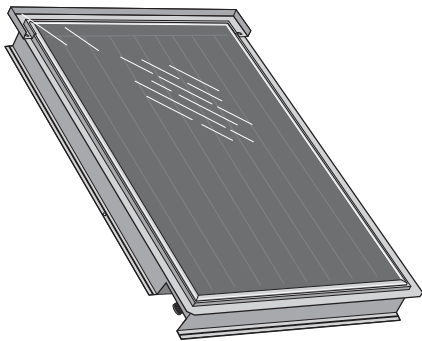
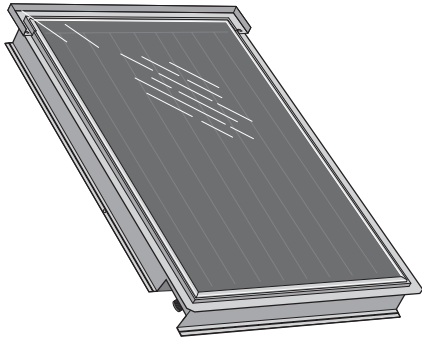


# Solar water heating systems

## Installation • Operation • Maintenance



CLI U12 SD0(W/L/F/P)118 EI B/U  
 CLI U12 SK0(W/L/F/P)218 EI B/U  
 CLI U12 SK0(W/L/F/P)318 EI B/U  
 Solar with electric element back-up

CLI U12 SD0(W/L/F/P)119 HX B/U  
 CLI U12 SK0(W/L/F/P)219 HX B/U  
 CLI U12 SK0(W/L/F/P)319 HX B/U  
 Solar with heat exchanger back-up

CLI U12 SD0(W/L/F/P)11(10/12) NG B/U  
 CLI U12 SK0(W/L/F/P)21(10/12) NG B/U  
 Solar with natural gas back-up

CLI U12 SD0(W/L/F/P)11(11/13) LP B/U  
 CLI U12 SK0(W/L/F/P)21(11/13) LP B/U  
 Solar with propane back-up

CLI U12 SD0(W/L/F/P)118 AUX EL  
 CLI U12 SK0(W/L/F/P)218 AUX EL  
 CLI U12 SK0(W/L/F/P)318 AUX EL  
 Solar pre-heat to electric tank water heater

CLI U12 SD0(W/L/F/P)118 AUX GAS  
 CLI U12 SK0(W/L/F/P)218 AUX GAS  
 CLI U12 SK0(W/L/F/P)318 AUX GAS  
 Solar pre-heat to gas tank water heater

CLI U12 SD0(W/L/F/P)118 AUX TLG  
 CLI U12 SK0(W/L/F/P)218 AUX TLG  
 CLI U12 SK0(W/L/F/P)318 AUX TLG  
 Solar pre-heat to tankless gas water heater

**The solar energy system described in this manual, when properly installed and maintained, meets the minimum standards established by the SRCC.**

**This certification does not imply endorsement or warranty of this product by SRCC.**

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# Part 1: Product and safety information

Be sure to read and understand this entire manual before attempting to install and operate your VELUX solar water heating system. Pay particular attention to the special attention boxes located throughout this manual which will alert the user of a hazard. Failure to follow these warnings could result in serious bodily injury or death. Should you have a problem understanding the instructions in this manual or have any questions, STOP, and get help from a qualified installer, service technician, local electric utility or supplier.

## Special attention boxes

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels or to important information concerning this product.

### Definitions

#### **DANGER**

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

#### **CAUTION**

CAUTION Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

#### **WARNING**

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

#### **CAUTION**

CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

### Local installation regulation

Installation of the VELUX solar water heating system may be governed by local rules and regulations for this type of product. The installation must be done in accordance with those regulations. Always use the latest edition of codes. The installation, adjustment, service and maintenance of the VELUX solar water heating system must be done by a licensed professional who is qualified and experienced in the installation, service and maintenance of solar hot water systems.

#### **DANGER**

##### **DANGER**



Water temperature over 125 degrees F. can cause severe burns instantly, or death from scalds. Children, disabled, and elderly are at highest risk of being scalded. See instruction manual before setting temperature at water heater. Feel water before bathing or showering! Temperature limiting valves are available.

##### **DANGER**



### Water temperature adjustment

The solar water heating system may transfer heat into the water heater above the set temperature limit. This may create the potential for scald injury. To protect against injury, you must install the supplied ASSE approved mixing valve in the water system. Refer to the instructions supplied with the mixing valve for installation procedures and specifications.

#### **WARNING**

Households with small children, disabled, or elderly persons may require a 120°F or lower temperature setting to prevent scalding with hot water.

# Part 2: General information

## Preface

The VELUX solar water heating system uses the sun's energy as a source of heat to produce hot water for domestic household use. Designed to meet the certification requirements of SRCC OG-300, VELUX solar water heating systems are reliable, and can typically generate from 50% to 80% of your annual household water heating needs free from the sun. Your remaining hot water needs can be supplied by a suitable backup or auxiliary energy source. Results will vary based upon on your specific region in the country.

## Introduction

The system performance varies as a function of the household hot water load. The ambient air temperature, the roof pitch and orientation along with seasonal solar intensity will determine the amount of hot water generated by your VELUX solar water heating system.

Your VELUX solar water heating system uses a circulation pump that circulates a propylene glycol heat transfer fluid throughout the system. This fluid protects the collector piping from freezing, prevents corrosion of system components, and keeps scale deposits from forming that could reduce the performance of the system. Proper maintenance of the propylene glycol in the system can protect the solar water heating system to minus 40° Fahrenheit. This manual is intended to familiarize you with the proper installation and maintenance of your VELUX solar water heating system. This system must be installed by a licensed solar or plumbing contractor in accordance with SRCC Standard OG-300 and all applicable national, state and local codes. Failure to follow the procedures described in this manual can void the manufacturers' warranty.

## System description

The VELUX solar water heating system is a closed-loop active solar system which, when installed with a suitable auxiliary heat source, can act as the primary source of domestic hot water for residential use. The system components provided with the VELUX solar water heating system include the solar collectors, collector flashings, solar loop pipe and fittings, solar storage tank, solar pump station and controller, temperature sensors, expansion tank, microbubble air separator, mixing valve, and non-toxic propylene glycol heat transfer fluid. The solar collector is the engine of the VELUX solar water heating system. When the sun is shining, the heat energy is absorbed by the solar collector and transferred to the heat transfer fluid circulating through the solar collectors. The system pump efficiently circulates this heated fluid through the collector's piping and the heat exchanger located in the solar storage tank. As the heat transfer fluid passes through the heat exchanger, the heat in the fluid is transferred by conduction to the potable water in your solar storage tank causing the temperature in the tank to rise. This process continues as long as the sun is shining or until the temperature in the solar storage tanks reaches its maximum temperature set point.

## Specifications

The VELUX solar water heating system is designed to produce domestic hot water from either solar collectors, an electrical backup, a gas backup, or a boiler back up (provided by others). The VELUX systems can also be used as a solar preheat system to conventional electric, gas, or tankless water heaters (provided by others).

## Collectors and flashings

VELUX solar collectors and flashings allow for a low profile, roof integrated, solar panel installation. The VELUX collector is made up of copper tubes and a copper plate that is covered with a highly selective absorber coating; this assembly is enclosed in a well insulated aluminum frame or "box" and covered with low-iron tempered glass glazing. VELUX solar water heating systems are available for integration into either shingle or tile roofs or for rack mounting. VELUX solar water heating system model numbers CLI U12 SDOL 118, CLI U12 SKOL 218, CLI U12 SKOL 318, CLI U12 SDOL 119, CLI U12 SKOL 219, CLI U12 SKOL 319, CLI U12 SDOL 1110, CLI U12 SKOL 2110, CLI U12 SDOL 1111, CLI U12 SKOL 2111, CLI U12 SDOL 1112, CLI U12 SKOL 2112, CLI U12 SDOL 1113, and CLI U12 SKOL 2113, are systems that include "L" step flashings for integration into shingle roofs. VELUX solar water heating system models CLI U12 SDOW 118, CLI U12 SKOW 218, CLI U12 SKOW 318, CLI U12 SDOW 119, CLI U12 SKOW 219, CLI U12 SKOW 319, CLI U12 SDOW 1110, CLI U12 SKOW 2110, CLI U12 SDOW 1111, CLI U12 SKOW 2111, CLI U12 SDOW 1112, CLI U12 SKOW 2112, CLI U12 SDOW 1113, and CLI U12 SKOW 2113, are systems that include flashings for integration into tile roofs. CLI U12 SDOF 118, CLI U12 SKOF 218, CLI U12 SKOF 318, CLI U12 SDOF 119, CLI U12 SKOF 219,

CLI U12 SKOF 319, CLI U12 SDOF 1110, CLI U12 SKOF 2110, CLI U12 SDOF 1111, CLI U12 SKOF 2111, CLI U12 SDOF 1112, CLI U12 SKOF 2112, CLI U12 SDOF 1113, and CLI U12 SKOF 2113, are systems that include rack systems for installation on flat roofs. CLI U12 SDOP 118, CLI U12 SKOP 218, CLI U12 SKOP 318, CLI U12 SDOP 119, CLI U12 SKOP 219, CLI U12 SKOP 319, CLI U12 SDOP 1110, CLI U12 SKOP 2110, CLI U12 SDOP 1111, CLI U12 SKOP 2111, CLI U12 SDOP 1112, CLI U12 SKOP 2112, CLI U12 SDOP 1113, and CLI U12 SKOP 2113, are systems that include rack systems for installation on pitched roofs. Reference your VELUX collector installation manual for instructions on mounting collectors with each roof type.

## Solar storage tank

All VELUX solar water heating systems will include a solar storage tank with the solar heat exchanger located in the bottom section of the tank to heat the entire water volume of the tank. The thermostatic controls for the electric, gas, or boiler back up shall be located in the upper portion of the tank to provide back up heat if the solar collector is not providing enough heat to maintain the upper operating set point of the tank. The solar tank is equipped with a control well located a third of the way from the bottom of the tank located near the heat exchanger coil to monitor the solar heat input.

## Collector loop piping

VELUX solar water heating systems are designed for use with the pre-insulated corrugated stainless steel flexible piping provided with the VELUX system kit. Collector piping installation requires the use of copper and brass fittings in the collector loop. Piping in new solar installations may have dirt, grease, or other impurities that over time affect the quality of the propylene glycol heat transfer fluid. A thorough cleaning is required before charging the system with glycol. All vertical piping between the storage tank and the collector shall be supported at each story or at maximum intervals of ten feet (10') using the pipe hangers provided. If additional supports are needed, copper plumbers tape or tube strap may be used. The pipe insulation may not be compressed or crimped by the strapping material. The installation of all horizontal and vertical piping may not reduce the performance or rating of any structural member or fire rated assembly. Adhere to all applicable local codes and ordinances.

The collector loop cold supply and hot return lines must be well insulated with the high quality flexible closed cell insulation provided to minimize heat loss. There shall be no exposed piping or fittings. The wall thickness of the pipe insulation should not be less than  $\frac{3}{4}$ ". To the extent possible, slide the insulation material over the pipe without cutting or taping. All butt joints must be sealed with contact adhesive. The use of rigid polyethylene pipe insulation is prohibited. The temperatures generated by your collector in the summer months or under stagnation conditions can melt this type of material. Any above ground exterior pipe insulation that may be subject to UV degradation must be wrapped with foil tape or painted with two coats of high quality water-based acrylic resin coating as supplied by the insulation manufacturer. Rubatex UV Protective Coating or equal is the required coating material.

## Pump station controller

All VELUX solar water heating systems include a pump station controller that includes the temperature and pressure gauges, check valves, ball valves, flow meter, fill and drain valves, and differential controller required to properly operate the VELUX solar water heating system. The system temperatures for the collector and storage tank can be read from the differential controller. Typical tank operating temperatures can range from the cold supply of 40°-80° F up to 180° F which represents the high limit of the tank. This will vary depending on the climate where the system is installed. The collector temperature sensor should be 5°-20° F above the tank sensor during normal operation. During idle periods, when there is no sun, the collector will read the ambient temperature and when there is full sun upward to 250° F.

## Balance of system

The balance of components in all VELUX solar water heating systems: solar loop pipe and fittings, temperature sensors, expansion tank, microbubble air separator, mixing valve, and non-toxic propylene glycol heat transfer fluid components carry temperature and pressure ratings required of the VELUX solar water heating system design.

The VELUX solar water heating system can be operated down to ambient temperatures of -40°F using proper concentrations of propylene glycol. Freeze tolerance limits are based upon an assumed set of environmental conditions. Refer to the propylene glycol specification sheet in the back of this manual for recommended concentrations. The differential controller uses temperature sensors to monitor the temperature difference between the collector and the solar storage tank. The controller turns on when the collector is 12° F above tank temperature and turns off when the differential drops below 8° F.

# Part 3: Solar water heater system installation

The Contractor shall obtain all required permits and approvals for installing the solar system. The installation shall conform to all federal, state and local regulations governing solar water heating system installations. The contractor shall adhere to sound building safety and trade practices. Special consideration must be given to building code requirements for the penetration of structural members and fire rated assemblies. Before beginning with the installation, the contractor shall inspect the condition of the roof and notify the homeowner of any existing roof damage or necessary repairs.

## Installation check list

### Collector location:

- ❑ South facing within 45 degrees of due south
- ❑ Roof pitch is between 15–60 degrees of horizontal
- ❑ Collectors are located in an unshaded area
- ❑ Collectors are located as close to tank as possible
- ❑ Roof and roofing material are in good condition

### Storage tank location:

- ❑ Sufficient room to service water heater
- ❑ Provisions made to protect area from water damage
- ❑ Temperature and pressure relief valve properly installed and discharge line runs to outdoors, or open drain
- ❑ T&P discharge is not exposed to freezing temperatures
- ❑ Tank and piping protected from freezing temperatures
- ❑ Area free of flammable vapors

### Potable water supply:

- ❑ All related piping is free from leaks
- ❑ Thermal expansion tank installed
- ❑ Tank and piping properly purged of air
- ❑ Anti-scald mixing valve set to 120°F

### Systems with electric back-up solar tank:

- ❑ Power supply voltage agrees with the water heater rating plate
- ❑ Branch circuit wiring and circuit breaker properly sized
- ❑ Electrical connections tight and unit properly grounded

### Systems with gas back-up solar tank:

- ❑ Gas line properly sized and installed per code
- ❑ Gas line and connections properly checked for leaks
- ❑ Venting system properly sized and installed per code

### Systems with boiler back-up solar tank:

- ❑ Water heater sensor is secure in sensor well
- ❑ Boiler back-up sensor is wired back to the boiler control or relay center

### Solar heat exchanger to solar panel:

- ❑ Heat transfer fluid is added and copy of MSDS sheet is left with manual for homeowner
- ❑ Solar heat exchanger is completely purged of air
- ❑ Expansion tank and pressure temperature gauge are operating properly
- ❑ Solar control shows circulators operating properly on the solar loop system

### Boiler heat exchanger; boiler back-up systems:

- ❑ Heat exchanger is completely purged of air
- ❑ Expansion tank and pressure temperature gauge are operating properly
- ❑ Boiler control is operating circulator for the boiler back-up heat exchanger

### Heat transfer fluid:

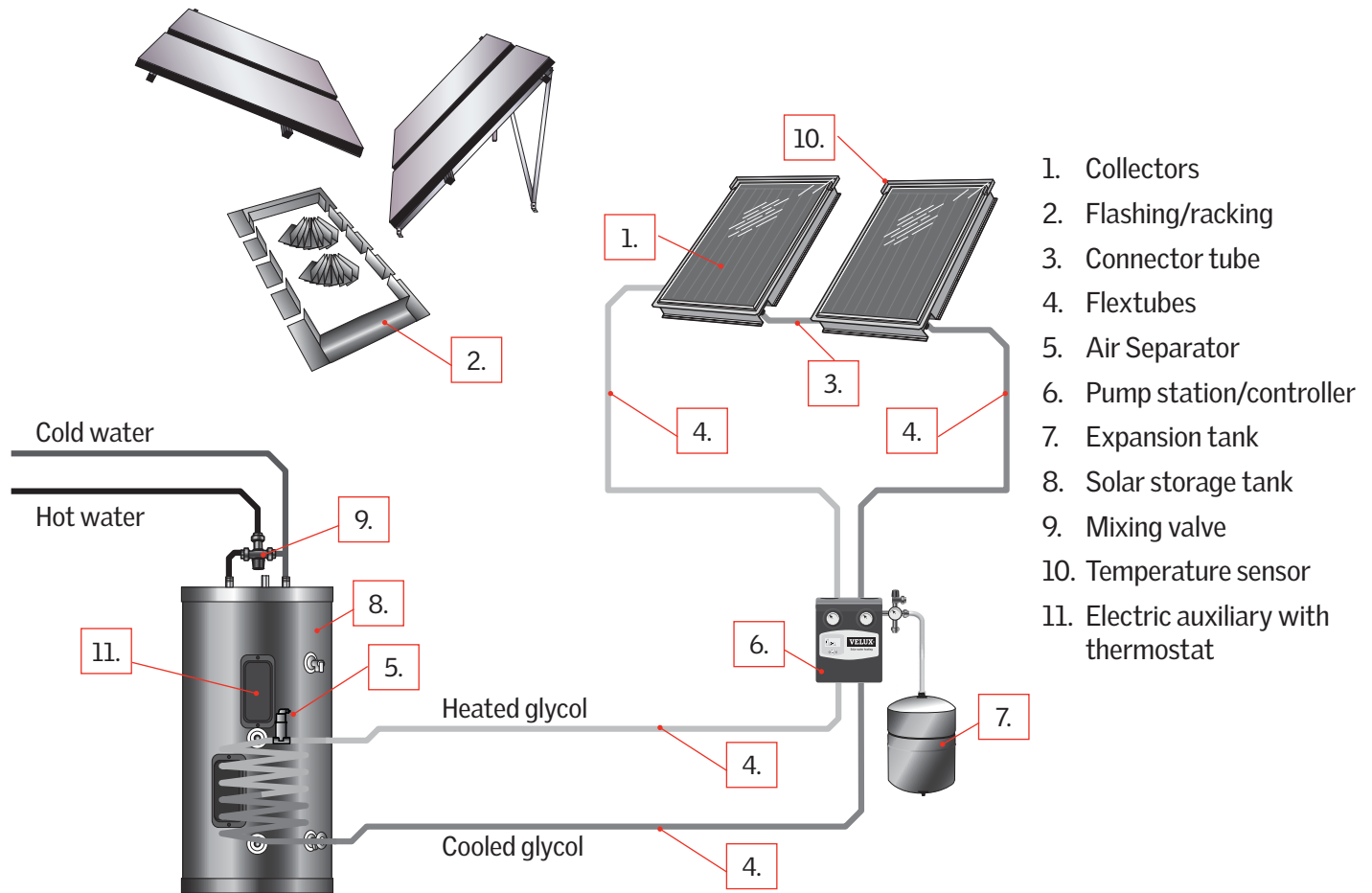
- ❑ Make sure heat transfer fluids are as specified in manual
- ❑ Heat transfer fluid percentage must be calculated per local area freeze level
- ❑ Provide propylene glycol MSDS sheet to end user

### Pump station / Controller:

- ❑ Solar loop pressure set to 50 psi.
- ❑ Air has been bled from circulating pump
- ❑ Pressure relief valve is piped per local codes
- ❑ Controller is set to "Automatic (Active)" Operation Mode

# VELUX solar water heating system with electric or gas back-up

System models: CLI U12 SD0(W/L/F/P) 118 EI B/U    CLI U12 SD0(W/L/F/P) 1110 NG B/U    CLI U12 SD0(W/L/F/P) 1111 LP B/U  
 CLI U12 SK0(W/L/F/P) 218 EI B/U    CLI U12 SK0(W/L/F/P) 2110 NG B/U    CLI U12 SK0(W/L/F/P) 2111 LP B/U  
 CLI U12 SK0(W/L/F/P) 318 EI B/U    CLI U12 SK0(W/L/F/P) 1112 NG B/U    CLI U12 SK0(W/L/F/P) 1113 LP B/U  
 CLI U12 SK0(W/L/F/P) 2112 NG B/U    CLI U12 SK0(W/L/F/P) 2113 LP B/U



## Notes:

1. This drawing is meant to show a system piping concept only. The installer is responsible for all equipment and detailing by local codes.
2. Anti-freeze, non-potable heat transfer fluid shall be used for the solar storage tank heat exchanger circuit only. Never introduce Anti-freeze solution to any other solar storage tank connection other than the solar heat exchanger.
3. If there is a check valve on the cold water feed line, a thermal expansion tank suitable for potable water must be sized and installed within this piping system between the check valve and the cold water inlet of the solar storage tank.
4. The anti-scald mixing valve provided must always be installed as shown.
5. For all electric back-up models, make sure solar storage tank is fully purged of air before power is turned on to the back-up heat source.

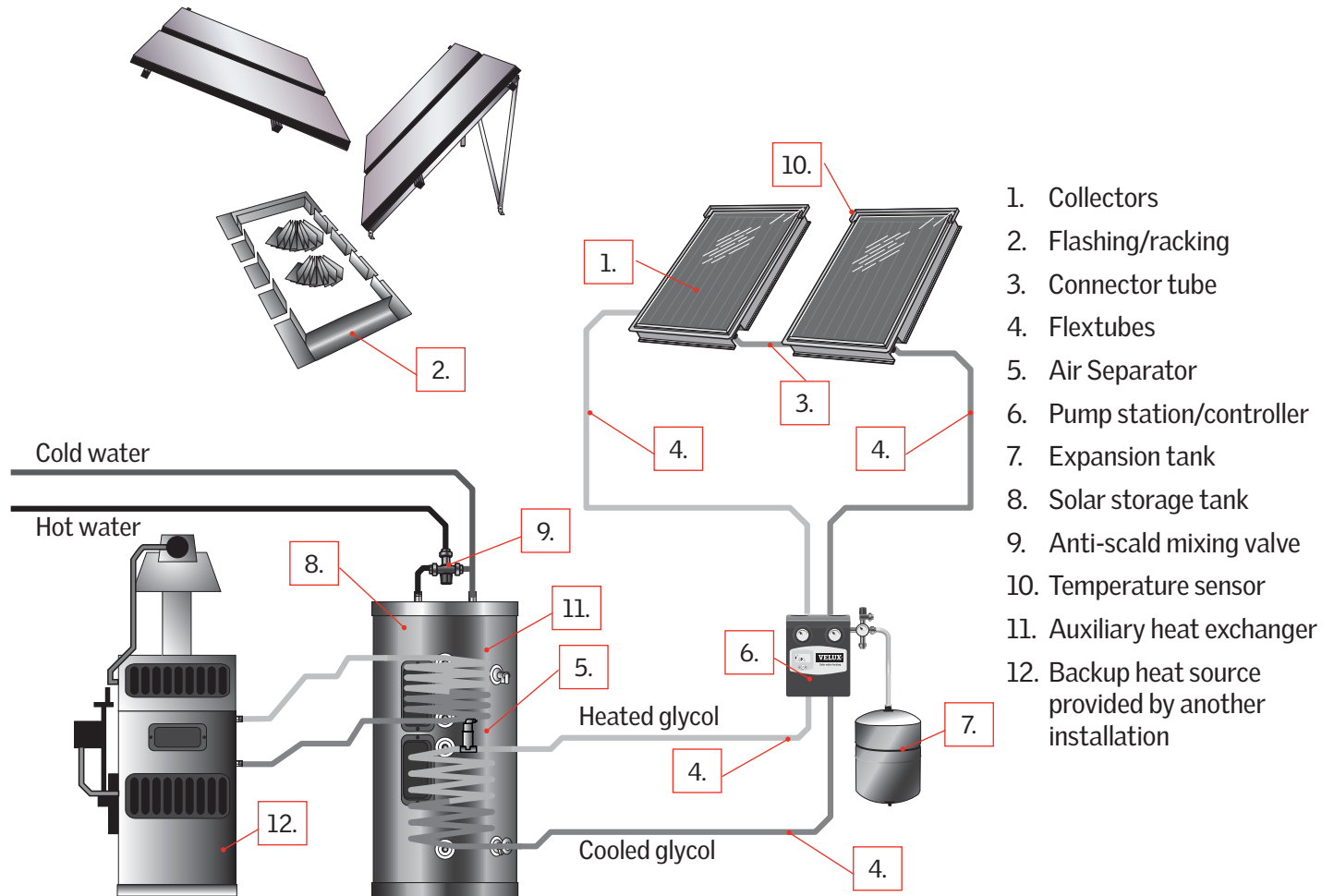
# VELUX solar water heating system with boiler back-up

System models:

CLI U12 SD0(W/L/F/P) 119 HX B/U

CLI U12 SK0(W/L/F/P) 219 HX B/U

CLI U12 SK0(W/L/F/P) 319 HX B/U



## Notes:

1. This drawing is meant to show a system piping concept only. The installer is responsible for all equipment and detailing by local codes.
2. Anti-freeze, non-potable heat transfer fluid shall be used for the solar storage tank heat exchanger circuit only. Never introduce Anti-freeze solution to any other solar storage tank connection other than the solar heat exchanger.
3. If there is a check valve on the cold water feed line, a thermal expansion tank suitable for potable water must be sized and installed within this piping system between the check valve and the cold water inlet of the solar water heater.
4. The anti-scald mixing valve provided must always be installed as shown.
5. Circulators shown in the hydronic boiler piping above should have an integral flow check or alternately use a stock pump with an external spring type check valve. (Circulators with integral flow checks are not to be used in solar systems due to extreme temperatures.)



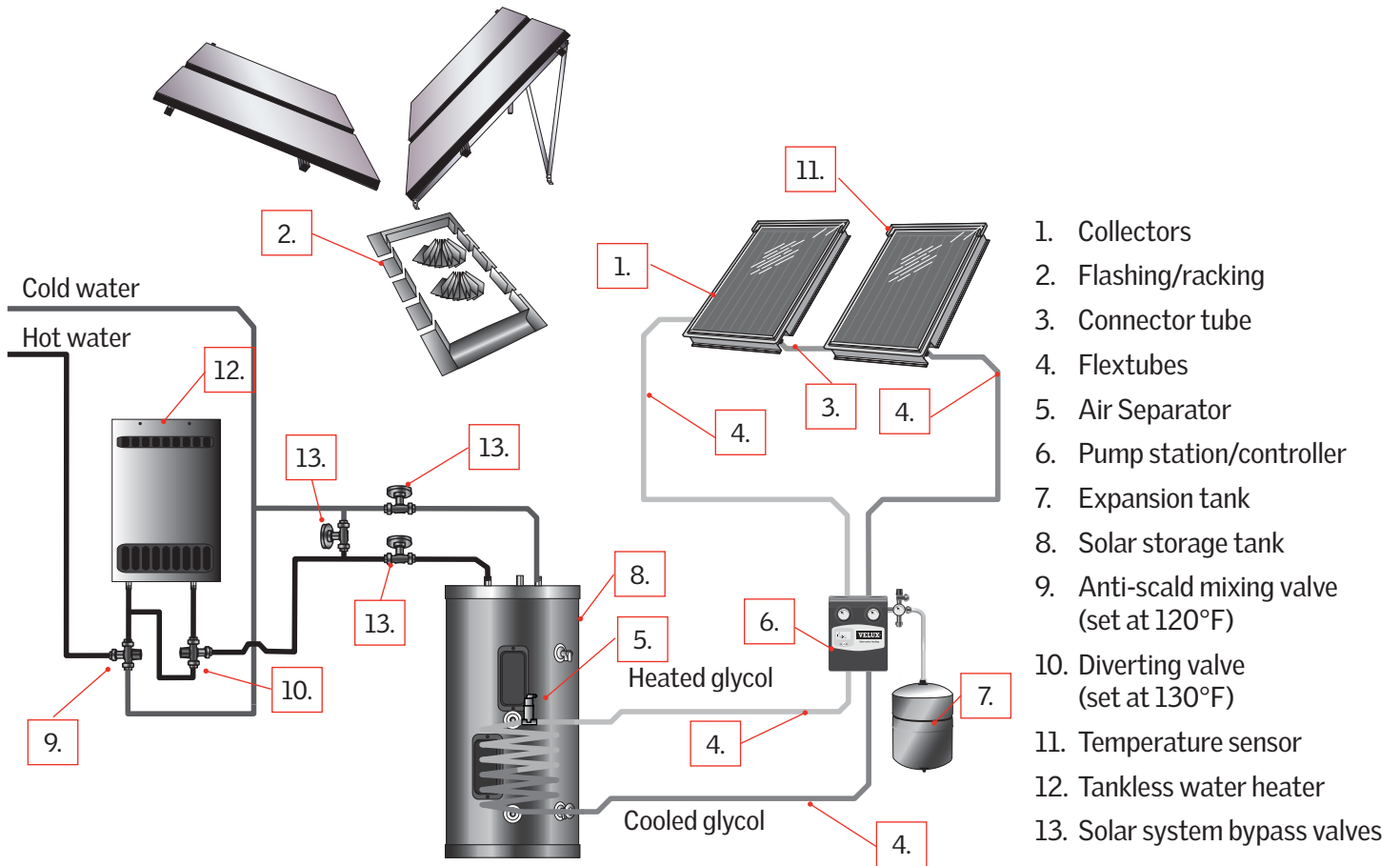
# VELUX water heating system with tankless back-up

System models:

CLI U12 SD0(W/L/F/P)118 AUX TLG

CLI U12 SK0(W/L/F/P)218 AUX TLG

CLI U12 SK0(W/L/F/P)318 AUX TLG



Notes:

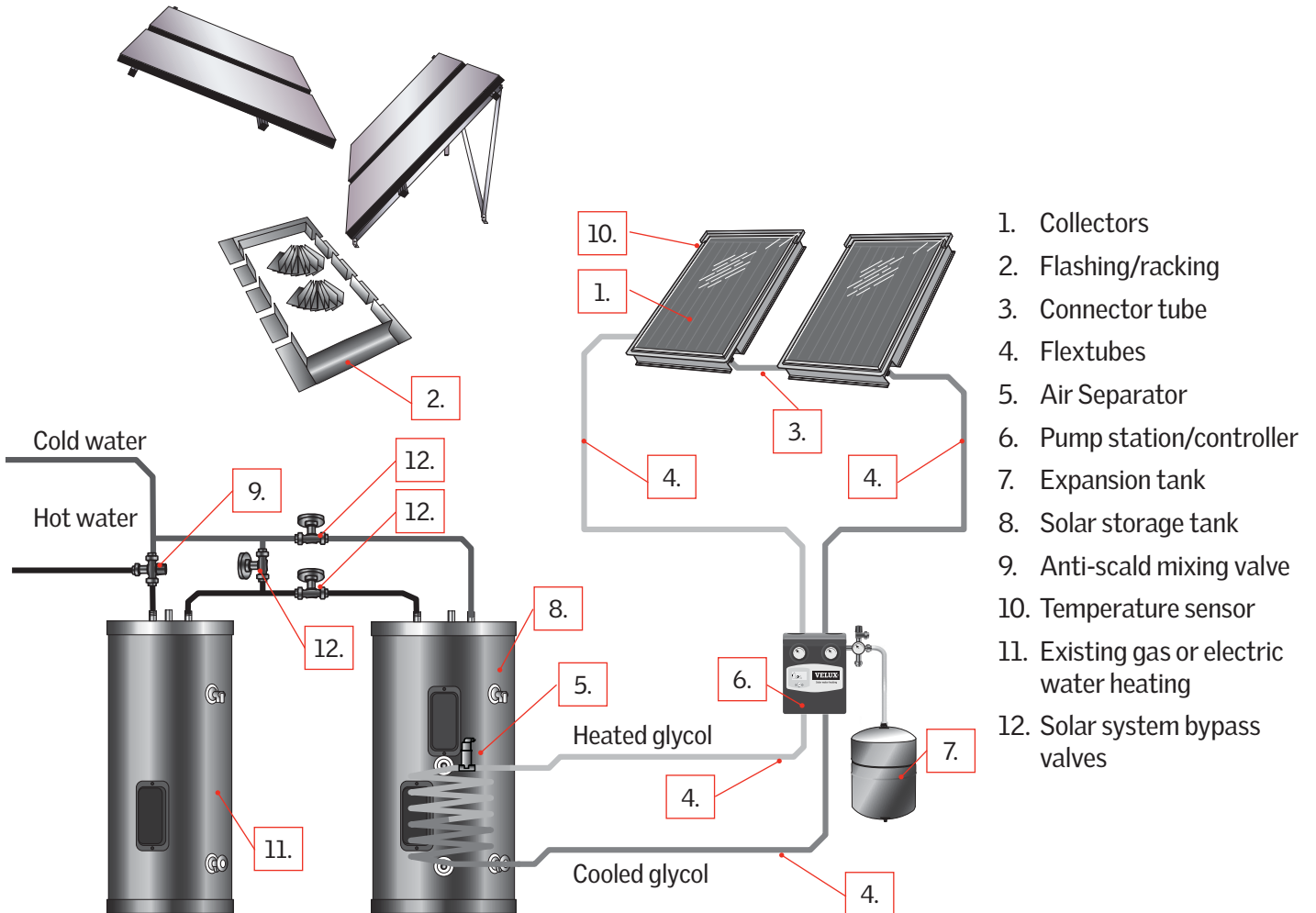
1. This drawing is meant to show a system piping concept only. The installer is responsible for all equipment and detailing by local codes.
2. Anti-freeze, non-potable heat transfer fluid shall be used for the solar storage tank heat exchanger circuit only. Never introduce Anti-freeze solution to any other solar storage tank connection other than the solar heat exchanger.
3. If there is a check valve on the cold water feed line, a thermal expansion tank suitable for potable water must be sized and installed within this piping system between the check valve and the cold water inlet of the solar storage tank.
4. The anti-scald mixing valve provided must always be installed as shown.
5. For all electric back-up models, make sure solar storage tank is fully purged of air before power is turned on to the back-up heat source.

# VELUX solar pre-heat water heating system

System models:

CLI U12 SD0(W/L/F/P)118 AUX EL  
 CLI U12 SK0(W/L/F/P)218 AUX EL  
 CLI U12 SK0(W/L/F/P)318 AUX EL

CLI U12 SD0(W/L/F/P)118 AUX GAS  
 CLI U12 SK0(W/L/F/P)218 AUX GAS  
 CLI U12 SK0(W/L/F/P)318 AUX GAS



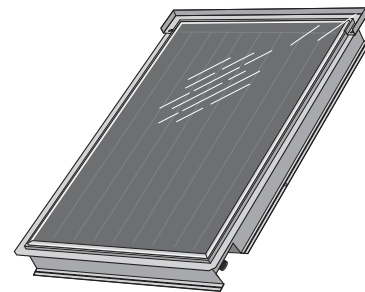
Notes:

1. This drawing is meant to show a system piping concept only. The installer is responsible for all equipment and detailing by local codes.
2. Anti-freeze, non-potable heat transfer fluid shall be used for the solar storage tank heat exchanger circuit only. Never introduce Anti-freeze solution to any other solar storage tank connection other than the solar heat exchanger.
3. If there is a check valve on the cold water feed line, a thermal expansion tank suitable for potable water must be sized and installed within this piping system between the check valve and the cold water inlet of the solar storage tank.
4. The anti-scald mixing valve provided must always be installed as shown.
5. For all electric back-up models, make sure solar storage tank is fully purged of air before power is turned on to the back-up heat source.

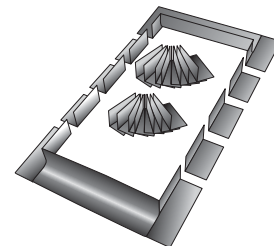
## VELUX solar system components

Listed below are the components included in the VELUX water heating systems.

1. VELUX solar collector: Absorbs the sun's energy and transfers this energy into the heat exchanger located on the bottom of the solar storage tank.
2. VELUX collector flashings/racking: Flashings integrate the solar collectors into the roofing material for an aesthetic low profile "skylight" look; racks are used to mount the collectors above flat roofs or metal roofs.
3. Solar storage tank: Transfers sun's energy to the domestic hot water through the solar heat exchanger located in the tank. Consists of the following components:
  - a. Drain valve (Tank): Used to flush sediment which may accumulate on the bottom of the solar storage tank and also provide a means of draining the tank.
  - b. Solar heat exchanger: The solar heat exchanger is designed to transfer heated energy rapidly from the solar collector into the potable water.
  - c. Hot water outlet: The solar storage tank has a hot water dip tube outlet which draws water from the very top of the heater. This helps to keep the heat trapped inside the highly insulated storage tank.
  - d. Temperature and pressure relief valve: The relief valve provided complies with standards for relief valves (ANSI Z21.22). No valve of any type should be installed between the relief valve and tank. Local codes govern installation of relief valves. The outlet of the relief valve must be piped to suitable open drain so that the discharge water cannot contact live electric parts to eliminate potential damage. Piping used should be approved for hot water distribution. The valve discharge line must be no smaller than the outlet of the valve and must be pitched downward from the valve to allow complete drainage of the relief valve and discharge line. The end of the discharge piping should be not be threaded or concealed and should be protected from freezing. No valve of any type, restriction or reducer coupling should be installed in the discharge line.
  - e. Back-Up electric element with thermostat (electric back-up systems): The back- up electric element will only be activated when the desired minimum set point temperature set on the back-up thermostat cannot be satisfied by the solar gain achieved from the solar collector.
  - f. Back-Up burner with thermostat (NG and LP back-up systems): The back burner will only be activated when the desired minimum set point temperature set on the back-up thermostat cannot be satisfied by the solar gain achieved from the solar collector.
  - g. Boiler back-up heat exchanger (boiler back-up systems): The back-up boiler will only be activated when the desired minimum set point temperature set on the back-up thermostat can not be satisfied by the solar input from the solar collector.
  - h. Boiler back-up aquastat (boiler back-up systems): The boiler back-up aquastat will activate the boiler to circulate the hot water generated from the boiler into the heat exchanger located on the top section of the solar storage tank. Once the controller is satisfied and has reached its desired set point, it will shut off the boiler. This back-up portion will only be activated if the solar gain achieved from the solar collector can not keep the tank at the minimum desired temperature setting.



VELUX solar collector



VELUX collector flashings



VELUX collector racks



Solar storage tank

4. Pump station controller: Operational control center for VELUX solar systems. All solar loop system safety devices, temperature gauges, pressure gauges, fill valves and drain valves are housed within or attached to the pump station controller. Consists of the following components:

- a. Solar controller: The solar controller, turns on or off solar loop circulator depending on the heat gained in the solar collectors. The controller will also limit over heating in the solar collectors and overheating in the solar storage tank.
- b. Tank and heat exchanger temperature and pressure and gauges: The temperature and pressure gauges in the pump station controller will show the user the actual temperature and pressure being supplied and returned to the solar collector and through the heat exchanger.



Pump station controller

- c. Check valves: Check valves located in the "hot" and "cold" lines of pump station controller help minimize the convective heat loss at night when the system is not operating. If check valves are not installed, most of the heated energy stored during the day would be transferred back up into the collectors and lost.
- d. Collector array isolation valves: Valves located in the "hot" and "cold" lines of pump station controller are used to isolate the solar collector loop from the solar storage tank.

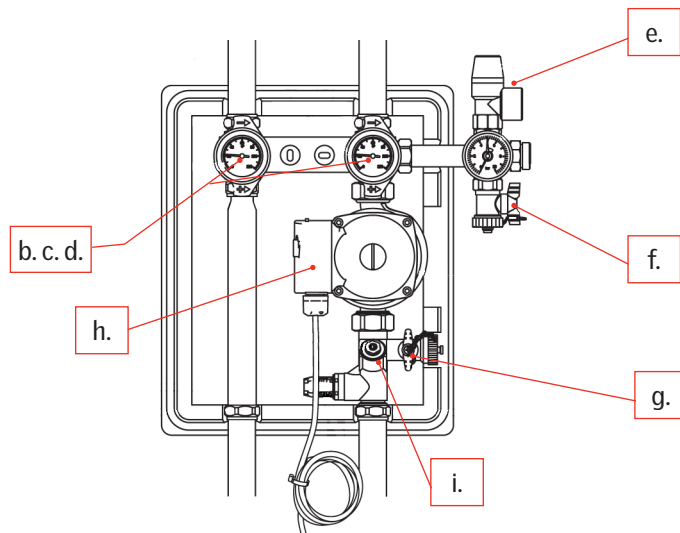
e. Pressure relief valve (for solar loop): Will release the pressure in the solar loop when it exceeds 82 PSI. If the valve opens and releases fluids, than it is recommend that you contact your contractor immediately.

f. System fill valve: Used to fill the system with heat transfer fluid and also eliminate air from the system.

g. System drain valve: Used to charge the collector loop with propylene glycol, purge air from loop and drain the solar water heating system of heat transfer fluid.

h. Circulator: Circulates the heat transfer fluid from the solar collectors into the solar storage tank heat exchanger.

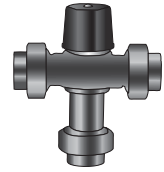
i. Ball valve (for circulator): Used to isolate the circulator pump for service and when filling the system with heat transfer fluid.



Inside a pump station controller

5. Other system components:

a. Anti-Scald Mixing Valve: Automatically blends the hot water and the cold water feed line to control the discharge temperature to an acceptable and safe temperature. This will also increase the amount of hot water that is drawn from the solar storage tank by not allowing the incoming water to fully temper the hot water stored inside the tank.



Anti-Scald Mixing Valve

b. Expansion tank: Pre-charged with air to allow for the expansion as the heat transfer fluid expands and contracts with heating and cooling.



Expansion tank

c. Solar collector temperature sensor  
This sensor is wired to the solar controller and automatically turns on the circulator pump when the differential set point is reached between the solar water heater and the solar collector.



Collector temperature sensor

d. Tank temperature sensor: The tank sensor is wired to the solar controller to measure the temperature on the bottom of the solar storage tank.



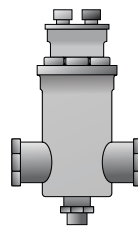
Tank temperature sensor

e. VELUX flexible piping: Pre-insulated corrugated stainless steel flexible piping designed specifically for VELUX solar loop piping. VELUX has designed a special cone shaped fitting which ensures a tight and secure connection to collectors without requiring a gasket or o-ring seal.



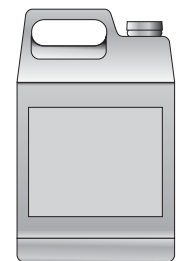
VELUX flexible piping

f. Microbubble air separator: This automatic air vent is used in the solar system to allow air contained in the system to be released. The air vent valve is designed to work in high temperatures (as high as 350°F) with a propylene glycol medium.



Microbubble air separator

g. Propylene glycol heat transfer fluid: Non-toxic fluid used to transfer heat from solar collectors to solar storage tank. Includes corrosion inhibitors to prevent corrosion of solar loop components.



Propylene glycol

## Solar collector orientation

Operating your VELUX solar water heater for optimal efficiency is based on the correct orientation, pitch, and location of the solar collectors. In North America, collectors should be oriented due south, however they may be oriented up to 45 degrees east or west of due south with minimal losses in solar gain. Optimal pitch is  $\pm 10^\circ$  from the latitude of the installation site. VELUX collectors must be installed at a minimum pitch of 15 degrees from horizontal, and for optimal performance, the recommended pitch is between 15–60 degrees. The collector should be mounted as close to the storage tank as possible to minimize heat loss in the piping runs. The solar collector must be located in an area of the roof that will be unshaded for the majority of the day (from 9:00–3:00) all year round. Adjacent buildings and trees should be checked for possible winter shading.

## Collector installation

The most important structural consideration is to securely anchor the solar collector to the structural members of the roof with the stainless steel mounting screws provided. Preserving the integrity of the roof membrane is the most important roofing consideration. Ensure that the solar collectors can be properly flashed and sealed in accordance with standard roofing practices and the VELUX flashing instructions. Reference your VELUX collector installation manual for proper guidelines in your application. All equipment should be installed in accordance with all local codes and best practices as identified with National Roofing Contractors Association (NRCA) or other qualified body.

1. Open the packaging for the collectors and flashings. Carefully read all provided installation instructions.

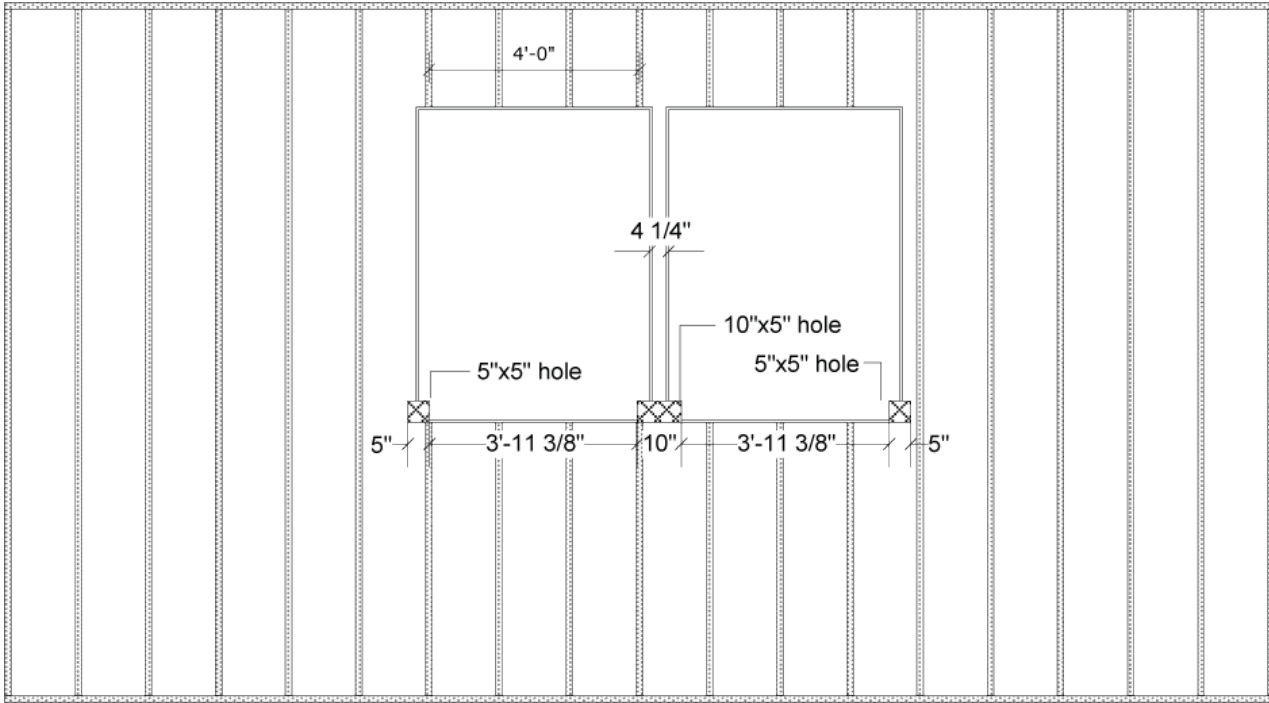


2. Prepare the roof for collector mounting. If needed, carefully remove shingles to expose underlayment. Mark off the location of the collectors and nail a temporary collector support to roof.

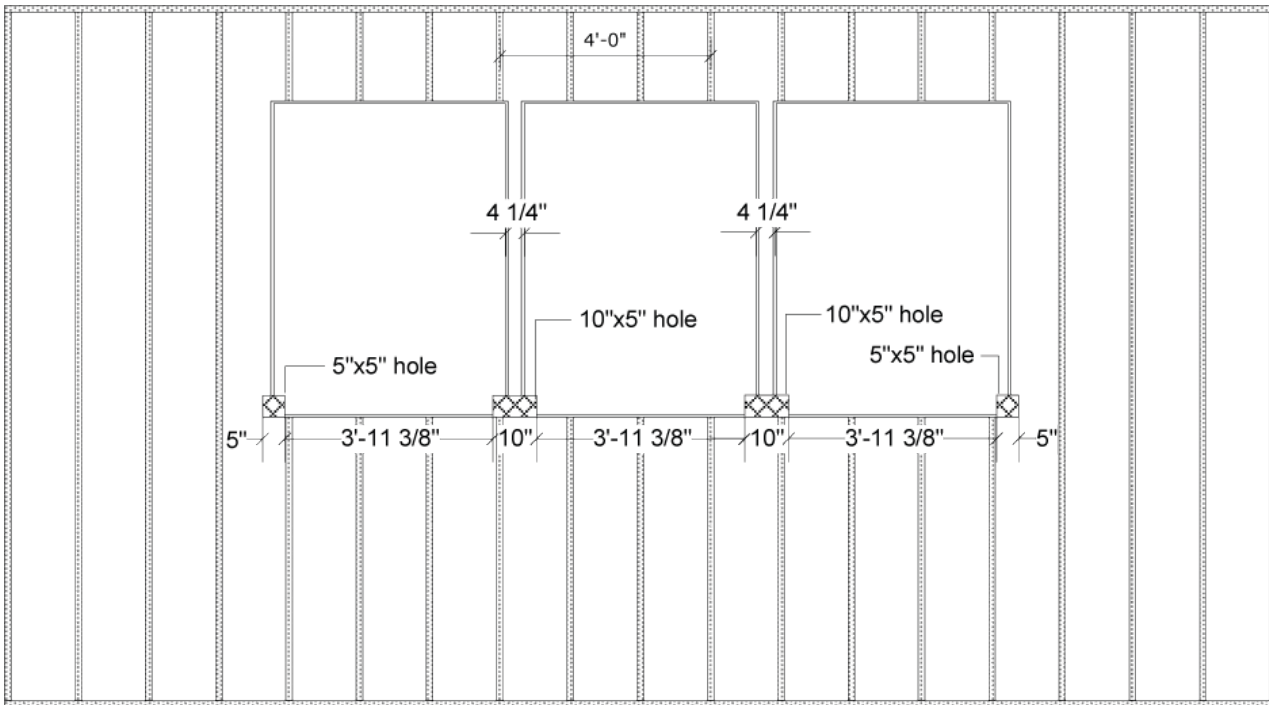


## Collector location on 16" o.c. rafters

CLI U12 4000 • 2 Collector layout • 16" o.c. rafters

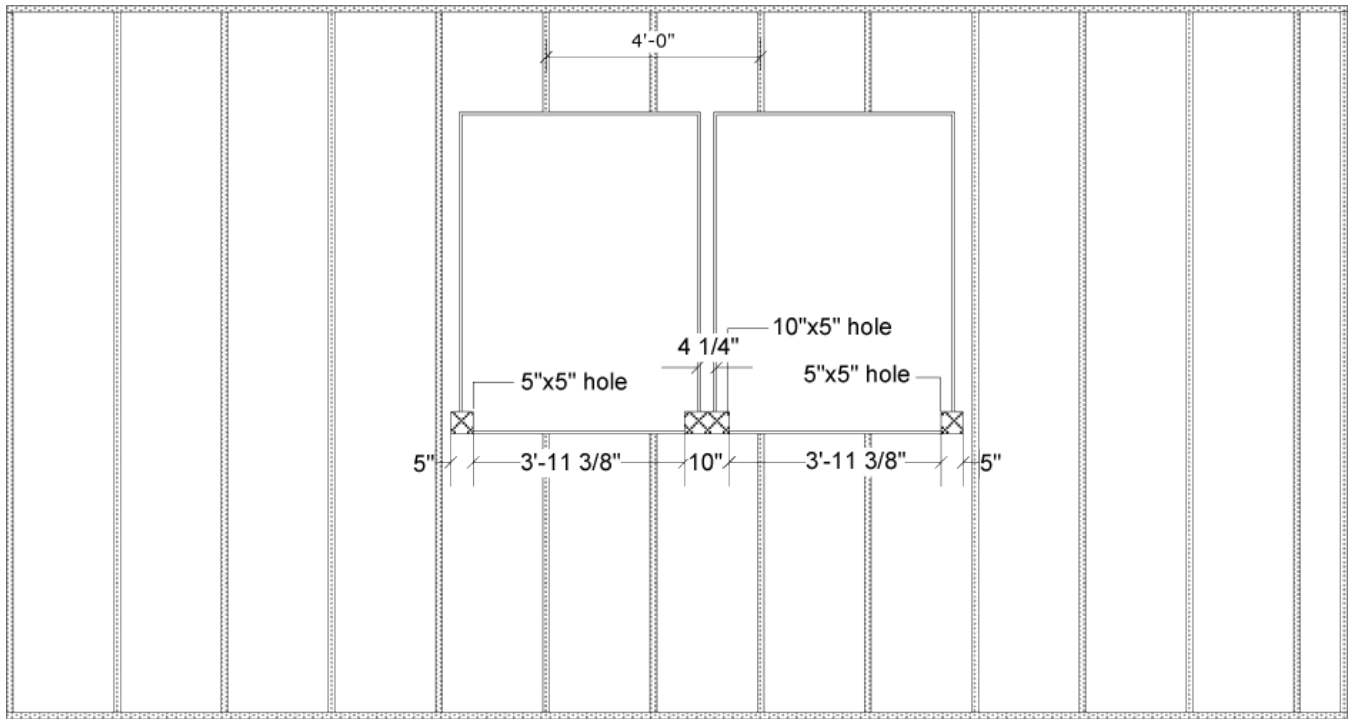


CLI U12 4000 • 3 Collector layout • 16" o.c. rafters

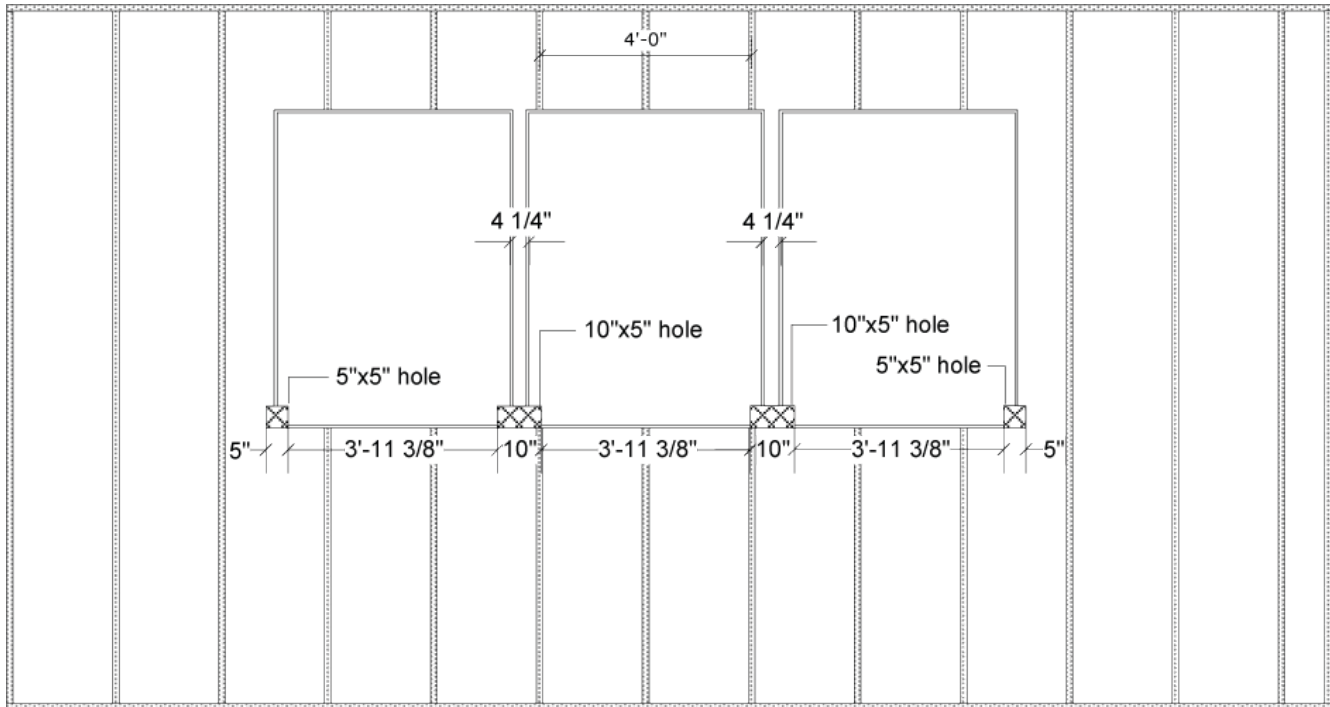


## Collector location on 24" o.c. rafters

CLI U12 4000 • 2 Collector layout • 24" o.c. rafters

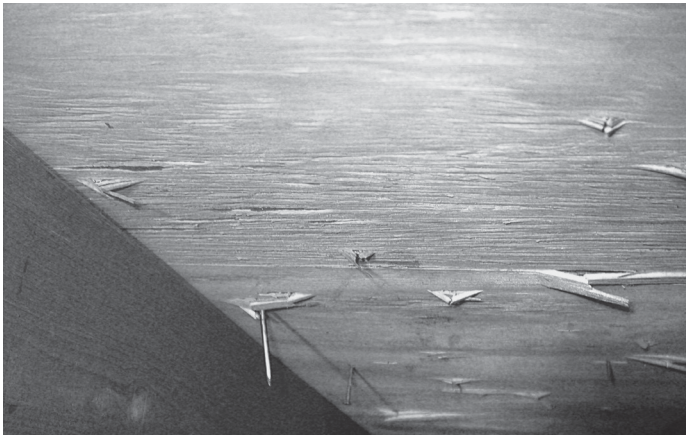


CLI U12 4000 • 3 Collector layout • 24" o.c. rafters





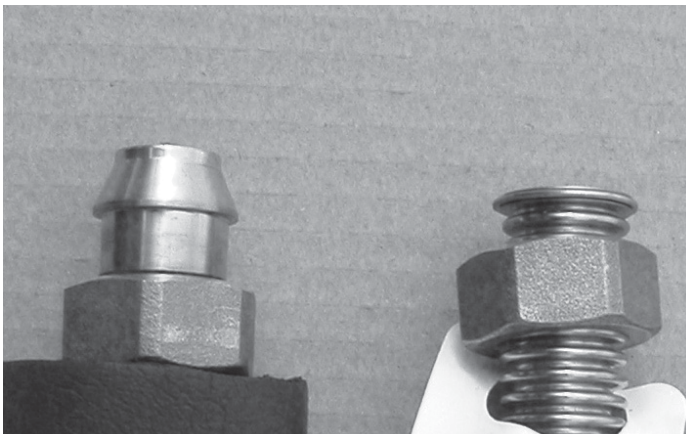
3. Mark off the location for the flexible piping penetration locations. Verify that there are no roof joists or obstructions prior to drilling, then drill, or cut openings for piping penetrations.



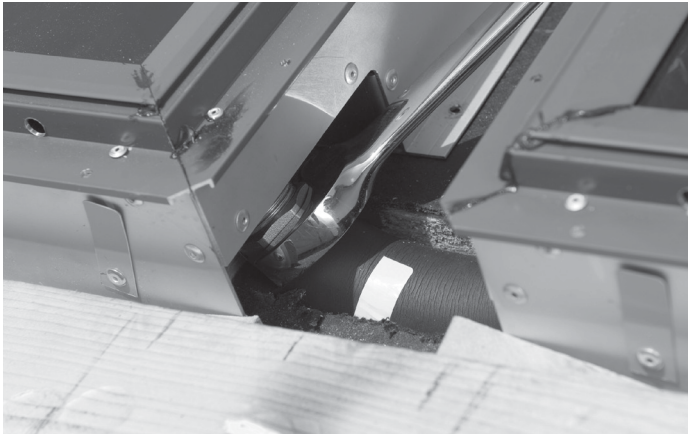
4. Carefully place collectors on roof. Place collector against temporary support and align them so that the flexible piping connections align with the openings cut into the roof deck. Ensure that there is 4" of space between collectors (measured to the vertical wall casing). Secure collector top support flange to roof deck using three self-tapping stainless steel mounting screws (provided). When possible, screws shall be located to secure the collectors to the roof supports below.



5. Open the packaging for the ZFM flexible pipes (used to connect the collectors to the pump station). Identify ZFM flexible pipe connection end for connection to the pump station (end with red/blue tabs) and the connection end for connection to the collector (end with cone shape). Route the collector ends up through the roof and attach flexible piping to collectors. Secure flexible piping nuts securely using wrench.



6. Open the packaging for the ZFR flexible pipes (used for interconnection between two collectors). The ZFR pipes are a fixed length and are not to be cut -- the cone shaped end connections on these pipes are designed specifically for use with VELUX collectors. Route the ZFR pipes between the collectors and attach to collectors. Secure nuts securely using wrench. Fully insulate flexible piping connections with insulation and tape provided.



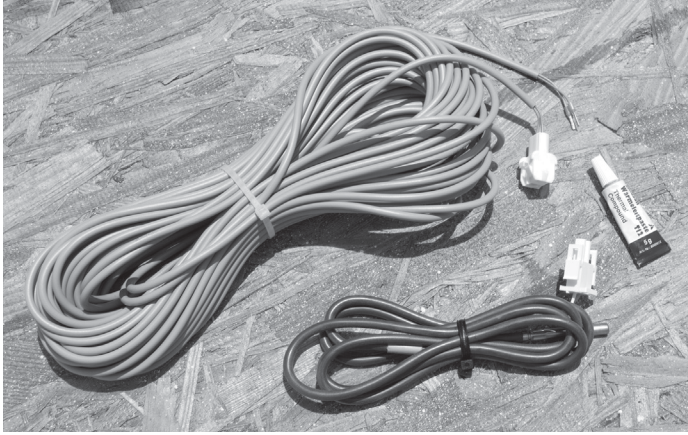
7. Locate the end of the flexible pipe connected to the bottom left corner of the collector bank (this is the heat transfer fluid "cold" pipe). Locate the indicator tab near the end connection. Tear off "red" tab from the indicator tab, leaving the "blue" tab in place -- this will help to identify this pipe as the "cold" pipe later in the installation.



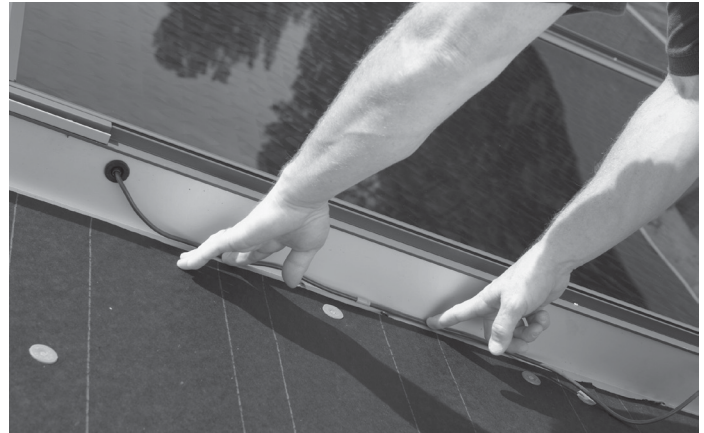
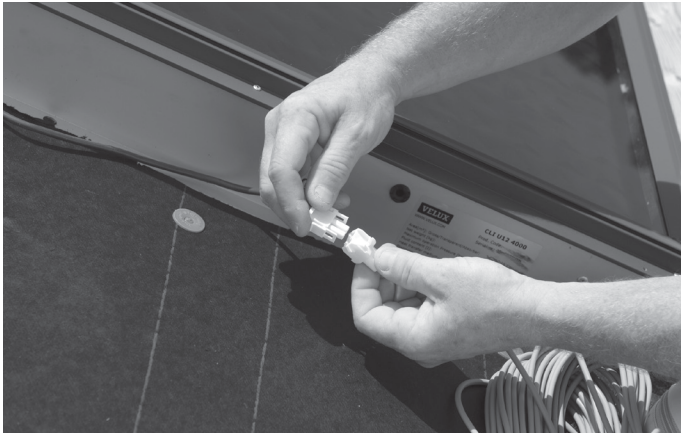
8. Locate the end of the flexible pipe connected to the bottom right corner of the collector bank (this is the heat transfer fluid "hot" pipe). Locate the indicator tab near the end connection. Tear off "blue" tab from the indicator tab, leaving the "red" tab in place -- this will help to identify this pipe as the "hot" pipe later in the installation.



9. Locate the collector temperature sensor, couplant tube, and extension cable. Locate the collector temperature sensor well in the top left corner of the collector bank (last collector in the collector array with "hot" pipe connected). Fill the collector sensor port with couplant and then insert sensor into the sensor well. Secure the sensor in place with insulating tape.



10. Connect the extension cable to the collector temperature sensor. Drill a 1" hole alongside the collector flange near the temperature sensor well. Route the cable from the cable wall down through the 1" hole.



11. Secure the side flanges of the collectors to the roof structure using four self-tapping stainless steel mounting screws spaced 16" on center per side. Carefully remove the temporary support from the bottom edge of the collectors and secure the bottom flange of all collectors to the roof structure using the remaining self-tapping stainless steel mounting screws. When possible, screws shall be located to secure the collectors to the roof supports below. Wrap collectors with self adhesive underlayment on all four sides.



## Flashing installation

Install the VELUX flashings ensuring that the collectors are properly flashed and sealed in accordance with standard roofing practices and the VELUX flashing instructions. Reference your VELUX collector installation manual for proper guidelines in your application. All equipment should be installed in accordance with all local codes and best practices as identified with National Roofing Contractors Association (NRCA) or other qualified body.

1. Install the bottom pan flashings and gutters and secure in place using metal tabs as referenced in the VELUX flashing instructions. Do not drive roofing nails, screws, or other fasteners, through the flashings to secure.



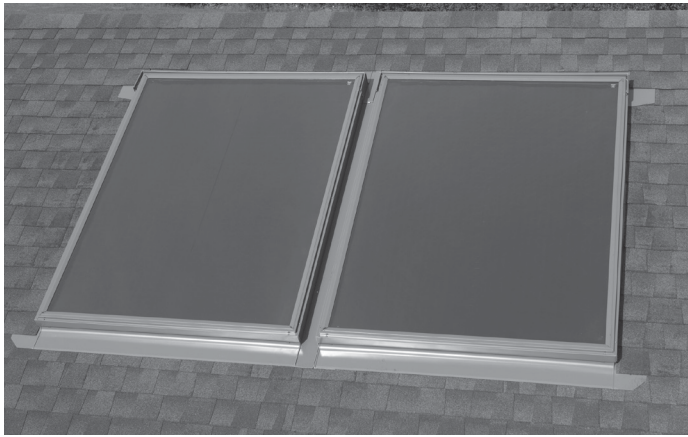
2. Install the first course of roofing material and VELUX flashings along left side of collector bank. Repeat procedure along right side of collector bank.



3. Install the top pan flashings and secure in place using metal tabs as referenced in the VELUX flashing instructions. Finish the flashing installation by installing the collector cladding and the last course of roofing material.



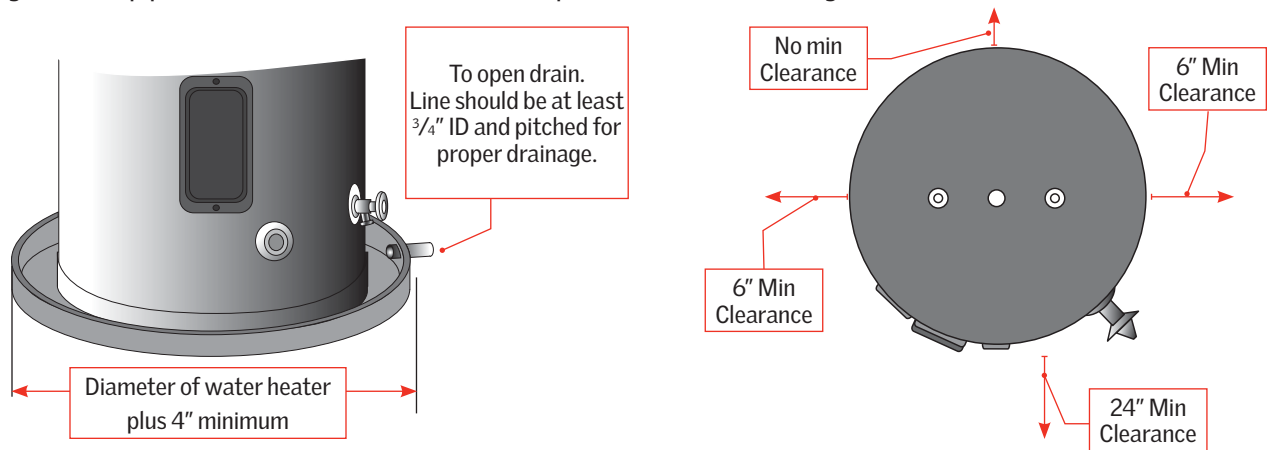
4. Cover the solar collectors before proceeding to the next step of the system installation procedure.



## Solar storage tank and pump station controller location

Choose a location for your solar storage tank and pump station controller centralized to the domestic hot water piping system. You must also locate the solar storage tank and related domestic piping where it will not be exposed to freezing temperature. All piping should be insulated. The storage tank should be installed so there is access to the electric element (or burner) and thermostat for future service. If you do not provide minimum clearances, it might not be possible to service the tank without removing it from the space.

The water tank must be located in an area where a leak will not damage the building contents or structure. If you do not have this location requirement available, you must use an auxiliary catch pan. The tank must also be placed in a location where the T&P discharge, and drain pan discharge, can be piped to the outdoors or a floor drain. The T&P discharge and drain pan discharge shall be piped to the outdoors, or a floor drain, per state or local building codes.



## ⚠ WARNING

Do not introduce heat transfer fluids into any fittings on the tank except those clearly marked for that purpose. See heat transfer fluid specification in the back of this manual.

Provide clear access to the storage tank, pump station controller, expansion tank, mixing valve, and other key components. The components on the potable side of the system may require future service or maintenance, so it is recommended that the connections be made with brass unions. You must use the VELUX pipe and fittings when plumbing the solar loop for the solar storage tank and the expansion tank. The use of galvanized fittings, nipples, di-electric unions, CPVC, PVC or other plastic pipe is prohibited.

Hard copper connections to the city cold water supply line and home hot water feed lines are recommended. The gaskets in standard water heater flex hose connectors can become brittle and compressed over time and begin leaking on the water heater. If not detected in a timely manner, even a drip or leak may cause serious damage to the tank's electrical components or in extreme cases, may cause the tank to leak from the outside in.

## Inspection of solar storage tank

Prior to installation, inspect the solar storage tank for possible damage. Check markings on the rating plate to be certain the power supply corresponds to that for which the water heater is equipped (electric and powervent gas back-up models only).

## Solar storage tank and pump station controller installation

The design and installation of the VELUX solar water heating system should be done by qualified individuals that have been trained in the proper installation techniques for VELUX solar water heating systems. It is important that good design and installation practice be followed to assure that your system will operate properly. Failure to follow installation guidelines for your VELUX solar water heating system could cause component failure and possible safety issues.

It is mandatory that all plumbing be done in accordance with all local and state codes or warranty will be void. It is also necessary on all solar loop piping mechanical connections to use both thread tape and the gaskets provided. The solar loop piping heat exchanger connections are located on the side of your solar storage tank, and also on the top and bottom of the pump station controller.

1. Carefully place storage tank in predetermined location and route the collector hot supply and cold return flexible pipes and collector sensor wire to the wall adjacent to the storage tank (area pump station controller will be installed).



2. Identify and mark the location the pump station will be installed -- The pump station should be installed within 4' of solar tank heat exchanger. Attach the pump station controller to the wall adjacent to the tank.

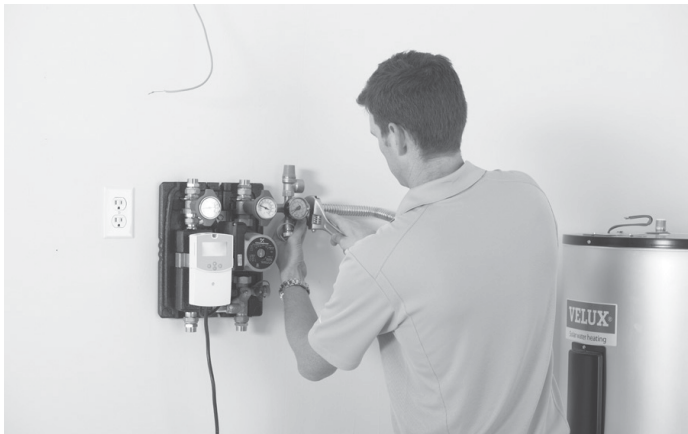


## Expansion tank installation

1. Locate the expansion tank wall bracket to the right of the pump station controller and secure to wall. The wall bracket screws should screw directly into a wall stud, or 1/2" plywood backer board.



2. Attach one end of expansion tank flex connector securely to pump station using pipe tape and the gasket provided. Tighten the flexible pipe nut securely.
3. Adjust flex connector as needed and attach the other end of expansion tank flex connector securely to expansion tank bracket using pipe tape and the gasket provided. Tighten the flexible pipe nut securely.



4. Secure the expansion tank bracket fitting to the expansion tank using pipe tape. Connect the expansion tank to the expansion tank bracket. Tighten securely.



## Air separator and fittings to tank

1. Connect the air separator to the solar heat exchanger at the upper port marked "FROM SOLAR COLLECTOR" using the brass nipple provided. Install the flextube connection fittings provided to the air separator and solar heat exchanger lower port marked "TO SOLAR COLLECTOR".



## Solar loop piping to collectors

1. Locate the collector hot supply flexible pipe (with red tab) -- extend the hot supply past the hot water connection on the pump station, remove any excess pipe, and prepare the end of the flextube, as needed. Repeat these steps for the collector cold return flexible pipe (with blue tab).



2. Using pipe tape and gaskets provided, attach the collector hot supply pipe to the pump station hot connection (top left connection) -- when making flexible pipe connections, tighten the flexible pipe nuts  $\frac{1}{4}$  turn past snug. Repeat these steps for the collector cold return pipe connecting it to the pump station cold connection (top right connection).





## Solar loop piping to solar heat exchanger

1. Install the ZFM-002 flexible pipes between pump station and solar storage tank heat exchanger. Connect the gasket end of one of the ZFM-002 flexible pipes to the air separator connection with pipe tape and the gasket provided. Connect the gasket end of the other ZFM-002 flexible pipe to the bottom solar heat exchanger connection with pipe tape and the gasket provided.



2. Route the flextubes such that the flextube connected to the air separator is connected to the pump station bottom left connection and the flextube connected to the heat exchanger bottom connection is connected to the bottom right connection of the pump station. Tighten all connections securely.



3. Install solar loop pressure relief valve drain line per state or local building code. The preferred method of piping is shown, with discharge routed from the pressure relief valve to an empty heat transfer fluid storage container using CPVC piping or other code approved piping (not provided with VELUX solar system).



## Potable water piping

The design and installation of the VELUX solar water heating system should be done by qualified individuals. It is important that good design and installation practice be followed to assure that your system will operate properly. Failure to follow installation guidelines for your VELUX solar water heating system could cause component failure and possible safety issues. It is mandatory that all plumbing be done in accordance with all local and state codes or warranty will be void. It is also necessary on all domestic plumbing mechanical connections to use both thread tape and pipe dope. The potable water piping is located on the top of your solar storage tank and marked Hot and Cold.

All VELUX solar water heating systems are provided with an anti-scald mixing valve, and the required fittings and flexible copper tubing to properly connect the solar system to the domestic potable water piping system. The anti-scald mixing valve, and all fittings provided must always be installed as shown in the following instructions. It is recommended that the VELUX hot and cold water connection fittings provided are always used, so the solar hot water storage tank can be easily serviced. Install a shut-off valve in the cold feed near the solar storage tank to isolate the tank for future service.

1. Connect the thermostatic mixing valve provided to the solar storage tank "Hot" water connection using pipe tape. Connect the mixing valve hot port "H" to the solar storage tank, as shown.

Connect the brass tee fitting provided to the solar storage tank "Cold" port using pipe tape, as shown.

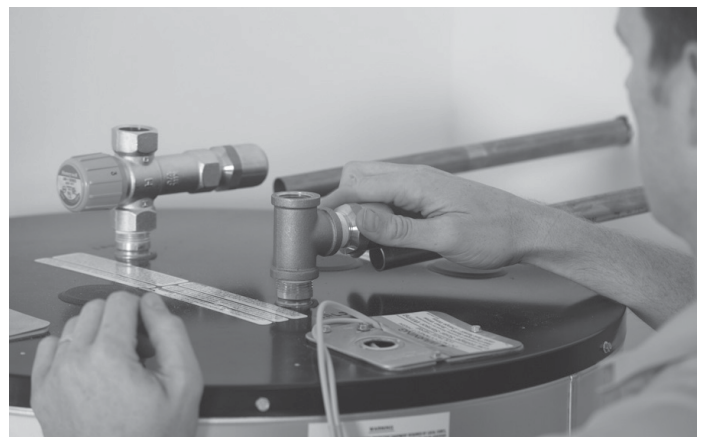
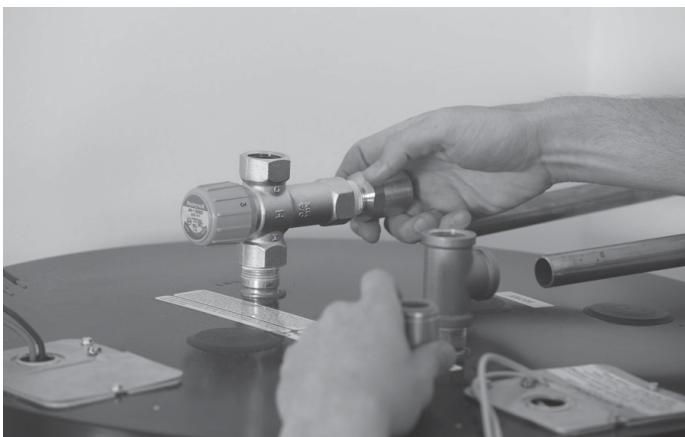
Tighten both fittings securely.



2. Connect a brass quick connect fitting to the mixing valve mixed port "M" using pipe tape.

Connect a brass quick connect fitting to the brass tee using pipe tape, as shown.

Tighten both fittings securely.



3. Connect the 3/4" hot and cold water service pipes to the hot water quick connect fitting and cold water quick connect fitting, respectively, as shown. Insure that the service piping connections are inserted into the quick connect fittings to a depth of 1 1/2".

Connect 3/4" brass nipples to the mixing valve cold water port "C" and to the brass tee using pipe tape, as shown. Tighten both fitting securely.



4. Connect the 3/4" copper flexible connector between the mixing valve cold port "C" and the cold water service brass tee, as shown. Tighten both connections securely.



5. Install solar storage tank temperature and pressure relief valve (T&P) drain line per state and/or local building code. The T&P discharge must be piped to the outdoors or to a floor drain (piping not included).

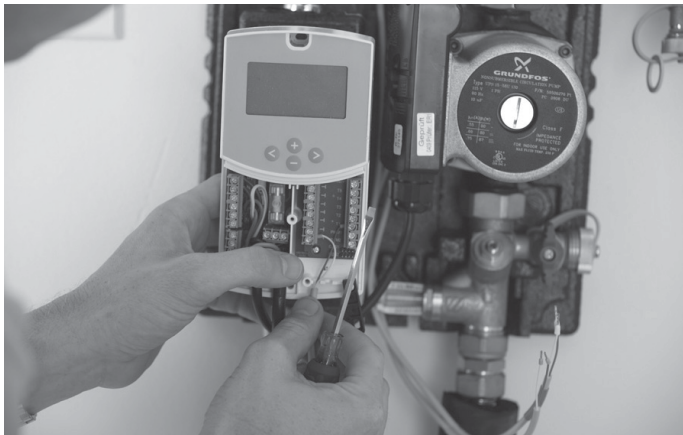


## Tank and collector temperature sensor connection to pump station controller

1. Route the solar collector sensor, storage tank bottom sensor, and storage tank top sensor wires to the solar pump station controller and remove the solar system control panel front cover for access to the temperature sensor terminal blocks.



2. Connect the collector temperature sensor cable ends to the terminals marked T1. Connect the tank bottom sensor (brown wire) to the terminals marked T2 and connect the tank top sensor (gray) to the terminals marked T3 (polarity does not matter on these connections). Replace the system control front cover, as shown.



## Solar loop and potable water piping insulation and support

1. Insulate all exposed solar loop and potable water connections and piping. The  $\frac{3}{4}$ " cold water supply line to the solar storage tank must be insulated with a minimum  $\frac{1}{2}$ " pipe insulation to a minimum distance of 5' up stream of the storage tank, or to the wall if closer than 5'. All piping must be supported at a maximum interval of 10' and the piping supports must not crimp or compress the insulation.



## Electrical connection

(VELUX solar water heating system with electric back-up only)

Refer to the Installation/Operation manual provided with your solar storage tank, and keep it with this manual at all times.

### ⚠ WARNING

Tank must be filled with water before unit is turned on! The heating element will be damaged if energized for even a short period of time while tank is dry!

### ⚠ CAUTION

Be sure to ground the water heater. The preferred way to ground, is to use rigid metal conduit between the main panel and the water heater junction box with approved end fittings. The separate ground wire connection provided in the water heater junction box must also be grounded. Replace the junction box cover and insulation after you've made all wiring connections.

The heating elements in the solar storage tank are wired to a junction box on top of the water heater for 240 volt / 4500 watt A.C. The voltage requirement and wattage load for the heater is also specified on the heater identification plate. Consult an electrician to determine if your electrical service is adequate for the additional load of the heater. The electrical installation should be done by a qualified licensed electrician. All wiring must conform to the National Electric Code and per local codes.

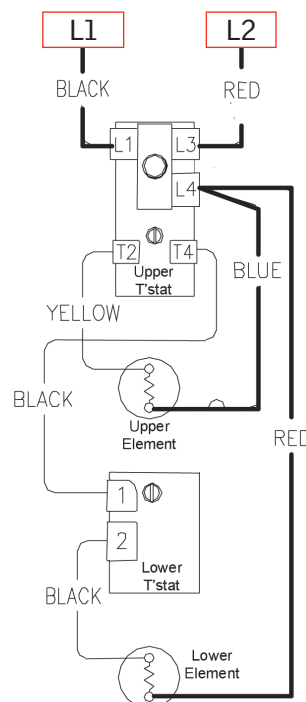
### ⚠ CAUTION

The manufacturer's warranty does not cover any damage or defect caused by the installation, attachment or use of any type of unapproved devices into, onto or in conjunction with this water heater. The use of unauthorized energy saving devices may shorten the life of the water heater and may endanger life and property. The manufacturer disclaims any responsibility for such loss or injury resulting from the use of such unauthorized devices.

## Dual Element, Non-Simultaneous Operation, Single Phase

Minimum branch circuit protection must be 25 amps

Solar water heater single element  
240 volt AC-4500 watt elements.  
#12 AWG wire suitable for at least 75 degrees is to be used.



## Gas connection

(VELUX solar water heating system with gas back-up only)

For installation and operation instructions, refer to the Installation/Operation manual provided with your solar storage tank. The Installation/Operation manual for your water heater must be kept with this manual at all times.

This water heater must be installed in accordance with local codes. In the absence of local codes, it must be installed in compliance with the National Fuel Gas Code (ANSI Z223.1-Latest Edition), or in Canada CAN/CGA B149.1 Natural Gas Installation Code (Latest Edition) or CAN/CGA B149.2 Propane Installation Code (Latest Edition).

Do not use this appliance if any part has been submerged in water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control, which has been under water. Depending upon the individual circumstances, it may be necessary to replace the entire water heater.

### **DANGER**

Do not store or use gasoline or other flammable, combustible, or corrosive vapors and liquids in the vicinity of this or any other appliance.

### **CAUTION**

The manufacturer's warranty does not cover any damage or defect caused by the installation, attachment or use of any type of unapproved devices into, onto or in conjunction with this water heater. The use of unauthorized energy saving devices may shorten the life of the water heater and may endanger life and property. The manufacturer disclaims any responsibility for such loss or injury resulting from the use of such unauthorized devices.

**WARNING:** If the information in these instructions is not followed exactly, a fire or explosion may result causing property damage, personal injury or death.

### **FOR YOUR SAFETY**

– Do not store or use gasoline or other flammable, combustible, or corrosive vapors and liquids in the vicinity of this or any other appliance.

#### – **WHAT TO DO IF YOU SMELL GAS**

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

– Installation and service must be performed by a qualified installer, service agency or the gas supplier.

## Venting connection

(VELUX solar water heating system with gas back-up only)

### ⚠ WARNING

The venting system must be installed properly following all local codes or in the absence of local codes, the latest edition of the National Fuel Gas Code (ANSI Z223.1-latest edition), or in Canada, The Natural Gas and Propane Installation Code (B149.1-00 latest edition). Failure to properly install the venting system could result in property damage, personal injury, or death.

Provide adequate air for combustion and ventilation. An insufficient supply of air will cause recirculation of combustion products resulting in air contamination that may be hazardous to life. Such a condition often will result in a yellow, luminous burner flame, causing carboning or sooting of the combustion chamber, burners and flue tubes with possible damage to the water heater. When an exhaust fan is installed in the same room with a water heater, sufficient openings for air must be provided in the walls. Undersized openings will cause air to be drawn into the room through the chimney, causing recirculation of combustion products.

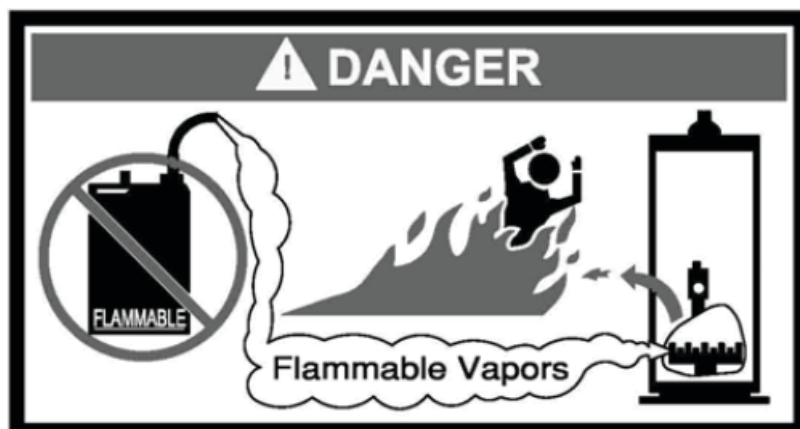
### ⚠ WARNING

Liquefied petroleum gases/propane gases are heavier than air and will remain at floor level if there is a leak. Basements, crawl spaces, closets and areas below ground level will serve as pockets for accumulation of leaking gas. Before lighting, smell all around the appliance area for gas. Be sure to smell next to the floor.

#### IF YOU SMELL GAS:

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any telephone in your building.
- Immediately call your gas supplier from a neighbor's telephone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

**DO NOT OPERATE APPLIANCE UNTIL LEAKAGE IS CORRECTED!**



## Boiler back-up heat exchanger connection

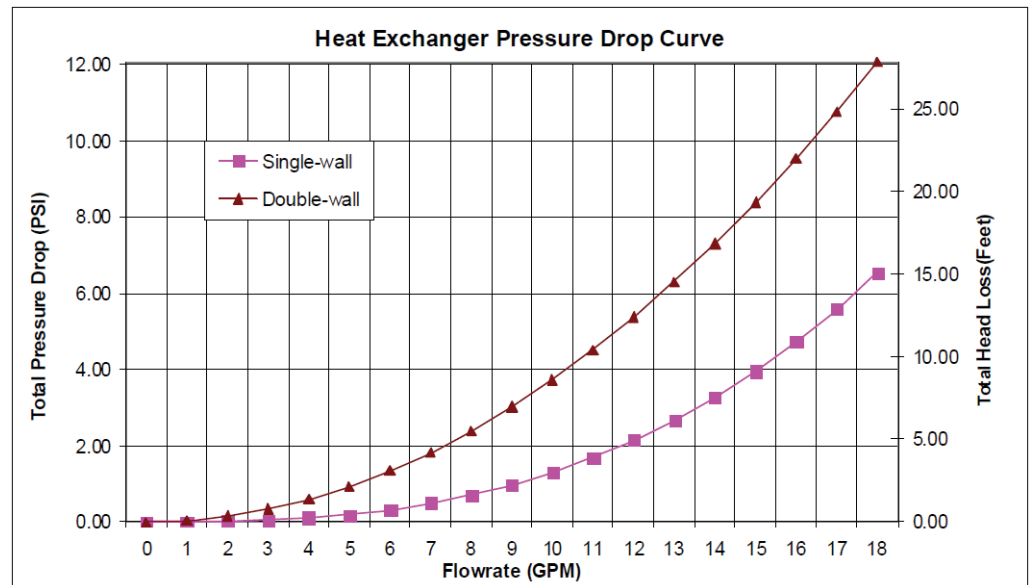
(VELUX solar water heating system with boiler back-up only)

For installation and operation instructions, refer to the Installation/Operation manual provided with your solar storage tank. The Installation/Operation manual for your water heater must be kept with this manual at all times.

The boiler heat exchanger connections are located in the front of the solar storage tank. Use a minimum 1" nominal tube size, wherever you are using zone valves or circulators. The inlet of the circulator is to be connected to the hot outlet side of the boiler. Be sure the direction of the arrow on the circulator is facing toward the flow direction from the boiler to the boiler heat exchanger inlet of the water heater. On the water heater, the boiler return is to be connected to the return side of the boiler. The return from heating loop should have a flow check or swing check valve installed before the return pipe from the boiler heat exchanger.

## Boiler loop circulator sizing

The boiler back-up circulator pump must be sized for the related piping and pressure drop of the heat exchanger. The following graph represents the pressure drop of the solar back-up heat exchanger. Select a 115 volt circulator pump with a maximum current draw of 1 amp.



## Charging the potable water system

Solar storage tank

Fill the solar tank with water. Do this by opening the cold water isolation ball valve to the solar tank. Inspect all fittings for leaks. Purge all air from the potable water system by turning on several hot and cold faucets and running water for several minutes. Air is purged when water runs continuously for 1-2 minutes without air discharge.

After the water and electrical connections have been made, the tank has been filled with water, and all air has been purged from the tank, turn on power to heater. The heater is now operational.

## Freeze protection

The propylene glycol heat transfer fluid provided acts as a freeze protection fluid and must be used to protect the system from freezing. The VELUX propylene glycol provided is rated as nontoxic. A 40% propylene glycol/60% water mixture should be used, however, you must use a mixture most appropriate for your climate. Do not use a higher glycol to water concentration than necessary, as this will adversely impact heat transfer efficiency. See the propylene glycol Data Sheet in the back of this manual for recommended concentrations. A copy of the MSDS sheet must be left with the end user of the solar system. See "Propylene glycol emergency overview" as part of the propylene glycol Data Sheet in the back of this manual. The collector loop must be charged with a mixture of heat transfer fluid and distilled or deionized water. The use of regular tap water as a mixing agent is prohibited. Scheduled maintenance must be established to monitor and maintain the proper PH level of the heat transfer fluid in the system to protect the heat exchanger and other components in the system.



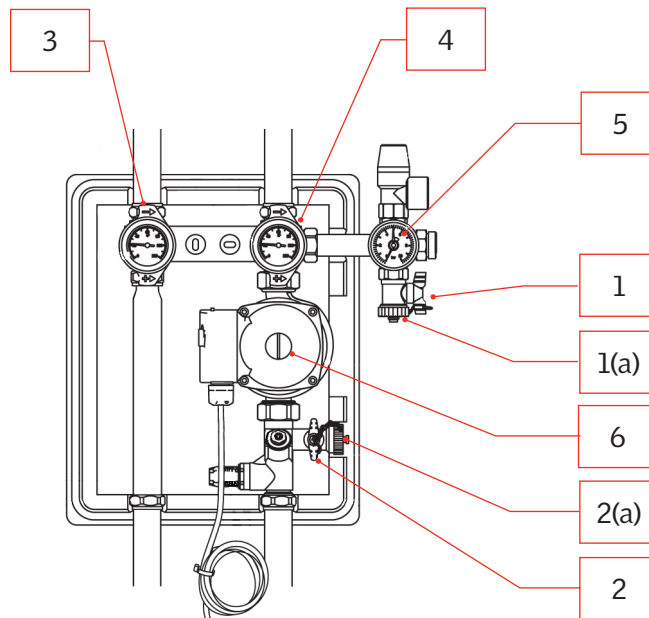
## Commissioning the solar system

Prior to filling the solar collectors with heat transfer fluid, ensure that the collectors have been covered for a minimum of 1 hour. The solar loop piping should be pressure tested with air (80 psi) and checked for leaks before you pressurize the solar collector loop with glycol. The charging process will require a low flow high head end suction pump to fill and pressurize the collector loop.

1. Mix the propylene glycol and distilled water in accordance with the propylene glycol Data Sheet in the back of this manual. Two collector systems will require approximately 6 gallons of fluid; three collector systems will require approximately 7.5 gallons of fluid. Connect the discharge hose from the end suction fill pump to the pump station fill valve connector (1). Connect the fill pump return hose to the pump station drain valve connector (2). Prime the end suction pump.



2. Open the fill valve (1) and drain valve (2). Open the "hot" (3) isolation valve turning it fully counterclockwise to the vertical position. Close the "cold" (4) isolation valve turning it fully clockwise to the horizontal position. Turn on the end suction pump to begin charging the collector loop with glycol. Run the pump 15-20 minutes to purge air from the system while periodically opening and closing the "cold" (4) isolation valve.
3. With the pump running and while watching the system pressure gauge (5), adjust the fill valve (1) to the almost closed position. Close the drain valve (2) and allow the system pressure to slowly build up to 50 psi -- immediately close the fill valve (1) and then turn off the pump.
4. Remove the fill pump hoses from the pump station controller and install the fill valve and drain valve caps 1(a) and 2(a).
5. Turn power on to the pump station.
6. Fully open "hot" (3) and "cold" (4) line isolation valves.
7. Bleed air from the pump (6)

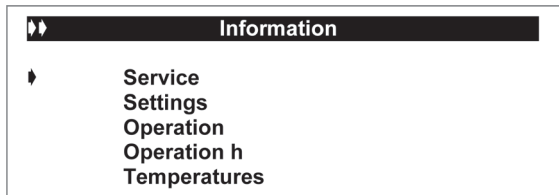


# Programming system controller

## ⚠ IMPORTANT

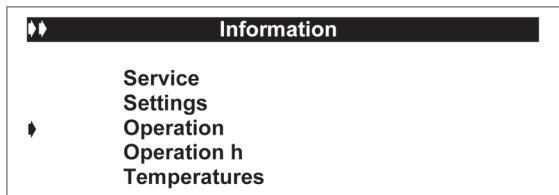
The factory default settings on the solar system controller OPERATION MENU is OFF -- this prevents system pumps from operating until the system has been commissioned. To turn on the system, change the setting to AUTOMATIC (Active) for normal operation.

1. To enter the programming mode, press the forward button **>** to show the Main Menu Navigation Menu.

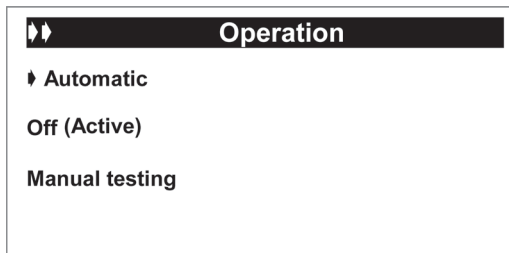


(The active menu is highlighted in black at the top of the display.)

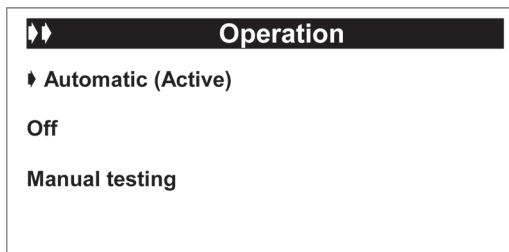
2. Use the **+** or **-** buttons to navigate up and down in the menus. The selection cursor (**▴**) will indicate the current submenu. Navigate down until the cursor is to the left of the Operation submenu.



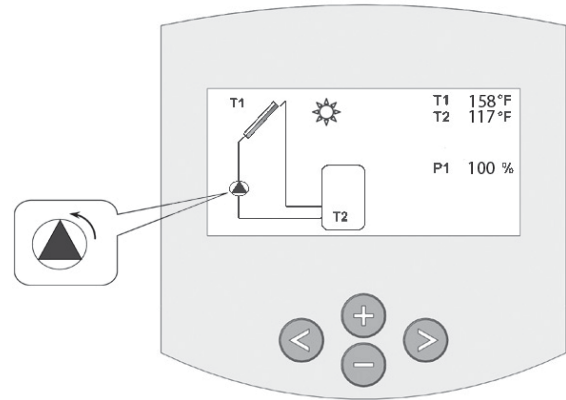
Press the **>** button to enter the Operation submenu. The factory default setting is Off (Active).



3. With the cursor to the left of Automatic, press the **>** button. The display will change to Automatic (Active), which is the normal operating mode.



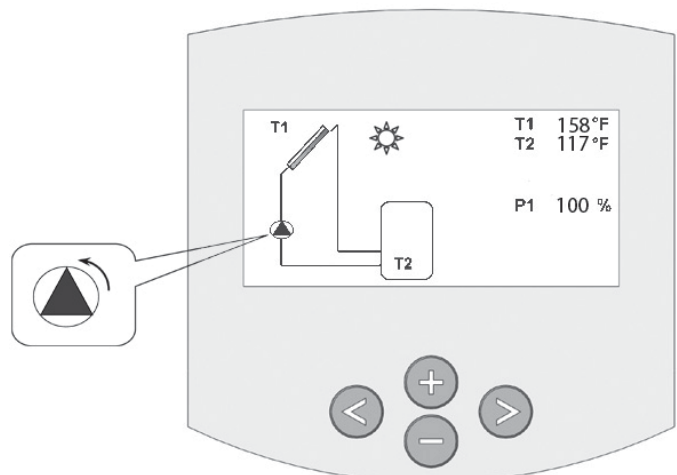
4. Press the **<** button repeatedly until the display returns to the main screen.



## System controller operation

During normal operation the controller will function as follows:

1. Controller display will show the basic system diagram.
  - T1 will indicate the current collector temperature
  - T2 will indicate the tank bottom temperature
  - P1 will indicate pump speed (0 = Off/100 = On)
2. When temperature T1 is 12°F hotter than T2, the system will begin transferring heat to the solar tank.
  - Pump symbol will rotate on display
  - Sun symbol will be displayed
  - P1 will indicate pump speed (100 = On)



# Part 4: Maintenance

## Maintenance check list

A properly maintained solar water heating system can provide years of dependable trouble free service. It is suggested that a routine preventive maintenance program be established and followed by the end user with his contractor. Listed below is the maintenance check list that outlines the primary components of the solar system that need to be inspected annually.

- ❑ Propylene glycol – It is very important that the quality of the propylene glycol heat transfer fluid is maintained to avoid damage to the collector loop and related components which come in contact with the fluid. See the propylene glycol Data Sheet located in the back of the manual for further details.
- ❑ Water quality can effect the operation of the solar heat exchanger over time. In very hard water areas, it is recommended you drain a few gallons of water from the storage tank to keep the bottom of the tank free of sediment.
- ❑ Inspect and clean the solar collectors of any dirt, leaves, debris or film that may have settled on the surface and may effect the performance. Clean by spraying with a pressurized water hose only.
- ❑ Check Insulation for deterioration.
- ❑ Check solar tank sensors and the boiler back up aquastat sensors to assure that they are secure and have not moved or loosened.
- ❑ Inspect the T&P valve on the water heater. Lift the release handle lever and make sure discharge is directed to an open drain. Always remove sediment from tank prior to testing T&P valve.
- ❑ The area near the water heater must be kept free of flammable liquids such as gasoline, paint thinners, adhesive or other combustible materials.
- ❑ The electric element may need cleaning – A hissing sound while operating will happen when the element starts to build up deposits that will require cleaning. This should be done only by a qualified individual or licensed plumber.
- ❑ Anode rod Inspection – The anode rod should be removed from the water heater tank annually for inspection. If the anode core wire is exposed more than few inches it is recommended that the anode rod be replaced. It is important to turn off the power to the heater and run water until it is cold, then drain tank and replace the anode rod.

### CAUTION

If the heating element needs replacement, it is VERY important to use the same voltage, wattage and construction.

## Shut down procedures

The solar system is designed to be easily isolated for emergency repairs or routine maintenance. To isolate the water heater, simply shut down the supply water shut off valve which isolates the water heater from the pressurized cold water supply. The collector loop can be isolated from the solar storage tank by closing the collector array "hot" and "cold" line isolation valves. If the pressure in this loop drops or you find a glycol leak, close these valves and turn the circulating pump off by shutting down the power to the control, then contact your installation contractor.

## Vacation planning

Solar water heaters can build up very high temperatures when there is no daily draw on the system. Your VELUX solar water heating system controller is programmed to protect your system from overheating. When leaving your home for extended periods of time, no special shut down procedures are required. The best way to protect your system is to make sure power is always on and to keep the system in normal operating mode. . The system controller will use the collectors to radiate heat back to the atmosphere , preventing the system from stagnating at very high temperatures.

## Estimated life of components

Proper care and maintenance of your solar system will determine the life expectancy of the individual components of the system. Refer to the manufacturers' warranty of the individual components for warranty coverage. To obtain warranty service, call your local service or installing contractor.

### **WARNING**

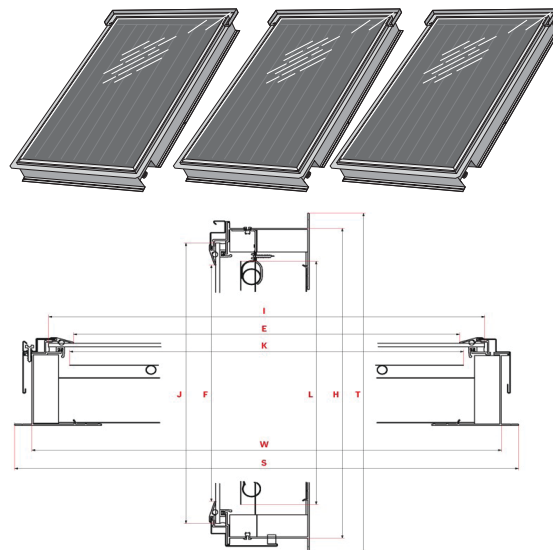
Following installation of the T & P Relief Valve, the valve lever **MUST** be operated **AT LEAST ONCE A YEAR** by the water heater owner to ensure that waterways are clear. Certain naturally occurring mineral deposits may adhere to the valve, blocking waterways, rendering it inoperative. When the lever is operated, hot water will discharge if the waterways are clear. **PRECAUTIONS MUST BE TAKEN TO AVOID PERSONAL INJURY FROM CONTACT WITH HOT WATER AND TO AVOID PROPERTY DAMAGE. BEFORE** operating lever, check to see that a discharge line is connected to the valve, directing the flow of hot water from the valve to a proper place of disposal (T&P valve must be piped to the outdoors or to a floor drain per state and/or local building codes). If no water flows when the lever is operated, replacement of the valve is required. **TURN THE WATER HEATER "OFF" AND CALL A PLUMBER IMMEDIATELY.** This device is designed for emergency safety relief and shall not be used as an operating control. A relief valve functions, in an emergency, by discharging water. Therefore, it is essential that a discharge line be piped from the valve in order to carry the overflow to a safe place of disposal. The discharge line must be the same size as the valve outlet and must pitch downward from the valve and terminate at least 6" above a drain where any discharge will be clearly visible.

# Part 5: Specifications

## VELUX solar collector

VELUX collectors feature:

- Copper absorber plate coated with highly selective coating having emissivity  $< 0.05$  and absorptivity  $> 0.95$
- Absorber coating applied by cathode sputtering process
- Collector flow tubes laser welded to the absorber plate
- Single layer cover glazing made of low iron tempered glass with a direct solar transmittance  $> 0.89$
- Back and sides of absorber plate insulated with rock wool, maximum K-factor =  $0.035 \text{ W/m K}$
- Extruded aluminum alloy 6063-T5 casing with  $0.055''$  wall thickness



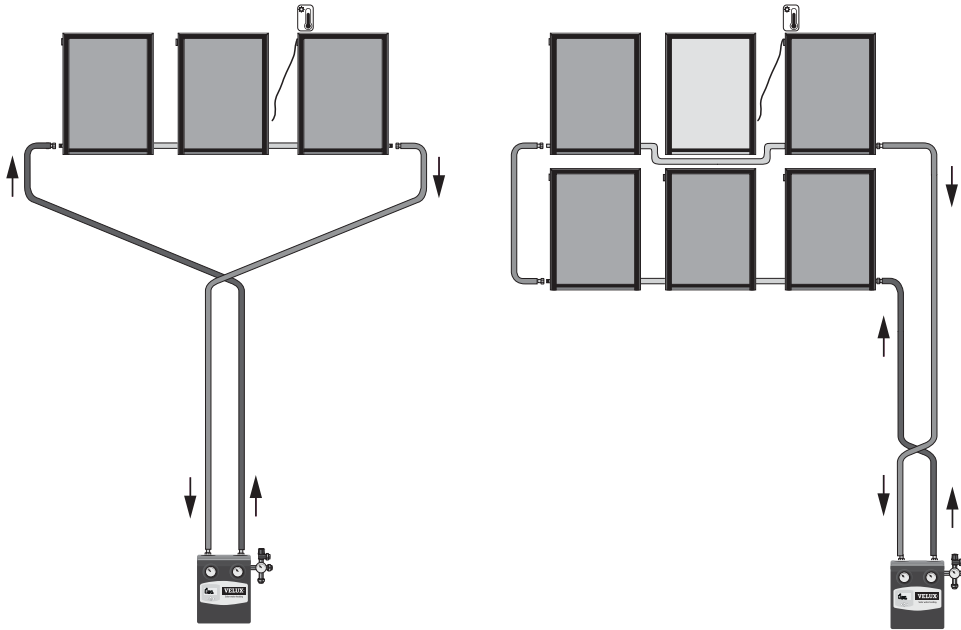
Measurements (inches)	Width				Height				Depth
	Code	U12	S06	M08	Code	U12	S06	M08	All
Gross	S	54.1	46.2	32.0	T	72.0	47.5	56.2	3.9
Frame	W	52.8	44.9	30.7	H	70.7	46.2	54.8	
Glass	I	51.5	43.6	29.4	J	69.4	44.9	53.5	
Aperture	E	49.5	41.6	27.4	F	67.4	42.9	51.6	
Absorber	K	49.8	41.9	27.8	L	67.7	43.2	51.9	

Technical specifications		CLR U12 4000	CLI U12 4000	CLI S06 4000	CLI M08 4000
Weight (lbs.)	Collector weight	130	130	73	57
	Weight w/fluid	141	141	79	64
Collector area (sq. ft.)	Gross area	27.1	27.1	15.2	12.5
	Aperture area	23.1	23.1	12.4	9.8
	Absorber area	23.4	23.4	12.6	10.0
Fluid volume (gal.)		0.58	0.58	0.34	0.24
Max operating pressure (psi)		87	87	87	87
Test pressure (psi)		145	145	145	145
Stagnation temperature (°F)		374	374	374	365
Thermal performance rating - warm climate (1000s btu/day)	Clear day	29	29	15	12
	Mildly cloudy day	20	20	11	8
	Cloudy day	11	11	6	5
Thermal performance rating - cool climate (1000s btu/day)	Clear day	19	19	10	8
	Mildly cloudy day	11	11	6	4
	Cloudy day	4	4	2	1
Efficiency	eta0 (start efficiency)	0.6960	0.6960	0.6610	0.6390
	a1 (Btu/hr*ft2*°F)	0.4747	0.4747	0.4666	0.4603
	a2 (Btu/hr*ft2*°F2)	0.0020	0.0020	0.0019	0.0018
Structural performance design pressure (DP)	Downward load (psf)	+70	+125	+200	+255
	Uplift load (psf)	-60	-70	-87.5	-55

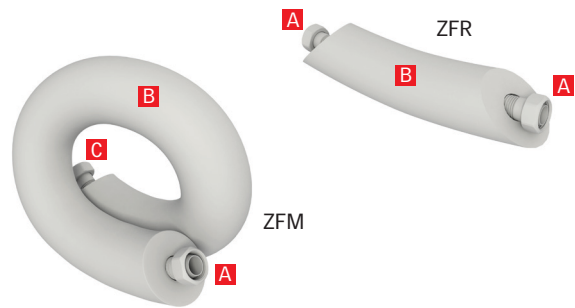
# VELUX flextubes and connections

VELUX flextubes feature:

- Flexible corrugated stainless steel tubing
- Pre-installed Armaflex HT insulation with UV inhibitors
- Brass connection fittings
- Gasket-free conical connections ensure tight and secure connections to VELUX solar collectors
- Pipe hangers and supports included



- A** Gasket-free conical connection for connection to VELUX solar collectors
- B** The flextubes are pre-insulated to allow for quick and easy installation
- C** Adjustable length end for connection to VELUX pump stations and solar tanks using lock ring, nut and gasket

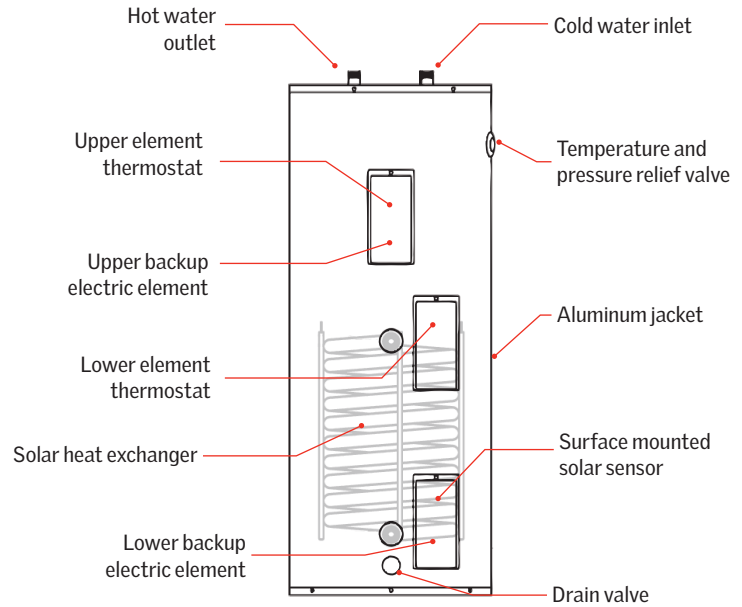
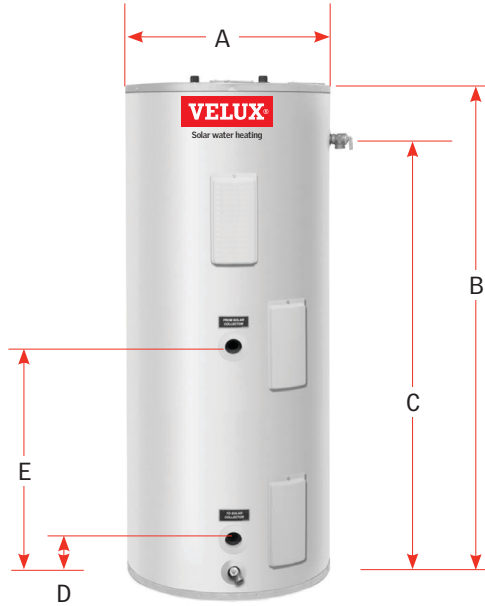


VELUX flexible pipe specifications	
Max operating pressure	145 psi
External diameter, pipe	7/8"
Internal diameter, pipe	5/8"
Wall thickness, insulation	5/8"
Liquid volume	0.02 gal./ft.
Material, pipe	Stainless steel / AISI 316 TI
Material, insulation	Foam EPDM
Temperature limit, insulation	+ 350 °F to - 40 °F
Insulation value	0.04 w/mK
R-Value	R-4

# VELUX glass lined solar storage tank (with electric back-up)

- Glass lined steel tank
- Two protective aluminum anode rods
- R-value of R-17
- Internal double wall glass coated steel solar heat exchanger

- Dual backup heating elements
- Direct heat transfer with immersed incoloy elements
- T&P relief valve – included
- Brass drain valve – tamper proof



## VELUX solar storage tank dimensions

MODEL #	GAL	Dimensions				
		A	B	C	D	E
TFF 060 0205US	60	22"	59 <sup>1</sup> / <sub>4</sub> "	53"	7 <sup>3</sup> / <sub>8</sub> "	29 <sup>1</sup> / <sub>2</sub> "
TFF 080 0205US	75	24"	59 <sup>1</sup> / <sub>4</sub> "	53"	7 <sup>3</sup> / <sub>8</sub> "	29 <sup>1</sup> / <sub>2</sub> "
TFF 120 0205US	115	28 <sup>1</sup> / <sub>4</sub> "	62 <sup>3</sup> / <sub>4</sub> "	55 <sup>3</sup> / <sub>4</sub> "	7 <sup>3</sup> / <sub>8</sub> "	29 <sup>1</sup> / <sub>2</sub> "

## VELUX solar storage tank connections and weight

MODEL #	Solar heat exchanger inlet/outlet connection sizes	Hot/cold potable water connection sizes	Shipping weight (lbs)
TFF 060 0205US	3/4" NPT	3/4" NPT	217
TFF 080 0205US	3/4" NPT	3/4" NPT	241
TFF 120 0205US	3/4" NPT	3/4" NPT	345

## VELUX solar storage tank specs

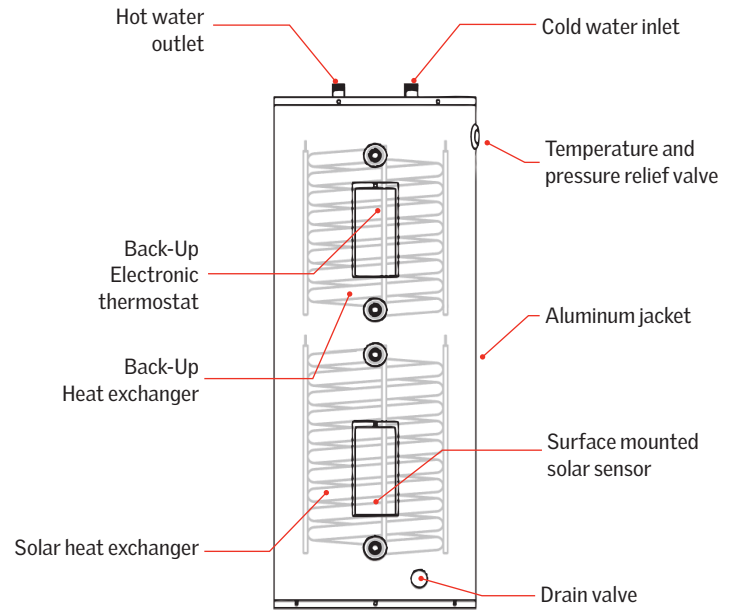
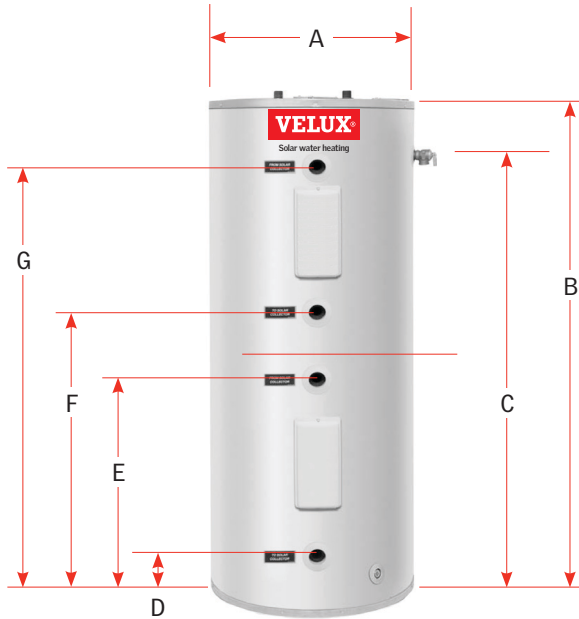
MODEL #	Backup elements * input (Watts)	Voltage	Solar HX volume (gal)	Heated water volume of back up	Recovery (gph)		First hour supply (gal)	
					77° rise	90° rise	77° rise	90° rise
TFF 060 0205US	4,500	240V / 1 Φ	2.5 gal	60 gal	24	20	66 gal	62 gal
TFF 080 0205US	4,500	240V / 1 Φ	2.5 gal	75 gal	24	20	77 gal	73 gal
TFF 120 0205US	4,500	240V / 1 Φ	2.5 gal	115 gal	24	20	105 gal	101 gal

\* Two 4,500 watt elements, non-simultaneous operation

Toxic chemicals, such as those used for boiler treatment, shall NEVER be introduced into the potable side of this system. The potable side may NEVER be connected to any existing heating system or component(s) previously used with a non-potable water heating appliance.

# VELUX glass lined solar storage tank (with back-up heat exchanger)

- Glass lined steel tank
- Three protective aluminum anode rods
- R-value of R-17
- Internal double wall glass coated steel solar heat exchanger
- Internal single wall glass coated steel back-up heat exchanger
- T&P Relief Valve – Included
- Brass Drain Valve – Tamper proof



## VELUX solar storage tank dimensions

MODEL #	GAL	Dimensions						
		A	B	C	D	E	F	G
TFF 060 1205US	55	22"	59 <sup>1</sup> / <sub>4</sub> "	53"	5 <sup>3</sup> / <sub>8</sub> "	27 <sup>1</sup> / <sub>2</sub> "	37 <sup>1</sup> / <sub>2</sub> "	56"
TFF 080 1205US	70	24"	59 <sup>1</sup> / <sub>4</sub> "	53"	5 <sup>3</sup> / <sub>8</sub> "	27 <sup>1</sup> / <sub>2</sub> "	37 <sup>1</sup> / <sub>2</sub> "	56"
TFF 120 1205US	110	28 <sup>1</sup> / <sub>4</sub> "	62 <sup>3</sup> / <sub>4</sub> "	55 <sup>3</sup> / <sub>4</sub> "	5 <sup>3</sup> / <sub>8</sub> "	27 <sup>1</sup> / <sub>2</sub> "	39 <sup>1</sup> / <sub>4</sub> "	57 <sup>3</sup> / <sub>4</sub> "

## VELUX solar storage tank connections and weight

MODEL #	Solar heat exchanger inlet/outlet connection sizes	Back-up heat exchanger inlet/outlet connection sizes	Hot/cold potable water connection sizes	Shipping weight (lbs)
TFF 060 1205US	3/4" NPT	1" NPT	3/4" NPT	282
TFF 080 1205US	3/4" NPT	1" NPT	3/4" NPT	313
TFF 120 1205US	3/4" NPT	1" NPT	3/4" NPT	442

## VELUX solar storage tank specs

MODEL #	Solar HX volume gallons	Heated water volume of back up	Recovery of back up in minutes		Boiler output for test recovery	First hour supply (gal)	
			77° rise	90° rise		77° rise	90° rise
TFF 060 1205US	2.5 gal	27 gal	13 min	15 min	80,000 BTU/HR	144 gal	126
TFF 080 1205US	2.5 gal	37 gal	16 min	18 min	90,000 BTU/HR	166 gal	146
TFF 120 1205US	2.5 gal	67 gal	26 min	30 min	100,000 BTU/HR	203 gal	180

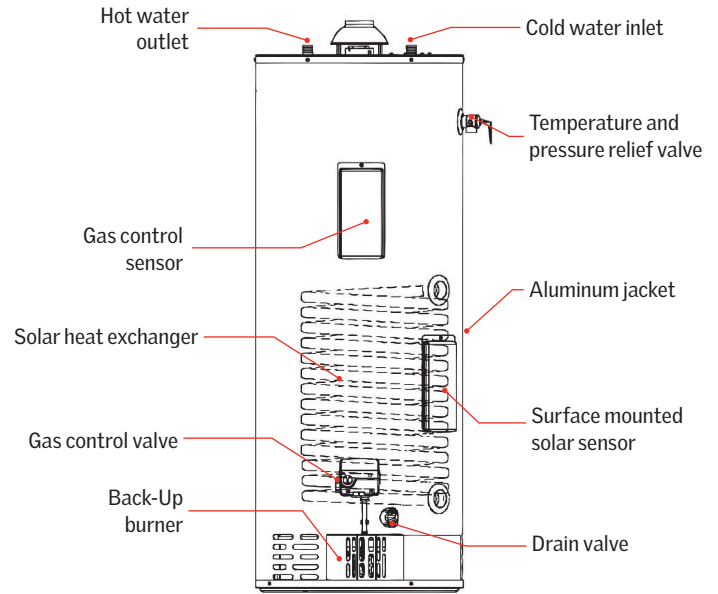
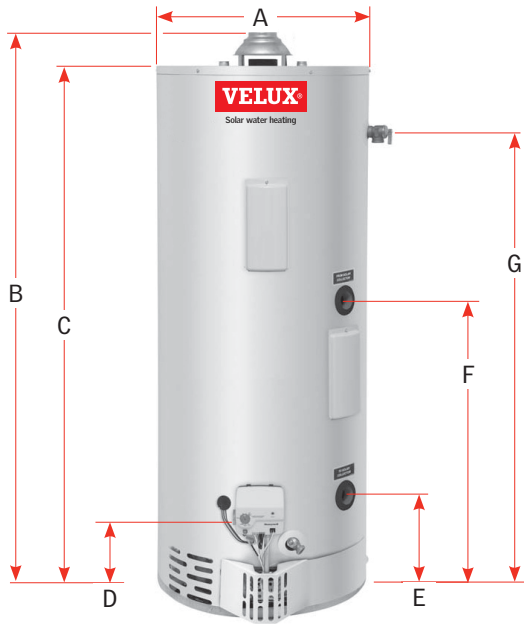
Toxic chemicals, such as those used for boiler treatment, shall NEVER be introduced into the potable side of this system. The potable side may NEVER be connected to any existing heating system or component(s) previously used with a non-potable water heating appliance.



# VELUX glass lined solar storage tank (with atmospheric gas backup)

- Glass Lined Steel Tank
- Two Protective Aluminum Anode Rods
- R-value of R-17
- Internal double wall glass coated steel solar heat exchanger
- Honeywell Self Diagnostic Gas Control

- Flammable Vapor Ignition Resistant technology (FVIR) (TFF 060 2205 and TFF 060 3205)
- Backup Low NOx Burner (Ultra Low NOx Burner with TFF 060 2205) – Comply with SCAQMD Rule 1121.
- T&P Relief Valve – Included
- Brass Drain Valve – Tamper proof



## VELUX solar storage tank dimensions

MODEL #	GAL	Dimensions						
		A	B	C	D	E	F	G
TFF 060 2205US	60	24"	63"	59½"	11⅝"	10⅞"	32¼"	53½"
TFF 080 2205US	70	26"	62⅜"	59"	14⅜"	12½"	34⅝"	52"
TFF 060 3205US	60	24"	63"	59½"	11⅝"	10⅞"	32¼"	53½"
TFF 080 3205US	70	26"	62⅜"	59"	14⅜"	12½"	34⅝"	52"

## VELUX solar storage tank connections and weight

MODEL #	Solar heat exchanger inlet/outlet connections	Hot/cold potable water connections	Vent connection	Shipping weight (lbs)
TFF 060 2205US	3/4" NPT	3/4" NPT	4"	272
TFF 080 2205US	3/4" NPT	3/4" NPT	4"	306
TFF 060 3205US	3/4" NPT	3/4" NPT	4"	264
TFF 080 3205US	3/4" NPT	3/4" NPT	4"	306

## VELUX solar storage tank specs

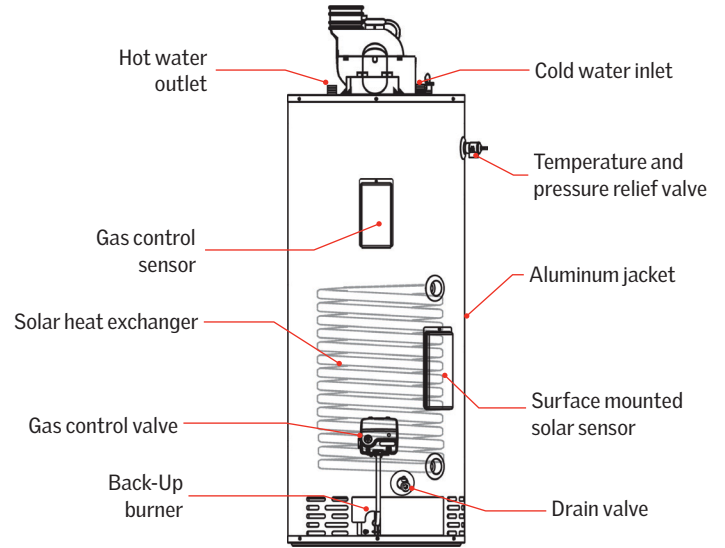
MODEL #	Backup fuel	Backup input rate (btu/h)	Solar HX volume (gal)	Heated water volume of back up	Recovery (gph)		First hour supply (gal)	
					77° rise	90° rise	77° rise	90° rise
TFF 060 2205US	Natural gas	55,000	2.5 gal	60 gal	67	57	109	99
TFF 080 2205US	Natural gas	76,000	2.5 gal	70 gal	92	79	141	128
TFF 060 3205US	LP	63,000	2.5 gal	60 gal	77	66	119	108
TFF 080 3205US	LP	76,000	2.5 gal	70 gal	92	79	141	128

Toxic chemicals, such as those used for boiler treatment, shall NEVER be introduced into the potable side of this system. The potable side may NEVER be connected to any existing heating system or component(s) previously used with a non-potable water heating appliance.

# VELUX glass lined solar storage tank (with power vent gas backup)

- Glass Lined Steel Tank
- Two Protective Aluminum Anode Rods
- R-value of R-17
- Internal double wall glass coated steel solar heat exchanger
- Honeywell Self Diagnostic Gas Control (120 V.A.C.)

- Flammable Vapor Ignition Resistant technology (FVIR) (TFF 060 4205 and TFF 060 5205)
- Backup Low NOx Burner – Comply with SCAQMD Rule 1121.
- T&P Relief Valve – Included
- Brass Drain Valve – Tamper proof
- Horizontal or Vertical venting with 3" or 4" PVC, ABS, or CPVC



## VELUX solar storage tank dimensions

MODEL #	GAL	Dimensions						
		A	B	C	D	E	F	G
TFF 060 4205US	60	24"	75"	59½"	11¾"	10¼"	32¼"	53½"
TFF 080 4205US	70	26"	74¾"	59"	14¾"	12½"	34⅝"	52"
TFF 060 5205US	60	24"	75"	59½"	11¾"	10¼"	32¼"	53½"
TFF 080 5205US	70	26"	74¾"	59"	14¾"	12½"	34⅝"	52"

## VELUX solar storage tank connections and weight

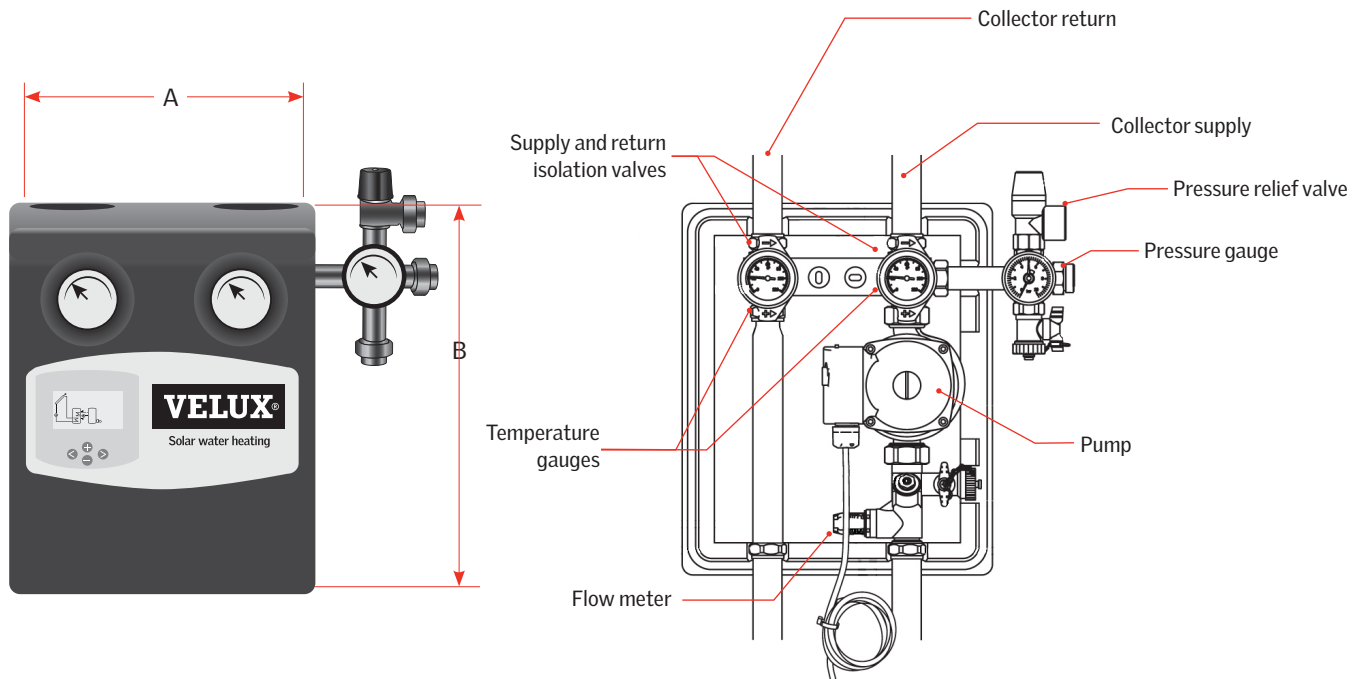
MODEL #	Solar heat exchanger inlet/outlet connections	Hot/cold potable water connections	Vent connection	Shipping weight (lbs)
TFF 060 4205US	3/4" NPT	3/4" NPT	3" or 4"	281
TFF 080 4205US	3/4" NPT	3/4" NPT	4"	336
TFF 060 5205US	3/4" NPT	3/4" NPT	3" or 4"	281
TFF 080 5205US	3/4" NPT	3/4" NPT	4"	336

## VELUX solar storage tank specs

MODEL #	Backup fuel	Backup input rate (btu/h)	Solar HX volume (gal)	Heated water volume of back up	Recovery (gph)		First hour supply (gal)	
					77° rise	90° rise	77° rise	90° rise
TFF 060 4205US	Natural gas	70,000	2.5 gal	60 gal	88	75	130	117
TFF 080 4205US	Natural gas	76,000	2.5 gal	70 gal	96	82	145	131
TFF 060 5205US	LP	75,500	2.5 gal	60 gal	94	80	136	122
TFF 080 5205US	LP	76,000	2.5 gal	70 gal	95	81	144	130

Toxic chemicals, such as those used for boiler treatment, shall NEVER be introduced into the potable side of this system. The potable side may NEVER be connected to any existing heating system or component(s) previously used with a non-potable water heating appliance.

# VELUX solar pump station



## VELUX solar pump station dimensions

Height (A)	12"
Width (B)	10"
Center distance supply - return	4 3/4"
Supply - return connections	3/4" NPT

## VELUX solar pump station technical data

Power supply	120 Volt, 2 Amp
Maximum design pressure	145 psi
Maximum temperature (sustained)	250 °F
Maximum temperature (short-term)	320 °F

## VELUX solar pump station component technical data

Pressure relief valve	87 psi
Pressure gauge	0 - 87 psi
Temperature gauges	250 °F
Flow meter	0.5 - 3.5 gpm

# VELUX heat transfer fluid – Inhibited propylene glycol-based heat transfer fluid

DOWFROST heat transfer fluid is a formulation of 94.0 percent propylene glycol and a specially designed package of industrial corrosion inhibitors. The fluid is dyed bright yellow to aid in leak detection. Solutions in water provide freeze protection to below -50°C (-60°F) and burst protection to below -73°C (-100°F).

**Recommended use temperature range:**  
-45°C (-50°F) to 150°C (325°F)

**Suitable applications:** single fluid process heating and cooling, closed-loop, water-based HVAC applications where propylene glycol solutions are preferred or required.

For health and safety information for this product, contact your VELUX solar water heating system sales representative to request a Material Safety Data Sheet (MSDS).

Typical concentrations of DOWFROST fluid required to provide freeze and burst protection at various temperatures

Temperature		Percent DOWFROST Fluid Concentration Required
°C	(°F)	For freeze protection volume %
-10	(14)	25
-14	(7)	30
-17	(2)	35
-21	(-6)	40
-26	(-15)	45
-34	(-26)	50
-40	(-40)	55

Note: These figures are examples only and may not be appropriate to your situation. Generally, for an extended margin of protection, you should select a temperature in this table that is at least 3°C (5°F) lower than the expected lowest ambient temperature.

Note: Freeze tolerance limits are based upon an assumed set of environmental conditions. Extended periods of cold weather, including ambient air temperatures above the specified limit, may cause freezing in exposed parts of the system. It is the owner's responsibility to protect the system in accordance with the Supplier's instructions if the air temperature is anticipated to approach the specified freeze tolerance limit.

Material safety data for VELUX heat transfer fluid	
Service temperature range	-45°C (-50°F) to 160°C (325°F)
Propylene glycol composition (% by weight)	94%
Performance additives composition (% by weight)	6%
Color	Fluorescent yellow
Specific gravity (15/15°C)	1.053 - 1.063
pH ( 50% propylene glycol)	9.5 - 10.5
Reserve alkalinity (min)	15.0ml

## Testing your fluid's pH level

Control of pH between 6.5 and 10.5 is important to minimize corrosion and glycol degradation. Using narrow range pH paper such as pHydration Control paper with a 7.2 to 8.8 pH range is an easy and reliable way to read your pH level. A pH tester can also measure alkalinity or acidity and give you an indication of the reserve alkalinity or inhibitor level of the fluid. The desirable pH range should fall between 7 and 9.

## Spill, leak and disposal procedures for propylene glycol

Using appropriate safety equipment, small spills may be soaked up with common absorbent material. For large spills, the fluid should be pumped into suitable containers located in diked areas. Residual material should be cleaned up with water. Concentrate can be handled according to local, state, and federal regulations.

## Propylene glycol emergency overview

### Potential health effects

Exposed to	Potential health effects	First aid
Eye	May cause slight transient (temporary) eye irritation. Corneal injury is unlikely. Mists may cause eye irritation.	Flush eyes with plenty of water.
Skin contact	Prolonged contact is essentially non-irritating to skin. A single prolonged exposure is not likely to result in the material being absorbed through the skin in harmful amounts. Repeated exposure may cause flaking and softening of skin.	Wash off under flowing water or shower.
Ingestion	Single dose oral toxicity is considered to be extremely low. No hazards anticipated from swallowing small amounts incidental to normal handling operations.	None required.
Inhalation	At room temperature, vapors are minimal due to physical properties. Mists may cause irritation of upper respiratory tract (nose and throat).	Remove to fresh air if effects occur, consult a physician.  Note to physician: No specific antidote. Supportive care. Treatment based on judgement of the physician in response to the reaction of the patient.

Notice: No freedom from any patent owned by Seller or others is to be inferred. Because use conditions and applicable laws may differ from one location to another and may change with time, Customer is responsible for determining whether products and the information in this document are appropriate for Customer's use and for ensuring that Customer's workplace and disposal practices are in compliance with applicable laws and other governmental enactments. Seller assumes no obligation or liability for the information in this document. NO WARRANTIES ARE GIVEN: ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.

# Part 6: Component lists

## VELUX solar system kits

### Parts breakdown

System models	System component	Part number	Quantity
CLI U12 SD0L 118 EI B/U CLI U12 SD0L 118 AUX EL CLI U12 SD0L 118 AUX GAS CLI U12 SD0L 118 AUX TLG	Collector	CLI U12 4000	1
	Flashing system	EDL U12 0000	1
	Storage tank	TFF 060 0205US	1
	Pump station controller kit	307354	1
CLI U12 SK0L 218 EI B/U CLI U12 SK0L 218 AUX EL CLI U12 SK0L 218 AUX GAS CLI U12 SK0L 218 AUX TLG	Collector	CLI U12 4000	2
	Flashing system	EKL U12 0021E	1
	Storage tank	TFF 080 0205US	1
	Pump station controller kit	307355	1
CLI U12 SK0L 318 EI B/U CLI U12 SK0L 318 AUX EL CLI U12 SK0L 318 AUX GAS CLI U12 SK0L 318 AUX TLG	Collector	CLI U12 4000	3
	Flashing system	EKL U12 0021E	1
		EKL U12 0002E	1
	Storage tank	TFF 120 0205US	1
	Pump station controller kit	307355	1
CLI U12 SD0L 119 HX B/U	Collector	CLI U12 4000	1
	Flashing system	EDL U12 0000	1
	Storage tank	TFF 060 1205US	1
	Pump station controller kit	307354	1
CLI U12 SK0L 219 HX B/U	Collector	CLI U12 4000	2
	Flashing system	EKL U12 0021E	1
	Storage tank	TFF 080 1205US	1
	Pump station controller kit	307355	1
CLI U12 SK0L 319 HX B/U	Collector	CLI U12 4000	3
	Flashing system	EKL U12 0021E	1
		EKL U12 0002E	1
	Storage tank	TFF 120 1205US	1
	Pump station controller kit	307355	1
CLI U12 SD0L 11(10 or 12) NG B/U	Collector	CLI U12 4000	1
	Flashing system	EDL U12 0000	1
	Storage tank	TFF 060 2205US or TFF 060 4205US	1
	Pump station controller kit	307354	1
CLI U12 SK0L 21(10 or 12) NG B/U	Collector	CLI U12 4000	2
	Flashing system	EKL U12 0021E	1
	Storage tank	TFF 080 2205US or TFF 080 4205US	1
	Pump station controller kit	307355	1
CLI U12 SD0L 11(11 or 13) LP B/U	Collector	CLI U12 4000	1
	Flashing system	EDL U12 0000	1
	Storage tank	TFF 060 3205US or TFF 060 5205US	1
	Pump station controller kit	307354	1
CLI U12 SK0L 21(11 or 13) LP B/U	Collector	CLI U12 4000	2
	Flashing system	EKL U12 0021E	1
	Storage tank	TFF 080 3205US or TFF 080 5205US	1
	Pump station controller kit	307355	1

# VELUX solar system kits

## Parts breakdown

System models	System component	Part number	Quantity
CLI U12 SD0W 118 EI B/U CLI U12 SD0W 118 AUX EL CLI U12 SD0W 118 AUX GAS CLI U12 SD0W 118 AUX TLG	Collector	CLI U12 4000	1
	Flashing system	EDL U12 0000	1
	Storage tank	TFF 060 0205US	1
	Pump station controller kit	307354	1
CLI U12 SK0W 218 EI B/U CLI U12 SK0W 218 AUX EL CLI U12 SK0W 218 AUX GAS CLI U12 SK0W 218 AUX TLG	Collector	CLI U12 4000	2
	Flashing system	EKL U12 0021E	1
	Storage tank	TFF 080 0205US	1
	Pump station controller kit	307355	1
CLI U12 SK0W 318 EI B/U CLI U12 SK0W 318 AUX EL CLI U12 SK0W 318 AUX GAS CLI U12 SK0W 318 AUX TLG	Collector	CLI U12 4000	3
	Flashing system	EKL U12 0021E	1
		EKL U12 0002E	1
	Storage tank	TFF 120 0205US	1
	Pump station controller kit	307355	1
CLI U12 SD0W 119 HX B/U	Collector	CLI U12 4000	1
	Flashing system	EDL U12 0000	1
	Storage tank	TFF 060 1205US	1
	Pump station controller kit	307354	1
CLI U12 SK0W 219 HX B/U	Collector	CLI U12 4000	2
	Flashing system	EKL U12 0021E	1
	Storage tank	TFF 080 1205US	1
	Pump station controller kit	307355	1
CLI U12 SK0W 319 HX B/U	Collector	CLI U12 4000	3
	Flashing system	EKL U12 0021E	1
		EKL U12 0002E	1
	Storage tank	TFF 120 1205US	1
	Pump station controller kit	307355	1
CLI U12 SD0W 11(10 or 12) NG B/U	Collector	CLI U12 4000	1
	Flashing system	EDL U12 0000	1
	Storage tank	TFF 060 2205US or TFF 060 4205US	1
	Pump station controller kit	307354	1
CLI U12 SK0W 21(10 or 12) NG B/U	Collector	CLI U12 4000	2
	Flashing system	EKL U12 0021E	1
	Storage tank	TFF 080 2205US or TFF 080 4205US	1
	Pump station controller kit	307355	1
CLI U12 SD0W 11(11 or 13) LP B/U	Collector	CLI U12 4000	1
	Flashing system	EDL U12 0000	1
	Storage tank	TFF 060 3205US or TFF 060 5205US	1
	Pump station controller kit	307354	1
CLI U12 SK0W 21(11 or 13) LP B/U	Collector	CLI U12 4000	2
	Flashing system	EKL U12 0021E	1
	Storage tank	TFF 080 3205US or TFF 080 5205US	1
	Pump station controller kit	307355	1

# VELUX solar system kits

## Parts breakdown

System models	System component	Part number	Quantity
CLI U12 SD0F 118 EI B/U CLI U12 SD0F 118 AUX EL CLI U12 SD0F 118 AUX GAS CLI U12 SD0F 118 AUX TLG	Collector	CLI U12 4000	1
	Rack system	ZFT 101	1
	Storage tank	TFF 060 0205US	1
	Pump station controller kit	307354	1
CLI U12 SK0F 218 EI B/U CLI U12 SK0F 218 AUX EL CLI U12 SK0F 218 AUX GAS CLI U12 SK0F 218 AUX TLG	Collector	CLI U12 4000	2
	Rack system	ZFT 101	2
	Storage tank	TFF 080 0205US	1
	Pump station controller kit	307355	1
CLI U12 SK0F 318 EI B/U CLI U12 SK0F 318 AUX EL CLI U12 SK0F 318 AUX GAS CLI U12 SK0F 318 AUX TLG	Collector	CLI U12 4000	3
	Rack system	ZFT 101	3
	Storage tank	TFF 120 0205US	1
	Pump station controller kit	307355	1
CLI U12 SD0F 119 HX B/U	Collector	CLI U12 4000	1
	Rack system	ZFT 101	1
	Storage tank	TFF 060 1205US	1
	Pump station controller kit	307354	1
CLI U12 SK0F 219 HX B/U	Collector	CLI U12 4000	2
	Rack system	ZFT 101	2
	Storage tank	TFF 080 1205US	1
	Pump station controller kit	307355	1
CLI U12 SK0F 319 HX B/U	Collector	CLI U12 4000	3
	Rack system	ZFT 101	3
	Storage tank	TFF 120 1205US	1
	Pump station controller kit	307355	1
CLI U12 SD0F 11(10 or 12) NG B/U	Collector	CLI U12 4000	1
	Rack system	ZFT 101	1
	Storage tank	TFF 060 2205US or TFF 060 4205US	1
	Pump station controller kit	307354	1
CLI U12 SK0F 21(10 or 12) NG B/U	Collector	CLI U12 4000	2
	Rack system	ZFT 101	2
	Storage tank	TFF 080 2205US or TFF 080 4205US	1
	Pump station controller kit	307355	1
CLI U12 SD0F 11(11 or 13) LP B/U	Collector	CLI U12 4000	1
	Rack system	ZFT 101	1
	Storage tank	TFF 060 3205US or TFF 060 5205US	1
	Pump station controller kit	307354	1
CLI U12 SK0F 21(11 or 13) LP B/U	Collector	CLI U12 4000	2
	Rack system	ZFT 101	2
	Storage tank	TFF 080 3205US or TFF 080 5205US	1
	Pump station controller kit	307355	1



# VELUX solar system kits

## Parts breakdown

System models	System component	Part number	Quantity
CLI U12 SD0P 118 EI B/U CLI U12 SD0P 118 AUX EL CLI U12 SD0P 118 AUX GAS CLI U12 SD0P 118 AUX TLG	Collector	CLI U12 4000	1
	Rack system	ZFT 100	1
	Storage tank	TFF 060 0205US	1
	Pump station controller kit	307354	1
CLI U12 SK0P 218 EI B/U CLI U12 SK0P 218 AUX EL CLI U12 SK0P 218 AUX GAS CLI U12 SK0P 218 AUX TLG	Collector	CLI U12 4000	2
	Rack system	ZFT 100	2
	Storage tank	TFF 080 0205US	1
	Pump station controller kit	307355	1
CLI U12 SK0P 318 EI B/U CLI U12 SK0P 318 AUX EL CLI U12 SK0P 318 AUX GAS CLI U12 SK0P 318 AUX TLG	Collector	CLI U12 4000	3
	Rack system	ZFT 100	3
	Storage tank	TFF 120 0205US	1
	Pump station controller kit	307355	1
CLI U12 SD0P 119 HX B/U	Collector	CLI U12 4000	1
	Rack system	ZFT 100	1
	Storage tank	TFF 060 1205US	1
	Pump station controller kit	307354	1
CLI U12 SK0P 219 HX B/U	Collector	CLI U12 4000	2
	Rack system	ZFT 100	2
	Storage tank	TFF 080 1205US	1
	Pump station controller kit	307355	1
CLI U12 SK0P 319 HX B/U	Collector	CLI U12 4000	3
	Rack system	ZFT 100	3
	Storage tank	TFF 120 1205US	1
	Pump station controller kit	307355	1
CLI U12 SD0P 11(10 or 12) NG B/U	Collector	CLI U12 4000	1
	Rack system	ZFT 100	1
	Storage tank	TFF 060 2205US	1
	Pump station controller kit	307354	1
CLI U12 SK0P 21(10 or 12) NG B/U	Collector	CLI U12 4000	2
	Rack system	ZFT 100	2
	Storage tank	TFF 080 2205US	1
	Pump station controller kit	307355	1
CLI U12 SD0P 11(11 or 13) LP B/U	Collector	CLI U12 4000	1
	Rack system	ZFT 100	1
	Storage tank	TFF 060 3205US	1
	Pump station controller kit	307354	1
CLI U12 SK0P 21(11 or 13) LP B/U	Collector	CLI U12 4000	2
	Rack system	ZFT 100	2
	Storage tank	TFF 080 3205US	1
	Pump station controller kit	307355	1

# Part 7: Troubleshooting

Nature of trouble	Possible cause	Service	
No hot water.	Improper wiring.	Check controller and tank wiring.	
	No Power – blown fuse or circuit breaker tripped.	a. Shorted wiring.	Replace or repair.
		b. Circuit overloaded.	Provide adequate circuit or reduce load.
		c. Improper wiring.	Rewire per wiring diagram.
		d. Grounded element or thermostat.	Replace.
	Manual reset limit (ECO) open. Refer to "Operation" Section.	a. Thermostat defective.	Replace thermostat.
		b. Thermostat out of calibration.	Lower setting or replace.
		c. Heat build-up due to loose wires.	Tighten wire connections.
		d. Defective Limit (ECO).	Replace.
	Solar system controller incorrectly installed.	Check installation.	
Defective storage tank element.	Replace element.		
Leaking plumbing or open hot water faucet(s).	Make sure all faucet(s) are closed and check water meter.		
Not enough hot water.	System undersized.	Reduce rate of hot water use.	
	Defective element.	Check amperage, replace element.	
	Defective thermostat or wired incorrectly.	Check wiring or replace.	
	Solar system controller incorrectly installed.	Check Installation.	
	Leaking plumbing or open hot water faucet(s).	Make sure all faucet(s) are closed and check water meter.	
Water too hot or not hot enough.	Thermostat setting too high or low.	Change setting as required.	
	Thermostat out of calibration.	Replace.	
	Solar system incorrectly installed.	Check installation.	
	Grounded element.	Replace.	
Noisy tank heating element.	Scale build-up on element.	Remove and clean.	
Rattling noise in tank during periods of water usage.	Tank internal heat trap fittings in operation.	None. Normal for heat trap fittings.	
	Water pressure too high.	Check and call local utility if necessary.	
	Scale build-up inside storage tank.	Drain and flush tank.	

## CAUTION

For your safety, do not attempt repair of electrical wiring, thermostat, heating element or other operating controls. Refer repairs to qualified service personnel.

Nature of trouble	Possible cause	Service
Pump does not operate (even though there is solar radiation and the tank is cold).	No power to pump.	Check controller and pump wiring.
	Controller improperly set.	Check program - Refer to pump station manual "Control parameter" section.
	Sensor out of position.	Check position of all sensors.
	Sensor defective.	Check sensor resistance - Refer to controller manual "Tips for Fault Localization" section.
	Pump defective.	Replace pump.
Pump operates intermittently.	Normal when weather changes.	None.
	Sensors connected to wrong terminals.	Check sensor connections - Refer to controller manual "Installation" section.
	Improper system "switch-on" or "switch-off" temperature.	Check sensor resistance - Refer to controller manual "Control parameter" section.
	Sensor out of position.	Secure sensor properly.
System pressure too high.	Filling pressure too high.	Adjust system pressure to 50 psi (3.5 bar).
	Expansion tank initial pressure too high.	Isolate and adjust expansion tank to 40 psi (2.8 bar).
	Expansion tank too small.	Properly size and replace expansion tank.
System pressure too low.	Propylene glycol leak in system.	Check system for leaks and repair.
	Expansion tank too small (release of propylene glycol from relief valve).	Properly size and replace expansion tank.
	Controller improperly set or sensor defective.	Check program - Refer to controller manual "Control parameter" section.
Temperature differential between collector and storage tank too high.	Controller improperly set.	Check program - Refer to controller manual "Control parameter" section.
	Sensor out of position.	Secure sensor properly.
	No power to pump.	Check controller and pump wiring.
	Air or impurities present in system.	Properly commission system, purge all air.
	Pump defective.	Replace pump.
Pump operates at night.	Normal on very warm nights.	None.
	Check valve open or dirty.	Check position of check valves, clean or replace if necessary.
	Controller defective.	Replace controller.
Storage tank cools down rapidly.	Consumption higher than design for system.	Reduce rate of hot water use.
	Check valve open or dirty.	Check position of check valves, clean or replace if necessary.
	Insulation defective or inadequate.	Add, repair, or replace pipe insulation as needed.

# VELUX solar SRCC OG-300 label set

## Instructions

The following labels must be attached to the relevant valves in the system in order for it to be considered OG-300 compliant. This page should be laminated, each label cut from it, punched in the margin at the right hand side and affixed to the appropriate valve with a wire tie, plastic ties are inappropriate due to high operating temperatures. Failure to affix these labels will void the SRCC OG-300 system certification (Refer to page 33 for placement)

### Valve 1 collector array fill/drain valve

Please consult your installation manual for specific freeze tolerance information. A 40% concentration of DOWFROST propylene glycol and distilled water can protect your VELUX solar system to temperatures as low as -40° F. Lower concentrations of DOWFROST and distilled water will provide a lower level of freeze protection.

### Valve 1 collector array fill/drain valve (Warning hot)

Valve 1 is normally closed. When open, it is used to charge and drain the solar collector loop piping.

The heat transfer fluid used in this system is DOWFROST propylene glycol. It must be handled and disposed of in accordance with the dow chemical company material safety data sheet. A copy of the msds has been provided with your installation manual. No other fluid shall be used that would change the original classification of this system. Unauthorized alterations to this system could result in a hazardous health condition.

Be extremely careful when draining this fluid. It may be discharged at a very high temperature and/or pressure.

### Valve 2 collector array fill/drain valve (Warning hot)

Valve 2 is normally closed. When open, it is used to charge and drain the solar collector loop piping.

The heat transfer fluid used in this system is DOWFROST propylene glycol. It must be handled and disposed of in accordance with the dow chemical company material safety data sheet. A copy of the msds has been provided with your installation manual. No other fluid shall be used that would change the original classification of this system. Unauthorized alterations to this system could result in a hazardous health condition.

Be extremely careful when draining this fluid. It may be discharged at a very high temperature and/or pressure.

### Valve 3 collector array isolation valve

Valve 3 is normally open during operation. It is closed to isolate the storage tank from the collector array should the storage tank need servicing or replacing.

### Valve 4 collector array isolation valve

Valve 4 is normally open during operation . It is closed to isolate the storage tank from the collector array should the storage tank need servicing or replacing.



# Service Information

## Installer information

Installers name:

---

Company:

---

Address 1:

---

Address 2:

---

City:

State:

Zip:

---

Phone number:

---

Fax number:

---

E-mail:

---

## Installation information

Collectors:

Model number:

Serial number:

---

1.

---

2.

---

3.

---

4.

---

Tank:

Gallons:

Aux:

---

Orientation:

Pitch:

---

Installed date:

---

# SRCC OG-300 System Certification



This product certified by:  
 Solar Rating and  
 Certification Corporation  
 1679 Clearlake Road  
 Cocoa, FL 32922  
 (321)638-1537  
[www.solar-rating.org](http://www.solar-rating.org)

VELUX America, Inc.  
 104 Ben Casey Drive  
 Fort Mill, SC 29708  
 SRCC Document OG-300

System Model:	SRCC Certification Number:
<input type="checkbox"/> CLI U12 SD0(W/L/F/P)118 EI B/U	2010110A
<input type="checkbox"/> CLI U12 SK0(W/L/F/P)218 EI B/U	2010110B
<input type="checkbox"/> CLI U12 SK0(W/L/F/P)318 EI B/U	2010110C
<input type="checkbox"/> CLI U12 SD0(W/L/F/P)118 AUX EL	2009155A
<input type="checkbox"/> CLI U12 SK0(W/L/F/P)218 AUX EL	2009155B
<input type="checkbox"/> CLI U12 SK0(W/L/F/P)318 AUX EL	2009155C
<input type="checkbox"/> CLI U12 SD0(W/L/F/P)118 AUX GAS	2009156A
<input type="checkbox"/> CLI U12 SK0(W/L/F/P)218 AUX GAS	2009156B
<input type="checkbox"/> CLI U12 SK0(W/L/F/P)318 AUX GAS	2009156C
<input type="checkbox"/> CLI U12 SD0(W/L/F/P)118 AUX TLG	2009157A
<input type="checkbox"/> CLI U12 SK0(W/L/F/P)218 AUX TLG	2009157B
<input type="checkbox"/> CLI U12 SK0(W/L/F/P)318 AUX TLG	2009157C
<input type="checkbox"/> CLI U12 SD0(W/L/F/P)119 HX B/U	2010111A
<input type="checkbox"/> CLI U12 SK0(W/L/F/P)219 HX B/U	2010111B
<input type="checkbox"/> CLI U12 SK0(W/L/F/P)319 HX B/U	2010111C
<input type="checkbox"/> CLI U12 SD0(W/L/F/P)11(10/12) NG B/U	2010112A
<input type="checkbox"/> CLI U12 SK0(W/L/F/P)21(10/12) NG B/U	2010112B
<input type="checkbox"/> CLI U12 SD0(W/L/F/P)11(11/13) LP B/U	2010112C
<input type="checkbox"/> CLI U12 SK0(W/L/F/P)21(11/13) LP B/U	2010112D

The installed system is checked above.



VELUX America Inc.  
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