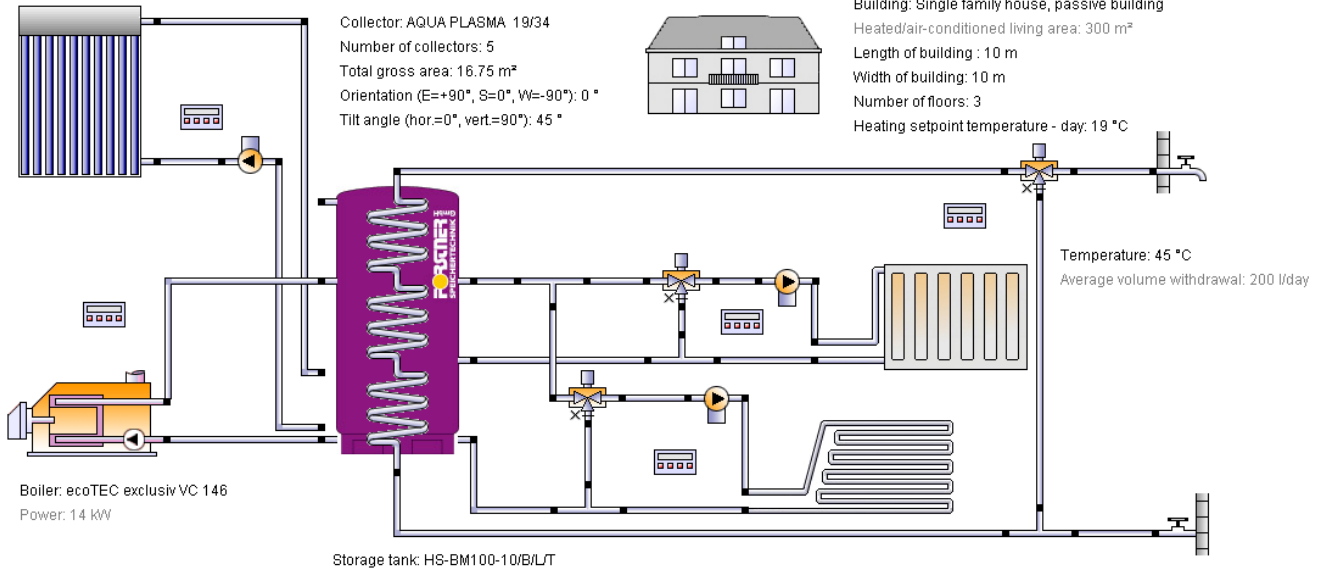


# Professional Report

## Project

## Forstner combi system with gas/pellets/oil



### Location of the system

### Map section

Rapperswil SG  
 Longitude: 8.82°  
 Latitude: 47.23°  
 Elevation: 417 m

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### This report has been created by:

Vela Solaris AG

### System overview (annual values)

Total fuel and/or electrical energy consumption of the system [E <sub>tot</sub> ]	1,909.2 kWh
Total energy consumption [Q <sub>use</sub> ]	5,056.9 kWh
System performance (Q <sub>use</sub> / E <sub>tot</sub> )	2.65
Comfort demand	Energy demand covered

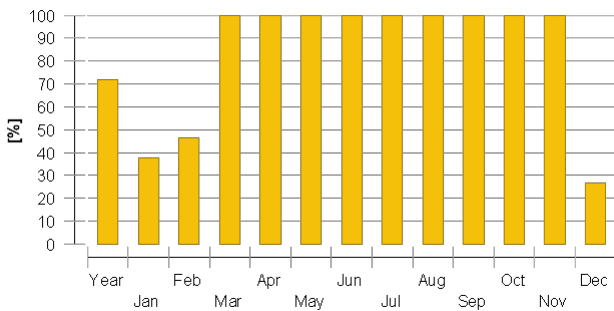
Demo Version

# Professional Report

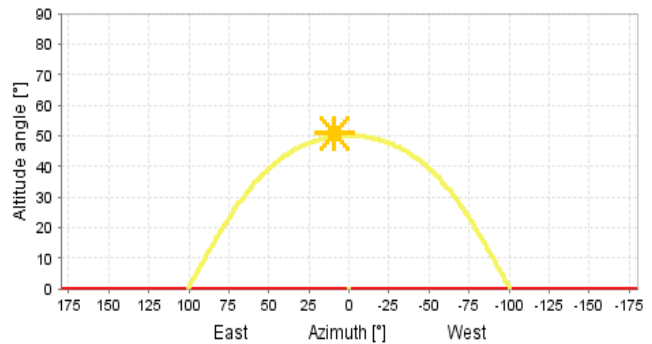
## Overview solar thermal energy (annual values)

Collector area	16.8 m <sup>2</sup>
Solar fraction total	71.7%
Solar fraction hot water [SF <sub>n</sub> Hw]	87.4 %
Solar fraction building [SF <sub>n</sub> Bd]	26.1 %
Total annual field yield	5,053.9 kWh
Collector field yield relating to gross area	301.7 kWh/m <sup>2</sup> /Year
Collector field yield relating to aperture area	336.9 kWh/m <sup>2</sup> /Year
Max. fuel savings	505.4 l: [Heating oil]
Max. energy savings	5,053.9 kWh
Max. reduction in CO <sub>2</sub> emissions	1,519.6 kg

Solar fraction: fraction of solar energy to system [SF<sub>n</sub>]



Horizon line



## Meteorological data-Overview

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

## Component overview (annual values)

Boiler	ecoTEC exclusiv VC 146	
Power	kW	14
Total efficiency	%	106
Energy from/to the system [Q <sub>aux</sub> ]	kWh	1,995.4
Fuel and electrical energy consumption [E <sub>aux</sub> ]	kWh	1,881.7
Energy savings solar thermal	kWh	5,053.9
CO <sub>2</sub> savings solar thermal	kg	1,519.6
Fuel savings solar thermal	l	505.4

# Professional Report

Collector	AQUA PLASMA 19/34	
Data Source		ITW
Number of collectors		5
Number of arrays		2
Total gross area	m <sup>2</sup>	16.75
Total aperture area	m <sup>2</sup>	15
Total absorber area	m <sup>2</sup>	15
Tilt angle (hor.=0°, vert.=90°)	°	45
Orientation (E=+90°, S=0°, W=-90°)	°	0
Collector field yield [Qsol]	kWh	5,053.9
Irradiation onto collector area [Esol]	kWh	18,542.5
Collector efficiency [Qsol / Esol]	%	27.3
Direct irradiation after IAM	kWh	9,586.2
Building	Single family house, passive building	
Heated/air-conditioned living area	m <sup>2</sup>	300
Heating setpoint temperature	°C	18.7
Heating energy demand excluding DHW [Qdem]	kWh	1,903.2
Specific heating energy demand excluding DHW [Qdem]	kWh/m <sup>2</sup>	6.3
Solar gain through windows	kWh	17,277.4
Total energy losses	kWh	30,720.8
Heating element 1	Floor heating	
Number of heating/cooling modules	-	9
Power per heating element under standard conditions	W	1,000
Nominal inlet temperature	°C	30
Nominal return temperature	°C	25
Net energy from/to heating/cooling modules	kWh	1,883.9
Heating element 2	Radiator	
Number of heating/cooling modules	-	9
Power per heating element under standard conditions	W	1,000
Nominal inlet temperature	°C	45
Nominal return temperature	°C	35
Net energy from/to heating/cooling modules	kWh	-0.001
Hot water demand	Constant	
Volume withdrawal/daily consumption	l/d	202.1
Temperature setting	°C	45
Energy demand [Qdem]	kWh	2,994.1

# Professional Report

Pump Solar loop	Eco, medium	
Circuit pressure drop	bar	0.021
Flow rate	l/h	600
Fuel and electrical energy consumption [Epar]	kWh	26

Pump Heating loop	Eco, small	
Circuit pressure drop	bar	0.008
Flow rate	l/h	804.1
Fuel and electrical energy consumption [Epar]	kWh	1.5

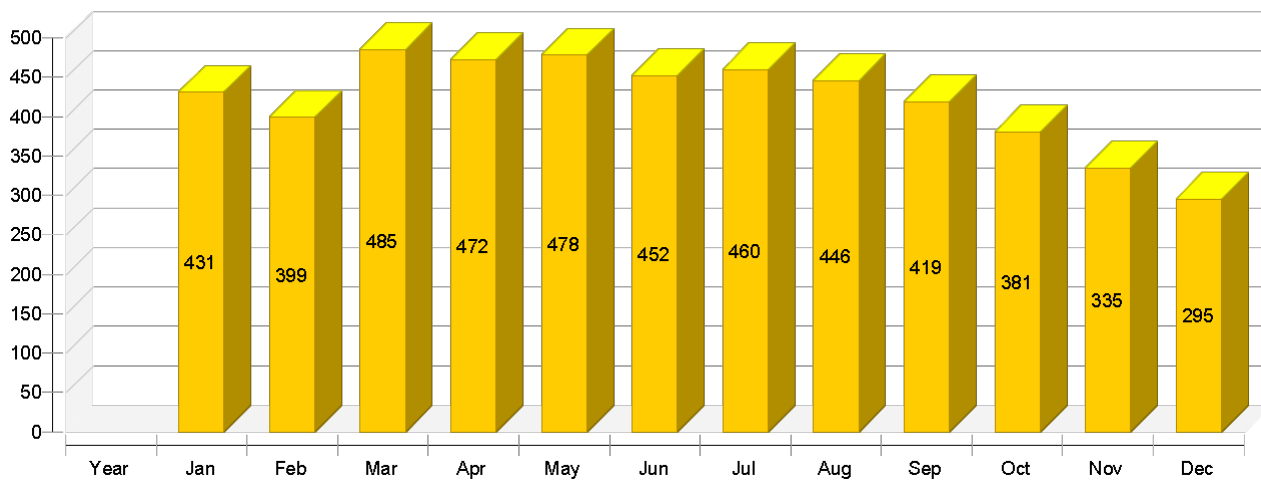
Storage tank	HS-BM100-10/B/L/T	
Volume	l	1,000
Height	m	1.92
Material		Steel
Insulation		Forstner PU-HS
Thickness of insulation	mm	110
Heat loss	kWh	791.4
Connection losses	kWh	333.8

## Loop

Solar loop		
Fluid mixture		Propylene mixture
Fluid concentration	%	33.3
Fluid domains volume	l	41.1
Pressure on top of the circuit	bar	4

## Solar thermal energy to the system [Qsol]

kWh

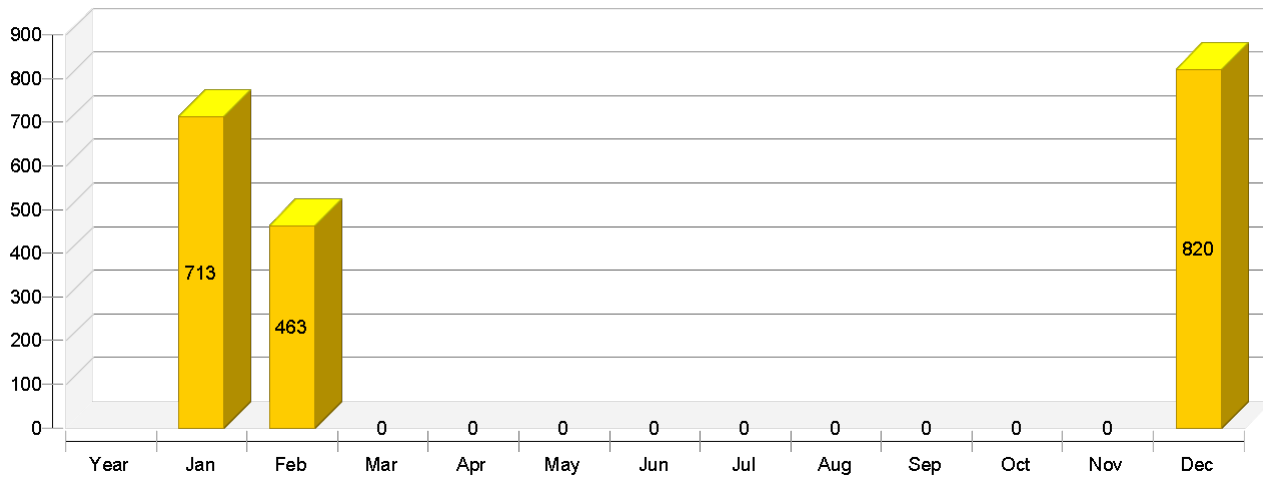


Demo Version

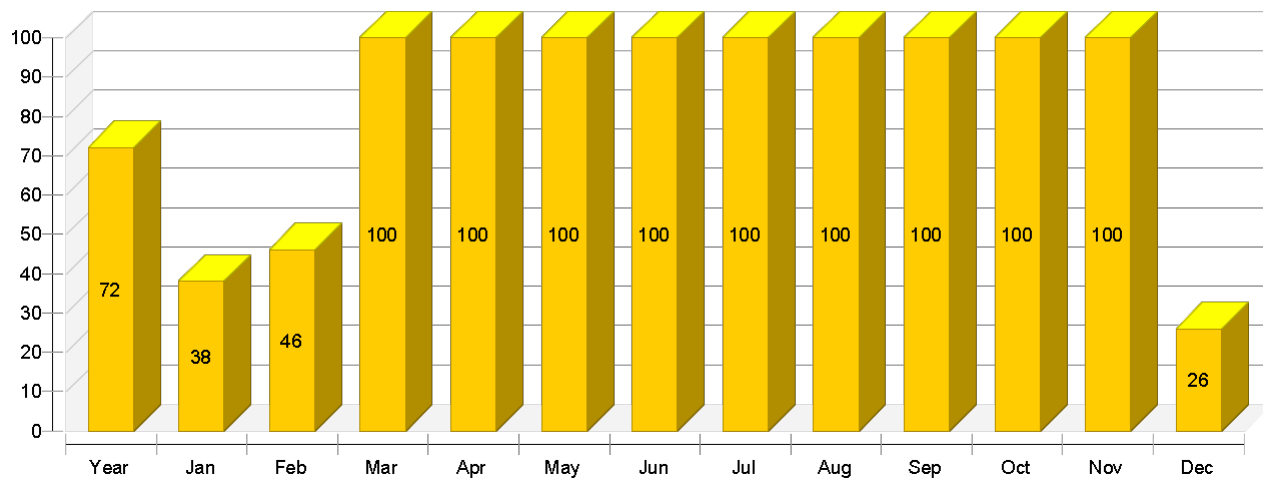
# Professional Report

Demo Version

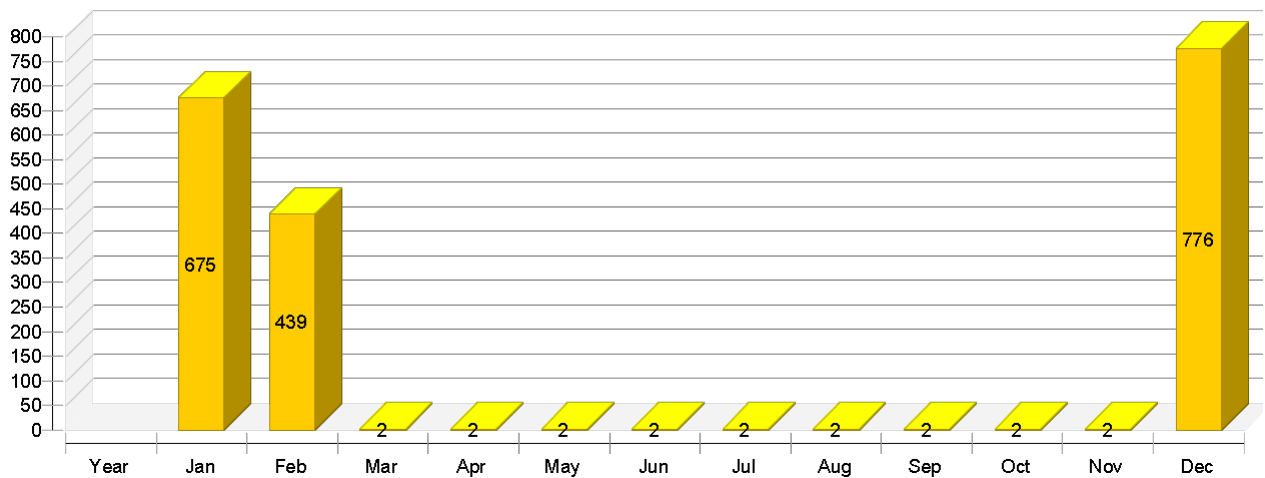
Heat generator energy to the system (solar thermal energy not included) [Qaux] kWh



Solar fraction: fraction of solar energy to system [SFn] %



Total fuel and/or electrical energy consumption of the system [Etot] kWh



# Professional Report

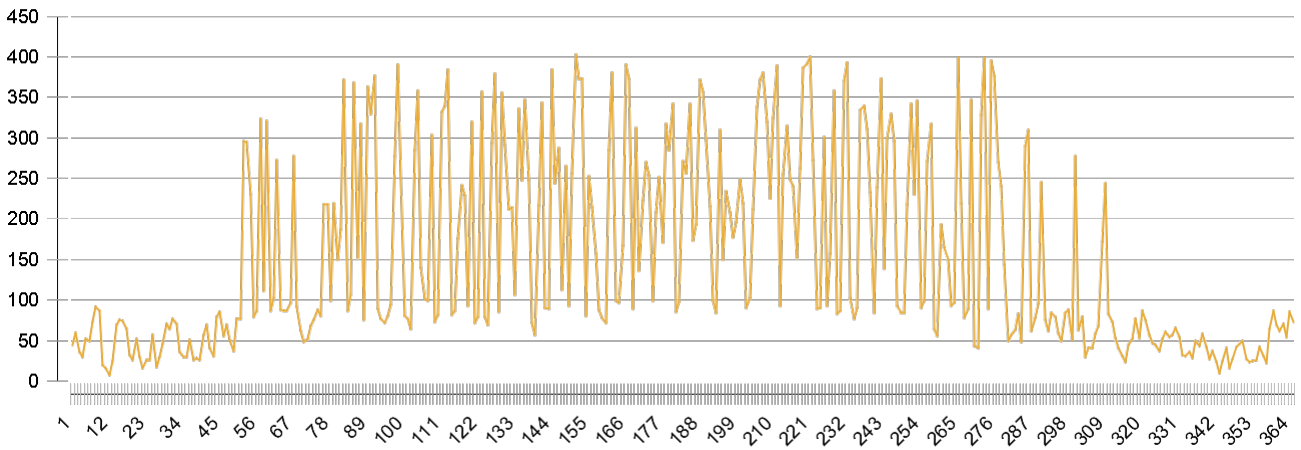
	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Solar thermal energy to the system [Qsol]</b>													
kWh	5054	431	399	485	472	478	452	460	446	419	381	335	295
<b>Heat generator energy to the system (solar thermal energy not included) [Qaux]</b>													
kWh	1995	713	463	0	0	0	0	0	0	0	0	0	820
<b>Heat generator fuel and electrical energy consumption [Eaux]</b>													
kWh	1882	672	436	0	0	0	0	0	0	0	0	0	773
<b>Solar fraction: fraction of solar energy to system [SFn]</b>													
%	71.7	37.7	46.3	100	100	100	100	100	100	100	100	100	26.4
<b>Total fuel and/or electrical energy consumption of the system [Etot]</b>													
kWh	1909	675	439	2	2	2	2	2	2	2	2	2	776
<b>Irradiation onto collector area [Esol]</b>													
kWh	18542	855	1081	1665	1897	2101	2047	2248	2188	1787	1279	772	623
<b>Electrical energy consumption of pumps [Epar]</b>													
kWh	28	3	3	2	2	2	2	2	2	2	2	2	3
<b>Total energy consumption [Quse]</b>													
kWh	5057	1029	719	294	277	274	252	250	243	235	251	256	976
<b>Heat loss to indoor room (including heat generator losses) [Qint]</b>													
kWh	1494	46	74	152	154	161	163	168	165	152	137	89	35
<b>Heat loss to surroundings (without collector losses) [Qext]</b>													
kWh	416	22	28	43	45	44	44	43	41	37	30	21	18

Demo Version

Demo Version

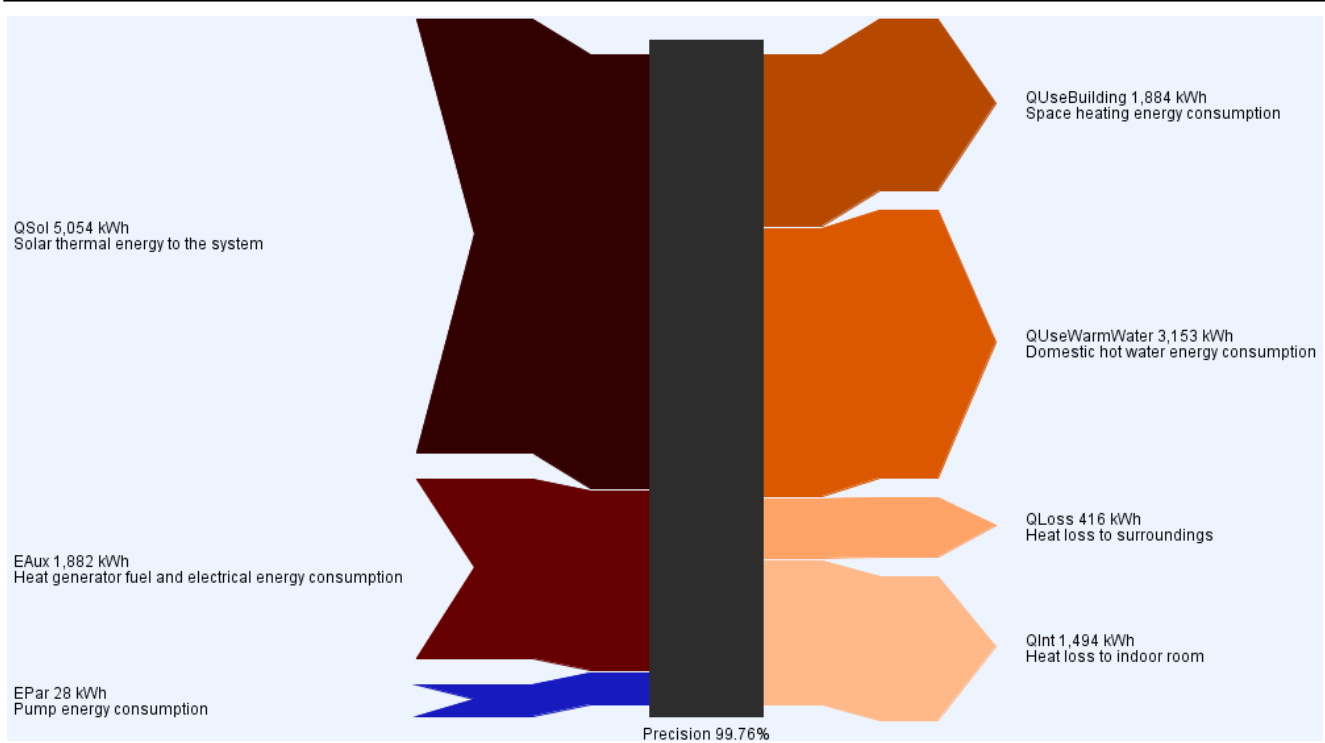
## Collector

Daily maximum temperature [ °C]



# Professional Report

## Energy flow diagram (annual balance)



Demo Version