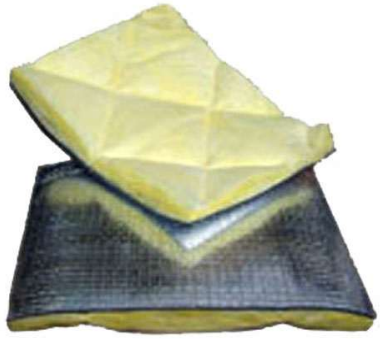
PRODUCT DATA SHEET

NIKOLAG® – Acoustic pipe and duct lagging

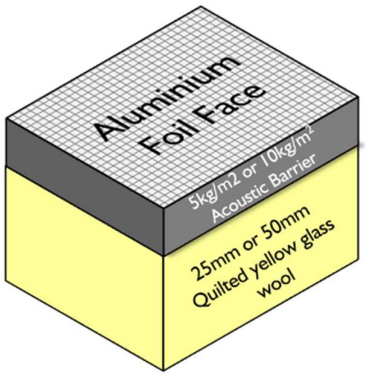
General Product Information



NIKOLAG® is designed to reduce noise breakout from wastewater pipes and air-conditioning ductwork by isolating noise.

It is a flexible tri-laminate acoustic lagging product. NIKOLAG® consists of an aluminium foil-faced heavy mass acoustic layer laminated to a decoupling layer. The decoupling layer is a 25mm or 50mm thick, non-combustible glass mineral wool with a quilted white scrim to prevent shedding of fibres. NIKOLAG® is available in two barrier options meeting ASTM E84 Class A or Class B fire ratings and ISO 15665[1] Class B or C acoustic categories.

The highly dense and flexible mass layer provides excellent sound reduction properties. NIKOLAG® decoupling layer breaks the vibration path between the substrate and the mass barrier, allowing it to remain flexible – optimising acoustic performance. All NIKOLAG® products are easy to cut to size with a retractable utility knife, or scissors. They can be fitted following easy steps - cut, wrap, tape seams and band/pin where required.



Designed and manufactured in the UK by Niko Coatings Limited, the country's largest primary producer of heavy-layer acoustic materials.

Typical Applications

- Wastewater pipes
- Hydraulic pipes
- Compressor and pump wraps
- Airconditioning ducts
- Fan housings

Key Features & Customer Benefits

Feature	What It Means for You the Customer
Engineered for Acoustic Performance	Designed to reduce breakout noise. Varying range of acoustic layer weights and thicknesses of glass mineral wool available.
Fire safety	Tested to ASTM E84 – complies with international building requirements. Low spread of flame foil surface.
Fire toxicity	Low smoke and toxic gas output compared to vinyl-based products. Burns cleanly, with minimal contribution to carbon monoxide and halogenated compounds. [2][3]
Ease of Installation	NIKOLAG® uses a quilted, scrim-faced construction that significantly reduces surface fibre release, making it cleaner and more installer-friendly on site. Broad operating temperature (-40 °C to 100 °C).
Healthier Indoor Air	Ultra-low VOC emissions and low odour make it safe for sensitive environments. PVC/Chloride Free.
Eco-Conscious Choice	Acoustic layer is made with over 50% recycled content. Glass mineral wool from over 80% recycled glass.

Product Dimensions

Product name	Nominal barrier weight (kg/m^2)	Glass mineral wool thickness – single layer (mm)	Nominal Thickness (mm)	Sheet Size (mm)	Sheet weight (kg)	Pallet quantity (sheets) – 1200mm x 2000mm wooden pallet	Pallet quantity (rolls) 1200mm x 1200mm wooden pallet
NIKOLAG® 5/25	5	25	27mm	1200 W x 2000 L	13.4	75 sheets	40 rolls
NIKOLAG® 5/50	5	50	52mm		14.9	75 sheets	30 rolls
NIKOLAG® 10/25	10	25	29mm		25.4	45 sheets	25 rolls
NIKOLAG® 10/50	10	50	54mm		26.9	45 sheets	25 rolls
Manufacturing tolerance ±10% weight and thickness, *±20mm* sheet sizes. Custom sizes available depending on MOQ							

Storage conditions

NIKOLAG® must be stored in a clean, dry environment. If stored outdoors on site, it must be fully protected from rain, ground moisture, and standing water using waterproof sheeting or within a covered structure. Always store off the ground on pallets or bearers to prevent moisture ingress. Avoid prolonged exposure to direct sunlight or extreme temperatures. Ideally store and install the product at temperatures above 5°C to avoid cracking.

Sustainability & Safety

NIKOLAG® is engineered for high performance with a strong focus on environmental responsibility and indoor air quality. Independently tested to international standards.

- PVC and chloride-free
- Low odour and ultra-low VOCs – ideal for sensitive environments
- It's ultralow VOC content means NIKOLAG® contain no known ozone-depleting substances. Independent testing demonstrates it achieves exemplary level results for BREEAM® International/NOR Regulations. It also passes LEED v4.1 (outside U.S.) and has a Eurofins Gold+ Standard rating for indoor air comfort.
- Made with recycled content to reduce carbon impact (>50% acoustic layer, >80% glass mineral wool)
- Eco-friendly – free from SVHCs, including lead, halogens, and unrefined aromatic oils
- Low fire toxicity – burns cleanly without releasing harmful toxins

Installation

NIKOLAG® is easy to handle and install. It can be cut with ease using a retractable knife or scissors. The product needs to be mechanically fixed and joint sealed with seal adhesive foil tape.

Installer-Friendly Design:

NIKOLAG® features a quilted, scrim-faced finish that dramatically reduces fibre release during handling and installation vs unscrimmed glass mineral wool. Unlike many alternative lagging products that shed fibres during handling, NIKOLAG® stays clean – reducing mess and improving installer experience. This makes it ideal for fast, tidy installation in sensitive environments like hospitals, schools, and residential projects.

Technical Information

Acoustic barrier layer options for NIKOLAG® to provide different flammability performance:

- **DENSBAK®** standard acoustic barrier layer.
  - **Flammability:** UL94 HB or ISO 3795[4] (burn rate < 35mm/min)
  - Suitable for applications where standard fire performance is acceptable.

  OR
- **SONOSHIELD®** High-performance acoustic barrier layer with enhanced fire resistance.
  - **Fire Classification:** Euroclass B[5] (to BS EN 13501 – 5kg/m² Class B, S2, D0, 10kg/m² Class B, S1, D0)
  - Recommended for uses requiring higher fire safety standards.

Property	Test Method	NIKOLAG® DENSBAK®	NIKOLAG® SONOSHIELD®
Fire classification	Steiner Tunnel - ASTM E84 – 21a: Standard test method for surface burning characteristics of building materials. Flame spread index (FSI) Smoke Development Index (SDI) **Product Configuration:** Composite product tested as supplied (5 kg/m² barrier with 25 mm glass insulation—the thinnest available configuration; thicker options expected to perform better) **Test Orientation:** Foil surface exposed directly to flame source *(Foil side = fire side, quilted glass insulation = non-fire side)*	Class B[6] 40 200	Class A[7] 15 70
Colour		Grey acoustic layer	Red acoustic layer
Below features apply to both NIKOLAG® DENSBAK® and NIKOLAG® SONOSHIELD® products			
Emissions / VOC	VOC EN 16516[8]	TVOC 6.5 $\mu g/m^3$ EUROFINS Gold A+ Pass	
BREEAM		A+ rating according to BRE Green Guide	
Odour intensity	VDA 270 C1 (Acoustic layer only)	≤3	

Features of each individual component:

Glass Mineral Wool is classified as Euroclass A1 non-combustible (BS EN 13501), offering excellent fire safety, with a thermal conductivity of 0.032 W/mK according to TS EN 12667.
The Aluminium Foil meets Class O flammability standards (BS 476) and provides effective moisture control, with water vapour permeability of 0.05 g/m²/24h (DIN EN ISO 12572).
Fire testing on full composite product shows options for standard or high performance depending on requirements.

Emissions / VOC / Air quality

- Eurofins Indoor Air Comfort GOLD
- Complies with: BREEAM® Int. & NOR (Exemplary), LEED v4.1 (outside U.S.), French VOC & CMR, Italian CAM, Belgian, ABG/AgBB
- VDA 277 / 278 (VOC/FOG automotive)
- Nissan Engineering Standard M0402, Method #2

Acoustic performance

NIKOLAG® has been independently tested for insertion loss (IL) to reflect real-world installation conditions.

Insertion loss measures the real-world noise reduction achieved when NIKOLAG® is applied to a pipe or duct — quantifying the improvement over bare metal or plastic across each octave band.

This provides a practical measure of how effectively NIKOLAG® reduces airborne noise in real building environments.

How NIKOLAG® works?

NIKOLAG® is **a mass–spring–mass system** designed to reduce noise breakout from HVAC systems and wastewater pipes across the full frequency range. The quilt layer acts as a decoupling spring, isolating the dense outer barrier from the vibrating surface beneath.

This improves **low-frequency performance** (125–500 Hz), where structure-borne noise and fluid-borne "thud" or "rumble" dominate. The **heavy barrier layer** then delivers increased **transmission loss at mid/high frequencies** (≥ 1 kHz), following the mass law principle: more weight = more sound blocked. This combination delivers a **broad and balanced insertion loss profile,** making NIKOLAG® effective on both round and rectangular ductwork in real-world installations.

Insertion Loss Testing by SRL

NIKOLAG® was independently tested by SRL Technical Services Ltd[9][10], one of the UK's most respected UKAS-accredited acoustic laboratories. Tests were conducted on real pipe geometries consistent with BS ISO 15665:2003, allowing accurate before/after insertion loss measurements across HVAC-relevant frequencies, using two real pipe types:

- 315 mm spiral steel duct (0.7mm gauge)
- 100 mm rigid PVC pipe (3.5mm wall thickness)

Lagging systems combined 5kg/m² and 10kg/m² mass layers with either 25mm or 50mm quilt, simulating realistic build-ups used in HVAC and mechanical services.

Results Across Real Frequency Ranges

Insertion loss (IL) was measured over an extended range of 50 Hz to 10,000 Hz, exceeding ISO 15665's typical lower bound (100–125Hz). This wider window captures not only the core performance bands (125–8,000Hz) relevant to human hearing and consultant design tools, but also low-frequency sources such as pumps and pipe-borne vibration often missed by standard test scopes.

Results demonstrated consistent reductions across the entire spectrum, with significant IL gains in both low (125–500Hz) and mid/high frequency bands (1–4kHz) depending on the selected build-up.

Applicability to Rectangular Ducts

Although tested on round pipes, the system's core mechanism — decoupling plus mass — applies equally to rectangular ductwork. In fact, flat duct panels of similar gauge typically radiate as much or more noise than round pipe. When installed with continuous coverage, taped seams, and maintained quilt

compression, the reductions observed on pipe provide a conservative and reliable indicator of real-world rectangular performance.

Test Results: Before vs After on Real Pipes

The SRL insertion loss testing showed clear and measurable acoustic improvements across all key HVAC noise bands when NIKOLAG® was applied to both steel and PVC pipework. The results compare the bare pipe breakout levels to those with NIKOLAG® lagging installed — providing direct, real-world evidence of performance.

Low Frequencies (63–250 Hz)

There was little difference between bare and lagged PVC pipe at these very low frequencies — but this is expected. PVC naturally radiates very little sound in this band due to its high damping and wall stiffness. Far from being a weakness, this validates the product: it's not trying to reduce noise where there isn't any.

Mid Frequencies (500–1000 Hz)

The test showed insertion loss gains of 6–9.5 dB, depending on the build-up. This range is especially important because it overlaps with human speech sensitivity[11] and common pipe breakout noise. The dip in relative performance sometimes seen in this band — particularly with 5×50 builds — reflects the expected physical behaviour: a thicker decoupler helps low-end noise more than it helps the mid-band. To push this band further, extra mass is the key.

High Frequencies (2–4 kHz)

This is where the results were most striking, with reductions of 15–17 dB — even on builds using a lightweight 25mm quilt. These high-frequency gains are ideal for residential risers, fan noise, or speech-driven disturbance, where sound travels easily through walls and pipe chases. Here, the mass layer dominates, and its performance follows the mass law: heavier = better.

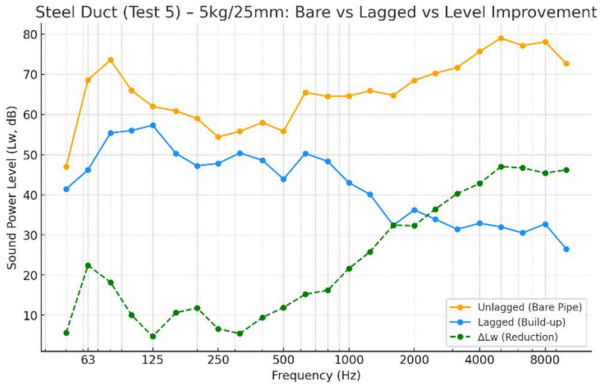
Tested product configurations

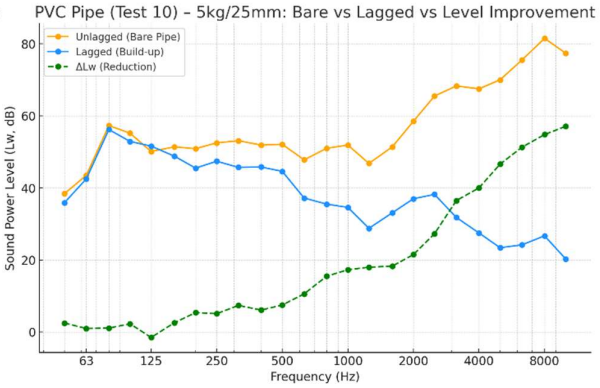
The following table summarises the tested NIKOLAG® product configurations, including acoustic barrier weight, quilt thickness, pipe/duct type. Each setup has been independently tested to ISO 15665 to determine acoustic classification.

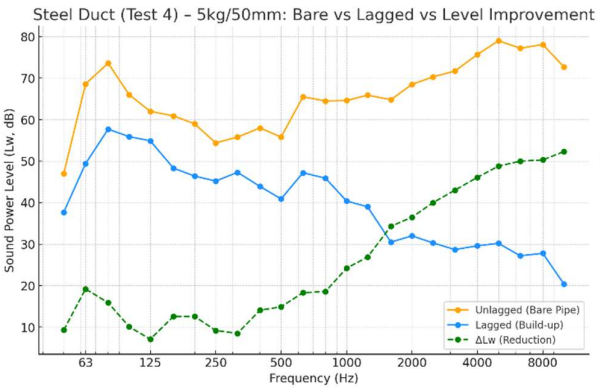
Product name	Nominal barrier weight (kg/m^2)	Glass mineral wool thickness – single layer (mm)	Steel duct	PVC Pipe
NIKOLAG® 5/25	5	25	✓	✓
NIKOLAG® 5/50	5	50	✓	✓
NIKOLAG® 10/25	10	25	✓	✓
NIKOLAG® 10/50	10	50	✓	✓

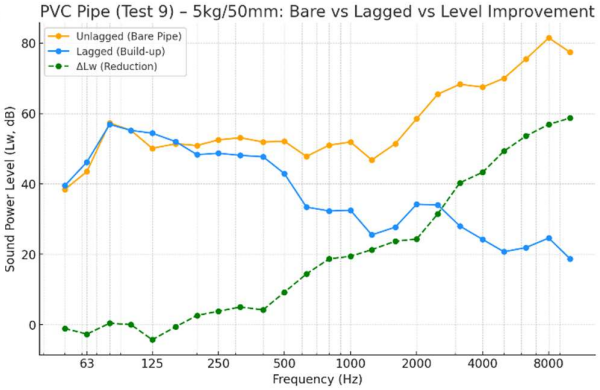
The following graphs compare the insertion loss performance of each NIKOLAG® configuration against the unlagged (bare) pipe baseline. These visuals clearly show the uplift in acoustic performance provided by the lagging system across the full frequency spectrum. The difference between the bare and lagged lines represents the real-world noise reduction achieved by each product setup.

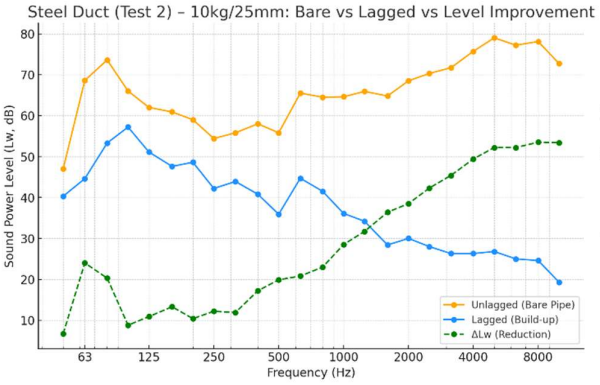
Acoustic performance graphs - Bare vs lagged (Steel duct and PVC pipe)

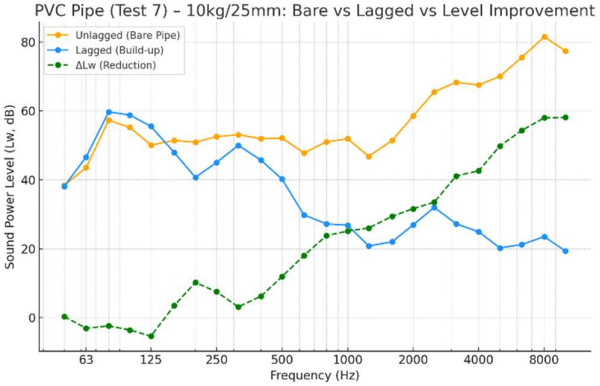


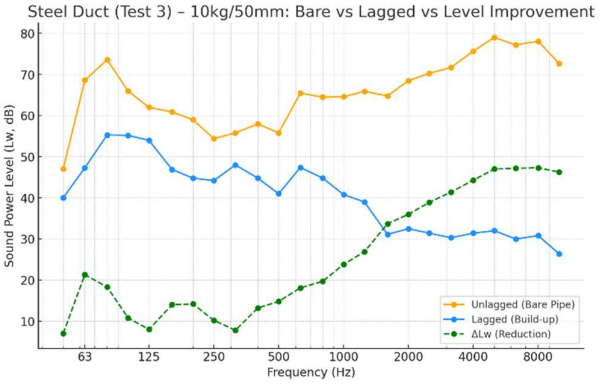


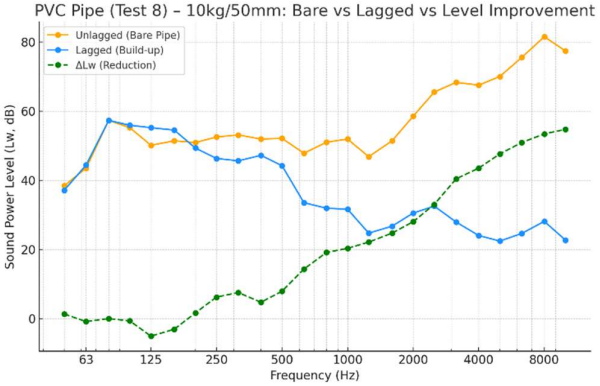










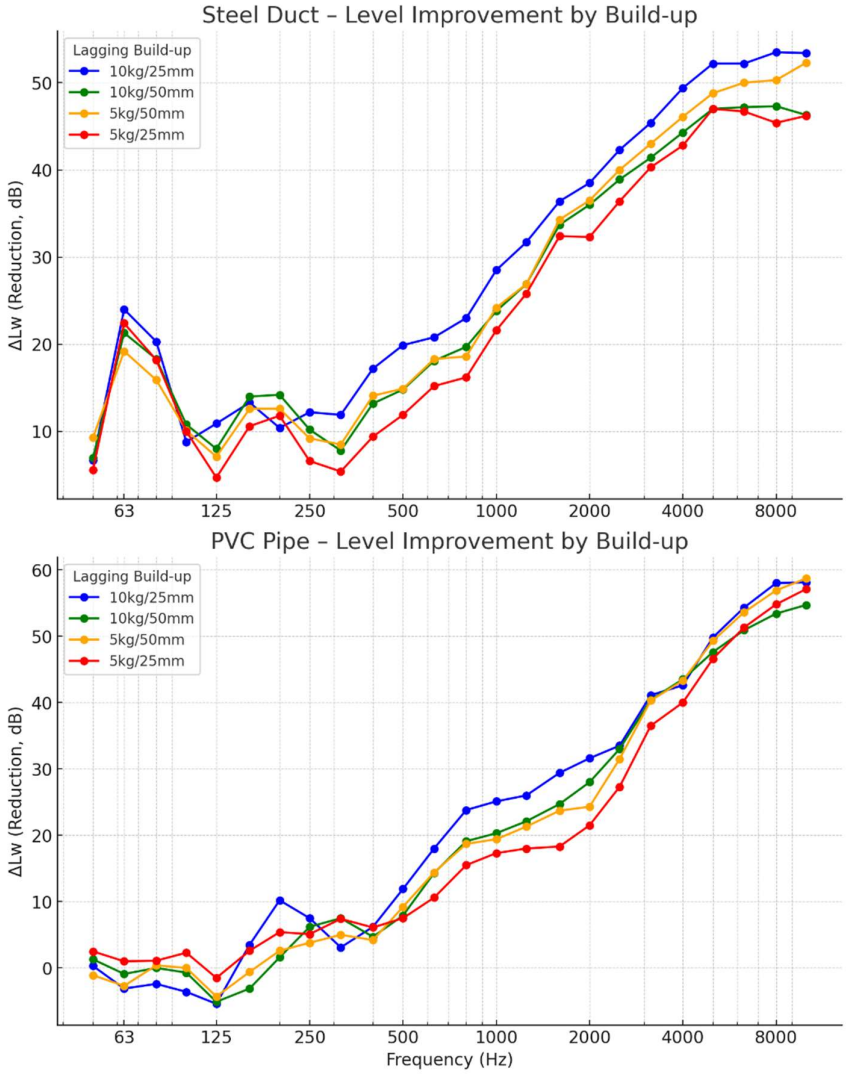


Acoustic performance (continued)

Insertion Loss Performance: Comparative Summary

The following charts provide a comparative overview of **level improvement (ΔLw)** achieved using four different **NIKOLAG®** lagging build-ups, applied to both **steel ducts** and **rigid PVC pipes.**
Results are shown across standard octave bands from **63 Hz to 8,000 Hz**, which align with the standardised classification bands defined in ISO 11654:1997 highlighting frequency-dependent performance[12].

These comparisons help specifiers balance **acoustic attenuation, installation constraints,** and **weight limitations,** and are based on the most common real-world configurations: 5 kg/m² and 10 kg/m² mass layers combined with either 25mm or 50mm mineral wool quilt.



The 10kg/m² + 25mm quilt build-up consistently delivered equal or superior insertion loss compared to the 10kg/m² + 50mm version — particularly at mid-to-high frequencies (500 Hz to 8,000 Hz), where human hearing is most sensitive. This effect is attributed to more effective mass–spring–mass behaviour, reduced compression during installation, and improved consistency of contact with the pipe surface. As a result, the 10kg/m² + 25mm quilt configuration is often preferred where performance, weight, and ease of installation must be balanced.

Acoustic performance (continued)

Choosing the Right Product for the Right Noise

NIKOLAG® configurations can be tailored to the dominant noise profile in your system:

- **Dominant noise 125–500 Hz** (flushes, pump rumble, structural "thud"):

  Choose a 50mm quilt variant for better decoupling (e.g. **5kg/m² × 50mm or 10kg/m² × 50mm**).

- **Dominant noise ≥ 1 kHz** (fan whine, valve clicks, air hiss, speech breakout):

  Prioritise **mass** — e.g. **10kg/m² × 25mm** (compact) or **10kg/m² × 50mm** (for wider-band control).

- **Balanced control / weight-sensitive install:**

  The **5kg/m² × 25mm** configuration remains the **anchor SKU,** offering effective broadband performance where both space and cost matter.

This frequency-targeted approach allows specifiers and engineers to **optimise acoustic performance** without over-engineering or over-spending — all while staying within real-world installation limits.

Manufacturing and Quality Assurance

NIKOLAG® is manufactured in the UK by **Niko Coatings Limited**, the leading producer of heavy layer acoustic materials in the country. All production takes place under certified management systems to ensure quality, safety, and environmental responsibility:

- **ISO 9001 – Quality Management**
  Ensures consistent product quality through rigorous process control and continuous improvement.
- **ISO 14001 – Environmental Management**
  Certifies reduced environmental impact through energy efficiency, emissions control, and sustainable resource use.
- **ISO 45001 – Occupational Health & Safety**
  Demonstrates commitment to worker safety and proactive risk management across manufacturing operations.

Niko Coatings Limited is proud to have achieved an **EcoVadis Silver Rating**, placing the company in the top 7% of businesses assessed worldwide for sustainability, environmental performance, labour standards, ethics, and responsible procurement.

While EcoVadis has tightened its criteria and banding thresholds this year, we are pleased to report that our overall score has improved, reflecting our ongoing commitment to continuous improvement in responsible and sustainable manufacturing.

This result underlines our progress and determination to lead with integrity, transparency, and measurable impact.

Frequently asked questions

Why didn't you use DN100 Schedule 40 steel pipe for testing?

DN100 Schedule 40 pipe is required for formal ISO 15665 classification, but it's rarely used in real-world HVAC or building services applications. We tested on 315mm galvanised steel duct and 100mm PVC pipe because they more accurately reflect the materials our customers actually install.

Can the results still be trusted without ISO 15665 classification?

Yes. The insertion loss results are independently measured by SRL, a recognised UK acoustic test house. While the test pipes don't match ISO 15665 reference geometries, the data still provides a valid comparison of:

- 5kg/m² vs 10kg/m² barriers
- 25mm vs 50mm quilt
- Performance across real-world PVC vs steel pipe installations

This gives specifiers and engineers the insight they need to make informed decisions — even without formal classification.

Will you repeat the tests using ISO-standard pipes?

No. We don't plan to conduct further testing on Schedule 40 pipes, as our priority is to model real-world installation scenarios that better match our customer base. The current test data provides all the necessary guidance for most projects.

What can we conclude from these tests?

The testing confirms that:

- Thicker quilt (50mm) improves mid/high frequency performance
- Heavier acoustic barrier (10kg/m²) gives modest gains at mid frequencies
- PVC pipe systems generally show higher insertion loss than steel ducting, especially at high frequencies
- Performance trends can still be used to guide specifier choices and system optimisation

Why was NIKOLAG® tested to ISO 15665 and not ISO 717-1?

ISO 15665:2003 was chosen because it is the dedicated international standard for measuring the acoustic performance of pipe lagging systems, particularly those used on HVAC ducts, process piping, and mechanical services. It measures insertion loss — the reduction in sound radiated from a pipe when insulation is applied — which is the most relevant performance metric for pipe lagging.

In contrast, ISO 717-1:2020 is used to classify building elements such as walls, doors, and partitions based on their airborne sound insulation, derived from laboratory sound transmission loss (STL) data. It is designed for rigid, flat components forming room boundaries — not cylindrical or curved lagging systems applied to pipes.

ISO 15665 is the only standard that tests full-size pipe sections (e.g. steel or plastic), under controlled lab conditions, with and without lagging. It accounts for:

- Pipe material (metal vs plastic)
- Pipe diameter
- Frequency-dependent breakout noise
- Practical acoustic build-ups (e.g. mass layers + quilt)

Therefore, ISO 15665 was the correct and most technically appropriate standard to test NIKOLAG® as an acoustic pipe lagging solution for mechanical and HVAC applications.

Why was NIKOLAG® tested to ASTM E84 fire rating instead of BS 476 Parts 6 & 7?

ASTM E84 (Standard Test Method for Surface Burning Characteristics of Building Materials)[13] was selected because it is the dominant international fire test standard used for HVAC lagging systems, particularly in projects governed by the International Building Code (IBC), NFPA 90A[14], and various Middle Eastern fire codes (e.g. UAE Fire & Life Safety Code, Saudi Building Code).

While BS 476 Parts 6 & 7[15] remain in use in the UK, they are more commonly applied to rigid surface-mounted construction products, not flexible acoustic composites. Furthermore, BS 476 is being phased out in favour of EN 13501-1[16], which still does not adequately represent the geometry and use case of pipe-wrap materials.

ASTM E84 better reflects the fire propagation behaviour of flexible lagging under ventilated duct conditions. It provides both a Flame Spread Index (FSI) and Smoke Developed Index (SDI) under controlled airflow, as required by UL listings, ASHRAE guidelines[17], and NFPA 90A Section 4.3.5.3.1 for duct insulation.

What is the difference between NIKOLAG® DENSBAK and SONOSHIELD, and when should I specify each?

Both NIKOLAG® DENSBAK and NIKOLAG® SONOSHIELD are high-performance acoustic lagging systems designed to reduce breakout noise from ducts, pipes, and mechanical services. The key difference lies in their fire classification, compliance level, and target application:

NIKOLAG® SONOSHIELD - ASTM E84 Class A fire rating (Flame Spread Index ≤25, Smoke Developed Index ≤50)

Designed for consultant-led specifications, large commercial projects, and code-driven applications where top-tier fire performance is mandatory.

Typically required in projects governed by NFPA 90A, IBC, UAE Fire Code, or where acoustic lagging must comply with Class A fire resistance.

NIKOLAG® DENSBAK - ASTM E84 Class B fire rating (FSI 26–75, SDI ≤450)

NIKOLAG® Class B-rated products are ideal for cost-sensitive installations where Class A fire performance is not mandated. They are commonly used in industrial plant rooms, commercial risers, and retrofit upgrades where acoustic performance is the priority, but Class A compliance isn't contractually required.

Both Class A and B options deliver comparable insertion loss when paired with appropriate quilt backing, so the choice typically depends on fire rating requirements, consultant specifications, and budget considerations.

Why was NIKOLAG® tested to ASTM E84 instead of Euroclass EN 13501-1 fire standards?

ASTM E84 was selected as the fire test method for NIKOLAG® because it is the dominant international standard for evaluating the surface burning characteristics of materials used in HVAC insulation systems, particularly in projects governed by:

- The International Building Code (IBC)
- NFPA 90A (North America)
- Middle Eastern regulations such as the UAE Fire & Life Safety Code and the Saudi Building Code (SBC)

In contrast, EN 13501-1 is typically used for internal wall and ceiling linings, not for pipe and duct lagging, which fall outside the standard's core scope.

Furthermore, EN 13501-1 relies on data from small-scale cone calorimeter and SBI (Single Burning Item) tests, which do not simulate duct airflow conditions. ASTM E84, by contrast, is a 25-foot tunnel test under controlled ventilation, which more closely reflects real-world conditions in mechanical service risers and plenum spaces.

As a result, ASTM E84 is the most relevant and widely accepted method for flexible lagging and mechanical insulation materials — especially for international projects, MEP specifications, and export markets.

Why was the Eurofins test method used to assess emissions and VOC performance?

Eurofins was selected because they operate one of the leading international laboratories for indoor air quality (IAQ) and volatile organic compound (VOC) emissions testing, with accreditations across:

- Eurofins Indoor Air Comfort (IAC) GOLD
- EN 16516 and ISO 16000 series standards
- Recognition under AgBB, LEED v4, BREEAM, EMICODE, and other global schemes

The Eurofins IAC GOLD method was used because it provides a single, harmonised test protocol that covers all major international labelling schemes. This ensures that NIKOLAG® meets the strictest VOC emission limits required for:

- Green building certification (e.g. LEED, BREEAM, DGNB)
- European market access under AgBB and Belgian Regulation
- Specifiers demanding low-emission materials for indoor use

Additionally, Eurofins offers a "one-way conservative worst-case grouping" methodology — which means the results reported are based on the worst-performing configuration across the NIKOLAG® range, providing a credible, representative, and risk-averse profile of emissions.

Choosing Eurofins ensures maximum transparency and global acceptance of the product's IAQ credentials — helping consultants, contractors, and developers streamline compliance without needing to cross-check multiple country-specific reports.

References

[1] BS ISO 15665:2003 Acoustic insulation for pipes, valves and flanges. Defines the laboratory method for determining insertion loss performance of pipe lagging systems. All NIKOLAG® test data was produced in accordance with this standard by SRL Technical Services Ltd (UKAS-accredited laboratory) 2003.
[2] Hull, Stec & Kaczorek (2011) *Carbon Monoxide Generation in Fires: Effect of Temperature on Halogenated and Aromatic Fuels.* Fire Safety Science.
[3] Hull, T.R., Stec, A.A., & Paul, K.T. (2008). *Hydrogen Chloride in Fires*. Fire Safety Science – Proceedings of the Ninth International Symposium, 665–676. International Association for Fire Safety Science.
[4] ISO 3795 Test Report – Flammability of Interior Materials, Report number 252125
[5] BS EN 13501-1: 2007 +A1:2009 Fire classification of Construction Products and Building Elements. Report number 27/05796/01/22, 2022
[6] ASTM E84 Test Report – Reaction to Fire Test, Report No. WC034-1, 2022.
[7] ASTM E84 Test Report – Reaction to Fire Test, Report No. WE002-1, 2022.
[8] VOC Emissions Test Report – Indoor Air Comfort Gold. Report number 392-2022-00151401_A_EN, 2022.
[9] Technical Report - The Laboratory Measurement of the Acoustic Insertion Loss of Lagging Material Applied to Spiral Duct and Waste Pipes, Report number 82510-SRL-RP-XT-001-P1, 2025
[10] Technical Report - The Laboratory Measurement of the Acoustic Insertion Loss of Lagging Material Applied to Spiral Duct and Waste Pipes, Report number 82510-SRL-RP-XT-002-P1, 2025
[11] ISO 226:2003 Acoustics — Normal equal-loudness-level contours. Reference for the frequency sensitivity of human hearing, illustrating the greater audibility of noise in the 500–4,000 Hz range. 2003.
[12] ISO 11654:1997 Sound absorbers for use in buildings — Rating of sound absorption. Supports the use of standardised octave bands (125–8,000 Hz) for characterising acoustic materials in building services.
[13] ASTM E84-22 Standard Test Method for Surface Burning Characteristics of Building Materials, ASTM International, 2022.
[14] NFPA 90A:2024 Edition Standard for the Installation of Air-Conditioning and Ventilating Systems, National Fire Protection Association, Section 4.3.5.3.1.
[15] BS 476-6:1989 + A1:2009 / BS 476-7:1997 Fire tests on building materials and structures – Method of test for fire propagation / surface spread of flame.
[16] EN 13501-1:2019 Fire classification of construction products and building elements – Classification using data from reaction to fire tests.
[17] ASHRAE Handbook – HVAC Systems and Equipment (2020) Chapter 23 – Insulation for Mechanical Systems (E84 referenced as the performance benchmark for thermal/acoustic lagging).

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