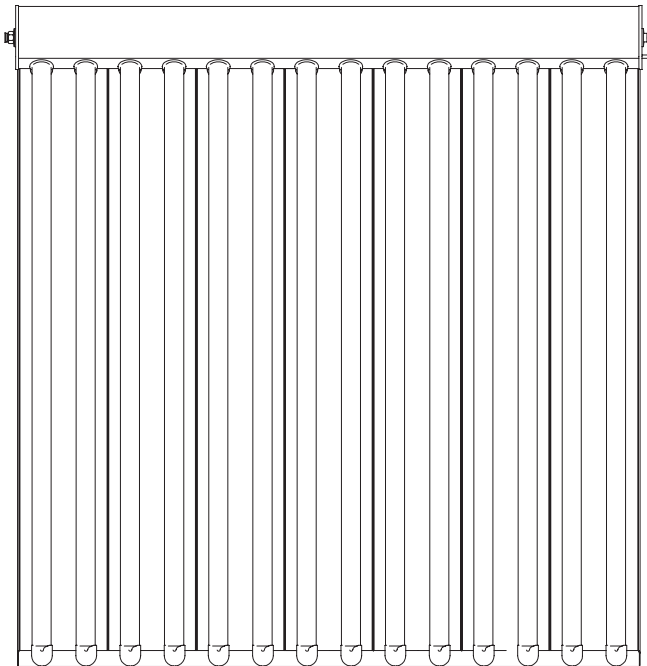


Zenith Evacuated Tube Solar thermal collectors



Installation & Servicing Instructions



**THESE INSTRUCTIONS
TO BE RETAINED
BY USER**



Vokèra is a licensed member of the Benchmark scheme which aims to improve the standards of installation and commissioning of domestic hot water systems in the UK.

CONFORMITY

ETV08 solar collectors conform to EN 12975 standard

RANGE

MODEL	CODE
Kit of 2 collectors ETV08	50-37685-13571-5

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The following symbols are used in this manual:













CAUTION! = Indicates actions that require caution and adequate preparation.



STOP! = Identifies actions that you **MUST NOT** do.

This manual, Code xxxxxxEN - Rev. 0 (04/08) is made up of 16 pages.

GENERAL SAFETY INFORMATION AND PRECAUTIONS

-  As soon as you open the packaging, check immediately that the contents are all present and undamaged. Contact the reseller from whom you purchased the solar collector if you notice any problems.
-  This solar collector must be used only for the proper purpose for which it is designed and made. The manufacturer declines all responsibility, contractual or other, for damage to property or injury to persons or animals caused by improper installation, adjustment, maintenance or use.
-  The solar collector must be serviced every two years.
-  Work near uncovered and live electrical wires, with which it is possible to come into contact, is only permitted under the following conditions:
 - wires must be free from voltage for the entire duration of the work
 - parts remaining live must be covered or accidental contact prevented
 - the following minimum safety distances must be respected:
 - 1 m for voltages of up to 1000 Volts
 - 3 m for voltages from 1000 to 11000 Volts
 - 4 m for voltages from 11000 to 22000 Volts
 - 5 m for voltages from 22000 to 38000 Volts
 - over 5 m if the voltage is not known.Contact with open, live electrical wires may lead to electrocution and may even be fatal.
-  Always wear safety goggles when drilling. Always wear safety shoes, cut-proof protective gloves and a safety helmet when performing installation work.
-  Before beginning installation work on roofs, install the necessary fall prevention and fall arrest devices and ensure that all applicable safety standards are applied. Use only tools and materials that conform to the safety standards that are applicable in the place of work.
-  Only wear overalls that have a safety harness (with a suitable safety or fall-arrest belt, ropes or slings, fall dampers or dissipaters). In the absence of adequate fall prevention and security devices, failure to use a proper safety harness may lead to falls from great heights with serious or even fatal consequences.
-  The use of ladders leaned against walls can lead to serious falls if the ladder slips, slides or falls. When using ladders, always ensure that they are stable, and that suitable ladder stops are present. If possible secure the ladder with hooks. Make sure that there are no live electrical wires near the ladder.
-  Especially when installing the solar collector as part of a domestic hot water system, follow the orientation and angle of the roof to ensure that the collector blends in with the architecture of the building.
-  This instruction manual is an integral part of the solar collector. It must be kept safe and must ALWAYS accompany the solar collector, even if it is sold to another owner or transferred to another user or to another installation. If you lose this manual, order a replacement immediately from your local Technical Assistance Centre.

DESCRIPTION OF THE SOLAR COLLECTOR

The **ETV08** solar collector is made up of 14 double sleeve evacuated glass tubes, each of which contains a "U" shaped copper pipe. These copper pipes are connected in parallel and filled with heat transfer fluid that descends and rises to absorb the heat generated by solar radiation, direct and reflected by a mirror known as a "compound parabolic concentrator". There is a vacuum inside the double sleeved glass tubes. This provides effective thermal insulation (on the same principle as a vacuum flask) and permits the collectors to generate heat from the sun even in bad weather and in the winter. A black, heat absorbent coating is deposited on the inside wall of the tube.

The main characteristics of the **ETV08** collector are as follows:

- Evacuated tube technology for high temperatures and high efficiency even in bad weather.
- Circular absorbers and CPC mirrors for maximum absorption even in oblique light.
- Long working life, with no metal parts passing through the glass tubes to cause loss of vacuum.
- Constant absorption over time, thanks to a selective coating that is well protected inside the vacuum environment.
- Easy replacement of glass tubes without having to empty the solar heating circuit.
- Elegant design.


IDENTIFICATION

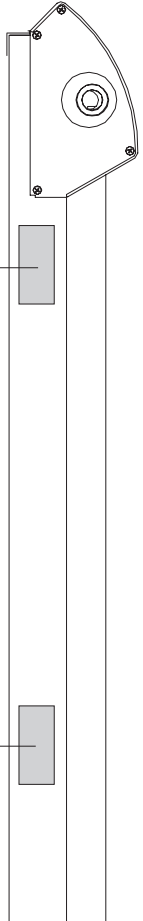
The solar collectors are identified by two plates:


- Data plate
This lists the technical specifications and performance of the product.

Modello:	N° di reg:
Codice:	
Matricola:	
EVACUATED SOLAR COLLECTOR	
Dimensioni: 1560 X 1647 X 107 mm	Max pressione di esercizio: 10 bar
Superficie lorda: 2,57 m ²	Temperatura massima: 270 °C
Superficie di apertura: 2,21 m ²	Liquido termovettore: acqua
Superficie assorbitore: 2,36 m ²	+ glicole propilenico
Peso a vuoto: 42 kg	Contenuto liquido: 2,30 l
USARE SOLO LIQUIDO ANTIGELO PREMISCELATO	
Collegamento in serie fino ad un massimo di 6 collettori	

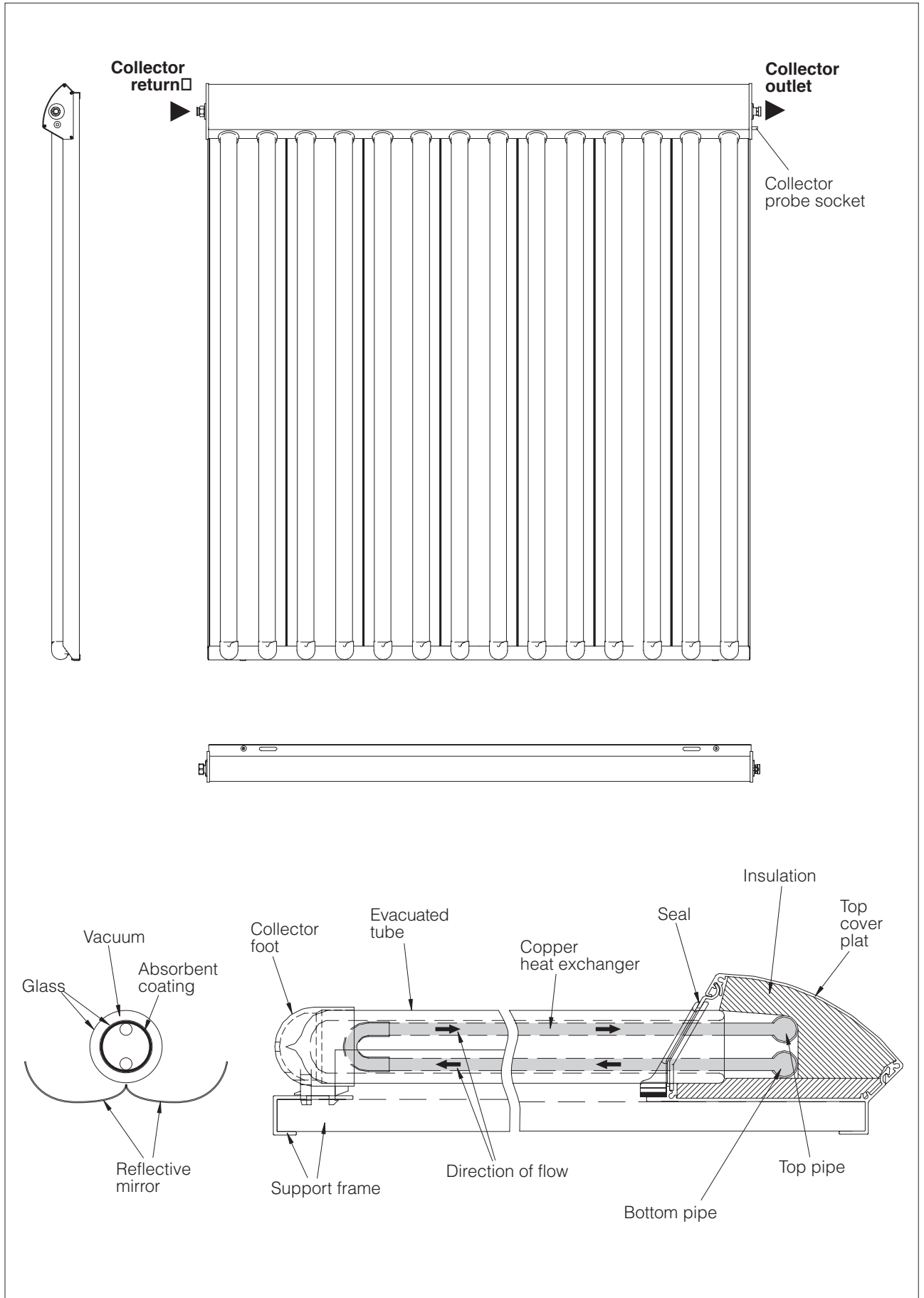
- Serial number plate
This bears the collector's code number, model and serial number.

	
Code	Serial number
Model	



 If these plates or any other means of clearly identifying the product are defaced, removed or lost, proper installation and servicing may be rendered difficult.

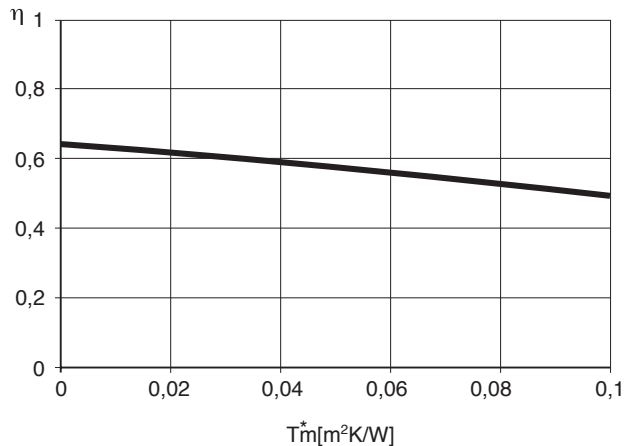
DESIGN



TECHNICAL SPECIFICATIONS

DESCRIPTION		
Total area	2,57	m ²
Exposed area	2,21	m ²
Effective absorption area	2,36	m ²
Connections (M) – (F)	3/4"	
Empty weight	42	kg
Liquid content	2,30	l
Recommended flow rate per m ² of panel	30	l/h
Absorption (α)	~ 0,96 ± 0,01	%
Emissions (ε)	~ 0,06 ± 0,01	%
Maximum permitted pressure	10	bar
Maximum temperature	270	°C
Maximum number of collectors connectable in series	6	n°

Efficiency curve



Optical efficiency of absorber (η ₀)	Thermal dispersion factor of absorber	
	a1 W/(m ² K)	a2 W/(m ² K ²)
0,641	1,059	0,0045

Tested according to EN 12975, referred to water, average flow rate of 161 kg/h, and irradiation G = 800W/m².

$T_m = (\text{Coll.}_{\text{inlet_temp.}} + \text{Coll.}_{\text{outlet_temp.}})/2$

$T^*m = (T_m - \text{ambient_temp})/G$

- ⚠ Minimum recommended slope is 30° (to ensure efficient self-cleaning and minimise snow pressure).
 Installation in locations liable to frequent snow and hail is not recommended.
 Do not install outlet pipe probes that could limit flow, because this could cause overheating.

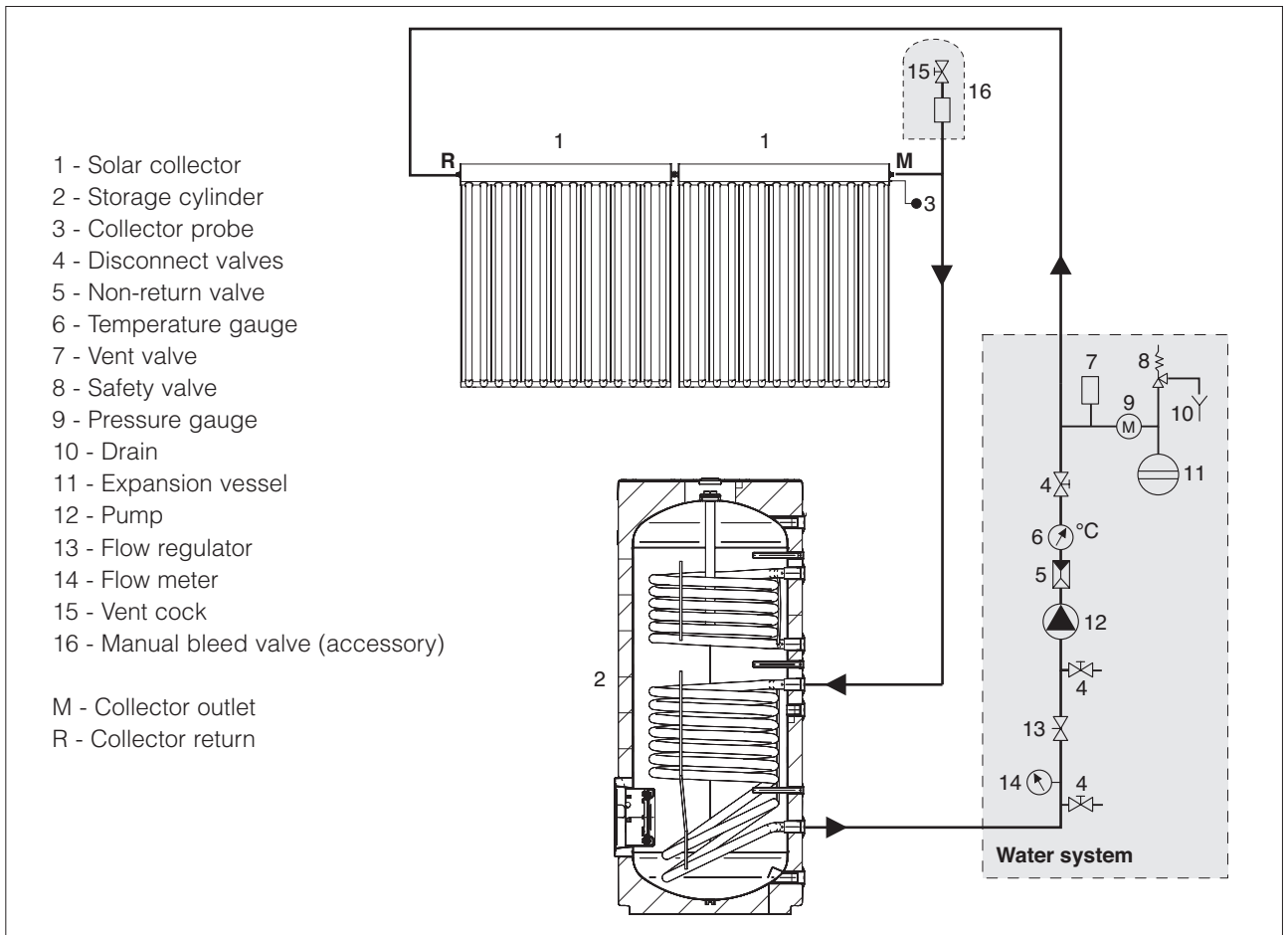
ACCESSORIES

The following accessories are available, to be ordered separately.

ACCESSORY	CODE
kit connection vacuum	1151019
kit support vacuum TP 1C	1151039
kit support vacuum TI 1C	1151049
kit support vacuum TP 2C	1151059
kit support vacuum TI 2C	1151069
Premix glicole for vacuum	1151029
Kit connection additional support	1151079

WATER CIRCUIT

The diagram below illustrates the water connections between solar collectors and a storage cylinder.



⚠ Connect no more than 6 collectors in series.

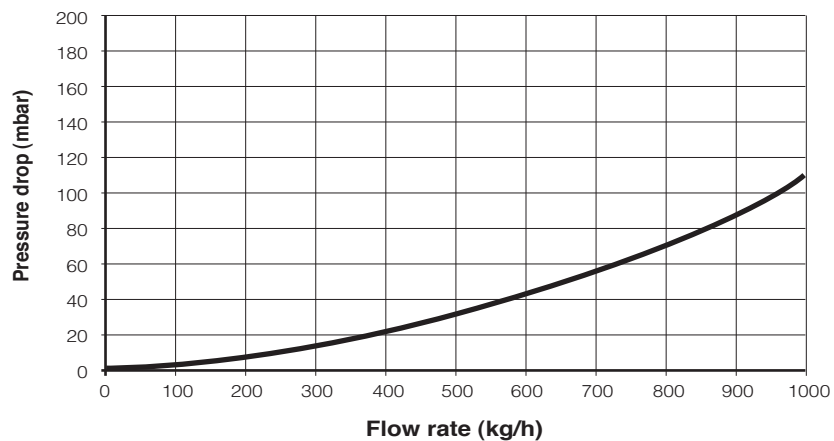
⚠ If copper pipes are used, joints must be hot brazed.

⚠ We recommend the use of stainless steel pipes specially made for solar collectors for the outlet, return and probe pipes. The probe cable should be of the shielded type.

⚠ Do not use plastic or multistrata pipes. Operating temperature can exceed 180°C.

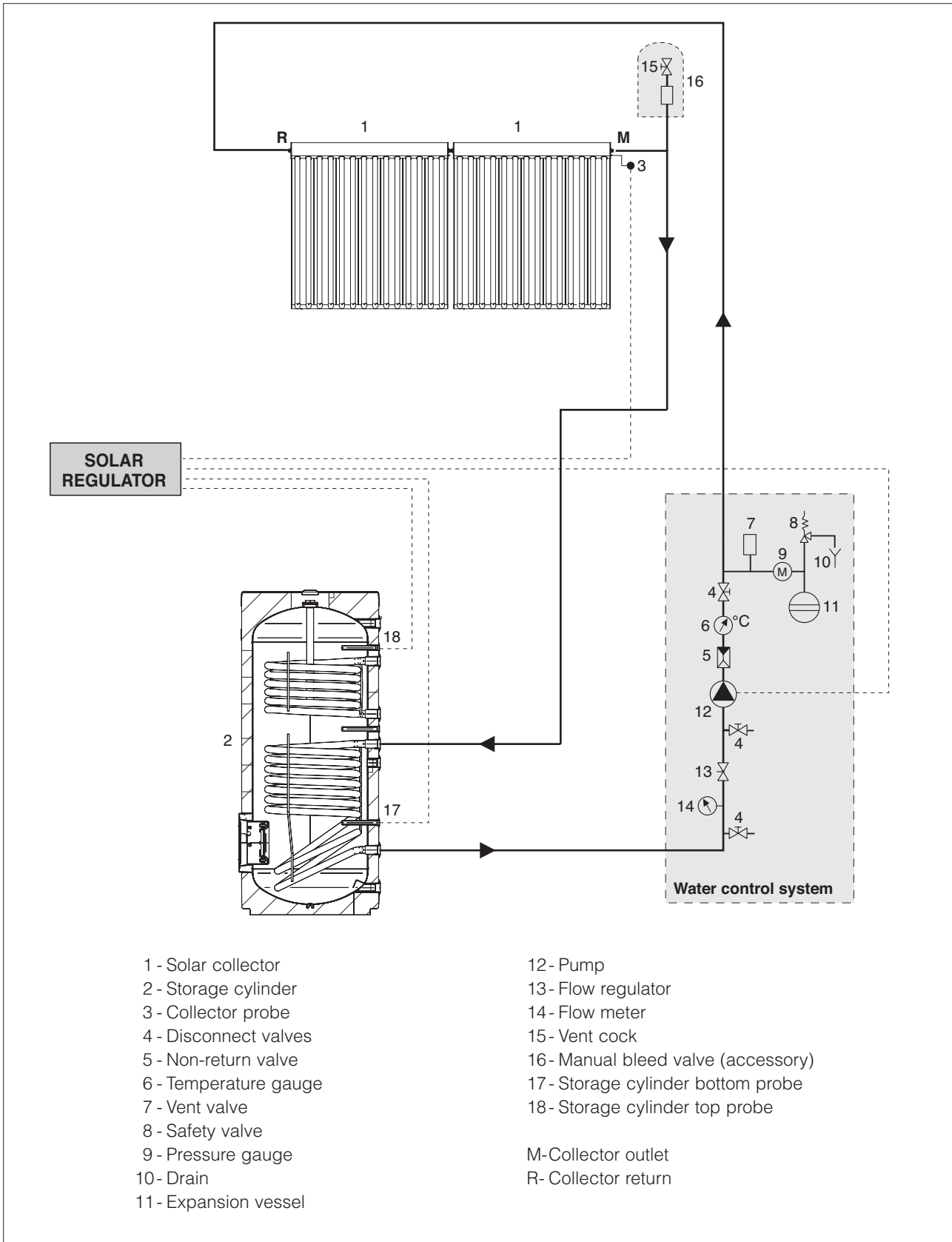
⚠ Pipe lagging must be able to resist high temperatures (180°C).

Pressure drop in solar collectors



LOCATION OF PROBES

The temperature sensor must be installed in a socket as near as possible to the collector outlet. Make sure that the sensor makes good contact with the socket. Materials (sensor, cables, seals and insulation) used to install the temperature sensor must be able to withstand high temperatures (up to 250°C).

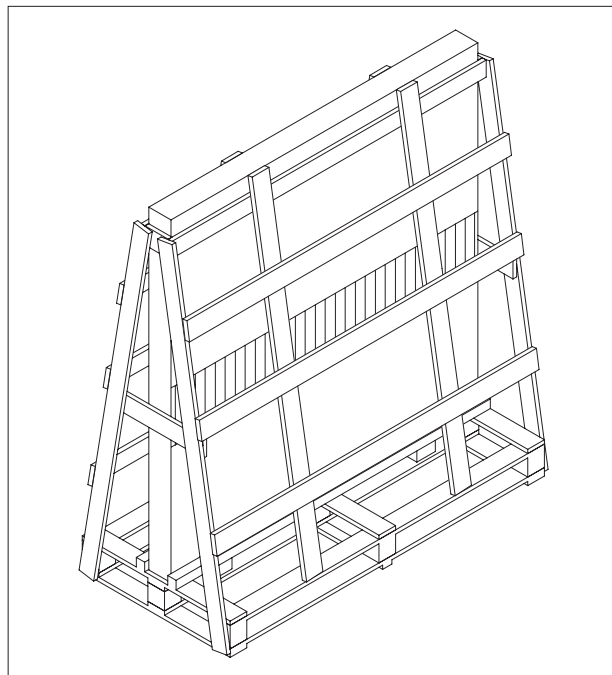



UNPACKING THE COLLECTOR


ETV08 evacuated tube solar collectors come individually packed in a wooden crate.

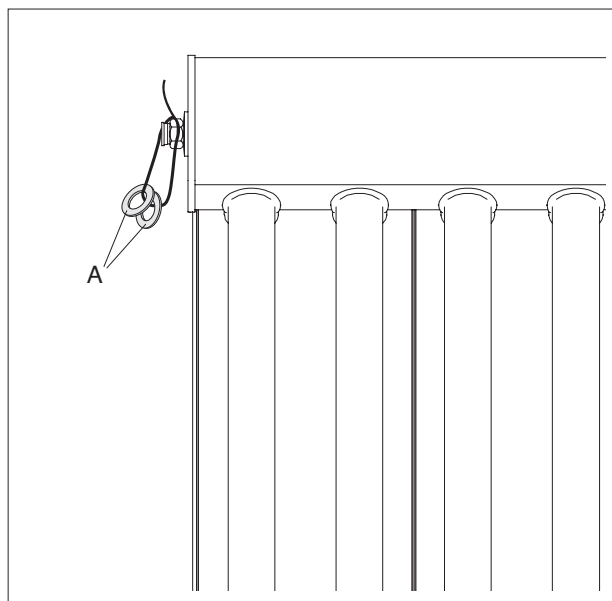
Pallet contents:

- Collector
- Documentation envelope containing:
 - Installation manual
 - Certificate of warranty and label with bar code.

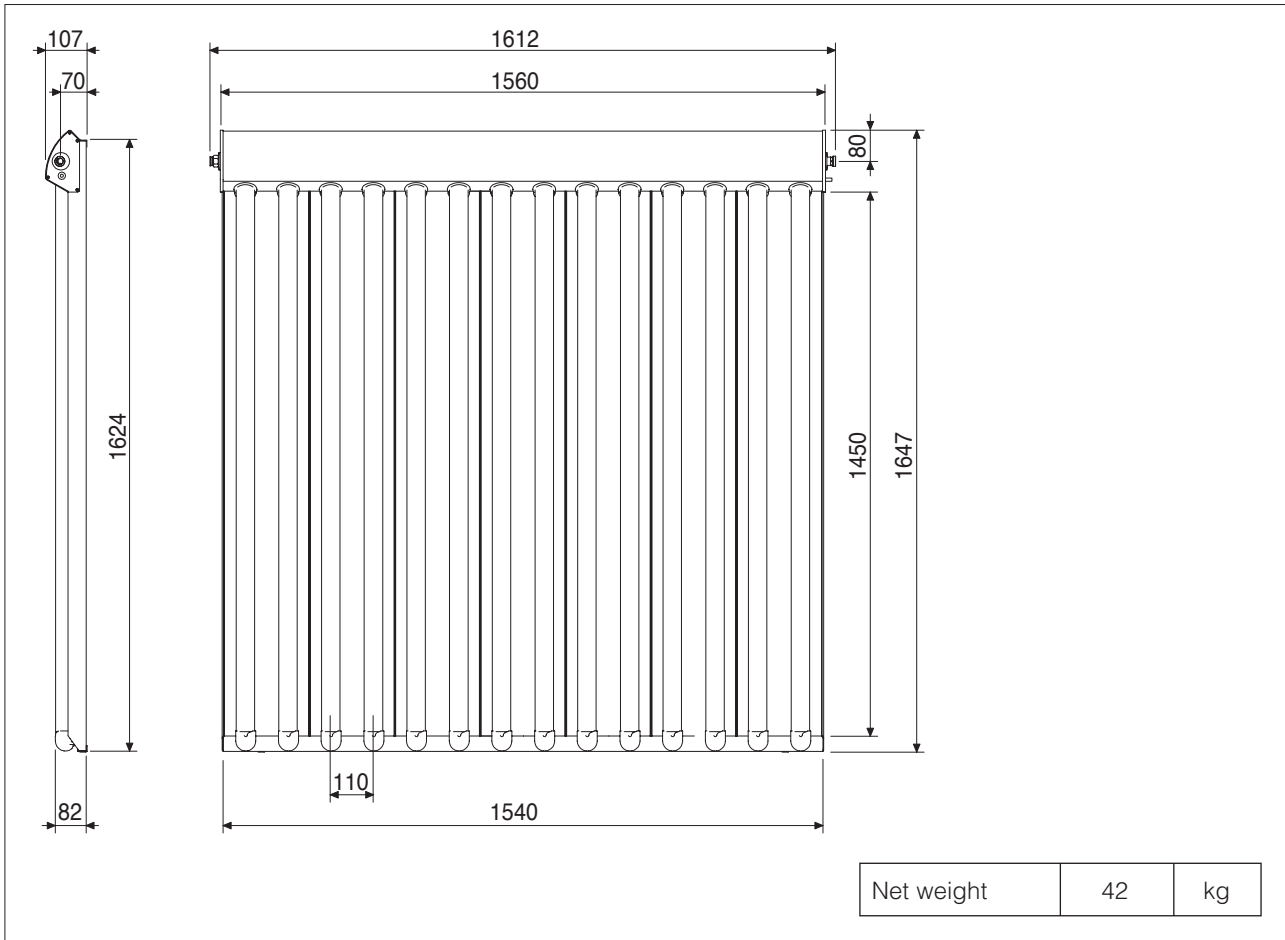


 Take care not to lose the flat seal rings (A) strapped to the fittings of the solar connector.

 The instruction manual is an integral part of the solar connector. Once located, read it thoroughly and keep it safe.



DIMENSIONS AND WEIGHT



HANDLING THE COLLECTOR

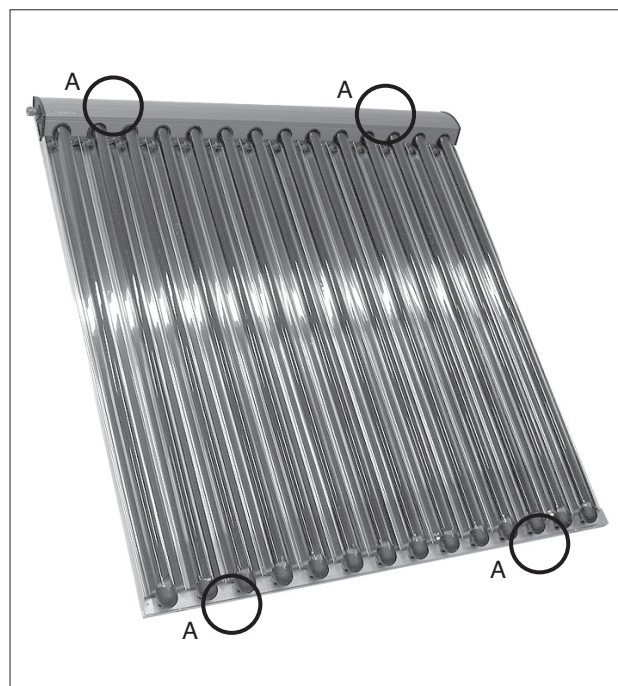
Once you have removed the outer packaging, proceed as follows to unpack and handle the solar collector:

- Tilt the solar collector slightly and grip it at the four points shown (A) to lift it.
- Use a hoist or other suitable lifting equipment to hoist the solar collector on to the roof.

⚠ Never lift the collector by its threaded water fittings.

⚠ Wear suitable personal protective equipment and use suitable safety devices.

⊘ Do not dispose of the packaging material into the environment where it can become a potential hazard. Dispose of the packaging material in compliance with applicable legislation.



GENERAL INSTRUCTIONS

Assembly

The solar collector must be fitted by specialist personnel. Use only the assembly material supplied with the solar collector. The supporting framework and all masonry or brickwork fixing points must be checked by a person expert in static loading, and must be suitable for the nature of the installation site.

Static load

The solar collector must only be installed on roofs or frames that are strong enough to support its weight. The strength of the roof or frame must be verified on site by a person expert in static loading before the solar collector is installed. During this process, it is important to verify the suitability of the supporting frame to hold the screw fasteners that fix the solar collector in place. An expert in static loading must verify that the entire frame complies with relevant standards, especially in areas liable to snow and areas exposed to high winds. Conditions (gusts of wind, formation of wind vortices, etc.) at the point where the solar collector is to be installed must be carefully considered since these can increase the loads on the supporting structure.

Lightning protection

The metal piping of the solar heating circuit must be connected to the main potential compensation bar by a (yellow-green) copper wire (H07 V-U or R) of at least 16 mm². If a lightning conductor system is already installed, the solar collectors may be connected to the existing system. Alternatively, the solar collector piping may be connected to ground via a ground wire sunk into the earth. Ground wires must be sunk outside the house. The ground wire must be connected to the potential compensation bar through a wire of the same diameter.

Connections

Solar collectors must be connected in series via the fittings and seal rings provided. If flexible pipes are not used to connect the solar collectors, the piping must be fitted with expansion joints (U-type expansion joints, flexible hoses) to absorb thermal expansion. Provided adequate expansion joints are used, up to 6 solar collectors may be connected in series. Make sure that the seal rings are correctly positioned in their seats. When tightening a fitting with a pipe wrench or spanner, always hold the opposite fitting steady with a second tool to avoid damaging the absorber.



All pipes in the water circuit must be insulated in conformity to relevant standards. Lagging and insulation must be protected against damage by the weather and birds and animals.

Angle of collectors / General

Solar collectors are designed to be installed at angles of between 15° (minimum) and 75° (maximum).

Make sure that the bleed and vent valves of the collectors remain open while the collectors are being installed. Take care to protect all fittings, connections, bleed and vent valves against dirt and dust etc.

In installations which serve primarily to produce domestic hot water in the summer, install the collectors facing from east to west at an angle of between 20 and 60°. The ideal orientation is southwards, at an angle equal to the latitude of the location minus 10°.

If the system sustains the greatest thermal load in the winter (as in systems that combine domestic hot water production with central heating), install the collectors facing south (or south-east or south-west) at an angle greater than 35°. The ideal orientation is southwards, at an angle equal to the latitude of the location plus 10°.

Flushing and filling

For safety reasons, only fill the system when the sun is not shining.

In areas liable to frost, fill the circuit with LS (pink) glycol premix to guarantee anti-freeze protection down to -28°C.



DO NOT ADD WATER TO THE GLYCOL PREMIX.

The glycol premix supplied for use with solar collectors comes ready to use. It provides anti-freeze protection down to -28°C. IT MUST NOT BE MIXED WITH WATER.




Take care if you flush the system out, because water trapped inside the circuit before filling with glycol premix may freeze.


Bleeding

Bleed the circuit:

- On startup (after initial filling) (see the figure on page 10).
- Whenever necessary, as in the event of system malfunctioning.

Make quite sure that all air has been bled out of the system.

 Risk of burns from hot fluid inside the collectors!

 Only open the vent valve if the temperature of the fluid in the circuit is below 60°C.

Make sure that the collectors are not hot before you start bleeding the circuit. Always cover the solar collectors before bleeding the circuit. Always perform bleeding in the morning.

Checking the heat transfer liquid

Check the anti-freeze effect and the pH level of the heat transfer liquid every 2 years.

Use an instrument like a refractometer or densimeter to check the anti-freeze effect (which must have a nominal protection value of approx. -28°C). If density is other than 1.030 kg/dm³, replace the mix, or add anti-freeze as required.


- Use litmus paper to check the pH (nominal value 9 to 10.5). If the measured value is below 7, change the mix.


FILLING THE CIRCUIT


Perform the following steps before starting up the system.


1 - FLUSHING AND SEAL TESTING THE SYSTEM

If copper piping has been used and joints have been hot brazed, flush out the system to remove any brazing residues. Seal test the system after you have flushed it out.

 Fill the solar collector with glycol premix immediately after flushing it out, because flushing water may remain trapped in the circuit (with a consequent risk of freezing).

 The glycol premix supplied is specially formulated for solar collector applications and is efficient throughout the -28 to +170°C temperature range. The mix is also non-toxic, biodegradable and biocompatible.

 Do NOT part fill the circuit with glycol then top up with water.

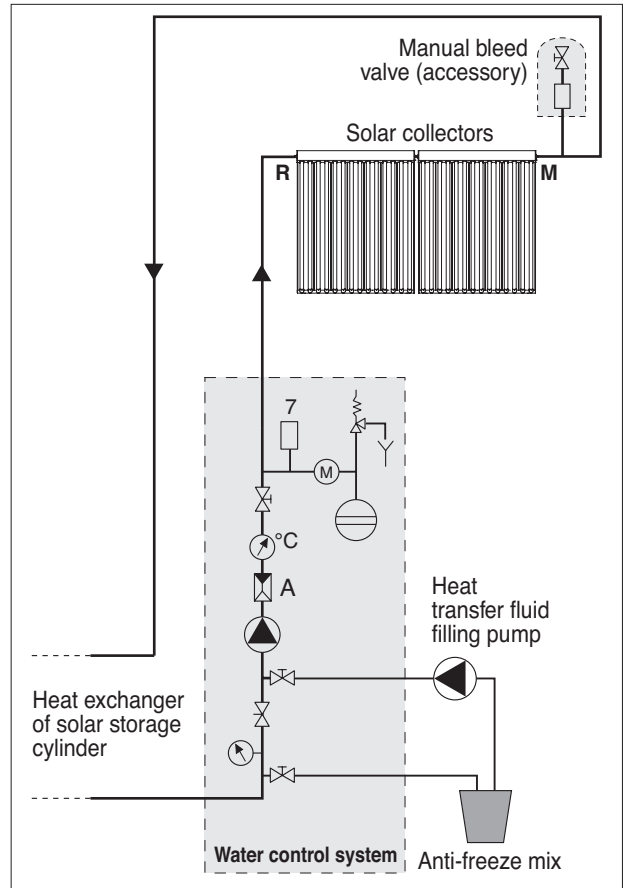
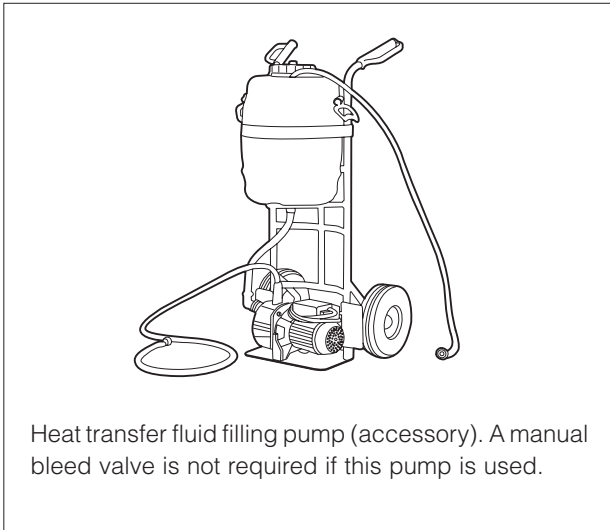
 Temperatures in excess of 200°C can cause the glycol mix to break down. This is easily visible because the liquid becomes darker.

Anti-freeze	Temperature	Density
Glycol premix	20°C	1,032÷1,035 kg/dm ³

 Do not use automatic filling systems.

2 - FILLING

- 1 - Open the non-return valve (A).
- 2 - Open the air vent at the highest point in the system (see figure alongside) and keep it open throughout the filling operation.
- 3 - Open the vent valve (7).
- 4 - Pump the heat transfer fluid around the circuit with an external filling pump until all air bubbles have been eliminated. Close the manual bleed valve.
- 5 - Temporarily raise the pressure in the system to 4 bar.
- 6 - Start up the system for about 20 minutes.
- 7 - Bleed the system again from step 2 until all the air has been removed.
- 8 - Set the pressure in the system to 3 bar.
- 9 - Close the non-return valve (A) and any open vent valves to prevent the heat transfer fluid from evaporating.



⚠ Do not fill the system in bright, sunny conditions or if the collectors are hot.

⚠ Make sure that you have bled all the air out of the system, using the water control system vent too.

CONTROLS

On completion of the installation, perform the checks listed in the table below.

DESCRIPTION	OK
Collector circuit	
Cold pressure 3 bar	
Collector circuit seal test	
Safety valve check	
Anti-freeze checked to - ____ °C	
pH of heat transfer fluid = ____	
Collector circuit bled	
Flow rate of 30l/h per m ² checked	
Non-return valve functioning	

DESCRIPTION	OK
Solar collectors	
Visual check of collectors	
Collectors cleaned if necessary	
Visual check of collector fixing points	
Visual check of roof impermeability	
Visual check of insulation/lagging	

MAINTENANCE

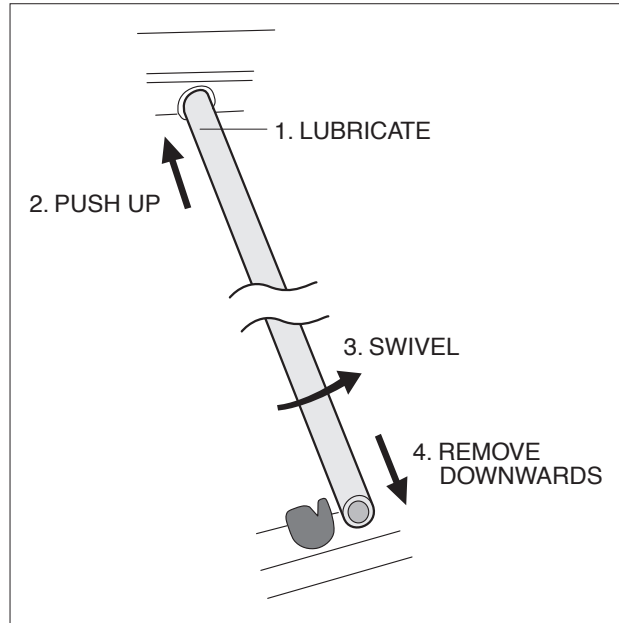
REPLACING EVACUATED TUBES

The evacuated tubes are fully functional when delivered. Nevertheless, if problems occur, they can be replaced quickly and easily.

Defective tubes are easy to recognise because they turn white and their surfaces become extremely hot.

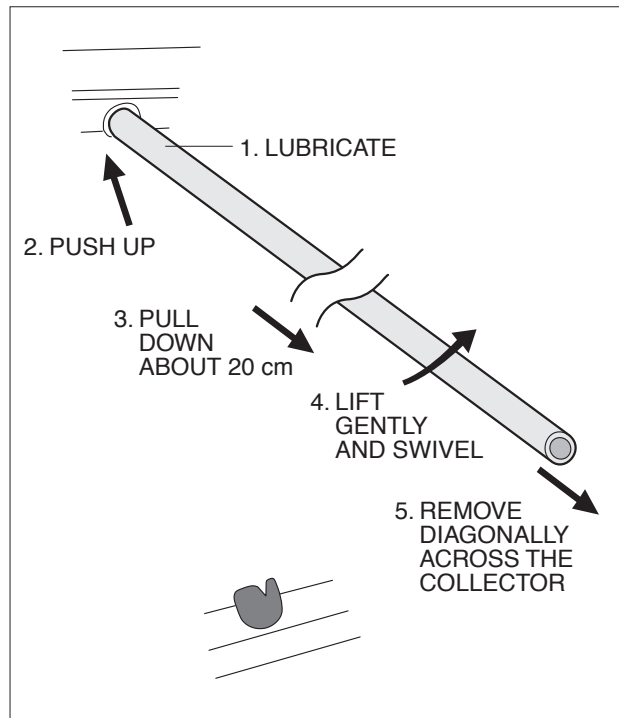
Proceed as follows to remove an evacuated tube:

- Smear the part of the tube near the seal ring with a suitable lubricant
- Push the tube upwards until the bottom of the tube can be removed from the foot of the collector. Pull the tube downwards to remove it.
If you wish, you can release the fixing clips and remove the foot of the collector to facilitate removal of the tube.



If you do not have sufficient room to remove the tube downwards, proceed as follows.

- Remove the tube from the collector foot as instructed above
- Pull the tube down about 20 cm
- Hold the tube in a glove, lift it gently and swivel it to the left or right. This bends the copper pipes inside the glass tube. Take care not to damage them, however
- Pull the tube out diagonally across the collector to remove it.



Reverse the above steps to fit the new tube.

! Remove any pieces of broken glass without damaging the surface of the mirror. Also remove any residues that might have formed around the copper pipes.

! Make sure that the silicon seal ring is still correctly seated.



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