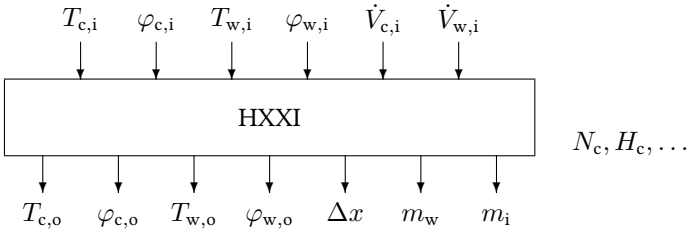
Block HXXI

The HXXI block simulates a cross-flow heat exchanger including condensation and icing on the heat exchanger walls.





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Inputs

1 Inlet temperature cold air stream $T_{c,i}$ / °C
2 Inlet relative humidity cold air stream $\varphi_{c,i}$
3 Inlet temperature warm air stream $T_{w,i}$ / °C
4 Inlet relative humidity warm air stream $\varphi_{w,i}$
5 Volume flow cold air stream $\dot{V}_{c,i}$ / $m^3\,s^{-1}$
6 Volume flow warm air stream $\dot{V}_{w,i}$ / $m^3\,s^{-1}$

Outputs

1 Outlet temperature cold air stream $T_{c,o}$ / °C
2 Outlet relative humidity cold air stream $\varphi_{c,o}$
3 Outlet temperature warm air stream $T_{w,o}$ / °C
4 Outlet relative humidity warm air stream $\varphi_{w,o}$
5 Dehumidification warm air stream by condensation Δx / $kg\,kg^{-1}$
6 Total condensation water mass m_w / $kg\,h^{-1}$
7 Total ice mass m_i / $kg\,h^{-1}$

Parameters

1 Number of air channels of the heat exchangers cold air side N_c

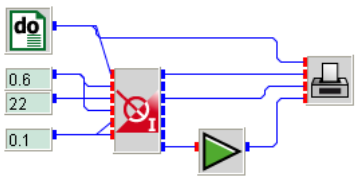
2 Channel height of the heat exchanger canals cold air side H_c / m
3 Channel width cold air side W_c / m
4 Channel length cold air side L_c / m
5 Number of air channels of the heat exchangers warm air side N_w
6 Channel height of the heat exchanger canals warm air side H_w / m
7 Channel width warm air side W_w / m
8 Channel lenght warm air side L_c / m
9 Thickness of the heat exchanger walls / m
10 Heat exchanger with ribs on the walls / 0=yes, 1=no
11 Thickness of the ribs / m
12 Number of ribs in each channel cold air side $N_{r,c}$
13 Number of ribs in each channel warm air side $N_{r,w}$
14 Heat conductivity of the heat exchanger walls λ / W m^{-1} K^{-1}
15 Number of elements along I-Direction (division cold air channel width) N_I
16 Number of elements along J-Direction (division warm air channel width) N_J
17 Total pressure p / Pa (about 101300 Pa)

Strings

None

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hxxi.vseit



A cross flow heat exchanger with condensation and icing is simulated with the following parameters:

```
Number of air channels of the heat exchangers cold air side   35
Channel height of the heat exchanger canals cold air side      0.004
Channel width cold air side                                    0.5
Channel lenght cold air side                                   0.5
Number of air channels of the heat exchangers warm air side   35
Channel height of the heat exchanger canals warm air side      0.004
Channel width warm air side                                    0.5
Channel lenght warm air side                                   0.5
Thickness of the heat exchanger walls                          0.002
Heat exchanger with ribs on the walls                          0
Thickness of the ribs                                          0.004
Number of ribs in each channel cold air side                  30
Number of ribs in each canal warm air side                    30
Heat conductivity of the heat exchanger walls                  0.88
Number of elements along I-Direction                          50
Number of elements along J-Direction                          50
Total pressure                                            101300
```

A DO block varies the cold side air temperature of a heat exchanger between -15 and 5 °C in steps of 0.1 °C.

The other inputs of the HXXI block are defined through CONST blocks: Both relative humidities of the inlet air stream are set to 60 %, the warm inlet air stream temperature is set to 22 °C, and both volume flows are assumed to be 0.1 m^3/s.

The PLOT block displays the two outlet temperatures of the heat exchanger and the total ice mass in g/h as converterted from kg/h by a GAIN block with parameter 1000.

