

Location of the system

Switzerland
Rapperswil (SG)
Longitude: 8.82°
Latitude: 47.23°
Elevation: 417 m

This report has been created by:

Vela Solaris AG

System overview (annual values)

Total fuel and/or electrical energy consumption of the system [E _{tot}]	2,211.4 kWh
Total energy consumption [Q _{use}]	13,544.3 kWh
System performance (Q _{use} / E _{tot})	6.12
Comfort demand	Energy demand covered

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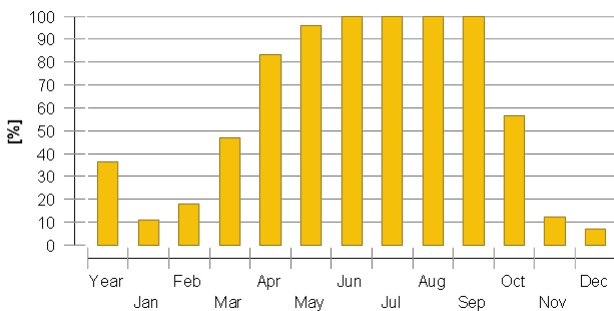
Overview solar thermal energy (annual values)

Collector area	17.6 m ²
Solar fraction total	36.1%
Solar fraction hot water [SF _n Hw]	66.9 %
Solar fraction building [SF _n Bd]	18 %
Total annual field yield	5,962.8 kWh
Collector field yield relating to gross area	338 kWh/m ² /Year
Collector field yield relating to aperture area	394.4 kWh/m ² /Year
Max. energy savings	1,198.4 kWh
Max. reduction in CO ₂ emissions	642.8 kg

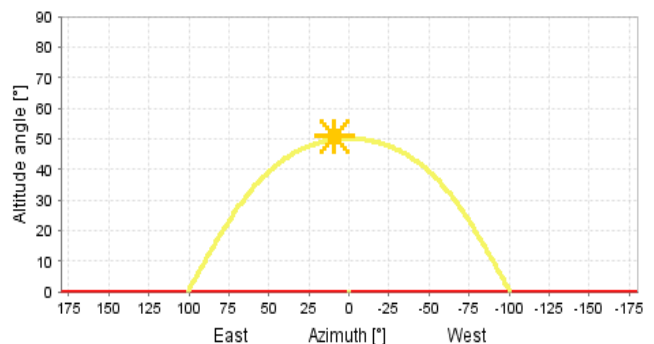
Overview heat pump (annual values)

Seasonal performance factor (without pump energy)	5
Total electrical energy consumption when heating [E _{aux}]	2,117.2 kWh
Ground loop length (Total)	400 m
Energy withdrawal of the ground-source loop	8,392.8 kWh
Total energy savings	8,417.2 kWh
Total reduction in CO ₂ emissions	4,515 kg

Solar fraction: fraction of solar energy to system [SF_n]



Horizon line



Meteorological data-Overview

Average outdoor temperature	10.1 °C
Global irradiation, annual sum	1,103.5 kWh/m ²
Diffuse irradiation, annual sum	578 kWh/m ²

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Component overview (annual values)

B/W or W/W heat pump		Thermalia®H (15)
Seasonal performance factor (without pump energy)		4.98
Energy from/to the system [Qaux]	kWh	10,534.4
CO2 emissions	kg	1,135.7
Fuel and electrical energy consumption [Eaux]	kWh	2,117.2
Energy savings solar thermal	kWh	1,198.4
CO2 savings solar thermal	kg	642.8
Energy savings heat pump	kWh	8,417.2
CO2 savings heat pump	kg	4,515
Collector		PANNELLO SKY PRO 8L CPC 58
Number of collectors		12
Number of arrays		2
Total gross area	m²	17.64
Total aperture area	m²	15.12
Total absorber area	m²	15.12
Tilt angle (hor.=0°, vert.=90°)	°	45
Orientation (E=+90°, S=0°, W=-90°)	°	0
Collector field yield [Qsol]	kWh	5,962.8
Irradiation onto collector area [Esol]	kWh	18,690.8
Collector efficiency [Qsol / Esol]	%	31.9
Direct irradiation after IAM	kWh	9,126
Ground-source loop 1		32 mm double U ground loop
Ground loop length	m	100
Number of ground-source loops		4
Distance between ground loops	m	5
Earth layer 1	m	10 / Limestone
Inflow temperature during operation	°C	7.9
Outflow temperature during operation	°C	8.6
Energy withdrawal of the ground-source loop	kWh	8,392.8
Building		Single family house, low-energy building
Heated/air-conditioned living area	m²	195
Heating setpoint temperature	°C	20.3
Heating energy demand excluding DHW [Qdem]	kWh	10,415.4
Specific heating energy demand excluding DHW [Qdem]	kWh/m²	53.4
Solar gain through windows	kWh	20,503.8
Total energy losses	kWh	40,615.2

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Heating element		Floor heating
Number of heating/cooling modules	-	14
Power per heating element under standard conditions	W	1,000
Nominal inlet temperature	°C	35
Nominal return temperature	°C	25
Net energy from/to heating/cooling modules	kWh	10,387.8
Hot water demand		Constant
Volume withdrawal/daily consumption	l/d	202.1
Temperature setting	°C	45
Energy demand [Qdem]	kWh	2,994.5
Pump Building loop		Eco, medium
Circuit pressure drop	bar	0.006
Flow rate	l/h	700.1
Fuel and electrical energy consumption [Epar]	kWh	27.9
Pump Solar loop		Eco, small
Circuit pressure drop	bar	0.006
Flow rate	l/h	226.8
Fuel and electrical energy consumption [Epar]	kWh	12.5
Pump Heating loop		Eco, small
Circuit pressure drop	bar	0.118
Flow rate	l/h	3,600
Fuel and electrical energy consumption [Epar]	kWh	5.5
Pump Ground-source loop pump		Eco, large
Circuit pressure drop	bar	1.861
Flow rate	l/h	10,800
Fuel and electrical energy consumption [Epar]	kWh	48.2
Storage tank Tank		CombiSol Compact
Volume	l	1,200
Height	m	1.5
Material		Steel
Insulation		Rigid PU foam
Thickness of insulation	mm	100
Heat loss	kWh	944.5
Connection losses	kWh	1,330.4

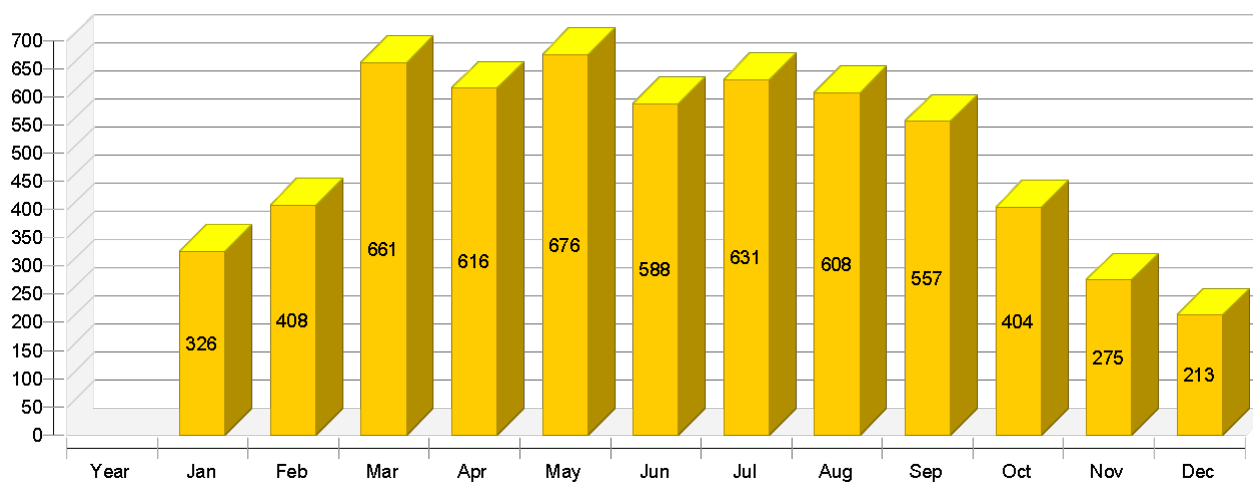
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Loop

Solar loop		
Fluid mixture		Propylene mixture
Fluid concentration	%	33.3
Fluid domains volume	l	50
Pressure on top of the circuit	bar	4

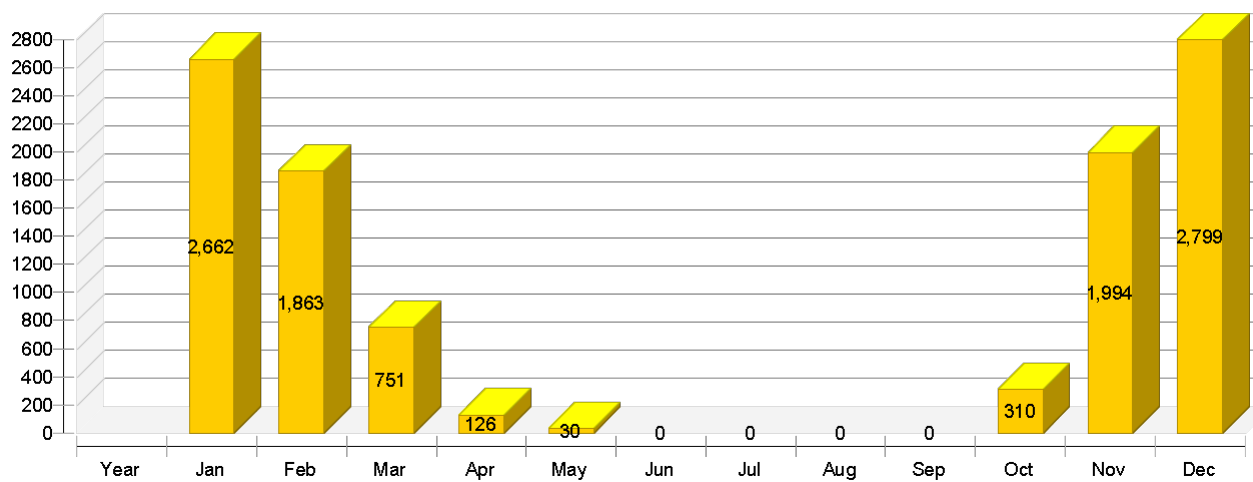
Solar thermal energy to the system [Qsol]

kWh



Heat generator energy to the system (solar thermal energy not included) [Qaux]

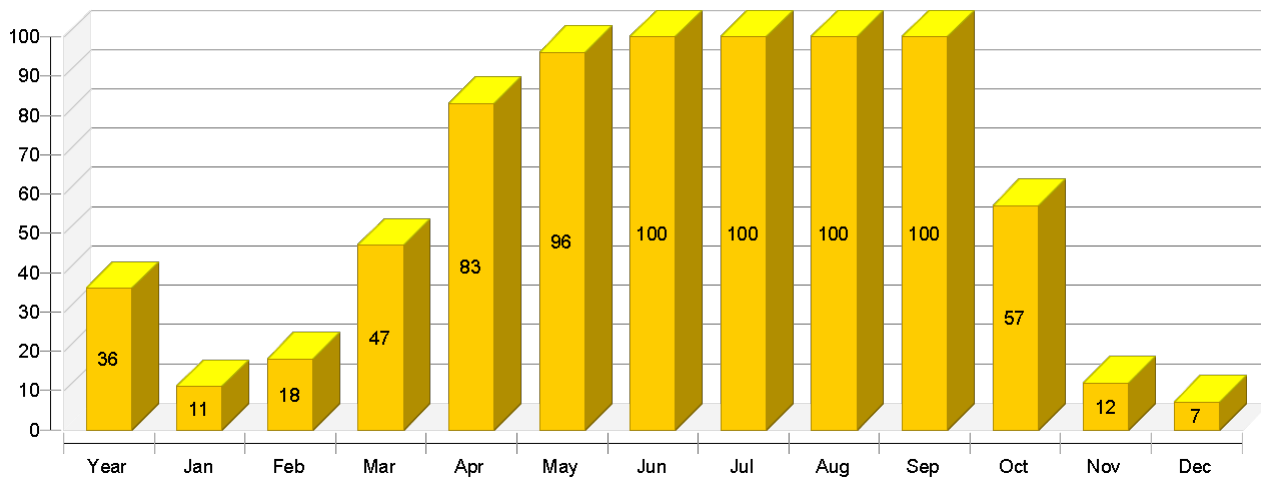
kWh



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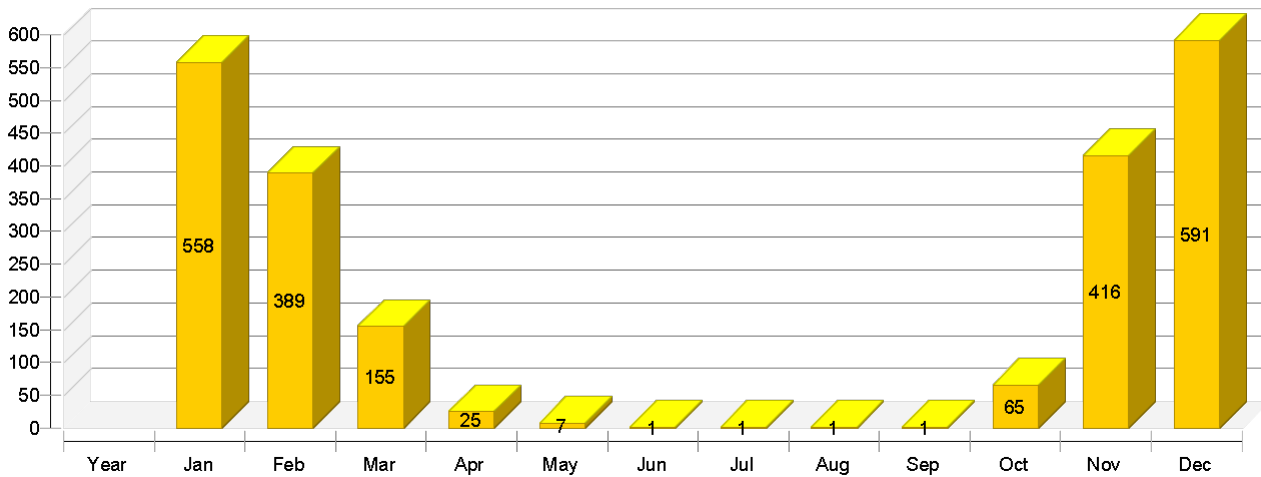
Solar fraction: fraction of solar energy to system [SF_n]

%



Total fuel and/or electrical energy consumption of the system [E_{tot}]

kWh



Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Solar thermal energy to the system [Q_{sol}]

kWh	5963	326	408	661	616	676	588	631	608	557	404	275	213
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Heat generator energy to the system (solar thermal energy not included) [Q_{aux}]

kWh	10534	2662	1863	751	126	30	0	0	0	0	310	1994	2799
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Heat generator fuel and electrical energy consumption [E_{aux}]

kWh	2117	537	374	147	23	6	0	0	0	0	62	400	569
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Solar fraction: fraction of solar energy to system [SF_n]

%	36.1	10.9	17.9	46.8	83	95.8	100	100	100	100	56.5	12.1	7.1
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Total fuel and/or electrical energy consumption of the system [E_{tot}]

kWh	2211	558	389	155	25	7	1	1	1	1	65	416	591
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Irradiation onto collector area [E_{sol}]

kWh	18691	861	1090	1678	1912	2118	2064	2266	2206	1801	1289	778	628
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Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Electrical energy consumption of pumps [Epar]

kWh	94	21	15	8	3	2	1	1	1	1	3	16	22
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Total energy consumption [Quse]

kWh	13544	2853	2108	1166	507	336	253	250	243	246	558	2136	2889
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Heat loss to indoor room (including heat generator losses) [Qint]

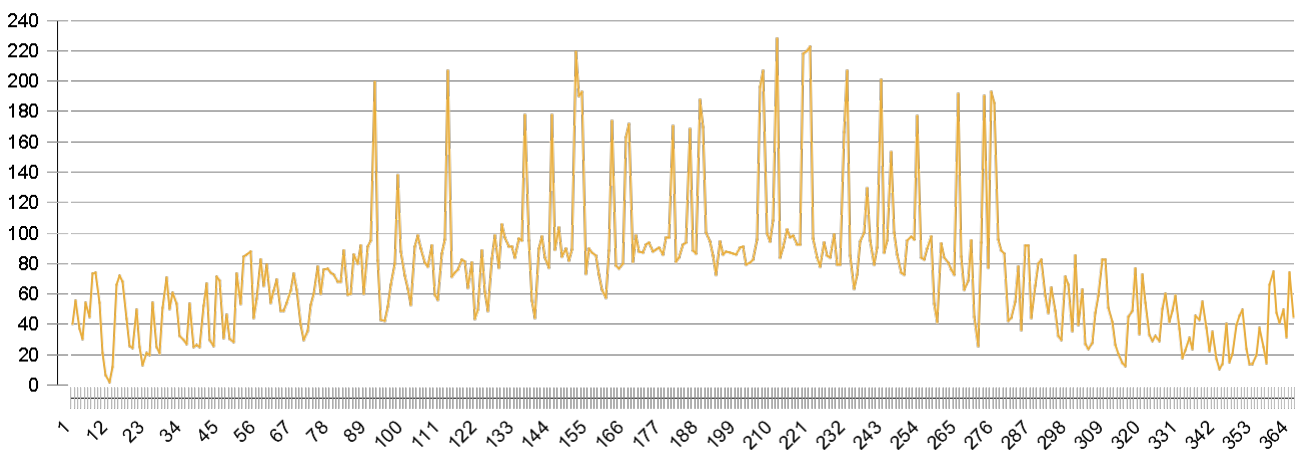
kWh	2601	122	127	166	230	286	293	327	324	279	205	124	118
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Heat loss to surroundings (without collector losses) [Qext]

kWh	435	19	25	38	46	49	51	56	49	42	28	18	14
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Collector

Daily maximum temperature [°C]



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Energy flow diagram (annual balance)

