

AN ACOUSTIC AND THERMAL SOLUTION

ArmaSound Industrial Systems AG

Combining **ArmaGel**® thermal insulation and noise reduction into a single modular solution, ArmaSound Industrial Systems offer innovative noise control solutions to use in oil and gas, petrochemical and industrial applications.

www.armacell.com/energy



Contact us:
acoustic.services@armacell.com



armacell
ArmaSound®

INTEGRATED ACOUSTIC AND THERMAL SOLUTION.

INNOVATION

ArmaGel based ArmaSound Industrial Systems are a continuation of the ArmaFlex and ArmaSound based insulation systems pioneered by Armacell.

These noise control systems minimise CUI and provide a combined thermal insulation and noise reduction in a single solution. Additionally, significant savings can be achieved through reduced installation time and lower maintenance costs.

High acoustic insertion loss is combined with minimal insulation thickness and proven project performance, worldwide. Armacell's standard systems meet ISO 15665 classifications and bespoke solutions are available.

Proven performance, installed on Energy projects worldwide.

Sound performance



Thermal performance



Reduces risk of CUI



[Learn more](#)

ARMASOUND INDUSTRIAL SYSTEMS AG

ArmaSound Industrial Systems comprise several combinations of ArmaGel and ArmaSound barrier to provide combined thermal and acoustic benefits. Various cladding materials (metal or glass-reinforced plastic cladding) can be used. ArmaSound Industrial Systems provide significant noise reduction for all process pipework typically used in the energy destination market.

OTHER ARMASOUND INDUSTRIAL SYSTEMS

ArmaSound Industrial Systems are also available as ArmaFlex based systems and for equipment noise control. Where fixed acoustic insulation is not desirable, our ArmaGel based removable ArmaSound Industrial Systems are the ideal solution. Please visit our website or contact us for more information.



FEATURES & BENEFITS



While each of the individual insulation materials used in our acoustic insulation systems comes with its own set of features and benefits, superior performance is achieved when optimally engineered together.

We innovate and focus on materials and systems that deliver superior performance.

// Designed to deliver

We have developed a dedicated range of industrial materials meeting the demanding requirements of the oil and gas, petrochemical and power plant sectors.

// Lifetime performance

Resistance to water plus an optimal system design delivers long-term predictable thermal and acoustic stability and enhanced process performance.

// Two in one

Our insulation materials combine thermal and acoustic performance and can also be engineered with traditional insulation materials for specific demands.

// Training and technical support

Our team of technical experts support operators, engineers and contractors in optimising the value gained from using our insulation systems. We can offer a reliable technical service at every stage of your project.

Flexible, thinner and lighter systems. Easy maintenance. Connecting your business with lower lifecycle costs.

// Reduce space and weight

Up to 85% reduced thickness for improved space efficiency and a smaller plant footprint, reduced supporting steel work and weight. Fewer layers of material are required with lower installation costs.



// Straightforward installation

Our flexible insulation materials are easy and quick to install and fabricate, leading to reduced installation time and costs. They also fit better reducing rework and wastage.

// Protect workers and the environment from noise

ArmaGel based ArmaSound Industrial Systems offers enhanced protection for workers and the surrounding environment from plant noise.

Mitigate the spread of Corrosion Under Insulation (CUI). Best-in-class noise reduction.

// Reduce the risk of CUI

Our hydrophobic ArmaGel insulation materials are proven to reduce the onset and spread of CUI.

// Prevent moisture ingress

ArmaGel is designed to resist the passage of liquid moisture from the outside of the pipe to the surface but is breathable to allow liquid vapour to escape from the pipe surface. This technology has been proven to resist CUI.

// Reduce the risk of water trapped at the pipe surface

Flexible materials and well performed application techniques means a better fit around complex parts and no voids between insulation and pipe, where water could otherwise collect with rigid or less flexible materials.

// Eliminate the risk of galvanic corrosion

Systems qualified with GRP jacketing eliminates the opportunity for galvanic corrosion.

// Noise Reduction

Our technical acoustic insulation systems meet ISO15665 classifications and offer superior noise mitigation compared to traditional systems.

The ArmaSound Industrial Systems are Armacell's answer to true innovation for the oil and gas, petrochemical and power plant markets.

PROVEN PERFORMANCE

ArmaSound Industrial Systems are tested by recognised institutes and satisfy - and in many cases exceed - the requirements of the main standards on noise control, such as ISO 15665 Class A to Class D and Shell DEP 31.46.00.31 Class D specification, NORSOK standard M-004 Class 6, 7 and 8 and ASTM E1222.

ArmaSound in practice: acoustic treatment of plants

The graphics below illustrate typical noise levels and potential noise reduction around a gas processing plant without acoustic treatment (fig. 1) and with ArmaSound Industrial Systems acoustic treatment (fig. 2).

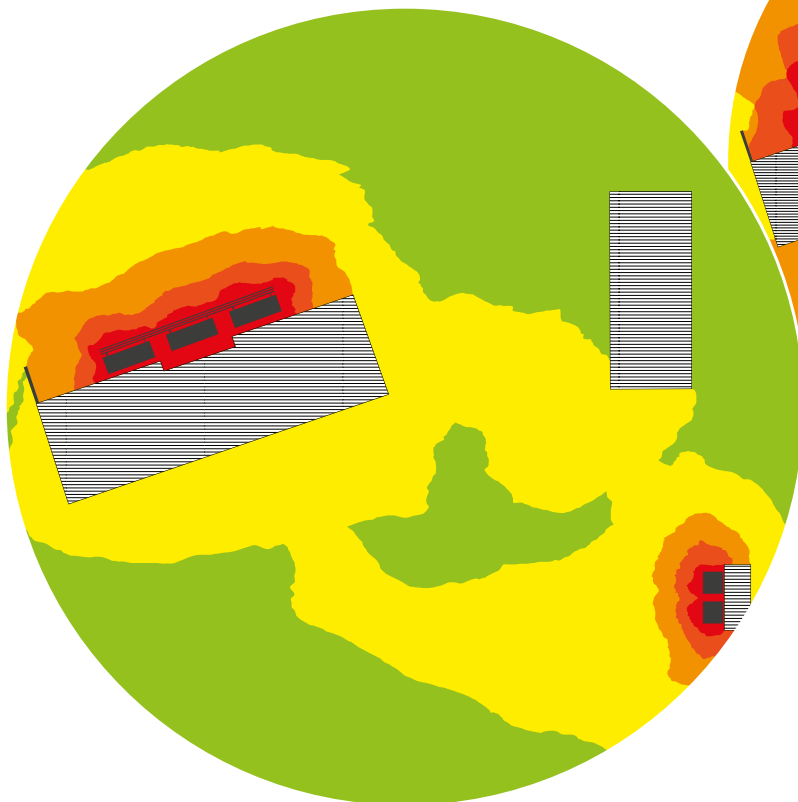


Fig 2: Acoustically treated plant

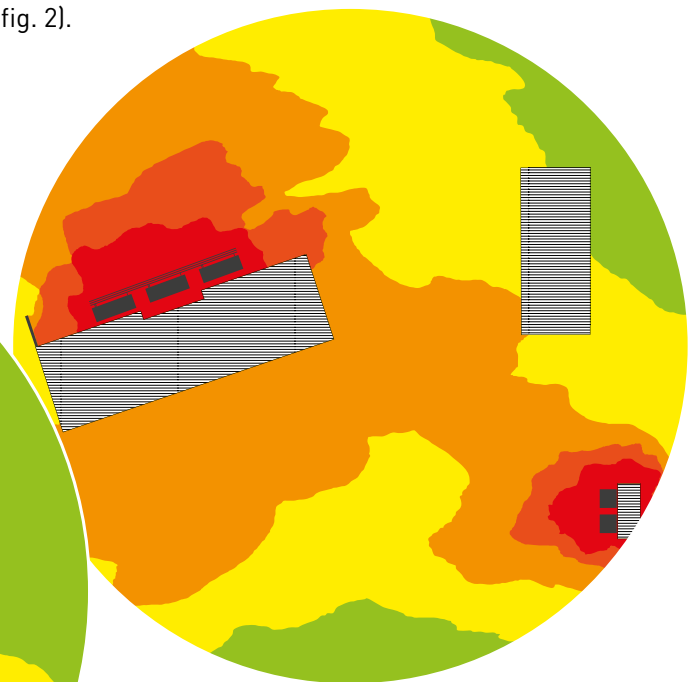
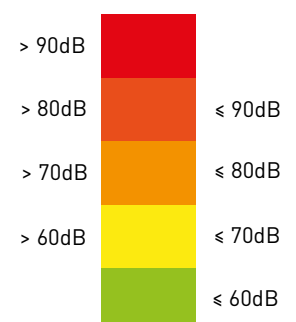


Fig 1: Acoustically untreated plant

Noise levels in dB.

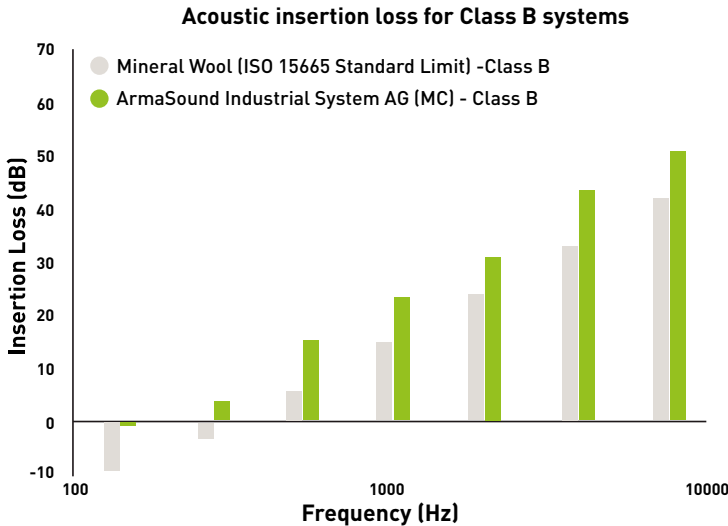


Caring about Health, Safety & Environment

Reduced noise levels are inherently beneficial for the environment. The impact of noise from industrial plants has significant effects on health, safety and the environment. Noise induced hearing loss, compromised communication, loss of amenity and detrimental effects on wildlife are all consequences of a noisy plant. Using our ArmaSound Industrial Systems help noise attenuation in valves and pipework and should be a cornerstone in any plants' noise reduction strategy.



PERFORMANCE DELIVERED



EXCELLENT RESULTS

Class-based classification requires that a system design meets or exceeds the performance of a traditional mineral wool-based acoustic system. All ArmaSound Industrial Systems configurations meet the classifications of ISO 15665.

The enhanced low frequency performance means that in many cases a lower class of ArmaSound Industrial System can be recommended as a thinner, lighter, lower-cost alternative to a higher class of mineral wool-based acoustic system.

Learn more: [our services](#)

Efficient and practical engineering solutions for your acoustic and insulation challenges:

- Acoustic surveys / system design
- Specification support
- Insulation thickness tables
- TIPCHECK energy audit
- Bespoke proof-point testing
- System optimisation
- MTO - Material Take-Offs
- Technical training
- Mock up and trial installation
- Installation instructions
- Application training
- Inspection and site support

ACOUSTIC PERFORMANCE

Acoustic Standard ISO 15665 is an international standard that defines the acoustic performance of pipe insulation. This performance is categorised into classes A, B, C and D* based on measured acoustic insertion loss.

Furthermore, it defines a standardised test method for measuring the acoustic performance of any type of construction, thereby allowing existing and new insulation constructions to be rated against the specific classes.

Insulation systems are classified by their acoustic insertion loss performance and the diameter of pipe onto which they are applied. The standard allows noise control engineers to select the correct insulation system during the design stage in order to ensure that specified noise targets are met. ISO 15665 allows for any acoustic system configuration to be qualified providing that it meets the acoustic insertion loss requirements.

ISO 15665 classification table and Shell DEP Class D				Octave band centre frequency (Hz)						
Class	Nominal pipe diameter D (mm)		125	250	500	1000	2000	4000	8000	
	Lower limit	Upper limit	Minimum insertion loss (dB)							
A	A1	-	< 300	-4	-4	2	9	16	22	29
	A2	≥ 300	< 650	-4	-4	2	9	16	22	29
	A3	≥ 650	< 1,000	-4	2	7	13	19	24	30
B	B1	-	< 300	-9	-3	3	11	19	27	35
	B2	≥ 300	< 650	-9	-3	6	15	24	33	42
	B3	≥ 650	< 1,000	-7	2	11	20	29	36	42
C	C1	-	< 300	-5	-1	11	23	34	38	42
	C2	≥ 300	< 650	-7	4	14	24	34	38	42
	C3	≥ 650	< 1,000	1	9	17	26	34	38	42
D*	D2	≥ 300	< 650	-3	4	15	36	45	45	45
	D3	≥ 650	< 1,000	3	9	26	36	45	40	40

*Class D is also classified according to the Shell DEP 31.46.00.31 specification.

ArmaSound calculated broadband insertion loss

For typical industrial plants, measured calculated broadband insertion loss (noise reduction) of ArmaSound Industrial Systems is often higher than the minimum required in ISO 15665.

See noise reduction prediction comparison in the table below:

Typical Noise Reduction dB(A)

ISO 15665 Specification / Performance

ISO 15665 - Class A2

ArmaSound Industrial System AG (MC) A2

ISO 15665 - Class B2

ArmaSound Industrial System AG (MC) B2

ISO 15665 - Class C2

ArmaSound Industrial System AG (MC) C2

ISO 15665 & Shell DEP - Class D2

ArmaSound Industrial System AG (MC) D2

Based on ISO 15665 calculations.

Legend:

AG ArmaGel
MC Metal Cladding

Control Valve	Centrifugal Compressor	Centrifugal Pump	Reciprocating Compressor
14	10	4	5
23	19	11	12
18	13	5	6
23	19	11	12
24	20	10	10
28	23	14	15
27	22	12	13
30	26	15	16

ISO 15665 and SHELL DEP values for Classes A2, B2, C2 and D2 are based on mineral wool and metal jacketing.

ARMASOUND INDUSTRIAL SYSTEMS AG (MC): SOUND DECOUPLING, ABSORPTION AND BARRIER IN ONE.

// ArmaGel: sound decoupling and absorption

With excellent thermal properties, ArmaGel HT & ArmaGel DT are hydrophobic and repel water. They mitigate the risk of CUI and are utilised for low to mid temperature (DT: -180 °C to +250 °C) and high temperature (HT: 0 °C to +650 °C). As part of the acoustic system, ArmaGel layers are a key element for effective acoustic decoupling (isolation) and sound absorption. The low dynamic stiffness and inherent damping of ArmaGel provide excellent acoustic system performance across a wide frequency range.

// ArmaSound Barrier E: efficient sound barrier

ArmaSound Barrier E is a vinyl sound barrier mass loaded with naturally occurring minerals. The product is free of lead, unrefined aromatic oils and bitumen. With its high density, it combines minimum thickness with an excellent reduction of the transmission of air-borne sound while enhancing the overall insertion loss performance of pipe insulation system.

SUMMARY

ARMASOUND INDUSTRIAL SYSTEMS AG (MC)

Acoustic classification is rated A through D for increasing insertion loss requirements according to ISO 15665/ASTM E1222 and Shell DEP 31.46.00.31.



Acoustic class	A1 & A2	A3	B1 & B2	B3
Minimum ArmaGel Thickness	10mm	20mm	10mm	30mm
Total Mass per unit Area of Barrier	10kg/m ²	10kg/m ²	10kg/m ²	5kg/m ²
Total Thickness of Acoustic System	14.5mm	24.5mm	14.5mm	32.5mm
Total Mass per unit Area of Acoustic System	13.4 kg/m ²	15.4 kg/m ²	13.4 kg/m ²	12.4 kg/m ²

A. Classification: Numbers 1 through 3 represent the pipe size:

- "1" for pipes below DN300 (12 in./300mm)
- "2" for pipes between DN300 and DN650 (12 in./300mm. to 26 in./650mm.)
- "3" for pipes greater than DN650 (26 in./650mm.)

Note 1: All systems meet ISO 15665/ASTM E1222/Shell DEP Insertion Loss classification from lowest to highest listed – e.g. ArmaSound Industrial Systems AG (MC) Class C2 meets Class A2, B2 and C2.

Note 2: ISO15665 and Shell DEP 31.46.00.31 do not have a Class D1

B. ArmaSound Barrier E (ASBE) can be applied in multiple layers as long as the mass is equivalent

C. Metal jacketing must have a mass per unit area $\geq 1.4\text{kg/m}^2$ (0.29 psf)



Sheet Metal Jacket
ArmaSound Barrier E
ArmaGel Blanket

Additional thermal layers (if required) to be installed below the acoustic system

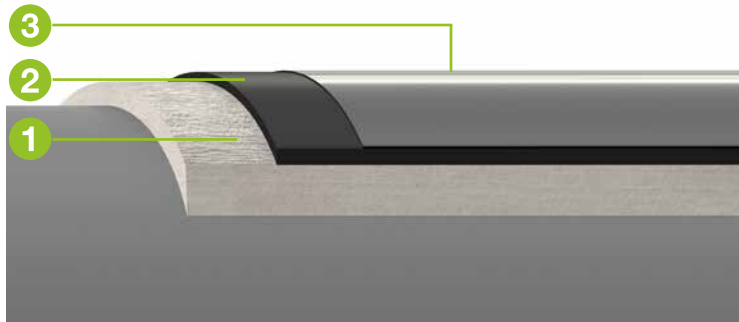
Metal Substrate

C1 & C2	C3	Shell D2	Shell D3	Acoustic class
30mm	50mm	50mm	70mm	Minimum ArmaGel Thickness
15kg/m ²	15kg/m ²	20kg/m ²	20kg/m ²	Total Mass per unit Area of Barrier
36.5mm	56.5mm	58.5mm	78.5mm	Total Thickness of Acoustic System
22.4 kg/m ²	26.4 kg/m ²	31.4 kg/m ²	35.4 kg/m ²	Total Mass per unit Area of Acoustic System

THE COMPONENT

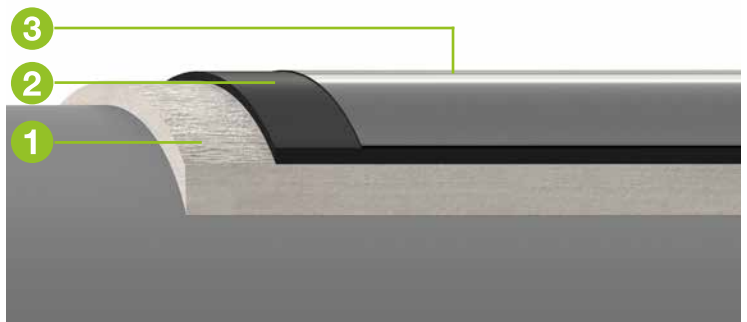
ARMASOUND INDUSTRIAL SYSTEMS AG (MC)

CLASS A | AG (MC) - CLASS A2 & B2



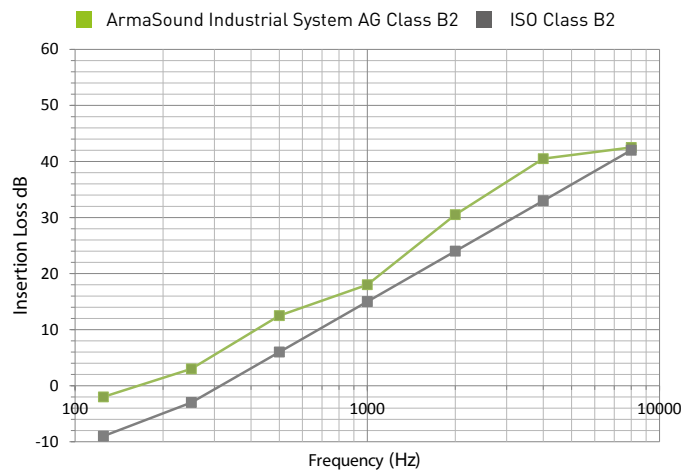
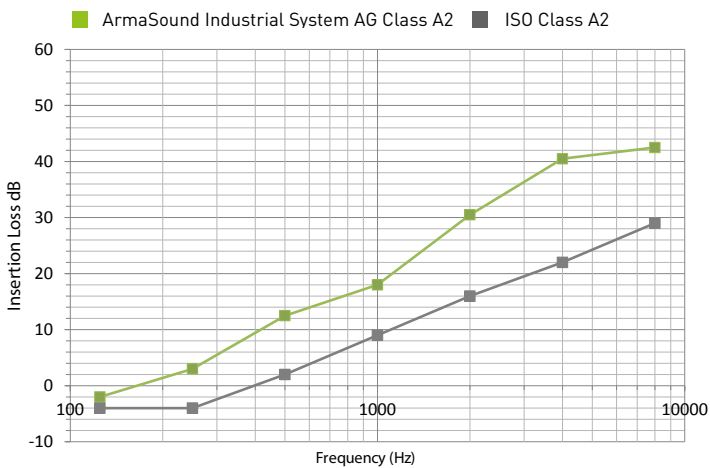
- 1 ArmaGel 10 mm
- 2 ArmaSound Barrier E 4 mm
- 3 Aluminium 0.5 mm

CLASS B | AG (MC) - CLASS -A2 & B2



- 1 ArmaGel 10 mm
- 2 ArmaSound Barrier E 4 mm
- 3 Aluminium 0.5 mm

Test results acc. to ISO 15665



Test results Class A2	Octave band centre frequency Hz						
	125	250	500	1000	2000	4000	8000
Insertion loss, dB	-2.0	3.0	12.5	18.0	30.5	40.5	42.5
ISO 15665 Class A2, dB	-4.0	-4.0	2.0	9.0	16.0	22.0	29.0

Total thickness (mm): 14.5
Total weight, flat (kg/m²): 13.4

Test results Class B2	Octave band centre frequency Hz						
	125	250	500	1000	2000	4000	8000
Insertion loss, dB	-2.0	3.0	12.5	18.0	30.5	40.5	42.5
ISO 15665 Class B2, dB	-9.0	-3.0	6.0	15.0	24.0	33.0	42.0

Total thickness (mm): 14.5
Total weight, flat (kg/m²): 13.4

NTS

ArmaSound Industrial Systems AG (MC) are based on ArmaGel with metal cladding.

Classification:

- Systems A, B and C according to ISO 15665
- System D according to ISO15665 and Shell DEP 31.46.00.31-Gen. specification

Conditions:

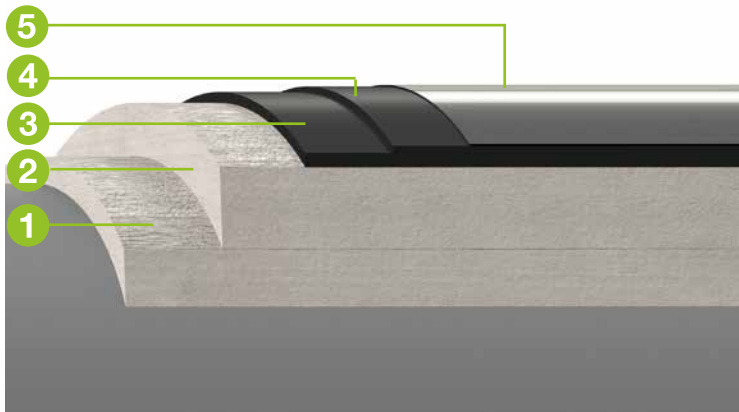
Test results for nominal pipe-Ø: from 300mm to 650mm.

Weight and thickness based on typical values.

All data and technical information are based on results achieved under typical application conditions. For each component the thickness in [mm] is provided.

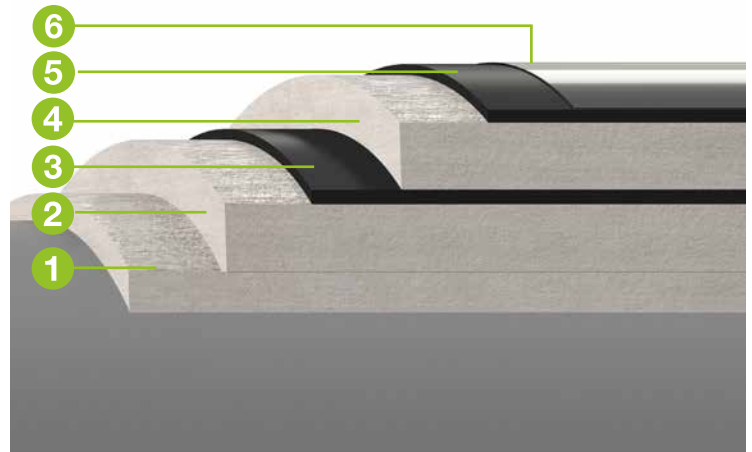
Note: Constructions to meet ISO 15665 and Shell DEP#31 classifications for Acoustic Insertion Loss for pipes between 300 and 650mm diameter.

CLASS C | AG (MC) - CLASS C2



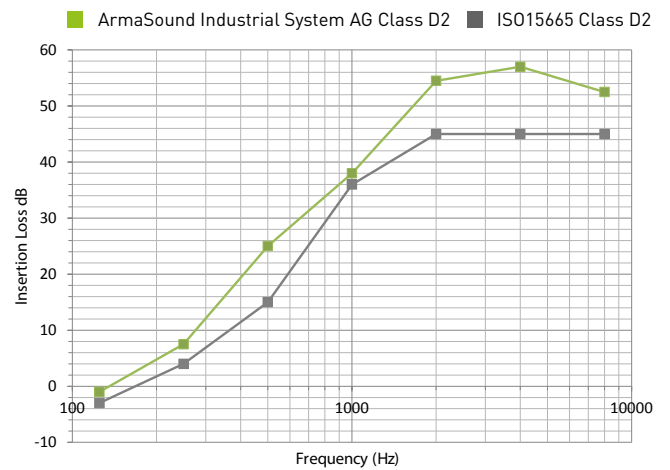
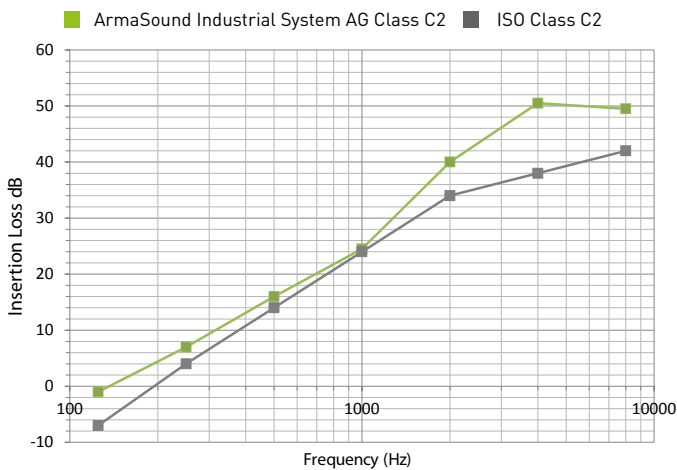
1	ArmaGel	10 mm	4	ArmaSound Barrier E	2 mm
2	ArmaGel	20 mm	5	Aluminium	0.5 mm
3	ArmaSound Barrier E	4 mm			

CLASS D | AG (MC) - CLASS D2



1	ArmaGel	10 mm	4	ArmaGel	20 mm
2	ArmaGel	20 mm	5	ArmaSound Barrier E	4 mm
3	ArmaSound Barrier E	4 mm	6	Aluminium	0.5 mm

Test results acc. to ISO15665 & Shell DEP 31.46.00.31-Gen.



Test results	Octave band centre frequency Hz						
	125	250	500	1000	2000	4000	8000
Class C2							
Insertion loss, dB	-1.0	7.0	16.0	24.5	40.0	50.5	49.5
ISO 15665 Class C2, dB	-7.0	4.0	14.0	24.0	34.0	38.0	42.0

Total thickness (mm): 36.5
Total weight, flat (kg/m²): 22.4

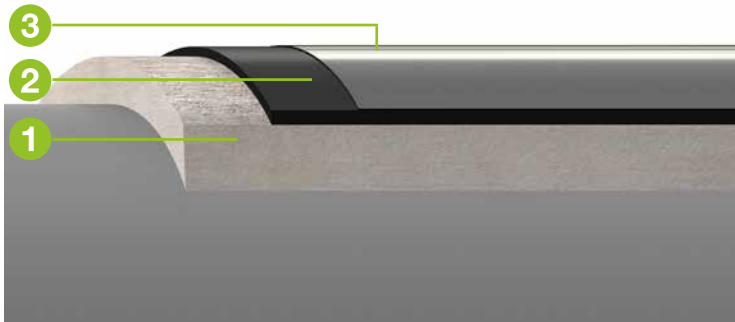
Test results	Octave band centre frequency Hz						
	125	250	500	1000	2000	4000	8000
Class D2							
Insertion loss, dB	-1.0	7.5	25.0	38.0	54.5	57.0	52.5
ISO 15665 Class D2, dB	-3.0	4.0	15.0	36.0	45.0	45.0	45.0

Total thickness (mm): 58.5
Total weight, flat (kg/m²): 31.4

THE COMPONENT

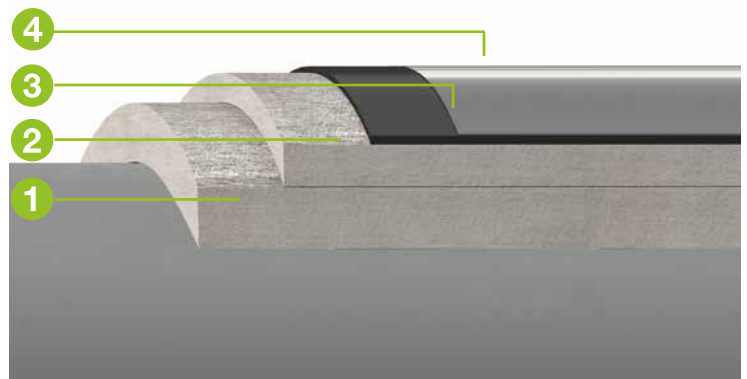
ARMASOUND INDUSTRIAL SYSTEMS AG (MC)

CLASS A | AG (MC) - CLASS A3



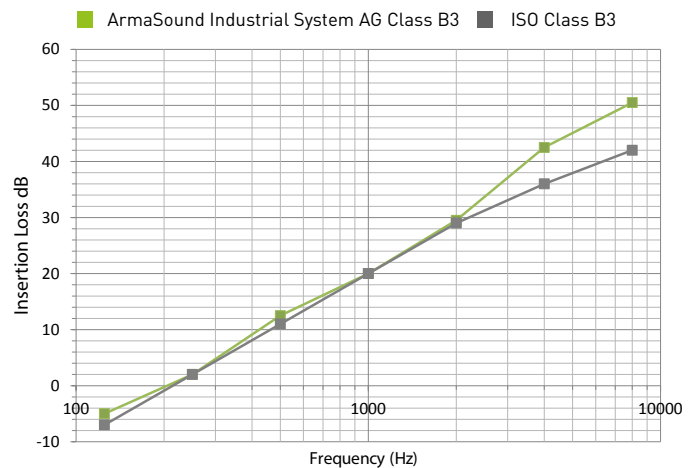
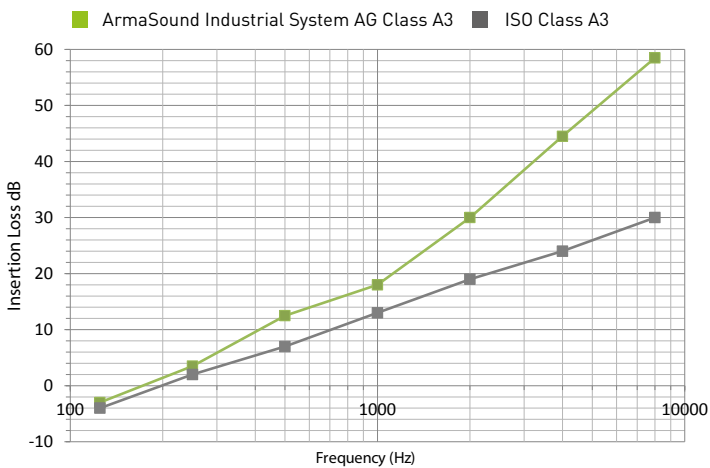
- 1 ArmaGel 20 mm
- 2 ArmaSound Barrier E 4 mm
- 3 Aluminium 0.5 mm

CLASS B | AG (MC) - CLASS B3



- 1 ArmaGel 20 mm
- 2 ArmaGel 10 mm
- 3 ArmaSound Barrier E 2 mm
- 4 Aluminium 0.5 mm

Test results acc. to ISO 15665



Test results Class A3	Octave band centre frequency Hz						
	125	250	500	1000	2000	4000	8000
Insertion loss, dB	-3.0	3.5	12.5	18.0	30.0	44.5	58.5
ISO 15665 Class A3, dB	-4.0	2.0	7.0	13.0	19.0	24.0	30.0

Total thickness (mm): 24.5
Total weight, flat (kg/m²): 15.4

Test results Class B3	Octave band centre frequency Hz						
	125	250	500	1000	2000	4000	8000
Insertion loss, dB	-5.0	2.0	12.5	20.0	29.5	42.5	50.5
ISO 15665 Class B3, dB	-7.0	2.0	11.0	20.0	29.0	36.0	42.0

Total thickness (mm): 32.5
Total weight, flat (kg/m²): 12.4

NTS

ArmaSound Industrial Systems AG (MC) are based on ArmaGel with metal cladding.

Classification:

- Systems A, B and C according to ISO 15665
- System D according to ISO15665 & Shell DEP 31.46.00.31-Gen. specification

Conditions:

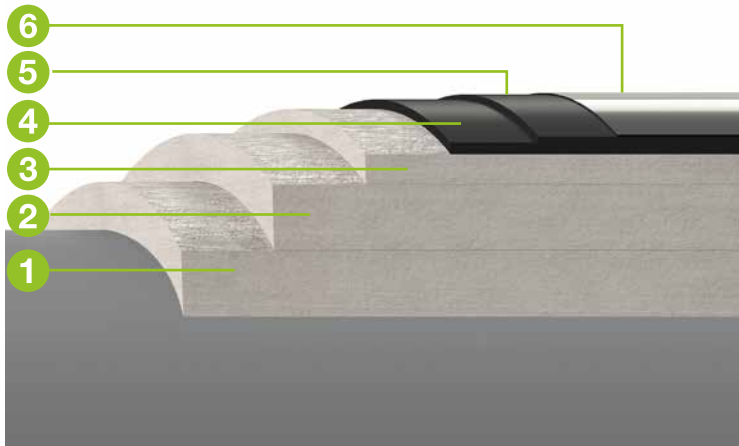
Test results for nominal pipe-Ø: from 650mm to 1000mm.

Weight and thickness based on typical values. All data and technical information are based on results achieved under typical application conditions.

For each component the thickness in [mm] is provided.

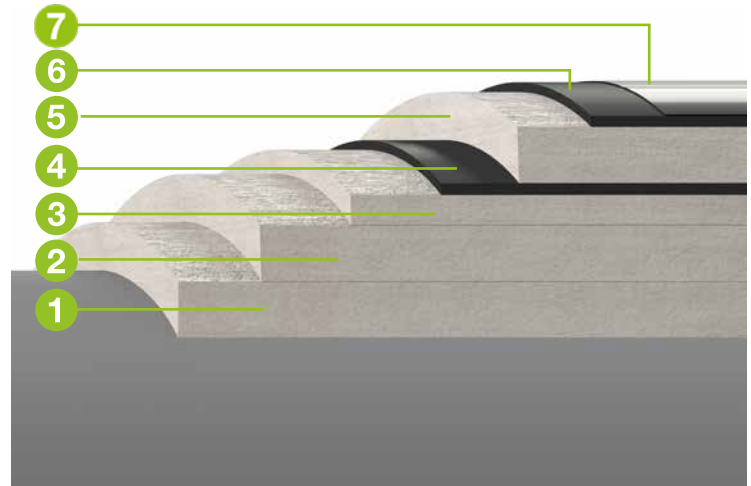
Note: Constructions to meet ISO 15665 and Shell DEP#31 classifications for Acoustic Insertion Loss for pipes between 650 and 100mm diameter.

CLASS C | AG (MC) - CLASS C3



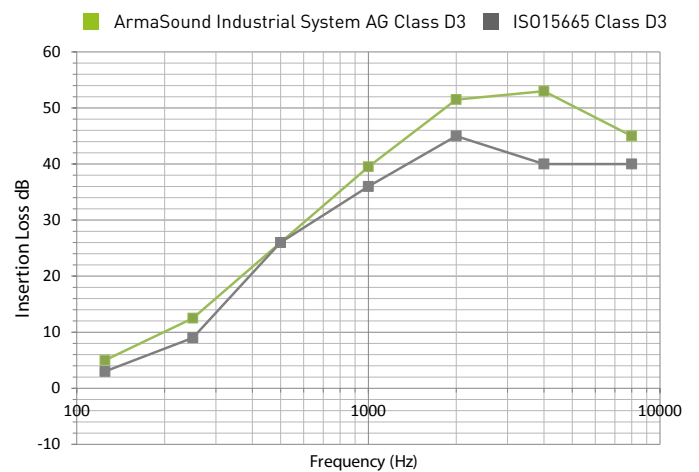
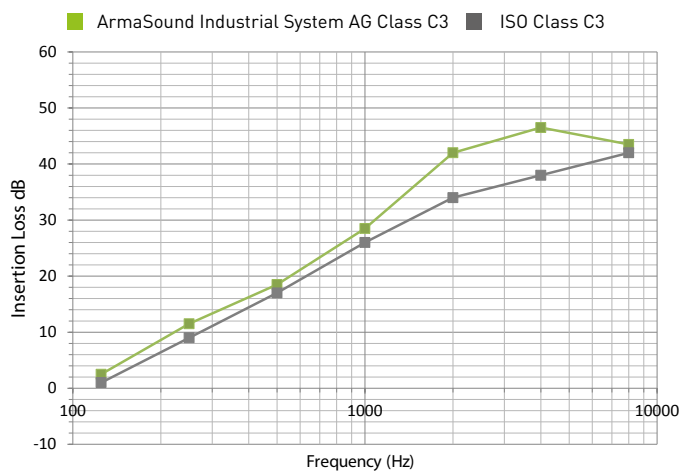
1	ArmaGel	20 mm	4	ArmaSound Barrier E	4 mm
2	ArmaGel	20 mm	5	ArmaSound Barrier E	2 mm
3	ArmaGel	10 mm	4	Aluminium	0.5 mm

CLASS D | AG (MC) - CLASS D3



1	ArmaGel	20 mm	5	ArmaGel	20 mm
2	ArmaGel	20 mm	6	ArmaSound Barrier E	4 mm
3	ArmaGel	10 mm	7	Aluminium	0.5 mm
4	ArmaSound Barrier E	4 mm			

Test results acc. to ISO15665 & Shell DEP 31.46.00.31-Gen.



Test results Class C3

Octave band centre frequency Hz

	125	250	500	1000	2000	4000	8000
Insertion loss, dB	2.5	11.5	18.5	28.5	42.0	46.5	43.5
ISO 15665 Class C3, dB	1.0	9.0	17.0	26.0	34.0	38.0	42.0

Total thickness (mm): 56.5
Total weight, flat (kg/m²): 26.4

Test results Class D3

Octave band centre frequency Hz

	125	250	500	1000	2000	4000	8000
Insertion loss, dB	5.0	12.5	26.0	39.5	51.5	53.0	45.0
ISO 15665 Class D3, dB	3.0	9.0	26.0	36.0	45.0	40.0	40.0

Total thickness (mm): 78.5
Total weight, flat (kg/m²): 35.5

// Email

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All data and technical information are based on results achieved under the specific conditions defined according to the testing standards referenced. Despite taking every precaution to ensure that said data and technical information are up to date, Armacell does not make any representation or warranty, express or implied, as to the accuracy, content or completeness of said data and technical information. Armacell also does not assume any liability towards any person resulting from the use of said data or technical information. Armacell reserves the right to revoke, modify or amend this document at any moment. It is the customer's responsibility to verify if the product is suitable for the intended application. The responsibility for professional and correct installation and compliance with relevant building regulations lies with the customer. This document does not constitute nor is part of a legal offer to sell or to contract.

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ABOUT ARMACELL

As the inventor of flexible foam for equipment insulation and a leading provider of engineered foams, Armacell develops innovative and safe thermal and mechanical solutions that create sustainable value for its customers. Armacell's products significantly contribute to global energy efficiency making a difference around the world every day.

With more than 3,300 employees and 25 production plants in 19 countries, the company operates two main businesses, Advanced Insulation and Engineered Foams. Armacell focuses on insulation materials for technical equipment, high-performance foams for acoustic and lightweight applications, recycled PET products, next-generation aerogel technology and passive fire protection systems.

For more information, please visit:
www.armacell.com/energy