

SEA CLIMAVER®

Sustainable HVAC systems for Marine & Offshore



Get on board WITH SEA CLIMAVER®



Optimising HVAC system architectures to deliver SAFER, GREENER AND MORE COMFORTABLE SHIPS

HVAC systems in marine & offshore are a key element of the comfort and safety on board. Thermal comfort is often the first element we think of when referring to marine wellbeing. Focusing on ambient temperature and humidity is an essential aspect of the ship design process, particularly for overnight accommodation units.

Modern heating and cooling systems provide ideal temperatures for the well-being of passengers and crew, while at the same time ensuring the proper functioning of on-board equipment.

Ship owners and operators are looking for ever more efficient and sustainable HVAC solutions, but also ever smaller, lighter and quieter.

Optimising your HVAC system on board primarily means two things for you:

- ▶ Reducing its energy consumption
- ▶ Making the best use of the space available on board

HVAC design in the marine and offshore industries is complex and must address many challenges, in terms of health and safety, logistics, economics, quality assurance and overall performance.

And insulation plays a huge role in all of this.

ENHANCE YOUR HVAC PRODUCTIVITY AND CONSTRUCTION QUALITY WITH SEA CLIMAVER®, YOUR ALL-IN-ONE DUCT SYSTEM.

Made from dense and rigid glass wool boards, **SEA CLIMAVER®** self-supporting air ducts are a cost-effective, easy-to-install alternative to traditional insulated metal ducts:

- ▶ An all-in-one metal-free system, delivered flat on a pallet, and assembled in a single operation.
- ▶ Duct sections are assembled easily, without the need for expensive machinery usually used on-site.
- ▶ A shiplap on the edges ensures tight closure of the duct.



A UNIQUE PRODUCT TO REPLACE METAL DUCTS, PROVIDING STATE-OF-THE-ART INSULATION AND COMFORT.

Add value at EVERY STEP OF THE PROJECT

Invest in this exceptional duct solution to add value throughout the life of the project.



AS A SHIP OWNER

- › Take a step towards green shipbuilding
- › Improve the safety, comfort and well-being of passengers and crew
- › Significantly reduce operational costs
- › Benefit from easy maintenance and dismantling



AS A NAVAL ARCHITECT OR HVAC DESIGNER

- › Design high-performance ventilation & air-conditioning systems for marine and offshore
- › Optimise your projects through space-saving designs
- › Bring key benefits to your customers
- › Demonstrate your capacity to innovate
- › Address the most stringent regulations (Energy Efficiency Design Index, Green Ship Design...)



AS A SHIPYARD

- › Improve your project planning and overall performance
- › Reduce TCI (total cost of installation)
- › Optimise your logistics
- › Innovate with energy-efficient technology



AS AN INSTALLER

- › Install duct and insulation in a single operation
- › Reduce installation time and labour costs
- › Install more easily and safely
- › Optimise your logistics

7 GOOD REASONS TO CHOOSE SEA CLIMAVER®

Go for green shipbuilding

Reduce operation costs

Control noise pollution

Ensure fire safety

Work with safe and healthy materials

Ensure reliable, long-term performance

Increase your site productivity

Go for GREEN SHIPBUILDING



If the marine & offshore sector is often considered a polluting sector, in particular as a strong emitter of CO₂, the industry has understood the urgency to act and is committed more than ever to reducing its environmental impact.

While the main fields of action are alternative fuels (such as green methanol, hydrogen, fuel cells) and electrified transport (battery-powered ships, port charging solutions), we talk less often about lightweight materials and the potential for optimisation that these offer to modern shipbuilding.



OPTIMISE ENERGY CONSUMPTION AND CO₂ EMISSIONS FROM THE HVAC SYSTEM WITH SEA CLIMAVER®, YOUR BEST-IN-CLASS DUCT SOLUTION

Very good thermal resistance, reduced thermal bridges and excellent airtightness help significantly reduce energy consumption and limit greenhouse gas emissions from your ventilation system. Remember: The best energy is the energy we don't use.

DESIGN AND BUILD SUSTAINABLE SHIPS WITH INNOVATIVE ENERGY-EFFICIENT TECHNOLOGY

SEA CLIMAVER® will help reduce the Energy Efficiency Design Index of your marine projects.

SAVE FUEL AND REDUCE CO₂ EMISSIONS OF YOUR SHIPS WITH SEA CLIMAVER®, YOUR LIGHTWEIGHT DUCT SOLUTION

Compared to a traditional ductwork solution (metal duct + insulation), SEA CLIMAVER® reduces the weight of your HVAC ductwork by up to 65%. This translates directly into reduced fuel consumption, which in turn decreases greenhouse gas emissions (each tonne of fuel used is equivalent to 3 tonnes of CO₂).

SCENARIO

A **140 000** gross tonnes cruise ship -
3 300 passengers - **1 400** passenger cabins



Assumption: **SEA CLIMAVER®** replacing traditional steel duct for all straight ducts inside the passenger cabins.

	Weight of ductwork	 WEIGHT SAVINGS	 FUEL SAVINGS*	 AVOIDED CO ₂ EMISSIONS**
Steel duct + insulation	25 tonnes			
SEA CLIMAVER®	9.5 tonnes	-15.5 tonnes	-15.5 tonnes / year	-50 tonnes CO₂ / year

* Rule of thumb: A reduction of 1 tonne in the mass of ships saves around 1 tonne of fuel per year

** CO₂ emission calculating acc. MEPC.1/circ 684, diesel fuel type



In addition, **SEA CLIMAVER®** provides various benefits to the environment across its entire lifecycle, lessening the impact from sourcing to manufacture, from distribution to end-of-life:

➤ **SEA CLIMAVER® helps save materials & resources:**

Manufactured from up to 75% recycled glass wool, it reduces the need for sand extracted from quarries and helps protect biodiversity. But that is not all! Compared to metal ducts requiring the use of screws and welding, **SEA CLIMAVER®** also reduces the consumption of additional tools and equipment.

➤ **SEA CLIMAVER® limits waste generation:**

The exclusive Straight Duct Method (SDM) and unique guiding lines (cf. pages 16-18) ensure the optimal use of material, reducing building site waste.

➤ **SEA CLIMAVER® reduces transport emissions:**

The product is usually delivered flat on a pallet and assembled on-site.

SEA CLIMAVER®'s space-saving packaging reduces and optimises transport-related emissions.



Reduce OPERATION COSTS

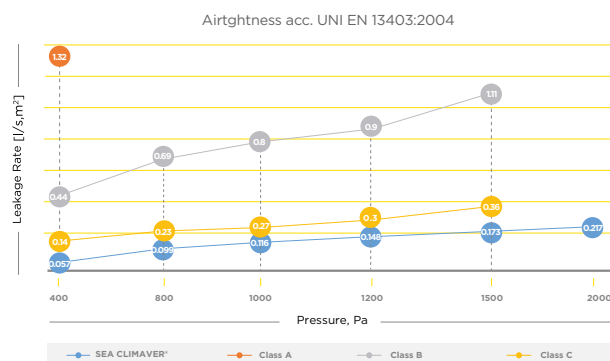


For ship owners and operators alike, cost is a key consideration while the vessel is operating. However, performance and lightweight materials offer the perfect opportunity to significantly reduce the total cost of ownership (TCO). The SEA CLIMAVER® duct system helps optimise TCO in several ways.

EXCELLENT THERMAL PERFORMANCES REDUCE HVAC ENERGY CONSUMPTION

Where HVAC represents on average 30% of a ship's total energy consumption, SEA CLIMAVER®'s exceptional thermal resistance and airtightness significantly reduce this energy consumption, while maximising passenger comfort.

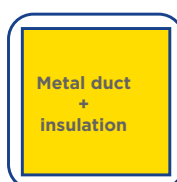
HIGHEST CLASSIFICATION OF AIRTIGHTNESS (EXCEEDING THE MOST STRINGENT AIRTIGHTNESS CLASSIFICATION)



EXCELLENT THERMAL RESISTANCE

Thermal conductivity at 10°C (W/m.K): $\lambda = 0,032$
Thermal resistance (m².K/W): $R = 0.78$

REDUCED THERMAL BRIDGES



Reduced thickness of insulation at the edges



Thermal bridges + risk of condensation



SEA CLIMAVER®

Constant thickness of insulation all around the duct



No thermal bridges

?

DID YOU KNOW?

Duct leakage is not only detrimental to indoor air quality and comfort, but also to the energy efficiency of the whole system. Most people are unaware of this “out-of-sight” problem around the seams and joints of duct take-offs.

Reducing leakage means:

- › Less heat loss
- › Less power for air handling unit (AHU) or ventilation machine needed to compensate for the effect of the leaks
- › Lower total airflow rates to and from unconditioned spaces
- › Optimised energy efficiency measures, including demand-control and heat recovery
- › The air needed to maintain the indoor environment at the desired temperature flows exactly where it is needed
- › The whole system can be precisely dimensioned

Energy used for heating & cooling is reduced by ~15%.

UP TO 65% LESS WEIGHT FOR LOWER OPERATING COSTS

By installing **SEA CLIMAVER®**, you can capitalise on the full capacity of your equipment while controlling costs for maximum profitability. Since every extra kilogramme means higher fuel consumption, any weight savings significantly reduce operating costs – while also maintaining at least the same levels of safety and comfort as traditional solutions.

LESS WEIGHT FOR BETTER STABILITY

Lightweight HVAC solutions help designers make the ship's construction more stable with identical performance. Less weight in critical areas above the water line like accommodation also means more freedom during the design phase.

LESS WEIGHT FOR MORE PAYLOAD

For critical weight-sensitive projects, reducing the weight of your HVAC systems with **SEA CLIMAVER®** enables you to increase the deadweight. This could mean increasing the number of passenger cabins, trailers or other crucial equipment. So that deadload becomes payload.



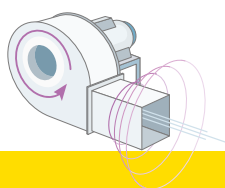
Control NOISE POLLUTION



Noise is recognised as an environmental pollutant that has a significant impact on our health and wellbeing. Acoustic comfort is therefore an essential consideration in any marine and offshore project for the benefit of both passengers and crew members. Controlling sound and vibration levels is an integral part of ship design, especially for passenger ships where comfort is a priority.

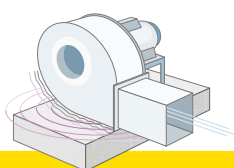
Ventilation and air-conditioning systems can be a source of noise and vibrations, either from the equipment itself or from the air flow circulating through the system.

Main sources of noise in a ventilation and/or air-conditioning system:



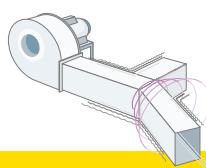
Ventilation/ air-conditioning system

Noise transmission due to the ventilation and/or air-conditioning system itself.



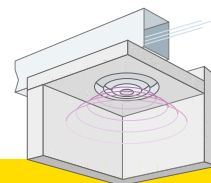
Machinery vibrations

Noise transmission due to the structure on account of vibration.



Air circulation

Generation of noise by the air speed effect.



Grilles and diffusers

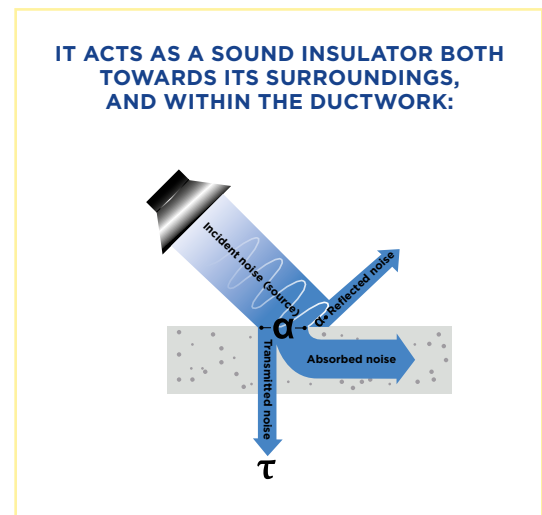
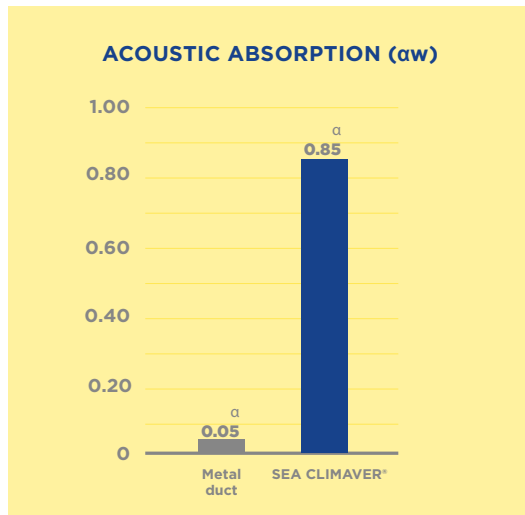
Noise transmission via grilles and diffusers.

This phenomenon is particularly noticeable if the internal surface of the ducts is made of a material that easily reflects sound, e.g. metal.

CREATE A WELL-BALANCED ACOUSTIC ENVIRONMENT WITH SEA CLIMAVER®

- Increase the level of acoustic comfort of your marine and offshore projects
- Avoid additional sound insulation liners inside the ducts
- No need for silencers or sound attenuators (depending on the system design)

SEA CLIMAVER® offers best-in-class sound absorption with a weighted absorption coefficient of α_w 0.85 (acc. NF EN ISO 354 & 11654).



Acoustic attenuation in dB for 2.4 m of 200x300 mm duct (measurement acc. ISO11691)

Sound pressure level dB	Frequency (Hz)				
	125	250	500	1000	2000
Metal duct	52.8	83.2	89.8	92.6	84.8
SEA CLIMAVER®	44.7	68.4	66.3	43.6	19.6

**?
DID YOU
KNOW?**

SEA CLIMAVER® is highly absorbent, including at low frequencies, where the problem of noise generated by the AHU or ventilation machine is greater.

WHATEVER THE SOURCE OF THE NOISE, SEA CLIMAVER® REDUCES THE PROPAGATION OF SOUND THROUGH THE DUCT WALL BY AT LEAST 10 dBA*

**measurement acc. ISO15665 (duct size 200x300 mm)*

Ensure FIRE SAFETY



Reducing the risk of fire at sea is essential, especially given how difficult it can be for the emergency services to reach isolated locations. As an integral part of any ship design, fire safety is therefore a priority for shipbuilders, designers and contractors who need to ensure that people and vessels are protected, while meeting ever strict construction standards for fire protection.

The choice of materials can significantly affect the spread of fire and its rate of travel, even though they are not likely to be the first things to ignite.

This is particularly important for duct networks. When selecting duct materials, their fire behaviour should always be taken into account, in particular non-combustibility, calorific content and flame propagation.







The various components of **SEA CLIMAVER®** carry the wheel mark which indicates that they are MED type approved for installation on ships registered in a country of the European Economic Area.

**DID YOU
KNOW?**

With SEA CLIMAVER®, no need for combustible accessories such as antivibration components.

COMPLY WITH MARITIME REGULATIONS

In order to meet the regulations and standards implemented by the International Maritime Organization defined in SOLAS Reg. II-2, **SEA CLIMAVER®** has been tested according to the FTP code for non-combustibility and surface flammability:

- 
Non-combustible substrate
- 
Exterior and interior finishes tested and certified for low flame spread
- 
Accessories like glue and tapes tested and certified as low flame spread
- 
Calorific value much lower than the maximum permitted

FTP code	TEST	DIRECTIVE	TESTING PROCEDURE
Part 1	Testing on Non-combustibility	MSC.307(88)	ISO 1182
Part 5	Testing of Surface Flammability for Linings, Coatings and Floor covers	MSC.307(88)	ISO 5658-2

INNOVATE THE DESIGN OF YOUR DUCT NETWORK

The codes which regulate the fundamental aspects of ship safety, including the requirements relating to ventilation ducts, vary according to the type of ship (SOLAS, HSC Code, REG Code, MODU...).

Although certain regulations would at first glance restrict its application, the use of **SEA CLIMAVER®** is possible for most marine duct systems.

Our ISOVER experts are there to help you design your duct system with **SEA CLIMAVER®** and to support you with certification bodies.

Work with SAFE AND HEALTHY MATERIALS

Our commitment to protecting the planet extends to the people living on it, from our employees to customers, end users and local populations. We push for positive change across the shipping sector and beyond, e.g. advocating European guidelines for disclosing and assessing hazard substances. And we constantly challenge the way we work by ensuring our products don't contain any hazardous substances.

PROVIDING FRESH, CLEAN AIR

It is obvious that a properly dimensioned HVAC system is essential for a comfortable and healthy indoor environment. Fresh air is vital for passengers and crew. A constant supply of clean, fresh air helps people to be more productive, happier and to experience fewer health issues.

The best way to improve indoor air quality is to reduce pollution at source while improving ventilation and purifying the air. With **SEA CLIMAVER®**, you can effortlessly carry fresh air inside without having to worry about mould or bacteria, as it has successfully passed all non-proliferation tests of the latter (according to the European standard for non-metallic ducts EN 13403).



DID YOU KNOW?

More than 2500 scientific publications have demonstrated that mineral wool fibres are safe to manufacture, install and live with. This has been recognised by health authorities at an international level e.g. REACH regulation.

WORKING WITH A SAFE MATERIAL



SEA CLIMAVER® ensures safe and comfortable installation. All ISOVER glass wool fibres are bio-soluble and exonerated from any classifications on carcinogenic, mutagenic, or toxic for reproduction criteria. **SEA CLIMAVER®** is certified according to EUCED and therefore complies with all EU regulatory requirements. It also has no impact on the Inventory of Hazardous Materials (according to MEPC.269(68)).

In addition, **SEA CLIMAVER®** is easy to handle thanks to its ergonomic product dimensions and weight up to 65% lower than a metal duct + insulation solution.

Ensure reliable, LONG-TERM PERFORMANCE



As SEA CLIMAVER® is made of glass wool, it could be perceived as fragile. However, SEA CLIMAVER® is both robust and flexible, which means that it can withstand all kinds of mechanical stress.

WITHSTANDING HIGH PRESSURE

To make sure your **SEA CLIMAVER®** duct is not affected by the working pressure of your air conditioning system, it has been tested in accordance with EN 13403. The Resistance Against Pressure test determines the fitness for purpose of ductwork assembled without reinforcements. The air ducts and connector sections with joints should withstand the test pressure without rupturing. This standard requires the duct to be tested at a pressure of 2.5 times the pressure declared by the manufacturer. **SEA CLIMAVER®** has therefore been tested at a pressure of 3000 Pa without generating any cracks or swelling, despite the test being performed on a joint between two ducts.

**DID YOU
KNOW?**

SEA CLIMAVER® ducts can withstand constant static pressure of up to 1200 Pa and air-circulation up to 18m/s.

A ROBUST SYSTEM

Contrary to metal ducts, **SEA CLIMAVER®** is not at risk of dents or damage on building sites. The interior facing is bonded to the mineral wool panel during its manufacture by thermo-pressing which makes it impossible to tear or detach.

MINIMISE MAINTENANCE

In order for your HVAC system to operate efficiently over time, **SEA CLIMAVER®** is easy to clean without compromising its original properties.

The internal coating offers the mechanical resistance required to clean the air conditioning systems, including with nylon brushes, without causing any deterioration or requiring post-cleaning treatments (encapsulation). In addition, the resistance of the internal coating reduces the frequency of access required for cleaning. **SEA CLIMAVER®** ducts retain all their acoustic, thermal and fire protection properties over the whole lifetime of the system.



Increase your SITE PRODUCTIVITY



Installation time and cost are major concerns for shipyards and installers, always on the lookout to optimise their work, increase productivity and reduce installation times.

With **SEA CLIMAVER®**, a single product replaces the two traditional trades of metal ductwork and their insulation. Assembled in a single operation, it offers numerous installation benefits:

Fast installation:

The many experiences with CLIMAVER® in buildings lead to the conclusion that **SEA CLIMAVER®** is up to 5 times faster to install than metal ducts + insulation. One worker can install 20 to 25 m² of **SEA CLIMAVER®** per day, which can help optimise the use of manpower.

Flexibility:

Installed on site, **SEA CLIMAVER®** can easily be adapted to last-minute changes in ductwork or alternative routing.

Comfortable installation:

Up to 65% weight reduction compared to metal ducts + insulation, and its ergonomic product dimensions make it easy to carry and lift. Installation also requires fewer duct supports.

Optimised logistics:

Saves space during transport and storage, as **SEA CLIMAVER®** is delivered flat on a pallet, and no special power tools or machines are needed for installation.

Limited waste generation



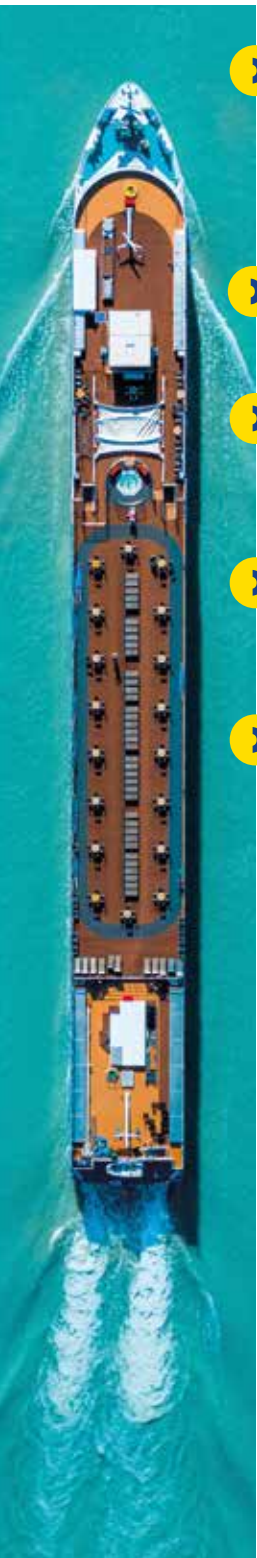
UNDERSTANDING THE STRAIGHT DUCT METHOD (SDM)

As its name suggests, the Straight Duct Method (SDM) involves combining straight duct boards in different configurations and parts like elbows, branches and offsets etc. By constructing self-supporting ducts in this way, greater precision, resistance and quality can be achieved, with less load loss and waste.

What's more, you'll save time and money, as the boards are faster to install.

5 times faster than cutting from pieces.

We've added guiding lines on all **SEA CLIMAVER®** boards, so the installer does not have to draw lines himself. This limits the risk of mistakes, while improving performance and optimising the quantity of material used.




GET MORE FROM THE STRAIGHT DUCT METHOD (SDM)


With our exclusive leaning shiplap, you can further optimise the performance of your ductwork:

- **Improve airtightness & reduce pressure loss**
- **Enhance aesthetics**
- **Obtain stronger, more precise jointing**
- **Choose your configuration**, including complex shapes
- **Connect to any HVAC** standard equipment

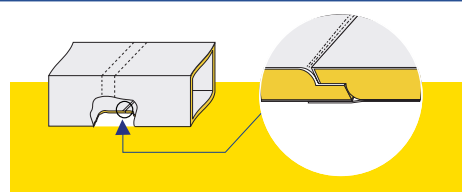
0% waste with SDM



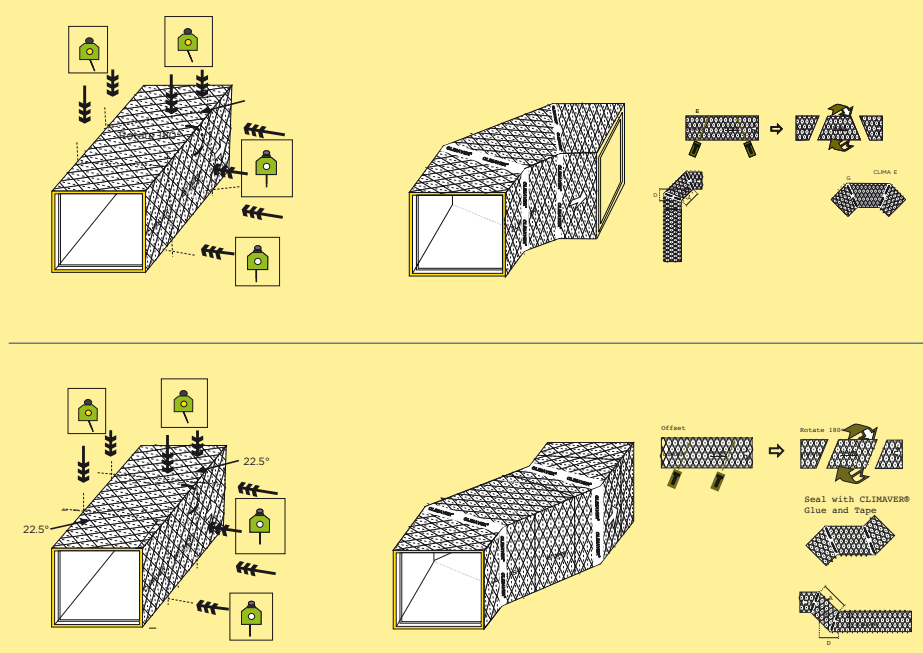
Example:
waste generated
creating two 90° elbows
of 300x350mm

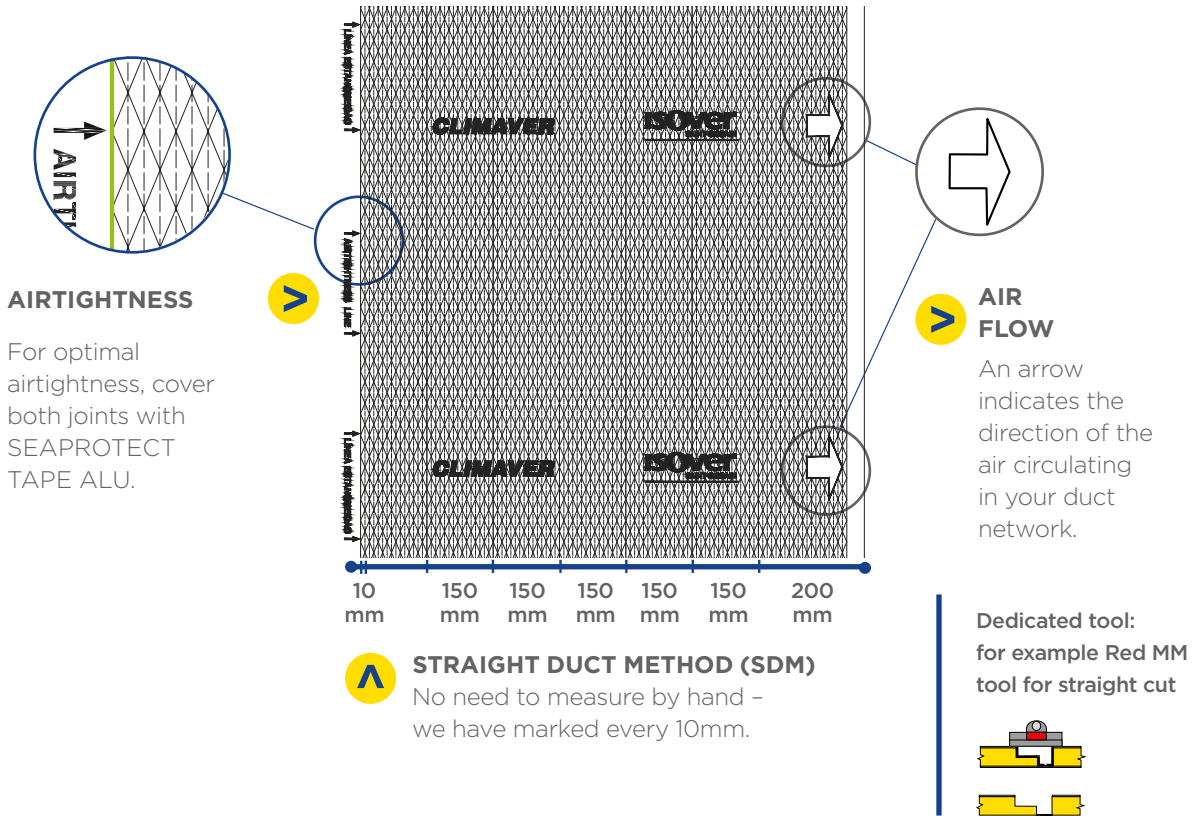


1.5 m ²	Cut from 4 pieces
0 m ²	Straight Duct Method (SDM)



ALL COMPLEX SHAPES AND CONNECTIONS NEEDED WITH OTHER HVAC EQUIPMENT ARE EASY TOAchieve WITH SEA CLIMAVER®.





More information about the Straight Duct Method?

Take a look at the CLIMAVER® Installation Guide or download our CLIMAVER® app.

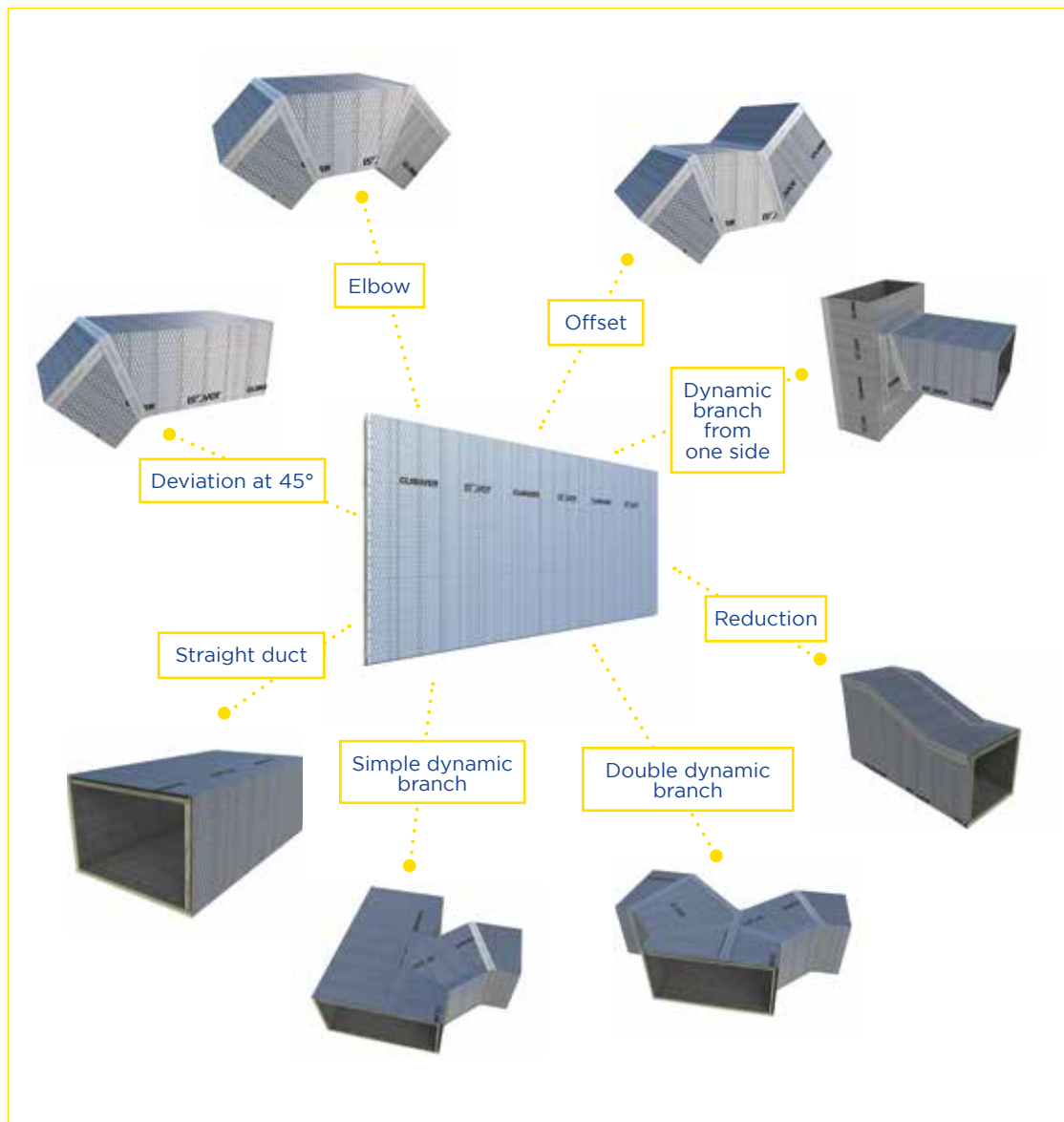


SEA CLIMAVER®
ALL YOU NEED
TO KNOW

SEA CLIMAVER® AT A GLANCE

SEA CLIMAVER® is a self-supporting duct for ventilation and air conditioning systems in the form of a high density rigid glass wool panel. It has an exterior facing of aluminium foil reinforced with glass mesh which acts as a vapour barrier, and an interior facing in black reinforced glass fabric offering high mechanical resistance.

A UNIQUE SYSTEM TO REPLACE METAL DUCTS, PROVIDING INSULATION AND COMFORT!





DID YOU KNOW?

SEA CLIMAVER® accessories like glue and tapes have also been tested in accordance with maritime regulations.



A proven track record in the BUILDING AND MOBILITY SECTORS

CLIMAVER® solutions have been chosen by customers around the world looking to combine high performance with significant cost savings in a variety of sectors, from public, commercial to residential buildings or even trains.

- Commercial buildings
- Residential buildings
- Airports
- Hotels
- Hospitals
- High-rise buildings
- Schools and educational institutions
- Trains

BE CONFIDENT: A SYSTEM USED WIDELY FOR MORE THAN 50 YEARS

More than 180 million metres of CLIMAVER® duct have already been installed worldwide.

OFFICE BUILDINGS



Oriental Fisherman's Wharf
Shanghai, China

HEALTHCARE



Hospital San Juan de Dios
Cordoba, Spain

EDUCATION



Scuola dell'Infanzia e Primaria
Giano dell'Umbria, Italy

TRAINS



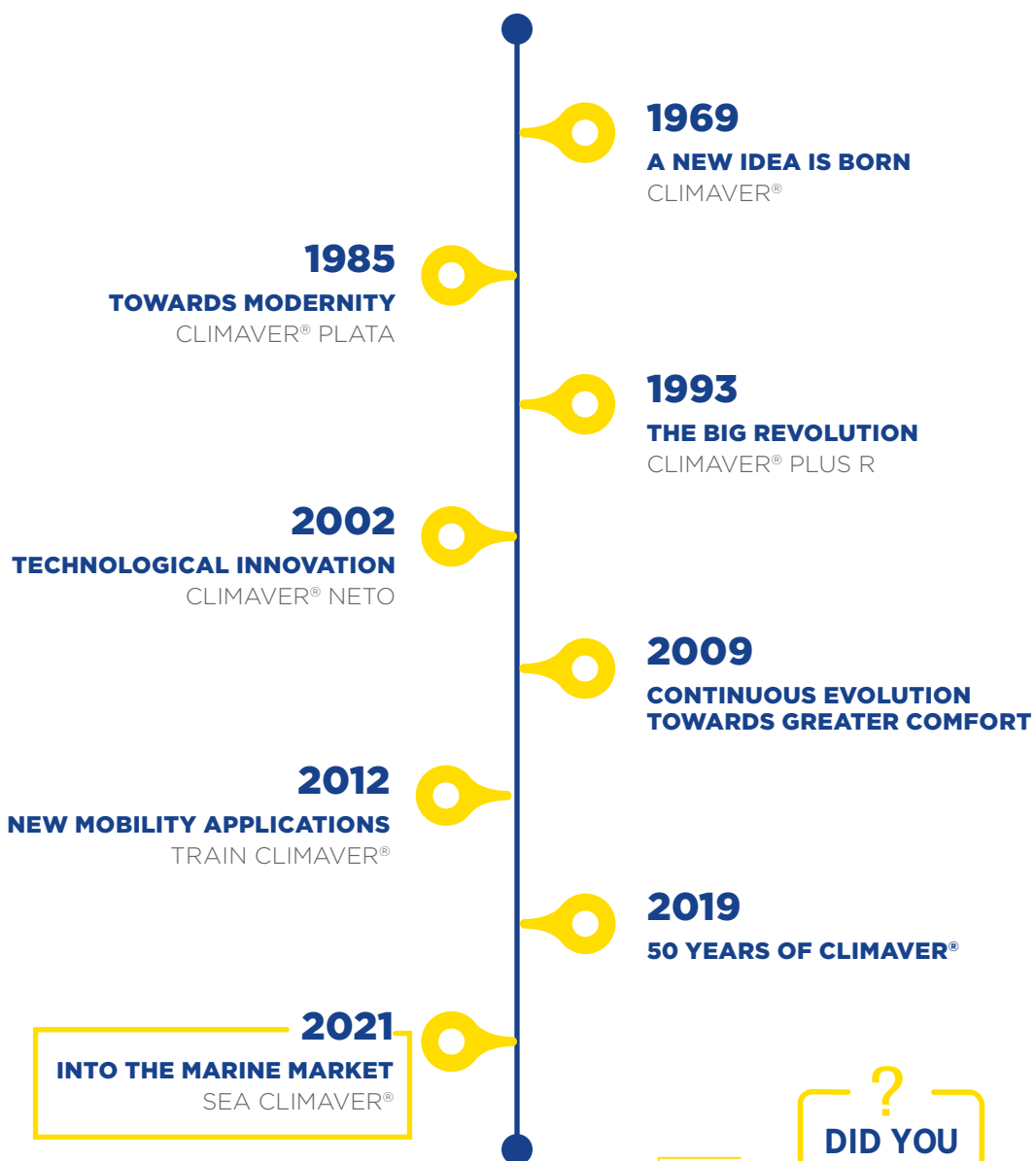
Metro Santiago (Chile)
Metro Brussels (Belgium)
Metro Istanbul (Turkey)
FlyToGet (Norway)
Euskotren (Spain)

TO IMPLEMENT SEA CLIMAVER® IN YOUR SHIPBUILDING PROJECTS, OUR EXPERTS ARE AT YOUR DISPOSAL TO PROVIDE ALL THE NECESSARY TECHNICAL SUPPORT AND DEVELOP THE MOST SUITABLE SOLUTION FOR YOUR NEEDS. CONTACT US VIA OUR WEBSITE.



The CLIMAVER® STORY

For 50 years, we have constantly updated and improved the CLIMAVER® range to meet our customers' evolving needs. Based on this deep sector experience, we have constantly improved our manufacturing techniques to build a product optimised for both installers and end users.



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**DID YOU
KNOW?**

Many first-generation
CLIMAVER® installations
are still operational.

First customer FEEDBACK

Naval Consortium (HVAC Installer, Italy)



Roberto Toscan,
Site Manager

“

A FEW WORDS ABOUT YOUR COMPANY

“Naval Consortium is an HVAC installer specialising in the marine segment and working for all major shipyards in Italy.”

YOUR MAIN CHALLENGES?

“Our job is quite technical and requires a lot of skills. We are often faced with very tight deadlines and have to coordinate our work with other equipment installers.”

WHAT TYPE OF INSULATION DO YOU TYPICALLY USE?

“Either glass wool, stone wool or ULTIMATE™ from ISOVER. We favour quality products and features that allow quick installation, such as lightweight solutions. It also needs to look good and we don't want any issues after installation.”

YOUR FIRST IMPRESSIONS OF SEA CLIMAVER®?

We took part in the very first Italian project. The solution was completely new and we asked ourselves a lot of questions: how does it work? How long to build a duct? ... Of course, we had some doubts, but since we trust ISOVER, we wanted to know more.

It was quickly realised that the installation is quite easy thanks to a patented efficient construction method. As we install the duct and insulation in one, it saves installation time considerably! And the fact that installers must undergo training to be recognised as official **SEA CLIMAVER®** installers adds value to our work.

AND WHAT COMES NEXT?

SEA CLIMAVER® offers an excellent opportunity to differentiate our work. The solution has very good acoustic performance, so it should be perfect for cabins and public areas of cruise ships and for mega-yachts. Of course the solution is still new, and change is not easy in a very traditional marine industry. But as we truly believe in it, we will continue to promote all the benefits of **SEA CLIMAVER®** to our customers.

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ABOUT US

Discover the Saint-Gobain Group,
and read more about
Saint-Gobain Technical Insulation,
the world-leading supplier
of sustainable insulation solutions.



MAKING THE WORLD A BETTER HOME



Saint-Gobain designs, manufactures and distributes solutions for the construction, mobility, healthcare and other industrial application markets. Developed through a continuous innovation process, they provide wellbeing, performance and safety while addressing the challenges of sustainable construction, resource efficiency and the fight against climate change.

This strategy of responsible growth is guided by the Saint-Gobain purpose, "MAKING THE WORLD A BETTER HOME", which responds to the shared ambition of the women and men in the Group to act every day to make the world a more beautiful and sustainable place to live in.



Aligned with this commitment, Saint-Gobain Technical Insulation has been delivering sustainable insulation solutions to customers since 1937. Across all technical markets - from Marine to Industry, HVAC, automotive and household appliances - and with a worldwide presence deployed locally, we support our customers at every step of the project, from design to installation. This means customising our approach based on specific needs. This means adding value through high levels of comfort, health, safety and performance. This also means helping limit environmental impact of each project, while managing costs.

With expertise in an array of insulation materials, we are constantly pushing the limits of our solutions. These unwavering R&D efforts also enable us to reduce the carbon footprint of each product, whether through high levels of recycled content, recyclability or lower energy consumption.

Drawing on a unique combination of global resources, local deployment and multi-material expertise, Saint-Gobain Technical Insulation strives to always be more efficient and responsible. Together with our customers, we are making this an everyday reality.

**Saint-Gobain Technical Insulation
PUSHING THE LIMITS OF SUSTAINABILITY TOGETHER.**



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