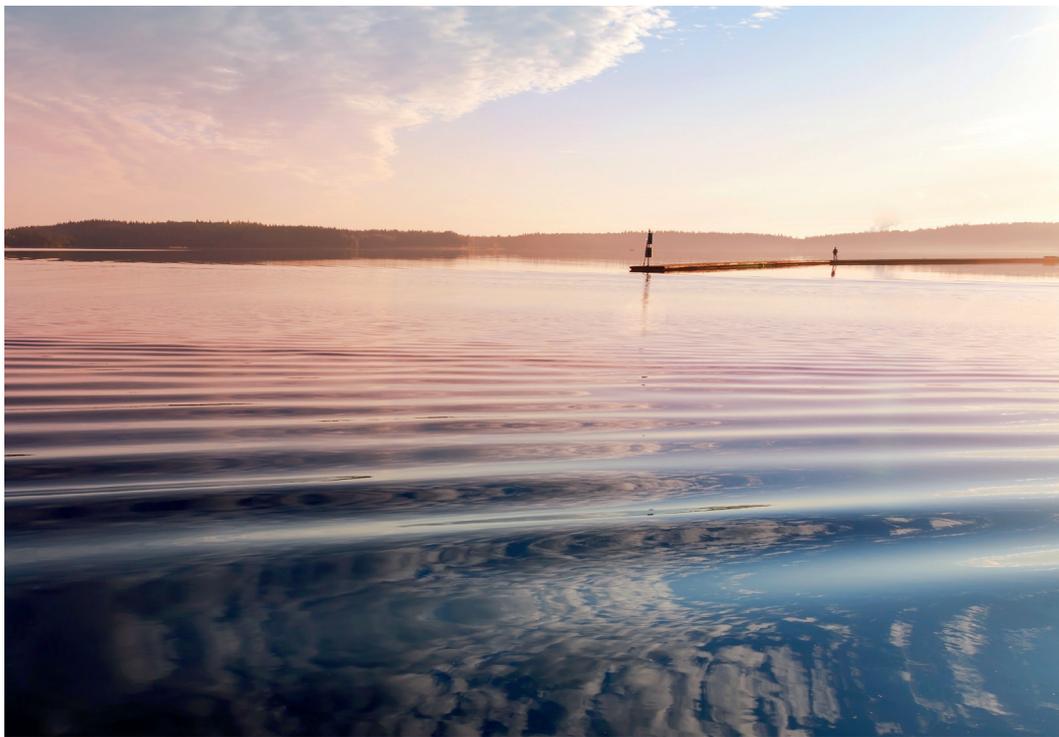




HEAT PUMPS

# HEAT PUMPS



**THE BASICS OF HEAT PUMPS AND THE RELIABLE SOLUTIONS  
AVAILABLE FROM THERMIA**



## What exactly is a heat pump? How does it work?

The basic principle is as simple as it is brilliant: take the free energy that exists in the air and ground, and convert it into heating for a house.

But things are rarely this straightforward. As the popularity of heat pumps has grown, so has the number of options. Today homeowners who have decided to do something about their heating costs can find it difficult to get an overview of the world of heat pumps.

At Thermia's R&D centre in Sweden we work continuously to take the heat pump technology to the next level, even though we have produced many of the market's very best heating systems for years. This also means that we possess invaluable knowledge about every aspect of the heat pump. And that's what this booklet is about.

Of course we want to present our solutions, but most of all we want to offer you a convenient forum to get the knowledge you need, so you can make the right decisions based on your specific needs.

I hope you will take a few minutes to look through this booklet. We trust you will find it both informative and enjoyable.



**Hans Wreifält**  
*Sales Director, Export  
Thermia Heat Pumps*



## Heat pumps – the basics

**1** A heat pump extracts stored solar energy and converts this into heating and hot water for your home.

**2** There are four types of heat pumps:  
**Air/air** collects energy from the outdoor air and converts this into warm air. Does not always work at lower temperatures and cannot produce hot water. Should be seen as a complement to other forms of heating.

**Air/water** converts the energy in the outdoor air into heating for a water-based heating system (radiator or floor heating). Some models function at outdoor temperatures as low as minus 20 °C. Can also produce hot water. This type provides a complete and flexible heating solution.

**Brine/water** collects energy from the ground or ground water by circulating brine fluid in a loop in the ground. The heat is then transferred to a water-based heating system (radiator or floor heating). Can also produce hot water. This type provides a complete and flexible heating solution and is more efficient than air/water at low outdoor temperatures.

**Exhaust air** recycles energy from the home's ventilation and returns it to the heating system. Can help deliver savings, but cannot be the main supplier of heating and hot water.

**3** Heat pumps use approximately one part electrical energy to extract three parts solar energy stored in the air or the ground.



Like a battery, our planet can store energy – in this case, solar energy that is stored when the sun heats up land, air and water. It's this stored solar energy that the heat pump exploits – at any time of the year, and 24 hours a day.

**4** High-quality heat pump systems can be equipped with an electric heating element for extra safety. The heating element provides extra high temperatures to the hot water, to prevent the formation of legionella bacteria.

### Service life and operation

**5** The service life of a heat pump varies for different types and brands, but in general an air/water or brine/water heat pump from a good manufacturer can last between 20 and 30 years.

**6** A major advantage of a heat pump is that it requires minimal maintenance and attention. If it's installed correctly you can almost forget that you have one. It should work every day, all year round, keeping your home warm and comfortable.

### Renewable energy

**7** The EU has classified heat pumps as a renewable source of energy since the amount of solar energy it extracts is much greater than the amount of energy it consumes.

## Heat pumps – a smarter use of energy

A heat pump from Thermia creates a comfortable indoor climate in your home. While it's supplying your home with heating, hot water and cooling, you can reduce your energy consumption by up to 75 per cent. When it's time to select a new source of energy for your home, a heat pump from Thermia means you're also contributing your share to help the environment.

### Economical

Solar power generates large amounts of free energy that is stored in the air, ground and ground water. A heat pump will help you unlock this free energy. By extracting this heat efficiently you

can reduce your energy consumption considerably. The savings are often large enough to pay for the investment in just a few years.

### Comfortable

A heat pump requires virtually no maintenance or refilling of fuel, and it's very easy to operate. You can adjust your indoor temperature with just a touch of a button. The heat pump does not take up much space, normally only about as much as a fridge.

### Eco-friendly

By choosing a heat pump you help to reduce the impact on the environment.

The technology is well-tested and the EU classifies heat pumps as a renewable source of energy. The amount of solar energy the heat pump extracts is much greater than the amount of energy it consumes.

### Reliable

Buying a heat pump is a long-term investment; it will just run and run. After more than 35 years of developing and supplying heat pumps for the European markets, including the severe Nordic climate, Thermia can guarantee a reliable and cost efficient solution.

# Four ways to collect energy

The air, bedrock, soil, and groundwater all contain stored solar energy which can be used for heating. A heat pump extracts this unlimited, eco-friendly energy and converts it into heating for your home.

Every day the sun heats our air, ground and waterways. A heat pump extracts this free source of energy very efficiently.

## Air source heat pumps

### Air source



With an air source heat pump there is no need to dig or drill. Instead the energy is sourced straight from the surrounding air.

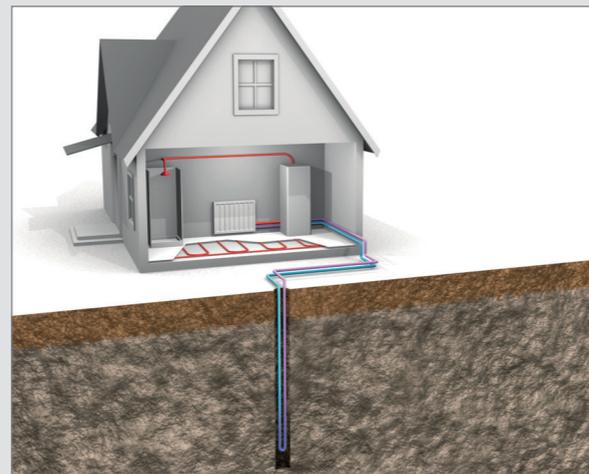
For a complete system that covers all your heating requirements, including hot water, you need an air/water heat pump. In comparison, an air/air heat pump is only capable of supplying partial heating, not hot water.

#### Benefits:

- Lower investment cost.
- No impact on the ground.
- No large plot needed.

## Ground source heat pumps

### Vertical ground loop



The vertical ground loop collects solar energy stored in the bedrock. A hole is drilled into the bedrock and a pipe is installed to a depth of between 100 and 200 metres. The exact depth depends on the house, size of heat pump and surrounding conditions.

A common myth about heat pumps is that they will not work if several homes in the neighbourhood have already drilled down to the bedrock. This is definitely not true! The earth's ability to store heat is almost endless – there's enough heat for everyone.

#### Benefits:

- A large plot is not necessary.
- Small impact on the plot.

### Horizontal ground loop



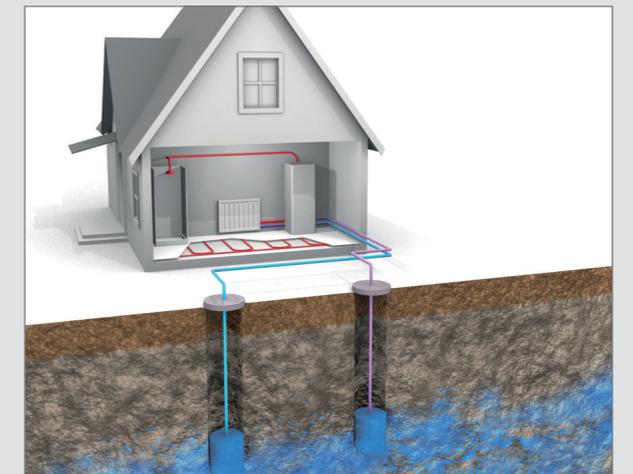
The horizontal ground loop collects solar energy stored in the ground, near the surface. If the bedrock is too deep down, or if you don't want to drill for other reasons, this is a good option.

The loop is buried about one metre below the surface, and energy is extracted from the ground. The length of the loop depends on the house, the size of the heat pump and local ground conditions.

#### Benefits:

- Lower installation cost compared to vertical ground loop.
- Can also be used to extract heat from lakes.

### Groundwater



A groundwater heat pump collects energy from the groundwater. The water is pumped up from a water borehole to a heat exchanger, where the energy is recovered.

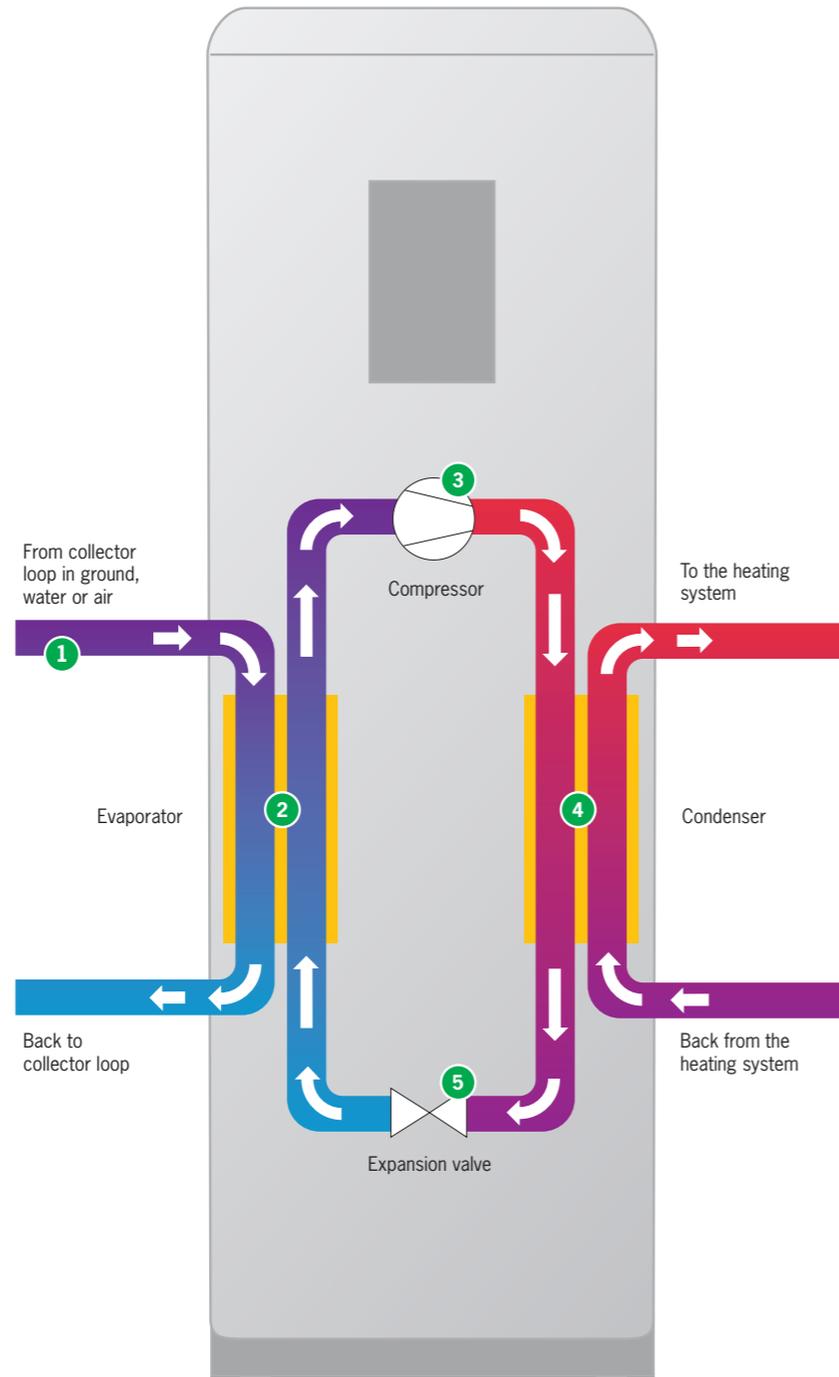
The water is then discharged back through another well. This solution can be the best choice when groundwater is readily available.

#### Benefits:

- Groundwater maintains a relatively high, even temperature, year round.

# How a heat pump works

- 1 A brine\* circulates in a collector loop and absorbs heat energy from the bedrock, ground, air or water.
- 2 In a heat exchanger (evaporator) the tepid brine in the collector loop meets the refrigerant\*\* circulating in the refrigerant loop. The refrigerant absorbs energy, heats up and turns into gas.
- 3 A compressor increases the pressure of the refrigerant, and by doing so the temperature climbs to a required heating level.
- 4 In a second heat exchanger (condenser) the refrigerant releases its heat to the heating system in the house. As this occurs the refrigerant is cooled down.
- 5 The refrigerant continues to circulate. In an expansion valve its pressure falls. This reduces the temperature and the refrigerant returns to liquid form. The process recommences when the refrigerant again meets the brine.



Heat pumps are based on the principle that as a gas is compressed it heats up, while gas that expands becomes colder.

\* Brine is a fluid that cannot freeze, such as a mixture of water and alcohol or glycol.  
 \*\* These days eco-friendly refrigerants such as carbon dioxide and hydrocarbons are used. Previously freon was used



## Heat pump – a profitable investment for everyone

**Investing in a heat pump pays off, whether you're building a new house or renovating an existing one. You reduce your energy consumption while also increasing the value of your house. Plus, you help cut carbon dioxide emissions, a benefit for future generations.**

### May pay for itself twice

With a good heat pump, up to 75 per cent of your energy consumption for heating and hot water is for free. This saving means that the heat pump will pay for itself in time. Moreover you increase the value of your house when you install a heat pump which may mean that it pays for itself twice: firstly you recover the investment cost and secondly there is a good chance the sales price of the house will be higher the day you sell it.

The future volatile market situation of

the earth's limited oil and gas resources is another strong reason for choosing a renewable energy solution.

### New construction

When building a new house there are lots of decisions to make, and choosing the correct heating solution is one of the most important ones. With the right heat pump you can cover a range of applications, for instance heating, cooling and pool heating, in a single system. As a result you avoid investing in, and maintaining, separate solutions. Moreover, many countries have energy efficiency requirements for new construction, making it extra important to choose a future-secure energy source.

### Replacement and renovation

The savings a heat pump can provide will depend on the house, existing heating system and geographical location. To find out how high the savings can be in your specific case, contact an autho-

rized installer, who can help you with a calculation showing your savings based on your situation and requirements.

The heat pump can also be adapted to an existing heating system you may already have and be combined with different types of supplementary energy sources, such as solar, gas, wood or pellets.

### Subsidies

Both within and outside the EU, considerable efforts are underway to reduce environmental impacts and increase the proportion of renewable energy used. In line with this, more and more countries make subsidies available to those who choose a renewable energy source. As the EU has classified the heat pump as a renewable energy source, these subsidies may be available to you. To find out which subsidies are available in your area, contact an authorized heat pump installer.

## Three decisive issues when choosing a heat pump

Installing a heat pump is a long-term investment. You can rely on it to provide a comfortable indoor climate with the largest possible cost savings. Year after year, day by day, minute by minute.

When you choose a heat pump it's important to understand the basics. The following pages will guide you through the three areas you need knowledge about to make the right decision.

① Annual efficiency

② Hot water production

③ Flexibility



Some heat pump manufacturers cite a COP (Coefficient of Performance) based on for instance an average spring day in April. This doesn't give a correct picture of the heat pump's total efficiency. It's more accurate to measure the efficiency over a whole year.

Here is a good way to see the difference between COP and annual efficiency: COP is similar to a car's fuel consumption at a particular speed and rpm, e.g. 72 km/h and 3,000 rpm, while annual efficiency resembles the average fuel consumption at different speeds and rpm's during a full year.

## 1 Annual efficiency

### COP – efficiency in specific conditions

As a buyer it's important that you find out how efficient a heat pump is. Most manufacturers present this information in terms of COP (Coefficient of Performance). In specific test conditions, an assessment is made of the heat pump's ability to supply heat, relative to the amount of electricity required to extract it. If a heat pump has a COP of 4, this means that in the specified test conditions it produces four times more energy than it consumes. Consequently the extracted energy makes up three quarters.

### Be careful when comparing values

It's important to be conscious when comparing a heat pumps efficiency. Measuring the COP in specified test conditions, without calculating the

energy consumption for all the components in the system (e.g. circulation pumps), can produce what seems to be very good values. But a measurement should not be done just to support a manufacturer's marketing. It should give homeowners like you a more correct picture of how efficient the heat pump is, over time.

### Annual efficiency – the real measure

A far more accurate measure of a heat pump's performance is its annual efficiency (seasonal performance factor). This incorporates the whole year, including the warmest and the coldest periods, as well as the production of hot water. Other factors that affect the overall result include house size, geographical location and number of residents.

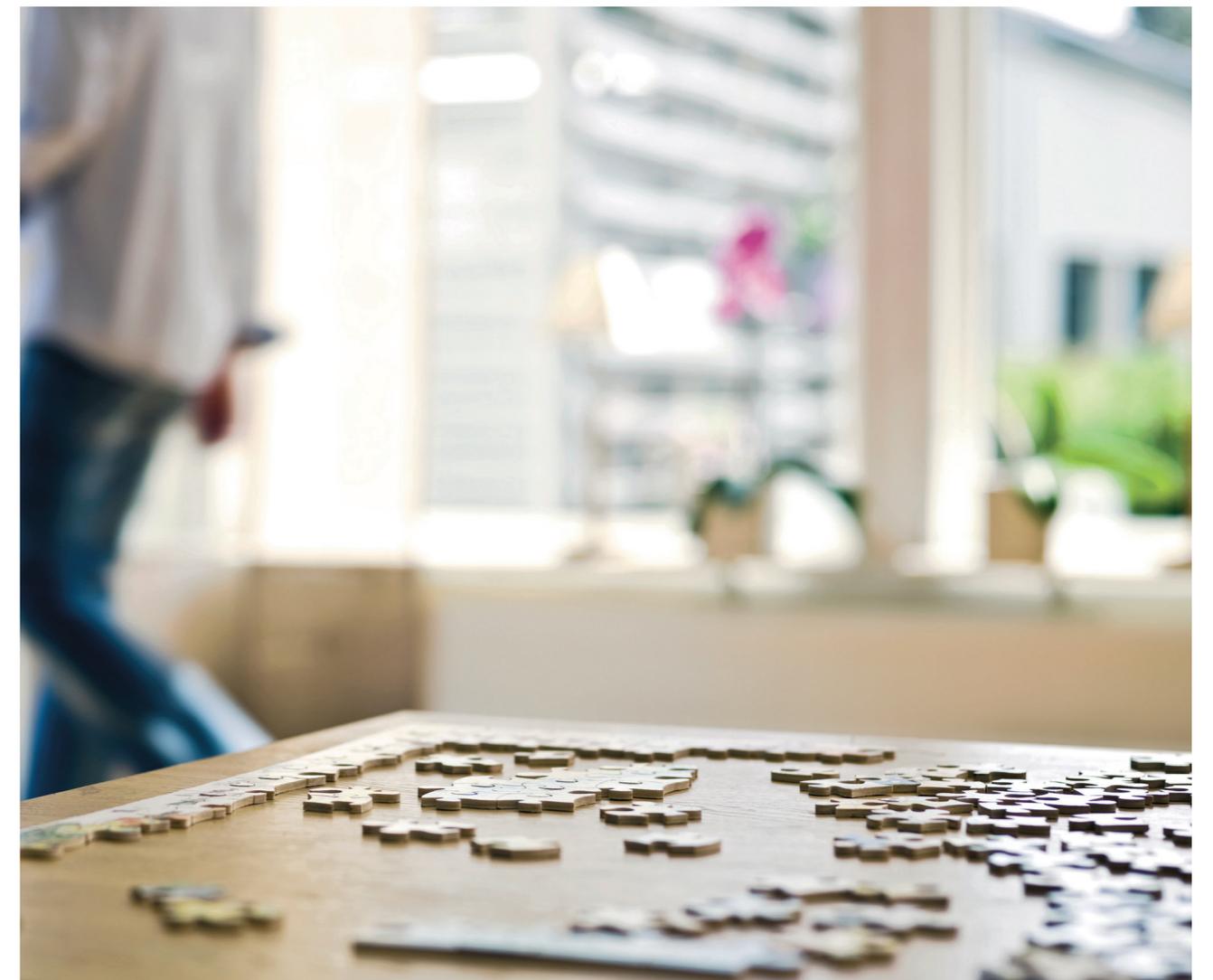
The annual efficiency is unique to every heating system's specific conditions. Therefore, it is not possible to specify a seasonal performance factor value as part of a standard technical data. This value must be calculated by an authorized Thermia installer on a case by case basis and based on your specific home's location and conditions.

## 2 Hot water production a key component

**Roughly 20 per cent or more of the energy consumed by a heat pump is used to produce hot water. The availability of the hot water must be sufficient to meet the needs of the whole household, therefore it's important to choose a heat pump that can meet the demand.**

As our water consumption is increasing and our homes are better insulated, the hot water production represents a growing share of a home's energy needs. Therefore it becomes more and more important that the hot water is produced with the highest possible annual efficiency. At the same time the hot water tank must be replenished quickly to maintain the hot water comfort. It's also vital that the heat pump has a system that minimizes the risk of legionella bacteria breeding in the water.

- A good heat pump should produce sufficient hot water while maintaining a high annual efficiency. (That is, costs are kept as low as possible.)
- It's important not to focus excessively on how hot the hot water gets. The key is how quickly the hot water is produced in order to meet the needs of the entire household.



## 3 Flexibility

**When investing in a new heating system it is important to examine the requirements of the entire house, before making a final decision. With a heat pump you can customize a solution that meets all your demands and requirements, including heating, cooling, pool heating, and additional heating sources.**

Once you have decided to install a heat pump, it's important to select a supplier who can provide you with all the climate solutions you and your home would require. Ask yourself what you want your heat pump to supply, besides heating and hot water. For instance do you also want cooling? Perhaps you have a swimming pool that needs heating or a wine cellar that you want to cool. With a heat pump it's possible to combine

these types of solutions with the basic heat pump functions. This means you don't have to invest in separate systems such as air conditioning or a cooling unit. Moreover, it's fully possible to combine a heat pump with other heating sources like solar panels, wood- or pellet-burning furnaces. In order to have all this flexibility, make sure you choose a supplier that can offer these more comprehensive solutions.



## Technology for highest annual efficiency

To ensure you get maximum performance and functionality, Thermia has developed a number of technologies,

all contributing to increased annual efficiency, comfort, reliability and cost savings.

### Controller for optimal operation

The controller coordinates all the various parts of the heating system to provide the best possible indoor climate and hot water production at the lowest possible cost. The controller also integrates any other functions that may have been added to the system, such as cooling or pool heating.

Thermia's controller manages the supply of heat at the source rather than in the heating system itself. This solution, called floating condensation, can result in up to 15 per cent energy savings compared to traditional technologies.

### Optimum technology for highest annual efficiency

Optimum technology keeps the heat pump working in ideal conditions at all times. This means maximum efficiency and minimum energy consumption, second by second.

Thermia's Optimum technology uses automatic variable speed controlled circulation pumps to optimize conditions for the heat pump by controlling delta T in heating system and brine collector. The temperature difference between supply line water and return line water is kept constant between 7–10 °C. For the collector a difference of 3 °C between inlet and outlet is optimal. The Optimum technology reduces energy consumption and thus improves annual efficiency.



### Demand-controlled defrosting for air source heat pumps

Outdoor air units require defrosting at low temperatures to ensure an unrestricted air flow through the fin coil. Thermia has developed a technology for defrosting that operates only when and as long as required, in contrast to standard solutions used by other brands which defrost even when it is not needed. Demand-controlled defrosting minimizes the energy consumption.

### Effective scroll compressor

At the heart of the Thermia heat pump is a specially developed scroll compressor. Its unique feature is its high efficiency, even when producing heating and hot water above 40 °C. Another advantage is that it contains fewer moving parts than a conventional compressor. This means lower noise levels and a longer product life.

## Thermia – a safe investment

Installing a heat pump is a long term investment that must provide a convenient and comfortable indoor climate with the maximum cost savings year by year, day by day, and minute by minute. A Thermia heat pump provides just that, with a minimum of attention required.

When you choose one of our products, you get more than a heat pump. More than 35 years ago we produced the very first heat pump with a built-in warm water heater, and ever since we have taken upon ourselves to be more than just a supplier of heat pumps. As a Thermia heat pump owner you can expect the highest possible performance at the maximum savings, expert support when the unexpected happens, the safety of always having a home that is warm and comfortable, and enough hot water for the whole family.

On the following pages you can read more about what makes our heat pumps repeatedly receive top test results and how you proceed to choose the heat pump that is right for your needs.



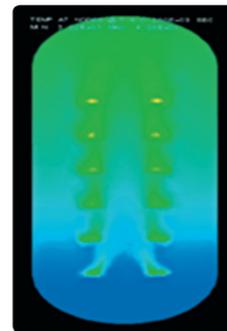
Thermia's Research & Development department works continuously to develop, improve and refine heat pump technology. With TWS and HGW we have created market-leading technologies for hot water production. Here you can read more about these technologies, how they work and their benefits.



## TWS technology for exceptional hot water production

Thermia's heat pumps produce hot tap water using the patented TWS (Tap Water Stratificator) technology. TWS provides more effective heat transfer and more efficient layering of the water in the hot water tank. The results are impressive. Heat pumps equipped with TWS are the best on the market, in terms of hot water production. TWS ensures a plentiful supply of hot water,

quickly and at low operating cost, which means that a heat pump with TWS increases your annual efficiency. Thermia's heat pumps are factory-set to increase the water temperature to above 65°C once a week. This is to eliminate the risk of legionella bacteria. The normal temperature is sufficiently high to prevent bacteria growth, but this system provides extra safety.



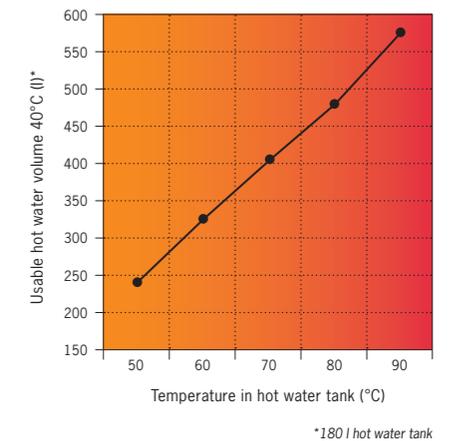
TWS hot water tanks are specially designed for heat pumps. The technology layers the hot water in the hot water tank so that the heat can be used in the best way. (In the photograph, the hot water is represented by the green colouring and cool water by the blue.) The amount of energy used to create hot water by TWS could only create lukewarm water in a conventional hot water tank.

## Boosting annual efficiency with HGW technology

With HGW (Hot Gas Water heater), Thermia has developed a unique patent pending method for producing hot water. With this new technology we have solved a seemingly impossible equation: higher annual efficiency in combination with hot water production at higher temperatures and increased volumes. At the same time as water is heated for distribution through the house's heating system, hot water is produced at very high temperature through an extra de-superheater.

This means that during the part of the year when the house is heated, you get lots of hot water at a very low cost. The result is up to 20 percent higher annual efficiency. The COP for hot water production can be as high as five, which means that the production of hot water is five times as high as the supply of energy.

HGW technology is used in the Thermia Diplomat Optimum G3 models.



By using the HGW technology the temperature in the hot water tank can reach up to 90°C. This radically increases the volume of usable tap water.

**Traditional technology**

In a traditional water heater for heat pumps the heater is surrounded by the hot water from the heat pump. The resulting heat transfer is both poor and slow.

After a consumption peak that has drained the hot water tank, with traditional technology it takes 50 minutes\* to refill the tank with hot water.

\*Time calculated when heating from 40 °C.

**TWS technology**

In a TWS hot water tank, the hot water is led from the heat pump in a coil through the water that is to be heated. This delivers more effective heat transfer and more hot water.

After a consumption peak that has drained the hot water tank, it takes just 21 minutes\* to refill the tank with hot water.

\*Time calculated when heating from 40 °C.

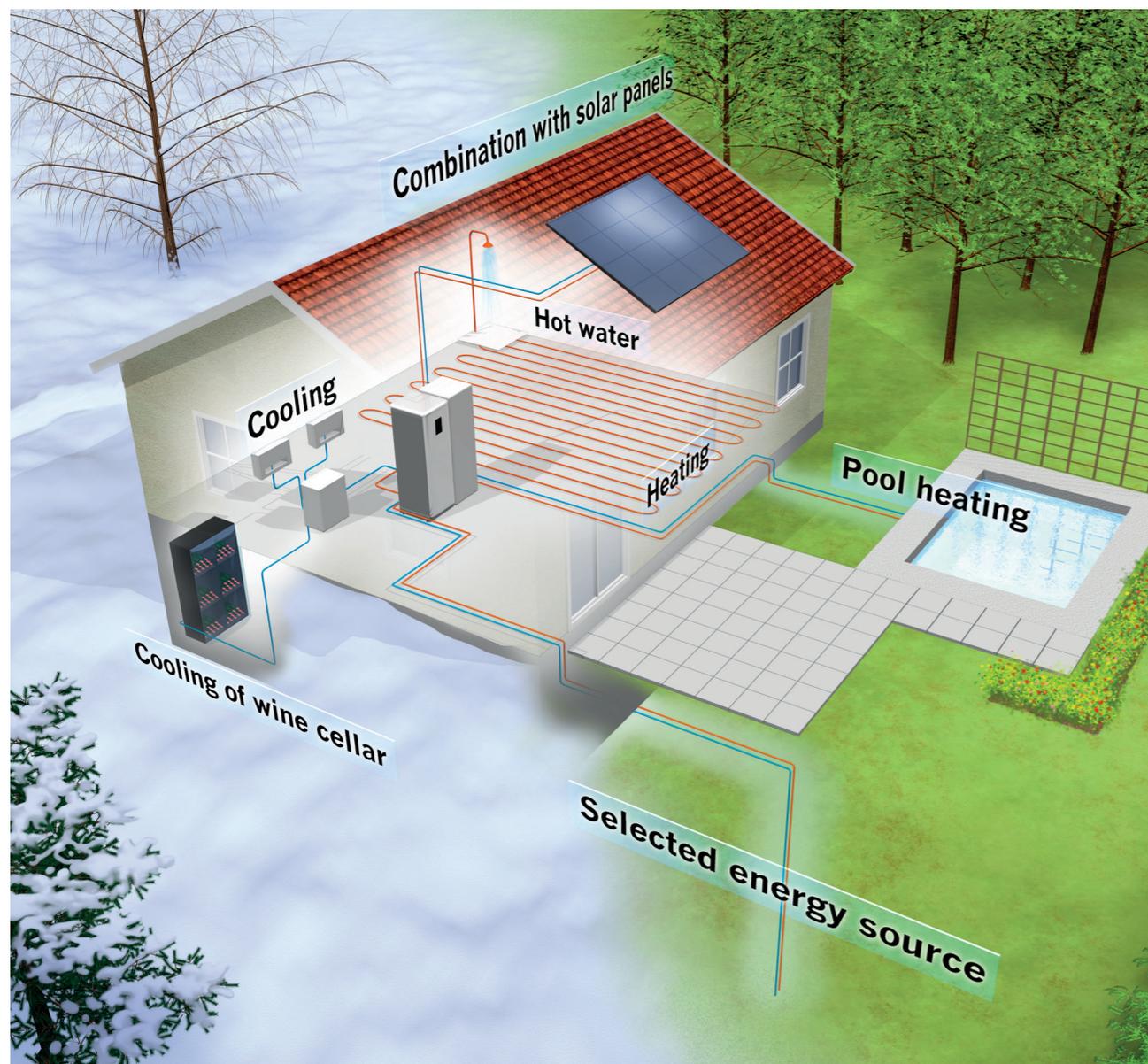
**HGW technology**

With HGW technology, the temperature in the hot water tank can reach 90 °C. This radically increases the volume of usable tap water.

- 1 A small portion of the heated water that is on the way to the house's heating system passes the extra de-superheater.
- 2 There it is heated up further, to between 50 °C and 90 °C, before going into the water heater.
- 3 The result is that, at no additional cost, you get more, and hotter hot water during the months of the year that the house is heated.

# One system – multiple functions

With a Thermia heat pump you get a flexible solution that can satisfy all your heating and cooling requirements in a single system.



## Cool your house with a heat pump

A Thermia heat pump is a complete solution that provides a comfortable indoor climate all year round. Heat is produced during the cold season and you can get comfort cooling when it is hot outside.

By adding a cooling unit to your heat pump you get a comprehensive climate comfort system that gives you a perfect indoor climate all year round. It's also more economical both in terms of investment and running costs, compared to traditional solutions. There are two ways to cool your home with a heat pump: passive and active cooling.

**Passive cooling**  
By taking advantage of the cool brine in the ground loop, cooling is created at

a cost corresponding to the energy consumption of a couple of light bulbs. Passive cooling comes as standard on Thermia Comfort and is optional on all other Thermia ground source heat pumps by adding a separate passive cooling module. (Note: passive cooling is not available on air source heat pumps).

**Active cooling**  
Passive cooling is normally sufficient, but if necessary, extra cooling can be achieved by using active cooling where cooling is produced using the compressor system. With this method, cooling produced by a ground source heat pump is more cost efficient than traditional air conditioning.

Active cooling is standard on Thermia Atec, and optional on Thermia ground source heat pumps.



Passive cooling can be used to cool a certain room or area, such as a wine cellar.

# Let the heat pump heat your pool

**The Thermia heat pumps can easily be supplemented to heat also your pool all year round. This way you can substantially lower the heating costs for the pool.**

## **Indoor pool**

For indoor pools the heat pump is dimensioned to heat the pool all year round. The heat pump then coordinates the heating of the pool with the home's current heating and/or cooling needs and ensures that the cost is kept at a minimum.

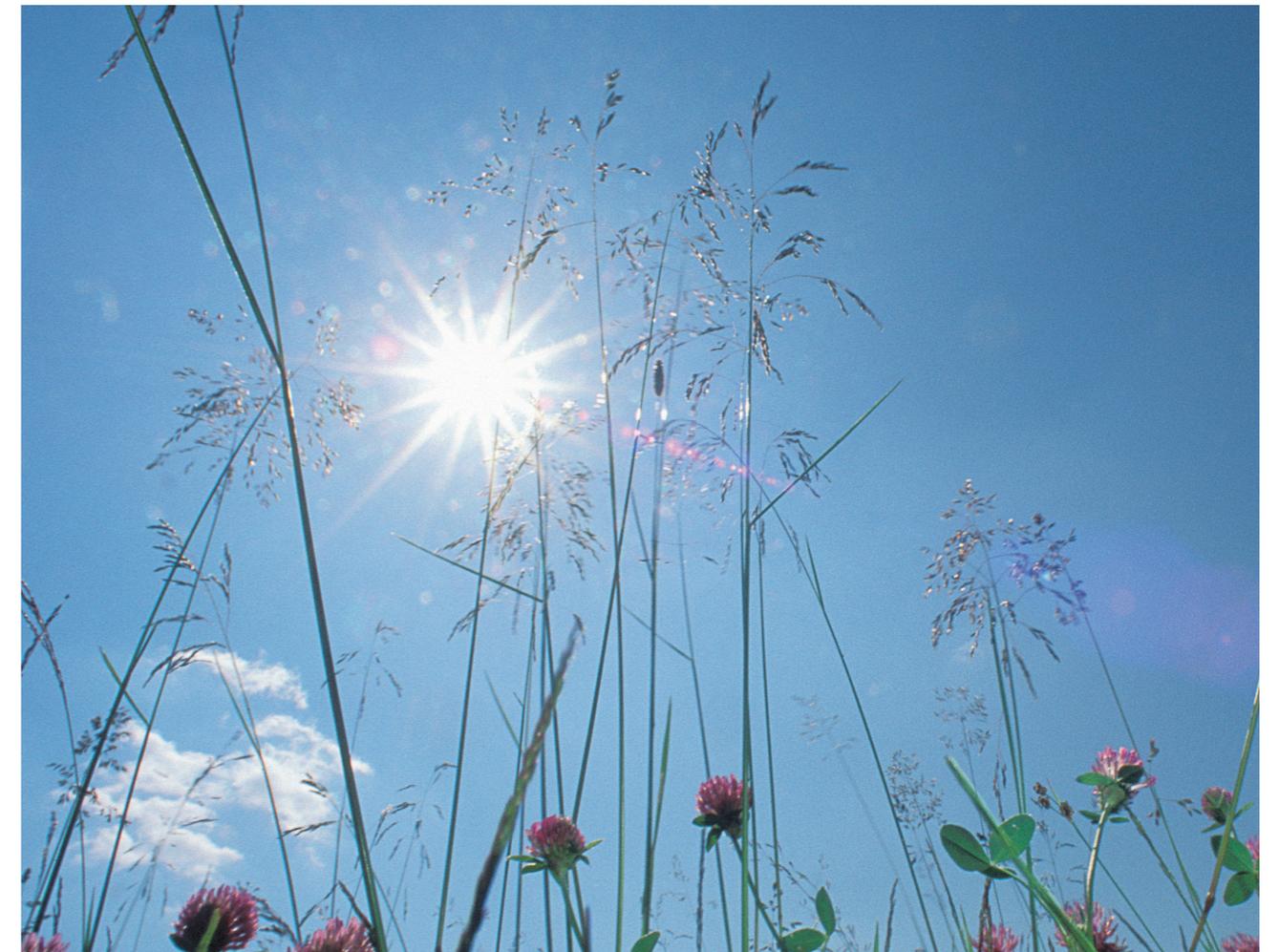
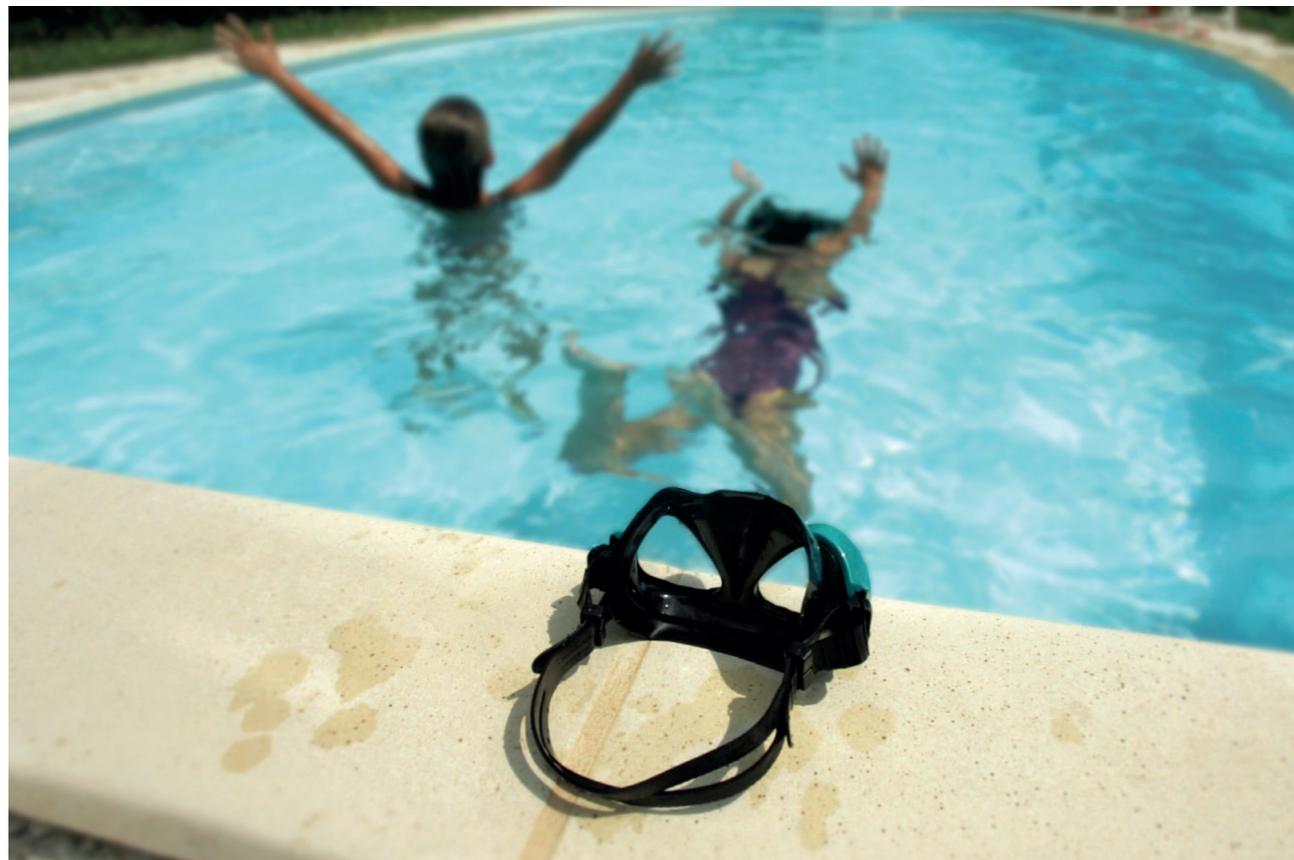
## **Outdoor pool**

Many outdoor pools are used only during the summer and since the need for heating the house is low during this period there's plenty of capacity to heat the pool. By leveraging this unused capacity, the pool can be heated at a significantly lower cost than traditional pool heating systems.

## **Leverage the excess energy to heat your pool**

When a house is cooled using an active cooling module, heating is produced

as a bi-product. This excess energy is usually dumped back into the ground, but if you have a pool you can instead use this energy to heat the water.



# Ready for solar collectors and other alternative energy sources

**You can easily supplement your system with solar collectors or some other alternative energy sources, the heat pump is already prepared for this.**

Every Thermia heat pump is already prepared to be combined with alternative energy sources, such as solar collectors or water-jacket wood- or pellet furnaces. If you want to wait with making this addition it's not a problem, since everything is ready to be activated when you decide it's time to proceed. Of course, the heat pump can also be combined with existing gas or oil furnace.

Thermia's unique control system ensures an optimal interplay between the heat pump and the alternative energy source to minimize the energy consumption for the entire system. Thermia can offer a large number of predefined solutions for a wide variety of applications.

# Which heat pump is best for you?

These tables provides an overview of the different technologies used in Thermia's products. On the pages following you can learn more about each product and determine which one is right for you.

All models are also available with a separate hot water tank, perfect for areas with low ceilings or if you need extra volume of hot water.

To read about how the technologies works, see the following pages:

- HGW, page 17
- Optimum, page 15
- TWS, page 16
- Cooling, page 19
- Heat pump unit located outdoors, page 24
- Heat pump unit located indoors, page 26

## Ground sourced heat pumps

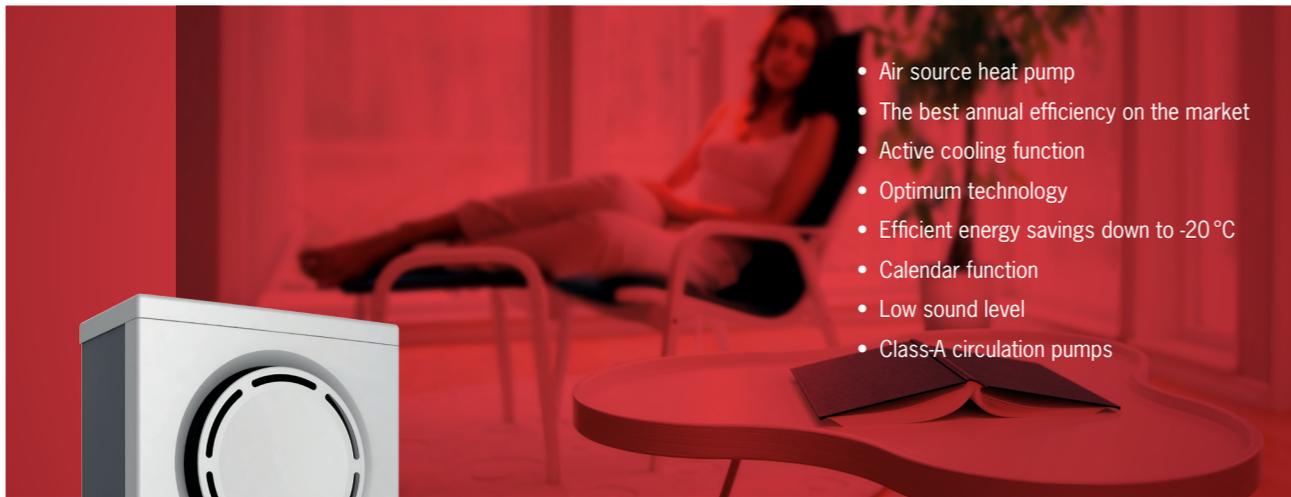
Product	Feature			
	HGW	Optimum	TWS	Cooling
 Diplomat Optimum G3	✓	✓	✓	Optional
 Comfort Optimum		✓	✓	✓
 Diplomat Optimum		✓	✓	Optional
 Diplomat			✓	Optional

## Air sourced heat pumps

Product	Feature				
	Heat pump unit located indoors	Heat pump unit located outdoors	Optimum	TWS	Cooling
 Atec		✓	✓	Optional	✓
 Atria Optimum	✓		✓	✓	

## Ground sourced heat pumps – Large capacity

Product	Feature			
	Cascade function (up to 336 kW)	Built-in web server	Heating and cooling simultaneously	Output capacity 20-42 kW
 Robust	✓	✓	✓	✓
 Solid				✓



- Air source heat pump
- The best annual efficiency on the market
- Active cooling function
- Optimum technology
- Efficient energy savings down to -20 °C
- Calendar function
- Low sound level
- Class-A circulation pumps



## ATEC Maximum performance and comfort, year round

Thermia Atec sets a new standard for air source heat pumps. With a superior annual efficiency Thermia Atec delivers maximal energy savings. By a unique acoustic design, it is developed to be the quietest on the market. The cooling function assures a pleasant indoor climate also during the hottest period of the year.

And if you have a swimming pool, you can reduce the heating cost significantly as Thermia Atec is prepared for heating of pools.

Thermia Atec is developed using the latest technology. The energy consumption is put to a minimum by continuously optimizing the three key performance parameters of air flow (variable-speed EC fan), heating circuit flow (electronic expansion valve) and heat distribution flow (Optimum technology). Energy is extracted from the outdoor air, and is used for heating of hot water and hydro- nomic heating systems, delivering efficient energy savings at temperatures as

low as -20 °C. This means you can reduce your energy consumption for heating by up to 75 percent.

Thermia Atec consists of two parts: the heat pump itself, which is located outdoors, and an indoor unit. This gives a smooth installation and a flexible solution - you can choose from three versions of the indoor unit, each with different features.

### Choose indoor package



- **Standard:**
- Control panel



- **Plus:**
- Control panel
  - Circulation pump
  - 3-way valve
  - Electric heater cartridge, stepped settings from 3–15 kW



- **Total:**
- Control panel
  - Hot water tank, 200 litre
  - Circulation pump
  - 3-way valve
  - Electric heater cartridge, stepped settings from 3–15 kW  
*(Not an option for Atec 16 and Atec 18)*

Available in output sizes:	6–18 kW (up to 36 kW through cascading)
Electrical connections:	230V 1N (≤16 kW) or 400V 3N
Dimensions outdoor unit(DxWxH):	510x856x1272 mm
Dimensions indoor unit (DxWxH):	Standard 204x380x600, Plus 255x420x625, Total 690x596x1845 mm



## ”Thermia Atec delivers the biggest savings”

In 2011 the Swedish Energy Agency, a government organization, conducted a thorough test of air/water heat pumps available on the market. The tests were carried out as per the European standard EN 14511. According to the test result, Thermia Atec is the heat pump that delivers the biggest overall savings. Moreover, Thermia Atec has top results in terms of hot water temperature, low noise levels and low energy losses.

### Thermia Atec ”Best in test”

The test involved calculating the energy savings and the seasonal performance factor for three houses with different heating needs: 15,000, 25,000 and 35,000 kWh/year. Thermia Atec had the highest seasonal performance factor in all three cases, which means it delivers the biggest annual savings of all heat pumps tested.

“Annual efficiency is the most important factor for the customer. It’s a key parameter when choosing a heat pump”, says Anders Odell, who leads

the Energy Board’s testing. As well as the biggest annual savings, Thermia Atec also had top results in the other categories tested.

### Very quiet

Thermia Atec has extremely low noise levels, the second lowest in the test, 61 dB(A). It is also possible to operate Thermia Atec in Silent mode, which further reduces noise levels.

### Top results for hot water comfort

Thanks to its efficient insulation, Thermia Atec has very low energy losses from the hot water tank, minimizing the costs for water heating. Of all the models tested, Thermia Atec produces the greatest volume of 40°C hot water, in relation to the volume of the hot water tank. This means high levels of hot water comfort without a hot water tank that requires a lot of space.

### Built-in cooling

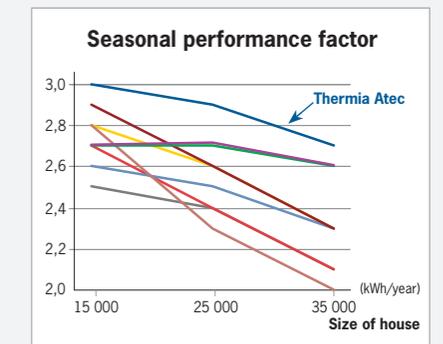
Thermia Atec is one of the few models in the test with a built-in cooling function.

### The test results in brief Thermia Atec:

- has the highest annual efficiency
- has the lowest energy costs
- delivers the biggest savings
- is very quiet in operation
- has top results in terms of hot water comfort
- maintains a high temperature in the hot water tank
- has a high proportion of 40 °C hot water
- has low energy losses

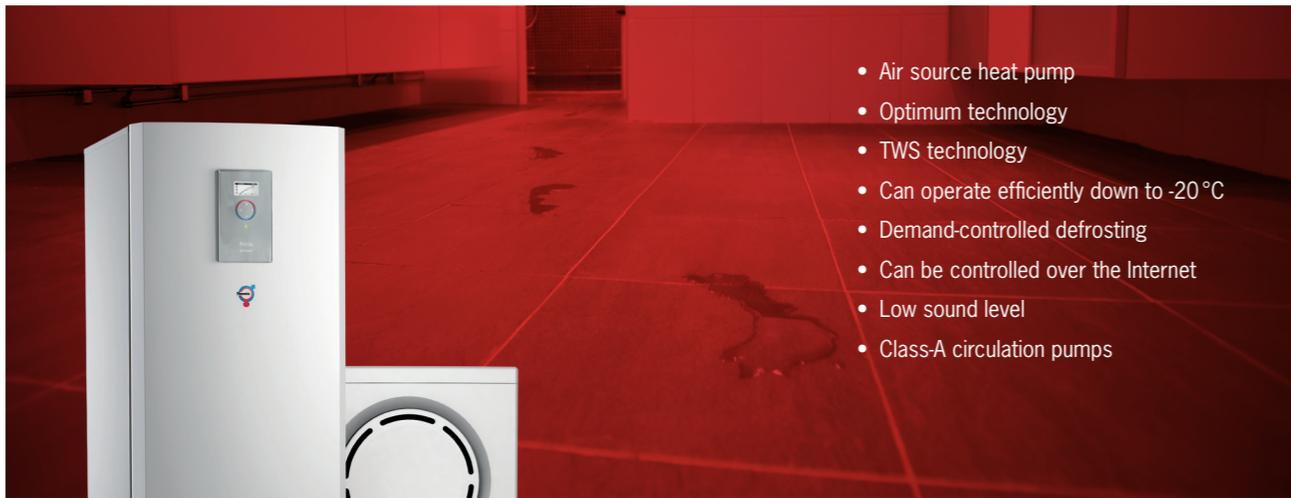
### Efficient down to -20°C

The test shows that not all the models can live up to their stated performance down to -20°C. However results for Thermia Atec show good savings all the way down to -20°C.



Thermia Atec has the highest seasonal performance factor of all the air/heat pumps in the test.

See more details and complete results at [thermia.com](http://thermia.com)



- Air source heat pump
- Optimum technology
- TWS technology
- Can operate efficiently down to -20 °C
- Demand-controlled defrosting
- Can be controlled over the Internet
- Low sound level
- Class-A circulation pumps

## ATRIA OPTIMUM

### The silent heat pump that can also handle tougher conditions

Thermia Atria Optimum is an air source heat pump with automatic variable speed controlled circulation pumps.

The Optimum technology continually adjusts the heat pump to work optimally at all times. This leads to maximum efficiency and minimum energy consumption – at all times, all year round.

The heat pump consists of two units – one indoor part and one outdoor part. As all of the Atria Optimum’s essential parts (such as the compressor and electronic controls) are located indoors, the heat pump is particularly well suited to locations with harsh weather conditions and a cold climate.

#### Low sound level

Atria Optimum has been developed with a view to being extremely quiet. The low sound level is mainly due to the outdoor unit’s unique acoustic design.

#### Brings TWS technology one step further

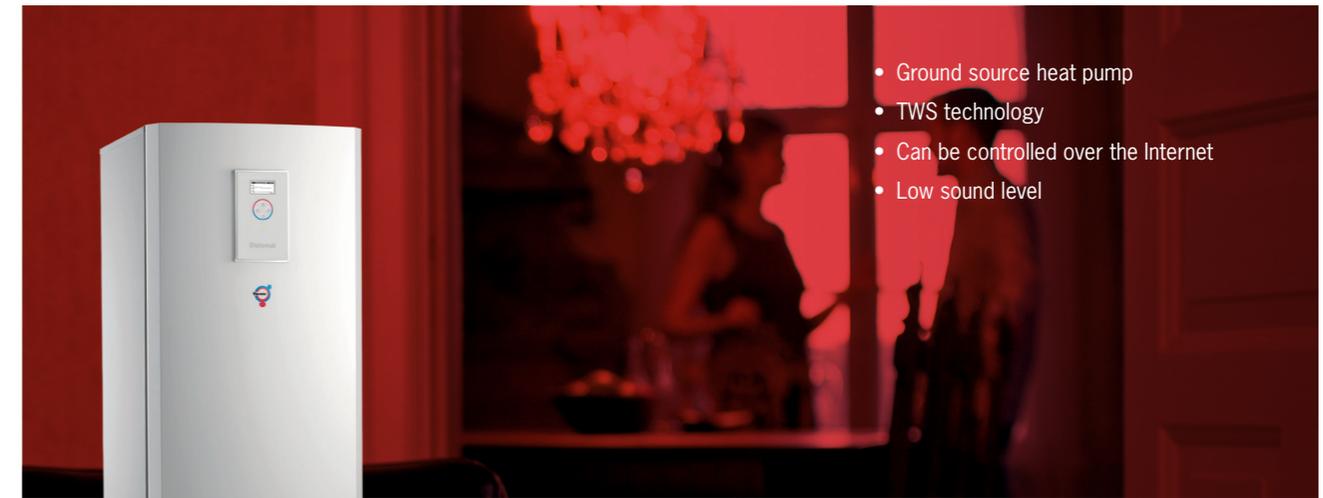
The hot water tank features Thermia’s patented TWS technology, and Optimum technology takes this solution one step further. By controlling the circulation pump (warm side) during hot water production, the Optimum technology will allow even quicker replenishing of the hot water tank and a completely controlled stratification of the hot water.



### Atria Duo Optimum

Atria Optimum is also available with a separate hot water tank, perfect for areas with low ceilings or if you need extra volume of hot water.

Available in output sizes:	6–12 kW
Electrical connections:	230V 1N or 400V 3N
Dimensions indoor unit (DxWxH):	690x596x1754 mm
Dimensions outdoor unit (DxWxH):	630x1175x1200 mm



- Ground source heat pump
- TWS technology
- Can be controlled over the Internet
- Low sound level

## DIPLOMAT

### Reliable and efficient

Diplomat is our baseline ground source heat pump that is the ideal solution for homes with basic needs for an efficient and reliable heating system.

#### TWS technology

The hot water tank features Thermia’s patented TWS technology, which means that hot water is produced faster and at higher temperatures than with traditional technologies.

Like all other Thermia heat pumps, Diplomat has an intelligent, integrated

control system that allows you to easily adjust the indoor temperature and operating parameters with the touch of a button.

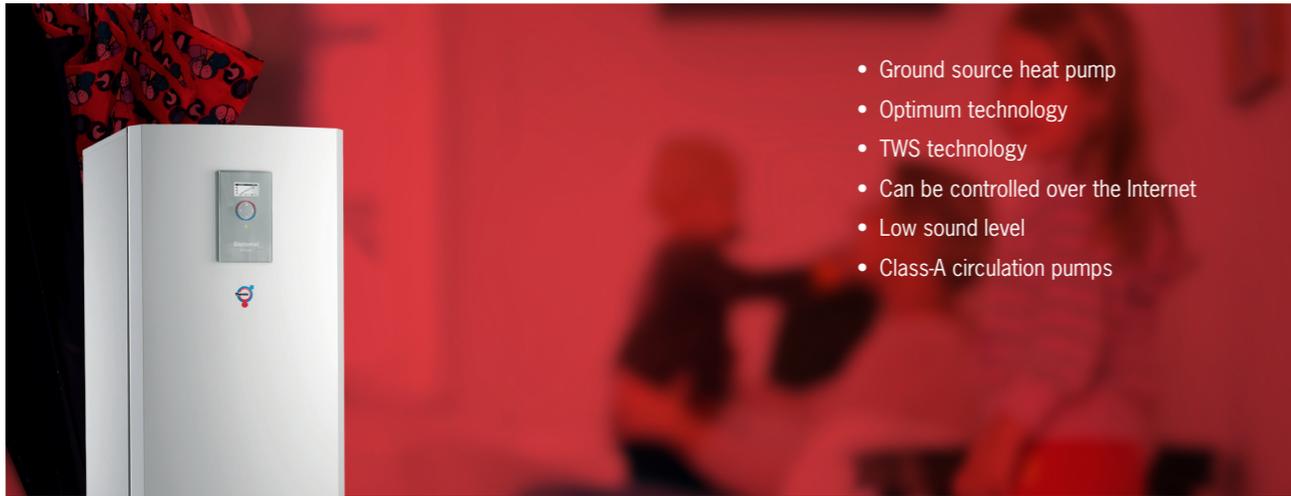
Despite its compact footprint, the unit has all the essential parts and functions built-in. It’s as close to a plug-and-play unit as you can get.



### Diplomat Duo

Diplomat is also available with a separate hot water tank, perfect for spaces with low ceilings or if you need extra volume of hot water.

Available in output sizes:	6–16 kW
Electrical connections:	230V 1N (≤12 kW) or 400V 3N
Dimensions (DxWxH):	690x596x1754 mm



- Ground source heat pump
- Optimum technology
- TWS technology
- Can be controlled over the Internet
- Low sound level
- Class-A circulation pumps

## DIPLOMAT OPTIMUM

### Minimum energy consumption thanks to automatic speed control

Thermia Diplomat Optimum is a ground source heat pump that includes the same features as Thermia Diplomat, with the addition of the Optimum technology with automatic variable speed controlled circulation pumps. The Optimum technology continuously adjusts the heat pump to work optimally at all times. This leads to maximum efficiency and minimum energy consumption – at all times, all year round.

#### Brings TWS technology one step further

The hot water tank features Thermia’s patented TWS technology, and Optimum

technology takes this solution one step further. By controlling the circulation pump (warm side) during hot water production, the Optimum technology will allow even quicker replenishing of the hot water tank and a completely controlled stratification of the hot water.

#### Annual efficiency

Thanks to the lower energy consumption of the circulation pumps and the efficient hot water production you get an improved annual efficiency compared to our base-line models.



### Diplomat Duo Optimum

Diplomat Optimum is also available with a separate hot water tank, perfect for areas with low ceilings or if you need extra volume of hot water.

Available in output sizes: 4–16 kW  
 Electrical connections: 230V 1N (≤12 kW) or 400V 3N  
 Dimensions (DxWxH): 690x596x1754 mm



- Ground source heat pump
- Passive cooling function
- TWS technology
- Can be controlled over the Internet
- Low sound level
- Class-A circulation pumps

## COMFORT OPTIMUM

### The complete climate control system

The Comfort ground source heat pump is a complete climate solution that delivers the best possible indoor comfort – heating in winter, cooling in summer and hot water all year round.

#### Integrated cooling

Cooling is possible as a result of the passive cooling module built into the unit. By circulating the cool brine in the ground loop, cooling is produced at a cost corresponding to the energy consumption of a couple of light bulbs.

Installation is simple thanks to the system’s capability to distribute both heating and cooling in a single system. Normally there is no need for a separate cooling system.

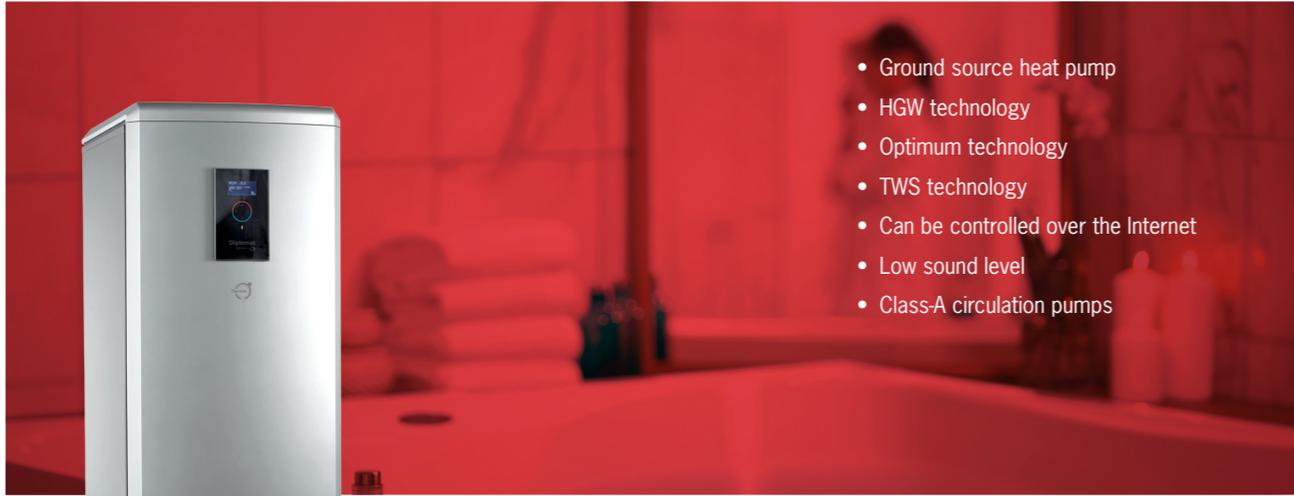
#### Optimum technology

Thermia’s Optimum technology uses automatic variable speed controlled circulation pumps, which optimizes operation in accordance with the current temperature and conditions. The Optimum technology reduces the amount of electricity used, and ensures that the heat pump is always running at maximum efficiency.

#### TWS technology

The built-in hot water tank features Thermia’s patented TWS technology, which means that the hot water is produced faster and at higher temperatures than with traditional technologies.

Available in output sizes: 4–10 kW  
 Electrical connections: 400V 3N  
 Dimensions (DxWxH): 690x596x1754 mm



- Ground source heat pump
- HGW technology
- Optimum technology
- TWS technology
- Can be controlled over the Internet
- Low sound level
- Class-A circulation pumps

## DIPLOMAT OPTIMUM G3

### Superior performance in all aspects

Diplomat Optimum G3 is a ground source heat pump that produces more and hotter water than traditional heat pumps, while also consuming less energy.

Thermia's patent-pending HGW technology utilizes the regular space heating to also produce hot water. The result is that when the heat pump heats your home, it generates hot water at the same time. This leads to a higher annual efficiency and you can reduce your heat pump's energy consumption by an additional 20 per cent (see page 17).

The newly developed cooling circuit with a more efficient compressor, new refrigerant and the latest generation of heat exchanger means that G3 works at maximum efficiency throughout the year.

Thermia's Optimum technology uses automatic variable speed controlled circulation pumps, which optimizes operation in accordance with the current temperature and conditions. The Optimum technology reduces the amount of electricity used, and ensures that the heat pump is always running at maximum efficiency.

The hot water tank features Thermia's patented TWS technology, and Optimum technology together with the HGW function takes this solution one step further. By controlling the circulation pump (warm side) during hot water production, the Optimum technology will allow even quicker replenishing of the hot water tank and a completely controlled stratification of the hot water. The higher temperatures achieved by HGW results in additional volumes of hot tap water.

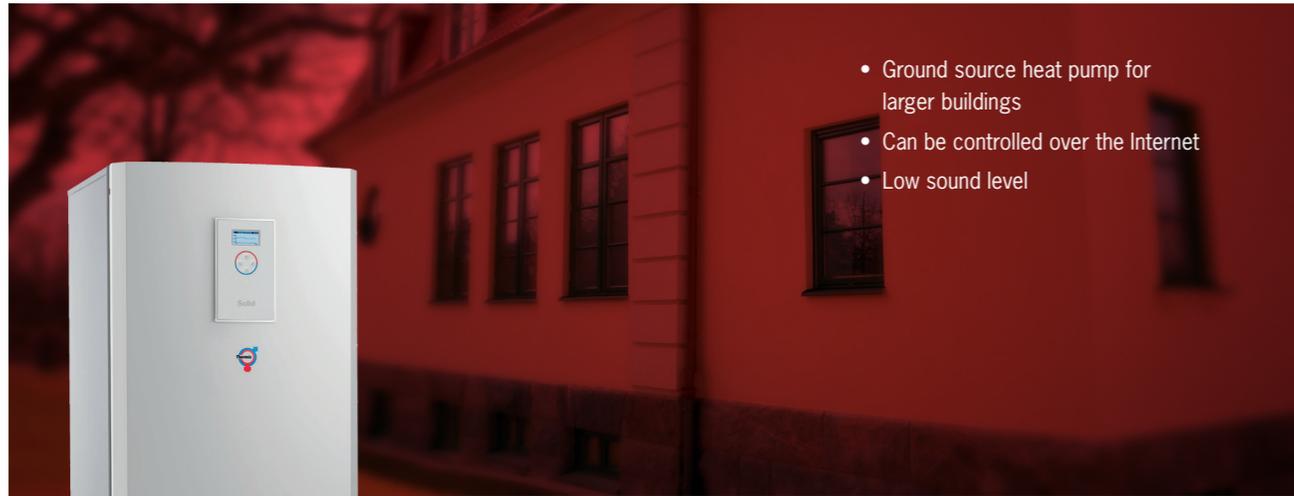


### Diplomat Duo Optimum G3

Diplomat Duo Optimum G3 is also available with a separate hot water tank, perfect for areas with low ceilings or if you need extra volume of hot water.

Available in output sizes:	6–16 kW
Electrical connections:	230V 1N (≤12 kW) or 400V 3N
Dimensions (DxWxH):	690x596x1754 mm





- Ground source heat pump for larger buildings
- Can be controlled over the Internet
- Low sound level

## THERMIA SOLID

### Excellent performance at a low investment cost

Thermia Solid is a large capacity heat pump for those seeking optimum performance and access to the most important functions. The perfect solution for larger buildings without the need for special applications.

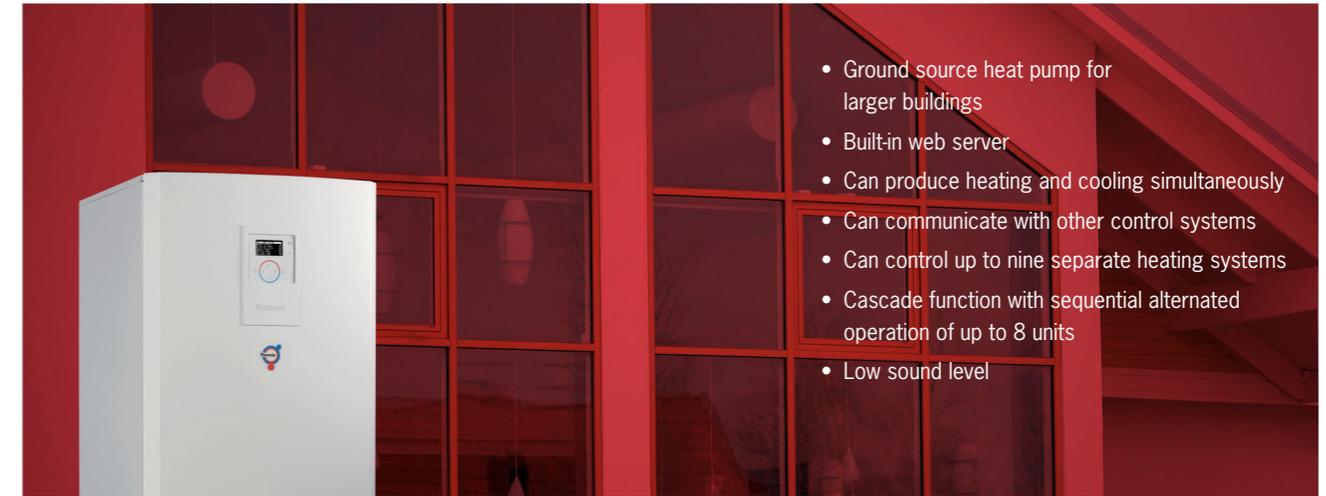
#### Keeps costs at a minimum

With Thermia Solid you get a complete solution to cover basic needs that is perfectly suited for larger buildings, such as schools, churches, mansions, business premises, sports halls etc., without the need for advanced extra functions.

#### Controls for maximum output

Thermia Solid can control two separate heating systems in the same building at the same time. The intelligent controls also make it easy to monitor and control other parts of the system, such as additional heater, tap hot water, cooling and shunt groups. This means that the system can be fine tuned at all times to suit prevailing needs and conditions, giving optimum efficiency and energy saving.

Available in output sizes:	20–42 kW
Electrical connections:	400V 3N
Dimensions (DxWxH):	690x596x1488 mm



- Ground source heat pump for larger buildings
- Built-in web server
- Can produce heating and cooling simultaneously
- Can communicate with other control systems
- Can control up to nine separate heating systems
- Cascade function with sequential alternated operation of up to 8 units
- Low sound level

## THERMIA ROBUST

### Excellent performance with advanced features

Thermia Robust gives the same high performance as Thermia Solid but has more functions due to a more advanced control system. The control system continuously monitors all functions and provides you with a clear overview of the complete system.

Thermia Robust can communicate with other building management systems. It can also be controlled and monitored via a management system that gathers all the information on, for example, alarms, lifts, ventilation, etc., in the same building.

#### Integrated web server

Thermia Robust includes an integrated web server that enables you to control and monitor the heat pump via the Internet in real time anywhere in the world. It

gives you control over all the settings, such as alarm management, operational data and prevailing temperatures.

#### Full control and comfort

It is possible to control up to nine separate heating systems in the building via a 0-10V signal. This could, for example, be radiators, underfloor heating, fan coil units and the heating of ventilation. With Thermia Robust you can cool certain parts of the building at the same time as other parts are heated. Heating and cooling are produced simultaneously, which can be utilised in several energy saving ways. For example, the cooling effect that occurs when apartments are heated can be put to use to cool a store or warehouse in the same building.

#### Cascade-connecting

It is possible to cascade-connect up to eight machines and get up to 336 kW (8x42 kW). Cascade-connected pumps start one after the other depending on the energy need, thus ensuring minimum energy consumption regardless of the output.



Seven Thermia Robust units connected together.

Available in output sizes:	20–42 kW (up to 336 kW through cascading)
Electrical connections:	400V 3N
Dimensions (DxWxH):	690x596x1474 mm



## THERMIA ONLINE

# Control your heat pump remotely no matter where you are

With the Thermia Online accessory, you can control and monitor your heat pump from any smartphone, computer or tablet, wherever you are in the world. For example, you can lower the temperature when you are on holiday, and increase it for when you come back. If you come home earlier than expected; no problem – using Online, you can easily ensure that your house is warm and comfortable whenever you need it to be.

At any time of day, you can use Online to check that your heating system is working properly and what temperature your home is at. If anything unexpected comes up and needs to be fixed, you – or your installation engineer, where agreed

– will immediately receive this information via Online. You can also control and monitor several locations if you need to; for example, if you have a holiday cottage with a heat pump or have relatives who need assistance.

Thermia Online connects the heat pump to your existing home broadband. If there is no internet connection available, it is possible to connect using a mobile 3G/4G modem (provided by your local mobile service provider). The Online app is available for both Android and iPhone.



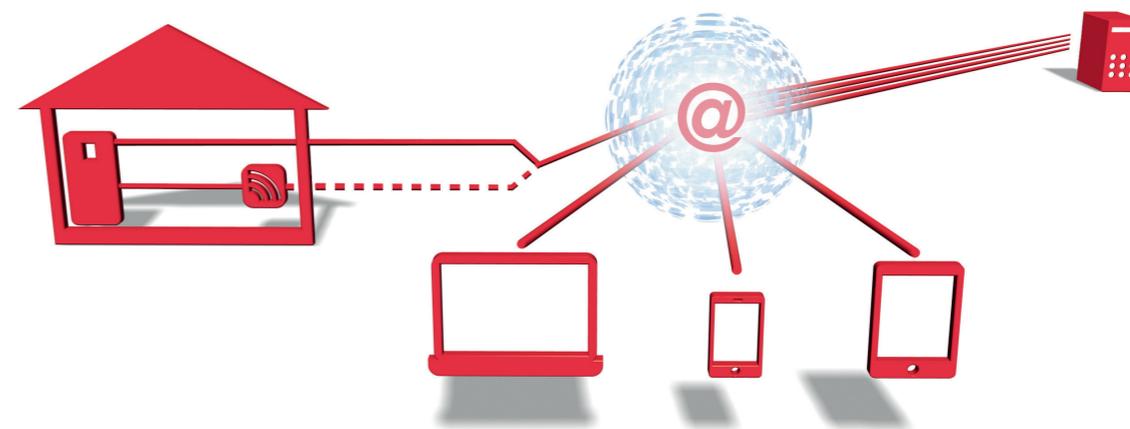
Login via computer, tablet, or smartphone app.

### Total security

- Monitor the heat pump whenever you want to
- Alarm function – if a problem occurs, you will automatically receive a notification
- All data is stored on an external server – if your computer or mobile becomes unavailable, you can log in from any other device
- Option to control and monitor several locations, for example, if you have a holiday cottage, or relatives who need assistance

### Complete control

- Control the heat pump remotely, wherever you are in the world
- Option to change temperatures and operating parameters
- Calendar function – allow Online to lower the temperature when you are away
- The event log lets you view the activity history



### How it works:

Thermia Online is connected to your heat pump through the internet. If you already have an internet connection, your Thermia dealer can connect the heat pump directly. This means that there are no additional ongoing costs for the data traffic. If you do not already have an internet connection

(e.g. in a summer cottage), we recommend acquiring an external 3G/4G modem from your local provider.

As all data sent from the heat pump is stored on an external server, you can access Online at any time – log in from any

smartphone, computer or tablet, no matter where you are in the world. Download the app for Thermia Online from the App Store (iPhone) or from Google Play (Android). The system works on all heat pump models in Thermia's current domestic range, as well as Thermia Solid.



### THERMIA MBH Separate hot water tank

Thermia MBH is a hot water tank for those who require larger volumes of hot water, or who prefers a separate tank. MBH is compatible with Thermia's Duo models as well as the rest of the heat pump range.

Just like Thermia's built-in tanks, MBH is equipped with TWS technology (see page 16). This means

it can produce high volumes of hot water, quickly and efficiently. Energy consumption is low and the hot water supply can handle high demands.

The tank is available with capacities of 200 or 300 litres, and with a copper-lined or stainless steel tank. The cabinet design can be selected to match the corresponding heat pump.



### THERMIA VENT Recycle the heat you already have

Thermia Vent is a heat recovery unit, an accessory that can be combined with most Thermia heat pumps.

It helps you make use of the heat in the indoor air that is vented out from your house. Thermia Vent is an exhaust air module – an efficient

complement that uses the house's exhaust air to heat the incoming ground loop to your heat pump. As a result, heat which otherwise would have been wasted is recycled, while the heat pump's efficiency increases.



### THERMIA EXTENDER Buffer tank combinable with alternative heat sources

Thermia Extender is an accessory that enables you to combine the heat pump with alternative heat sources, e.g. solar panels. This way the heat pump's annual efficiency can increase further. Thermia Extender also preheats the tap water before it reaches the hot water tank, resulting in a greater volume

of available hot water at a lower cost.

The buffer tank enables connection of two different heating systems, such as floor heating in combination with radiators. All Thermia heat pumps have a control unit that supports the buffer tank function.



### THERMIA COOLING MODULE Turns the heat pump into a climate control unit

Thermia Cooling module Passive/Active enables your heat pump to also produce cooling, cost- and energy-efficiently. You get a complete climate control system that delivers a comfortable indoor climate all year round – heat in the winter, cooling in the summer and hot water throughout the year.

Thermia Cooling module Passive/Active has a compact design and can be installed right next to the heat pump. It is compatible with all Thermia ground source heat pumps.

For those who only require passive cooling there is a solution with only this function: Thermia Cooling module Passive.



# This is Thermia

Thermia's history starts back in 1889 with the development and production of energy-efficient kitchen stoves. Ever since, Thermia's core business has been energy-saving heating solutions. As a result we're now one of Europe's leading heat pump producers.

## Pioneers in the heat pump business

In 1973 Thermia manufactured the very first heat pump with an integrated hot water tank. Over the years Thermia has continued to develop new solutions in its quest to create better and more efficient heat pumps, providing a more comfortable life in thousands and thousands of households around Europe.

## Thermia and Danfoss

Today Thermia is owned by Danfoss, a global company headquartered in Denmark with more than 20,000 employees. Thermia is the core of Danfoss' heat pump division, with a plant and research centre in Arvika, Sweden. Here, work is constantly underway to create the heating solutions of the future for customers all over the world.



Testing in one of the R&D climate chambers, set to severe weather conditions.

## One of Europe's foremost R&D centres

Thermia's facility in Sweden includes the company's 3,000 square metres global R&D centre for heat pumps. Here, engineers and technicians work to meet future global demands for high-tech, energy-efficient heating solutions.

The centre has a state-of-the-art climate chambers where conditions varying all the way from tropical to arctic can be simulated. This enables the heat pumps to be tested in all types of climates, which is necessary when the aim is to

develop heat pumps of the future, for use worldwide.

When planning the climate chambers, Thermia sent the tender request documentation to recipients all over Europe. However no company could match Thermia's strict requirements on machinery and equipment. As a result, Thermia decided to build the climate chambers themselves.

Achieving low noise levels are a crucial part of the R&D work. The R&D centre has special sound rooms where the

heat pumps' noise levels are tested. It's important to analyze and minimize the noise levels, and to remove all low-frequency noise.

Design is another important feature of heat pumps used in household settings, therefore Thermia's engineers collaborate with designers to ensure that the products have the best possible balance between form and function.

# Driven by innovation

Thermia's history starts with its founder, Per Andersson, born 1861. Just ten years old he started his career as an apprentice black smith, and he later began his own production of kitchen stoves. The driving force behind his business was his desire to always develop better and better products. The stoves had to be more efficient, easier to use and more fuel efficient. When one model was ready, work began immediately to develop one that was even better.

## The same core values

In time the range expanded to include wood-burning boilers, coke-fired boilers, hot water tanks, radiators and numerous other products used for heating. Always with the same basic philosophy: to have the market's best products. Or in the words of Per Andersson himself: "The products one releases must be not only the best of their time, but before their time, over time."

To this day, long after Per Andersson's passing in 1942, this philosophy is alive and well at Thermia. And even if Thermia's focus since 1973 has been on heat pump production, the same drive and passion still inspire the company to advance – to constantly develop, with the aim of continuous improvements.



*The products one releases must be not only the best of their time, but before their time, over time.*

Per Andersson (1861–1942), Thermia's founder.

## Milestones in Thermia's heat pump development

This timeline demonstrates Thermia's pioneering role in the evolution of the heat pump over the past four decades.

1977

Thermia's training school for retailers is started. No one is permitted to be a Thermia retailer without having documented product knowledge. All to ensure quality and reliability for the customers.

1984

Control computer for fully automatic control of the heat pump, hot water and additional heater is introduced in the Thermia range.

1994

A scroll compressor with high efficiency, great reliability and low noise level is introduced in Thermia products.

2000

Remote control/monitoring of the heat pump becomes possible. This lays the foundation for the Internet-based service that we today call Thermia Online.

2004

Thermia presents its TWS technology which results in the market's best hot water production. The technology uses stratification to deliver more economical water heating.

2007

Thermia's heat pump R&D centre in Arvika is opened by the Swedish prince Carl Philip. The centre develops heat pumps for climates ranging from tropical to arctic, allowing Thermia to satisfy demands from around the world.

The Thermia museum in Arvika opens. Boilers, ovens and wood-fired water heaters from the last century sit alongside modern heat pumps in the premises used by Thermia between 1923 and 1968.

2011

Thermia Atec is launched, instantly setting a new standard for air/water heat pumps. With a superior annual efficiency it delivers maximum energy savings.

1973

The very first heat pump with integrated hot water tank is developed by Thermia as a result of a collaboration project.



1980

A revolutionary heat exchanger is developed, with significantly increased heat transfer and reduced amounts of refrigerant. The latter is a benefit from an environmental point of view. One of the key persons behind the innovation is Thermia's head of development.

1993

Thermia presents the first heat pump with all the functional components combined in a single module. Heating, hot water, electrical heating element and control computer are combined in a practical and space saving "package" which takes up only 60 x 60 cm of floor area.

2002

A scroll compressor specially developed for heat pump application is introduced in Thermia products. This delivers significantly higher annual efficiency.

2005

The launch of the first air/water heat pump, Thermia Atria, which operates efficiently at temperatures down to -20°C. This groundbreaking technology, that makes air source a viable option, is introduced during the spring.

The Thermia Diplomat Optimum is introduced. It is the first ground source heat pump with automatic variable speed control, which adjusts the operation of the circulation pumps according to the prevailing heating requirements.



2008

Thermia revolutionizes the heat pump market again – now with Thermia Diplomat Optimum G2 with HGW technology. The new technology for water heating solves a previously impossible equation: during the part of the year when the house is heated, Thermia Diplomat Optimum G2 produces more and hotter water than traditional heat pumps, while consuming less energy.

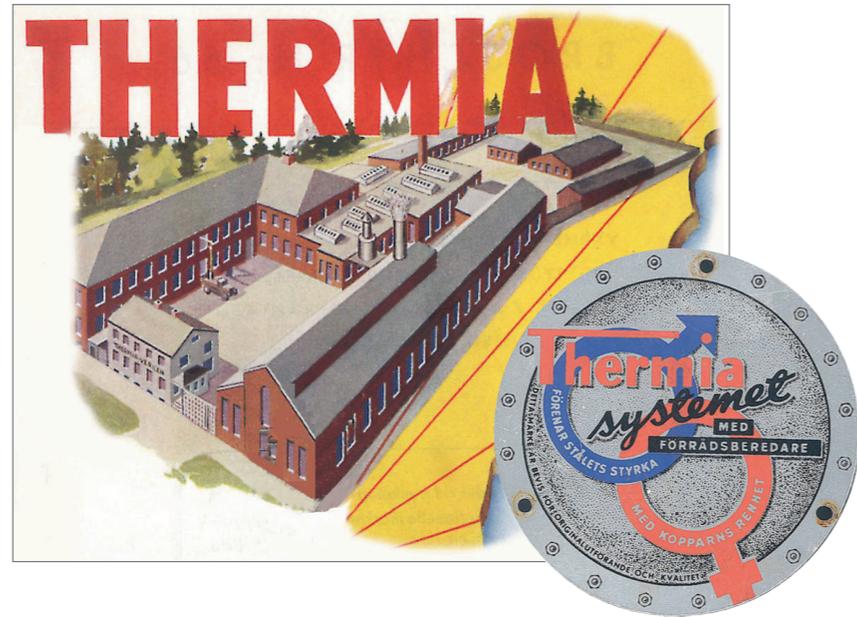


2012

With a new and more efficient compressor, new refrigerant and the latest generation of heat exchanger, the G3 is now more efficient than its predecessor the G2.

With the Thermia Online accessory, you can control and monitor your heat pump from any smartphone, computer or tablet.





*The Thermia factory from the 1940's together with the original symbol that is the foundation of today's Thermia logotype. The colour blue represents the "strength of steel" and red represents the "purity of copper".*





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