
# OPTICUBE

EASY & LARGE SOLAR THERMAL KIT

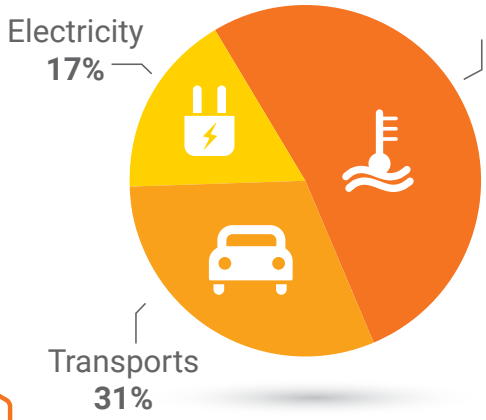
EN

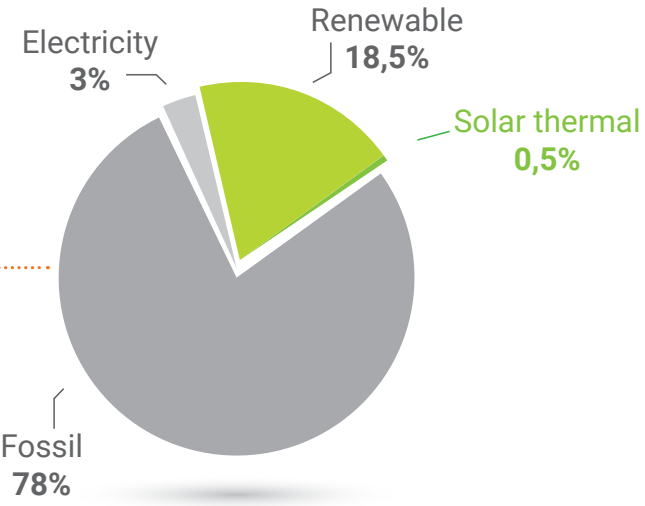
# ALL IN ONE
# SOLAR THERMAL KIT

The Opticube is an easy and large « all-in-one » solar thermal kit, removing the barriers to solar thermal industry development. All the technical complexity has been considered and integrated in a 20 feet container. The hydraulic part is entirely pre-assembled: what remains to be done on site is the mounting of the metallic structure and of the collectors, which can be handled quickly and easily by anyone. Such as in the sales strategy of a famous Swedish furniture firm, you just have to follow the guidebook! This system brings up to 40% total cost reduction in comparison to a classic solar thermal installation, while producing a 100% green energy, for less than 20€/MWh. Save the planet, save your money!

OPTICUBE
EASY & LARGE SOLAR THERMAL KIT

# THE CHALLENGE




1

## The heat demand

Heat is an absolute necessity all over the world. It's so important that it represents more than half of the world energy demand.

2

## Fossil energies

Heat is mainly produced using fossil energies. Those are harmful for our planet and are more and more expensive.

3

## Use of green energies

As part of the energy transition, we have to strongly reduce our greenhouse gases emissions.

4

## Solar thermal: the "noblest" energy

Among all those renewable energies, solar thermal is the most ideal on paper:

- Free energy source (the sun)
- High efficiency (>85%)
- Proven technology
- High reliability (>30 years)
- No deforestation
- Preservation of cultivable fields
- Self-consumption

5

## And yet...

Despite the advantages of this technolgy, the participation of solar thermal to the global heat demand weighs less than 0.5%. This is due to:

- Complexity (specialists needed)
- High set-up time
- Cost of the installation
- Integration to the  exisiting building

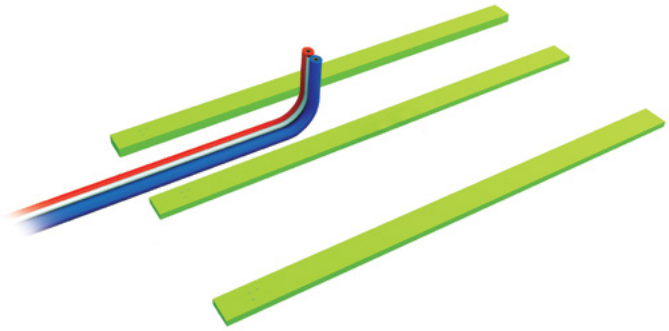
# Solar thermal: an ideal

6

## Opticube: a revolutionary solution !

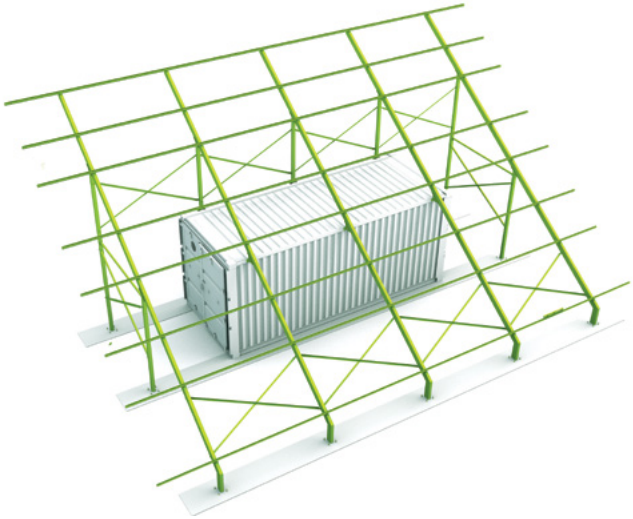
Sunoptimo has designed a product able to solve the barriers to the development of solar thermal. The technical complexities are bypassed thanks to this «all in one» kit. Solar thermal technolgy becomes mountable by anyone, and the set-up time of the system is incredibly low.

# AN EASY, QUICK AND EFFICIENT MOUNTING



**1|** Concrete studs to support the container and its metallic structures. Two pipes come from the boiler room, and will be linked to the Opticube.

**2|** A crane truck lays down the container on the concrete. The pipes from the boiler room are linked to the container through a trap door.



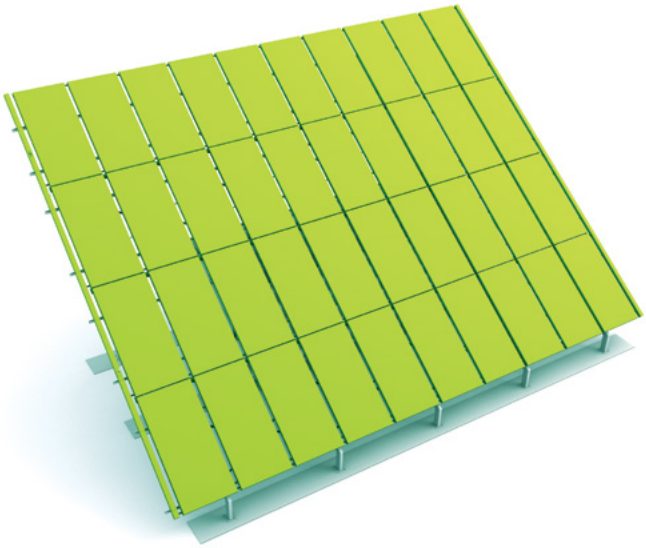
**3|** Mounting of the primary structure on the container and individual supports. Aluminium rails are then fixed to the primary structure.

**4|** Last step: the collectors are set on the aluminium rails, are linked together and connected to the pre-mounted primary circuit connections, waiting for the flow.

The mounting of the collectors starts from the bottom. The following collectors simply line up above the first ones.

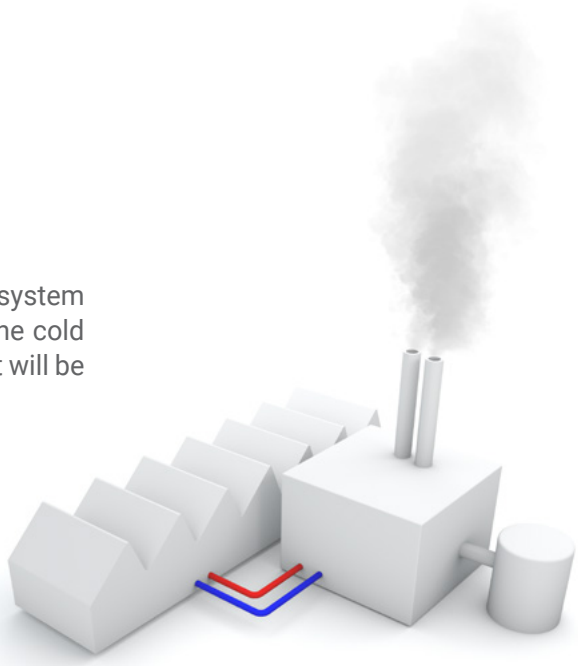
Each collector is linked to the previous one both mechanically through specific fixings and hydraulically with Opticonnect which allows the absorption of the dilation and the relative motion of each collector.

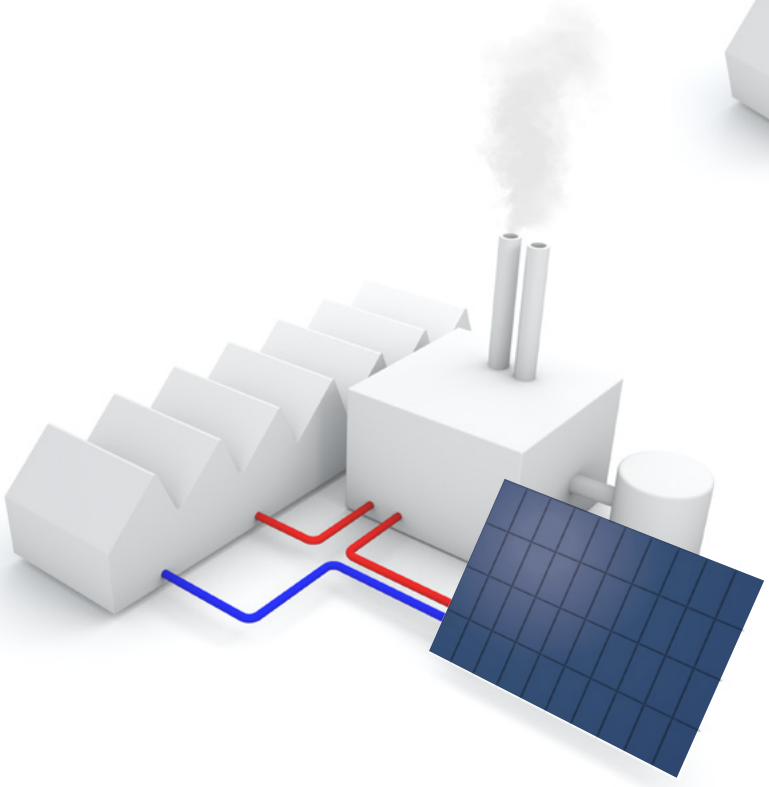
Once the collectors are set, the pre-isolated piping directly links the collectors lines to each other and further to the container.



**Thanks to this "all in one" kit**, Sunoptimo has changed the solar thermal dynamics. Previously considered as a technology requiring specific skills and an important set-up time, it is now synonym of simplicity and rapidity. The observed time for installating and linking the collectors is of about five collectors per hour (with two persons working on it). For instance, it would take approximately 3 days for 2 workers to mount an Opticube 100.

**The integration of the Opticube** into the existing heating system is very simple and can be done by diverting all or part of the cold water entering the boiler room through the Opticube where it will be heated by the solar system.





## An Opticube, how does it work ?

# OPTIMUM SIZING

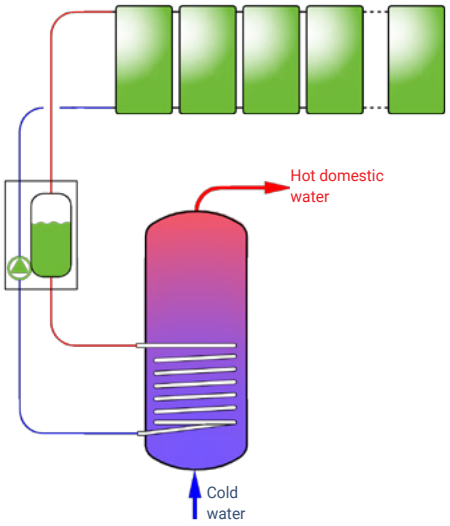
## The functioning of a solar thermal system:

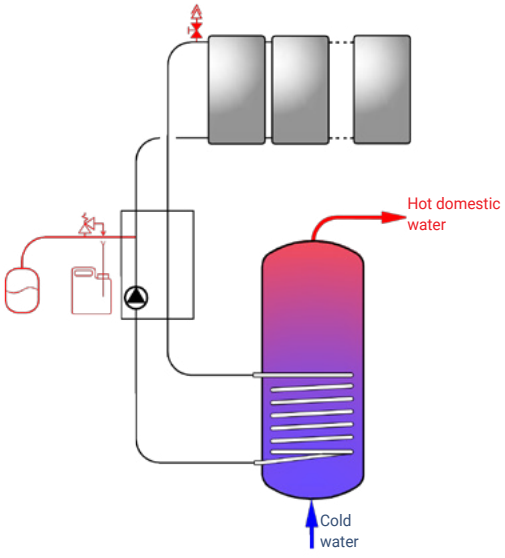
**The sunbeams heat up** the absorber of the solar collectors. The heat is then transmitted to a heat transfer fluid thanks to the coil brazed on the absorber. The heated up fluid is carried off by a pump in a closed piping circuit. Progressively, the heat from the collectors will be transfered to the water located in the tanks. Finally, this free hot water, heated up by solar energy, will be brought to the hot water supply network.

### Two types of technology:

### Drainback Sunoptimo

- The pump is off: the air takes place in the collectors instead of the fluid
- No overheating: the fluid does not deteriorates itself
- No technical limits: Optimum Sizing is possible
- Passive protection of the system
- Low technical maintenance




### Pressurized systems

- The pump is off: the fluid stays in the collectors
- Overheating: the fluid deteriorates itself
- Technical limit due to overheating: sizing limit is about 45%
- High technical maintenance

# Optimum Sizing principle is simple:

**The more** collectors we set up
**The more** the heat demand is covered by solar energy
**The more** we reduce the cost of the auxiliary energy

The ideal number of collectors to install is calculated in order to reach an economic optimum.

**● 100 m²**

Fossil energy

Solar energy
**50%**

**● 150 m²**

Fossil energy

Solar energy
**70%**

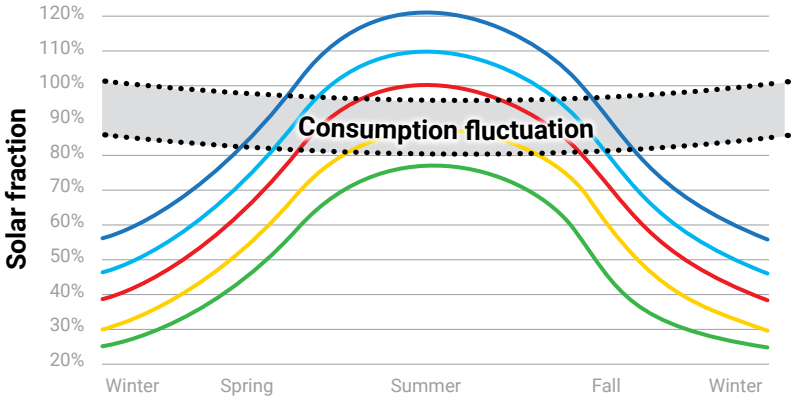
**● 200 m²**

Fossil energy

Solar energy
**80%**

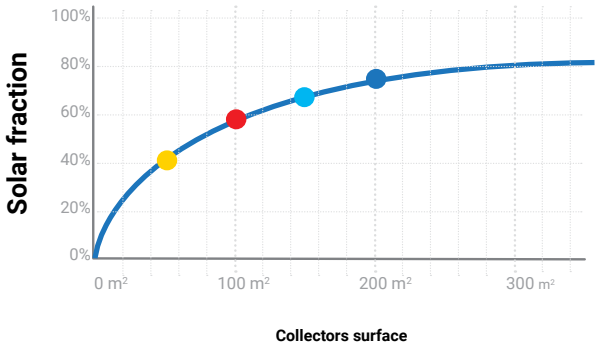
The drainback allows to avoid the overheating of the system. More collectors can then be placed to cover a higher part of the heat need in case the economic calculation advises so.

A pressurized system which would reach 100% of the energy needs at the best time of the year (red line) would suffer from serious damages. This would not happen with a drainback system (blue line).




The Optimum Sizing is calculated through different datas.

The yellow dot represents the solar fraction which is reached by a pressurized system throughout the year. It's far lower than the performances of a drainback Sunoptimo installation (light blue and dark blue dots).



## 1| Analysis of the auxiliary energy cost

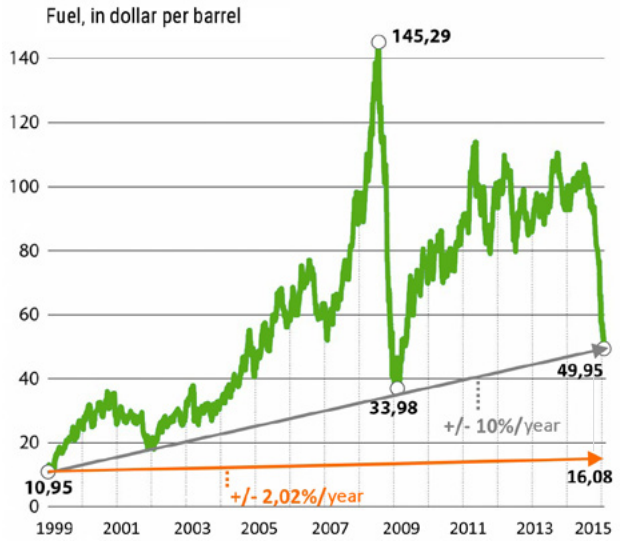
with regard to the solar collectors' surface. The smaller the installation size is, the higher the residual cost to heat water with fossil energy will be.

Taking into account different scenarios for the evolution of fossil energy prices, we can compute the cost of the necessary auxiliary energy depending on the installed surface.

Traditional energies are subject to speculation and the law of supply and demand. In the last 15 years, fuel prices increased on average by 10,4% each year.

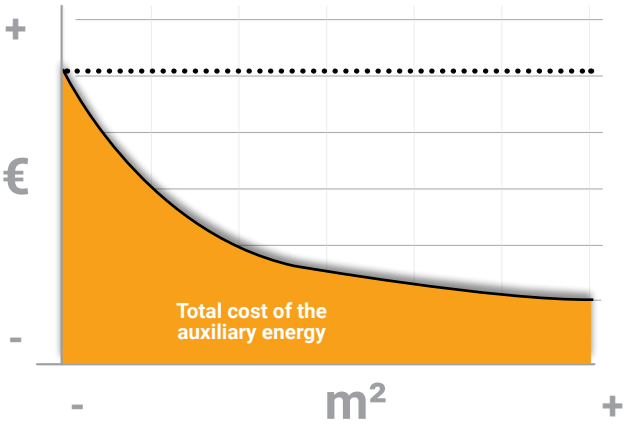
The fixed costs for setting up a solar thermal system being high, the more collectors we place, the lower the cost per m² will be.

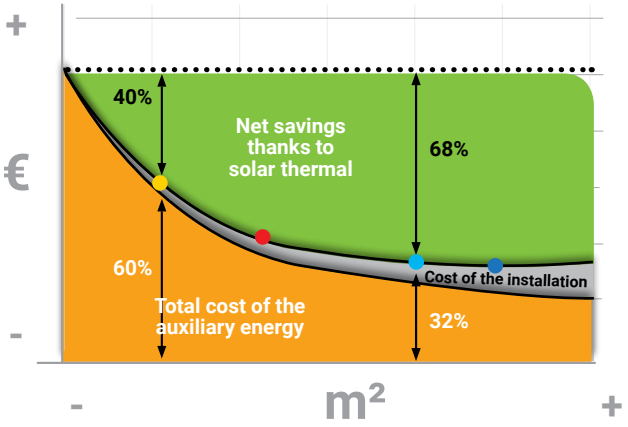
To get the total cost for water heating, we simply add the cost of installation according to the number of collectors to fossil energy spendings.




## 2| Calculation total water heating cost and net savings.

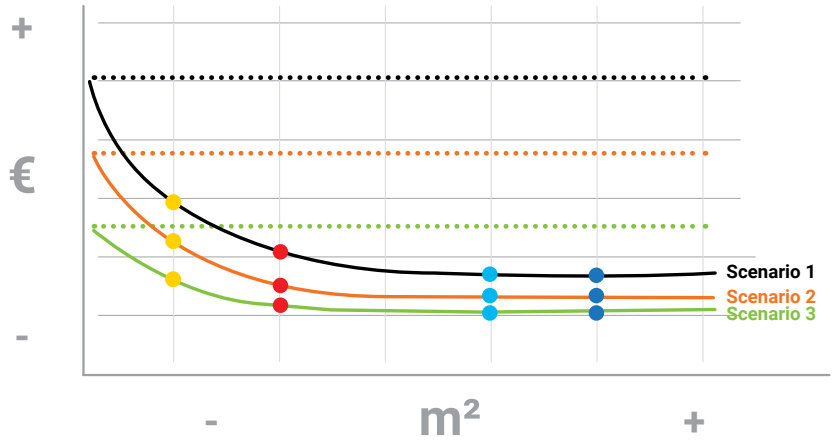
The difference between the total cost with a solar system and the total cost without a solar system corresponds to the profit generated thanks to solar thermal energy after return on investment. The graph shows that, for the given example, the Sunoptimo drainback system and the Optimum Sizing make it possible to save up to 68% on the total energy bill dedicated to heat production, while taking into account the cost of the solar system. The "classic" pressurized system limits the possible savings because of its technical constraints.



**3|** **The MWh price is fixed** for the next 20-30 years. By cross-checking the cost of the installation and of the auxiliary energy (according to the 3 cost evolution scenarios), we get a precise idea of the total cost for water heating. The graph below shows that the higher the collectors' surface, the lower the cost for water heating (until a certain point, corresponding to the Optimum Sizing). Financially speaking, we can observe that even in the case in which the rise of fuel prices wouldn't be outrageous, solar thermal solution remains the best option:

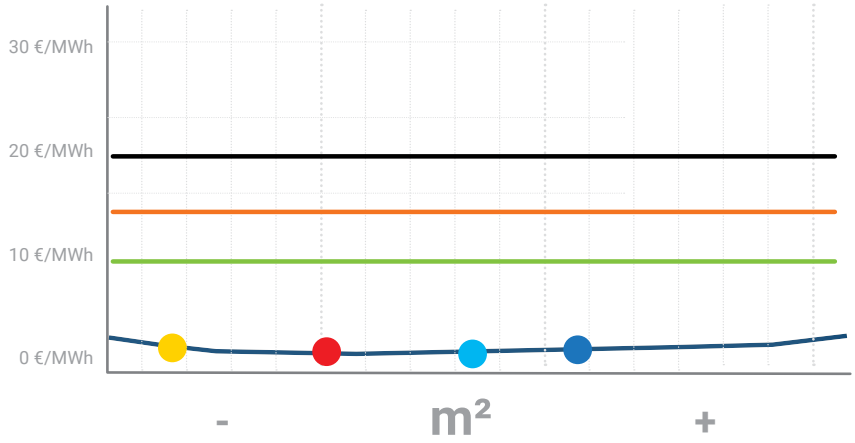
**Total cost (solar + auxiliary, for the 3 evolution scenarios)**




**Scenario 1**: evolution according to what happened in the last 20 years
**Scenario 2**: in between scenario 1 and 3
**Scenario 3**: evolution close to inflation

It's easy to cross-check this information with the hot water consumption in order to fix the net price of a solar MWh. Once again, even if the least favorable scenario happens, the economic advantage brought by solar thermal technology remains important:

**Net cost solar MWh**




Average cost of fossil energy according to the 3 scenarios

## How to size your Opticube?

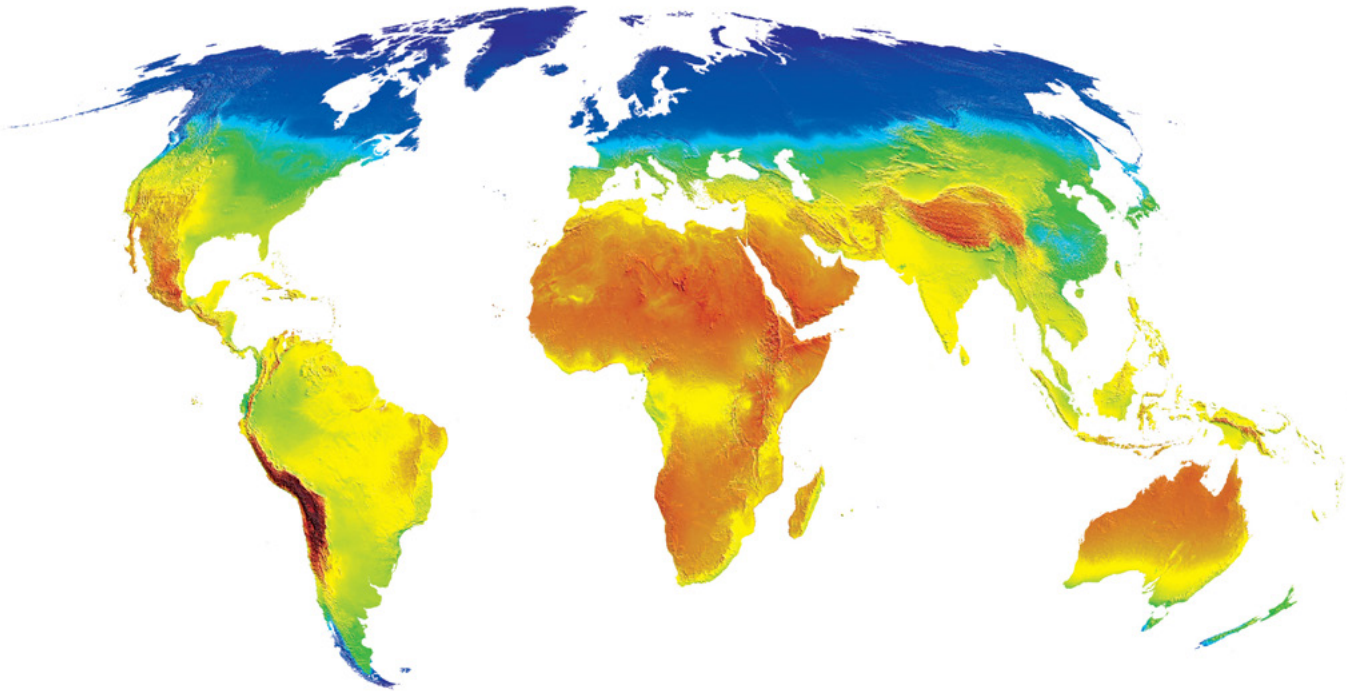
# CALCULATION METHOD

## Step 1 : Locate the geographic area of the project

**Area 1**
<1300 kWh/m²/year

**Area 2**
1300-1500 kWh/m²/year

**Area 3**
1500-2000 kWh/m²/year



**Identify the geographic area** of your project in order to determine the approximate amount of energy the sun provides in your area. The 3 zones are shown in the graphs on the following page and give you an idea of how much energy the sun can bring you according to the size of the selected Opticube model.

## Step 2 : Assess the energy needs

**Your energy needs** are key information to choose the Opticube size.
If you know your daily hot water consumption or your annual kWh (or MWh) need, use the known data. Otherwise, here are some examples often used to assess your consumption.
The results are then reported on the x-axis of the graph on the next page corresponding to your zone.

| Daily hot water consumption (60°c) | |
|---|---|
| **Shower :** | 35 liters/shower |
| **Bath :** | 80 liters/bath |
| **Hotel room with shower :** | 75 liters/night |
| **Company restaurant :** | 4 liters/tableware |
| **Rest-home:** | 30 liters/bed |
| **Hospital :** | 55 liters/bed |
| **Camping :** | 12 liters/shower |
| **Swimming pool (shower) :** | 15 liters/swimmer |
| **Swimming pool (water renewal) :** | 10 liters/swimmer |

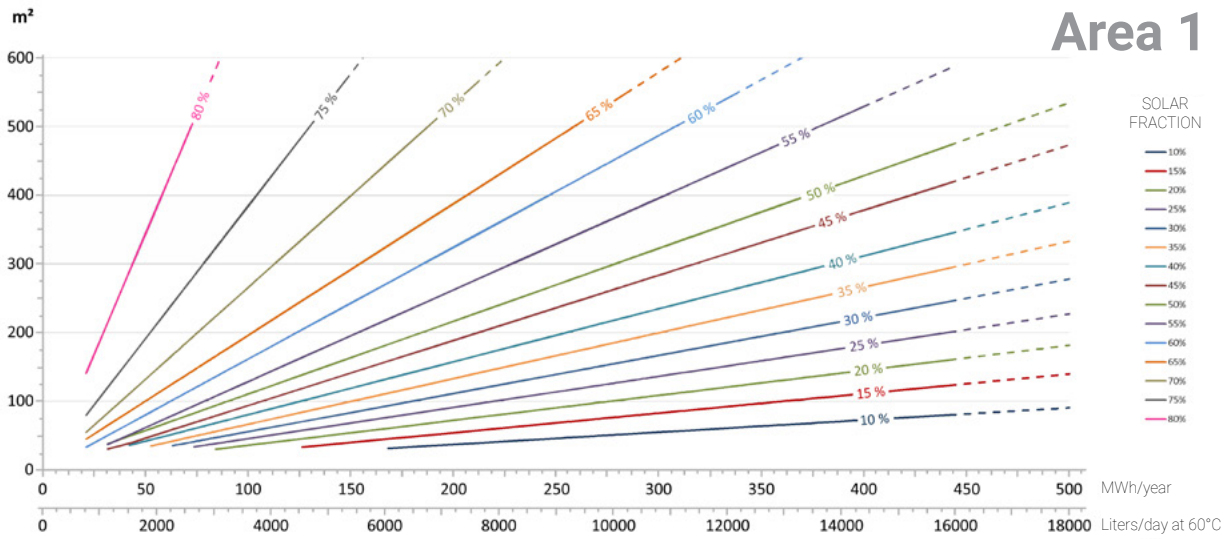
**Conversion in useful kWh (or MWh) according to a gas or fuel consumption**

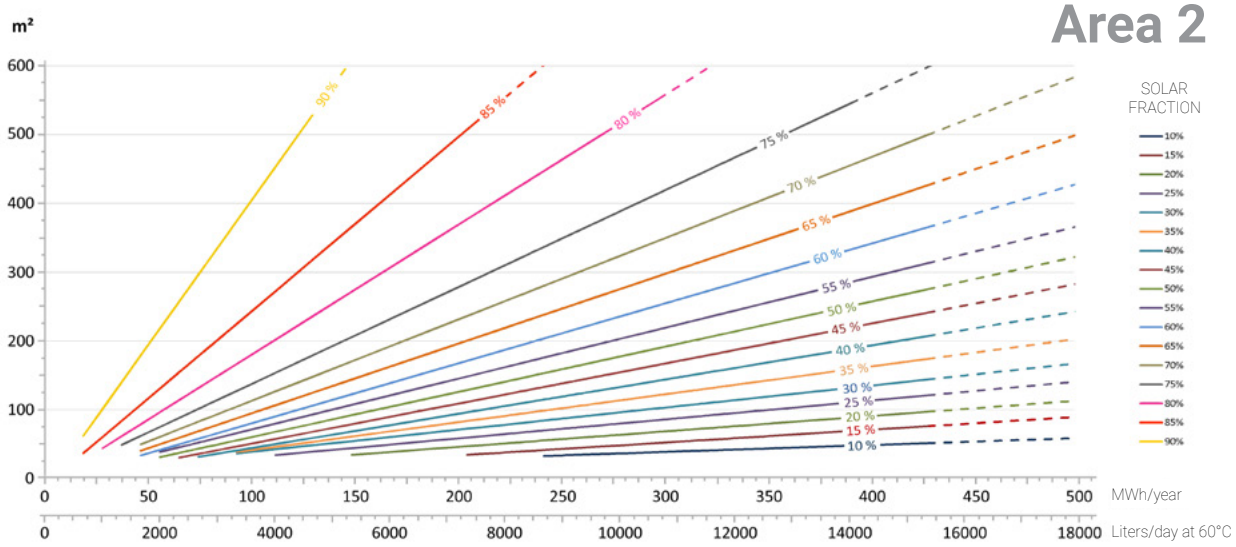
(Taking into account the average efficiency of boilers)

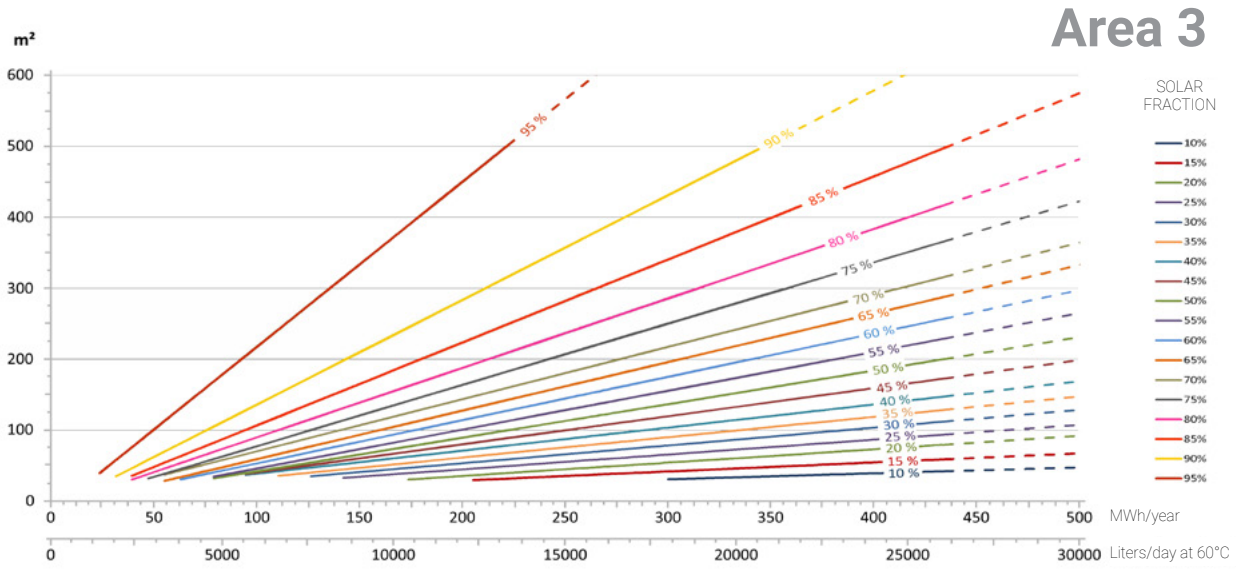
**Fuel**
Consumption [Kwh] = Used liters x 8

**Gas:**
Consumption [Kwh] = Invoiced kWh x 0.8
1000kWh = 1 MWh to report on the x-axis of the next page graph.

## Step 3 : Finding the best solar surface according to the desired savings (solar fraction)



# PRACTICAL EXAMPLES

## With the different sizing steps, it's easy to determine which Opticube perfectly suits your needs.

**In Brazil, a hotel** with 150 rooms with an average occupancy rate of 60% wants to generate 80% savings on the heating of its sanitary water. Its consumption is 6750 liters per day. (150 x 0.6 x 75 liters)

With a 100 m² Opticube, the economic objective of this hotel will be achieved.


**In Italy, a sports complex** consumes annually 315 MWh of gas for heating water. It wants an installation able to produce more than half of its needs for the next 20 years.
Its energy requirements are 250 MWh. (315 MWh x 0.8)

With 250 m² of solar collectors, the gas consumption of this entity will be reduced by 70%!

**In the south side of Spain**, a plant uses 25 m³ of hot water for its process. Anticipating an increase in energy prices, this firm wishes to take advantage of the strong sun in its region to produce its heat economically and respectfully towards the environment.

With two Opticube of 300 m², this company will cover almost 90% of its need for hot water!


**With an annual consumption** of 2000 MWh of heat, this agro-food industry near Lille wants to reduce the cost of its process. By equipping itself with a solar surface of 1200m ², the company drastically dropped its MWh price.

The total savings generated will surpass the million euro mark.

# THE OPTICUBE:
# A LARGE PRODUCT RANGE


## Antifreeze option

In addition to the reinforced insulation of the container, an electric convector is activated if there is any risk of freezing. A recirculation pump (coupled to an electrical resistor) is activated to avoid the freezing of the pipes.

## Electric auxiliary option

Two immersed electric resistors hold a technical water tank at temperature. The water is preheated by the solar system and, if there is a lack of solar energy, the electrical resistances are switched on. In this case there is no need for a back-up storage tank.

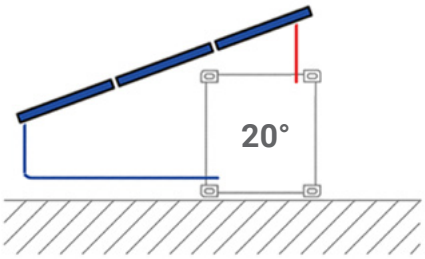
## Hydraulic auxiliary option

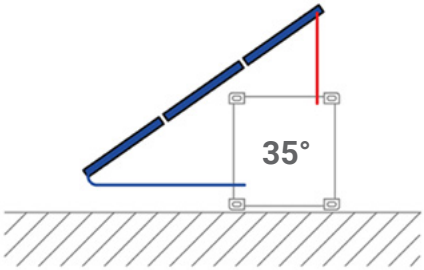
The last technical water tank is kept warm thanks to an immersed coil. The auxiliary energy source can be a gas boiler, oil, wood, pellet or even a heating pump. The water is preheated by the solar system and, if there is a lack of solar energy, the boiler switches on by itself.

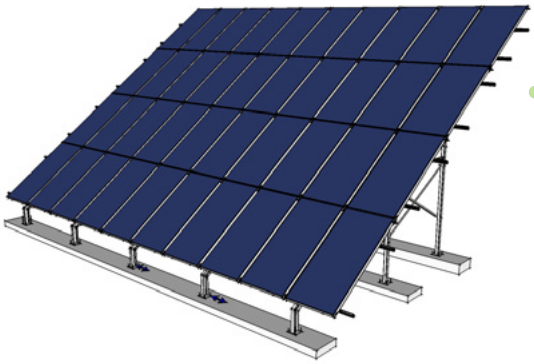
## Hydro-electric option

This option is a mix of the electric backup and hydraulic power supply options.

**The different versions of this system** make its set-up possible everywhere.
The Opticube is available in two inclinations:



Version with 4 collectors high

Version with 3 collectors high

A parking version of the Opticube also exists (3 collectors high):

# OUR REFERENCES

## Our Opticube references

**Wherever it is set up,** the Opticube is source of satisfaction. It allows you to strongly reduce your spendings on water heating while perfectly integrating itself to the existing environment.

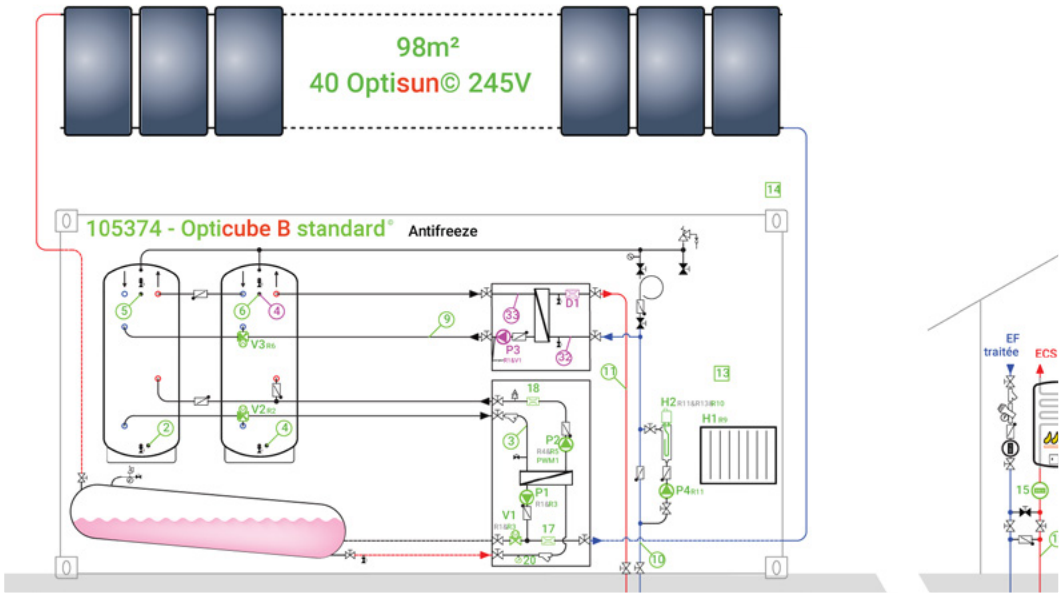
## Our traditional references

**Sunoptimo has become** a major player in the sphere of large scale solar thermal systems.

Many building owners all over Europe have already opted for a Sunoptimo installation.

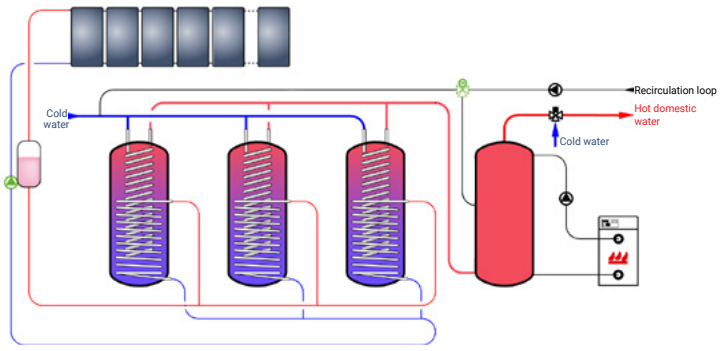
It is of course possible to visit our different systems.

# MONITORING & INSURANCE OF GOOD FUNCTIONING

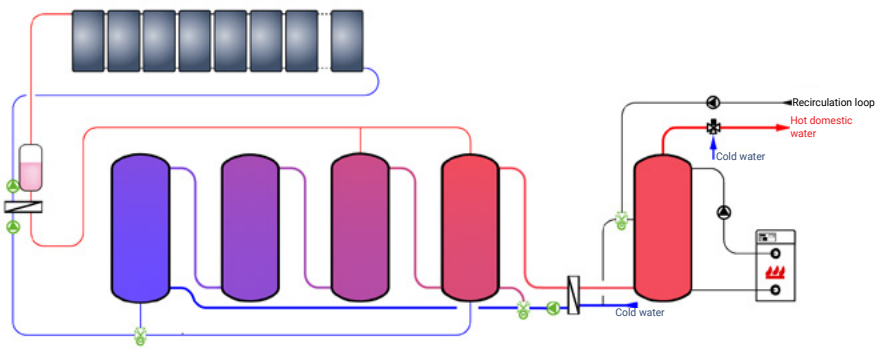



| Energy | Day | Week | Total |
|---|---|---|---|
| **Solar primary** | 105 kWh | 231 kWh | 5317 kWh |
| **Solar secondary** | 89 kWh | 186 kWh | 4789 kWh |
| **Sanitary (S11)** | 37 kWh | 137 kWh | 3684 kWh |
| **Sanitary (S12)** | 35 kWh | 129 kWh | 5024 kWh |

## Collective schema with technical water: Optitank Combi tanks. Ideal for middle scale installations

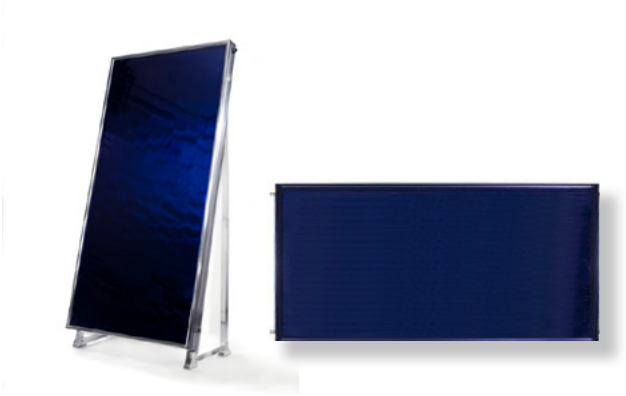



## Collective schema with technical water: Optitank Steel tanks. Ideal for large scale installations



## Solar collector: **Optisun 245™**

**The Optisun 245** is the ideal collector for large scale solar thermal installation. The ergonomy of this collector and its outstanding performances make it easy to deal with huge solar projects. It's the collector used in most Opticube projects

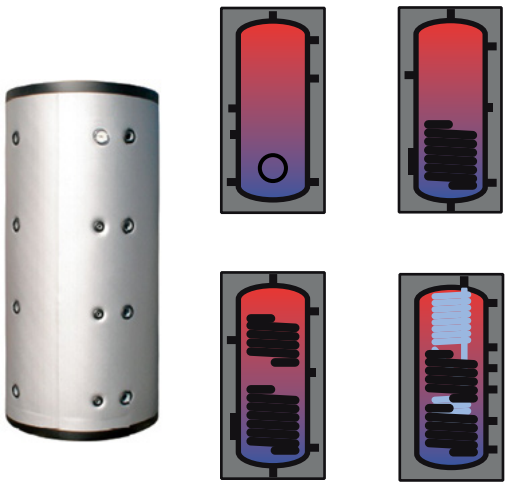


## Hydraulic group: **Optiflow™**

**Thanks to the Optiflow**, the flow of the fluid is optimized. The role of the draining bottle which is linked to the station is to store the fluid when the system is off, and the air when it's w orking. The Optiflow range is adapted for installations from 4 to 200 collectors, with standard or custom made versions (over 500 m²). A specific version of the Optiflow is used in all Opticube.

## Solar tanks: **Optitank™**

**The Optitank range** consists of 4 options: Email, Combi, Steel and Inox. With the Optitank tanks, it's the certitude that every requirement will be satisfied, no matter the construction site. Those tanks make every solar project possible, from the smallest to the most ambitious one. Specific versions of Optitank are used in all Opticube.



## Hot domestic water supply: **Optiaqua™**

**Those systems supply** domestic hot water at the required temperature, for flows from 40 liters/minute to 21 m³/hour. In the case of simultaneous water intake, it's possible to combine those systems to modulate the production ad infinitum. The Optiaqua range consists of 5 versions, which all include their own integrated regulation. A specific version of Optiaqua is used in all Opticube.

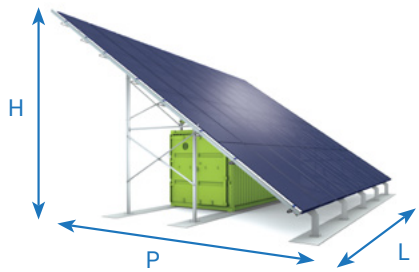
# THE OPTICUBE PRODUCT RANGE

| Number of collectors | Surface in m² | 20° | | | 35° | | | Container type |
|---|---|---|---|---|---|---|---|---|
| | | L x P x H L x 6,7 x 4 | L x P x H L x 8,95 x 4,85 | L x P x H L x 6,7 x 4,8 | L x P x H L x 5,85 x 4,75 | L x P x H L x 7,85 x 6,1 | L x P x H L x 5,85 x 6,45 | |
| 16 | 39 | | L=6,1 | | | L=6,1 | | A |
| 18 | 44 | L=7,7 | | L=7,7 | L=7,7 | | L=7,7 | |
| 20 | 49 | | L=6,5 | | | L=6,5 | | |
| 21 | 51 | L=8,9 | | L=8,9 | L=8,9 | | L=8,9 | B |
| 24 | 59 | L=10,1 | L=7,7 | L=10,1 | L=10,1 | L=7,7 | L=10,1 | |
| 27 | 66 | L=11,3 | | L=11,3 | L=11,3 | | L=11,3 | |
| 28 | 68 | | L=8,9 | | | L=8,9 | | |
| 30 | 73 | L=12,5 | | L=12,5 | L=12,5 | | L=12,5 | |
| 32 | 78 | | L=10,1 | | | L=10,1 | | |
| 33 | 81 | L=13,7 | | L=13,7 | L=13,7 | | L=13,7 | |
| 36 | 88 | L=14,9 | L=11,3 | L=14,9 | L=14,9 | L=11,3 | L=14,9 | |
| 39 | 95 | L=16,1 | | L=16,1 | L=16,1 | | L=16,1 | |
| 40 | 98 | | L=12,5 | | | L=12,5 | | |
| 42 | 102 | L=17,3 | | L=17,3 | L=17,3 | | L=17,3 | C |
| 44 | 107 | | L=13,7 | | | L=13,7 | | |
| 45 | 110 | L=18,4 | | L=18,4 | L=18,4 | | L=18,4 | |
| 48 | 117 | L=20,1 | L=14,9 | L=20,1 | L=20,1 | L=14,9 | L=20,1 | |
| 52 | 127 | | L=16,1 | | | L=16,1 | | |
| 54 | 132 | L=22,5 | | L=22,5 | L=22,5 | | L=22,5 | |
| 56 | 137 | | L=17,3 | | | L=17,3 | | |
| 60 | 146 | L=24,9 | L=18,4 | L=24,9 | L=24,9 | L=18,4 | L=24,9 | |
| 64 | 156 | | L=20,1 | | | L=20,1 | | |
| 66 | 161 | L=27,3 | | L=27,3 | L=27,3 | | L=27,3 | |
| 72 | 176 | L=29,7 | L=22,5 | L=29,7 | L=29,7 | L=22,5 | L=29,7 | |
| 78 | 190 | L=32,1 | | L=32,1 | L=32,1 | | L=32,1 | D |
| 80 | 195 | | L=24,9 | | | L=24,9 | | |
| 84 | 205 | L=34,5 | | L=34,5 | L=34,5 | | L=34,5 | |
| 88 | 215 | | L=27,3 | | | L=27,3 | | |
| 90 | 220 | L=36,9 | | L=36,9 | L=36,9 | | L=36,9 | |
| 96 | 234 | | L=29,7 | | | L=29,7 | | |
| 104 | 254 | | L=32,1 | | | L=32,1 | | |
| 112 | 273 | | L=34,5 | | | L=34,5 | | |
| 120 | 293 | | L=36,9 | | | L=36,9 | | |

Version with 3 collectors high

Version with 4 collectors high

Parking version - 3 collectors high

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