Chapter:	Miscellaneous
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* *Subscripts including entire words which are self explaining are not included.*

Abbreviations

AR	Anti reflective
asl	Above sea level
ATES	Aquifer thermal energy storage
BHE	Borehole heat exchanger
BTES	Borehole thermal energy storage
CHP	Combined heat and power
CSHPSS	Central solar heating plants with seasonal storage
DH	District heating
EFTE	Ethylene tetrafluoroethylene
ESCO	Energy service company
ETC	Evacuated tubular collector
FEP	Fluorinated ethylene propylene
FPC	Flat plate collector
HX	Heat exchanger
IEE	Intelligent Energy Europe
PCM	Phase change material(s)
PTES	Pit thermal energy storage
PV	Photovoltaic
SDH	Solar district heating
ST	Solar thermal
TTES	Tank thermal energy storage
UV	Ultraviolet (radiation)
VAT	Value added tax

Symbols

Subscripts are included when they are a part of a “non-stand alone” symbol.

Symbol	Description	Unit
α_e	Heat transfer coefficient on the external surface of thermal insulation	[W/(m^2·K)]
α_w	Safety valve outflow coefficient	[-]
η	Efficiency	[-]
λ_{iz}	Thermal conductivity of the insulation	[W/(m·K)]
ρ	Density of fluid	[kg/m^3]
A	Area	[m²]
a_1	1st order collector heat loss coefficient	[W/(K·m²)]
a_2	2nd order collector heat loss coefficient	[W/(K²·m²)]
b_0	Constant in incident angle modifier expression	[-]
c_1	Slope of the linear function f($P_{hx,meas}$)	[K/W]
c_2	Constant of the linear function f($P_{hx,meas}$)	[K]
c_p	Heat capacity of solar collector fluid	[J/(kg·K)]
d_e	Diameter of pipe (external)	[m]
$D_{location}$	Distance from collector field to network connection point (half the length of the total transmission pipe length)	[km]
f	Safety factor	[-]
F’’	Efficiency factor	[-]
F’’’	Heat exchanger factor	[-]
f($P_{hx,meas}$)	Linear function of $P_{hx,meas}$	[K]
G	Global solar irradiance (if nothing else is mentioned: On collector plane)	[kWh/y]
g	Gravitational acceleration	[m/s^2]
H_H	Height of the heat supplier	[m]
H_A	Highest point of the network	[m]
K	Pressure dependant coefficient of safety valve	[kW/mm^2]
K_θ	Incidence angle modifier for the solar collector	[-]
K_{60}	Incident angle modifier for diffuse radiation	[-]
l	Length of pipe	[m]
$\dot{m}$	Mass flow	[kg/s]
Δp_H	Pressure loss of the plant	[bar]
Δp_N	Pressure loss of the network	[bar]
$\Delta p_Ü$	Pressure difference at the last costumer station	[bar]
P	Power	[W]

p	Constant in incident angle modifier expression	[-]
$p'(t_v)$	Saturated steam pressure	[bar]
$p_{B,max}$	Maximum operating pressure	[bar]
$p_{land,location}$	Investment costs for collector land area	[€]
p_{RU}	Static pressure	[bar]
p_S	Pressure safety factor for saturation	[bar]
p_{SD}	Pressure fluctuations safety factor	[bar]
pr	Price	[€ per...]
Q	Energy	[kWh/y]
q_{land}	Solar energy output in kWh per m^2 of land used and per year	[kWh/m^2/y]
Q_l	Total heat loss of pipes (from collectors to heat exchanger)	[W]
$Q_{pipe,loss}$	Heat loss from pipe in kWh/y per km distance between collector field and network connection point	[kWh/y/km]
R_T	Temperature correction factor	[-]
S_0	Cross section of safety valve	[mm^2]
S_F	Solar fraction	[-]
s_{iz}	Thickness of thermal insulation	[m]
T	Temperature	[°C]
ΔT	Temperature difference	[K]
$T_{hx,prim,in,min}$	Minimum inlet temperature on the primary side of the heat exchanger	[°C]
U	Heat loss coefficient for the pipes from collectors to the heat exchanger (loss per m of pipe length)	[W/(m·K)]
UA	Heat transfer coefficient (e.g. of heat exchanger)	[W/K]
$\dot{V}$	Flow rate	[m^3/h][†]
w	Capacity flow	[W/K]

[†] *Normally measured in m^3/h and converted to m^3/s by multiplying with 3600 s/h.*

Subscripts

0	Horizontal (e.g. global radiation *on horizontal*) or maximum/optical (efficiency)
50	At 50 °C
60	At 60°
a	Ambient air
θ	Incidence angle (current for the given irradiation onto the collector plane)
actual	actual operating temperature
b	Beam
c	Collector
d	Diffuse
e	External
f	At full load
g	Guarantee
hx	Heat exchanger
in	Inlet (e.g. collector fluid inlet)
land	land used for the collector field or ...per m^2 of land used.
location	distance to location or ...per km in distance to location
low	At low solar fractions
m	Mean
max	Maximum
meas	Measured
min	Minimum
O	Other things
out	Outlet (e.g. collector fluid outlet)
p	Performance
P	Pipe heat loss
prim	Primary side (of heat exchanger) i.e. solar collector loop
sec	Secondary side (of heat exchanger) i.e. district heating network side
solar	Provided by solar energy
U	Uncertainty

The SDH fact sheets addresses both technical and non-technical issues, and provide state-of-the-art industry guidelines to which utilities can refer when considering/realizing SDH plants. For further information on Solar District Heating and the SDHtake-off project please visit www.solar-district-heating.eu.

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