Software Information

- Please check, whether your inputs, the equations applied and the charactersitics are displayed correctly.
- You are welcome to send your feedback via `https://github.com/oemof/tespy/issues`.
- LaTeXpackages required are:
  - graphicx
  - float
  - hyperref
  - booktabs
  - amsmath
  - units
  - cleveref
- To supress these messages, call the model documentation with the keyword draft=False.

TESPy Version:	0.4.0 - dev
Commit:	d918f10d@feature/self_documenting_models
CoolProp version:	6.4.0
Python version:	3.8.0 (default, Oct 28 2019, 16:14:01) [GCC 8.3.0]

1 Connections in design mode

1.1 Specified connection parameters

label	m in kg/s (1)	p in bar (2)	T in °C (3)	x in − (4)
feed steam	200.000	100.000	650.000	-
extraction1	-	20.000	-	-
extraction2	-	3.000	-	-
low pressure turbine:out1_condenser:in1	-	0.050	-	-
economizer:out1_evaporator:in1	-	-	-	0.000
evaporator:out1_superheater:in1	-	-	-	1.000
cooling water source:out1_condenser:in2	-	10.000	20.000	-

Table 1: Specified connection parameters

1.2 Equations applied

$$0 = \dot{m} - \dot{m}_{\text{spec}} \tag{1}$$

$$0 = p - p_{\text{spec}} \tag{2}$$

$$0 = T\left(p, h\right) - T_{\text{spec}} \tag{3}$$

$$0 = h - h\left(p, x_{\text{spec}}\right) \tag{4}$$

1.3 Specified fluids

label	water (5)
feed steam	1.000
cooling water source:out1_condenser:in2	1.000

Table 2: Specified fluids

1.4 Equations applied

$$0 = x_{\text{water}} - x_{\text{water,spec}} \tag{5}$$

2 Components in design mode

2.1 Components of type CycleCloser

2.1.1 Mandatory constraints

$$0 = p_{\text{in},i} - p_{\text{out},i} \; \forall i \in [1] \tag{6}$$

$$0 = h_{\text{in},i} - h_{\text{out},i} \; \forall i \in [1] \tag{7}$$

2.2 Components of type Turbine

2.2.1 Mandatory constraints

$$0 = \dot{m}_{\mathrm{in},i} - \dot{m}_{\mathrm{out},i} \; \forall i \in [1] \tag{8}$$

$$0 = x_{fl,\mathrm{in},i} - x_{fl,\mathrm{out},i} \; \forall fl \in \text{network fluids}, \forall i \in [1] \tag{9}$$

2.2.2 Inputs specified

label	eta_s (10)
high pressure turbine	0.900
mid pressure turbine	0.900
low pressure turbine	0.900

Table 3: Parameters of components of type Turbine

2.2.3 Equations applied

$$0 = -\left(h_{\mathrm{out}} - h_{\mathrm{in}}\right) + \left(h_{\mathrm{out,s}} - h_{\mathrm{in}}\right) \cdot \eta_{\mathrm{s}} \tag{10}$$

2.3 Components of type Splitter

2.3.1 Mandatory constraints

$$0 = \sum \dot{m}_{\mathrm{in},i} - \sum \dot{m}_{\mathrm{out},j} \; \forall i \in \text{inlets}, \forall j \in \text{outlets} \tag{11}$$

$$0 = x_{fl,\mathrm{in}} - x_{fl,\mathrm{out},j} \; \forall fl \in \text{network fluids}, \forall j \in \text{outlets} \tag{12}$$

$$0 = h_{in} - h_{\mathrm{out},j} \; \forall j \in \text{outlets} \tag{13}$$

$$\begin{aligned} 0 &= p_{\mathrm{in},1} - p_{\mathrm{in},i} \; \forall i \in \text{inlets} \setminus \{1\} \\ 0 &= p_{\mathrm{in},1} - p_{\mathrm{out},j} \; \forall j \in \text{outlets} \end{aligned} \tag{14}$$

2.4 Components of type Condenser

2.4.1 Mandatory constraints

$$0 = \dot{m}_{\mathrm{in},i} - \dot{m}_{\mathrm{out},i} \; \forall i \in [1, 2] \tag{15}$$

$$0 = x_{fl,\mathrm{in},i} - x_{fl,\mathrm{out},i} \; \forall fl \in \text{network fluids}, \forall i \in [1, 2] \tag{16}$$

$$0 = \dot{m}_{\mathrm{in},1} \cdot \left(h_{\mathrm{out},1} - h_{\mathrm{in},1}\right) + \dot{m}_{\mathrm{in},2} \cdot \left(h_{\mathrm{out},2} - h_{\mathrm{in},2}\right) \tag{17}$$

2.4.2 Inputs specified

label	ttd_u (18)	pr1 (19)	pr2 (20)	subcooling (21)
condenser	5.000	0.990	0.990	True
feed water preheater 1	5.000	0.990	0.990	True
feed water preheater 2	5.000	0.990	0.990	True

Table 4: Parameters of components of type Condenser

2.4.3 Equations applied

$$0 = ttd_{\mathrm{u}} - T_{\mathrm{sat}}\left(p_{\mathrm{in},1}\right) + T_{\mathrm{out},2} \tag{18}$$

$$0 = p_{\mathrm{in},1} \cdot pr1 - p_{\mathrm{out},1} \tag{19}$$

$$0 = p_{\mathrm{in},2} \cdot pr2 - p_{\mathrm{out},2} \tag{20}$$

$$0 = h_{\mathrm{out},1} - h\left(p_{\mathrm{out},1}, x = 0\right) \tag{21}$$

2.5 Components of type Pump

2.5.1 Mandatory constraints

$$0 = \dot{m}_{\mathrm{in},i} - \dot{m}_{\mathrm{out},i}\ \forall i \in [1] \tag{22}$$

$$0 = x_{fl,\mathrm{in},i} - x_{fl,\mathrm{out},i}\ \forall fl \in \text{network fluids},\ \forall i \in [1] \tag{23}$$

2.5.2 Inputs specified

label	eta_s (24)
feed water pump	0.800
feed water pump 2	0.800
feed water pump 3	0.800

Table 5: Parameters of components of type Pump

2.5.3 Equations applied

$$0 = -\left(h_{\mathrm{out}} - h_{\mathrm{in}}\right) \cdot \eta_{\mathrm{s}} + \left(h_{\mathrm{out,s}} - h_{\mathrm{in}}\right) \tag{24}$$

2.6 Components of type Merge

2.6.1 Mandatory constraints

$$0 = \sum \dot{m}_{\mathrm{in},i} - \sum \dot{m}_{\mathrm{out},j}\ \forall i \in \text{inlets}, \forall j \in \text{outlets} \tag{25}$$

$$0 = \sum_{i} \dot{m}_{\mathrm{in},i} \cdot x_{fl,\mathrm{in},i} - \dot{m}_{\mathrm{out}} \cdot x_{fl,\mathrm{out}}\ \forall fl \in \text{network fluids},\ \forall i \in \text{inlets} \tag{26}$$

$$0 = \sum_{i} \left(\dot{m}_{\mathrm{in},i} \cdot h_{\mathrm{in},i}\right) - \dot{m}_{\mathrm{out}} \cdot h_{\mathrm{out}}\ \forall i \in \text{inlets} \tag{27}$$

$$\begin{aligned} 0 &= p_{\mathrm{in},1} - p_{\mathrm{in},i}\ \forall i \in \text{inlets} \setminus \{1\} \\ 0 &= p_{\mathrm{in},1} - p_{\mathrm{out},j}\ \forall j \in \text{outlets} \end{aligned} \tag{28}$$

2.7 Components of type Desuperheater

2.7.1 Mandatory constraints

$$0 = \dot{m}_{\mathrm{in},i} - \dot{m}_{\mathrm{out},i}\ \forall i \in [1, 2] \tag{29}$$

$$0 = x_{fl,\mathrm{in},i} - x_{fl,\mathrm{out},i}\ \forall fl \in \text{network fluids},\ \forall i \in [1, 2] \tag{30}$$

$$0 = \dot{m}_{\mathrm{in},1} \cdot \left(h_{\mathrm{out},1} - h_{\mathrm{in},1}\right) + \dot{m}_{\mathrm{in},2} \cdot \left(h_{\mathrm{out},2} - h_{\mathrm{in},2}\right) \tag{31}$$

$$0 = h_{\mathrm{out},1} - h\left(p_{\mathrm{out},1}, x = 1\right) \tag{32}$$

2.7.2 Inputs specified

label	pr1 (33)	pr2 (34)
desuperheater	0.990	0.990

Table 6: Parameters of components of type Desuperheater

2.7.3 Equations applied

$$0 = p_{\text{in},1} \cdot pr1 - p_{\text{out},1} \tag{33}$$

$$0 = p_{\text{in},2} \cdot pr2 - p_{\text{out},2} \tag{34}$$

2.8 Components of type HeatExchangerSimple

2.8.1 Mandatory constraints

$$0 = \dot{m}_{\text{in},i} - \dot{m}_{\text{out},i} \; \forall i \in [1] \tag{35}$$

$$0 = x_{fl,\text{in},i} - x_{fl,\text{out},i} \; \forall fl \in \text{network fluids}, \forall i \in [1] \tag{36}$$

2.8.2 Inputs specified

label	pr (37)
economizer	0.990
evaporator	0.990
superheater	0.990

Table 7: Parameters of components of type HeatExchangerSimple

2.8.3 Equations applied

$$0 = p_{\text{in},1} \cdot pr - p_{\text{out},1} \tag{37}$$

3 Busses in design mode

3.1 Bus “power”

This bus is used for postprocessing only.

label	$\dot{E}_{\text{comp}}$	$\dot{E}_{\text{bus}}$	η
high pressure turbine	$\dot{m}_{\text{in}} \cdot (h_{\text{out}} - h_{\text{in}})$	$\dot{E}_{\text{comp}} \cdot \eta$	-1.000
mid pressure turbine	$\dot{m}_{\text{in}} \cdot (h_{\text{out}} - h_{\text{in}})$	$\dot{E}_{\text{comp}} \cdot \eta$	-1.000
low pressure turbine	$\dot{m}_{\text{in}} \cdot (h_{\text{out}} - h_{\text{in}})$	$\dot{E}_{\text{comp}} \cdot \eta$	-1.000
feed water pump	$\dot{m}_{\text{in}} \cdot (h_{\text{out}} - h_{\text{in}})$	$\dot{E}_{\text{comp}} \cdot \eta$	-1.000
feed water pump 2	$\dot{m}_{\text{in}} \cdot (h_{\text{out}} - h_{\text{in}})$	$\dot{E}_{\text{comp}} \cdot \eta$	-1.000
feed water pump 3	$\dot{m}_{\text{in}} \cdot (h_{\text{out}} - h_{\text{in}})$	$\dot{E}_{\text{comp}} \cdot \eta$	-1.000

Table 8: power

3.2 Bus “heat”

This bus is used for postprocessing only.

label	$\dot{E}_{\mathrm{comp}}$	$\dot{E}_{\mathrm{bus}}$	η
economizer	$\dot{m}_{\mathrm{in}} \cdot (h_{\mathrm{out}} - h_{\mathrm{in}})$	$\dot{E}_{\mathrm{comp}} \cdot \eta$	1.000
evaporator	$\dot{m}_{\mathrm{in}} \cdot (h_{\mathrm{out}} - h_{\mathrm{in}})$	$\dot{E}_{\mathrm{comp}} \cdot \eta$	1.000
superheater	$\dot{m}_{\mathrm{in}} \cdot (h_{\mathrm{out}} - h_{\mathrm{in}})$	$\dot{E}_{\mathrm{comp}} \cdot \eta$	1.000

Table 9: heat