Simulink Report: Hot_Bar_

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2008-03-06

Model - Hot_Bar_

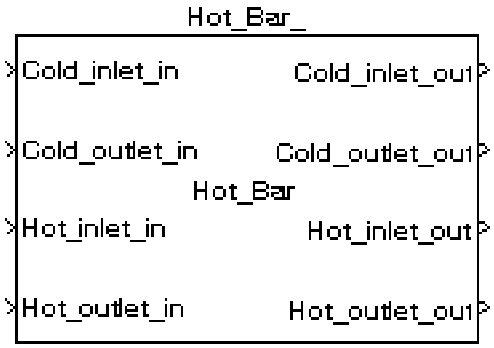


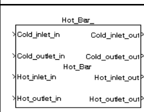
Tabelle 1.1. Hot_Bar_ Simulation Parameters

Solver ode14x	*ZeroCross* on	*StartTime* 0.0*StopTime* 10.0
RelTol 1e-3	*AbsTol* auto	*Refine* 1
InitialStep auto	*FixedStep* auto	*MaxStep* auto

Tabelle 1.2. Hot_Bar_ Summary Information

NumModelInputs	N/A	*NumModelOutputs*	N/A
NumVirtualSubsystems	N/A	*NumNonvirtSubsystems*	N/A
NumNonVirtBlocksInModel	N/A	*NumBlockTypeCounts*	N/A
NumBlockSignals	N/A	*NumBlockParams*	N/A
NumZCEvents	N/A	*NumNonsampledZCs*	N/A

Systems

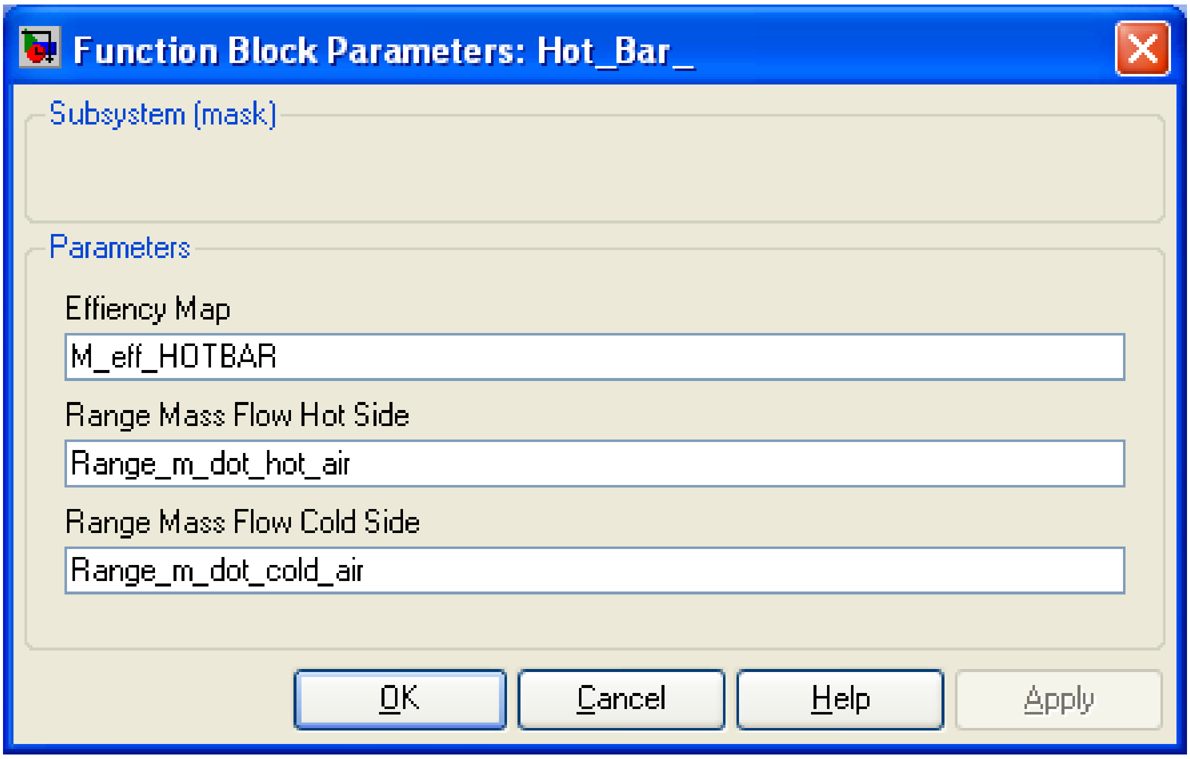
Name	Parent	Snapshot	Blocks	Signals
Hot_Bar_	<root>		Hot_Bar_	Hot_Bar_<1> Hot_Bar_<2> Hot_Bar_<3> Hot_Bar_<4>

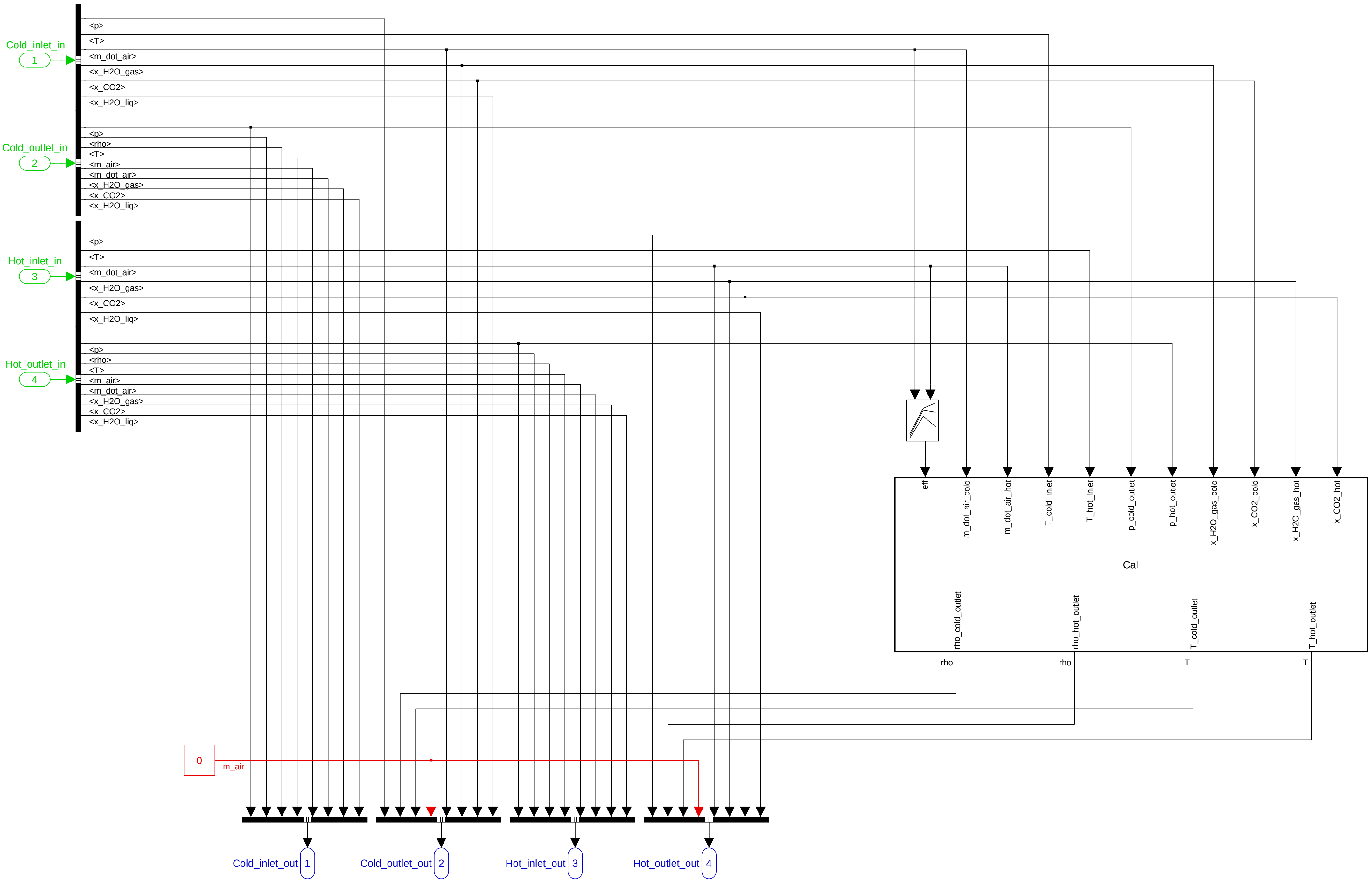
Blocks

Tabelle 1.3. Block Type Count

BlockType	Count	Block Names
Inport	15	Cold_inlet_in, Cold_outlet_in, Hot_inlet_in, Hot_outlet_in, eff, m_dot_air_cold, m_dot_air_hot,

BlockType	Count	Block Names
		T_cold_inlet, T_hot_inlet, p_cold_outlet, p_hot_outlet, x_H2O_gas_cold, x_CO2_cold, x_H2O_gas_hot, x_CO2_hot
Outport	8	rho_cold_outlet, rho_hot_outlet, T_cold_outlet, T_hot_outlet, Cold_inlet_out, Cold_outlet_out, Hot_inlet_out, Hot_outlet_out
BusSelector	4	Bus Selector1, Bus Selector2, Bus Selector3, Bus Selector4
BusCreator	4	Bus Creator1, Bus Creator2, Bus Creator3, Bus Creator4
Terminator	1	Terminator
SubSystem	1	Hot_Bar_
Stateflow (m)	1	Embedded MATLA Function1
S-Function	1	SFunction
Lookup2D	1	Lookup Table (2-D)1
Demux	1	Demux
Constant	1	m_air


Function Block Parameters: Hot_Bar_
Subsystem (mask)
Parameters
Effiency Map
M_eff_HOTBAR
Range Mass Flow Hot Side
Range_m_dot_hot_air
Range Mass Flow Cold Side
Range_m_dot_cold_air
OK
Cancel
Help
Apply



Cold_inlet_in
1
<p>
<T>
<m_dot_air>
<x_H2O_gas>
<x_CO2>
<x_H2O_liq>
Cold_outlet_in
2
<p>
<rho>
<T>
<m_air>
<m_dot_air>
<x_H2O_gas>
<x_CO2>
<x_H2O_liq>
Hot_inlet_in
3
<p>
<T>
<m_dot_air>
<x_H2O_gas>
<x_CO2>
<x_H2O_liq>
Hot_outlet_in
4
<p>
<rho>
<T>
<m_air>
<m_dot_air>
<x_H2O_gas>
<x_CO2>
<x_H2O_liq>
eff
m_dot_air_cold
m_dot_air_hot
T_cold_inlet
T_hot_inlet
p_cold_outlet
p_hot_outlet
x_H2O_gas_cold
x_CO2_cold
x_H2O_gas_hot
x_CO2_hot
Cal
rho_cold_outlet
rho_hot_outlet
T_cold_outlet
T_hot_outlet
rho
rho
T
T
0
m_air
Cold_inlet_out
1
Cold_outlet_out
2
Hot_inlet_out
3
Hot_outlet_out
4

```
function [rho_cold_outlet,rho_hot_outlet,T_cold_outlet,T_hot_outlet] = Cal(eff,↙
m_dot_air_cold,m_dot_air_hot,T_cold_inlet,T_hot_inlet,p_cold_outlet,p_hot_outlet,↙
x_H2O_gas_cold,x_CO2_cold,x_H2O_gas_hot,x_CO2_hot)

% **************************************************************************
% * Definition of a hot bar
% *
% * Number of inputs :                4
% *
% * Parameter: Characteristic Map:    Efficiency
% *
% *
% * Relevant input variables of Hot_Bar
% *
% * Pressure:                         p_in
% * Density:                          rho_in
% * Temperature:                      T_in
% * Mass flow dry air:                m_dot_air_in
% * Content water vapor:              x_H2O_gas_in
% * Content CO2:                      x_CO2_in
% * Content water:                    x_H2O_liq_in
% *
% *
% * Relevant output variables of Hot_Bar
% *
% * Temperature:                      T
% * Content water vapor:              x_H2O_gas
% * Content CO2:                      x_CO2
% * Content water:                    x_H2O_liq
% *
% *************************************************************************
% * Embedded Matlab Function Cal:
% *
% * Calculations:
% * 1. Definition specific gas constants.
% * 2. Calculation mass flow.
% * 3. Calculation heat transfer.
% *
% *
% * Last modification : 15.03.2008
% * Author : Christian Müller(HAW)
% *
% *************************************************************************

rho_cold_outlet         = 0;
rho_hot_outlet          = 0;
T_cold_outlet           = 0;
T_hot_outlet            = 0;
check                   = 0;

% * 1. Definition specific gas constants
R_air                   = 287.058;
R_H2O_gas               = 461.523;
R_CO2                   = 188.924;
c_p_air                 = 1005;
c_p_H2O_gas             = 1870;
```

```
c_p_CO2                  = 830;

R_cold                   = (R_air+x_H2O_gas_cold*R_H2O_gas+x_CO2_cold*R_CO2)/↙
(1+x_H2O_gas_cold+x_CO2_cold);
R_hot                    = (R_air+x_H2O_gas_hot*R_H2O_gas+x_CO2_hot*R_CO2)/↙
(1+x_H2O_gas_hot+x_CO2_hot);
c_p_cold                 = (c_p_air+x_H2O_gas_cold*c_p_H2O_gas+x_CO2_cold*c_p_CO2)/↙
(1+x_H2O_gas_cold+x_CO2_cold);
c_p_hot                  = (c_p_air+x_H2O_gas_hot*c_p_H2O_gas+x_CO2_hot*c_p_CO2)/↙
(1+x_H2O_gas_hot+x_CO2_hot);
% ***********************************************************************

% * 2. Calculation mass flow
m_dot_cold               = m_dot_air_cold*(1+x_H2O_gas_cold+x_CO2_cold);
m_dot_hot                = m_dot_air_hot*(1+x_H2O_gas_hot+x_CO2_hot);

if m_dot_cold > 0.001
   if m_dot_hot > 0.001
      check              = 1;
   end
end
% ***********************************************************************

% * 3. Calculation heat transfer
if check == 0
   T_cold_outlet         = T_cold_inlet;
   T_hot_outlet          = T_hot_inlet;
   rho_cold_outlet       = p_cold_outlet/(R_cold*T_cold_inlet);
   rho_hot_outlet        = p_hot_outlet/(R_hot*T_hot_inlet);
end

if check > 0
   H_dot_hot_inlet       = m_dot_hot*c_p_hot*T_hot_inlet;
   H_dot_hot_outlet_min  = m_dot_hot*c_p_hot*T_cold_inlet;
   H_dot_hot_outlet      = H_dot_hot_inlet-eff*(H_dot_hot_inlet-H_dot_hot_outlet_min);
   T_hot_outlet          = H_dot_hot_outlet/(m_dot_hot*c_p_hot);

   H_dot_cold_inlet      = m_dot_cold*c_p_cold*T_cold_inlet;
   H_dot_cold_outlet     = H_dot_cold_inlet+(H_dot_hot_inlet-H_dot_hot_outlet);
   T_cold_outlet         = H_dot_cold_outlet/(m_dot_cold*c_p_cold);

   rho_cold_outlet       = p_cold_outlet/(R_cold*T_cold_outlet);
   rho_hot_outlet        = p_hot_outlet/(R_hot*T_hot_outlet);
end
% ***********************************************************************
```