English

Installation, use, maintenance manual - DualSun pressurized systems

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1. Introduction

1.1. General safety instructions

Please read this installation manual thoroughly and in detail in order to be able to fully exploit the functionality of the product. DualSun disclaims all liability for defetcs and damages that would result from non-compliance with the installation instructions (improper use, incorrect installation, handling error, etc.).

IMPORTANT

- It is important to follow these instructions for personal safety. Improper mounting may cause serious injury. The end user must keep these safety instructions.
- The installation, control, commissioning, maintenance and repair of the installation must only be carried out by qualified personnel.
- The correct functioning of the installation is only guaranteed if the installation and assembly have been carried out in accordance with the rules of the art.

CAUTION

- The entire solar installation must be installed and operated in accordance with recognized technical rules.
- All electrical work must be done according to local guidelines.
- The installation must not be used if it shows signs of damage.

DANGER

- For installations on roofs, it is necessary to comply with personal safety standards, relating to roofing and waterproofing work and relating to scaffolding work with safety net by mounting the respective devices before starting work . Refer to the recommendation published by the national risk prevention organization.
- Gloves are compulsory when handling the panels to avoid any risk of injury or burns.
- Disconnect all connection cables from the power supply before working on the installation.

1.2. General standards to be observed

To ensure safe, ecological and economical operation, all applicable regional and national standards, rules and directives must be observed, particularly the international standards mentioned below:

1.2.1. Photovoltaic solar standards

- CEI / EN 61215 1 and 2: Design qualification and approval of crystalline silicon photovoltaic (PV) modules for terrestrial application.

- CEI / EN 61730 1 and 2: Qualification for dependability of photovoltaic (PV) modules - part 1: Requirements for construction and part 2: requirements for tests.

1.2.2. Solar thermal standards

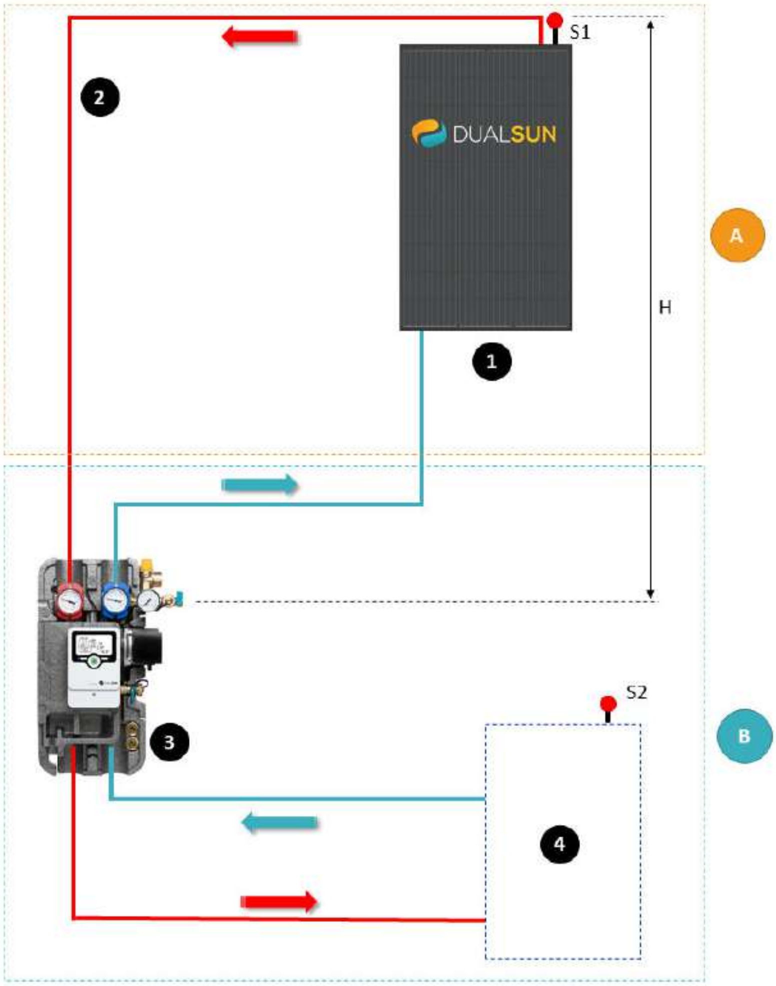
- EN 12975 1 and 2: General requirements and control method for solar thermal collectors.
- EN 12976 1 and 2: General requirements and process for testing prefabricated solar thermal installations.

The installation instructions and safety instructions must be met.

Observe the regulations on the prevention of industrial accidents prescribed by professional associations, in particular those relating to work carried out on the roof.

2. Definition of a pressurized solar thermal system

In a pressurized solar thermal system, the solar circuit is a closed hydraulic loop.



A. See Installation, use, maintenance manual DualSun SPRING downloadable from DualSun online library

B: Part concerned by this manual, for installations equipped with a DualSun SLL solar station.

(1) = DualSun SPRING hybrid solar panels

(2) = Transfer lines

(3) = DualSun SLL solar station

(4) = Heat transfer device

H = Distance in meters between the highest point of the installation and the manometer of the solar station

This manual details the installation steps of the elements placed in the technical room as well as the commissioning steps of a pressurized solar thermal circuit.

The Installation, use, maintenance manual DualSun SPRING details the installation of the panels on roofs and the connection of the hydraulic transfer lines between the roof and the technical room

This chapter details:

2.1. Operating principle of a pressurized solar thermal system

A pressurized solar thermal installation is a solar process involved in, partly, preheating and covering the domestic hot water needs of a building or the heating needs of a swimming pool, etc.

The installation is made up of three main parts, as shown in the block diagram, see Definition of a pressurized solar thermal system [6]:

- **Solar panels**: They transform solar radiation into heat, the heat transfer fluid (mixture of water and antifreeze) circulates inside. The primary loop is filled with antifreeze liquid which protects the installation regardless of the climatic zone.
- **The solar station** : It ensures the transport of energy, via the heat transfer fluid, from the solar panels to the thermal transfer device. The station comprises in particular the circulator (or the pump) as well as the associated regulation. The temperature controller activates the solar circuit circulation pump when the panel temperature is higher than that of the heat transfer device.
- **The thermal transfer device**: This may be:
  - A domestic hot water calorifier, by means of a heat exchanger incorporated in the storage, enables the domestic hot water to be raised in temperature for its future use. The back-up can be separate or integrated into the storage tank, or
  - A tubular or plate heat exchanger. This heat exchanger can:
    - Return the heat recovered by the primary circuit to the medium to heat (for example heating a swimming pool)
    - Transfer the heat recovered by the primary circuit to a secondary circuit (for example heat pump, boiler, cascade of storage tanks, etc.)

2.2. Components of a pressurized solar thermal system

2.2.1. The DualSun SPRING hybrid panel

DualSun SPRING is a new generation hybrid solar panel that provides both electricity (photovoltaic) and hot water (thermal) for homes.

Protected by several patents, the SPRING panel produces 2.5 times more energy than a photovoltaic panel of the same surface. This innovative technology saves space and total integration on the roof, at a competitive energy cost.

Our technology is the result of a double observation on photovoltaic panels:

- They produce much more heat (80%) than electricity (20%) when exposed to the sun,
- Their yield decreases when their temperature increases.

The SPRING panel thus absorbs solar energy to restore it in the form of two energies useful for the operation of buildings:

- Electricity through photovoltaic cells,
- Heat via a heat exchanger, completely integrated into the panel. This heat is captured at the DualSun SPRING panel exchanger by a heat transfer fluid. The latter transports the heat to the heat transfer device, which restores the calories of the heat transfer fluid to thermal storage or directly to the tank to be heated.

Thanks to a vertically integrated design of the photovoltaic and thermal components in a single panel (protected by 3 families of patents), the SPRING panel is specifically designed for optimized industrial manufacturing, making it more efficient, more aesthetic and cheaper than competitors.

Having the same shape as a conventional photovoltaic panel, the SPRING offers:

- A harmonious design and total integration into the roof,
- A real space saving thanks to a more efficient solar panel per m²,
- Simple and safe installation.

1. **Photovoltaic solar cells** : monocrystalline, high efficiency, they are cooled by the circulation of water
2. **Heat exchanger** : fully integrated into the panel, it allows excellent heat transfer between the photovoltaic front panel and the circulation of water.

For more details on the DualSun SPRING panel, you can consult the following chapters of the Installation, use, maintenance manual DualSun SPRING:

- Technical characteristics of the DualSun SPRING panel
- Recommended hydraulic flow rates for the DualSun SPRING panel
- Maximum allowable pressures for the DualSun SPRING panel

2.2.2. DualSun SLL solar station

- **Transfer group**

  The transfer group is a compact unit composed of a circulator (or pump), valves with non-return valve, safety valve, pressure gauge and flowmeter. It is used to fill the installation with heat transfer fluid and, in operation, to convey the fluid through the solar installation. The volume flow is calculated and modulated by the solar regulation according to the temperature difference between the panels and the thermal transfer device

- **SLL solar control**

  The solar regulation allows the control and the modulation of the speed of rotation of the circulator. Several temperature probes can be connected to it.

  A potential-free relay (R4) is fitted to the DualSun SLL regulation for controlling a back-up.

  A telemetry measurement box can be connected to the regulation, allowing remote configuration and monitoring of the installation.

2.2.3. The DualSun T-Box KM2 telemetry box (Optional)

The DualSun T-Box KM2 telemetry box allows:

- Monitoring of your thermal production in real time
- Remote setting of solar control to minimize any field interventions

Its installation is simple:

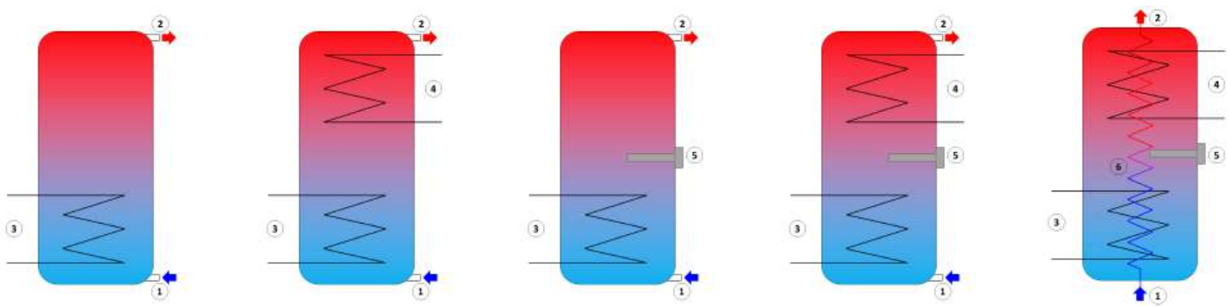
- Power supply via wall plug
- Connection with solar control by 2-wire cable
- Connection with the internet router by RJ45 cable, PLC or Wi-Fi

2.2.4. The thermal transfer device

- **Hot water storage tank**

  Different types of tank for the production of domestic hot water:

Without back-up | **Hydraulic back-up** | **Electrical back-up** | **Hydraulic + electrical back-ups**



Simple solar tank | **Bi-energy solar tank** | **Tri-energy solar tank** | **Tank with fresh water exchanger**

(1) = Cold water inlet

(2) = Hot water outlet

(3) = Bottom tank solar exchanger

(4) = Hydraulic back-up exchanger (ex: boiler)

(5) = Electrical back-up (resistance)

(6) = Fresh water exchanger

- **Solar thermodynamic water heaters**

  These water heaters are part of the hydraulic back-up storage tanks.

  They have two submerged exchangers. A lower heat exchanger connected to the solar installation. The second exchanger connected to the air-water monobloc heat pump of the thermodynamic water heater. This exchanger is most often located in the lower part as well, which requires controlling the thermodynamic back-up so as not to degrade the solar supply.

  The heat pump improves electrical efficiency by drawing calories from the ambient air to produce domestic hot water. This technology makes it possible to significantly reduce electricity bills, however the technical room accommodating the thermodynamic balloon must thus be large enough so that the air in the vicinity is not too cooled.

- **Plate heat exchangers**

  In some cases, a plate heat exchanger allows heat to be transferred between solar panels and large volume reservoirs, such as swimming pools, or to thermal machines such as heat pumps.

3. Installation of solar components

3.1. Installation of the DualSun SPRING hybrid panel

The installation steps of the DualSun SPRING hybrid solar panel are detailed in the Installation, use, maintenance manual DualSun SPRING downloadable from DualSun online library.

Sizing:

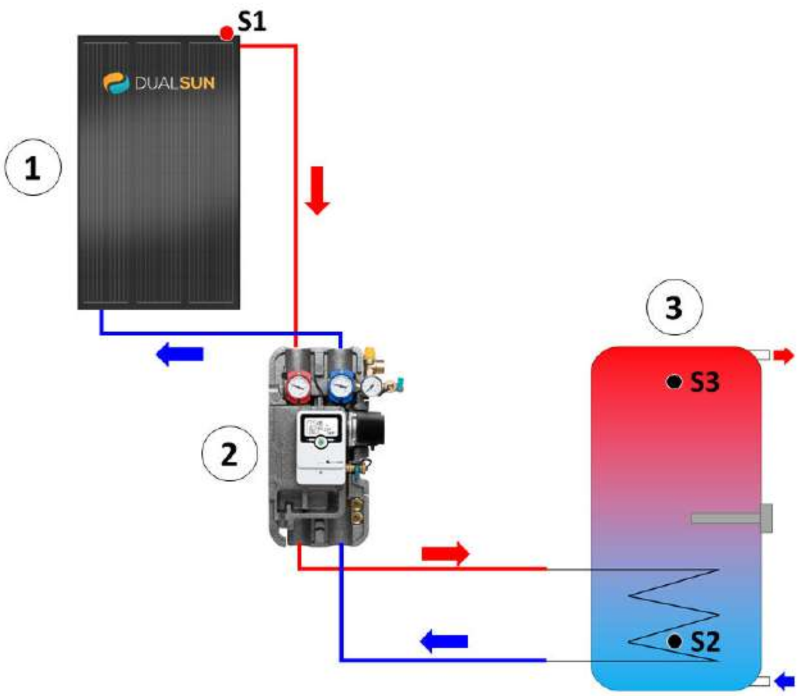
The sizing of the number of panels depends mainly on the space available for their installation, the consumption profile to be covered and the geographical area. The online simulator MyDualSun allows you to determine the number of panels required according to the parameters of the installation to be carried out.

3.2. Installation of the heat transfer device

In a solar thermal installation, the thermal transfer devices have the role of exchanging heat between different reservoirs or media in order to:

- Store the heat in a solar tank for direct use of domestic hot water: see Presentation of an individual solar water heater installation - ISWH [11]
- Store the heat in a solar tank for direct use of domestic hot water and restore the excess heat: see Presentation of a ISWH pool discharge installation [12]
- Discharge the heat to a reservoir for indirect use: geothermal probes, swimming pool, etc.

3.2.1. Presentation of an individual solar water heater installation - ISWH



(1) = DualSun SPRING hybrid solar panels

(2) = DualSun SLL solar station

(3) = Solar tank

(S1) = Panel temperature sensor

(S2) = Bottom tank temperature probe (to be placed at the lowest)

(S3) = Top tank temperature probe (if thermal monitoring with T-Box)

* Expansion vessel not required, see chapter 2 of the document Installation, use, maintenance manual DualSun SPRING downloadable from DualSun online library

The choice of the tank depends on the size of the household, the space available in the technical room, the desired comfort (need for + or - powerful back-up), the presence of a back-up (gas boiler, wood), etc ... :Quick sizing of a solar water heater [12]

3.2.1.1. Quick sizing of a solar water heater

- Domestic hot water (DHW) requirement:

50L of hot water at 50 ° C / person

Source: Solar water heater in individual housing, design and sizing, July 2013, ADEME - France

- Solar tank with internal backup:

Tank volume = 1.5 x DHW requirement x Number of people in the household

- Solar tank with external back-up (upstream of a boiler for example):

Tank volume = DHW requirement x Number of people in the household

The choice of solar tank is the responsibility of the installer, who must consider the above verification elements to meet the needs of the end customer.

NOTE

See the installation instructions for the chosen solar tank

3.2.2. Presentation of a ISWH pool discharge installation

When a residence is equipped with a swimming pool, it is particularly interesting to install a solar system making it possible to heat both domestic hot water and swimming pool water.

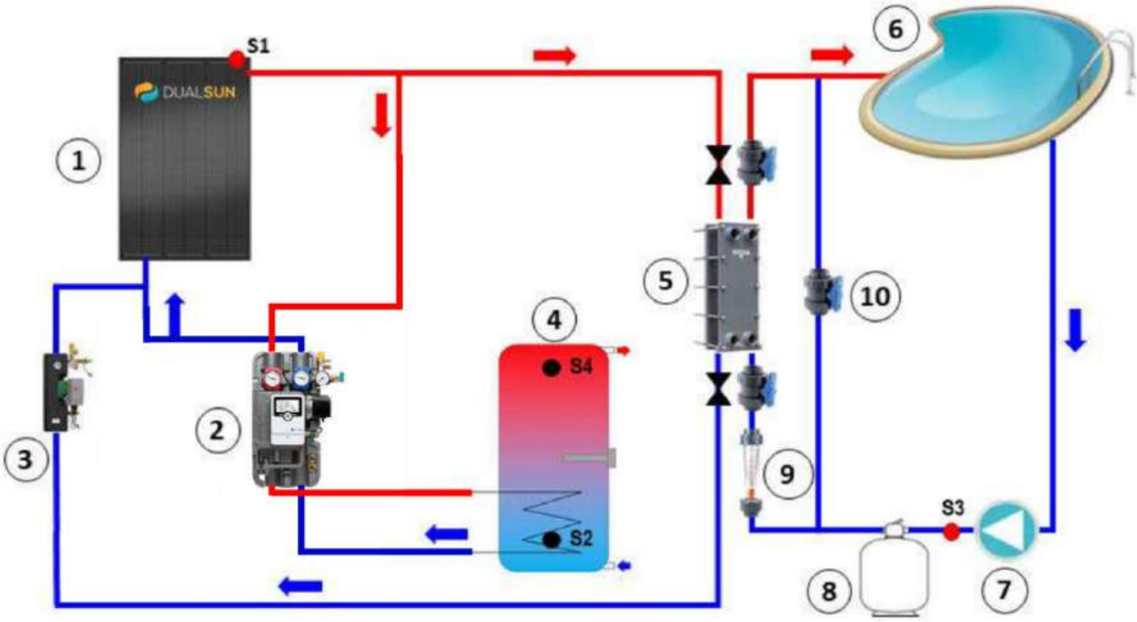
Indeed, the domestic hot water needs are inversely proportional to the average outside temperature. Domestic hot water needs are significantly lower in summer than in winter.

If the solar tank is less used during warm seasons, thermal discharge to a swimming pool is an excellent solution for optimizing the overall efficiency of the solar installation, extending the swimming period and increasing the thermal comfort of the swimming pool.

The large volume of water in the swimming pool represents a very important storage towards which all the solar energy can be restored. The limited temperature of the swimming pool water, generally 30 ° C, also makes it possible to cool the DualSun SPRING hybrid solar panels all the more efficiently and thus improve their photovoltaic efficiency.

The production of electricity from the SPRING panels can be directly consumed to supply the swimming pool filtration pump.

Composition of the pool discharge kit:



(1) = DualSun SPRING hybrid solar panels

(2) = DualSun SLL solar station - Solar tank loop - Pump R1

(3) = Pool discharge solar station - Pool loop - Pump R2

(4) = Solar tank

(S1) = Panel temperature probe

(S2) = Bottom tank temperature probe (to be placed at the lowest)

(S4) = Top tank temperature probe (if thermal monitoring with T-Box)

* Expansion vessel not required, see chapter 2 of the document Installation, use, maintenance manual DualSun SPRING downloadable from DualSun online library

(5) = Pool plate heat exchanger

(6) = Swimming pool

(7) = Pool filtration pump

(8) = Sand filter

(9) = Pool filtration loop flowmeter

(10) = Flow rate adjustment bypass valve

(S3) = Swimming pool temperature probe (applied to the piping)

Pool discharge accessories kit:

- 1 x Grundfos UPM3 Solar 25-75 pump unit (R2 pump + flowmeter + filling valve + drain valve)
- 1 x S3 probe: FKP23 on surface with 316 stainless steel clamp for 50 mm pipe
- 1 x female screw cap with fiber gasket on pressure gauge connection (3), see chapter Installation of the hydraulic transfer unit for the pool discharge loop [29]
- 2 x male / male reduction to be screwed on the pipe connections of the swimming pool discharge hydraulic transfer unit

- 2 x male / male ball valve to be installed near the pool discharge heat exchanger for its isolation
- 2 x straight multilayer crimp fitting / female free nut to screw on the pipe fittings of the pool discharge hydraulic transfer unit.

Pool discharge bypass kit:

- 1 x Flowmeter on swimming pool filtration loop: D40
- 2 x 50/40 PVC pressure reduction for mounting the flowmeter
- 3 x Shut-off and regulation valve (By-pass) DN50

The pool plate heat exchanger and its 2 isolation valves are not supplied by DualSun

The sizing of the solar tank is the same as for an Individual Solar Water Heater (ISWH) installation, see chapter Quick sizing of a solar water heater [12]

3.2.2.1. Quick sizing of a heat exchanger for ISWH pool discharge installation

It is recommended to choose a titanium heat exchanger, or at least 316 stainless steel to guarantee a long service life with chlorinated water.

Sizing of the heat exchanger:

The calculation of the minimum heat exchanger power to ensure good heat transfer is based on the solar energy collection power. The thermal power of DualSun SPRING panels should be retained at 25 ° C = 950.

$$P_{exchanger} \text{ [kW]} = \text{[Number\_panels x Power\_SPRING\_Panel] / 1000}$$

Number of SPRING panels	5	10	15	20	25	30	35	40
Minimum heat exchanger power [kW]	4,8	9,5	14,3	19	23,8	28,5	33,3	38

Adjustment of the flow rates in the heat exchanger:

Inlet flow rate (solar side) = 100 L / h / panel x Number_panels = Outlet flow rate (pool side)

See the following chapters for detailed flow rate settings:

- Adjustment of the operating pressure and flow rate of the swimming pool discharge solar circuit [48]
- Adjusting the flow rate of the heat exchanger - Pool side [50]

3.3. Installation of the DualSun SLL solar station

Presentation of the DualSun SLL solar station [16]

Fastening the DualSun SLL solar station [21]

ISWH wiring of the DualSun SLL solar controller [21]

ISWH wiring for pool discharge of the DualSun SLL solar control [22]

In which case is it necessary to control the back-up so as not to hamper the operation of the solar installation? [22]

Parameter setting of the OPARR parallel relay option of the DualSun SLL solar controller [26]

Factory settings of the DualSun SLL solar controller [27]

Optional parameters of the DualSun SLL solar controller [29]

3.3.1. Presentation of the DualSun SLL solar station

The DualSun SLL solar station is the central component of any pressurized solar installation. It allows to:

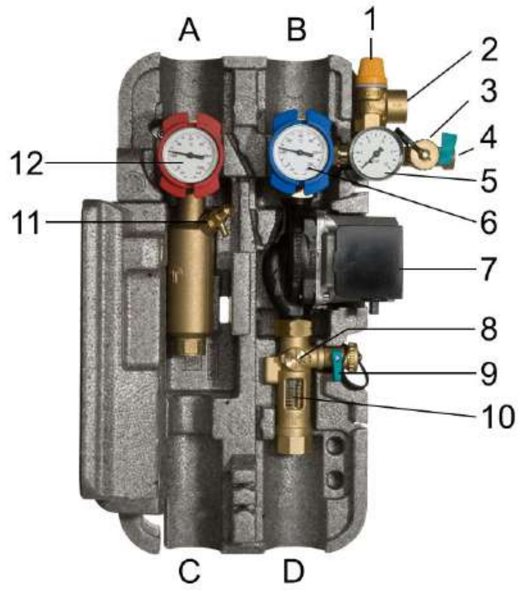
- Fill and drain the hydraulic circuit via fill and drain valves and check the hydraulic pressure with a manometer.
- To control the circulation flow rate of the heat transfer fluid by means of a circulation pump controlled by the SLL solar control. The latter makes it possible to modulate the circulation speed thanks to the variable PWM signal.

It is delivered pre-assembled and equipped with all the hydraulic components essential for the operation of a pressurized solar installation.

It is composed of :

- a 2-way DualSun SLL solar station hydraulic transfer unit [17], and
- a DualSun SLL solar controller [18].

3.3.1.1. DualSun SLL solar station hydraulic transfer unit



(1) = 6 bar safety valve

(2) = 3/4 "female connection to heat transfer fluid storage container

(3) = 3/4 "male connection and filling valve

(4) = 3/4 "male connection

(5) = Pressure gauge

(6) = Ball valve (flow) with thermometer and integrated non-return valve

(7) = Circulation pump

(8) = Flowmeter adjustment valve

(9) = 3/4 "male connection and drain valve

(10) = Flowmeter

(11) = Air vent

(12) = Ball valve (return) with thermometer and integra-ted non-return valve

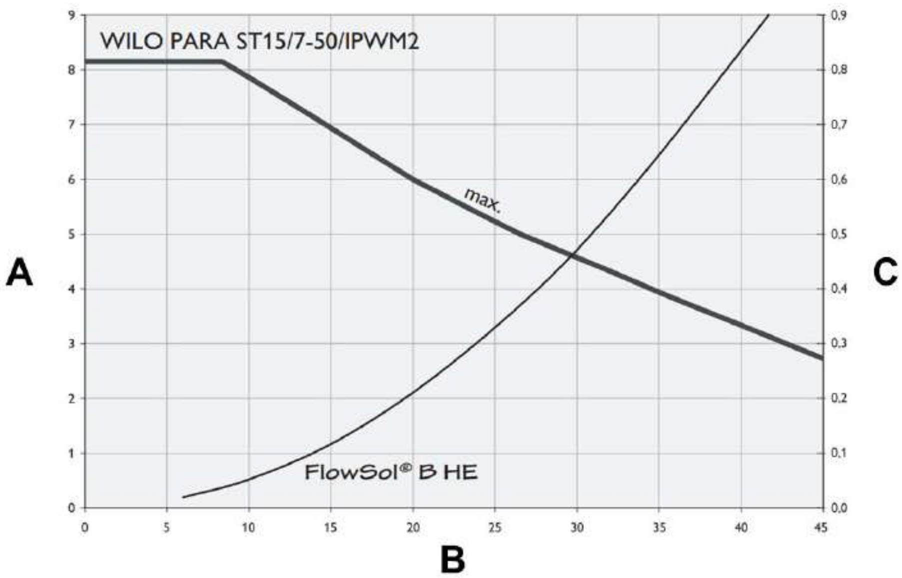
(A) = Return from solar panel field outlet

(B) = Departure to solar panel field inlet

(C) = departure to thermal device inlet

(D) = Return from thermal device outlet

Each element will be identified by its number in brackets **(SS x)** in the remainder of the document.



(A) = Delivery height [m]

(B) = Flow rate [L / min]

(C) = Pressure drop [bar]

Characteristic curve of the circulation pump of the DualSun SLL solar station

⚠ **CAUTION**

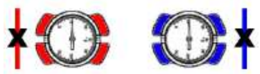
Maximum number of DualSun SPRING hybrid solar panels that can be connected to the Dual-Sun SLL solar station = 12.

For larger installations please consult DualSun

Positions of the ball valves:

Ball valve in service position, flow only in current direction

Open ball valve, two-way flow possible

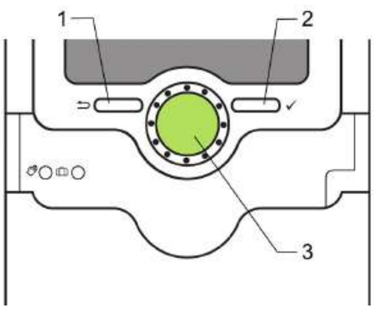


Closed ball valve, no circulation

3.3.1.2. DualSun SLL solar controller

The DualSun SLL solar controller has been optimized for use in small and medium-sized solar heating installations, it also offers 10 preconfigured systems.

The regulator is also equipped with a potential-free low voltage relay for auxiliary heating and a pulse input for performing calorimetric balances with a V40 flowmeter.



(1) = Esc key: Return to the previous menu or exit the current menu

(2) = Validation key: Choose to enter a menu and validate the parameter

(3) = Rotary actuator: Navigate in the menus, move the cursor up or down, increase or decrease values

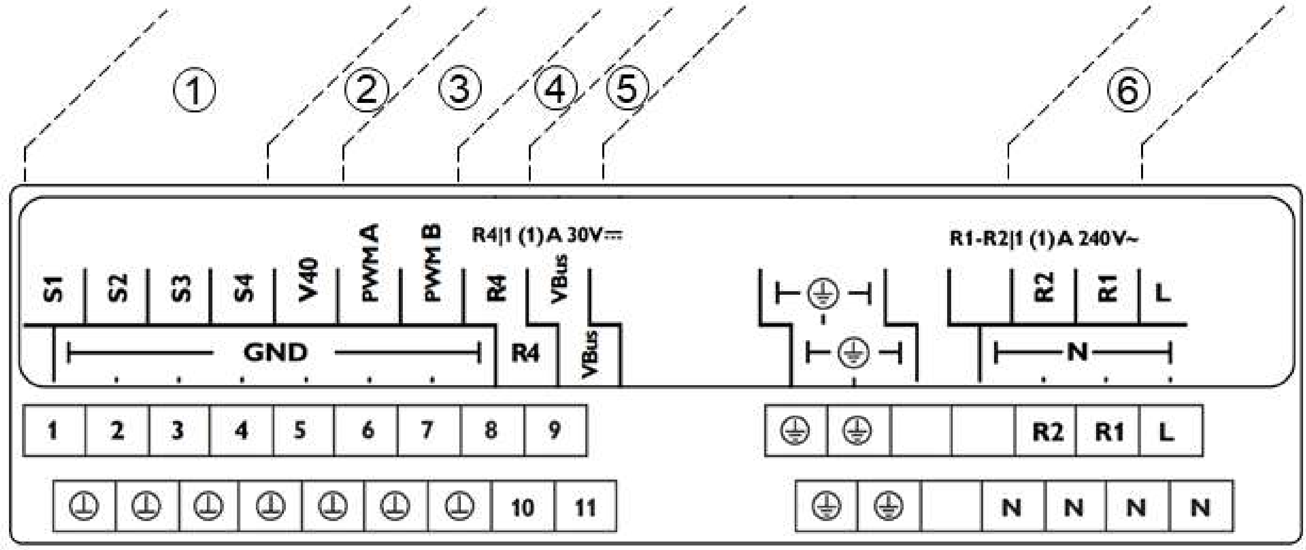
The solar controller is operated with the 2 keys and the rotary actuator located under the screen.

The solar controller has two micro-buttons for accessing the holiday function and manual mode, which can be accessed by sliding the cover down.

Key for directly opening the manual mode menu of the regulator.

Button used to activate the vacation function of the regulator.

See the DualSun SLL controller installation manual for more details.



(1) = Temperature probe input x 4

(2) = V40 flowmeter pulse counter input x 1

(3) = PWM output for speed control of high efficiency circulation pumps x 2

(4) = Potential-free relay output x 1

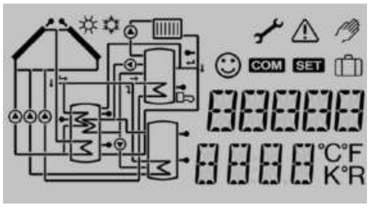
(5) = VBus monitoring input x 1

(6) = Semiconductor relay output x 2

Technical characteristics :

- **Inputs** : 4 Pt1000, Pt 500 or KTY temperature probes, 1 V40 pulse counter input
- **Outputs** : 2 semiconductor relays, 1 potential-free low-voltage relay, 2 PWM outputs
- **PWM frequency** :
- **PWM voltage** : 10,5 V
- **Cut-off capacity** : 1 (1) A 240 V ~ (semiconductor relay) / 1 (1) A 30 V = (potential-free relay)
- **Total cut-off capacity** : 2 A 240 V~
- **Power input** :
- **Data interface** : VBus®
- **VBus® current output** : 60 mA
- **Dimensions** : 110 x 166 x 47 mm
- **Basic systems** :

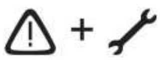
Control screen



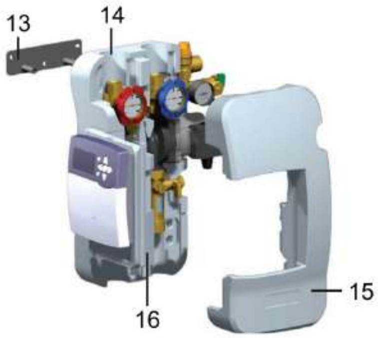
The System-Monitoring control screen consists of 3 elements: the channel indicator, the symbol bar and the system diagram.

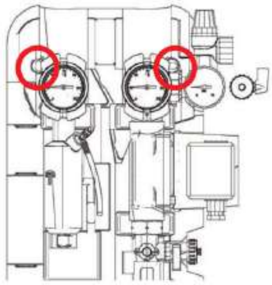
The channel indicator consists of two lines. The top line is a 16-segment alphanumeric line mainly indicating the name of the channels and the various submenus. The lower 16-segment line displays values.

Additional symbols in the symbol bar indicate the current state of the system.

Symbol	Permanently displayed	Flashing light
Status displayed:		
	Maximum tank limitation active (tank temperature has exceeded maximum value)	Panels cooling function active, system or tank cooling function active
	Antifreeze option activated	Panel temperature below minimum value, antifreeze function active
		Safety deactivation of panel active
		Manual mode active
		Safety deactivation of tank active
SET		Setting mode
	Holiday function activated	
	Normal running	
Fault symbols:		
		Defective probe

3.3.2. Fastening the DualSun SLL solar station





(13) = Wall bracket

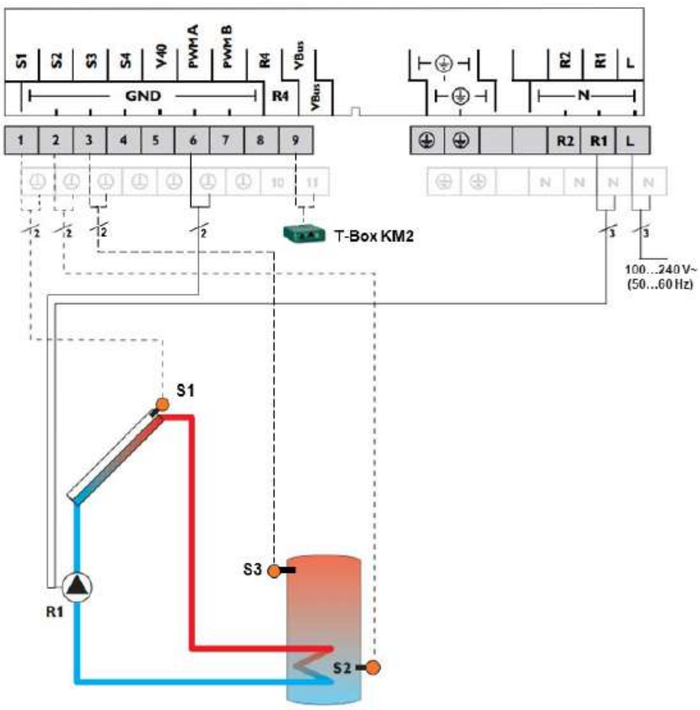
(14) = Rear part of the insulation

(15) = Front part of the insulation

(16) = Support for fastening the solar control

Remove the front part of the insulation (13) and secure the solar station to the wall with the screws included in the mounting material at the red circles in the image above. The hydraulic unit can be detached from the wall support to facilitate installation and hydraulic connections.

3.3.3. ISWH wiring of the DualSun SLL solar controller

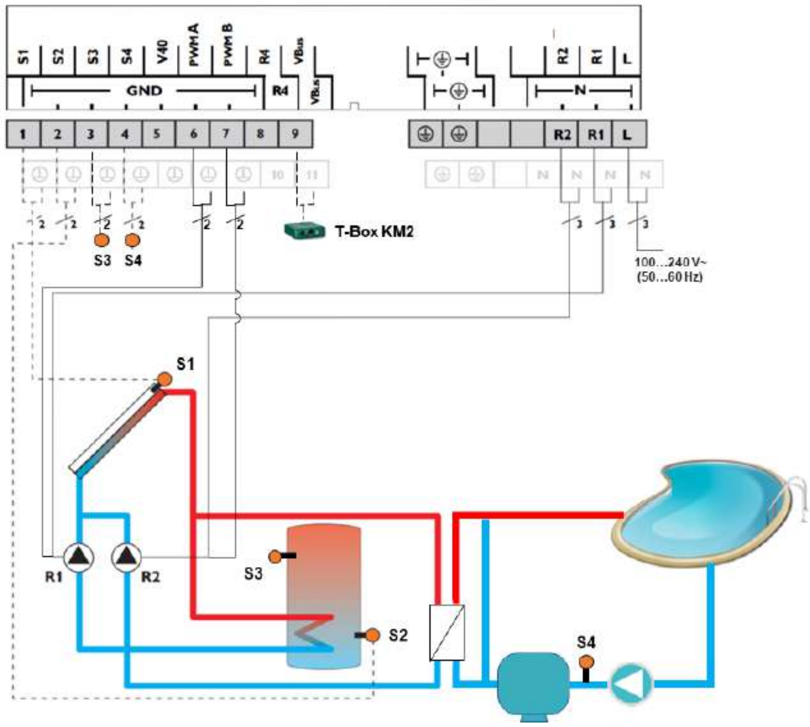


- The S1 probe is supplied in the essential kit, delivered with the DualSun SPRING panels
  - S1 4 mm in the exchanger hole at the outlet of the last panel
- The S2 probe is supplied with the DualSun SLL regulation
  - S2 at the bottom of the tank in a 6 mm thermowell
- If a KM2 T-Box has been ordered, S3 is supplied with the T-Box. This additional probe must be installed
  - S3 at the top of the tank (6 mm thermowell probe)

The solar tanks can be equipped with an internal backup. In this case, the position of the back-up in relation to the solar exchanger should be checked in order to determine the need for controlling the back-up.

Indeed, if the back-up is close to the solar exchanger, the addition of calories by the back-up can significantly diminish the energy yield of the solar installation. See chapter In which case is it necessary to control the back-up so as not to hamper the operation of the solar installation? [22].

3.3.4. ISWH wiring for pool discharge of the DualSun SLL solar control



- The S1 probe is supplied with the essential kit, delivered with the DualSun SPRING panels
  - S1 (4 mm) in the exchanger hole at the outlet of the last panel
- The S2 probe is supplied with the DualSun SLL regulation
  - S2 at the bottom of the tank in a 6 mm thermowell
- The S4 probe is supplied with the pool discharge accessories kit
  - S4 mounted with thermal paste and clamp on the surface of the swimming pool filtration pipe, after the pump. Wrap the probe with thermal adhesive tape to insulate it from ambient air
- If a KM2 T-Box has been ordered, S3 is supplied with the T-Box. This additional probe must be installed
  - S3 at the top of the tank (6 mm thermowell probe)

NOTE

The length of the R2 pump PWM cable is 1m. If necessary, it can be extended with a standard cable of 0.5 or 0.75 mm² section

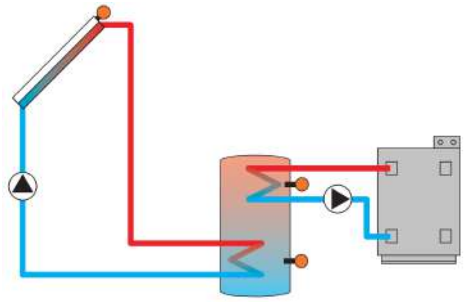
3.3.5. In which case is it necessary to control the back-up so as not to hamper the operation of the solar installation?

The back-up must be controlled in order to obtain the desired hot water temperature at the times when the drafts are made.

However, on some tanks, the solar and back-up exchangers can sometimes be superimposed or the positioning of the thermowells does not allow the positioning of the tank probe close to the solar exchanger.

In these cases, this directly impacts the solar installation to operate due to the heating of the sanitary water at the level of the solar exchanger. The result is a premature shutdown of the solar system when the sunshine conditions are right.

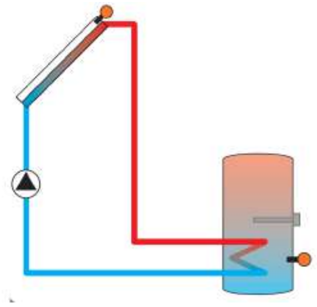
We distinguish below the cases where the control of the back-up is necessary so as not to hamper the operation of the solar installation:



Case 1:

Boiler exchanger loop at the top of the tank: no direct conflict between the heating layers.

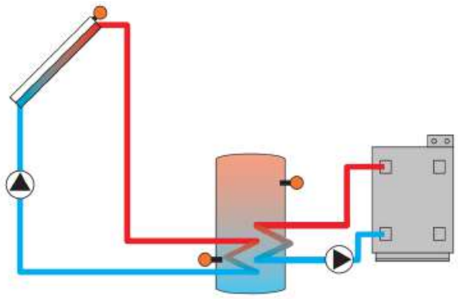
⇒ Non-justified back-up control



Case 2:

The electric resistance works in the middle-top of the tank: no direct conflict between the heating layers.

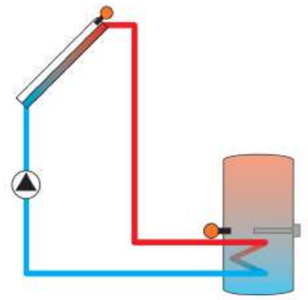
⇒ Non-justified back-up control



Case 3:

Boiler exchanger loop in the middle of the tank: direct conflict between the heating layers.

⇒ Control of the back-up necessary or installation of a preheating tank dedicated to solar

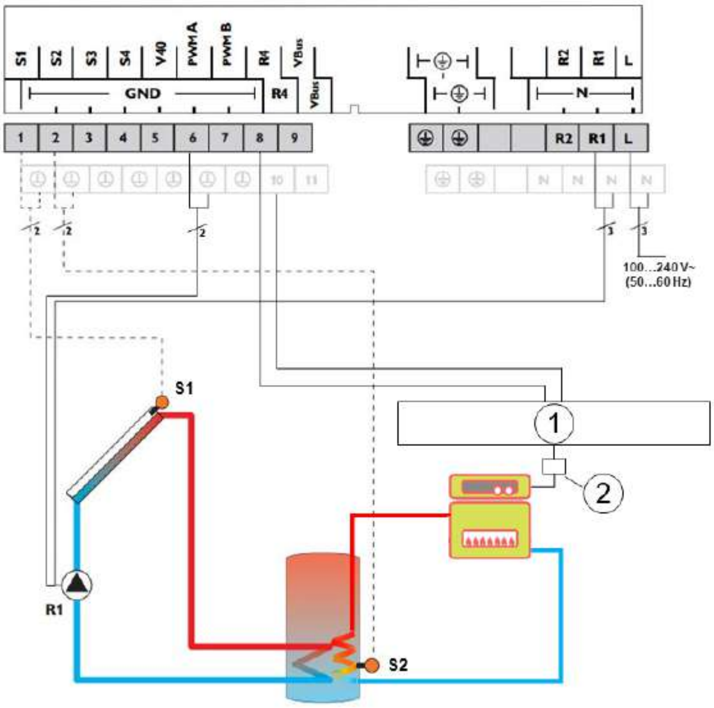


Case 4:

The electrical heater is slightly above the solar exchanger and the S2 probe is placed at the same level as the electrical heater. Heating the electric resistance may affect the value of the S2 probe and stop the solar pump.

⇒ Control of the back-up necessary or installation of a preheating tank dedicated to solar

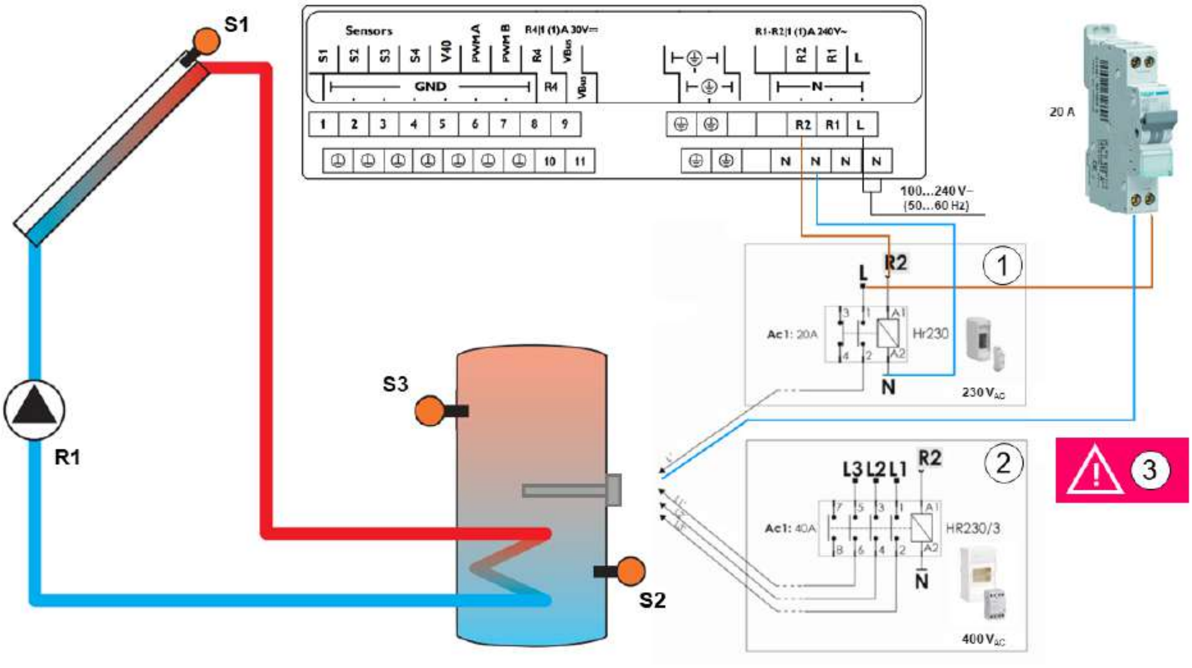
3.3.5.1. Control by the DualSun SLL solar controller of a hydraulic back-up



1. Domestic hot water (DHW) dry contact input for the boiler
2. Clock contactor in series

- **System parameter = 1**
- A S3 probe at the top of the tank is not necessary
- The boiler must be equipped with a dry contact input for its DHW function.
- Attention if it is a double service boiler, make sure that you only wire the DHW dry contact.
- Set the parallel relay to **R4 with R1 as reference relay** and the inverted mode in OFF if the contactor input used is NC (Normally Closed) - to be checked according to the boiler model. See Parameter setting of the OPARR parallel relay option of the DualSun SLL solar controller [26] for setting the parallel relay R4.
- Example of the boiler hourly programming or with a timer according to the household profile, main DHW draws in the evening or in the morning:
  - Evening: HOn1 = 16:00, HOff1 = 23h00
  - Morning: HOn1 = 00h00; HOff1 = 07h00

3.3.5.2. Control by DualSun SLL solar controller of an electrical back-up



(1) = Power auxiliary relay for single-phase 230V electric heater

- 1 NO - 20A contact (normally open)
- 1 NC contact - 20A (normally closed)

(2) = 3 phase power auxiliary relay for 400V three-phase electric resistance

- 4 NO - 40A contacts (normally open)

(3) = **Relay output R2 must be configured in On / Off mode** (REL ... REL2 ... ONOF)

Installation:

- Place a PT1000 probe at the top of the hot water tank and wire it to terminal block S3 of the solar regulation
- Wire an auxiliary power relay as in the diagram above

Parameterization of solar control:

- **System parameter = 3**
  - Long press on validation key
  - Turn the rotary actuator up to SYS
  - Activate the modification of the parameter by pressing the validation key a first time
  - Turn the rotary actuator to choose the system number
  - Validate the choice with the validation key
  - Esc key to return to menu
- **Setting the auxiliary heating menu (AH)**
  - Use of relay R2 with thermostat function taking probe S3 as a reference and with time range to be defined
  - Long press on validation key

- Turn the rotary actuator up to AH
- Activate the modification of parameters by pressing the validation key ✓
- Turn the rotary actuator to adjust the parameters
- Validate the choice with the validation key ✓
  - Settings:
  - AHO = 45 (if necessary to ensure better hot water comfort, increase the activation setpoint temperature)
  - AHF = 60
  - Examples of time schedules according to the household's hot water consumption profile, evening or morning shower
    - Evening:
      - t1O = 16.00
      - t1F = 23.00
    - Morning:
      - t1O = 02.00
      - t1F = 08.00
- Esc key ⮌ to return to menu

- **Setting relay R2 to ONOF in the relay menu (REL)**
  - Long press on validation key ✓
  - Turn the rotary actuator up to REL
  - Activate the modification of the parameter by pressing the validation key ✓
  - Turn the rotary actuator to choose relay R2
  - Activate the modification of the parameter by pressing the validation key ✓
  - Turn the rotary actuator to choose the ONOF parameter
  - Validate the choice with the validation key ✓
  - Esc key ⮌ to return to menu

3.3.5.3. Control by DualSun SLL solar controller of a thermodynamic tank with dry contact

Solar heat exchangers and thermodynamic back-up are generally superimposed in monobloc thermodynamic water heaters, see The thermal transfer device [9].

It is therefore important to be able to control the activation of the thermodynamic back-up so as not to degrade the solar contributions by heating the water while the solar energy can be transferred to the tank.

Thermodynamic water heaters generally have a programmable internal intelligence making it possible to set up piloting time slots adapted to user needs. It is also possible to control the back-up according to solar operation via a potential-free contact. The DualSun SLL solar station enables this control by setting the parallel relay function OPARR.

See in the DualSun online library the wiring and adjustment instructions for the monobloc thermodynamic tanks for more details on the implementation of this optimization.

3.3.6. Parameter setting of the OPARR parallel relay option of the DualSun SLL solar controller

The OPARR parallel relay function of the DualSun SLL solar station makes it possible to control the thermal backup so as not to interfere with the solar energy input.

This function is particularly useful when the back-up is very close to or superimposed on the solar exchanger.

The OPARR function thus makes it possible to control a potential-free contact (R4) so that the back-up detects a logic 1 or 0 signal.

- Long press on validation key ✓
- Turn the rotary actuator until **OPARR**
- Validate the OPARR choice with the validation key ✓
- **REL R**: choose the reference relay R1 or R2
- **INVER**

ON: inversion of the signal from relay R4 with respect to the reference relay If R1 = 1 then R4 = 0	**OFF**: no inversion of signal R4 with respect to the reference relay If R1 = 1 then R4 = 1

3.3.7. Factory settings of the DualSun SLL solar controller

WARNING

The factory setting of the solar controller is configured for the ISWH wiring (system 1).

For a ISWH pool discharge installation, set the system parameter to 6, see procedure below.

Here are the pre-recorded parameters to check during thermal commissioning:

Value	Description value	ISWH	ISWH with back-up piloting (dry contact - R4)	ISWH with back-up piloting (power - R2)	ISWH pool discharge
SYS	System type	1	1	3	6
DT ON	Solar activation	6	6	6	6
DT OFF	Solar shutdown	2	2	2	2
R NOM	Nominal tank temperature 1	60 ° C	60 ° C	60 ° C	45 ° C
R MAX	Maximum tank temperature 1	80 ° C	80 ° C	80 ° C	60 ° C
R2 NOM	Nominal tank temperature 2	N / A	N / A	N / A	30 ° C
R2 MAX	Maximum tank temperature 2	N / A	N / A	N / A	32 ° C
REL	Relay mode R1	PSOL	PSOL	PSOL	PSOL
N MIN	Minimum speed relay 1	50%	50%	50%	50%
N MAX	Maximum speed relay 1	100%	100%	100%	100%
REL 2	Relay mode 2	N / A	N / A	ONOF	PSOL
N MIN2	Minimum speed relay 2	N / A	N / A	N / A	To be modulated according to the desired flow rate, see Adjustment of the operating pressure and flow rate of the swimming pool discharge solar circuit [48]
N MAX2	Maximum speed relay 2	N / A	N / A	N / A	N MAX2 = N MIN2

Procedure for modifying the system parameter:

- Long press on validation key ✓
- Turn the rotary actuator up to SYS
- Activate the modification of the parameter by pressing the validation key a first time ✓
- Turn the rotary actuator to choose the system number
- Validate the choice with the validation key ✓
- Esc key ⊃ to return to menu

3.3.8. Optional parameters of the DualSun SLL solar controller

Option	Parameter description	ISWH	ISWH with back-up piloting (dry contact - R4)	ISWH with back-up piloting (power - R2)	ISWH pool discharge
SYS	System type	1	1	3	6
OHQM	**Calorimeter option (energy calculation)**	**ON**	**ON**	**ON**	**ON**
FTYPE	Flow rate measurement type	1	1	1	1
FMAX	Flow rate (L / min)	Number of SPRING panels	Number of SPRING panels	Number of SPRING panels	Number of SPRING panels
MEDT	Heat transfer fluid	1	1	1	1
MED%	Antifreeze concentration (%)	40	40	40	40
SFHQM	Departure probe	S1	S1	S1	S1
SRHQM	Return probe	S2	S2	S2	S2
OPARR	**Parallel relay option**	**OFF**	**ON**	**OFF**	**ON**
REL	Parallel relay	-	R4 (dry contact)	-	R4 (if swimming pool filtration pump control necessary)
REL R	Reference relay	-	R1	-	R2
AH	Backup heating option	N / A	N / A	**ON**	N / A
AHO	Activation temperature	N / A	N / A	40	N / A
AHF	Switch-off temperature	N / A	N / A	55	N / A
t	Piloting time slots	N / A	N / A	Morning: t10 = 2h00; t1F = 8h00 Evening: t20 = 16h:00 - t2F = 22h00	N / A

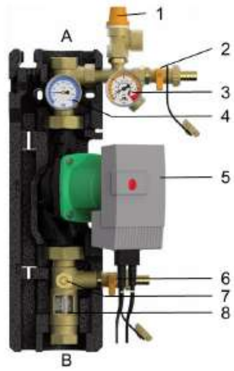
3.4. Installation of the hydraulic transfer unit for the pool discharge loop

Presentation

As presented in chapter Presentation of a ISWH pool discharge installation [12], a single channel transfer unit completes the ISWH installation.

The SLL DualSun solar station must be connected to the ISWH solar circuit (solar tank loop). The single-channel transfer unit is to be connected to the swimming pool discharge solar circuit.

The pool discharge hydraulic transfer unit is made up of the following elements:



(1) = 6 bar safety valve

(2) = Filling valve

(3) = Pressure gauge

(4) = Non-return valve with thermometer

(5) = Circulation pump

(6) = Drain valve

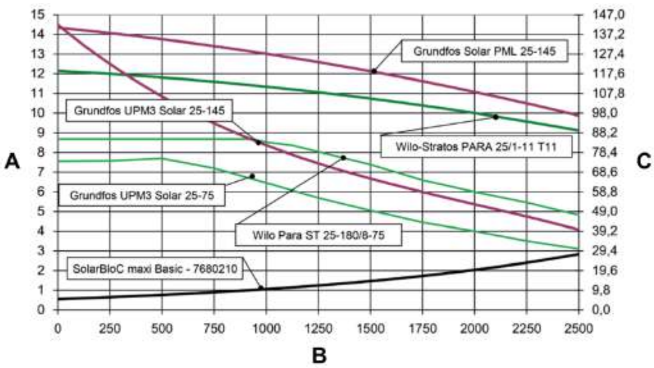
(7) = Flowmeter adjustment valve

(8) = Flowmeter

(A) = Departure to solar panel field entrance

(B) = Return from swimming pool heat exchanger outlet

Each element of the pool transfer group **(GTP)** will be identified by its number in brackets **(GTP x)** in the remainder of the document. Each element of the DualSun SLL solar station **(SS)** will be identified by its number in brackets **(SS x)** in the rest of the document, see DualSun SLL solar station hydraulic transfer unit [17].



(A) = Delivery height [m]

(B) = Flow rate [L / min]

(C) = Pressure drop [kPa]

Info: 1 kPa = 0.01 bar

Read the Grundfos UPM3 Solar 25-75 curve

Characteristic curve of the circulation pump of the swimming pool discharge transfer unit

CAUTION

Make sure that the pressure losses of the swimming pool heat exchanger are less than 3 m at 1200 L / h

Maximum number of DualSun SPRING hybrid solar panels that can be connected to the DualSun SLL solar station and to the pool discharge hydraulic transfer unit = 12

For larger installations please consult DualSun

Fastening

Remove the front part of the insulation and secure the solar station to the wall with the screws included in the mounting hardware.

Electrical connection of circulation pump R2

See the wiring diagram for pump R2 in chapter ISWH wiring for pool discharge of the DualSun SLL solar control [22].

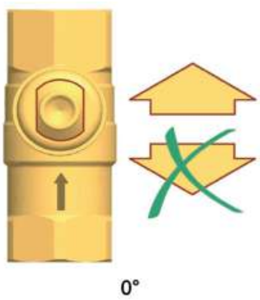
The PWM cable is connected to the pump terminal block as follows:

- PWM = brown
- Earth = blue

> **NOTE**
>
> The length of the R2 pump PWM cable is 1m. If necessary, it can be extended with a standard cable of 0.5 or 0.75 mm² section

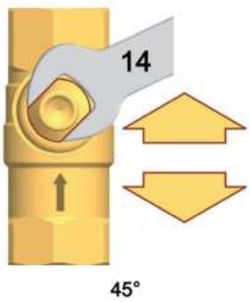
Valve position

The non-return valve **(GTP4)** is adjustable with a 14 mm open-end wrench. Remove the thermometer to access it:



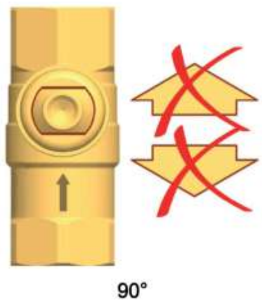
Vertical valve (operating position)

One-way flow



Valve inclined at 45 ° (position for emptying)

Bidirectional circulation



Horizontal valve

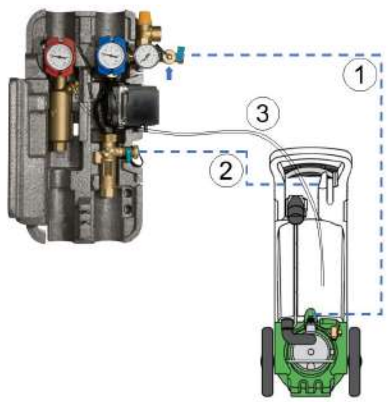
No flow possible

4. ISWH hydraulic commissioning steps

IMPORTANT

The installation must be commissioned cold, ideally in a range of **panel temperature between 10 and 45 ° C**.

4.1. Rinsing the ISWH solar circuit



1. Filling pipe to be connected to the filling valve **(SS3)** of the solar station

2. Drain hose to connect to the drain valve **(SS9)** of the solar station

3. Air purge pipe to be connected to the air vent **(SS11)** of the solar station

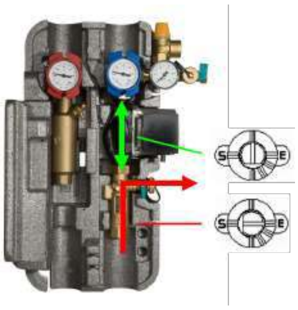
- Immerse the hose in the filling station
- Make sure that the fluid level in the filling station is always sufficient so that the end of the hose is always submerged
- Close the ball valve **(SS6)** of the solar station

Setting the solar station

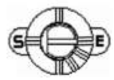
Stopping the solar station circulator:

- Push the button solar regulation
- Switch MAN1 to "OFF" then confirm

Adjusting the flow meter valve



Orient the flowmeter valve **(SS8)** horizontally to direct the flow towards the drain valve



Pay attention to the flat which must be on the S side of the valve

Rinsing the solar circuit

Before starting up the flushing and filling station, the circulation pump must be stopped and the valve **(SS8)** flowmeter must be adjusted horizontally so that the heat transfer fluid passes through the filling pump.

At any time **the filling pressure in the panels must never exceed 1,5 bars**.

The reading at the manometer must take into account the height of the installation so that the pressure on the manometer **(SS5)** Equals :

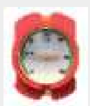
$$P_{filling} = 1,5 + H / 10 \text{ [bar]}$$

A [m]	0	2	4	6	8	10	12	14
B [bar]	1,5	1,7	1,9	2,1	2,3	2,5	2,7	2,9

Table 1: Initial solar circuit filling pressure

A. Height between panels and solar station [m]

B. Filling / operating pressure [bar]

Positioning of the transfer unit valves **FLUSHING PHASE**				**Comments**
Ball valve (SS12)	**Ball valve (SS6)**	**Filling valve (SS3)**	**Drain valve (SS9)**	
		Closed	Closed	**Start of filling:** Switch on the filling pump. Open the drain valve **(SS9)** then gradually the filling valve **(SS3)**
		Partially open	Opened	**Filling:** Fill the circuit with demineralized water so as to evacuate any impurities which could block the circuit. Make sure not to exceed the maximum pressure indicated in table 1, Pmax filling = 1,5 + H / 10

Checking the watertightness of the solar circuit

Positioning of the transfer unit valves **WATERTIGHTNESS CHECK PHASE**				**Comments**
Ball valve (SS12)	**Ball valve (SS6)**	**Filling valve (SS3)**	**Drain valve (SS9)**	
		Closed	Closed	**Checking the watertightness of the circuit:** Once the filling volume is reached, close the filling **(SS3)** and drain **(SS9)** valves. Stop the filling pump. Leave the installation under pressure at Pmax filling = 1,5 + H / 10. Go through the installation and check visually that no leaks appear in the circuit. Check that the pressure is maintained after 10 minutes.

Draining the solar circuit

Positioning of the transfer unit valves **DRAINING PHASE**				**Comments**
Ball valve (SS12)	**Ball valve (SS6)**	**Filling valve (SS3)**	**Drain valve (SS9)**	
		Opened	Opened	**Draining:** Drain the entire installation of its water
		Opened	Opened	**End of emptying:** Close the filling valves **(SS3)** and drain **(SS9)**

4.2. Choice of heat transfer fluid

The percentage of glycol dilution of the heat transfer fluid depends on the climatic extremes of the geographical area of the installation:

° C protection	Glycol mixture
-8 ° C to +/- 2 ° C	25%
-12 ° C to +/- 2 ° C	33%
-18 ° C to +/- 2 ° C	40%
-32 ° C to +/- 2 ° C	50%
Below -32 ° C	> 50%

4.3. Determination of the volume of heat transfer fluid

The total volume of heat transfer fluid required to fill the solar circuit consists of the sum of the following parameters:

- Volume of heat exchanger of heat transfer device
- Volume of solar panels
- Volume of hydraulic lines
- Filling volume of the filling vessel

1. **Heat exchanger volume of the heat transfer device = V_1**

   Refer to the technical sheet of the heat exchanger used to transfer heat from the primary solar circuit.

   As an indication, here is the volume of the heat exchanger of common solar tanks:

Solar tank volume [L]	200	300	400	500	800	1000
Volume of solar tank exchanger [L]	6,5	8	10	11	15	17

2. **Volume of solar panels = V_2**

   Volume of a DualSun SPRING exchanger = 5 L

   Volume to multiply by the number of panels installed

3. **Volume of hydraulic transfer lines = V_3**

   Calculate the length of the in and out hydraulic lines in meters.

   Multilayer pipes:

DN multilayer pipe	16	18	20	26	32	40	50
Volume of fluid contained in 10m of pipe [L]	1,13	1,54	2,01	3,14	5,31	8,55	13,85

   Copper pipes:

DN copper pipe	14	16	18	20	22	28	32	42
Volume of fluid contained in 10m of pipe [L]	1,13	1,54	2,01	2,54	3,14	5,31	7,07	12,57

   Steel pipes:

DN steel pipe	12	15	20	25	32	40	50
Volume of fluid contained in 10m of pipe [L]	1,13	1,77	3,14	5,31	8,55	12,57	19,63

Total filling volume:

$$V_{total\_fill} = (V_1 + V_2 + V_3) \times 1.2$$

$$V_{total\_fill} = (V_1 + V_2 + V_3 + V_4) \times 1.2$$

Or:

V_1 = Volume of solar tank heat exchanger [L]

V_2 = Volume of solar panels [L]

V_3 = Volume of hydraulic lines [L]

V_4 = Half volume of the filling vessel [L]

A margin of 20% is taken from the calculation of the total volume.

Fill the filling pump with heat transfer fluid, respecting the above dosages and volumes. Always provide more heat transfer fluid than necessary so that the filling pump is always fully submerged.

4.4. Filling the ISWH solar circuit with heat transfer fluid

☐ A.1. Check that the temperature of the panels is between 10 and 45 ° C.

☐ A.2. Check that the circulation pump **(SS7)** is stopped and the flowmeter valve **(SS8)** is horizontal 

☐ A.3. Make sure that the level of heat transfer fluid is always high in the filling pump so as not to inject air bubbles into the circuit.

☐ A.4. During the pre-filling period, ensure that **the pressure in the panels does not exceed 1,5 bar**.

Allow about 5 to 10 minutes to achieve thermal equilibrium between the panels and the glycol.

☐ A.5. Follow the details below:

Positioning of the transfer unit valves HEAT FLUID FILLING PHASE				Comments
Ball valve (SS12)	**Ball valve (SS6)**	**Filling valve (SS3)**	**Drain valve (SS9)**	
		Closed	Closed	**Start of filling:** Open the air vent **(SS11)** wide and immerse the transparent pipe in the reservoir of the filling pump. Switch on the filling pump. Open the drain valve **(SS9)** then gradually the filling valve **(SS3)**
		Partially open	Opened	**Filling:** Fill the circuit with heat transfer fluid. Make sure not to exceed the maximum pressure indicated in table 1: **Pmax = 1,5 + H / 10**

☐ A.6. The solar circuit begins to be well filled when the heat transfer fluid returns in quantity to the filling station. This can be checked through the flowmeter window **(SS10)** and at the end of the pipe connected to the drain valve **(SS9)**.

☐ A.7. At this stage, the heat transfer fluid expels a lot of air from the solar circuit. Let the filling pump run with the air vent **(SS11)** open while respecting the pressures indicated in table 1 (Pmax = 1,5 + H / 10) for at least 10 minutes.

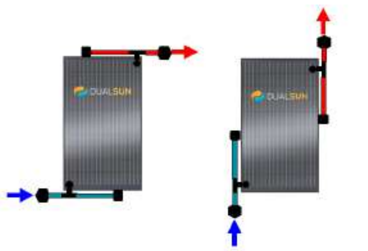
Start of air purge:

☐ A.8. To make it easier to bleed air from the circuit, increasing the flow rate and filling pressure help push out air bubbles.

☐ A.9. Gradually open the filling valve **(SS3)** until the minimum flow rate or maximum admissible pressure is obtained at the level of the panels indicated in table 2 below.

☐ A.10. Minimum flow rate necessary for good filling depending on the installation of the panels:

PORTRAIT

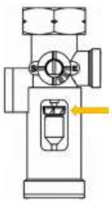


Minimum flow = 200 L / h / panel

LANDSCAPE

Minimum flow rate = 250 L / h / panel

☐ A.11. Check that the flowmeter float **(SS10)** of the solar station is at the top of the window



On the flowmeter, the flow rate is indicated at the upper edge of the float Position your eye at the height of the flowmeter for a good reading

☐ A.12. The increase in flow generates an increase in pressure in the solar circuit. **The pressure in the panels must never exceed 2 bar**

☐ A.13. Limit the flow with the filling valve **(SS3)** up to the maximum allowable pressure

☐ A.14. Manometer reading **(SS5)** from the solar station:

$$P_{max\_purge} = 2 + H / 10 \text{ [bar]}$$

A [m]	0	2	4	6	8	10	12	14
B [bar]	2	2,2	2,4	2,6	2,8	3	3,2	3,4

Table 2: Maximum pressure to purge the air from the solar circuit

A. Height between panels and solar station [m]

B. Maximum pressure to purge the air from the solar circuit [bar]

☐ A.15. Close the air vent **(SS11)** when it only expels liquid

☐ A.16. Allow to circulate for a few minutes by carrying out a few successive water hammers while partially closing the drain valve **(SS9)** then by opening it fully with a sharp blow. **Be careful not to exceed the maximum pressure indicated in table 2: P_{max_purge} = 2 + H / 10**

☐ A.17. Open the air vent **(SS11)** every 2 minutes to remove the air, then close it

☐ A.18. When air bubbles no longer appear as a result of water hammer, it is possible to concentrate them by creating an internal depression. Then adjust the pressure to: **$P_{nominal}$ = 1,5 + H / 10**. Simultaneously close the drain valves **(SS9)** and filling **(SS3)** when the pressure to be set is reached **see table 1**

☐ A.19. Stop the filling pump

☐ A.20. Handle the valves as shown below and turn the flowmeter valve **(SS8)**  in vertical position. This allows the air trapped at the bottom of the circuit to rise

Positioning of the transfer unit valves **AIR PURGE PHASE**				**Comments**
Ball valve (SS12)	**Ball valve (SS6)**	**Filling valve (SS3)**	**Drain valve (SS9)**	
		Closed	Closed	The air rises in the panels and the water goes down to a low point - wait 5 minutes

☐ A.21. Place the flowmeter valve **(SS8)** to the horizontal 

☐ A.22. Start over at step A.5.

Repeat steps A.5 to A.21 as many times as necessary to properly expel the air from the circuit.

4.5. Bleeding the air contained in the ISWH solar circuit

At this point, the solar circulation pump **(SS7)** has not been activated and contains air.

☐ B.1. Adjust the ball valves **(SS6)** and **(SS12)** and filling **(SS3)** and drain **(SS9)** as shown below :

Positioning of the transfer unit valves **AIR PURGE PHASE**				**Comments**
Ball valve (SS12)	**Ball valve (SS6)**	**Filling valve (SS3)**	**Drain valve (SS9)**	
		Closed	Closed	Adjusting the valves before the pump is forced into operation

☐ B.2. Adjust the flowmeter valve **(SS8)** so that it is vertical 

- [ ] B.3. Put the circulator in forced operation
    - Push the button solar regulation
    - Switch MAN1 to "Max" with the rotary actuator then validate ✓
- [ ] B.4. Let the circulator run for 10 minutes, checking for the presence of air bubbles through the flowmeter window **(SS10)**
- [ ] B.5. Open the air vent **(SS11)** every 2 minutes
- [ ] B.6. Stop the circulator

IMPORTANT

To properly bleed the air from the hydraulic circuit, repeat steps A as many times as necessary.

To check if the filling is good, this process must be repeated until the following conditions are verified:

- No longer expel air when opening the air vent **(SS11)**
- No air passing through the flowmeter window **(SS10)** of the solar station, when water hammer is carried out or when the pump is on and off
- No air bubbles into the fluid returning to the tank of the filling station

4.6. Adjustment of the operating pressure and flow rate of the ISWH solar circuit

1. **Adjustment of the operating pressure:**

Positioning of the transfer unit valves **OPERATING PRESSURE ADJUSTMENT PHASE**				**Comments**
Ball valve (SS12)	**Ball valve (SS6)**	**Filling valve (SS3)**	**Drain valve (SS9)**	
		Closed	Closed	Place the flowmeter valve **(SS8)** horizontally. Switch on the filling pump. Open the drain valve **(SS9)** then gradually the filling valve **(SS3)**
		Partially open	Opened	**Adjustment of the operating pressure:** Make sure not to exceed the maximum pressure indicated in table 3: **Pmax = 1,5 + H / 10**

Manometer reading **(SS5)** of the solar station for final filling of the installation:

$$P_{service} = 1,5 + H / 10 \text{ [bar]}$$

A [m]	0	2	4	6	8	10	12	14
B [bar]	1,5	1,7	1,9	2,1	2,3	2,5	2,7	2,9

Table 3: Solar circuit operating pressure

A. Height between panels and solar station [m]

B. Filling / operating pressure [bar]

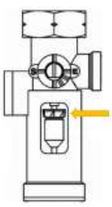
2. **End of filling:**

Positioning of the transfer unit valves **END OF OPERATING PRESSURE ADJUSTMENT PHASE**				**Comments**
Ball valve (SS12)	**Ball valve (SS6)**	**Filling valve (SS3)**	**Drain valve (SS9)**	
		Closed	Closed	Simultaneously close the drain **(SS9)** and filling **(SS3)** valves when the operating pressure is reached. Stop the filling pump.
		Closed	Closed	Place the flowmeter valve **(SS8)** vertically Disconnect the rinsing and filling station from the pool discharge hydraulic transfer unit.

3. **Adjustment of the operating flow rate:**

- ☐ C.1. Push the button of the solar controller
- ☐ C.2. Switch MAN1 to "Max" with the rotary actuator then validate ✓
- ☐ C.3. Turn the flowmeter valve **(SS8)** to obtain the service flow rate:

Service flow rate = 1 L / min / panel x Number_panels_SPRING



On the flowmeter, the flow rate is indicated at the top edge of the float. Place your eye at the height of the flowmeter for a good reading

- ☐ C.4. Switch MAN1 to "Auto" with the rotary actuator then validate ✓

IMPORTANT

Complete the commissioning report provided in the essential kit and accessible in the DualSun online library to activate DualSun guarantees

5. Hydraulic commissioning steps for ISWH pool discharge

5.1. Rinsing of the ISWH solar and pool discharge circuits

The ISWH solar circuit and the swimming pool discharge circuit can be rinsed simultaneously or separately.

Reminder of names:

(SSx) = element of the DualSun SLL solar station

(GTPx) = element of the pool discharge hydraulic transfer unit

Simultaneous rinsing:

Simultaneous rinsing of the two solar loops is possible provided that the valves **(SS6)** - **(SS12)** and **(GTP4)** and flowmeter valves **(SS8)** and **(GTP7)** are positioned vertically.

Rinse as indicated in chapter Rinsing the ISWH solar circuit [32].

Separated solar loop rinsing is however recommended.

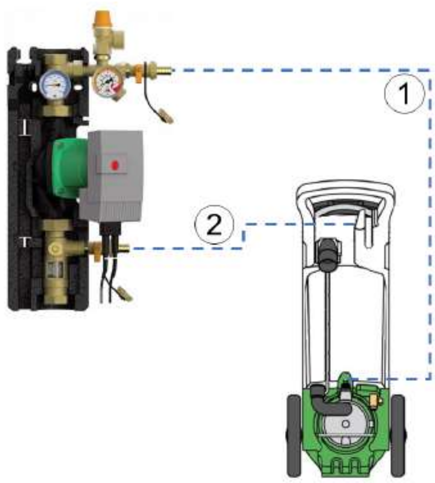
Separate rinsing:

1. Rinsing of the ISWH solar loop:

- Make sure that the MAN1 and MAN2 circulators are set to OFF while the ISWH solar loop is rinsed.
- Close the flowmeter valve **(GTP7)** (horizontal)
- Follow the steps described in Rinsing the ISWH solar circuit [32]
- Open the flowmeter valve **(GTP7)** (vertical)

2. Rinsing the swimming pool discharge solar loop:

- Make sure that the MAN1 and MAN2 circulators are set to OFF during the rinsing of the swimming pool discharge solar loop
- Close the ball valves **(SS6)** and **(SS12)**
- Check that the non-return valve **(GTP4)** either in a vertical position
- Orient the flowmeter valve **(GTP7)** horizontally to direct the flow towards the drain valve **(GTP6)**
- Connect the filling pipes of the rinsing and filling station to the swimming pool discharge hydraulic transfer unit



1. Filling hose to be connected to the filling valve **(GTP2)**

2. Draining hose to connect to the drain valve **(GTP6)**

- At any time **the filling pressure in the panels must never exceed 1,5 bars**
- The reading on the manometer must take into account the height of the installation so that the pressure at the manometer **(GTP3)** is equal to:

$$\mathbf{P_{filling} = 1{,}5 + H / 10\ [bar]}$$

A [m]	0	2	4	6	8	10	12	14
B [bar]	1,5	1,7	1,9	2,1	2,3	2,5	2,7	2,9

Table 4: Initial solar circuit filling pressure

A. Height between panels and solar station [m]

B. Filling / operating pressure [bar]

- Switch on the filling pump
- Open the drain valve **(GTP6)** then gradually the filling valve **(GTP2)**
- Fill the circuit with demineralized water so as to evacuate any impurities that could block the circuit
- Once the filling volume is reached, close the filling **(GTP2)** and drain **(GTP6)** valves by adjusting the pressure as indicated in table 4
- Check that no leaks appear in the circuit. Check that the pressure is maintained after 10 minutes.

3. Draining the swimming pool discharge solar loop:

- Turn the non-return valve **(GTP4)** at 45 ° 
- Open the drain valve **(GTP6)** and drain the installation of all its water
- Close the filling **(GTP2)** and drain **(GTP6)** valves
- Place the non-return valve **(GTP4)**  vertically

5.2. Filling of the ISWH solar circuit with swimming pool discharge connection

> **CAUTION**
>
> - Make sure that the MAN1 and MAN2 circulators are set to OFF when filling the ISWH solar loop
> - Close the flowmeter valve of the swimming pool discharge transfer unit **(GTP7)** horizontally 

Follow the procedure described in the chapter ISWH hydraulic commissioning steps [32]

> **CAUTION**
>
> **At the end of filling the ISWH solar cricuit:**
>
> - Do not activate the MAN1 circulator on "AUTO", this step must be postponed until the end of the complete commissioning of the ISWH solar loops and swimming pool discharge
> - Open the flowmeter valve (vertically) of the swimming pool discharge transfer unit **(GTP7)** 

5.3. Filling of the swimming pool discharge solar circuit

Fill the swimming pool discharge solar circuit with the same heat transfer fluid as for the ISWH solar circuit.

Calculation of the volume of heat transfer fluid to be filled:

The total volume of heat transfer fluid necessary for filling the swimming pool discharge solar circuit consists of the sum of the following parameters:

- Volume of the swimming pool discharge heat exchanger, marked (6) in Presentation of a ISWH pool discharge installation [12]
- Volume of hydraulic lines, see chapter Determination of the volume of heat transfer fluid [35]

Reminder of names:

(SSx) = element of the DualSun solar station

(GTPx) = element of the pool discharge hydraulic transfer unit

Filling steps

Isolate the DHW solar circuit by manipulating the ball valves of the DualSun SLL solar station:

Positioning of the valves of the DualSun SLL transfer unit ISOLATION PHASE OF THE ISWH SOLAR CIRCUIT				Comments
Ball valve (SS12)	**Ball valve (SS6)**	**Filling valve (SS3)**	**Drain valve (SS9)**	
		Closed	Closed	**Insulation of the ISWH solar circuit**

- ☐ D.1. Connect the rinsing and filling station to the filling **(GTP 2)** and drain **(GTP 6)** valves
- ☐ D.2. Push the button of SLL solar controller
- ☐ D.3. Check that MAN1 and MAN2 are OFF
- ☐ D.4. Check that the temperature of the panels is between 10 and 45 ° C
- ☐ D.5. Check that the flowmeter valve **(GTP7)** is horizontal
- ☐ D.6. Check that the non-return valve **(GTP4)** is vertical
- ☐ D.7. Make sure that the fluid level in the filling station is always sufficient
- ☐ D.8. During the pre-filling period, ensure that **the pressure in the panels does not exceed 1,5 bar, see table 4**
- ☐ D.9. Follow the details below:

Positioning of the pool discharge transfer unit valves HEAT TRANSFER FLUID FILLING PHASE		Comments
Filling valve (GTP2)	**Drain valve (GTP6)**	
Closed	Closed	**Start of filling:** Switch on the filling pump. Open the drain valve **(GTP6)** then gradually the filling valve **(GTP2)**
Partially open	Opened	**Filling:** Fill the circuit with heat transfer fluid. Take care not to exceed the maximum pressure indicated in table 4, Pmax = 1,5 + H / 10

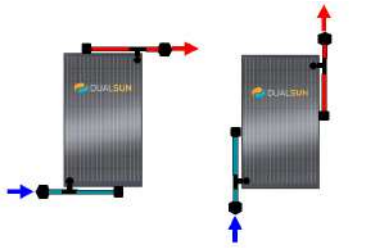
- ☐ D.10. The solar circuit begins to be well filled when the heat transfer fluid returns in quantity to the filling station. This can be checked through the flowmeter window **(GTP8)** and at the end of the pipe connected to the drain valve **(GTP6)**.
- ☐ D.11. At this stage, the heat transfer fluid expels a lot of air from the solar circuit. Let the filling pump run while respecting the pressures indicated in table 4, Pmax = 1,5 + H / 10, for at least 10 minutes.

Start of air purge:

- ☐ D.12. To facilitate bleeding of air in the circuit, increasing the flow rate and filling pressure help push out air bubbles
- ☐ D.13. Gradually open the filling valve **(GTP2)** until the minimum flow rate or the maximum admissible pressure is obtained at the level of the panels indicated in table 5 below, Pmax_purge = 2 + H / 10

☐ D.14. Minimum flow rate necessary for good filling depending on the installation of the panels:

PORTRAIT

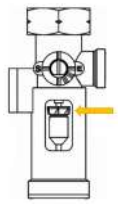


Minimum flow = 200 L / h / panel

LANDSCAPE

Minimum flow rate = 250 L / h / panel

☐ D.15. Check that the flowmeter float **(GTP8)** be well at the top of the window



On the flowmeter, the flow rate is indicated at the top edge of the float. Place your eye at the height of the flowmeter for a good reading

☐ D.16. The increase in flow generates an increase in pressure in the solar circuit. **The pressure in the panels must never exceed 2 bar**

☐ D.17. Limit the flow with the filling valve **(GTP2)** up to the maximum allowable pressure

☐ D.18. Manometer reading **(GTP3)** :

$$P_{max\_purge} = 2 + H / 10 \text{ [bar]}$$

A [m]	0	2	4	6	8	10	12	14
B [bar]	2	2,2	2,4	2,6	2,8	3	3,2	3,4

Table 5: Maximum pressure to purge the air from the solar circuit

A. Height between panels and solar station [m]

B. Maximum pressure for the solar circuit air purge [bar]

☐ D.19. Allow to circulate for a few minutes by carrying out a few successive water hammers while partially closing the drain valve **(GTP6)** then by opening it fully with a sharp blow. **Be careful not to exceed the maximum pressure indicated in table 5 -** $P_{maximum} = 2 + H / 10$

☐ D.20. When air bubbles no longer appear as a result of water hammer, it is possible to concentrate them by creating an internal depression. Then adjust the pressure to: $P_{nominal} = 1{,}5 + H / 10$. Simultaneously close the drain **(GTP69)** and filling **(GTP2)** valves when the pressure to be set is reached **see table 4**

☐ D.21. Stop the filling pump

☐ D.22. Open (45 ° position) the non-return valve **(GTP4)**

☐ D.23. Open the drain valve **(GTP6)** and recover the coolant in the filling station. This creates a depression to allow air bubbles to concentrate. If an automatic vent is installed at the outlet of the panels field on the roof, this vent must be closed before opening the drain valve. **(GTP6)**.

☐ D.24. Close the drain valve **(GTP6)** when the pressure at the manometer **(GTP3)** has dropped by 0.5 bar, then leave the system at rest for at least 5 minutes: this allows the air blocked at the bottom of the circuit to rise

☐ D.25. Position the non-return valve **(GTP4)** in operating position (vertical position)

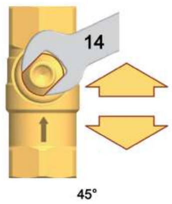
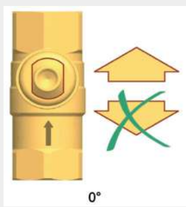
☐ D.26. Repeat from step D.9.

Repeat steps D.9 to D.26 as many times as necessary to properly expel the air from the circuit

5.4. Bleeding the air contained in the swimming pool discharge solar circuit

At this point, the solar circulation pump **(GTP5)** has not been activated and contains air.

☐ E.1. Adjust the check valve **(GTP4)** , filling **(GTP2)** and drain **(GTP6)** valves as shown below :

Positioning of the pool discharge transfer unit valves **AIR PURGE PHASE**			**Comments**
Non-return valve (GTP4)	**Filling valve (GTP2)**	**Drain valve (GTP6)**	
	Closed	Closed	The air rises in the panels and the water goes down to a low point - wait 5 minutes
	Closed	Closed	Adjusting the valves before the pump is forced into operation

☐ E.2. Adjust the flowmeter valve **(GTP7)** so that it is vertical

☐ E.3. Put the circulator in forced operation

- Push the button of the solar controller
- Switch MAN2 to "Max" with the rotary actuator then validate ✓

☐ E.4. Let the circulator run for 10 minutes, checking for the presence of air bubbles through the flowmeter window **(GTP8)**

☐ E.5. Switch MAN2 to "OFF" with the rotary actuator then validate ✓Stop the circulator

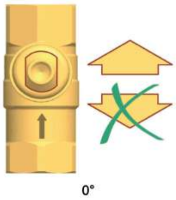
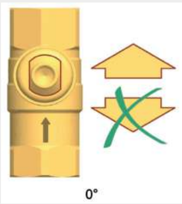
☐ E.6. Repeat at step D.4 if air is still present in the circuit

To check if the filling is good, this process must be repeated until the following conditions are verified:

- No air passing through the flowmeter window **(GTP8)** of the pool discharge transfer unit, when water hammer is carried out or when the pump is on and off
- No air bubbles into the fluid returning to the tank of the filling station

5.5. Adjustment of the operating pressure and flow rate of the swimming pool discharge solar circuit

1. **Adjustment of the operating pressure:**

Positioning of the pool discharge transfer unit valves **OPERATING PRESSURE ADJUSTMENT PHASE**			**Comments**
Non-return valve (GTP4)	**Filling valve (GTP2)**	**Drain valve (GTP6)**	
	Closed	Closed	Place the flowmeter valve **(GTP7)** horizontally. Switch on the filling pump. Open the drain valve **(GTP6)** then gradually the filling valve **(GTP2)**
	Partially open	Opened	**Adjustment of the operating pressure:** Make sure not to exceed the maximum pressure indicated in table 6: **Pmax = 1,5 + H / 10**

Manometer reading **(GTP3)** of the pool discharge hydraulic transfer unit for final filling of the installation:

$$P_{service} = 1{,}5 + H / 10 \text{ [bar]}$$

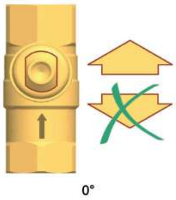
A [m]	0	2	4	6	8	10	12	14
B [bar]	1,5	1,7	1,9	2,1	2,3	2,5	2,7	2,9

Table 6: Final filling pressure of the solar circuit

A. Height between panels and solar station [m]

B. Filling / operating pressure [bar]

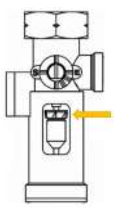
2. **End of filling:**

Positioning of the pool discharge transfer unit valves **END OF OPERATING PRESSURE ADJUSTMENT PHASE**			**Comments**
Non-return valve (GTP4)	**Filling valve (GTP2)**	**Drain valve (GTP6)**	
	Closed	Closed	Simultaneously close the drain **(GTP6)** and filling **(GTP2)** valves when the operating pressure is reached. Stop the filling pump. Place the flowmeter valve **(GTP7)** vertically Disconnect the rinse and fill station from the pool discharge hydraulic transfer unit.

3. **Adjustment of the operating flow rate:**

> **IMPORTANT**
>
> To minimize the pressure losses in the swimming pool discharge solar circuit and consequently the electrical consumption of the circulation pump, the pool loop flowmeter valve **(GTP7)** must be vertical .
>
> To adjust the flow rate, go through the adjustment of the Min and Max speeds of relay R2

- ☐ F.1. Press the button for at least 3 seconds ✓ on the solar controller
- ☐ F.2. Turn the rotary actuator until the REL menu then validate ✓
- ☐ F.3. Pass REL2 on PSOL
- ☐ F.4. Set MIN (2) and MAX (2) to 100% then confirm ✓ and return to the main menu
- ☐ F.5. Check that the flowmeter valve **(GTP7)** is vertical
- ☐ F.6. Push the button of the solar controller
- ☐ F.7. Switch MAN2 to "Max" then validate ✓
- ☐ F.8. Read the flow rate from the flowmeter **(GTP8)**



On the flowmeter, the flow rate is indicated at the upper edge of the float. Position your eye at the height of the flowmeter for a good reading

- ☐ F.9. The service flow rate of the swimming pool discharge solar circuit must be:

Service flow rate = 1,7 L / min / panel x Number_panels_SPRING

☐ F.10. as in F.1, enter the REL menu of the SLL solar controller, then modulate MIN (2) and MAX (2) so as to obtain the service flow rate corresponding to the number of DualSun SPRING panels installed

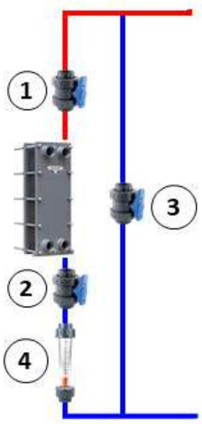
☐ F.11. Reposition the ball valves of the DualSun solar station in vertical position

Opening of the ISWH solar circuit				Comments
Ball valve (SS12)	**Ball valve (SS6)**	**Filling valve (SS3)**	**Drain valve (SS9)**	
		Closed	Closed	**Opening of the ISWH solar circuit**

☐ Push the button of the SLL solar controller

☐ Switch MAN1 and MAN2 to "AUTO" then confirm ✓

5.6. Adjusting the flow rate of the heat exchanger - Pool side



(1) = Pool discharge heat exchanger isolation valve

(2) = Pool discharge heat exchanger isolation valve

(3) = Bypass valve / swimming pool discharge heat exchanger flow rate adjustment

(4) = Pool filtration flowmeter

☐ G.1. Fully open the 3 valves of the swimming pool discharge bypass kit **(1)**, **(2)** and **(3)**

☐ G.2. Adjust the bypass valve **(3)** so as to obtain the same flow rate as on the solar loop side

Flow rate to adjust = 1,7 L / min / panel * Number of Spring panels

1.7 L / min = 0.1 m^3/ h

NOTE

This flow rate adjustment mode keeps the total filtration flow rate of the pool.

IMPORTANT

Complete the commissioning report provided in the essential kit and accessible in the DualSun online library to activate DualSun guarantees

6. Guarantees

The legal warranty rights only apply if assembly, commissioning and maintenance have been carried out correctly.

We accept no liability for any improper use or unauthorized modification of the assembly components and the consequences thereof, as well as for the improper execution of the assembly instructions.

We invite you to consult the DualSun warranty conditions in our online library.

This warranty is only valid if maintenance is performed and documented by qualified personnel.

This warranty takes effect on the invoice date of the equipment.

6.1. Commissioning report

The commissioning report can be downloaded from the DualSun online library

IMPORTANT

It is important to fill it out correctly in order to activate the DualSun guarantees.

7. General recommendations

Please read this manual carefully before starting the installation, the advice provided will help you ensure the safe installation, use and maintenance of your DualSun device.

The installation of the device, maintenance and repair must be carried out by companies trained in the specifics of the process, having the required skills in climatic engineering, plumbing and roofing, in accordance with the recommendations of this manual, using the accessories described in it, following the rules of the art.

This very important manual forms a whole with the device. It should be kept with care and must follow the device in the event of transfer to another owner or user and / or transfer to another installation.

Safety of workers

The implementation of the process at height imposes provisions relating to the protection and safety of people against the risk of falls such as:

The implementation of devices allowing the movement of people without direct support on the solar panels

The installation of fall arrest devices in accordance with the regulations in force: on the one hand, to prevent falls on the sensors and on the other hand, to prevent falls from the roof.

During upkeep and maintenance, the safety of workers must be ensured by the installation of protection against falls using guardrails or the like (refer to the recommendations indicated in the installation guidelines). and the maintenance of thermal and photovoltaic solar panels published by the national risk prevention body).

WARNING

This device is not intended for use by children or by persons with limited physical, sensory or intellectual faculties and / or knowledge impaired, unless they are under supervision or following the instructions of a person responsible for their safety.

The manufacturer declines all responsibility in the event of damage to persons, animals or property resulting from improper installation or use of the device.

The packaging elements represent a danger for children, do not leave them within their reach.

No flammable object must be near the device.

Keep the solar panels in their packaging until the final installation location to avoid damaging them.

After-sales service and maintenance conditions

The conditions of use and maintenance, all the checks to be carried out are specified in the care and maintenance instructions provided upon delivery:

- Integrity check and possible replacement of solar panels
- Integrity check and possible replacement of hydraulic connections
- Control of media and their integrity
- Checking the readability of product labels