cod. 20024195 rev. 9 10/2018

CSV 25-35 R

EN INSTALLATION INSTRUCTIONS

RIELLO

CONFORMITY

Solar collectors conform to EN 12975 standard and to Solar Keymark certification standard.

RANGE

MODEL	CODE
CSV 25 R	20023353
Kit of 5 collectors CSV 25 R	20023354
CSV 35 R	20023416
Kit of 5 collectors CSV 35 R	20023417

CONTENTS

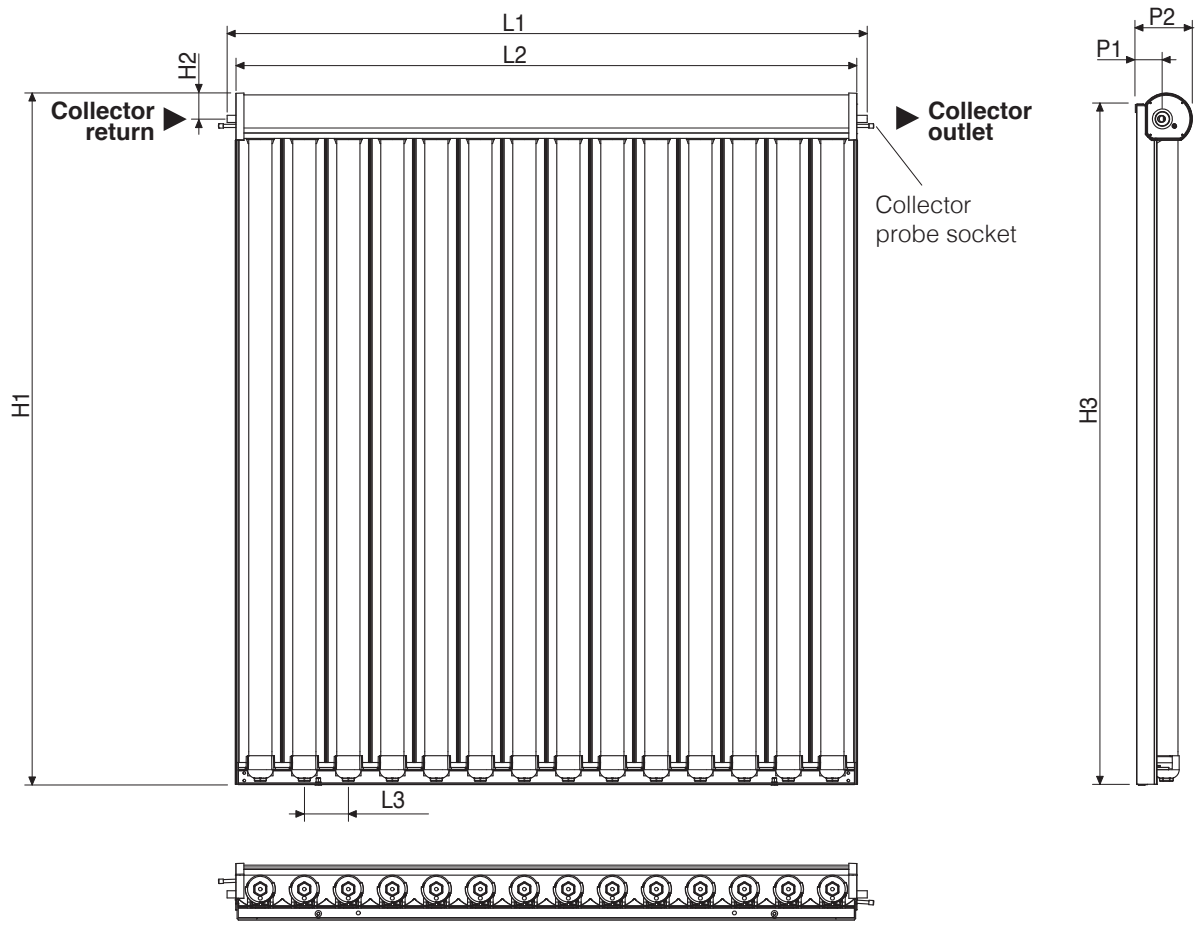
The following symbols are used in this manual:

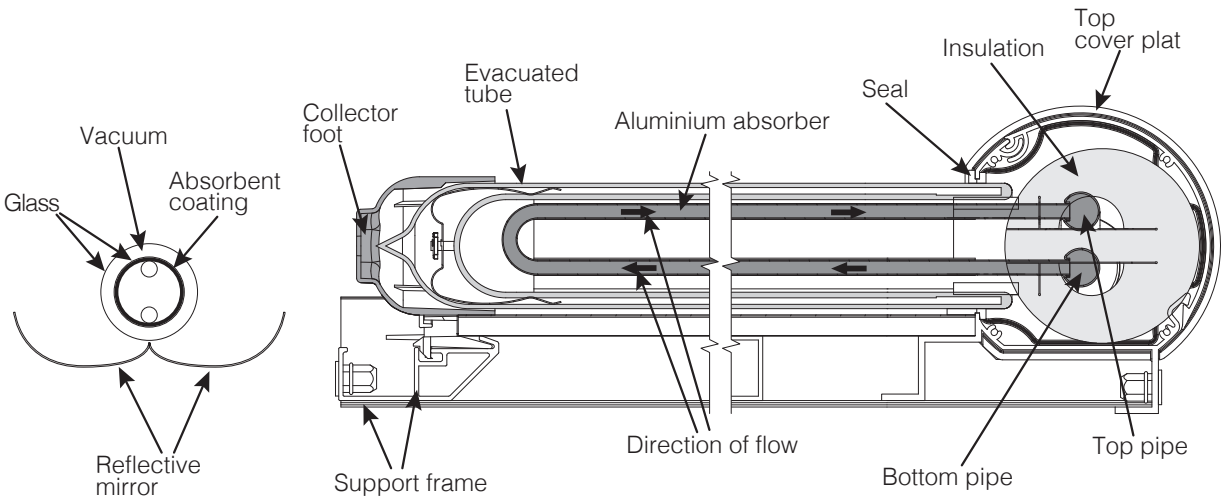
CAUTION! = Identifies actions that require caution and adequate preparation.

STOP! = Identifies actions that you MUST NOT do.

This manual, Code 20024195 – Rev. 9 (10/2018) comprises 16 pages.

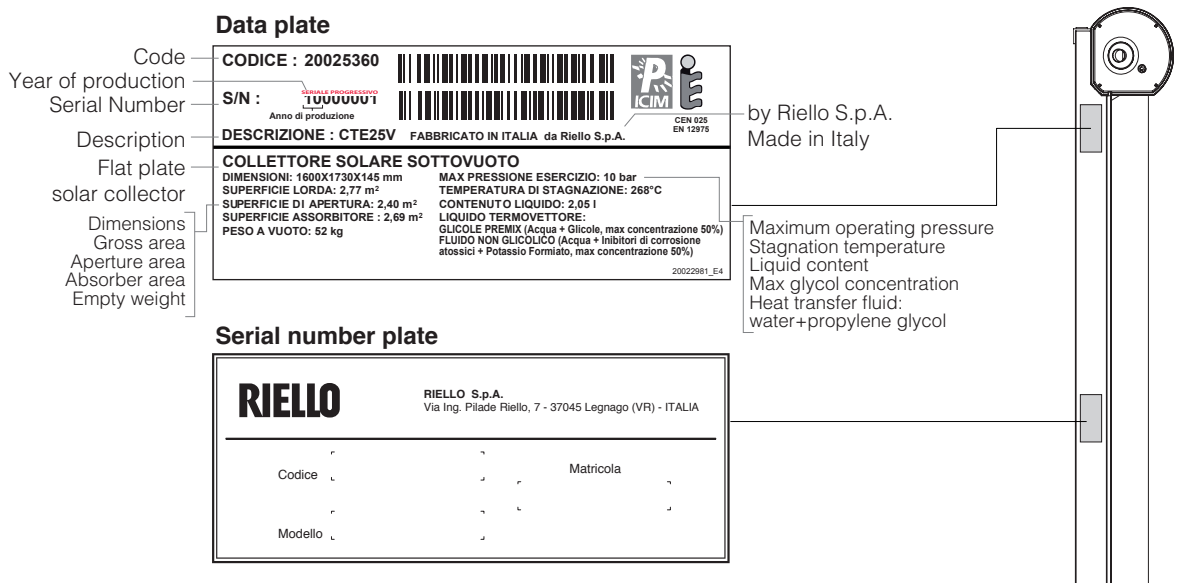
1 SYSTEM LAYOUT





Description	H1	H2	H3	L1	L2	L3	P1	P2	U/M
CSV 25 R	1730	65	1700	1600	1552	110X14	68	145	mm
CSV 35 R				2260	2212	110X20			mm

2 IDENTIFICATION



⚠ 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.

3 TECHNICAL SPECIFICATIONS

DESCRIPTION	CSV 25 R	CSV 35 R	
Total area	2,77	3,91	m^2
Exposed area	2,40	3,43	m^2
Effective absorption area	2,69	3,84	m^2
Water connections	threaded on Ø 18 pipes		mm
Empty weight	52	74	kg
Liquid content	2,05	2,90	l
Recommended flow rate per m^2 of panel	30		l/(h x m^2)
Absorption (α)	> 94		%
Emissions (ε)	< 7		%
Maximum permitted pressure	10		bar
Stagnation temperature	268		°C
Maximum number of collectors connectable in series	6		n°

Efficiency parameters

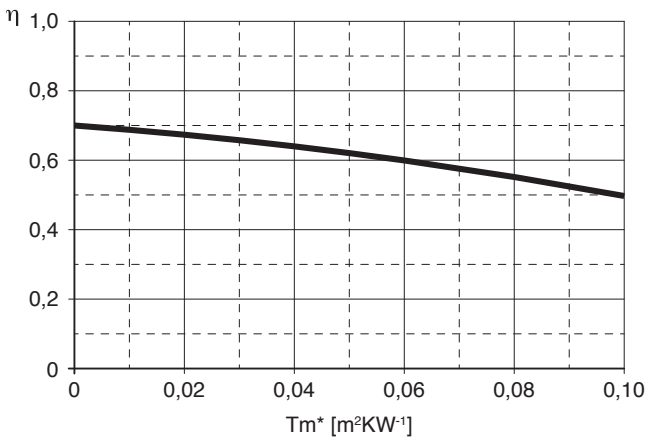
Description	Absorber surface area	Open surface area	U/M
Optical efficiency (ηo) (*)	0,627	0,70	-
Thermal dispersion factor (a1) (*)	1,027	1,15	W/(m^2K)
Thermal dispersion temperature dependence factor (a2) (*)	0,010	0,011	W/(m^2K^2)

Description		U/M
IAM T (50°) (*)	1,07	-
IAM L (50°) (*)	0,954	-
Efficiency (ηcol) (**)	64	%

(*) Tested according to EN 12975, referred to a 33.3% water-glycol mix, flow rate of 170 l/h (**CSV 25 R**) - 240 l/h (**CSV 25 R**), and irradiation G = 800W/m^2.
Tm = (Coll._inlet _temp.+Coll._outlet_temp.)/2
T*m = (Tm-T_ambient)/G

(**) Calculated with a temperature difference of 40K between the solar collector and the surrounding air, and with total solar radiation of 1000 W/m^2 referred to the exposed area.

Efficiency curve referred to exposed area



⚠ Minimum recommended slope is 15° (to ensure efficient self-cleaning and minimise snow pressure).
Installations in locations liable to frequent snow and hail, and installations on flat roofs in locations subject to strong winds are not recommended (see "Static load" on page 11).

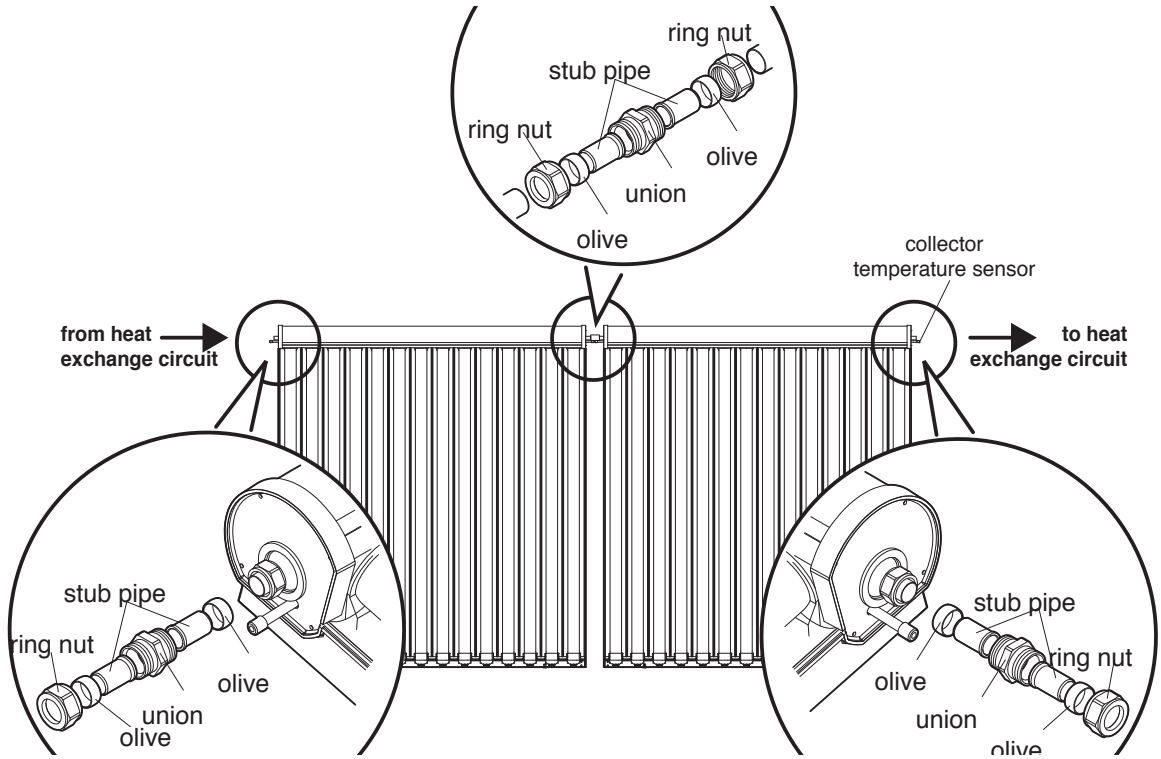
COLLECTOR WIND AND SNOW LOADING CHART
(Calculated for standard, zone 1 wind loads and snow loads)

	Installation height above ground (m)	Site's wind exposure	Mass in kg to secure collector against lifting by wind		Altitude (m.a.s.l.)	Total load on roof from wind and snow loads and collector weight (kg)	
			At angle of 45°	At angle of 20°		At angle of 45°	At angle of 20°
CSV 25 R	0–10	low	60	40	100	424	546
	10–20	low	80	50	250	595	773
	0–10	medium	80	70	100	396	510
	10–20	medium	90	80	250	533	691
CSV 35 R	0–10	low	90	80	100	599	771
	10–20	low	110	100	250	841	1093
	0–10	medium	110	100	100	561	720
	10–20	medium	130	120	250	753	976

⚠ These specifications are purely indicative. The entire structure must be inspected by an expert in static loading in compliance with applicable standards.

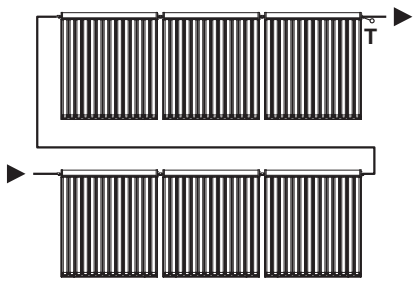
4 CONNECTIONS

The diagram below illustrates the connections between solar collectors in lines.
The fittings are available as accessories to be ordered separately.

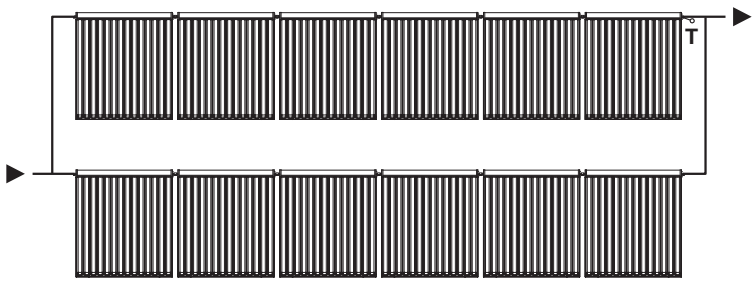


Collectors in the same line must be connected so that the heat transfer fluid flows through them in series.
Lines of solar collectors can be connected either in series (provided each line contains no more than 6 collectors) or in parallel. The complete circuit must always be hydraulically balanced. See the following sample layouts.

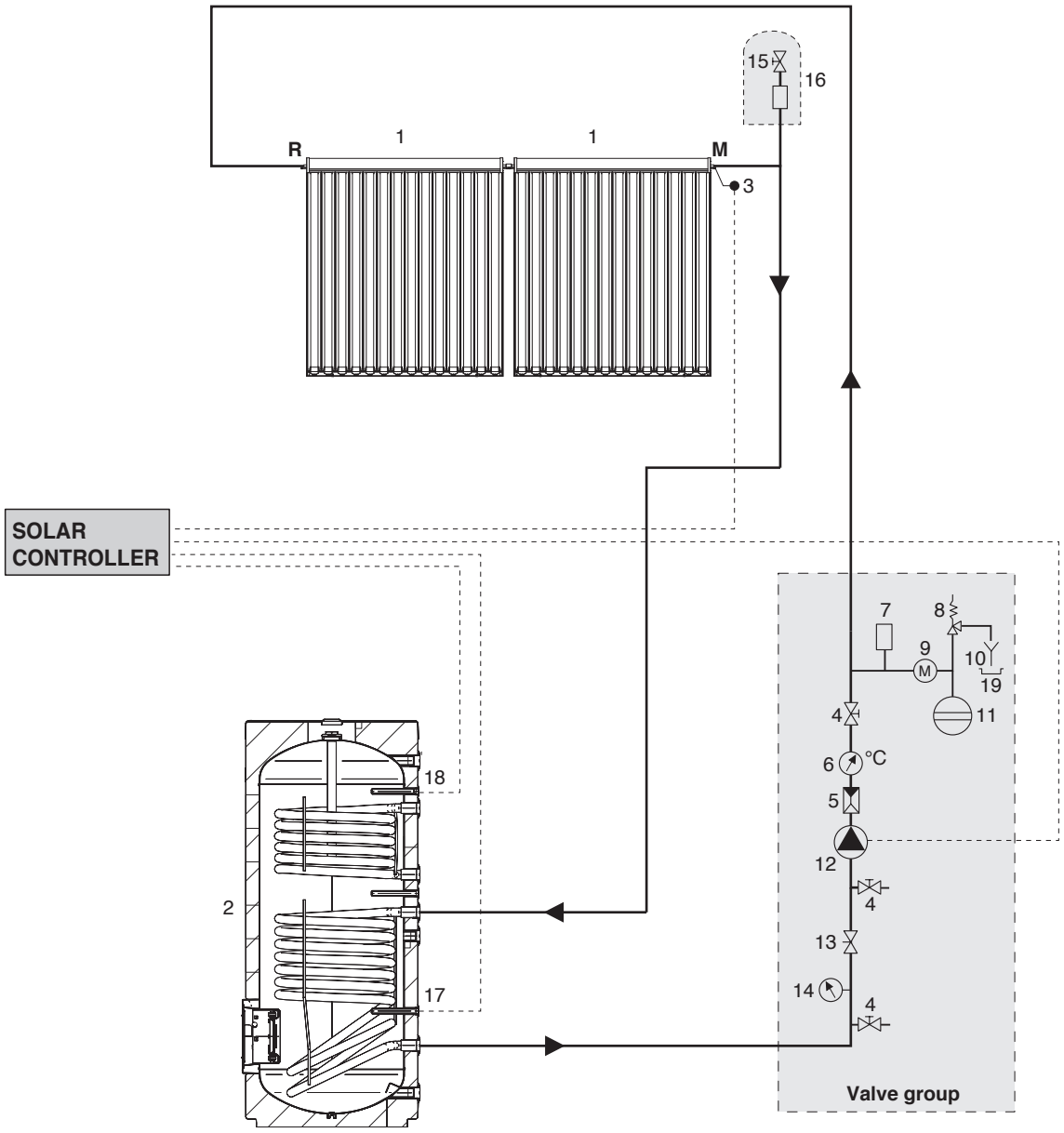
Two lines in series



Two lines in parallel



5 WATER CIRCUIT



1 Solar collector
2 Storage cylinder
3 Collector probe
4 Disconnect valves
5 Non-return valve
6 Temperature gauge
7 Vent valve
8 Safety valve
9 Pressure gauge
10 Drain
11 Expansion vessel
12 Pump
13 Flow regulator
14 Flow meter
15 Vent cock
16 Manual bleed valve (accessory)
17 Storage cylinder bottom temperature sensor
18 Storage cylinder top temperature sensor
19 Heat transfer fluid recovery

M Collector outlet
R Collector return

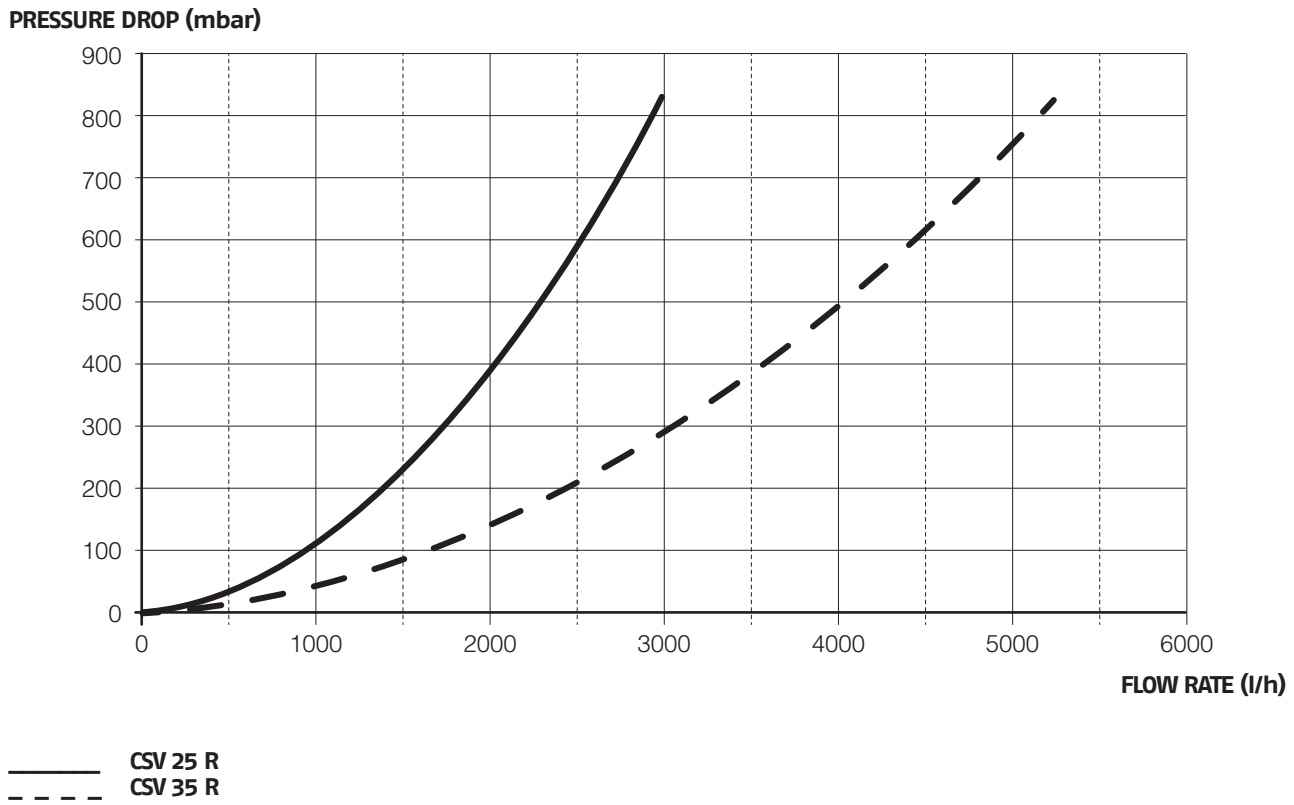
⚠ Connect no more than 6 collectors in series.

⚠ 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 multistrate pipes. Operating temperature can exceed 180°C.

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

Pressure drop in solar collectors



Diameter of connection pipes for a specific flow rate of 30 lt/m²h

Total surface area (m²)	2 – 4	6 – 12	14 – 20
Diameter of copper pipe (mm)	10 – 12	14	18
Diameter of steel pipe (inch)	3/8" – 1/2"	1/2"	3/4"

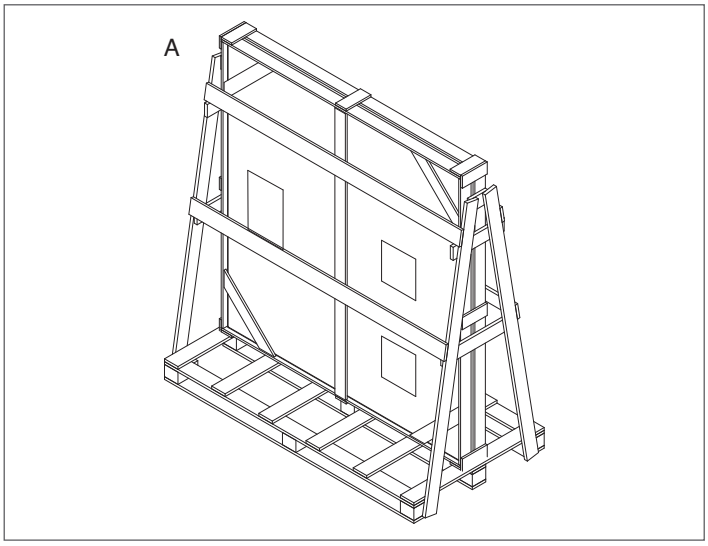
6 UNPACKING THE PRODUCT

The solar collectors are packed in various ways depending on the number of units supplied:

A **In a pack of 1**
B **Packages of 5 collectors**

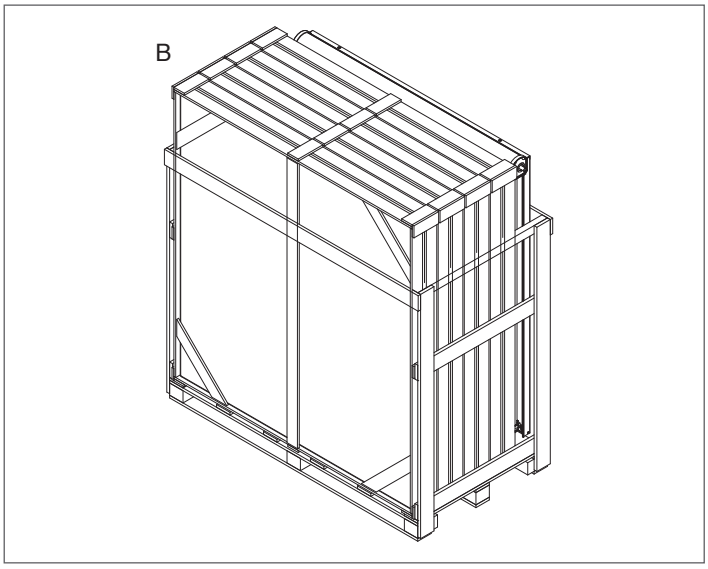
Pallet contents:

- collector
- documentation envelope containing certificate of warranty and label with bar code.



⚠ Keep the front of the packaging and use it to shade the glass tubes before the system is started up.
If the solar collectors are not going to be put into operation immediately, and there is any risk of their being exposed to rain, do not use the packaging to shade them as it is not water-proof.

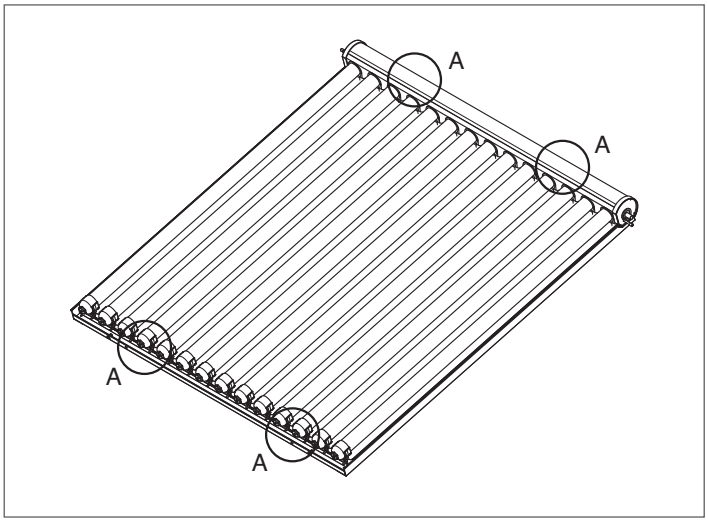
⚠ The instruction manual is an integral part of the solar connector. Once located, read it thoroughly and keep it safe.



7 HANDLING

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

- Remove the PVC wrapping to free the solar collector from the pallet
- 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.



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

⛔ Do not dispose of packaging material into the environment, or leave it within the reach of children, since it can become a potential hazard. Dispose of packaging material in compliance with applicable legislation.

⛔ Do not lift the solar collector by its water fittings.

8 INSTALLATION

GENERAL INSTRUCTIONS

Assembly
The system must be installed 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. Allow for a maximum permissible total load on each collector of 850 Pa (possible in the event of a peak wind speed of 130 km/h).

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 mm^2. 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.

Water connections
Solar collectors must be connected in series using the threaded unions 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 unions are located correctly when tightening them. When tightening a union with a pipe wrench or spanner, always hold the opposite union steady with a second tool to avoid twisting the pipe to which the union is attached.

⚠ 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, the solar collector must be covered, using the packaging it came in, for at least two hours before it can be filled. In areas liable to frost, fill the collector with an anti-freeze heat transfer fluid.

⚠ **DO NOT ADD WATER TO THE GLYCOL PREMIX.**
The anti-freeze supplied for use with solar collectors comes ready to use. 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.

Vent
Bleed the circuit:
- On startup (after initial filling) (see the figure on page 12).
- 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: if the fluid's density differs from that declared in the manufacturer's technical specifications, replace the anti-freeze fluid.
- Check the pH of the anti-freeze fluid using litmus paper: if measured pH differs from that specified in the manufacturer's technical specifications, replace the anti-freeze fluid.

⚠ At the end of its useful life, dispose of the product in compliance with applicable legislation.

9 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.

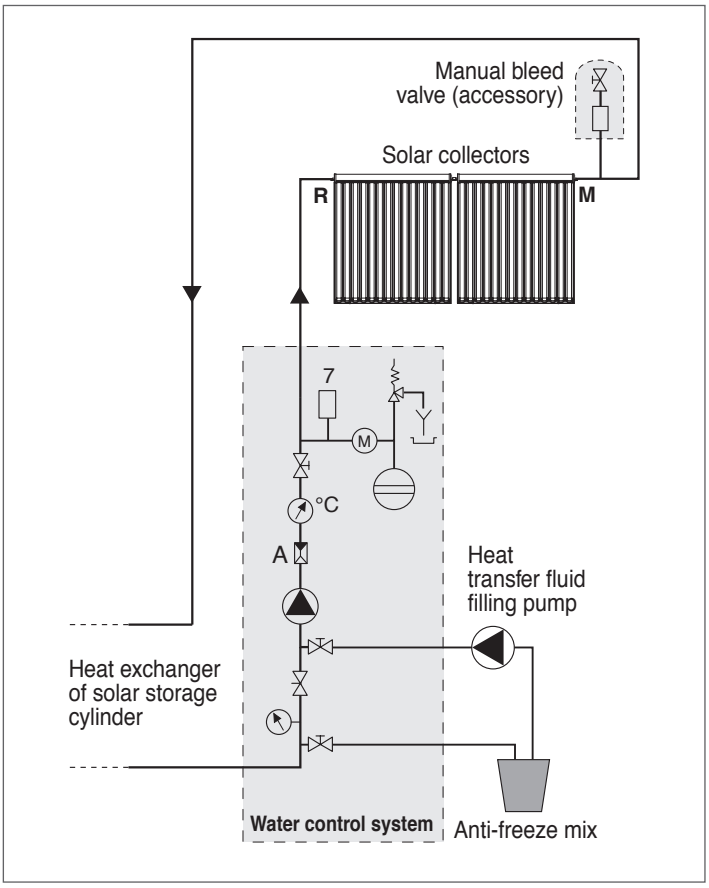
⚠ Fill the solar collector with anti-freeze heat transfer liquid immediately after flushing it out, because flushing water may remain trapped in the circuit (with a consequent risk of freezing).

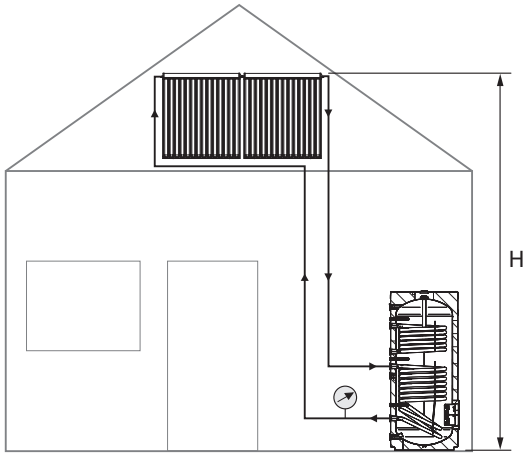
⚠ The anti-freeze fluid supplied as an accessory has been specially formulated for use in solar applications, and maintains its characteristics over its entire working life. The mix is also non-toxic, biodegradable and biocompatible.

⚠ Do NOT part fill the circuit with anti-freeze then top up with water.

⚠ Temperatures in excess of the specified working temperature can cause the anti freeze to break down. This is easily visible because the liquid becomes darker.

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 circuit again from step 2 until all the air has been removed
8 Set the circuit pressure at the boiler according to the table below in order to ensure a minimum pressure of 1.5 bar at the height of the collector field.
9 Close the non-return valve (A) and any open vent valves to prevent the heat transfer fluid from evaporating.



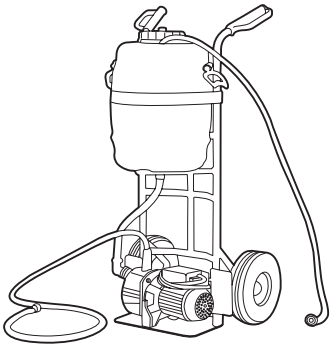


H	Pressure at boiler
up to 15 m	3 bar
15 – 20 m	3,5 bar
20 – 25 m	4 bar
25 – 30 m	4,5 bar

General rule: p [bar] = 1.5 + H [m] / 10

⚠ Do not fill the system in bright, sunny conditions or if the collectors are hot. Cover the solar collector with the packaging it came in for at least two hours before filling it.

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



Heat transfer fluid filling pump (accessory). A manual bleed valve is not required if this pump is used.

10 CHECKS

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

Collector circuit	
Cold circuit pressure:____bar (see table above)	
Collector circuit seal test	
Safety valve check	
Anti-freeze checked to - ___ °C	
pH of heat transfer fluid = ____	
Collector circuit bled	
Flow rate of 30 l/h per m^2 checked	
Non-return valve functioning	

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	

11 MAINTENANCE

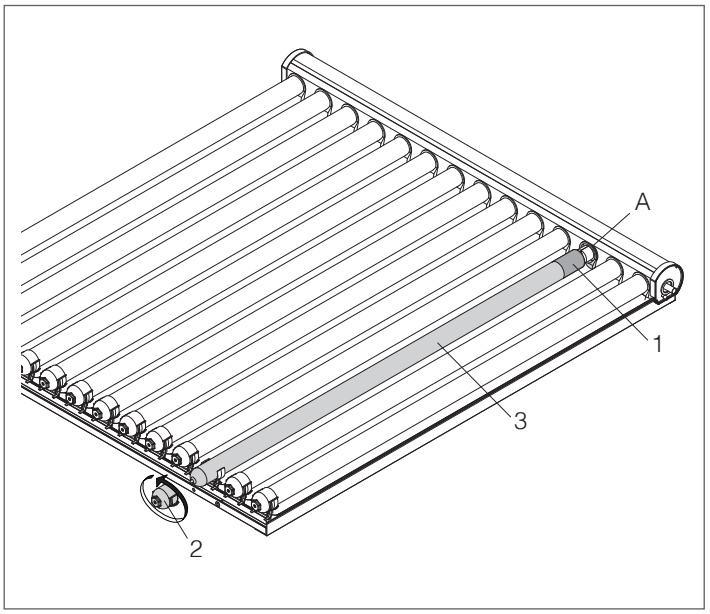
The collector must be cleaned and all parts (reflector, glass tubes, etc.) inspected every six months.

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 their undersides turn white and their surfaces become extremely hot.

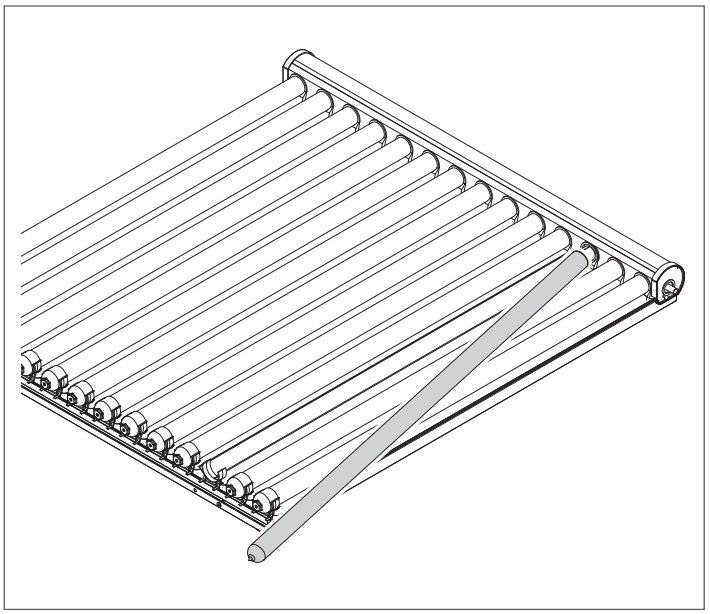
Proceed as follows to remove an evacuated tube. Wear gloves and take all the necessary precautions:

- Smear the top of the tube (1) near the seal ring with a lubricant paste
- Unscrew and remove the plug (2) from the foot of the tube
- Pull the tube (3) downwards, twisting it gently to release it from the top seal
- Remove the tube from the bottom of the collector.



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.

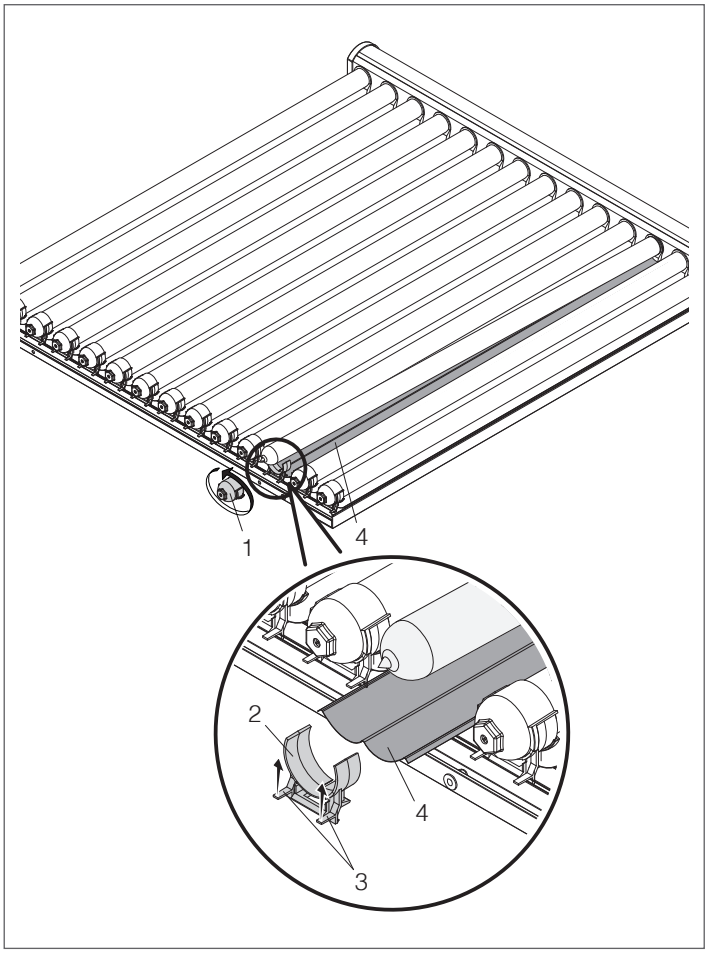
⚠ Make sure that the silicon seal ring is still correctly seated. silicone.

REPLACING THE CPC REFLECTOR

Our CPC reflectors are manufactured and delivered under the best possible conditions.
Nevertheless, if a fault (e.g. a large dent) is found, they can be replaced quickly and easily.

Proceed as follows, taking all the necessary precautions, to remove a damaged reflector:

- Unscrew and remove the plug (1) from the foot of the collector
- Remove the bracket (2) into which the plug was screwed by bending back the clips (3)
- Remove the reflector (4) without moving its glass tube.



RIELLO

RIELLO S.p.A.
Via Ing. Pilade Riello, 7
37045 – Legnago (VR)
www.riello.com