P_{st,i=1}^{LV}}{P_{st}} \cdot \gamma_{st,i=1}$$

- Eq: 178897: stage_equilibriumconstant2.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Equilibrium constant Parameter List: 178893: parameterlist.mospar

$$K_{st,i=2} = \frac{P^{LV}_{st,i=2}}{P_{st}} \cdot \gamma_{st,i=2}$$

Applied Functions:

- Fun: 168170: Dampfdruck.mosfun (using Nota: 168167: NotationVDI.mosnot) Desc.: VDI Wärmeatlas Stoffdaten D3.1 Dampfdruck p in unit of pc T in K

  Uses Param List: 168168: ParameterListVDI.mospar

$$p_s = \mathbf{f}\,(T)$$

  with

$$\mathbf{f} = p_c \cdot \exp(\frac{T_c}{T} \cdot (A^{vdi2} \cdot (1 - \frac{T}{T_c}) + B^{vdi2} \cdot (1 - \frac{T}{T_c})^{1.5} + C^{vdi2} \cdot (1 - \frac{T}{T_c})^{2.5} + D^{vdi2} \cdot (1 - \frac{T}{T_c})^5))$$

  applied as

$$P^{LV}_{st,i=1} = \mathbf{f}(T_{st})$$
$$P^{LV}_{st,i=2} = \mathbf{f}(T_{st})$$

Equation System: 179300: EQS_stage_energybalance.moseqs

Description: equations and functions to include energybalance

Connected Equations:

- Eq: 179618: stage_energybalance.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Energy balance Parameter List: 178893: parameterlist.mospar

$$\frac{\mathrm{d}U_{st}}{\mathrm{d}t} = F^V_{st+1} \cdot h^V_{st+1} - F^V_{st} \cdot h^V_{st} + F^L_{st-1} \cdot h^L_{st-1} - F^L_{st} \cdot h^L_{st} + Q_{st}$$

- Eq: 179245: stage_enthalpy.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: enthalpy Parameter List: 178893: parameterlist.mospar

$$H_{st} = HU^L_{st} \cdot h^L_{st} + HU^V_{st} \cdot h^V_{st}$$

- Eq: 179296: stage_enthalpy_vapor_mix.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: enthalpy mixture vapor Parameter List: 178893: parameterlist.mospar

$$h^V_{st} = \sum_{i=1}^{NC} y_{st,i} \cdot (h^L_{st,i} + h^{LV}_{st,i})$$

- Eq: 179246: stage_enthalpy_definition.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: enthalpy definition Parameter List: 178893: parameterlist.mospar

$$H_{st} = U_{st} + P_{st} \cdot V^{tot}_{st}$$

- Eq: 179295: stage_enthalpy_liquid_mix.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: enthalpy mixture liquid Parameter List: 178893: parameterlist.mospar

$$h_{st}^{L} = \sum_{i=1}^{NC} x_{st,i} \cdot h_{st,i}^{L}$$

Applied Functions:

- Fun: 179299: polynomial4.mosfun (using Nota: 178892: notation.mosnot) Desc.: polynomial of order 4 used for thermoproperties

  Uses Param List: 178893: parameterlist.mospar

$$val = \mathbf{f}\,(T)$$

  with

$$\mathbf{f} = Param_{A}^{poly4} + Param_{B}^{poly4} \cdot T + Param_{C}^{poly4} \cdot (T)^2 + Param_{D}^{poly4} \cdot (T)^3 + Param_{E}^{poly4} \cdot (T)^4$$

  applied as

$$h_{st,i}^{LV} = \mathbf{f}(T_{st})$$
$$h_{st,i}^{L} = \mathbf{f}(T_{st})$$

Equation System: 178903: EQS_stage_liquid_flowrate.moseqs

Description: EQS flowrate liquid

Connected Equations:

- Eq: 179786: stage_liquid_filmthickness.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: film thickness Parameter List: 178893: parameterlist.mospar

$$\delta_{st} = \frac{V_{st}^{L}}{V_{st}^{tot} \cdot a_{packing}}$$

- Eq: 179788: stage_liquid_flowrate_activation_helper.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: sigmoidal function activation of liquid flow Parameter List: 178893: parameterlist.mospar

$$aux_{st}^{L} = V_{st}^{L} - V_{correlation,st}^{L,spec} \cdot V_{st}^{tot}$$

- Eq: 178887: stage_liquid_flowrate.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: liquid flow rate Parameter List: 178893: parameterlist.mospar

$$F_{st}^{L} = F_{film,st}^{L} \cdot \sigma_{st}^{L}$$

- Eq: 179785: stage_liquid_filmflowrate.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Liquid flow on packing Parameter List: 178893: parameterlist.mospar

$$F_{film,st}^{L} = \frac{g \cdot (\delta_{st})^3 \cdot (\rho_{st}^{L})^2}{3 \cdot \eta_{st}^{L} \cdot M_{st}^{L}} \cdot L_{film,st} \cdot (10)^{-3}$$

- Eq: 179787: stage_liquid_flowrate_activation.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: sigmoidal function activation of liquid flow Parameter List: 178893: parameterlist.mospar

$$\sigma_{st}^{L} = \frac{aux_{st}^{L} + ((aux_{st}^{L})^2 + (Param_{sharp}^{L,sig})^2)^{0.5}}{2 \cdot ((aux_{st}^{L})^2 + (Param_{sharp}^{L,sig})^2)^{0.5}}$$

Equation System: 179440: 230426_reboiler_DAE_heat_safetyvalve.moseqs

Description: EQS Reboiler DAE safetyvalve

Connected Equations:

- Eq: 179636: reboiler_pressuredrop.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Pressure drop reboiler Parameter List: 178893: parameterlist.mospar

$$P_{st=Nst+1} = P_{st=Nst} + \Delta P_{st=Nst}$$

- Eq: 179431: reboiler_diracactivation_liquid.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: dirac activation liquid Parameter List: 178893: parameterlist.mospar

$$\sigma_{st=Nst+1}^{dirac,L} = \exp(-\frac{(\sum_{i=1}^{NC} x_{st=Nst+1,i} - 1)^2}{2 \cdot (Param_{sharp}^{L,dirac})^2})$$

Connected EQ-Systems:

- 179436: EQS_reboiler_safetyvalve_flowrate.moseqs
- 179441: EQS_reboiler_density.moseqs
- 179444: EQS_reboiler_volume.moseqs
- 179438: EQS_reboiler_energybalance_safetyvalve.moseqs
- 179437: EQS_vapor_flowrate.moseqs
- 179442: EQS_reboiler_equilibrium.moseqs
- 179443: EQS_reboiler_midfunction.moseqs
- 179400: EQS_reboiler_massbalance_safetyvalve.moseqs
- 179435: EQS_reboiler_nitrogen_flowrate.moseqs

Connection Level (2) – EQ-Systems connected to 179440: 230426_reboiler_DAE_heat_safetyvalve.moseqs:

Equation System: 179436: EQS_reboiler_safetyvalve_flowrate.moseqs

Description: EQS flowrate safetyvalve reboiler

Connected Equations:

- Eq: 179434: reboiler_safetyvalve_flowrate.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Safety valve flow rate Parameter List: 178893: parameterlist.mospar

$$F^{SV}_{st=Nst+1} = c^{SV}_{st=Nst+1} \cdot g^{SV}_{b,st=Nst+1} \cdot g^{SV}_{c,st=Nst+1}$$

- Eq: 179432: reboiler_safetyvalve_checkvalve.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: check valve, safety valve Parameter List: 178893: parameterlist.mospar

$$g^{SV}_{c,st=Nst+1} = (\frac{aux^{SV}_{c,st=Nst+1} + ((aux^{SV}_{c,st=Nst+1})^2 + (Param^{max,SV}_{sharp})^2)^{0.5}}{2})^{0.5}$$

- Eq: 179496: reboiler_safetyvalve_blockingvalve.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: liquid blocking valve safetyvalve Parameter List: 178893: parameterlist.mospar

$$g^{SV}_{b,st=Nst+1} = \frac{V^V_{min,st=Nst+1} + V^V_{st=Nst+1} - ((V^V_{min,st=Nst+1} - V^V_{st=Nst+1})^2 + (Param^{min,V}_{sharp})^2)^{0.5}}{2}$$

- Eq: 179433: reboiler_safetyvalve_checkvalve_helper.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: check valve, safetyvalve, helper function (bar) Parameter List: 178893: parameterlist.mospar

$$aux^{SV}_{c,st=Nst+1} = P_{st=Nst+1} - P^{SV}_{st=Nst+1}$$

Equation System: 179441: EQS_reboiler_density.moseqs

Description: EQS reboiler density

Connected Equations:

- Eq: 179419: reboiler_liquid_molarmass.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Molar mass liquid Parameter List: 178893: parameterlist.mospar

$$M^L_{st=Nst+1} = ((\sum_{i=1}^{NC} x_{st=Nst+1,i} \cdot M_i)^2 + Param^{L,abs}_{sharp})^{0.5}$$

- Eq: 179420: reboiler_liquid_density_mix.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: actual liquid density Parameter List: 178893: parameterlist.mospar

$$\rho^L_{st=Nst+1} = \rho^{L,dummy} + \sigma^{dirac,L}_{st=Nst+1} \cdot (\frac{1}{\sum_{i=1}^{NC} \frac{x_{st=Nst+1,i}}{\rho_{st=Nst+1,i}}} - \rho^{L,dummy})$$

- Eq: 179418: reboiler_liquid_density_mix_mass.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: liquid mass density Parameter List: 178893: parameterlist.mospar

$$\rho^{L,mass}_{st=Nst+1} = \rho^{L}_{st=Nst+1} \cdot M^{L}_{st=Nst+1}$$

Equation System: 179444: EQS_reboiler_volume.moseqs

Description: EQS reboiler volume

Connected Equations:

- Eq: 179422: reboiler_total_volume.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: total volume Parameter List: 178893: parameterlist.mospar

$$V^{tot}_{st=Nst+1} = V^{L}_{st=Nst+1} + V^{V}_{st=Nst+1}$$

- Eq: 179421: reboiler_liquid_volume.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: liquid volume Parameter List: 178893: parameterlist.mospar

$$V^{L}_{st=Nst+1} = \frac{HU^{L}_{st=Nst+1}}{\rho^{L}_{st=Nst+1}}$$

- Eq: 179423: reboiler_vapor_volume.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: vapor volume Parameter List: 178893: parameterlist.mospar

$$V^{V}_{st=Nst+1} = \frac{HU^{V}_{st=Nst+1} \cdot R \cdot T_{st=Nst+1}}{P_{st=Nst+1} \cdot (10)^5}$$

Equation System: 179438: EQS_reboiler_energybalance_safetyvalve.moseqs

Description: EQS energybalance and related equations for reboiler

Connected Equations:

- Eq: 179409: reboiler_enthalpy_vapor_mix.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: enthalpy mixture vapor Parameter List: 178893: parameterlist.mospar

$$h^{V}_{st=Nst+1} = \sum_{i=1}^{NC} y_{st=Nst+1,i} \cdot (h^{L}_{st=Nst+1,i} + h^{LV}_{st=Nst+1,i})$$

- Eq: 179406: reboiler_enthalpy_feed_mix.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: enthalpy mixture nitrogen Parameter List: 178893: parameterlist.mospar

$$h^{F}_{st=Nst+1} = \sum_{i=1}^{NC} x^{F}_{st=Nst+1,i} \cdot h^{F}_{st=Nst+1,i}$$

- Eq: 179407: reboiler_enthalpy_liquid_mix.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: enthalpy mixture liquid Parameter List: 178893: parameterlist.mospar

$$h^{L}_{st=Nst+1} = \sum_{i=1}^{NC} x_{st=Nst+1,i} \cdot h^{L}_{st=Nst+1,i}$$

- Eq: 179408: reboiler_enthalpy_nitrogen_mix.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: enthalpy mixture nitrogen Parameter List: 178893: parameterlist.mospar

$$h^{N2}_{st=Nst+1} = \sum_{i=1}^{NC} (x^{N2}_{st=Nst+1,i} \cdot (h^{N2,L}_{st=Nst+1,i} + h^{N2,LV}_{st=Nst+1,i}))$$

- Eq: 179405: reboiler_enthalpy_definition.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: enthalpy definition in reboiler Parameter List: 178893: parameterlist.mospar

$$H_{st=Nst+1} = U_{st=Nst+1} + P_{st=Nst+1} \cdot V^{tot}_{st=Nst+1}$$

- Eq: 179403: reboiler_energybalance_safetyvalve.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Energy balance in reboiler Parameter List: 178893: parameterlist.mospar

$$\frac{\mathrm{d}U_{st=Nst+1}}{\mathrm{d}t} = F^{F}_{st=Nst+1} \cdot h^{F}_{st=Nst+1} + F^{N2}_{st=Nst+1} \cdot h^{N2}_{st=Nst+1} + F^{L}_{st=Nst} \cdot h^{L}_{st=Nst} - F^{V}_{st=Nst+1} \cdot h^{V}_{st=Nst+1} - F^{SV}_{st=Nst+1} \cdot h^{V}_{st=Nst+1} -$$

- Eq: 179404: reboiler_enthalpy.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: enthalpy in reboiler Parameter List: 178893: parameterlist.mospar

$$H_{st=Nst+1} = HU^{L}_{st=Nst+1} \cdot h^{L}_{st=Nst+1} + HU^{V}_{st=Nst+1} \cdot h^{V}_{st=Nst+1}$$

Applied Functions:

- Fun: 179299: polynomial4.mosfun (using Nota: 178892: notation.mosnot) Desc.: polynomial of order 4 used for thermoproperties

  Uses Param List: 178893: parameterlist.mospar

$$val = \mathbf{f}\,(T)$$

  with

$$\mathbf{f} = Param^{poly4}_{A} + Param^{poly4}_{B} \cdot T + Param^{poly4}_{C} \cdot (T)^2 + Param^{poly4}_{D} \cdot (T)^3 + Param^{poly4}_{E} \cdot (T)^4$$

  applied as

$$h^{LV}_{st=Nst+1,i} = \mathbf{f}(T_{st=Nst+1})$$
$$h^{F}_{st=Nst+1,i} = \mathbf{f}(T^{F}_{st=Nst+1})$$
$$h^{L}_{st=Nst+1,i} = \mathbf{f}(T_{st=Nst+1})$$
$$h^{LV,N2}_{st=Nst+1,i} = \mathbf{f}(T^{N2}_{st=Nst+1})$$
$$h^{L,N2}_{st=Nst+1,i} = \mathbf{f}(T^{N2}_{st=Nst+1})$$

Equation System: 179437: EQS_vapor_flowrate.moseqs

Description: EQS flowrate vapor reboiler

Connected Equations:

- Eq: 179424: reboiler_vapor_blockingvalve.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: liquid blocking valve vapor Parameter List: 178893: parameterlist.mospar

$$g^{V}_{b,st=Nst+1} = \frac{V^{V}_{min,st=Nst+1} + V^{V}_{st=Nst+1} - ((V^{V}_{min,st=Nst+1} - V^{V}_{st=Nst+1})^2 + (Param^{min,V}_{sharp})^2)^{0.5}}{2}$$

- Eq: 179426: reboiler_vapor_checkvalve_helper.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: check valve, liquid, helper function (bar) Parameter List: 178893: parameterlist.mospar

$$aux^{V}_{c,st=Nst+1} = P_{st=Nst+1} - P_{st=Nst}$$

- Eq: 179427: reboiler_vapor_flowrate.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: vapor flow rate Parameter List: 178893: parameterlist.mospar

$$F^{V}_{st=Nst+1} = c^{V}_{st=Nst+1} \cdot g^{V}_{b,st=Nst+1} \cdot g^{V}_{c,st=Nst+1}$$

- Eq: 179425: reboiler_vapor_checkvalve.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: check valve, Vapor Parameter List: 178893: parameterlist.mospar

$$g^{V}_{c,st=Nst+1} = (\frac{aux^{V}_{c,st=Nst+1} + ((aux^{V}_{c,st=Nst+1})^2 + (Param^{max,V}_{sharp})^2)^{0.5}}{2})^{0.5}$$

Equation System: 179442: EQS_reboiler_equilibrium.moseqs

Description: EQS reboiler equilibrium

Connected Equations:

- Eq: 179411: reboiler_equilibriumconstant1.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Equilibrium constant Parameter List: 178893: parameterlist.mospar

$$K_{st=Nst+1,i=1} = \frac{P^{LV}_{st=Nst+1,i=1}}{P_{st=Nst+1}} \cdot \gamma_{st=Nst+1,i=1}$$

- Eq: 179412: reboiler_equilibriumconstant2.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Equilibrium constant Parameter List: 178893: parameterlist.mospar

$$K_{st=Nst+1,i=2} = \frac{P^{LV}_{st=Nst+1,i=2}}{P_{st=Nst+1}} \cdot \gamma_{st=Nst+1,i=2}$$

- Eq: 179410: reboiler_equilibrium.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: equilibrium Parameter List: 178893: parameterlist.mospar

$$y_{st=Nst+1,i} = K_{st=Nst+1,i} \cdot x_{st=Nst+1,i}$$

Applied Functions:

- Fun: 168170: Dampfdruck.mosfun (using Nota: 168167: NotationVDI.mosnot) Desc.: VDI Wärmeatlas Stoffdaten D3.1 Dampfdruck p in unit of pc T in K

  Uses Param List: 168168: ParameterListVDI.mospar

$$p_s = \mathbf{f}\,(T)$$

  with

$$\mathbf{f} = p_c \cdot \exp(\frac{T_c}{T} \cdot (A^{vdi2} \cdot (1 - \frac{T}{T_c}) + B^{vdi2} \cdot (1 - \frac{T}{T_c})^{1.5} + C^{vdi2} \cdot (1 - \frac{T}{T_c})^{2.5} + D^{vdi2} \cdot (1 - \frac{T}{T_c})^5))$$

  applied as

$$P^{LV}_{st=Nst+1,i=2} = \mathbf{f}(T_{st=Nst+1})$$
$$P^{LV}_{st=Nst+1,i=1} = \mathbf{f}(T_{st=Nst+1})$$

Equation System: 179443: EQS_reboiler_midfunction.moseqs

Description: EQS reboiler midfunction

Connected Equations:

- Eq: 179414: reboiler_midfunction_residual.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: midfun residual Parameter List: 178893: parameterlist.mospar

$$res_{st=Nst+1} = 0$$

- Eq: 179461: reboiler_midfunction.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: midfun Parameter List: 178893: parameterlist.mospar

$$res_{st=Nst+1} = \chi_{inv,st=Nst+1} + \chi_{st=Nst+1} + \zeta_{st=Nst+1} - aux^{mid}_{max,st=Nst+1} - aux^{mid}_{min,st=Nst+1}$$

- Eq: 179417: reboiler_closed_summation.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Closed summation Parameter List: 178893: parameterlist.mospar

$$\zeta_{st=Nst+1} = \sum_{i=1}^{NC} x_{st=Nst+1,i} - \sum_{i=1}^{NC} y_{st=Nst+1,i}$$

- Eq: 179415: reboiler_vapor_quality.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Vapor Quality Parameter List: 178893: parameterlist.mospar

$$\chi_{st=Nst+1} \cdot (HU^{L}_{st=Nst+1} + HU^{V}_{st=Nst+1}) = HU^{V}_{st=Nst+1}$$

- Eq: 179416: reboiler_liquid_quality.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: liquid Quality Parameter List: 178893: parameterlist.mospar

$$\chi_{inv,st=Nst+1} = \chi_{st=Nst+1} - 1$$

- Eq: 179459: reboiler_midfunction_helpermax.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: midfun helper max(zea, chi, chiinv) = max(zeta,chi) Parameter List: 178893: parameterlist.mospar

$$aux^{mid}_{max,st=Nst+1} = \frac{\zeta_{st=Nst+1} + \chi_{st=Nst+1} + ((\zeta_{st=Nst+1} - \chi_{st=Nst+1})^2 + (Param^{mid}_{sharp})^2)^{0.5}}{2}$$

- Eq: 179460: reboiler_midfunction_helpermin.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: midfun helper min(zea, chi, chiinv) = min(zeta,chiinv) Parameter List: 178893: parameterlist.mospar

$$aux^{mid}_{min,st=Nst+1} = \frac{\zeta_{st=Nst+1} + \chi_{inv,st=Nst+1} - ((\zeta_{st=Nst+1} - \chi_{inv,st=Nst+1})^2 + (Param^{mid}_{sharp})^2)^{0.5}}{2}$$

Equation System: 179400: EQS_reboiler_massbalance_safetyvalve.moseqs

Description: EQS reboiler

Connected Equations:

- Eq: 179399: reboiler_mass_balance_safetyvalve.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Component mass balance for reboiler Parameter List: 178893: parameterlist.mospar

$$\frac{\mathrm{d}HU_{st=Nst+1,i}}{\mathrm{d}t} = F^{F}_{st=Nst+1} \cdot x^{F}_{st=Nst+1,i} + F^{N2}_{st=Nst+1} \cdot x^{N2}_{st=Nst+1,i} + F^{L}_{st=Nst} \cdot x_{st=Nst,i} - F^{V}_{st=Nst+1} \cdot y_{st=Nst+1,i} - F^{SV}_{st=Nst+1} \cdot y_{st=}$$

- Eq: 179401: reboiler_mass_holdup.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: Holdup Parameter List: 178893: parameterlist.mospar

$$HU_{st=Nst+1,i} = HU^{L}_{st=Nst+1} \cdot x_{st=Nst+1,i} + HU^{V}_{st=Nst+1} \cdot y_{st=Nst+1,i}$$

- Eq: 179402: reboiler_mass_holdup_total.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: total holdup in reboiler Parameter List: 178893: parameterlist.mospar

$$\sum_{i=1}^{NC} HU_{st=Nst+1,i} = HU^{L}_{st=Nst+1} + HU^{V}_{st=Nst+1}$$

Equation System: 179435: EQS_reboiler_nitrogen_flowrate.moseqs

Description: EQS flowrate nitrogen reboiler

Connected Equations:

- Eq: 179430: reboiler_nitrogen_flowrate.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: vapor flow rate Parameter List: 178893: parameterlist.mospar

$$F^{N2}_{st=Nst+1} = c^{N2}_{st=Nst+1} \cdot g^{N2}_{c,st=Nst+1}$$

- Eq: 179428: reboiler_nitrogen_checkvalve.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: check valve, nitrogen Parameter List: 178893: parameterlist.mospar

$$g^{N2}_{c,st=Nst+1} = (\frac{aux^{N2}_{c,st=Nst+1} + ((aux^{N2}_{c,st=Nst+1})^2 + (Param^{max,N2}_{sharp})^2)^{0.5}}{2})^{0.5}$$

- Eq: 179429: reboiler_nitrogen_checkvalve_helper.mosequ (using Nota: 178892: notation.mosnot)
  Desc.: check valve, nitrogen, helper function (bar) Parameter List: 178893: parameterlist.mospar

$$aux^{N2}_{c,st=Nst+1} = P^{N2} - P_{st=Nst+1}$$

Equation instances:

Eq: 179499: condenser_massbalance.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Component mass balance for condenser. Parameter List: 178893: parameterlist.mospar.

$$\frac{e0.HU_{st=0,i=1}}{e0.t} = e0.F^V_{st=1} \cdot e0.y_{st=1,i=1} - e0.F^V_{st=0} \cdot e0.y_{st=0,i=1} - e0.F^L_{st=0} \cdot e0.x_{st=0,i=1} - e0.F^P_{st=0} \cdot e0.x_{st=0,i=1}$$

$$\frac{e0.HU_{st=0,i=2}}{e0.t} = e0.F^V_{st=1} \cdot e0.y_{st=1,i=2} - e0.F^V_{st=0} \cdot e0.y_{st=0,i=2} - e0.F^L_{st=0} \cdot e0.x_{st=0,i=2} - e0.F^P_{st=0} \cdot e0.x_{st=0,i=2}$$

$$\frac{e0.HU_{st=0,i=3}}{e0.t} = e0.F^V_{st=1} \cdot e0.y_{st=1,i=3} - e0.F^V_{st=0} \cdot e0.y_{st=0,i=3} - e0.F^L_{st=0} \cdot e0.x_{st=0,i=3} - e0.F^P_{st=0} \cdot e0.x_{st=0,i=3}$$

Eq: 179500: condenser_mass_holdup.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Holdup. Parameter List: 178893: parameterlist.mospar.

$$e0.HU_{st=0,i=1} = e0.HU^L_{st=0} \cdot e0.x_{st=0,i=1} + e0.HU^V_{st=0} \cdot e0.y_{st=0,i=1}$$

$$e0.HU_{st=0,i=2} = e0.HU^L_{st=0} \cdot e0.x_{st=0,i=2} + e0.HU^V_{st=0} \cdot e0.y_{st=0,i=2}$$

$$e0.HU_{st=0,i=3} = e0.HU^L_{st=0} \cdot e0.x_{st=0,i=3} + e0.HU^V_{st=0} \cdot e0.y_{st=0,i=3}$$

Eq: 179501: condenser_mass_holdup_total.mosequ (using Nota: 178892: notation.mosnot). Descrciption: total holdup in condenser. Parameter List: 178893: parameterlist.mospar.

$$(e0.HU_{st=0,i=1} + e0.HU_{st=0,i=2} + e0.HU_{st=0,i=3}) = e0.HU^L_{st=0} + e0.HU^V_{st=0}$$

Eq: 179502: condenser_energybalance.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Energy balance in condenser. Parameter List: 178893: parameterlist.mospar.

$$\frac{e0.U_{st=0}}{e0.t} = e0.F^{V}_{st=1} \cdot e0.h^{V}_{st=1} - e0.F^{V}_{st=0} \cdot e0.h^{V}_{st=0} - e0.F^{L}_{st=0} \cdot e0.h^{L}_{st=0} - e0.F^{P}_{st=0} \cdot e0.h^{L}_{st=0} + e0.Q_{st=0}$$

Eq: 179503: condenser_enthalpy.mosequ (using Nota: 178892: notation.mosnot). Descrciption: enthalpy in condenser. Parameter List: 178893: parameterlist.mospar.

$$e0.H_{st=0} = e0.HU^{L}_{st=0} \cdot e0.h^{L}_{st=0} + e0.HU^{V}_{st=0} \cdot e0.h^{V}_{st=0}$$

Eq: 179504: condenser_enthalpy_definition.mosequ (using Nota: 178892: notation.mosnot). Descrciption: enthalpy definition in condenser. Parameter List: 178893: parameterlist.mospar.

$$e0.H_{st=0} = e0.U_{st=0} + e0.P_{st=0} \cdot e0.V^{tot}_{st=0}$$

Eq: 179505: condenser_enthalpy_liquid_mix.mosequ (using Nota: 178892: notation.mosnot). Descrciption: enthalpy mixture liquid. Parameter List: 178893: parameterlist.mospar.

$$e0.h^{L}_{st=0} = (e0.x_{st=0,i=1} \cdot e0.h^{L}_{st=0,i=1} + e0.x_{st=0,i=2} \cdot e0.h^{L}_{st=0,i=2} + e0.x_{st=0,i=3} \cdot e0.h^{L}_{st=0,i=3})$$

Eq: 179506: condenser_enthalpy_vapor.mosequ (using Nota: 178892: notation.mosnot). Descrciption: enthalpy mixture vapor. Parameter List: 178893: parameterlist.mospar.

$$e0.h^{V}_{st=0} = (e0.y_{st=0,i=1} \cdot (e0.h^{L}_{st=0,i=1} + e0.h^{LV}_{st=0,i=1}) + e0.y_{st=0,i=2} \cdot (e0.h^{L}_{st=0,i=2} + e0.h^{LV}_{st=0,i=2}) + e0.y_{st=0,i=3} \cdot (e0.h^{L}_{st=0,i=3} + e0.h^{LV}_{st=0}$$

Eq: 179507: condenser_equilibrium.mosequ (using Nota: 178892: notation.mosnot). Descrciption: equilibrium. Parameter List: 178893: parameterlist.mospar.

$$e0.y_{st=0,i=1} = e0.K_{st=0,i=1} \cdot e0.x_{st=0,i=1}$$

$$e0.y_{st=0,i=2} = e0.K_{st=0,i=2} \cdot e0.x_{st=0,i=2}$$

$$e0.y_{st=0,i=3} = e0.K_{st=0,i=3} \cdot e0.x_{st=0,i=3}$$

Eq: 179508: condenser_equilibriumconstant1.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Equilibrium constant. Parameter List: 178893: parameterlist.mospar.

$$e0.K_{st=0,i=1} = \frac{e0.P^{LV}_{st=0,i=1}}{e0.P_{st=0}} \cdot e0.\gamma_{st=0,i=1}$$

Eq: 179509: condenser_equilibriumconstant2.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Equilibrium constant. Parameter List: 178893: parameterlist.mospar.

$$e0.K_{st=0,i=2} = \frac{e0.P^{LV}_{st=0,i=2}}{e0.P_{st=0}} \cdot e0.\gamma_{st=0,i=2}$$

Eq: 179510: condenser_closed_summation.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Closed summation. Parameter List: 178893: parameterlist.mospar.

$$e0.\zeta_{st=0} = (e0.x_{st=0,i=1} + e0.x_{st=0,i=2} + e0.x_{st=0,i=3}) - (e0.y_{st=0,i=1} + e0.y_{st=0,i=2} + e0.y_{st=0,i=3})$$

Eq: 179511: condenser_vapor_quality.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Vapor Quality. Parameter List: 178893: parameterlist.mospar.

$$e0.\chi_{st=0} \cdot (e0.HU^{L}_{st=0} + e0.HU^{V}_{st=0}) = e0.HU^{V}_{st=0}$$

Eq: 179512: condenser_liquid_quality.mosequ (using Nota: 178892: notation.mosnot). Descrciption: liquid Quality. Parameter List: 178893: parameterlist.mospar.

$$e0.\chi_{inv,st=0} = e0.\chi_{st=0} - 1$$

Eq: 179513: condenser_midfunction_helpermax.mosequ (using Nota: 178892: notation.mosnot). Descrciption: midfun helper max(zea, chi, chiinv) = max(zeta,chi). Parameter List: 178893: parameterlist.mospar.

$$e0.aux^{mid}_{max,st=0} = \frac{e0.\zeta_{st=0} + e0.\chi_{st=0} + ((e0.\zeta_{st=0} - e0.\chi_{st=0})^{(2)} + (e0.Param^{mid}_{sharp})^{(2)})^{(0.5)}}{2}$$

Eq: 179514: condenser_midfunction_helpermin.mosequ (using Nota: 178892: notation.mosnot). Descrciption: midfun helper min(zea, chi, chiinv) = min(zeta,chiinv). Parameter List: 178893: parameterlist.mospar.

$$e0.aux^{mid}_{min,st=0} = \frac{e0.\zeta_{st=0} + e0.\chi_{inv,st=0} - ((e0.\zeta_{st=0} - e0.\chi_{inv,st=0})^{(2)} + (e0.Param^{mid}_{sharp})^{(2)})^{(0.5)}}{2}$$

Eq: 179515: condenser_midfunction.mosequ (using Nota: 178892: notation.mosnot). Descrciption: midfun. Parameter List: 178893: parameterlist.mospar.

$$e0.res_{st=0} = e0.\chi_{inv,st=0} + e0.\chi_{st=0} + e0.\zeta_{st=0} - e0.aux^{mid}_{max,st=0} - e0.aux^{mid}_{min,st=0}$$

Eq: 179516: condenser_midfunction_residual.mosequ (using Nota: 178892: notation.mosnot). Descrciption: midfun residual. Parameter List: 178893: parameterlist.mospar.

$$e0.res_{st=0} = 0$$

Eq: 179517: condenser_liquid_density_mix.mosequ (using Nota: 178892: notation.mosnot). Descrciption: actual liquid density. Parameter List: 178893: parameterlist.mospar.

$$e0.\rho^{L}_{st=0} = e0.\rho^{L,dummy} + e0.\sigma^{L,dirac}_{st=0} \cdot (\frac{1}{(\frac{e0.x_{st=0,i=1}}{e0.\rho_{st=0,i=1}} + \frac{e0.x_{st=0,i=2}}{e0.\rho_{st=0,i=2}} + \frac{e0.x_{st=0,i=3}}{e0.\rho_{st=0,i=3}})} - e0.\rho^{L,dummy})$$

Eq: 179518: condenser_liquid_density_mix_mass.mosequ (using Nota: 178892: notation.mosnot). Descrciption: liquid mass density. Parameter List: 178893: parameterlist.mospar.

$$e0.\rho^{L,mass}_{st=0} = e0.\rho^{L}_{st=0} \cdot e0.M^{L}_{st=0}$$

Eq: 179519: condenser_liquid_molarmass.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Molar mass liquid. Parameter List: 178893: parameterlist.mospar.

$$e0.M^{L}_{st=0} = (((e0.x_{st=0,i=1} \cdot e0.M_{i=1} + e0.x_{st=0,i=2} \cdot e0.M_{i=2} + e0.x_{st=0,i=3} \cdot e0.M_{i=3}))^{(2)} + e0.Param^{L,abs}_{sharp})^{(0.5)}$$

Eq: 179520: condenser_liquid_volume.mosequ (using Nota: 178892: notation.mosnot). Descrciption: liquid volume. Parameter List: 178893: parameterlist.mospar.

$$e0.V^{L}_{st=0} = \frac{e0.HU^{L}_{st=0}}{e0.\rho^{L}_{st=0}}$$

Eq: 179521: condenser_total_volume.mosequ (using Nota: 178892: notation.mosnot). Descrciption: total volume. Parameter List: 178893: parameterlist.mospar.

$$e0.V^{tot}_{st=0} = e0.V^{L}_{st=0} + e0.V^{V}_{st=0}$$

Eq: 179522: condenser_vapor_volume.mosequ (using Nota: 178892: notation.mosnot). Descrciption: vapor volume. Parameter List: 178893: parameterlist.mospar.

$$e0.V^{V}_{st=0} = \frac{e0.HU^{V}_{st=0} \cdot e0.R \cdot e0.T_{st=0}}{e0.P_{st=0} \cdot (10)^{(5)}}$$

Eq: 179530: condenser_liquid_flowrate.mosequ (using Nota: 178892: notation.mosnot). Descrciption: liquid flow rate. Parameter List: 178893: parameterlist.mospar.

$$e0.F^{L}_{Cond} = e0.F^{L}_{film,st=0} \cdot e0.\sigma^{L}_{st=0}$$

Eq: 179532: condenser_liquid_flowrate_reflux.mosequ (using Nota: 178892: notation.mosnot). Descrciption: liquid flow rate. Parameter List: 178893: parameterlist.mospar.

$$e0.F^{L}_{st=0} = e0.F^{L}_{Cond} \cdot e0.\sigma^{R}$$

Eq: 179666: condenser_liquid_flowrate_product.mosequ (using Nota: 178892: notation.mosnot). Descrciption: liquid flow rate product. Parameter List: 178893: parameterlist.mospar.

$$e0.F^{P}_{st=0} = e0.F^{L}_{Cond} \cdot (1 - e0.\sigma^{R})$$

Eq: 179789: condenser_liquid_filmflowrate.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Liquid flow on condenser. Parameter List: 178893: parameterlist.mospar.

$$e0.F^{L}_{film,st=0} = \frac{e0.g \cdot (e0.\delta_{st=0})^{(3)} \cdot (e0.\rho^{L}_{st=0})^{(2)}}{3 \cdot e0.\eta^{L}_{st=0} \cdot e0.M^{L}_{st=0}} \cdot e0.L_{film,st=0} \cdot (10)^{(-3)}$$

Eq: 179790: condenser_liquid_filmthickness.mosequ (using Nota: 178892: notation.mosnot). Descrciption: film thickness. Parameter List: 178893: parameterlist.mospar.

$$e0.\delta_{st=0} = \frac{e0.V^{L}_{st=0}}{e0.V^{tot}_{st=0} \cdot e0.a_{Cond}}$$

Eq: 179791: condenser_liquid_flowrate_activation.mosequ (using Nota: 178892: notation.mosnot). Descrciption: sigmoidal function activation of liquid flow. Parameter List: 178893: parameterlist.mospar.

$$e0.\sigma^{L}_{st=0} = \frac{e0.aux^{L}_{st=0} + ((e0.aux^{L}_{st=0})^{(2)} + (e0.Param^{L,sig}_{sharp})^{(2)})^{(0.5)}}{2 \cdot ((e0.aux^{L}_{st=0})^{(2)} + (e0.Param^{L,sig}_{sharp})^{(2)})^{(0.5)}}$$

Eq: 179792: condenser_liquid_flowrate_activation_helper.mosequ (using Nota: 178892: notation.mosnot). Descrciption: sigmoidal function activation of liquid flow. Parameter List: 178893: parameterlist.mospar.

$$e0.aux^{L}_{st=0} = e0.V^{L}_{st=0} - e0.V^{L,spec}_{correlation,st=0} \cdot e0.V^{tot}_{st=0}$$

Eq: 179523: condenser_vapor_blockingvalve.mosequ (using Nota: 178892: notation.mosnot). Descrciption: condenser blocking valve vapor. Parameter List: 178893: parameterlist.mospar.

$$e0.g^{V}_{b,st=0} = \frac{e0.V^{V}_{min,st=0} + e0.V^{V}_{st=0} - ((e0.V^{V}_{min,st=0} - e0.V^{V}_{st=0})^{(2)} + (e0.Param^{V,min}_{sharp})^{(2)})^{(0.5)}}{2}$$

Eq: 179524: condenser_vapor_checkvalve.mosequ (using Nota: 178892: notation.mosnot). Descrciption: check valve, Vapor max(0,aux). Parameter List: 178893: parameterlist.mospar.

$$e0.g^{V}_{c,st=0} = (\frac{e0.aux^{V}_{c,st=0} + ((e0.aux^{V}_{c,st=0})^{(2)} + (e0.Param^{V,max}_{sharp})^{(2)})^{(0.5)}}{2})^{(0.5)}$$

Eq: 179525: condenser_vapor_checkvalve_helper.mosequ (using Nota: 178892: notation.mosnot). Descrciption: check valve, liquid, helper function (bar). Parameter List: 178893: parameterlist.mospar.

$$e0.aux^{V}_{c,st=0} = e0.P_{st=0} - e0.P^{amb}$$

Eq: 179526: condenser_vapor_flowrate.mosequ (using Nota: 178892: notation.mosnot). Descrciption: vapor flow rate. Parameter List: 178893: parameterlist.mospar.

$$e0.F^{V}_{Cond} = e0.c^{V}_{st=0} \cdot e0.g^{V}_{b,st=0} \cdot e0.g^{V}_{c,st=0}$$

Eq: 179535: condenser_vapor_flowrate_controlled.mosequ (using Nota: 178892: notation.mosnot). Descrciption: liquid flow rate. Parameter List: 178893: parameterlist.mospar.

$$e0.F^{V}_{st=0} = e0.\sigma^{PC}_{Cond} \cdot e0.F^{V}_{Cond}$$

Eq: 179605: condenser_vapor_flowrate_controller.mosequ (using Nota: 178892: notation.mosnot). Descrciption: sigmoidal function Pressure control. Parameter List: 178893: parameterlist.mospar.

$$e0.\sigma^{PC}_{Cond} = \frac{e0.aux^{PC}_{st=0} + ((e0.aux^{PC}_{st=0})^{(2)} + (e0.Param^{PC,sig}_{sharp})^{(2)})^{(0.5)}}{2 \cdot ((e0.aux^{PC}_{st=0})^{(2)} + (e0.Param^{PC,sig}_{sharp})^{(2)})^{(0.5)}}$$

Eq: 179604: condenser_vapor_flowrate_controller_helper.mosequ (using Nota: 178892: notation.mosnot). Descrciption: helper variable Pressure control. Parameter List: 178893: parameterlist.mospar.

$$e0.aux^{PC}_{st=0} = e0.P_{st=0} - e0.P^{SP}$$

Eq: 179531: condenser_diracactivation_liquid.mosequ (using Nota: 178892: notation.mosnot). Descrciption: dirac activation liquid. Parameter List: 178893: parameterlist.mospar.

$$e0.\sigma^{L,dirac}_{st=0} = \exp\left(-\frac{((e0.x_{st=0,i=1} + e0.x_{st=0,i=2} + e0.x_{st=0,i=3}) - 1)^{(2)}}{2 \cdot (e0.Param^{L,dirac}_{sharp})^{(2)}}\right)$$

Eq: 179395: stage_mass_balance.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Component mass balance for generic stage. Parameter List: 178893: parameterlist.mospar.

$$\frac{e0.HU_{st=1,i=1}}{e0.t} = e0.F^{V}_{st=2} \cdot e0.y_{st=2,i=1} - e0.F^{V}_{st=1} \cdot e0.y_{st=1,i=1} + e0.F^{L}_{st=0} \cdot e0.x_{st=0,i=1} - e0.F^{L}_{st=1} \cdot e0.x_{st=1,i=1}$$

$$\frac{e0.HU_{st=2,i=1}}{e0.t} = e0.F^{V}_{st=3} \cdot e0.y_{st=3,i=1} - e0.F^{V}_{st=2} \cdot e0.y_{st=2,i=1} + e0.F^{L}_{st=1} \cdot e0.x_{st=1,i=1} - e0.F^{L}_{st=2} \cdot e0.x_{st=2,i=1}$$

$$\frac{e0.HU_{st=3,i=1}}{e0.t} = e0.F^{V}_{st=4} \cdot e0.y_{st=4,i=1} - e0.F^{V}_{st=3} \cdot e0.y_{st=3,i=1} + e0.F^{L}_{st=2} \cdot e0.x_{st=2,i=1} - e0.F^{L}_{st=3} \cdot e0.x_{st=3,i=1}$$

$$\frac{e0.HU_{st=4,i=1}}{e0.t} = e0.F^{V}_{st=5} \cdot e0.y_{st=5,i=1} - e0.F^{V}_{st=4} \cdot e0.y_{st=4,i=1} + e0.F^{L}_{st=3} \cdot e0.x_{st=3,i=1} - e0.F^{L}_{st=4} \cdot e0.x_{st=4,i=1}$$

$$\frac{e0.HU_{st=5,i=1}}{e0.t} = e0.F^{V}_{st=6} \cdot e0.y_{st=6,i=1} - e0.F^{V}_{st=5} \cdot e0.y_{st=5,i=1} + e0.F^{L}_{st=4} \cdot e0.x_{st=4,i=1} - e0.F^{L}_{st=5} \cdot e0.x_{st=5,i=1}$$

$$\frac{e0.HU_{st=6,i=1}}{e0.t} = e0.F^{V}_{st=7} \cdot e0.y_{st=7,i=1} - e0.F^{V}_{st=6} \cdot e0.y_{st=6,i=1} + e0.F^{L}_{st=5} \cdot e0.x_{st=5,i=1} - e0.F^{L}_{st=6} \cdot e0.x_{st=6,i=1}$$

$$\frac{e0.HU_{st=7,i=1}}{e0.t} = e0.F^{V}_{st=8} \cdot e0.y_{st=8,i=1} - e0.F^{V}_{st=7} \cdot e0.y_{st=7,i=1} + e0.F^{L}_{st=6} \cdot e0.x_{st=6,i=1} - e0.F^{L}_{st=7} \cdot e0.x_{st=7,i=1}$$

$$\frac{e0.HU_{st=8,i=1}}{e0.t} = e0.F^{V}_{st=9} \cdot e0.y_{st=9,i=1} - e0.F^{V}_{st=8} \cdot e0.y_{st=8,i=1} + e0.F^{L}_{st=7} \cdot e0.x_{st=7,i=1} - e0.F^{L}_{st=8} \cdot e0.x_{st=8,i=1}$$

$$\frac{e0.HU_{st=1,i=2}}{e0.t} = e0.F^{V}_{st=2} \cdot e0.y_{st=2,i=2} - e0.F^{V}_{st=1} \cdot e0.y_{st=1,i=2} + e0.F^{L}_{st=0} \cdot e0.x_{st=0,i=2} - e0.F^{L}_{st=1} \cdot e0.x_{st=1,i=2}$$

$$\frac{e0.HU_{st=2,i=2}}{e0.t} = e0.F^{V}_{st=3} \cdot e0.y_{st=3,i=2} - e0.F^{V}_{st=2} \cdot e0.y_{st=2,i=2} + e0.F^{L}_{st=1} \cdot e0.x_{st=1,i=2} - e0.F^{L}_{st=2} \cdot e0.x_{st=2,i=2}$$

$$\frac{e0.HU_{st=3,i=2}}{e0.t} = e0.F^{V}_{st=4} \cdot e0.y_{st=4,i=2} - e0.F^{V}_{st=3} \cdot e0.y_{st=3,i=2} + e0.F^{L}_{st=2} \cdot e0.x_{st=2,i=2} - e0.F^{L}_{st=3} \cdot e0.x_{st=3,i=2}$$

$$\frac{e0.HU_{st=4,i=2}}{e0.t} = e0.F^{V}_{st=5} \cdot e0.y_{st=5,i=2} - e0.F^{V}_{st=4} \cdot e0.y_{st=4,i=2} + e0.F^{L}_{st=3} \cdot e0.x_{st=3,i=2} - e0.F^{L}_{st=4} \cdot e0.x_{st=4,i=2}$$

$$\frac{e0.HU_{st=5,i=2}}{e0.t} = e0.F^{V}_{st=6} \cdot e0.y_{st=6,i=2} - e0.F^{V}_{st=5} \cdot e0.y_{st=5,i=2} + e0.F^{L}_{st=4} \cdot e0.x_{st=4,i=2} - e0.F^{L}_{st=5} \cdot e0.x_{st=5,i=2}$$

$$\frac{e0.HU_{st=6,i=2}}{e0.t} = e0.F^{V}_{st=7} \cdot e0.y_{st=7,i=2} - e0.F^{V}_{st=6} \cdot e0.y_{st=6,i=2} + e0.F^{L}_{st=5} \cdot e0.x_{st=5,i=2} - e0.F^{L}_{st=6} \cdot e0.x_{st=6,i=2}$$

$$\frac{e0.HU_{st=7,i=2}}{e0.t} = e0.F^{V}_{st=8} \cdot e0.y_{st=8,i=2} - e0.F^{V}_{st=7} \cdot e0.y_{st=7,i=2} + e0.F^{L}_{st=6} \cdot e0.x_{st=6,i=2} - e0.F^{L}_{st=7} \cdot e0.x_{st=7,i=2}$$

$$\frac{e0.HU_{st=8,i=2}}{e0.t} = e0.F^{V}_{st=9} \cdot e0.y_{st=9,i=2} - e0.F^{V}_{st=8} \cdot e0.y_{st=8,i=2} + e0.F^{L}_{st=7} \cdot e0.x_{st=7,i=2} - e0.F^{L}_{st=8} \cdot e0.x_{st=8,i=2}$$

$$\frac{e0.HU_{st=1,i=3}}{e0.t} = e0.F^{V}_{st=2} \cdot e0.y_{st=2,i=3} - e0.F^{V}_{st=1} \cdot e0.y_{st=1,i=3} + e0.F^{L}_{st=0} \cdot e0.x_{st=0,i=3} - e0.F^{L}_{st=1} \cdot e0.x_{st=1,i=3}$$

$$\frac{e0.HU_{st=2,i=3}}{e0.t} = e0.F^{V}_{st=3} \cdot e0.y_{st=3,i=3} - e0.F^{V}_{st=2} \cdot e0.y_{st=2,i=3} + e0.F^{L}_{st=1} \cdot e0.x_{st=1,i=3} - e0.F^{L}_{st=2} \cdot e0.x_{st=2,i=3}$$

$$\frac{e0.HU_{st=3,i=3}}{e0.t} = e0.F^{V}_{st=4} \cdot e0.y_{st=4,i=3} - e0.F^{V}_{st=3} \cdot e0.y_{st=3,i=3} + e0.F^{L}_{st=2} \cdot e0.x_{st=2,i=3} - e0.F^{L}_{st=3} \cdot e0.x_{st=3,i=3}$$

$$\frac{e0.HU_{st=4,i=3}}{e0.t} = e0.F^{V}_{st=5} \cdot e0.y_{st=5,i=3} - e0.F^{V}_{st=4} \cdot e0.y_{st=4,i=3} + e0.F^{L}_{st=3} \cdot e0.x_{st=3,i=3} - e0.F^{L}_{st=4} \cdot e0.x_{st=4,i=3}$$

$$\frac{e0.HU_{st=5,i=3}}{e0.t} = e0.F^{V}_{st=6} \cdot e0.y_{st=6,i=3} - e0.F^{V}_{st=5} \cdot e0.y_{st=5,i=3} + e0.F^{L}_{st=4} \cdot e0.x_{st=4,i=3} - e0.F^{L}_{st=5} \cdot e0.x_{st=5,i=3}$$

$$\frac{e0.HU_{st=6,i=3}}{e0.t} = e0.F^{V}_{st=7} \cdot e0.y_{st=7,i=3} - e0.F^{V}_{st=6} \cdot e0.y_{st=6,i=3} + e0.F^{L}_{st=5} \cdot e0.x_{st=5,i=3} - e0.F^{L}_{st=6} \cdot e0.x_{st=6,i=3}$$

$$\frac{e0.HU_{st=7,i=3}}{e0.t} = e0.F^{V}_{st=8} \cdot e0.y_{st=8,i=3} - e0.F^{V}_{st=7} \cdot e0.y_{st=7,i=3} + e0.F^{L}_{st=6} \cdot e0.x_{st=6,i=3} - e0.F^{L}_{st=7} \cdot e0.x_{st=7,i=3}$$

$$\frac{e0.HU_{st=8,i=3}}{e0.t} = e0.F^{V}_{st=9} \cdot e0.y_{st=9,i=3} - e0.F^{V}_{st=8} \cdot e0.y_{st=8,i=3} + e0.F^{L}_{st=7} \cdot e0.x_{st=7,i=3} - e0.F^{L}_{st=8} \cdot e0.x_{st=8,i=3}$$

Eq: 178828: stage_mass_holdup.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Holdup. Parameter List: 178893: parameterlist.mospar.

$$e0.HU_{st=1,i=1} = e0.HU^{L}_{st=1} \cdot e0.x_{st=1,i=1} + e0.HU^{V}_{st=1} \cdot e0.y_{st=1,i=1}$$

$$e0.HU_{st=2,i=1} = e0.HU^{L}_{st=2} \cdot e0.x_{st=2,i=1} + e0.HU^{V}_{st=2} \cdot e0.y_{st=2,i=1}$$

$$e0.HU_{st=3,i=1} = e0.HU^{L}_{st=3} \cdot e0.x_{st=3,i=1} + e0.HU^{V}_{st=3} \cdot e0.y_{st=3,i=1}$$

$$e0.HU_{st=4,i=1} = e0.HU^{L}_{st=4} \cdot e0.x_{st=4,i=1} + e0.HU^{V}_{st=4} \cdot e0.y_{st=4,i=1}$$

$$e0.HU_{st=5,i=1} = e0.HU^{L}_{st=5} \cdot e0.x_{st=5,i=1} + e0.HU^{V}_{st=5} \cdot e0.y_{st=5,i=1}$$

$$e0.HU_{st=6,i=1} = e0.HU^{L}_{st=6} \cdot e0.x_{st=6,i=1} + e0.HU^{V}_{st=6} \cdot e0.y_{st=6,i=1}$$

$$e0.HU_{st=7,i=1} = e0.HU^{L}_{st=7} \cdot e0.x_{st=7,i=1} + e0.HU^{V}_{st=7} \cdot e0.y_{st=7,i=1}$$

$$e0.HU_{st=8,i=1} = e0.HU^{L}_{st=8} \cdot e0.x_{st=8,i=1} + e0.HU^{V}_{st=8} \cdot e0.y_{st=8,i=1}$$

$$e0.HU_{st=1,i=2} = e0.HU^{L}_{st=1} \cdot e0.x_{st=1,i=2} + e0.HU^{V}_{st=1} \cdot e0.y_{st=1,i=2}$$

$$e0.HU_{st=2,i=2} = e0.HU^{L}_{st=2} \cdot e0.x_{st=2,i=2} + e0.HU^{V}_{st=2} \cdot e0.y_{st=2,i=2}$$

$$e0.HU_{st=3,i=2} = e0.HU^{L}_{st=3} \cdot e0.x_{st=3,i=2} + e0.HU^{V}_{st=3} \cdot e0.y_{st=3,i=2}$$

$$e0.HU_{st=4,i=2} = e0.HU^{L}_{st=4} \cdot e0.x_{st=4,i=2} + e0.HU^{V}_{st=4} \cdot e0.y_{st=4,i=2}$$

$$e0.HU_{st=5,i=2} = e0.HU^{L}_{st=5} \cdot e0.x_{st=5,i=2} + e0.HU^{V}_{st=5} \cdot e0.y_{st=5,i=2}$$

$$e0.HU_{st=6,i=2} = e0.HU^{L}_{st=6} \cdot e0.x_{st=6,i=2} + e0.HU^{V}_{st=6} \cdot e0.y_{st=6,i=2}$$

$$e0.HU_{st=7,i=2} = e0.HU^{L}_{st=7} \cdot e0.x_{st=7,i=2} + e0.HU^{V}_{st=7} \cdot e0.y_{st=7,i=2}$$

$$e0.HU_{st=8,i=2} = e0.HU^{L}_{st=8} \cdot e0.x_{st=8,i=2} + e0.HU^{V}_{st=8} \cdot e0.y_{st=8,i=2}$$

$$e0.HU_{st=1,i=3} = e0.HU^{L}_{st=1} \cdot e0.x_{st=1,i=3} + e0.HU^{V}_{st=1} \cdot e0.y_{st=1,i=3}$$

$$e0.HU_{st=2,i=3} = e0.HU^{L}_{st=2} \cdot e0.x_{st=2,i=3} + e0.HU^{V}_{st=2} \cdot e0.y_{st=2,i=3}$$

$$e0.HU_{st=3,i=3} = e0.HU^{L}_{st=3} \cdot e0.x_{st=3,i=3} + e0.HU^{V}_{st=3} \cdot e0.y_{st=3,i=3}$$

$$e0.HU_{st=4,i=3} = e0.HU^{L}_{st=4} \cdot e0.x_{st=4,i=3} + e0.HU^{V}_{st=4} \cdot e0.y_{st=4,i=3}$$

$$e0.HU_{st=5,i=3} = e0.HU^{L}_{st=5} \cdot e0.x_{st=5,i=3} + e0.HU^{V}_{st=5} \cdot e0.y_{st=5,i=3}$$

$$e0.HU_{st=6,i=3} = e0.HU^{L}_{st=6} \cdot e0.x_{st=6,i=3} + e0.HU^{V}_{st=6} \cdot e0.y_{st=6,i=3}$$

$$e0.HU_{st=7,i=3} = e0.HU^{L}_{st=7} \cdot e0.x_{st=7,i=3} + e0.HU^{V}_{st=7} \cdot e0.y_{st=7,i=3}$$

$$e0.HU_{st=8,i=3} = e0.HU^{L}_{st=8} \cdot e0.x_{st=8,i=3} + e0.HU^{V}_{st=8} \cdot e0.y_{st=8,i=3}$$

Eq: 178829: stage_mass_holdup_total.mosequ (using Nota: 178892: notation.mosnot). Descrciption: total holdup. Parameter List: 178893: parameterlist.mospar.

$$(e0.HU_{st=1,i=1} + e0.HU_{st=1,i=2} + e0.HU_{st=1,i=3}) = e0.HU^{L}_{st=1} + e0.HU^{V}_{st=1}$$

$$(e0.HU_{st=2,i=1} + e0.HU_{st=2,i=2} + e0.HU_{st=2,i=3}) = e0.HU^{L}_{st=2} + e0.HU^{V}_{st=2}$$

$$(e0.HU_{st=3,i=1} + e0.HU_{st=3,i=2} + e0.HU_{st=3,i=3}) = e0.HU^{L}_{st=3} + e0.HU^{V}_{st=3}$$

$$(e0.HU_{st=4,i=1} + e0.HU_{st=4,i=2} + e0.HU_{st=4,i=3}) = e0.HU^{L}_{st=4} + e0.HU^{V}_{st=4}$$

$$(e0.HU_{st=5,i=1} + e0.HU_{st=5,i=2} + e0.HU_{st=5,i=3}) = e0.HU^{L}_{st=5} + e0.HU^{V}_{st=5}$$

$$(e0.HU_{st=6,i=1} + e0.HU_{st=6,i=2} + e0.HU_{st=6,i=3}) = e0.HU^{L}_{st=6} + e0.HU^{V}_{st=6}$$

$$(e0.HU_{st=7,i=1} + e0.HU_{st=7,i=2} + e0.HU_{st=7,i=3}) = e0.HU^{L}_{st=7} + e0.HU^{V}_{st=7}$$

$$(e0.HU_{st=8,i=1} + e0.HU_{st=8,i=2} + e0.HU_{st=8,i=3}) = e0.HU^{L}_{st=8} + e0.HU^{V}_{st=8}$$

Eq: 179618: stage_energybalance.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Energy balance. Parameter List: 178893: parameterlist.mospar.

$$\frac{e0.U_{st=1}}{e0.t} = e0.F^{V}_{st=2} \cdot e0.h^{V}_{st=2} - e0.F^{V}_{st=1} \cdot e0.h^{V}_{st=1} + e0.F^{L}_{st=0} \cdot e0.h^{L}_{st=0} - e0.F^{L}_{st=1} \cdot e0.h^{L}_{st=1} + e0.Q_{st=1}$$

$$\frac{e0.U_{st=2}}{e0.t} = e0.F^{V}_{st=3} \cdot e0.h^{V}_{st=3} - e0.F^{V}_{st=2} \cdot e0.h^{V}_{st=2} + e0.F^{L}_{st=1} \cdot e0.h^{L}_{st=1} - e0.F^{L}_{st=2} \cdot e0.h^{L}_{st=2} + e0.Q_{st=2}$$

$$\frac{e0.U_{st=3}}{e0.t} = e0.F^{V}_{st=4} \cdot e0.h^{V}_{st=4} - e0.F^{V}_{st=3} \cdot e0.h^{V}_{st=3} + e0.F^{L}_{st=2} \cdot e0.h^{L}_{st=2} - e0.F^{L}_{st=3} \cdot e0.h^{L}_{st=3} + e0.Q_{st=3}$$

$$\frac{e0.U_{st=4}}{e0.t} = e0.F^{V}_{st=5} \cdot e0.h^{V}_{st=5} - e0.F^{V}_{st=4} \cdot e0.h^{V}_{st=4} + e0.F^{L}_{st=3} \cdot e0.h^{L}_{st=3} - e0.F^{L}_{st=4} \cdot e0.h^{L}_{st=4} + e0.Q_{st=4}$$

$$\frac{e0.U_{st=5}}{e0.t} = e0.F^{V}_{st=6} \cdot e0.h^{V}_{st=6} - e0.F^{V}_{st=5} \cdot e0.h^{V}_{st=5} + e0.F^{L}_{st=4} \cdot e0.h^{L}_{st=4} - e0.F^{L}_{st=5} \cdot e0.h^{L}_{st=5} + e0.Q_{st=5}$$

$$\frac{e0.U_{st=6}}{e0.t} = e0.F^{V}_{st=7} \cdot e0.h^{V}_{st=7} - e0.F^{V}_{st=6} \cdot e0.h^{V}_{st=6} + e0.F^{L}_{st=5} \cdot e0.h^{L}_{st=5} - e0.F^{L}_{st=6} \cdot e0.h^{L}_{st=6} + e0.Q_{st=6}$$

$$\frac{e0.U_{st=7}}{e0.t} = e0.F^{V}_{st=8} \cdot e0.h^{V}_{st=8} - e0.F^{V}_{st=7} \cdot e0.h^{V}_{st=7} + e0.F^{L}_{st=6} \cdot e0.h^{L}_{st=6} - e0.F^{L}_{st=7} \cdot e0.h^{L}_{st=7} + e0.Q_{st=7}$$

$$\frac{e0.U_{st=8}}{e0.t} = e0.F^{V}_{st=9} \cdot e0.h^{V}_{st=9} - e0.F^{V}_{st=8} \cdot e0.h^{V}_{st=8} + e0.F^{L}_{st=7} \cdot e0.h^{L}_{st=7} - e0.F^{L}_{st=8} \cdot e0.h^{L}_{st=8} + e0.Q_{st=8}$$

Eq: 179245: stage_enthalpy.mosequ (using Nota: 178892: notation.mosnot). Descrciption: enthalpy. Parameter List: 178893: parameterlist.mospar.

$$e0.H_{st=1} = e0.HU^{L}_{st=1} \cdot e0.h^{L}_{st=1} + e0.HU^{V}_{st=1} \cdot e0.h^{V}_{st=1}$$

$$e0.H_{st=2} = e0.HU^{L}_{st=2} \cdot e0.h^{L}_{st=2} + e0.HU^{V}_{st=2} \cdot e0.h^{V}_{st=2}$$

$$e0.H_{st=3} = e0.HU^{L}_{st=3} \cdot e0.h^{L}_{st=3} + e0.HU^{V}_{st=3} \cdot e0.h^{V}_{st=3}$$

$$e0.H_{st=4} = e0.HU^{L}_{st=4} \cdot e0.h^{L}_{st=4} + e0.HU^{V}_{st=4} \cdot e0.h^{V}_{st=4}$$

$$e0.H_{st=5} = e0.HU^{L}_{st=5} \cdot e0.h^{L}_{st=5} + e0.HU^{V}_{st=5} \cdot e0.h^{V}_{st=5}$$

$$e0.H_{st=6} = e0.HU^{L}_{st=6} \cdot e0.h^{L}_{st=6} + e0.HU^{V}_{st=6} \cdot e0.h^{V}_{st=6}$$

$$e0.H_{st=7} = e0.HU^{L}_{st=7} \cdot e0.h^{L}_{st=7} + e0.HU^{V}_{st=7} \cdot e0.h^{V}_{st=7}$$

$$e0.H_{st=8} = e0.HU^{L}_{st=8} \cdot e0.h^{L}_{st=8} + e0.HU^{V}_{st=8} \cdot e0.h^{V}_{st=8}$$

Eq: 179246: stage_enthalpy_definition.mosequ (using Nota: 178892: notation.mosnot). Descrciption: enthalpy definition. Parameter List: 178893: parameterlist.mospar.

$$e0.H_{st=1} = e0.U_{st=1} + e0.P_{st=1} \cdot e0.V^{tot}_{st=1}$$

$$e0.H_{st=2} = e0.U_{st=2} + e0.P_{st=2} \cdot e0.V^{tot}_{st=2}$$

$$e0.H_{st=3} = e0.U_{st=3} + e0.P_{st=3} \cdot e0.V^{tot}_{st=3}$$
$$e0.H_{st=4} = e0.U_{st=4} + e0.P_{st=4} \cdot e0.V^{tot}_{st=4}$$
$$e0.H_{st=5} = e0.U_{st=5} + e0.P_{st=5} \cdot e0.V^{tot}_{st=5}$$
$$e0.H_{st=6} = e0.U_{st=6} + e0.P_{st=6} \cdot e0.V^{tot}_{st=6}$$
$$e0.H_{st=7} = e0.U_{st=7} + e0.P_{st=7} \cdot e0.V^{tot}_{st=7}$$
$$e0.H_{st=8} = e0.U_{st=8} + e0.P_{st=8} \cdot e0.V^{tot}_{st=8}$$

Eq: 179295: stage_enthalpy_liquid_mix.mosequ (using Nota: 178892: notation.mosnot). Descrciption: enthalpy mixture liquid. Parameter List: 178893: parameterlist.mospar.

$$e0.h^{L}_{st=1} = (e0.x_{st=1,i=1} \cdot e0.h^{L}_{st=1,i=1} + e0.x_{st=1,i=2} \cdot e0.h^{L}_{st=1,i=2} + e0.x_{st=1,i=3} \cdot e0.h^{L}_{st=1,i=3})$$
$$e0.h^{L}_{st=2} = (e0.x_{st=2,i=1} \cdot e0.h^{L}_{st=2,i=1} + e0.x_{st=2,i=2} \cdot e0.h^{L}_{st=2,i=2} + e0.x_{st=2,i=3} \cdot e0.h^{L}_{st=2,i=3})$$
$$e0.h^{L}_{st=3} = (e0.x_{st=3,i=1} \cdot e0.h^{L}_{st=3,i=1} + e0.x_{st=3,i=2} \cdot e0.h^{L}_{st=3,i=2} + e0.x_{st=3,i=3} \cdot e0.h^{L}_{st=3,i=3})$$
$$e0.h^{L}_{st=4} = (e0.x_{st=4,i=1} \cdot e0.h^{L}_{st=4,i=1} + e0.x_{st=4,i=2} \cdot e0.h^{L}_{st=4,i=2} + e0.x_{st=4,i=3} \cdot e0.h^{L}_{st=4,i=3})$$
$$e0.h^{L}_{st=5} = (e0.x_{st=5,i=1} \cdot e0.h^{L}_{st=5,i=1} + e0.x_{st=5,i=2} \cdot e0.h^{L}_{st=5,i=2} + e0.x_{st=5,i=3} \cdot e0.h^{L}_{st=5,i=3})$$
$$e0.h^{L}_{st=6} = (e0.x_{st=6,i=1} \cdot e0.h^{L}_{st=6,i=1} + e0.x_{st=6,i=2} \cdot e0.h^{L}_{st=6,i=2} + e0.x_{st=6,i=3} \cdot e0.h^{L}_{st=6,i=3})$$
$$e0.h^{L}_{st=7} = (e0.x_{st=7,i=1} \cdot e0.h^{L}_{st=7,i=1} + e0.x_{st=7,i=2} \cdot e0.h^{L}_{st=7,i=2} + e0.x_{st=7,i=3} \cdot e0.h^{L}_{st=7,i=3})$$
$$e0.h^{L}_{st=8} = (e0.x_{st=8,i=1} \cdot e0.h^{L}_{st=8,i=1} + e0.x_{st=8,i=2} \cdot e0.h^{L}_{st=8,i=2} + e0.x_{st=8,i=3} \cdot e0.h^{L}_{st=8,i=3})$$

Eq: 179296: stage_enthalpy_vapor_mix.mosequ (using Nota: 178892: notation.mosnot). Descrciption: enthalpy mixture vapor. Parameter List: 178893: parameterlist.mospar.

$$e0.h^{V}_{st=1} = (e0.y_{st=1,i=1} \cdot (e0.h^{L}_{st=1,i=1} + e0.h^{LV}_{st=1,i=1}) + e0.y_{st=1,i=2} \cdot (e0.h^{L}_{st=1,i=2} + e0.h^{LV}_{st=1,i=2}) + e0.y_{st=1,i=3} \cdot (e0.h^{L}_{st=1,i=3} + e0.h^{LV}_{st=1}$$
$$e0.h^{V}_{st=2} = (e0.y_{st=2,i=1} \cdot (e0.h^{L}_{st=2,i=1} + e0.h^{LV}_{st=2,i=1}) + e0.y_{st=2,i=2} \cdot (e0.h^{L}_{st=2,i=2} + e0.h^{LV}_{st=2,i=2}) + e0.y_{st=2,i=3} \cdot (e0.h^{L}_{st=2,i=3} + e0.h^{LV}_{st=2}$$
$$e0.h^{V}_{st=3} = (e0.y_{st=3,i=1} \cdot (e0.h^{L}_{st=3,i=1} + e0.h^{LV}_{st=3,i=1}) + e0.y_{st=3,i=2} \cdot (e0.h^{L}_{st=3,i=2} + e0.h^{LV}_{st=3,i=2}) + e0.y_{st=3,i=3} \cdot (e0.h^{L}_{st=3,i=3} + e0.h^{LV}_{st=3}$$
$$e0.h^{V}_{st=4} = (e0.y_{st=4,i=1} \cdot (e0.h^{L}_{st=4,i=1} + e0.h^{LV}_{st=4,i=1}) + e0.y_{st=4,i=2} \cdot (e0.h^{L}_{st=4,i=2} + e0.h^{LV}_{st=4,i=2}) + e0.y_{st=4,i=3} \cdot (e0.h^{L}_{st=4,i=3} + e0.h^{LV}_{st=4}$$
$$e0.h^{V}_{st=5} = (e0.y_{st=5,i=1} \cdot (e0.h^{L}_{st=5,i=1} + e0.h^{LV}_{st=5,i=1}) + e0.y_{st=5,i=2} \cdot (e0.h^{L}_{st=5,i=2} + e0.h^{LV}_{st=5,i=2}) + e0.y_{st=5,i=3} \cdot (e0.h^{L}_{st=5,i=3} + e0.h^{LV}_{st=5}$$
$$e0.h^{V}_{st=6} = (e0.y_{st=6,i=1} \cdot (e0.h^{L}_{st=6,i=1} + e0.h^{LV}_{st=6,i=1}) + e0.y_{st=6,i=2} \cdot (e0.h^{L}_{st=6,i=2} + e0.h^{LV}_{st=6,i=2}) + e0.y_{st=6,i=3} \cdot (e0.h^{L}_{st=6,i=3} + e0.h^{LV}_{st=6}$$
$$e0.h^{V}_{st=7} = (e0.y_{st=7,i=1} \cdot (e0.h^{L}_{st=7,i=1} + e0.h^{LV}_{st=7,i=1}) + e0.y_{st=7,i=2} \cdot (e0.h^{L}_{st=7,i=2} + e0.h^{LV}_{st=7,i=2}) + e0.y_{st=7,i=3} \cdot (e0.h^{L}_{st=7,i=3} + e0.h^{LV}_{st=7}$$
$$e0.h^{V}_{st=8} = (e0.y_{st=8,i=1} \cdot (e0.h^{L}_{st=8,i=1} + e0.h^{LV}_{st=8,i=1}) + e0.y_{st=8,i=2} \cdot (e0.h^{L}_{st=8,i=2} + e0.h^{LV}_{st=8,i=2}) + e0.y_{st=8,i=3} \cdot (e0.h^{L}_{st=8,i=3} + e0.h^{LV}_{st=8}$$

Eq: 178830: stage_equilibrium.mosequ (using Nota: 178892: notation.mosnot). Descrciption: equilibrium. Parameter List: 178893: parameterlist.mospar.

$$e0.y_{st=1,i=1} = e0.K_{st=1,i=1} \cdot e0.x_{st=1,i=1}$$
$$e0.y_{st=2,i=1} = e0.K_{st=2,i=1} \cdot e0.x_{st=2,i=1}$$
$$e0.y_{st=3,i=1} = e0.K_{st=3,i=1} \cdot e0.x_{st=3,i=1}$$
$$e0.y_{st=4,i=1} = e0.K_{st=4,i=1} \cdot e0.x_{st=4,i=1}$$
$$e0.y_{st=5,i=1} = e0.K_{st=5,i=1} \cdot e0.x_{st=5,i=1}$$
$$e0.y_{st=6,i=1} = e0.K_{st=6,i=1} \cdot e0.x_{st=6,i=1}$$
$$e0.y_{st=7,i=1} = e0.K_{st=7,i=1} \cdot e0.x_{st=7,i=1}$$
$$e0.y_{st=8,i=1} = e0.K_{st=8,i=1} \cdot e0.x_{st=8,i=1}$$
$$e0.y_{st=1,i=2} = e0.K_{st=1,i=2} \cdot e0.x_{st=1,i=2}$$

$$e0.y_{st=2,i=2} = e0.K_{st=2,i=2} \cdot e0.x_{st=2,i=2}$$

$$e0.y_{st=3,i=2} = e0.K_{st=3,i=2} \cdot e0.x_{st=3,i=2}$$

$$e0.y_{st=4,i=2} = e0.K_{st=4,i=2} \cdot e0.x_{st=4,i=2}$$

$$e0.y_{st=5,i=2} = e0.K_{st=5,i=2} \cdot e0.x_{st=5,i=2}$$

$$e0.y_{st=6,i=2} = e0.K_{st=6,i=2} \cdot e0.x_{st=6,i=2}$$

$$e0.y_{st=7,i=2} = e0.K_{st=7,i=2} \cdot e0.x_{st=7,i=2}$$

$$e0.y_{st=8,i=2} = e0.K_{st=8,i=2} \cdot e0.x_{st=8,i=2}$$

$$e0.y_{st=1,i=3} = e0.K_{st=1,i=3} \cdot e0.x_{st=1,i=3}$$

$$e0.y_{st=2,i=3} = e0.K_{st=2,i=3} \cdot e0.x_{st=2,i=3}$$

$$e0.y_{st=3,i=3} = e0.K_{st=3,i=3} \cdot e0.x_{st=3,i=3}$$

$$e0.y_{st=4,i=3} = e0.K_{st=4,i=3} \cdot e0.x_{st=4,i=3}$$

$$e0.y_{st=5,i=3} = e0.K_{st=5,i=3} \cdot e0.x_{st=5,i=3}$$

$$e0.y_{st=6,i=3} = e0.K_{st=6,i=3} \cdot e0.x_{st=6,i=3}$$

$$e0.y_{st=7,i=3} = e0.K_{st=7,i=3} \cdot e0.x_{st=7,i=3}$$

$$e0.y_{st=8,i=3} = e0.K_{st=8,i=3} \cdot e0.x_{st=8,i=3}$$

Eq: 178896: stage_equilibriumconstant1.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Equilibrium constant. Parameter List: 178893: parameterlist.mospar.

$$e0.K_{st=1,i=1} = \frac{e0.P^{LV}_{st=1,i=1}}{e0.P_{st=1}} \cdot e0.\gamma_{st=1,i=1}$$

$$e0.K_{st=2,i=1} = \frac{e0.P^{LV}_{st=2,i=1}}{e0.P_{st=2}} \cdot e0.\gamma_{st=2,i=1}$$

$$e0.K_{st=3,i=1} = \frac{e0.P^{LV}_{st=3,i=1}}{e0.P_{st=3}} \cdot e0.\gamma_{st=3,i=1}$$

$$e0.K_{st=4,i=1} = \frac{e0.P^{LV}_{st=4,i=1}}{e0.P_{st=4}} \cdot e0.\gamma_{st=4,i=1}$$

$$e0.K_{st=5,i=1} = \frac{e0.P^{LV}_{st=5,i=1}}{e0.P_{st=5}} \cdot e0.\gamma_{st=5,i=1}$$

$$e0.K_{st=6,i=1} = \frac{e0.P^{LV}_{st=6,i=1}}{e0.P_{st=6}} \cdot e0.\gamma_{st=6,i=1}$$

$$e0.K_{st=7,i=1} = \frac{e0.P^{LV}_{st=7,i=1}}{e0.P_{st=7}} \cdot e0.\gamma_{st=7,i=1}$$

$$e0.K_{st=8,i=1} = \frac{e0.P^{LV}_{st=8,i=1}}{e0.P_{st=8}} \cdot e0.\gamma_{st=8,i=1}$$

Eq: 178897: stage_equilibriumconstant2.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Equilibrium constant. Parameter List: 178893: parameterlist.mospar.

$$e0.K_{st=1,i=2} = \frac{e0.P^{LV}_{st=1,i=2}}{e0.P_{st=1}} \cdot e0.\gamma_{st=1,i=2}$$

$$e0.K_{st=2,i=2} = \frac{e0.P^{LV}_{st=2,i=2}}{e0.P_{st=2}} \cdot e0.\gamma_{st=2,i=2}$$

$$e0.K_{st=3,i=2} = \frac{e0.P^{LV}_{st=3,i=2}}{e0.P_{st=3}} \cdot e0.\gamma_{st=3,i=2}$$

$$e0.K_{st=4,i=2} = \frac{e0.P^{LV}_{st=4,i=2}}{e0.P_{st=4}} \cdot e0.\gamma_{st=4,i=2}$$

$$e0.K_{st=5,i=2} = \frac{e0.P^{LV}_{st=5,i=2}}{e0.P_{st=5}} \cdot e0.\gamma_{st=5,i=2}$$

$$e0.K_{st=6,i=2} = \frac{e0.P^{LV}_{st=6,i=2}}{e0.P_{st=6}} \cdot e0.\gamma_{st=6,i=2}$$

$$e0.K_{st=7,i=2} = \frac{e0.P^{LV}_{st=7,i=2}}{e0.P_{st=7}} \cdot e0.\gamma_{st=7,i=2}$$

$$e0.K_{st=8,i=2} = \frac{e0.P^{LV}_{st=8,i=2}}{e0.P_{st=8}} \cdot e0.\gamma_{st=8,i=2}$$

Eq: 178831: stage_closed_summation.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Closed summation. Parameter List: 178893: parameterlist.mospar.

$$e0.\zeta_{st=1} = (e0.x_{st=1,i=1} + e0.x_{st=1,i=2} + e0.x_{st=1,i=3}) - (e0.y_{st=1,i=1} + e0.y_{st=1,i=2} + e0.y_{st=1,i=3})$$

$$e0.\zeta_{st=2} = (e0.x_{st=2,i=1} + e0.x_{st=2,i=2} + e0.x_{st=2,i=3}) - (e0.y_{st=2,i=1} + e0.y_{st=2,i=2} + e0.y_{st=2,i=3})$$

$$e0.\zeta_{st=3} = (e0.x_{st=3,i=1} + e0.x_{st=3,i=2} + e0.x_{st=3,i=3}) - (e0.y_{st=3,i=1} + e0.y_{st=3,i=2} + e0.y_{st=3,i=3})$$

$$e0.\zeta_{st=4} = (e0.x_{st=4,i=1} + e0.x_{st=4,i=2} + e0.x_{st=4,i=3}) - (e0.y_{st=4,i=1} + e0.y_{st=4,i=2} + e0.y_{st=4,i=3})$$

$$e0.\zeta_{st=5} = (e0.x_{st=5,i=1} + e0.x_{st=5,i=2} + e0.x_{st=5,i=3}) - (e0.y_{st=5,i=1} + e0.y_{st=5,i=2} + e0.y_{st=5,i=3})$$

$$e0.\zeta_{st=6} = (e0.x_{st=6,i=1} + e0.x_{st=6,i=2} + e0.x_{st=6,i=3}) - (e0.y_{st=6,i=1} + e0.y_{st=6,i=2} + e0.y_{st=6,i=3})$$

$$e0.\zeta_{st=7} = (e0.x_{st=7,i=1} + e0.x_{st=7,i=2} + e0.x_{st=7,i=3}) - (e0.y_{st=7,i=1} + e0.y_{st=7,i=2} + e0.y_{st=7,i=3})$$

$$e0.\zeta_{st=8} = (e0.x_{st=8,i=1} + e0.x_{st=8,i=2} + e0.x_{st=8,i=3}) - (e0.y_{st=8,i=1} + e0.y_{st=8,i=2} + e0.y_{st=8,i=3})$$

Eq: 178832: stage_vapor_quality.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Vapor Quality. Parameter List: 178893: parameterlist.mospar.

$$e0.\chi_{st=1} \cdot (e0.HU^{L}_{st=1} + e0.HU^{V}_{st=1}) = e0.HU^{V}_{st=1}$$

$$e0.\chi_{st=2} \cdot (e0.HU^{L}_{st=2} + e0.HU^{V}_{st=2}) = e0.HU^{V}_{st=2}$$

$$e0.\chi_{st=3} \cdot (e0.HU^{L}_{st=3} + e0.HU^{V}_{st=3}) = e0.HU^{V}_{st=3}$$

$$e0.\chi_{st=4} \cdot (e0.HU^{L}_{st=4} + e0.HU^{V}_{st=4}) = e0.HU^{V}_{st=4}$$

$$e0.\chi_{st=5} \cdot (e0.HU^{L}_{st=5} + e0.HU^{V}_{st=5}) = e0.HU^{V}_{st=5}$$

$$e0.\chi_{st=6} \cdot (e0.HU^{L}_{st=6} + e0.HU^{V}_{st=6}) = e0.HU^{V}_{st=6}$$

$$e0.\chi_{st=7} \cdot (e0.HU^{L}_{st=7} + e0.HU^{V}_{st=7}) = e0.HU^{V}_{st=7}$$

$$e0.\chi_{st=8} \cdot (e0.HU^{L}_{st=8} + e0.HU^{V}_{st=8}) = e0.HU^{V}_{st=8}$$

Eq: 178833: stage_liquid_quality.mosequ (using Nota: 178892: notation.mosnot). Descrciption: liquid Quality. Parameter List: 178893: parameterlist.mospar.

$$e0.\chi_{inv,st=1} = e0.\chi_{st=1} - 1$$

$$e0.\chi_{inv,st=2} = e0.\chi_{st=2} - 1$$

$$e0.\chi_{inv,st=3} = e0.\chi_{st=3} - 1$$

$$e0.\chi_{inv,st=4} = e0.\chi_{st=4} - 1$$

$$e0.\chi_{inv,st=5} = e0.\chi_{st=5} - 1$$

$$e0.\chi_{inv,st=6} = e0.\chi_{st=6} - 1$$

$$e0.\chi_{inv,st=7} = e0.\chi_{st=7} - 1$$

$$e0.\chi_{inv,st=8} = e0.\chi_{st=8} - 1$$

Eq: 179611: stage_midfunction_helpermax.mosequ (using Nota: 178892: notation.mosnot). Descrciption: midfun helper max(zea, chi, chiinv) = max(zeta,chi). Parameter List: 178893: parameterlist.mospar.

$$e0.aux^{mid}_{max,st=1} = \frac{e0.\zeta_{st=1} + e0.\chi_{st=1} + ((e0.\zeta_{st=1} - e0.\chi_{st=1})^{(2)} + (e0.Param^{mid}_{sharp})^{(2)})^{(0.5)}}{2}$$

$$e0.aux^{mid}_{max,st=2} = \frac{e0.\zeta_{st=2} + e0.\chi_{st=2} + ((e0.\zeta_{st=2} - e0.\chi_{st=2})^{(2)} + (e0.Param^{mid}_{sharp})^{(2)})^{(0.5)}}{2}$$

$$e0.aux^{mid}_{max,st=3} = \frac{e0.\zeta_{st=3} + e0.\chi_{st=3} + ((e0.\zeta_{st=3} - e0.\chi_{st=3})^{(2)} + (e0.Param^{mid}_{sharp})^{(2)})^{(0.5)}}{2}$$

$$e0.aux^{mid}_{max,st=4} = \frac{e0.\zeta_{st=4} + e0.\chi_{st=4} + ((e0.\zeta_{st=4} - e0.\chi_{st=4})^{(2)} + (e0.Param^{mid}_{sharp})^{(2)})^{(0.5)}}{2}$$

$$e0.aux^{mid}_{max,st=5} = \frac{e0.\zeta_{st=5} + e0.\chi_{st=5} + ((e0.\zeta_{st=5} - e0.\chi_{st=5})^{(2)} + (e0.Param^{mid}_{sharp})^{(2)})^{(0.5)}}{2}$$

$$e0.aux^{mid}_{max,st=6} = \frac{e0.\zeta_{st=6} + e0.\chi_{st=6} + ((e0.\zeta_{st=6} - e0.\chi_{st=6})^{(2)} + (e0.Param^{mid}_{sharp})^{(2)})^{(0.5)}}{2}$$

$$e0.aux^{mid}_{max,st=7} = \frac{e0.\zeta_{st=7} + e0.\chi_{st=7} + ((e0.\zeta_{st=7} - e0.\chi_{st=7})^{(2)} + (e0.Param^{mid}_{sharp})^{(2)})^{(0.5)}}{2}$$

$$e0.aux^{mid}_{max,st=8} = \frac{e0.\zeta_{st=8} + e0.\chi_{st=8} + ((e0.\zeta_{st=8} - e0.\chi_{st=8})^{(2)} + (e0.Param^{mid}_{sharp})^{(2)})^{(0.5)}}{2}$$

Eq: 179612: stage_midfunction_helpermin.mosequ (using Nota: 178892: notation.mosnot). Descrciption: midfun helper min(zea, chi, chiinv) = min(zeta,chiinv). Parameter List: 178893: parameterlist.mospar.

$$e0.aux^{mid}_{min,st=1} = \frac{e0.\zeta_{st=1} + e0.\chi_{inv,st=1} - ((e0.\zeta_{st=1} - e0.\chi_{inv,st=1})^{(2)} + (e0.Param^{mid}_{sharp})^{(2)})^{(0.5)}}{2}$$

$$e0.aux^{mid}_{min,st=2} = \frac{e0.\zeta_{st=2} + e0.\chi_{inv,st=2} - ((e0.\zeta_{st=2} - e0.\chi_{inv,st=2})^{(2)} + (e0.Param^{mid}_{sharp})^{(2)})^{(0.5)}}{2}$$

$$e0.aux^{mid}_{min,st=3} = \frac{e0.\zeta_{st=3} + e0.\chi_{inv,st=3} - ((e0.\zeta_{st=3} - e0.\chi_{inv,st=3})^{(2)} + (e0.Param^{mid}_{sharp})^{(2)})^{(0.5)}}{2}$$

$$e0.aux^{mid}_{min,st=4} = \frac{e0.\zeta_{st=4} + e0.\chi_{inv,st=4} - ((e0.\zeta_{st=4} - e0.\chi_{inv,st=4})^{(2)} + (e0.Param^{mid}_{sharp})^{(2)})^{(0.5)}}{2}$$

$$e0.aux^{mid}_{min,st=5} = \frac{e0.\zeta_{st=5} + e0.\chi_{inv,st=5} - ((e0.\zeta_{st=5} - e0.\chi_{inv,st=5})^{(2)} + (e0.Param^{mid}_{sharp})^{(2)})^{(0.5)}}{2}$$

$$e0.aux^{mid}_{min,st=6} = \frac{e0.\zeta_{st=6} + e0.\chi_{inv,st=6} - ((e0.\zeta_{st=6} - e0.\chi_{inv,st=6})^{(2)} + (e0.Param^{mid}_{sharp})^{(2)})^{(0.5)}}{2}$$

$$e0.aux^{mid}_{min,st=7} = \frac{e0.\zeta_{st=7} + e0.\chi_{inv,st=7} - ((e0.\zeta_{st=7} - e0.\chi_{inv,st=7})^{(2)} + (e0.Param^{mid}_{sharp})^{(2)})^{(0.5)}}{2}$$

$$e0.aux^{mid}_{min,st=8} = \frac{e0.\zeta_{st=8} + e0.\chi_{inv,st=8} - ((e0.\zeta_{st=8} - e0.\chi_{inv,st=8})^{(2)} + (e0.Param^{mid}_{sharp})^{(2)})^{(0.5)}}{2}$$

Eq: 179613: stage_midfunction.mosequ (using Nota: 178892: notation.mosnot). Descrciption: midfun. Parameter List: 178893: parameterlist.mospar.

$$e0.res_{st=1} = e0.\chi_{inv,st=1} + e0.\chi_{st=1} + e0.\zeta_{st=1} - e0.aux^{mid}_{max,st=1} - e0.aux^{mid}_{min,st=1}$$

$$e0.res_{st=2} = e0.\chi_{inv,st=2} + e0.\chi_{st=2} + e0.\zeta_{st=2} - e0.aux^{mid}_{max,st=2} - e0.aux^{mid}_{min,st=2}$$

$$e0.res_{st=3} = e0.\chi_{inv,st=3} + e0.\chi_{st=3} + e0.\zeta_{st=3} - e0.aux^{mid}_{max,st=3} - e0.aux^{mid}_{min,st=3}$$

$$e0.res_{st=4} = e0.\chi_{inv,st=4} + e0.\chi_{st=4} + e0.\zeta_{st=4} - e0.aux^{mid}_{max,st=4} - e0.aux^{mid}_{min,st=4}$$

$$e0.res_{st=5} = e0.\chi_{inv,st=5} + e0.\chi_{st=5} + e0.\zeta_{st=5} - e0.aux^{mid}_{max,st=5} - e0.aux^{mid}_{min,st=5}$$

$$e0.res_{st=6} = e0.\chi_{inv,st=6} + e0.\chi_{st=6} + e0.\zeta_{st=6} - e0.aux^{mid}_{max,st=6} - e0.aux^{mid}_{min,st=6}$$

$$e0.res_{st=7} = e0.\chi_{inv,st=7} + e0.\chi_{st=7} + e0.\zeta_{st=7} - e0.aux^{mid}_{max,st=7} - e0.aux^{mid}_{min,st=7}$$

$$e0.res_{st=8} = e0.\chi_{inv,st=8} + e0.\chi_{st=8} + e0.\zeta_{st=8} - e0.aux^{mid}_{max,st=8} - e0.aux^{mid}_{min,st=8}$$

Eq: 178834: stage_midfunction_residual.mosequ (using Nota: 178892: notation.mosnot). Descrciption: midfun residual. Parameter List: 178893: parameterlist.mospar.

$$e0.res_{st=1} = 0$$

$$e0.res_{st=2} = 0$$

$$e0.res_{st=3} = 0$$

$$e0.res_{st=4} = 0$$

$$e0.res_{st=5} = 0$$

$$e0.res_{st=6} = 0$$

$$e0.res_{st=7} = 0$$

$$e0.res_{st=8} = 0$$

Eq: 179614: stage_liquid_density_mix.mosequ (using Nota: 178892: notation.mosnot). Descrciption: actual liquid density. Parameter List: 178893: parameterlist.mospar.

$$e0.\rho^{L}_{st=1} = e0.\rho^{L,dummy} + e0.\sigma^{L,dirac}_{st=1} \cdot (\frac{1}{(\frac{e0.x_{st=1,i=1}}{e0.\rho_{st=1,i=1}} + \frac{e0.x_{st=1,i=2}}{e0.\rho_{st=1,i=2}} + \frac{e0.x_{st=1,i=3}}{e0.\rho_{st=1,i=3}})} - e0.\rho^{L,dummy})$$

$$e0.\rho^{L}_{st=2} = e0.\rho^{L,dummy} + e0.\sigma^{L,dirac}_{st=2} \cdot (\frac{1}{(\frac{e0.x_{st=2,i=1}}{e0.\rho_{st=2,i=1}} + \frac{e0.x_{st=2,i=2}}{e0.\rho_{st=2,i=2}} + \frac{e0.x_{st=2,i=3}}{e0.\rho_{st=2,i=3}})} - e0.\rho^{L,dummy})$$

$$e0.\rho^{L}_{st=3} = e0.\rho^{L,dummy} + e0.\sigma^{L,dirac}_{st=3} \cdot (\frac{1}{(\frac{e0.x_{st=3,i=1}}{e0.\rho_{st=3,i=1}} + \frac{e0.x_{st=3,i=2}}{e0.\rho_{st=3,i=2}} + \frac{e0.x_{st=3,i=3}}{e0.\rho_{st=3,i=3}})} - e0.\rho^{L,dummy})$$

$$e0.\rho^{L}_{st=4} = e0.\rho^{L,dummy} + e0.\sigma^{L,dirac}_{st=4} \cdot (\frac{1}{(\frac{e0.x_{st=4,i=1}}{e0.\rho_{st=4,i=1}} + \frac{e0.x_{st=4,i=2}}{e0.\rho_{st=4,i=2}} + \frac{e0.x_{st=4,i=3}}{e0.\rho_{st=4,i=3}})} - e0.\rho^{L,dummy})$$

$$e0.\rho^{L}_{st=5} = e0.\rho^{L,dummy} + e0.\sigma^{L,dirac}_{st=5} \cdot (\frac{1}{(\frac{e0.x_{st=5,i=1}}{e0.\rho_{st=5,i=1}} + \frac{e0.x_{st=5,i=2}}{e0.\rho_{st=5,i=2}} + \frac{e0.x_{st=5,i=3}}{e0.\rho_{st=5,i=3}})} - e0.\rho^{L,dummy})$$

$$e0.\rho^{L}_{st=6} = e0.\rho^{L,dummy} + e0.\sigma^{L,dirac}_{st=6} \cdot (\frac{1}{(\frac{e0.x_{st=6,i=1}}{e0.\rho_{st=6,i=1}} + \frac{e0.x_{st=6,i=2}}{e0.\rho_{st=6,i=2}} + \frac{e0.x_{st=6,i=3}}{e0.\rho_{st=6,i=3}})} - e0.\rho^{L,dummy})$$

$$e0.\rho^{L}_{st=7} = e0.\rho^{L,dummy} + e0.\sigma^{L,dirac}_{st=7} \cdot (\frac{1}{(\frac{e0.x_{st=7,i=1}}{e0.\rho_{st=7,i=1}} + \frac{e0.x_{st=7,i=2}}{e0.\rho_{st=7,i=2}} + \frac{e0.x_{st=7,i=3}}{e0.\rho_{st=7,i=3}})} - e0.\rho^{L,dummy})$$

$$e0.\rho^{L}_{st=8} = e0.\rho^{L,dummy} + e0.\sigma^{L,dirac}_{st=8} \cdot (\frac{1}{(\frac{e0.x_{st=8,i=1}}{e0.\rho_{st=8,i=1}} + \frac{e0.x_{st=8,i=2}}{e0.\rho_{st=8,i=2}} + \frac{e0.x_{st=8,i=3}}{e0.\rho_{st=8,i=3}})} - e0.\rho^{L,dummy})$$

Eq: 179615: stage_liquid_density_mix_mass.mosequ (using Nota: 178892: notation.mosnot). Descrciption: liquid mass density. Parameter List: 178893: parameterlist.mospar.

$$e0.\rho^{L,mass}_{st=1} = e0.\rho^{L}_{st=1} \cdot e0.M^{L}_{st=1}$$

$$e0.\rho^{L,mass}_{st=2} = e0.\rho^{L}_{st=2} \cdot e0.M^{L}_{st=2}$$

$$e0.\rho^{L,mass}_{st=3} = e0.\rho^{L}_{st=3} \cdot e0.M^{L}_{st=3}$$

$$e0.\rho^{L,mass}_{st=4} = e0.\rho^{L}_{st=4} \cdot e0.M^{L}_{st=4}$$

$$e0.\rho^{L,mass}_{st=5} = e0.\rho^{L}_{st=5} \cdot e0.M^{L}_{st=5}$$

$$e0.\rho^{L,mass}_{st=6} = e0.\rho^{L}_{st=6} \cdot e0.M^{L}_{st=6}$$

$$e0.\rho_{st=7}^{L,mass} = e0.\rho_{st=7}^{L} \cdot e0.M_{st=7}^{L}$$
$$e0.\rho_{st=8}^{L,mass} = e0.\rho_{st=8}^{L} \cdot e0.M_{st=8}^{L}$$

Eq: 179616: stage_liquid_molarmass.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Molar mass liquid. Parameter List: 178893: parameterlist.mospar.

$$e0.M_{st=1}^{L} = (((e0.x_{st=1,i=1} \cdot e0.M_{i=1} + e0.x_{st=1,i=2} \cdot e0.M_{i=2} + e0.x_{st=1,i=3} \cdot e0.M_{i=3}))^{(2)} + e0.Param_{sharp}^{L,abs})^{(0.5)}$$
$$e0.M_{st=2}^{L} = (((e0.x_{st=2,i=1} \cdot e0.M_{i=1} + e0.x_{st=2,i=2} \cdot e0.M_{i=2} + e0.x_{st=2,i=3} \cdot e0.M_{i=3}))^{(2)} + e0.Param_{sharp}^{L,abs})^{(0.5)}$$
$$e0.M_{st=3}^{L} = (((e0.x_{st=3,i=1} \cdot e0.M_{i=1} + e0.x_{st=3,i=2} \cdot e0.M_{i=2} + e0.x_{st=3,i=3} \cdot e0.M_{i=3}))^{(2)} + e0.Param_{sharp}^{L,abs})^{(0.5)}$$
$$e0.M_{st=4}^{L} = (((e0.x_{st=4,i=1} \cdot e0.M_{i=1} + e0.x_{st=4,i=2} \cdot e0.M_{i=2} + e0.x_{st=4,i=3} \cdot e0.M_{i=3}))^{(2)} + e0.Param_{sharp}^{L,abs})^{(0.5)}$$
$$e0.M_{st=5}^{L} = (((e0.x_{st=5,i=1} \cdot e0.M_{i=1} + e0.x_{st=5,i=2} \cdot e0.M_{i=2} + e0.x_{st=5,i=3} \cdot e0.M_{i=3}))^{(2)} + e0.Param_{sharp}^{L,abs})^{(0.5)}$$
$$e0.M_{st=6}^{L} = (((e0.x_{st=6,i=1} \cdot e0.M_{i=1} + e0.x_{st=6,i=2} \cdot e0.M_{i=2} + e0.x_{st=6,i=3} \cdot e0.M_{i=3}))^{(2)} + e0.Param_{sharp}^{L,abs})^{(0.5)}$$
$$e0.M_{st=7}^{L} = (((e0.x_{st=7,i=1} \cdot e0.M_{i=1} + e0.x_{st=7,i=2} \cdot e0.M_{i=2} + e0.x_{st=7,i=3} \cdot e0.M_{i=3}))^{(2)} + e0.Param_{sharp}^{L,abs})^{(0.5)}$$
$$e0.M_{st=8}^{L} = (((e0.x_{st=8,i=1} \cdot e0.M_{i=1} + e0.x_{st=8,i=2} \cdot e0.M_{i=2} + e0.x_{st=8,i=3} \cdot e0.M_{i=3}))^{(2)} + e0.Param_{sharp}^{L,abs})^{(0.5)}$$

Eq: 178837: stage_liquid_volume.mosequ (using Nota: 178892: notation.mosnot). Descrciption: liquid volume. Parameter List: 178893: parameterlist.mospar.

$$e0.V_{st=1}^{L} = \frac{e0.HU_{st=1}^{L}}{e0.\rho_{st=1}^{L}}$$
$$e0.V_{st=2}^{L} = \frac{e0.HU_{st=2}^{L}}{e0.\rho_{st=2}^{L}}$$
$$e0.V_{st=3}^{L} = \frac{e0.HU_{st=3}^{L}}{e0.\rho_{st=3}^{L}}$$
$$e0.V_{st=4}^{L} = \frac{e0.HU_{st=4}^{L}}{e0.\rho_{st=4}^{L}}$$
$$e0.V_{st=5}^{L} = \frac{e0.HU_{st=5}^{L}}{e0.\rho_{st=5}^{L}}$$
$$e0.V_{st=6}^{L} = \frac{e0.HU_{st=6}^{L}}{e0.\rho_{st=6}^{L}}$$
$$e0.V_{st=7}^{L} = \frac{e0.HU_{st=7}^{L}}{e0.\rho_{st=7}^{L}}$$
$$e0.V_{st=8}^{L} = \frac{e0.HU_{st=8}^{L}}{e0.\rho_{st=8}^{L}}$$

Eq: 178836: stage_total_volume.mosequ (using Nota: 178892: notation.mosnot). Descrciption: total volume. Parameter List: 178893: parameterlist.mospar.

$$e0.V_{st=1}^{tot} = e0.V_{st=1}^{L} + e0.V_{st=1}^{V}$$
$$e0.V_{st=2}^{tot} = e0.V_{st=2}^{L} + e0.V_{st=2}^{V}$$
$$e0.V_{st=3}^{tot} = e0.V_{st=3}^{L} + e0.V_{st=3}^{V}$$
$$e0.V_{st=4}^{tot} = e0.V_{st=4}^{L} + e0.V_{st=4}^{V}$$
$$e0.V_{st=5}^{tot} = e0.V_{st=5}^{L} + e0.V_{st=5}^{V}$$
$$e0.V_{st=6}^{tot} = e0.V_{st=6}^{L} + e0.V_{st=6}^{V}$$
$$e0.V_{st=7}^{tot} = e0.V_{st=7}^{L} + e0.V_{st=7}^{V}$$

$$e0.V_{st=8}^{tot} = e0.V_{st=8}^{L} + e0.V_{st=8}^{V}$$

Eq: 178838: stage_vapor_volume.mosequ (using Nota: 178892: notation.mosnot). Descrciption: vapor volume. Parameter List: 178893: parameterlist.mospar.

$$e0.V_{st=1}^{V} = \frac{e0.HU_{st=1}^{V} \cdot e0.R \cdot e0.T_{st=1}}{e0.P_{st=1} \cdot (10)^{(5)}}$$

$$e0.V_{st=2}^{V} = \frac{e0.HU_{st=2}^{V} \cdot e0.R \cdot e0.T_{st=2}}{e0.P_{st=2} \cdot (10)^{(5)}}$$

$$e0.V_{st=3}^{V} = \frac{e0.HU_{st=3}^{V} \cdot e0.R \cdot e0.T_{st=3}}{e0.P_{st=3} \cdot (10)^{(5)}}$$

$$e0.V_{st=4}^{V} = \frac{e0.HU_{st=4}^{V} \cdot e0.R \cdot e0.T_{st=4}}{e0.P_{st=4} \cdot (10)^{(5)}}$$

$$e0.V_{st=5}^{V} = \frac{e0.HU_{st=5}^{V} \cdot e0.R \cdot e0.T_{st=5}}{e0.P_{st=5} \cdot (10)^{(5)}}$$

$$e0.V_{st=6}^{V} = \frac{e0.HU_{st=6}^{V} \cdot e0.R \cdot e0.T_{st=6}}{e0.P_{st=6} \cdot (10)^{(5)}}$$

$$e0.V_{st=7}^{V} = \frac{e0.HU_{st=7}^{V} \cdot e0.R \cdot e0.T_{st=7}}{e0.P_{st=7} \cdot (10)^{(5)}}$$

$$e0.V_{st=8}^{V} = \frac{e0.HU_{st=8}^{V} \cdot e0.R \cdot e0.T_{st=8}}{e0.P_{st=8} \cdot (10)^{(5)}}$$

Eq: 178884: stage_vapor_blockingvalve.mosequ (using Nota: 178892: notation.mosnot). Descrciption: liquid blocking valve vapor. Parameter List: 178893: parameterlist.mospar.

$$e0.g_{b,st=1}^{V} = \frac{e0.V_{min,st=1}^{V} + e0.V_{st=1}^{V} - ((e0.V_{min,st=1}^{V} - e0.V_{st=1}^{V})^{(2)} + (e0.Param_{sharp}^{V,min})^{(2)})^{(0.5)}}{2}$$

$$e0.g_{b,st=2}^{V} = \frac{e0.V_{min,st=2}^{V} + e0.V_{st=2}^{V} - ((e0.V_{min,st=2}^{V} - e0.V_{st=2}^{V})^{(2)} + (e0.Param_{sharp}^{V,min})^{(2)})^{(0.5)}}{2}$$

$$e0.g_{b,st=3}^{V} = \frac{e0.V_{min,st=3}^{V} + e0.V_{st=3}^{V} - ((e0.V_{min,st=3}^{V} - e0.V_{st=3}^{V})^{(2)} + (e0.Param_{sharp}^{V,min})^{(2)})^{(0.5)}}{2}$$

$$e0.g_{b,st=4}^{V} = \frac{e0.V_{min,st=4}^{V} + e0.V_{st=4}^{V} - ((e0.V_{min,st=4}^{V} - e0.V_{st=4}^{V})^{(2)} + (e0.Param_{sharp}^{V,min})^{(2)})^{(0.5)}}{2}$$

$$e0.g_{b,st=5}^{V} = \frac{e0.V_{min,st=5}^{V} + e0.V_{st=5}^{V} - ((e0.V_{min,st=5}^{V} - e0.V_{st=5}^{V})^{(2)} + (e0.Param_{sharp}^{V,min})^{(2)})^{(0.5)}}{2}$$

$$e0.g_{b,st=6}^{V} = \frac{e0.V_{min,st=6}^{V} + e0.V_{st=6}^{V} - ((e0.V_{min,st=6}^{V} - e0.V_{st=6}^{V})^{(2)} + (e0.Param_{sharp}^{V,min})^{(2)})^{(0.5)}}{2}$$

$$e0.g_{b,st=7}^{V} = \frac{e0.V_{min,st=7}^{V} + e0.V_{st=7}^{V} - ((e0.V_{min,st=7}^{V} - e0.V_{st=7}^{V})^{(2)} + (e0.Param_{sharp}^{V,min})^{(2)})^{(0.5)}}{2}$$

$$e0.g_{b,st=8}^{V} = \frac{e0.V_{min,st=8}^{V} + e0.V_{st=8}^{V} - ((e0.V_{min,st=8}^{V} - e0.V_{st=8}^{V})^{(2)} + (e0.Param_{sharp}^{V,min})^{(2)})^{(0.5)}}{2}$$

Eq: 178886: stage_vapor_checkvalve.mosequ (using Nota: 178892: notation.mosnot). Descrciption: check valve, Vapor. Parameter List: 178893: parameterlist.mospar.

$$e0.g_{c,st=1}^{V} = (\frac{e0.aux_{c,st=1}^{V} + ((e0.aux_{c,st=1}^{V})^{(2)} + (e0.Param_{sharp}^{V,max})^{(2)})^{(0.5)}}{2})^{(0.5)}$$

$$e0.g_{c,st=2}^{V} = (\frac{e0.aux_{c,st=2}^{V} + ((e0.aux_{c,st=2}^{V})^{(2)} + (e0.Param_{sharp}^{V,max})^{(2)})^{(0.5)}}{2})^{(0.5)}$$

$$e0.g^{V}_{c,st=3} = (\frac{e0.aux^{V}_{c,st=3} + ((e0.aux^{V}_{c,st=3})^{(2)} + (e0.Param^{V,max}_{sharp})^{(2)})^{(0.5)}}{2})^{(0.5)}$$

$$e0.g^{V}_{c,st=4} = (\frac{e0.aux^{V}_{c,st=4} + ((e0.aux^{V}_{c,st=4})^{(2)} + (e0.Param^{V,max}_{sharp})^{(2)})^{(0.5)}}{2})^{(0.5)}$$

$$e0.g^{V}_{c,st=5} = (\frac{e0.aux^{V}_{c,st=5} + ((e0.aux^{V}_{c,st=5})^{(2)} + (e0.Param^{V,max}_{sharp})^{(2)})^{(0.5)}}{2})^{(0.5)}$$

$$e0.g^{V}_{c,st=6} = (\frac{e0.aux^{V}_{c,st=6} + ((e0.aux^{V}_{c,st=6})^{(2)} + (e0.Param^{V,max}_{sharp})^{(2)})^{(0.5)}}{2})^{(0.5)}$$

$$e0.g^{V}_{c,st=7} = (\frac{e0.aux^{V}_{c,st=7} + ((e0.aux^{V}_{c,st=7})^{(2)} + (e0.Param^{V,max}_{sharp})^{(2)})^{(0.5)}}{2})^{(0.5)}$$

$$e0.g^{V}_{c,st=8} = (\frac{e0.aux^{V}_{c,st=8} + ((e0.aux^{V}_{c,st=8})^{(2)} + (e0.Param^{V,max}_{sharp})^{(2)})^{(0.5)}}{2})^{(0.5)}$$

Eq: 178885: stage_vapor_checkvalve_helper.mosequ (using Nota: 178892: notation.mosnot). Descrciption: check valve, liquid, helper function (bar). Parameter List: 178893: parameterlist.mospar.

$$e0.aux^{V}_{c,st=1} = e0.P_{st=1} - e0.P_{st=0}$$

$$e0.aux^{V}_{c,st=2} = e0.P_{st=2} - e0.P_{st=1}$$

$$e0.aux^{V}_{c,st=3} = e0.P_{st=3} - e0.P_{st=2}$$

$$e0.aux^{V}_{c,st=4} = e0.P_{st=4} - e0.P_{st=3}$$

$$e0.aux^{V}_{c,st=5} = e0.P_{st=5} - e0.P_{st=4}$$

$$e0.aux^{V}_{c,st=6} = e0.P_{st=6} - e0.P_{st=5}$$

$$e0.aux^{V}_{c,st=7} = e0.P_{st=7} - e0.P_{st=6}$$

$$e0.aux^{V}_{c,st=8} = e0.P_{st=8} - e0.P_{st=7}$$

Eq: 178883: stage_vapor_flowrate.mosequ (using Nota: 178892: notation.mosnot). Descrciption: vapor flow rate. Parameter List: 178893: parameterlist.mospar.

$$e0.F^{V}_{st=1} = e0.c^{V}_{st=1} \cdot e0.g^{V}_{b,st=1} \cdot e0.g^{V}_{c,st=1}$$

$$e0.F^{V}_{st=2} = e0.c^{V}_{st=2} \cdot e0.g^{V}_{b,st=2} \cdot e0.g^{V}_{c,st=2}$$

$$e0.F^{V}_{st=3} = e0.c^{V}_{st=3} \cdot e0.g^{V}_{b,st=3} \cdot e0.g^{V}_{c,st=3}$$

$$e0.F^{V}_{st=4} = e0.c^{V}_{st=4} \cdot e0.g^{V}_{b,st=4} \cdot e0.g^{V}_{c,st=4}$$

$$e0.F^{V}_{st=5} = e0.c^{V}_{st=5} \cdot e0.g^{V}_{b,st=5} \cdot e0.g^{V}_{c,st=5}$$

$$e0.F^{V}_{st=6} = e0.c^{V}_{st=6} \cdot e0.g^{V}_{b,st=6} \cdot e0.g^{V}_{c,st=6}$$

$$e0.F^{V}_{st=7} = e0.c^{V}_{st=7} \cdot e0.g^{V}_{b,st=7} \cdot e0.g^{V}_{c,st=7}$$

$$e0.F^{V}_{st=8} = e0.c^{V}_{st=8} \cdot e0.g^{V}_{b,st=8} \cdot e0.g^{V}_{c,st=8}$$

Eq: 178887: stage_liquid_flowrate.mosequ (using Nota: 178892: notation.mosnot). Descrciption: liquid flow rate. Parameter List: 178893: parameterlist.mospar.

$$e0.F^{L}_{st=1} = e0.F^{L}_{film,st=1} \cdot e0.\sigma^{L}_{st=1}$$

$$e0.F^{L}_{st=2} = e0.F^{L}_{film,st=2} \cdot e0.\sigma^{L}_{st=2}$$

$$e0.F^{L}_{st=3} = e0.F^{L}_{film,st=3} \cdot e0.\sigma^{L}_{st=3}$$

$$e0.F^{L}_{st=4} = e0.F^{L}_{film,st=4} \cdot e0.\sigma^{L}_{st=4}$$

$$e0.F^{L}_{st=5} = e0.F^{L}_{film,st=5} \cdot e0.\sigma^{L}_{st=5}$$

$$e0.F^{L}_{st=6} = e0.F^{L}_{film,st=6} \cdot e0.\sigma^{L}_{st=6}$$

$$e0.F^{L}_{st=7} = e0.F^{L}_{film,st=7} \cdot e0.\sigma^{L}_{st=7}$$

$$e0.F^{L}_{st=8} = e0.F^{L}_{film,st=8} \cdot e0.\sigma^{L}_{st=8}$$

Eq: 179785: stage_liquid_filmflowrate.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Liquid flow on packing. Parameter List: 178893: parameterlist.mospar.

$$e0.F^{L}_{film,st=1} = \frac{e0.g \cdot (e0.\delta_{st=1})^{(3)} \cdot (e0.\rho^{L}_{st=1})^{(2)}}{3 \cdot e0.\eta^{L}_{st=1} \cdot e0.M^{L}_{st=1}} \cdot e0.L_{film,st=1} \cdot (10)^{(-3)}$$

$$e0.F^{L}_{film,st=2} = \frac{e0.g \cdot (e0.\delta_{st=2})^{(3)} \cdot (e0.\rho^{L}_{st=2})^{(2)}}{3 \cdot e0.\eta^{L}_{st=2} \cdot e0.M^{L}_{st=2}} \cdot e0.L_{film,st=2} \cdot (10)^{(-3)}$$

$$e0.F^{L}_{film,st=3} = \frac{e0.g \cdot (e0.\delta_{st=3})^{(3)} \cdot (e0.\rho^{L}_{st=3})^{(2)}}{3 \cdot e0.\eta^{L}_{st=3} \cdot e0.M^{L}_{st=3}} \cdot e0.L_{film,st=3} \cdot (10)^{(-3)}$$

$$e0.F^{L}_{film,st=4} = \frac{e0.g \cdot (e0.\delta_{st=4})^{(3)} \cdot (e0.\rho^{L}_{st=4})^{(2)}}{3 \cdot e0.\eta^{L}_{st=4} \cdot e0.M^{L}_{st=4}} \cdot e0.L_{film,st=4} \cdot (10)^{(-3)}$$

$$e0.F^{L}_{film,st=5} = \frac{e0.g \cdot (e0.\delta_{st=5})^{(3)} \cdot (e0.\rho^{L}_{st=5})^{(2)}}{3 \cdot e0.\eta^{L}_{st=5} \cdot e0.M^{L}_{st=5}} \cdot e0.L_{film,st=5} \cdot (10)^{(-3)}$$

$$e0.F^{L}_{film,st=6} = \frac{e0.g \cdot (e0.\delta_{st=6})^{(3)} \cdot (e0.\rho^{L}_{st=6})^{(2)}}{3 \cdot e0.\eta^{L}_{st=6} \cdot e0.M^{L}_{st=6}} \cdot e0.L_{film,st=6} \cdot (10)^{(-3)}$$

$$e0.F^{L}_{film,st=7} = \frac{e0.g \cdot (e0.\delta_{st=7})^{(3)} \cdot (e0.\rho^{L}_{st=7})^{(2)}}{3 \cdot e0.\eta^{L}_{st=7} \cdot e0.M^{L}_{st=7}} \cdot e0.L_{film,st=7} \cdot (10)^{(-3)}$$

$$e0.F^{L}_{film,st=8} = \frac{e0.g \cdot (e0.\delta_{st=8})^{(3)} \cdot (e0.\rho^{L}_{st=8})^{(2)}}{3 \cdot e0.\eta^{L}_{st=8} \cdot e0.M^{L}_{st=8}} \cdot e0.L_{film,st=8} \cdot (10)^{(-3)}$$

Eq: 179786: stage_liquid_filmthickness.mosequ (using Nota: 178892: notation.mosnot). Descrciption: film thickness. Parameter List: 178893: parameterlist.mospar.

$$e0.\delta_{st=1} = \frac{e0.V^{L}_{st=1}}{e0.V^{tot}_{st=1} \cdot e0.a_{packing}}$$

$$e0.\delta_{st=2} = \frac{e0.V^{L}_{st=2}}{e0.V^{tot}_{st=2} \cdot e0.a_{packing}}$$

$$e0.\delta_{st=3} = \frac{e0.V^{L}_{st=3}}{e0.V^{tot}_{st=3} \cdot e0.a_{packing}}$$

$$e0.\delta_{st=4} = \frac{e0.V^{L}_{st=4}}{e0.V^{tot}_{st=4} \cdot e0.a_{packing}}$$

$$e0.\delta_{st=5} = \frac{e0.V^{L}_{st=5}}{e0.V^{tot}_{st=5} \cdot e0.a_{packing}}$$

$$e0.\delta_{st=6} = \frac{e0.V^{L}_{st=6}}{e0.V^{tot}_{st=6} \cdot e0.a_{packing}}$$

$$e0.\delta_{st=7} = \frac{e0.V^{L}_{st=7}}{e0.V^{tot}_{st=7} \cdot e0.a_{packing}}$$

$$e0.\delta_{st=8} = \frac{e0.V^{L}_{st=8}}{e0.V^{tot}_{st=8} \cdot e0.a_{packing}}$$

Eq: 179787: stage_liquid_flowrate_activation.mosequ (using Nota: 178892: notation.mosnot). Descrciption: sigmoidal function activation of liquid flow. Parameter List: 178893: parameterlist.mospar.

$$e0.\sigma^{L}_{st=1} = \frac{e0.aux^{L}_{st=1} + ((e0.aux^{L}_{st=1})^{(2)} + (e0.Param^{L,sig}_{sharp})^{(2)})^{(0.5)}}{2 \cdot ((e0.aux^{L}_{st=1})^{(2)} + (e0.Param^{L,sig}_{sharp})^{(2)})^{(0.5)}}$$

$$e0.\sigma^{L}_{st=2} = \frac{e0.aux^{L}_{st=2} + ((e0.aux^{L}_{st=2})^{(2)} + (e0.Param^{L,sig}_{sharp})^{(2)})^{(0.5)}}{2 \cdot ((e0.aux^{L}_{st=2})^{(2)} + (e0.Param^{L,sig}_{sharp})^{(2)})^{(0.5)}}$$

$$e0.\sigma^{L}_{st=3} = \frac{e0.aux^{L}_{st=3} + ((e0.aux^{L}_{st=3})^{(2)} + (e0.Param^{L,sig}_{sharp})^{(2)})^{(0.5)}}{2 \cdot ((e0.aux^{L}_{st=3})^{(2)} + (e0.Param^{L,sig}_{sharp})^{(2)})^{(0.5)}}$$

$$e0.\sigma^{L}_{st=4} = \frac{e0.aux^{L}_{st=4} + ((e0.aux^{L}_{st=4})^{(2)} + (e0.Param^{L,sig}_{sharp})^{(2)})^{(0.5)}}{2 \cdot ((e0.aux^{L}_{st=4})^{(2)} + (e0.Param^{L,sig}_{sharp})^{(2)})^{(0.5)}}$$

$$e0.\sigma^{L}_{st=5} = \frac{e0.aux^{L}_{st=5} + ((e0.aux^{L}_{st=5})^{(2)} + (e0.Param^{L,sig}_{sharp})^{(2)})^{(0.5)}}{2 \cdot ((e0.aux^{L}_{st=5})^{(2)} + (e0.Param^{L,sig}_{sharp})^{(2)})^{(0.5)}}$$

$$e0.\sigma^{L}_{st=6} = \frac{e0.aux^{L}_{st=6} + ((e0.aux^{L}_{st=6})^{(2)} + (e0.Param^{L,sig}_{sharp})^{(2)})^{(0.5)}}{2 \cdot ((e0.aux^{L}_{st=6})^{(2)} + (e0.Param^{L,sig}_{sharp})^{(2)})^{(0.5)}}$$

$$e0.\sigma^{L}_{st=7} = \frac{e0.aux^{L}_{st=7} + ((e0.aux^{L}_{st=7})^{(2)} + (e0.Param^{L,sig}_{sharp})^{(2)})^{(0.5)}}{2 \cdot ((e0.aux^{L}_{st=7})^{(2)} + (e0.Param^{L,sig}_{sharp})^{(2)})^{(0.5)}}$$

$$e0.\sigma^{L}_{st=8} = \frac{e0.aux^{L}_{st=8} + ((e0.aux^{L}_{st=8})^{(2)} + (e0.Param^{L,sig}_{sharp})^{(2)})^{(0.5)}}{2 \cdot ((e0.aux^{L}_{st=8})^{(2)} + (e0.Param^{L,sig}_{sharp})^{(2)})^{(0.5)}}$$

Eq: 179788: stage_liquid_flowrate_activation_helper.mosequ (using Nota: 178892: notation.mosnot). Descrciption: sigmoidal function activation of liquid flow. Parameter List: 178893: parameterlist.mospar.

$$e0.aux^{L}_{st=1} = e0.V^{L}_{st=1} - e0.V^{L,spec}_{correlation,st=1} \cdot e0.V^{tot}_{st=1}$$

$$e0.aux^{L}_{st=2} = e0.V^{L}_{st=2} - e0.V^{L,spec}_{correlation,st=2} \cdot e0.V^{tot}_{st=2}$$

$$e0.aux^{L}_{st=3} = e0.V^{L}_{st=3} - e0.V^{L,spec}_{correlation,st=3} \cdot e0.V^{tot}_{st=3}$$

$$e0.aux^{L}_{st=4} = e0.V^{L}_{st=4} - e0.V^{L,spec}_{correlation,st=4} \cdot e0.V^{tot}_{st=4}$$

$$e0.aux^{L}_{st=5} = e0.V^{L}_{st=5} - e0.V^{L,spec}_{correlation,st=5} \cdot e0.V^{tot}_{st=5}$$

$$e0.aux^{L}_{st=6} = e0.V^{L}_{st=6} - e0.V^{L,spec}_{correlation,st=6} \cdot e0.V^{tot}_{st=6}$$

$$e0.aux^{L}_{st=7} = e0.V^{L}_{st=7} - e0.V^{L,spec}_{correlation,st=7} \cdot e0.V^{tot}_{st=7}$$

$$e0.aux^{L}_{st=8} = e0.V^{L}_{st=8} - e0.V^{L,spec}_{correlation,st=8} \cdot e0.V^{tot}_{st=8}$$

Eq: 179635: stage_pressuredrop.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Pressure drop stage. Parameter List: 178893: parameterlist.mospar.

$$e0.P_{st=1} = e0.P_{st=0} + e0.\Delta P_{st=0}$$

$$e0.P_{st=2} = e0.P_{st=1} + e0.\Delta P_{st=1}$$

$$e0.P_{st=3} = e0.P_{st=2} + e0.\Delta P_{st=2}$$

$$e0.P_{st=4} = e0.P_{st=3} + e0.\Delta P_{st=3}$$

$$e0.P_{st=5} = e0.P_{st=4} + e0.\Delta P_{st=4}$$

$$e0.P_{st=6} = e0.P_{st=5} + e0.\Delta P_{st=5}$$

$$e0.P_{st=7} = e0.P_{st=6} + e0.\Delta P_{st=6}$$

$$e0.P_{st=8} = e0.P_{st=7} + e0.\Delta P_{st=7}$$

Eq: 179216: stage_diracactivation_liquid.mosequ (using Nota: 178892: notation.mosnot). Descrciption: dirac activation liquid. Parameter List: 178893: parameterlist.mospar.

$$e0.\sigma_{st=1}^{L,dirac} = \exp\left(-\frac{((e0.x_{st=1,i=1} + e0.x_{st=1,i=2} + e0.x_{st=1,i=3}) - 1)^{(2)}}{2 \cdot (e0.Param_{sharp}^{L,dirac})^{(2)}}\right)$$

$$e0.\sigma_{st=2}^{L,dirac} = \exp\left(-\frac{((e0.x_{st=2,i=1} + e0.x_{st=2,i=2} + e0.x_{st=2,i=3}) - 1)^{(2)}}{2 \cdot (e0.Param_{sharp}^{L,dirac})^{(2)}}\right)$$

$$e0.\sigma_{st=3}^{L,dirac} = \exp\left(-\frac{((e0.x_{st=3,i=1} + e0.x_{st=3,i=2} + e0.x_{st=3,i=3}) - 1)^{(2)}}{2 \cdot (e0.Param_{sharp}^{L,dirac})^{(2)}}\right)$$

$$e0.\sigma_{st=4}^{L,dirac} = \exp\left(-\frac{((e0.x_{st=4,i=1} + e0.x_{st=4,i=2} + e0.x_{st=4,i=3}) - 1)^{(2)}}{2 \cdot (e0.Param_{sharp}^{L,dirac})^{(2)}}\right)$$

$$e0.\sigma_{st=5}^{L,dirac} = \exp\left(-\frac{((e0.x_{st=5,i=1} + e0.x_{st=5,i=2} + e0.x_{st=5,i=3}) - 1)^{(2)}}{2 \cdot (e0.Param_{sharp}^{L,dirac})^{(2)}}\right)$$

$$e0.\sigma_{st=6}^{L,dirac} = \exp\left(-\frac{((e0.x_{st=6,i=1} + e0.x_{st=6,i=2} + e0.x_{st=6,i=3}) - 1)^{(2)}}{2 \cdot (e0.Param_{sharp}^{L,dirac})^{(2)}}\right)$$

$$e0.\sigma_{st=7}^{L,dirac} = \exp\left(-\frac{((e0.x_{st=7,i=1} + e0.x_{st=7,i=2} + e0.x_{st=7,i=3}) - 1)^{(2)}}{2 \cdot (e0.Param_{sharp}^{L,dirac})^{(2)}}\right)$$

$$e0.\sigma_{st=8}^{L,dirac} = \exp\left(-\frac{((e0.x_{st=8,i=1} + e0.x_{st=8,i=2} + e0.x_{st=8,i=3}) - 1)^{(2)}}{2 \cdot (e0.Param_{sharp}^{L,dirac})^{(2)}}\right)$$

Eq: 179399: reboiler_mass_balance_safetyvalve.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Component mass balance for reboiler. Parameter List: 178893: parameterlist.mospar.

$$\frac{e0.HU_{st=Nst+1,i=1}}{e0.t} = e0.F_{st=Nst+1}^{F} \cdot e0.x_{st=Nst+1,i=1}^{F} + e0.F_{st=Nst+1}^{N2} \cdot e0.x_{st=Nst+1,i=1}^{N2} + e0.F_{st=8}^{L} \cdot e0.x_{st=8,i=1} - e0.F_{st=9}^{V} \cdot e0.y_{st=9,i=1}$$

$$\frac{e0.HU_{st=Nst+1,i=2}}{e0.t} = e0.F_{st=Nst+1}^{F} \cdot e0.x_{st=Nst+1,i=2}^{F} + e0.F_{st=Nst+1}^{N2} \cdot e0.x_{st=Nst+1,i=2}^{N2} + e0.F_{st=8}^{L} \cdot e0.x_{st=8,i=2} - e0.F_{st=9}^{V} \cdot e0.y_{st=9,i=2}$$

$$\frac{e0.HU_{st=Nst+1,i=3}}{e0.t} = e0.F_{st=Nst+1}^{F} \cdot e0.x_{st=Nst+1,i=3}^{F} + e0.F_{st=Nst+1}^{N2} \cdot e0.x_{st=Nst+1,i=3}^{N2} + e0.F_{st=8}^{L} \cdot e0.x_{st=8,i=3} - e0.F_{st=9}^{V} \cdot e0.y_{st=9,i=3}$$

Eq: 179401: reboiler_mass_holdup.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Holdup. Parameter List: 178893: parameterlist.mospar.

$$e0.HU_{st=Nst+1,i=1} = e0.HU_{st=Nst+1}^{L} \cdot e0.x_{st=Nst+1,i=1} + e0.HU_{st=Nst+1}^{V} \cdot e0.y_{st=9,i=1}$$

$$e0.HU_{st=Nst+1,i=2} = e0.HU_{st=Nst+1}^{L} \cdot e0.x_{st=Nst+1,i=2} + e0.HU_{st=Nst+1}^{V} \cdot e0.y_{st=9,i=2}$$

$$e0.HU_{st=Nst+1,i=3} = e0.HU_{st=Nst+1}^{L} \cdot e0.x_{st=Nst+1,i=3} + e0.HU_{st=Nst+1}^{V} \cdot e0.y_{st=9,i=3}$$

Eq: 179402: reboiler_mass_holdup_total.mosequ (using Nota: 178892: notation.mosnot). Descrciption: total holdup in reboiler. Parameter List: 178893: parameterlist.mospar.

$$(e0.HU_{st=Nst+1,i=1} + e0.HU_{st=Nst+1,i=2} + e0.HU_{st=Nst+1,i=3}) = e0.HU_{st=Nst+1}^{L} + e0.HU_{st=Nst+1}^{V}$$

Eq: 179403: reboiler_energybalance_safetyvalve.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Energy balance in reboiler. Parameter List: 178893: parameterlist.mospar.

$$\frac{e0.U_{st=Nst+1}}{e0.t} = e0.F_{st=Nst+1}^{F} \cdot e0.h_{st=Nst+1}^{F} + e0.F_{st=Nst+1}^{N2} \cdot e0.h_{st=Nst+1}^{N2} + e0.F_{st=8}^{L} \cdot e0.h_{st=8}^{L} - e0.F_{st=9}^{V} \cdot e0.h_{st=9}^{V} - e0.F_{st=Nst+1}^{SV} \cdot e0.h$$

Eq: 179404: reboiler_enthalpy.mosequ (using Nota: 178892: notation.mosnot). Descrciption: enthalpy in reboiler. Parameter List: 178893: parameterlist.mospar.

$$e0.H_{st=Nst+1} = e0.HU^{L}_{st=Nst+1} \cdot e0.h^{L}_{st=Nst+1} + e0.HU^{V}_{st=Nst+1} \cdot e0.h^{V}_{st=9}$$

Eq: 179405: reboiler_enthalpy_definition.mosequ (using Nota: 178892: notation.mosnot). Descrciption: enthalpy definition in reboiler. Parameter List: 178893: parameterlist.mospar.

$$e0.H_{st=Nst+1} = e0.U_{st=Nst+1} + e0.P_{st=Nst+1} \cdot e0.V^{tot}_{st=Nst+1}$$

Eq: 179406: reboiler_enthalpy_feed_mix.mosequ (using Nota: 178892: notation.mosnot). Descrciption: enthalpy mixture nitrogen. Parameter List: 178893: parameterlist.mospar.

$$e0.h^{F}_{st=Nst+1} = (e0.x^{F}_{st=Nst+1,i=1} \cdot e0.h^{F}_{st=Nst+1,i=1} + e0.x^{F}_{st=Nst+1,i=2} \cdot e0.h^{F}_{st=Nst+1,i=2} + e0.x^{F}_{st=Nst+1,i=3} \cdot e0.h^{F}_{st=Nst+1,i=3})$$

Eq: 179407: reboiler_enthalpy_liquid_mix.mosequ (using Nota: 178892: notation.mosnot). Descrciption: enthalpy mixture liquid. Parameter List: 178893: parameterlist.mospar.

$$e0.h^{L}_{st=Nst+1} = (e0.x_{st=Nst+1,i=1} \cdot e0.h^{L}_{st=Nst+1,i=1} + e0.x_{st=Nst+1,i=2} \cdot e0.h^{L}_{st=Nst+1,i=2} + e0.x_{st=Nst+1,i=3} \cdot e0.h^{L}_{st=Nst+1,i=3})$$

Eq: 179408: reboiler_enthalpy_nitrogen_mix.mosequ (using Nota: 178892: notation.mosnot). Descrciption: enthalpy mixture nitrogen. Parameter List: 178893: parameterlist.mospar.

$$e0.h^{N2}_{st=Nst+1} = ((e0.x^{N2}_{st=Nst+1,i=1} \cdot (e0.h^{L,N2}_{st=Nst+1,i=1} + e0.h^{LV,N2}_{st=Nst+1,i=1})) + (e0.x^{N2}_{st=Nst+1,i=2} \cdot (e0.h^{L,N2}_{st=Nst+1,i=2} + e0.h^{LV,N2}_{st=Nst+1,i=2}))$$

Eq: 179409: reboiler_enthalpy_vapor_mix.mosequ (using Nota: 178892: notation.mosnot). Descrciption: enthalpy mixture vapor. Parameter List: 178893: parameterlist.mospar.

$$e0.h^{V}_{st=9} = (e0.y_{st=9,i=1} \cdot (e0.h^{L}_{st=Nst+1,i=1} + e0.h^{LV}_{st=Nst+1,i=1}) + e0.y_{st=9,i=2} \cdot (e0.h^{L}_{st=Nst+1,i=2} + e0.h^{LV}_{st=Nst+1,i=2}) + e0.y_{st=9,i=3} \cdot (e0.$$

Eq: 179410: reboiler_equilibrium.mosequ (using Nota: 178892: notation.mosnot). Descrciption: equilibrium. Parameter List: 178893: parameterlist.mospar.

$$e0.y_{st=9,i=1} = e0.K_{st=Nst+1,i=1} \cdot e0.x_{st=Nst+1,i=1}$$

$$e0.y_{st=9,i=2} = e0.K_{st=Nst+1,i=2} \cdot e0.x_{st=Nst+1,i=2}$$

$$e0.y_{st=9,i=3} = e0.K_{st=Nst+1,i=3} \cdot e0.x_{st=Nst+1,i=3}$$

Eq: 179411: reboiler_equilibriumconstant1.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Equilibrium constant. Parameter List: 178893: parameterlist.mospar.

$$e0.K_{st=Nst+1,i=1} = \frac{e0.P^{LV}_{st=Nst+1,i=1}}{e0.P_{st=Nst+1}} \cdot e0.\gamma_{st=Nst+1,i=1}$$

Eq: 179412: reboiler_equilibriumconstant2.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Equilibrium constant. Parameter List: 178893: parameterlist.mospar.

$$e0.K_{st=Nst+1,i=2} = \frac{e0.P^{LV}_{st=Nst+1,i=2}}{e0.P_{st=Nst+1}} \cdot e0.\gamma_{st=Nst+1,i=2}$$

Eq: 179417: reboiler_closed_summation.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Closed summation. Parameter List: 178893: parameterlist.mospar.

$$e0.\zeta_{st=Nst+1} = (e0.x_{st=Nst+1,i=1} + e0.x_{st=Nst+1,i=2} + e0.x_{st=Nst+1,i=3}) - (e0.y_{st=9,i=1} + e0.y_{st=9,i=2} + e0.y_{st=9,i=3})$$

Eq: 179415: reboiler_vapor_quality.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Vapor Quality. Parameter List: 178893: parameterlist.mospar.

$$e0.\chi_{st=Nst+1} \cdot (e0.HU^{L}_{st=Nst+1} + e0.HU^{V}_{st=Nst+1}) = e0.HU^{V}_{st=Nst+1}$$

Eq: 179416: reboiler_liquid_quality.mosequ (using Nota: 178892: notation.mosnot). Descrciption: liquid Quality. Parameter List: 178893: parameterlist.mospar.

$$e0.\chi_{inv,st=Nst+1} = e0.\chi_{st=Nst+1} - 1$$

Eq: 179459: reboiler_midfunction_helpermax.mosequ (using Nota: 178892: notation.mosnot). Descrciption: midfun helper max(zea, chi, chiinv) = max(zeta,chi). Parameter List: 178893: parameterlist.mospar.

$$e0.aux^{mid}_{max,st=Nst+1} = \frac{e0.\zeta_{st=Nst+1} + e0.\chi_{st=Nst+1} + ((e0.\zeta_{st=Nst+1} - e0.\chi_{st=Nst+1})^{(2)} + (e0.Param^{mid}_{sharp})^{(2)})^{(0.5)}}{2}$$

Eq: 179460: reboiler_midfunction_helpermin.mosequ (using Nota: 178892: notation.mosnot). Descrciption: midfun helper min(zea, chi, chiinv) = min(zeta,chiinv). Parameter List: 178893: parameterlist.mospar.

$$e0.aux^{mid}_{min,st=Nst+1} = \frac{e0.\zeta_{st=Nst+1} + e0.\chi_{inv,st=Nst+1} - ((e0.\zeta_{st=Nst+1} - e0.\chi_{inv,st=Nst+1})^{(2)} + (e0.Param^{mid}_{sharp})^{(2)})^{(0.5)}}{2}$$

Eq: 179461: reboiler_midfunction.mosequ (using Nota: 178892: notation.mosnot). Descrciption: midfun. Parameter List: 178893: parameterlist.mospar.

$$e0.res_{st=Nst+1} = e0.\chi_{inv,st=Nst+1} + e0.\chi_{st=Nst+1} + e0.\zeta_{st=Nst+1} - e0.aux^{mid}_{max,st=Nst+1} - e0.aux^{mid}_{min,st=Nst+1}$$

Eq: 179414: reboiler_midfunction_residual.mosequ (using Nota: 178892: notation.mosnot). Descrciption: midfun residual. Parameter List: 178893: parameterlist.mospar.

$$e0.res_{st=Nst+1} = 0$$

Eq: 179420: reboiler_liquid_density_mix.mosequ (using Nota: 178892: notation.mosnot). Descrciption: actual liquid density. Parameter List: 178893: parameterlist.mospar.

$$e0.\rho^{L}_{st=Nst+1} = e0.\rho^{L,dummy} + e0.\sigma^{L,dirac}_{st=Nst+1} \cdot (\frac{1}{(\frac{e0.x_{st=Nst+1,i=1}}{e0.\rho_{st=Nst+1,i=1}} + \frac{e0.x_{st=Nst+1,i=2}}{e0.\rho_{st=Nst+1,i=2}} + \frac{e0.x_{st=Nst+1,i=3}}{e0.\rho_{st=Nst+1,i=3}})} - e0.\rho^{L,dummy})$$

Eq: 179418: reboiler_liquid_density_mix_mass.mosequ (using Nota: 178892: notation.mosnot). Descrciption: liquid mass density. Parameter List: 178893: parameterlist.mospar.

$$e0.\rho^{L,mass}_{st=Nst+1} = e0.\rho^{L}_{st=Nst+1} \cdot e0.M^{L}_{st=Nst+1}$$

Eq: 179419: reboiler_liquid_molarmass.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Molar mass liquid. Parameter List: 178893: parameterlist.mospar.

$$e0.M^{L}_{st=Nst+1} = (((e0.x_{st=Nst+1,i=1} \cdot e0.M_{i=1} + e0.x_{st=Nst+1,i=2} \cdot e0.M_{i=2} + e0.x_{st=Nst+1,i=3} \cdot e0.M_{i=3}))^{(2)} + e0.Param^{L,abs}_{sharp})^{(0.5)}$$

Eq: 179421: reboiler_liquid_volume.mosequ (using Nota: 178892: notation.mosnot). Descrciption: liquid volume. Parameter List: 178893: parameterlist.mospar.

$$e0.V^{L}_{st=Nst+1} = \frac{e0.HU^{L}_{st=Nst+1}}{e0.\rho^{L}_{st=Nst+1}}$$

Eq: 179422: reboiler_total_volume.mosequ (using Nota: 178892: notation.mosnot). Descrciption: total volume. Parameter List: 178893: parameterlist.mospar.

$$e0.V^{tot}_{st=Nst+1} = e0.V^{L}_{st=Nst+1} + e0.V^{V}_{st=Nst+1}$$

Eq: 179423: reboiler_vapor_volume.mosequ (using Nota: 178892: notation.mosnot). Descrciption: vapor volume. Parameter List: 178893: parameterlist.mospar.

$$e0.V^{V}_{st=Nst+1} = \frac{e0.HU^{V}_{st=Nst+1} \cdot e0.R \cdot e0.T_{st=Nst+1}}{e0.P_{st=Nst+1} \cdot (10)^{(5)}}$$

Eq: 179428: reboiler_nitrogen_checkvalve.mosequ (using Nota: 178892: notation.mosnot). Descrciption: check valve, nitrogen. Parameter List: 178893: parameterlist.mospar.

$$e0.g^{N2}_{c,st=Nst+1} = (\frac{e0.aux^{N2}_{c,st=Nst+1} + ((e0.aux^{N2}_{c,st=Nst+1})^{(2)} + (e0.Param^{N2,max}_{sharp})^{(2)})^{(0.5)}}{2})^{(0.5)}$$

Eq: 179429: reboiler_nitrogen_checkvalve_helper.mosequ (using Nota: 178892: notation.mosnot). Descrciption: check valve, nitrogen, helper function (bar). Parameter List: 178893: parameterlist.mospar.

$$e0.aux^{N2}_{c,st=Nst+1} = e0.P^{N2} - e0.P_{st=Nst+1}$$

Eq: 179430: reboiler_nitrogen_flowrate.mosequ (using Nota: 178892: notation.mosnot). Descrciption: vapor flow rate. Parameter List: 178893: parameterlist.mospar.

$$e0.F^{N2}_{st=Nst+1} = e0.c^{N2}_{st=Nst+1} \cdot e0.g^{N2}_{c,st=Nst+1}$$

Eq: 179424: reboiler_vapor_blockingvalve.mosequ (using Nota: 178892: notation.mosnot). Descrciption: liquid blocking valve vapor. Parameter List: 178893: parameterlist.mospar.

$$e0.g^{V}_{b,st=Nst+1} = \frac{e0.V^{V}_{min,st=Nst+1} + e0.V^{V}_{st=Nst+1} - ((e0.V^{V}_{min,st=Nst+1} - e0.V^{V}_{st=Nst+1})^{(2)} + (e0.Param^{V,min}_{sharp})^{(2)})^{(0.5)}}{2}$$

Eq: 179425: reboiler_vapor_checkvalve.mosequ (using Nota: 178892: notation.mosnot). Descrciption: check valve, Vapor. Parameter List: 178893: parameterlist.mospar.

$$e0.g^{V}_{c,st=Nst+1} = (\frac{e0.aux^{V}_{c,st=Nst+1} + ((e0.aux^{V}_{c,st=Nst+1})^{(2)} + (e0.Param^{V,max}_{sharp})^{(2)})^{(0.5)}}{2})^{(0.5)}$$

Eq: 179426: reboiler_vapor_checkvalve_helper.mosequ (using Nota: 178892: notation.mosnot). Descrciption: check valve, liquid, helper function (bar). Parameter List: 178893: parameterlist.mospar.

$$e0.aux^{V}_{c,st=Nst+1} = e0.P_{st=Nst+1} - e0.P_{st=8}$$

Eq: 179427: reboiler_vapor_flowrate.mosequ (using Nota: 178892: notation.mosnot). Descrciption: vapor flow rate. Parameter List: 178893: parameterlist.mospar.

$$e0.F^{V}_{st=9} = e0.c^{V}_{st=Nst+1} \cdot e0.g^{V}_{b,st=Nst+1} \cdot e0.g^{V}_{c,st=Nst+1}$$

Eq: 179434: reboiler_safetyvalve_flowrate.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Safety valve flow rate. Parameter List: 178893: parameterlist.mospar.

$$e0.F^{SV}_{st=Nst+1} = e0.c^{SV}_{st=Nst+1} \cdot e0.g^{SV}_{b,st=Nst+1} \cdot e0.g^{SV}_{c,st=Nst+1}$$

Eq: 179432: reboiler_safetyvalve_checkvalve.mosequ (using Nota: 178892: notation.mosnot). Descrciption: check valve, safety valve. Parameter List: 178893: parameterlist.mospar.

$$e0.g^{SV}_{c,st=Nst+1} = (\frac{e0.aux^{SV}_{c,st=Nst+1} + ((e0.aux^{SV}_{c,st=Nst+1})^{(2)} + (e0.Param^{SV,max}_{sharp})^{(2)})^{(0.5)}}{2})^{(0.5)}$$

Eq: 179433: reboiler_safetyvalve_checkvalve_helper.mosequ (using Nota: 178892: notation.mosnot). Descrciption: check valve, safetyvalve, helper function (bar). Parameter List: 178893: parameterlist.mospar.

$$e0.aux^{SV}_{c,st=Nst+1} = e0.P_{st=Nst+1} - e0.P^{SV}_{st=Nst+1}$$

Eq: 179496: reboiler_safetyvalve_blockingvalve.mosequ (using Nota: 178892: notation.mosnot). Descrciption: liquid blocking valve safetyvalve. Parameter List: 178893: parameterlist.mospar.

$$e0.g^{SV}_{b,st=Nst+1} = \frac{e0.V^{V}_{min,st=Nst+1} + e0.V^{V}_{st=Nst+1} - ((e0.V^{V}_{min,st=Nst+1} - e0.V^{V}_{st=Nst+1})^{(2)} + (e0.Param^{V,min}_{sharp})^{(2)})^{(0.5)}}{2}$$

Eq: 179636: reboiler_pressuredrop.mosequ (using Nota: 178892: notation.mosnot). Descrciption: Pressure drop reboiler. Parameter List: 178893: parameterlist.mospar.

$$e0.P_{st=Nst+1} = e0.P_{st=8} + e0.\Delta P_{st=Nst}$$

Eq: 179431: reboiler_diracactivation_liquid.mosequ (using Nota: 178892: notation.mosnot). Descrciption: dirac activation liquid. Parameter List: 178893: parameterlist.mospar.

$$e0.\sigma^{L,dirac}_{st=Nst+1} = \exp\left(-\frac{((e0.x_{st=Nst+1,i=1} + e0.x_{st=Nst+1,i=2} + e0.x_{st=Nst+1,i=3}) - 1)^{(2)}}{2 \cdot (e0.Param^{L,dirac}_{sharp})^{(2)}}\right)$$

Function instances:

Fun: 179299: polynomial4.mosfun (using Nota: 178892: notation.mosnot) Desc.: polynomial of order 4 used for thermoproperties

Uses Param List: 178893: parameterlist.mospar

$$std.val = \mathbf{f}\,(std.T)$$

with

$$\mathbf{f} = Param^{poly4}_{A} + Param^{poly4}_{B} \cdot T + Param^{poly4}_{C} \cdot (T)^2 + Param^{poly4}_{D} \cdot (T)^3 + Param^{poly4}_{E} \cdot (T)^4$$

applied as

$$e0.h^{LV}_{st,i} = \mathbf{f}(e0.T_{st})$$
$$e0.h^{L}_{st,i} = \mathbf{f}(e0.T_{st})$$
$$e0.h^{LV}_{st=0,i} = \mathbf{f}(e0.T_{st=0})$$
$$e0.h^{L}_{st=0,i} = \mathbf{f}(e0.T_{st=0})$$
$$e0.h^{F}_{st=Nst+1,i} = \mathbf{f}(e0.T^{F}_{st=Nst+1})$$
$$e0.h^{L,N2}_{st=Nst+1,i} = \mathbf{f}(e0.T^{N2}_{st=Nst+1})$$
$$e0.h^{LV,N2}_{st=Nst+1,i} = \mathbf{f}(e0.T^{N2}_{st=Nst+1})$$
$$e0.h^{LV}_{st=Nst+1,i} = \mathbf{f}(e0.T_{st=Nst+1})$$
$$e0.h^{L}_{st=Nst+1,i} = \mathbf{f}(e0.T_{st=Nst+1})$$

Fun: 168170: Dampfdruck.mosfun (using Nota: 168167: NotationVDI.mosnot) Desc.: VDI Wärmeatlas Stoffdaten D3.1 Dampfdruck p in unit of pc T in K

Uses Param List: 168168: ParameterListVDI.mospar

$$std.p_s = \mathbf{f}\,(std.T)$$

with

$$\mathbf{f} = p_c \cdot \exp(\frac{T_c}{T} \cdot (A^{vdi2} \cdot (1 - \frac{T}{T_c}) + B^{vdi2} \cdot (1 - \frac{T}{T_c})^{1.5} + C^{vdi2} \cdot (1 - \frac{T}{T_c})^{2.5} + D^{vdi2} \cdot (1 - \frac{T}{T_c})^5))$$

applied as

$$e0.P^{LV}_{st,i=1} = \mathbf{f}(e0.T_{st})$$
$$e0.P^{LV}_{st,i=2} = \mathbf{f}(e0.T_{st})$$
$$e0.P^{LV}_{st=0,i=1} = \mathbf{f}(e0.T_{st=0})$$
$$e0.P^{LV}_{st=0,i=2} = \mathbf{f}(e0.T_{st=0})$$
$$e0.P^{LV}_{st=Nst+1,i=1} = \mathbf{f}(e0.T_{st=Nst+1})$$
$$e0.P^{LV}_{st=Nst+1,i=2} = \mathbf{f}(e0.T_{st=Nst+1})$$

Variable Specs '179850: varspec_230510_fullsystem_8stages.mosvar'

Design variables

$$
\begin{aligned}
e0.F^{F}_{st=9} &= 0.0 \\
e0.F^{L}_{st=9} &= 0.0 \\
e0.K_{st=0,i=3} &= 50000.0 \\
e0.K_{st=1,i=3} &= 50000.0 \\
e0.K_{st=2,i=3} &= 50000.0 \\
e0.K_{st=3,i=3} &= 50000.0 \\
e0.K_{st=4,i=3} &= 50000.0 \\
e0.K_{st=5,i=3} &= 50000.0 \\
e0.K_{st=6,i=3} &= 50000.0 \\
e0.K_{st=7,i=3} &= 50000.0 \\
e0.K_{st=8,i=3} &= 50000.0 \\
e0.K_{st=9,i=3} &= 50000.0 \\
e0.L_{film,st=0} &= 0.314159 \\
e0.L_{film,st=1} &= 0.25 \\
e0.L_{film,st=2} &= 0.25 \\
e0.L_{film,st=3} &= 0.25 \\
e0.L_{film,st=4} &= 0.25 \\
e0.L_{film,st=5} &= 0.25 \\
e0.L_{film,st=6} &= 0.25 \\
e0.L_{film,st=7} &= 0.25 \\
e0.L_{film,st=8} &= 0.25 \\
e0.P^{N2} &= 1.1 \\
e0.P^{SP} &= 1.05 \\
e0.P^{amb} &= 1.0 \\
e0.P^{SV}_{st=9} &= 1.3 \\
e0.Q_{st=0} &= 1.0449005E-17 \\
e0.Q_{st=1} &= -8.712161E-18 \\
e0.Q_{st=2} &= -8.712161E-18 \\
e0.Q_{st=3} &= -8.712161E-18 \\
e0.Q_{st=4} &= -8.712161E-18 \\
e0.Q_{st=5} &= -8.712161E-18 \\
e0.Q_{st=6} &= -8.712161E-18 \\
e0.Q_{st=7} &= -8.712161E-18 \\
e0.Q_{st=8} &= -8.712161E-18 \\
e0.Q_{st=9} &= 8.435772500000001E-17 \\
e0.T^{F}_{st=9} &= 300.0 \\
e0.T^{N2}_{st=9} &= 300.0 \\
e0.V^{L,spec}_{correlation,st=0} &= 1.25E-4 \\
e0.V^{L,spec}_{correlation,st=1} &= 0.00777 \\
e0.V^{L,spec}_{correlation,st=2} &= 0.00777 \\
e0.V^{L,spec}_{correlation,st=3} &= 0.00777 \\
e0.V^{L,spec}_{correlation,st=4} &= 0.00777 \\
e0.V^{L,spec}_{correlation,st=5} &= 0.00777 \\
e0.V^{L,spec}_{correlation,st=6} &= 0.00777 \\
e0.V^{L,spec}_{correlation,st=7} &= 0.00777 \\
e0.V^{L,spec}_{correlation,st=8} &= 0.00777 \\
e0.V^{V}_{min,st=0} &= 1.0E-5 \\
e0.V^{V}_{min,st=1} &= 1.0E-5 \\
e0.V^{V}_{min,st=2} &= 1.0E-5 \\
e0.V^{V}_{min,st=3} &= 1.0E-5 \\
e0.V^{V}_{min,st=4} &= 1.0E-5
\end{aligned}
$$

$$
\begin{aligned}
e0.V^{V}_{min,st=5} &= 1.0E-5\\
e0.V^{V}_{min,st=6} &= 1.0E-5\\
e0.V^{V}_{min,st=7} &= 1.0E-5\\
e0.V^{V}_{min,st=8} &= 1.0E-5\\
e0.V^{V}_{min,st=9} &= 1.0E-5\\
e0.V^{tot}_{st=0} &= 0.00314159\\
e0.V^{tot}_{st=1} &= 3.92699E-4\\
e0.V^{tot}_{st=2} &= 3.92699E-4\\
e0.V^{tot}_{st=3} &= 3.92699E-4\\
e0.V^{tot}_{st=4} &= 3.92699E-4\\
e0.V^{tot}_{st=5} &= 3.92699E-4\\
e0.V^{tot}_{st=6} &= 3.92699E-4\\
e0.V^{tot}_{st=7} &= 3.92699E-4\\
e0.V^{tot}_{st=8} &= 3.92699E-4\\
e0.V^{tot}_{st=9} &= 0.0286\\
e0.\Delta transfun^{DT1,PC}_{Cond} &= 0.001\\
e0.\eta^{L}_{st=0} &= 0.0019\\
e0.\eta^{L}_{st=1} &= 0.0019\\
e0.\eta^{L}_{st=2} &= 0.0019\\
e0.\eta^{L}_{st=3} &= 0.0019\\
e0.\eta^{L}_{st=4} &= 0.0019\\
e0.\eta^{L}_{st=5} &= 0.0019\\
e0.\eta^{L}_{st=6} &= 0.0019\\
e0.\eta^{L}_{st=7} &= 0.0019\\
e0.\eta^{L}_{st=8} &= 0.0019\\
e0.\gamma_{st=0,i=1} &= 1.0\\
e0.\gamma_{st=0,i=2} &= 1.0\\
e0.\gamma_{st=1,i=1} &= 1.0\\
e0.\gamma_{st=1,i=2} &= 1.0\\
e0.\gamma_{st=2,i=1} &= 1.0\\
e0.\gamma_{st=2,i=2} &= 1.0\\
e0.\gamma_{st=3,i=1} &= 1.0\\
e0.\gamma_{st=3,i=2} &= 1.0\\
e0.\gamma_{st=4,i=1} &= 1.0\\
e0.\gamma_{st=4,i=2} &= 1.0\\
e0.\gamma_{st=5,i=1} &= 1.0\\
e0.\gamma_{st=5,i=2} &= 1.0\\
e0.\gamma_{st=6,i=1} &= 1.0\\
e0.\gamma_{st=6,i=2} &= 1.0\\
e0.\gamma_{st=7,i=1} &= 1.0\\
e0.\gamma_{st=7,i=2} &= 1.0\\
e0.\gamma_{st=8,i=1} &= 1.0\\
e0.\gamma_{st=8,i=2} &= 1.0\\
e0.\gamma_{st=9,i=1} &= 1.0\\
e0.\gamma_{st=9,i=2} &= 1.0\\
e0.\rho_{st=0,i=1} &= 17136.3\\
e0.\rho_{st=0,i=2} &= 55555.6\\
e0.\rho_{st=0,i=3} &= 36345.95\\
e0.\rho_{st=1,i=1} &= 17136.3\\
e0.\rho_{st=1,i=2} &= 55555.6\\
e0.\rho_{st=1,i=3} &= 36345.95\\
e0.\rho_{st=2,i=1} &= 17136.3\\
e0.\rho_{st=2,i=2} &= 55555.6\\
e0.\rho_{st=2,i=3} &= 36345.95\\
e0.\rho_{st=3,i=1} &= 17136.3\\
e0.\rho_{st=3,i=2} &= 55555.6
\end{aligned}
$$

$$
\begin{aligned}
e0.\rho_{st=3,i=3} &= 36345.95\\
e0.\rho_{st=4,i=1} &= 17136.3\\
e0.\rho_{st=4,i=2} &= 55555.6\\
e0.\rho_{st=4,i=3} &= 36345.95\\
e0.\rho_{st=5,i=1} &= 17136.3\\
e0.\rho_{st=5,i=2} &= 55555.6\\
e0.\rho_{st=5,i=3} &= 36345.95\\
e0.\rho_{st=6,i=1} &= 17136.3\\
e0.\rho_{st=6,i=2} &= 55555.6\\
e0.\rho_{st=6,i=3} &= 36345.95\\
e0.\rho_{st=7,i=1} &= 17136.3\\
e0.\rho_{st=7,i=2} &= 55555.6\\
e0.\rho_{st=7,i=3} &= 36345.95\\
e0.\rho_{st=8,i=1} &= 17136.3\\
e0.\rho_{st=8,i=2} &= 55555.6\\
e0.\rho_{st=8,i=3} &= 36345.95\\
e0.\rho_{st=9,i=1} &= 17136.3\\
e0.\rho_{st=9,i=2} &= 55555.6\\
e0.\rho_{st=9,i=3} &= 36345.95\\
e0.\sigma^{R} &= 1.0\\
e0.a_{Cond} &= 80.0\\
e0.c^{V}_{st=0} &= 150000.0\\
e0.c^{V}_{st=1} &= 150000.0\\
e0.c^{V}_{st=2} &= 150000.0\\
e0.c^{V}_{st=3} &= 150000.0\\
e0.c^{V}_{st=4} &= 150000.0\\
e0.c^{V}_{st=5} &= 150000.0\\
e0.c^{V}_{st=6} &= 150000.0\\
e0.c^{V}_{st=7} &= 150000.0\\
e0.c^{V}_{st=8} &= 150000.0\\
e0.c^{N2}_{st=9} &= 0.145\\
e0.c^{SV}_{st=9} &= 1.5E7\\
e0.c^{V}_{st=9} &= 1.5E7\\
e0.x^{F}_{st=9,i=1} &= 0.15\\
e0.x^{N2}_{st=9,i=1} &= 0.0\\
e0.x^{F}_{st=9,i=2} &= 0.85\\
e0.x^{N2}_{st=9,i=2} &= 0.0\\
e0.x^{F}_{st=9,i=3} &= 0.0\\
e0.x^{N2}_{st=9,i=3} &= 1.0
\end{aligned}
$$

Iteration variables

$$
\begin{aligned}
e0.F^{L}_{Cond} &= 1.0644820000000001E-39\\
e0.F^{V}_{Cond} &= 0.33540294\\
e0.F^{L}_{film,st=0} &= 3.355472E-39\\
e0.F^{L}_{film,st=1} &= -3.7416930000000005E-39\\
e0.F^{L}_{film,st=2} &= -3.7416930000000005E-39\\
e0.F^{L}_{film,st=3} &= -3.7416930000000005E-39\\
e0.F^{L}_{film,st=4} &= -3.7416930000000005E-39\\
e0.F^{L}_{film,st=5} &= -3.7416930000000005E-39\\
e0.F^{L}_{film,st=6} &= -3.7416930000000005E-39\\
e0.F^{L}_{film,st=7} &= -3.7416930000000005E-39\\
e0.F^{L}_{film,st=8} &= -3.7416930000000005E-39\\
e0.F^{L}_{st=0} &= 0.0
\end{aligned}
$$

$$
\begin{aligned}
e0.F^{P}_{st=0} &= 0.0\\
e0.F^{V}_{st=0} &= 0.03227368\\
e0.F^{L}_{st=1} &= -9.303999999999999E-41\\
e0.F^{V}_{st=1} &= 0.03227368\\
e0.F^{L}_{st=2} &= -9.303999999999999E-41\\
e0.F^{V}_{st=2} &= 0.03227368\\
e0.F^{L}_{st=3} &= -9.303999999999999E-41\\
e0.F^{V}_{st=3} &= 0.03227368\\
e0.F^{L}_{st=4} &= -9.303999999999999E-41\\
e0.F^{V}_{st=4} &= 0.03227368\\
e0.F^{L}_{st=5} &= -9.303999999999999E-41\\
e0.F^{V}_{st=5} &= 0.03227368\\
e0.F^{L}_{st=6} &= -9.303999999999999E-41\\
e0.F^{V}_{st=6} &= 0.03227368\\
e0.F^{L}_{st=7} &= -9.303999999999999E-41\\
e0.F^{V}_{st=7} &= 0.03227368\\
e0.F^{L}_{st=8} &= -9.303999999999999E-41\\
e0.F^{V}_{st=8} &= 0.03227368\\
e0.F^{N2}_{st=9} &= 0.0\\
e0.F^{SV}_{st=9} &= 0.0\\
e0.F^{V}_{st=9} &= 0.03227368\\
e0.HU^{L}_{st=0} &= 1.6542631E-14\\
e0.HU^{V}_{st=0} &= 0.13225344\\
e0.HU^{L}_{st=1} &= -1.4462264E-14\\
e0.HU^{V}_{st=1} &= 0.016531762\\
e0.HU^{L}_{st=2} &= -1.4462264E-14\\
e0.HU^{V}_{st=2} &= 0.016531762\\
e0.HU^{L}_{st=3} &= -1.4462264E-14\\
e0.HU^{V}_{st=3} &= 0.016531762\\
e0.HU^{L}_{st=4} &= -1.4462264E-14\\
e0.HU^{V}_{st=4} &= 0.016531762\\
e0.HU^{L}_{st=5} &= -1.4462264E-14\\
e0.HU^{V}_{st=5} &= 0.016531762\\
e0.HU^{L}_{st=6} &= -1.4462264E-14\\
e0.HU^{V}_{st=6} &= 0.016531762\\
e0.HU^{L}_{st=7} &= -1.4462264E-14\\
e0.HU^{V}_{st=7} &= 0.016531762\\
e0.HU^{L}_{st=8} &= -1.4462264E-14\\
e0.HU^{V}_{st=8} &= 0.016531762\\
e0.HU^{L}_{st=9} &= 1.5044585E-13\\
e0.HU^{V}_{st=9} &= 1.2039908\\
e0.H_{st=0} &= 0.0022573275\\
e0.H_{st=1} &= 2.8217028E-4\\
e0.H_{st=2} &= 2.8217028E-4\\
e0.H_{st=3} &= 2.8217028E-4\\
e0.H_{st=4} &= 2.8217028E-4\\
e0.H_{st=5} &= 2.8217028E-4\\
e0.H_{st=6} &= 2.8217028E-4\\
e0.H_{st=7} &= 2.8217028E-4\\
e0.H_{st=8} &= 2.8217028E-4\\
e0.H_{st=9} &= 0.020550165\\
e0.K_{st=0,i=1} &= 0.08429179\\
e0.K_{st=0,i=2} &= 0.03370845\\
e0.K_{st=1,i=1} &= 0.08429143\\
e0.K_{st=1,i=2} &= 0.033708304\\
e0.K_{st=2,i=1} &= 0.08429186
\end{aligned}
$$

$e0.K_{st=2,i=2} = 0.03370845$
$e0.K_{st=3,i=1} = 0.08429143$
$e0.K_{st=3,i=2} = 0.03370845$
$e0.K_{st=4,i=1} = 0.08429143$
$e0.K_{st=4,i=2} = 0.03370845$
$e0.K_{st=5,i=1} = 0.08429143$
$e0.K_{st=5,i=2} = 0.03370845$
$e0.K_{st=6,i=1} = 0.08429143$
$e0.K_{st=6,i=2} = 0.03370845$
$e0.K_{st=7,i=1} = 0.08429143$
$e0.K_{st=7,i=2} = 0.03370845$
$e0.K_{st=8,i=1} = 0.08429143$
$e0.K_{st=8,i=2} = 0.03370845$
$e0.K_{st=9,i=1} = 0.08429143$
$e0.K_{st=9,i=2} = 0.03370845$
$e0.M^L_{st=0} = 0.001$
$e0.M^L_{st=1} = 0.001$
$e0.M^L_{st=2} = 0.001$
$e0.M^L_{st=3} = 0.001$
$e0.M^L_{st=4} = 0.001$
$e0.M^L_{st=5} = 0.001$
$e0.M^L_{st=6} = 0.001$
$e0.M^L_{st=7} = 0.001$
$e0.M^L_{st=8} = 0.001$
$e0.M^L_{st=9} = 0.001$
$e0.P_{st=0} = 1.0499986$
$e0.P_{st=1} = 1.0500032$
$e0.P_{st=2} = 1.0500032$
$e0.P_{st=3} = 1.0500032$
$e0.P_{st=4} = 1.0500032$
$e0.P_{st=5} = 1.0500032$
$e0.P_{st=6} = 1.0500032$
$e0.P_{st=7} = 1.0500032$
$e0.P_{st=8} = 1.0500032$
$e0.P_{st=9} = 1.0500032$
$e0.T_{st=0} = 300.0$
$e0.T_{st=1} = 300.0$
$e0.T_{st=2} = 300.0$
$e0.T_{st=3} = 300.0$
$e0.T_{st=4} = 300.0$
$e0.T_{st=5} = 300.0$
$e0.T_{st=6} = 300.0$
$e0.T_{st=7} = 300.0$
$e0.T_{st=8} = 300.0$
$e0.T_{st=9} = 300.0$
$e0.V^L_{st=0} = 3.6001373000000003E-16$
$e0.V^V_{st=0} = 0.00314159$
$e0.V^L_{st=1} = -3.1473918E-16$
$e0.V^V_{st=1} = 3.92699E-4$
$e0.V^L_{st=2} = -3.1473918E-16$
$e0.V^V_{st=2} = 3.92699E-4$
$e0.V^L_{st=3} = -3.1473918E-16$
$e0.V^V_{st=3} = 3.92699E-4$
$e0.V^L_{st=4} = -3.1473918E-16$
$e0.V^V_{st=4} = 3.92699E-4$
$e0.V^L_{st=5} = -3.1473918E-16$

$e0.V^{V}_{st=5} = 3.92699E-4$
$e0.V^{L}_{st=6} = -3.1473918E-16$
$e0.V^{V}_{st=6} = 3.92699E-4$
$e0.V^{L}_{st=7} = -3.1473918E-16$
$e0.V^{V}_{st=7} = 3.92699E-4$
$e0.V^{L}_{st=8} = -3.1473918E-16$
$e0.V^{V}_{st=8} = 3.92699E-4$
$e0.V^{L}_{st=9} = 3.2741205E-15$
$e0.V^{V}_{st=9} = 0.0286$
$e0.\Delta P^{PC}_{Cond} = 0.0$
$e0.\Delta P_{st=0} = 4.5758993E-6$
$e0.\Delta P_{st=1} = -5.354092E-6$
$e0.\Delta P_{st=2} = -5.354092E-6$
$e0.\Delta P_{st=3} = -5.354092E-6$
$e0.\Delta P_{st=4} = -5.354092E-6$
$e0.\Delta P_{st=5} = -5.354092E-6$
$e0.\Delta P_{st=6} = -5.354092E-6$
$e0.\Delta P_{st=7} = -5.354092E-6$
$e0.\Delta P_{st=8} = -5.354092E-6$
$e0.\chi_{inv,st=0} = -1.2510706E-13$
$e0.\chi_{inv,st=1} = 8.7477893E-13$
$e0.\chi_{inv,st=2} = 8.7477893E-13$
$e0.\chi_{inv,st=3} = 8.7477893E-13$
$e0.\chi_{inv,st=4} = 8.7477893E-13$
$e0.\chi_{inv,st=5} = 8.7477893E-13$
$e0.\chi_{inv,st=6} = 8.7477893E-13$
$e0.\chi_{inv,st=7} = 8.7477893E-13$
$e0.\chi_{inv,st=8} = 8.7477893E-13$
$e0.\chi_{inv,st=9} = -1.2497887E-13$
$e0.\chi_{st=0} = 1.0$
$e0.\chi_{st=1} = 1.0$
$e0.\chi_{st=2} = 1.0$
$e0.\chi_{st=3} = 1.0$
$e0.\chi_{st=4} = 1.0$
$e0.\chi_{st=5} = 1.0$
$e0.\chi_{st=6} = 1.0$
$e0.\chi_{st=7} = 1.0$
$e0.\chi_{st=8} = 1.0$
$e0.\chi_{st=9} = 1.0$
$e0.\delta_{st=0} = 1.4324503E-15$
$e0.\delta_{st=1} = -1.6029537E-15$
$e0.\delta_{st=2} = -1.6029537E-15$
$e0.\delta_{st=3} = -1.6029537E-15$
$e0.\delta_{st=4} = -1.6029537E-15$
$e0.\delta_{st=5} = -1.6029537E-15$
$e0.\delta_{st=6} = -1.6029537E-15$
$e0.\delta_{st=7} = -1.6029537E-15$
$e0.\delta_{st=8} = -1.6029537E-15$
$e0.\rho^{L,mass}_{st=0} = 0.045950003$
$e0.\rho^{L}_{st=0} = 45.95$
$e0.\rho^{L,mass}_{st=1} = 0.045950003$
$e0.\rho^{L}_{st=1} = 45.95$
$e0.\rho^{L,mass}_{st=2} = 0.04595$
$e0.\rho^{L}_{st=2} = 45.95$
$e0.\rho^{L,mass}_{st=3} = 0.045950003$
$e0.\rho^{L}_{st=3} = 45.95$

$$
\begin{aligned}
e0.\rho_{st=4}^{L,mass} &= 0.045950003\\
e0.\rho_{st=4}^{L} &= 45.95\\
e0.\rho_{st=5}^{L,mass} &= 0.045950003\\
e0.\rho_{st=5}^{L} &= 45.95\\
e0.\rho_{st=6}^{L,mass} &= 0.045950003\\
e0.\rho_{st=6}^{L} &= 45.95\\
e0.\rho_{st=7}^{L,mass} &= 0.045950003\\
e0.\rho_{st=7}^{L} &= 45.95\\
e0.\rho_{st=8}^{L,mass} &= 0.045950003\\
e0.\rho_{st=8}^{L} &= 45.95\\
e0.\rho_{st=9}^{L,mass} &= 0.045950003\\
e0.\rho_{st=9}^{L} &= 45.95\\
e0.\sigma_{Cond}^{PC,aux,max} &= 0.0\\
e0.\sigma_{Cond}^{PC,aux,min} &= 0.0\\
e0.\sigma_{Cond}^{PC,aux} &= 0.0\\
e0.\sigma_{Cond}^{PC,unlim} &= 0.0\\
e0.\sigma_{Cond}^{PC} &= 0.096223615\\
e0.\sigma_{st=0}^{L,dirac} &= 0.0\\
e0.\sigma_{st=0}^{L} &= 0.31723768\\
e0.\sigma_{st=1}^{L,dirac} &= 0.0\\
e0.\sigma_{st=1}^{L} &= 0.024866018\\
e0.\sigma_{st=2}^{L,dirac} &= 0.0\\
e0.\sigma_{st=2}^{L} &= 0.024866018\\
e0.\sigma_{st=3}^{L,dirac} &= 0.0\\
e0.\sigma_{st=3}^{L} &= 0.024866018\\
e0.\sigma_{st=4}^{L,dirac} &= 0.0\\
e0.\sigma_{st=4}^{L} &= 0.024866018\\
e0.\sigma_{st=5}^{L,dirac} &= 0.0\\
e0.\sigma_{st=5}^{L} &= 0.024866018\\
e0.\sigma_{st=6}^{L,dirac} &= 0.0\\
e0.\sigma_{st=6}^{L} &= 0.024866018\\
e0.\sigma_{st=7}^{L,dirac} &= 0.0\\
e0.\sigma_{st=7}^{L} &= 0.024866018\\
e0.\sigma_{st=8}^{L,dirac} &= 0.0\\
e0.\sigma_{st=8}^{L} &= 0.024866018\\
e0.\sigma_{st=9}^{L,dirac} &= 0.0\\
e0.\zeta_{st=0} &= -0.99941975\\
e0.\zeta_{st=1} &= -0.9994832\\
e0.\zeta_{st=2} &= -0.9994832\\
e0.\zeta_{st=3} &= -0.9994832\\
e0.\zeta_{st=4} &= -0.9994832\\
e0.\zeta_{st=5} &= -0.9994832\\
e0.\zeta_{st=6} &= -0.9994832\\
e0.\zeta_{st=7} &= -0.9994832\\
e0.\zeta_{st=8} &= -0.9994832\\
e0.\zeta_{st=9} &= -0.9994832\\
e0.aux_{c,st=0}^{V} &= 0.04999863\\
e0.aux_{c,st=1}^{V} &= 4.5758993E-6\\
e0.aux_{c,st=2}^{V} &= 4.5758993E-6\\
e0.aux_{c,st=3}^{V} &= 4.5758993E-6\\
e0.aux_{c,st=4}^{V} &= 4.5758993E-6\\
e0.aux_{c,st=5}^{V} &= 4.5758993E-6\\
e0.aux_{c,st=6}^{V} &= 4.5758993E-6\\
e0.aux_{c,st=7}^{V} &= 4.5758993E-6
\end{aligned}
$$

$$
\begin{aligned}
e0.aux^{V}_{c,st=8} &= 4.5758993E-6\\
e0.aux^{N2}_{c,st=9} &= 0.1\\
e0.aux^{SV}_{c,st=9} &= -0.3\\
e0.aux^{V}_{c,st=9} &= -5.354092E-6\\
e0.aux^{mid}_{max,st=0} &= 1.0\\
e0.aux^{mid}_{max,st=1} &= 1.0\\
e0.aux^{mid}_{max,st=2} &= 1.0\\
e0.aux^{mid}_{max,st=3} &= 1.0\\
e0.aux^{mid}_{max,st=4} &= 1.0\\
e0.aux^{mid}_{max,st=5} &= 1.0\\
e0.aux^{mid}_{max,st=6} &= 1.0\\
e0.aux^{mid}_{max,st=7} &= 1.0\\
e0.aux^{mid}_{max,st=8} &= 1.0\\
e0.aux^{mid}_{max,st=9} &= 1.0\\
e0.aux^{mid}_{min,st=0} &= -0.99941975\\
e0.aux^{mid}_{min,st=1} &= -0.9994832\\
e0.aux^{mid}_{min,st=2} &= -0.9994832\\
e0.aux^{mid}_{min,st=3} &= -0.9994832\\
e0.aux^{mid}_{min,st=4} &= -0.9994832\\
e0.aux^{mid}_{min,st=5} &= -0.9994832\\
e0.aux^{mid}_{min,st=6} &= -0.9994832\\
e0.aux^{mid}_{min,st=7} &= -0.9994832\\
e0.aux^{mid}_{min,st=8} &= -0.9994832\\
e0.aux^{mid}_{min,st=9} &= -0.9994832\\
e0.aux^{L}_{st=0} &= -3.9269875E-7\\
e0.aux^{L}_{st=1} &= -3.0512713E-6\\
e0.aux^{L}_{st=2} &= -3.0512713E-6\\
e0.aux^{L}_{st=3} &= -3.0512713E-6\\
e0.aux^{L}_{st=4} &= -3.0512713E-6\\
e0.aux^{L}_{st=5} &= -3.0512713E-6\\
e0.aux^{L}_{st=6} &= -3.0512713E-6\\
e0.aux^{L}_{st=7} &= -3.0512713E-6\\
e0.aux^{L}_{st=8} &= -3.0512713E-6\\
e0.g^{V}_{b,st=0} &= 9.999921E-6\\
e0.g^{V}_{b,st=1} &= 9.999347E-6\\
e0.g^{V}_{b,st=2} &= 9.999992E-6\\
e0.g^{V}_{b,st=3} &= 9.999347E-6\\
e0.g^{V}_{b,st=4} &= 9.999347E-6\\
e0.g^{V}_{b,st=5} &= 9.999347E-6\\
e0.g^{V}_{b,st=6} &= 9.999347E-6\\
e0.g^{V}_{b,st=7} &= 9.999347E-6\\
e0.g^{V}_{b,st=8} &= 9.999347E-6\\
e0.g^{SV}_{b,st=9} &= 9.999992E-6\\
e0.g^{V}_{b,st=9} &= 9.999347E-6\\
e0.g^{V}_{c,st=0} &= 0.22360374\\
e0.g^{V}_{c,st=1} &= 0.0021517193\\
e0.g^{V}_{c,st=2} &= 0.0021517193\\
e0.g^{V}_{c,st=3} &= 0.0021517193\\
e0.g^{V}_{c,st=4} &= 0.0021517193\\
e0.g^{V}_{c,st=5} &= 0.0021517193\\
e0.g^{V}_{c,st=6} &= 0.0021517193\\
e0.g^{V}_{c,st=7} &= 0.0021517193\\
e0.g^{V}_{c,st=8} &= 0.0021517193\\
e0.g^{N2}_{c,st=9} &= 0.2236116\\
e0.g^{SV}_{c,st=9} &= 1.0000028E-6
\end{aligned}
$$

$$
\begin{aligned}
e0.g^{V}_{c,st=9} &= 2.1515807E-4\\
e0.h^{L}_{st=0} &= -0.16315421\\
e0.h^{V}_{st=0} &= 0.017068196\\
e0.h^{L}_{st=1} &= -0.14466123\\
e0.h^{V}_{st=1} &= 0.017068373\\
e0.h^{L}_{st=2} &= -0.14466123\\
e0.h^{V}_{st=2} &= 0.017068375\\
e0.h^{L}_{st=3} &= -0.14466123\\
e0.h^{V}_{st=3} &= 0.017068375\\
e0.h^{L}_{st=4} &= -0.14466123\\
e0.h^{V}_{st=4} &= 0.017068375\\
e0.h^{L}_{st=5} &= -0.14466123\\
e0.h^{V}_{st=5} &= 0.017068375\\
e0.h^{L}_{st=6} &= -0.14466123\\
e0.h^{V}_{st=6} &= 0.017068375\\
e0.h^{L}_{st=7} &= -0.14466123\\
e0.h^{V}_{st=7} &= 0.017068375\\
e0.h^{L}_{st=8} &= -0.14466123\\
e0.h^{V}_{st=8} &= 0.017068375\\
e0.h^{F}_{st=9} &= -284.22464\\
e0.h^{L}_{st=9} &= -0.14266495\\
e0.h^{N2}_{st=9} &= 0.0170685\\
e0.h^{V}_{st=9} &= 0.017068375\\
e0.res_{st=0} &= 1.0E-12\\
e0.res_{st=1} &= 1.0E-12\\
e0.res_{st=2} &= 1.0E-12\\
e0.res_{st=3} &= 1.0E-12\\
e0.res_{st=4} &= 1.0E-12\\
e0.res_{st=5} &= 1.0E-12\\
e0.res_{st=6} &= 1.0E-12\\
e0.res_{st=7} &= 1.0E-12\\
e0.res_{st=8} &= 1.0E-12\\
e0.res_{st=9} &= 1.0E-12\\
e0.transfun^{DT1,PC}_{Cond} &= 0.0\\
e0.transfun^{P,PC}_{Cond} &= 0.0\\
e0.x_{st=0,i=1} &= -3.9136226E-4\\
e0.x_{st=0,i=2} &= 9.516112E-4\\
e0.x_{st=0,i=3} &= 2.0000018E-5\\
e0.x_{st=1,i=1} &= -3.4701466E-4\\
e0.x_{st=1,i=2} &= 8.437609E-4\\
e0.x_{st=1,i=3} &= 2.0000016E-5\\
e0.x_{st=2,i=1} &= -3.4222598E-4\\
e0.x_{st=2,i=2} &= 8.437609E-4\\
e0.x_{st=2,i=3} &= 2.0000016E-5\\
e0.x_{st=3,i=1} &= -3.4701466E-4\\
e0.x_{st=3,i=2} &= 8.437609E-4\\
e0.x_{st=3,i=3} &= 2.0000018E-5\\
e0.x_{st=4,i=1} &= -3.4701466E-4\\
e0.x_{st=4,i=2} &= 8.437609E-4\\
e0.x_{st=4,i=3} &= 2.0000018E-5\\
e0.x_{st=5,i=1} &= -3.4701466E-4\\
e0.x_{st=5,i=2} &= 8.437609E-4\\
e0.x_{st=5,i=3} &= 2.0000018E-5\\
e0.x_{st=6,i=1} &= -3.4701466E-4\\
e0.x_{st=6,i=2} &= 8.437609E-4\\
e0.x_{st=6,i=3} &= 2.0000018E-5
\end{aligned}
$$

$$
\begin{aligned}
e0.x_{st=7,i=1} &= -3.4701466E-4\\
e0.x_{st=7,i=2} &= 8.437609E-4\\
e0.x_{st=7,i=3} &= 2.0000018E-5\\
e0.x_{st=8,i=1} &= -3.4701466E-4\\
e0.x_{st=8,i=2} &= 8.437609E-4\\
e0.x_{st=8,i=3} &= 2.0000018E-5\\
e0.x_{st=9,i=1} &= -3.4701466E-4\\
e0.x_{st=9,i=2} &= 8.437609E-4\\
e0.x_{st=9,i=3} &= 2.0000018E-5\\
e0.y_{st=0,i=1} &= -3.2988628E-5\\
e0.y_{st=0,i=2} &= 3.207734E-5\\
e0.y_{st=0,i=3} &= 1.000001\\
e0.y_{st=1,i=1} &= -2.9250361E-5\\
e0.y_{st=1,i=2} &= 2.844175E-5\\
e0.y_{st=1,i=3} &= 1.0000008\\
e0.y_{st=2,i=1} &= -2.8846864E-5\\
e0.y_{st=2,i=2} &= 2.844175E-5\\
e0.y_{st=2,i=3} &= 1.0000008\\
e0.y_{st=3,i=1} &= -2.9250361E-5\\
e0.y_{st=3,i=2} &= 2.844175E-5\\
e0.y_{st=3,i=3} &= 1.0\\
e0.y_{st=4,i=1} &= -2.9250361E-5\\
e0.y_{st=4,i=2} &= 2.844175E-5\\
e0.y_{st=4,i=3} &= 1.0\\
e0.y_{st=5,i=1} &= -2.9250361E-5\\
e0.y_{st=5,i=2} &= 2.844175E-5\\
e0.y_{st=5,i=3} &= 1.0\\
e0.y_{st=6,i=1} &= -2.9250361E-5\\
e0.y_{st=6,i=2} &= 2.844175E-5\\
e0.y_{st=6,i=3} &= 1.0\\
e0.y_{st=7,i=1} &= -2.9250361E-5\\
e0.y_{st=7,i=2} &= 2.844175E-5\\
e0.y_{st=7,i=3} &= 1.0\\
e0.y_{st=8,i=1} &= -2.9250361E-5\\
e0.y_{st=8,i=2} &= 2.844175E-5\\
e0.y_{st=8,i=3} &= 1.0\\
e0.y_{st=9,i=1} &= -2.9250361E-5\\
e0.y_{st=9,i=2} &= 2.844175E-5\\
e0.y_{st=9,i=3} &= 1.0
\end{aligned}
$$

State variables

$$
\begin{aligned}
e0.HU_{st=0,i=1} &= -4.3628597E-6\\
e0.HU_{st=0,i=2} &= 4.2423385E-6\\
e0.HU_{st=0,i=3} &= 0.13225356\\
e0.HU_{st=1,i=1} &= -4.8356003E-7\\
e0.HU_{st=1,i=2} &= 4.7019222E-7\\
e0.HU_{st=1,i=3} &= 0.016531775\\
e0.HU_{st=2,i=1} &= -4.8356003E-7\\
e0.HU_{st=2,i=2} &= 4.7019222E-7\\
e0.HU_{st=2,i=3} &= 0.016531775\\
e0.HU_{st=3,i=1} &= -4.8356003E-7\\
e0.HU_{st=3,i=2} &= 4.7019222E-7\\
e0.HU_{st=3,i=3} &= 0.016531775\\
e0.HU_{st=4,i=1} &= -4.8356003E-7
\end{aligned}
$$

$$
\begin{array}{lcl}
e0.HU_{st=4,i=2} & = & 4.7019222E-7 \\
e0.HU_{st=4,i=3} & = & 0.016531775 \\
e0.HU_{st=5,i=1} & = & -4.8356003E-7 \\
e0.HU_{st=5,i=2} & = & 4.7019222E-7 \\
e0.HU_{st=5,i=3} & = & 0.016531775 \\
e0.HU_{st=6,i=1} & = & -4.8356003E-7 \\
e0.HU_{st=6,i=2} & = & 4.7019222E-7 \\
e0.HU_{st=6,i=3} & = & 0.016531775 \\
e0.HU_{st=7,i=1} & = & -4.8356003E-7 \\
e0.HU_{st=7,i=2} & = & 4.7019222E-7 \\
e0.HU_{st=7,i=3} & = & 0.016531775 \\
e0.HU_{st=8,i=1} & = & -4.8356003E-7 \\
e0.HU_{st=8,i=2} & = & 4.7019222E-7 \\
e0.HU_{st=8,i=3} & = & 0.016531775 \\
e0.HU_{st=9,i=1} & = & -3.4731358E-5 \\
e0.HU_{st=9,i=2} & = & 3.3771226E-5 \\
e0.HU_{st=9,i=3} & = & 1.2039918 \\
e0.U_{st=0} & = & -0.0010413377 \\
e0.U_{st=1} & = & -1.3016493E-4 \\
e0.U_{st=2} & = & -1.3016493E-4 \\
e0.U_{st=3} & = & -1.3016493E-4 \\
e0.U_{st=4} & = & -1.3016493E-4 \\
e0.U_{st=5} & = & -1.3016493E-4 \\
e0.U_{st=6} & = & -1.3016493E-4 \\
e0.U_{st=7} & = & -1.3016493E-4 \\
e0.U_{st=8} & = & -1.3016493E-4 \\
e0.U_{st=9} & = & -0.009479773 \\
e0.transfun_{Cond}^{PC,PT1} & = & 0.0
\end{array}
$$

Differential variables

$$
e0.t \quad = \quad 0.0
$$

Parameter Specs '179807: parspec_230508_fullsystem_1stage.mosvar'

Paramaters

$$
\begin{array}{lcl}
e0.M_{i=1} & = & 0.046069 \\
e0.M_{i=2} & = & 0.018015 \\
e0.M_{i=3} & = & 0.02801 \\
e0.P_{c,i=1} & = & 61.48 \\
e0.P_{c,i=2} & = & 220.64 \\
e0.Param_{A,i=1}^{VDI2} & = & -8.33801 \\
e0.Param_{A,i=1}^{hLV} & = & 37.364136 \\
e0.Param_{A,i=1}^{hL} & = & -286.5152 \\
e0.Param_{A,i=2}^{VDI2} & = & -7.86975 \\
e0.Param_{A,i=2}^{hLV} & = & 54.697876 \\
e0.Param_{A,i=2}^{hL} & = & -306.6468 \\
e0.Param_{A,i=3}^{hLV} & = & -8.673213 \\
e0.Param_{A,i=3}^{hL} & = & 0.0 \\
e0.Param_{B,i=1}^{VDI2} & = & 0.08719 \\
e0.Param_{B,i=1}^{hLV} & = & 0.21758129
\end{array}
$$

$$
\begin{aligned}
e0.Param^{hL}_{B,i=1} &= -0.17589763 \\
e0.Param^{VDI2}_{B,i=2} &= 1.90561 \\
e0.Param^{hLV}_{B,i=2} &= -0.02827908 \\
e0.Param^{hL}_{B,i=2} &= 0.06390862 \\
e0.Param^{hLV}_{B,i=3} &= 0.028969195 \\
e0.Param^{hL}_{B,i=3} &= 0.0 \\
e0.Param^{VDI2}_{C,i=1} &= -3.30578 \\
e0.Param^{hLV}_{C,i=1} &= -0.0013882424 \\
e0.Param^{hL}_{C,i=1} &= 0.0013536256 \\
e0.Param^{VDI2}_{C,i=2} &= -2.30891 \\
e0.Param^{hLV}_{C,i=2} &= -6.08415E-5 \\
e0.Param^{hL}_{C,i=2} &= 5.03617E-5 \\
e0.Param^{hLV}_{C,i=3} &= 1.1047E-6 \\
e0.Param^{hL}_{C,i=3} &= 0.0 \\
e0.Param^{DT1,K,PC}_{Cond} &= 1.0 \\
e0.Param^{DT1,PC,T}_{Cond} &= 0.08685889638 \\
e0.Param^{VDI2}_{D,i=1} &= -0.25986 \\
e0.Param^{hLV}_{D,i=1} &= 3.3797E-6 \\
e0.Param^{hL}_{D,i=1} &= -3.1434E-6 \\
e0.Param^{VDI2}_{D,i=2} &= -2.06472 \\
e0.Param^{hLV}_{D,i=2} &= 2.024E-7 \\
e0.Param^{hL}_{D,i=2} &= -1.833E-7 \\
e0.Param^{hLV}_{D,i=3} &= -3.7E-9 \\
e0.Param^{hL}_{D,i=3} &= 0.0 \\
e0.Param^{hLV}_{E,i=1} &= -3.3E-9 \\
e0.Param^{hL}_{E,i=1} &= 3.1E-9 \\
e0.Param^{hLV}_{E,i=2} &= -3.0E-10 \\
e0.Param^{hL}_{E,i=2} &= 3.0E-10 \\
e0.Param^{hLV}_{E,i=3} &= 0.0 \\
e0.Param^{hL}_{E,i=3} &= 0.0 \\
e0.Param^{L,abs}_{sharp} &= 1.0E-6 \\
e0.Param^{L,dirac}_{sharp} &= 1.0E-6 \\
e0.Param^{L,sig}_{sharp} &= 1.0E-6 \\
e0.Param^{N2,max}_{sharp} &= 1.0E-6 \\
e0.Param^{PC,max,unlim}_{sharp} &= 1.0E-6 \\
e0.Param^{PC,min,unlim}_{sharp} &= 1.0E-6 \\
e0.Param^{PC,sig}_{sharp} &= 1.0E-6 \\
e0.Param^{SV,max}_{sharp} &= 1.0E-6 \\
e0.Param^{V,max}_{sharp} &= 1.0E-6 \\
e0.Param^{V,min}_{sharp} &= 1.0E-6 \\
e0.Param^{mid}_{sharp} &= 1.0E-6 \\
e0.R &= 8.314 \\
e0.T_{c,i=1} &= 513.9 \\
e0.T_{c,i=2} &= 647.1 \\
e0.\rho^{L,dummy} &= 45.95 \\
e0.a_{packing} &= 500.0 \\
e0.g &= 9.81
\end{aligned}
$$

Notation '168167: NotationVDI.mosnot'

Base line symbols

A	Parameter
B	Parameter
C	Parameter
D	Parameter
E	Parameter
F	Parameter
G	Parameter
R	Gaskonstante
T	Temperatur
Δh	Verdampfungsenthalpie
η	dynamische Viskosität
λ	Wärmeleitfähigkeit
ρ	Dichte
σ	Oberflächenspannung
c	spezifische Wärmekapazität
h	Enthalpie
p	Druck

Superscripts

fl	Flüssigkeit
id	ideales Gas
o	Referenz
$vdi1$	Gl. 1 - Flüssigkeitsdichte
$vdi10$	Gl.10 - Oberflächenspannung
$vdi2$	Gl.2 - Dampfdruck
$vdi3$	Gl.3 - Verdampfungsenthalpie
$vdi4$	Gl.4 - spez. Wärmekapazität Flüssigkeit
$vdi5$	Gl.5 - spez. Wärmekapazität ideales Gas
$vdi6$	Gl.6 - dynamische Viskosität Flüssigkeit
$vdi7$	Gl.7 - dynamische Viskosität Gas
$vdi8$	Gl.8 - Wärmeleitfähigkeit Flüssigkeit
$vdi9$	Gl.9 - Wärmeleitfähigkeit Gas

Subscripts

c	kritisch
p	konstanter Druck
s	gesättigt
v	Verdampfung

Notation '178892: notation.mosnot'

Base line symbols

A	area [mˆ2]
F	Flow (mol/s)
H	Enthalpy (kJ)
HU	Hold up (mol)
K	equilibrium constant
L	Length (m)

M	Molar Mass (kg/mol)
P	Pressure (bar)
$Param$	Generic parameter/equation constant
Q	Heatflux (kW)
R	Gas Constant (J/mol*K)
T	Temperature (K)
U	Inner Energy (kJ)
V	Volume (m^3)
ΔP	pressure drop (bar)
$\Delta transfun$	deviation of transfun for sigmoidal functions
χ	vapor quality (-)
δ	film thickness (m)
η	viscosity (N.s/m2)
γ	activity coefficient(-)
π	Number pi
ρ	density (mol/m^3), mass: (kg/m3)
σ	Switching variable
ζ	deviation from closed summation terms
a	specific area (m2/m3)
aux	auxiliary, helper variable
c	valve parameter
$d\sigma dt$	derivative of switch
g	constraints or valve or gravitational constant
h	Molar enthalpy (kJ/mol)
res	residual (-)
t	Time (s)
$transfun$	transition function
val	Undefined value/input
x	Molar fraction (liquid) (mol/mol)
y	Molar fraction (vapor) (mol/mol)

Superscripts

$DT1$	DT1 element
F	Feed
K	gain parameter in transition function
L	Liquid Phase
LV	Liquid-Vapor
$N2$	nitrogen
P	Product, P element
PC	pressure control
$PT1$	PT1 element
R	reflux
SP	setpoint
SV	Safety valve
T	time parameter in transition function
V	Vapor phase
$VDI1$	Specific molar densitiy
$VDI2$	Pure component vapor pressure
$VDI3$	Specific enthalpy of evaporation
$VDI4$	Specific heat capacity/Specific enthalpy
$VDI5$	specific enthalpy ideal gas
abs	abs function
$actual$	variable obtained via max operator, dirac, etc
aux	auxiliary

cr	Critical point
$dirac$	Dirac impulse
$dummy$	dummy
hL	liquid enthalpy
hLV	heat of evapopration
$mass$	mass
max	max function
mid	mid function
min	min function
$poly4$	polynomial of oder 4
sig	sigmoidal
$spec$	specific
tot	Property of total mixture
$unlim$	unlimited

Subscripts

A	Parameter A or activation
B	Parameter B
C	Parameter C
$Cond$	condenser
D	Parameter D
E	Parameter E
F	Parameter F
G	Parameter G
Reb	reboiler
b	liquid blocking
c	check
$correlation$	correlation
$film$	film
inv	inverse
max	Maximum
mid	median
min	Minimum
$packing$	packing
$sharp$	Sharpness of sigmoid function

Indices

i	$1..NC$	Component
st	$1..Nst$	stage