INSTALL IT. ENJOY QUIETNESS.

Building acoustic solutions

Noise has become one of the greatest environmental problems of our times. Whether at work, in public buildings or at home – hardly anything disturbs us as much as noise, and it can impair the quality of life. Noise protection measures must be consistently planned and properly carried out, both when constructing new buildings and when modernising existing ones. **Rely on an expert partner for the design of your noise protection projects.**

www.armacell.com

IMPROVING ACOUSTIC COMFORT

armacell®

MAKING A DIFFERENCE AROUND THE WORLD

ABOUT ARMACELL

SOLUTIONS FOR THE COMFORT OF SILENCE.

We are the inventors of flexible foams for equipment insulation and a leading provider of engineered foams. Our thermal, acoustic and mechanical solutions create sustainable value for our customers. Innovation and entrepreneurship are an integral part of our DNA. We drive industry-leading solutions and aspire to launch new technologies using alternative resources or natural feedstock.

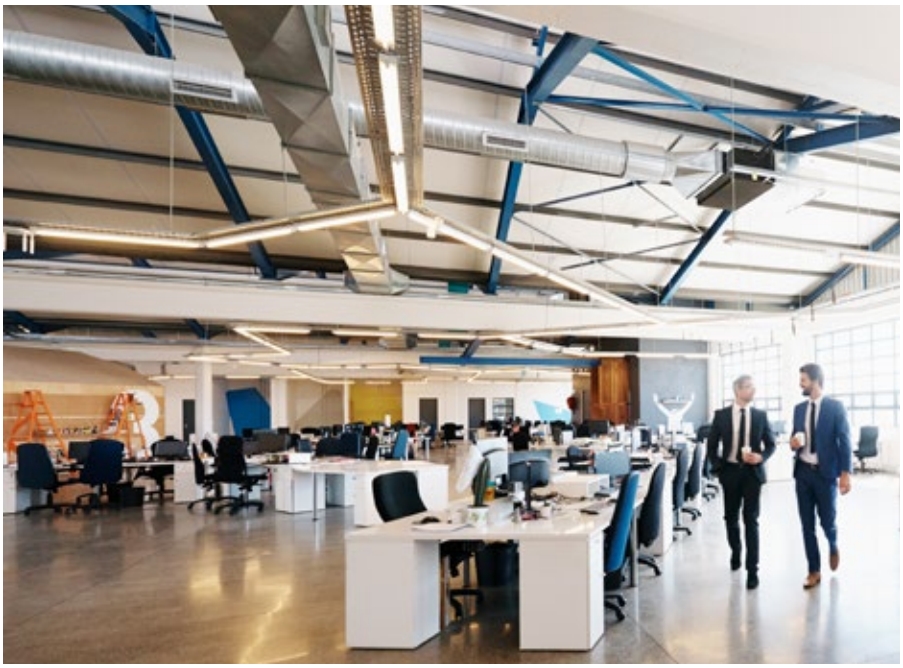
Day in day out, our products significantly contribute to global energy efficiency, reduce annoying noise and make a difference around the world. In meeting the challenges of megatrends, such as energy efficiency, noise control, the globalisation of food supplies, our product solutions stand out in terms of functionality and ease of installation.

We create genuine value for our customers, value them as partners and are committed to developing solutions tailored to their requirements. The outcome is added value for our business partners and, most significantly, energy savings, noise attenuation and a longer working life for their critical equipment.

Armacell. Making a difference around the world.

ADDRESSING NOISE POLLUTION

ENJOY THE COMFORT OF QUIET TECHNICAL EQUIPMENT



Our pioneering spirit has always been part of our DNA. Well-known for our flexible thermal insulation, we now also offer best-in-class sound attenuation technology. Our acoustic solutions significantly reduce disturbing noise for a higher level of comfort and efficiency in buildings.

Whether at work, in public buildings or at home, noise is all around us and it can harm our productivity, wellbeing, and even our health. Poor acoustics in a building significantly affects the efficiency in offices and quality of life at home.

According to a report by the World Green Building Council, distractions caused by noise in the office led to a 66 percent drop in concentration and performance among respondents. Acoustic comfort is essential to ensure effective communication and employees' wellbeing.

As cities grow and evolve, people seek to find quiet in their homes. Acoustic comfort in residential buildings means ease and cosiness, as well as privacy, intimacy and a sense of security. The increasing appreciation of private living space is reflected in higher demands. Nowadays, tenants, employees and hotel guests expect enhanced noise control.

Mechanical equipment such as plumbing, heating, ventilation, and air conditioning (HVAC) systems can generate excessive noise inside the building. A better understanding of where noise is generated and how it is propagated will help to address this issue.

CONTENT

WHAT'S THAT NOISE?

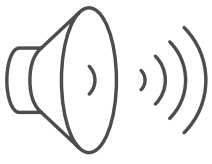
THE TYPES OF SOUND AND NOISE CONTROL MEASURES

Measures to reduce noise are highly dependent on the nature of the noise source, the path the noise takes from the source to the receiver, and the amount of noise that has to be reduced.

The sound we hear is created when the air is excited by a mechanical disturbance and propagates as a pressure wave. How loud we perceive a sound relates to numerous factors such as intensity, volume, duration, frequency, and amplitude. The most common ways to quantify sound are sound pressure, sound power and sound intensity. While the sound power level is independent of the distance or the environment, the sound pressure level must be represented by the distance at which it is measured from the sound source and whether it is in an enclosed space with reflecting surfaces. The sound intensity obeys in open air an inverse square law with distance: By doubling the distance of the sound source, the sound intensity decreases by six dB or the factor four. The human ear perceives every increase of 10 dB as doubling of the volume, every decrease of 10 dB as halving of the volume.

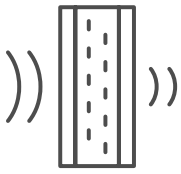
TYPE OF SOUNDS

AIRBORNE SOUND



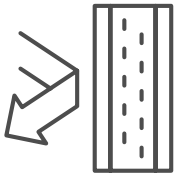
Airborne sound refers to sound that travels through the air such as sounds from the radio or TV.

STRUCTURE-BORNE SOUND

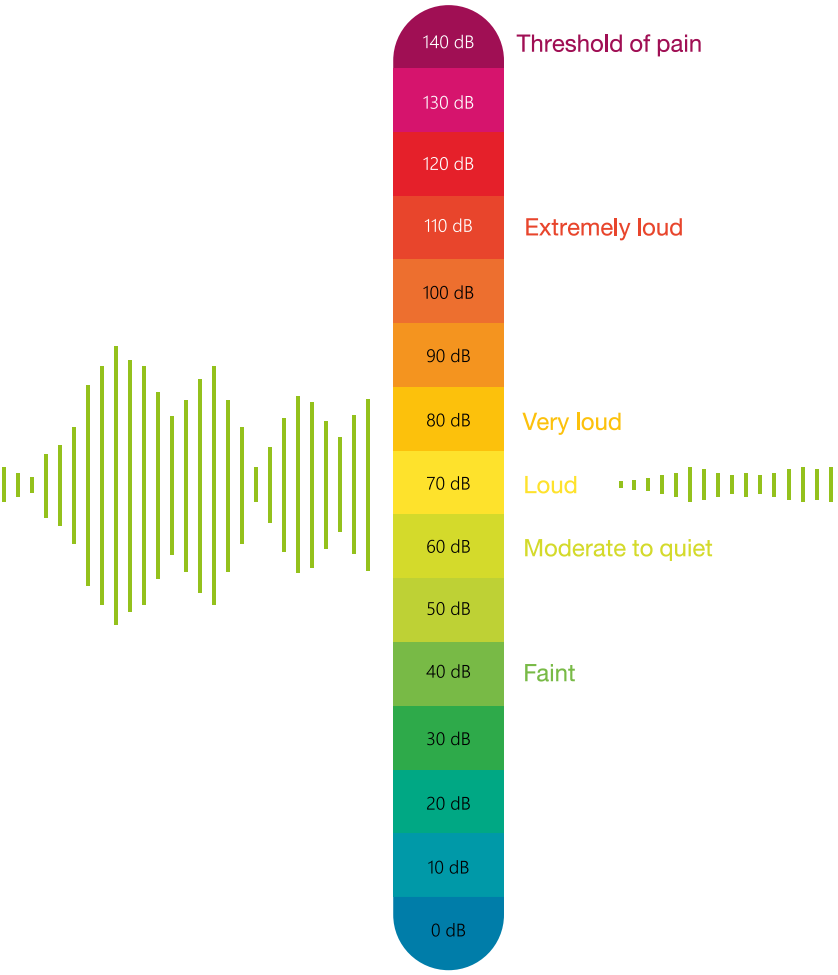


Structure-borne sound travels through solid objects such as stone, concrete, steel or wood and occurs because the impact causes the building element to vibrate, generating sound waves.

REFLECTED SOUND



Reflected sound refers to sound that reflects off surfaces and is amplified through the building.



Change in Sound Pressure (dB)	Sound Perception
-1	Insignificant
-3	Just perceptible
-5	Clearly noticeable
-10	Half as loud
-15	Significant
-20	Much quieter, four times as quiet

HOW TO CONTROL NOISE

A proper assessment of the nature of the noise problem ensures that the correct sound control methods are selected. To reduce airborne noise, you need suitable sound absorbing and/or barrier materials and for structure-borne noise control, vibration isolation or structural damping.

SOUND ABSORPTION

Sound-absorbing materials such as **ArmaSound®** absorb noise by converting sound energy into heat. Our sound absorption products can be combined with with our sound barrier solutions.

INSERTION LOSS

Equipment noise can be also attributed to vibration airborne and structure-borne noise. Vibration-damping materials can reduce the transmission from drainage, duct, fan coils and HVAC systems. In our **ArmaComfort® AB range**, we offer acoustic multilayer solutions which combine elastomeric or polyurethane foams with acoustic barriers.

TRANSMISSION LOSS

These materials prevent sound waves from travelling through a surface by stopping them from entering or leaving a space. Our **ArmaComfort Barrier** products reduce sound transmission.

EXPLORE A MULTITUDE OF WAYS TO MINIMISE DISTRUBING NOISE IN BUILDINGS

KEYS TO IMPROVE ACOUSTIC COMFORT

Whether office buildings, schools, universities, hospitals, hotels or residential buildings, acoustics is one of the most important factors on the health, well-being and comfort of a building's occupants. Mechanical equipment such as machinery, pipelines, air ducts and fan coils provide buildings with drinking water, heating and cooling as well as the disposal of wastewater and rainwater. Unfortunately, this equipment often transmits noise throughout the building.

Enjoy the comfort of quietness

APPLICATIONS

At Armacell, we are committed to perform BEYOND BETTER, today and tomorrow, so that you can achieve best-in-class thermal and acoustic performance for your high-quality projects.

1 DRAINAGE PIPES

One of the most common sources of nuisance noise in living and working environments emanates from wastewater and rainwater pipes. If these pipes are not properly insulated, the noise of falling water is transferred to walls and ceilings, and from there to adjoining rooms where it can create an ongoing disturbance to occupants.

2 HVAC SYSTEMS

Humming, rattling, buzzing, squealing... When people are surveyed about workplace comfort, their most prevalent complaints involve excessive noise and vibration from the HVAC systems. But not only in working environments, noisy AC systems are among the most frequent complaints from hotel guests and tenants.

3 HEAT PUMPS

Both the indoor and outdoor components of a heat pump generate noise. On average, outdoor units of modern air source heat pumps have a sound rating of 35 to 75 decibels. The noise level depends on the type and size of the heat pump and as the sound is related to the amount of air movement, on the speed of the fan and the vibration from the compressor.

4 FLOORS

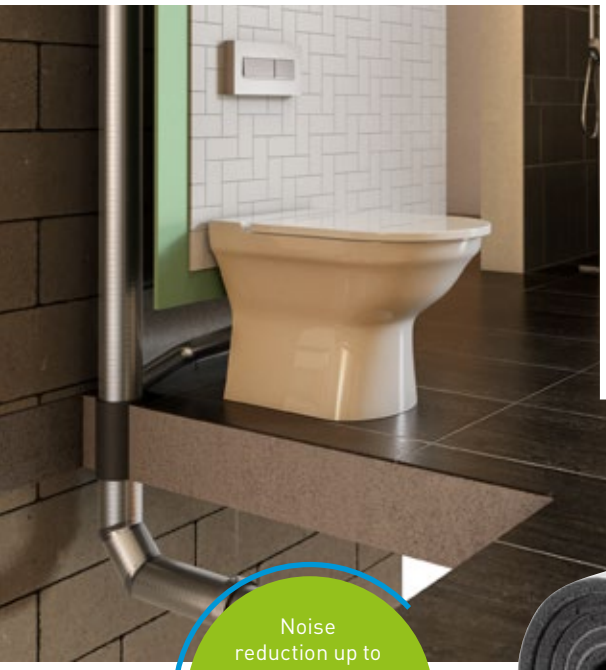
Sound can travel through a building in different ways. One of the most common issues is structure-borne sound which is transmitted by footsteps on the floor above. People running, dropping objects or even walking can cause impact sound. Not only the room below is affected, but also neighbouring rooms as the sound travels as a result of the vibration from the impact.

CONTROLLING PIPE NOISE

DRAINAGE PIPES

According to the World Health Organization (WHO), noise has emerged as a leading environmental nuisance. Topped only by traffic, neighbour noise is listed as the second most frequent source of annoyance. One of the most frequent disputes in real estate is the disturbing noise of sewage equipment from neighbours.

Building acoustics and noise control are complex issues, and waste-water and rainwater pipes are often given little or no consideration in the specification. Wastewater noise disturbs us when we sleep, relax or work, and can lead to complaints to hotel management, landlords or plumbers. Noise from drainage pipes is often exacerbated by unfavourable pipe routing, which causes increased flow noise. For reasons of drinking water hygiene, pipelines are usually dimensioned as small as possible, which in turn results in higher flow velocities. If the pipes are not acoustically protected, the noise of falling water is transferred to wall and ceiling elements and from there to adjoining rooms.



Noise reduction up to **24.5 dB(A)** with ArmaComfort AB Alu Plus

Did you know that a conventional PVC drainage pipe can easily have a water flow rate of two litres per second when flushing a toilet? This can generate noise of up to 55 dB in a vertical pipe in the room where the sound is emitted. As the building structure can reflect this sound, the noise will increase significantly and be disturbing.

With our ArmaComfort range we provide highly efficient noise control solutions specially developed for this application. On a horizontal pipe ArmaComfort AB can reduce the noise by 24 dB.

PIPE LAGGING WITH ARMACOMFORT

The multilayer produtcs have very good acoustic damping and acoustic isolation properties across the frequency range relevant for building acoustics – no matter whether they are installed on cast-iron or plastic pipes. The thin wall thickness of the materials is an advantage during the installation process because space is often at a premium. ArmaComfort AB Plus is available as self-adhesive sheets, making the installation even more easy.

ArmaComfort AB range

Depending on the requirements, specifiers can choose from four different products. They are either based on closed-cell ArmaFlex® or halogen-free polyurethane insulation and they all feature a high-performing acoustic EPM-EVA barrier.

ArmaComfort AB Alu and ArmaComfort AB Alu Plus are classified as B-s1,d0, the best fire class for organic products in the European fire test. What's more, the attractive silver-coloured covering is easy to clean and fits in well with metal-clad installations in areas where pipes are visible.

1 **Airborne sound**
In pipes, ar-borne sound is caused by the flow of water and can spread into the room.

2 **Structure-borne sound**
Noise can originate from the pipe support or from the connection between the pipe and the building frame.

Being one of the most annoying sound sources in residential and non-residential buildings, HVAC noise should be considered in the design stage by architects and engineers. Our high performance, multilayer ArmaComfort AB Alu Plus provides efficient sound reduction.

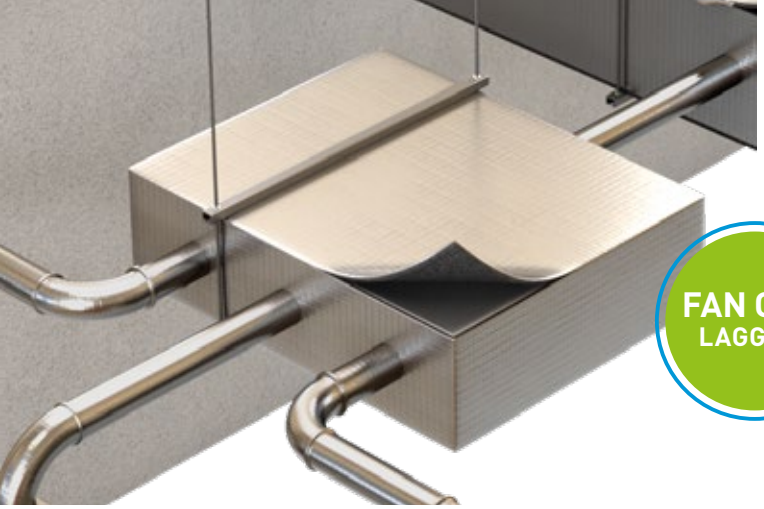
HVAC NOISE REDUCTION

NOISE CONTROL SOLUTIONS

HVAC SYSTEMS

While HVAC systems keep indoor temperatures and humidity comfortable, they also generate airflow noise and vibrations that can become a significant noise nuisance and affect our sleep at home and productivity at work. Noise abatement measures are always much more effective and economical if they are introduced in the planning phase than when applied retrospectively.

Noise is the single most disturbing factor for the majority of employees working in open-plan offices. Acoustics affect our performance. In office buildings, fan coil units operate on average around 40 percent of the time, in hotels even 80 percent. Depending on the operating time and location they typically generate a sound level up to 55 dB (A). Fan noise must be silenced before entering the air ducts.



FAN COILS

The sound power of a fan coil unit depends on its capacity and the airflow speed. By encapsulating the fan coil unit with ArmaComfort AB Alu Plus, a sound power of 45 dB at high speed can be reduced by around 6 dB. A reduction of 3 dB means more than halving the noise, as dB is a logarithmic value. The perceived noise therefore decreases significantly depending on the distance from the source. Thanks to its small material thickness and high flexibility, it also allows easy and quick installation even in hard-to-reach places.

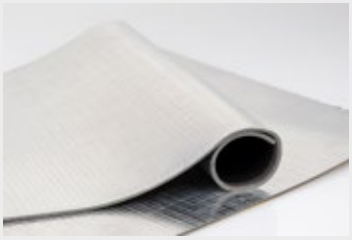
AIR DUCTS

When planning and installing air ducts, both thermal and sound insulation must be taken into account. Noise from air ducts arises and is transmitted in different ways. Only a combination of sound absorption and encapsulation, vibration damping and decoupling ensures that noise transfer is minimised. In addition to air-borne noise from the duct outlets, sound may also transmit directly through the wall of the ducting and into the surrounding room. This breakout noise can be dampened by a viscoelastic material such as ArmaFlex which also ensures energy savings and condensation control. Further attenuation is achieved by adding a mass layer onto the insulation. With the combination of 40 mm ArmaFlex and 2 mm ArmaComfort Barrier B-Alu air duct noise can be reduced by 10 dB, which means halved.

ArmaComfort AB Alu Plus

Insulating fan coils with our high performance, B-s1,d0 classified ArmaComfort AB Alu Plus significantly reduces the noise level by providing a barrier to both structural and airborne sounds. The aluminium foil coating is easy to clean and optically attractive in open-plan offices without suspended ceilings.

ArmaComfort Barrier B Alu



With our ArmaComfort Barrier range we offer acoustic barriers with excellent transmission reduction at ultrathin thicknesses. ArmaComfort Barrier products allow space-saving sound attenuation of new and existing building constructions like partition walls and mechanical equipment.

AVOIDING NOISE NUISANCE

HEAT PUMPS

The electrification of heating systems will play a significant role in the transition towards carbon neutrality and heat pumps are the key technology. The energy crisis and the increasing number of countries that have already enacted bans on fossil fuel heating systems, have significantly strengthened the global trend towards heat pumps. More and more people in an increasing number of countries are turning to the climate-friendly alternative to oil or gas heating and the worldwide market for heat pumps is anticipated to grow considerably. Air source heat pumps (ASHP) produce noise levels of 35 to 75 dB and often exceed permissible noise levels by about 14 dB (A). They must therefore be soundproofed by insulating the compressor and to further reduce noise emissions placed inside a soundproof enclosure. Next to our sound-absorbing ArmaSound RD solutions, we have just launched ArmaComfort NR-P, a multilayer solution for enclosures and cabins.

ArmaComfort NR-P

Our newest innovation unifies superior sound absorption performance of a polyurethane foam and transmission loss of a heavy mass layer in one product. The multilayer insulation consists of a PU foam and an acoustic barrier of 2 mm thickness and is equipped with a self-adhesive layer for clean and quick installation even in tight spaces.

ArmaSound RD

This high-performance sound absorber is designed for use in a wide range of acoustic applications. The open-cell material offers excellent sound absorption behaviour across the entire frequency range, additional barrier (transmission loss) performarnce as well as vibration damping and de-coupling (isolation) properties. ArmaSound RD provides optimum performance at lower thicknesses than conventional materials.

ArmaComfort NR-P or ArmaSound RD

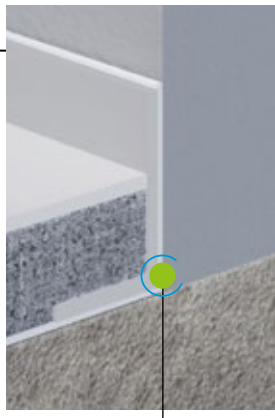
HT/ArmaFlex
To ensure high energy efficiency, all pipes must be protected to prevent thermal losses and condensation. Closed-cell HT/ArmaFlex features high water vapour diffusion resistance and low thermal conductivity.

ArmaComfort AB
This multilayer solution combines acoustic performance of an acoustic barrier of 2 mm thickness with 4 kg/m² of weight and a damping ArmaFlex elastomeric foam of 9 mm. Due to its high flexibility it can be easliy wrapped around the compressor.

IMPACT SOUND INSULATION

FLOATING FLOORS

The most common source of annoying noise from neighbours is impact noise. This noise, usually from above like footsteps on a floor but sometimes from adjacent apartments, is more irritating than other noise-related nuisances and can even affect our health and lead to cardiovascular problems and sleep disturbance. Impact sound is a form of structure-borne sound that occurs when an object is struck by another, resulting in the generation and transmission of sound. The structural vibration caused by this impact results in sound being radiated from an adjacent vibrating surface. Impact sound can travel through solid structures and cavities. By installing an acoustic membrane as a sublayer under the screed impact noise can be significantly reduced.



ArmaComfort SF Tape
To avoid acoustic bridges between the subfloor and structural elements of the building, ArmaComfort SF should always be installed in combination with ArmaComfort SF Tape around the entire perimeter of the corner formed by the floor and walls.

ArmaComfort SF (Super Floor)

This flexible acoustic insulation is based on an expanded closed-cell polyethylene foam and especially designed for floating floors to reduce impact noise and transmission noise between floors. The layer is used between final screed and concrete construction slab. While conventional acoustic PE underfloor materials reduce the noise by 20 to 23 dB, with a layer of 5 mm ArmaComfort SF a noise impact reduction of 29 dB (ΔLw) can be achieved, which means noise can be reduced by a significant higher degree. The materials is water and moisture resistant, odourless and 100 percent recyclable.

WHAT'S THAT NOISE?

EXPERTISE IN ACOUSTIC INSULATION

Based on our extensive cross-industry experience, we develop tailored solutions for your specific acoustic requirements. As experts in acoustic noise of equipment, we support you from the design stage to the installation of our products.

360° SERVICE

We help you in analysing your acoustic requirements by defining the type of noise and finding the ideal solution for your project. Our acoustic insulation solutions for mechanical equipment and structural elements are tested according to the highest standards. Due to their flexibility and versatility, they provide a high level of noise reduction even in challenging applications with limited space and on complex shapes. To ensure excellent installation of our acoustic solutions offer training courses to insulation contractors.

We perform acoustic measurements in compliance with the most stringent standards.

TECHNICAL INFORMATION

FAN COILS

Sound power reduction at high speed of around 6.1 dB

ISO 3741-2011	Without insulation	With ArmaComfort AB Alu Plus	Delta L_{WA}
	L_{WA} (dB)	L_{WA} (dB)	(dB)
Noise level (medium speed)	37.3	32.7	**4.6**
Noise level (high speed)	45.8	39.7	**6.1**

AIR DUCTS

Sound power reduction of around 10 dB

ISO 3741-2011	Without insulation	With ArmaFlex 40 mm & ArmaComfort Barrier B-Alu 2 mm	Delta L_{WA}
Circular duct Ø = 300 mm	L_{WA} (dB)	L_{WA} (dB)	(dB)
Noise level	75.8	65.3	**10.5**

DRAINAGE PIPES

Sound reduction at 1 and 2 l /s around 16 dB

EN 14366		Vertical HD PVC pipe (Ø = 110 mm)	
Airborne sound	**Flow rate**	**1 l/s**	**2 l/s**
	L_{an} bare pipe	55	57
	L_{an} insulated pipe*	39	41
	$IL_{a,A}$	**16**	**16**
Structual-borne sound	**L_{sc} bare pipe**	22	22

Sound reduction above 24 dB at 1 and 2 l/s

EN 14366		Horizontal HD PVC pipe (Ø = 110 mm)	
Airborne sound	**Flow rate**	**1 l/s**	**2 l/s**
	L_{an} bare pipe	56.8	59.6
	L_{an} insulated pipe*	31.8	35.1
	$IL_{a,A}$	**25**	**24.5**
Structual-borne sound	**L_{sc} bare pipe**	13	14.7

Values dB (A) 100 Hz to 5000 Hz; With ArmaComfort AB, AB Alu Plus

ARMACELL GOES BEYOND BETTER.

At Armacell, we are committed to creating an exceptional customer experience. We understand the challenges when planning complex acoustic projects and are here to help you complete your projects successfully. From the planning stage to the handover – our 360° service supports you throughout.

Our **insulation manuals** provide ideal guidance.

ARMACELL APPLICATION TRAINING

To ensure that our thermal and acoustic insulation materials are installed properly, Armacell has trained thousands of installers around the world. Special training centres have been set up at many locations and we also provide valuable support on site. Several thousand insulators attend courses on installing Armacell products every year and are awarded the ArmaFlex application certificate.

ARMACELL'S CUSTOMISED SOLUTIONS

Take the fast track and get your Armacell fittings trimmed by our professional waterjet-cutting technology. Just provide us with CAD or DXF files of the shapes you need and we will make prototypes. Our machines cut smooth, precise edges in any two- or three-dimensional shape. Call us to discuss your specifications.

PRODUCT SELECTOR

	ArmaComfort AB	ArmaComfort AB Plus	ArmaComfort AB Alu	ArmaComfort AB Alu Plus	ArmaComfort Barrier P	ArmaComfort Barrier B	ArmaComfort Barrier B Alu	ArmaComfort Band	ArmaComfort NR-P	ArmaSound RD 120	ArmaSound RD 240	ArmaComfort SF	ArmaComfort SF Band
PIPE LAGGING	•	•	•	•				•					
FAN COIL	•	•	•	•	•	•	•						
DUCT WRAPPING				•	•	•	•	•					
HEAT PUMPS	•								•	•	•		
ENCLOSURES						•	•		•	•	•		
PARTITION WALL					•	•	•						
FLOOR												•	•

POSITIVE TRACK RECORD

CUSTOMERS AROUND THE WORLD RELY ON OUR PROVEN SOLUTIONS.

PERFORMANCE BEYOND BETTER

SMART SOLUTIONS FOR YOUR BUSINESS

Just a few of the **successful projects:**

// **France**
AgroParis Tech, University of Paris, Saclay
Cheval Blanc Hotel, Paris
CitizenM Paris Gare de Lyon Hotel, Paris
EHPAD Saint Antoine de Padoue, Lille
Science Po Paris, University of Paris
Tour la Marseillaise, Marseille

// **Norway**
Britannia Hotel, Trondheim

// **Poland**
Mennica Legacy Tower, Warsaw
Hotel The Bridge, Warszawa
Hotel Puro, Krakow

// **Saudi Arabia**
As Safiyyah Museum & Park, Medina
Park Inn by Radisson Hotel, Riyadh
PIF Tower, Riyadh

// **Switzerland**
Riviera-Chablais hospital, Rennaz

// **The Netherlands**
Upark Student's hotel University of Twente, Twente

Enjoy the benefits of our excellent customer service.
All over the world, our customers rely on sales representatives, technical consultants and applications engineers.

Your project demands more. You deserve the best solution. Get the original closed-cell thermal and acoustic solutions from Armacell.

Armacell Goes Beyond Better. Driving performance beyond the expected – supporting you today and tomorrow.

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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 27 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 further product information, please visit:
www.armacell.eu

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