Learning situation "Planning, commissioning and operation of a solar thermal system"

In this learning module, the installation and commissioning of a solar thermal system is planned for the energy-efficient heat supply of a new residential building and common and exemplary fault patterns of solar thermal systems are worked out.

Skills from different professions are required to solve the problems described in the modules. In order to successfully complete the learning module, skills from different professions are required. For this reason, the traditional skills of one trade are supplemented by skills from other trades.

The learning module is divided into a main module and two optional sub-modules in order to achieve the targeted competences and develop the technical content. There is an assignment for each module, which is divided into several subtasks that are worked on by the learners over several hours.

The learning modules are organised as follows:

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Main module:

"Planning and commissioning a solar thermal system"

Contents:

- Mechanical and electrical components and functions of the solar thermal system
- Creation of a functional diagram of the mechanical and electrical components of the solar thermal system

Time: approx. 6 hours

Level: EQF 4

The following teaching objectives are pursued in the main module:

- Familiarisation with the interfaces between the trades.
- Understand the most important mechanical and electrical elements of a solar thermal system and their functions.
- Learn how to professionally visualise a solar thermal system (electrical and mechanical) and analyse manufacturer documentation.
- Selection of the connection cable (number of cores, cable types if necessary)

Submodule 1: **Final commissioning of the solar thermal system**	**Submodule 2:** **Problem and conflict resolution on the solar thermal system**

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Contents: - Checking the electrical safety devices (RCD, MCB) - Function test of the solar thermal system using actuator test and function test Time: approx. 4 hours EQF 4	Contents: - Problem 1: Stuck solar pump due to corrosion - Problem 2: lack of system heating - Problem 3: Fault in the power supply Time: approx. 14 hours EQF 4

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Teaching Sequence Main modules	Description and Material Short description and Link to pdf`s/digital tools/etc.	How to use? Methodical and didactic explanations (approx. 10 sentences as a first orientation) + link to further documentation if applicable (pdf's)
Introductory scenario	**Introduction of the main learning situation (e.g.)** *You have been commissioned to ensure the hot water supply of a residential building in a remote location with a solar thermal system. A plant mechanic and an electrician are sent to the project site for the installation.* *A photovoltaic system has already been installed on the building, providing a reliable power supply. Drinking water is drawn from a domestic well that is fed with spring water.* *Their task is to plan the installation of the solar thermal system and to commission the system after installation.*	✓ This learning situation is aimed at electricians or mixed classes of electricians and plumbers. ✓ The students are divided into interdisciplinary groups in which they work together. If plumbers and electricians are in the same class, they have the opportunity to learn from each other. ✓ If it is not possible to mix the two trades, they can also be taught separately, with the information materials of the other trade being made available. ✓ Previous mechanical knowledge: - Basic mechanical knowledge of hydraulic components (pipes, pumps, etc.) - Basic knowledge of heat transfer (radiation, conduction)

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		- Basic knowledge of hydraulics (transport of heat transfer medium by pump) ✓ Basic electrical knowledge: - Basic knowledge of electrical safety devices (MCB, RCD) - Basic knowledge of connecting electrical components (sensors, pumps, control unit...) See "1.3 Main module - Solar thermal order" **Procedure:** 1) The teacher introduces the situation and organises the groups. 2) In their groups, the learners consider how the assignment will be processed and develop an initial idea of the scope of the assignment. 3) Collection of ideas in plenary and agreement on a common approach as well as the quality and scope of the product to be created (functional diagrams).

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Tasks	**Procedure:** 1) Information on the function and structure of a solar thermal system Duration: 0.75h 2) Inspection of the operating documents for the solar thermal system and reference book documents. Selection and compilation of the required information by the trainees Duration: 0.75h 3) Creation of an overview diagram in which the basic mechanical and electrical components are professionally represented Duration: 0.5h 4) Calculation of the electrical connected load and selection of suitable safety devices (RCD, circuit breaker) Duration: 0.5h	✓ The aim is to independently create a functional diagram with the electrical and mechanical components within the individual groups. ✓ The learners inform themselves using the information materials provided and the specialised literature on the various trades. ✓ The teacher is available to answer questions and provide assistance during the independent work phase. Possible questions are discussed within the groups and the learners support each other, especially with subject-specific questions. ✓ The functional diagram is a visualisation of the components of the solar thermal system and its electrical and mechanical (functional) connections. The standard symbols used in technical communication must be used when creating the diagram.

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		✓ Individual products are developed in the individual groups. These should contain the basic components of the solar thermal system, such as collector, solar pumps, collector sensor, heat storage tank and electrical equipment. ✓ A sketch is sufficient for the presentation if no further objectives are pursued in the lesson with regard to the correct presentation / creation of functional diagrams. In strong learning groups, the learners can sketch the diagrams of the other trade. In this phase, the learners give each other hints and tips for the correct and meaningful presentation of the functional diagram. ✓ Standard reference books and manufacturer documentation for the respective region and nation should be used as information material. In this way, the regional differences in the various construction methods of the solar thermal system (with/without

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		frost protection; with/without central heating backup) can be taken into account. ✓ A possible solution can be found under the following link: ✓ Left: - 1.1 Main module - solar thermal order - 1.2 Main module - solar thermal order Horizon of expectations
Presentation and	5) The groups present their products to each other, add to and/or correct them as required and agree on a joint or corrected system diagram. Possible questions or ambiguities are uncovered and documented. Duration: 0.75h 6) Individual groups present their products for discussion in plenary as required. Duration: 0.5h	Re 5) ✓ If the groups are split to compare the products, half of the group switches to another group and presents their own products to the new group members. ✓ For the assessment, the newly formed groups are given a checklist with assessment criteria with which the products of the other groups are assessed. This enables the learners to check the

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	7) Collection of possible questions, discrepancies and/or additional topics from phase 5) in a topic memory. Duration: 0.25h	products and provide feedback on the quality and completeness of the products based on the criteria. ✓ This gives learners the opportunity to check their own learning progress and to correct the products of the new group members (after the change). This helps weaker learners to present their products in a small "protected" circle and compare them with other products. This gives individuals the confidence to present their products to the whole group in the following phase. ✓ Left: - 1.3 Main module - Criteria checklist Product evaluation
Reflection/evaluation	8) In the student-teacher dialogue, the learners collect the possible problems from the previous phases of the learning situation. The interfaces and performance limits between the trades are also discussed with regard to the aforementioned objectives of the learning situation.	Re 9) ✓ Working individually and looking back at the previous content, the learners create a functional description of the solar thermal system.

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	Duration: 0.5h 9) To reflect on their own level of knowledge, learners create a functional description using the most important components of the solar thermal system. Duration: 1,5h	✓ This phase enables learners to review their own learning progress and close any final gaps in their knowledge. ✓ The learners can coordinate quietly with the other learners or turn to the teacher.

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Learning situation
"Planning, installation and commissioning of a solar thermal system"

Source: fobizz AI-generated

Main module: Planning the solar thermal system

Initial scenario

You have been commissioned to ensure the hot water supply of a residential building in a remote location with a solar thermal system. A plant mechanic and an electrician are sent to the project site for the installation.

A photovoltaic system has already been installed on the building, providing a reliable power supply. Drinking water is drawn from a domestic well that is fed with spring water.

Their task is to plan the installation of the solar thermal system and to commission it after installation.

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Order 1.1)

Find out about the components and their structure and function of the solar thermal system. Use the product documentation of the (common) manufacturers for this.

Order 1.2)

In preparation for planning the installation of the solar thermal system, create a professional diagram in which the following points are to be shown:

- the most important components of the solar thermal system.
- Labelling of the electrical connection data, such as power, voltage and amperage as well as the number of electrical conductors required

Order 1.3)

Select suitable components for the main power distribution of the holiday home for electrical protection.

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Learning situation

"Planning, installation and commissioning of a solar thermal system"

Source: fobizz AI-generated

Main module: Planning the solar thermal system

Initial scenario

You have been commissioned to ensure the hot water supply of a residential building in a remote location with a solar thermal system. A plant mechanic and an electrician are sent to the project site for the installation.

A photovoltaic system has already been installed on the building, providing a reliable power supply. Drinking water is drawn from a domestic well that is fed with spring water.

Their task is to plan the installation of the solar thermal system and to commission it after installation.

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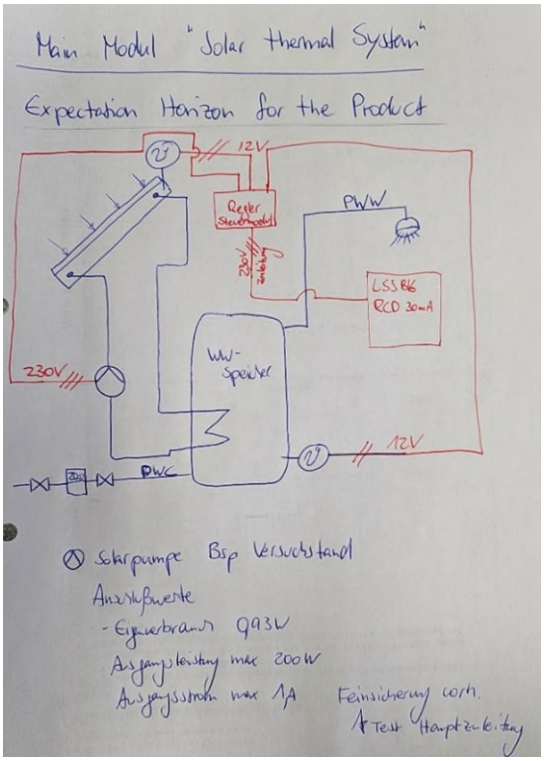
Order 1.1)
Find out about the components and their structure and function of the solar thermal system. Use the product documentation of the (common) manufacturers for this.

Order 1.2)
In preparation for planning the installation of the solar thermal system, create a professional diagram in which the following points are to be shown:

- the most important components of the solar thermal system.
- Labelling of the electrical connection data, such as power, voltage and amperage as well as the number of electrical conductors required

Possible solution of the students:



Order 1.3)
Select suitable components for the main power distribution of the holiday home for electrical protection.

Possible solution: Circuit breaker B10A or B16A depending on the cross-section of the connecting cable; RCD with 30mA

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Main module: Planning the solar thermal system

Source: fobizz AI-generated

Criteria for evaluating the products

Criterion	Fulfilled	Not fulfilled
Shown components of the solar thermal system:		
- Solar pump in the feed pipe to the collector		
- Collector with flow and return pipe		
- Hot water tank with solar heat exchanger		
- Temperature sensor on the collector (collector sensor)		
- Temperature sensor in the bottom of the hot water tank		
- Solar control module / controller		
Electrical connection cables from the solar control module...		
- ...for solar pump, 3-wire, 230V		
- ...to the solar control module, 3-wire 230V		
- ...to the collector sensor, 2-wire, 12V		
- ...to the storage tank sensor, 2-wire, 12V		
Other criteria		
- All components are clearly displayed		
- Clean sketch		
- ...		

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Submodule 1: Final Integration Testing and Commissioning --> The role of electrician/plumber and Workflow Coordination

In this learning module, the installation and commissioning of a solar thermal system is planned for the energy-efficient heat supply of a new residential building and common and exemplary fault patterns of solar thermal systems are worked out.

Skills from different professions are required to solve the problems described in the modules. In order to successfully complete the learning module, skills from different professions are required. For this reason, the traditional skills of one trade are supplemented by skills from other trades.

The learning module is divided into a main module and two optional sub-modules in order to achieve the targeted competences and develop the technical content. There is an assignment for each module, which is divided into several subtasks that are worked on by the learners over several hours.

The learning modules are organised as follows:

Main module:

"Planning and commissioning a solar thermal system"

Contents:

- Mechanical and electrical components and functions of the solar thermal system
- Creation of a functional diagram of the mechanical and electrical components of the solar thermal system

Time: approx. 6 hours

Level: EQF 4

The following teaching objectives are pursued in the main module:

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- Familiarisation with the interfaces between the trades.
- Understand the most important mechanical and electrical elements of a solar thermal system and their functions.
- Learn how to professionally visualise a solar thermal system (electrical and mechanical) and analyse manufacturer documentation.
- Selection of the connection cable (number of cores, cable types if necessary)

Submodule 1: **Final commissioning of the solar thermal system**	**Submodule 2:** **Problem and conflict resolution on the solar thermal system**
Contents: - Checking the electrical safety devices (RCD, MCB) - Function test of the solar thermal system using actuator test and function test Time: approx. 4 hours EQF 4	Contents: - Problem 1: Stuck solar pump due to corrosion - Problem 2: lack of system heating - Problem 3: Fault in the power supply Time: approx. 14 hours EQF 4

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Teaching Sequence	Description and Material Short description and Link to pdf`s/digital tools/etc.	How to use? Methodical and didactic explanations (approx. 10 sentences as a first orientation) + link to further documentation if applicable (pdf's)
Introductory scenario	**Introduction of the learning situation (e.g.)** *In the meantime, the solar system has been fully installed, now only the final commissioning and electrical test are still pending.* *Create a checklist of the* work to be carried out and the tools required at . Use the technical documentation available for the solar thermal system and your specialist documentation for information. Duration: 0.5h	✓ This learning situation is aimed at electricians or mixed classes of electricians and plumbers. ✓ The students are divided into interdisciplinary groups in which they work together. If plumbers and electricians are in the same class, they have the opportunity to learn from each other. ✓ If it is not possible to mix the two trades, they can also be taught separately, with the information materials of the other trade being made available. ✓ Prior knowledge: The learning content of the main module "Planning and commissioning a solar thermal system" See "2.1 Submodule - Commissioning order"

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		Procedure: 1) The teacher introduces the situation and organises the groups. 2) In their groups, the learners consider how the assignment will be processed and develop an initial idea of the scope of the assignment 3) Collection of ideas in plenary and agreement on a common approach as well as the quality and scope of the product to be created (checklist).
Tasks	**Procedure:** 10) Inspection of the operating documents for the solar thermal system and reference book documents. Selection and compilation of the required information by the trainees. Duration: 1,0h 11) Create a table (checklist) or enter the information from step 1) and determine the sequence of the work steps.	✓ The aim of this teaching phase is for the individual groups to create the checklist independently. ✓ The learners inform themselves using the information materials provided and the specialised literature on the various trades. ✓ The teacher is available to answer questions and provide assistance during the independent work phase. Possible questions are discussed within the

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	Duration: 0.5h	groups and the learners support each other, especially with subject-specific questions. ✓ The checklist to be created is an overview of the steps required for the electrical commissioning of the solar thermal system. The list should also be used to work out the limits of the performance boundaries of the trades, but also the possible interfaces between them. ✓ Individual products are developed in the individual groups. These should show the most important work steps, tools and assignment of the work step of the respective trade. ✓ The apprentices from the two trades work together to create the checklist and jointly determine a sensible sequence of activities. ✓ Standard reference books and manufacturer documentation, as well as statutory regulations and standards of the respective region and nation

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		should be used as information material. In this way, the regional differences in the various designs of the solar thermal system (with/without frost protection; with/without central heating backup) can be taken into account with regard to the electrical commissioning of the system. ✓ A possible solution can be found under the following link: ✓ Left: - 2.1 Submodule - Commissioning Commissioning expectations
Presentation	12) One group presents its products in plenary, projecting them onto the board. The other groups give strength-orientated feedback and jointly derive suggestions for improvement. Duration: 0.5h 13) The learners return to the groups and complete and correct the checklists as required	

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	Duration: 0.5h	
Assessment	14) The products are collected and assessed by the teacher.	to 5) The most important criterion for the assessment is the sensible sequence of the work steps and the allocation of tasks to the two trades.
Reflection/evaluation	15) The learners draw up a joint checklist in plenary in a student-teacher discussion. Possible differences, advantages and disadvantages of the various approaches are discussed and weighed up. Duration: 1,0h 16) Clarification of remaining questions 17) Agreement on the most important steps for the final commissioning of a solar thermal system with clarification of responsibilities (who is authorised to do what?) Duration: 0.5h	

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Submodule 1: final commissioning of the solar thermal system

Source: fobizz AI-generated

Initial scenario

The solar system has now been fully installed and all that remains is the final commissioning and electrical inspection.

Create a checklist of the tasks to be completed and the necessary tools. Use the existing technical documentation of the solar thermal system and your specialised materials as a reference.

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Order 2.1)
Find out about the measurements required for the electrical testing of the solar thermal system. Limit yourself to the metrological testing of the miniature circuit breaker and residual current circuit breaker.

Order 2.2)
Create a checklist that can be used for commissioning a solar thermal system. The checklist must clearly state the order in which the individual work steps are to be carried out. It must also state who is authorised to carry out the measurement and what qualifications the person must have.

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Submodule 1: final commissioning of the solar thermal system

Source: fobizz AI-generated

Initial scenario

The solar system has now been fully installed and all that remains is the final commissioning and electrical inspection.

Create a checklist of the tasks to be completed and the necessary tools. Use the existing technical documentation of the solar thermal system and your specialised materials as a reference.

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Order 2.1)
Find out about the measurements required for the electrical testing of the solar thermal system. Limit yourself to the metrological testing of the miniature circuit breaker and residual current circuit breaker.

Order 2.2)
Create a checklist that can be used for commissioning a solar thermal system. The checklist must clearly state the order in which the individual work steps are to be carried out. It must also state who is authorised to carry out the measurement and what qualifications the person must have.

Model solution:

No.	Description of the activity	Who?	Miscellaneous
1	Implementation of the 5 safety rules for electrical work.	AM / E	Duspol
2	Inspection of the solar pump: - Checking the electrical connection - Checking if the cable cross-section matches the electrical power of the pump - Disconnecting the pump from the control unit	E	
3	Inspection of the control unit: - ...	E	
4	Inspection of the collector sensor: - ...	E	
5	Switching on the main system	AM / E	
6	Checking for possible error messages	AM	
7	Performing the actuator test by activating the listed components	AM	
8	Checking the system function by assessing various operating states (depending on feasibility and weather conditions)	AM	

Legend:
AM = System Mechanic
E = Electrician

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Submodule 2: Problem solving on a solar thermal system

In this learning module, the installation and commissioning of a solar thermal system is planned for the energy-efficient heat supply of a new residential building and common and exemplary fault patterns of solar thermal systems are worked out.
Skills from different professions are required to solve the problems described in the modules. In order to successfully complete the learning module, skills from different professions are required. For this reason, the traditional skills of one trade are supplemented by skills from other trades.
The learning module is divided into a main module and two optional sub-modules in order to achieve the targeted competences and develop the technical content. There is an assignment for each module, which is divided into several subtasks that are worked on by the learners over several hours.
The learning modules are organised as follows:

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Main module:

"Planning and commissioning a solar thermal system"

Contents:

- Mechanical and electrical components and functions of the solar thermal system
- Creation of a functional diagram of the mechanical and electrical components of the solar thermal system

Time: approx. 6 hours

Level: EQF 4

The following teaching objectives are pursued in the main module:

- Familiarisation with the interfaces between the trades.
- Understand the most important mechanical and electrical elements of a solar thermal system and their functions.
- Learn how to professionally visualise a solar thermal system (electrical and mechanical) and analyse manufacturer documentation.
- Selection of the connection cable (number of cores, cable types if necessary)

Submodule 1: **Final commissioning of the solar thermal system**	**Submodule 2:** **Problem and conflict resolution on the solar thermal system**
Contents: - Checking the electrical safety devices (RCD, MCB) - Function test of the solar thermal system using actuator test and function test Time: approx. 2 hours EQF 4	Contents: - Problem 1: Stuck solar pump due to corrosion - Problem 2: lack of system heating - Problem 3: Fault in the power supply Time: approx. 14 hours EQF 4

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Teaching Sequence	Description and Material Short description and Link to pdf`s/digital tools/etc.	How to use? Methodical and didactic explanations (approx. 10 sentences as a first orientation) + link to further documentation if applicable (pdf's)
Introductory scenario	**Introduction of the learning situation (e.g.)** *In the meantime, the solar thermal system has been fully installed, tested for function and put into operation. After one year, you carry out maintenance on the solar thermal system. You realise that the solar pump is malfunctioning (see message below!). When removing the pump, you notice that the pump is stuck and that the solar fluid has changed considerably. The pH value of the solar fluid has dropped to pH=4.* *When asked, the customer describes the operation of the system since commissioning:* - *The first summer was very warm with many hours of sunshine. On many summer days, there was more solar heat available than the customer could use. The system therefore often switched off even though the sun was shining.*	✓ This learning situation is aimed at electricians or mixed classes of electricians and plumbers. ✓ The students are divided into interdisciplinary groups in which they work together. If plumbers and electricians are in the same class, they have the opportunity to learn from each other. ✓ If it is not possible to mix the two trades, they can also be taught separately, with the information material of the other trade being made available. ✓ Prior knowledge: The learning content of the main module "Planning and commissioning a solar thermal system" See "3.1 Submodule - Troubleshooting order" **Procedure:** 4) The teacher introduces the situation and organises the groups.

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	- *The following winter there were very few hours of sunshine, so the system was not in operation over the winter months.* *Your job is to describe to the customer in writing how the poor condition of the system could have come about. You also give the customer a list of tips on how to minimise these problems in the future.* Duration: 0.5h	5) In their groups, the learners consider how the assignment will be processed and develop an initial idea of the scope of the assignment 6) Collection of ideas in plenary and agreement on a common approach as well as the quality and scope of the product to be created (tips for the customer to improve system operation).
Tasks	**Procedure:** 18) Inspection of information material on the solar thermal system and textbook documents. Selection and compilation of the required information by the trainees. Duration: 1,0h 19) Creation of a description of the effects of solar radiation on the condition of the solar pump 20) Development of possible recommendations for action for the customer for the long-term improved utilisation of solar thermal energy and avoidance of stagnation. Duration: 1,0h	✓ The aim of this teaching phase is for the individual groups to work independently on the assignment. ✓ The learners inform themselves using the information materials and specialised literature provided. ✓ The teacher is available to answer questions and provide assistance during the independent work phase. Possible questions are discussed within the groups and the learners support each other, especially with subject-specific questions. ✓ The description of the causes of corrosion and changes to the heat transfer medium can be created in the form of a list or in a continuous text using technical terms ✓ In addition to the causes of the stagnation, the individual description of the groups should also

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		include suitable measures taken by the customer to avoid it. ✓ Standard textbooks for system mechanics and the information materials provided should be used for information. This learning situation can be used in regions with medium to high solar irradiation, in which outside temperatures < 0°C prevail in the winter months, so that antifreeze must be used as a heat transfer medium in the solar thermal system. ✓ In order to take into account further regional differences, additional information materials would have to be supplemented by the teachers concerned as required. ✓ The documents for this learning module can be found under the following link: Left: "3.1 Submodule - Troubleshooting order" "3.1 Submodule - Troubleshooting assignment Expectation horizon" "3.1 Submodule - Glycol info"
Presentation	21) One group presents its product in the plenary session, which is projected onto the board. The other groups give	

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	strength-orientated feedback and jointly derive suggestions for improvement. Duration: 0.5h 22) The learners return to the groups and complete and correct their products as required Duration: 0.5h	
Assessment	23) The products are collected and assessed by the teacher. Alternatively, the content of the entire learning situation can be tested in a written examination.	to 6) The evaluation should take into account the use of technical terms and the number of meaningful suggestions.
Reflection/evaluation	24) The students discuss the limits of solar thermal energy in a student-teacher dialogue. 25) Clarification of remaining questions. Duration: 0.5h	Re 7) ✓ Possible problems with the dimensioning of the solar thermal system can be discussed. For example, it could be discussed that, on the one hand, the customer wants to generate the highest possible solar yield, but on the other hand, the system should not be dimensioned too large in order to avoid too frequent stagnation. ✓ Furthermore, the following aspects can be integrated in this phase with a view to sustainability: - Conservation of resources through long-term utilisation of the heat transfer medium.

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		- Compliance with environmental regulations for the handling and disposal of glycol. - Improved utilisation of solar gains through adapted usage behaviour.

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Submodule 2: Problem and conflict resolution on the solar thermal system

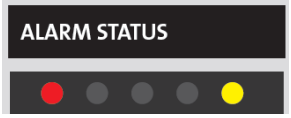
➔ The solar pump no longer delivers solar fluid

Initial scenario

In the meantime, the solar thermal system has been fully installed, tested for function and put into operation. After one year, you carry out maintenance on the solar thermal system.

You realise that the solar pump is malfunctioning (see message below!). When removing the pump, you notice that the pump is stuck and that the solar fluid has changed considerably. The pH value of the solar fluid has dropped to pH=4.

Source: Viessmann (2008) Solar thermal planning manual, https://community.viessmann.de/viessmann/attachments/viessmann/customers-solar/139/1/Planungshandbuch%20Solarthermie.pdf; accessed 25.02.2025



Source: Grundfos (2020) Instructions UPM3(K) Auto

<u>When asked, the customer describes the operation of the system since commissioning:</u>

-

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- The first summer was very warm with many hours of sunshine. On many summer days, there was more solar heat available than the customer could use. The system therefore often switched off even though the sun was shining.
- The following winter, there were very few hours of sunshine, so the system was not in operation over the winter months.

Your job is to describe to the customer in writing how the poor condition of the system could have come about. You also give the customer a list of tips on how to minimise these problems in the future.

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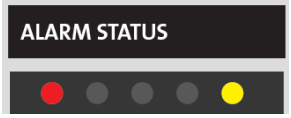

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Possible solution:

Description of the cause:

According to the customer's description, the weather was very good in the summer of the first year of operation, with many hours of sunshine. During this time, the solar heat could often not be fully utilised, which meant that the solar thermal system often went into stagnation. As a result, the solar collector heat transfer medium evaporated, causing the water-glycol mixture to change colour, structure and pH value (acidic with pH<7). The acidic liquid caused corrosion in the system, causing the pump to "rust solid".

Possible solutions:

To avoid or at least reduce stagnation in the summer months, I would recommend the customer to adapt their usage behaviour. For example, it would make sense to use the hot water when the sun is shining and the solar heat gains are high.

This would allow the customer to shower/bathe at midday or in the evening when the sun is strong, instead of in the morning when the cylinder has cooled down. It would also be possible to connect the washing machine and dishwasher to the hot water and also use these appliances, possibly with the timer function, during periods of strong sunlight. This cools down the heat storage tank and counteracts possible stagnation.

It would also be possible to shade the collectors for longer periods without heat demand, e.g. when the customer is on holiday.

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Submodul 2: Problem and Conflict Resolution in Solar Thermal Systems

➔ The solar pump no longer circulates the solar fluid

Information – Water-Glycol Mixture

The heat transfer fluid in the solar circuit transports heat from the collector to the hot water storage tank. In the pipes of the solar collector (absorber), it heats up and transfers the heat to the domestic hot water in the storage tank via the heat exchanger. When the storage tank is fully charged, no additional solar energy can be absorbed. In this case, the solar pump switches off, and the heat transfer fluid remains stationary in the collector. Since the sun continues to heat the collector, the fluid evaporates. During this stagnation, the highest temperatures and pressures occur in the solar system.

To prevent the heat transfer fluid from freezing in winter and damaging the pipes, a water-glycol mixture is used as antifreeze. However, this mixture degrades over time. A basic buffering keeps the pH value stable (> 7.0) to prevent corrosion in the solar circuit. Under normal conditions, the heat transfer fluid lasts up to ten years but should be regularly checked for pH levels.

High temperatures (from 170 °C) can break down (“crack”) glycol, leading to acid formation and increased corrosion. Oxygen in the system accelerates this process and can cause deposits in the solar circuit. Scientific studies show that leaky systems with oxygen ingress are more problematic than high temperatures due to stagnation.

For systems with long idle periods, such as in solar heating support, an annual inspection is recommended. Maintenance contracts should clearly address these aspects.

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