Marine & Offshore insulation

U SeaProtect Technical Manual

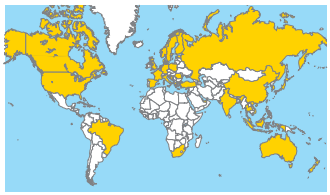
Solutions for Steel constructions (FTP Code 2010)

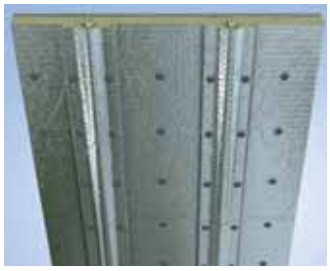
Fire & Sound protection, Thermal, Installation guidelines

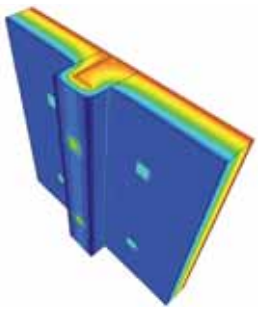
SAINT-GOBAIN 350

ISOVER SAINT-GOBAIN

Content







Introduction

Dear customers,

Paul Delouche
International Market Manager
Marine & Offshore

Carole Durantet
Products and Systems development
Marine & Offshore

this first ISOVER Marine & Offshore technical manual aims at providing all information about our insulation solutions that naval architects, designers and acoustic experts may need when working on a steel construction.

Besides fire protection, a large part of this manual is dedicated to thermal and acoustic performance. During the past years of extensive use in the cruise shipbuilding industry, ULTIMATE lightweight solutions have proven their excellence in sound protection. The new U SeaProtect products range, with higher acoustic performance, will fully contribute to the common goal of the industry to deliver lightweight constructions with improved comfort and quietness aboard.

To the particular attention of distributors and installers, this manual gives as well an overview of the technical benefits of our solutions: optimized logistics, thin design, simplicity of installation. Thanks to the revolutionary Quick-Cover system, installing insulation around the stiffeners has become as easy as possible.

Keeping in mind the spirit of constant innovation that made the success of ULTIMATE during the last years, we hope, with the help of this manual, to further collaborate and share our passion with you for the Marine business.

ULTIMATE U SeaProtect, – get the real performance!

The ISOVER Marine & Offshore team

General information

ULTIMATE: A new generation of high performance mineral wool

ULTIMATE portrays a new era in fire protection for Marine & Offshore markets.

It results from more than 25 years of intense research carried out by ISOVER to develop a new generation of mineral wool with excellent fire protection, thermal and acoustic properties combined with a drastically reduced weight when compared to traditional stone wool solutions.

Thanks to ISOVER's unique patented technology, ULTIMATE mineral fibres are extruded through horizontal spinners instead vertical rotary wheels.

This unique fiberizing process ensures the fine control of the fibre diameter and results in a totally shot free product made of long interwoven fibres ISOVER's high techonology production expertise makes ULTIMATE products performance outstanding.

The U SeaProtect range

With U SeaProtect for Marine & Offshore applications, ISOVER offers a full line of fire protection products that comply with the 2010 Fire Test Procedures Code for steel constructions including a number of improved solutions:

Thinner solutions

- 25 mm around the stiffeners for A60 steel constructions
- 20 mm around the stiffeners for A30 steel constructions
- 50 mm on the plate for A60 steel Bulkhead and Deck
- No insulation needed around the stiffeners for A15 steel Bulkhead and Deck

Lighter solutions

- U SeaProtect solutions are increasingly lighter than traditional stone wool solutions of previous generation: they are up to 45% lighter, providing equivalent fire certified protection.

Easy to install

- U SeaProtect solutions are incredibly fast to install thanks to the unique Quick-Cover mounting system enabling to reduce drastically installation time.

Quick-Cover system

Excellent Thermal and Acoustic performance

- Comfort on board passenger ships is critical; this is why ISOVER designed ULTIMATE U SeaProtect **Best Comfort Class** with excellent thermal and acoustic performance. Our **Best Comfort Class** constructions will provide you with the highest level of performance that can be reached with mineral wool systems.

Optimized Logistics

- All Steel A-Fire Class constructions can be achieved with only four ULTIMATE products that are part of the **Easy Logistics portfolio** including various facings. For products part of the **Easy Logistics portfolio**, there is no need to worry about Minimum Order Quantities: products can be bought with a minimum of 1 pallet. Highly compressed product packages result in significant transport and storage cost savings.

A new standard for Marine & Offshore

All-in-one Concept

Using ULTIMATE U SeaProtect solutions enable subsequent weight savings aboard a ship, which will contribute to improve its stability and reduce operating costs for the shipowner.

But this is far from being the only benefit provided by ULTIMATE and the innovative U SeaProtect solutions:

- The smart and efficient Quick-Cover system enables a faster and easier installation, which benefits to installers and shipyards
- The optimized logistics allow to reduce the space occupied in warehouses, which benefits to shipyards and distributors and helps reducing transport costs and emissions
- The excellent thermal & acoustic performances benefit to passengers onboard, who will enjoy a peaceful and comfortable cruise. It also allows reduction of HVAC energy consumption for the shipowners

U SeaProtect solutions have been developed in the spirit of providing the best performance achievable paying great attention to our customers' demands.

- **Effective Fire Protection**
- **Unique Lightness**
- **Easy to Install**
- **Thin Solutions**
- **Optimal Acoustic Performance**
- **Excellent Thermal Insulation**
- **Optimal Logistics**
- **Cost Effective Solutions**
- **Active Environmental Protection**

U SeaProtect Rolls solutions can be compressed and provide subsequent space savings for storing

Bending around the stiffeners is possible only thanks to the outstanding flexibility of ULTIMATE

Quick-Cover system , the easiest and fastest way to insulate stiffeners

Norwegian Breakaway , Meyer Werft, Germany, 2013, ©Michael Wessels

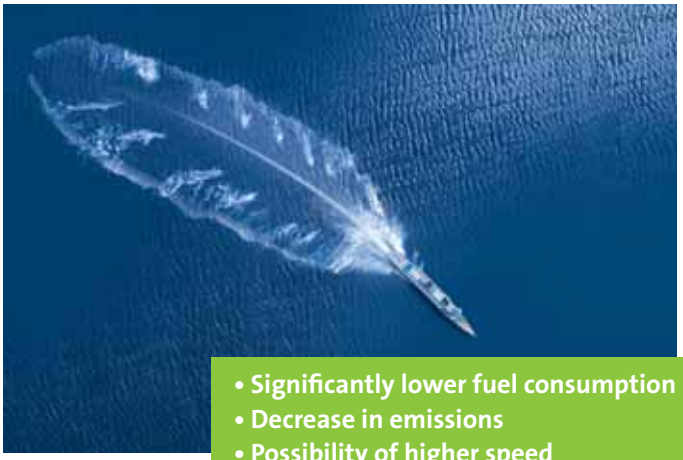
Weight savings

Maximum efficiency thanks to U SeaProtect

Due to their unique microstructure (100% fiberized, no "shot"), ULTIMATE U SeaProtect mineral wool solutions **save up to 50 % on the weight of insulation** when compared to traditional stone wool solutions. While providing equivalent fire protection level, they will ensure the same or better level of sound protection and thermal comfort.

By installing ULTIMATE insulation solutions, you will be sure to utilize the full capacity of the equipment you invested in.

ULTIMATE U SeaProtect: “Get the real performance”



- **Significantly lower fuel consumption**
- **Decrease in emissions**
- **Possibility of higher speed**
- **Better stability**

Less weight means lower operating costs

Increasing operating costs incents ship owners to look for more innovative and efficient vessels or offshore constructions.
ULTIMATE offers an ideal chance to massively cut down on energy consumption. Since every extra kilogram means higher costs, the weight savings realized with ULTIMATE significantly reduce fuel consumption and emissions. All this is achieved with at least identical levels of safety and comfort compared to traditional solutions.

Less weight means better stability

ULTIMATE lightweight U SeaProtect solutions help designers to improve the stability of a ship construction with identical insulation performance and less weight – that ensures more freedom at the planning phase.
ULTIMATE solutions help to put a construction ahead of the game already at the design phase by saving weight in critical areas located typically above the water line or in accommodation areas.

Less weight for insulation means more payload

Increased requirements in terms of safety, comfort level and complexity of equipment force ship builders to look for more innovative solutions to reach the target.
For critically weight sensitive projects, reducing weight of insulation by using ULTIMATE solutions opens the door to increase the deadweight proportionally. Depending on the project, U SeaProtect solutions will make it possible to increase the number of passenger cabins, trailers or any equipment crucial to be embarked for the considered construction.
ULTIMATE **U SeaProtect solutions enable to turn deadload into payload** on a scale that could not be reached before with traditional mineral wool insulation solutions

AIDA diva, Meyer Werft, Germany, 2007

Cost efficiency

Benefits of weight savings

Case study (Study carried out by an independant naval architecture design office)

RoRo Passenger Ferry				Original Design (traditional stone wool)	ULTIMATE	Difference
Length	210 m	Beam	29 m			
Passengers	2800	Passengers publick decks	2			
Passenger cabins	900	Passengers cabin decks	4			
		Car decks	1			
Estimated weight (t) of Insulation				575 t	295 t	**-280 t (-50 % !)**

Using ULTIMATE solutions allows weight reduction of approximately 280 t at the full scale of the ship compared to traditional stone wool solutions.

1) Weight reduction not compensated: -280 t

	Lightship		Fully Loaded		Difference
	Original	ULTIMATE	Original	ULTIMATE	
Displacement	18.600 t	18.320 t	23.750 t	23.470 t	**-280 t**
Draught	/	/	6.3 m	6.23 m	**-7 cm**
Block coefficient	/	/	0.649	0.642	**-1 %**
Gravity Vertical Center	15.45 m	15.35 m	/	/	**-10 cm**

Decreasing the Gravity Vertical Center of the ship by nearly **10 cm** will significantly **improve the stability** of the ship. With a cruise speed assumption of **23 knots** it has been estimated that it is approximately **180 000 $/year** that could be **saved on fuel consumption**(*).

2) Weight reduction compensated

Another approach is to make use of the weight savings realized.

Higher revenues

For example, 280 t corresponds to an increase of the deadweight of this ship by 5,3 %. The **weight savings** enabled by the use of ULTIMATE solutions are equivalent to the weight of **6 trailers of 45 t each**, enabling the ferry ship operator to increase its revenue proportionally.

Savings on construction costs

The weight savings realized thanks to the use of ULTIMATE could be utilized to substitute completely one of the upper deck Aluminium structure located on deck 11 initially planned in the original design due to weight constrains to a less costly construction made of steel. **The total estimated savings for this substitution amount to 1 800 000 $.**

Savings on logistics and installation time

From installers and distributors point of view ULTIMATE U Sea Protect solutions provide significant savings at different levels. Manpower hours can be saved in significant proportions by using the Quick-Cover system around the stiffeners (more information page 6 and 19).

Quick-Cover system

Additionally by using ULTIMATE in rolls format rather than in slabs, savings on quantity of material purchased can be done (~ -15 %) thanks to a reduction of the waste due to off-cut.

Space and transport costs are as well highly reduced (~ -40 %) thanks to the high compression of rolls in comparison with slabs (more information page 14).

All these advantages help to save money on the total cost of insulation solutions: **total installed cost = material cost + logistics + installation cost.**

(*) calculation hypothesis: 15 h/day, 340 d/year and 300 t of HFO saved/year at 600 $/ton of Heavy Fuel

U SeaProtect range and solutions

New product name structure

Find your U SeaProtect product quickly and in a simple way.

ULTIMATE	Product range	Product Form	Density (kg/m³)	Facing	Thickness (mm)
U	SeaProtect	Roll Slab Wired Mat	24 36 56 76 86 90 ...	Alu1 → unfaced Alu1 → Aluminium G120 → Glass cloth (black) G220 → Glass cloth (white) G420 → Glass cloth (white) B-Al → B Facing[1] (Alu outside) B-Gl → B Facing[1] (Glass cloth outside)	20 mm 25 mm 30 mm 40 mm 50 mm 70 mm 100 mm ...

U SeaProtect range: snapshot of product combinations

Various thickness solutions are possible between and around the stiffeners. As space is so important on a ship it is good to have a choice. U SeaProtect constructions are up to 45 % lighter than traditional stone wool solutions, providing equivalent fire protection when tested according to the FTP Code 2010.

Steel Constructions FTP Code 2010		Stiffener[2]			
A- Fire Class	Plate[2]	U SeaProtect Slab 76 25 mm	U SeaProtect Slab 76 20 mm	U SeaProtect Slab 56 30 mm	Other Possibilities
A-60 Bulkhead	U SeaProtect Slab 56 70 mm	●	●	●	
	U SeaProtect Slab 86 50 mm				
A-60 Bulkhead (Double Sided)	U SeaProtect Slab 46 30 mm on each side				U SeaProtect Slab 46 30 mm X1 (on the stiffener side)
A-60 Bulkhead Restricted	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	●			U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm
A-30 Bulkhead	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	●	●	●	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm
	U SeaProtect Slab 76 40 mm or U SeaProtect Slab 76 20 mm x 2	●	●		
A-30 Bulkhead Restricted	U SeaProtect Slab 46 40 mm				U SeaProtect Slab 46 30 mm or U SeaProtect Slab 46 40 mm
A-15 Bulkhead	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	●	●	●	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm
	U SeaProtect Slab 66 30 mm				no insulation around the stiffeners
A-60 Deck	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	●			U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm
	U SeaProtect Slab 66 50 mm	●			
A-15 Deck A-30 Deck	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	●	●	●	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm
	U SeaProtect Slab 76 25 mm	●	●		
A-15 Deck	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm				no insulation around the stiffeners

1) B Facing is a laminated composite facing combining Glass cloth and Aluminium foil.
2) All U SeaProtect products are available for each construction with different facings approved by a recognized test laboratory (Alu facing Alu1, Glass cloth facings G120, G220, G420, B facing, etc...).

Standard Design

Light weight and Easy Logistics. Only four products are necessary to cover all Steel A-Fire Classifications.

STEEL	Plate		Stiffener		Complete solution
	Products[1)]	Weight [kg/m²]	Products[1)]	Weight [kg/m²]	Weight [kg/m²][3)]
A-15 Bulkhead	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	1,20	U SeaProtect Slab 76 25 mm	1,90	2,53
			U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	1,20	2,04
A-30 Bulkhead A-60 Bulkhead Restricted	U SeaProtect Slab 36 7 0mm or U SeaProtect Roll 36 70 mm	2,52	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2,52	4,28
			U SeaProtect Slab 76 25 mm	1,90	3,85
A-60 Bulkhead	U SeaProtect Slab 56 70 mm	3,92	U SeaProtect Slab 76 25 mm	1,90	5,25
A-15 Deck A-30 Deck	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	1,20	U SeaProtect Slab 76 25 mm	1,90	2,53
			U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	1,20	2,04
A-60 Deck	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2,52	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2,52	4,28
			U SeaProtect Slab 76 25 mm	1,90	3,85

Thin Design

Thin Solutions between and around the stiffeners.

The solutions below help you gaining space, often a critical issue when designing a ship.

STEEL	Plate		Stiffener		Complete solution
	Products[1)]	Weight [kg/m²]	Products[1)]	Weight [kg/m²]	Weight [kg/m²][3)]
A-15 Bulkhead	U SeaProtect Slab 66 30 mm	1,98	no insulation around stiffeners	–	1,98
A-30 Bulkhead Restricted	U SeaProtect Slab 46 40 mm	1,84	U SeaProtect Slab 46 30 mm	1,38	2,81
A-30 Bulkhead	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2,52	U SeaProtect Slab 76 20 mm	1,52	3,58
	U SeaProtect Slab 76 40 mm or U SeaProtect Slab 76 20 mm x 2	3,04	U SeaProtect Slab 76 20 mm	1,52	4,10
			or U SeaProtect Slab 76 25 mm	1,90	4,37
A-60 Bulkhead	U SeaProtect Slab 56 70 mm	3,92	U SeaProtect Slab 76 20 mm	1,52	4,98
	U SeaProtect Slab 86 50 mm	4,30	U SeaProtect Slab 76 25 mm	1,90	5,63
A-15 Deck	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2,52	no insulation around stiffeners	–	2,52
A-15 Deck A-30 Deck	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	1,20	U SeaProtect Slab 76 20 mm	1,52	2,26
	U SeaProtect Slab 76 25 mm	1,90	U SeaProtect Slab 76 20 mm	1,52	2,96
			or U SeaProtect Slab 76 25 mm	1,90	3,23
A-60 Deck	U SeaProtect Slab 66 50 mm	3,30	U SeaProtect Slab 76 25 mm	1,90	4,63

Products highlighted in colors are part of the ISOVER U SeaProtect Easy Logistics Portfolio. These products are available with a low Minimum Order Quantity (equivalent to 1 pallet) for various facings. For more information, please refer to pages 32-33 and 110-111

3) Estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0,7 for the stiffener. The weight in kg/m² is given for 1 m² "seen" from the flat side ("projected area").

Customized solutions

Design your own set of solutions

Pick the most appropriate U SeaProtect solutions depending on the requirements of each project: size of the project, level of thermal and acoustic comfort required vs. budget, space or weight constraints, limited warehouse capacity. By combining in a smart way the multiple solutions of the U SeaProtect range, you can customize a set of solutions perfectly tailored to your needs. Please refer to your ISOVER local contact to help you choosing the most adapted solutions of our range for your project. You will find below a few guiding examples.

Optimal Logistics Design

*If logistics is identified as a potential issue on a project (Minimum Order Quantity, warehouse space limited ...), the Optimal Logistics Design answers to your demand by covering all A-60 and A-30 Steel Fire Classifications with **only 3 products**. It could be particularly advised for small scale projects or where a need to reduce complexity on worksite is expressed.*

STEEL	Plate		Stiffener		Complete solution
	Products[1)]	Weight [kg/m²]	Products[1)]	Weight [kg/m²]	Weight [kg/m²][2)]
A-60 Bulkhead	U SeaProtect Slab 56 70 mm	3.92	U SeaProtect Slab 76 25 mm	1.90	5.25
A-30 Bulkhead A-60 Bulkhead Restricted	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2.52	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2.52	4.28
			U SeaProtect Slab 76 25 mm	1.90	3.85
A-60 Deck	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2.52	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2.52	4.28
			U SeaProtect Slab 76 25 mm	1.90	3.85
A-30 Deck	U SeaProtect Slab 76 25 mm	1.90	U SeaProtect Slab 76 25 mm	1.90	3.23

Lightweight Design

This set of solutions is particularly advised for projects where weight is the most critical parameter and where using several different solutions can be done without raising any Logistics issues (typically for a large scale project).The solutions below are the lighter ones of the U SeaProtect range making them the most cost effective as well.

STEEL	Plate		Stiffener		Complete solution
	Products[1)]	Weight [kg/m²]	Products[1)]	Weight [kg/m²]	Weight [kg/m²][2)]
A-60 Bulkhead	U SeaProtect Slab 56 70 mm	3.92	U SeaProtect Slab 76 20 mm	1.52	4.98
A-30 Bulkhead	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2.52	U SeaProtect Slab 76 20 mm	1.52	3.58
A-15 Bulkhead	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	1.20	U SeaProtect Slab 76 20 mm	1.52	2.26
			U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	1.20	2.04
A-15 Bulkhead	U SeaProtect Slab 66 30 mm	1.98	no insulation around stiffeners	–	1.98
A-60 Deck	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2.52	U SeaProtect Slab 76 25 mm	1.90	3.85
A-30 Deck	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	1.20	U SeaProtect Slab 76 20 mm	1.52	2.26
			U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	1.20	2,04
A-15 Deck	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2.52	no insulation around stiffeners	–	2.52

Best Comfort Class constructions

Excellent thermal insulation, excellent acoustic performance.

Comfort onboard passenger ships is critical, this is why we paid special attention to design ULTIMATE U SeaProtect constructions not only according fire resistance but also with excellent thermal and acoustic performance.

Best Comfort Class constructions are obtained by adding a 2nd layer of ULTIMATE 24 kg/m³ 50 mm between the stiffeners only, making it easy to install and simple from logisitics point of view while occupying less space under the stiffeners.

Steel Constructions FTP Code 2010				Best Comfort Class constructions				Fire certification
Stiffener[1]	Plate	Sound Reduction[3] Rw (C,Ctr) [dB]	U-value [W/m²·K]	+ 2nd Layer on the Plate (Optional)	Total Thickness on the plate [mm]	Sound Reduction[3] Rw (C,Ctr) [dB]	U-value [W/m²·K]	
	U SeaProtect Slab 66 30 mm	45(-1;-5)	2.065					A-15 Bulkhead
	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	47(-1;-6)	1.475					A-15 Deck
U SeaProtect Slab 76 25 mm	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	47(-2;-6)	0.819	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm (2nd layer on top)	100	49(-2,-6)	0.506	A-15 Bulkhead A-15 Deck A-30 Deck
	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	48(-1;-6)	0.645		120	50(-2,-7)	0.429	A-30 Bulkhead A-60 Bulkhead Restricted A-60 Deck
	U SeaProtect Slab 56 70 mm	49(-2;-7)	0.636		120	51(-3;-8)	0.425	A-60 Bulkhead
	U SeaProtect Slab 66 50 mm	48(-2;-7)	0.785		100	50(-3;-8)	0.496	A-60 Deck (Thin Design)
	U SeaProtect Slab 76 25 mm	45(-1;-5)	1.154		75	48(-2;-6)	0.624	A-15 Deck (Thin Design) A-30 Deck (Thin Design)
	U SeaProtect Slab 76 40 mm or U SeaProtect Slab 76 20 mm x 2	47(-2,-6)	0.893		90	–	0.543	A-30 Bulkhead (Thin Design)
	U SeaProtect Slab 86 50 mm	48(-2;-7)	0.785		100	50(-2;-8)	0.496	A-60 Bulkhead (Thin Design)

Products highlighted in colors are part of the ISOVER U SeaProtect Easy Logistics Portfolio. These products are available with a lower Standard Minimum Order Quantity (equivalent to 1 pallet) for various facings. For more information, please refer to pages 32-33 and 110-111

1) All U SeaProtect products are available for each construction with different facings approved by a recognized test laboratory (Alu facing Alu1, Glass cloth facings G120, G220, G420, B facing, etc...).
2) Estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0,7 for the stiffener. The weight in kg/m² is given for 1 m² "seen" from the flat side ("projected area").
3) Facings do not influence Sound Reduction performance; measurement shows that variation of thickness around the stiffeners between 20 mm and 30 mm has a limited influence on the measurement of sound reduction level. Results are shown for measurement done with U SeaProtect Slab 76 25 mm around the stiffeners.
4) All U-values have been calculated with U SeaProtect Slab 76 25 mm around the stiffeners (76 kg/m³ 25 mm products). The U-value are given for 1 m² "seen" from the flat side ("projected area").

Benefits of rolls solutions

To benefit from all the advantages that ULTIMATE solutions provide, it is also important to be aware of all the savings that result from using ULTIMATE solutions available in rolls and not only in slab format.

Cost effective solutions

By using rolls instead of slabs, waste due to off-cut left overs are drastically reduced. For a distance between stiffeners of 500 mm, using ULTIMATE rolls instead of slabs of 600 mm width will optimize the usage of the products. At the end, the bill of quantity (number of m²) can be reduced by 15 % compared to slabs.

Density	Thickness	Form	Products Name	Theoretical waste due to Off-cut				
				Distance between stiffeners				
				400 mm	450 mm	500 mm	550 mm	600 mm
24 kg/m³	50 mm	Roll	U SeaProtect Roll 24 Alu1 50 mm (14 m x 1,2 m)	0.0 % 0 mm	0.4 % 50 mm	0.0 % 0 mm	1.8 % 250 mm	1.4 % 200 mm
		Slab	U SeaProtect Slab 24 Alu1 50 mm (0,6 m x 1,2 m)	33.3 % 200 mm	25.0 % 150 mm	16.7 % 100 mm	8.3 % 50 mm	0.0 % 0 mm
36 kg/m³	70 mm	Roll	U SeaProtect Roll 36 Alu1 70 mm (5,5 m x 1,2 m)	5.5 % 300 mm	1.8 % 100 mm	0.0 % 0 mm	0.0 % 0 mm	1.8 % 100 mm
		Slab	U SeaProtect Slab 36 Alu1 70 mm (0,6 m x 1,2 m)	33.3 % 200 mm	25.0 % 150 mm	16.7 % 100 mm	8.3 % 50 mm	0.0 % 0 mm

Easy to install

By using rolls instead of slabs, due to higher compression, the costs of manual handling and carrying of packs onboard the ship are drastically reduced.

Density	Thickness	Form	Products Name	Length	Width	Content m²/pack	
24 kg/m³	50 mm	Roll	U SeaProtect Roll 24 Alu1 50 mm	14 m	1.2 m	16.8 m²	+133%
		Slab	U SeaProtect Slab 24 Alu1 50 mm	1.2 m	0.6 m	7.2 m²	
36 kg/m³	70 mm	Roll	U SeaProtect Roll 36 Alu1 70 mm	5.5 m	1.2 m	6.6 m²	+83%
		Slab	U SeaProtect Slab 36 Alu1 70 mm	1.2 m	0.6 m	3.6 m²	

Using rolls of 24 kg/m³ in 50 mm instead of slab, 133 % more m² can be put in a pack. The manpower cost related to handling and carrying operations paid by m² when using rolls is consequently reduced by 57 %.

Optimal Logistics

By using ULTIMATE rolls instead of slabs for the same density and the same thickness, major savings on storage and transport costs are possible. The same applies when compared to traditional stone wool solutions in slab format.

Density	Thickness	Form	Products Name	Quantity per pallet	Quantity per Truck (for 22 PAL)		Quantity per HC 40ft container (approx.)	
24 kg/m³	50 mm	Roll	U SeaProtect Roll 24 Alu1 50 mm	201.60 m²	4,435.20 m²	+75%	3,360.00 m²	+102%
		Slab	U SeaProtect Slab 24 Alu1 50 mm	115.20 m²	2,534.40 m²		1,656.00 m²	
36 kg/m³	70 mm	Roll	U SeaProtect Roll 36 Alu1 70 mm	79.20 m²	1,742.40 m²	+83%	1,320.00 m²	+59%
		Slab	U SeaProtect Slab 36 Alu1 70 mm	43.20 m²	950.40 m²		828.00 m²	

Using rolls of 24 kg/m³ in 50 mm instead of slab, 75 % more m² can be put on a pallet and henceforth on a truck. The transport cost paid by m² when using rolls is consequently reduced by 42 %.
From a distributor and storage point of view, it is also 42 % less space occupied in the warehouse and almost 2 times (1,7) less operations required for up-loading, off-loading and carrying the pallets with a forklift for the same quantity of products moved.

Norwegian Getaway, Meyer Werft, Germany, 2014, © Hero Lang

Products application overview

ISOVER ULTIMATE U SeaProtect offers a complete range of solutions for the different requirements of Marine & Offshore applications. Please refer to your ISOVER local representative to be advised on the best solution adapted to your need or visit our website : www.isover-technical-insulation.com

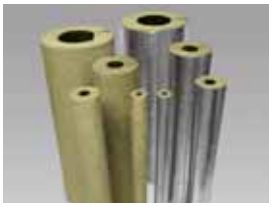
Thermal

Acoustics

Fire & Sound protection

Product	Thickness	Application & Feature	
U SeaProtect Roll 13 Alu1	50, 100, 150 mm	Comfort Insulation Reduced space due to very high compression (optimal logistics)	
U SeaProtect Roll 24 U SeaProtect Roll 24 Alu1 U SeaProtect Slab 24 U SeaProtect Slab 24 Alu1 U SeaProtect Slab 24 G220	50, 100 mm 50, 100 mm 50, 100 mm 50, 100 mm 50, 100 mm	Comfort Insulation Good acoustics (47 dB in 50 mm) A-15 Steel Bulkhead A-30 Steel Deck Reduced space due to high compression (optimal logistics) and limited waste due to off-cuts in roll formats	
U SeaProtect Roll 36 U SeaProtect Roll 36 Alu1 U SeaProtect Slab 36 U SeaProtect Slab 36 Alu1 U SeaProtect Slab 36 G220	70 mm 70 mm 70 mm 70 mm 70 mm	Excellent acoustics (48 dB in 70 mm) A-30 Steel Bulkhead A-60 Steel Deck Reduced space due to high compression (optimal logistics) and limited waste due to off-cuts in roll formats	
U SeaProtect Slab 56 U SeaProtect Slab 56 Alu1 U SeaProtect Slab 56 G220	30, 70 mm 30, 70 mm 30, 70 mm	30 mm: Steel stiffeners insulation Easy to bend and wrap around stiffeners 70 mm: A-60 Steel Bulkhead plate	
U SeaProtect Slab 66 U SeaProtect Slab 66 Alu1 U SeaProtect Slab 66 G220	30, 50 mm 30, 50 mm 30, 50 mm	30 mm: A-15 Steel Bulkhead no insulation of the stiffeners ; A-60 Alu construction (double layer) solution Easy to bend and wrap around stiffeners 50 mm: A-60 Steel Deck plate (Thin Design); FRD (composite) solution	
U SeaProtect Slab 76 U SeaProtect Slab 76 Alu1 U SeaProtect Slab 76 G220	20, 25 mm 20, 25 mm 20, 25 mm	Steel stiffeners insulation 25 mm: A-30 Steel Deck Easy to bend and wrap around stiffeners	
U SeaProtect Slab 86 U SeaProtect Slab 86 Alu1 U SeaProtect Slab 86 G220	25, 50 mm 25, 50 mm 25, 50 mm	25 mm: FRP (composite) insulation 50 mm: A-60 Bulkhead plate (Thin Design)	
U SeaProtect Slab 90	25, 50 mm	A-60 Floating floor Lightweight and excellent acoustic performance	

High Temperature

U SeaProtect Wired Mat 66 U SeaProtect Wired Mat 66 Alu1	50 mm 50 mm	A-60 Steel equivalent for HVAC ducts FRP (composite) stiffeners insulation Recommended for High Temperature equipment	
U SeaProtect Wired Mat 48	100 mm	A-60 Steel Bulkhead equivalent for High Temperature equipment	
U TECH Pipe Section MT 4.0 U Protect Pipe Section Alu2	20-120 mm	High Temperature pipe insulation 1,2 m length for fast and easy installation	

U SeaProtect systems

Facings

U SeaProtect products can be covered directly on our manufacturing line with **different facings**. ISOVER can deliver alternatively on request these facings in **single rolls format of 20 kg each, easy to carry by one person** and perfectly adapted for work-sites.

Type of Facing	Name	Color	Vapour barrier	Mechanical protection	Sound absorption	Other properties
Reinforced Aluminium foil	Alu1	shiny	yes (sensitive to punching)	–	–	cost effective
Thin Glass tissue	V1 V2	white black	no	–	excellent	
Glass cloth	G 120 G 220 G 420	black white white	no	light strong heavy duty	excellent	good aesthetics
Aluminium foil/ Glass cloth composite	B-Al B-Gl	shiny (Alu outside) white (Glass cloth outside)	yes (robust)	heavy duty (resistant to tearing)	–	easy to clean water tight water tight

Tapes

ISOVER supplies **high-quality marine certified tapes** to seal the joints of products covered with facings in a cost-effective manner (fast installation). ISOVER tapes have been selected and tested in combination with ISOVER facings. They work as a full system to ensure a strong bonding and that no delamination will occur in time.

Marine Tape Alu

- Marine IMO Low Flame Spread certified
- Excellent bonding properties
- Long-lasting
- Operation Temperature: -40 °C / +80 °C
- Installation Temperature: +5 °C / +30 °C on dry surface

SeaProtect Tape G120

- Marine IMO Low Flame Spread certified
- Excellent bonding properties
- Long-lasting (no delamination due to high humidity)
- Operation Temperature: -25 °C / +70 °C
- Installation Temperature: +5 °C / +35 °C on dry surface
- Storage conditions: -5 °C/ +30 °C in dry conditions and protected from UV

U SeaProtect short form: “U SP”

Short Name vs Long Name

Due to space constraints, the name of the product range U Sea Protect may be used in a contracted form "U SP" to save space (the short form can be particularly useful for drawings or to enter the U SeaProtect products range in a software for logistics management for example).

We do not advise to shorten the name of the product form (Roll, Slab, Wired Mat) or the facing (Alu1, G120, G220, G420, B-Al, B-Gl) in order to avoid any confusion on key elements of the products.

You can find below some examples:

Long name version	Short name version
U SeaProtect Slab 76 Alu1 25 mm	U SP Slab 76 Alu1 25 mm
U SeaProtect Roll 36 Alu1 70 mm	U SP Roll 36 Alu1 70 mm
U SeaProtect Slab 56 G220 70 mm	U SP Slab 56 G220 70 mm

"Mein Schiff", STX Finnland

Health, Safety & Environment

ISOVER is part of the Saint-Gobain group, where care for health, safety and respect of the environment are core values. We make sure that all our products have been tested according to the latest regulations.

Care for health with ULTIMATE solutions

We believe it is highly important to guarantee that the mineral wool which is installed by workers on a daily basis does not represent any danger for their health or for the passengers aboard the ship. ULTIMATE mineral wool meets the EU criteria for receiving the EUCEB certification. It is even certified as RAL (stricter German requirement).
ULTIMATE mineral wool fibres are classified as bio soluble and consequently non harmful to health.

Easy to check marks for maximum safety onboard

We take our mission of supplying solutions for fire protection aboard passengers ships very seriously and try our best to help reinforcing their reliability.

It is sometimes difficult for surveyors to identify insulation products once installed, and for installer's foremen to make sure that workers will not do any confusion on site. This is the reason why ULTIMATE products are "marked" on their surface:

- ULTIMATE brand is visible
- a pair of double digit numbers are located at regular spaces
  - for example "76-25": the first number indicates the density of the product in kg/m³ and the last number indicates the thickness of the product in mm

By helping to make sure that the right products have been used at the right place, ISOVER contributes to safer environment onboard ships.

Did you know? ULTIMATE products are marked on their surface with the brand and pair of double digit numbers indicating the density in kg/m³ and the thickness in mm.

ULTIMATE solutions for active environmental protection

Saint-Gobain is supplying innovative materials and solutions for the construction of buildings, industrial and marine equipment, contributing to a better future in a sustainable manner.

ULTIMATE U SeaProtect lightweight solutions participate in reaching this objective on many aspects:

- by reducing energy consumption of ships
- by decreasing fuel emissions of ships
- by reducing transport of goods (more information page 14)
- by using less raw material for equivalent fire protection level than traditional stone wool (~ 50 % reduction in weight).

MF Ampere, Fjellstrand AS, Norway 2014, GLAVA®

Saint-Gobain Marine Applications

ISOVER is part of Saint-Gobain Marine Applications, an entity established in 2005 gathering several international companies whose activities contribute to the construction or renovation of ships and offshore constructions.

Right from the initial stages of a project, Saint-Gobain Marine Applications provides architects, designers, owners and administrative authorities with a choice of innovative products and services: high-performance glazing, high performance mineral wool insulation, wall lining systems and floor finishing's, interior boards, steel pipes, pipe components and industrial valves, actuators and monitoring systems, etc.

All the products comply with the environmental, energy efficiency, weight savings, safety, aesthetic and comfort requirements for ships that are omnipresent in customers' specifications.

Partner companies within Saint-Gobain Marine Applications

Vetrotech offers a whole range of high performance marine glass with an almost endless number of options and many extra features (insulating, solar control, fire-resistant, heatable glass, high security glazing and many glass specialties)

Weber offers high performance floor systems, suitable for use in all commercial and industrial environments in addition to marine applications. The flooring systems are built layer by layer to provide the optimum solution for each individual client's requirement.

Glassolutions interior designs and delivers glazing solutions for our interior environment. A wide range of solutions for interior applications onboard ships.

Optimera Marine is a supplier and distributor of innovative panels for interior finishing and furniture onboard ships and offshore accommodations. All paneling solutions are IMO & Solas certified.

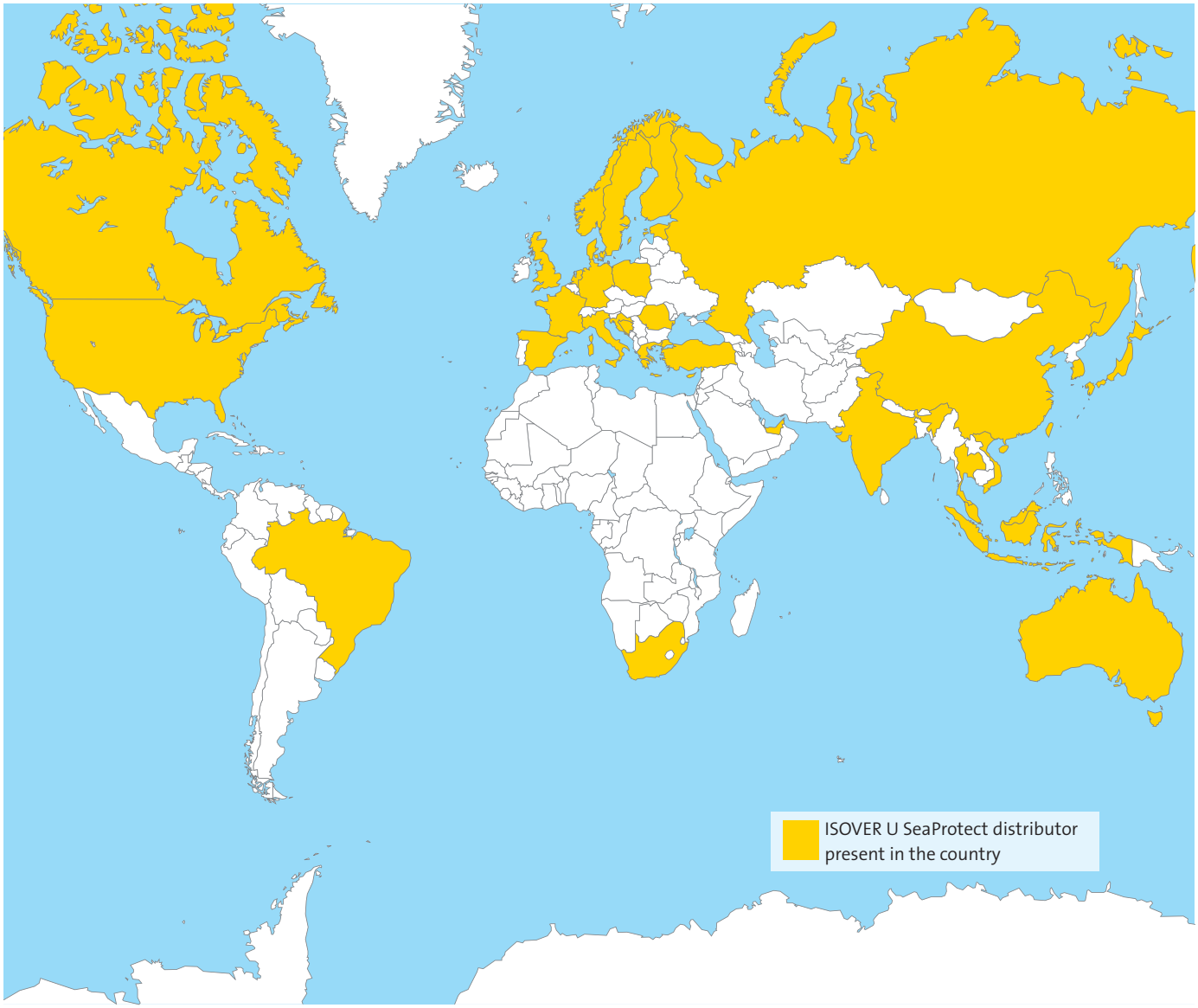
Brødrene Dahl specializes in supplying steel pipes, pipe components and industrial valves, actuators and monitoring systems. Brødrene Dahl is a Norwegian wholesaler, large supplier to the Norwegian Shipyards, but also exports in foreign markets.

Norwegian Getaway © Ingrid Fiebak / MEYER WERFT

Norwegian Getaway © Michael Wessels / MEYER WERFT

ISOVER Marine & Offshore worldwide

ISOVER has developed during the past decade **a wide network of selected distributors and partners** in the Marine & Offshore sector. Do not hesitate to contact us to get advices on the nearest dealer able to supply you in the best way with ISOVER solutions.



Rainbow Warrior III, Fassmer GmbH, Germany, 2011

Norwegian Escape, Meyer Werft, Germany, 2015 © Ingrid Fiebak-Kremer

Gran Roque, Murueta, Spain, 2014, ©Oliver Design

Technical information

Construction details*: 3D drawings

Main mounting systems and pin patterns recommended by ISOVER*.For other installation methods possible please refer to our MED certificates or page 120.

Mounting systems around the stiffeners

Mounting systems recommended by ISOVER:

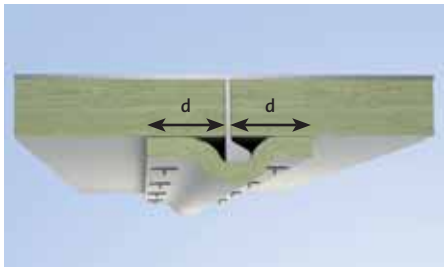
Easy to Install

Cost effective solutions

1) Quick-Cover system and 2) Wrap installation method

Thanks to the outstanding pliability of ULTIMATE mineral wool, U SeaProtect products can be bent around stiffeners without any edge break. This enables substantial savings on labour cost when compared to traditionnal box method 3).

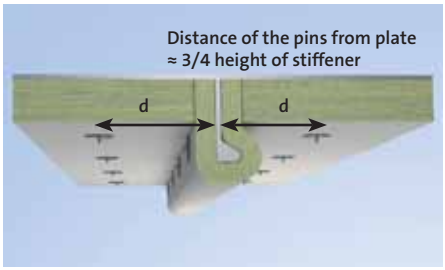
1) Quick-Cover system



Distance of the pins from stiffeners

- d = 75 mm to 125 mm max recommended by ISOVER
- d ≤ 150 mm according to certificates

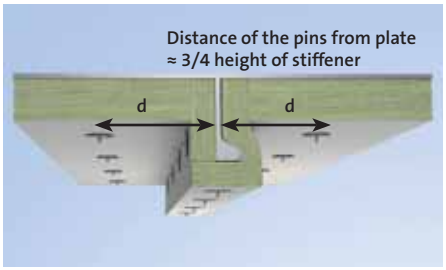
2) Wrap



Distance of the pins from stiffeners

- d = 150 mm recommended by ISOVER
- d ≤ 150 mm according to certificates

3) Box



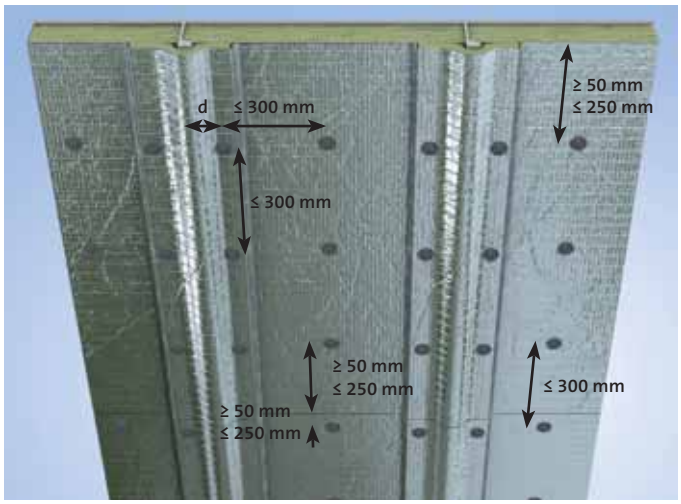
Distance of the pins from stiffeners

- d = 150 mm recommended by ISOVER
- d ≤ 150 mm according to certificates

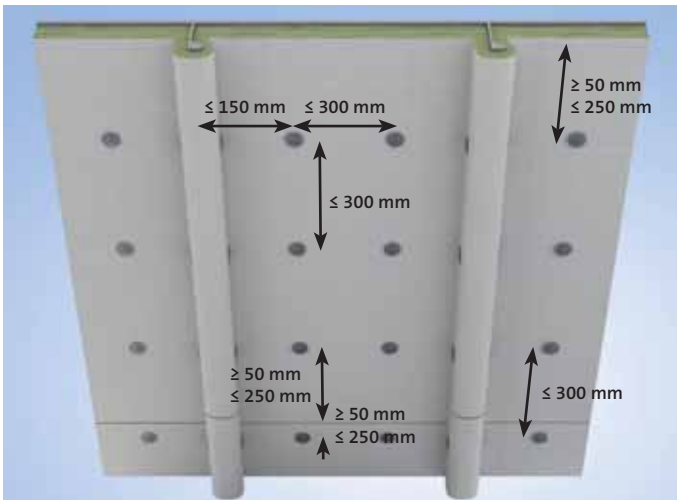
Universal Pin Pattern "Square 300 mm x 300 mm"

for all U SeaProtect constructions tested according to FTP Code 2010

A/ Pin Pattern recommended by ISOVER for the Quick-Cover system 1)

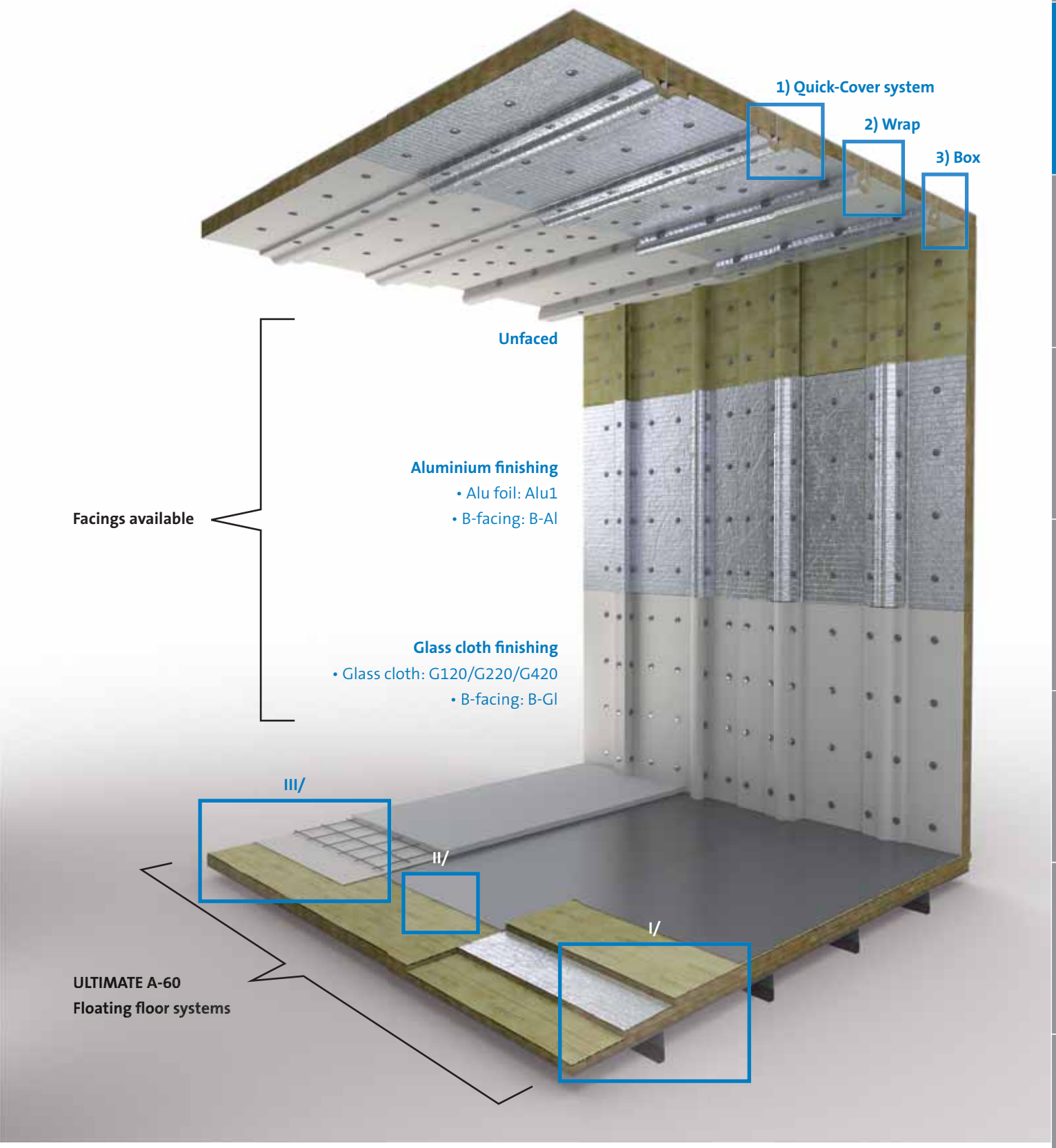


B/ Pin Pattern recommended by ISOVER for the 2) Wrap and 3) Box mounting systems



- d = 75 mm to 125 recommended by ISOVER
- d ≤ 150 mm according to certificates

** The information contained in this page is to be considered as guidance material only. We recommend that you carefully check its suitability for your intended use. It is important to compare the real geometry of the stiffeners and installation configuration to the ones described above.*
In general, any recommendation for installation or technical guidance given by ISOVER Marine & Offshore is purely advisory, based on the best of our knowledge at the time as a product manufacturer. No liability can be derived there from. ISOVER Marine & Offshore reserves the right to change its technical specifications at any time it deems appropriate. For more information, please check our certificates on our website: www.isover-technical-insulation.com.



I/ A-60 "Low Flame Spread material on Top"

INSULATION (3 layers system):

1) U SeaProtect Slab 90 25 mm

2) U SeaProtect Slab 90 Alu1 25 mm

3) U SeaProtect Slab 90 25 mm

COVER:

Low Flame Spread material

II/ A-60 "Steel plate on Top"

INSULATION:

U SeaProtect Slab 90 50 mm

COVER:

Steel plate (single sheet, or double with visco-elastic layer in between)

III/ A-60 "WEBER cement screed on Top"

INSULATION:

U SeaProtect Slab 90 50 mm

COVER:

Glass cloth +Steel mesh

+ Weber screed 25 mm (4665)

Construction details*: 2D drawings

Main mounting systems and pin patterns recommended by ISOVER*. For other installation methods please refer to our MED certificates or to page 120.

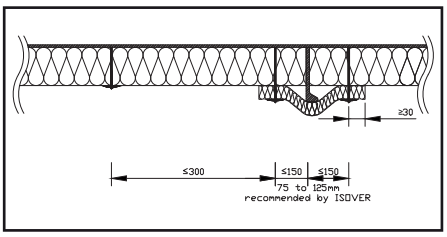
Possible mounting systems around the stiffeners

Mounting systems recommended by ISOVER:

Easy to Install

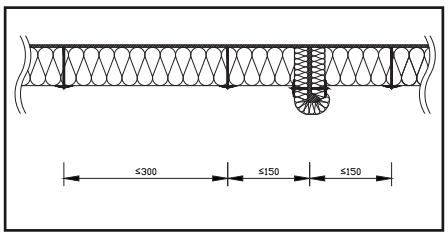
Cost effective solutions

1) Quick-Cover system*



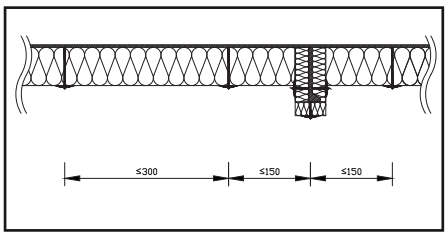
* *No pin on stiffener's head*

2) Wrap**



** *alternative mounting possible with only one pin on stiffener's head (see page 120)*

3) Box***

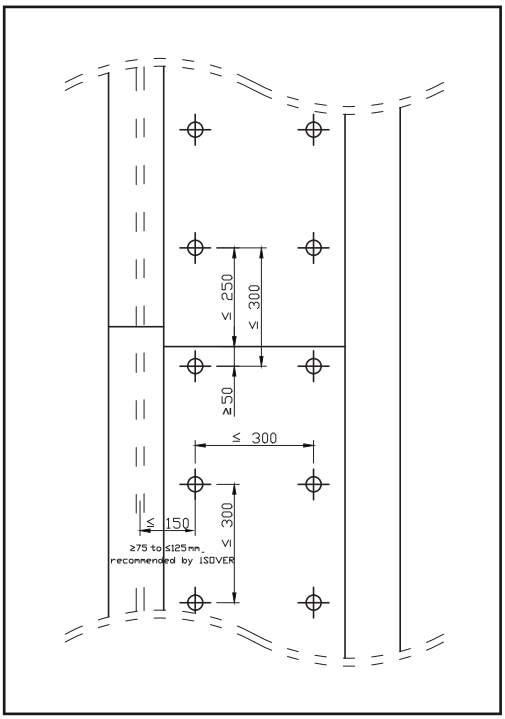


*** *alternative mounting possible with only one pin on stiffener's head (see page 120)*

Universal Pin Pattern "Square 300 mm x 300 mm"

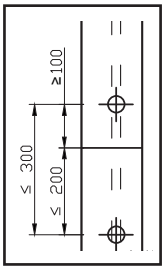
for all U SeaProtect constructions tested according to FTP Code 2010

A/ Pin Pattern recommended by ISOVER for the Quick-Cover system 1)

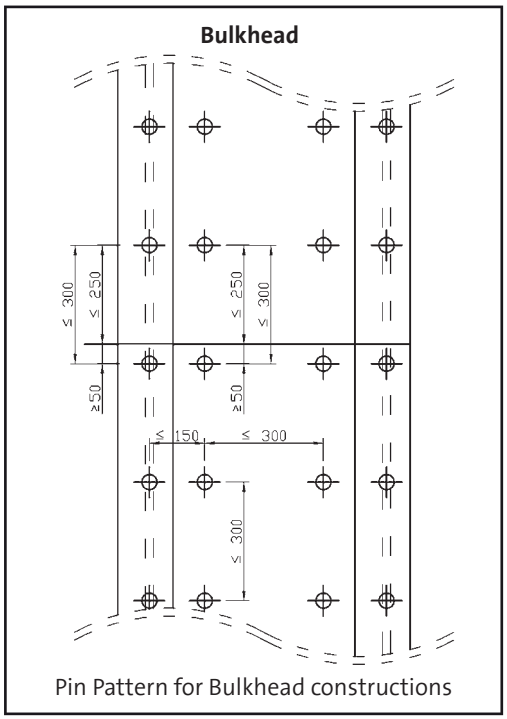


B/ Pin Pattern recommended by ISOVER for the 2) Wrap and 3) Box mounting systems

Deck



Bulkhead



Pin Pattern for Bulkhead constructions

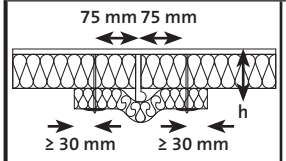
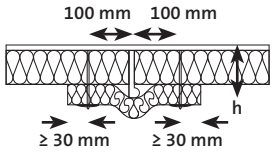
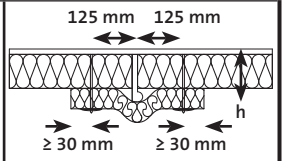
Detail for Deck stiffener construction

Pin pattern identical for Bulkhead except for the distance tolerated from edges of the insulation for the pins on the stiffeners

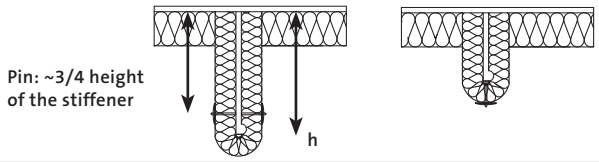
Focus on insulation length around the stiffeners*

In order to help installers, you will find below an indication of the approximate length to cover the stiffeners.
This information is to be considered as guidance only*. We recommend to check the suitability of this information for intended use. It is important to compare the real geometry of the stiffeners and the installation configuration to the ones described below. For more details on installation methods, please refer to page 114-121.

Quick-Cover system

			Indicative length of insulation required to "cover" the stiffener*						
			Pins 75 mm from Stiffener		Pins 100 mm from Stiffener			Pins 125 mm from Stiffener	
									
			"Bulb"/Hp profile Design according to DIN 1019		"Bulb"/Hp profile Design according to DIN 1019			"Bulb"/Hp profile Design according to DIN 1019	
Level insulation	**Stiffener insulation**		**Stiffener height h (mm)**		**Stiffener height h (mm)**			**Stiffener height h (mm)**	
Thickness (mm)	**Density (kg/m³)**	**Thickness (mm)**	**80**	**100**	**80**	**100**	**120**	**100**	**120**
50	**76**	**20**	≥ 250		≥ 300	≥ 300		≥ 350	
	76	**25**	≥ 250		≥ 300	≥ 300		≥ 350	
	56	**30**	≥ 250		≥ 300	≥ 300		≥ 350	
70	**76**	**20**	≥ 250	≥ 250	≥ 300	≥ 300	≥ 300	≥ 350	≥ 350
	76	**25**	≥ 250	≥ 250	≥ 300	≥ 300	≥ 300	≥ 350	≥ 350
	56	**30**	≥ 250	≥ 250	≥ 300	≥ 300	≥ 300	≥ 350	≥ 350

Wrap installation method

		Indicative length of insulation required to "wrap" the stiffener*			
		2 pins (one on each side of the stiffener) or 1 pin at the top			
					
		"Bulb"/Hp profile Design according to DIN 1019			
Stiffener insulation		**Stiffener height h (mm)**			
Density (kg/m³)	**Thickness (mm)**	**80**	**100**	**120**	**140**
24	**50**	340	370	390	445
76	**20**	225	260	310	360
76	**25**	245	275	315	375
56	**30**	245	280	320	380

** In general, any recommendation for installation or technical guidance given by ISOVER Marine & Offshore is purely advisory, based on the best of our knowledge at the time as a product manufacturer. No liability can be derived there from. ISOVER Marine & Offshore reserves the right to change its technical specifications at any time it deems appropriate. For more information, please check our certificates on our website: www.isover-technical-insulation.com.*

U-value of constructions and products

Steel fire constructions

U SeaProtect fire construction solutions have excellent U-values. The U-values we declare for our constructions have been calculated using a 3D model taking into account the thermal bridges due to the presence of the stiffeners and pins (see page 81).

Steel Constructions FTP Code 2010		U-value [W/m²·K]				
A- Fire Class	Plate	Stiffener				
		U SeaProtect Slab 76 25 mm	U SeaProtect Slab 76 20 mm	U SeaProtect Slab 56 30 mm	Other Possibilities	
A-60 Bulkhead	U SeaProtect Slab 56 70 mm	0.636	0.669	0.609		
	U SeaProtect Slab 86 50 mm	0.785				
A-60 Bulkhead (Double Sided)	U SeaProtect Slab 46 30 mm on each side				U SeaProtect Slab 46 30 mm X1 (on the stiffener side)	0.528
A-60 Bulkhead Restricted	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	0.645			U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	0.504
A-30 Bulkhead	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	0.645	0.678	0.618	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	0.504
	U SeaProtect Slab 76 40 mm or U SeaProtect Slab 76 20 mm x 2	0.893	0.934			
A-30 Bulkhead Restricted	U SeaProtect Slab 46 40 mm				U SeaProtect Slab 46 40 mm U SeaProtect Slab 46 30 mm	0.807 0.859
A-15 Bulkhead	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	0.819	0.858	0.787	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	0.716
	U SeaProtect Slab 66 30 mm				no insulation around the stiffeners	2.065
A-60 Deck	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	0.645			U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	0.504
	U SeaProtect Slab 66 50 mm	0.785				
A-15 Deck A-30 Deck	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	0.819	0.858	0.787	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	0.716
	U SeaProtect Slab 76 25 mm	1.154	1.199			
A-15 Deck	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm				no insulation around the stiffeners	1.475

Best Comfort Class constructions

Best Comfort Class constructions are obtained by adding a 2nd layer of ULTIMATE between the stiffeners only,making it easy to install while occupying a reduced space under the stiffeners.

Steel Constructions FTP Code 2010			Best Comfort Class constructions			Fire certification
Stiffener	Plate	U-value [W/m²·K]	+ 2nd Layer on the Plate (Optional)	Total Thickness on the plate [mm]	U-value [W/m²·K]	
U SeaProtect Slab 76 25 mm	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	0.819	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm (2nd layer on top)	100	0.506	A-15 Bulkhead A-15 Deck A-30 Deck
	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	0.645		120	0.429	A-30 Bulkhead A-60 Bulkhead Restricted A-60 Deck
	U SeaProtect Slab 56 70 mm	0.636		120	0.425	A-60 Bulkhead
	U SeaProtect Slab 66 50 mm	0.785		100	0.496	A-60 Deck (Thin Design)
	U SeaProtect Slab 76 25 mm	1.154		75	0.624	A-15 Deck (Thin Design) A-30 Deck (Thin Design)
	U SeaProtect Slab 76 40 mm or U SeaProtect Slab 76 20 mm x 2	0.893		90	0.543	A-30 Bulkhead (Thin Design)
	U SeaProtect Slab 86 50 mm	0.785		100	0.496	A-60 Bulkhead (Thin Design)

Thermal conductivity and U-values of main products

U SeaProtect products have excellent U-values. Products in 50 mm thickness can have a U-value below ≤ 0,6 W/m²·K and products in 70 mm ≤ 0,45 W/m²·K. This is possible only thanks to the excellent intrinsic thermal performance of ULTIMATE mineral wool.

The U-values we declare for products are based on measurements made by a recognized laboratory (see page 80) and have been calculated for 1 m² of flat steel surface taking into account the thermal resistance of the steel plate (6 mm) and the thermal bridges due to the presence of the pins for fixation.

Main ULTIMATE Densities [kg/m³]	Thickness mm	Products	Thermal conductivity [W/m·K]	U-value [W/m²·K]	Facings						
					Unfaced	Aluminium	Glass cloth			B facing (Alu-Glass cloth omposite)	
						Alu1	G 120 (black)	G 220 (white)	G 420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
24 kg/m³	50 mm	U SeaProtect Roll 24 50 mm	0,034	0,619	●	●		●			
	50 mm	U SeaProtect Slab 24 50 mm		0,619	●	●	●	●	●	●	●
	100 mm	U SeaProtect Roll 24 100 mm		0,343	●	●		●			
36 kg/m³	70 mm	U SeaProtect Roll 36 70 mm	0,032	0,446	●	●					
	70 mm	U SeaProtect Slab 36 70 mm		0,446	●	●	●	●	●	●	●
48 kg/m³	100 mm	U SeaProtect Wired Mat 48 100 mm	0,031	0,318	●	●					
56 kg/m³	70 mm	U SeaProtect Slab 56 70 mm	0,031	0,434	●	●	●	●	●	●	●
66 kg/m³	30 mm	U SeaProtect Slab 66 30 mm	0,031	0,860	●	●	●	●	●	●	●
66 kg/m³	50 mm	U SeaProtect Slab 66 50 mm		0,576	●	●	●	●	●	●	●
	50 mm	U SeaProtect Wired Mat 66 50 mm		0,576	●	●					
76 kg/m³	25 mm	U SeaProtect Slab 76 25 mm	0,031	0,983	●	●	●	●	●	●	●
86 kg/m³	50 mm	U SeaProtect Slab 86 50 mm	0,031	0,576	●	●	●	●	●	●	●
90 kg/m³	50 mm	U SeaProtect Slab 90 50 mm	0,031	0,576	●	●	●	●	●	●	●

● *Products part of the Easy Logistics portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).*

● *Products not part of the Easy Logistics portfolio that can be manufactured on order. Standard Minimum Order Quantity applies (equivalent to 2t).*

Products that cannot be manufactured with this facing.

Sound reduction

Steel Fire constructions

U SeaProtect fire construction solutions deliver excellent sound reduction performance.

Steel Constructions FTP Code 2010		Sound Reduction Index Rw (C,Ctr) [dB]				
A- Fire Class	Plate	Stiffener				
		U SeaProtect Slab 76 25 mm	U SeaProtect Slab 76 20 mm	U SeaProtect Slab 56 30 mm	Other Possibilities	
A-60 Bulkhead	U SeaProtect Slab 56 70 mm	49 dB (-2.-7)	/	48 dB (-2;-7)		
	U SeaProtect Slab 86 50 mm	48 dB (-2;-7)				
A-60 Bulkhead (Double Sided)	U SeaProtect Slab 46 30 mm on each side				U SeaProtect Slab 46 30 mm X1 (on the stiffener side)	45 dB (-1;-5)
A-60 Bulkhead Restricted	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	48 dB (-1;-6)			U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	48 dB (-2;-6)
A-30 Bulkhead	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	48 dB (-1;-6)	49 dB (-3;-7)	/	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	48 dB (-2;-6)
	U SeaProtect Slab 76 40 mm or U SeaProtect Slab 76 20 mm x 2	/	47 dB (-2;-6)			
A-15 Bulkhead	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	47 dB (-2;-6)	46 dB (-1;-5)	/	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	46 dB (-1;-5)
	U SeaProtect Slab 66 30 mm				no insulation around the stiffeners	45 dB (-1;-5)
A-60 Deck	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	48 dB (-1;-6)			U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	48 dB (-2;-6)
	U SeaProtect Slab 66 50 mm	48 dB (-2;-7)				
A-15 Deck A-30 Deck	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	47 dB (-2;-6)	46 dB (-1;-5)	/	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	46 dB (-1;-5)
	U SeaProtect Slab 76 25 mm	45 dB (-1;-5)	46 dB (-2;-5)			
A-15 Deck	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm				no insulation around the stiffeners	47 dB (-1;-6)

Best Comfort Class constructions

The Best Comfort Class constructions will provide you with the highest level of acoustical performance that can be reached by mineral wool systems while occupying a reduced space under the stiffeners.

Steel Constructions FTP Code 2010			Best Comfort Class constructions			Fire certification
Stiffener[1)]	Plate[1)]	Sound Reduction Rw (C,Ctr) [dB]	+ 2nd Layer on the Plate (Optional)	Total Thickness on the plate [mm]	Sound Reduction[2)] Rw (C,Ctr) [dB]	
U SeaProtect Slab 76 25 mm	U SeaProtect Slab 24 50 mm	47 dB (-2;-6)	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm (2nd layer on top)	100 mm	49 dB (-2,-6)	A-15 Bulkhead
	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	48 dB (-1;-6)		120 mm	50 dB (-2,-7)	A-30 Bulkhead A-60 Bulkhead Restricted A-60 Deck
	U SeaProtect Slab 56 70 mm	49 dB (-2;-7)		120 mm	51 dB (-3;-8)	A-60 Bulkhead
	U SeaProtect Slab 66 50 mm	48 dB (-2;-7)		100 mm	50 dB (-3;-8)	A-60 Deck (Thin Design)
	U SeaProtect Slab 76 25 mm	45 dB (-1;-5)		75 mm	48 dB (-2;-6)	A-15 Deck (Thin Design) A-30 Deck (Thin Design)
	U SeaProtect Slab 76 40 mm or U SeaProtect Slab 76 20 mm x 2	47 dB (-2,-6)		90 mm	48 dB (-2;-6)	A-30 Bulkhead (Thin Design)
	U SeaProtect Slab 86 50 mm	48 dB (-2;-7)		100 mm	50 dB (-2;-8)	A-60 Bulkhead (Thin Design)

Sound absorption

Sound absorption coefficients of U SeaProtect products

Noise control aboard a ship is critical. In order to help naval architects and acoustic experts to make the right choice of products, we provide below the sound absorption properties of a wide range of U SeaProtect products. ULTIMATE U SeaProtect solutions have high sound absorption properties. However the impact of the type of facing is critical on the final result. For detailed information on each product, please refer to the absorption graphs available from pages 95 to 107.

Main ULTIMATE Densities [kg/m³]	Thickness mm	Products	Facings Weighted absorption (α_w)						
			Unfaced	Aluminium	Glass cloth			B facing (Alu-Glass cloth composite)	
				Alu1	G 120 (black)	G 220 (white)	G 420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
24 kg/m³	50 mm	U SeaProtect Roll 24 50 mm	α_w= 1.00	α_w= 0.70		α_w= 1.00			
	50 mm	U SeaProtect Slab 24 50 mm	α_w= 1.00	α_w= 0.70	α_w= 1.00	α_w= 1.00	α_w= 0.90	α_w= 0.30	α_w= 0.30
	100 mm	U SeaProtect Roll 24 100 mm	α_w= 1.00	α_w= 0.75		●			
36 kg/m³	70 mm	U SeaProtect Roll 36 70 mm	α_w= 1.00	α_w= 0.85					
	70 mm	U SeaProtect Slab 36 70 mm	α_w= 1.00	α_w=0.85	●	α_w= 1.00	α_w= 0.95	α_w= 0.40	α_w= 0.40
48 kg/m³	100 mm	U SeaProtect Wired Mat 48 100 mm	α_w= 1.00	●					
56 kg/m³	30 mm	U SeaProtect Slab 56 30 mm	α_w= 0.80	α_w= 0.80	●	●	●	●	●
	70 mm	U SeaProtect Slab 56 70 mm	α_w= 1.00	α_w= 0.85	●	α_w= 1.00	α_w= 0.95	α_w= 0.45	α_w= 0.45
66 kg/m³	30 mm	U SeaProtect Slab 66 30 mm	α_w= 0.85	α_w= 0.80	●	α_w= 0.80	●	●	●
66 kg/m³	50 mm	U SeaProtect Slab 66 50 mm	α_w= 1.00	α_w= 0.90	●	α_w= 1.00	α_w= 0.90	α_w= 0.45	α_w= 0.45
	50 mm	U SeaProtect Wired Mat 66 50 mm	α_w= 1.00	α_w= 0.90					
76 kg/m³	20 mm	U SeaProtect Slab 76 20 mm	α_w= 0.55	α_w= 0.70	●	●	●	●	●
	25 mm	U SeaProtect Slab 76 25 mm	α_w= 0.65	α_w= 0.80	●	α_w= 0.75	α_w= 0.80	α_w= 0.40	α_w= 0.40
86 kg/m³	50 mm	U SeaProtect Slab 86 50 mm	α_w= 0.95	α_w= 0.90	●	α_w= 0.95	α_w= 0.90	α_w= 0.45	α_w= 0.45
90 kg/m³	50 mm	U SeaProtect Slab 90 50 mm	α_w= 0.95	●	●	●	●	●	●

●/α_w *Products part of the Easy Logistics portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).*

●/α_w *Products not part of the Easy Logistics portfolio that can be manufactured on order. Standard Minimum Order Quantity applies (equivalent to 2t).*

Products that cannot be manufactured with this facing.

Date of the measurement: December 2014 & February 2015
According to ISO 354-2003 (α_w calculated according to EN ISO 11654:1997)
Laboratory: CSTB (France)

Easy Logistics portfolio, Minimum Order Quantities

Optimal Logistics

Products highlighted in green are part of the Easy Logistics portfolio. They are available with a lower Minimum Order Quantity (equivalent to 1 pallet), making life easier from a design and logistics point of view. By choosing solutions inside the Easy Logistics portfolio, from the start of a project you make sure that the products specified will be easy to find in a relatively short lead time.

Main ULTIMATE Densities [kg/m³]	Thickness mm	Products	Minimum Order Quantity (MOQ)				
			Unfaced	Aluminium	Glass cloth		
				Alu1	G 120 (black)	G 220 (white)	G 420 (white)
24 kg/m³	50 mm	U SeaProtect Roll 24 50 mm	201.60 m²	201.60 m²		1,612.80 m²	
	50 mm	U SeaProtect Slab 24 50 mm	1,612.80 m²	115.20 m²	1,680.00 m²	120.00 m²	1,680.00 m²
	100 mm	U SeaProtect Roll 24 100 mm	100.80 m²	100.80 m²		806.40m²	
36 kg/m³	70 mm	U SeaProtect Roll 36 70 mm	69.12 m²	79.20 m²			
	70 mm	U SeaProtect Slab 36 70 mm	43.20 m²	43.20 m²	720.00 m²	45.00 m²	720.00 m²
48 kg/m³	100 mm	U SeaProtect Wired Mat 48 100 mm	66.96 m²	535.68 m²			
56 kg/m³	70 mm	U SeaProtect Slab 56 70 mm	46.08 m²	46.08 m²	768.00 m²	48.00 m²	768.00 m²
66 kg/m³	30 mm	U SeaProtect Slab 66 30 mm	112.32 m²	112.32 m²	1,053.00 m²	117.00 m²	1,053.00 m²
66 kg/m³	50 mm	U SeaProtect Slab 66 50 mm	69.12 m²	69.12 m²	648.00 m²	648.00 m²	648.00 m²
	50 mm	U SeaProtect Wired Mat 66 50 mm	777.60 m²	129.60 m²			
76 kg/m³	25 mm	U SeaProtect Slab 76 25 mm	138.24 m²	138.24 m²	1,152.00 m²	144.00 m²	1,152.00 m²
86 kg/m³	50 mm	U SeaProtect Slab 86 50 mm	69.12 m²	69.12 m²	504.00 m²	72.00 m²	504.00 m²
90 kg/m³	50 mm	U SeaProtect Slab 90 50 mm	69.12 m²	414.72 m²	432.00 m²	432.00 m²	432.00 m²

Products highlighted in colors are part of the ISOVER U SeaProtect Easy Logistics Portfolio. These products are available with a lower Minimum Order Quantity (equivalent to 1 pallet) for various facings. For more information, please contact your local ISOVER representative.

(MOQ)

The products selected in this portfolio should answer most of your needs. If you have specific needs not covered in the table below, please refer to your ISOVER local representative.

B facing (Alu-Glass cloth composite)		Recommended applications	Fire certification & performance level
B-Gl (Glass cloth outside)	B-Al (Alu facing outside)		
		24kg/m³ density: - recommended for thermal insulation - 2nd layer of Best Comfort Class constructions in 50 mm thickness	A-15 Steel Bulkhead FTPC2010 A-30 Steel Deck FTPC2010 2nd layer for acoustic solutions Good thermal, good acoustics
1,680.00 m²	1,680.00 m²		
			A-15 Steel Bulkhead FTPC2010 A-30 Steel Deck FTPC2010 Very high thermal, excellent acoustics.
		36kg/m³ density: - recommended for acoustic applications in 60 mm and 70 mm - Excellent acoustic performance	A-60 Steel Bulkhead Restricted FTPC2010 A-30 Steel Bulkhead FTPC2010 A-60 Steel Deck FTPC2010 A-15 Steel Deck FTPC2010 High thermal, excellent acoustics
768.00m²	768.00m²		
		excellent acoustic performance, recommended for High Temperature applications	A-60 Steel Bulkhead Very high thermal, superior acoustics
768.00 m²	768.00 m²	main solution for A-60 Steel Bulkhead construction	A-60 Steel Bulkhead FTPC2010 High thermal, excellent acoustics
1,053.00 m²	1,053.00 m²	main solution for Alu constructions between and around the stiffeners (in 2 layers)	A-15 Steel Bulkhead FTPC2010 all A- 60 Fire Class Aluminium constructions. Good thermal, excellent acoustics (2 layers)
648.00 m²	648.00 m²	main solution for B-15 extension wall and FRP (composite) constructions	A-60 Steel Deck FTPC2010 (Thin Design) B-15 extension wall (A/A) Good thermal, excellent acoustics
		solution around stiffeners for FRP (composite) constructions High Temperature applications A-60 equivalent solution for wrapping around HVAC duct	all FRD Class constructions around the stiffeners Good thermal, excellent acoustics
1,152.00 m²	1,152.00 m²	main solution around stiffeners for Steel constructions thin A-30 Steel Deck	all A-Fire Class Steel constructions around stiffeners A-30 Steel Deck FTPC2010
504.00 m²	504.00 m²	thin solution for A-60 Steel Bulkhead construction	A-60 Steel Bulkhead FTPC2010 (Thin Design) Good thermal, excellent acoustics
432.00 m²	432.00 m²	main solution for Floating Floor Steel constructions	A60 Floating Floor Steel construction

Products part of the U SeaProtect Easy Logistics products portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Products not part of the U SeaProtect Easy Logistics products portfolio that can be manufactured on order. Standard Minimum Order Quantity applies (equivalent to 2t).
Products that cannot be manufactured with this facing.

Mein Schiff 3, STX Finland, 2014, ©Jouni Saaristo

Fire & Sound protection

Fire protection certificates

A-Fire class construction certificates

U SeaProtect fire-rated constructions with the same A-Fire classification are gathered under the same certificate.
All U SeaProtect constructions tested according to FTP Code 2010 can be installed in the same way (unique installation process). In each certificate, the different mounting systems possible (which apply to all our constructions) are described with drawings and approved by notified body. You will find in the table below the MED Certificates numbers.

Steel Constructions FTP Code 2010			Stiffener[1]			
A- Fire Class	**MED Certificate n° (notified body DNV)**	**Plate[1]**	**U SeaProtect Slab 76 25 mm**	**U SeaProtect Slab 76 20 mm**	**U SeaProtect Slab 56 30 mm**	**Other Possibilities**
A-60 Bulkhead	**MED-B-9334**	U SeaProtect Slab 56 70 mm	●	●	●	
		U SeaProtect Slab 86 50 mm				
A-60 Bulkhead (Double Sided)		U SeaProtect Slab 46 30 mm on each side				U SeaProtect Slab 46 30 mm X1 (on the stiffener side)
A-60 Bulkhead Restricted		U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	●			U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm
A-30 Bulkhead	**MED-B-9333**	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	●	●	●	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm
		U SeaProtect Slab 76 40 mm or U SeaProtect Slab 76 20 mm x 2	●	●		
A-30 Bulkhead Restricted		U SeaProtect Slab 46 40 mm				U SeaProtect Slab 46 30 mm or U SeaProtect Slab 46 40 mm
A-15 Bulkhead	**MED-B-9516**	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	●	●	●	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm
	MED-B-9517	U SeaProtect Slab 66 30 mm				no insulation around the stiffeners
A-60 Deck	**MED-B-9519**	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	●			U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm
		U SeaProtect Slab 66 50 mm	●			
A-15 Deck A-30 Deck	**MED-B-9328**	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	●	●	●	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm
		U SeaProtect Slab 76 25 mm	●	●		
A-15 Deck	**MED-B-9517**	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm				no insulation around the stiffeners

Application limitations
The different constructions in the table above indicated by a ● are covered by a MED certificate.

Mininmum density, minimum thickness
For each of them, it is allowed to increase density and or thickness of the products for the plate and stiffener part with a limitation to 5,28 kg/m² maximum or 66 kg/m³ maximum (whichever comes first) for the decks, and a maximum density of 86 kg/m³ for bulkheads.

Washers diameter
The MED certificates allow the possibility to use washers in 38 mm diameter (standard) and 30 mm diameter for bulkheads only (mainly used in Japan).

Distance between pins
Distance between pins is maximum 300 mm with a "square" pattern or "diagonal" pattern.
Distance of the pins from the joints of the products is minimum 50 mm and maximum 250 mm on the plate and stiffener, except for the stiffener of decks where the distance is respectively minimum 100 mm and maximum 200 mm from the joints. For more details on this point, and to avoid any mistake, please refer to the drawings of the certificates or page 24.

Facings and adhesives
The insulation materials and adhesives used have to be approved according to the Marine Equipment Directive and bear the Mark of Conformity. This requirement may also be applicable for surface materials used, if required by relevant rules and regulations.

Products highlighted in colors are part of the Easy Logistics portfolio. These products are available with a lower Minimum Order Quantity (equivalent to 1 pallet) for various facings. For more information, please refer to pages 32-33 and 110-111.

Non combustibility and Low Flame Spread certificates

IMO SOLAS code requires that insulation products without any facing can justify a Non-Combustibility certificate[1]. Additionnally, if a facing is to be installed on top of the insulation, this covering should be able to justify at minimum a Low Flame Spread certificate[1] to be accepted by surveyor.

ISOVER took the step forward and tested to Non Combustibility all its ULTIMATE mineral wool products with facing applied on top in our plant (the complex ULTIMATE mineral wool + adhesive + facing is then certified as Non Combustible). It is ISOVER commitment to develop solutions with the highest fire safety standard possible to guarantee the best reliability of fire protection systems. ISOVER Marine Tapes are as well certified according to Low Flame Spread[1].

By using ISOVER U SeaProtect Systems (faced products + tape), you make sure that the full system is in line with the latest fire protection regulations and that each component can justify the conformity "wheel" mark.

Non Combustibility certificate[1] n° (MED) (min-max density)	Facings						
	Unfaced	Aluminium	Glass cloth			B facing (Alu-Glass cloth composite)	
	/	Alu1	G 120 (black)	G 220 (white)	G 420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu-facing outside
U SeaProtect Roll	114.478 13 kg/m³ - 36 kg/m³	114.479 13 kg/m³ - 36 kg/m³		114.529 20 kg/m³ - 24 kg/m³			
U SeaProtect Slab	114.477 20 kg/m³ - 100 kg/m³	114.483 20 kg/m³ - 120 kg/m³	114.480 20 kg/m³ - 90 kg/m³			114.542 20 kg/m³ - 100 kg/m³	
U SeaProtect Wired Mat	MED068414CS 36 kg/m³ - 66 kg/m³	114.540 36 kg/m³ - 66 kg/m³					
U TECH Pipe Section MT 4.0	114.498 ~60 kg/m³ - ~85 kg/m³						
U TECH Pipe Section Alu2		114.504 ~60 kg/m³ - ~85 kg/m³					

	Facings						
	Unfaced	Aluminium	Glass cloth			B facing (Alu-Glass cloth composite)	
	/	Alu1	G 120 (black)	G 220 (white)	G 420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu-facing outside
Low Flame Spread certificate[1] n°		118.147	118.168			118.302	

	Tape	
	Aluminium	Glass cloth (white)
	Marine Tape Alu	SeaProtect Tape G120
Low Flame Spread certificate[1] n°	118.308	118.212

1) Non combustible and Low Flame Spread according to IMO-Resolution MSC.61(67)-(FTPCode),IMO MSC/Circ. 1120.

Sleipner A, Sleipner ÿst Stemning, Norway, © ÿyvind Hagen, GLAVA®

A-constructions

You will find in the following pages a set of datasheets dedicated to each construction highlighting their main features together with the graph of the Sound Reduction measurements.

Steel Fire constructions

Steel Constructions FTP Code 2010		Stiffener[1]			
A- Fire Class	**Plate[1]**	**U SeaProtect Slab 76 25 mm**	**U SeaProtect Slab 76 20 mm**	**U SeaProtect Slab 56 30 mm**	**Other Possibilities**
A-60 Bulkhead	U SeaProtect Slab 56 70 mm	**page 40**	**page 41**	**page 42**	
	U SeaProtect Slab 86 50 mm	**page 43**			
A-60 Bulkhead (Double Sided)	U SeaProtect Slab 46 30 mm **on each side**				U SeaProtect Slab 46 30 mm X1 (on the stiffener side) **page 44**
A-60 Bulkhead Restricted	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	**page 45**			U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm **page 46**
A-30 Bulkhead	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	**page 47**	**page 49**	**page 50**	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm **page 48**
	U SeaProtect Slab 76 40 mm or U SeaProtect Slab 76 20 mm x 2	**page 51**	**page 52**		
A-30 Bulkhead (Double Sided)	U SeaProtect Slab 46 40 mm				U SeaProtect Slab 46 30 mm or U SeaProtect Slab 46 40 mm **page 53**
A-15 Bulkhead	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	**page 55**	**page 57**	**page 58**	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm **page 56**
	U SeaProtect Slab 66 30 mm				no insulation around the stiffeners **page 59**
A-60 Deck	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	**page 60**			U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm **page 61**
	U SeaProtect Slab 66 50 mm	**page 62**			
A-15 Deck A-30 Deck	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	**page 63**	**page 65**	**page 66**	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm **page 64**
	U SeaProtect Slab 76 25 mm	**page 67**	**page 68**		
A-15 Deck	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm				no insulation around the stiffeners **page 69**

1) All U SeaProtect products are available with different facings for each construction approved by a recognized test laboratory (Alu facing Alu1, Glass cloth facings G120, G220, G420, B facing, etc...).

Sound reduction measurement (in accordance with NF EN ISO 140-3 Standard)

Geometry:

Dimensions of the steel plate 2.18 m x 1.85 m, Design of the steel plate t = 6 mm + 2 L-shape stiffeners H = 115 mm W = 80 mm t = 10 mm

Conditions:

Emission room volume: 98 m³ – Reception room volume: 86 m³

A-60 Bulkhead – Standard Design
Plate: 56-70 mm – Stiffener: 76-25 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 56 70 mm	3.92	U SeaProtect Slab 76 25 mm	1.90	5.25	0.636	49 dB (-2;-7)

Certificates

- Module B MED: n°MED-B-9334 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

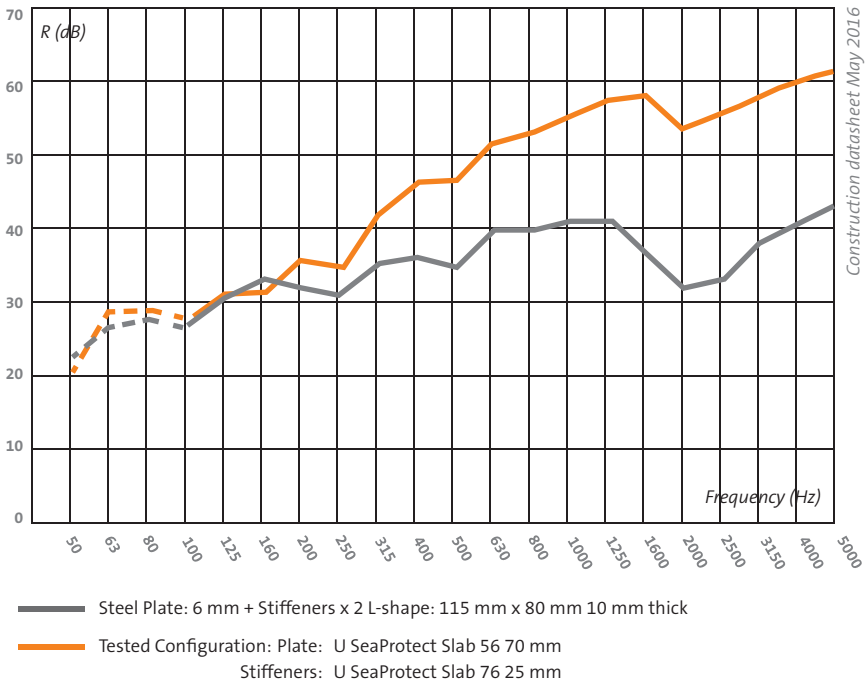
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Slab 56 70 mm	●	●	●	●	●	●	●
U SeaProtect Slab 76 25 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	19.9
63	26.6	28.4
80	27.7	28.8
100	26.4	27.5
125	30.4	30.6
160	33	30.7
200	32	35.7
250	30.6	34.8
315	35.2	41.7
400	35.7	45.8
500	34.6	46.7
630	39.4	51.2
800	39.7	52.6
1,000	40.8	55
1,250	40.6	57.2
1,600	36.9	58
2,000	31.7	53.5
2,500	32.6	55
3,150	37.6	58
4,000	40.5	59.9
5,000	42.7	61.1
R_W(C;C_{tr})	37(-2;-1)	49(-2;-7)
R_A	35	47
$R_{A,tr}$	36	42

Sound Reduction measurement



Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-60 Bulkhead – Thin Design
Plate: 56-70 mm– Stiffener: 76-20 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 56 70 mm	3.92	U SeaProtect 76 20 mm	1.52	4.98	0.669	48 dB (-2;-7)

Certificates

- Module B MED: n°MED-B-9334 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

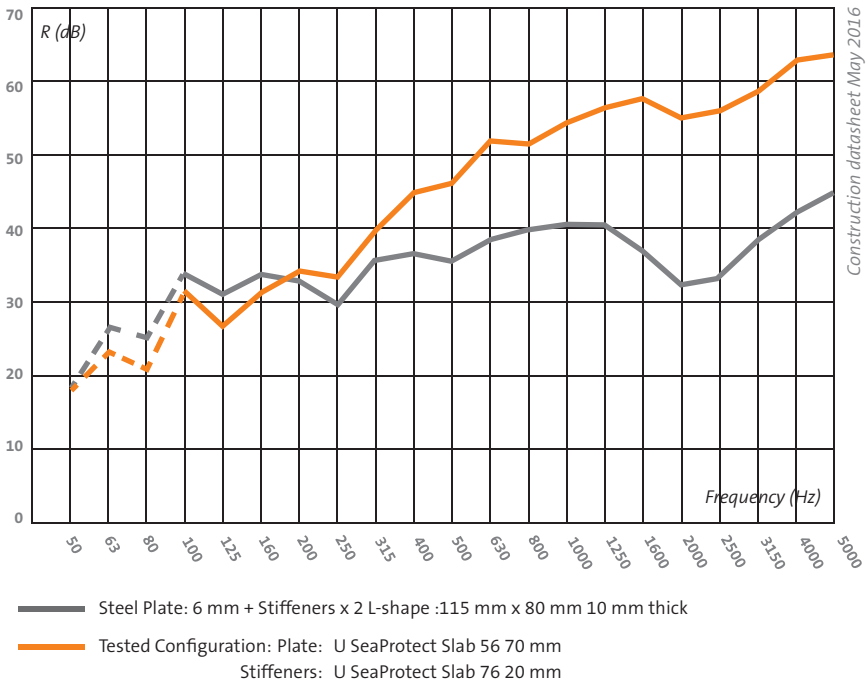
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Slab 56 70 mm	●	●	●	●	●	●	●
U SeaProtect Slab 76 20 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	18.2	17.9
63	26.5	23.1
80	25	20.8
100	34.1	31.6
125	30.8	26.6
160	33.8	31.1
200	32.9	34.2
250	30	33.3
315	35.8	39.6
400	36.4	45
500	35.5	46.2
630	38.5	51.8
800	39.6	51.4
1,000	40.5	54.3
1,250	40.1	56.2
1,600	36.9	57.7
2,000	32.4	54.9
2,500	33.4	55.9
3,150	38.4	58.6
4,000	42.1	62.7
5,000	44.6	63.6
$R_W(C;C_{tr})$	37(-1;-1)	48(-2;-7)
R_A	36	46
$R_{A,tr}$	36	41

Sound Reduction measurement



Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-60 Bulkhead - Light Design
Plate: 56-70 mm - Stiffener: 56-30 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 56 70 mm	3.92	U SeaProtect Slab 56 30 mm	1.68	5.10	0.609	48 dB (-2;-7)

Certificates

- Module B MED: n°MED-B-9334 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

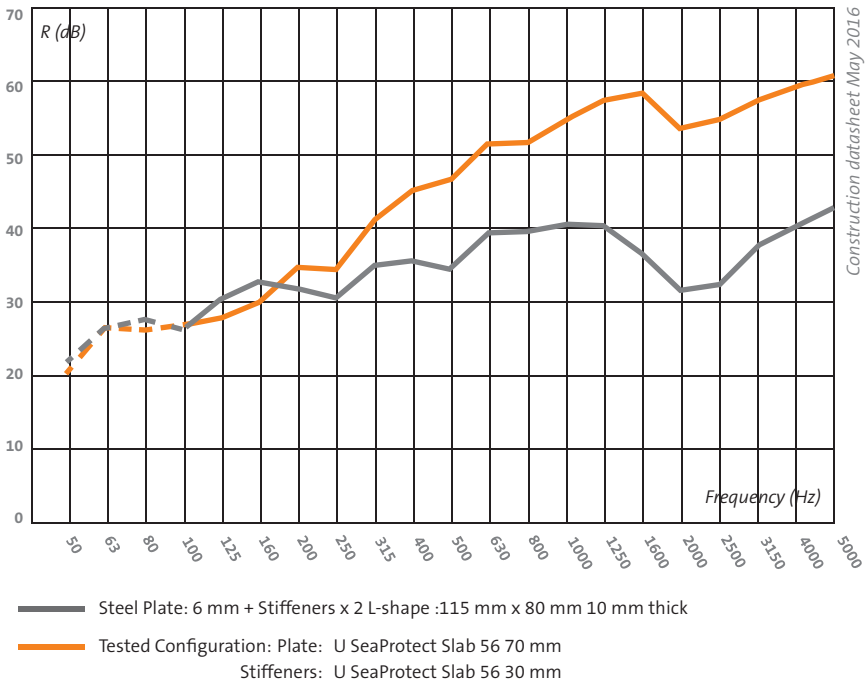
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Slab 56 70 mm	●	●	●	●	●	●	●
U SeaProtect Slab 56 30 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	20.6
63	26.6	26.7
80	27.7	26.3
100	26.4	26.9
125	30.4	28
160	33	30
200	32	34.7
250	30.6	34.6
315	35.2	41.4
400	35.7	45.3
500	34.6	46.6
630	39.4	51.5
800	39.7	51.8
1,000	40.8	54.8
1,250	40.6	57.3
1,600	36.9	58.3
2,000	31.7	53.7
2,500	32.6	54.9
3,150	37.6	57.6
4,000	40.5	59.4
5,000	42.7	60.8
$R_W(C;C_{tr})$	37(-2;-1)	48(-2;-7)
R_A	35	46
$R_{A,tr}$	36	41

Sound Reduction measurement



Steel Plate: 6 mm + Stiffeners x 2 L-shape :115 mm x 80 mm 10 mm thick

Tested Configuration: Plate: U SeaProtect Slab 56 70 mm
Stiffeners: U SeaProtect Slab 56 30 mm

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-60 Bulkhead - Thin Design
Plate: 86-50 mm - Stiffener: 76-25 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 86 50 mm	4.30	U SeaProtect Slab 76 25 mm	1.90	5.63	0.785	48 dB (-2;-7)

Certificates

- Module B MED: n°MED-B-9334 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

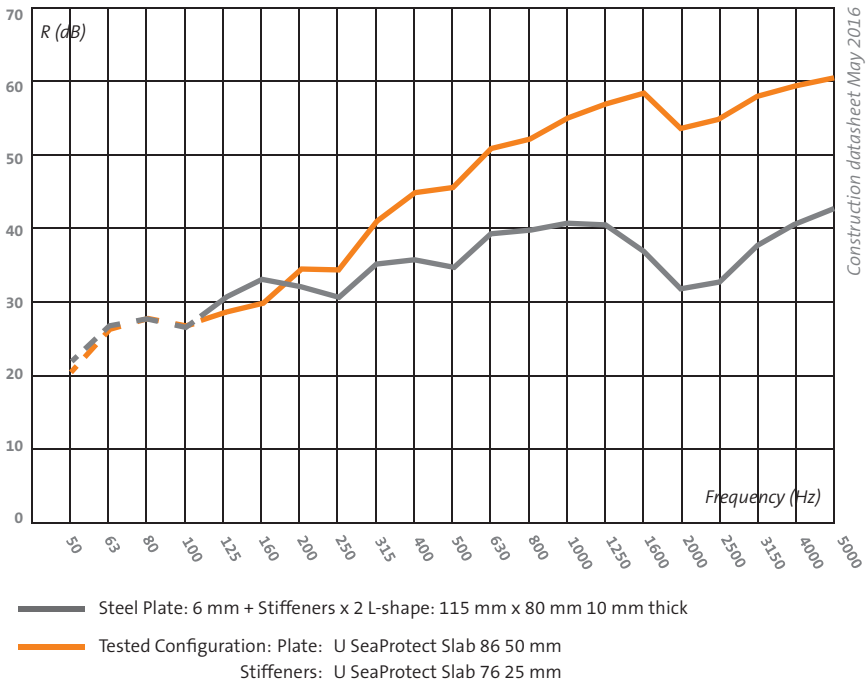
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Slab 86 50 mm	●	●	●	●	●	●	●
U SeaProtect Slab 76 25 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	20.5
63	26.6	26.3
80	27.7	27.7
100	26.4	26.6
125	30.4	28.5
160	33	29.8
200	32	34.4
250	30.6	34.4
315	35.2	41
400	35.7	44.9
500	34.6	45.6
630	39.4	51
800	39.7	52.2
1,000	40.8	55
1,250	40.6	57
1,600	36.9	58.4
2,000	31.7	53.7
2,500	32.6	54.9
3,150	37.6	57.9
4,000	40.5	59.4
5,000	42.7	60.4
R_W(C;C_{tr})	37(-2;-1)	48(-2;-7)
R_A	35	46
$R_{A,tr}$	36	41

Sound Reduction measurement



Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-60 Bulkhead - Double Sided Application
Plate: 46-30 mm (each side) - Stiffener: 46-30 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 46 30 mm on each side	2,76	U SeaProtect Slab 46 30 mm	1.38	3.73	0.528	45 dB (-1;-5)

Certificates

- Module B MED: n°MED-B-9334 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

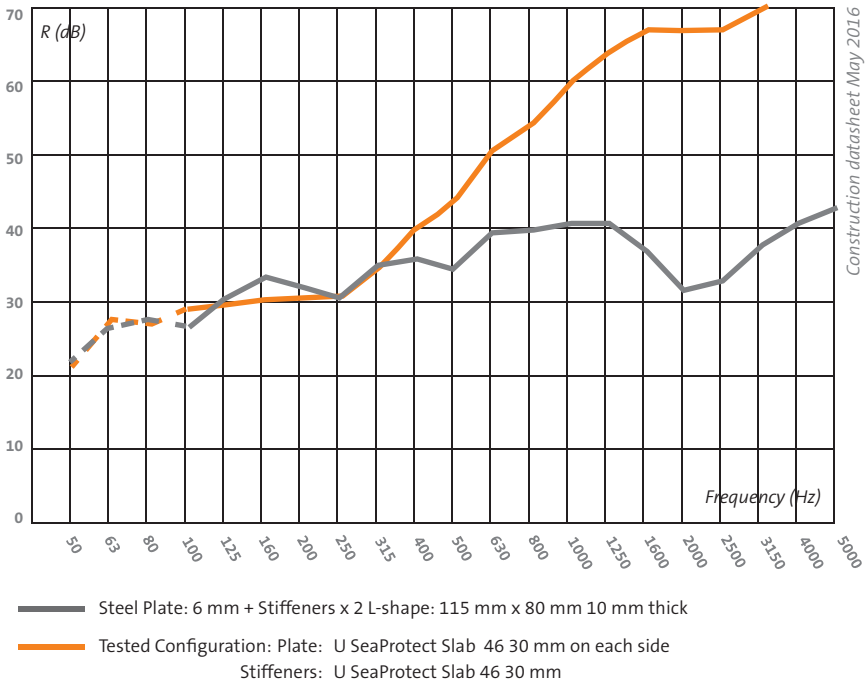
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Slab 46 30 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	21.2
63	26.6	27.6
80	27.7	26.8
100	26.4	29
125	30.4	29.4
160	33	30.4
200	32	30.2
250	30.6	30.6
315	35.2	34.5
400	35.7	40
500	34.6	43.7
630	39.4	50.5
800	39.7	54.1
1,000	40.8	59.6
1,250	40.6	63.8
1,600	36.9	66.9
2,000	31.7	66.6
2,500	32.6	66.8
3,150	37.6	69.5
4,000	40.5	72.7
5,000	42.7	74.7
$R_W(C;C_{tr})$	37(-2;-1)	45(-1;-5)
R_A	35	44
$R_{A,tr}$	36	40

Sound Reduction measurement



Steel Plate: 6 mm + Stiffeners x 2 L-shape: 115 mm x 80 mm 10 mm thick

Tested Configuration: Plate: U SeaProtect Slab 46 30 mm on each side
Stiffeners: U SeaProtect Slab 46 30 mm

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-60 Bulkhead Restricted - Standard Design
Plate: 36-70 mm - Stiffener: 76-25 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2.52	U SeaProtect Slab 76 25 mm	1.90	3.85	0.645	48 dB (-1; -6)

Certificates

- Module B MED: n°MED-B-9334 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

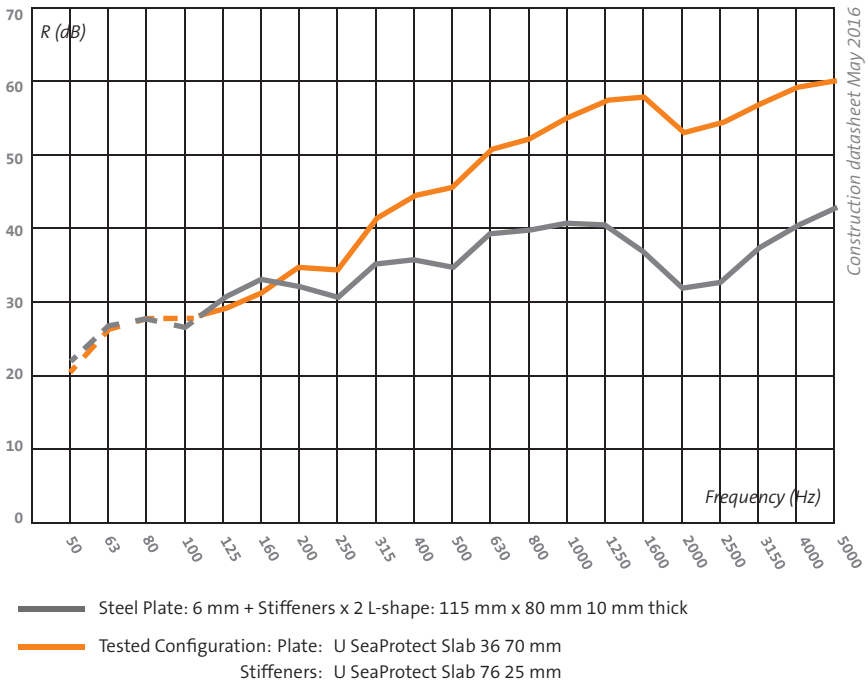
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 36 70 mm	●	●					
U SeaProtect Slab 36 70 mm	●	●	●	●	●	●	●
U SeaProtect Slab 76 25 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	20.6
63	26.6	26.7
80	27.7	28
100	26.4	27.6
125	30.4	29.3
160	33	31.3
200	32	34.8
250	30.6	34.6
315	35.2	41.8
400	35.7	44.6
500	34.6	45.8
630	39.4	50.6
800	39.7	52.3
1,000	40.8	54.9
1,250	40.6	57.4
1,600	36.9	58.1
2,000	31.7	53.2
2,500	32.6	54.6
3,150	37.6	57.3
4,000	40.5	59.2
5,000	42.7	60.3
$R_W(C;C_{tr})$	37(-2;-1)	48(-1;-6)
R_A	35	47
$R_{A,tr}$	36	42

Sound Reduction measurement



Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-60 Bulkhead Restricted - Standard Design
Plate: 36-70 mm - Stiffener: 36-70 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2.52	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2.52	4.28	0.504	48 dB (-2;-6)

Certificates

- Module B MED: n°MED-B-9334 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

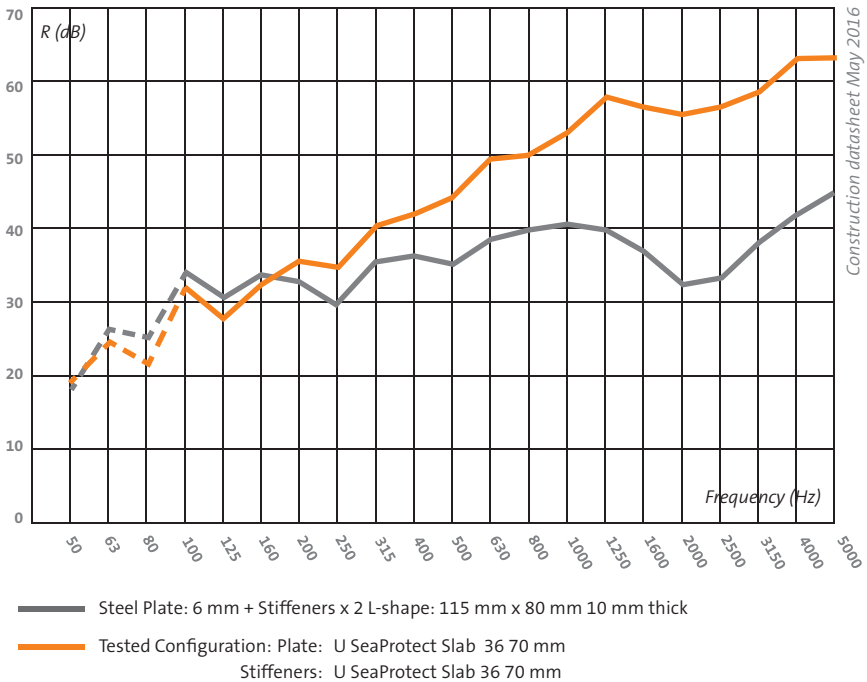
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 36 70 mm	●	●					
U SeaProtect Slab 36 70 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	18.2	19.4
63	26.5	24.6
80	25	21.6
100	34.1	32.1
125	30.8	27.6
160	33.8	32.4
200	32.9	35.7
250	30	34.7
315	35.8	40.4
400	36.4	42.2
500	35.5	44.3
630	38.5	49.6
800	39.6	50.1
1,000	40.5	53.2
1,250	40.1	57.9
1,600	36.9	56.6
2,000	32.4	55.6
2,500	33.4	56.7
3,150	38.4	58.5
4,000	42.1	63
5,000	44.6	63.3
R_w(C;C_{tr})	37(-1;-1)	48(-2;-6)
R_A	36	46
$R_{A,tr}$	36	42

Sound Reduction measurement



Steel Plate: 6 mm + Stiffeners x 2 L-shape: 115 mm x 80 mm 10 mm thick

Tested Configuration: Plate: U SeaProtect Slab 36 70 mm
Stiffeners: U SeaProtect Slab 36 70 mm

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-30 Bulkhead - Standard Design
Plate: 36-70 mm - Stiffener: 76-25 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2.52	U SeaProtect Slab 76 25 mm	1.90	3.85	0.645	48 dB (-1; -6)

Certificates

- Module B MED: n°MED-B-9333 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

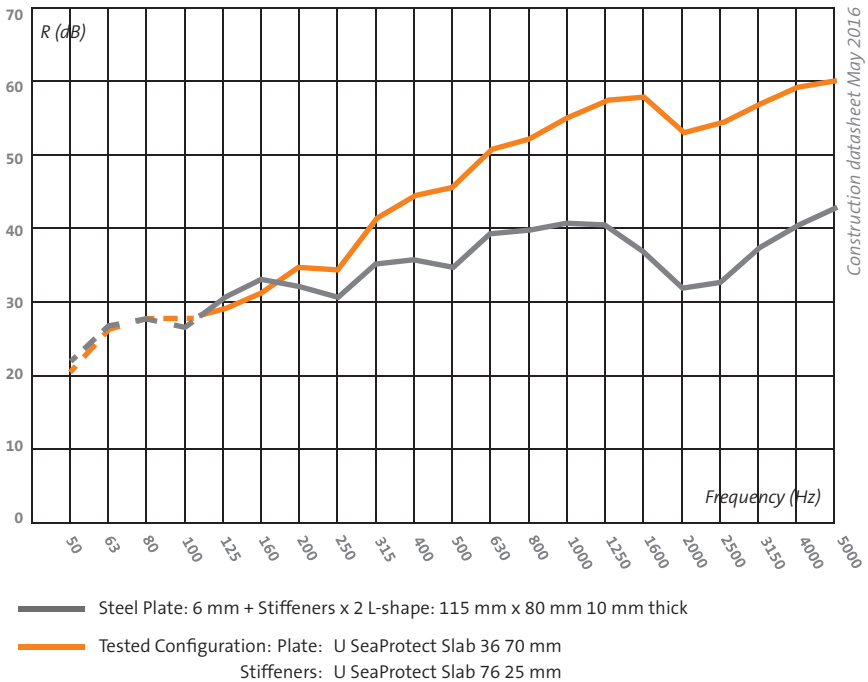
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 36 70 mm	●	●					
U SeaProtect Slab 36 70 mm	●	●	●	●	●	●	●
U SeaProtect Slab 76 25 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	20.6
63	26.6	26.7
80	27.7	28
100	26.4	27.6
125	30.4	29.3
160	33	31.3
200	32	34.8
250	30.6	34.6
315	35.2	41.8
400	35.7	44.6
500	34.6	45.8
630	39.4	50.6
800	39.7	52.3
1,000	40.8	54.9
1,250	40.6	57.4
1,600	36.9	58.1
2,000	31.7	53.2
2,500	32.6	54.6
3,150	37.6	57.3
4,000	40.5	59.2
5,000	42.7	60.3
$R_W(C;C_{tr})$	37(-2;-1)	48(-1;-6)
R_A	35	47
$R_{A,tr}$	36	42

Sound Reduction measurement



Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-30 Bulkhead - Standard Design
Plate: 36-70 mm - Stiffener: 36-70 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2.52	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2.52	4.28	0.504	48 dB (-2;-6)

Certificates

- Module B MED: n°MED-B-9333 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

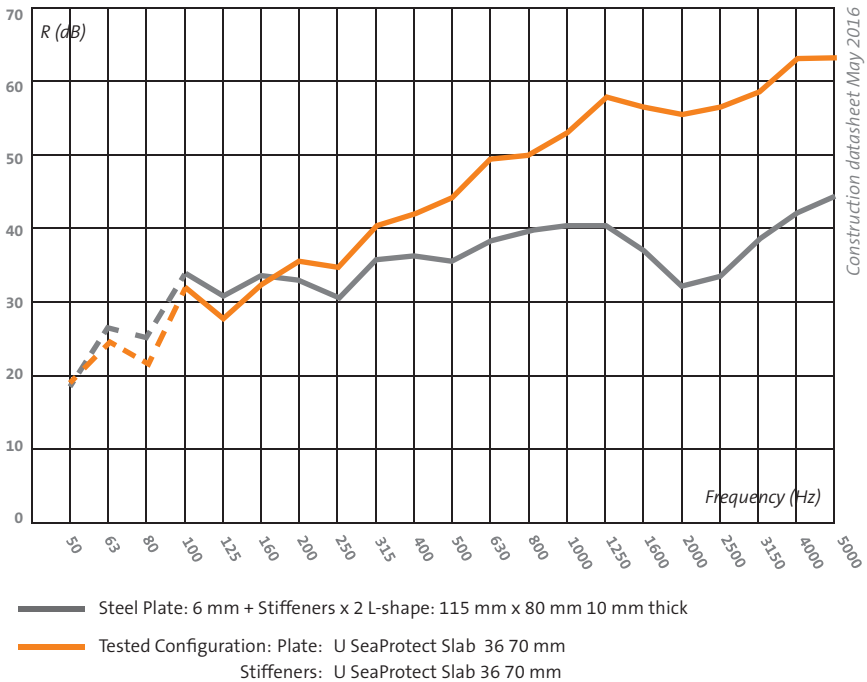
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 36 70 mm	●	●					
U SeaProtect Slab 36 70 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	18.2	19.4
63	26.5	24.6
80	25	21.6
100	34.1	32.1
125	30.8	27.6
160	33.8	32.4
200	32.9	35.7
250	30	34.7
315	35.8	40.4
400	36.4	42.2
500	35.5	44.3
630	38.5	49.6
800	39.6	50.1
1,000	40.5	53.2
1,250	40.1	57.9
1,600	36.9	56.6
2,000	32.4	55.6
2,500	33.4	56.7
3,150	38.4	58.5
4,000	42.1	63
5,000	44.6	63.3
R_w(C;C_{tr})	37(-1;-1)	48(-2;-6)
R_A	36	46
$R_{A,tr}$	36	42

Sound Reduction measurement



Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-30 Bulkhead - Thin Design
Plate: 36-70 mm - Stiffener: 76-20 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2.52	U SeaProtect Slab 76 20 mm	1.52	3.58	0.678	49 dB (-3;-7)

Certificates

- Module B MED: n°MED-B-9333, U.S Coast Guard: n° 164.105 notified body DNV. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

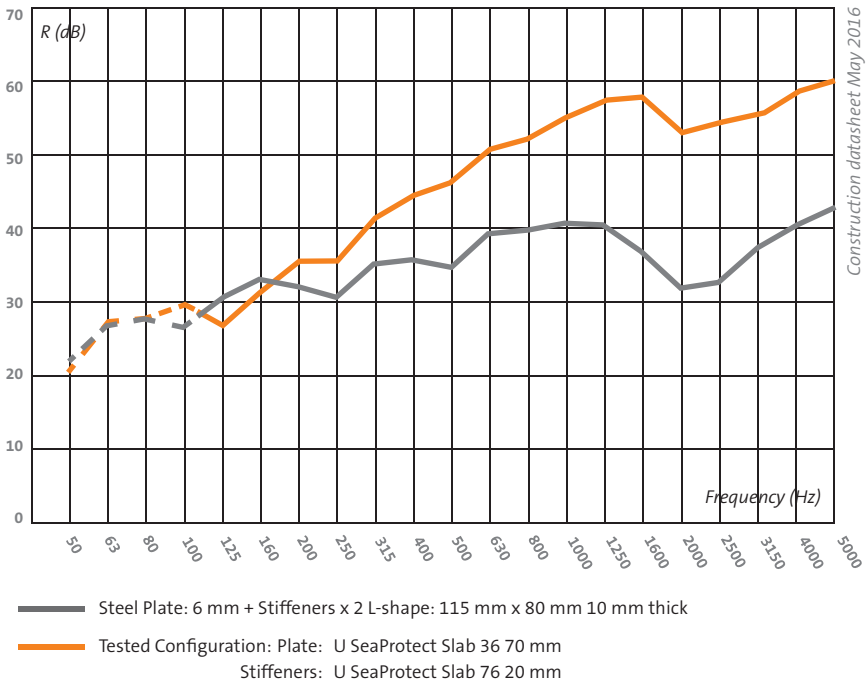
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 36 70 mm	●	●					
U SeaProtect Slab 36 70 mm	●	●	●	●	●	●	●
U SeaProtect Slab 76 20 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	20.2
63	26.6	27.7
80	27.7	27.4
100	26.4	29.8
125	30.4	26.9
160	33	30.9
200	32	35.3
250	30.6	35.6
315	35.2	41.2
400	35.7	44.4
500	34.6	46.5
630	39.4	50.7
800	39.7	52.3
1,000	40.8	54.9
1,250	40.6	57.7
1,600	36.9	58.2
2,000	31.7	53.3
2,500	32.6	54.1
3,150	37.6	55.7
4,000	40.5	58.4
5,000	42.7	60
$R_W(C;C_{tr})$	37(-2;-1)	49(-3;-7)
R_A	35	46
$R_{A,tr}$	36	42

Sound Reduction measurement



Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-30 Bulkhead - Light Design
Plate: 36-70 mm - Stiffener: 56-30 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2.52	U SeaProtect Slab 56 30 mm	1.68	3.70	0.618	48 dB (-2;-6)

Certificates

- Module B MED: n°MED-B-9333 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

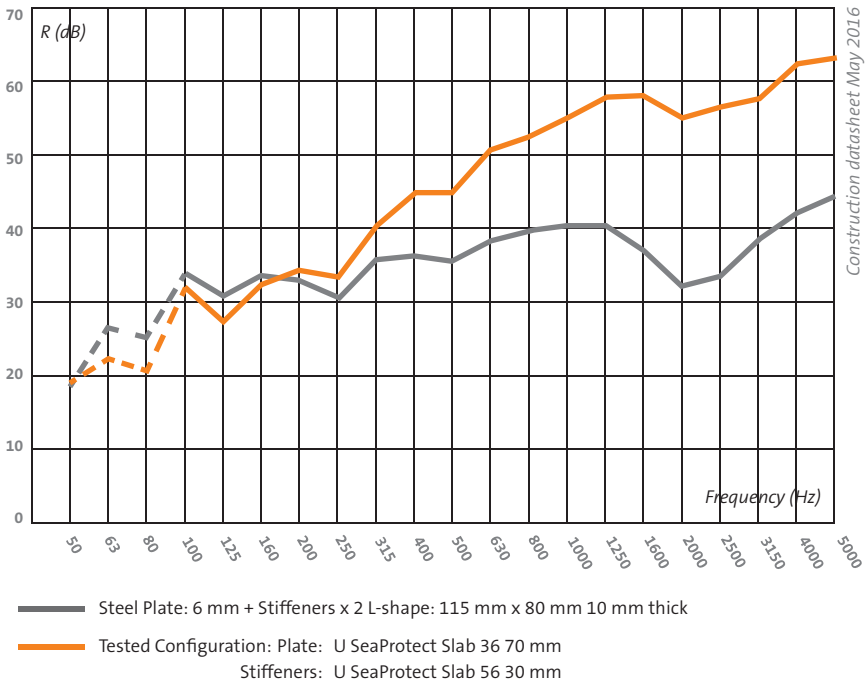
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 36 70 mm	●	●					
U SeaProtect Slab 36 70 mm	●	●	●	●	●	●	●
U SeaProtect Slab 56 30 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	18.2	18.8
63	26.5	22.4
80	25	20.6
100	34.1	31.6
125	30.8	27.3
160	33.8	32.6
200	32.9	34.3
250	30	33.3
315	35.8	40.1
400	36.4	44.9
500	35.5	44.7
630	38.5	50.5
800	39.6	52.5
1,000	40.5	55.2
1,250	40.1	57.6
1,600	36.9	58.1
2,000	32.4	55
2,500	33.4	56.4
3,150	38.4	57.7
4,000	42.1	62.4
5,000	44.6	63.1
$R_W(C;C_{tr})$	37 (-1; -1)	48 (-2; -6)
R_A	36	46
$R_{A,tr}$	36	42

Sound Reduction measurement



Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-30 Bulkhead - Thin Design
Plate: 76-40 mm or 76-20 mm x 2 - Stiffener: 76-25 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 76 40 mm or U SeaProtect 76 20 mmX2	3.04	U SeaProtect Slab 76 25 mm	1.90	4.37	0.893	/

Certificates

- Module B MED: n°MED-B-9333 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Slab 76 40 mm	●	●	●	●	●	●	●
U SeaProtect Slab 76 25 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

A-30 Bulkhead - Thin Design
Plate: 76-40 mm or 76-20 mm x 2 - Stiffener: 76-20 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 76 40 mm or U SeaProtect Slab 76 20 mm x 2	3.04	U SeaProtect Slab 76 20 mm	1.52	4.10	0.934	47 dB (-2;-6)

Certificates

- Module B MED: n°MED-B-9333 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

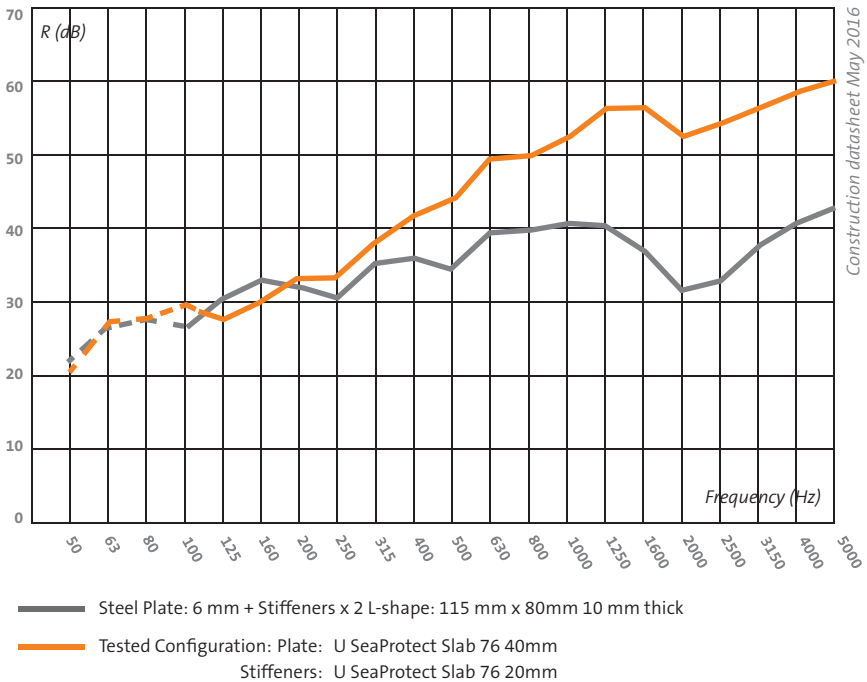
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Slab 76 40 mm	●	●	●	●	●	●	●
U SeaProtect Slab 76 20 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	19.5
63	26.6	27.4
80	27.7	27.6
100	26.4	29.7
125	30.4	27.6
160	33	29.8
200	32	33.3
250	30.6	33.5
315	35.2	38.3
400	35.7	41.7
500	34.6	43.9
630	39.4	49.3
800	39.7	49.6
1,000	40.8	52.4
1,250	40.6	56.2
1,600	36.9	56.5
2,000	31.7	52.3
2,500	32.6	54
3,150	37.6	56.3
4,000	40.5	58.4
5,000	42.7	59.9
R_W(C;C_{tr})	37(-2;-1)	47(-2;-6)
R_A	35	45
$R_{A,tr}$	36	41

Sound Reduction measurement



Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-30 BHD Restricted - Thin Design
Plate: 46-40 mm - Stiffener: 46-40 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 46 40 mm	1.84	U SeaProtect Slab 46 40 mm	1.84	3.13	0.807	/

Certificates

- Module B MED: n°MED-B-9333 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Slab 46 40 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

A-30 BHD Restricted - Thin Design
Plate: 46-40 mm - Stiffener: 46-30 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 46 40 mm	1.84	U SeaProtect Slab 46 30 mm	1.38	2.81	0.859	46d B (-1;-5)

Certificates

- Module B MED: n°MED-B-9333 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

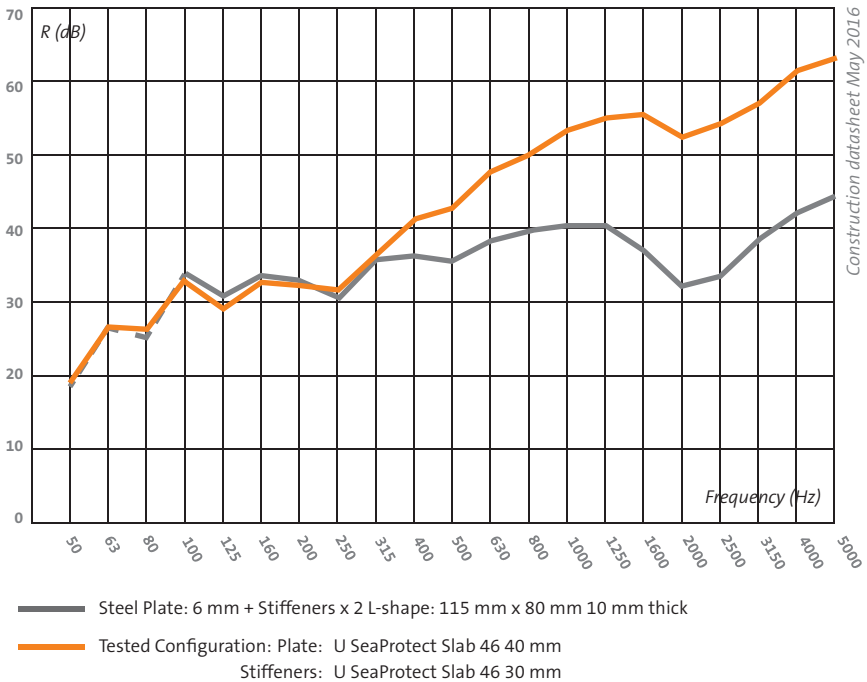
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Slab 46 40 mm	●	●	●	●	●	●	●
U SeaProtect Slab 46 30 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	18.2	18.8
63	26.5	26.6
80	25	26.1
100	34.1	33.2
125	30.8	29
160	33.8	32.5
200	32.9	32.3
250	30	31.1
315	35.8	36.4
400	36.4	41.4
500	35.5	42.6
630	38.5	47.9
800	39.6	49.9
1,000	40.5	53.3
1,250	40.1	55.3
1,600	36.9	55.3
2,000	32.4	52.5
2,500	33.4	54.3
3,150	38.4	57
4,000	42.1	61.6
5,000	44.6	63.2
$R_W(C;C_{tr})$	37(-1;-1)	46(-1;-5)
R_A	36	45
$R_{A,tr}$	36	41

Sound Reduction measurement



Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-15 Bulkhead - Standard Design
Plate: 24-50 mm - Stiffener: 76-25 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	1,20	U SeaProtect Slab 76 25 mm	1,90	2,53	0,819	47 dB (-2,-6)

Certificates

- Module B MED: n°MED-B-9516 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

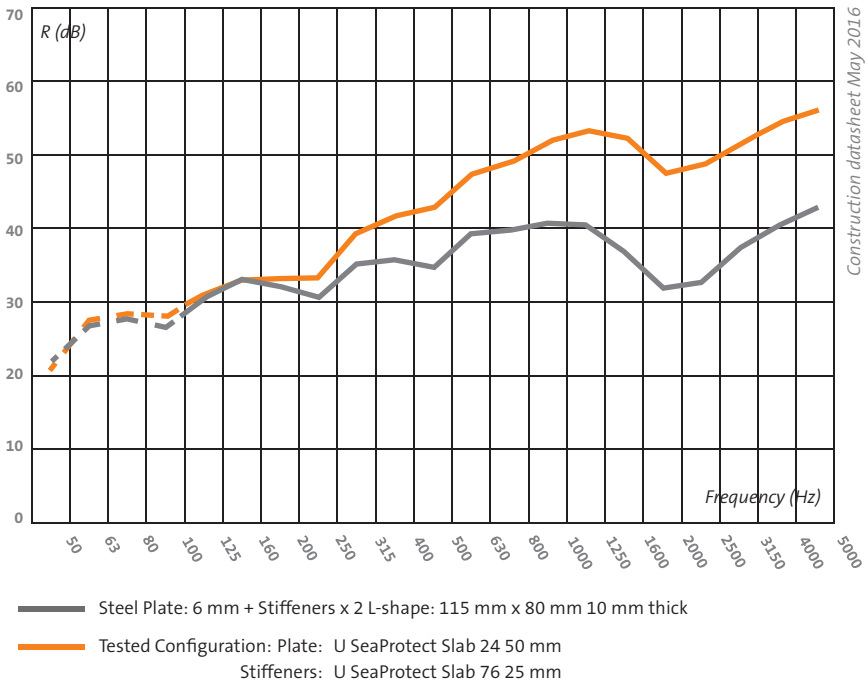
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 24 50 mm	●	●		●			
U SeaProtect Slab 24 50 mm	●	●	●	●	●	●	●
U SeaProtect Slab 76 25 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	20,7
63	26,6	27,7
80	27,7	28,5
100	26,4	28,2
125	30,4	31
160	33	32,9
200	32	33,5
250	30,6	33,1
315	35,2	39,2
400	35,7	41,5
500	34,6	42,8
630	39,4	47,6
800	39,7	49
1,000	40,8	51,5
1,250	40,6	53,3
1,600	36,9	52,8
2,000	31,7	47,7
2,500	32,6	48,6
3,150	37,6	51,8
4,000	40,5	54,3
5,000	42,7	56,2
$R_W(C;C_{tr})$	37(-2;-1)	47(-2;-6)
R_A	35	45
$R_{A,tr}$	36	41

Sound Reduction measurement



Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-15 Bulkhead - Standard Design
Plate: 24-50 mm - Stiffener: 24-50 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw(C,C_{tr})
U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	1.20	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	1.20	2.04	0.716	46 dB (-1;-5)

Certificates

- Module B MED: n°MED-B-9516 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

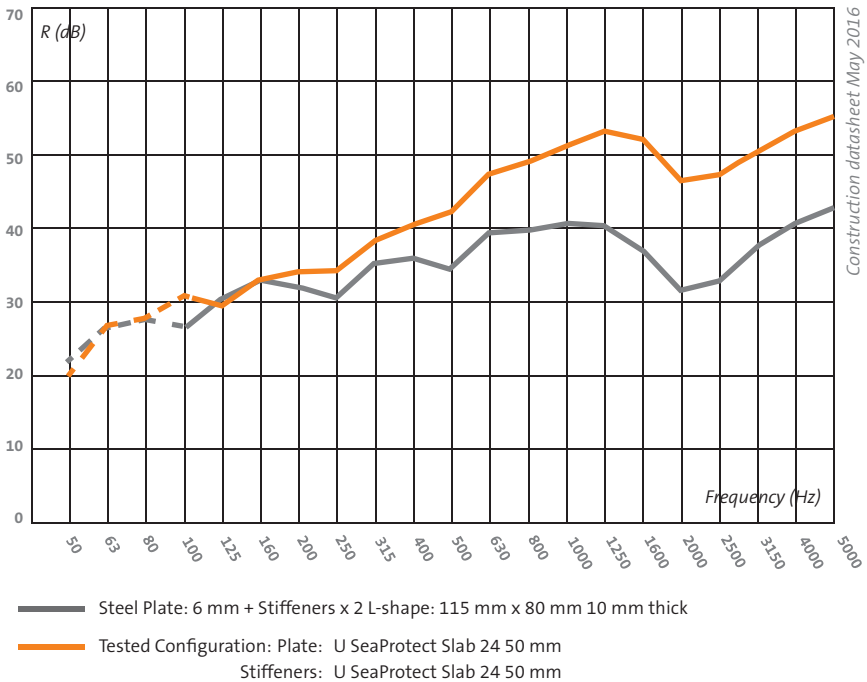
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 24 50 mm	●	●		●			
U SeaProtect Slab 24 50 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	19.7
63	26.6	26.9
80	27.7	27.8
100	26.4	30.9
125	30.4	29.4
160	33	32.9
200	32	34
250	30.6	34.3
315	35.2	38.3
400	35.7	40.6
500	34.6	42.4
630	39.4	47.4
800	39.7	48.9
1,000	40.8	51.1
1,250	40.6	53.2
1,600	36.9	52.2
2,000	31.7	46.6
2,500	32.6	47.4
3,150	37.6	50.6
4,000	40.5	53.1
5,000	42.7	55.3
$R_W(C;C_{tr})$	37(-2;-1)	46(-1;-5)
R_A	35	45
$R_{A,tr}$	36	41

Sound Reduction measurement



1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-15 Bulkhead - Thin Design
Plate: 24-50 mm - Stiffener: 76-20 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	1.20	U SeaProtect Slab 76 20 mm	1.52	2.26	0.858	46 dB (-1;-5)

Certificates

- Module B MED: n°MED-B-9516 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

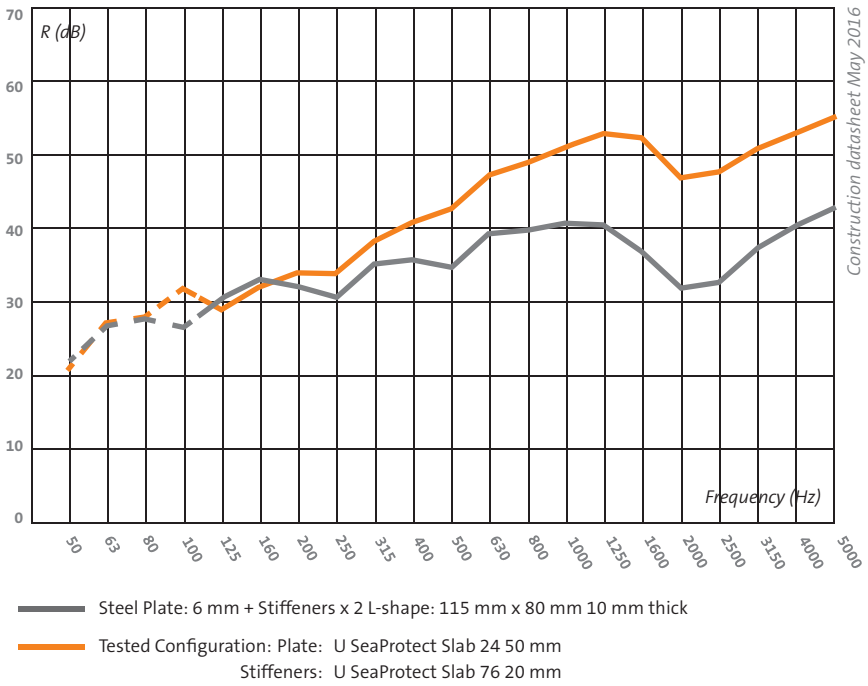
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 24 50 mm	●	●		●			
U SeaProtect Slab 24 50 mm	●	●	●	●	●	●	●
U SeaProtect Slab 76 20 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	20.8
63	26.6	27.3
80	27.7	28
100	26.4	31.8
125	30.4	29.1
160	33	32.1
200	32	34.1
250	30.6	33.9
315	35.2	38.3
400	35.7	40.9
500	34.6	42.7
630	39.4	47.3
800	39.7	48.9
1,000	40.8	51.2
1,250	40.6	53
1,600	36.9	52.3
2,000	31.7	46.9
2,500	32.6	47.8
3,150	37.6	50.9
4,000	40.5	53
5,000	42.7	55.3
$R_W(C;C_{tr})$	37(-2;-1)	46(-1;-5)
R_A	35	45
$R_{A,tr}$	36	41

Sound Reduction measurement



Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-15 Bulkhead - Light Design
Plate: 24-50 mm - Stiffener: 56-30 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	1.20	U SeaProtect Slab 56 30 mm	1.68	2.38	0.787	46 dB (-2;-5)

Certificates

- Module B MED: n°MED-B-9516 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

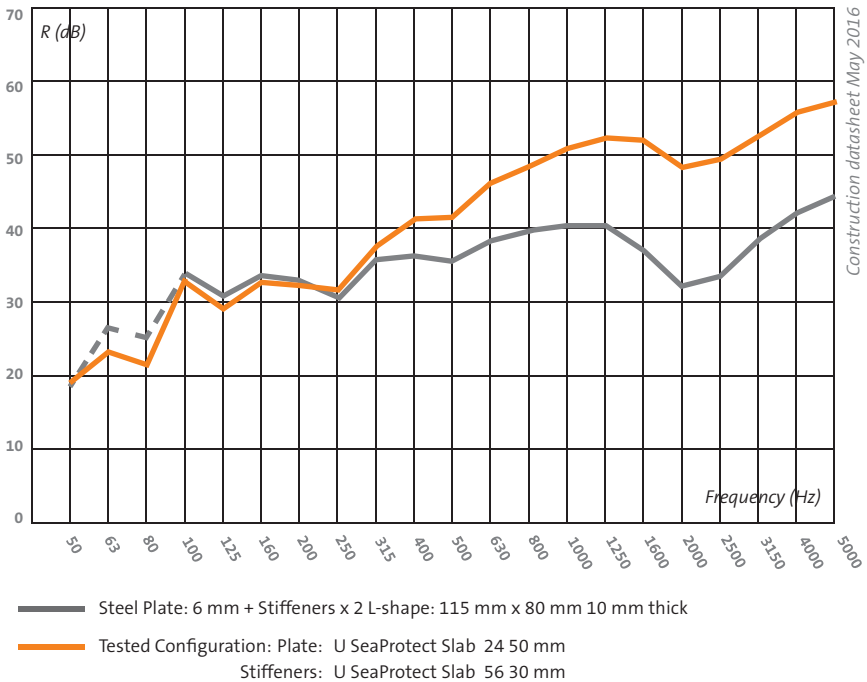
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 24 50 mm	●	●		●			
U SeaProtect Slab 24 50 mm	●	●	●	●	●	●	●
U SeaProtect Slab 56 30 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	18.2	18.7
63	26.5	23.2
80	25	21.6
100	34.1	33.3
125	30.8	29.1
160	33.8	33.1
200	32.9	32.8
250	30	31.5
315	35.8	37.8
400	36.4	41.4
500	35.5	41.7
630	38.5	46.4
800	39.6	48.5
1,000	40.5	51
1,250	40.1	52.3
1,600	36.9	52.2
2,000	32.4	48.1
2,500	33.4	49.4
3,150	38.4	52.9
4,000	42.1	56
5,000	44.6	57.6
$R_w(C;C_{tr})$	37(-1;-1)	46(-2;-5)
R_A	36	44
$R_{A,tr}$	36	41

Sound Reduction measurement



Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-15 Bulkhead - Thin Design
Plate: 66-30 mm - Stiffener: no insulation

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 66 30 mm	1.98			1.98	2.065	45 dB (-1;-5)

Certificates

- Module B MED: n°MED-B-9398 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

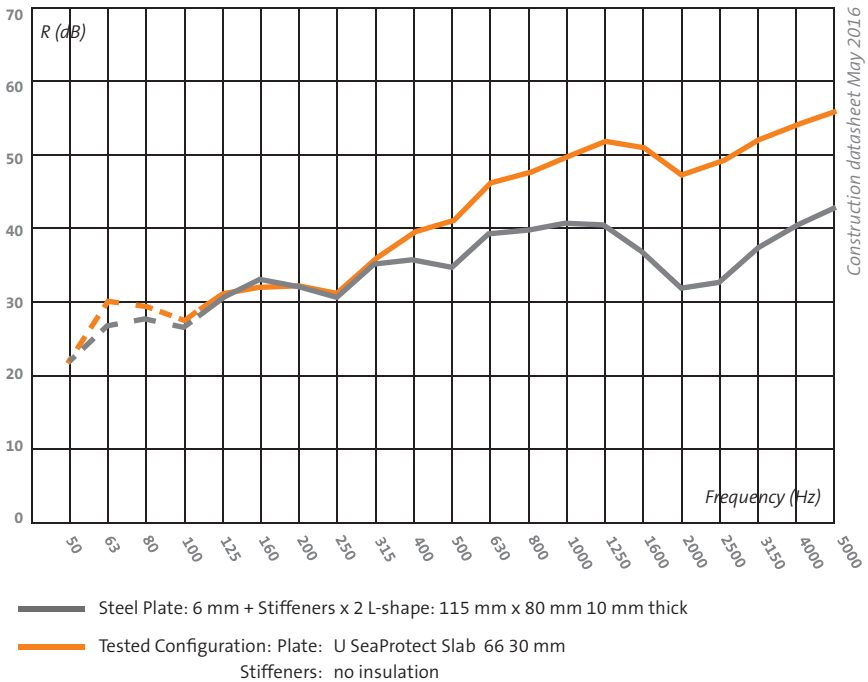
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Slab 66 30 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	21.8
63	26.6	30.2
80	27.7	29.6
100	26.4	27.6
125	30.4	31.2
160	33	32
200	32	32.2
250	30.6	31.3
315	35.2	36.1
400	35.7	39.7
500	34.6	41.1
630	39.4	46.3
800	39.7	47.5
1,000	40.8	50
1,250	40.6	52
1,600	36.9	51.2
2,000	31.7	47.3
2,500	32.6	49.1
3,150	37.6	52.1
4,000	40.5	54.2
5,000	42.7	56.1
$R_W(C;C_{tr})$	37(-2;-1)	45(-1;-5)
R_A	35	44
$R_{A,tr}$	36	40

Sound Reduction measurement



Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-60 Deck - Standard Design
Plate: 36-70 mm - Stiffener: 76-25 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2.52	U SeaProtect Slab 76 25 mm	1.90	3.85	0.645	48 dB (-1;-6)

Certificates

- Module B MED: n°MED-B-9519 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

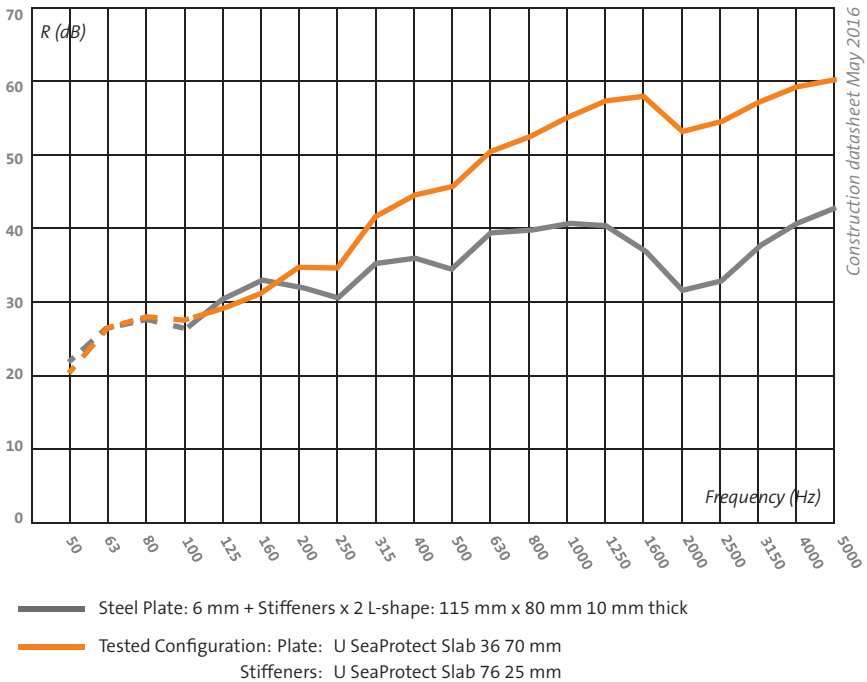
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 36 70 mm	●	●					
U SeaProtect Slab 36 70 mm	●	●	●	●	●	●	●
U SeaProtect Slab 76 25 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	20.6
63	26.6	26.7
80	27.7	28
100	26.4	27.6
125	30.4	29.3
160	33	31.3
200	32	34.8
250	30.6	34.6
315	35.2	41.8
400	35.7	44.6
500	34.6	45.8
630	39.4	50.6
800	39.7	52.3
1,000	40.8	54.9
1,250	40.6	57.4
1,600	36.9	58.1
2,000	31.7	53.2
2,500	32.6	54.6
3,150	37.6	57.3
4,000	40.5	59.2
5,000	42.7	60.3
R_W(C;C_{tr})	37(-2;-1)	48(-1;-6)
R_A	35	47
$R_{A,tr}$	36	42

Sound Reduction measurement



Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-60 Deck - Standard Design
Plate: 36-70 mm - Stiffener: 36-70 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2.52	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2.52	4.28	0.504	48 dB (-2;-6)

Certificates

- Module B MED: n°MED-B-9519 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

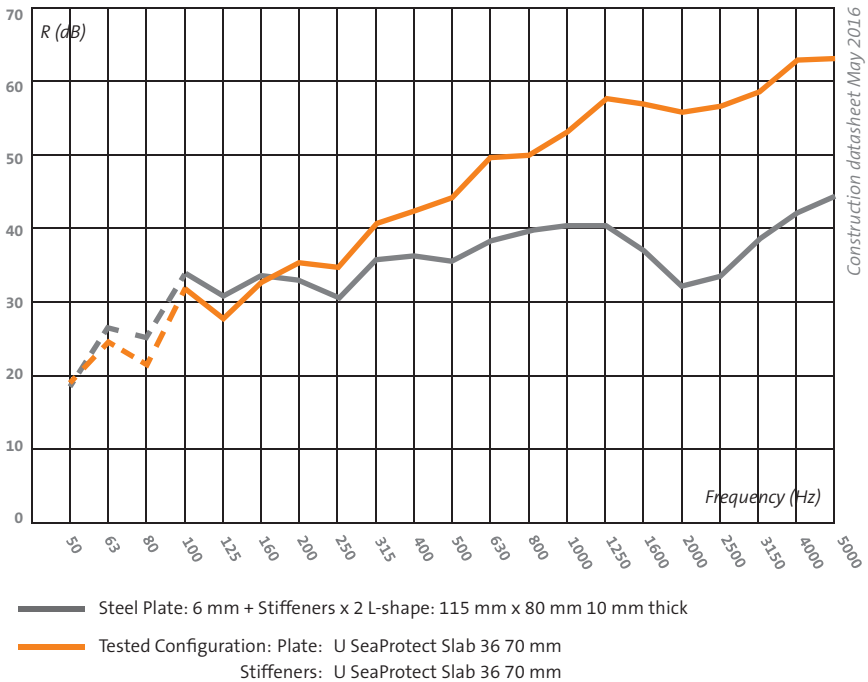
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 36 70 mm	●	●					
U SeaProtect Slab 36 70 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	18.2	19.4
63	26.5	24.6
80	25	21.6
100	34.1	32.1
125	30.8	27.6
160	33.8	32.4
200	32.9	35.7
250	30	34.7
315	35.8	40.4
400	36.4	42.2
500	35.5	44.3
630	38.5	49.6
800	39.6	50.1
1,000	40.5	53.2
1,250	40.1	57.9
1,600	36.9	56.6
2,000	32.4	55.6
2,500	33.4	56.7
3,150	38.4	58.5
4,000	42.1	63
5,000	44.6	63.3
R_W(C;C_{tr})	37(-1;-1)	48(-2;-6)
R_A	35,8	46,3
$R_{A,tr}$	36,1	42,0

Sound Reduction measurement



Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-60 Deck - Thin Design
Plate: 66-50 mm - Stiffener: 76-25 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 66 50 mm	3.30	U SeaProtect Slab 76 25 mm	1.90	4.63	0.785	48 dB (-2;-7)

Certificates

- Module B MED: n°MED-B-9519 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

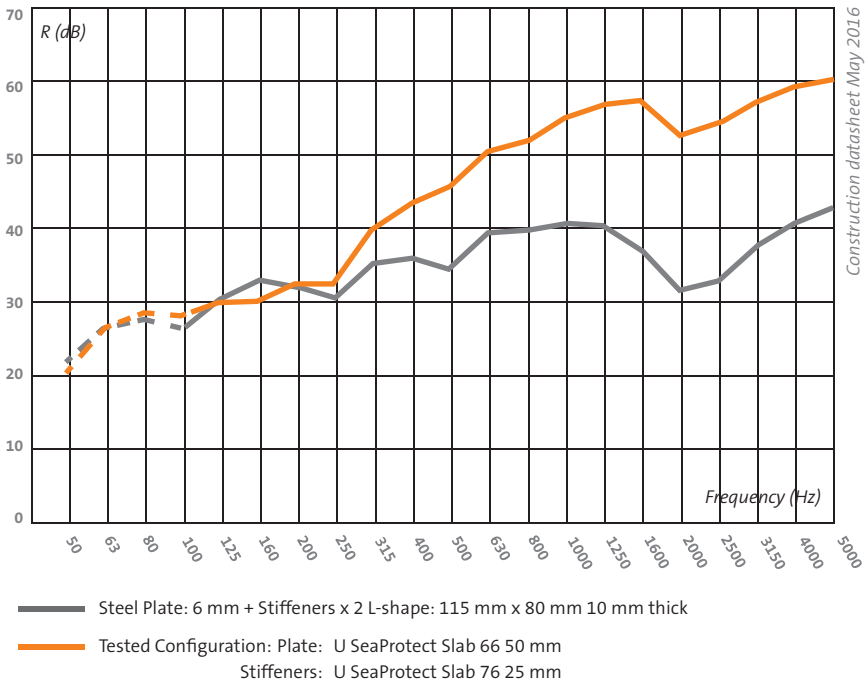
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Slab 66 50 mm	●	●	●	●	●	●	●
U SeaProtect Slab 76 25 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	20.6
63	26.6	26.7
80	27.7	28.7
100	26.4	28.2
125	30.4	30.1
160	33	30.4
200	32	32.6
250	30.6	32.6
315	35.2	39.7
400	35.7	43.7
500	34.6	45.8
630	39.4	50.6
800	39.7	51.9
1,000	40.8	54.8
1,250	40.6	56.8
1,600	36.9	57.4
2,000	31.7	52.6
2,500	32.6	54.1
3,150	37.6	57
4,000	40.5	59
5,000	42.7	60.4
$R_W(C;C_{tr})$	37(-2;-1)	48(-2;-7)
R_A	35	46
$R_{A,tr}$	36	41

Sound Reduction measurement



Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-30 Deck - Standard Design
Plate: 24-50 mm - Stiffener: 76-25 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	1.20	U SeaProtect Slab 76 25 mm	1.90	2.53	0.819	47 dB (-2;-6)

Certificates

- Module B MED: n°MED-B-9328 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

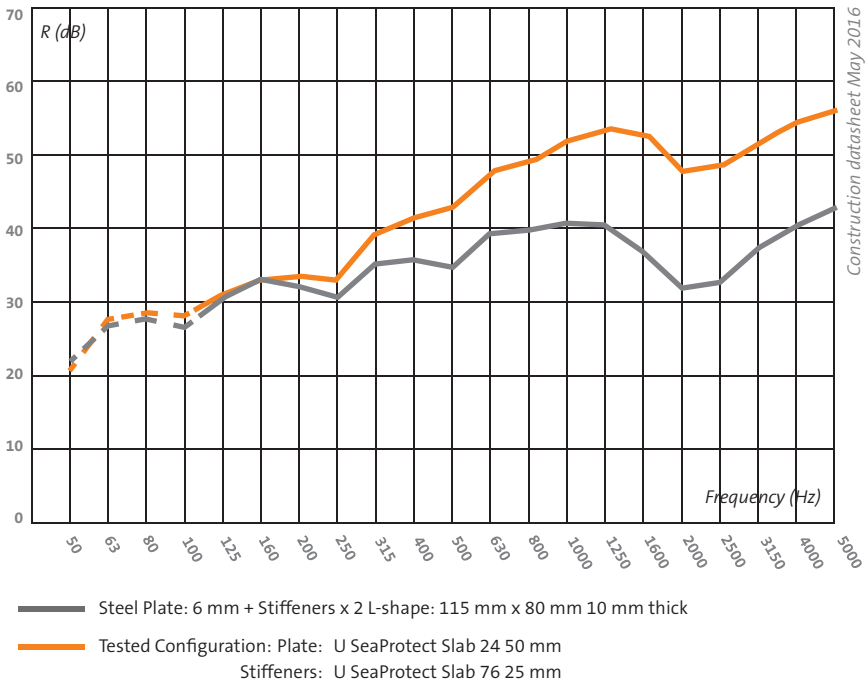
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 24 50 mm	●	●		●			
U SeaProtect Slab 24 50 mm	●	●	●	●	●	●	●
U SeaProtect Slab 76 25 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	20.7
63	26.6	27.7
80	27.7	28.5
100	26.4	28.2
125	30.4	31
160	33	32.9
200	32	33.5
250	30.6	33.1
315	35.2	39.2
400	35.7	41.5
500	34.6	42.8
630	39.4	47.6
800	39.7	49
1,000	40.8	51.5
1,250	40.6	53.3
1,600	36.9	52.8
2,000	31.7	47.7
2,500	32.6	48.6
3,150	37.6	51.8
4,000	40.5	54.3
5,000	42.7	56.2
R_W(C;C_{tr})	37(-2;-1)	47(-2;-6)
R_A	35	45
$R_{A,tr}$	36	41

Sound Reduction measurement



Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-30 Deck - Standard Design
Plate: 24-50 mm - Stiffener: 24-50 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw(C,C_{tr})
U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	1.20	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	1.20	2.04	0.716	46 dB (-1;-5)

Certificates

- Module B MED: n°MED-B-9328 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

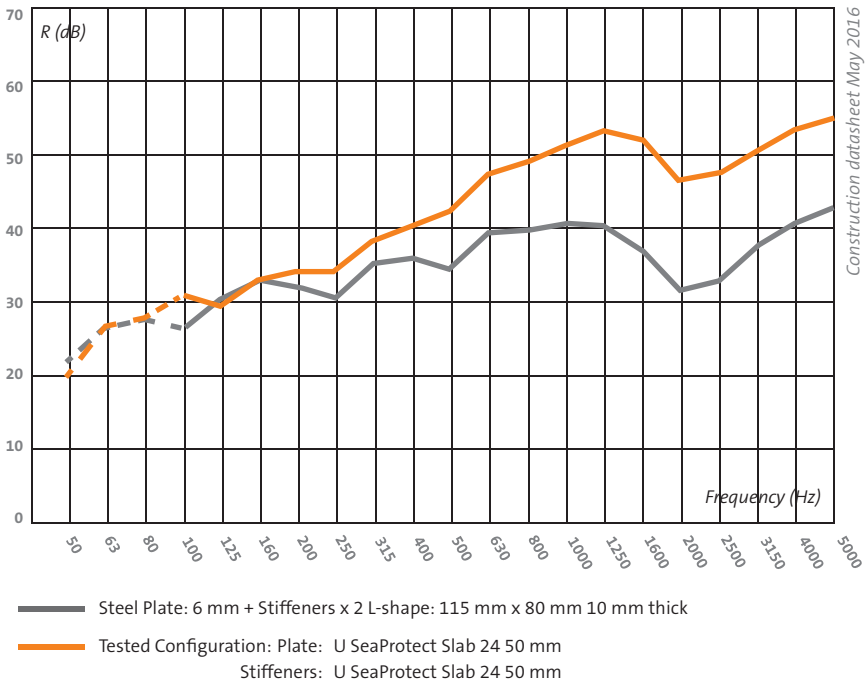
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 24 50 mm	●	●		●			
U SeaProtect Slab 24 50 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	19.7
63	26.6	26.9
80	27.7	27.8
100	26.4	30.9
125	30.4	29.4
160	33	32.9
200	32	34
250	30.6	34.3
315	35.2	38.3
400	35.7	40.6
500	34.6	42.4
630	39.4	47.4
800	39.7	48.9
1,000	40.8	51.1
1,250	40.6	53.2
1,600	36.9	52.2
2,000	31.7	46.6
2,500	32.6	47.4
3,150	37.6	50.6
4,000	40.5	53.1
5,000	42.7	55.3
$R_w(C;C_{tr})$	37(-2;-1)	46(-1;-5)
R_A	35	45
$R_{A,tr}$	36	41

Sound Reduction measurement



1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-30 Deck - Thin Design
Plate: 24-50 mm - Stiffener: 76-20 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	1.20	U SeaProtect Slab 76 20 mm	1.52	2.26	0.858	46 dB (-1;-5)

Certificates

- Module B MED: n°MED-B-9328 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

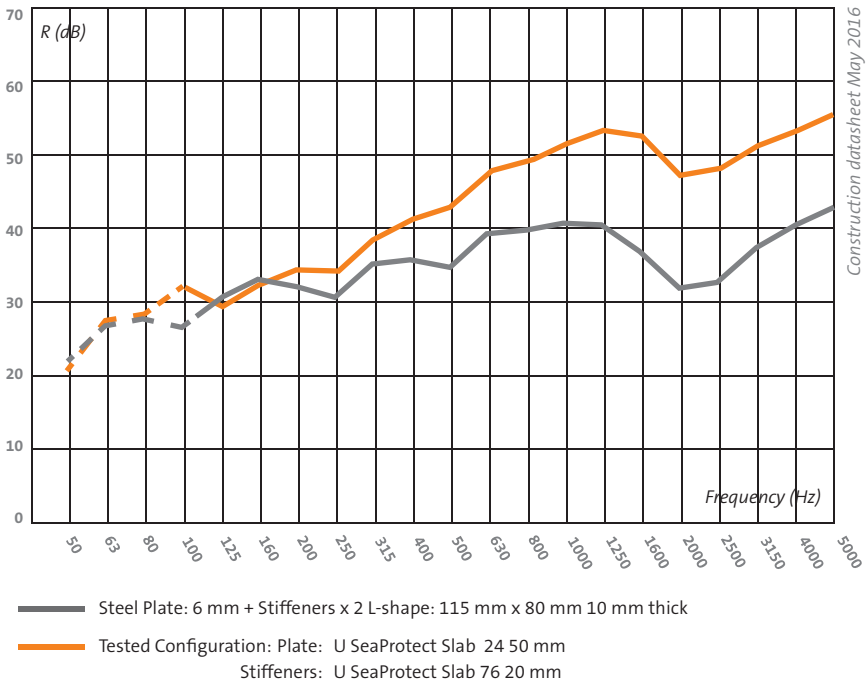
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 24 50 mm	●	●		●			
U SeaProtect Slab 24 50 mm	●	●	●	●	●	●	●
U SeaProtect Slab 76 20 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	20.8
63	26.6	27.3
80	27.7	28
100	26.4	31.8
125	30.4	29.1
160	33	32.1
200	32	34.1
250	30.6	33.9
315	35.2	38.3
400	35.7	40.9
500	34.6	42.7
630	39.4	47.3
800	39.7	48.9
1,000	40.8	51.2
1,250	40.6	53
1,600	36.9	52.3
2,000	31.7	46.9
2,500	32.6	47.8
3,150	37.6	50.9
4,000	40.5	53
5,000	42.7	55.3
$R_W(C;C_{tr})$	37(-2;-1)	46(-1;-5)
R_A	35	45
$R_{A,tr}$	36	41

Sound Reduction measurement



Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-30 Deck - Light Design
Plate: 24-50 mm - Stiffener: 56-30 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	1.20	U SeaProtect Slab 56 30 mm	1.68	2.38	0.787	46 dB (-2;-5)

Certificates

- Module B MED: n°MED-B-9328 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

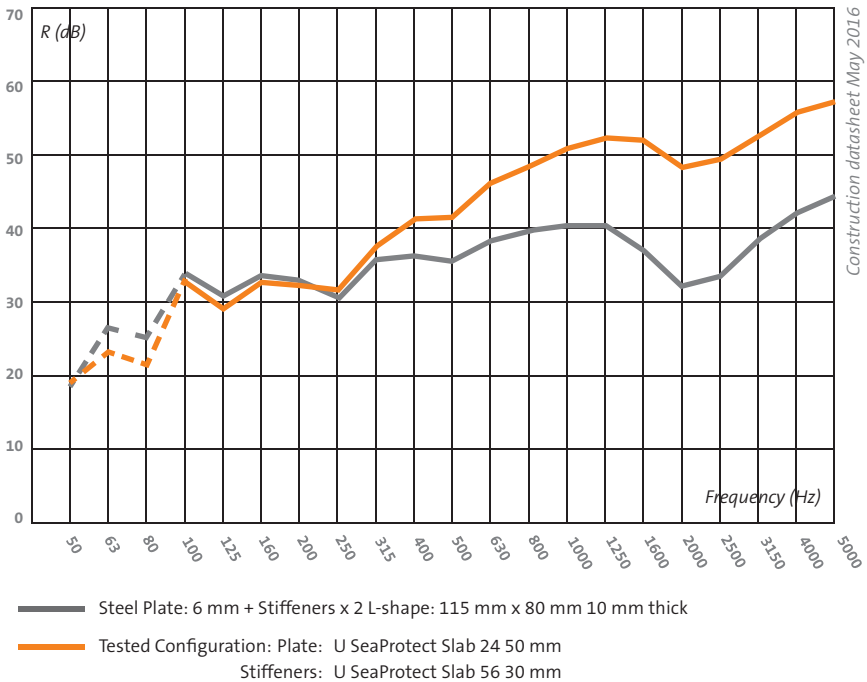
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 24 50 mm	●	●		●			
U SeaProtect Slab 24 50 mm	●	●	●	●	●	●	●
U SeaProtect Slab 56 30 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	18.2	18.7
63	26.5	23.2
80	25	21.6
100	34.1	33.3
125	30.8	29.1
160	33.8	33.1
200	32.9	32.8
250	30	31.5
315	35.8	37.8
400	36.4	41.4
500	35.5	41.7
630	38.5	46.4
800	39.6	48.5
1,000	40.5	51
1,250	40.1	52.3
1,600	36.9	52.2
2,000	32.4	48.1
2,500	33.4	49.4
3,150	38.4	52.9
4,000	42.1	56
5,000	44.6	57.6
$R_w(C;C_{tr})$	37(-1;-1)	46(-2;-5)
R_A	36	44
$R_{A,tr}$	36	41

Sound Reduction measurement



Construction datasheet May 2016

1) The estimation the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-30 Deck - Thin Design
Plate: 76-25 mm - Stiffener: 76-25 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 76 25 mm	1.90	U SeaProtect Slab 76 25 mm	1.90	3.23	1.154	45 dB (-1;-5)

Certificates

- Module B MED: n°MED-B-9328 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

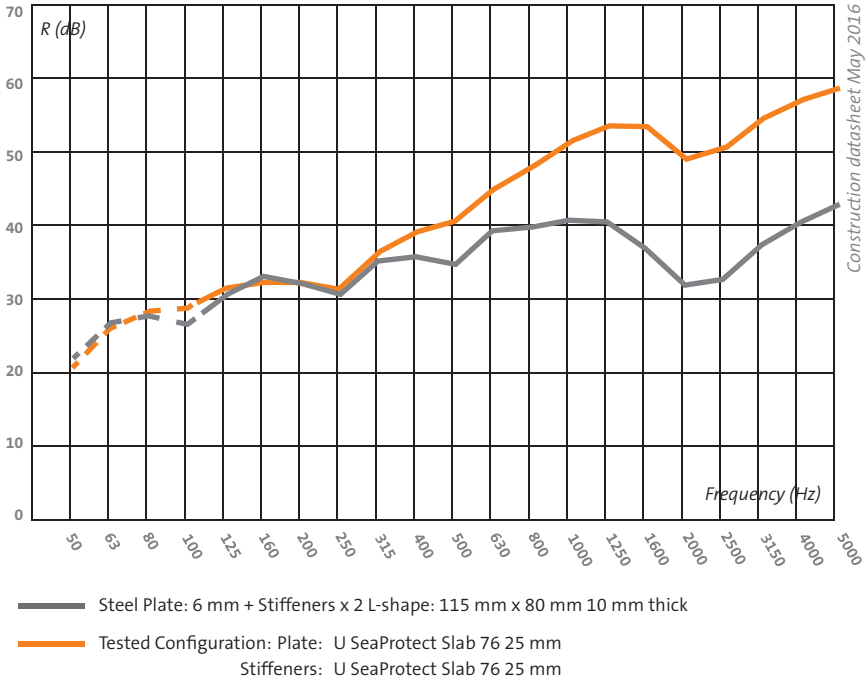
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Slab 76 25 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	20.8
63	26.6	26
80	27.7	28.5
100	26.4	28.9
125	30.4	31.4
160	33	32.3
200	32	32.2
250	30.6	31.5
315	35.2	36.5
400	35.7	39
500	34.6	40.6
630	39.4	45
800	39.7	47.8
1,000	40.8	51.4
1,250	40.6	53.6
1,600	36.9	53.4
2,000	31.7	48.9
2,500	32.6	50.4
3,150	37.6	54.5
4,000	40.5	57
5,000	42.7	58.6
$R_W(C;C_{tr})$	37(-2;-1)	45(-1;-5)
R_A	35	44
$R_{A,tr}$	36	40

Sound Reduction measurement



Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-30 Deck - Thin Design
Plate: 76-25 mm - Stiffener: 76-20 mm

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 76 25 mm	1.90	U SeaProtect Slab 76 20 mm	1.52	2.96	1.199	46 dB (-2;-5)

Certificates

- Module B MED: n°MED-B-9328 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

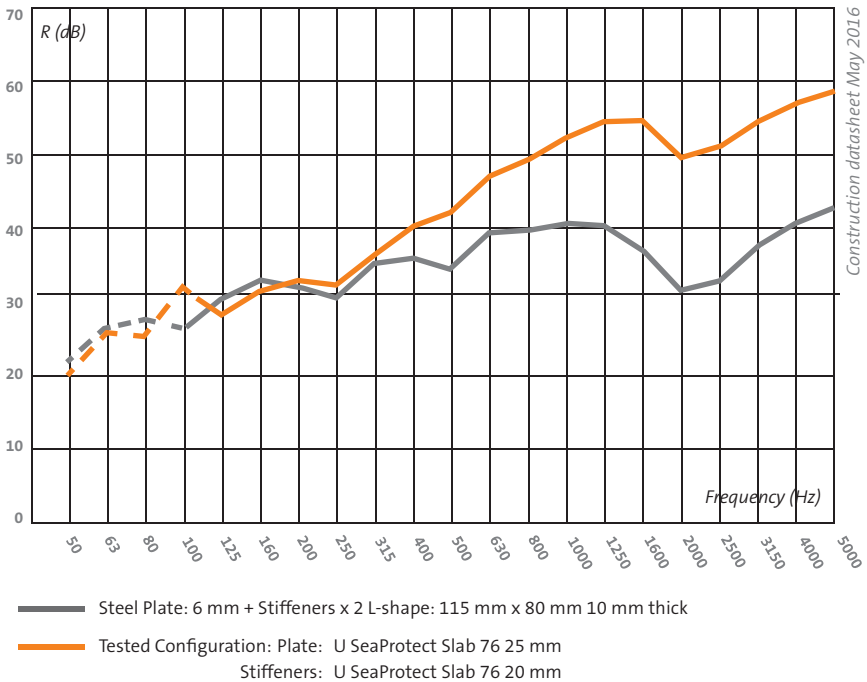
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Slab 76 25 mm	●	●	●	●	●	●	●
U SeaProtect Slab 76 20 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	19.9
63	26.6	25.9
80	27.7	25.2
100	26.4	31.8
125	30.4	28.2
160	33	31.2
200	32	32.8
250	30.6	32.3
315	35.2	36.4
400	35.7	40.1
500	34.6	42.1
630	39.4	47
800	39.7	49.2
1,000	40.8	52.1
1,250	40.6	54.3
1,600	36.9	54.5
2,000	31.7	49.5
2,500	32.6	51
3,150	37.6	54.3
4,000	40.5	56.7
5,000	42.7	58.6
$R_W(C;C_{tr})$	37(-2;-1)	46(-2;-5)
R_A	35	44
$R_{A,tr}$	36	41

Sound Reduction measurement



1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-15 Deck - Thin Design
Plate: 36-70 mm - Stiffener: no insulation

Plate		Stiffener		Complete solution[1)]		
Product	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	2.52			2.52	1.475	47 dB (-1;-6)

Certificates

- Module B MED: n°MED-B-9517 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

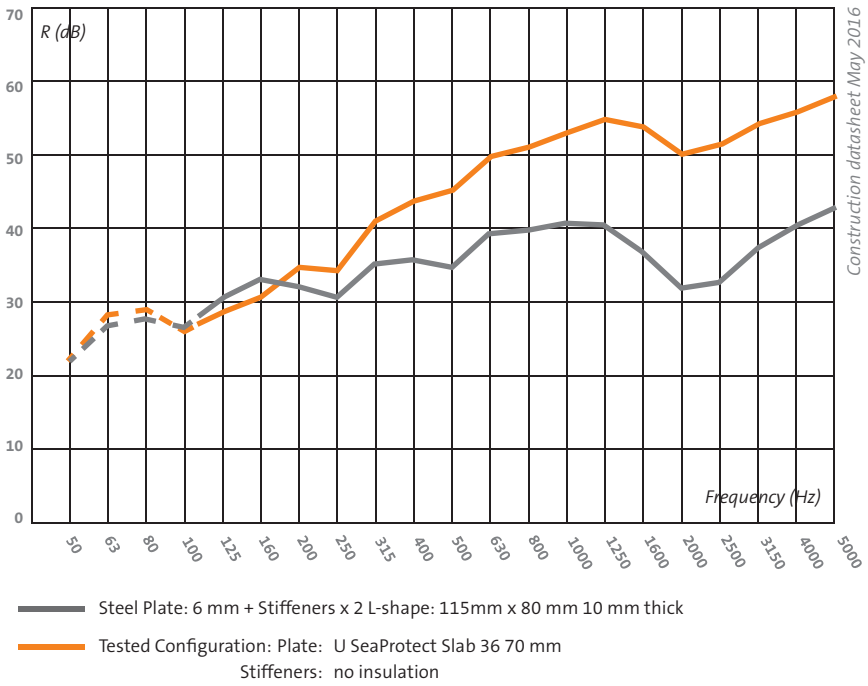
Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 36 70 mm	●	●					
U SeaProtect Slab 36 70 mm	●	●	●	●	●	●	●

Cells with a dot indicate products that can be manufactured, cells highlighted in green indicate products which are part of the Easy Logistics Portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Grey cells indicate products that cannot be manufactured with this facing.

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	21.9
63	26.6	28.3
80	27.7	29
100	26.4	26
125	30.4	28.7
160	33	30.7
200	32	34.7
250	30.6	34.2
315	35.2	41
400	35.7	43.8
500	34.6	45.1
630	39.4	49.8
800	39.7	51
1,000	40.8	53
1,250	40.6	54.7
1,600	36.9	53.8
2,000	31.7	49.9
2,500	32.6	51.3
3,150	37.6	54.1
4,000	40.5	55.9
5,000	42.7	58.1
R_W(C;C_{tr})	37(-2;-1)	47(-1;-6)
R_A	35	46
$R_{A,tr}$	36	41

Sound Reduction measurement



Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

Cecon Excellence, Davie shipyard, Canada, 2014

Best Comfort Class constructions (BCC)

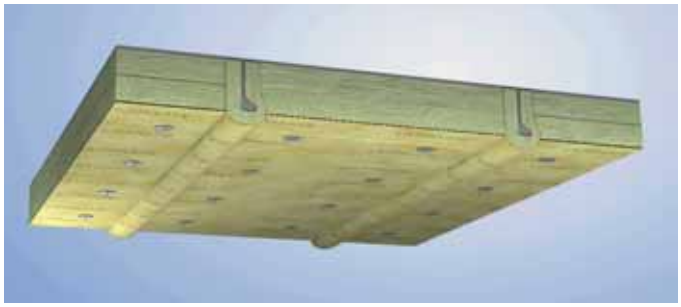
Excellent thermal insulation, excellent acoustic performance.

Best Comfort Class constructions are obtained by adding a second layer of ULTIMATE 24 kg/m³ 50 mm between the stiffeners only, making it easy to install and simple from the logistics point of view. The Best Comfort Class constructions will provide you with the highest level of acoustic performance that can be reached with ULTIMATE mineral wool systems while keeping a reduced space occupied around the stiffeners. High sound reduction index of 50 dB can be reached with a thickness of 100 mm and even 51 dB with 120 mm between the stiffeners.

You will find in the following pages a set of datasheets dedicated to each construction highlighting their main features together with the graph of the Sound Reduction measurement.

Steel Constructions FTP Code 2010		Best Comfort Class constructions				page	Fire certification
Stiffener[1]	Plate	+ 2nd Layer on the Plate[1] (Optional)	Total Thickness on the plate [mm]	Sound Reduction[1] Rw (C,Ctr) [dB]	U-value[2] [W/m²·K]		
U SeaProtect Slab 76 25 mm	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm (2nd layer on top)	100 mm	49 (-2;-6)	0.506	**page 72**	A-15 Bulkhead A-15 Deck A-30 Deck
	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm		120 mm	50 (-2;-7)	0.429	**page 73**	A-30 Bulkhead A-60 Bulkhead Restricted A-60 Deck
	U SeaProtect Slab 56 70 mm		120 mm	51 (-3;-8)	0.425	**page 74**	A-60 Bulkhead
	U SeaProtect Slab 66 50 mm		100 mm	50 (-3;-8)	0.496	**page 75**	A-60 Deck (Thin Design)
	U SeaProtect Slab 76 25 mm		75 mm	48 (-2;-6)	0.624	**page 76**	A-15 Deck (Thin Design) A-30 Deck (Thin Design)
	U SeaProtect Slab 76 40 mm		90 mm	/	0.543	**page 77**	A-30 Bulkhead (Thin Design)
	U SeaProtect Slab 86 50 mm		100 mm	50 (-2;-8)	0.496	**page 78**	A-60 Bulkhead (Thin Design)

1) All U SeaProtect products are available for each construction with different facings approved by a recognized test laboratory (Alu facing Alu1, Glass cloth facings G120, G220, G420, B facing, etc...). Facings doe not influence the Sound Reduction performance level.
2) The U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area"). They have been calculated with a 3D model taking into account the thermal bridges due to the presence of the pins and stiffeners.



Best Comfort Class constructions are obtained by adding a 2nd layer of ULTIMATE 24 kg/m³ 50 mm on top of fire rated constructions, **between the stiffeners only**.

Sound Reduction measurement (in accordance with NF EN ISO 140-3 Standard)

Geometry:
Dimensions of the steel plate 2.18 m x 1.85 m, Design of the steel plate t = 6 mm + 2 L-shape stiffeners H = 115 mm W = 80 mm t = 10mm
Conditions:
Emission room volume: 98 m³ – Reception room volume: 86 m³

Best Comfort Class - Standard Design
Plate: 24-50 mm x 2 or 24-100 mm - Stiffener: 76-25 mm

A-30 Deck; A-15 Bulkhead

Plate			Stiffener		Complete solution[1]		
Product	Thickness mm	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 24 50 mm X2 or U SeaProtect Roll 24 50 mm X2 **or** U SeaProtect Slab 24 100 mm or U SeaProtect Roll 24 100 mm	100 mm	2.40	U SeaProtect 76 25 mm	1.90	3.73	0.506	49 dB (-2;-7)

Certificates

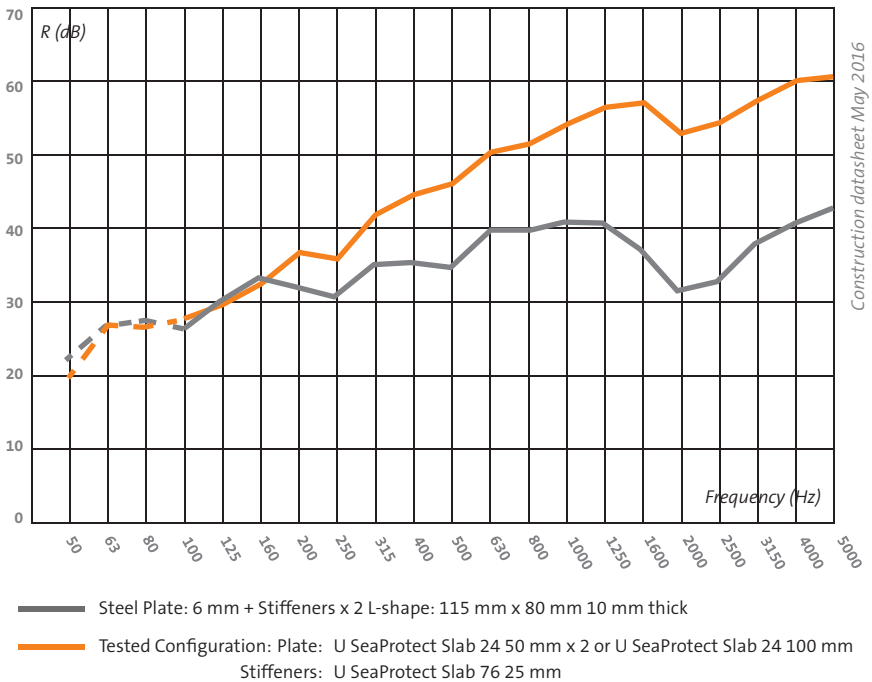
- Module B MED: n°MED-B-9328; 9516 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 24 50 mm	●	●		●			
U SeaProtect Slab 24 50 mm	●	●	●	●	●	●	●
U SeaProtect Roll 24 100 mm	●	●					
U SeaProtect Slab 24 100 mm	●	●	●	●	●	●	●
U SeaProtect Slab 76 25 mm	●	●	●	●	●	●	●

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	19.8
63	26.6	26.7
80	27.7	26.5
100	26.4	27.6
125	30.4	29.6
160	33	32.5
200	32	36.6
250	30.6	35.7
315	35.2	41.9
400	35.7	44.4
500	34.6	45.9
630	39.4	50.3
800	39.7	51.3
1000	40.8	54
1250	40.6	56.4
1600	36.9	56.9
2000	31.7	52.8
2500	32.6	54.2
3150	37.6	57.2
4000	40.5	59.8
5000	42.7	60.4
R_W(C;C_{tr})	37(-2;-1)	49(-2;-7)
R_A	35	47
$R_{A,tr}$	36	42

Sound Reduction measurement



Steel Plate: 6 mm + Stiffeners x 2 L-shape: 115 mm x 80 mm 10 mm thick

Tested Configuration: Plate: U SeaProtect Slab 24 50 mm x 2 or U SeaProtect Slab 24 100 mm
Stiffeners: U SeaProtect Slab 76 25 mm

Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-60 Deck; A-60 BHD Restricted; A-30 BHD

Plate			Stiffener		Complete solution[1]		
Product	Thickness mm	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm + U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	120 mm	3.72	U SeaProtect 76 25 mm	1.90	5.05	0.429	50 dB (-2;-7)

Certificates

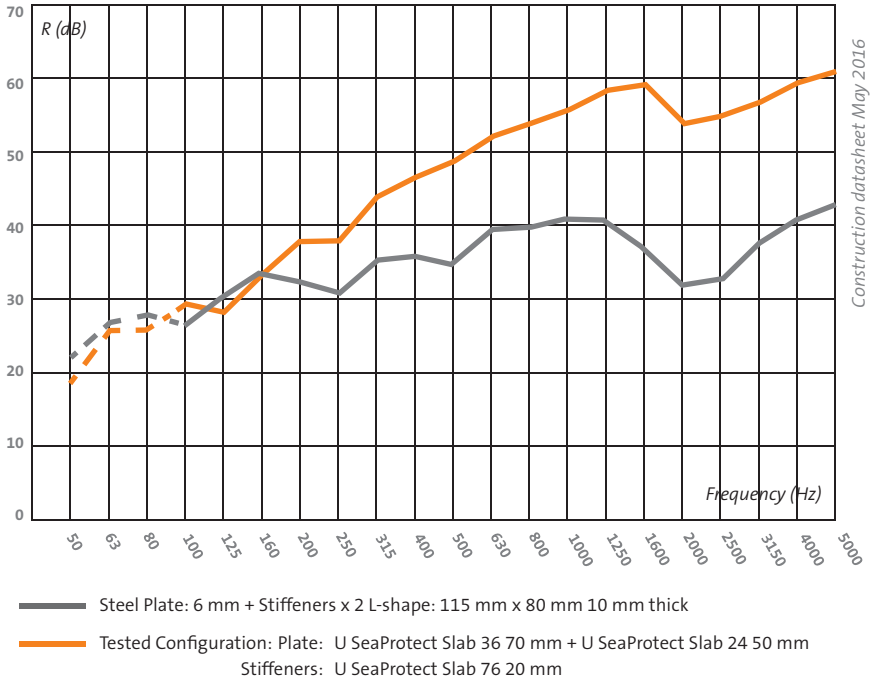
- Module B MED: n°MED-B-9519; 9334; 9333 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 24 50 mm	●	●		●			
U SeaProtect Slab 24 50 mm	●	●	●	●	●	●	●
U SeaProtect Roll 36 70 mm	●	●					
U SeaProtect Slab 36 70 mm	●	●	●	●	●	●	●
U SeaProtect Slab 76 25 mm	●	●	●	●	●	●	●

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	18.4
63	26.6	25.5
80	27.7	25.8
100	26.4	29
125	30.4	28.1
160	33	33.3
200	32	37.7
250	30.6	37.7
315	35.2	43.8
400	35.7	46.4
500	34.6	48.5
630	39.4	51.9
800	39.7	53.5
1000	40.8	55.7
1250	40.6	58.2
1600	36.9	59.1
2000	31.7	53.8
2500	32.6	54.9
3150	37.6	56.6
4000	40.5	59.2
5000	42.7	60.8
R_w(C;C_{tr})	37(-2;-1)	50(-2;-7)
R_A	35	48
$R_{A,tr}$	36	43

Sound Reduction measurement



Steel Plate: 6 mm + Stiffeners x 2 L-shape: 115 mm x 80 mm 10 mm thick

Tested Configuration: Plate: U SeaProtect Slab 36 70 mm + U SeaProtect Slab 24 50 mm
Stiffeners: U SeaProtect Slab 76 20 mm

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

Construction datasheet May 2016

Best Comfort Class - Standard Design
Plate: 56-70 mm + 24-50 mm - Stiffener: 76-25 mm

A-60 Bulkhead

Plate			Stiffener		Complete solution[1]		
Product	Thickness mm	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 56 70 mm + U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	120 mm	5.12	U SeaProtect 76 25 mm	1.90	6.45	0.425	51 dB (-3;-8) dB

Certificates

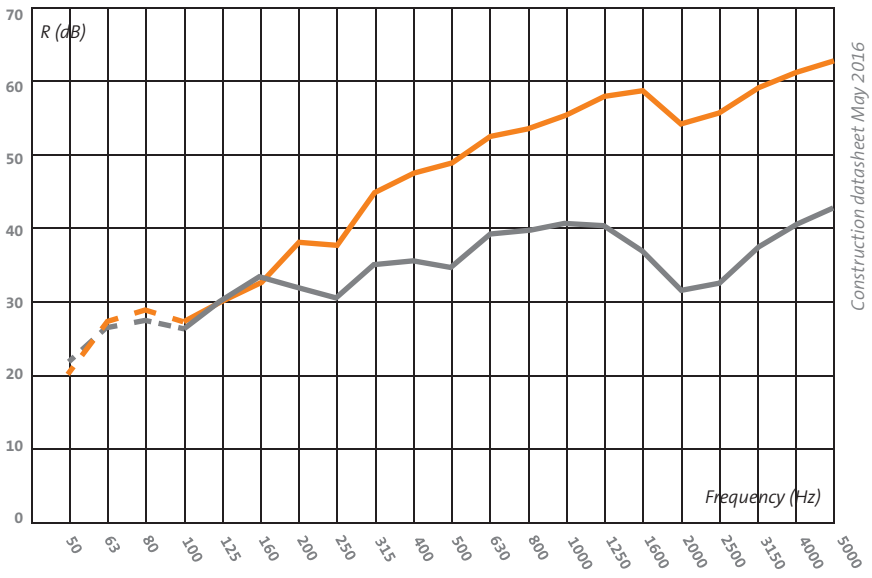
- Module B MED: n°MED-B-9334 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 24 50 mm	●	●		●			
U SeaProtect Slab 24 50 mm	●	●	●	●	●	●	●
U SeaProtect Slab 56 70 mm	●	●	●	●	●	●	●
U SeaProtect Slab 76 25 mm	●	●	●	●	●	●	●

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	20.3
63	26.6	27.6
80	27.7	29
100	26.4	27.4
125	30.4	30.3
160	33	32.7
200	32	38
250	30.6	37.6
315	35.2	44.9
400	35.7	47.5
500	34.6	48.9
630	39.4	52.6
800	39.7	53.5
1000	40.8	55.5
1250	40.6	58.1
1600	36.9	58.9
2000	31.7	54.3
2500	32.6	55.8
3150	37.6	59.2
4000	40.5	61.2
5000	42.7	62.8
$R_w(C;C_{tr})$	37(-2;-1)	51(-3;-8)
R_A	35	48
$R_{A,tr}$	36	43

Sound Reduction measurement



Steel Plate: 6 mm + Stiffeners x 2 L-shape: 115 mm x 80 mm 10 mm thick

Tested Configuration: Plate: U SeaProtect Slab 56 70 mm + U SeaProtect Slab 24 50 mm
Stiffeners: U SeaProtect Slab 76 25 mm

Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

Best Comfort Class - Thin Design
Plate: 66-50 mm + 24-50 mm - Stiffener: 76-25 mm

A-60 Deck

Plate			Stiffener		Complete solution[1)]		
Product	Thickness mm	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw(C,C_{tr})
U SeaProtect Slab 66 50 mm + U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	100 mm	4.50	U SeaProtect 76 25 mm	1.90	5.83	0.496	50 dB (-3;-8)

Certificates

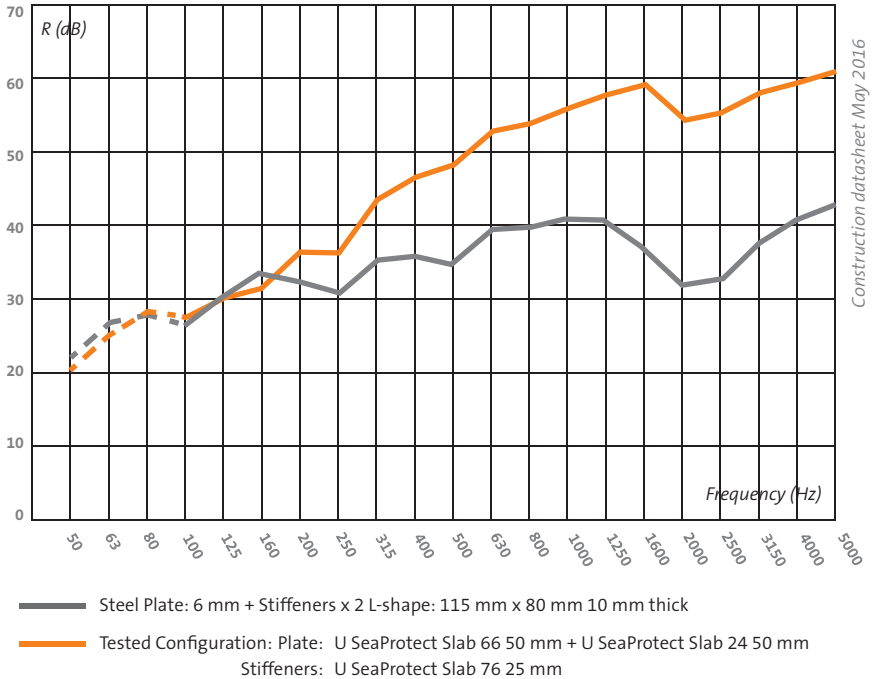
- Module B MED: n°MED-B-9519 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 24 50 mm	●	●		●			
U SeaProtect Slab 24 50 mm	●	●	●	●	●	●	●
U SeaProtect Slab 66 50 mm	●	●	●	●	●	●	●
U SeaProtect Slab 76 25 mm	●	●	●	●	●	●	●

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	20.2
63	26.6	24.9
80	27.7	28.1
100	26.4	27.4
125	30.4	30
160	33	31.3
200	32	36.3
250	30.6	36
315	35.2	43.3
400	35.7	46.4
500	34.6	48.1
630	39.4	52.5
800	39.7	53.6
1000	40.8	55.8
1250	40.6	57.7
1600	36.9	58.9
2000	31.7	54.1
2500	32.6	55.3
3150	37.6	57.8
4000	40.5	59.5
5000	42.7	60.3
$R_w(C;C_{tr})$	37(-2;-1)	50(-3;-8)
R_A	35	47
$R_{A,tr}$	36	42

Sound Reduction measurement



Steel Plate: 6 mm + Stiffeners x 2 L-shape: 115 mm x 80 mm 10 mm thick

Tested Configuration: Plate: U SeaProtect Slab 66 50 mm + U SeaProtect Slab 24 50 mm
Stiffeners: U SeaProtect Slab 76 25 mm

1) The estimation the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

Construction datasheet May 2016

Best Comfort Class - Thin Design
Plate: 76-25 mm + 24-50 mm - Stiffener: 76-25 mm

A-30 Deck

Plate			Stiffener		Complete solution[1]		
Product	Thickness mm	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 76 25 mm + U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	75 mm	3.10	U SeaProtect 76 25 mm	1.90	4.43	0.624	48 dB (-2;-6)

Certificates

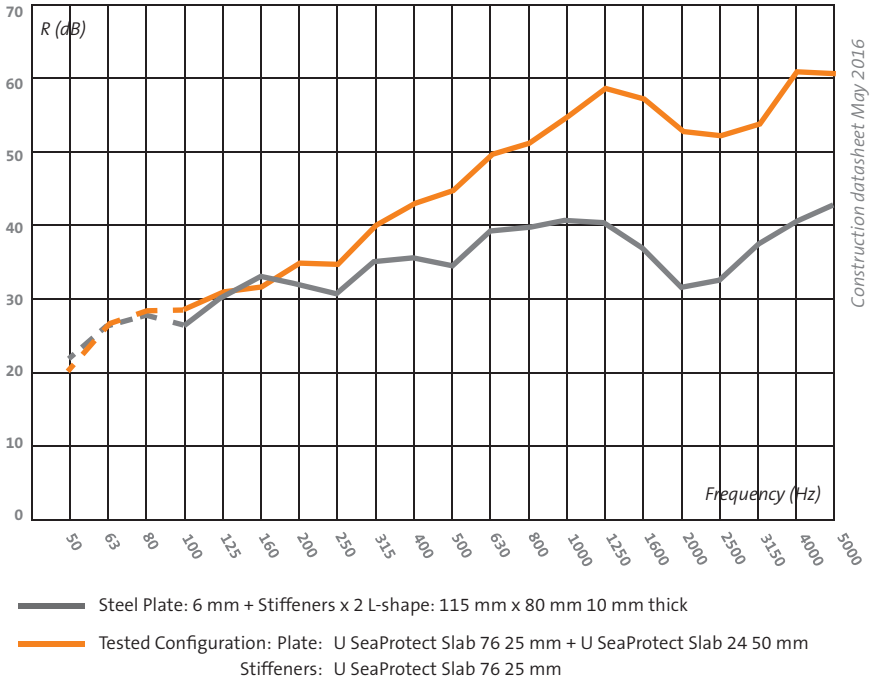
- Module B MED: n°MED-B-9328 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 24 50 mm	●	●		●			
U SeaProtect Slab 24 50 mm	●	●	●	●	●	●	●
U SeaProtect Slab 76 25 mm	●	●	●	●	●	●	●

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	20.4
63	26.6	26.6
80	27.7	28.4
100	26.4	28.6
125	30.4	30.8
160	33	31.7
200	32	34.8
250	30.6	34.7
315	35.2	40.2
400	35.7	43.1
500	34.6	44.7
630	39.4	49.7
800	39.7	51.2
1000	40.8	54.8
1250	40.6	58.6
1600	36.9	57.3
2000	31.7	52.8
2500	32.6	52.1
3150	37.6	53.7
4000	40.5	60.8
5000	42.7	60.6
R_w(C;C_{tr})	37(-2;-1)	48(-2;-6)
R_A	35	46
$R_{A,tr}$	36	42

Sound Reduction measurement



Steel Plate: 6 mm + Stiffeners x 2 L-shape: 115 mm x 80 mm 10 mm thick

Tested Configuration: Plate: U SeaProtect Slab 76 25 mm + U SeaProtect Slab 24 50 mm
Stiffeners: U SeaProtect Slab 76 25 mm

Construction datasheet May 2016

1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

A-30 Bulkhead

Plate			Stiffener		Complete solution[1)]		
Product	Thickness mm	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 76 40 mm + U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	90 mm	4.24	U SeaProtect 76 25 mm	1.90	5.57	0.543	

Certificates

- Module B MED: n°MED-B-9333 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 24 50 mm	●	●		●			
U SeaProtect Slab 24 50 mm	●	●	●	●	●	●	●
U SeaProtect Slab 76 40 mm	●	●	●	●	●	●	●
U SeaProtect Slab 76 25 mm	●	●	●	●	●	●	●

Best Comfort Class - Thin Design
Plate: 86-50 mm + 24-50 mm - Stiffener: 76-25 mm

A-60 Bulkhead

Plate			Stiffener		Complete solution[1]		
Product	Thickness mm	weight kg/m²	Product	weight kg/m²	weight kg/m²	U-value W/m²·K	Sound Reduction Rw (C,C_{tr})
U SeaProtect Slab 86 50 mm + U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	100 mm	5.50	U SeaProtect 76 25 mm	1.90	6.83	0.496	50 dB (-2;-8)

Certificates

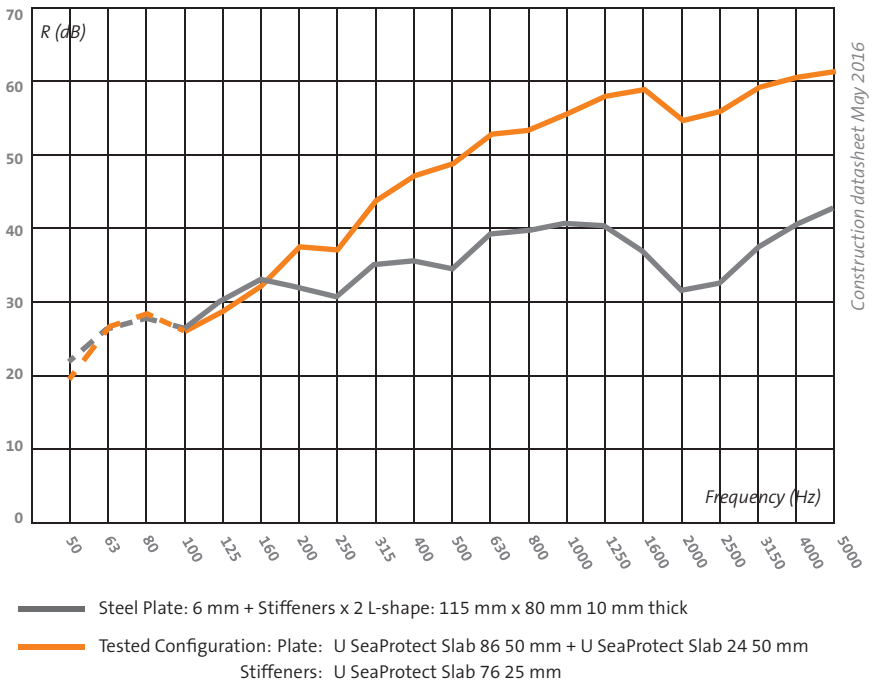
- Module B MED: n°MED-B-9334 notified body DNV. U.S Coast Guard. Type Approvals: ABS, Bureau Veritas
- Possibility to use various facings and to increase density and/or thickness according to our certificates (more details pages 36-37)
- Latest version of certificates downloadable online: http://www.isover-technical insulation.com/Documentation/Marine-Insulation

Easy Logistics portfolio (for more details, please refer to pages 32-33 and 110-111)

Products name	Facings						
	Unfaced	Aluminum	Glass cloth			B facing (Alu-Glass cloth composite)	
		Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
U SeaProtect Roll 24 50 mm	●	●		●			
U SeaProtect Slab 24 50 mm	●	●	●	●	●	●	●
U SeaProtect Slab 86 50 mm	●	●	●	●	●	●	●
U SeaProtect Slab 76 25 mm	●	●	●	●	●	●	●

	Steel 6mm	Tested Configuration
Frequency (Hz)	R (dB)	R (dB)
50	22	19.7
63	26.6	26.5
80	27.7	28.4
100	26.4	26.1
125	30.4	28.8
160	33	32
200	32	37.5
250	30.6	37
315	35.2	44
400	35.7	47.1
500	34.6	48.8
630	39.4	52.7
800	39.7	53.3
1000	40.8	55.7
1250	40.6	58.1
1600	36.9	59.1
2000	31.7	54.7
2500	32.6	56.1
3150	37.6	59.1
4000	40.5	60.7
5000	42.7	61.4
R_w(C;C_{tr})	37(-2;-1)	50(-2;-8)
R_A	35	48
$R_{A,tr}$	36	42

Sound Reduction measurement



Steel Plate: 6 mm + Stiffeners x 2 L-shape: 115 mm x 80 mm 10 mm thick

Tested Configuration: Plate: U SeaProtect Slab 86 50 mm + U SeaProtect Slab 24 50 mm
Stiffeners: U SeaProtect Slab 76 25 mm

Construction datasheet May 2016

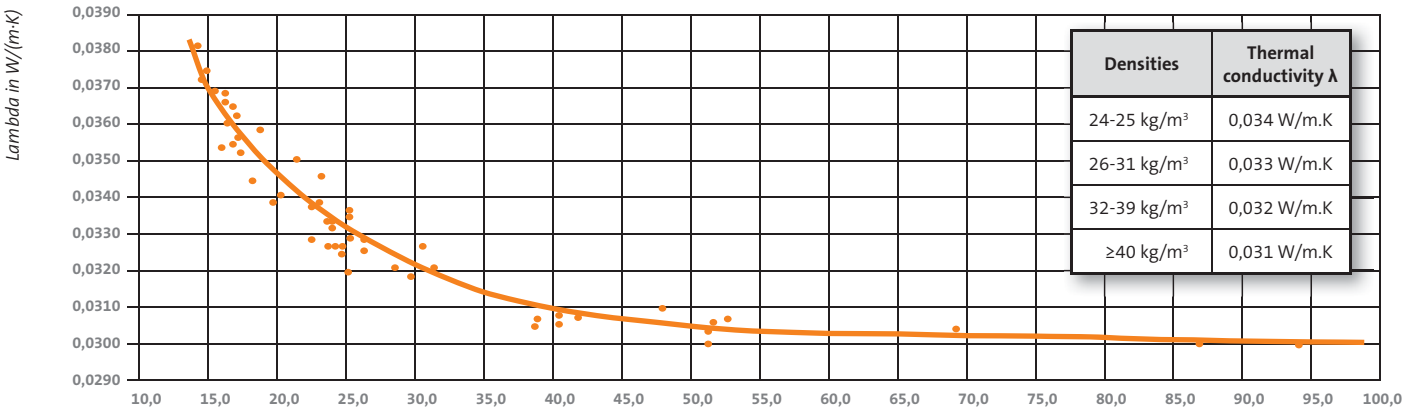
1) The estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").

Thermal

Thermal conductivity and U-value

Thermal conductivity of ULTIMATE U SeaProtect products have been tested by FIW, a laboratory based in Germany recognized in the world for its expertise in Thermal performance measurements.

Thermal conductivity (λ) measurement at 10 °C



Densities	Thermal conductivity λ
24-25 kg/m³	0,034 W/m.K
26-31 kg/m³	0,033 W/m.K
32-39 kg/m³	0,032 W/m.K
≥40 kg/m³	0,031 W/m.K

FIW laboratory, Germany, ULTIMATE products from ISOVER Lübz plant

Thermal conductivity (lambda λ [W/m·K]) and U-value
– the most important properties when evaluating thermal performance of insulation materials

The thermal conductivity, lambda λ, measured in units of W/m·K, is the property of a material that indicates its ability to conduct heat. The lower the thermal conductivity, the less conductive the material, and the better the insulation material.
For a given thickness of insulation t in [m], installing a product having a lower conductivity λ in [W/m·K] will reduce the heat loss Q in [W/m²] (proportional to the U-value) and enables at the end of the day to save more energy and money.
$Q = U.\Delta T$ where $U = \lambda/t = 1/R$ is the U-value, reverse of the thermal resistance R and ΔT is the difference of temperature in [K].

Based on the thermal performance of ULTIMATE products, for thermal applications, ISOVER recommends to use ULTIMATE products in rolls format with a density of 24 kg/m³. These products are a good balance between excellent thermal performance (thermal conductivity of 34 mW/m·K), good acoustics, good mechanics and optimal logistics (compressed rolls enable to save on transport costs). We believe it is the best purchasing value in ULTIMATE range for thermal comfort applications.

The products in 24 kg/m³ 50 mm shall be applied as a second layer between the stiffeners only in order to achieve the Best Comfort Class constructions (for more details, refer to page 13).
Rolls with a density of 24 kg/m³ and a thickness of 50 mm or 100 mm are part of the Easy Logistics portfolio with a lower Minimum Order Quantity of 1 pallet (unfaced and Alu faced version both available).

Densitiy [kg/m³]	Thickness mm	Products	Facings			Thermal conductivity [W/m·K]	U-value [W/m²·K]
			Unfaced	Aluminium	Glass cloth		
				Alu1	G220 white		
24 kg/m³	50 mm	U SeaProtect Roll 24 50 mm	●	●	●	0.034	0.619
	100 mm	U SeaProtect Roll 24 100 mm	●	●	●		0.343

U-value calculation method

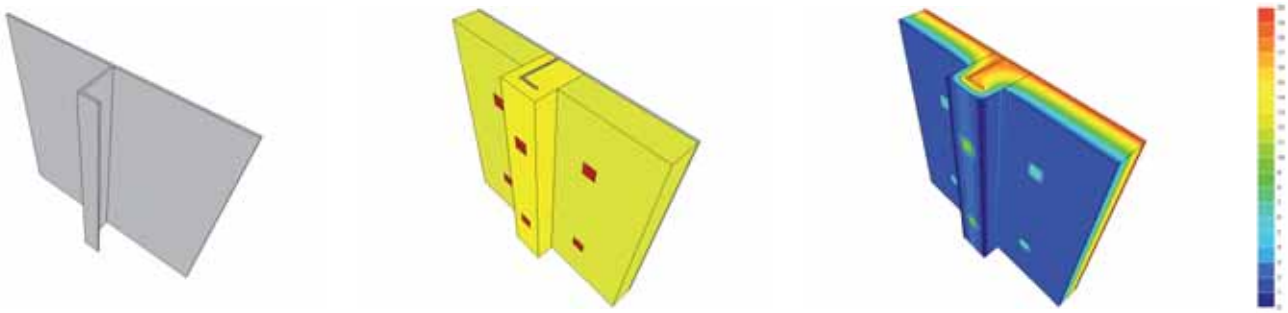
Calculation method for constructions

Reducing the U-value of walls is crucial for the comfort of passengers aboard a ship and for energy consumption related to HVAC (Heating Ventilation and Air Conditionning) systems. The energy consumption related to HVAC systems becomes more and more an important part of the total fuel consumption of a ship (up to 35% for cruise ships). We believe it is our duty as insulation supplier to provide to engineers, designers and naval architects the most accurate information possible regarding U-values.

To calculate the U-values declared for our constructions, we have used a 3D thermal model taking into account:

- the thermal resistance of the steel sheet (6 mm)
- the geometry of the stiffeners
- the thickness and thermal conductivity of the insulation installed on the plate
- the thickness and thermal conductivity of the insulation installed around the stiffeners
- the thermal bridges due to the pins
- the internal and external surface resistance of the complete system

For the insulant part, the U-values used are based on the measurement of the thermal conductivity of ULTIMATE products realized by an internationally recognized laboratory (FIW in Germany, see page 80) and the thickness of the products.



Geometry: Steel plate: Thickness = 6 mm; Height = 600 mm; Width = 600 mm
Stiffener: L-shape Thickness = 6 mm; Length = 600 mm; Height = 100 mm; Width = 50 mm

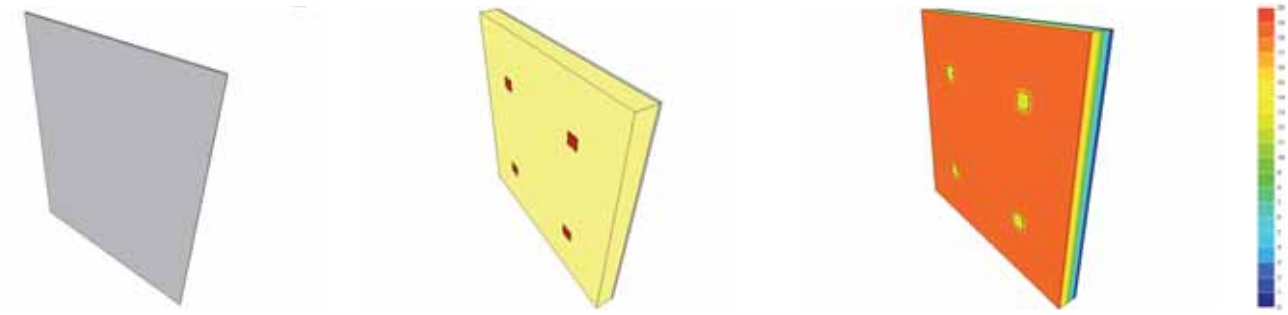
Parameters: λ_{Steel}= 50 W/(m·K); Internal Surface resistance: R_{SI} = 0.13 m²·K/W; External Surface resistance: R_{SO} = 0.04 m²·K/W

Calculation method for products

For the U-values we declare for our products, we used a 3D thermal calculation model similar to the one above but for a "flat" geometry (no stiffener) taking into account:

- the thermal resistance of the steel sheet (6 mm)
- the thickness and thermal conductivity of the insulation installed on the plate
- the thermal bridges due to the pins
- the internal and external surface resistance of the complete system

For the insulant part, the U-values used are based on the measurement of the thermal conductivity of ULTIMATE products realized by an internationally recognized laboratory (FIW in Germany, see page 80) and the thickness of the products.



Geometry: Steel plate: Thickness = 6 mm; Height = 600 mm; Width = 600 mm

Parameters: λ_{Steel}= 50 W/(m·K); Internal Surface resistance: R_{SI} = 0.13 m²·K/W; External Surface resistance: R_{SO} = 0.04 m²·K/W

U-value of products

Thermal performance

U SeaProtect products have excellent U-values. Products in 50 mm thickness can have a U-value below ≤0,6 W/m².K and products in 70 mm ≤ 0,45W/m².K .

This is possible only thanks to the excellent intrinsic thermal performance of ULTIMATE mineral wool.

The U-values we declare for products are based on measurement made by a recognized laboratory (see page 80) and have been calculated taking into account:

- the thermal resistance of the steel plate (6mm)
- the internal and external surface resistance of the plate
- the thermal bridges due to the presence of the pins for fixation

Main ULTIMATE Densities [kg/m³]	Thermal conductivity [W/m.K]	Products form	U-value (in W/m²·K) Thickness 20 mm	25 mm	30 mm	40 mm	50 mm	60 mm	70 mm	80 mm	90 mm	100 mm	110 mm	120 mm
24 kg/m³	0.034	Slab or Roll	1.222	1.049	0.920	0.739	0.619	0.533	0.468	0.417	0.377	0.343	0.315	0.292
36 kg/m³	0.032	Slab or Roll or Wired Mat	1.174	1.005	0.880	0.706	0.591	0.508	0.446	0.397	0.358	0.327	0.300	0.277
48 kg/m³	0.031	Slab or Wired Mat	1.149	0.983	0.860	0.689	0.576	0.495	0.434	0.387	0.349	0.318	0.292	0.270
56 kg/m³	0.031	Slab	1.149	0.983	0.860	0.689	0.576	0.495	0.434	0.387	0.349	0.318	0.292	0.270
66 kg/m³	0.031	Slab or Wired Mat	1.149	0.983	0.860	0.689	0.576	0.495	0.434	0.387	0.349	0.318		
76 kg/m³	0.031	Slab	1.149	0.983	0.860	0.689	0.576	0.495	0.434	0.387				
86 kg/m³	0.031	Slab	1.149	0.983	0.860	0.689	0.576	0.495	0.434	0.387				
90 kg/m³	0.031	Slab	1.149	0.983	0.860	0.689	0.576	0.495	0.434	0.387				
100 kg/m³	0.031	Slab	1.149	0.983	0.860	0.689	0.576	0.495						

Products part of the U SeaProtect Easy Logistics products portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet). For more information, please refer to pages 26-27 and 110-111.

Products not part of the U SeaProtect Easy Logistics products portfolio that can be manufactured on order. Standard Minimum Order Quantity applies (equivalent to 2t).

Products that cannot be manufactured with this facing.

Best Comfort Class Plus constructions

Best thermal insulation plus excellent acoustic performance

The Best Comfort Class **Plus** constructions are obtained by adding a 2nd layer of ULTIMATE 24 kg/m³ 50 mm **between the stiffeners and around the stiffeners**, making them very quick to install and simple from a logisitics point of view.
The Best Comfort Class **Plus** constructions are an evolution of the Best Comfort Class solutions (see page 71). They will provide higher levels of thermal performance (lower U-value). Having the second layer around the stiffeners makes it faster to install (no cutting between the stiffeners) but has the drawback to increase the space around the stiffeners to 75 mm and does not provide a flat finishing.
From acoustic point of view, the thickness increase around the stiffeners only (from 25 mm to 75 mm) has limited effect. Measurements prove that sound reduction levels are sensibly the same as Best Comfort Class constructions (very high index value of 50 dB can be reached).
We recommend to use Best Comfort Class Plus for thermal purposes mainly when very low U-values are required.

Steel Constructions FTP Code 2010		Best Comfort Calss Plus constructions				
Stiffener	Plate	+ 2nd Layer on the Plate and around the stiffeners[1)]	Total Thickness on the plate [mm]	Total Thickness around the stiffeners [mm]	U-value[2)] [W/m²·K]	Fire certification
	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm (2nd layer on top)	100 mm	50 mm	0.448	
U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm			100 mm	100 mm	0.373	A-15 Bulkhead A-15 Deck A-30 Deck
U SeaProtect Slab 76 25 mm	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm		100 mm	75 mm	0.401	A-15 Bulkhead A-15 Deck A-30 Deck
	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm		120 mm	75 mm	0.345	A-30 Bulkhead A-60 Bulkhead Restricted A-60 Deck
	U SeaProtect Slab 56 70 mm		120 mm	75 mm	0.342	A-60 Bulkhead
	U SeaProtect Slab 66 50 mm		100 mm	75 mm	0.392	A-60 Deck (Thin Design)
	U SeaProtect Slab 76 25 mm		75 mm	75 mm	0.483	A-15 Deck (Thin Design) A-30 Deck (Thin Design)
	U SeaProtect Slab 76 40 mm		90 mm	75 mm	0.424	A-30 Bulkhead (Thin Design)
	U SeaProtect Slab 86 50 mm		100 mm	75 mm	0.392	A-60 Bulkhead (Thin Design)

1) All U SeaProtect products are available for each construction with different facings approved by a recognized test laboratory (Alu facing Alu1, Glass cloth facings G120, G220, G420, B facing, etc...). Facings doe not influence the Sound Reduction performance level.

2) The U-values (W/m2·K) are given for 1 m² "seen" from the flat side ("projected area"). They have been calculated with a 3D model taking into account the thermal bridges due to the presence of the pins and stiffeners.

Best Comfort Class Plus constructions are obtained by adding a 2nd layer of ULTIMATE 24 kg/m³ 50 mm **on top and between the stiffeners** of fire rated constructions.

Platform Supply Vessel PSV PX 105 CNN. La Naval, Spain, ©Oliver Design

High Temperature

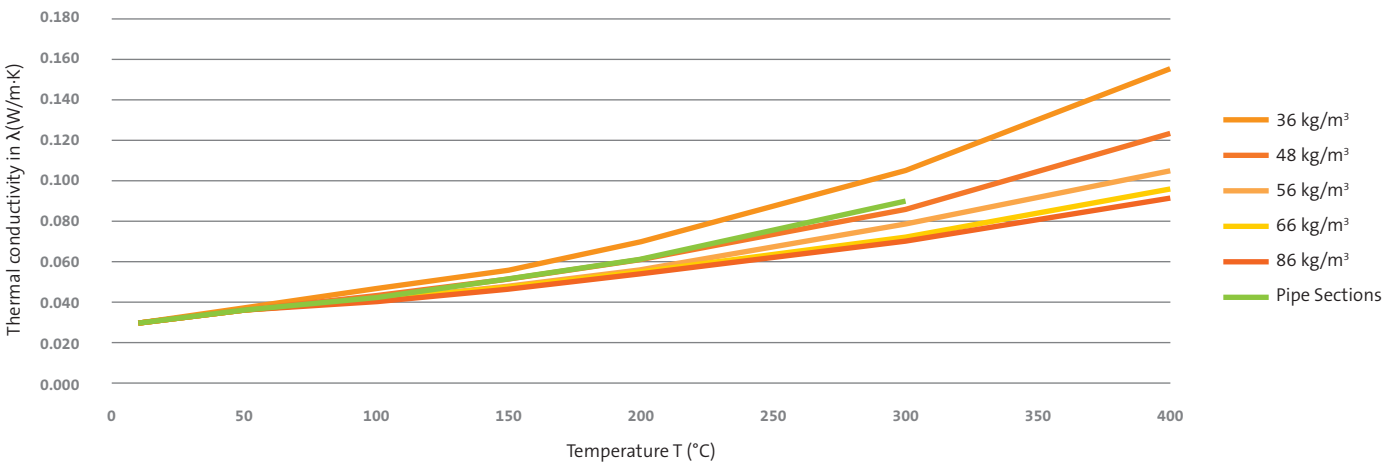
Thermal conductivity at high temperatures

The thermal conductivity, lambda λ(T), measured in units of W/m·K, is the property of a material that indicates its ability to conduct heat. The lower the thermal conductivity, the less conductive the material, and the better the insulation. The thermal conductivity of a material increases as the temperature increases. For the ULTIMATE products, conductivity declared has been measured according to EN 12667 for flat products (wired mats, slabs, rolls) and ISO 8497 for pipe sections. For a given thickness of insulation, installing a product having a lower conductivity will reduce the heat loss and save more energy and money at the end of the day.

ULTIMATE achieves excellent lambda values across the entire temperature range and this high level of thermal performance will significantly reduce energy losses as the operational temperature increases. This has been achieved mainly due to the unique fiberizing process which converts 100 % of the raw materials into fibres creating a totally shot free product. The resultant product has tightly controlled fibre length and diameter which give to ULTIMATE its superior thermal properties.

Density [kg/m³]	Thickness [mm]	Products	Thermal conductivity λ(T) [W/m·K]						
			Temperature (°C)						
			10	50	100	150	200	300	400
36	70	U SeaProtect Slab 36 70 mm U SeaProtect Roll 36 70 mm	0.032	0.037	0.045	0.055	0.069	0.104	0.153
48	100	U SeaProtect Wired Mat 48 100 mm	0.032	0.036	0.042	0.051	0.060	0.086	0.122
56	70	U SeaProtect Slab 56 70 mm	0.031	0.036	0.041	0.049	0.057	0.078	0.104
66	50	U SeaProtect Slab 66 50 mm U SeaProtect Wired Mat 66 50 mm	0.031	0.035	0.040	0.047	0.054	0.072	0.096
86	50	U SeaProtect Slab 86 50 mm	0.031	0.035	0.040	0.046	0.054	0.070	0.091
60 - 90		U TECH Pipe Section MT 4.0 or U Protect Pipe Section Alu2		0.037	0.043	0.052	0.062	0.089	

ULTIMATE thermal efficiency λ(T)



Energy efficiency for hot equipment

The main function of insulation for high temperature equipment is the reduction of heat loss, contributing to the reduction of energy consumption and thus cost savings. It provides also personnal protection. When evaluating insulation, the primary parameter is the thermal conductivity (lambda value λ (W/m·K)); the lower the lambda value,the better the insulation. ULTIMATE products have an excellent thermal performance at high temperatures enabling to get the best efficiency of an equipment.

Insulation at high temperatures with ULTIMATE products

For large scale equipment having flat surfaces or with a low curve (diameters Ø ≥ 2 m) such as vessels, big tanks or boilers, we recommend to use ULTIMATE slabs or rolls.
For cylindrical equipment with diameter Ø ≥ 200 mm such as large pipes or small and medium size tanks, we recommend to use ULTIMATE Wired Mats.
For pipes having a diameter Ø ≤ 200 mm, we recommend to use ULTIMATE pipe sections.

If a certain level of fire rating has to be fulfilled (for example equivalence to A-60), then we recommend to use either:

- U SeaProtect Slab or Roll 36 70 mm (A-60 Deck, A-60 Bullkhead restricted certificate)
- U SeaProtect Slab 56 70 mm (A-60 Bulkhead certificate)
- U SeaProtect Slab 66 50 mm (A-60 Deck certificate)
- U SeaProtect Slab 86 50 mm (A-60 Bulkhead certificate)
- U SeaProtect Wired Mat 66 Alu1 50 mm (A-60 Deck certificate)
- U SeaProtect Wired Mat 48 100 mm (A-60 Bulkhead certificate, former FTP code)

These products are all part of the Easy Logistics portfolio and consequently with a lower Minimum Order Quantity (equivalent to 1 pallet, see page 32-33).

In applications where only Non Combustibility according to Marine tests is required. Alternatively to the U SeaProtect Wired range, also products of the industry ULTIMATE TECH range can be used: U TECH Wired Mat MT 5.0, MT 6.0, MT 7.0. Please ask your ISOVER local contact to get advise on this or refer to the ISOVER Industry section of our website: www.isover-technical-insulation.com

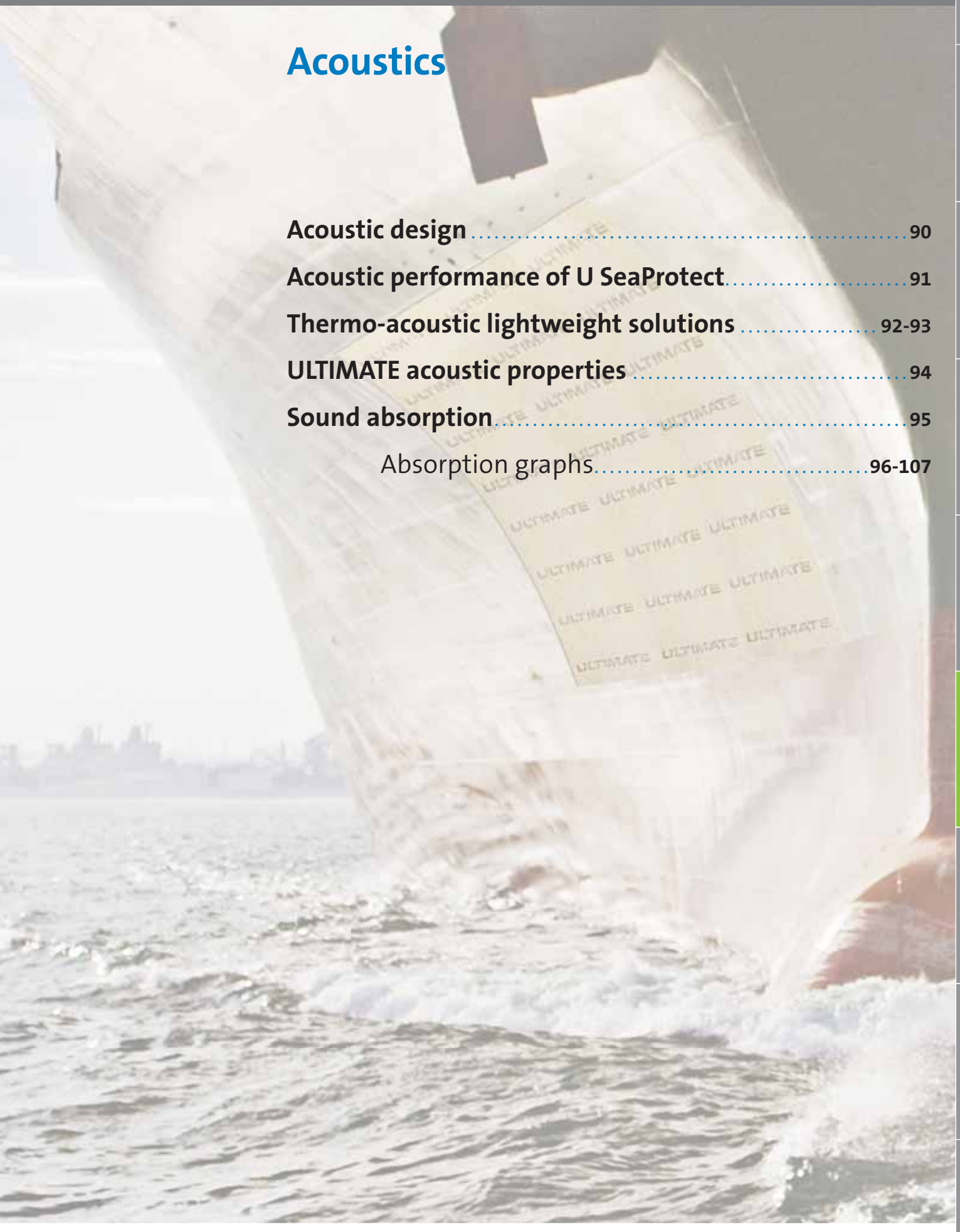
ULTIMATE pipe sections are available unfaced under the name "U TECH Pipe Section MT 4.0" or with an aluminium facing "U Protect Pipe Section Alu2".

Thickness [mm]	Quantity in Linear Meter per box																				
	Outside pipe diameter [mm]																				
	15	18	22	28	35	42	45	48	54	57	60	64	70	76	89	102	108	114	133	140	159
20	57.6	50.4	43.2	36.0	30.0	24.0	19.2	19.2	28.8	28.8	27.6	24.0	19.2	19.2	16.8						
30	30.0	28.8	24.0	19.2	19.2	14.4	24.0	24.0	19.2	19.2	19.2	18.0	14.4	14.4	10.8	9.6	9.6	7.2	6.0	6.0	4.8
40			14.4	19.2	10.8	10.8	10.8	9.6	10.8	10.8	10.8	10.8	10.8	10.8	9.6	7.2	7.2	6.0	4.8	4.8	4.8
50					10.8	10.8	10.8	10.8	10.8	10.8	9.6	9.6	9.6	4.8	4.8	6.0	6.0	4.8	4.8	3.6	3.6
60										4.8	4.8	4.8	4.8	6.0	4.8	4.8	4.8	4.8	3.6	1.2	1.2
70												4.8	4.8	4.8	4.8	3.6	3.6	3.6	1.2	1.2	1.2
80														4.8	3.6	1.2	1.2	1.2	1.2	1.2	1.2
100															1.2	1.2	1.2	1.2	1.2	1.2	1.2
120																					1.2

Pipe section with slit on one side, length 1,200 mm. Further dimensions on inquiry.
The information shows the linear meter per packaging unit, e. g.: 4.8 = 4 pipe sections per packaging unit.

Norwegian Getaway, Meyer Werft, Germany, 2014, © Meyer Werft

Acoustics

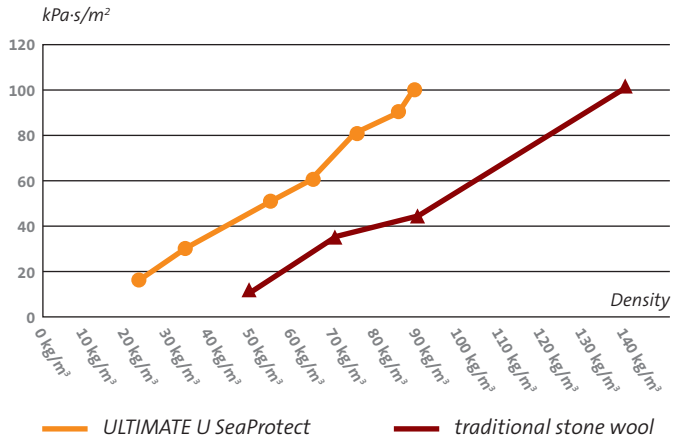


Sound reduction performance: Air flow resistivity & thickness as key parameters

To achieve good sound reduction performance, models and measurements show that, for a given thickness, air flow resistivity is the main property to consider for a mineral wool product.

ULTIMATE mineral wool products have outstandingly high air flow resistivity values from density 36 kg/m³ onwards when compared to traditional stone wool products.

Air flow resistivity



Air flow resistivity [kPa·s/m²]			
ULTIMATE		Stone wool	
		50 kg/m³	11
24 kg/m³	15	70 kg/m³	35
36 kg/m³	30	90 kg/m³	44
56 kg/m³	50	140 kg/m³	102
66 kg/m³	60		
76 kg/m³	80		
86 kg/m³	90		
90 kg/m³	100		

With ULTIMATE, there is no need anymore for high density products to achieve high performance in sound reduction.

There is a common belief on the market that insulation materials with high densities and even heavyweight will have better sound reduction performance. Modelization and measurements of sound reduction performance show that for porous materials such as mineral wools, air flow resistivity and thickness are the main influential factors to consider. The air flow resistivity measures the ability of a porous material to "block" the passage of air under a certain difference of pressure, it is measured in kPa·s/m². ULTIMATE products have outstandingly high air flow resistivity values at a relatively low density when compared to traditional stone wool ones. This is mainly due to the internal structure of the ULTIMATE mats: length and diameter of the fibers, laminar geometry, no shot content ...

If it is true that air flow resistivity is increasing with density for a given mineral wool material, however, after a certain level of air flow resistivity passed (≥ 30 kPa·s/m²), increasing the density will not necessarily increase the total performance of a sound protection system (but the weight and total cost for sure!). When a material with a sufficiently high air flow resistivity has been chosen (density ≥ 36 kg/m³ for ULTIMATE), it is recommended to rather increase the thickness of this material than its density.

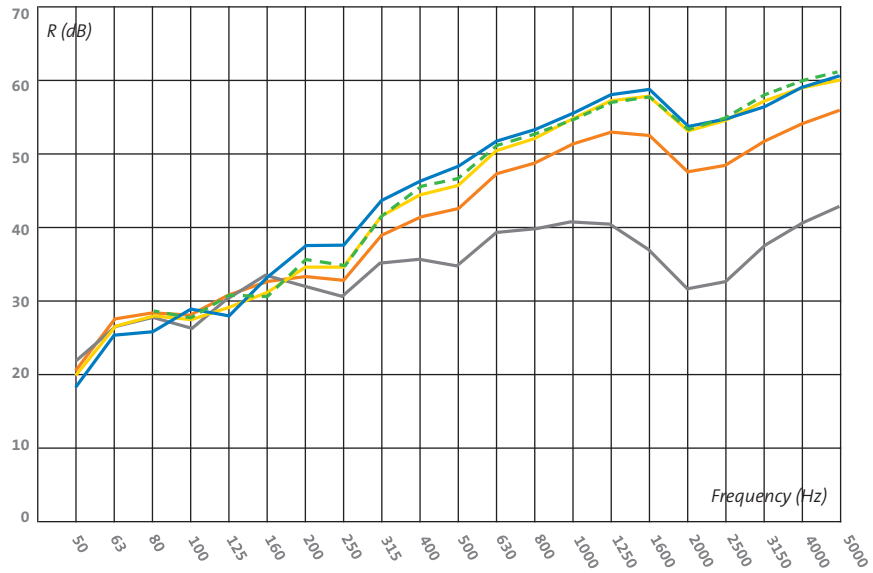
Acoustic performance of U SeaProtect

Sound reduction performance: High performance with U SeaProtect solutions

Based on the measurements made on ULTIMATE products and our experience, products with density of 36 kg/m³ in 70 mm thickness are probably the best purchasing value of the U SeaProtect range, providing superior sound protection insulation at a limited cost (best value for money). Depending on the situation and the level of sound reduction performance targeted, in some cases, products with a density of 24 kg/m³ in 50 mm thickness can be considered as sufficient, reaching a good level of sound protection while keeping a low budget (cost optimized solutions).

For situations where a high level of sound reduction is required combined with fire protection, we recommend to use the Best Comfort Class constructions (see Page 71). These solutions are using a second layer of ULTIMATE product 24 kg/m³ 50 mm between the stiffeners only, keeping the constraint of having a reduced space occupied around the stiffeners. These systems enable to obtain high sound reduction index of 50 dB with a thickness of 100 mm between the stiffeners.

Density [kg/m³]	Thickness mm	Products name	Facings						
			Unfaced	Alu1	G120 (black)	G220 (white)	G420 (white)	B-Gl	B-Al
24 kg/m³	50 mm	U SeaProtect Roll 24 50 mm	●	●		●			
		U SeaProtect Slab 24 50 mm	●	●	●	●	●	●	●
36 kg/m³	70 mm	U SeaProtect Roll 36 70 mm	●	●					
		U SeaProtect Slab 36 70 mm	●	●	●	●	●	●	●



Best Comfort Class

Steel Plate: 6 mm + Stiffeners x 2 L-shape: 115 mm x 80 mm 10 mm thick

Plate: U SeaProtect 24 50 mm
Stiffeners: U SeaProtect 76 25 mm
Rw(C;Ctr) = 47 (-2;-6)
Weight: 2.53 kg/m²

Plate: U SeaProtect 36 70 mm
Stiffeners: U SeaProtect 76 25 mm
Rw(C;Ctr) = 48 (-1;-6)
Weight: 3.85 kg/m²

Plate: U SeaProtect 56 70 mm
Stiffeners: U SeaProtect 76 25 mm
Rw(C;Ctr) = 49 (-2;-7)
Weight: 5.25 kg/m²

Plate: U SeaProtect [36 70 mm + 24 50 mm]
Stiffeners: U SeaProtect 76 25 mm
Rw(C;Ctr) = 50 (-2;-7)
Weight: 5.05 kg/m²

Lab measurements done on U SeaProtect products, density 36 kg/m³ and 56 kg/m³, thickness 70 mm, do not show any improvement of performance in sound reduction for the higher density one. It is an example proving that increasing density of an insulant does not necessary help improving the sound reduction performance.

In a general way, when a product has a sufficiently high air flow resistivity (which is the case for ULTIMATE products with density ≥ 36 kg/m³), it is a better investment to increase its thickness rather than its density.

By adding a second layer of ULTIMATE product in 24 kg/m³ in 50 mm on the plate only (between the stiffeners) on top of a first layer 36 kg/m³ 70 mm (Best Comfort Class solution page 71), the total weight of the solution 5.05 kg/m² is less than a single layer solution with 56kg/m³ 70 mm on the plate (5.25 kg/m²), however the sound reduction of the lighter system is significantly better.

In order to achieve good level of sound reduction performance, we do not recommend to install products with thickness lower than 50 mm or density below 24 kg/m³ (Rw (C;Ctr) = 47 (-2;-6)).

Sound reduction performance: High performance with U SeaProtect systems

Based on the intrinsic properties of ULTIMATE mineral wool (see Acoustic Design pages 90-91 and 94), when it comes to choose a U SeaProtect solution for sound reduction performance only, we recommend to choose products with a density equal or lower than 36 kg/m³.

You will find below some lightweight constructions we selected in order to achieve as a first purpose sound reduction. We indicated as well their thermal performance (U-value). Even if most of the solutions can justify a certain level of fire protection, they have been selected in order to be as cost effective as possible for a certain level of sound protection targeted. For designing these solutions, we paid particular attention to take into account the material and installation costs.

For high demanding applications such as machine rooms, a high level of sound reduction combined with a fire rating are required. For these applications, we recommend to use our Best Comfort Class constructions (see page 71).

U SeaProtect 36 70 mm "between the stiffeners only"

A-15 Deck

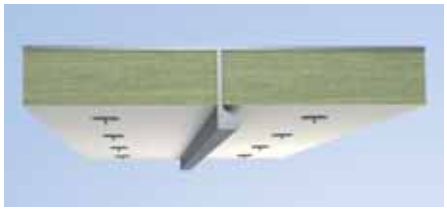


Plate	Stiffener
U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	/
2.25 kg/m²	
Complete solution [1]	
Rw(C;Ctr): 47 dB (-1;-6) **U-value:** 1.475 W/m²·K **Total Weight:** 2.52 kg/m²	

U SeaProtect 24 50 mm "One layer"

A-30 Deck, A-15 Bulkhead

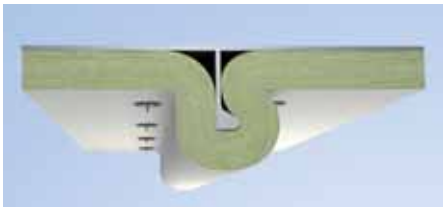


Plate	Stiffener
U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm
1.20 kg/m²	1.20 kg/m²
Complete solution [1]	
Rw(C;Ctr): 46 dB (-1;-5) **U-value:** 0.716 W/m²·K **Total Weight:** 2.04 kg/m²	

U SeaProtect 24 50 mm + U SeaProtect 76 25 mm

A-30 Deck, A-15 Bulkhead

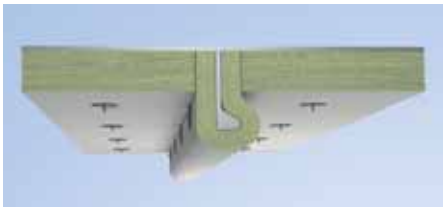
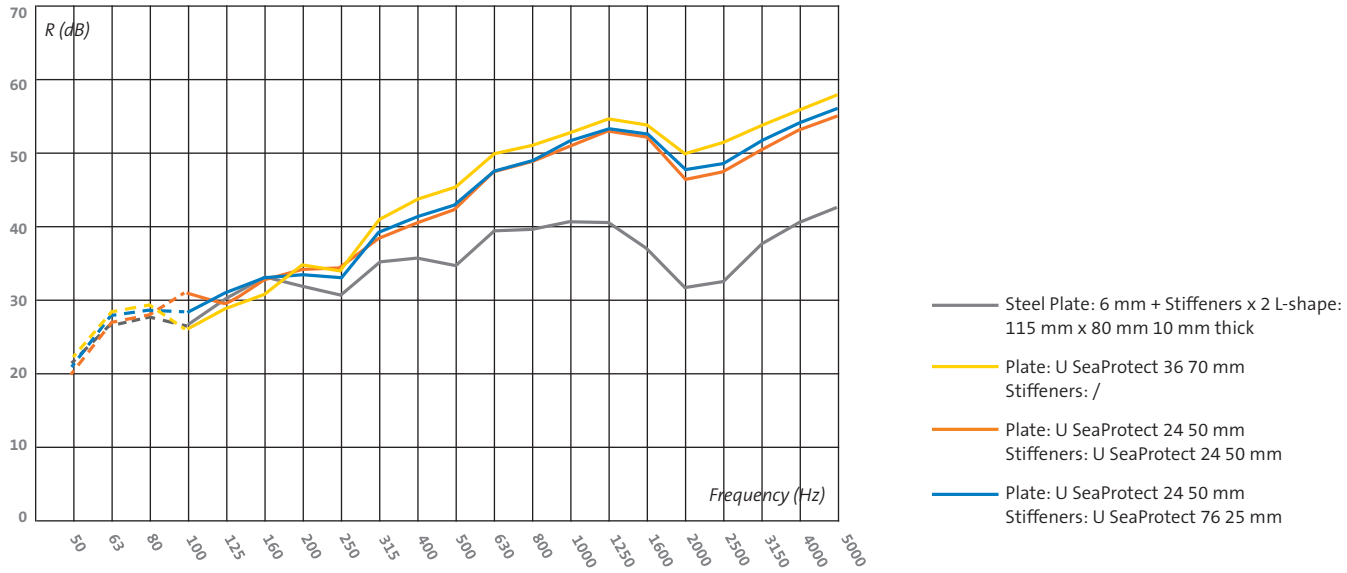


Plate	Stiffener
U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	U SeaProtect Slab 76 25 mm
1.20 kg/m²	1.90 kg/m²
Complete solution [1]	
Rw(C;Ctr): 47 dB (-2;-6) **U-value:** 0.819 W/m²·K **Total Weight:** 2.53 kg/m²	

1) Estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0,7 for the stiffener. The weight (kg/m²) and the U-values (W/m².K) are given for 1 m² "seen" from the flat side ("projected area").



Sound reduction performance: High performance with U SeaProtect systems

U SeaProtect 24 100 mm "One layer"

A-30 Deck, A-15 Bulkhead

Plate	Stiffener
U SeaProtect Slab 24 100 mm or U SeaProtect Roll 24 100 mm	U SeaProtect Slab 24 100 mm or U SeaProtect Roll 24 100 mm
2.40 kg/m²	2.40 kg/m²
Complete solution [1]	
Rw(C;Ctr): 49 dB (-2;-7) **U-value:** 0.373 W/m²·K **Total Weight:** 4.08 kg/m²	

U SeaProtect 24 50 mm "Double layer on the plate only" (single layer around the stiffeners)

A-30 Deck, A-15 Bulkhead

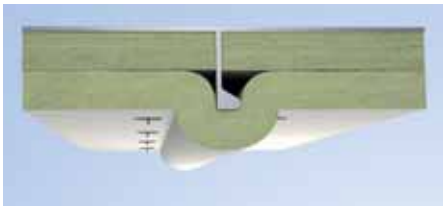


Plate	Stiffener
U SeaProtect Slab 24 50 mm x 2 or U SeaProtect Roll 24 50 mm x 2	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm
2.40 kg/m²	1.20 kg/m²
Complete solution [1]	
Rw(C;Ctr): 49 dB (-2;-7) **U-value:** 0.448 W/m²·K **Total Weight:** 3.24 kg/m²	

U SeaProtect 36 70 mm "One layer"

A-60 Deck

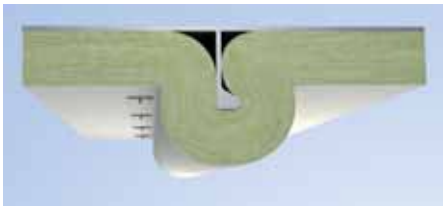


Plate	Stiffener
U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm
2.52 kg/m²	2.52 kg/m²
Complete solution [1]	
Rw(C;Ctr): 48 dB (-2;-7) **U-value:** 0.504 W/m²·K **Total Weight:** 4.28 kg/m²	

U SeaProtect 36 70 mm + U SeaProtect 76 25 mm

A-60 Deck

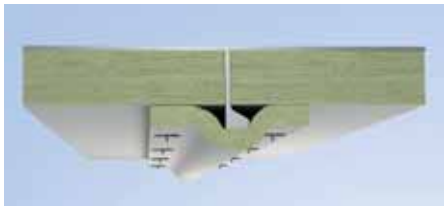
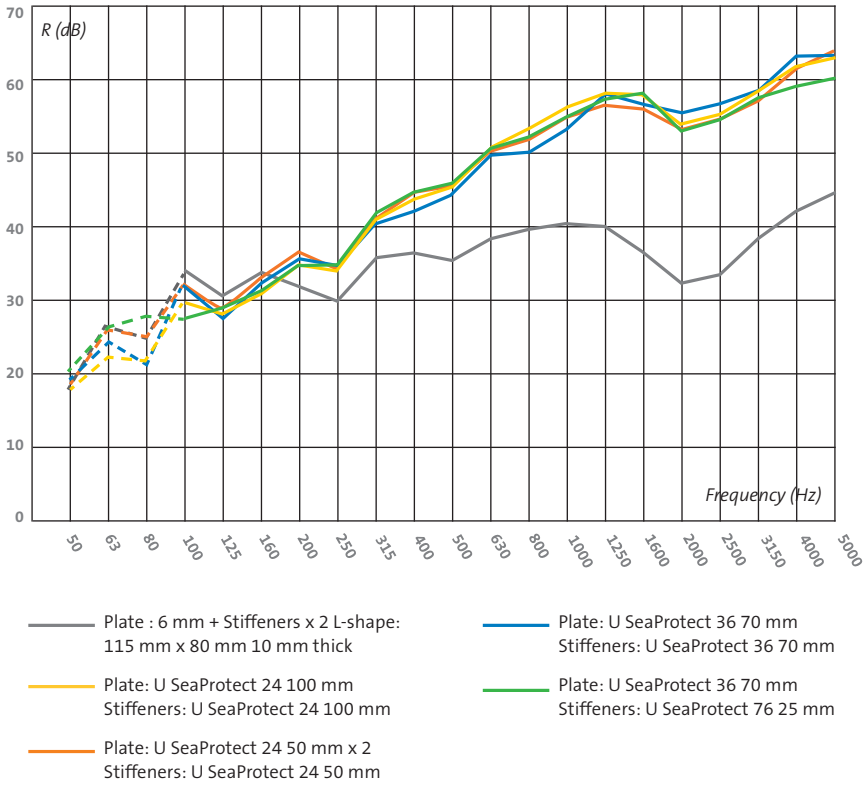


Plate	Stiffener
U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	U SeaProtect Slab 76 25 mm
2.52 kg/m²	1.90 kg/m²
Complete solution [1]	
Rw(C;Ctr): 48 dB (-1;-6) **U-value:** 0.645 W/m²·K **Total Weight:** 3.85 kg/m²	



1) Estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0.7 for the stiffener. The weight (kg/m²) and the U-values (W/m²·K) are given for 1 m² "seen" from the flat side ("projected area").

ULTIMATE acoustic properties

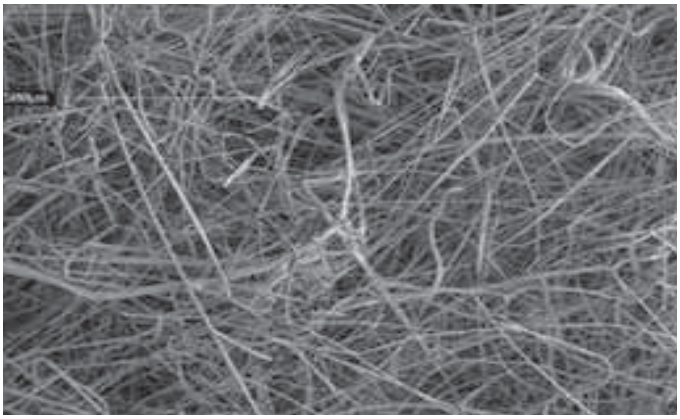
ULTIMATE mineral wool microstructure : laminar and "shot free"

ULTIMATE mineral wool, 100 % fiberized, no shot content.
ULTIMATE mineral wool products are manufactured through an extrusion process by using horizontal spinners.

Traditional stone wool products are manufactured by using vertical wheels leading to a subsequent high shot content (25 % to 40 % of the total mass of the products can be unfiberized particles). The unfiberized particles, also called slugs or shots, contained in traditional stone wool products, do not bring extra performance from acoustics point of view while increasing artificially the weight and density.

ULTIMATE products are 100 % fiberized with controlled length and diameter of fibres. The laminar microstructure of ULTIMATE products with no shot mainly explains their excellent air flow resistivity values and more generally the excellent sound protection performance with relatively low density.

Traditional stone wool *microstructure*
(25 % - 40 % of slugs/ unfiberized particles)



ULTIMATE *microstructure*
(100 % fiberized, no "shot" content)

ULTIMATE acoustic properties

For the specialists who are interested in using an acoustic software modelling, main properties of ULTIMATE products depending on density can be found in the table below. These values are normally the ones required for doing acoustic modelization with a software.

		U SeaProtect 24	U SeaProtect 36	U SeaProtect 46	U SeaProtect 56	U SeaProtect 66	U SeaProtect 76	U SeaProtect 86	U SeaProtect 90
Airflow resistivity	**kPa·s·m²**	15	30	45	50	60	80	90	100
Young Modulus	**kPa**	≤ 10	≤ 15	≤ 15	≤ 20	≤ 20	≤ 25	≤ 50	≤ 80
Open porosity	**–**	≥ 0.99	≥ 0.98	≥ 0.98	≥ 0.98	≥ 0.97	≥ 0.97	≥ 0.96	≥ 0.96

Sound absorption

Sound absorption coefficients of U SeaProtect products

Main ULTIMATE Densities [kg/m³]	Thickness mm	Products	Facings Weighted absorption (α_w)						
			Unfaced	Aluminium	Glass cloth			B facing (Alu-Glass cloth composite)	
				Alu1	G 120 (black)	G 220 (white)	G 420 (white)	B-Gl (Glass cloth outside)	B-Al (Alu facing outside)
24 kg/m³	50 mm	U SeaProtect Roll 24 50 mm	page 96	page 96		page 96			
	50 mm	U SeaProtect Slab 24 50 mm	page 96	page 96	page 96	page 96	page 97	page 97	page 97
	100 mm	U SeaProtect Roll 24 100 mm	page 97	page 97		●			
36 kg/m³	70 mm	U SeaProtect Roll 36 70 mm	page 98	page 98					
	70 mm	U SeaProtect Slab 36 70 mm	page 98	page 98	●	page 98	page 98	page 99	page 99
48 kg/m³	100 mm	U SeaProtect Wired Mat 48 100 mm	page 99	●					
56 kg/m³	30 mm	U SeaProtect Slab 56 30 mm	page 100	page 100	●	●	●	●	●
	70 mm	U SeaProtect Slab 56 70 mm	page 101	page 101	●	page 101	page 101	page 100	page 100
66 kg/m³	30 mm	U SeaProtect Slab 66 30 mm	page 102	page 102	●	page 102	●	●	●
66 kg/m³	50 mm	U SeaProtect Slab 66 50 mm	page 103	page 103	●	page 103	page 103	●	page 102
	50 mm	U SeaProtect Wired Mat 66 50 mm	page 103	page 104					
76 kg/m³	20 mm	U SeaProtect Slab 76 20 mm	page 106	page 104	●	●	●	●	●
	25 mm	U SeaProtect Slab 76 25 mm	page 105	page 105	●	page 105	page 105	page 104	page 104
86 kg/m³	50 mm	U SeaProtect Slab 86 50 mm	page 106	page 106	●	page 106	page 106	page 107	page 107
90 kg/m³	50 mm	U SeaProtect Slab 90 50 mm	page 107	●	●	●	●	●	●

●/α_w *Products part of the Easy Logistics portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).*

●/α_w *Products not part of the Easy Logistics portfolio that can be manufactured on order. Standard Minimum Order Quantity applies (equivalent to 2t).*

Products that cannot be manufactured with this facing.

Date of the measurement: December 2014 & February 2015
According to ISO 354-2003 (α_w calculated according to EN ISO 11654:1997)
Laboratory: CSTB (France)

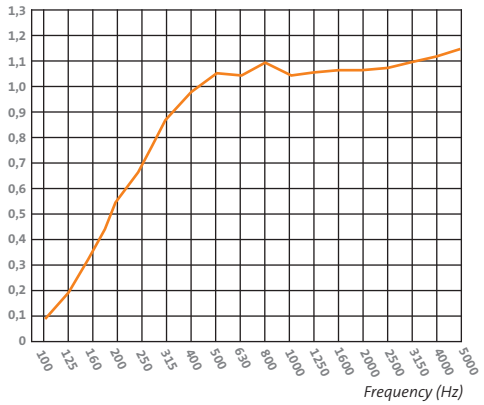
Absorption graphs

Products highlighted in green are part of the Easy Logistics portfolio
(for more details, please refer to pages 32-33 and 110-111)

Frequency (Hz)	α_s
100	0.09
125	0.19
160	0.36
200	0.55
250	0.69
315	0.89
400	0.97
500	1.05
630	1.04
800	1.09
1,000	1.04
1,250	1.05
1,600	1.06
2,000	1.06
2,500	1.07
3,150	1.08
4,000	1.11
5,000	1.14

U SeaProtect Roll 24 50 mm

U SeaProtect Slab 24 50 mm

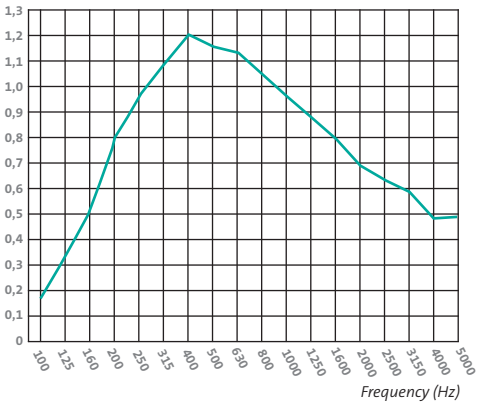


$\alpha_w = 1.00$

Frequency (Hz)	α_s
100	0.18
125	0.34
160	0.51
200	0.79
250	0.96
315	1.08
400	1.20
500	1.16
630	1.13
800	1.05
1,000	0.96
1,250	0.88
1,600	0.79
2,000	0.69
2,500	0.63
3,150	0.58
4,000	0.48
5,000	0.49

U SeaProtect Roll 24 Alu1 50 mm

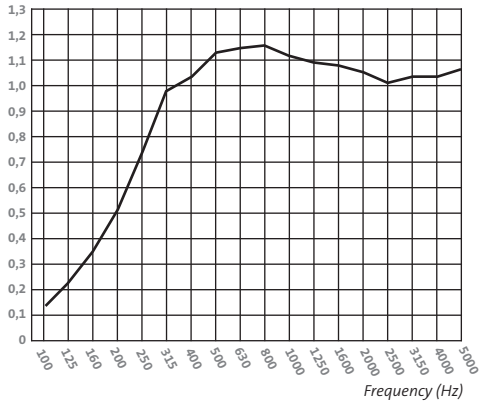
U SeaProtect Slab 24 Alu1 50 mm



$\alpha_w = 0.70$

Frequency (Hz)	α_s
100	0.13
125	0.22
160	0.35
200	0.52
250	0.73
315	0.98
400	1.03
500	1.13
630	1.15
800	1.16
1,000	1.11
1,250	1.09
1,600	1.08
2,000	1.05
2,500	1.01
3,150	1.04
4,000	1.04
5,000	1.06

U SeaProtect Slab 24 G120 50 mm

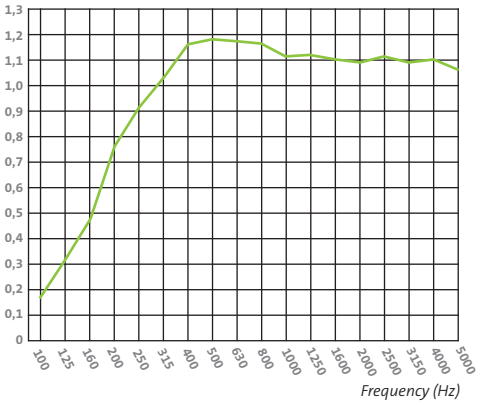


$\alpha_w = 1.00$

Frequency (Hz)	α_s
100	0.16
125	0.31
160	0.47
200	0.77
250	0.91
315	1.03
400	1.16
500	1.18
630	1.17
800	1.16
1,000	1.11
1,250	1.12
1,600	1.10
2,000	1.09
2,500	1.11
3,150	1.09
4,000	1.10
5,000	1.06

U SeaProtect Roll 24 G220 50 mm

U SeaProtect Slab 24 G220 50 mm



$\alpha_w = 1.00$

Facings:

- Unfaced
- Alu1
- G120
- G220
- G420
- B-Al/B-Gl

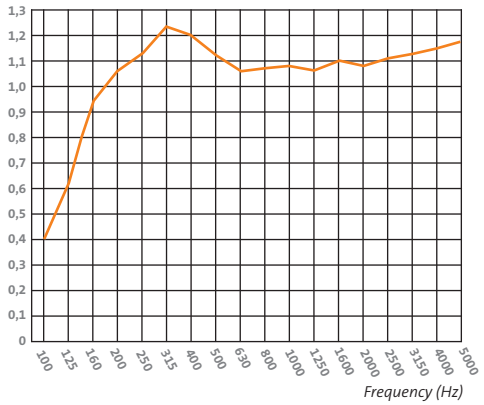
Date of the measurement: December 2014 & February 2015
According to ISO 354-2003 (α_w calculated according to EN ISO 11654:1997)
Laboratory: CSTB (France)

Products highlighted in green are part of the Easy Logistics portfolio
(for more details, please refer to pages 32-33 and 110-111)

Frequency (Hz)	α_s
100	0.40
125	0.62
160	0.94
200	1.06
250	1.13
315	1.23
400	1.20
500	1.12
630	1.06
800	1.07
1,000	1.08
1,250	1.06
1,600	1.10
2,000	1.08
2,500	1.11
3,150	1.13
4,000	1.15
5,000	1.17

U SeaProtect Roll 24 100 mm

U SeaProtect Slab 24 100 mm

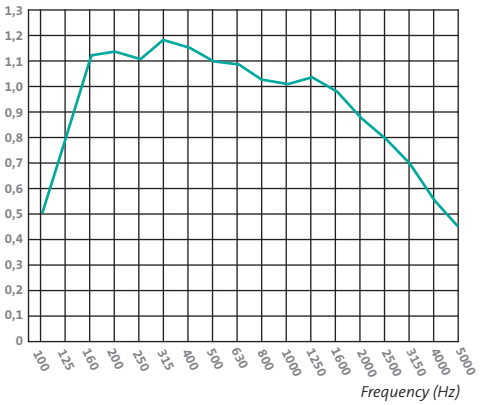


$\alpha_w = 1.00$

Frequency (Hz)	α_s
100	0.51
125	0.81
160	1.12
200	1.14
250	1.11
315	1.19
400	1.15
500	1.10
630	1.09
800	1.03
1,000	1.01
1,250	1.03
1,600	0.98
2,000	0.87
2,500	0.79
3,150	0.69
4,000	0.55
5,000	0.46

U SeaProtect Roll 24 Alu1 100 mm

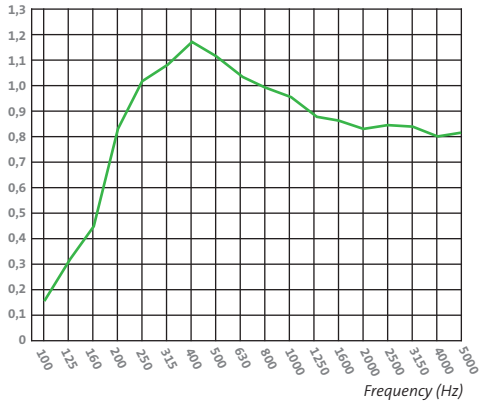
U SeaProtect Slab 24 Alu1 100 mm



$\alpha_w = 0.75$

Frequency (Hz)	α_s
100	0.16
125	0.31
160	0.45
200	0.83
250	1.02
315	1.08
400	1.17
500	1.11
630	1.04
800	0.99
1,000	0.96
1,250	0.88
1,600	0.86
2,000	0.83
2,500	0.85
3,150	0.84
4,000	0.80
5,000	0.82

U SeaProtect Slab 24 G420 50 mm

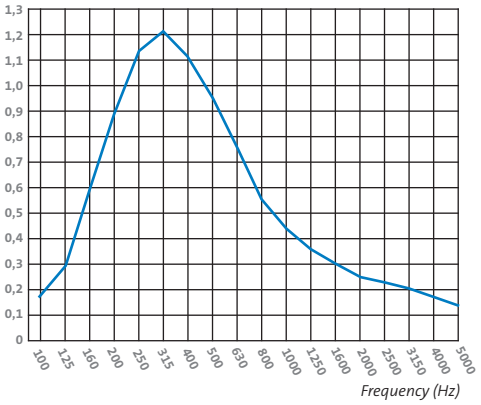


$\alpha_w = 0.90$

Frequency (Hz)	α_s
100	0.17
125	0.29
160	0.58
200	0.87
250	1.13
315	1.21
400	1.11
500	0.95
630	0.75
800	0.56
1,000	0.44
1,250	0.36
1,600	0.30
2,000	0.25
2,500	0.23
3,150	0.20
4,000	0.17
5,000	0.14

U SeaProtect Slab 24 B-Al 50 mm

U SeaProtect Slab 24 B-Gl 50 mm



$\alpha_w = 0.30$

Facings:

- Unfaced
- Alu1
- G120
- G220
- G420
- B-Al/B-Gl

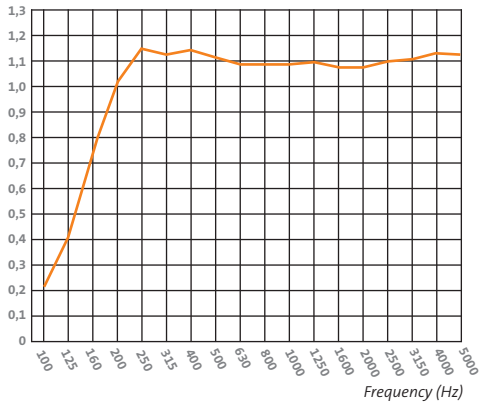
Date of the measurement: December 2014 & February 2015
According to ISO 354-2003 (α_w calculated according to EN ISO 11654:1997)
Laboratory: CSTB (France)

Absorption graphs

Products highlighted in green are part of the Easy Logistics portfolio
(for more details, please refer to pages 32-33 and 110-111)

Frequency (Hz)	α_s
100	0.22
125	0.40
160	0.74
200	1.01
250	1.15
315	1.12
400	1.14
500	1.11
630	1.08
800	1.08
1,000	1.08
1,250	1.09
1,600	1.07
2,000	1.07
2,500	1.09
3,150	1.10
4,000	1.12
5,000	1.12

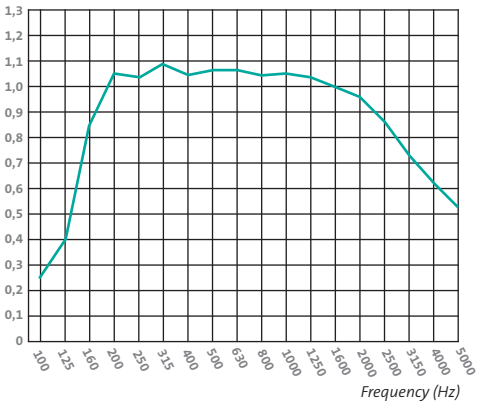
U SeaProtect Roll 36 70 mm
U SeaProtect Slab 36 70 mm



$\alpha_w = 1.00$

Frequency (Hz)	α_s
100	0.25
125	0.40
160	0.84
200	1.05
250	1.04
315	1.09
400	1.04
500	1.06
630	1.06
800	1.04
1,000	1.05
1,250	1.03
1,600	1.00
2,000	0.96
2,500	0.86
3,150	0.74
4,000	0.62
5,000	0.53

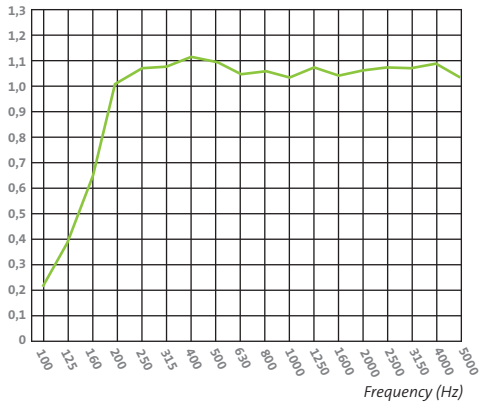
U SeaProtect Roll 36 Alu1 70 mm
U SeaProtect Slab 36 Alu1 70 mm



$\alpha_w = 0.85$

Frequency (Hz)	α_s
100	0.22
125	0.39
160	0.64
200	1.01
250	1.07
315	1.07
400	1.11
500	1.09
630	1.04
800	1.06
1,000	1.03
1,250	1.07
1,600	1.04
2,000	1.06
2,500	1.07
3,150	1.07
4,000	1.09
5,000	1.03

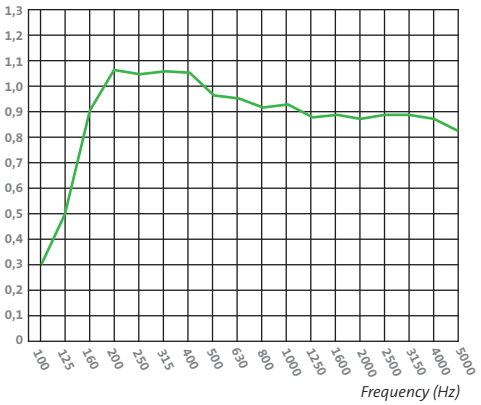
U SeaProtect Slab 36 G220 70 mm



$\alpha_w = 1.00$

Frequency (Hz)	α_s
100	0.29
125	0.50
160	0.91
200	1.06
250	1.04
315	1.06
400	1.05
500	0.96
630	0.95
800	0.92
1,000	0.93
1,250	0.88
1,600	0.89
2,000	0.87
2,500	0.89
3,150	0.89
4,000	0.87
5,000	0.82

U SeaProtect Slab 36 G420 70 mm



$\alpha_w = 0.95$

Facings:

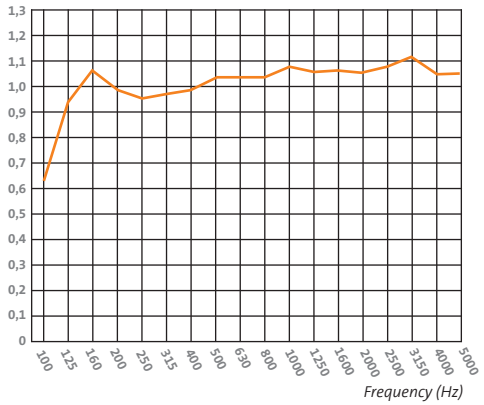
- Unfaced
- Alu1
- G120
- G220
- G420
- B-Al/B-Gl

Date of the measurement: December 2014 & February 2015
According to ISO 354-2003 (α_w calculated according to EN ISO 11654:1997)
Laboratory: CSTB (France)

Products highlighted in green are part of the Easy Logistics portfolio
(for more details, please refer to pages 32-33 and 110-111)

Frequency (Hz)	α_s
100	0.63
125	0.95
160	1.07
200	0.99
250	0.96
315	0.97
400	0.99
500	1.04
630	1.04
800	1.03
1,000	1.09
1,250	1.06
1,600	1.07
2,000	1.06
2,500	1.08
3,150	1.12
4,000	1.05
5,000	1.06

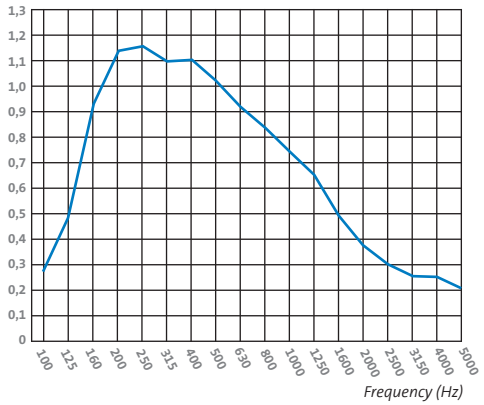
U SeaProtect Wired Mat 48
100 mm



$\alpha_w = 1.00$

Frequency (Hz)	α_s
100	0.28
125	0.49
160	0.94
200	1.14
250	1.15
315	1.09
400	1.10
500	1.02
630	0.92
800	0.84
1,000	0.75
1,250	0.65
1,600	0.50
2,000	0.38
2,500	0.31
3,150	0.26
4,000	0.26
5,000	0.21

U SeaProtect Slab 36 B-Al 70 mm
U SeaProtect Slab 36 B-Gl 70 mm



$\alpha_w = 0.40$

Facings:

- Unfaced
- Alu1
- G120
- G220
- G420
- B-Al/B-Gl

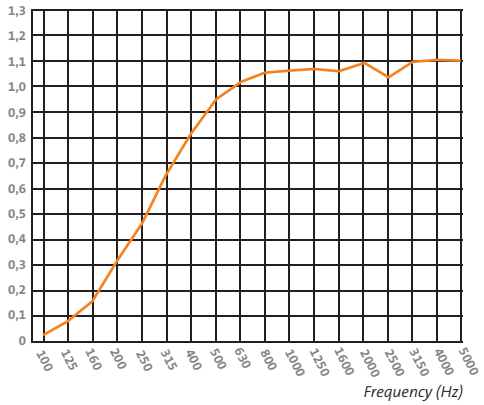
Date of the measurement: December 2014 & February 2015
According to ISO 354-2003 (α_w calculated according to EN ISO 11654:1997)
Laboratory: CSTB (France)

Absorption graphs

Products highlighted in green are part of the Easy Logistics portfolio
(for more details, please refer to pages 32-33 and 110-111)

U SeaProtect Slab 56 30 mm

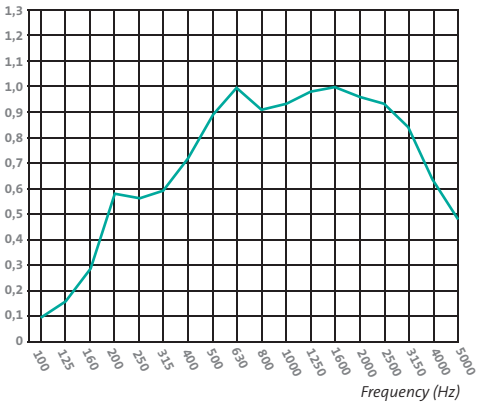
Frequency (Hz)	α_s
100	0.03
125	0.09
160	0.17
200	0.33
250	0.47
315	0.66
400	0.83
500	0.96
630	1.02
800	1.06
1,000	1.07
1,250	1.07
1,600	1.06
2,000	1.09
2,500	1.04
3,150	1.10
4,000	1.11
5,000	1.11



$\alpha_w = 0.80$

U SeaProtect Slab 56 Alu1 30 mm

Frequency (Hz)	α_s
100	0.09
125	0.17
160	0.29
200	0.58
250	0.56
315	0.59
400	0.71
500	0.89
630	1.00
800	0.91
1,000	0.93
1,250	0.98
1,600	1.00
2,000	0.96
2,500	0.93
3,150	0.84
4,000	0.64
5,000	0.48

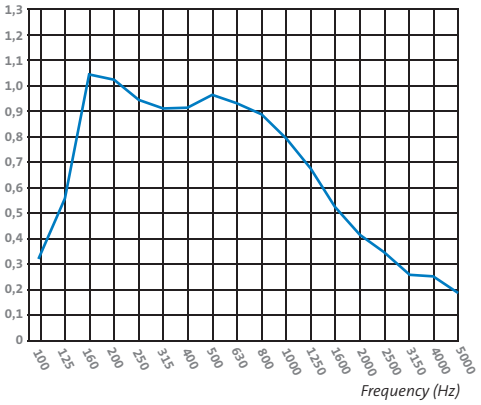


$\alpha_w = 0.80$


Logos Hope, Brodotrogir, Croatia

U SeaProtect Slab 56 B-Al 70 mm
U SeaProtect Slab 56 B-Gl 70 mm

Frequency (Hz)	α_s
100	0.32
125	0.55
160	1.04
200	1.02
250	0.94
315	0.91
400	0.91
500	0.96
630	0.93
800	0.89
1,000	0.80
1,250	0.69
1,600	0.53
2,000	0.42
2,500	0.35
3,150	0.26
4,000	0.25
5,000	0.19



$\alpha_w = 0.45$

Facings:

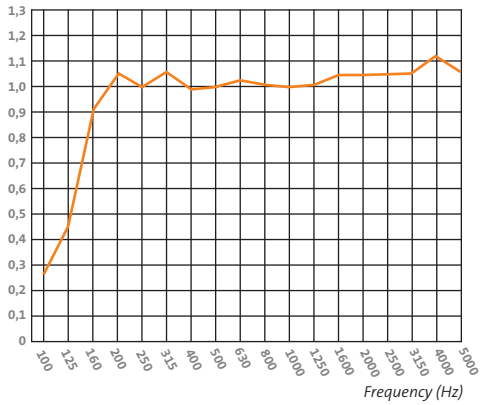
- Unfaced
- Alu1
- G120
- G220
- G420
- B-Al/B-Gl

Date of the measurement: December 2014 & February 2015
According to ISO 354-2003 (α_w calculated according to EN ISO 11654:1997)
Laboratory: CSTB (France)

Products highlighted in green are part of the Easy Logistics portfolio
(for more details, please refer to pages 32-33 and 110-111)

U SeaProtect Slab 56 70 mm

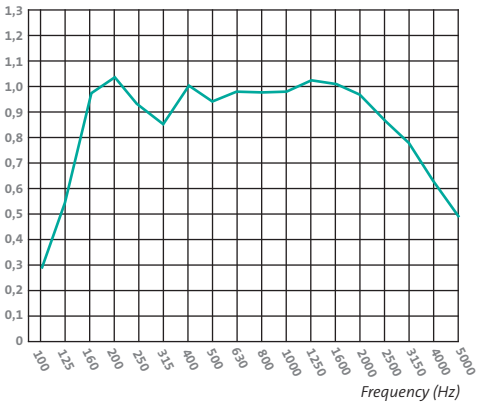
Frequency (Hz)	α_s
100	0.27
125	0.45
160	0.92
200	1.05
250	1.00
315	1.06
400	0.99
500	1.00
630	1.02
800	1.01
1,000	1.00
1,250	1.01
1,600	1.04
2,000	1.04
2,500	1.05
3,150	1.05
4,000	1.12
5,000	1.06



$\alpha_w = 1.00$

U SeaProtect Slab 56 Alu1 70 mm

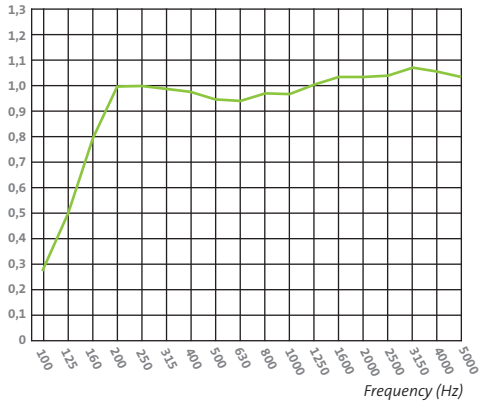
Frequency (Hz)	α_s
100	0.27
125	0.53
160	0.97
200	1.03
250	0.93
315	0.85
400	1.01
500	0.94
630	0.98
800	0.98
1,000	0.98
1,250	1.02
1,600	1.01
2,000	0.97
2,500	0.87
3,150	0.78
4,000	0.63
5,000	0.49



$\alpha_w = 0.85$

U SeaProtect Slab 56 G220 70 mm

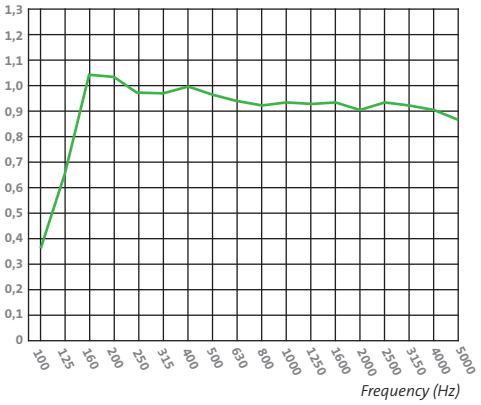
Frequency (Hz)	α_s
100	0.28
125	0.50
160	0.80
200	1.00
250	1.00
315	0.99
400	0.98
500	0.95
630	0.94
800	0.97
1,000	0.97
1,250	1.01
1,600	1.03
2,000	1.03
2,500	1.04
3,150	1.07
4,000	1.06
5,000	1.03



$\alpha_w = 1.00$

U SeaProtect Slab 56 G420 70 mm

Frequency (Hz)	α_s
100	0.35
125	0.65
160	1.04
200	1.04
250	0.97
315	0.97
400	0.99
500	0.96
630	0.94
800	0.92
1,000	0.93
1,250	0.93
1,600	0.93
2,000	0.90
2,500	0.93
3,150	0.92
4,000	0.90
5,000	0.86



$\alpha_w = 0.95$

Facings:

- Unfaced
- Alu1
- G120
- G220
- G420
- B-Al/B-Gl

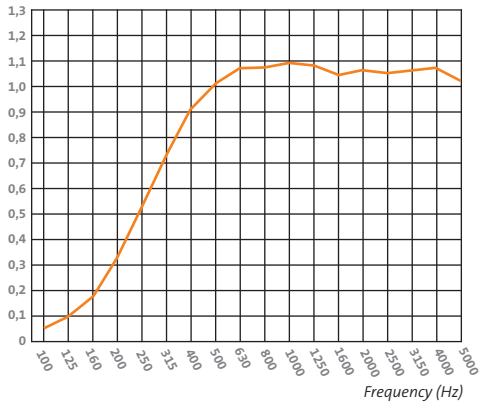
Date of the measurement: December 2014 & February 2015
According to ISO 354-2003 (α_w calculated according to EN ISO 11654:1997)
Laboratory: CSTB (France)

Absorption graphs

Products highlighted in green are part of the Easy Logistics portfolio
(for more details, please refer to pages 32-33 and 110-111)

U SeaProtect Slab 66 30 mm

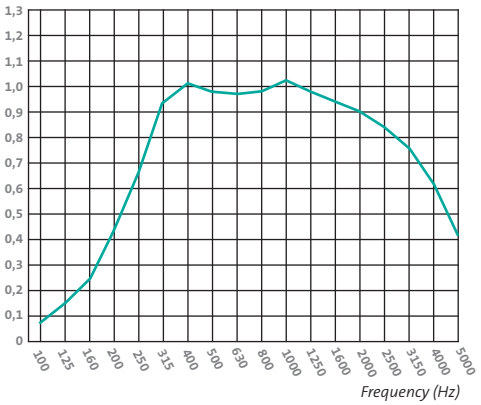
Frequency (Hz)	α_s
100	0.05
125	0.10
160	0.18
200	0.33
250	0.52
315	0.73
400	0.91
500	1.01
630	1.07
800	1.07
1,000	1.09
1,250	1.08
1,600	1.04
2,000	1.06
2,500	1.05
3,150	1.06
4,000	1.07
5,000	1,02



$\alpha_w = 0.85$

U SeaProtect Slab 66 Alu1 30 mm

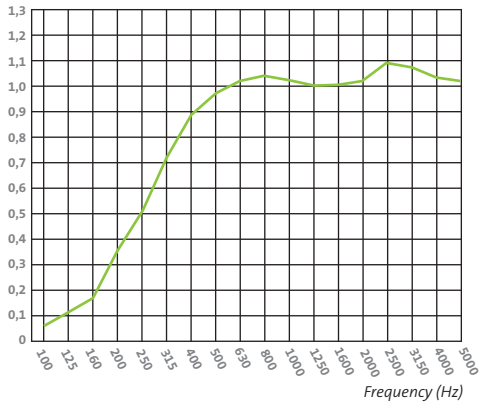
Frequency (Hz)	α_s
100	0.07
125	0.15
160	0.24
200	0.43
250	0.66
315	0.93
400	1.01
500	0.98
630	0.97
800	0.98
1,000	1.02
1,250	0.98
1,600	0.94
2,000	0.90
2,500	0.84
3,150	0.76
4,000	0.62
5,000	0.42



$\alpha_w = 0.80$

U SeaProtect Slab 66 G220 30 mm

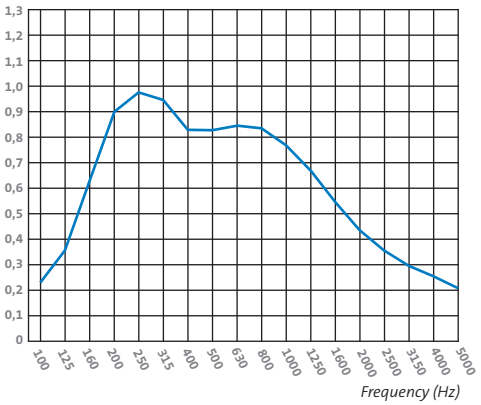
Frequency (Hz)	α_s
100	0.06
125	0.11
160	0.17
200	0.35
250	0.51
315	0.71
400	0.88
500	0.97
630	1.02
800	1.04
1,000	1.02
1,250	1.00
1,600	1.00
2,000	1.02
2,500	1.09
3,150	1.07
4,000	1.03
5,000	1.02



$\alpha_w = 0.80$

U SeaProtect Slab 66 B-Al 50 mm
U SeaProtect Slab 66 B-Gl 50 mm

Frequency (Hz)	α_s
100	0.23
125	0.35
160	0.62
200	0.90
250	0.98
315	0.95
400	0.83
500	0.83
630	0.85
800	0.84
1,000	0.77
1,250	0.67
1,600	0.55
2,000	0.44
2,500	0.36
3,150	0.30
4,000	0.26
5,000	0.21



$\alpha_w = 0.45$

Facings:

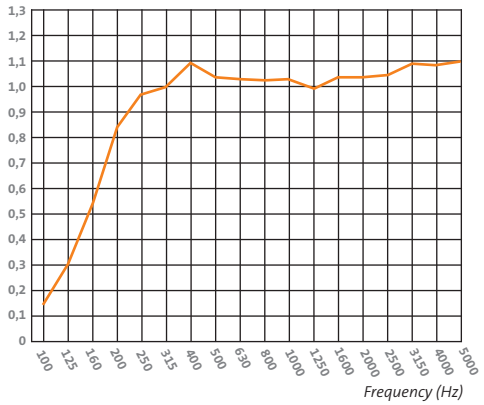
- Unfaced
- Alu1
- G120
- G220
- G420
- B-Al/B-Gl

Date of the measurement: December 2014 & February 2015
According to ISO 354-2003 (α_w calculated according to EN ISO 11654:1997)
Laboratory: CSTB (France)

Products highlighted in green are part of the Easy Logistics portfolio
(for more details, please refer to pages 32-33 and 110-111)

Frequency (Hz)	α_s
100	0.14
125	0.30
160	0.55
200	0.84
250	0.97
315	1.00
400	1.09
500	1.04
630	1.03
800	1.02
1,000	1.03
1,250	0.99
1,600	1.03
2,000	1.04
2,500	1.04
3,150	1.09
4,000	1.08
5,000	1.10

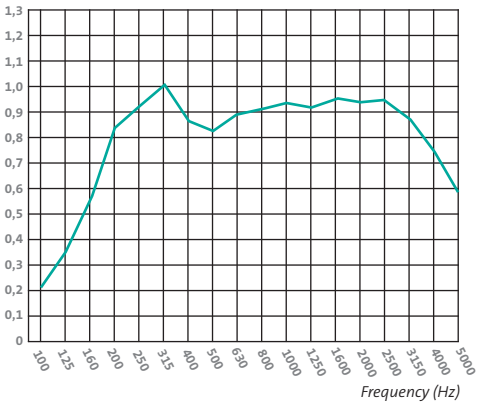
U SeaProtect Slab 66 50 mm
U SeaProtect Wired Mat 66 50 mm



$\alpha_w = 1.00$

Frequency (Hz)	α_s
100	0.22
125	0.36
160	0.57
200	0.84
250	0.93
315	1.01
400	0.87
500	0.83
630	0.89
800	0.91
1,000	0.94
1,250	0.92
1,600	0.96
2,000	0.94
2,500	0.95
3,150	0.88
4,000	0.75
5,000	0.60

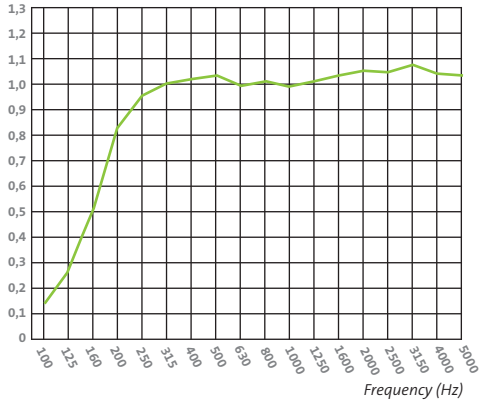
U SeaProtect Slab 66 Alu1 50 mm
U SeaProtect Wired Mat 66 Alu1 50 mm



$\alpha_w = 0.90$

Frequency (Hz)	α_s
100	0.14
125	0.26
160	0.52
200	0.83
250	0.96
315	1.00
400	1.02
500	1.04
630	0.99
800	1.01
1,000	0.99
1,250	1.01
1,600	1.03
2,000	1.05
2,500	1.05
3,150	1.07
4,000	1.04
5,000	1.03

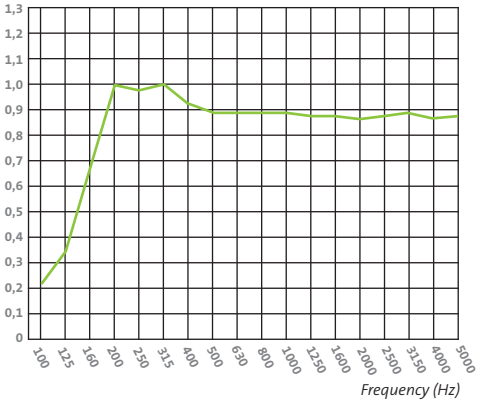
U SeaProtect Slab 66 G220 50 mm



$\alpha_w = 1.00$

Frequency (Hz)	α_s
100	0.21
125	0.33
160	0.66
200	0.99
250	0.97
315	0.99
400	0.92
500	0.89
630	0.88
800	0.88
1,000	0.88
1,250	0.87
1,600	0.87
2,000	0.86
2,500	0.87
3,150	0.88
4,000	0.86
5,000	0.86

U SeaProtect Slab 66 G420 50 mm



$\alpha_w = 0.90$

Facings:

- Unfaced
- Alu1
- G120
- G220
- G420
- B-Al/B-Gl

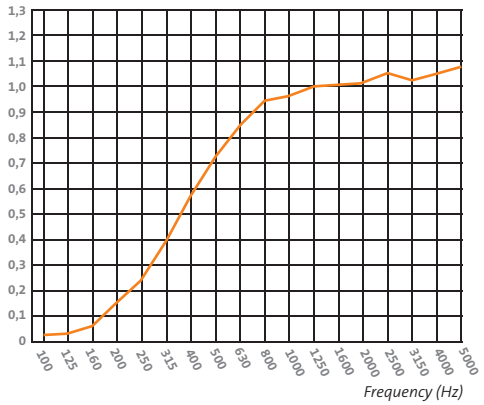
Date of the measurement: December 2014 & February 2015
According to ISO 354-2003 (α_w calculated according to EN ISO 11654:1997)
Laboratory: CSTB (France)

Absorption graphs

Products highlighted in green are part of the Easy Logistics portfolio
(for more details, please refer to pages 32-33 and 110-111)

U SeaProtect Slab 76 20 mm

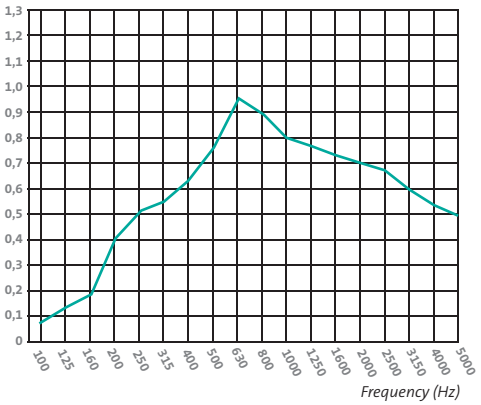
Frequency (Hz)	α_s
100	0.03
125	0.03
160	0.06
200	0.15
250	0.24
315	0.39
400	0.57
500	0.72
630	0.84
800	0.94
1,000	0.96
1,250	1.00
1,600	1.00
2,000	1.01
2,500	1.05
3,150	1.02
4,000	1.04
5,000	1.07



$\alpha_w = 0.55$

U SeaProtect Slab 76 Alu1 20 mm

Frequency (Hz)	α_s
100	0.07
125	0.13
160	0.19
200	0.41
250	0.51
315	0.55
400	0.63
500	0.76
630	0.95
800	0.90
1,000	0.79
1,250	0.77
1,600	0.73
2,000	0.70
2,500	0.67
3,150	0.60
4,000	0.54
5,000	0.49

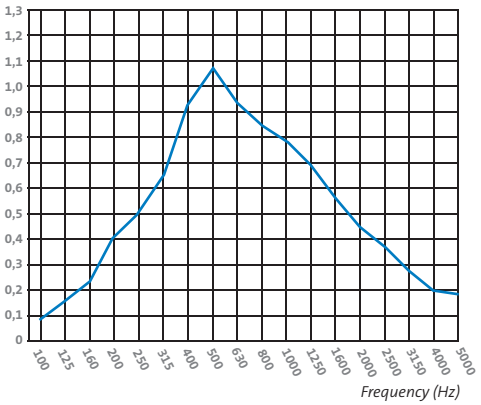


$\alpha_w = 0.70$


SMIT Piraha, Keppel Singmarine Brasil, Brazil, 2014

U SeaProtect Slab 76 B-Al 25 mm
U SeaProtect Slab 76 B-Gl 25 mm

Frequency (Hz)	α_s
100	0.08
125	0.15
160	0.24
200	0.40
250	0.50
315	0.65
400	0.92
500	1.07
630	0.93
800	0.85
1,000	0.78
1,250	0.69
1,600	0.56
2,000	0.45
2,500	0.37
3,150	0.28
4,000	0.20
5,000	0.19



$\alpha_w = 0.40$

Facings:

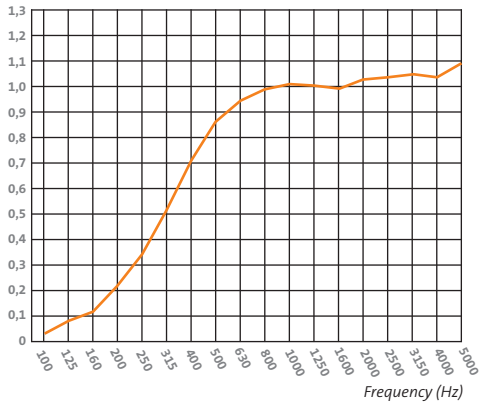
- Unfaced
- Alu1
- G120
- G220
- G420
- B-Al/B-Gl

Date of the measurement: December 2014 & February 2015
According to ISO 354-2003 (α_w calculated according to EN ISO 11654:1997)
Laboratory: CSTB (France)

Products highlighted in green are part of the Easy Logistics portfolio
(for more details, please refer to pages 32-33 and 110-111)

U SeaProtect Slab 76 25 mm

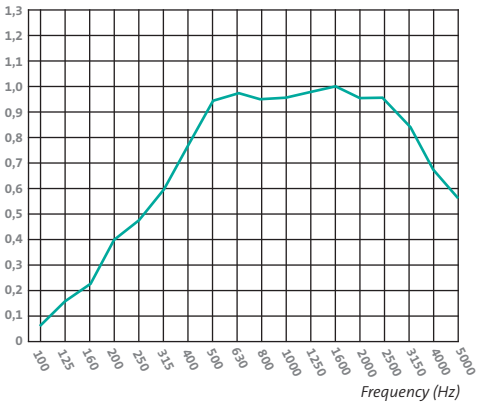
Frequency (Hz)	α_s
100	0.03
125	0.08
160	0.12
200	0.22
250	0.34
315	0.52
400	0.71
500	0.86
630	0.94
800	0.99
1,000	1.01
1,250	1.00
1,600	0.99
2,000	1.02
2,500	1.03
3,150	1.04
4,000	1.03
5,000	1.09



$\alpha_w = 0.65$

U SeaProtect Slab 76 Alu1 25 mm

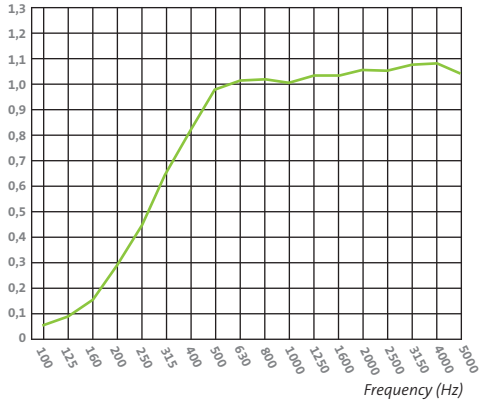
Frequency (Hz)	α_s
100	0.06
125	0.15
160	0.22
200	0.40
250	0.47
315	0.60
400	0.77
500	0.94
630	0.97
800	0.95
1,000	0.95
1,250	0.97
1,600	1.00
2,000	0.95
2,500	0.95
3,150	0.86
4,000	0.68
5,000	0.56



$\alpha_w = 0.80$

U SeaProtect Slab 76 G220 25 mm

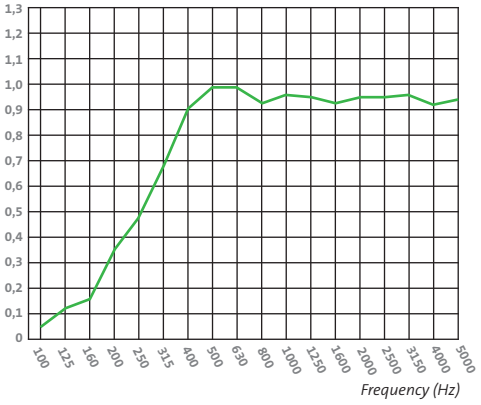
Frequency (Hz)	α_s
100	0.05
125	0.09
160	0.15
200	0.29
250	0.44
315	0.64
400	0.82
500	0.98
630	1.01
800	1.02
1,000	1.00
1,250	1.03
1,600	1.03
2,000	1.05
2,500	1.05
3,150	1.07
4,000	1.07
5,000	1.04



$\alpha_w = 0.75$

U SeaProtect Slab 76 G420 25 mm

Frequency (Hz)	α_s
100	0.04
125	0.12
160	0.16
200	0.35
250	0.48
315	0.68
400	0.90
500	0.99
630	0.99
800	0.93
1,000	0.96
1,250	0.95
1,600	0.93
2,000	0.95
2,500	0.95
3,150	0.96
4,000	0.92
5,000	0.94



$\alpha_w = 0.80$

Facings:

- Unfaced
- Alu1
- G120
- G220
- G420
- B-Al/B-Gl

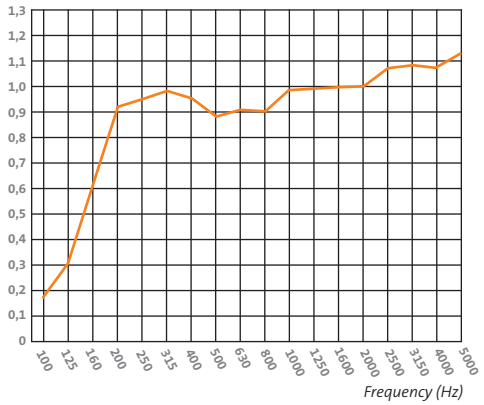
Date of the measurement: December 2014 & February 2015
According to ISO 354-2003 (α_w calculated according to EN ISO 11654:1997)
Laboratory: CSTB (France)

Absorption graphs

Products highlighted in green are part of the Easy Logistics portfolio
(for more details, please refer to pages 32-33 and 110-111)

U SeaProtect Slab 86 50 mm

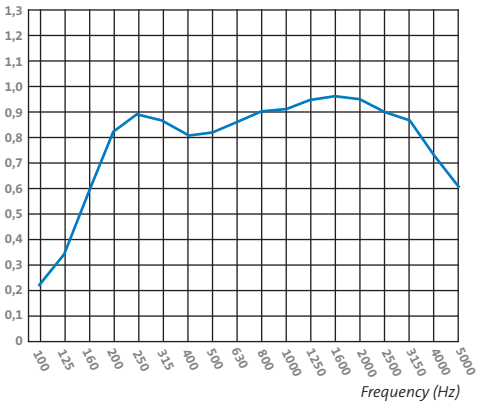
Frequency (Hz)	α_s
100	0.17
125	0.31
160	0.62
200	0.92
250	0.95
315	0.98
400	0.95
500	0.88
630	0.91
800	0.90
1,000	0.99
1,250	0.99
1,600	1.00
2,000	1.00
2,500	1.07
3,150	1.08
4,000	1.07
5,000	1.13



$\alpha_w = 0.95$

U SeaProtect Slab 86 Alu1 50 mm

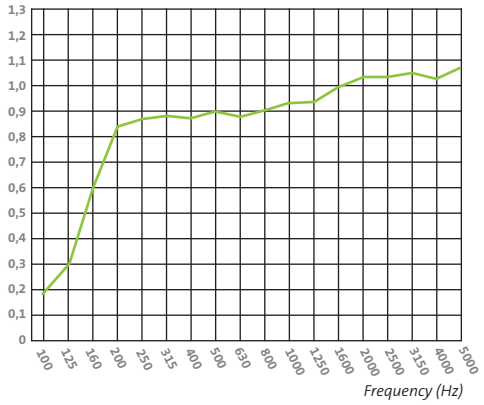
Frequency (Hz)	α_s
100	0.22
125	0.34
160	0.59
200	0.82
250	0.89
315	0.87
400	0.81
500	0.82
630	0.86
800	0.90
1,000	0.91
1,250	0.95
1,600	0.96
2,000	0.95
2,500	0.90
3,150	0.87
4,000	0.74
5,000	0.61



$\alpha_w = 0.90$

U SeaProtect Slab 86 G220 50 mm

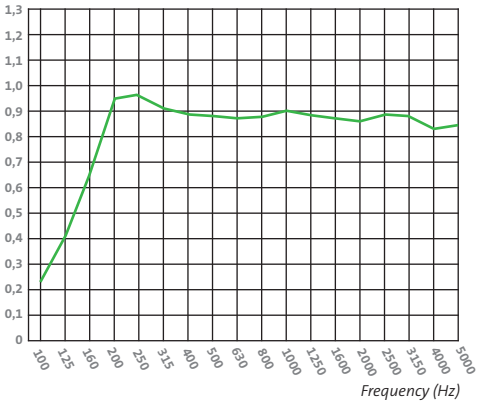
Frequency (Hz)	α_s
100	0.18
125	0.30
160	0.61
200	0.84
250	0.87
315	0.88
400	0.87
500	0.90
630	0.88
800	0.90
1,000	0.93
1,250	0.94
1,600	0.99
2,000	1.03
2,500	1.03
3,150	1.05
4,000	1.03
5,000	1.07



$\alpha_w = 0.95$

U SeaProtect Slab 86 G420 50 mm

Frequency (Hz)	α_s
100	0.22
125	0.40
160	0.65
200	0.95
250	0.96
315	0.91
400	0.89
500	0.88
630	0.87
800	0.88
1,000	0.90
1,250	0.88
1,600	0.87
2,000	0.86
2,500	0.89
3,150	0.88
4,000	0.83
5,000	0.84



$\alpha_w = 0.90$

Facings:

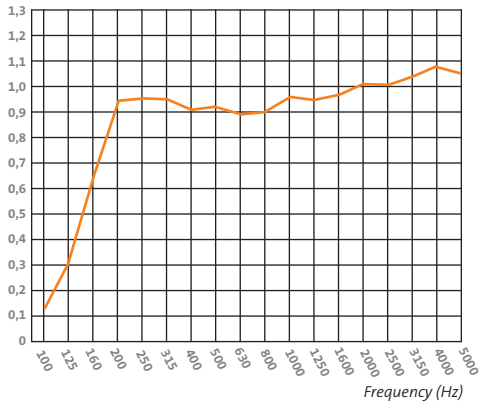
- Unfaced
- Alu1
- G120
- G220
- G420
- B-Al/B-Gl

Date of the measurement: December 2014 & February 2015
According to ISO 354-2003 (α_w calculated according to EN ISO 11654:1997)
Laboratory: CSTB (France)

Products highlighted in green are part of the Easy Logistics portfolio
(for more details, please refer to pages 32-33 and 110-111)

U SeaProtect Slab 90 50 mm

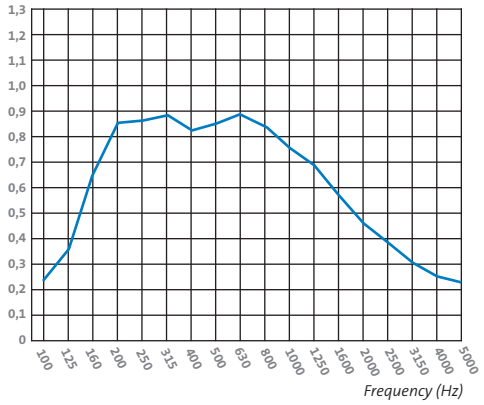
Frequency (Hz)	α_s
100	0.13
125	0.32
160	0.65
200	0.95
250	0.95
315	0.95
400	0.91
500	0.92
630	0.89
800	0.90
1,000	0.96
1,250	0.95
1,600	0.97
2,000	1.01
2,500	1.01
3,150	1.04
4,000	1.07
5,000	1.05



$\alpha_w = 0.95$

U SeaProtect Slab 86 B-Al 50 mm
U SeaProtect Slab 86 B-Gl 50 mm

Frequency (Hz)	α_s
100	0.24
125	0.37
160	0.65
200	0.85
250	0.86
315	0.88
400	0.82
500	0.85
630	0.88
800	0.84
1,000	0.76
1,250	0.69
1,600	0.57
2,000	0.46
2,500	0.39
3,150	0.31
4,000	0.25
5,000	0.23



$\alpha_w = 0.45$

Facings:

- Unfaced
- Alu1
- G120
- G220
- G420
- B-Al/B-Gl

Date of the measurement: December 2014 & February 2015
According to ISO 354-2003 (α_w calculated according to EN ISO 11654:1997)
Laboratory: CSTB (France)

Seabourn Sojourn, Mariotti Yard, Italy 2010

Logistics

U SeaProtect logistics tables

Key logistics information about the U SeaProtect range

Main ULTIMATE Densities [kg/m³]	Thickness mm	Form	Products Name	Facings			
				Unfaced	Alu1	G120 (black)	G220 (white)
24 kg/m³	50 mm	Roll	U SeaProtect Roll 24 50 mm	●	●		●
		Slab	U SeaProtect Slab 24 50 mm	●	●		
						●	●
	100 mm	Roll	U SeaProtect Roll 24 100 mm	●	●		●
		Slab	U SeaProtect Slab 24 100 mm	●	●		
						●	●
36 kg/m³	70 mm	Roll	U SeaProtect Roll 36 70 mm	●			
					●		
		Slab	U SeaProtect Slab 36 70 mm	●	●		
						●	●
48 kg/m³	100 mm	Wired Mat	U SeaProtect Wired Mat 48 100 mm	●	●		
56 kg/m³	70 mm	Slab	U SeaProtect Slab 56 70 mm	●	●		
						●	●
66 kg/m³	30 mm	Slab	U SeaProtect Slab 66 30 mm	●	●		
						●	●
66 kg/m³	50 mm	Slab	U SeaProtect Slab 66 50 mm	●	●		
						●	●
		Wired Mat	U SeaProtect Wired Mat 66 50 mm	●	●		
76 kg/m³	25 mm	Slab	U SeaProtect Slab 76 25 mm	●	●		
						●	●
86 kg/m³	50 mm	Slab	U SeaProtect Slab 86 50 mm	●	●		
						●	●
90 kg/m³	50 mm	Slab	U SeaProtect Slab 90 50 mm	●	●		
						●	●

** Quantity are given for full trucks that can carry 22 pallets. Possibility to use smaller trucks, quantity per truck is then less than the one provided here.*

*** Quantity per HC 40 ft container is only an approximate estimation. This quantity may vary depending on the exact size of the container and if different products are mixed when loading the container. Exact quantity will be provided when shipment is to be done.*

G420 (white)	B-Al	B-Gl	Length m	Width m	Content m²/pack m²	Quantity per pallett m²	Quantity per Truck m²	Quantity per HC 40 ft container** m²
			14.0	1.2	16.80	201.60	4,435.20	3,360.00
			1.2	0.6	7.20	115.20	2,534.40	1,656.00
●	●	●	1.2	0.625	7.50	120.00	2,640.00	1,725.00
			7.0	1.2	8.40	100.80	2,217.60	1,680.00
			1.2	0.6	3.60	57.60	1,267.20	828.00
●	●	●	1.2	0.625	3.75	60.00	1,320.00	862.50
			3.2	1.2	3.84	69.12	1,520.64	1,152.00
			5.5	1.2	6.60	79.20	1,742.40	1,320.00
			1.2	0.6	3.60	43.20	950.40	828.00
●	●	●	1.2	0.625	3.75	45.00	990.00	862.50
			3.1	0.6	3.72	66.96	1,473.12	1,004.40
			1.2	0.6	2.88	46.08	1,013.76	662.40
●	●	●	1.2	0.625	3.00	48.00	1,056.00	690.00
			1.2	0.6	9.36	112.32	2,471.04	2,152.80
●	●	●	1.2	0.625	9.75	117.00	2,574.00	2,242.50
			1.2	0.6	5.76	69.12	1,520.64	1,324.80
●	●	●	1.2	0.625	6.00	72.00	1,584.00	1,380.00
			6.0	0.6	7.20	129.60	2,851.20	1,944.00
			1.2	0.6	11.52	138.24	3,041.28	2,649.60
●	●	●	1.2	0.625	12.00	144.00	3,168.00	2,760.00
			1.2	0.6	5.76	69.12	1,520.64	1,324.80
●	●	●	1.2	0.625	6.00	72.00	1,584.00	1,380.00
			1.2	0.6	5.76	69.12	1,520.64	1,324.80
●	●	●	1.2	0.625	6.00	72.00	1,584.00	1,380.00

Products part of the U SeaProtect Easy Logistics products portfolio with a lower Minimum Order Quantity (equivalent to 1 pallet).
Products not part of the U SeaProtect Easy Logistics products portfolio that can be manufactured on order. Standard Minimum Order Quantity applies (equivalent to 2t).
Products that cannot be manufactured with this facing.

Storage conditions

Instructions for storing and handling

In order to keep mineral wool products in good conditions : please follow the instructions below for handling and storing.

- The products must be stored in dry indoor conditions, in closed warehouse facilities at all times.
- The products must be transported at all time in closed compartments, e.g. trailers, containers and other cargo holds in order to avoid exposure to water (rain, excessive moisture and/or condensation) or any bad weather conditions.
- When delivered on pallets, the pallets must not be stacked in more than two layers and total height should not exceed 3 m.
- When delivered in individual packs, the packs of slabs should be stored on the flat side and must not be stacked in heights of more than 3 m.
- When delivered in individual rolls, the rolls should be laid horizontally and must not be stacked in heights of more than 3 m.
- The packaging of the products must remain untouched during storage.
- The packaging and the products contained inside must not be exposed to any kind of treading, sitting or any kind of mechanical action which could damage its integrity.
- Products should not be stored for a period longer than twelve months after manufacturing date in the conditions described above. After this period, mechanics properties of ULTIMATE products may decrease (thickness recovery for compressed products and ability to be bent). This may have an impact as well on the installation process.

Norwegian Getaway © Ingrid Fiebak / MEYER WERFT

Installation guidelines

Cutting and fixing of U SeaProtect products

Cutting U SeaProtect products

ULTIMATE products are very easy to cut due to their unique micro-structures made of long fibers. There is no need for complex machinery such as a band saw to cut ULTIMATE products. With a simple knife – with big "teeth", similar to a "bread" knife, or a cutter with sharp blades – installers will easily succeed to make sharp and clean cut edges to the desired dimensions.

Plate insulation: How to cut the correct width

Depending on the installation methods chosen for insulating the stiffeners, insulation of the plate should be done:

- Firstly for the Quick-Cover system, insulation of the stiffeners should come after
- Secondly for the Wrap installation method , insulation of the stiffeners should come first

The exact "width" of the products to be cut between the stiffeners has to be adapted depending on the density of the product installed on the plate relatively to the thickness and density of the products installed around the stiffeners.

In a general way, we do not recommend to cut standard Rolls 1,2 m wide in two times the average distance between the insulated stiffeners. This method usually leads to big waste due to off-cut and long rolls which are not necessarily the easiest to be installed by one person. This method can be achieved with rolls of special dimensions which can be manufactured on order (please discuss with your ISOVER local representative for more details on such an offer).

In general, standard rolls are cut to the distance necessary for insulating the plate between stiffeners, having then 1,2 m long pieces to install.

For closing of the joints, we recommend to cut a bit of extra width in order to "clamp" the product between the stiffeners.
Due to the outstanding resiliency of ULTIMATE mineral wool, an installation without any gaps or open joints is made possible without additional effort.

Indication of the extra "width" for the products installed on the plate (to be adapted depending on the products installed around the stiffeners)

Density thickness	24 kg/m³ 50 mm	36 kg/m³ 70 mm	56 kg/m³ 70 mm	66 kg/m³ 50 mm	86 kg/m³ 50 mm
Roll	~ +9 mm to +13 mm	~ +7 mm to +11 mm			
Slab	~ +7 mm to +10 mm	~ +6 mm to +9 mm	~ +3/5 mm	~ + 3/5 mm	~ + 3/5 mm

Fixing U SeaProtect products

ULTIMATE products are very easy to fix mechanically on pins with washers. Installers should pay attention not to compress the products too much under the washers to a lower thickness than the one declared, especially for the lighter density products (≤36 kg/m³). ISOVER fire construction certificates are valid only for a given thickness. The installers should pay attention not to "squeeze" the ULTIMATE products due to a too high pressure exerted on the washers.

Steel junctions

According to SOLAS rules, steel connections and intersections may require special treatment in order to reduce the risk of heat transmission.

SOLAS Chap II-2/ Regulation 9/3.4

3.4 In approving structural fire protection details, the Administration shall have regard to the risk of heat transmission at intersections and terminal points of required thermal barriers. The insulation of a deck or bulkhead shall be carried past the penetration, intersection or terminal point for a distance of at least 450 mm in the case of steel and aluminium structures. If a space is divided with a deck or a bulkhead of "A" class standard having insulation of different values, the insulation with the higher value shall continue on the deck or bulkhead with the insulation of the lesser value for a distance of at least 450 mm.

This section applies for all kind of steel junctions: bulkhead and deck connections, terminal points such as corners but as well stiffeners, girders (T-shapes), etc...

The Marine Safety Committee has published in 2004 a circular (**SOLAS MSC/circ. 1120 annex reg. 9.3.4**) with drawings giving the construction details for the most commonly encountered configurations.

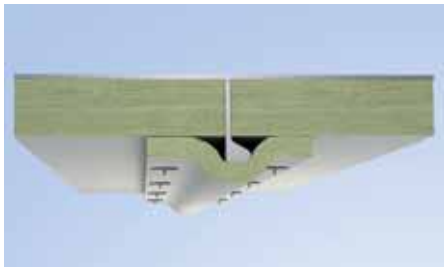
Theoretically, heat transfer from one unexposed surface through the steel structure onto another unexposed surface should go under a minimum of 450 mm of insulation, leading to the installation of additional insulation pieces in key identified areas.

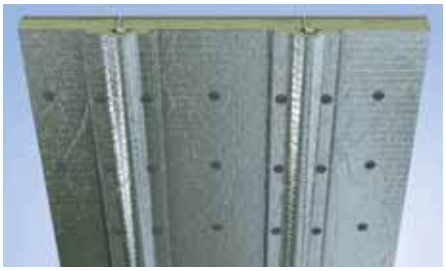
Practically, as it is not possible to give a general design which covers all situations, the exact construction details have to be discussed and validated by the official representative of appointed notified body for the project.
When surveyor will review fire insulation for a specific project, the fire expert may request to install additional insulation pieces according to his judgement of the potential fire hazard of some configurations.

In a first step, we advise our customers having questions regarding interpretation of the SOLAS code section Chap II-2/Registration 9/3.4 to refer to the drawings of the circular 1120 above mentioned.
For specific configurations which may require dedicated discussion for approval by an authorized class society, our customers are welcome to ask for technical advice to the ISOVER Marine & Offshore team.

Quick-Cover system

ULTIMATE products are pliable and can be easily bent on top of stiffeners heads making installation around the stiffeners very fast and easy. This way to install products, called Quick-Cover system, provides very cost-efficient constructions when taking into account the installation costs. We advise our customers to use this unique mounting system whenever possible.





ULTIMATE products have an outstanding flexibility and can be bent on the top head of stiffeners without breaking. Attention should be paid to cut a piece long enough to have a minimum distance ≥30 mm from stiffener to the edge of the piece installed.

Stiffeners: The thinner, the easier to install

In general, we recommend to use slabs products with a thickness ≤30 mm to be bent on top of stiffeners heads.

The thinner the products, the easier they will be to install:

- U SeaProtect Slab 76 20 mm, U SeaProtect Slab 76 25 mm and U SeaProtect Slab 56 30 mm are perfectly adapted for this application

We do not recommend to bend ULTIMATE products with thickness >40mm on top of stiffeners heads.

- U SeaProtect 24 Slab 50 mm, U SeaProtect 24 Roll 50 mm, U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm are consequently not advised for being bent on top of the stiffeners heads: they are too thick

Ability of U SeaProtect products to be bent on top of stiffeners heads					
Density thickness	**24 kg/m³ 50 mm**	**36 kg/m³ 70 mm**	**56 kg/m³ 30 mm**	**76 kg/m³ 20 mm**	**76 kg/m³ 25 mm**
Roll	✖	✖			
Slab	✖	✖	★ ★ ★ ★ ★	★ ★ ★ ★ ★	★ ★ ★ ★ ★

★ ★ ★ ★ ★ *suitable* ✖ *improper use* *not available*

Plate: The thicker, the better the installation

On the plate, we recommend to use ULTIMATE products with an adapted thickness so that it is as close as possible to the top of the head of the stiffeners.

We do not recommend to use the Quick-Cover system when the distance between the top of the head of the stiffener and the insulation of the plate is > 50 mm.

Maximum height of stiffeners that can be insulated					
	Plate product				
Density thickness	**24 kg/m³ 50 mm**	**36 kg/m³ 70 mm**	**56 kg/m³ 70 mm**	**66 kg/m³ 50 mm**	**86 kg/m³ 50 mm**
Maximum height	100 mm	120 mm	120 mm	100 mm	100 mm

Faced products with joints sealed with tape versus unfaced products

We recommend to use faced products (Alu facing, Glass cloth facing or B facing) rather than unfaced products for a better finishing. By sealing the joints with ISOVER SeaProtect Alu Tape or G120 Tape (Glass cloth Tape), no fibres will be in contact with open air on the edges and the joints will be perfectly closed.

ISOVER recommendations for installation

When using the Quick-Cover system, installers should start first with insulation of the plate, then to install the products on top of the stiffeners heads with two pins, one on each side of the stiffeners, leaving a bit of extra length to make sure the distance between the edges of insulation material and the pins is ≥30 mm.

Pins: Two pins on each side of the stiffeners, one additional in the middle of the plate

Depending on the size of the stiffeners relatively to the thickness installed on the plate, the pins have to be located preferentially in different distances from the stiffeners (75 mm - 100 mm or 125 mm maximum recommended). We recommend to use the standard distance of 100 m from pin to stiffener.

According to our certificates, pins can be located at a maximum distance of 150 mm from the stiffener, but we do not recommend to use such a distance as too much material is then used for the stiffeners leading to high material costs.

Pay special attention to pins which should be long enough taking into account the extra thickness of the stiffener's insulation. We recommend to use pins with length between 15 mm to 20 mm higher than the total thickness of the insulation on the plate and stiffener; for example pins which are 110 mm to 115 mm long are required for a Quick-Cover construction using insulation with 70 mm thickness on the plate and 25 mm on the stiffeners.

Depending on the distance between the stiffeners, an additional central pin on the plate can be required.

ISOVER recommends to use the same length of pins all over the construction for simplicity reasons.

Phasing: Insulate the plate in a first step, stiffeners in a second step

In this installation method, the insulation of the plate has to be installed first. The exact "width" of the products to be cut for installation on the plate has to be adapted depending on the density and thickness of the product relatively to the distance between the stiffeners.

For a better closing of the joints, we recommend to cut a bit of extra width in order to "clamp" the product between the insulated stiffeners (see page 114 for more details).

Plate: Cut the correct length

During the installation around the stiffeners, it is crucial that workers pay attention to cut a long enough piece of insulation. If the length of the product cut is too short, then there is a risk that the products will be too much pressed at the top head of the stiffener or that the edges of the piece cut are too close from the pins (minimum distance recommended ≥ 30 mm).

According to fire certificates, the thickness should be kept roughly constant around the stiffeners. You will find indication of length we advise for this method in the table below.

Recommended length to be cut depending on the distance of the pins from stiffeners*					
Stiffener's height	**80 mm**		**100 mm**		**120 mm**
Thickness of insulation installed on the plate	**50 mm**	**70 mm**	**50 mm**	**70 mm**	**70 mm**
Distance of pins from stiffener for optimal installation	75 mm	75 mm	125 mm	100 mm	125 mm
Maximum distance between stiffeners without additional pin on the plate in the middle	450 mm	450 mm	550 mm	500 mm	550 mm
Maximum distance between stiffeners with additional pin on the plate in the middle	750 mm	750 mm	850 mm	800 mm	850 mm
Recommended length to be cut	**250 mm**	**250 mm**	**350 mm**	**300 mm**	**350 mm**
Distance of pins from stiffener fixed to 100 mm	100 mm	100 mm	100 mm	100 mm	100 mm
Maximum distance between stiffeners without additional pin on the plate in the middle	500 mm	500 mm	500 mm	500 mm	500 mm
Maximum distance between stiffeners with additional pin on the plate in the middle	800 mm	800 mm	800 mm	800 mm	800 mm
Recommended length to be cut	**300 mm**	**300 mm**	**300 mm**	**300 mm**	**300mm**

**) In general, any recommendation for installation or technical guidance given by ISOVER Marine & Offshore is purely advisory, based on the best of our knowledge at the time as a product manufacturer. No liability can be derived from there. ISOVER Marine & Offshore reserves the right to change its technical specifications at any time it deems appropriate. For more information, please check our certificates on our websites: www.isover-technical-insulation.com*

"Wrap" installation method

Choose the right product

ULTIMATE products are highly pliable and can be bent around corners or odd shapes without edge breaks. This prevents thermal bridging and guarantees an improved performance of the complete insulation system from fire safety, sound protection and thermal insulation without additional effort. Take the full advantage of this unique property of ULTIMATE when thinking about insulation design and installation.



Stiffeners: The thinner, the easier to install

In general, we recommend to use products with a thickness ≤30 mm maximum 50 mm in slabs format to be "wrapped" around the stiffeners.

The thinner the products, the easier they are to install:

- Preferably choose constructions using U SeaProtect Slab 76 20 mm or 25 mm to U SeaProtect Slab 56 30 mm or thicker products around the stiffeners when possible.

We do not recommend to use ULTIMATE products with a thickness >50 mm to "wrap" them around the stiffeners:

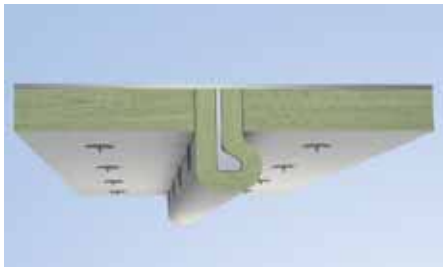
- U SeaProtect Slab 24 50 mm can be used, this solution is to be preferred from installation point of view to U SeaProtect Roll 24 50 mm which is a bit softer
- U SeaProtect Roll 36 70 mm can be used but is a bit too thick for wrapping easily around the stiffeners
- For instance U SeaProtect Slab 36 70 mm is not advised for wrapping around the stiffeners: it is too stiff and too thick

Ability of U SeaProtect products to be wrapped around stiffeners					
Density thickness	**24 kg/m³ 50 mm**	**36 kg/m³ 70 mm**	**56 kg/m³ 30 mm**	**76 kg/m³ 20 mm**	**76 kg/m³ 25 mm**
Roll	★ ★	★			
Slab	★ ★ ★	✖	★ ★ ★ ★ ★	★ ★ ★ ★ ★	★ ★ ★ ★ ★

★ ★ ★ ★ ★ *suitable* ✖ *improper use* *not available*

Faced products versus unfaced

We recommend to use faced products (Alu facing, Glass cloth facing or B facing) rather than unfaced products for a better finishing.




ULTIMATE products have an outstanding flexibility and can be bent at angles up to 180 ° without breaking. This unique property is of particular interest for "wrapping" stiffeners. Attention should be paid to keep a constant thickness especially when using low density products (≤ 46 kg/m³).

ISOVER recommendations for installation*

When using the "wrap" installation method around the stiffeners, we recommend installers to first start with the insulation of the stiffeners, mechanically fixing the insulation with at least two pins – one on each side – and then install the products between the stiffeners with a bit of extra width to clamp the insulation material and perfectly close the joints.

Stiffeners pins: Two pins or more is better

To make the installation easier for one person, we recommend to use at least two pins on the stiffeners (one on each side). It is possible to install our products with only one pin at the top of the stiffeners heads, but this method is less easy to install for a single person without assistance.

The products installed around the stiffeners will be hold in place thanks to the insulation piece that will be installed between the stiffeners afterwards (see next chapter).
You can also use three pins – 1 on the top and 2 on the sides – to better mechanically fix the products around the stiffeners.
All these options are covered by ISOVER MED fire certificates.

Stiffeners: Cut the correct length

During the installation around the stiffeners, it is crucial that workers pay attention to cut a long enough piece of insulation. If the length of the product cut is too short, then there is a risk that the products will be squeezed to make both ends touch on each side the steel plate, resulting in a lower thickness around the stiffeners heads. According to fire certificates, the thickness should be kept roughly constant around the stiffeners.

If the same length is required repeatedly on a large scale for a project, special dimension slabs with a width equal to two times the length required for each stiffener can be manufactured on request to reduce to zero the waste due to off-cut. Installers will then simply have to cut the slabs into two pieces (for more information, please refer to your ISOVER local representative).

		Insulation length recommended to "wrap" the stiffeners*			
Stiffeners solution		Height of stiffeners (Hp Profiles)			
Density	Thickness	80 mm	100 mm	120 mm	140 mm
76 kg/m³	20 mm	**225 mm** +~ 0/5 mm	**260 mm** +~ 0/5 mm	**310 mm** +~ 0/5 mm	**360 mm** +~ 0/5 mm
76 kg/m³	25 mm	**245 mm** +~ 0/5 mm	**275 mm** +~ 0/5 mm	**315 mm** +~ 0/5 mm	**375 mm** +~ 0/5 mm
56 kg/m³	30 mm	**245 mm** +~ 0/5 mm	**280 mm** +~ 0/5 mm	**320 mm** +~ 0/5 mm	**380 mm** +~ 0/5 mm

Stiffeners: Apply and fix the products

If you plan to fix the product wrapped around the stiffener with one pin welded at the top head of the stiffener, then we advise to bend the product symetrically around the stiffener's head with both hands as showed on pictures on top of the page 118. At first, the product will remain partly bent. Then it will be definitely secured in place when the insulation product installed on the plate is fixed.

If you plan to fix the product wrapped around the stiffener with two pins welded on each side of the core of the stiffener, then we advise to first apply the product on the flat side of the stiffener core. Secondly, secure the product in place with a washer and then carefully bend the product around the stiffener's bulkhead. Once completely bent around the stiffener head and applied along the stiffener core on the other side, the insulation product can be secured in place with a second washer.

Plate: Cut the correct width

In this installation method, the insulation of the plate has to be installed on a second step after the insulation of the stiffeners has been achieved. The exact "width" of the products to be cut for installation between the stiffeners has to be adapted depending on the density of the product relatively to the density and the thickness of the products installed around the stiffeners.

For a better closing of the joints, we recommend to cut a bit of extra width in order to "clamp" the product between the insulated stiffeners (see page 114 for more details).

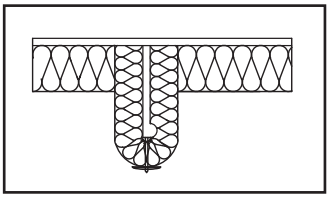
**) In general, any recommendation for installation or technical guidance given by ISOVER Marine & Offshore is purely advisory, based on the best of our knowledge at the time as a product manufacturer. No liability can be derived ther from. ISOVER Marine & Offshore reserves the right to change its technical specifications at any time it deems appropriate. For more information, please check our certificates on our websites: www.isover-technical-insulation.com*

Other installation methods*

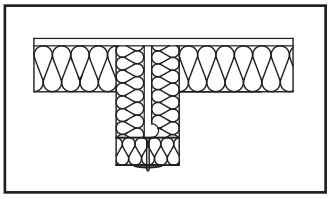
Other installation methods than the one described page 24 are possible for the installation of ULTIMATE products, especially for the "Wrap" and "Box" methods.
All certified mounting methods can be found in the drawings attached in the annexure of ISOVER MED constructions certificates and are downloadable on our website.

You will find below a few examples of alternative mountings, some of them involving the use of fewer pins on the stiffener (only one pin at the top of the stiffeners heads), but requiring more skills to secure the product in place (the product installed around the stiffener will be hold into position thanks to the product installed on the plate in a second step).

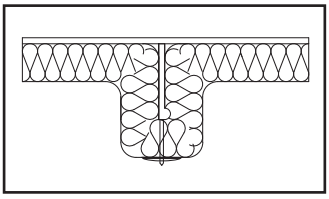
"Wrap"
with one pin on stiffener



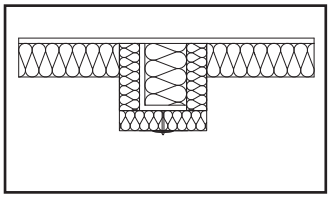
"Box"
with one pin on stiffener



"One layer"
with one pin on stiffener

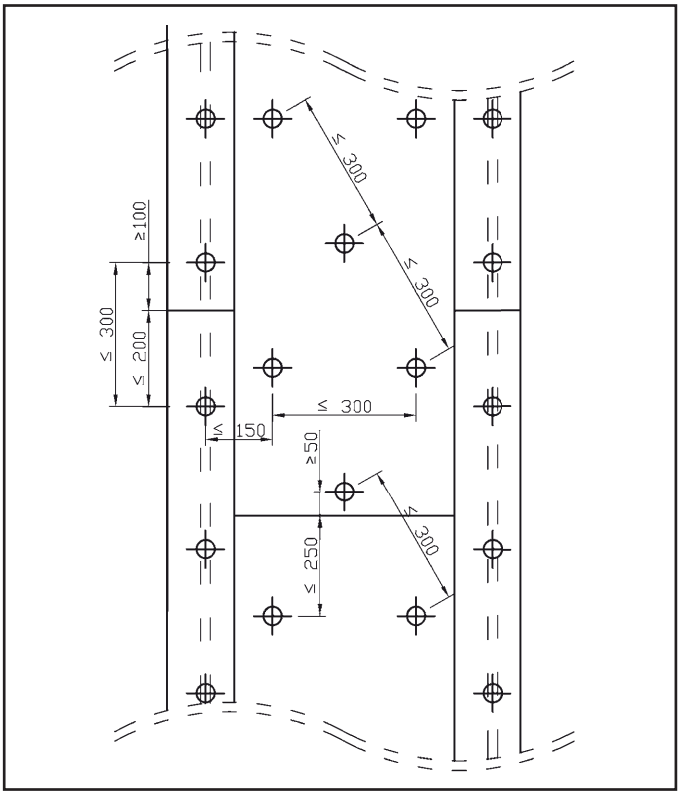


"Box" on a L-shape stiffener
with one pin on stiffener

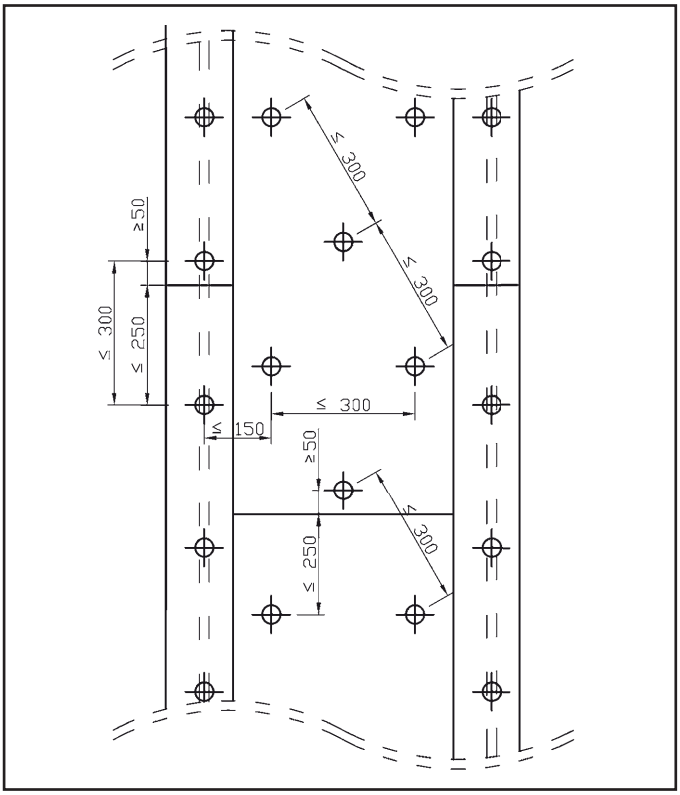


"Diagonal" pin pattern with a distance of 300mm between pins
Possible for all steel constructions certified to FTP code 2010

"Diagonal" pin pattern 300mm for steel Deck constructions



"Diagonal" pin pattern 300mm for steel Bulkhead constructions



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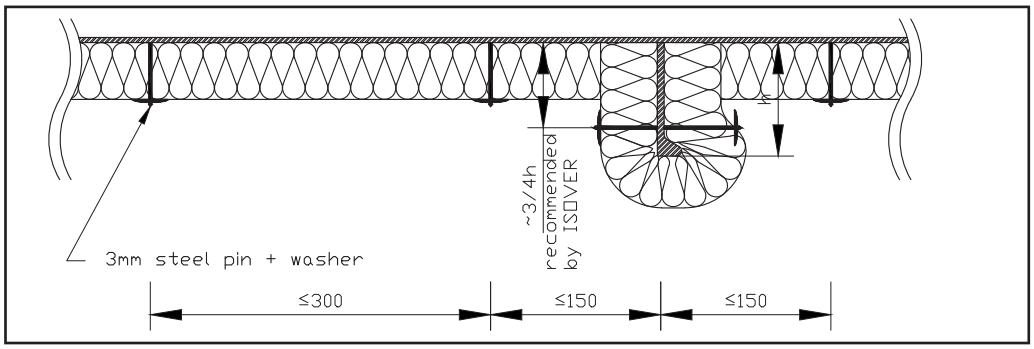
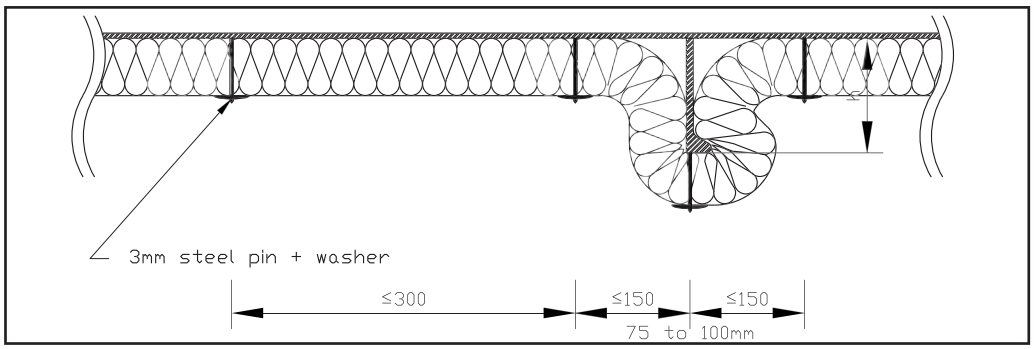
Construction details*

For each ULTIMATE certified construction, ISOVER can provide on request drawings in CAD format (dwg.) giving the details of installation methods for “bulb" profile stiffener (Holland profile “Hp"). These drawings can be downloaded freely on our website http://www.isover-technical-insulation.com in pdf. format. Below are a few examples:

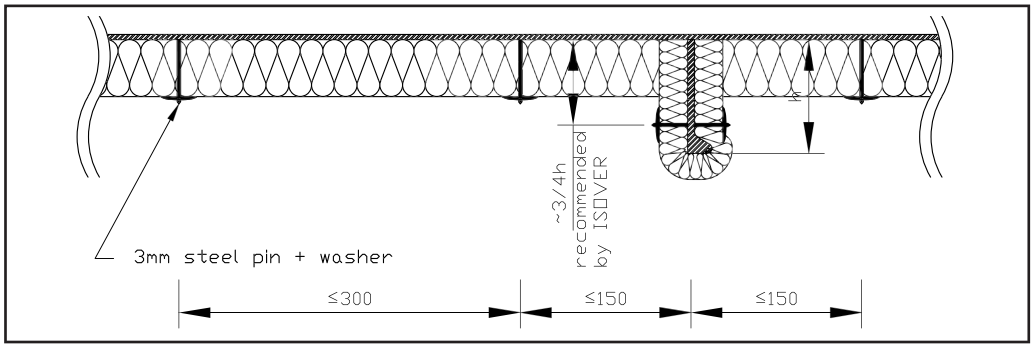
U SeaProtect 24 50 mm on the plate and stiffener using "Wrap" installation method



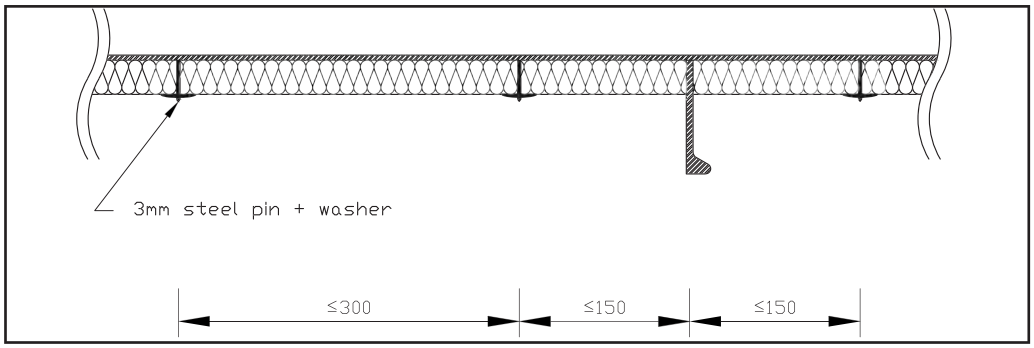
U SeaProtect 24 50 mm on the plate and stiffener using "One layer" installation method



U SeaProtect 24 50 mm on the plate, U SeaProtect 76 25 mm on stiffener using "Wrap" installation method



U SeaProtect 66 30 mm on the plate only (A-15 Bulkhead construction)



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References

Since their launch more than 10 years ago, ULTIMATE lightweight solutions have proven their added value in Marine & Offshore many times. A wide variety of ships and offshore constructions around the world have been equipped with ULTIMATE solutions.

In the last years, ULTIMATE solutions, uniquely manufactured by ISOVER, were supplied to all major shipyards building e.g cruise-ships such as Meyer Werft, Meyer Turku, Fincantieri, Mitsubishi Heavy Industry and STX France.

Quantum of the Seas, Meyer Werft, Germany, 2014, © Michael Wessels / MiWeFotos.de

Natalia Bekker, Abeking & Rasmussen, Germany, 2009

Seabourn Sojourn, Mariotti Yard, Italy, 2010

CSGS Corporal Kaeble V.C., Irving shipyard, Canada, 2012 © Fisheries and Oceans

USS Mount Whitney,Viktor Lenac shipyard, Croatia, 2015

Cecon Excellence, Davie shipyard, Canada, 2014

Piana , Brodogradjevna Industrija Split D.O.O., Croatia, 2011

Sleipner A, Sleipner ÿst Stemning, © ÿyvind Hagen, GLAVA®

U SeaProtect solutions at a glance

Steel Fire constructions

Steel Constructions FTP Code 2010		Sound Reduction Index[2] Rw (C,Ctr) [dB] & U-value [W/m²·K]				
A- Fire Class	Plate	Stiffener				
		U SeaProtect Slab 76 25 mm	U SeaProtect Slab 76 20 mm	U SeaProtect Slab 56 30 mm	Other Possibilities	
A-60 Bulkhead	U SeaProtect Slab 56 70 mm	**49 dB (-2.-7) 0.636**	**/ 0.669**	**48 dB (-2;-7) 0.609**		
	U SeaProtect Slab 86 50 mm	**48 dB (-2;-7) 0.785**				
A-60 Bulkhead (Double Sided)	U SeaProtect Slab 46 30 mm on each side				U SeaProtect Slab 46 30 mm X1 (on the stiffener side)	**45 dB (-1;-5) 0.528**
A-60 Bulkhead Restricted	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	**48 dB (-1;-6) 0.645**			U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	**48 dB (-2;-6) 0.504**
A-30 Bulkhead	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	**48 dB (-1;-6) 0.645**	**49 dB (-3;-7) 0.678**	**/ 0.618**	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	**48 dB (-2;-6) 0.504**
	U SeaProtect Slab 76 40 mm or U SeaProtect Slab 76 20 mm x 2	**/ 0.893**	**47 dB (-2;-6) 0.934**			
A-30 Bulkhead Restricted	U SeaProtect Slab 46 40 mm				U SeaProtect Slab 46 40 mm U SeaProtect Slab 46 30 mm	**/ 0.859** **/ 0.859**
A-15 Bulkhead	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	**47 dB (-2;-6) 0.819**	**46 dB (-1;-5) 0.858**	**/ 0.787**	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	**46 dB (-1;-5) 0.716**
	U SeaProtect Slab 66 30 mm				no insulation around the stiffeners	**45 dB (-1;-5) 2.065**
A-60 Deck	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	**48 dB (-1;-6) 0.645**			U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	**48 dB (-2;-6)**
	U SeaProtect Slab 66 50 mm	**48 dB (-2;-7) 0.785**				
A-15 Deck A-30 Deck	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	**47 dB (-2;-6) 0.819**	**46 dB (-1;-5) 0.858**	**/ 0.787**	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	**46 dB (-1;-5) 0.716**
	U SeaProtect Slab 76 25 mm	**45 dB (-1;-5) 1.154**	**46 dB (-2;-5) 1.199**			
A-15 Deck	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm				no insulation around the stiffeners	**47 dB (-1;-6) 1.475**

Best Comfort Class constructions

Steel Constructions FTP Code 2010				Best Comfort Class constructions				Fire certification
Stiffener	Plate	Weight[4] [kg/m²]	Sound Reduction[2] & U-value[3] [W/m²·K]	+ 2nd Layer on the Plate (Optional)	Total Thickness on the plate [mm]	Weight[4] [kg/m²]	Sound Reduction[2] & U-value[3] [W/m²·K]	
U SeaProtect Slab 76 25 mm	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	**2.53**	**47 dB(-2;-6) 0.819**	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm (2nd layer on top)	**100 mm**	**3.73**	**49 dB (-2;-6) 0.506**	A-15 Bulkhead A-15 Deck A-30 Deck
	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	**3.85**	**48 dB(-1;-6) 0.645**		**120 mm**	**5.05**	**50 dB (-2;-7) 0.429**	A-30 Bulkhead A-60 Bulkhead Restricted A-60 Deck
	U SeaProtect Slab 56 70 mm	**5.25**	**49 dB(-2;-7) 0.636**		**120 mm**	**6.45**	**51 dB (-3;-8) 0.425**	A-60 Bulkhead
	U SeaProtect Slab 66 50 mm	**4.63**	**48 dB(-2;-7) 0.785**		**100 mm**	**5.83**	**50 dB (-3;-8) 0.496**	A-60 Deck (Thin Design)
	U SeaProtect Slab 76 25 mm	**3.23**	**45 dB(-1;-5) 1.154**		**75 mm**	**4.43**	**48 dB (-2;-6) 0.624**	A-15 Deck (Thin Design) A-30 Deck (Thin Design)
	U SeaProtect Slab 76 40 mm or U SeaProtect Slab 76 20 mm x 2	**4.37**	**47 dB(-2.-6) 0.893**		**90 mm**	**5.57**	**/ 0.543**	A-30 Bulkhead (Thin Design)
	U SeaProtect Slab 86 50 mm	**5.63**	**48 dB(-2;-7) 0.785**		**100 mm**	**6.83**	**50 dB (-2;-8) 0.496**	A-60 Bulkhead (Thin Design)

Standard Design

Light weight and Easy Logistics. 4 products to cover all Steel A-Fire Classifications, it is all what it takes.

The latest lighter weight ULTIMATE solutions for Steel constructions, simple from logistics point of view.

STEEL	Plate [1]	Stiffener [1]	Weight [2]	Sound Reduction [3]	U-value [4]
	Products	Products	[kg/m²]	Rw (C,Ctr)	[W/m²·K]
A-15 Bulkhead	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	U SeaProtect Slab 76 25 mm	**2.53**	**47 dB (-2;-6)**	**0.819**
		U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	**2.04**	**46 dB (-1;-5)**	**0.716**
A-30 Bulkhead A-60 Bulkhead Restricted	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	**4.28**	**48 dB (-2;-6)**	**0.504**
		U SeaProtect Slab 76 25 mm	**3.85**	**48 dB (-1;-6)**	**0.645**
A-60 Bulkhead	U SeaProtect Slab 56 70 mm	U SeaProtect Slab 76 25 mm	**5.25**	**49 dB (-2;-7)**	**0.636**
A-15 Deck A-30 Deck	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	U SeaProtect Slab 76 25 mm	**2.53**	**47 dB (-2;-6)**	**0.819**
		U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	**2.04**	**46 dB (-1;-5)**	**0.716**
A-60 Deck	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	**4.28**	**48 dB (-2;-6)**	**0.504**
		U SeaProtect Slab 76 25 mm	**3.85**	**48 dB (-1;-6)**	**0.645**

Thin Design

Thin Solutions between and around the stiffeners.

The solutions below help to solve problems related to space constrains which can be critical when designing a ship.

STEEL	Plate [1]	Stiffener [1]	Weight [2]	Sound Reduction [3]	U-value [4]
	Products	Products	[kg/m²]	Rw (C,Ctr)	[W/m²·K]
A-15 Bulkhead	U SeaProtect Slab 66 30 mm	no insulation around stiffeners	**1.98**	**45 dB (-1;-5)**	**2.065**
A-30 Bulkhead Restricted	U SeaProtect Slab 46 40 mm	U SeaProtect Slab 46 30 mm	**2.81**	**/**	**0.859**
A-30 Bulkhead	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	U SeaProtect Slab 76 20 mm	**3.58**	**49 dB (-3;-7)**	**0.678**
	U SeaProtect Slab 76 40 mm or U SeaProtect Slab 76 20 mmX2	U SeaProtect Slab 76 20 mm	**4.10**	**47 dB (-2;-6)**	**0.934**
		or U SeaProtect Slab 76 25 mm	**4.37**	**/**	**0.893**
A-60 Bulkhead	U SeaProtect Slab 56 70 mm	U SeaProtect Slab 76 20 mm	**4.98**	**/**	**0.669**
	U SeaProtect Slab 86 50 mm	U SeaProtect Slab 76 25 mm	**5.63**	**48 dB (-2;-7)**	**0.785**
A-15 Deck	U SeaProtect Slab 36 70 mm or U SeaProtect Roll 36 70 mm	no insulation around stiffeners	**2.52**	**47 dB (-1;-6)**	**1.475**
A-15 Deck A-30 Deck	U SeaProtect Slab 24 50 mm or U SeaProtect Roll 24 50 mm	U SeaProtect Slab 76 20 mm	**2.26**	**46 dB (-1;-5)**	**0.858**
	U SeaProtect Slab 76 25 mm	U SeaProtect Slab 76 20 mm	**2.96**	**46 dB (-2;-5)**	**1.199**
		or U SeaProtect Slab 76 25 mm	**3.23**	**45 dB (-1;-5)**	**1.154**
A-60 Deck	U SeaProtect Slab 66 50 mm	U SeaProtect Slab 76 25 mm	**4.63**	**48 dB (-2;-7)**	**0.785**

1) All U SeaProtect products are available for each construction with different facings approved by a recognized test laboratory (Alu facing Alu1, Glass cloth facings G120, G220, G420, B facing, etc...). The different types of facings do not influence Sound Reduction and Thermal performance (U-Values).

2) For more details on the geometry and measurement conditons of the Sound reduction performance, please refer to page 39.

3) All U-values have been calculated using a 3D Thermal Calculation model. For more details on this, refer to page 80. The U-values are given for 1 m² "seen" from the flat side ("projected area").

4) Estimation of the weight for the complete solution is based on the surface ratio traditionally used in Marine industry of 1 for the plate part and 0,7 for the stiffener. The weight in kg/m² is given for 1 m² "seen" from the flat side ("projected area").

U SeaProtect in the makers list

Defining ULTIMATE mineral wool

Lightweight thermo-acoustics and fire protection solutions made out of a shot free, high temperature resistant mineral wool (ULTIMATE). The fibers of the mineral wool products should be:

- manufactured by an extrusion process using an horizontal spinner turning at high speed and leading to shot content of the final solutions ≤1 % of the total mass
- be certified as non-harmful to health according to EUCEB and RAL standards.

Properties of ULTIMATE mineral wool products								
Density (maximum)	**kg/m³**	**24**	**36**	**46**	**56**	**66**	**76**	**86**
Thermal conductivity (10 °C)	**W/m·K**	≤ 0.034	≤ 0.032	≤ 0.031	≤ 0.031	≤ 0.031	≤ 0.031	≤ 0.031
Airflow resistivity	**kPa·s·m⁻²**	≥ 15	≥ 30	≥ 45	≥ 50	≥ 60	≥ 80	≥ 90
Young Modulus	**kPa**	≥ 10	≥ 15	≥ 15	≥ 20	≥ 20	≥ 25	≥ 50
Open porosity	**–**	≥ 0.99	≥ 0.98	≥ 0.98	≥ 0.98	≥ 0.97	≥ 0.97	≥ 0.96

Main characteristics of the U SeaProtect solutions

- have been fire tested in a Marine approved laboratory located in Europe according to FTP Code 2010.
- meet the following criteria on weight and thermal performance:

Plate solution for Bulkhead:

A-60 • ≤ 4.0 kg/m² in a thickness ≤ 70mm with a U-value ≤ 0.440 W/m²·K
• ≤ 4.4 kg/m² in a thickness ≤ 50mm with a U-value ≤ 0.580 W/m²·K

A-30 • ≤ 2.6 kg/m² in a thickness ≤ 70mm with a U-value ≤ 0.450 W/m²·K

A-15 • ≤ 1.3 kg/m² in a thickness ≤ 50mm with a U-value ≤ 0.620 W/m²·K
• ≤ 2.0 kg/m² in a thickness ≤ 30mm with a U-value ≤ 0.860 W/m²·K and no additional solution installed around the stiffener

Plate solution for Deck:

A-60 • ≤ 2.6 kg/m² in a thickness ≤ 70 mm with a U-value ≤ 0.450 W/m²·K
• ≤ 3.4k g/m² in a thickness ≤ 50 mm with a U-value ≤ 0.580 W/m²·K

A-30 • ≤ 1.2 kg/m² in a thickness ≤ 50 mm with a U-value ≤ 0.620 W/m²·K
• ≤ 2.0 kg/m² in a thickness ≤ 25 mm with a U-value ≤ 0.985 W/m²·K

A-15 • ≤ 2.6 kg/m² in a thickness ≤ 70 mm with a U-value ≤ 0.450 W/m²·K and no additional solution installed around the stiffener

Around the stiffeners:

- ≤ 1.55 kg/m² in a thickness ≤ 20 mm with a U-value ≤ 1.150 W/m²·K
- ≤ 1.95 kg/m² in a thickness ≤ 25 mm with a U-value ≤ 0.985 W/m²·K
- ≤ 1.75 kg/m² in a thickness ≤ 30 mm with a U-value ≤ 0.860 W/m²·K
- ≤ 1.20 kg/m² in a thickness ≤ 50 mm with a U-value ≤ 0.620 W/m²·K

- are able to justify a global Sound reduction index performance (Rw) based on measurement made in an acoustics laboratory according to ISO 15186-1:2000 (Rw values given for tests carried on a 6 mm thick steel plate):
  - ≥ 47 dB with a thickness ≤ 50 mm on the plate and ≤ 25 mm around the stiffeners
  - ≥ 48 dB with a thickness ≤ 70 mm on the plate and ≤ 25 mm around the stiffeners
  - ≥ 49 dB with a thickness ≤ 100 mm on the plate and ≤ 25 mm around the stiffeners
  - ≥ 50 dB with a thickness ≤ 120 mm on the plate and ≤ 25 mm around the stiffeners

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For further information and contact details, please visit our website at: www.isover-technical-insulation.com or contact your local ISOVER organization.

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