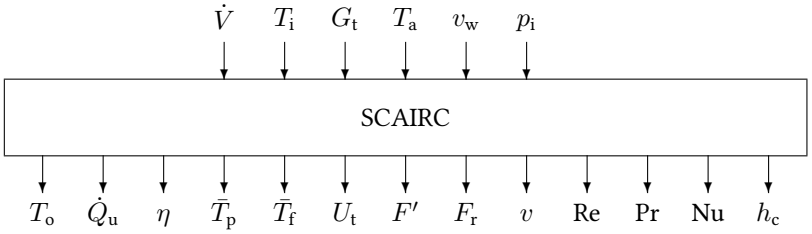
## Block SCAIRC

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 $T_\mathrm{i}$ / °C
3 Global radiation on the collector plane $G_\mathrm{t}$ / $\mathrm{W\,m^{-2}}$
4 Ambient temperature $T_\mathrm{a}$ / °C
5 Wind speed close to the collector $v_\mathrm{w}$ / $\mathrm{m\,s^{-1}}$
6 Inlet pressure $p_\mathrm{i}$ / Pa (optional)

### Outputs

1 Outlet temperatur $T_\mathrm{o}$ / °C
2 Useful heat $\dot{Q}_\mathrm{u}$ / W
3 Efficiency $\eta$
4 Mean absorber plate temperature $\bar{T}_\mathrm{p}$ / °C
5 Mean fluid temperature $\bar{T}_\mathrm{f}$ / °C
6 Overall heat loss coefficient $U_\mathrm{t}$ / $\mathrm{W\,m^{-2}\,K^{-1}}$
7 Absorber efficiency factor $F'$
8 Heat removal factor $F_\mathrm{r}$
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 $h_\mathrm{c}$ / $\mathrm{W\,m^{-2}\,K^{-1}}$ |

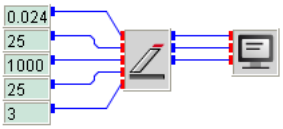
### Parameters

| | |
|---|---|
| 1 | Number of collectors in series $N_\mathrm{s}$ |
| 2 | Number of collectors in parallel $N_\mathrm{p}$ |
| 3 | Collector tilt angle $\beta$ / ° |
| 4 | Collector length $l_\mathrm{c}$ / m |
| 5 | Collector width $w_\mathrm{c}$ / m |
| 6 | Channel height $h_\mathrm{ch}$ / m |
| 7 | Channel width $w_\mathrm{ch}$ / m |
| 8 | Number of channels $N_\mathrm{ch}$ |
| 9 | Plate thickness $t_\mathrm{p}$ / m |
| 10 | Optical efficiency $(\tau\alpha)$ |
| 11 | Thickness of insulation material $t_\mathrm{i}$ / m |
| 12 | Heat conductivity of insulation material $\lambda_\mathrm{i}$ / $\mathrm{W\,m^{-1}\,K^{-1}}$ |
| 13 | Heat conductivity of absorber material $\lambda_\mathrm{a}$ / $\mathrm{W\,m^{-1}\,K^{-1}}$ |
| 14 | Emissivity of glas cover $\epsilon_\mathrm{c}$ |
| 15 | Emissivity of absorber plate front side towards cover $\epsilon_\mathrm{f}$ |
| 16 | Emissivity of absorber plate back side towards channel $\epsilon_\mathrm{b}$ |
| 17 | Emissivity of channel towards absorber plate back side $\epsilon_\mathrm{ch}$ |
| 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.