# SOLAR ENERGY

IES

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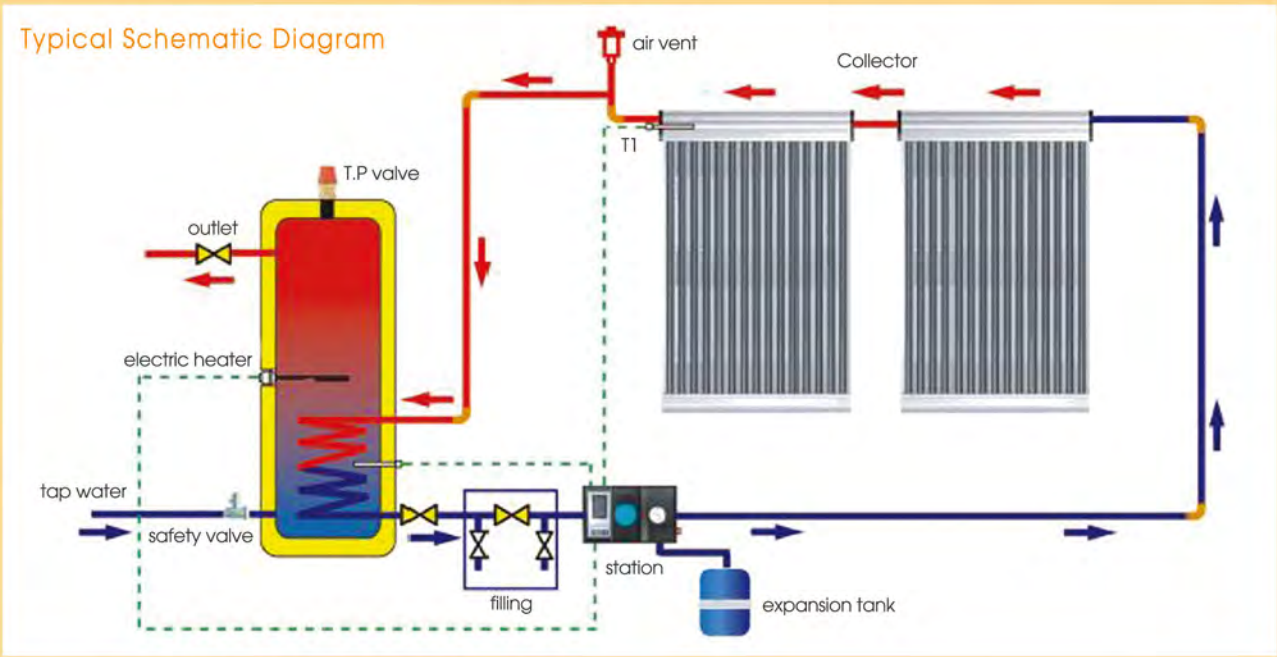
Solar energy is a renewable energy which can be used for generating electricity as well as for heating purpose. Recently, solar water heating technology has become one of the popular element for modern hot water system. With the latest development, solar water heating technology can be used for both pre-heat and booster heat for hot water supply, which can reduce the proportion of traditional heating and save energy.

# TYPE OF IES SOLAR COLLECTORS

(all complied with EN12975 standard)

| | |
|---|---|
| U type Vacuum tube - | FKA - VU series |
| Heat Pipe Vacuum tube - | FKA - VP series |
| High efficiency Vacuum tube - | FKV - VP100 series |
| Water heater with Heat Pipe - | FKA - 47/1500-20C |
| Flat Plate - | FKA – F series |

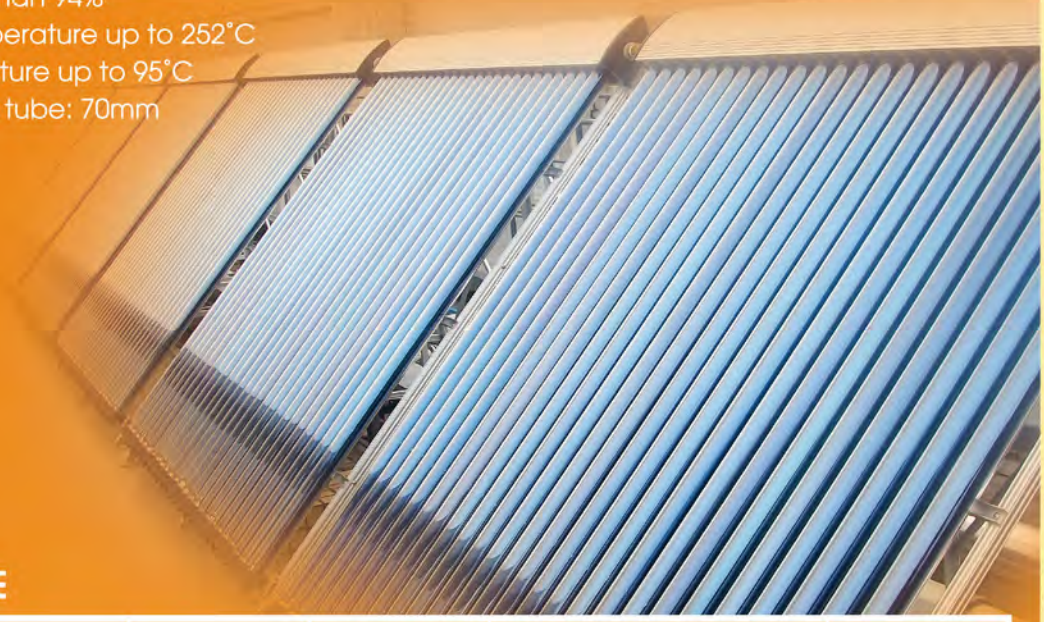
Typical Schematic Diagram



# SOLAR COLLECTOR (VACUUM TUBE - U TUBE) FKA - VU SERIES

## CHARACTERISTICS

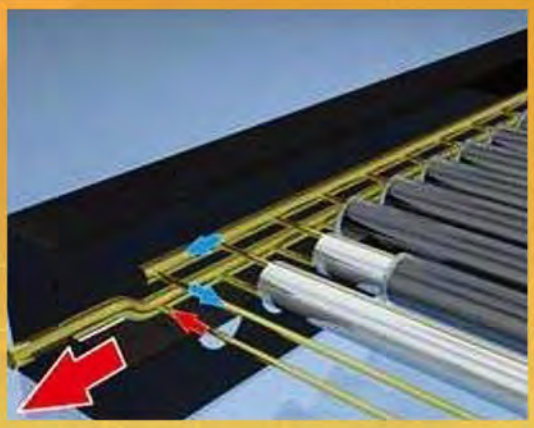
- Can operate even if one tube is broken
- Can be connected easily with existing pipeline
- Work well in any installation angle (0-90°)
- Suitable for pressurized water
- Vacuum tube: Diameter 47mm x 1500mm
- Absorption(α): More than 94%
- Max. stagnation temperature up to 252°C
- Max. service temperature up to 95°C
- Distance from tube to tube: 70mm



## PARAMETER TABLE

| Model | Aperture Area ($m^2$) | Volume of the fluid (L) | Vacuum tube Qty. (pcs) | Overall size L x W x H (mm) | Gross wet (kg) |
|---|---|---|---|---|---|
| FKA-VU-10 | 0.90 | 0.90 | 10 | 1642*805*150 | 26.7 |
| FKA-VU-15 | 1.35 | 1.35 | 15 | 1642*1155*150 | 38.3 |
| FKA-VU-20 | 1.80 | 1.80 | 20 | 1642*1505*150 | 50.6 |
| FKA-VU-25 | 2.25 | 2.25 | 25 | 1642*1855*150 | 63.3 |
| FKA-VU-30 | 2.67 | 2.70 | 30 | 1642*2205*150 | 75.0 |

1 Vacuum tube 2 Aluminium fin 3 Hot terminal 4 Cool terminal



# VACUUM TUBE

## Heat Pipe Working Principle

The heat pipe contains a very slight amount of fluid (non-toxic liquid). This fluid is easily to be vaporized under evacuated situation, and then rise to the top of the heat pipe condenser. The fluid will be cooled down in the manifold, liquefies in the condenser and then return to the bottom of the heat pipe. Repeating this process once and once again, and finally the cold water inside the manifold port will be heated up.

# SOLAR COLLECTOR (VACUUM TUBE - HEAT PIPE) FKA - VP SERIES

## CHARACTERISTICS

- Durable heat pipe with thickness of 0.6mm
- Heat pipe made of 100% pure TU1 copper
- Heat transfer area is increased with bigger condenser
- Latest anti-freeze technology with the working temperature below -30°C
- Max. stagnation temperature up to 200°C
- Max. service temperature up to 95°C
- Distance from tube to tube: 78mm
- Flow range recommendation (50-150L/$m^2$h)
- Operating pressure(Pa): 0.6 Mpa

## PARAMETER TABLE

| Specifications | Unit | Content | | | | |
|---|---|---|---|---|---|---|
| Product type | | FKA-VP-10 | FKA-VP-15 | FKA-VP-20 | FKA-VP-25 | FKA-VP-30 |
| Number of vacuum tube | | 10 | 15 | 20 | 25 | 30 |
| Aperture area | $m^2$ | 0.936 | 1.399 | 1.866 | 2.332 | 2.791 |
| Specification of vacuum tube | | Ø58 x 1800 | | | | |
| Absoroption(a) | % | More than 94% | | | | |
| Emission(e) | % | Less than 7% | | | | |
| Length | mm | 2020 | | | | |
| Width | mm | 852 | 1242 | 1632 | 2022 | 2412 |
| Height | mm | 155 | | | | |
| Volume of fuild | L | 0.77 | 1.155 | 1.54 | 1.925 | 2.3 |
| Manifol connections | inch | 1 | | | | |
| Test pressure | Mpa | 1 | | | | |
| Operating fluid pressure | Mpa | 0.6 | | | | |
| Max.stagnation temperature | °C | 200 | | | | |
| Max.service temperature | °C | 95 | | | | |
| Insulation thickness | mm | 40 | | | | |
| Distance from tube to tube | mm | 78 | | | | |
| Min.collector degree | degree | 15 | | | | |
| Max.collector degree | degree | 75 | | | | |
| Gross weight | kg | 39.9 | 58.3 | 77.1 | 96.1 | 114.1 |

# SOME ADVANTAGES OF IES VP SERIES

## 1. IMPROVED VACUUM TUBE

IES heat pipes are selectively coated with ALN/SS-ALN/CU. The latest advanced technology in vaccum tube coating which provide absorption coefficient more than 94%, and emissivity coefficient is less than 7%.

## 2. IMPROVED DESIGN OF HEADER PIPE AND HEAT PIPE PORT

IES Solar Collector uses heat pipe with 24mm condenser; heat pipe port with 26.6mm; manifold header pipe with 37mm and thickness with 1.2mm whereas other solar collector manufacturers offer only 0.8 or 1.0mm thickness of heat pipe. Thus, thicker copper pipe allows better welding and eliminate any leakage from the welding points. It can work well in high pressure working condition.

## 3. IMPROVED DESIGN OF HEAT-TRANSFER SHEETS

IES uses a complete sheet with 3mm thickness and 1800mm length for heat pipe whereas other manufacturers use short sheets with 2mm thickness for each heat pipe.

Compare to the sheet of other suppliers, our heat-transfer sheet can attach heat pipe much closer, so it can transfer more energy than others.

## CONSTRUCTION DETAIL FOR HEAT PIPE COLLECTOR

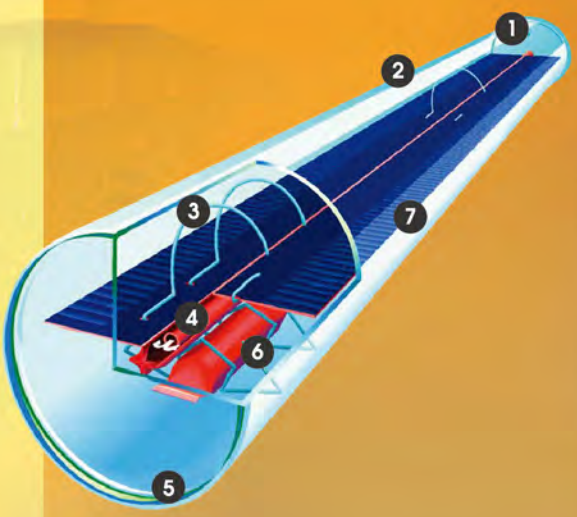
# SOLAR COLLECTOR (VACUUM TUBE - HEAT PIPE) FKA - VP100 SERIES

## CHARACTERISTICS

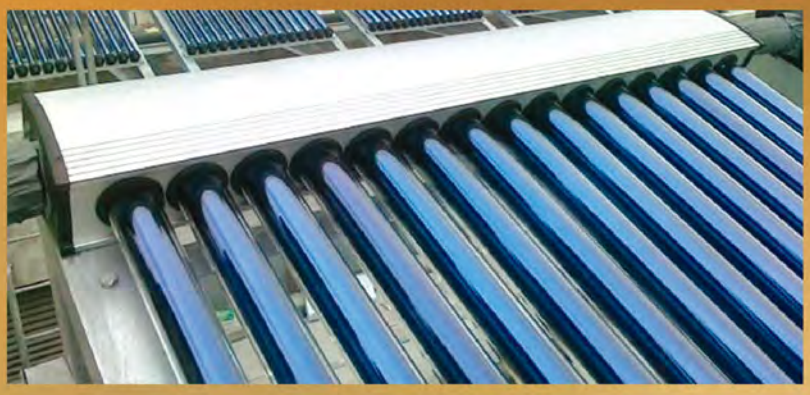
- High efficiency
- Energy saving all year long
- Advanced heat exchanger method
- Diffuse solar radiation can be effectively absorbed even in cloudy days
- Vacuum insulation minimize heat loss, and traps heat even in adverse weather condition
- The heat pipe technology ensures higher heat transfer efficiency and lower emissivity of heat

## PARAMETER TABLE

| Specifications | Unit | Content | | | |
|---|---|---|---|---|---|
| Product type | | FKA-VP100-8 | FKA-VP100-10 | FKA-VP100-12 | FKA-VP100-16 |
| Number of vacuum tube | | 8 | 10 | 12 | 16 |
| Aperture area | $m^2$ | 1.46 | 1.83 | 2.19 | 2.92 |
| Specification of vacuum tube | | Ø 102 * 2000 | | | |
| Absorption (a) | % | More than 93% | | | |
| Emission(e) | % | Less than 8% | | | |
| Length | mm | 2205 | | | |
| Width | mm | 1002 | 1228 | 1468 | 1959 |
| Height | mm | 175 | | | |
| Manifold connections | inch | 3/4 | | | |
| Test pressure | Mpa | 1 | | | |
| Operating fluid pressure | Mpa | 0.6 | | | |
| Max. stagnation temperature | degree | 231°C | | | |
| Max. service temperature | degree | 95°C | | | |
| Insulation thickness | mm | 40 | | | |
| Distance from tube to tube | mm | 120 | | | |
| Min. collector degree | degree | 15 | | | |
| Max. collector degree | degree | 90 | | | |
| Gross weight | kg | 48 | 59 | 70 | 91 |



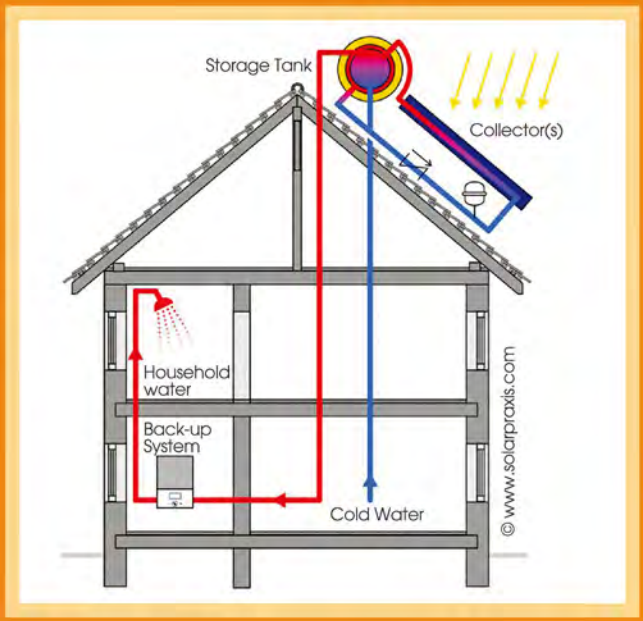

1. Vacuum -tight stainless steel lid
2. Supertransparent glass tube
3. Distance clip
4. Inlet/outlet of heat transfer medium
5. Glass bottom
6. Getter
7. Selektive absorber plate



# WATER HEATER WITH HEAT PIPE
# FKA-47/1500-20C

## PRINCIPLE

The aluminum fin of vacuum tubes absorbs the solar energy, and transfers the heat energy to the heat pipe. The liquid medium in the heat pipe is heated by the solar energy and turns into the gas medium. The gas medium flows up to the top of the heat pipe and transfer the energy to cold water in the tank, at the same time the gas medium turns into the liquid one, and flows down. Water inside the tank is heated up by repeating this process.

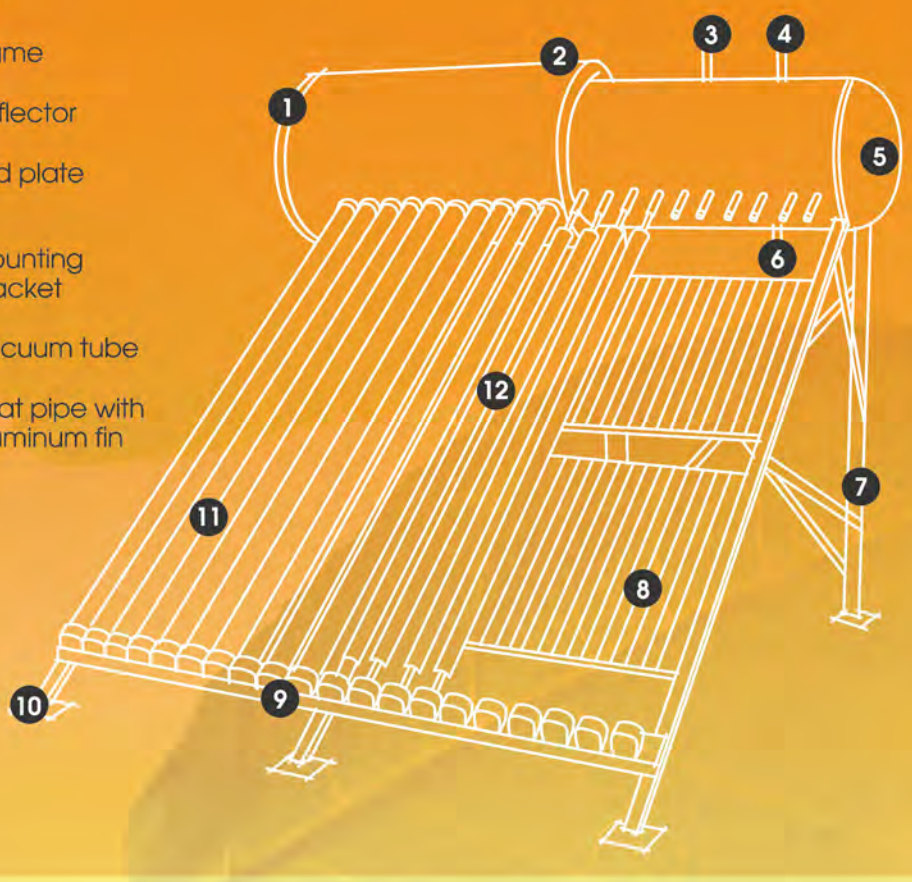



## PARAMETER

- Inner tank material: 1.2mm AISI 316L
- Outer tank material: 0.4mm AISI 304 / painted steel
- Qty. of tube: 20pcs per set
- Area: 1.985 $m^2$; Volume: 165 liters
- Working / Test Pressure: 0.6Mpa / 1.0 Mpa
- Insulation: 50mm
- Gross weight: 65 kg

## DETAIL OF STRUCTURE

1. Outer tank
2. Insulation
3. Temperature pressure relief valve
4. Auomatic air vent
5. Inner tank
6. Inlet pipe
7. Frame
8. Reflector
9. End plate
10. Mounting bracket
11. Vacuum tube
12. heat pipe with aluminum fin



# FLAT PLATE COLLECTOR
# FKA – F SERIES

## CHARACTERISTICS

IES flat plate collector adopt German magnetic sputtering coating absorber, has high absorption rate up to 97% and emission as low as 5%. The Low-iron tempered texture glass cover allows over 92% of full-spectrum light transmission rate. The high efficiency of enhanced model allows more energy saving.

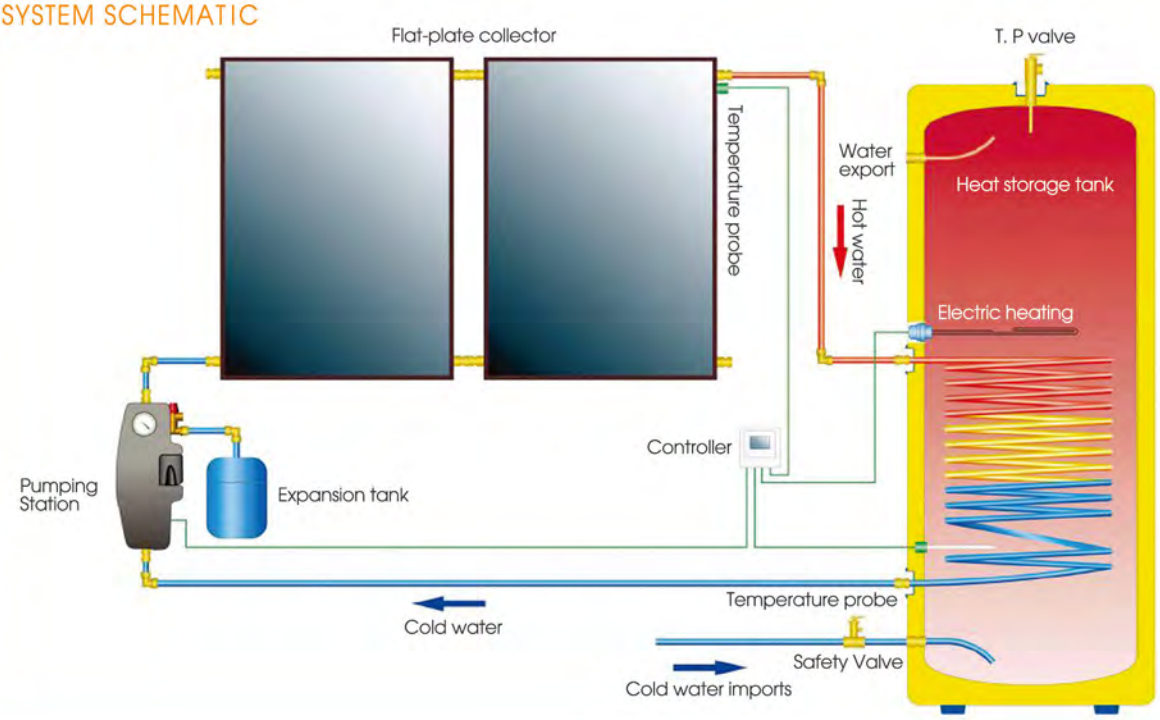
## BENEFITS

- High efficiency design to maximize the heat absorption.
- High purify oxygen-free copper (TP2 cooper) flow channel, good corrosion resistance.
- Biodegradable and recyclable, pollution free until product life period ends.
- Mounting slots and waterproof grooves specially designed for building integration.

## PARAMETER TABLE

| Specifications | Unit | Content | |
|---|---|---|---|
| Model | | FKA-F-1200 | FKA-F-1200.e |
| Overall Size | $m^2$ | 2.01 | 2.0 |
| Aperture area | $m^2$ | 1.86 | 1.9 |
| Overall size | mm | 2005x1003x80 | 2000x1000x95 |
| Weight | Kg | 32 | 35 |
| Housing | | Aluminum Alloy | Aluminum Alloy |
| Absorber | | Aluminum Alloy | Aluminum |
| Coating | | CU/Al, oxide film | Blue Selective Coating |
| Absorption | % | 95 | 95 |
| Emission | % | 8 | 5 |
| Transmittance | % | 88 | 92 |
| Insulation Material | | Glass Wool | Fiber Glass |
| Insulation Thickness | mm | 35 | 50 |
| Sealing | | EPDM | Silicon Glue |
| Max. Operating Pressure | Mpa | 1.0 | 0.8 |
| Test Pressure | Mpa | 1.5 | 1.2 |
| Min. collector angle | degree | 0 | 0 |
| Max. collector angle | degree | 90 | 90 |

SYSTEM SCHEMATIC

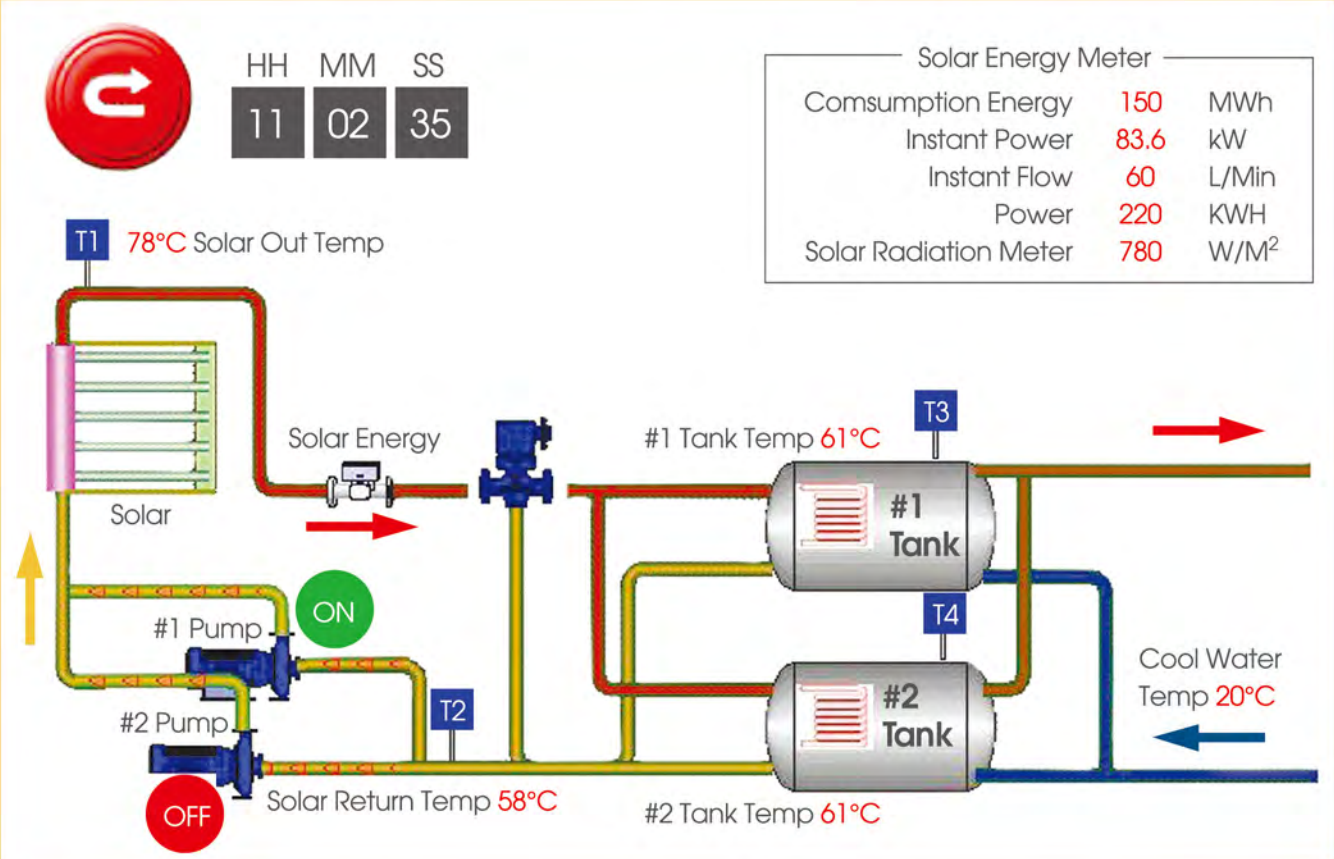


# COMPONENTS

Air Vent
Thermostatic Mixing Valve
Connection Kit
Mounting Kit

Pump Station
Controller
Collector Tube
Thermal Cylinder

Expansion Vessels
Solar Radiation Sensor
Temperature Controller
Data Logging System



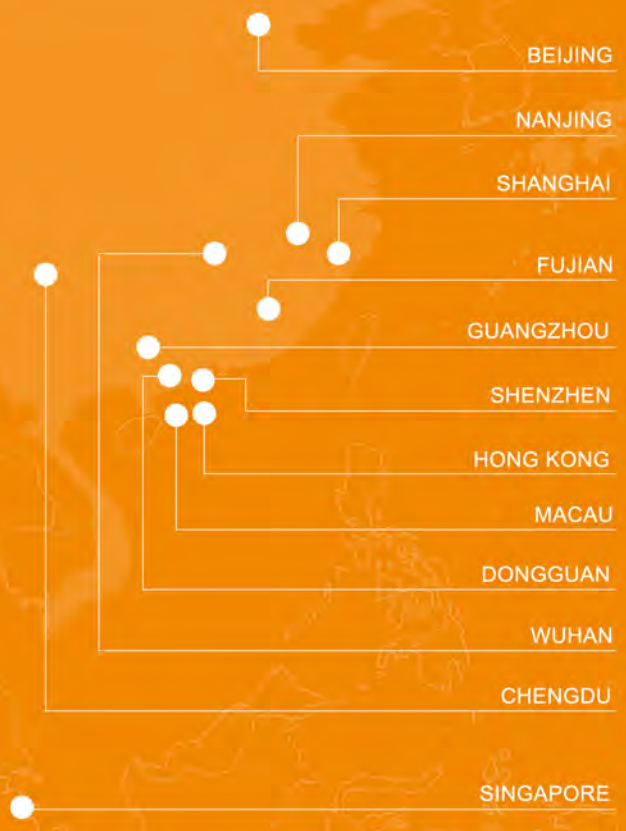
# REFERENCE LIST IN HONG KONG

Kowloon Bay Fire Station
Tin Shui Wai Sports Centre and Community Hall
HSBC Data Centre
Tin Shui Wai Open Space
Tamar Development
Kennedy Town Swimming Pool
Siu Sai Wan Complex
Fanling Sport Centre
Tseung Kwan O District Open Space
Lam Tin North Municipal Service Building
Man Kam To Food Inspection Facilities
Aberdeen Fire Station
Tseung Kwan O Sports Centre and Library
Caritas Medical Centre Phase 2
Hong Kong Science Park Phase 3
Tuen Mun Special School
Hong Kong University – Faculty of Medicine
Hong Kong Sport Institute
Education University of Hong Kong
Student Hostels of Chinese University of Hong Kong
Community College of City University
Baptist University Campus
Singapore International School
Mei Ho House

**Kennedy Town** Swimming Pool

**HSBC Shek Mun** Data Centre

**Hong Kong–Zhuhai–Macau** Bridge





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