



## Combisol project

Solar Combisystems Promotion and Standardisation

### D5.1: Standard form and procedure describing how to evaluate solar combisystems

Manual describing how to use this form:  
D5-1b\_CombiSol\_Evaluation-Procedure-SCS.doc

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**Intelligent Energy**  **Europe**

## To Do List for Checking a Solar Combisystem in Situ

1a

**Inspection 1: General A**

200801

Project: AT-

**GENERAL**



**Color indication means the following:**

- please take a photograph
- prepare a simple hand drawing for documentation
- please fill in **before (if possible)** in situ-inspection, but check it in situ!
- will be filled in automatically

**Project Data**

Project code: AT-

Address: [redacted]  
 Country: Austria  
 Number of persons in the household: 1  
 Gross floor area: [redacted] m<sup>2</sup>      Heated area: [redacted] m<sup>2</sup>  
 Altitude: [redacted] m      Latitude: [redacted] ° [redacted] '  
 Please indicate which standard was used to calculate it:

- Photo of the house is attached

**List of equipment to be taken along:**

- Documents about the system to be visited (hydraulic scheme, controller manual, system manual from installer/manufacture, ...)
- Camera
- Sliding gauge
- Measuring tape
- pH test strip
- Refractometer (or hydrometer or another device to determine the concentration of antifreeze)
- Temperature sensor for in situ measurements
- Tilt angle measurement device
- Compass
- Watch

Date: [redacted] Time: [redacted]  
 Inspected by: [redacted] (Person(s), Institute)  
 Contact person: Name: [redacted] Phone/email: [redacted]  
 Current weather situation: [redacted]

**2 Design data from the installer / house owner**

Space heating demand [redacted] kW at [redacted] °C (outdoor temp.)  
 Domestic hot water demand [redacted] l/day at [redacted] °C  
 Total energy consumption (for DHW and SH) [redacted] kWh/a

- 3 Is a maintenance manual on site ?  yes  no
- 4 Instruction manual for solar heating system exists?  yes  no
- 5 Did the owner sign a maintenance contract?  yes  no
- 6 Is a hydraulic scheme on site?  yes  no  
 Was the plant installed according to the attached scheme?  yes  no
- 7 Has the owner been instructed how to operate and maintain the system?  yes  no

**COMMENTS**

## To Do List for Checking a Solar Combisystem in Situ

**1b**

**Inspection 1: General B**

**200801**

Project: AT-



**GENERAL**

8 Customer feedback: His/her opinion / feeling about the situation

9 Purchased energy in kWh/a or EUR/a

	Type of fuel	before	after
		installing the solar combisystem	
Fuel 1			
Fuel 2			
Fuel 3			

- kWh/a
- EUR/a

10 Is there additional heating in the house (e.g tile stove, pellets stove, fireplace,...)

No     Yes, please specify  (fill in in table at pt. 9)

11 Any important historical facts about the heating system, please specify...

**COMMENTS**

## To Do List for Checking a Solar Combisystem in Situ

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### Inspection 2: Collector

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#### COLLECTOR

12 Collector Manufacturer: [Redacted]

13 Collector Model/Type: [Redacted]

Collector type: (Flat plate/vacuum tube)

14 Certification number/test center: [Redacted]

● 15 Total gross collector area: [Redacted] m<sup>2</sup>  Photo is attached

Total aperture area: [Redacted] m<sup>2</sup>

Number of collector modules: [Redacted]

16 Collector tilt angle: [Redacted] °

17 Collector orientation: [Redacted] ° (east = -90°, south = 0°, west = +90°)

● 18 Collector mounting:  Roof integrated  Photo is attached

On roof

Elevated on flat roof

Elevated on tilted roof

Elevated on the ground

Facade integrated

Other...please specify: [Redacted]

● 19 Details of collector mounting (materials, penetration of the roof construction): [Redacted]

Comments

Photo/drawing which shows shading of the collector (if applicable), is attached

20 Flow rate in collector loop: [Redacted] kg/h

Specific flow rate in collector loop (based on aperture area): #DIV/0! kg/(h m<sup>2</sup>)

Type of flow rate strategy:

Low flow

High flow

Matched flow

■ 21 Collector interconnection resulting in the collector field:

In parallel

In series

A combination of both

Sketch is attached

#### 22 Stagnation behaviour:

Emptying behavior of collector modules:  good  bad

Hydraulic layout of collector interconnection and piping:

Can liquid heat transfer medium get trapped in u-shaped loops?  yes  no

■  Sketch is attached (hydraulic layout of modules and piping)

23 **Material stress due to thermal expansion:** Does an expansion bend or a similar device exist to compensate thermal expansion of the pipes?  yes  no

●  Photo of the expansion bend(s) is attached

#### COMMENTS





## To Do List for Checking a Solar Combisystem in Situ

4

### Inspection 4: Secondary Collector Loop

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#### SECONDARY COLLECTOR LOOP

##### 42 Secondary collector loop pump

Product/type: [redacted]

Nominal electrical power: [redacted] W

Speed controlled pump

● Current switching status of the pump:

on

off

Photo of the pump (group) is attached

Pump speed setting: [redacted] level

Possible range: [redacted] level

Maximum pump hight according to the characteristic diagram of the pump: [redacted] kPa

43

Pressure according to the manometer (current value): [redacted] bar

44

Flow temperature (current value, if pump is in operation): [redacted] °C

45

Return temperature (current value, if pump is in operation): [redacted] °C

46

Dimension of **the pipes in the secondary collector loop**: [redacted] DN  
or [redacted] mm

● 47 Insulation of the pipes in the secondary collector loop:

Photo is attached

material: [redacted]

heat conductivity: [redacted] W/mK

thickness: [redacted] mm

quality of work: [redacted]

● 48 Is there any insulation of the fittings?

yes

no

Photo is attached

49 Approximate length of the secondary collector loop: [redacted] m

##### 50 Switching valve

Short description of the position, if it is not clearly shown in the scheme:

[redacted]

Current switching position of the valve: [redacted]

#### COMMENTS

[redacted]

## To Do List for Checking a Solar Combisystem in Situ

5a

Inspection 5: Heat store A

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### HEAT STORE

● 51 Special type of the heat store instead of pressurized water tank

no

Underfloor heating used as heat store

Tank open to the atmosphere

Other...please specify:

Photo of this special store is attached

52 Integrated burner?  no

53 If yes, what sort of integrated burner is that?

Natural gas

Heat pump

Fuel oil

Wood pellets

Other... please specify:

54 Total volume of the storage tank(s): l

55 Number of tanks:

●  Photo of the tank(s) is attached

56 Tank geometry:

Diameter of the tank (without insulation): cm

Height of the tank (without insulation): cm

Height to diameter ratio: : 1

### 57 Insulation of storage tank

Insulation material:

Heat conductivity: W/(m K)

Thickness of insulation: mm

Please describe the quality of work of the insulation:

### COMMENTS

## To Do List for Checking a Solar Combisystem in Situ

**5b**

**Inspection 5: Heat store B**

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**HEAT STORE**



**58 Pipe / sensor connections**

How many pipe connections does the storage tank have?   
 How many pipe connections are used?   
 Are the unused connections insulated?   
 How many sensor connections are used?

**59** Are there "thermosiphon breaks" on all warm connections of the storage tank?  yes  no  
 Photo of these "thermosiphon breaks" is attached

**60 Stratifying unit**

Are there stratifying units installed?  no  yes  
 If yes, in which hydraulic loop?   
 If yes, which type of stratifying unit?  Stratifying pipe which?   
 3-way valve   
 Other...please describe:

**61 Pipe connections of the storage tank**

In which height of the storage tank are the following connections located?

[Link to scetches](#)

		Height [mm]
Space heating circuit:	Flow line:	<input type="text"/>
	Return line:	<input type="text"/>
Collector circuit:	Flow line:	<input type="text"/>
	Return line:	<input type="text"/>
Auxiliary boiler circuit:	Flow line:	<input type="text"/>
	Return line:	<input type="text"/>
DHW circuit:	Flow line:	<input type="text"/>
	Return line:	<input type="text"/>
_____ circuit:	Flow line:	<input type="text"/>
	Return line:	<input type="text"/>

Comments:

Drawing with all pipe connections is attached

**62 Expansion vessel storage tank**

Nominal volume:  l Alternative: Diameter:  cm Height:  cm

Is the vessel partly filled with gas? (Please make a test by knocking)  yes  no

Check that there is no isolation valve between the expansion vessel and the store

ok  not ok

Which type of expansion vessel is used?  open  closed

**COMMENTS**



## To Do List for Checking a Solar Combisystem in Situ

7

### Inspection 7: Controller

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#### CONTROLLER

73 How many different controllers are installed?

	Which functions?	Manufacturer	Type
Controller #1			
Controller #2			
Controller #3			

**74 Instruction manual(s)**

Are instruction manual(s) for all controllers on site?  yes  no

Are the control values from the commissioning documented?  yes  no

Copy or photograph of this documentation is attached

**Control values**

75/76 Temperature difference between solar collector and the bottom of the storage tank...  
...at which the solar pump starts  K ...and stops  K

77 What collector temperature initiates overheating protection?  °C

What max. storage temperature stops solar pumps?  °C

78 Set temperature for turning auxiliary heater on  °C

Set temperature for turning auxiliary heater off  °C

79 Minimum running time of the burner  s

80 Set temperature for DHW draw-off  °C

**Further settings of controller**

81 Time schedule of DHW circulation pump

**82 Temperature sensors**

Sketch is attached

Sensor name / function	Sensor position	Position of sensor correct?
Collector temperature		<input type="checkbox"/>
Storage tank bottom		<input type="checkbox"/>
Storage tank top		<input type="checkbox"/>
Storage tank auxiliary volume		<input type="checkbox"/>
		<input type="checkbox"/>
		<input type="checkbox"/>
		<input type="checkbox"/>

83 Is there any controller protection against freezing of the external collector loop heat exchanger?  yes  no

**84 Description of space heating characteristic:** Flow temperature at .... outdoor temperature

Outdoor temperature	Space heating loop 1	Space heating loop 2	set room temp.
10°C			
0°C			
-10°C			

## To Do List for Checking a Solar Combisystem in Situ

**8**

### Inspection 8: Space Heating Loop

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#### SPACE HEATING LOOP

85 Number of space heating loops

86 Which kind of heat supply system is used?

Space heating circuit 1  (e.g. radiators, underfloor heating system,  
Space heating circuit 2  wall heating system, etc.)

87 **Design temperatures**

all values in °C	Design values		corresponding to		heated area
	Flow temp.	Return temp.	Outdoor temp.	Room temp.	m <sup>2</sup>
Space heating circuit 1	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>
Space heating circuit 2	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>

88 **Space heating pump**

Product / type

Nominal power of the pump  W

Switching status of the pump  on  off

**Current values (if pump is in operation)**

	Circuit 1	Circuit 2
89 Pressure according to manometer	<input type="text" value=""/> bar	<input type="text" value=""/> bar
90 Outdoor temperature	<input type="text" value=""/> °C	<input type="text" value=""/> °C
91 Flow temperature (in front of mixing valve)	<input type="text" value=""/> °C	<input type="text" value=""/> °C
92 Flow temperature (behind mixing valve)	<input type="text" value=""/> °C	<input type="text" value=""/> °C
93 Return temperature	<input type="text" value=""/> °C	<input type="text" value=""/> °C
94 Status of mixing valve for space heating	<input type="checkbox"/> completely open <input type="checkbox"/> half open, mixing <input type="checkbox"/> completely closed	<input type="checkbox"/> completely open <input type="checkbox"/> half open, mixing <input type="checkbox"/> completely closed

95 3-way switching valve in the space heating return line (if applicable)

Sketch showing the exact position / hydraulic connections, is attached (if not visible in the overall hydraulic scheme)

Switching valve is installed

Number of switching valves:  One switching valve per circuit  
 One switching valve for both circuits

Status of switching valve for space heating 1:  directly to boiler  to solar tank

Status of switching valve for space heating 2:  directly to boiler  to solar tank

96 Insulation of the pipes in the space heating loop: material:   
 Photo is attached heat conductivity:  W/mK  
thickness:  mm  
quality of work:

97 Is there any insulation of the fittings?  yes  no  Photo is attached

#### COMMENTS

## To Do List for Checking a Solar Combisystem in Situ

9

### Inspection 9: Auxiliary

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#### AUXILIARY

98 Type of auxiliary energy for space heating    
(e.g. natural gas, fuel oil, wood pellets, wood chips, heat pump, wood logs, electricity, etc.)

99 Product specification: Manufacturer, type number etc

●  Photo is attached  

100 Installed boiler capacity   kW

101 Is the boiler currently in operation  on  off

102 Can the boiler be switched off during summer?  automatically  manually  no

#### Current values

103 Pressure according to manometer   bar

104 Switching status of the pump  on  off

105 Flow temperature (in front of mixing valve)   °C (only if pump is in operation)

106 Return temperature (in front of mixing valve)   °C (only if pump is in operation)

107 Return temperature (behind mixing valve)   °C (only if pump is in operation)

108 Status of mixing valve for auxiliary boiler 0-100% open

Set temperature   °C

● 109 Insulation of the pipes in the boiler loop: material:    
 Photo is attached heat conductivity:   W/mK  
 thickness:   mm  
 quality of work:  

● 110 Is there any insulation of the fittings?  yes  no  Photo is attached

111 Set response pressure of the **pressure relief valve**:   bar

Check that there is no isolation valve between the pressure relief valve and the boiler:  ok  not ok  
 ●  Photo is attached

#### 112 Expansion vessel in the boiler loop

Nominal volume:   l *Alternative: Diameter/height:*   cm/cm

Which type of expansion vessel is used?  open  closed

Check that there is no isolation valve between expansion vessel and boiler  ok  not ok

Is the vessel partly filled with gas? (Please make a test by knocking)  yes  no

113 Is there an additional auxiliary heater in the solar combisystem? (e.g. electrical heating element in the tank beside the boiler)  
 If yes, which type, position and function in the system?  
 

#### COMMENTS

## To Do List for Checking a Solar Combisystem in Situ

I

**Main Data**

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Project: AT-

**MAIN DATA**



**Project Data**

Project code: Project: AT-

Country: Austria

Number of persons in the household: 0

Gross floor area: 0 m<sup>2</sup>      Heated area: 0 m<sup>2</sup>

Please indicate which standard was used to calculate it: 0

Please insert a photo of the house

**Agreement of the owner!!**

**Heat supply system for space heating**

Number of space heating loops: 0

Which kind of heat supply system is used?

Space heating circuit 1: 0

Space heating circuit 2: 0

Design values:

	Design values		corresponding to		heated area m <sup>2</sup>
	Flow temp.	Return temp.	Outdoor temp.	Room temp.	
Space heating circuit 1	0	0	0	0	0
Space heating circuit 2	0	0	0	0	0

**Auxiliary Boiler**

Type of auxiliary energy for space heating: 0

Installed nominal boiler capacity: 0 kW

**General**

**Site data:**

Space heating demand: 0 kW

Total energy consumption (for domestic hot water and space heating): 0 kWh/year

Is there any additional heating in the house?  
(e.g. fireplace, tile stove, pellet stove,...) 0

## To Do List for Checking a Solar Combisystem in Situ

**II**

### Key data of the system

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#### KEY DATA OF THE SYSTEM

##### Collector

Collector Type: (Flat plate, vacuum tube)

Total gross collector area:  m<sup>2</sup>

Collector tilt angle:  °

Collector orientation:  ° (east =-90°, south=0°, west=+90°)

##### Primary collector loop pump

Dimension of the pipes in the primary collector loop:

Set response pressure of the pressure relief valve:  bar

##### Expansion vessel

Nominal volume

Is there a drain-back system installed?

##### Heat store

Total volume of the storage tank(s)  l

Number of tanks

Nominal volume of the expansion vessel storage tank

##### Preparation of Domestic Hot Water (=DHW)

Type of DHW preparation:

Does hot water circulation exist?

##### Controller

How many different controllers are installed?

		Which functions?
Controller #1	<input type="text"/>	<input type="text" value="0"/>
Controller #2	<input type="text"/>	<input type="text" value="0"/>
Controller #3	<input type="text"/>	<input type="text" value="0"/>

## To Do List for Checking a Solar Combisystem in Situ

IIIa

Photos A

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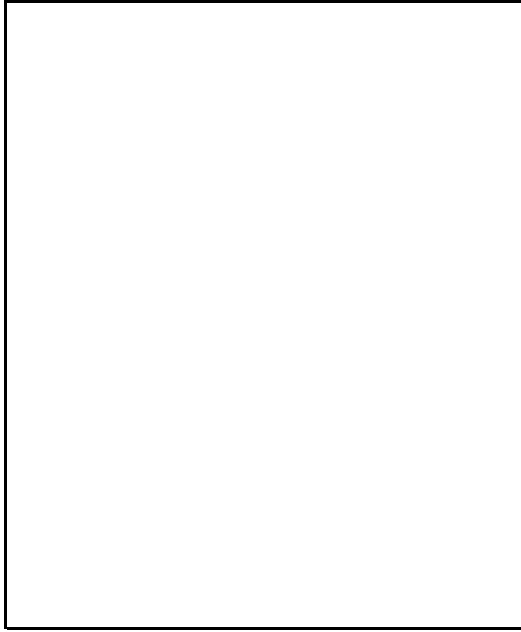


Photo of the panels

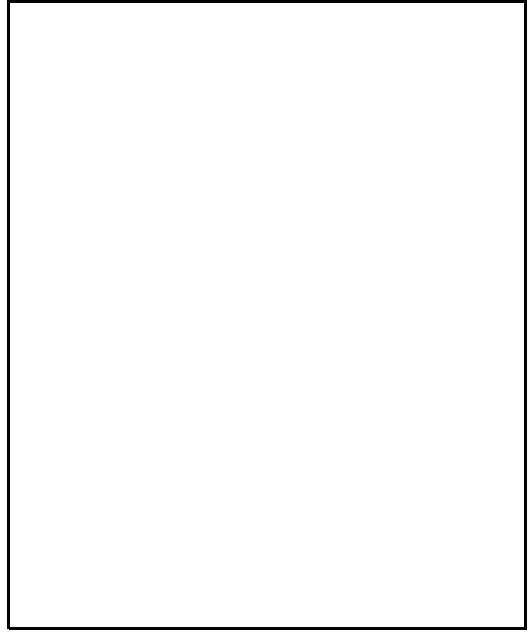


Photo of pump group (primary/secondary solar loop)

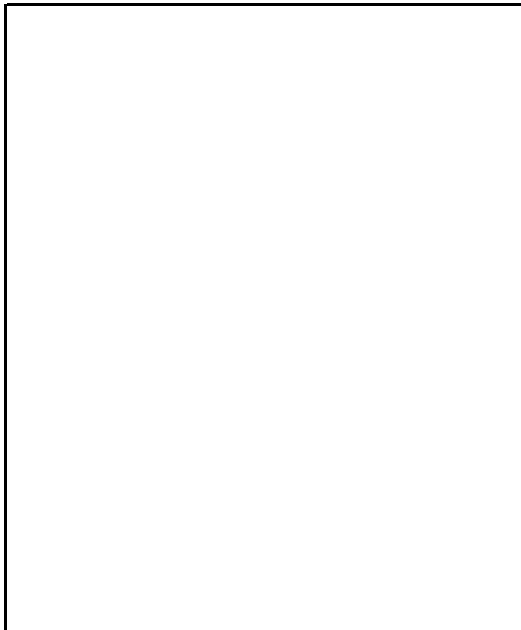


Photo of pump group (primary/secondary solar loop)

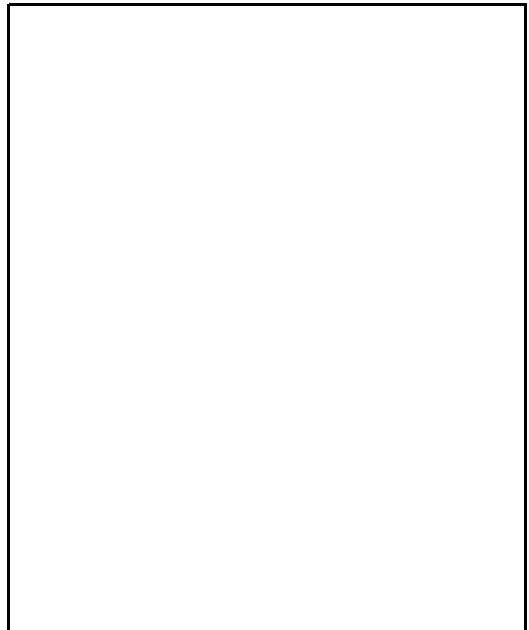


Photo of storage tank(s)

## To Do List for Checking a Solar Combisystem in Situ

IIIb

Scheme - Photos B

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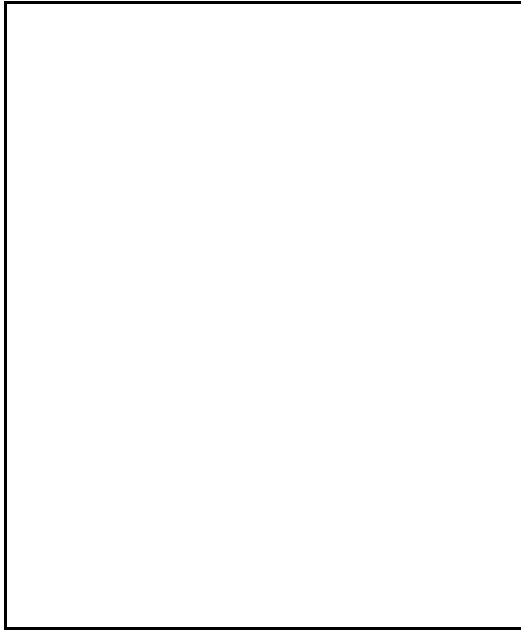


Photo of DHW preparation unit (if existing)

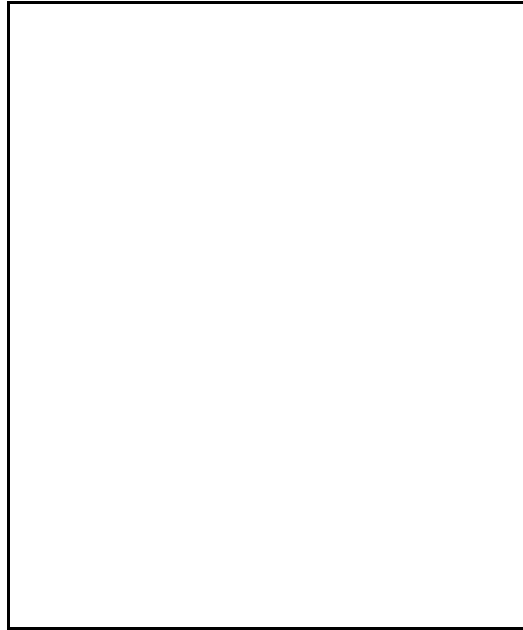


Photo of auxiliary boiler



Hydraulic scheme