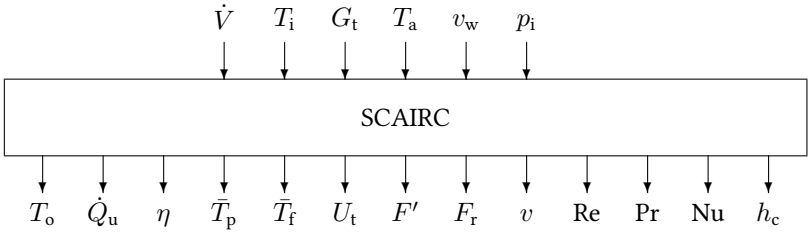
Block SCAIRC

The SCAIRC block simulates a solar air collector with a ripped absorber (channel structure).





Name	SCAIRC
Function	st0001
Inputs	5 . . . [6]
Outputs	13
Parameters	18
Strings	0
Group	S

Inputs

1 Volume flow $\dot{V}$ / $\mathrm{m_n^3\,s^{-1}}$
2 Inlet temperature T_i / °C
3 Global radiation on the collector plane G_t / $\mathrm{W\,m^{-2}}$
4 Ambient temperature T_a / °C
5 Wind speed close to the collector v_w / $\mathrm{m\,s^{-1}}$
6 Inlet pressure p_i / Pa (optional)

Outputs

1 Outlet temperatur T_o / °C
2 Useful heat $\dot{Q}_\mathrm{u}$ / W
3 Efficiency η
4 Mean absorber plate temperature $\bar{T}_\mathrm{p}$ / °C
5 Mean fluid temperature $\bar{T}_\mathrm{f}$ / °C
6 Overall heat loss coefficient U_t / $\mathrm{W\,m^{-2}\,K^{-1}}$
7 Absorber efficiency factor F'
8 Heat removal factor F_r
9 Flow speed v / $\mathrm{m\,s^{-1}}$
10 Reynolds number Re

11	Prandtl number Pr
12	Nusselt number Nu
13	Convective heat transfer coefficient h_c / $\mathrm{W\,m^{-2}\,K^{-1}}$

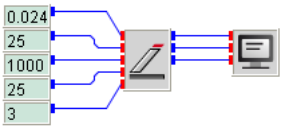
Parameters

1	Number of collectors in series N_s
2	Number of collectors in parallel N_p
3	Collector tilt angle β / °
4	Collector length l_c / m
5	Collector width w_c / m
6	Channel height h_ch / m
7	Channel width w_ch / m
8	Number of channels N_ch
9	Plate thickness t_p / m
10	Optical efficiency $(\tau\alpha)$
11	Thickness of insulation material t_i / m
12	Heat conductivity of insulation material λ_i / $\mathrm{W\,m^{-1}\,K^{-1}}$
13	Heat conductivity of absorber material λ_a / $\mathrm{W\,m^{-1}\,K^{-1}}$
14	Emissivity of glas cover ϵ_c
15	Emissivity of absorber plate front side towards cover ϵ_f
16	Emissivity of absorber plate back side towards channel ϵ_b
17	Emissivity of channel towards absorber plate back side ϵ_ch
18	Distance between absorber plate and front cover d / m

Strings

None

scairc.vseit



A solar air collector is simulated with the following parameters.

```
Number of collectors in series                          1
Number of collectors in parallel                        1
Collector tilt angle                                   45
Collector length                                        2.5
Collector width                                         0.96
Channel height                                          0.028
Channel width                                           0.026
Number of channels                                     36
Plate thickness                                         0.0006
Optical efficiency                                      0.812
Thickness of insulation material                        0.06
Heat conductivity of insulation material                0.04
Heat conductivity of absorber material                238
Emissivity of glas cover                                0.88
Emissivity of absorber plate front side towards cover   0.89
Emissivity of absorber plate back side towards channel  0.085
Emissivity of channel towards absorber plate back side  0.085
Distance between absorber plate and front cover         0.020
```

All inputs are set constant by CONST blocks. A SCREEN block displays outlet temperature, useful heat and the collector efficiency.

```
    65.62508  1069.95264     0.44581
```

See also Block SCAIRCD.