Matrix Silencers

A complete range of low pressure drop sound attenuators constructed by acoustic columns arranged in a matrix pattern

iac acoustics

making the world a quieter place

IAC Acoustics

Making the World a Quieter Place

Founded on an unrivalled history of engineering with some of the most pioneering discoveries in the industry, the IAC Acoustics brand is synonymous with technological innovation.

From controlling noise at a power station to tuning the sound in a TV or radio studio, IAC Acoustics has had a positive impact on society and helped to shape what can be achieved to make speech more intelligible, music more enjoyable, reduce the impact of industrial noise and protect people's sense of hearing.

The continual success of our products and services over the decades has brought the brand a reputation for quality and reliability among customers, whether they are multinational corporations or independent family businesses. This is supported by the expertise and passion of our workforce, the people behind the products, including designers, engineers and industry specialists.

To face the ever increasing noise reduction demands of the future, we will strive to further enhance our ability to reduce excessive noise. We aim to focus on developing tomorrow's solution today, innovating faster and delivering solutions that meet the requirements of the next generation. In doing so, we will stay true to our key values and founding philosophy to make the world a quieter place.

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Matrix Silencers Overview

IAC Acoustics is a leading global manufacturer of high performance silencers and has completed thousands of installations worldwide.

The Matrix Silencers from IAC Acoustics are an alternative to ordinary silencers made from attenuating baffles/splitters and are characterized by a better low frequency acoustics performance.

Sound Transmission Loss (dB) overview

For selected models of Matrix Silencers

Tip to tip Column Length (mm)	Active Zone Length (mm)	Model		
		IAC-M-300-S-100/100	IAC-M-300-S-130/130	IAC-M-300-S-150/150
		Acoustic rating R_w (dB)		
740	500	10	8	8
1240	1000	15	13	13
1740	1500	22	19	18
2240	2000	27	23	22
2740	2500	30	26	24
3240	3000	33	29	27

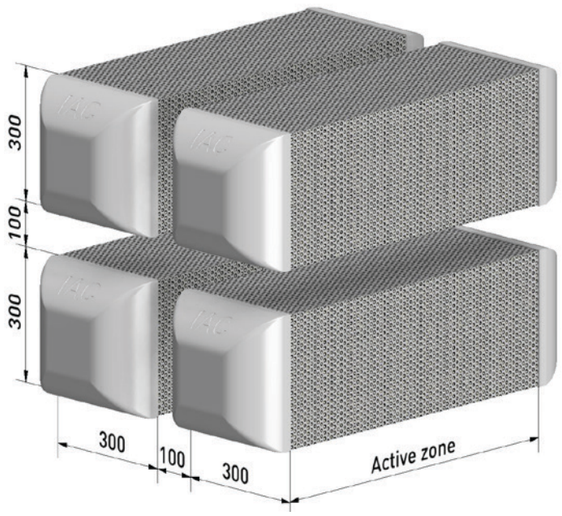
Aesthetics, Performance & Economy

The unique and simple design of the Matrix Silencer allows the air flow to pass in X, Y, Z. An ideal choice for broadband attenuation and low pressure drop.

Product Features Matrix Silencer

Matrix Silencers are rectangular muffling columns arranged in an array configuration.
By reducing the distance between the columns the acoustic performance can be tuned to match the acoustic target in any application without having to change the shape of the column.

The Matrix Silencer is created from a desire to build a silencer with similar acoustics as a traditional baffle silencer, but with a lower pressure drop.
The Matrix Silencer does exactly that. Compared to a traditional baffle silencer the sound absorbing surface area and the free area ration will be larger in a Matrix silencer.



Why choose Matrix

Acoustics and pressure drop

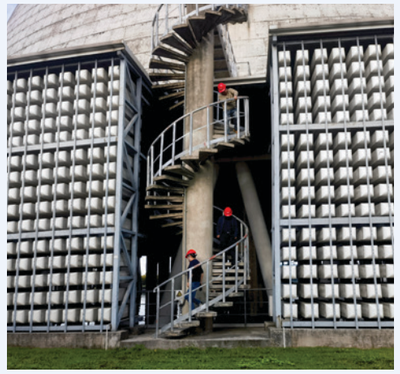
- Better broadband acoustic performance, suitable for broadband noise sources.
- Significant lower pressure drop, depending on specific design characteristics.

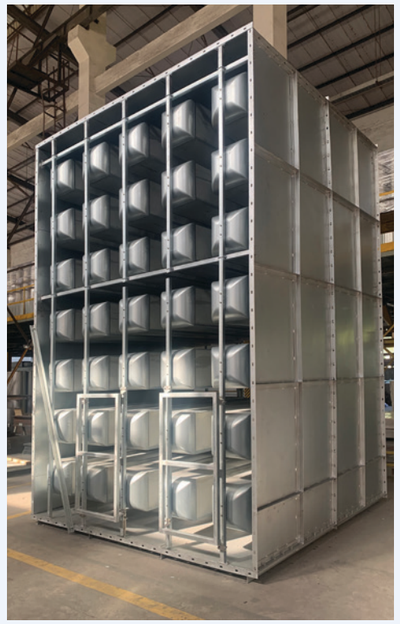
Installation and maintenance

- Can be installed through an access hatch in a large existing duct without having to cut the duct open.
- Can be installed without the use of cranes.
- Easy to install and uninstall, with a small crew.
- Easy maintenance by removing columns separately.

Economic benefits

- Simple engineering lowers design time and reduces cost.
- Less production time equals lower cost.
- Optimized packing equals reduced shipping cost.
- Not needing a large crane for installation will save money.
- Easy installation lowers installation cost.
- Low maintenance cost.

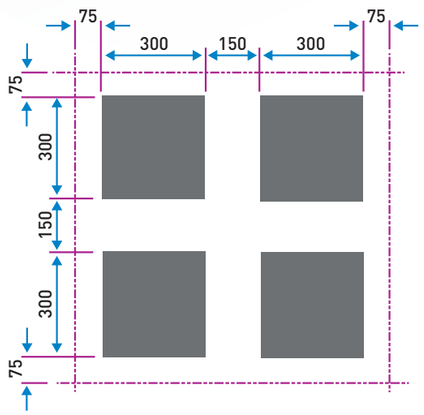




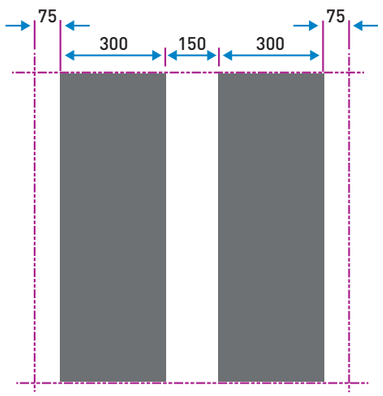
Matrix vs. Baffle

Example of two comparable silencers with the following casing dimensions.
Inlet face area: 900mm x 900 mm | **Length:** 1000mm

Matrix Silencer

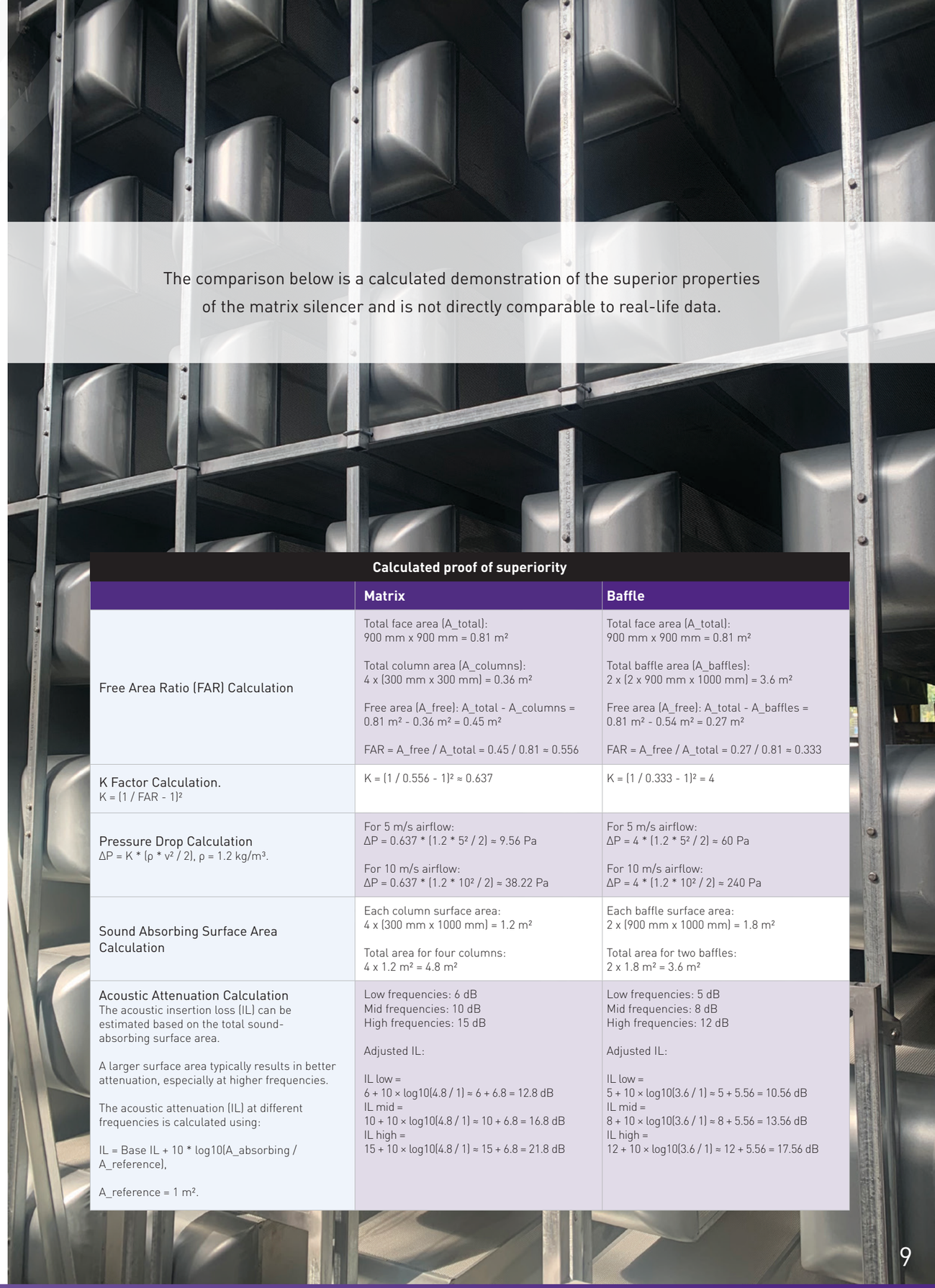


Baffle Silencer



In the example we see that the array silencer has a 67% larger free area ratio while at the same time having a 33% larger sound absorbing surface compared to a traditional silencer with similar spacing and element thickness.

Summary Table		
Parameter	**Matrix**	**Baffle**
FAR	0.556	0.333
K Factor	0.637	4
Pressure Drop (5 m/s) (Pa)	9.56	60
Pressure Drop (10 m/s) (Pa)	38.22	240
Absorbing Surface Area (m²)	4.8	3.6
Acoustic Attenuation (Low)	12.8 dB	10.56 dB
Acoustic Attenuation (Mid)	16.8 dB	13.56 dB
Acoustic Attenuation (High)	21.8 dB	17.56 dB



The comparison below is a calculated demonstration of the superior properties of the matrix silencer and is not directly comparable to real-life data.

Calculated proof of superiority		
	Matrix	**Baffle**
Free Area Ratio (FAR) Calculation	Total face area (A_total): 900 mm x 900 mm = 0.81 m² Total column area (A_columns): 4 x (300 mm x 300 mm) = 0.36 m² Free area (A_free): A_total - A_columns = 0.81 m² - 0.36 m² = 0.45 m² FAR = A_free / A_total = 0.45 / 0.81 ≈ 0.556	Total face area (A_total): 900 mm x 900 mm = 0.81 m² Total baffle area (A_baffles): 2 x (2 x 900 mm x 1000 mm) = 3.6 m² Free area (A_free): A_total - A_baffles = 0.81 m² - 0.54 m² = 0.27 m² FAR = A_free / A_total = 0.27 / 0.81 ≈ 0.333
K Factor Calculation. K = (1 / FAR - 1)²	K = (1 / 0.556 - 1)² ≈ 0.637	K = (1 / 0.333 - 1)² = 4
Pressure Drop Calculation ΔP = K * (ρ * v² / 2), ρ = 1.2 kg/m³.	For 5 m/s airflow: ΔP = 0.637 * (1.2 * 5² / 2) ≈ 9.56 Pa For 10 m/s airflow: ΔP = 0.637 * (1.2 * 10² / 2) ≈ 38.22 Pa	For 5 m/s airflow: ΔP = 4 * (1.2 * 5² / 2) ≈ 60 Pa For 10 m/s airflow: ΔP = 4 * (1.2 * 10² / 2) ≈ 240 Pa
Sound Absorbing Surface Area Calculation	Each column surface area: 4 x (300 mm x 1000 mm) = 1.2 m² Total area for four columns: 4 x 1.2 m² = 4.8 m²	Each baffle surface area: 2 x (900 mm x 1000 mm) = 1.8 m² Total area for two baffles: 2 x 1.8 m² = 3.6 m²
Acoustic Attenuation Calculation The acoustic insertion loss (IL) can be estimated based on the total sound-absorbing surface area. A larger surface area typically results in better attenuation, especially at higher frequencies. The acoustic attenuation (IL) at different frequencies is calculated using: IL = Base IL + 10 * log10(A_absorbing / A_reference), A_reference = 1 m².	Low frequencies: 6 dB Mid frequencies: 10 dB High frequencies: 15 dB Adjusted IL: IL low = 6 + 10 × log10(4.8 / 1) ≈ 6 + 6.8 = 12.8 dB IL mid = 10 + 10 × log10(4.8 / 1) ≈ 10 + 6.8 = 16.8 dB IL high = 15 + 10 × log10(4.8 / 1) ≈ 15 + 6.8 = 21.8 dB	Low frequencies: 5 dB Mid frequencies: 8 dB High frequencies: 12 dB Adjusted IL: IL low = 5 + 10 × log10(3.6 / 1) ≈ 5 + 5.56 = 10.56 dB IL mid = 8 + 10 × log10(3.6 / 1) ≈ 8 + 5.56 = 13.56 dB IL high = 12 + 10 × log10(3.6 / 1) ≈ 12 + 5.56 = 17.56 dB

Matrix Silencers Specifications

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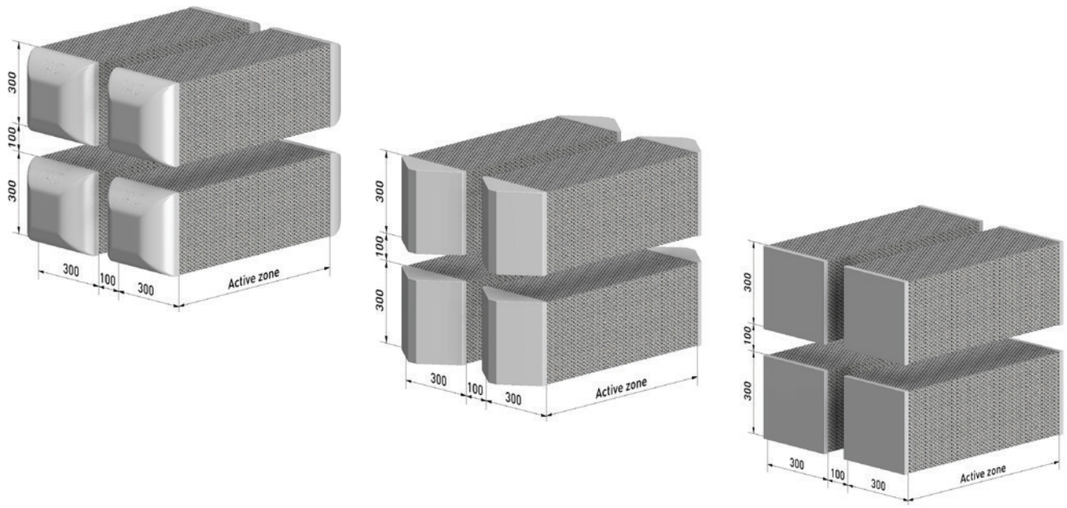
Easy to install and uninstall

Matrix Silencers are built up by elements that can be handled by one worker. They require very little space for installation.



Acoustics performance*

Tip to tip Column Length (mm)	Active Zone Length (mm)	Frequency HZ								Acoustic rating R_w (dB)
		63	125	250	500	1000	2000	4000	8000	
740	500	2	3	9	9	10	13	16	16	10
1240	1000	3	5	12	17	20	23	23	18	15
1740	1500	4	8	18	29	32	34	29	21	22
2240	2000	4	9	22	37	41	42	34	24	27
2740	2500	5	11	25	43	48	47	38	25	30
3240	3000	5	12	28	48	53	52	41	27	33
		Static Insertion loss (dB)								

* Tested on Matrix Columns fitted with Dome style tip and tail

Tested in Greentech lab in accordance to:
National standards GB/T 25516 2010 / ISO 7235
National standard HJ2523
Industrial standard Q/CP LCG 0001 2015

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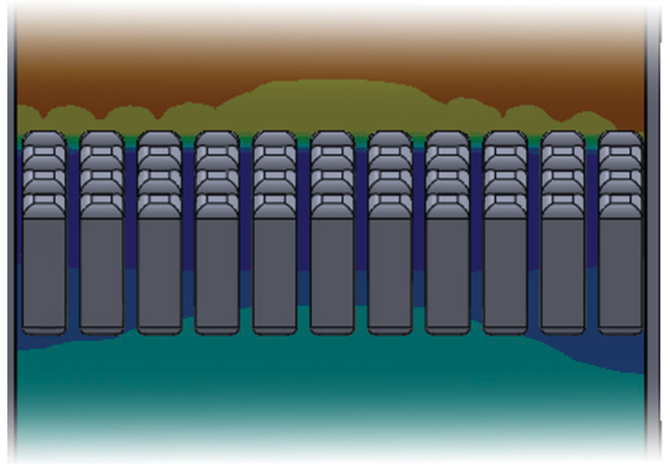
Matrix Silencer
IAC-M-300-S-100/100



Pressure drop

Tip to tip Column Length (mm)	Active Zone Length (mm)	Facevelocity, Volume Flow Rate (m/s)								Pressure loss coefficient (ζ)
		2	4	6	8	10	12	14	16	
740	500	3,8	15,2	34,1	60,7	94,8	136,5	185,8	242,7	1,58
1240	1000	4,8	19,0	42,8	76,0	118,8	171,1	232,8	304,1	1,98
1740	1500	5,6	22,5	50,5	89,9	140,4	202,2	275,2	359,4	2,34
2240	2000	6,3	25,3	57,0	101,4	158,4	228,1	310,5	405,5	2,64
2740	2500	7,0	27,8	62,6	111,4	174,0	250,6	341,0	445,4	2,90
3240	3000	7,5	29,9	67,2	119,4	186,6	268,7	365,7	477,7	3,11
		Pressure drop (N/mm²)								

Translating Pressure Loss Coefficient to Pressure Drop (Pa or N/m²)

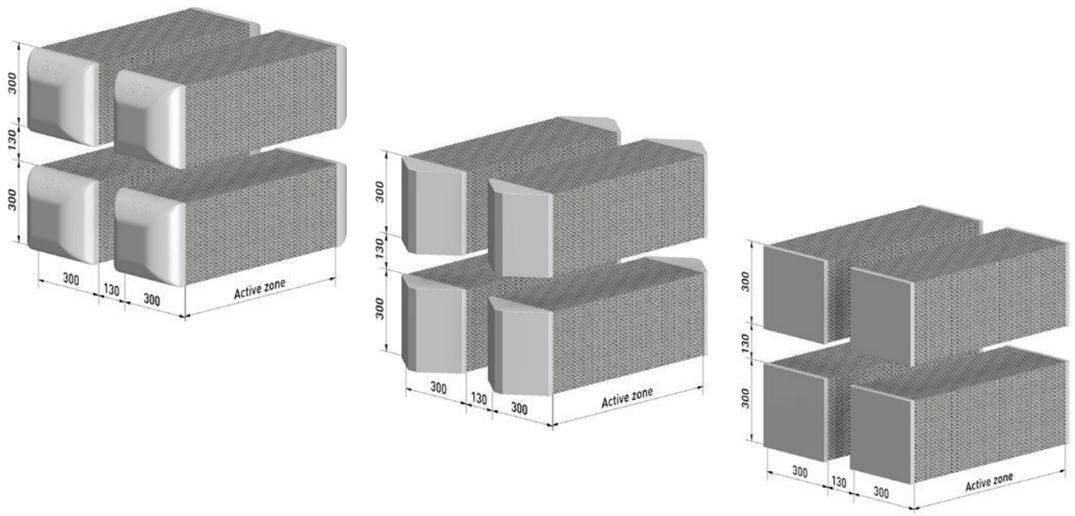
To convert the pressure loss coefficient to actual pressure drop in pascals (Pa) or N/m², you can use the following formula:

$$\Delta P = \zeta \times \frac{1}{2} \times \rho \times V^2$$

where:
- ΔP is the pressure drop (Pa or N/m²).
- ζ is the pressure loss coefficient.
- ρ is the air density (in kg/m³).
- V is the air velocity (in m/s).

Explanation:
Pressure loss coefficient: This value is dimensionless and characterizes the resistance offered by the silencer.
Air density: For standard air conditions at room temperature and pressure, the density ρ is approximately 1.2 kg/m³.

Errors and Omissions Excepted [E&OE].



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1740	1500	3	6	16	29	31	28	21	18	19
2240	2000	4	8	20	36	38	35	25	20	23
2740	2500	4	9	22	41	44	40	28	22	26
3240	3000	4	10	25	46	49	44	30	23	29
		Static Insertion loss (dB)								

* Tested on Matrix Columns fitted with Dome style tip and tail

Tested in Greentech lab in accordance to:
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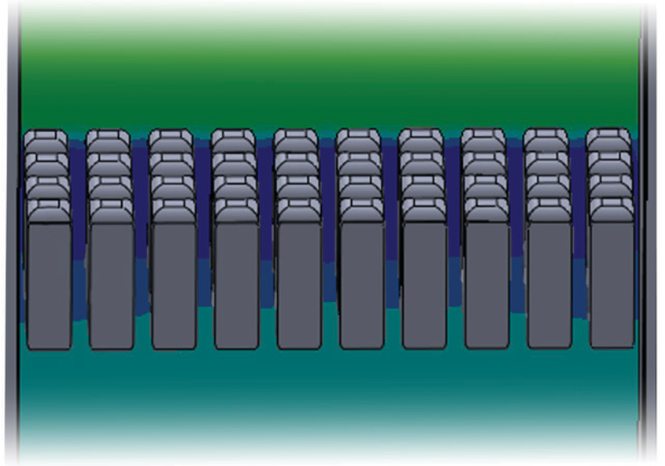
Matrix Silencer

IAC-M-300-S-130/130



Pressure drop

Tip to tip Column Length (mm)	Active Zone Length (mm)	Facevelocity, Volume Flow Rate (m/s)								Pressure loss coefficient (ζ)
		2	4	6	8	10	12	14	16	
740	500	3,1	12,6	28,3	50,3	78,6	113,2	154,1	201,2	1,31
1240	1000	5,4	21,7	48,8	86,8	135,6	195,3	265,8	347,1	2,26
1740	1500	6,4	25,5	57,5	102,1	159,6	229,8	312,8	408,6	2,66
2240	2000	7,2	28,9	65,0	115,6	180,6	260,1	354,0	462,3	3,01
2740	2500	7,9	31,7	71,3	126,7	198,0	285,1	388,1	506,9	3,30
3240	3000	8,5	34,0	76,5	135,9	212,4	305,9	416,3	543,7	3,54
		Pressure drop (N/mm²)								

Translating Pressure Loss Coefficient to Pressure Drop (Pa or N/m²)

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- V is the air velocity (in m/s).

Explanation:

Pressure loss coefficient: This value is dimensionless and characterizes the resistance offered by the silencer.
Air density: For standard air conditions at room temperature and pressure, the density ρ is approximately 1.2 kg/m³.

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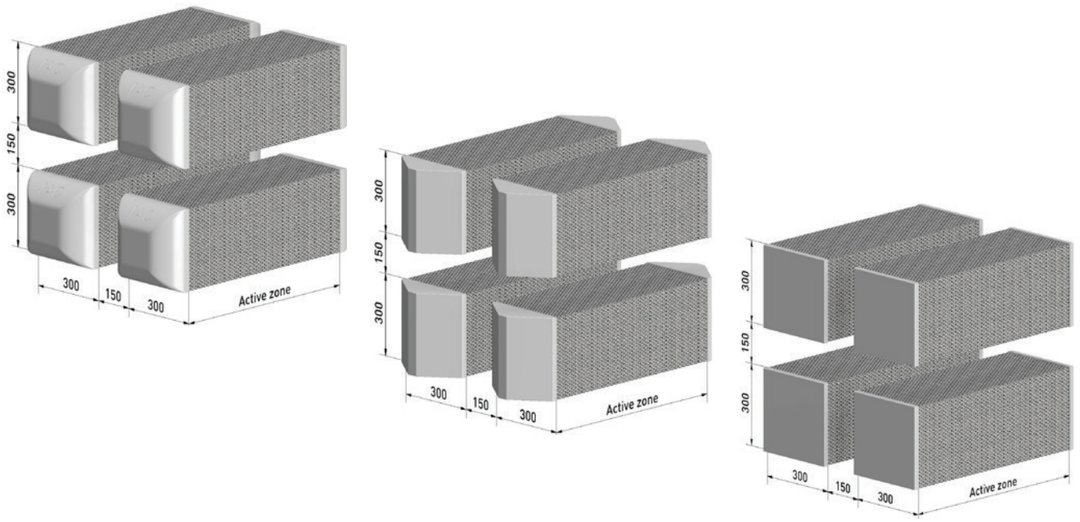

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1740	1500	3	6	15	26	28	26	21	19	18
2240	2000	3	7	18	32	35	32	25	21	22
2740	2500	3	8	21	37	40	36	28	22	24
3240	3000	4	9	23	41	44	39	30	23	27
		Static Insertion loss (dB)								

* Tested on Matrix Columns fitted with Dome style tip and tail

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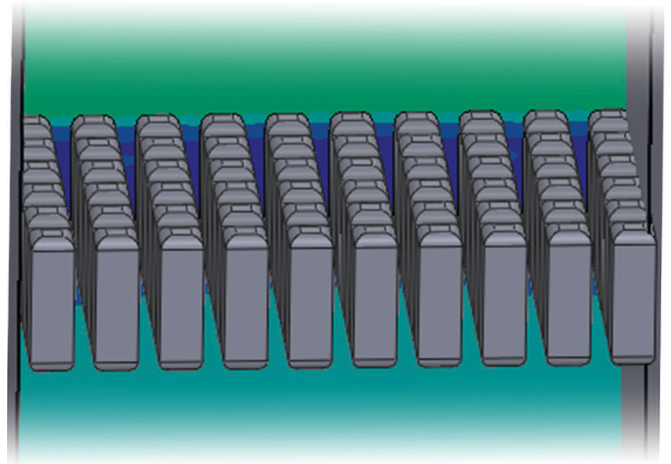
Matrix Silencer
IAC-M-300-S-150/150



Pressure drop

Tip to tip Column Length (mm)	Active Zone Length (mm)	Facevelocity, Volume Flow Rate (m/s)								Pressure loss coefficient (ζ)
		2	4	6	8	10	12	14	16	
740	500	2,7	10,8	24,2	43,0	67,2	96,8	131,7	172,0	1,12
1240	1000	3,4	13,4	30,2	53,8	84,0	121,0	164,6	215,0	1,40
1740	1500	4,0	15,8	35,6	63,4	99,0	142,6	194,0	253,4	1,65
2240	2000	4,5	18,0	40,4	71,8	112,2	161,6	219,9	287,2	1,87
2740	2500	4,9	19,7	44,3	78,7	123,0	177,1	241,1	314,9	2,05
3240	3000	5,3	21,1	47,5	84,5	132,0	190,1	258,7	337,9	2,20
		Pressure drop (N/mm²)								

Translating Pressure Loss Coefficient to Pressure Drop (Pa or N/m²)

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where:

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Explanation:

Pressure loss coefficient: This value is dimensionless and characterizes the resistance offered by the silencer.
Air density: For standard air conditions at room temperature and pressure, the density ρ is approximately 1.2 kg/m³.

Errors and Omissions Excepted [E&OE].

Product Referencing

Brand	Matrix	Column WxH	S: Square R: Rectangular	Column spacing	Active Zone Length	Tip and tail shape D: Dome F: Flat W: Wedge	Material GS: Galvanized AL: Aluminium SS: Stainless
IAC	M	300	S	100/100	500	D	GS
		380	R	130/130	1000	F	AL
				150/150	1500	W	SS
				100/130	2000		
				100/150	2500		
				130/150	3000		

● Standard ● Optional

Example:

IAC-M-300-S-100/100-1000-D-GS

Compliance

The design, manufacturing and selection of materials used for the Matrix silencers is in compliance with the following documents:

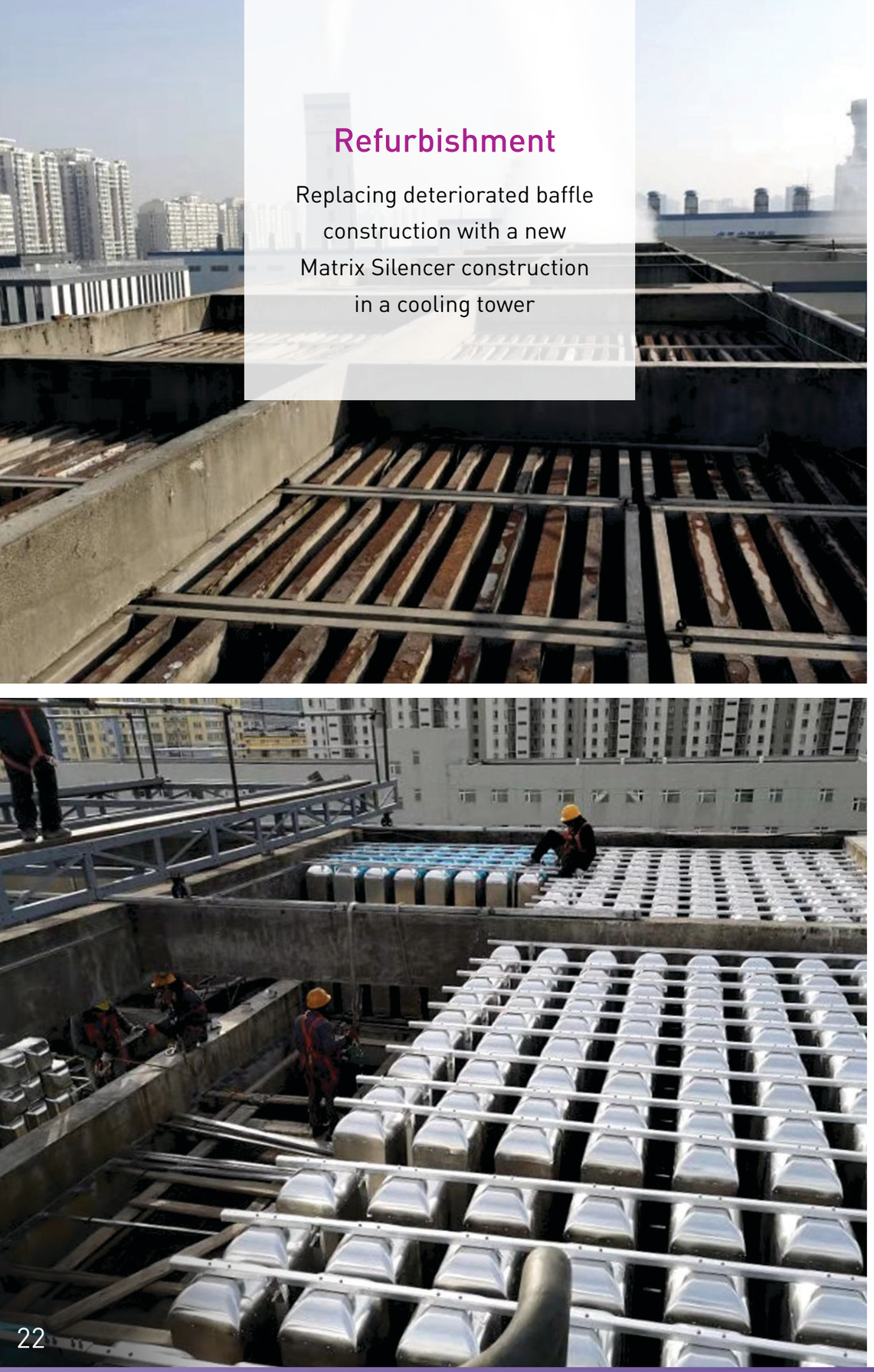
ISO 7235- Acoustics Laboratory measurement procedures for ducted silencers and air-terminal units - Insertion loss, flow noise and total pressure loss.
This is an international standard developed by the International Organization for Standardization (ISO). It outlines laboratory measurement procedures specifically for ducted silencers and air-terminal units, focusing on parameters such as insertion loss, flow noise, and total pressure loss.

GB/T 25516-2010 General specification for aerodynamic noise barrier materials.
This national standard, issued by the Standardization Administration of China (SAC), provides specifications for aerodynamic noise barrier materials. It includes guidelines and requirements for the design, testing, and application of materials used in the construction of noise barriers to mitigate aerodynamic noise.

HJ 2523-2012 - Technical specification for environmental noise impact assessment.
HJ 2523 is a national standard in China related to the technical specifications for conducting environmental noise impact assessments. It provides guidelines and criteria for assessing the impact of various sources of environmental noise, including methods for measurement, analysis, and evaluation.

Q/CP LCG 0001-2015 - Technical specifications for industrial sound insulation and noise control.
This industrial standard in China, identified by the code Q/CP LCG 0001-2015. It provides the technical specifications for sound insulation and noise control in industrial settings. It covers aspects such as materials, design criteria, and testing methods related to controlling and reducing noise in industrial environments.

These documents play crucial roles in establishing guidelines and specifications for various aspects of acoustics, noise control, and environmental impact assessments in different contexts.



Refurbishment

Replacing deteriorated baffle construction with a new Matrix Silencer construction in a cooling tower

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