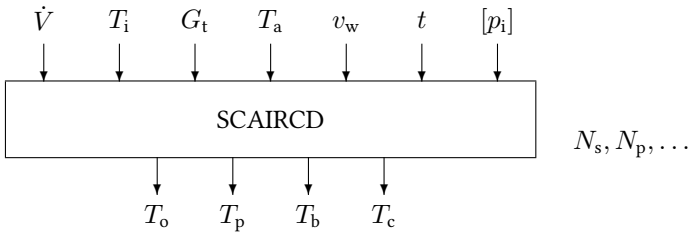
Block SCAIRCD

The SCAIRCD block simulates a solar air collector with a ripped absorber (channel structure) under consideration of the thermal heat capcity.





Name	SCAIRCD
Function	st0029
Inputs	6 . . . [7]
Outputs	4
Parameters	23
Strings	0
Group	S

Inputs

1 Volume flow $\dot{V}$ / $\mathrm{m^3\,s^{-1}}$
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 Time t / s
7 Inlet pressure p_i / Pa (optional)

Outputs

1 Outlet air temperature T_o / °C
2 Temperature absorber plate at outlet T_p / °C
3 Temperature back side at outlet T_b / °C
4 Temperature front cover at outlet T_c / °C

Parameters

1 Number of collectors in series N_s
2 Number of collectors in parallel N_p
3 Collector tilt angle β / °

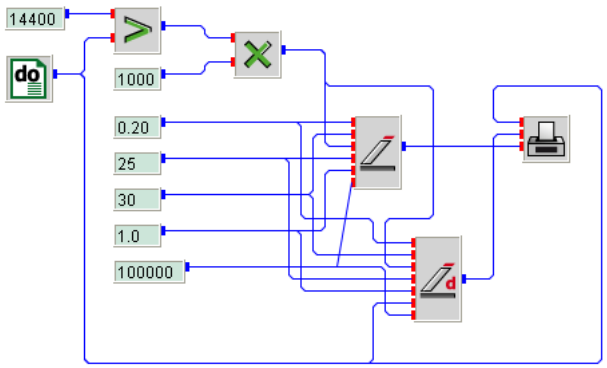
4 Collector length l_c / m
5 Collector width w_c / m
6 Channel height h_{ch} / m
7 Channel width w_{ch} / m
8 Number of channels N_{ch}
9 Plate thickness t_p / m
10 Optical efficiency $(\tau\alpha)$
11 Thickness of insulation material t_i / m
12 Heat conductivity of insulation material λ_i / $\mathrm{W\,m^{-1}\,K^{-1}}$
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
19 Thickness of back cover material d_b / m
20 Heat capacity of back cover material $c_{p,b}$ / $\mathrm{J\,kg^{-1}\,K^{-1}}$
21 Density of back cover material ρ_b / $\mathrm{kg\,m^{-3}}$
22 Heat capacity of absorber material $c_{p,a}$ / $\mathrm{J\,kg^{-1}\,K^{-1}}$
23 Density of absorber material ρ_a / $\mathrm{kg\,m^{-3}}$

Strings

None

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scaircd.vseit



In this example the static model used by the SCAIRC block is compared to the dynamic model, implemented in block SCAIRCD.

The parameters of the static SCAIRC block are set to these values:

Number of collectors in series	2
Number of collectors in parallel	2
Collector tilt angle	34
Collector length	12.5
Collector width	0.96
Channel height	0.095
Channel width	0.060
Number of channels	16
Plate thickness	0.0014
Optical efficiency	0.8
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	0.16
Emissivity of absorber plate back side towards channel	0.040
Emissivity of channel towards absorber plate back side	0.040
Distance between absorber plate and front cover	0.025

The dynamic SCAIRCD block uses these parameters.

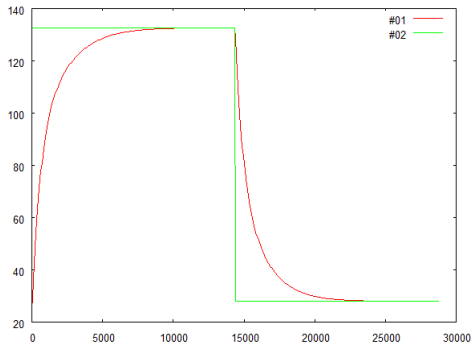
Number of collectors in series	2
Number of collectors in parallel	2
Collector tilt angle	34
Collector length	12.5
Collector width	0.96
Channel height	0.095
Channel width	0.060
Number of channels	16
Plate thickness	0.0014
Optical efficiency	0.812
Thickness of insulation material	0.06
Heat conductivity 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	0.16
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
Thickness of back cover material	0.002
Heat capacity of back cover material	500
Density of back cover material	7800
Heat capacity of absorber material	500
Density of absorber material	2702

Most of the inputs of the two air collector blocks are set constant by CONST blocks.

However, the time is varied between 0 and 28800 seconds (eight hours) in steps of 60 seconds by a DO block.

The collector irradiance of 1000 W/m^2, as defined by one of the CONST blocks is switched off after 14400 seconds. This is accomplished by a CONST block with parameter 14400 and a GT block. When the time signal, coming from the DO block gets greater than 14400, the GT block outputs zero and the MUL block "switches the irradiance off".

The PLOT block demonstrates the result.



See also Block SCAIRC.