



SOLAR THERMAL SYSTEMS



- **solar collectors**
- **pump stations and controllers**
- **accessories**



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SOLAR ENERGY UTILIZATION

Solar energy represents the majority of energy that is found and utilized on the Earth. The amount of solar energy reaching the Earth every year varies in Europe from 900 kWh/m² in the North to some 1500 kWh/m² in the South. Solar thermal systems are mostly used for DHW (domestic hot water) heating and support space heating.

Either flat plate solar collectors or evacuated tube ones are used to transform solar radiation into heat.

Flat plate collectors feature large glazed surface area and a large absorber

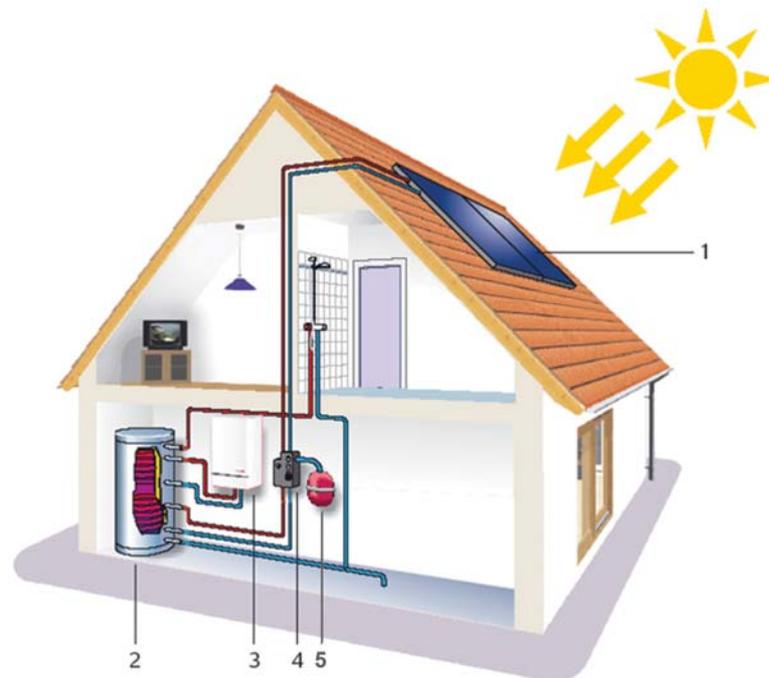
- Absorption area of solar collectors is represented by a highly selective surface. It features high level of solar radiation absorption while its heat radiation into ambient air (heat loss by radiation) is very low.
- Tempered solar glass in all models excels in high shatter resistance and high solar permeability.

MAIN COMPONENTS OF SOLAR THERMAL SYSTEMS

A principle component of a solar thermal system is a solar collector **(1)**, capable of absorbing solar radiation and transforming it to heat. The heat trapped inside the collector is then transferred by special antifreeze solar fluid into a solar thermal appliance **(2)**.

Solar thermal appliances are usually (drinking) hot water storage tanks, Thermal Stores or pools. In a hot water storage tank drinking water is directly heated up, in Thermal Stores it is heating water that is heated up for space heating. A solar thermal system needs to be backed up by an auxiliary source of heat. An electric heating element is usually installed directly into a hot water storage tank or Thermal Store, or tube heat exchangers that utilize energy from other heat sources like gas boilers **(3)**, fireplaces, biomass boilers or heat pumps.

In order to transfer heat from collectors into a hot water storage tank, any solar thermal system shall be equipped with a circulation pump that ensures circulation in a solar circuit. A circulation pump is included in a solar pump station **(4)** that involves also other important components of a solar circuit – a safety valve, flowmeter, non-return valve, filling valves etc. A solar expansion vessel **(5)** is also connected to a solar pump station. Since a hot water storage tank may be heated up to as much as 90°C by a solar thermal system, a hot water outlet shall be fitted with an anti-scald valve that keeps outgoing water at a safe temperature.



PRINCIPLES OF OPERATION - SOLAR THERMAL SYSTEMS

Solar radiation passes through a solar collector glass and hits the absorber where it is captured by a special selective layer and transformed to heat. The absorber is sealed in a compact frame with efficient insulation. The heat is then transferred to a heat carrying fluid that moves the heat (with the help of a circulation pump) into a building to solar consumers (hot water storage tank, thermal store, pool etc.). The pump is being switched by a controller that monitors temperatures through temperature sensors and evaluates the temperature differences between a collector and a solar consumer. As soon as the controller registers the pre-set temperature difference is exceeded, it starts the solar circulation pump. Warm heat transfer fluid then circulates through the solar circuit, giving away its solar heat into the desired solar consumers. A pressure expansion vessel shall be properly designed and installed in any solar circuit in order to avoid antifreeze fluid leaks through a safety valve in case that the solar circuit gets overheated.

In central Europe, a solar thermal system shall be always amended with an auxiliary heat source that will ensure heating of DHW or heating water to a desired temperature under cloudy weather. For this purpose, current energy sources are used, like gas or electric boilers, solid fuel boilers, heat pumps etc. The specific system layout is then influenced by the type of the auxiliary source, very often there are more auxiliary sources connected into a system, and their interconnection shall be solved e.g. by installing a combination thermal store.

KPG1 SOLAR COLLECTOR



Flat plate solar collector of 1882 W output (at 1000 W/m² irradiance) designed for either portrait or landscape on-roof installation. A harp absorber with highly selective TiNO_x surface is laser welded to copper tubing. The insulation consists of 40 mm mineral wool. Connection points are located laterally on the top and bottom.

Code: 10336

DIMENSIONS AND WEIGHT

height x width x thickness	2150 x 1170 x 85 mm
total area	2.52 m ²
aperture area	2.31 m ²
empty weight	38 kg

GLAZING

material	tempered low-iron glass
thickness	3.2 mm

ABSORBER

material	Al, 0.4 mm thick
surface finish	TiNO _x
design type	harp type, laser welded
material and size of connection pipes	copper 4 x Ø 22 mm x 0.8 mm
material and size of absorber tubes	copper 12 x Ø 8 mm x 0.4 mm
max. working pressure	10 bar
max. working temperature	120 °C
stagnation temperature	200 °C
heat transfer fluid	water solution of monopropylene glycol 1:1, 1.7 l
recommended flow rate	60 - 120 l/h

THERMAL INSULATION

insulation material	mineral wool
insulation thickness	40 mm

FRAME

frame material	aluminum alloy
frame color	silver
rear sheet	aluminum alloy, 0.5 mm thick

COLLECTOR EFFICIENCY PARAMETERS RELATED TO APERTURE/TOTAL SURFACE AREA

η_{0a}	0.812/0.744
a_{1a}	4.054/3.716 W/m ² K
a_{2a}	0.014/0.013 W/m ² K ²

Mount and connection kits (portrait mount)

	Code
Connection kit	7710
Kit for 1 collector	[for 4 roof anchors or 2 supports + 1 strut] 10538
Kit for 2 collectors	[for 6 roof anchors or 3 supports + 1 strut] 10539
Kit for 3 collectors	[for 8 roof anchors or 4 supports + 1 strut] 10540
Kit for 4 collectors	[for 10 roof anchors or 5 supports + 1 strut] 10541
Kit for 5 collectors	[for 12 roof anchors or 6 supports + 1 strut] 14067
Mount and interconnection kit for 1 collector	[for 4 roof anchors or 2 supports + 1 strut] 11986

Mount and connection kits (landscape mount)

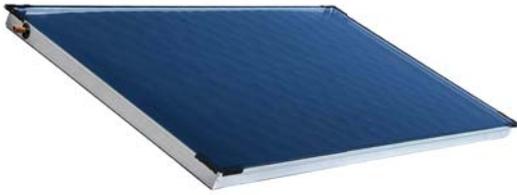
	Code
Connection kit	14134
Kit for 1 collector	[for 4 roof anchors or 2 supports + 1 strut] 10700

The Connection kit contains an inlet elbow (Cu22 x 3/4" F), outlet pipe cross (Cu22 x 3/4" F + 3/8" F for an air vent valve and 1/2" F for a temperature sensor sheath), sheath with a temperature sensor and 2 straight adapters (Cu22 x 3/4" F) with plug and gasket.



The mount and connection kits consist of aluminum mounting rails, retaining hooks for bottom mounting rails, retaining side clamps, bolts and nuts, straight fittings (2 and more collectors) and pipe insulation.

KPG1H SOLAR COLLECTOR



Flat plate collector of 1866 W output (at 1000 W/m² irradiance), designed for on-roof landscape installation. A harp absorber with highly selective TiNOx surface is laser welded to the copper pipes. The insulation consists of 40 mm mineral wool. Connections are located on both sides on the top.

Code: 11427

DIMENSIONS AND WEIGHT

height x width x thickness	1170 x 2150 x 85 mm
total area	2.52 m ²
aperture area	2.31 m ²
empty weight	38 kg

GLAZING

material	tempered low-iron glass
thickness	3.2 mm

ABSORBER

material	Al, 0.4 mm thick
surface finish	TiNOx
design type	harp type, laser welded
material and size of connection pipes	copper 2 x Ø 22 mm x 0.8 mm
material and size of absorber tubes	copper 12 x Ø 8 mm x 0.4 mm
max. working pressure	10 bar
max. working temperature	120 °C
stagnation temperature	200 °C
heat transfer fluid	water solution of monopropylene glycol 1:1, 1.7 l
recommended flow rate	60 - 120 l/h

THERMAL INSULATION

insulation material	mineral wool
insulation thickness	40 mm

FRAME

frame material	aluminum alloy
frame color	silver
rear sheet	aluminum alloy, 0.5 mm thick

COLLECTOR EFFICIENCY PARAMETERS RELATED TO APERTURE/TOTAL SURFACE AREA

η_{0a}	0.812/0.744
a_{1a}	4.054/3.716 W/m ² K
a_{2a}	0.014/0.013 W/m ² K ²

Mount and connection kits

		Code
Connection kit		14618
Kit for 1 collector	[for 4 roof anchors or 2 supports + 1 strut]	10700
Kit for 2 collectors	[for 6 roof anchors or 3 supports + 1 strut]	14517
Mount and interconnection kit for 1 collector	[for 4 roof anchors or 2 supports + 1 strut]	14518

The Connection kit contains an inlet elbow (Cu22 x 3/4" F), outlet pipe cross (Cu22 x 3/4" F + 3/8" F for an air vent valve and 1/2" F for a temperature sensor sheath), sheath with a temperature sensor.



The mount and connection kits consist of aluminum mounting rails, retaining hooks for bottom mounting rails, retaining side clamps, bolts and nuts, straight fittings (2 and more collectors) and pipe insulation.

KPS1 SOLAR COLLECTOR



Flat plate collector of 1481 W output (at 1000 W/m² irradiance), designed for on-roof portrait installation. A harp absorber with highly selective TiNOx surface is laser welded to the copper pipes. The insulation consists of 40 mm mineral wool. Connections are located on both sides on the top and bottom.

Code: 16277

DIMENSIONS AND WEIGHT

height x width x thickness	2037 x 1036 x 90 mm
total area	2.11 m ²
aperture area	1.907 m ²
empty weight	38 kg

GLAZING

material	tempered prismatic glass
thickness	3.2 mm

ABSORBER

material	Al, 0.5 mm thick
surface finish	TiNOx
design type	harp type, laser welded
material and size of connection pipes	copper 4 x Ø 22 mm x 0.7 mm
material and size of absorber tubes	copper 9 x Ø 8 mm x 0.5 mm
max. working pressure	10 bar
max. working temperature	110 °C
stagnation temperature	200 °C
heat transfer fluid	water solution of propylene glycol, 1.4l
recommended flow rate	60 - 120 l/h

THERMAL INSULATION

insulation material	mineral wool
insulation thickness	40 mm

FRAME

frame material	aluminum alloy
frame color	grey
rear sheet	zinc-plated steel, 0.5 mm thick

COLLECTOR EFFICIENCY PARAMETERS RELATED TO APERTURE/TOTAL SURFACE AREA

η_{0a}	0.777 / 0.702
a_{1a}	4.35 / 3.93 W/m ² K
a_{2a}	0.0073 / 0.0066 W/m ² K ²

Mount and connection kits

		Code
Connection kit		7710
Kit for 1 collector	[for 4 roof anchors or 2 supports + 1 strut]	12178
Kit for 2 collectors	[for 6 roof anchors or 3 supports + 1 strut]	12179
Kit for 3 collectors	[for 8 roof anchors or 4 supports + 1 strut]	12180
Kit for 4 collectors	[for 10 roof anchors or 5 supports + 1 strut]	12181
Mount and interconnection kit for 1 collector	[for 4 roof anchors or 2 supports + 1 strut]	12183

The Connection kit contains an inlet elbow (Cu22 x 3/4" F), outlet pipe cross (Cu22 x 3/4" F + 3/8" F for an air vent valve and 1/2" F for a temperature sensor sheath), sheath with a temperature sensor and 2 straight adapters (Cu22 x 3/4" F) with a plug and gaskets.



The mount and connection kits consist of aluminum mounting rails, retaining hooks for bottom mounting rails, retaining side clamps, bolts and nuts, straight fittings (2 and more collectors) and pipe insulation.

KPS11 SOLAR COLLECTOR



Flat plate collector of 1802 W output (at 1000 W/m² irradiance), designed for on-roof portrait installation. A harp absorber with highly selective TiNOx surface is laser welded to the copper pipes. The insulation consists of 40 mm mineral wool. Connections are located on both sides on the top and bottom.

Code: 16278

DIMENSIONS AND WEIGHT

height x width x thickness	2037 x 1235 x 90 mm
total area	2.516 m ²
aperture area	2.295 m ²
empty weight	45 kg

GLAZING

material	tempered prismatic glass
thickness	3.2 mm

ABSORBER

material	Al, tl. 0.5 mm
surface finish	TiNOx
design type	harp type, laser welded
material and size of connection pipes	copper 4 x Ø 22 mm x 0.7 mm
material and size of absorber tubes	copper 11 x Ø 8 mm x 0.5 mm
max. working pressure	10 bar
max. working temperature	110 °C
stagnation temperature	200 °C
heat transfer fluid	water solution of propylene glycol, 1.71
recommended flow rate	60 - 120 l/h

THERMAL INSULATION

insulation material	mineral wool
insulation thickness	40 mm

FRAME

frame material	aluminum alloy
frame color	gray
rear sheet	zinc-plated steel, 0.5 mm thick

COLLECTOR EFFICIENCY PARAMETERS RELATED TO APERTURE/TOTAL SURFACE AREA

η_{0a}	0.785 / 0.716
a_{1a}	4.44 / 4.05 W/m ² K
a_{2a}	0.0068 / 0.0062 W/m ² K ²

Mount and connection kits

		Code
Connection kit		7710
Kit for 1 collector	[for 4 roof anchors or 2 supports + 1 strut]	12184
Kit for 2 collectors	[for 6 roof anchors or 3 supports + 1 strut]	12185
Kit for 3 collectors	[for 8 roof anchors or 4 supports + 1 strut]	12186
Kit for 4 collectors	[for 10 roof anchors or 5 supports + 1 strut]	12187
Mount and interconnection kit for 1 collector	[for 4 roof anchors or 2 supports + 1 strut]	12188

The Connection kit contains an inlet elbow (Cu22 x 3/4" F), outlet pipe cross (Cu22 x 3/4" F + 3/8" F for an air vent valve and 1/2" F for a temperature sensor sheath), sheath with a temperature sensor and 2 straight adapters (Cu22 x 3/4" F) with a plug and gaskets.



The mount and connection kits consist of aluminum mounting rails, retaining hooks for bottom mounting rails, retaining side clamps, bolts and nuts, straight fittings (2 and more collectors) and pipe insulation.

SOLAR COLLECTOR MOUNT

Sloping roof mounting system



For solar collector installation onto a sloping roof, roof anchors are used that shall be fastened to rafters, or to an auxiliary board. Roof anchors shall be selected with respect to the roofing type and composition. The most popular and suitable for current roofing types are roof anchors in stainless steel or hot dip steel. For flat roofs, these are bolts with clamp for fastening H beams.



Roof anchor in stainless steel or zinc-plated steel

- Ceramic roof tiles
- Concrete roof tiles



Roof anchor in stainless steel

- Slate roofing
- Shingle roofing



Bolt with clamp for fixing mounting rails onto a roof

- Bitumen and metal roofing

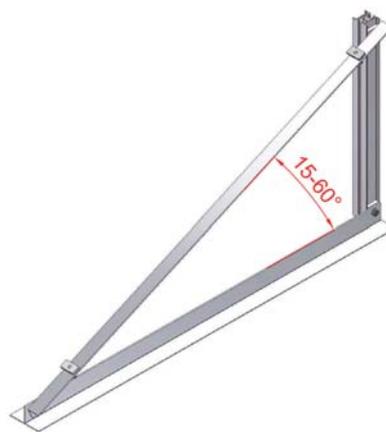
Roof anchors for sloping roofs

	Code
Roof anchor for pantiles, in stainless steel	6857
Roof anchor for pantiles, in hot dip galvanized steel	7929
Roof anchor for slate tiles, in stainless steel	11574
Roof anchor for pantiles for rafters, in stainless steel, incl. self tapping screws	10159
Bolt with clamp for fastening mounting rails onto a roof (incl. gasket)	7320
Roof bolt rubber gasket	8891

For low slope roofs, special supports can be mounted on roof anchors that adjust the collector tilt to a desired value.

Collector tilt adjustment supports for portrait installation	Code	Collector tilt adjustment supports for landscape installation	Code
15° Triangle Support	10748	15° Triangle Support	11070
25° Triangle Support	8805	25° Triangle Support	11071
45° Triangle Support	10094	45° Triangle Support	11072
60° Triangle Support	9631		

Flat roof mounting system



The installation of solar collectors onto flat roofs is the same as on sloping roofs, only the sloping roof and roof anchors are substituted by a triangle support structure. That can be selected depending on the desired tilt in 15°, 25°, 45° and 60° pitch. Stability of the structure is achieved either by applying a load (ballast), or by anchoring into the roof structure (usually a reinforced concrete roof panel). Any designed anchoring or added ballast shall be checked by a mechanical static engineer. For increased rigidity, the system of triangle supports is reinforced with a wind brace.

Ballasted support structure



Support structure fixed into the roof



Collector supports for flat roof (portrait installation)

	Kód
15° Triangle Support	11979
25° Triangle Support	10975
45° Triangle Support	6859
Wind brace incl. screws	9563

Collector supports for flat roof (landscape installation)

	Kód
25° Triangle Support	10907
45° Triangle Support	10921
Wind brace incl. screws	10908

Wall installation

The supports listed below can be used for landscape installation of the collectors on the walls (facades of houses).

Landscape collector wall supports

	Kód
15° Support (75° collector tilt angle)	14792
25° Support (65° collector tilt angle)	14793
45° Support (45° collector tilt angle)	14794

SOLAR PIPING

For an easy connection of solar thermal collectors, pump stations, and hot water storage tanks and thermal stores in a utility room, copper or stainless steel piping shall be used that resists glycol and temperatures up to 160°C. Pre-insulated pipes in EPDM mean a great advantage. The pipe diameter corresponds to the number of solar collectors connected and to the flow rate in question. Indicative values for the min. cross section area of pipes related to the number of collectors and flow rate in harp type collectors is shown in the chart:



Number of collectors	Connection type array x collector	Max. recommended flow rate	Connection pipes	
			in copper	kombiflex
1	1 × 1	2 l/min	Cu 15 × 1	DN 12
2	1 × 2 in series	4 l/min	Cu 15 × 1	DN 16
3	1 × 3 in series	6 l/min	Cu 18 × 1	DN 16
4	1 × 4 in series	8 l/min	Cu 18 × 1	DN 20
6	2 × 3 in parallel	12 l/min	Cu 22 × 1	DN 25
8	2 × 4 in parallel	16 l/min	Cu 28 × 1.5	DN 25
9	3 × 3 in parallel	18 l/min	Cu 28 × 1.5	DN 25
12	3 × 4 in parallel	24 l/min	Cu 28 × 1.5	-

Max. 30m in the flow and return piping altogether

SOLARFLEX A - DUO - twinway flexible stainless steel pipe, separable, for an easy connection of solar thermal collectors, pump station, hot water storage tank etc. Including a 2x0.75 mm² silicone cable to connect a temperature sensor. The pipes are insulated with 13mm thick EPDM insulation with a protective surface layer.

SOLARFLEX A - DUO (13mm thick insulation)	DN 16	DN 20
Twinway stainless-steel pipe 10m, incl. 4 nuts with lock rings and hex nipple	9916	9917
Twinway stainless-steel pipe 15m, incl. 4 nuts with lock rings and hex nipple	9619	9620
Twinway stainless-steel pipe 50m	10564	10565

SOLARFLEX A - MONO - flexible stainless steel pipe insulated with either 13 or 19mm thick EPDM insulation with a protective surface layer.

SOLARFLEX A - MONO (13 mm thick insulation)	DN 16	DN 20
Stainless-steel pipe, 10m, incl. insulation, 4 nuts with lock rings and hex nipple	12899	12903
Stainless-steel pipe, 20m, incl. insulation, 4 nuts with lock rings and hex nipple	12900	12904
Stainless-steel pipe, 30m, incl. insulation, 4 nuts with lock rings and hex nipple	12901	12905
Stainless-steel pipe, 50 m, incl. insulation	12902	12906

SOLARFLEX A - MONO (19 mm thick insulation)	DN 16	DN 20
Stainless-steel pipe, 10m, incl. insulation, 4 nuts with lock rings and hex nipple	12911	12915
Stainless-steel pipe, 20m, incl. insulation, 4 nuts with lock rings and hex nipple	12912	12916
Stainless-steel pipe, 30m, incl. insulation, 4 nuts with lock rings and hex nipple	12913	12917
Stainless-steel pipe, 50 m, incl. insulation	12914	12918

ACCESSORIES TO SOLARFLEX A STAINLESS STEEL TUBES

Stainless steel tubes are supplied with necessary connecting elements which can be also ordered separately.



Set of 4 nuts, lock rings and gaskets, with one threaded nipple.
Code - 9644 (DN16)
Code - 9645 (DN20)

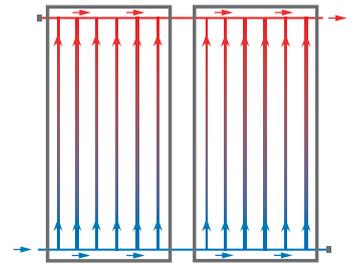


Set of 4 wall clamps, with hanger bolts and dowels.
Code - 9641 (for DUO)
Code - 12932 (for MONO)

Besides that also uninsulated flexible stainless-steel pipes are available for solar thermal systems - for the overview please consult the Catalogue.

SOLAR FLUID

Heat transfer fluid flows into the collector through the lower manifold where it is distributed into separate vertical tubes welded directly to the absorber. The fluid that has flown through the vertical tubes is led into the upper horizontal collector pipe and leaves the collector through return piping.



In order to allow all year round use of a solar thermal system for domestic water heating, special antifreeze fluid shall be used for heat transfer from solar collectors to a hot water storage tank or thermal store. The fluid will ensure protection of the whole system against freezing and frost damage in the winter.

It is recommended to use SOLARTEN SUPER antifreeze fluid in Regulus solar thermal systems. The fluid can be mixed with previously sold Solarten SUPER+ and Solarten HT types.

The fluid contains corrosion inhibitors and stabilizers for an increased thermal stability and extended lifetime.

Fluid properties

Freezing point	-28 °C
Operating temperature	up to 230 °C
Short-term overheating	300 °C
Colour	yellow

It is recommended to check the freezing point every 2 years.

Fluid packaging

Fluid packaging	Code
Plastic container 5l	10109
Plastic container 10l	10110
Plastic container 25l	10069
Plastic container 60l	10111
Barrel 200l	10112



Accessories to handle antifreeze fluid



Filling push cart with a powerful pump designed for professional filling and air venting of sealed systems like solar thermal systems, floor and wall heating circuits.

Code: 9561



Manual filling pump suitable for smaller solar thermal systems. It may stay installed in a system for a solar fluid top-up when needed.

Code: 15111

Code: 15054

- pump with 600 ml container



Electric filling and top-up pump, involving a reliable low-noise piston pump that is easy to use.

Code: 9688



Manual Refractometer (frost protection measurer) for freezing point measurement of anti-freeze fluids.

Code: 6933

AIR REMOVAL FROM SOLAR THERMAL SYSTEMS

Important components of all solar thermal systems are air removal elements. These are components securing trouble-free operation of a solar thermal system working under high temperatures that prevent possible reduction of their efficiency caused by the presence of air.



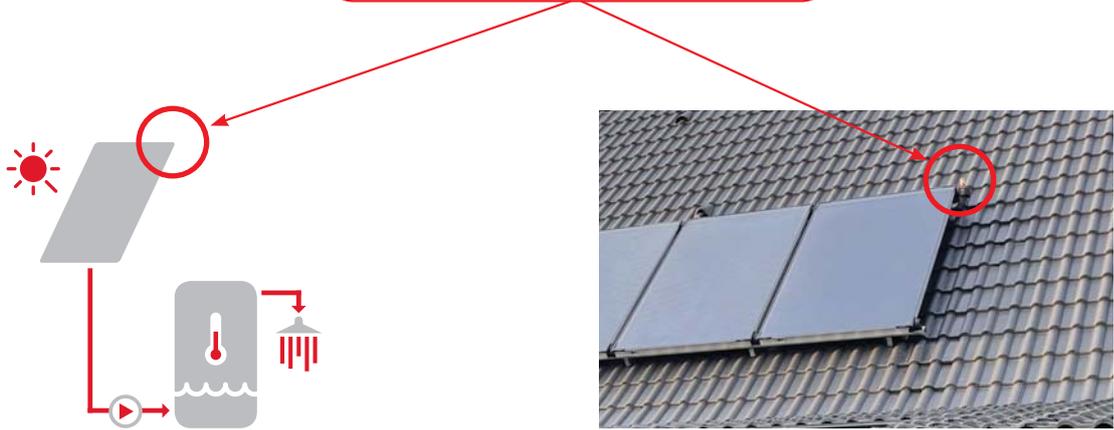
They are designed to remove air from a sealed solar thermal system, especially during its filling and commissioning. An air vent valve shall be placed at its highest point, usually directly at a collector outlet or to a pipe near the collector. In order to reach very good air separation, slower speed of fluid is necessary at the air vent. This is usually done by installing an air separator that brings a wider pipe diameter at the spot which ensures better separation of air bubbles from the fluid. The air removal itself from the solar thermal system is then performed through air vent valves, either manual or automatic ones.

For even more perfect air removal from solar thermal systems, another (vertical) air separator is usually fitted in compact solar pump stations incl. an air vent valve.

After the system has been filled, air vent valves shall be closed in order to avoid undesirable leaks of solar fluid during operation.



Typical location for an air vent valve



Valves for solar thermal systems	Code
Air vent valve, 3/8", bottom connection, up to 150°C	6118
Ball valve, 3/8" M/F, up to 160°C, under air vent valve	7250
Safety valve, 1/2" F, 6bar, up to 140°C, for solar thermal systems	1616
Safety valve 1/2"x3/4" M/F, 6 bar, up to 150 °C, for solar thermal systems	16680

Air separators and accessories	Code
Air separator in brass, horizontal, connections 2x 3/4" M, 3/8" F to air vent valve	11591
Vertical air separator with G 3/4" MF manual air vent valve	11224

Air vent kits	Code
Kit of air separator and air vent valve for solar thermal systems	13308
Insulation set for air separator and air vent valve	13197

EXPANSION VESSELS

The function of pressure expansion vessels is to compensate for fluid volume changes caused by temperature changes, and to keep the system pressure within the necessary limits. The vessels are made of high quality steel and treated with anti-corrosion surface coating. The steel vessel is fitted with an impermeable, highly elastic membrane resistant to high temperatures. In vessels of 50l volume and more, the inner membrane is replaceable. An expansion vessel in solar thermal systems shall be sized for a temperature difference between the min. winter temperature and max. summer temperature, and it shall be able to contain the fluid of all collectors in case of stagnation.

Data sheets for solar collectors involve the recommended sizes of expansion vessels depending on the number of collectors for elevation up to 20m and for the total length of the feed and return pipes up to 30m.

In all other cases the expansion vessel size shall be calculated. A wrongly sized expansion vessel may cause damage to life, health, property or environment.

Wall hung models



Name	Volume	Connection	Max. working pressure	Code
SL012 Expansion vessel	12	3/4"	8	13720
SL018 Expansion vessel	18	3/4"	8	13721
SL025 Expansion vessel	25	3/4"	8	13722
SL040 Expansion vessel	40	3/4"	8	13723

2.5 bar pre-charge pressure, up to 130° C working temperature.

Floor standing models, with replaceable membrane



Name	Volume	Connection	Max. working pressure	Code
SL050 Expansion vessel	50	3/4"	10	13724
SL080 Expansion vessel	80	3/4"	10	13725
SL100 Expansion vessel	100	1"	10	13726
SL150 Expansion vessel	150	6/4"	10	13727
SL200 Expansion vessel	200	6/4"	10	13728
SL300 Expansion vessel	300	6/4"	10	13729
SL500 Expansion vessel	500	6/4"	8	13730

2.5 bar pre-charge pressure, up to 130° C working temperature.

Wall brackets for expansion vessels



Expansion vessel bracket and connection kit - code: 7766

Connection fittings (with G 3/4" F and M threads) with a double check valve, permitting quick and safe expansion vessel disconnection without any leaks.



Wall bracket

code: 12174



Connection valve

3/4" - code: 8770

1" - code: 12295

6/4" - code: 14492

More components for solar thermal systems can be found in our **Heat Accumulation** catalogue.

SOLAR CONTROLLERS

These controllers are intended to control solar thermal systems with one or two solar collector arrays and up to 3 solar consumers. The solar consumers may be hot water storage tanks, pool heat exchangers, or thermal stores designed for heating.

They involve functions for efficient operation of solar thermal systems and permit solar pump speed control. They are user-friendly, featuring help function and menu in various languages. The graphic screen enables easy display and selection from typical solar thermal systems. They can be used as universal differential thermostats or as time and temperature-switched thermostats. SRS controllers are also equipped with CAN bus that permits to connect mutually 2 or more controllers or connect a controller with a datalogger to share data.

Main advantages:

- both graphics and texts on a backlit display
- simple viewing of the current measurement values
- analysis and monitoring of the system also by means of statistical graphics
- extensive setting menus with explanations
- menu lock can be activated to prevent unintentional setting changes
- usual preset parameters in factory setting

STDC E SOLAR CONTROLLER

STDC E controller is designed for use with single-array solar thermal systems with one heat collection circuit. Two Pt1000 temperature sensors are included.

SRS1 T SOLAR CONTROLLER

SRS1 T controller is designed for use with single-array solar thermal systems with one heat collection circuit. It also includes a potentialfree contact for switching a boiler/heating element of max. 3 kW power input, PWM/0-10V output, iPWM flow rate data and two Pt1000 temperature sensors.

SRS2 TE SOLAR CONTROLLER

SRS2 TE controller is designed for use with solar thermal systems with one solar array and one solar consumer, permitting to switch directly an auxiliary heat source of up to 3.5 kW power input (electric heating element, gas boiler, heat pump) and a circulation pump. Three Pt1000 temperature sensors are included.

SRS3 E SOLAR CONTROLLER

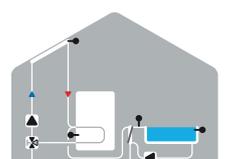
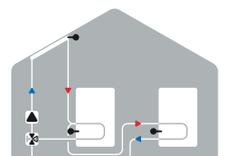
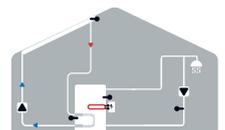
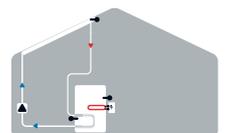
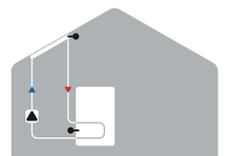
SRS3 E controller is designed for use with solar thermal systems with 2 independent solar arrays and one solar consumer or one solar array and up to 2 solar consumers or for 2 independent solar thermal systems. When connected with one solar array and one solar consumer also other functions can be used - auxiliary source, heating circuit return preheating, solid-fuel boiler control, heat exchange, cooling.... Three Pt1000 temperature sensors are included.

SRS6 EP SOLAR CONTROLLER

SRS6 EP controller is designed for use with solar thermal systems with 2 independent solar arrays and one or two solar consumers or one solar array and up to 3 solar consumers or for 2 independent solar thermal systems. In simple hydraulic variants where some outlets remain free, also other functions can be used - auxiliary source, heating circuit return preheating, solid-fuel boiler control, heat exchange, cooling... The controller enables 2 flowmeters to be connected. Five Pt1000 temperature sensors are included.

Solar thermal systems can be controlled also by IR weather compensated controllers that are designed to control heating systems as well.

MOST COMMON LAYOUTS



SOLAR CONTROLLERS - PARAMETER OVERVIEW



Name	SRS1T	STDC E	SRS2 TE	SRS3 E	SRS6 EP
Code	17570	13164	14388	13166	13168
Application	control of 2 outputs (1 mech. relay, 1 optional 0-10V or PWM), 3 inputs for Pt1000 temperature sensors and 1 iPWM input for reverse flow rate reading from a pump	control of 2 outputs (1 mech. relay, 1 optional 0-10V or PWM), 3 inputs for Pt1000 temperature sensors	control of 4 outputs (3 mech. relays, 1 optional 0-10V or PWM), 4 inputs for Pt1000 temperature sensors	control of 3 outputs (2 mech. relays, 1 optional 0-10V or PWM), 4 inputs for Pt1000 temperature sensors	control of 5 outputs (3 mech. relays, 2 optional 0-10V or PWM), 6 inputs for Pt1000 temperature sensors
Number of hydraulic variants for solar thermal and heating systems	6	9	8	27	42
Solar features					
1 separate collector array	YES	YES	YES	YES	YES
2 separate collector arrays	NO	NO	NO	YES ¹⁾	YES
1 solar consumer	YES	YES	YES	YES	YES
2 solar consumers	NO	NO	NO	YES ⁴⁾	YES
3 solar consumers	NO	NO	NO	NO	YES ⁴⁾
2 separate solar thermal systems	NO	NO	NO	YES ⁶⁾	YES ⁶⁾
Collector protective cooling (pump cycles)	YES	YES	YES	YES	YES
Solar consumer night cooling	YES	YES	YES	YES	YES
Cooling by external heat exchanger	NO	NO	NO	YES ^{1) 4)}	YES ^{1) 4)}
CAN port	NO	NO	YES	YES	YES
Free differential function	NO	NO	NO	YES ⁵⁾	YES ⁵⁾
VFS flowmeter input	NO	NO	NO	NO	2 x
PWM circulation pump speed control	YES	YES	YES	YES	2 x
Features parallel with solar thermal system (one of them only)					
Switching of DHW heating by auxiliary heat source	YES	NO	YES ²⁾	YES	YES
DHW heating from thermal store	NO	NO	NO	YES	YES ⁷⁾
DHW recirculation	YES	NO	YES	NO	NO
Solid-fuel boiler function ⁸⁾	NO	NO	NO	YES	YES
Heating circuit return preheating	NO	NO	NO	YES	YES ⁷⁾
Features instead of solar thermal system (one of them only)					
Switching of DHW heating by auxiliary heat source	NO	YES ³⁾	NO	YES	YES
DHW heating from thermal store	NO	YES	NO	YES	YES
Solid-fuel boiler function ⁸⁾	NO	YES	NO	YES	YES
Universal thermostat	NO	YES	NO	YES	YES
dT differential function	NO	YES	NO	YES	YES
Heating circuit return preheating	NO	YES	NO	YES	YES
¹⁾	systems with one solar consumer only				
²⁾	direct switching of AC3 power output up to 3 kW				
³⁾	without universal thermostat timer functions				
⁴⁾	systems with one solar array only				
⁵⁾	only as heating circuit return preheating or heat exchange functions				
⁶⁾	one collector to one solar consumer only				
⁷⁾	combination with DHW aux heating possible				
⁸⁾	switching of a circulation pump in a solid-fuel boiler primary circuit based on a temperature difference				

SINGLE-LINE PUMP STATIONS

Single-line pump stations are designed to be installed in the return line of a solar thermal system. All pump stations are equipped with a return line thermometer, a circulation pump and isolating ball valves enabling the pump to be replaced. In pump stations equipped with a flowrate indicator, there is only one ball valve used, and shut-off below the pump can be done with a control valve above the scale of the flowrate indicator. For filling and draining the solar system, two valves with a cap and a thread for connecting the hoses of the filling cart are fitted. Furthermore, the pump station contains safety elements of the solar thermal system - 6 bar safety valve, pressure gauge and a G 3/4" M outlet for connecting an expansion vessel.

PUMP STATIONS WITH SRS1T CONTROLLER

SRS1T Pump stations are internally wired and fitted with a 3m power cable with plug and two temperature sensors. The controller enables direct control of an auxiliary heat source with an electrical power input up to 3 kW.

CSE1 SOL SRS1 Pump Stations



Pump model	Flowrate measurement	Connection	Code
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 3/4" M	20566
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 1" M	20575
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	Cu 22	20584
Grundfos UPM3 Hybrid 7m	indicator 2-12 l/min	G 3/4" M	20576
Grundfos UPM3 Hybrid 7m	indicator 8-28 l/min	G 1" M	20572

CSE SOL SRS1 Pump Stations



Pump model	Flowrate measurement	Connection	Code
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 3/4" M	17726
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 1" M	17902
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	Cu 18	18117
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	Cu 22	17903
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	Cu 28	17904
Grundfos UPM3 Hybrid 7m	indicator 2-12 l/min	G 3/4" M	18969
Grundfos UPM3 Hybrid 7m	indicator 8-28 l/min	G 1" M	18960

PUMP STATIONS WITH SRS1T CONTROLLER AND SOCKET FOR EL. HEATING ELEMENT

SRS1 T-E Pump stations are internally wired, fitted with a 3m power cable with plug, three temperature sensors and a socket for a simple connection of an ETT-N el. heating element (element with a connector). The SRS1 T-E HDO variant enables blocking by Ripple control signal.

CSE1 SOL SRS1 T-E Pump Stations



Pump model	Flowrate measurement	Connection	Code
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 3/4" M	20574
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 1" M	20570
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	Cu 22	20578

CSE SOL SRS1 T-E Pump Stations



Pump model	Flowrate measurement	Connection	Code
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 3/4" M	16955
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 1" M	17318
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	Cu 18	18118
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	Cu 22	16965
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	Cu 28	17319
Grundfos UPM3 Hybrid 7m	indicator 2-12 l/min	G 3/4" M	18970
Grundfos UPM3 Hybrid 7m	indicator 8-28 l/min	G 1" M	18962

CSE1 SOL SRS1 T-E HDO Pump Stations



Pump model	Flowrate measurement	Connection	Code
Wilco PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 3/4" M	20580
Wilco PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 1" M	20582

CSE SOL SRS1 T-E HDO Pump Stations



Pump model	Flowrate measurement	Connection	Code
Wilco PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 3/4" M	17350
Wilco PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 1" M	17349
Wilco PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	Cu 22	17351
Wilco PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	Cu 28	17352
Grundfos UPM3 Hybrid 7m	indicator 2-12 l/min	G 3/4" M	18968
Grundfos UPM3 Hybrid 7m	indicator 8-28 l/min	G 1" M	18964

PUMP STATIONS WITH SRS1T CONTROLLER AND SOCKET FOR SWITCHING AN AUXILIARY HEAT SOURCE

SRS1 T-K Pump stations are internally wired, fitted with a 3m power cable with plug, three temperature sensors and a socket and a 4m cable with connector for switching an auxiliary heat source.

CSE1 SOL SRS1 T-K Pump Stations



Pump model	Flowrate measurement	Connection	Code
Wilco PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 3/4" M	20571
Wilco PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 1" M	20567

CSE SOL SRS1 T-K HDO Pump Stations



Pump model	Flowrate measurement	Connection	Code
Wilco PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 3/4" M	17899
Wilco PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 1" M	17898
Wilco PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	Cu 18	18119
Wilco PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	Cu 22	17900
Wilco PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	Cu 28	17901
Grundfos UPM3 Hybrid 7m	indicator 2-12 l/min	G 3/4" M	18971
Grundfos UPM3 Hybrid 7m	indicator 8-28 l/min	G 1" M	18966

PUMP STATIONS WITH NO CONTROLLER

Pump stations marked P are equipped either with a Wilco PARA ST 25/7 iPWM circulation pump (usable only in cooperation with PWM controllers), or with a Grundfos UPM3 Hybrid 7m circulation pump, ON/OFF controlled ($\Delta p-c$ / $\Delta p-v$ / I,II,III / Autoadapt) or PWM-C controlled (usable in cooperation with PWM controllers or with older solar controllers with 230V circulation pump switching). These pump stations contain a mechanical float flow indicator.

CSE1 SOL P Pump Stations



Pump model	Flowrate measurement	Connection	Code
Wilco PARA ST 25/7 iPWM2	indicator 2-12 l/min	G 3/4" M	19981
Wilco PARA ST 25/7 iPWM2	indicator 8-28 l/min	G 1" M	19991
Wilco PARA ST 25/7 iPWM2	indicator 2-12 l/min	Cu 22	20568
Grundfos UPM3 Hybrid 7m	indicator 2-12 l/min	G 3/4" M	19987
Grundfos UPM3 Hybrid 7m	indicator 8-28 l/min	G 1" M	19984

CSE SOL P Pump Stations



Pump model	Flowrate measurement	Connection	Code
Wilco PARA ST 25/7 iPWM2	indicator 2-12 l/min	G 3/4" M	17155
Wilco PARA ST 25/7 iPWM2	indicator 8-28 l/min	G 1" M	17325
Grundfos UPM3 Hybrid 7m	indicator 2-12 l/min	G 3/4" M	18958
Grundfos UPM3 Hybrid 7m	indicator 8-28 l/min	G 1" M	18957

TWIN-LINE PUMP STATIONS

Twin-line pump stations are designed to be installed in the flow or return line of a solar thermal system. The return line is equipped with a return line thermometer, a circulation pump and isolating ball valves enabling the pump to be replaced. In pump stations equipped with a flowrate indicator, there is only one ball valve used, and shut-off below the pump can be done with a control valve above the scale of the flowrate indicator. For filling and draining the solar system, two valves with a cap and a thread for connecting the hoses of the filling cart are fitted. Furthermore, the pump station contains safety elements of the solar thermal system - 6 bar safety valve, pressure gauge and a G 3/4" M outlet for connecting an expansion vessel. The flow line contains also a thermometer, a ball valve and an air separator for easier air discharge from the solar thermal system.

PUMP STATIONS WITH SRS1T CONTROLLER

SRS1T Pump stations are internally wired and fitted with a 3m power cable with plug and two temperature sensors.

CSE2 SOL SRS1T Pump Stations



Pump model	Flowrate measurement	Connection	Code
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 3/4" M	20564
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 1" M	20579
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	Cu 22	20573
Grundfos UPM3 Hybrid 7m	indicator 2-12 l/min	G 3/4" M	20581
Grundfos UPM3 Hybrid 7m	indicator 8-28 l/min	G 1" M	20577

PUMP STATIONS WITH SRS1T CONTROLLER AND SOCKET FOR EL. HEATING ELEMENT

SRS1 T-E Pump stations are internally wired, fitted with a 3m power cable with plug, three temperature sensors and a socket for a simple connection of an ETT-N el. heating element (element with a connector). The SRS1 T-E HDO variant enables blocking by Ripple control signal.

CSE2 SOL SRS1 T-E Pump Stations



Pump model	Flowrate measurement	Connection	Code
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 3/4" M	20557
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 1" M	20558
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	Cu 22	20560
Grundfos UPM3 Hybrid 7m	indicator 2-12 l/min	G 3/4" M	20522
Grundfos UPM3 Hybrid 7m	indicator 8-28 l/min	G 1" M	20556

CSE2 SOL SRS1 T-E HDO Pump Stations



Pump model	Flowrate measurement	Connection	Code
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 3/4" M	20526
Wilo PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 1" M	20551

PUMP STATIONS WITH SRS1T CONTROLLER AND SOCKET FOR SWITCHING AN AUXILIARY HEAT SOURCE

SRS1 T-K Pump stations are internally wired, fitted with a 3m power cable with plug, three temperature sensors and a socket and a 4m cable with connector for switching an auxiliary heat source.

CSE2 SOL SRS1 T-K Pump Stations



Pump model	Flowrate measurement	Connection	Code
Wilco PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 3/4" M	20569
Wilco PARA ST 25/7 iPWM2	electronically on the display 2-20 l/min	G 1" M	20583

PUMP STATIONS WITH SRS3 E CONTROLLER

SRS3 E Pump stations are internally wired, fitted with a 3m power cable with plug and three temperature sensors. They are intended for solar thermal systems with one collector array and up to 2 consumers, or two independent arrays and one consumer, or with an auxiliary switched heat source (e.g. electric heating element, gas boiler etc.).

CSE2 SOL SRS3 E Pump Stations



Pump model	Flowrate measurement	Connection	Code
Wilco PARA ST 25/7 iPWM2	indicator 2-12 l/min	G 3/4" M	20373
Wilco PARA ST 25/7 iPWM2	indicator 8-28 l/min	G 1" M	20452
Wilco PARA ST 25/7 iPWM2	indicator 2-12 l/min	Cu 22	20457
Grundfos UPM3 Hybrid 7m	indicator 2-12 l/min	G 3/4" M	20372
Grundfos UPM3 Hybrid 7m	indicator 8-28 l/min	G 1" M	20453

PUMP STATIONS WITH NO CONTROLLER

Pump stations marked P are equipped either with a Wilco PARA ST 25/7 iPWM circulation pump (usable only in cooperation with PWM controllers), or with a Grundfos UPM3 Hybrid 7m circulation pump, ON/OFF controlled (Δp -c / Δp -v / I,II,III / Autoadapt) or PWM-C controlled (usable in cooperation with PWM controllers or with older solar controllers with 230V circulation pump switching). These pump stations contain a mechanical float flow indicator.

CSE2 SOL P Pump Stations



Pump model	Flowrate measurement	Connection	Code
Wilco PARA ST 25/7 iPWM2	indicator 2-12 l/min	G 3/4" M	19985
Wilco PARA ST 25/7 iPWM2	indicator 8-28 l/min	G 1" M	19988
Wilco PARA ST 25/7 iPWM2	indicator 2-12 l/min	Cu 22	20549
Grundfos UPM3 Hybrid 7m	indicator 2-12 l/min	G 3/4" M	19990
Grundfos UPM3 Hybrid 7m	indicator 8-28 l/min	G 1" M	19983

S2 Solar 2 Pump Station



Pump model	Flowrate measurement	Connection	Code
Wilco PARA MAXO 25/1-8	indicator 20-70 l/min	G 6/4" M	14868



