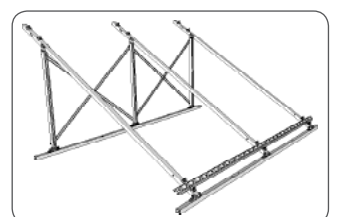
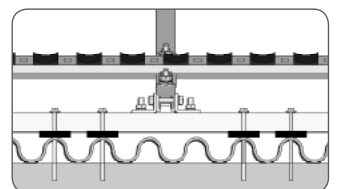
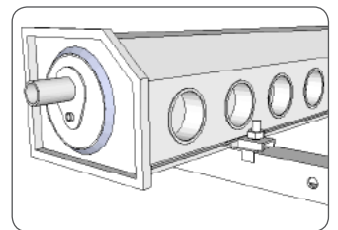
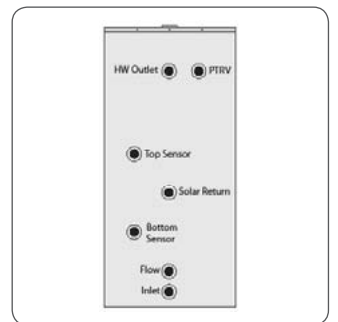
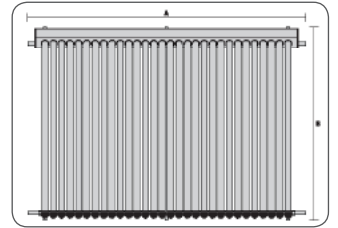
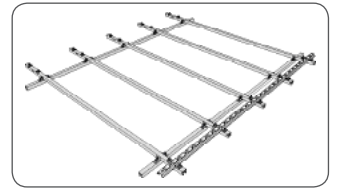




EVACUATED TUBE SOLAR HOT WATER SYSTEMS

TECHNICAL MANUAL
AUGUST 2013



Thermann Technical Manual Table of Contents

1. INTRODUCTION	4	5. INSTALLATION	14
1.1 Foreword.....	4	5.1 Mounting Frame System.....	14
1.2 Scope	4	5.1.1 Installation Notes.....	14
1.3 Terminology	4	5.1.2 Installation – Assembly Guide.....	14
1.4 Certification.....	4	5.1.3 Installation - Roof Fixing Guide	15
		5.1.4 Tin Roof Installation Example:.....	15
		5.1.5 Tiled Roof Installation Example:.....	16
		5.1.6 Adjusting Tilt Mount Angle	16
2. WARNINGS AND PRECAUTIONS	5	5.2 Thermann Solar Ready Tank	16
2.1 Installer Requirements	5	5.2.1 SRT Ports Explained.....	16
2.2 Occupational Health and Safety	5	5.2.2 SRT Port Connections	17
2.3 Over Pressure and Temperature Protection.....	5	5.2.3 SRT Port Sizes	17
2.3.1 Pressure Temperature Relief.....	5	5.2.4 Pipe Work.....	17
2.3.2 Mains Pressure Control.....	5	5.3 Pipe Work Connections.....	17
2.4 Water Quality.....	5	5.3.1 Inlet (Mains).....	17
2.5 Legionella Control	5	5.3.2 Solar Flow	17
2.6 Weather Related Issues and Acts of God	6	5.3.3 Solar Return	17
2.6.1 Freeze Protection	6	5.3.4 Outlet.....	17
2.6.2 Lightning Protection.....	6	5.3.5 Sensor Ports	18
2.6.3 Hail Resistance	6	5.3.6 PTRV Port	18
2.7 Stagnation and No-Load Conditions.....	6	5.4 Collector Manifold Connection.....	18
2.7.1 Information on Stagnation.....	6	5.4.1 Silver Soldering/Brazing.....	18
2.7.2 Hydrogen Build Up.....	6	5.4.2 Compression Fittings.....	18
2.7.3 Water Boiling Temperatures	6	5.4.3 Press Tools.....	18
2.7.4 Delayed Installation or Use	7	5.5 Pump Station.....	18
		5.5.1 Installation Guide.....	18
3. INFORMATION FOR END-USER	7	5.5.2 Flow Meter Settings	18
3.1 How Solar Heating Works.....	7	5.6 Solar Differential Controller.....	19
3.1.1 Introduction	7	5.6.1 Controller Settings	19
3.1.2 Summer and Winter Solar Heating	7	5.6.2 Temperature Sensors	19
3.1.3 How the Thermann System Works.....	7	5.7 Insulation	19
3.2 How Boosting Works	7	5.8 System Filling and Air Purge	19
3.2.1 Boosting Explained.....	7	5.9 Evacuated Tubes and Heat Pipes.....	19
3.2.2 Legionella Bacteria - The Importance of Boosting	7	5.9.1 Installation Notes.....	19
3.2.3 Electric Boosted Systems.....	7	5.9.2 Installation Guide.....	20
3.2.4 Gas Boosted Systems	7	5.10 Auxiliary Boosting Components	20
3.3 System Maintenance & Precautions.....	8	5.10.1 Electric Booster Tank Thermostat and Element Setup.....	20
3.3.1 System Maintenance.....	8	5.10.2 Gas Booster Setup.....	20
3.3.2 Glass Lined Tank Precautions.....	8		
3.4 End-User Troubleshooting Guide	9	6. POST INSTALLATION	20
4. PRE-INSTALLATION	10	6.1 Commissioning.....	20
4.1 System Selection.....	10	6.1.1 System Operation Check	20
4.2 Site Inspection	10	6.1.2 Photo Records	20
4.2.1 Collector Location	10	6.1.3 Rebate Forms.....	20
4.2.2 Mounting Frame Location.....	10	6.2 Maintenance	20
4.2.3 Storage Tank Location.....	10	6.2.1 Damaged Tubes	21
4.3 Transport and Unpacking	11	6.2.2 Insulation	21
4.3.1 Transport of Components	11	6.2.3 Draining the System.....	21
4.3.2 Unpacking of Components.....	11	6.2.4 Over Pressure Protection Maintenance	21
4.4 Component Inspection.....	11	6.2.5 Magnesium Anode Replacement	21
4.4.1 Evacuated Tubes & Heat Pipes.....	11		
4.4.2 Pump Station Inspection	11		
4.4.3 Mounting Frame System.....	11		



Thermann Technical Manual Table of Contents

7. APPENDIX	22
7.1 Thermann System Schematics.....	22
7.1.1 Thermann Electric Boosted Solar Hot Water System ...	22
7.1.2 Thermann Gas Boosted Solar Hot Water System	23
7.2 Conditional Requirements	24
7.2.1 Wind Loading Conditions.....	24
7.2.2 Installation Conditions	25
7.2.3 Roof Fixing Requirements	26
7.3 Frame Ordering Explained	27
7.3.1 Frame Part Numbers Explained	27
7.3.2 Frames Options Explained	28
7.3.2.1 Flush Mount Frames.....	28
7.3.2.2 Low Angle Tilt Mount Frames.....	28
7.3.2.3 High Angle Tilt Mount Frames.....	28
7.4 Region Based Ordering Examples	29
7.4.1 Region A	29
7.4.2 Region B.....	29
7.4.3 Region C.....	30
7.4.4 Region D.....	30
7.5 Mounting Frame Components	31
7.6 Mounting Frame Configurations	32
7.6.1 Flush Mount 3 Tracks.....	32
7.6.2 Flush Mount 5 Tracks.....	33
7.6.3 Tilt Mount 3 Tracks	34
7.6.4 Tilt Mount 5 Tracks	35
7.7 Thermann Component Information	36
7.7.1 Electric Storage Tank Dimensions	36
7.7.2 Gas Tank Dimensions	36
7.7.3 Thermann Pump Station Dimensions.....	37
7.7.4 Gas Booster Dimensions	37
7.7.5 Collector Technical Specifications:	37
7.8 Thermann Warranty Policy	40



1. Introduction

1.1 Foreword

Congratulations on taking a major step towards reducing your total home energy usage and making a positive difference to the environment we live in.

Thermann is a provider of premium solar hot water systems. These systems use high efficiency evacuated tube collectors to provide free hot water generated purely by the sun's energy.

1.2 Scope

This manual has been designed to cater for the needs of the end-user, installer and service agent.

Refer to section '7.1 Thermann System Schematics' for AS/NZS2712:2007 approved system designs.

Any deviation from these system designs will NOT be eligible for government or state rebates. Customised system designs and larger commercial systems should be validated and approved by a qualified hydraulic engineer prior to installation in collaboration with Thermann.

1.3 Terminology

The terminology used from region to region differs and so to avoid confusion please note the following terminology.

- » **Boost** - The process where a heating component (such as an electric element or gas heater) is used to provide additional heating when solar-heated water is not of an adequate temperature.
- » **Collector** - The Thermann solar collector is the manifold with heat pipes and evacuated tubes inserted.
- » **Expansion control valve (ECV)** - Installed on the cold mains line to relieve excess pressure.
- » **Flow Line** - indicates the plumbing line running from the tank (or heat exchanger) to the inlet of the collector. This line incorporates the circulation pump.
- » **Header (A)** - is the copper "heat exchanger" pipes in the solar collector through which the water flows.
- » **Insolation** - solar radiation level, expressed in kWh/m²/day
- » **Manifold (B)** - Refers to the solar collector which contains the header through which potable water flows.
- » **Clean Energy Regulator (CER)** - A statutory authority established to oversee the implementation of the Large-scale Renewable Energy Target (LRET) and the Small-scale Renewable Energy Scheme (SRES).
- » **Pressure temperature relief valve (PTRV)** - installed

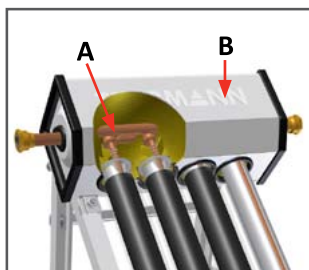


Figure 1. Collector cut-away.

on the hot water storage tank to relieve pressure, and excessive temperatures.

- » **Return Line** - indicates the plumbing line running from the outlet of the collector back to the tank.
- » **Stratification** - the passive separation of water into distinct layers of different temperatures; where the temperature at the top of the tank can be significantly higher than the temperature at the bottom.

1.4 Certification

AS/NZS2712 - The Australian Standard for solar collectors. Testing to meet this includes resistance to glass breakage and impact resistance under certain conditions including hail, stagnation conditions, protection against water ingress and structural strength.

'The Thermann collector has obtained AS/NZS 2712:2002 certification through Global Mark. The certification number is 100633.'

SRCC - The Solar Rating and Certification Corporation (SRCC) is a not for profit organization that assesses solar collectors. This allows solar collectors to be compared to one another on an independent platform. There is also a similar program for solar water heating systems.

'Solar Collector – SRCC OG-100 North America. Thermann has obtained SRCC OG-100 for the TH-22 & 30 tube evacuated tube solar collectors. Certification numbers: 100-2004003A/B/C/D'

ITW - Solar Keymark is the most widely recognised European standard for solar collectors. The testing done through this standard ensures that the collectors are reliable in both performance and quality.

'Thermann has obtained Solar Keymark certification for its TH-22 & TH-30 evacuated tube solar collectors.'

AS/NZS3498 - Applies to the hot water system. By meeting this standard it means that the entire system (including tank) meets requirements. Most importantly is the Watermark certificate meaning that all the products that Thermann provides in a given system from collector through to valves will meet Australian standard in relation to potable water.

'Thermann has obtained AS/NZS3498 for all the systems available in the CER register through Global Mark. The certification number is 40107.'



2. Warnings and Precautions

2.1 Installer Requirements

Installation must be completed by a licensed plumber in accordance with the requirements listed below, as well as any relevant local standards and regulations.

- » AS/NZS 3500 – National Plumbing and Drainage Code.
- » AS/NZS 2712.2007 – Solar and Heat Pump Water Heaters: Design and Construction.
- » AS/NZS 4234.2008 – Heated Water Systems – Calculation of Energy Consumption.
- » AS/NZS 5601.2004 – Gas Installations

2.2 Occupational Health and Safety

The installer must adhere to occupational health and safety guidelines and other relevant industry associations. Under no circumstances should any installer attempt to install an Thermann solar hot water system without reading and understanding this installation manual. For any queries contact your local Reece branch.

2.3 Over Pressure and Temperature Protection

2.3.1 Pressure Temperature Relief

Any system design must allow a means of pressure release at no more than 850kPa, using a PTRV. The PTRV must have a downward direction copper pipe connected that is open to the atmosphere, running the expelled hot water or air to a safe, frost free and appropriate drainage location. From time to time the PTRV may discharge small amounts of water under normal operations, this can be up to 10% of tank capacity. If the tank is installed indoors, a safe-tray must be installed beneath the hot water tank to safely collect any water expelled from the PTRV.

2.3.2 Mains Pressure Control

Where the mains pressure supply can exceed or fluctuate beyond the pressure of 500kPa, a pressure-limiting valve must be fitted to the cold mains line. The device is installed after the isolation valve (duo valve) and should have a pressure limit of 500kPa.

In some states it is a mandatory requirement that an expansion control valve be fitted on the cold mains line to provide a form of pressure relief. A separate drain line must be run for this relief valve (as per AS/NZS 3500). If unsure please check with the local authority.

2.4 Water Quality

Water quality is an important aspect of system lifetime. For the system to be warranted, the water used in the system must meet the requirements outlined in Table 1.

Table 1. Water Quality Threshold Values

Total Dissolved Solids	< 600 mg/L or p.p.m
Total Hardness	< 200 mg/L or p.p.m
Electrical Conductivity	850 μ S/cm
Chloride	< 250 mg/L or p.p.m
pH Level	Min 6.5 to Max. 8.5
Magnesium	< 10 mg/L or p.p.m
Sodium	< 150 mg/L or p.p.m

If in doubt contact your local water authority or have a water test completed. In areas of poor water quality all major components will have a reduced life due to the harshness of the water.

In areas with “hard water” (>200 mg/L or p.p.m), it is advised to install a water softening device to ensure the long term efficient operation of the system is met. It is also advisable that a glass-lined tank is used as opposed to a stainless steel tank, since the glass-lined tank has a sacrificial anode to protect from corrosion.

2.5 Legionella Control

Legionella bacteria can be found naturally in the environment and thrives in warm water and damp places. It can weaken the body's immune system, which can increase the chances of developing Legionnaires' disease.

To ensure legionella growth is inhibited, the boosting regime must meet the guidelines as shown in section 3.2.2 Table 3. This is in accordance with 'AS3498.2009 Authorisation requirements for plumbing products - water heater and hot-water storage tanks'

It is therefore, very important that the auxiliary boosting system remains on. It will only activate if the temperature falls below the temperatures outlined in section 3.2.2 Table 3.



2.6 Weather Related Issues and Acts of God

2.6.1 Freeze Protection

All Thermann systems have freeze protection built in. This is provided by the controller which will circulate water through the collector once the temperature falls below 4°C. This freeze protection method has passed Frost Level 2 protection (down to -15°C) in line with AS/NZS 2712:2007.



WARNING

Freeze protection will not operate if there is no power supply to the controller or pump.

2.6.2 Lightning Protection

At installation locations that are prone to lightning strikes, it is advisable to earth/ground the copper circulation loop of the collector to avoid lightning related damage, or electrical safety issues. Refer also to local building codes regarding lightning safety and grounding.

The inclusion of a residual-current device (RCD) is highly recommended for these lightning prone areas.

2.6.3 Hail Resistance

The borosilicate glass evacuated tubes have been tested under the Australian Standards requirement (AS/NZS 2712:2007 – Solar and heat pump water heater – design and construction). The impact resistance test results indicate that the evacuated tubes are able to withstand impact from hailstones up to 25mm/1" in diameter at 25 m/s.

In the unlikely circumstance that an evacuated tube should become broken it can be easily replaced. The solar collector can still function properly with one or more broken tubes, however it will result in a reduced heat output from the collector. A broken evacuated tube should be replaced by professional installers or service agents only.

2.7 Stagnation and No-Load Conditions

2.7.1 Information on Stagnation

Stagnation refers to the condition that occurs when the pump stops running, due to pump failure, power black-out, or as a result of the high tank temperature protection feature built into the controller, which turns the pump off. The system is designed to allow stagnation to prevent the tank from overheating.



WARNING

The collector and plumbing in close proximity may reach temperatures of up to 170°C; therefore components that may be exposed to the high temperatures such as valves, plumbing or insulation, must be suitably rated.

The system designs listed in the 'CER' Register meet the No-load system requirements detailed in AS/NZS 2712:2007. This means that they will not dump large volumes of water from the PTRV and do not require an auto air-vent. When the temperature has reached 70°C throughout the storage tank, cold water entering the tank can cause gurgling noises. This is a normal occurrence in any hot water storage system and does not affect the system's operation.

2.7.2 Hydrogen Build Up

Glass lined (vitreous enamel) tanks are fitted with a Magnesium anode to provide corrosion protection for the tank from the storage water. Small quantities of hydrogen gas can be released by the anode, which generally remains dissolved in the water and flushed away as hot water is used from the tank. Depending on the water quality there may be a degree of hydrogen build-up in the tank if the water heater hasn't been used for two or more weeks. To resolve the build-up of hydrogen within the tank "purge" the tank for approximately 30 seconds from the lever on the PTRV.

2.7.3 Water Boiling Temperatures

The boiling point of water varies based on the pressure within the hot water system. Under stagnation and no load conditions, the solar collector has the potential to reach temperatures well above 100°C. As the water temperature rises and water expands this creates pressure within the system. As the temperature rises, so too does the boiling point of water. This is why the solar hot water system (despite being at temperatures in excess of 100°C) will not boil and produce steam. Table 2 illustrates how the boiling point increases with pressure.

Table 2. The Relationship Between Pressure and Boiling Point

Pressure (kPa)	Boiling point (°C)
101	100
203	120
304	133
405	143
507	151
608	158
709	164
811	170



2.7.4 Delayed Installation or Use

The manifold and tubes should not be installed and sitting dry (no fluid) for more than 14 days. Prolonged dry stagnation may void the warranty as it could affect heat pipes or tube longevity.

The manifold **MUST NOT** be left without tubes and installed on the roof for any period of time, particularly during periods of rainfall or snowfall. There is a high probability of water entering the manifold and causing damage to the glass wool insulation.

If the installation cannot be completed fully and the system must be left dry for a period longer than 14 days, the collector must be covered. The collector can be covered with a durable, waterproof cover to prevent water ingress, or access to insects or birds.

3. Information for End-User

3.1 How Solar Heating Works

3.1.1 Introduction

Thermann strongly believe in informing the homeowner about the basic operation of the solar water heating system. By gaining a basic understanding of the systems operation, habits which maximise energy savings and most importantly, ensure safe and reliable operation can be developed.

3.1.2 Summer and Winter Solar Heating

Solar radiation is only half or one third as strong in the winter months compared to summer, and therefore not able to provide the same amount of hot water as in summer. For optimal performance of the solar system it is recommended that the collectors be angled (pitched) at no less than 20 degrees. For increased performance during winter it is recommended that collectors are pitched at latitude plus 10-20 degrees. Correct tilting of the system will provide increased year round performance and reduce energy costs further.

3.1.3 How the Thermann System Works

The Thermann solar collector converts the sun's energy into heat, quite different to photovoltaic (PV) solar panels, which convert the sun's energy into electricity.

How the Thermann system works:

1. The evacuated tubes absorb the sun's energy and convert it to usable heat.
2. The heat inside the evacuated tube, is carried via copper heat pipes to the insulated manifold, this contains a copper heat exchanger.
3. An electronic controller measures the temperature of

water in the manifold and compares it to the water in the bottom of the storage tank. If the manifold temperature is higher, the controller switches on a circulation pump which brings the solar heated water back down to the storage tank.

4. Throughout the day, the controller switches the pump on and off to continuously heat water in the storage tank.

3.2 How Boosting Works

3.2.1 Boosting Explained

If the solar contribution during the day is not enough to raise the water to a suitable temperature, an electric or gas booster can provide additional heating. During sufficient sunny weather, the solar collector will normally be able to provide enough hot water, but during winter months and overcast days boosting may be required.

3.2.2 Legionella Bacteria - The Importance of Boosting

It is a legal requirement that water be heated on a regular basis to kill Legionella bacteria that can lead to Legionnaires disease. The frequency this temperature must be reached varies, and is explained in Table 3:

Table 3. Minimum Heat Requirements

Type of Thermann System Installed	Minimum heat requirements
Bottom element electric boosted system	Once per week to 60°C
Mid element electric boosted system	Once per day to 60°C
Gas boosted systems	Minimum 70°C each time water is used

3.2.3 Electric Boosted Systems

If the system is electric boosted, when the electric element is activated it will heat up all the water above the element to 60°C (or the thermostat setting). This heating can take as long as 3-4 hours if the tank is cold.

Note: Thermann recommends that the electric booster is left on, or controlled by a suitable timer.

3.2.4 Gas Boosted Systems

The gas booster used on the Thermann system, allows water to bypass the booster if higher than 57°C, this means water is only heated as required. If the water is less than 57°C the gas booster starts and "boosts" pre-heated water to 70°C. This "post boosting" method supplies the household a virtually unlimited supply of hot water.



3.3 System Maintenance & Precautions

3.3.1 System Maintenance

- Cleaning - The Thermann tubes do not usually need cleaning, regular rain and wind should keep the tubes clean.
- Pressure & Temperature Relief Valve (PTRV) - The PTRV is located near the top of the hot water storage tank. It is designed to release pressure in the tank as water expands and contracts during normal heating.

The lever on the PTRV should be carefully lifted for a few seconds then placed down, once every 6 months. This will help prevent any debris or scale build up in the valve.



WARNING

When the PTRV is lifted hot water will be discharged. Ensure the drain pipe from PTRV is clear.

- Visual Check - Thermann recommend periodic visual checks of your system:
 - a. Check for leaks around the storage tank and pipework
 - b. Ensure the pump station is dry and free from moisture
 - c. If the tubes are safely visible from ground height, ensure all tubes are still dark in colour. *(Note: if the tubes are a milky/white colour the vacuum has escaped and the tube will not be working as efficiently as it should be)*



WARNING

Pipework can be extremely hot, do not touch any exposed copper piping.

3.3.2 Glass Lined Tank Precautions

Glass lined (Vitreous enamel) tanks are fitted with a magnesium anode to provide corrosion protection for the tank from the stored water. Thermann recommend the anode be inspected at least every three (3) years, and serviced as required.

Small quantities of hydrogen gas can be released by the anode which generally remains dissolved in the water. This is then flushed away during normal use.

Depending on the water quality there may be a degree of hydrogen build up in the tank if the water heater hasn't been used for two or more weeks. To resolve the build-up of hydrogen within the tank "purge" the tank for approximately 30 seconds from the lever on the PTRV.



3.4 End-User Troubleshooting Guide

Table 4. Basic Troubleshooting Guide

Problem	Cause	Solution
Pump Continuously Running	Air lock in manifold	Contact your plumber
	Insufficient flow rate	Increase pump speed
Pump is not circulating even during sunny weather	Maximum temperature reached in the tank	This is normal operation, controller switches pump off once maximum temperature is reached to prevent over-heating.
	Possible sensor issue	Contact your plumber
Why is the pump running at night?	Freeze protection operating	This is normal, but if the pump is running more than once an hour, additional insulation on the collector line should be installed.
	Possible faulty non-return valve	Contact your plumber
Why is the controller L.E.D. light flashing red?	Possible sensor issue	Contact your plumber
Why is the water not hot enough?	Booster is not configured correctly	Electric booster should have the thermostat temperature set to at least 60°C. Booster must be left on off-peak, or controlled by timer.
	Household hot water usage too high	Unit may be incorrectly sized, contact your plumber. Remember an efficient shower head uses 9 litres/minute. (10 minute shower = 90ltrs water)
	Tempering valve installed	A tempering valve must be installed on every solar hot water system. Tempering valves will mix water down to 50°C
		Tempering valve may need replacing or servicing.



LEFT BLANK INTENTIONALLY



4. Pre-Installation

4.1 System Selection

Correct system selection is crucial to ensure that all the hot water needs for the home are being met. The system is designed to meet 90-100% of the household needs in summer and 50-60% in winter.

A number of considerations need to be made including: the number of residents in the house, the time of day when most hot water will be used, the location of the customer within Australia and the resources available on site.

Thermann has designed its systems to meet the optimal demand required in most residential homes for domestic hot water requirements. Figures 2 and 3 Show a sizing guide which can be used as a “Rule of Thumb” for choosing a system that best meets the needs of the household.

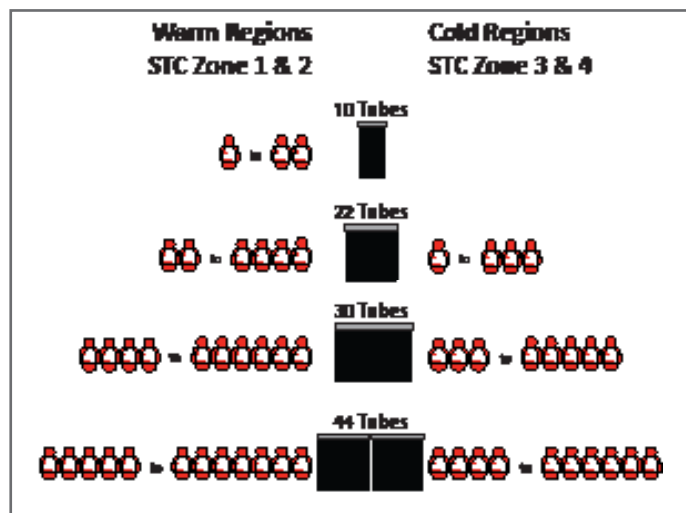


Figure 2. Collector sizing guide

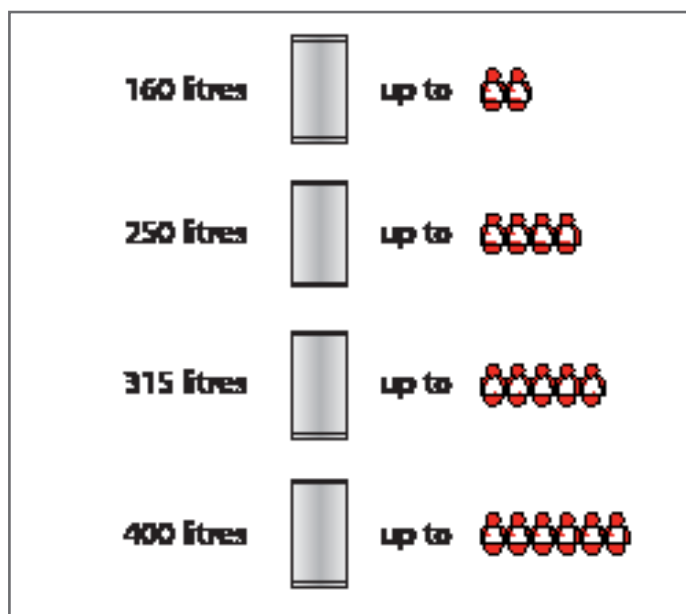


Figure 3. Tank sizing guide

4.2 Site Inspection

4.2.1 Collector Location

The location of the solar collector is crucial to achieving optimal system performance. A number of factors need to be considered when determining the placement of the collectors on the roof of a building. These are detailed below:

- **Solar collector vicinity to tank:** The collector should be positioned as close as possible to the storage tank to avoid long pipe runs and minimise heat loss.
- **Collector Orientation with respect to the sun:** To ensure optimal heat output the collector should face the equator, which in Australia and New Zealand (Southern hemisphere) is due North. A deviation of up to 15° east or west off due north is acceptable, and will have minimal affect on heat output.
- **Collector Plane:** Both sides of the manifold can be used interchangeably as the inlet and outlet ports. However, if the manifold is not level horizontally, the higher side must be used as the outlet since hot water rises.
- **Collector Angle:** So that the collector achieves maximum solar exposure, collectors are to be installed at an angle of the location's latitude +/- 10°. E.g. Sydney is at 34° S latitude, therefore the optimal angle for the collector on the roof would be 24-44° S. In some installations it may desirable to achieve an install angle of +10° latitude as this will optimise winter output since the sun is lower in the sky during Winter. This can also reduce stagnation effects in summer from over sizing.
- **Shading:** Collectors should be located so that shading does not occur for at least the 3 hours either side of 12pm noon local time. Partial shading due to small objects such as antennas and small flues are not of great concern.

4.2.2 Mounting Frame Location

Prior to installation of the mounting frame it is essential to carry out a site inspection and ensure that the site is compliant with the conditions stipulated in section '7.2 - Conditional Requirements'. In the case where conditional requirements are not met, a certified structural engineer may also be consulted prior to install to provide professional design work that will allow for the site to accommodate Thermann certified mounting frame systems.

4.2.3 Storage Tank Location

- The storage cylinder should be located as close as possible to the most frequent draw off points in the building such as the bathroom or kitchen. If the storage cylinder is located a long way from hot water draw points a hot water circulation loop on a timer may be considered to reduce the time-lag for water to heat up



and resultant water wastage.

- The tank should not obstruct any windows, doors or exits and should cause minimal intrusion to the existing site.
- For glass-lined tanks, consider the requirement of anode removal and replacement maintenance.

4.3 Transport and Unpacking

4.3.1 Transport of Components

- When transporting boxes, note the orientation of the "THIS WAY UP arrows".
- Ensure all boxes are strapped and secured to prevent movement during transit.
- All tanks must be transported upright. Stacking is not recommended for any tanks.
- Products should always be handled with care. Damage occurred during the transportation is not covered under product warranty.

4.3.2 Unpacking of Components

- When unpacking, take care to ensure that the components are not damaged in the process.
- Avoid using sharp blades or knives as this can scratch the surfaces of the products particularly the evacuated tubes and tanks.
- For evacuated tubes and heat pipes, tear open both ends of the box(es) to allow inspection of the vacuum at the bottom and for the heat pipes to be exposed for the application of heat transfer paste.

4.4 Component Inspection

4.4.1 Evacuated Tubes & Heat Pipes

- Ensure that the evacuated tubes are all intact, the bottom of each tube should be silver. If a tube has a white or clear bottom, it has lost its vacuum and should be replaced. In this case, the heat pipe should be removed and inserted into the replacement tube.
- The evacuated tubes have rubber tube caps on the end, these are to protect the bottom tip of the glass tube from being broken.
- Heat pipes are bright and shiny when newly manufactured, but will dull and may form dark-grey surface discoloration over time. This is due to mild surface oxidation (when exposed to air) and does not affect the heat pipe's operation.
- Do not remove and/or expose the tubes to sunlight until ready to install, otherwise the heat pipe tip will become very hot, sufficient to cause serious skin burns. Note: The outer glass surface will not become hot.



WARNING

NEVER touch the inside of the evacuated tube or heat pipe tip after exposure to sunlight.
WEAR thick leather gloves if handling the heat pipe.
WEAR safety glasses at ALL times when handling the glass tubes.

4.4.2 Pump Station Inspection

Every domestic solar hot water system supplied by Thermann comes with an Thermann Pump Station Kit. The Thermann Pump Station Kit comes bundled with the essential components required for installation of a solar hot water system. The kit comes pre-packaged and can easily be connected to plumbing and includes:

- Pump
- Solar controller
- Pump unions
- Flow meter
- Tempering valve
- Check valve
- Pump station lid and base

4.4.3 Mounting Frame System

Ensure that all necessary components required for installation have been received in the packaging. Figures 4 & 5 are diagrammatic guides showing what is included in a typical mounting frame system. Refer to section 7.5 for number of frame components required.



Thermann Flush Mount

This diagram shows a typical cyclonic wind region C frame with 5 x tracks and 10 x L-bracket packs.
Most regions across Australia require only 3 x tracks and 6 x L-Bracket Packs.

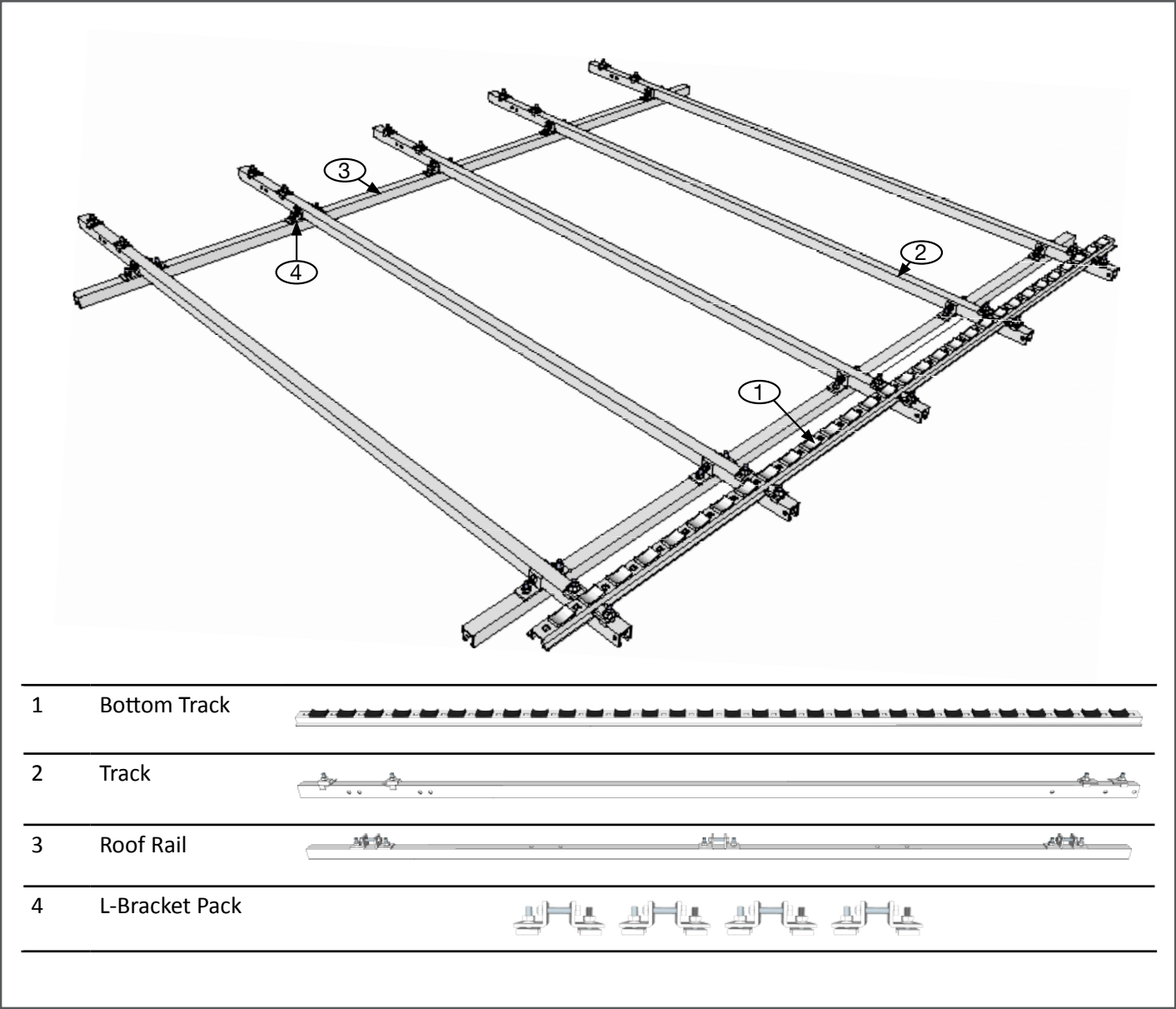


Figure 4. Flush-Mount Frame at 1800 mm spacing with 5 tracks.



Thermann Tilt Mount

This diagram shows a typical cyclonic wind region C frame with 5 x tracks, 10 x L-Bracket packs and 5 x Rear-legs. Most regions across Australia require only 3 x tracks and 6 x L-Bracket Packs.

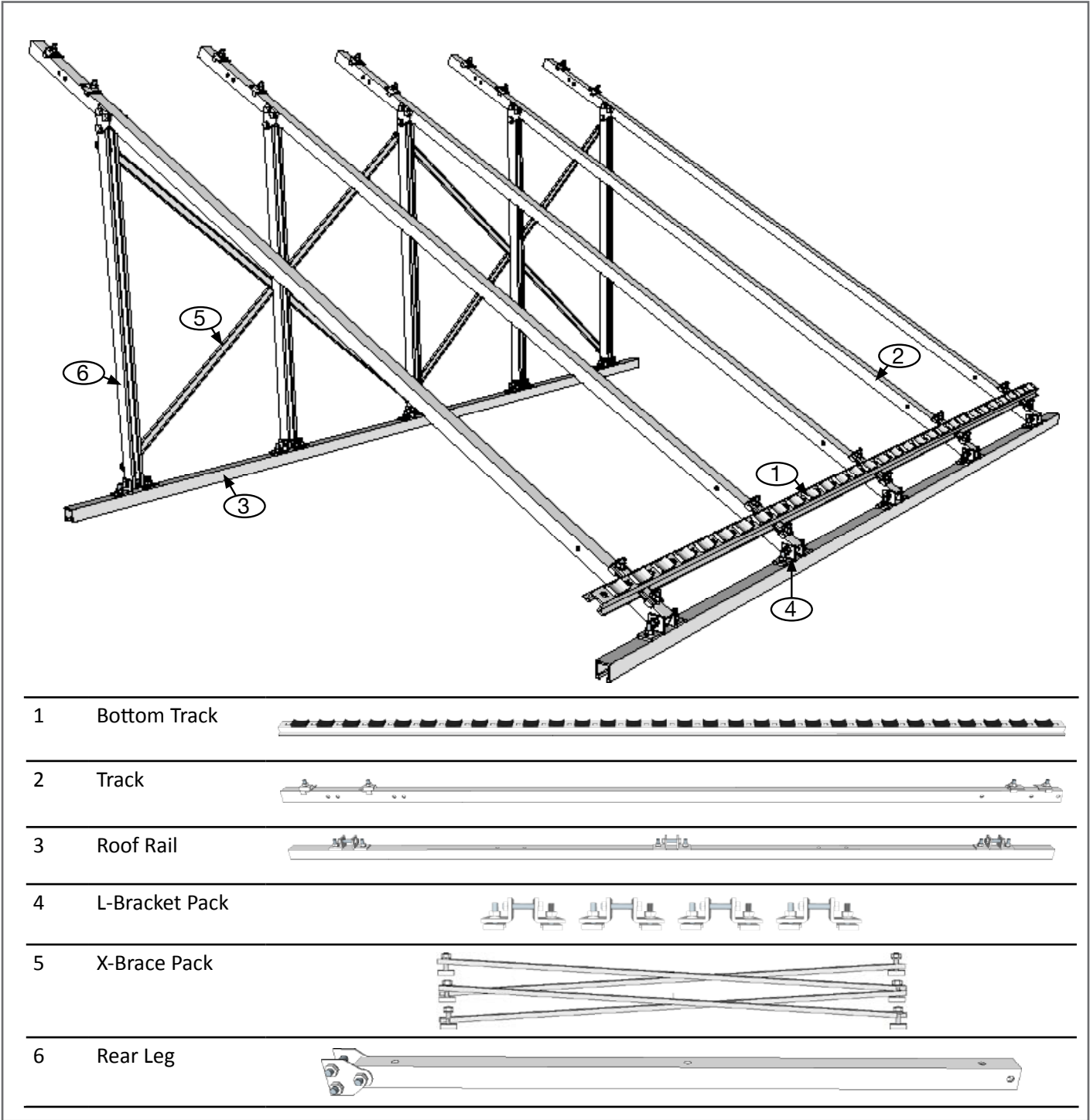


Figure 5. Tilt-Mount Frame at 1800 mm spacing with 5 tracks.



5. Installation

5.1 Mounting Frame System

The Thermann solar evacuated tube mounting frame systems are made of high-grade extruded anodized aluminium frame 6005-T5.

There are four easy to install mounting options: flush mounted with roof rail, flush mounted with roof straps, low angle tilt 30 degrees and high angle tilt 45 degrees.

Under a set of conditional requirements (see section 7.2 Conditional Requirements) these systems are certified to Australian Standard AS/NZS 1170.2:2011 Structural Design Actions Part 2: Wind Actions. See section 7.2 Mounting Frame Certification.

Check with local building authority to confirm whether or not this standard is a regulatory requirement.

5.1.1 Installation Notes

The installer is to provide the fixings for the frame to the roof, ensure the fixings are applied in accordance with section 7.2 Conditional Requirements and section 5.1.3 Installation – Roof Fixing Guide. Holes can be easily drilled into the extruded aluminium components. They are to be no larger than $\varnothing 10$ mm and not closer than 30mm centre to centre. Tighten frame bolts with spanners or short shafted socket wrenches only. DO NOT use power tools or long shafted tools that may over-torque the bolts (as stainless steel bolts are susceptible to galling/locking). Bolt assemblies come with spring washers to maintain long-term tension.

5.1.2 Installation – Assembly Guide

Thermann mounting frame systems come pre-packaged to ensure the most streamlined and simple assembly process. Use the following steps as a guide to assembly.

1. Lay the first roof rail down horizontally (add L-brackets if using a 5 track system).
2. Attach all tracks to the L-brackets, finger tighten all nuts and bolts. Ensure that the track is placed in the right location based on batten/purlin spacing.

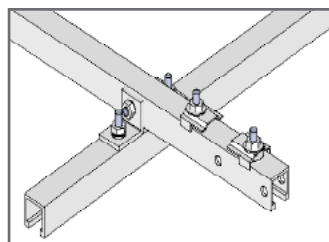


Figure 6. Flush mount 1500mm

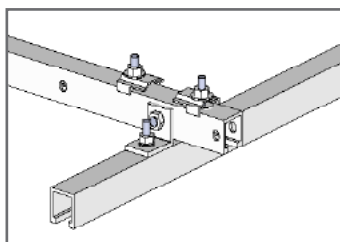


Figure 7. Flush mount 1800mm

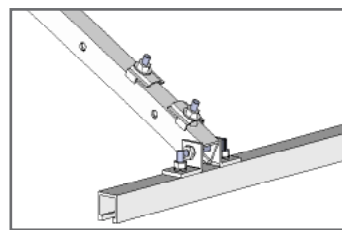


Figure 8. Tilt mount 1500mm or 1800mm

3. Slide the bottom track into the bottom attachment plates and finger tighten all nuts and bolts.

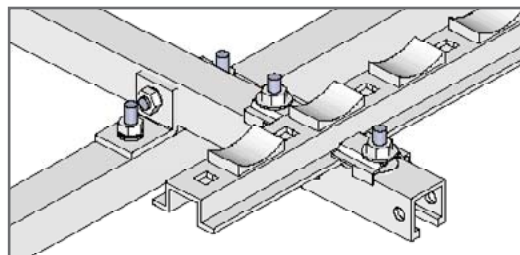


Figure 9. Bottom track and attachment plates

FLUSH MOUNT ONLY

4. For flush-mount frames attach the second roof rail. Continue onto Step 8.

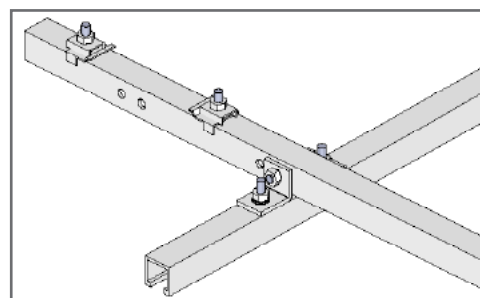


Figure 10. Flush mount 1500mm

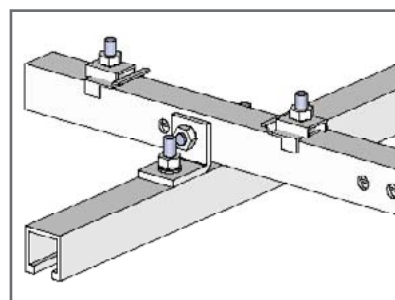


Figure 11. Flush mount 1800mm



TILT MOUNT ONLY

- For tilt-mount frames, lay down the second bottom track, but attach the L-brackets to the rear legs. Finger-tighten nuts and bolts.

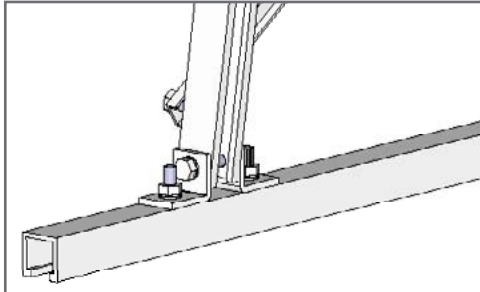


Figure 12. L-bracket connection

- Attach X-braces to the rear legs.

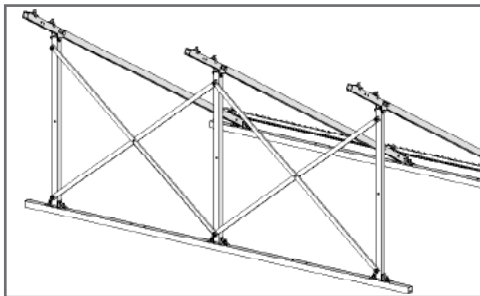


Figure 13. L-bracket connection

- Attach tri-attachment plates to the track

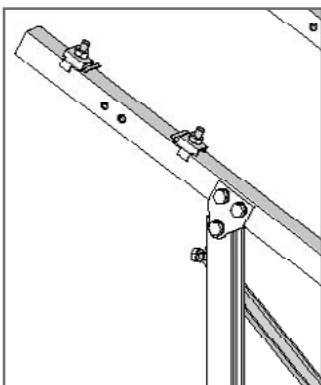


Figure 14. Tilt mount 1500mm

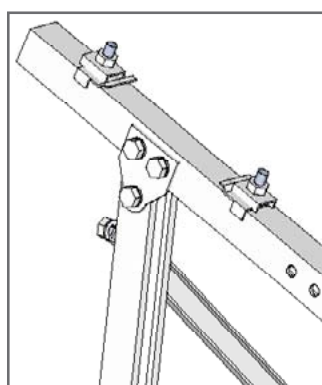


Figure 15. Tilt mount 1800mm

- Slide the manifold into the top attachment plates

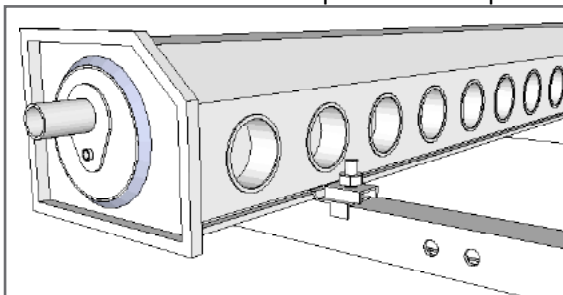


Figure 16. Manifold attachment to framework

- Using a spanner, tighten all nuts and bolts used for attachment.

5.1.3 Installation - Roof Fixing Guide

To proceed with attaching the mounting frame to the roof, follow all fixing rules as per section 7.2.2 Installation Conditions (for certification to apply).

Line up the roof rails with battens accordingly. For tilt-mount systems the batten/purlin spacing can be increased where the angle of the tilt decreases.

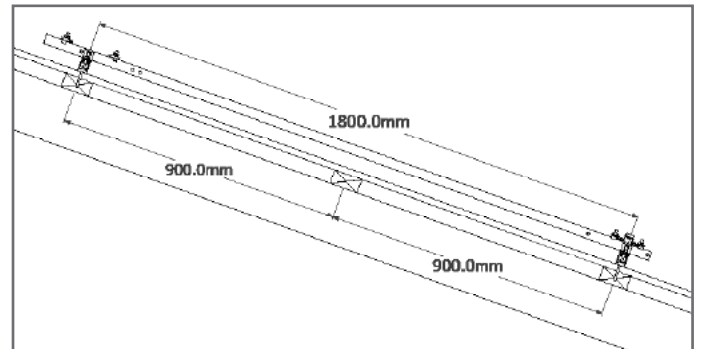


Figure 17. Roof fixing locations 1800mm

Ensure all roof penetrations are water tight. Use the following examples as a guide for installation for different roof types:

5.1.4 Tin Roof Installation Example:

For corrugated/tin roofs, place fixings on the peak of the roofing sheet material to minimize risk of leaks. Fixings are to be screwed into the batten with minimum 35mm embedment (for more details see section 7.2.2 Installation Conditions).

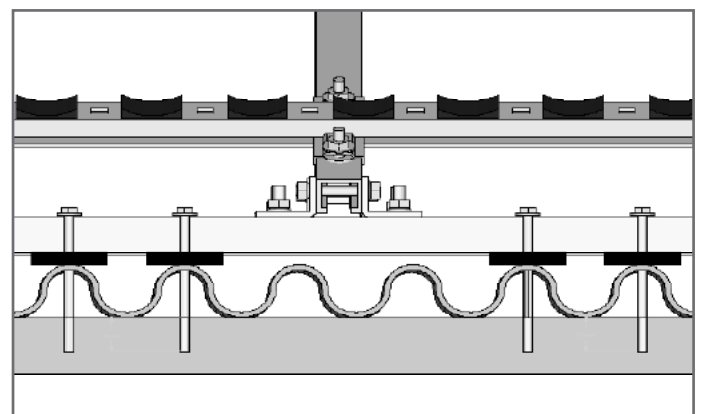


Figure 18. 35mm embedment into the batten/purlin [rear view]

5.1.5 Tiled Roof Installation Example:

For tiled roofs (where drilling is undesirable) use Thermann roof straps to attach the frame to the battens/purlins. Note: systems installed on tiled roofs are not certified under AS/NZS 1170.2. Roof straps can also be attached to roof rails by drilling through them.

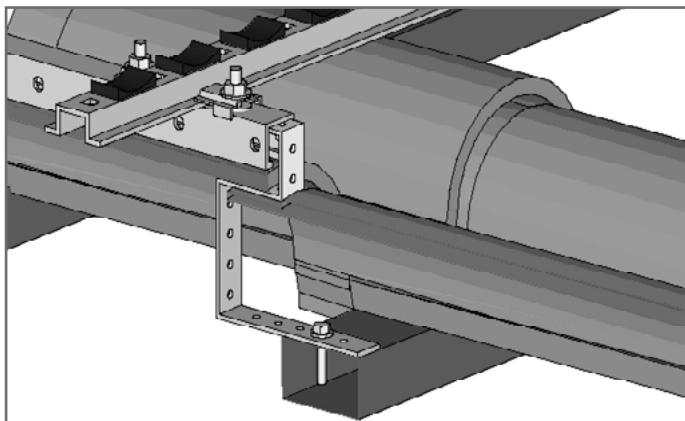


Figure 19. Roof attachment strap example

5.1.6 Adjusting Tilt Mount Angle

When installing tilt mount systems, the system can be modified to decrease the tilt angle to a more optimum angle, as this will decrease the wind loading on the system. To decrease the angle, aluminium rear legs can be cut and a new hole drilled to decrease their length, thus bringing the frame closer to the roof.

5.2 Thermann Solar Ready Tank

Thermann solar ready tanks (SRT) are an electric hot water storage tank that contains seven (7) ports, four (4) more than a standard electric hot water system.

This unique design advantage allows installation of an electric storage tank that can be easily, and cost effectively upgraded to solar at a later date. Perfect for emergency break downs and maintenance.

When solar is added to the SRT under certain conditions, it may still be eligible for government assistance/incentive schemes.



Figure 20. Solar Ready Tank

5.2.1 SRT Ports Explained

1. Inlet (Mains): Inlet line from mains water supply
2. Solar Flow: Flow line to the collector
3. Solar Return: Return line from the collector
4. Outlet: Outlet line to tempering valve and load
5. Sensor 1 Port: Bottom temperature sensor
6. Sensor 2 Port: Top temperature sensor
7. PTRV: Pressure temperature relief valve location

5.2.2 SRT Port Connections

⚠ IMPORTANT

Thermann solar ready tanks (SRT) must be installed in accordance to AS/NZS 3500.4 as well as any other relevant local/government standards.

All compression fittings must be of brass with copper olives.

Teflon tape must be used on all fittings.

5.2.3 SRT Port Sizes

Table 5. SRT Port Sizes

Port Location	Size
Inlet (Mains)	20mm (3/4") BSP
Solar Flow	20mm (3/4") BSP
Solar Return	20mm (3/4") BSP
Outlet	20mm (3/4") BSP
Sensor Ports	Adjustable Cable Gland
PTRV	20mm (3/4") BSP

5.2.4 Pipe Work

For general mains pressure systems, the recommended pipe size is 3/4". All pipe work and insulation must be installed in accordance with AS/NZS 3500.4

⚠ IMPORTANT

When solar is added to the storage tank, pipe work and insulation can be exposed to much higher maximum temperatures. It is necessary that all valves and fittings used are solar rated.

5.3 Pipe Work Connections

5.3.1 Inlet (Mains)

The mains line should consist of the following brass components when installing:

- Duo valve
- Expansion control valve
- Pressure limiting valve

The 'Quickie Kit' can be purchased separately and provides the above components with insulating jackets to streamline the installation process.

5.3.2 Solar Flow

When installing the SRT without a solar collector, this port is simply plugged using the supplied 3/4" brass plug.

When installing SRT with a solar collector, this port is used for the water line directed up to the solar collectors to be heated, and consists of the following components:

- Solar collector
- Circulation pump with unions
- Solar differential controller
- Check valve
- Flow meter

The Thermann retro-fit kit provides the above components to complete the plumbing of the solar flow line.

5.3.3 Solar Return

When installing the SRT without a solar collector, this port is simply plugged using the supplied 3/4" brass plug.

When installing SRT with a solar collector, this port is used for the water line returning from the solar collectors after being heated. This line does not require any additional components, but should be run as short as possible and have continuous fall back to the solar return port.

5.3.4 Outlet

The outlet is where the hot water from the SRT is extracted to be supplied to the household. This line must consist of the following component:

- Solar rated tempering valve

The Thermann pump station kit is provided with the above component to complete the plumbing of the outlet line of the system.



5.3.5 Sensor Ports

When installing the SRT without a solar collector, the sensor ports remain unused, as all heating is controlled by the thermostat and element inside the electrical cover.

When installing the SRT with a solar collector, the sensors must be coated with heat transfer paste inserted through the cable gland into the appropriate port and tightened. For more information on sensors, refer to manual supplied with controller.

5.3.6 PTRV Port

The PTRV port is where the SRT ‘pressure and temperature relief valve’ is to be installed. All PTRV’s must be fitted with a copper drain pipe to carry any discharge to an appropriate drain.

 **IMPORTANT**

All SRT’s include a PTRV, which is located in the vertical column of the SRT packaging.

PTRV handle must be operated every six months to ensure valve still works and is free from sediment and clarion/lime deposits.



Figure 21. PTRV Location in packaging



Figure 22. SRT Installed

5.4 Collector Manifold Connection

5.4.1 Silver Soldering/Brazing

Soldering may be used to connect piping to the collector header pipe. Only use potable water grade brazing material. Care should be taken to avoid overheating the copper pipe and exposing the manifold casing to an open flame.

5.4.2 Compression Fittings

Thermann collectors come supplied with 20mm flare x 12mm Male Iron (MI) 90° Elbows.

5.4.3 Press Tools

Seek manufacturers advice before using all press tools. Press tools are not suitable for direct manifold connection, or connecting multiple collectors together.

5.5 Pump Station

5.5.1 Installation Guide

Use the following steps as a guideline for the installation of the pump station and connection to piping:

1. Remove the contents from the box.
2. Remove the Pump Station Cover from the base plate.
3. Position base plate on the wall making sure there is a clearance height of 1 to 1.5 metres on the vertical wall, either side of the pump.
4. With a spirit level and pen mark screw holes on the wall for base plate.
5. Drill holes for green plugs.
6. Insert Green plugs into the drilled holes.
7. Fix base plate to wall with the 4 screws and rubber isolators.
8. Plumb in flow lines to the circulation pump (with a flow meter and check valve above the pump).

5.5.2 Flow Meter Settings

AS 4234.2008 Heated Water Systems – Calculation of energy consumption, Clause 3.7.2 – Low Flow Criteria stipulates that the maximum flow rate is 0.75 L/min/m2 of collector aperture area. Table 5 shows the maximum flow rate settings for the various Thermann collectors.

Table 6. Maximum flow rate requirements

Collector Size	Maximum Flow Rate (L/min)
10 Tubes	0.7
22 Tubes	1.5
30 Tubes	2
44 Tubes	2.5

Note: Each tube is 0.094 m2 of aperture area



5.6 Solar Differential Controller

5.6.1 Controller Settings

The Thermann controller comes with temperature sensors and power leads already connected. For most installations there is no need to alter any of the settings.

The controller has 3 sensor cables. The longest cable is for the roof sensor for the solar collector.

The controller comes pre-set with suitable settings for most domestic applications:

- Pump On = 8°C (Temperature differential between tank and roof sensors)
- Pump Off = 1°C (Temperature differential between tank and roof sensors)
- Top out = 85°C (Maximum tank temperature)
- Frost Protection = 4°C (temperature for when pump is forced to cycle)

The controller provides a digital display providing the 3 sensor temperatures and also signs when faults occur within the controller readings. To cycle through the temperature display readings press the NEXT button, the current displayed sensor is indicated on the display board through a flashing icon.

5.6.2 Temperature Sensors

Thermann solar rated tanks come with two temperature sensor ports. The bottom port connects to the Sensor 2 (S2), the middle port connects to the Sensor 3 (S3) sensor.

The third temperature sensor port is located on both sides of the manifold. Sensor 1 (S1) must be connected to the outlet (the higher side).

Use a thin layer of thermal paste when inserting all sensors. Ensure insulation covers the opening of the collector sensor port to prevent water ingress.

High temperature outdoor silicon sealant can be used to prevent water ingress to the manifold sensor port.

It is highly recommended that conduit be used to encapsulate the roof sensor and act as another protective layer as it is prone to physical damage by local fauna and extreme weather conditions. The sensor cable should run along the outside of the insulation and secured every 20cm with UV resistant nylon cable ties.

5.7 Insulation

- The solar circuit insulation must have a maximum thermal conductivity of 0.041W/mK for gas models and 0.0287W/mK for Electric models.
- All insulation needs to be solar-rated. Any insulation exposed to sunlight must be UV stabilised.
- Insulate all pipe running to and from the manifold with insulation of at least 15mm thickness, or 25mm in cold climates.
- Ensure the insulation is tight against the manifold casing, thus minimising loss of heat from the inlet and outlet.
- All internal piping as well as external should be insulated. This includes at least 1m from the hot water outlet of the tank, as this copper pipe can be a significant point of passive heat losses.

5.8 System Filling and Air Purge

After all the plumbing connections have been made, the solar hot water system needs to be filled with water and the collector loop purged of air. This should be completed prior to insertion of evacuated tubes.

To fill the system:

1. Open up one or more hot water fixtures at the site
2. Open the cold mains line to the tank
3. Turn the pump dial to speed 3 and connect it directly to the electricity mains rather than the controller.
4. Where an air-relief valve has been installed, air will be automatically released from the collector loop.
5. Filling is completed once there is a constant stream of water exiting from the hot water fixtures. Set the pump dial to speed 1 and reconnect the pump to the controller.

5.9 Evacuated Tubes and Heat Pipes

The Thermann evacuated tube solar collector is a simple "plug and play" system. See section 4.3.2 Unpacking of Components for details regarding the unpacking of the evacuated tubes. Use the following section as a guide to installing evacuated tubes.

5.9.1 Installation Notes

- The powder content of the heat paste may have settled during freight and storage. To ensure optimal thermal conductivity of the paste, place the heat paste tube in a glass of warm water for several minutes.
- If weather conditions are dusty, take care to ensure heat paste is not contaminated with impurities, as this may reduce thermal conductivity and efficiency of the heat paste.
- If weather conditions are wet, take care to ensure water does not enter the inside of the evacuated tube.



5.9.2 Installation Guide

1. Open the evacuated tube box on the side with the heat pipes.
2. Pull the heat pipe out ~10cm and ensure to keep the rest of the tube shaded.
3. Coat each heat pipe bulb with heat transfer paste, this can be applied using a piece of foam insulation.
4. Take out the evacuated tube and turn it upside-down (heat pipe down) before turning it back upright (heat pipe up). Repeat this several times to disperse the copper powder within the heat pipes.
5. Guide the heat pipe into the inside of the header port. Push the heat pipe in full depth.
6. Use a damp cloth, to lubricate the outer surface of the evacuated tube and the rubber ring in the manifold to minimize friction during insertion.
7. Insert the evacuated tube using a slight twist and pushing action.
8. Repeat steps 3-7 for the remainder of the tubes.
9. Using provided tube clips, secure the evacuated tubes into the bottom track.
10. Wipe down each evacuated tube with a damp cloth to ensure a polished and clean installation.

5.10 Auxiliary Boosting Components

5.10.1 Electric Booster Tank Thermostat and Element Setup



WARNING

WARNING: All electrical connections must be installed by a qualified electrician.

- The thermostat should be set to 60°C or above as per AS/NZS 3498.
- To adjust the temperature setting:
 - » Disconnect the electrical power supply to the tank
 - » Remove the element cover
 - » Using a screw driver, rotate the thermostat dial to the desired temperature.
- Where off-peak periods are unavailable it is advisable that a timer be installed to heat the system up to 60°C at least: i) once per week (bottom element tanks), or; ii) once per day (middle element tanks) to prevent legionella formation. See section 2.5 Legionella Control.

5.10.2 Gas Booster Setup

- All gas boosters come pre-set to heat up to 70°C as per AS/NZS 3500, see section 2.5 Legionella Control for more information.
- Installations must be compliant with AS/NZS 5601.
- Larger gas systems require adequate flueing and ventilation, this should also be done in accordance with

AS/NZS 5601.

- To customize settings please refer to relevant manufacturer's installation manual.

6. Post Installation

6.1 Commissioning

To ensure optimal operation and to maintain the integrity of Thermann solar hot water systems, commissioning is an essential process. Ensure that each of the following processes is carried out prior to leaving the site.

6.1.1 System Operation Check

Given good sunlight, the evacuated tubes will begin to produce heat after a 5-10 minute "warm up" period. There should be an observable increase in the temperature reading at the roof sensor on the controller. When there is an 8°C temperature differential between ROOF and TANK sensors the circulation pump should turn on.

After initial completed installation of collector, watch the operation of the pump and controller for at least 5 ON/OFF cycles or 15 minutes as the system stabilises. This process may take longer on overcast or cold conditions.

6.1.2 Photo Records

Take several photos of the installed product including: plumbing lines to/from the tank and collector and sensor port connections. These will serve as an important record for future servicing or warranty issues.

6.1.3 Rebate Forms

Complete any applicable rebate forms that require an installers signature prior to leaving the site.

6.2 Maintenance

Under normal conditions the solar collector is maintenance free. Please refer to the documentation provided by the manufacturer of other components for maintenance guidelines.

Maintenance and servicing should only be completed by a certified plumber, with experience in solar hot water systems.



6.2.1 Damaged Tubes



WARNING

WARNING: When replacing damaged tubes follow all relevant OH&S policies. Protective clothing is to be worn at all time.

WEAR thick leather gloves if handling the heat pipe.

WEAR safety glasses at ALL times when handling the glass tubes.

- If a tube is broken it should be replaced as soon as possible to maintain maximum collector performance. However, the system will continue to operate safely even with a damaged tube.
- Any broken glass should be cleared away to prevent injury.
- To replace a tube:
 1. Remove the tube clip, slide broken tube out and carefully pick up any glass pieces and dispose of appropriately.
 2. Avoid touching the glass wool insulation inside the manifold with bare hands, as it can cause mild skin irritation.
 3. If the heat pipe is not damaged, it can be left in place and a new evacuated tube inserted, guiding the heat pipe down the groove between the evacuated tube inner wall and heat transfer fin.

6.2.2 Insulation

- The plumbing pipes running to and from the collector should be well insulated. This insulation foam should be checked periodically (at least once every 3 years).
- Ensure protective cover/foil is in good condition, replace where required.

6.2.3 Draining the System

Draining of the collector may be required when servicing or performing maintenance on the system. Periodic flushing of the system is not required unless in areas with hard water resulting in scale formation in the bottom of the tank.

Follow the steps below to drain the collector:

1. Turn off the mains water supply to the solar storage tank.
2. If the storage tank is being drained,
 - a) Disconnect all power supply to water heater (for electric boosted tanks).
 - b) Release pressure in the tank by carefully operating the PTRV release lever.
 - c) Undo the cold inlet and attach a drain hose.
 - d) Operate the PTRV release lever allowing air into the heater and water to drain via the hose.

3. If the storage tank is not being drained,
 - a) Isolate piping to and from the solar collector and immediately undo fittings to open drain lines.



WARNING

Allowing the collector to sit pressured with the isolation valves closed may lead to dangerously high pressure.

- b) Open an air vent or drain cock, on the manifold outlet to allow air to enter the system.
 - c) Allow the manifold to sit in a vented state for 5-10min to allow the manifold to boil dry (may need longer in poor weather).
 - d) Close the air vent or drain cock.
4. Re-fill the system by following the same procedure outlined in section 5.8 System Filling and Air Purge.

6.2.4 Over Pressure Protection Maintenance

The lever on the PTRV should be carefully lifted and placed down once every 6 months, this will help prevent any debris or scale build up in the valve. Ensure the drain pipe from the PTRV is clear.

This should be similarly done for the expansion control valve on the cold mains line (if there is one installed).

6.2.5 Magnesium Anode Replacement

Glass-lined storage tanks have a magnesium anode inserted into the tank. This anode prevents internal corrosion that will otherwise drastically shorten storage tank life. Thermann recommend the anode be inspected at least every three (3) years, and serviced as required.



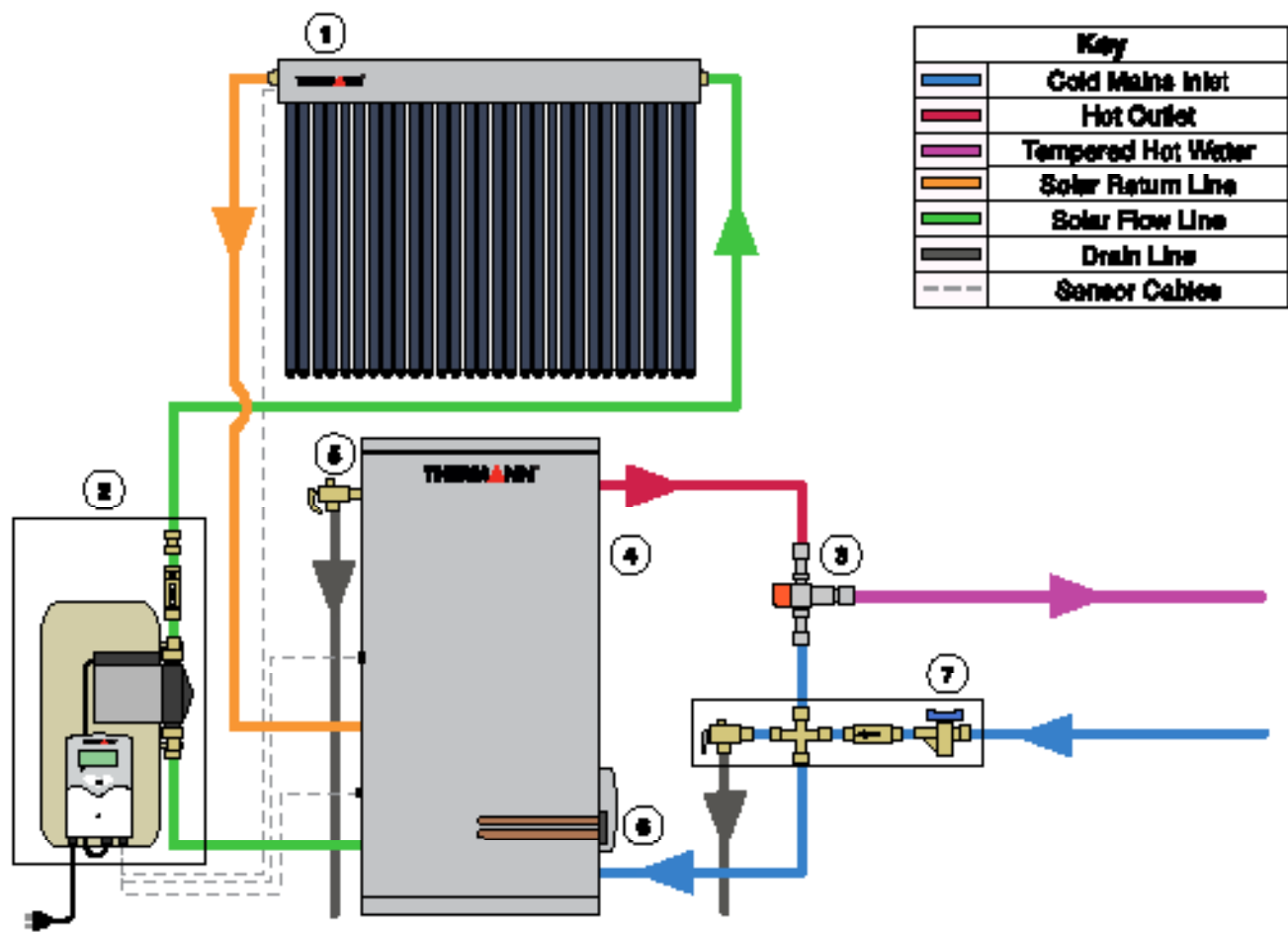
LEFT BLANK INTENTIONALLY



7. Appendix

7.1 Thermann System Schematics

7.1.1 Thermann Electric Boosted Solar Hot Water System



IMPORTANT

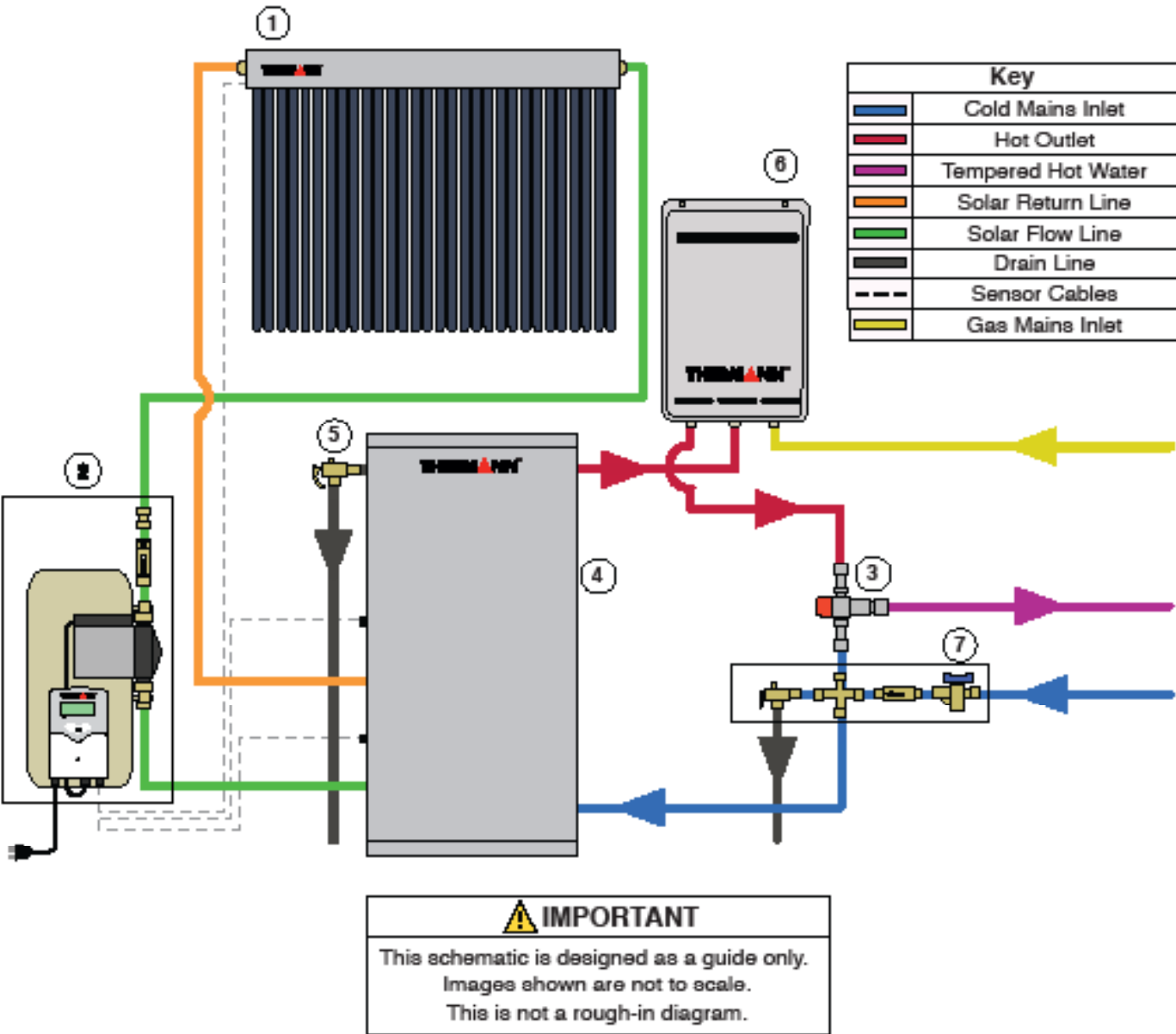
This schematic is designed as a guide only.
Images shown are not to scale.
This is not a rough-in diagram.

No	COMPONENT NAME
1	Evacuated Tube Collector
2	Pump Station Kit
3	(includes tempering valve, flow meter, check valve, circulation pump, controller)
4	Storage Tank
5	Pressure Temperature Relief Valve (PTRV)
6	Electric Element and Thermostat (Bot or Mid Element)
7	Quickie Kit (Optional Extra)
	(includes duo valve, pressure limiting valve, 4-way cross, expansion control valve)

Figure 23. Thermann Electric Boosted Schematic



7.1.2 Thermann Gas Boosted Solar Hot Water System



No	COMPONENT NAME
1	Evacuated Tube Collector
2	Pump Station Kit
3	(includes tempering valve, flow meter, check valve, circulation pump, controller)
4	Storage Tank
5	Pressure Temperature Relief Valve (PTRV)
6	In-Line Gas Booster (NG/LPG)
7	Quickie Kit (Optional Extra)
	(includes duo valve, pressure limiting valve, 4-way cross, expansion control valve)

Figure 24. Thermann Electric Boosted Schematic



7.2 Conditional Requirements

7.2.1 Wind Loading Conditions

The localised wind loading conditions can differ depending on a number of factors. These factors can vary greatly depending on location. What may be correct in one street or suburb, may be different in the next. The Wind loading parameters include: wind region, topography and terrain category. Figure 25 illustrates how Australia has been categorized. For more information on how to classify wind-loading parameters see AS/NZS 1170.2 – Wind Actions or consult a local structural engineer.

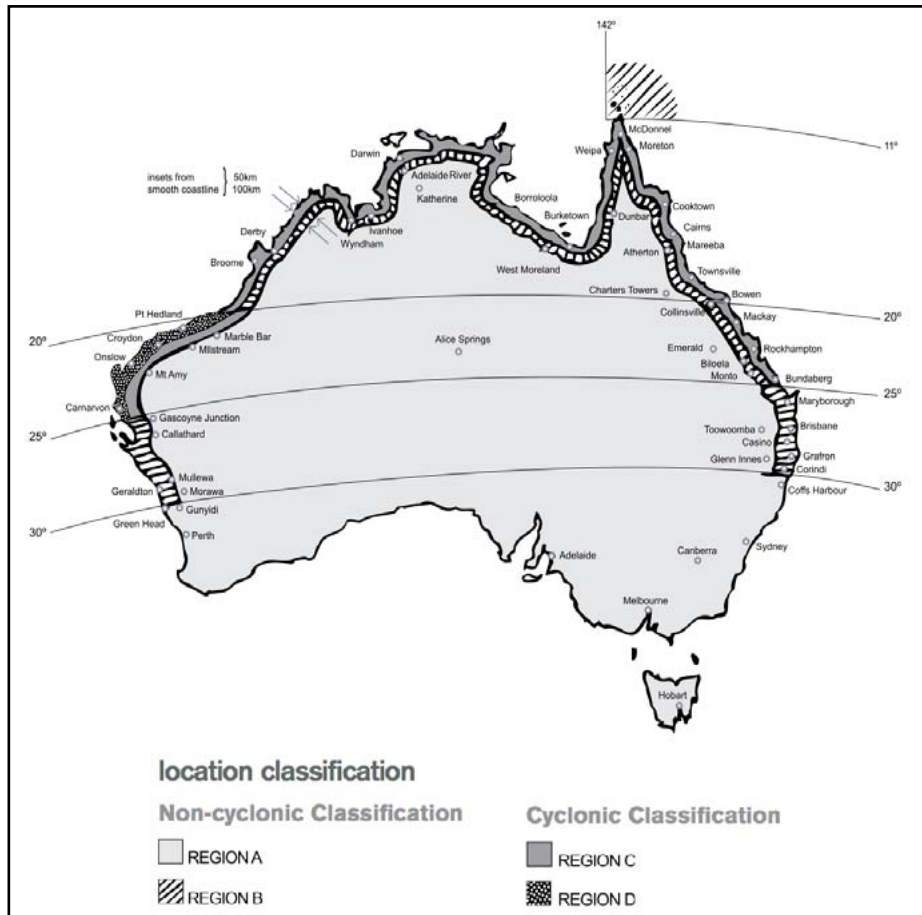


Figure 25. Wind Region Map of Australia

Source: STEGBAR Architectural Design Manual Section 3, Version 2 (Issued March 2009)

Wind Gust Speed: The Thermann mounting frame is certified to different wind speeds and this is determined by the region it is located in. The regional wind speeds are shown below:

- Region A (Non-Cyclonic): 162 km/h.
- Region B (Non-Cyclonic): 205 km/h.
- Region C (Cyclonic): 249km/h.
- Region D (Cyclonic): 316km/h.

Terrain Category: 2, 3 and 4. Terrain Category 2 (TC2) is characterized as an open terrain with only a few scattered obstructions to wind. Calculations of wind load have assumed TC2.

Topography: Flat topography. This means that the intended install site can not be located on a hill or escarpment unless subjected to prior additional engineering approval.



7.2.2 Installation Conditions

For mounting frame certification to apply, the following installation conditions must be met.

Batten/Purlin¹ Spacing: 600, 900, 1500 or 1800mm.

Batten/Purlin Screws:

- Timber Battens/Purlins: 14G Ø6.3mm timber screw, with minimum 35 mm embedment into battens. Minimum joint group J4.
- Steel Battens/Purlins: 14G Ø6.3mm tek screw. Minimum steel thickness 0.75 mm, Grade G550.
- Table 6 and 7 show the number of screws required per track for a flush-mounted and a tilt-mounted system respectively.

Maximum height of install: 10 m above ground.

Flush Mount: roof pitch needs to be 20-45° to the horizontal.

- Existing Roof Check: the structural adequacy of supporting roof members must be confirmed by a practicing structural engineer prior to installation, unless a roof rail is used for every batten location.

Tilt Mount: roof pitch needs to be 0-10° to the horizontal.

- Region A and B: Maximum tilt angle 45° to the horizontal.
- Region C: Maximum tilt angle 30° to the horizontal.
- Existing Roof Check: a practicing structural engineer prior to all installations must confirm the structural adequacy of supporting roof members.

Edge Exclusion Zones – As per AS/NZS 1170.2:2011, the flush mounted and tilt-mounted frame systems need to be installed within the internal roof zone. The edge exclusion zones is calculated from the minimum of $0.2 \times D'$ (width of the building), $0.2 \times B'$ (length of the building) and 'H' (average height of the building).

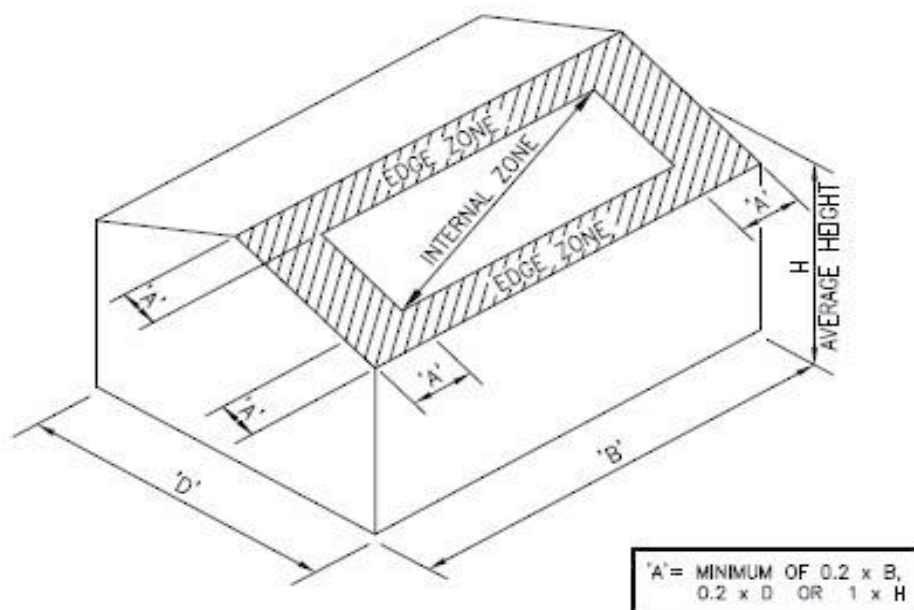


Figure 26. Edge exclusion zone

¹Battens and purlins are the same components and are usually located horizontal, or perpendicular to the roof pitch. This differs from rafters which are situated parallel to the roof pitch.



7.2.3 Roof Fixing Requirements

Table 7. Screw Fixing and Frame Configurations for Flush Mounted Systems

Number of Screw Fixings Required for the Front and Rear Roof Rail												
Wind Region	Wind Region A			Wind Region B			Wind Region C			Wind Region D		
	Number of Front Track	No of Fixings per Roof Rail		Number of Front Track	Total Fixings per Roof Rail		Number of Front Track	No of Fixings per Roof Rail		Number of Front Track	No of Fixings per Roof Rail	
		Timber Batten	Steel Batten		Timber Batten	Steel Batten		Timber Batten	Steel Batten		Timber Batten	Steel Batten
30 Tubes	3	6	6	3	6	6	5	10	20	5	10	20
22 Tubes	3	6	6	3	6	6	3	6	20	5	10	20
20 Tubes	3	6	6	3	6	6	3	6	20	5	10	20
10 Tubes	2	4	4	2	4	4	2	4	4	3	10	12

Table 8. Screw Fixing and Frame Configurations for Tilt Mounted Systems

Number of Screw Fixings Required for the Front Roof Rail										
Wind Region	Wind Region A			Wind Region B			Wind Region C			Wind Region D
	Number of Front Track	No of Fixings for Front Roof Rail		Number of Front Track	No of Fixings for Front Roof Rail		Number of Front Track	No of Fixings for Front Roof Rail		Tilt mount frames cannot be installed in wind region D.
		Timber Batten	Steel Batten		Timber Batten	Steel Batten		Timber Batten	Steel Batten	
30 Tubes	3	6	6	5	10	10	5	10	10	
22 Tubes	3	6	6	3	6	6	5	10	10	
20 Tubes	3	6	6	3	6	6	5	10	10	
10 Tubes	2	4	4	2	4	4	3	6	6	

Number of Screw Fixings Required for the Rear Roof Rail										
Wind Region	Wind Region A			Wind Region B			Wind Region C			Wind Region D
	Number of Front Track	No of Fixings for Rear Roof Rail		Number of Front Track	No of Fixings for Rear Roof Rail		Number of Front Track	No of Fixings for Rear Roof Rail		Tilt mount frames cannot be installed in wind region D.
		Timber Batten	Steel Batten		Timber Batten	Steel Batten		Timber Batten	Steel Batten	
30 Tubes	3	12	12	5	20	20	5	20	40	
22 Tubes	3	6	12	3	12	12	5	20	40	
20 Tubes	3	6	12	3	12	12	5	20	30	
10 Tubes	2	4	4	2	4	4	3	6	18	
Max. Pitch	45 degrees			45 degrees			30 degrees			



7.3 Frame Ordering Explained

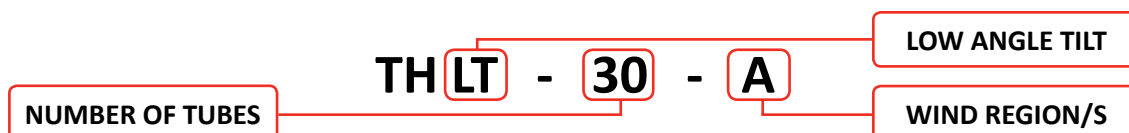
7.3.1 Frame Part Numbers Explained

The wind regions that the mounting frame will suit, is identified in the item/part number. These identifiers are explained below.

The below part number **THFR-30-ABC** is a **30 tube, flush mount frame** that is compliant in **regions A, B and C**:



The below part number **THLT-30-A** is a **30 tube, low angle tilt frame** that is compliant in **region A ONLY**:



The below part number **THHT-22-AB** is a **22 tube, high angle tilt frame** that is compliant in **region A and B**:



7.3.2 Frames Options Explained

7.3.2.1 Flush Mount Frames

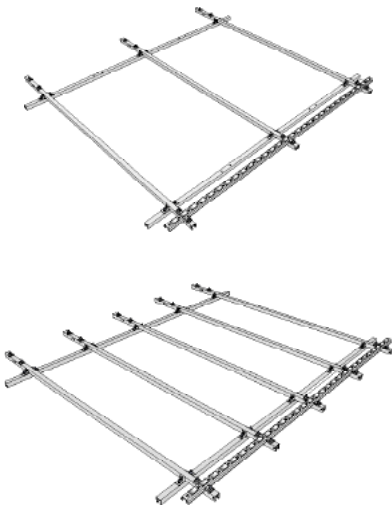


Figure 27. Flush Mount Frames

The Thermann manifold kits are packaged with the flush mount frame as standard. This frame will not add any additional pitch to the roof angle.

The 10, 22 and 30 tube variations of this frame are suitable for installation in regions A, B, C & D

⚠ IMPORTANT

Flush Mount Frames will not add any additional pitch to the roof angle.

7.3.2.2 Low Angle Tilt Mount Frames

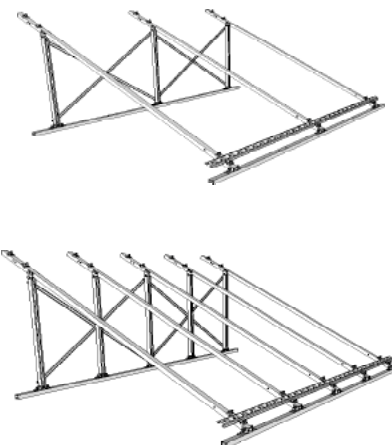


Figure 28. Low Angle Tilt Mount Frames

The low angle tilt mounting frame adds a 30° angle to the roof pitch. These frames are an addition to the flush mount frame to increase installation angle. Low angle tilt mount frames are recommended to be installed on low pitched or flat roofs.

The wind regions that low angle tilt mount frames suit vary depending on the size of the collector.

⚠ IMPORTANT

Tilt mount frames are an addition to the flush mount frame to increase installation angle.

Low angle tilt mount frames are **NOT SUITABLE** for installation in wind region D.

7.3.2.3 High Angle Tilt Mount Frames

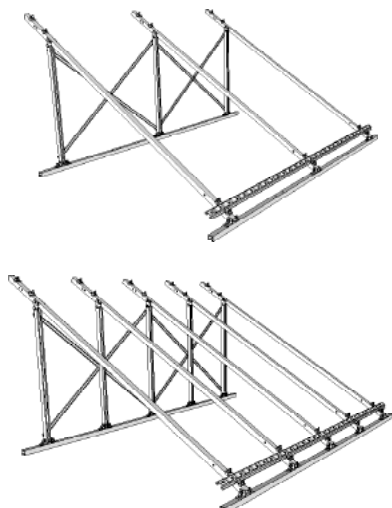


Figure 29. High Angle Tilt Mount Frames

The high angle tilt mounting frame adds a 45° angle to the roof pitch. These frames are an addition to the flush mount frame to increase installation angle. High angle tilt mount frames are recommended to be installed on low pitched or flat roofs.

High angle tilt frames are **NOT** suitable for installation in wind region C & D.

High angle tilt mount frames vary depending on the size of the collector.

⚠ IMPORTANT

High angle tilt frames are **NOT suitable** for installation in wind region C and D.



7.4 Region Based Ordering Examples

7.4.1 Region A

If an Thermann system is ordered in region A, (e.g. TE-315-GL-MID-30) the system will come with a flush mount frame as standard. If a tilt frame is required, the appropriate region A tilt frame (e.g. THLT-30-A) must be ordered.

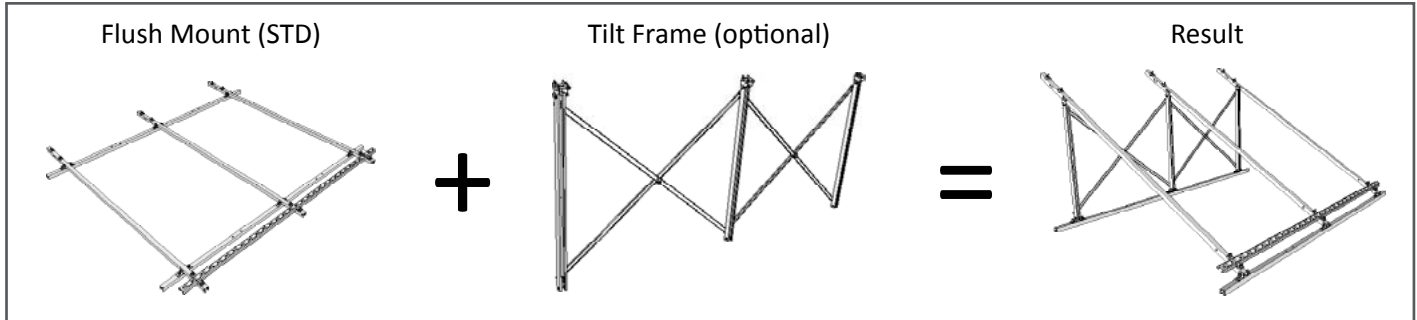


Figure 30. Region A Frame Ordering Examples

7.4.2 Region B

If an Thermann system is ordered in region B, (e.g. TE-250-GL-BOT-22) the system will come with a flush mount frame as standard. If a tilt frame is required, the appropriate region B tilt frame (e.g. THLT-22-AB) must be ordered.

Care must be taken when ordering tilt frames as some are rated to regions A and B (e.g. THLT-22-AB), while others are rated to B and C (e.g. THLT-30-BC). The Tilt mount frames rated to region B and C require extra components to withstand higher winds. Any extra components required are supplied within the Tilt frame (see Scenario 2).

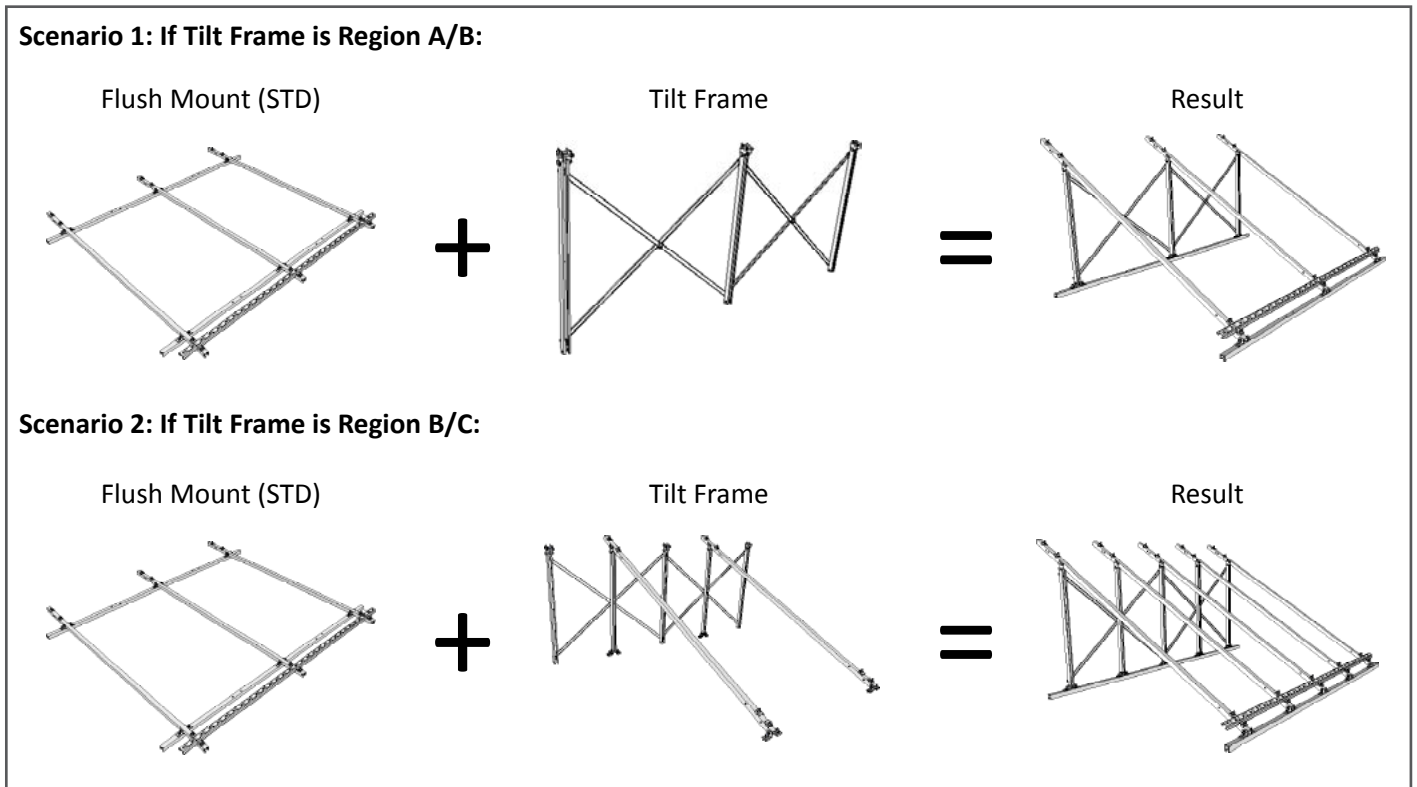


Figure 31. Region B Frame Ordering Examples

7.4.3 Region C

Region C is a Cyclonic wind region. If a Thermann system is ordered in region C, (e.g. TE-315-GL-BOT-30) the system will come with a flush mount frame as standard. Previously for a 30 tube system in region C, an add-on kit was required. As of 1st July 2013, this is no longer the case.

Due to the cyclonic wind conditions of region C, the only tilt frames that can be installed are the Low Angle Tilt Frames (e.g. THLT-30-BC).

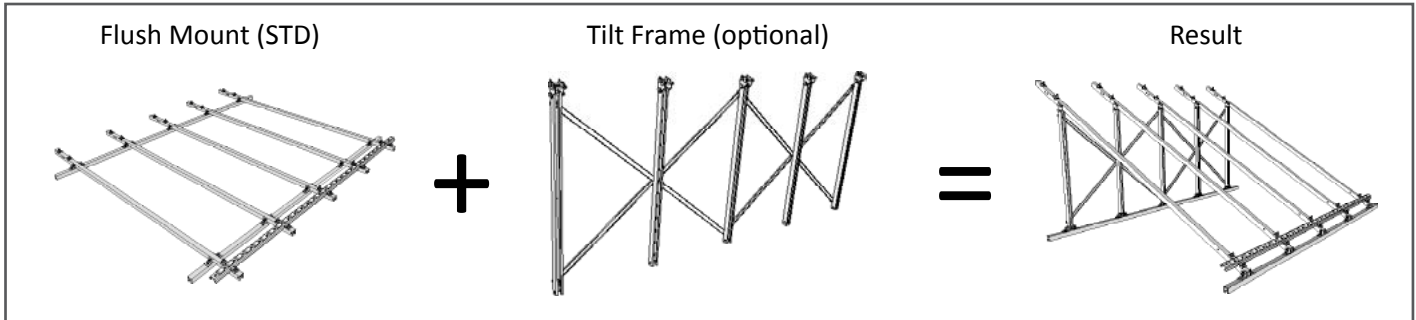


Figure 32. Region C Frame Ordering Examples

7.4.4 Region D

Region D is a Cyclonic wind region. Thermann systems must only be installed with a flush mount frame. (THFR-30-D)

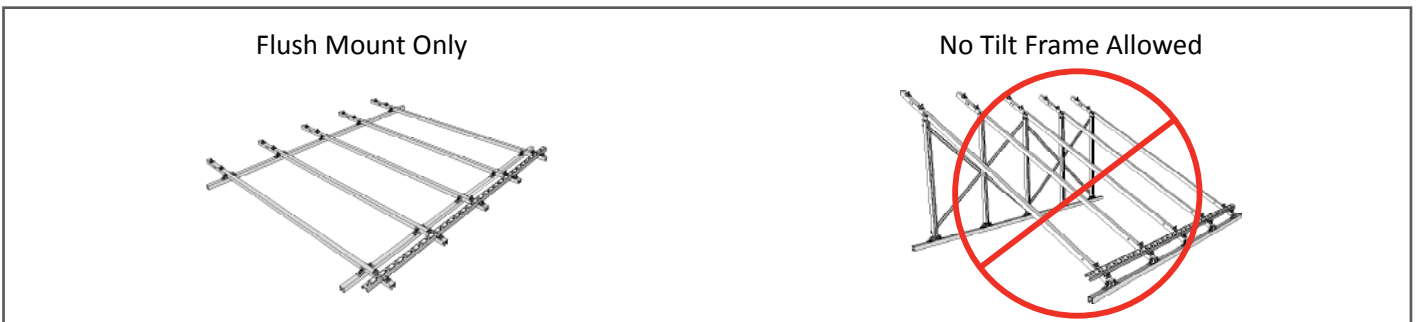


Figure 33. Region D Frame Ordering Example



IMPORTANT

45° (High Angle) Frames are **NOT suitable** for installation in **wind region C**.



IMPORTANT

No Tilt Frames can be installed in wind region D.
Only flush mount frames available.



7.5 Mounting Frame Components

Table 9. Mounting Frame Components

* Three roof straps per front track
 ** There is one roof pad for every railing required.

Type	Product Code	Description	Region	
			A/B/C	D
Bottom Tracks	APBT-30	TH-30 Bottom Track	Flush Mount Frame	A/B/C
	APBT-22	TH-22 Bottom Track		D
	APBT-30	TH-30 Bottom Track		A/B/C
	APBT-30	TH-30 Bottom Track		D
	APBT-30	TH-30 Bottom Track		A/B/C
	APBT-30	TH-30 Bottom Track		D
Rear Legs (30 deg)	APRL-30	TH-30 Rear Leg	Low Tilt (30 deg) Frame	A/B/C
	APRL-22	TH-22 Rear Leg		A/B
	APRL-30	TH-30 Rear Leg		C
	APRL-30	TH-30 Rear Leg		A
Rear Legs (45 deg)	APRL-45	TH-45 Rear Leg	High Tilt (45 deg) Frame	B/C
	APRL-22	TH-22 Rear Leg		A/B
	APRL-30	TH-30 Rear Leg		A
	APRL-30	TH-30 Rear Leg		B
X-Race Pads	APXP-30	TH-30 X-Race Pad	High Tilt (45 deg) Frame	A/B
	APXP-22	TH-22 X-Race Pad		A/B
	APXP-30	TH-30 X-Race Pad		A
	APXP-30	TH-30 X-Race Pad		B
Track	APT	Track	High Tilt (45 deg) Frame	A/B
	APT-30	TH-30 Track		A/B
	APT-22	TH-22 Track		A
	APT-30	TH-30 Track		B
Roof Pad	APRP-30	TH-30 Roof Pad	High Tilt (45 deg) Frame	A/B
	APRP-22	TH-22 Roof Pad		A/B
	APRP-30	TH-30 Roof Pad		A
	APRP-30	TH-30 Roof Pad		B
L-Bracket Pad	APLB-4	L-Bracket Pad	High Tilt (45 deg) Frame	A/B
	APLB-4	L-Bracket Pad		A/B
	APLB-4	L-Bracket Pad		A
	APLB-4	L-Bracket Pad		B
Roof Strap	APRS	Roof Strap	High Tilt (45 deg) Frame	A/B
	APRS	Roof Strap		A/B
	APRS	Roof Strap		A
	APRS	Roof Strap		B
Roof Pad	APRP	Roof Pad	High Tilt (45 deg) Frame	A/B
	APRP	Roof Pad		A/B
	APRP	Roof Pad		A
	APRP	Roof Pad		B
Quantity			Total	
1			17	17
1			19	19
1			24	24
1			29	29
1			39	39
1			29	29
1			7	7
1			16	16
1			37	37
1			8	8
1			26	26
1			7	7
1			16	16
1			8	8
1			26	26



7.6 Mounting Frame Configurations
7.6.1 Flush Mount 3 Tracks

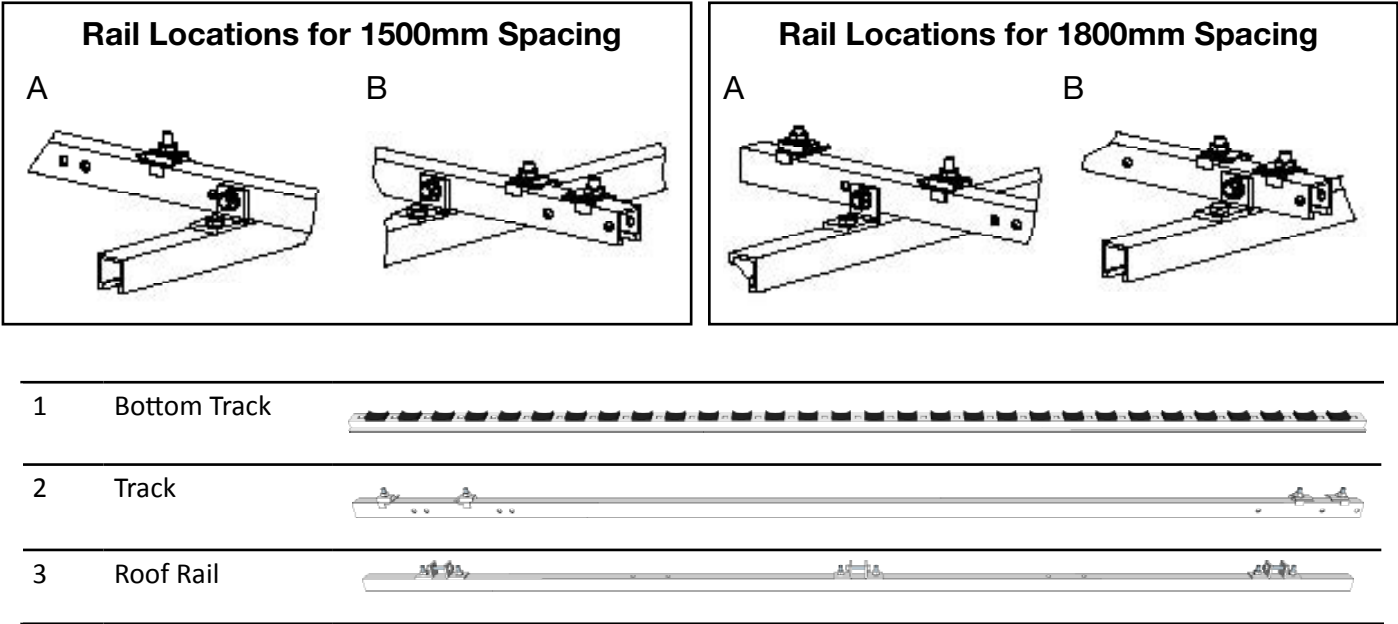
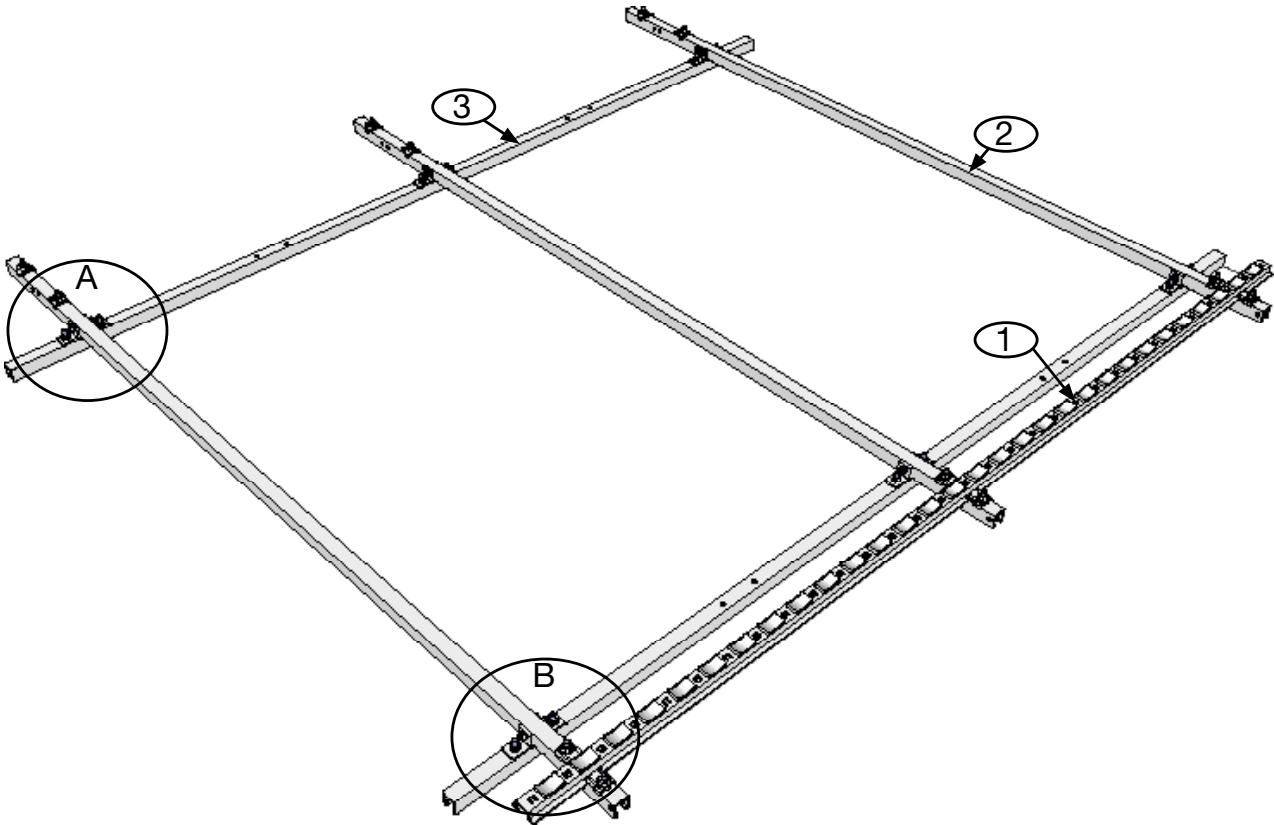
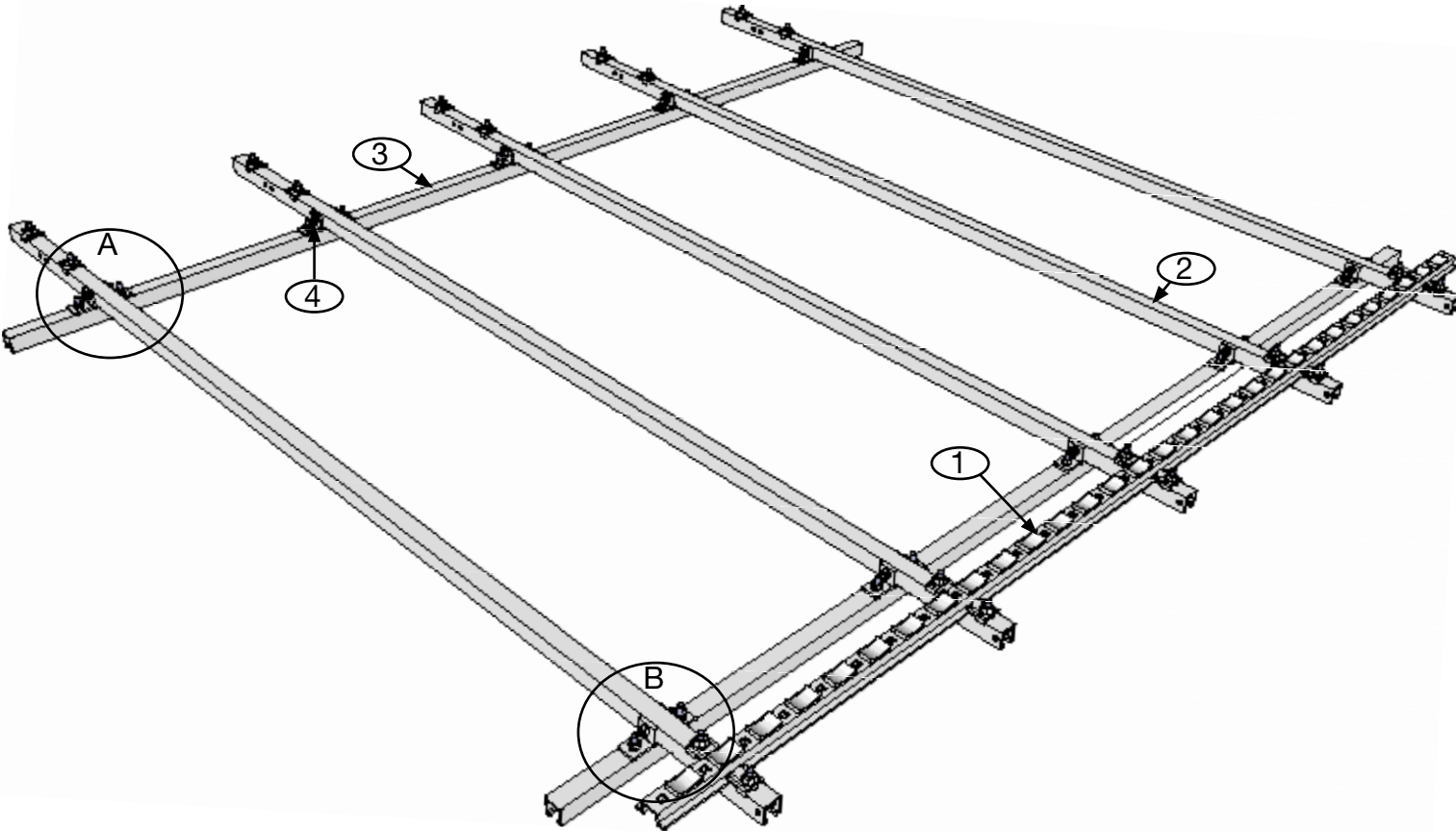


Figure 34. Flush Mount 3 Tracks



7.6.2 Flush Mount 5 Tracks



Rail Locations for 1500mm Spacing

A

B

Rail Locations for 1800mm Spacing

A

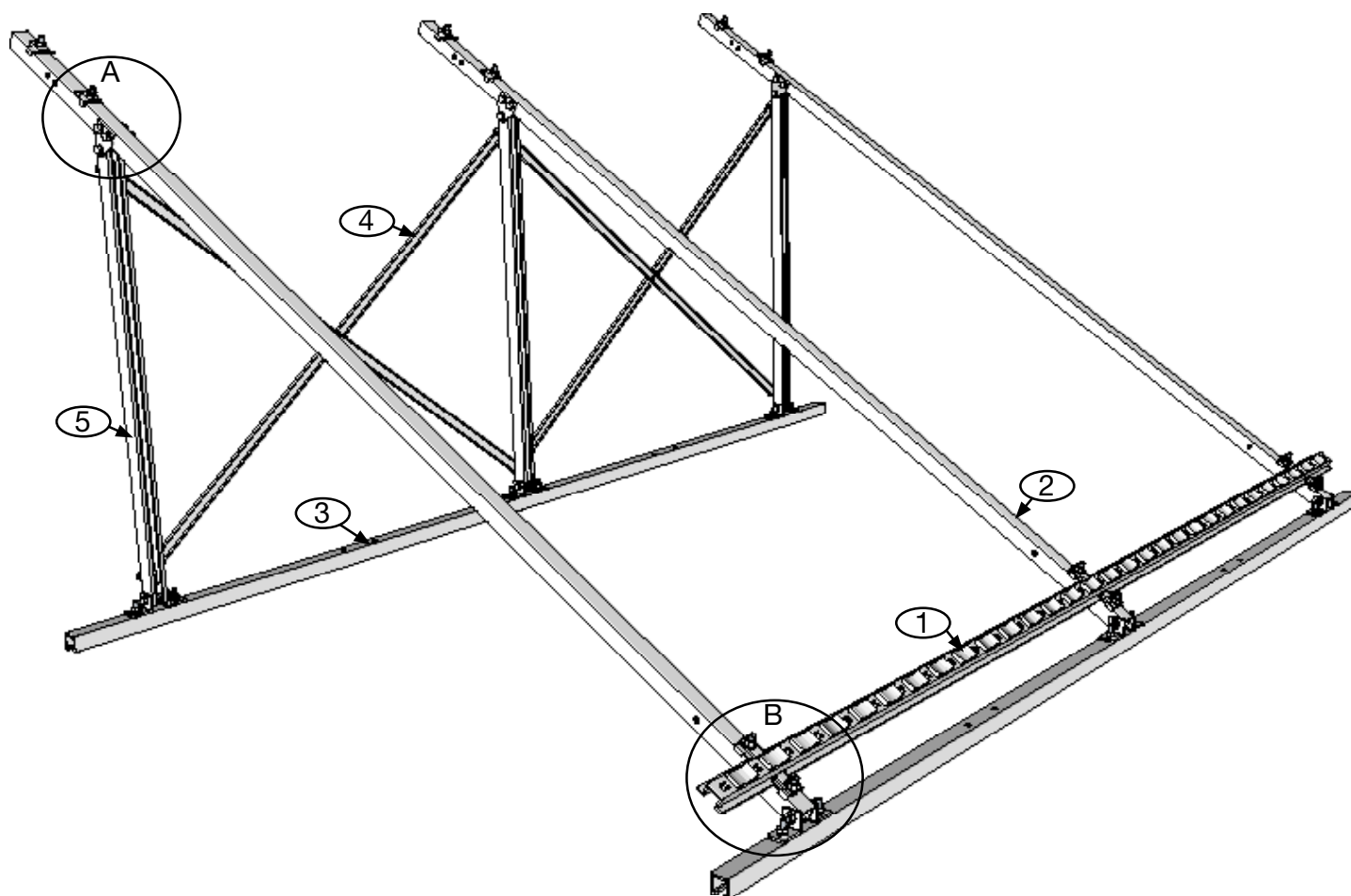
B

1	Bottom Track	
2	Track	
3	Roof Rail	
4	L-Bracket Pack	

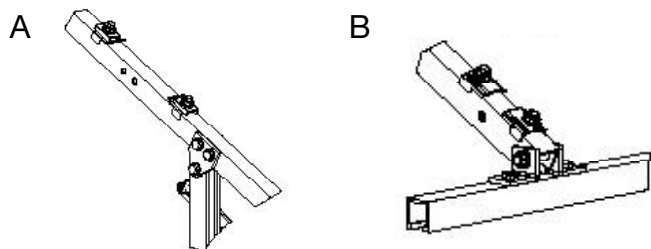
Figure 35. Flush Mount 5 Tracks



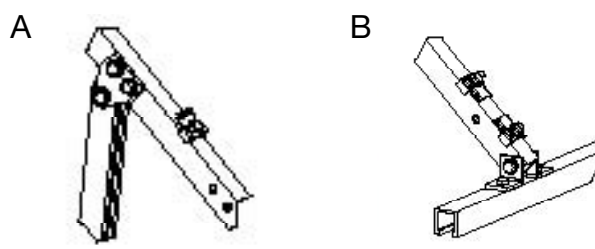
7.6.3 Tilt Mount 3 Tracks



Track Attachments for 30 Degree Frame



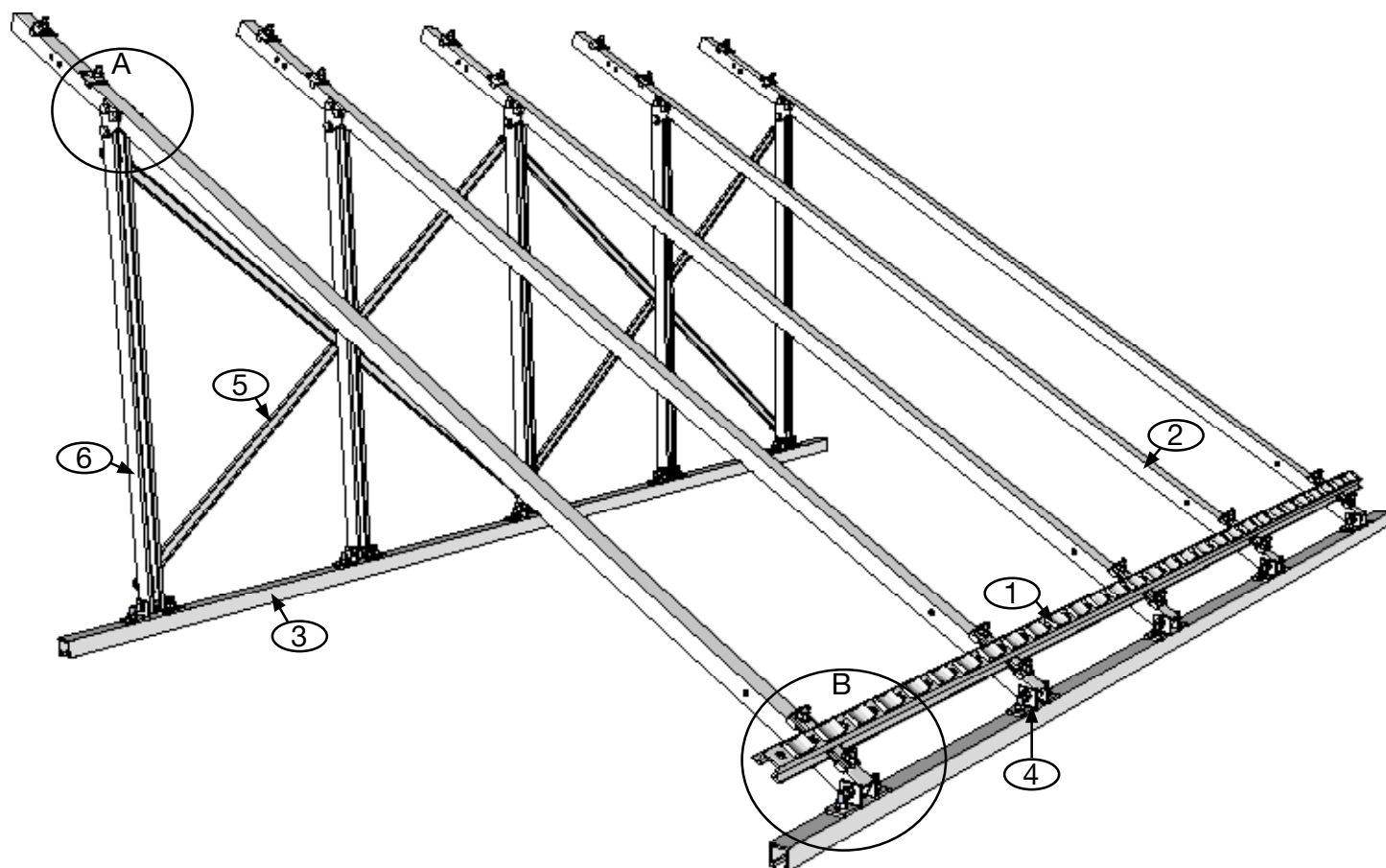
Track Attachments for 45 Degree Frame



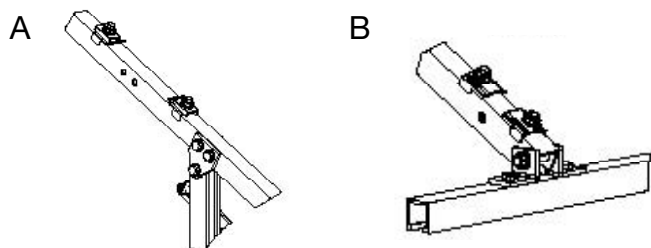
1	Bottom Track	
2	Track	
3	Roof Rail	
4	X-Brace Pack	
5	Rear Leg	

Figure 36. Tilt Mount 3 Tracks

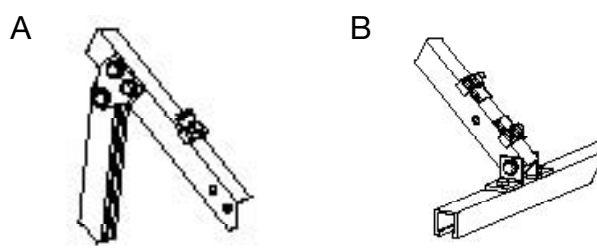
7.6.4 Tilt Mount 5 Tracks



Track Attachments for 30 Degree Frame



Track Attachments for 45 Degree Frame



1 Bottom Track



2 Track



3 Roof Rail



4 L-Bracket Pack



5 X-Brace Pack



6 Rear Leg



Figure 37. Tilt Mount 5 Tracks



7.7 Thermann Component Information

7.7.1 Electric Storage Tank Dimensions

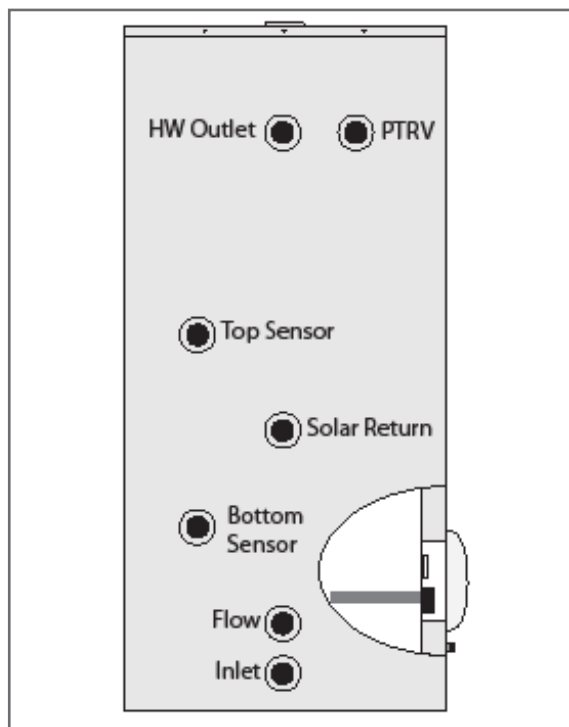


Figure 38. Electric tank layout

7.7.2 Gas Tank Dimensions

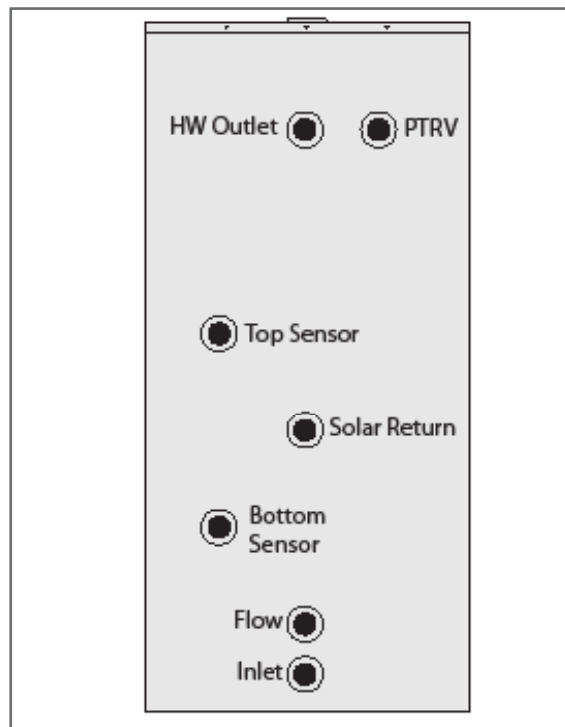


Figure 39. Gas tank layout

Table 10. Electric tank dimensions

Measure-ments (mm)	160L BOT	250L BOT	250L MID	315L BOT	315L MID	400L BOT	400L MID
Diameter	540	648	648	648	648	731	731
Height	1494	1388	1388	1682	1682	1721	1721
HW outlet	1292	1167	1167	1470	1470	1474	1474
PTRV port	1292	1167	1167	1470	1470	1474	1474
Top sensor	1048	759	759	841	841	841	841
Solar return	804	564	432	564	509	564	564
Bottom sensor	489	369	303	369	342	369	369
Solar Flow	174	174	174	174	174	174	174
Cold Water Inlet	74	74	74	74	74	74	74
Element Height	226	170	454	170	553	190	691
Dry Weight (kg)	61	86	86	98	98	130	130

Table 11. Gas tank dimensions

Measure-ments (mm)	160L GAS	250L GAS	315L GAS	400L GAS
Diameter	540	648	648	731
Height	1502	1389	1682	1721
HW outlet	1300	1167	1470	1464
PTRV port	1300	1167	1470	1464
Top sensor	1056	953	1196	1207
Solar return	812	740	922	950
Bottom sensor	497	457	548	562
Solar Flow	182	174	174	174
Cold Water Inlet	82	74	74	74
Element Height	n/a	n/a	n/a	n/a
Dry Weight (kg)	61	86	98	130



7.7.3 Thermann Pump Station Dimensions

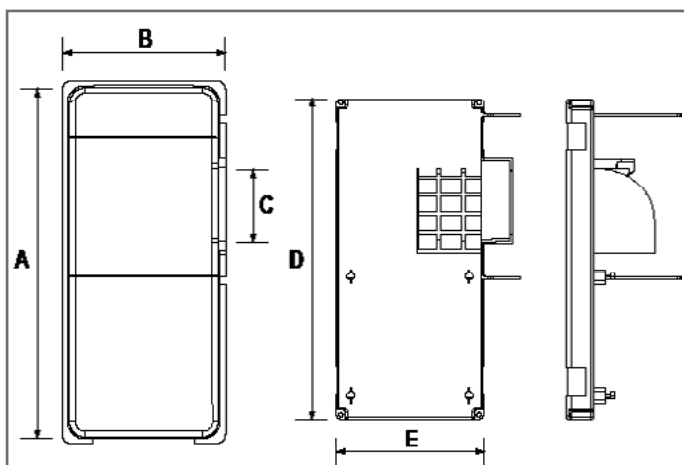


Figure 40. Pump station cover layout

Table 12. Pump station dimensions

Measurements	Label	mm
Lid Height	A	398
Lid Width	B	178
Lid	C	96
Base Plate Height	D	350
Base Plate Width	E	160

7.7.4 Gas Booster Dimensions

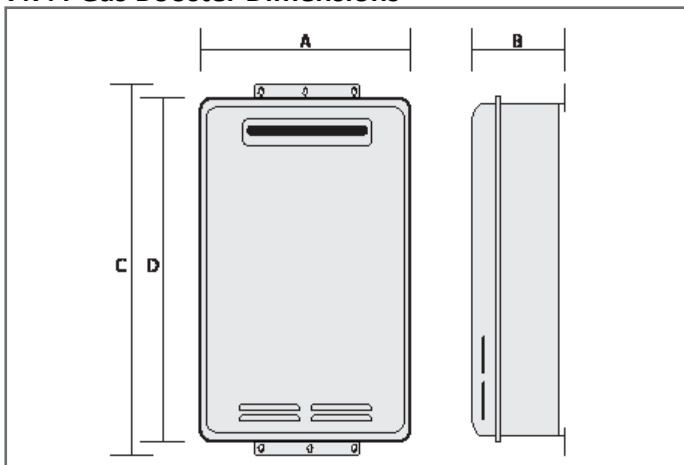


Figure 41. Gas booster layout

Table 13. Gas booster dimensions

Measurements (mm)	Label	26lpm
Width	A	350
Depth	B	194
Height	C	623
Height inc. Brackets	D	575

7.7.5 Collector Technical Specifications:

Technical data on Thermann solar collector construction, performance and physical specifications.

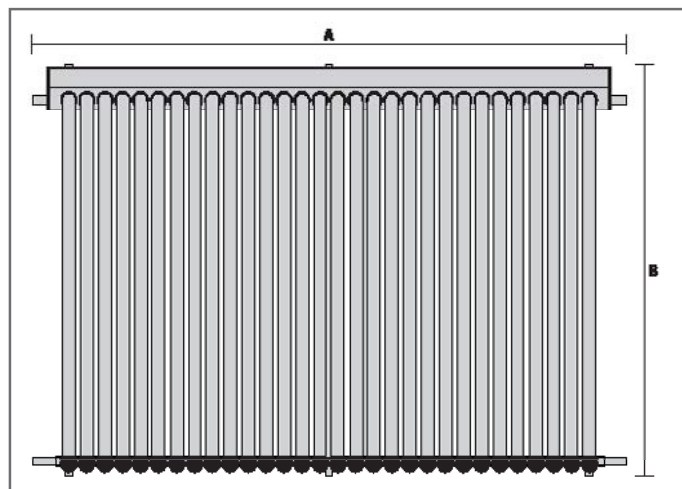


Figure 42. Collector layout

Table 14. Collector dimensions

Measurements			Dry Weight	
Collector	Width (A)	Length (B)	WO/Tubes	W/Tubes
10 Tubes	945 mm	2025 mm	11 kg	41 kg
22 Tubes	1636 mm	2025 mm	20 kg	85 kg
30 Tubes	2240 mm	2025 mm	24 kg	112 kg

Dry weights based on 3 track flush mount frame.

Table 15. Apricus TH-10 Collector Specifications

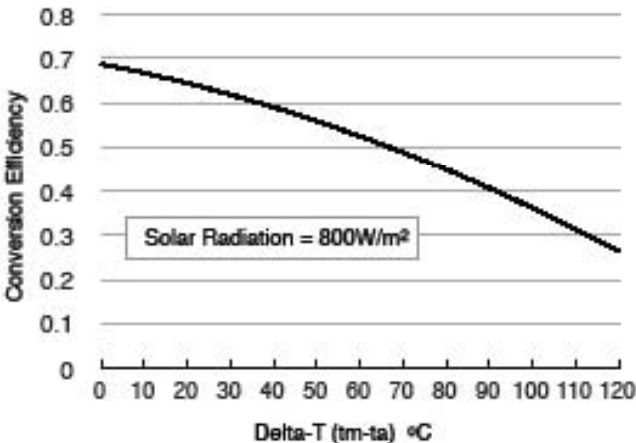
Collector Model: TH-10	
	
Materials of Construction	
Evacuated tubes:	1.8mm Borosilicate 3.3 glass
Absorber:	Al-N on Al on glass
Heat pipes:	High purity copper
Heat transfer fins:	Aluminium
Rubber components:	HTV Silicone rubber
Stainless mounting frame:	439 Stainless steel
Aluminium mounting frame:	6005-T5 Anodised AL
Manifold casing:	5005-H16 Anodised AL
Performance Data:	
Ideal flow rate:	<1 L/min
Max flow rate:	15 L/min
Peak power output:	648 W *
Eta0:	0.687 *
a1 (W/m²K):	1.505 *
a2 (W/m²K):	0.0111 *
*Data from ITW report 09COL805. Calculated at midday.	
Physical Specifications	
Aperture area:	0.94m²
Gross area:	1.57m²
Gross dry weight:	34.8kg
Fluid capacity:	500ml
Max pressure:	800kPa
Stagnation temperature:	220°C
TH-10 Collector Performance	
	

Table 16. Thermann TH-22 Collector Specifications

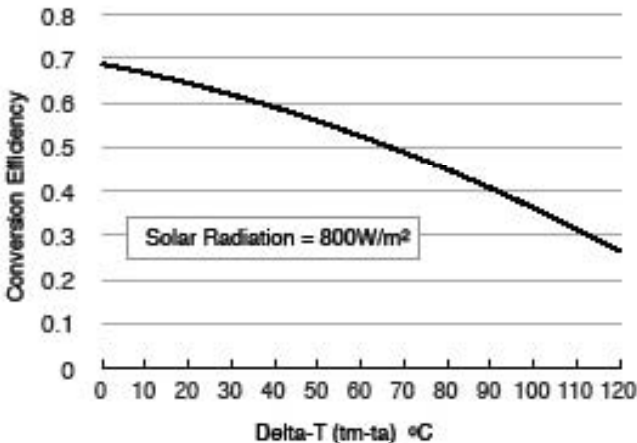
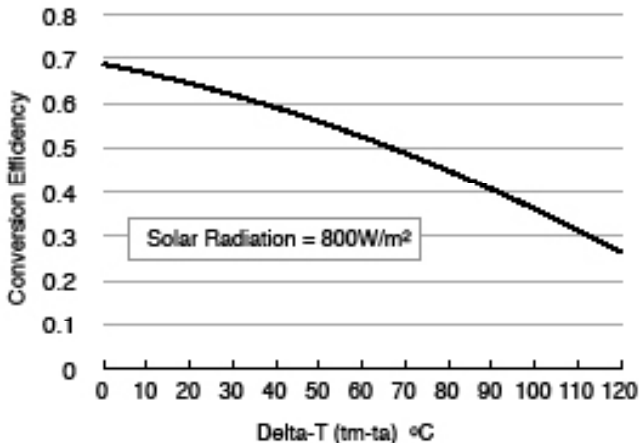
Collector Model: TH-22	
	
Materials of Construction	
Evacuated tubes:	1.8mm Borosilicate 3.3 glass
Absorber:	Al-N on Al on glass
Heat pipes:	High purity copper
Heat transfer fins:	Aluminium
Rubber components:	HTV Silicone rubber
Stainless mounting frame:	439 Stainless steel
Aluminium mounting frame:	6005-T5 Anodised AL
Manifold casing:	5005-H16 Anodised AL
Performance Data:	
Ideal flow rate:	<1.5 L/min
Max flow rate:	15 L/min
Peak power output:	1422 W *
Eta0:	0.687 *
a1 (W/m²K):	1.505 *
a2 (W/m²K):	0.0111 *
* Data from ITW report 09COL805. Calculated at midday	
Physical Specifications	
Aperture area:	2.07m²
Gross area:	3.28m²
Gross dry weight:	85kg
Fluid capacity:	550ml
Max pressure:	800kPa
Stagnation temperature:	220°C
TH-22 Collector Performance	
	



Table 17. Thermann TH-30 Collector Specifications

Collector Model: TH-30 	
Materials of Construction	
Evacuated tubes:	1.8mm Borosilicate 3.3 glass
Absorber:	Al-N on Al on glass
Heat pipes:	High purity copper
Heat transfer fins:	Aluminium
Rubber components:	HTV Silicone rubber
Stainless mounting frame:	439 Stainless steel
Aluminium mounting frame:	6005-T5 Anodised AL
Manifold casing:	5005-H16 Anodised AL
Performance Data:	
Ideal flow rate:	2 L/min
Max flow rate:	15 L/min
Peak power output:	1944 W *
Eta0:	0.687 *
a1 (W/m ² K):	1.505 *
a2 (W/m ² K):	0.0111 *
* Data from ITW report 09COL805. Calculated at midday	
Physical Specifications	
Aperture area:	2.83m ²
Gross area:	4.4m ²
Gross dry weight:	112kg
Fluid capacity:	710ml
Max pressure:	800kPa
Stagnation temperature:	220°C
TH-30 Collector Performance	
	



7.8 Thermann Warranty Policy

1. For all warranty issues please Call 1800 032 566 or visit www.reece.com.au for your nearest Reece store.
2. This Warranty is effective for all Thermann Solar Hot Water Heating Systems manufactured and installed after 1st July 2013.
3. If the Customer has not paid in full for the Thermann Solar Hot Water Heating System then this Warranty does not apply.
4. The Thermann Solar Hot Water Heating System and its components are covered by a warranty against defective factory parts or workmanship from the date the Thermann Solar Hot Water Heating System is installed for the relevant period for such component as outlined in Table 17 - Warranty periods. If the date of installation is unknown, the Warranty commences one (1) month after the date of manufacture.

Table 18. Warranty periods

Component	Warranty Period (Parts Only)	Warranty Period (Parts & Labour)
Manifold and Mounting Frame	15 years	1 year
Evacuated Tubes and Heat Pipes	15 years	1 year
Thermann Controller and sensor leads	1 year	1 year
Circulation Pump	2 years	1 year
Thermann Glass Lined Tank (does not include element and thermostat)	10 years on cylinder	1 year
Tank Thermostat & Element	1 year	1 year
Thermann Gas Booster	10 years on heat exchanger 3 years on all other components	3 years

5. This Warranty is for normal domestic use of the Thermann Solar Hot Water Heating System only.
6. To the extent a claim falls under the 'Parts Only' Warranty Period the Warranty covers the repair and/or replacement of such failed component in the Thermann Solar Hot Water Heating System free of charge. However, the transport, installation and labour costs of repairing the component or delivering the replacement component and removing and replacing the existing component will be the responsibility of the Customer of the existing Thermann Solar Hot Water

Heating System.

7. To the extent a claim falls under the 'Parts and Labour' Warranty Period, the Warranty covers the repair and/or replacement of such failed component in the Thermann Solar Hot Water Heating System and any associated labour costs free of charge.
8. The decision to repair or replace the component the subject of the Warranty will be entirely at the discretion of Thermann.
9. Where an Thermann Solar Hot Water Heating System or a component thereto is repaired or replaced by Thermann, the balance of any original Warranty Period will remain effective. The repaired or replaced part does not carry any additional warranty period.
10. The Thermann Solar Hot Water Heating System must be installed in accordance with Thermann's installation instructions, and all relevant local, state and national statutory requirements, including but not limited to, AS3500.4 & 5, AS5601, AS3000 and AS2712.
11. Installation must be completed by registered plumbers, gas fitters and electricians that are licensed in the State or Territory in which the installation is completed.
12. The electrical system components must be installed in a domestic application and connected to a 240V power supply by a qualified electrician in accordance with AS3000.
13. Thermann reserves the right to alter the design, components or construction to its Thermann Solar Hot Water Heating System. Such alterations shall not constitute a defect in design or construction under this Warranty.
14. Any claim under this Warranty must include full details of the defect and/or damage to the Thermann Solar Hot Water Heating System. All claims must be made within one (1) month of the detection of the defect.
15. Dated proof of purchase is required prior to commencement of any work under this Warranty.
16. This Warranty does not apply to any defects or damage NOT due to faulty factory parts or workmanship including, but not limited to, defects or damage caused by or resulting from:
 - (a) accidental damage, storm damage, vandalism, failure due to misuse or abuse, or neglect of any kind;
 - (b) incorrect or improper installation of the Thermann Solar Hot Water Heating System, including but not limited to, installation otherwise than in accordance with the instructions contained in the owner's manual supplied by Thermann or incorrect system selection;
 - (c) alteration or repair of the Thermann Solar Hot Water Heating System other than by a licensed plumber or by an approved Thermann agent;
 - (d) attachment of any parts or accessories other than



- those manufactured or approved by Thermann;
- (e) freezing in regions with minimum temperatures below -15oC (in accordance with AS/NZS 2712:2007 freeze level 1);
- (f) the power supply to the Thermann Solar Hot Water Heating System being cut;
- (g) power surges;
- (h) animals, birds and/or rodents;
- (i) the solar collector being left dry (no liquid circulation) and exposed to daily sunlight (i.e. not covered) for a period exceeding 14 consecutive days;
- (j) excessive water pressure, negative pressure (partial vacuum), excessive temperature, corrosive atmosphere, faulty plumbing and/or electrical wiring;
- (k) sludge/sediment as a result of connection to a water supply from filtered or treated sources ie. spring, dam, bore, river or town supply from a bore;
- (l) contamination and corrosion from particles in the water supply;
- (m) serial tags/stickers on any of the components being removed or defaced;
- (n) the Thermann Solar Hot Water Heating System being relocated from its original point of installation; and
- (o) the water stored in the cylinder exceeding at any time the following levels:

Total hardness	200 mg/litre or p.p.m
Total dissolved solids	600 mg/litre or p.p.m
Electrical conductivity	850 µS/cm
Chloride	250 mg/litre or p.p.m
Magnesium	10 mg/litre or p.p.m
Sodium	150 mg/litre or p.p.m
pH	Min 6.5 to Max 8.5.

Thermann Solar Hot Water Heating System or any other matter related to the system or its operation.

- 21. The benefits conferred by this Warranty are in addition to all other rights and remedies in respect of the Thermann Solar Hot Water Heating System, which the purchaser has under the Competition and Consumer Act 2010 and consumer protection legislation of the States and Territories. Nothing in this Warranty has the effect of excluding, restricting or modifying those rights.
- 22. Goods presented for repair may be replaced by refurbished goods of same type rather than being repaired. Refurbished parts may be used to repair/replace the goods.
- 23. Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.

- 18. Thermann does not warrant any work conducted by the installer of the Thermann Solar Hot Water Heating System.
- 19. This Warranty only applies to the Thermann Solar Hot Water Heating System and its components and does not cover any plumbing or electrical associated parts, including but not limited to any parts supplied by any person installing the Thermann Solar Hot Water Heating System.
- 20. To the extent permitted by law, Thermann shall not be liable under this Warranty for any consequential loss or damage or any incidental expenses resulting from any breach of this warranty, including but not limited to, claims for damage to buildings, roofs, ceilings, walls, foundations, gardens, personal belonging or household effects, fixtures and fittings. or any other consequential loss, damage or inconvenience, either directly or indirectly due to leakage from the



Reece. Works for you.™

Call 1800 032 586 or visit www.reece.com.au for your nearest Reece store.
TH-Technical-Manual-V1.3

THERMANN

