STARDUCT

SILENCERS AND ACOUSTIC LOUVER

HVAC Noise control

$$L_P = 10 \log_{10} \frac{p^2}{p_{ref}^2} = 20 \log_{10} \frac{p}{p_{ref}}$$

Starduct Ve.24

NOISE AND REDUCES NOISE METHODS

Noise pollution is an environmental issue that is increasingly receiving attention due to its negative impacts on human health and quality of life. Prolonged exposure to noise can cause various health problems, ranging from stress, insomnia, and reduced concentration to more serious issues such as hearing loss, hypertension, and heart disease. In the workplace, noise can reduce work performance, increase the risk of accidents, and decrease job satisfaction.

In HVAC (Heating, Ventilation, and Air Conditioning) systems, equipment such as fans, pumps, and ducts can generate significant noise. This noise not only causes discomfort but also affects the tranquility and comfort within buildings. To address this issue, the following methods can be used:

- **Installing silencers:** These devices are designed to absorb or reflect noise, reducing the noise transmitted through the system.

- **Soundproofing and acoustic treatment:** Using soundproof materials like fiberglass or acoustic foam to reduce noise from equipment and ducts.

- **Regular maintenance:** Periodically checking and maintaining equipment to ensure they operate smoothly and reduce noise caused by malfunctions.

- **Smart system design:** Optimizing system design to minimize noise from the start, such as using variable frequency drives to optimize the operating speed of fans, pumps, compressors, etc., to reduce noise and save energy in the building.

Controlling noise not only improves human health and well-being but also contributes to creating a better living and working environment. This is especially important in today's era of technology and urbanization, where noise is becoming an unavoidable part of daily life.

Noise can be classified based on various criteria, from its origin to how it affects the environment and human health. Here are some common types of noise and ways to control and reduce them using silencers:

Types of Noise:

1. **Continuous Noise:** This type of noise is constant or changes very little over time, often found in manufacturing plants or from machinery engines.
2. **Intermittent Noise:** This noise occurs intermittently and can change suddenly, such as traffic horns or hammering sounds.
3. **Impulse Noise:** Characterized by very short and strong bursts of noise, like gunshots or hammer blows.
4. **Low-frequency Noise:** Noise with low frequency, often more annoying and harder to insulate against, such as noise from generators, air conditioning units, cooling towers of chiller systems, water pumps, and ventilation fans.

Methods to Control and Reduce Noise Using Silencers:

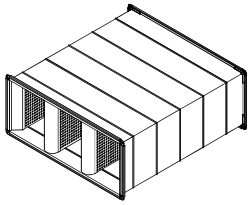
- **Silencer Design:** Choose a silencer design that matches the type of noise to be reduced. For example, silencers with thick baffles are more effective for low-frequency noise.
- **Acoustic Materials:** Use acoustic materials like fiberglass or acoustic foam to absorb noise, especially impulse noise and low-frequency noise.
- **Size and Shape:** Adjust the size and shape of the silencer to optimize noise reduction, particularly in confined spaces.
- **Maintenance:** Ensure that silencers are regularly maintained to keep their noise reduction performance at an optimal level.
- **Combining Methods:** Often, multiple noise reduction methods are combined to achieve the highest noise reduction efficiency, especially in complex HVAC systems.

Choosing and using the appropriate silencer not only helps reduce noise but also contributes to creating a quieter living and working environment, thereby improving quality of life and work performance.

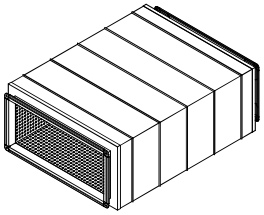
STARDUCT PRODUCTIONS RANGE

As a long-standing and experienced manufacturer, with the principle of continuously investing in people and production means, Starduct is daily striving to fulfill its role as a pioneering manufacturer in the HVAC field in general and noise reduction and silencing equipment in particular. This includes:

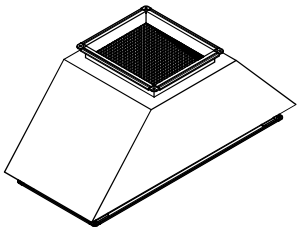
- Investing in people, equipping them with knowledge and expertise.
- Investing in tools and software to calculate and select technical parameters, types, and sizes of silencers suitable for each sound source characteristic, to address them according to project requirements.
- Investing in factories and machinery with the capacity to produce large quantities with consistent quality.



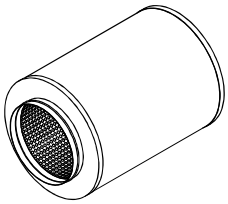
Multi Splitters Straight



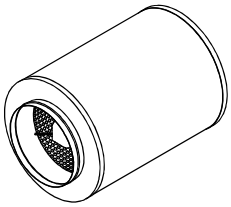
Straight Duct Silencer



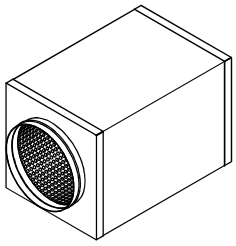
Accessories Silencers



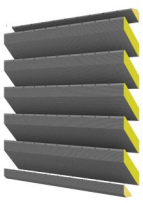
Single Wall Round Silencer



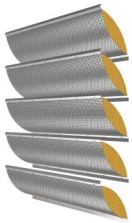
Turbine Silencer



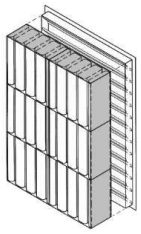
Square to Round Silencer



Acoustic Louver “t” Blade

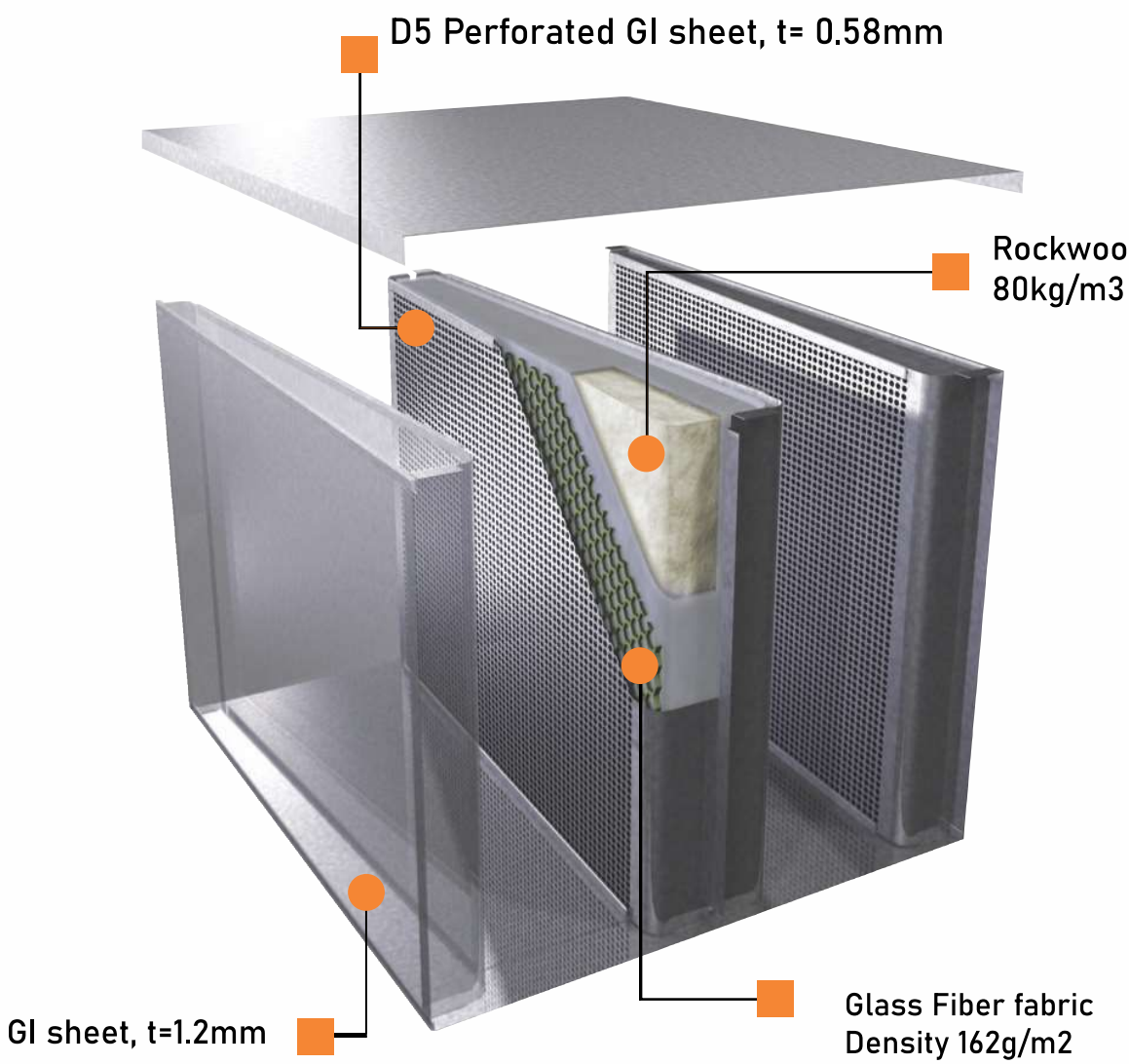


Acoustic Louver “o” Blade



Acoustic Wall

Basic Structure of Starduct's Standard Silencer



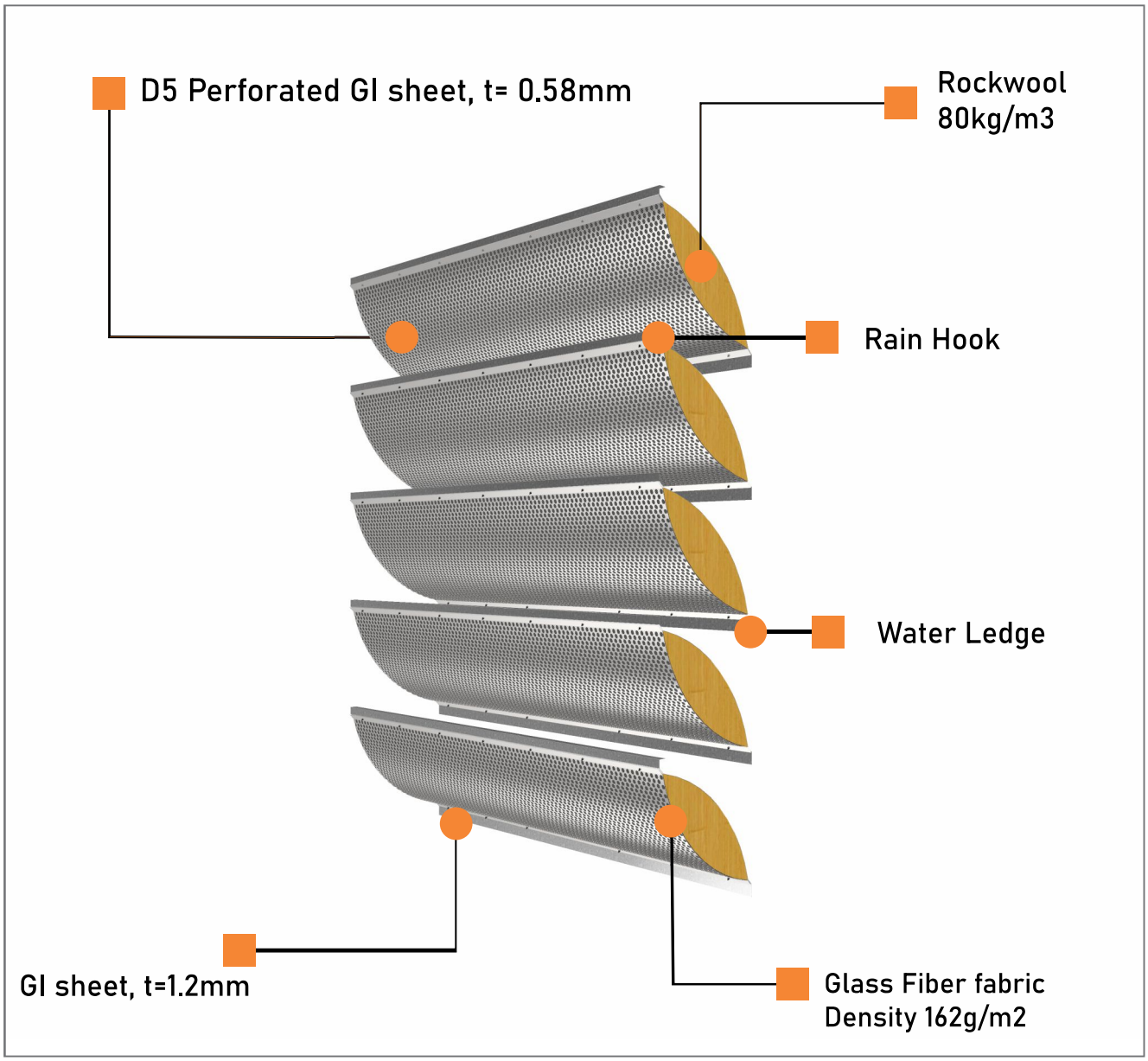
Standard Materials and Acoustic Layer Thickness:

- Casing made of 1.2mm thick galvanized steel
- Perforated steel sheet D5, 0.58mm thick
- Acoustic layer thickness: 50-100-150mm. Core wall: 100-150-200mm. Core gap: 100-200mm (according to design)
- Rock wool with a density of 80kg/m³

Advanced Materials (Upon Request):

- Casing made of high corrosion-resistant materials (Aluminum, Zam K27, Stainless Steel...), 1.5-2.0mm thick
- Perforated sheet made of high corrosion-resistant materials (Aluminum, Zam K27, Stainless Steel...), 0.75-0.95mm thick
- Water-resistant fiberglass, density 48kg/m³
- Water-resistant rock wool, density 100kg/m³

Basic Structure of Starduct's Standard Acoustic Louver



Standard Materials and Acoustic Layer Thickness:

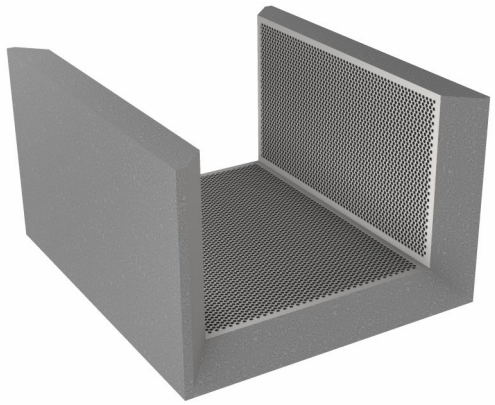
- Casing made of 1.2mm thick galvanized steel
- Perforated steel sheet D5, 0.58mm thick
- Acoustic layer thickness: 50-100-150mm. Core wall: 100-150-200mm. Core gap: 100-200mm (according to design)
- Rock wool with a density of 80kg/m³

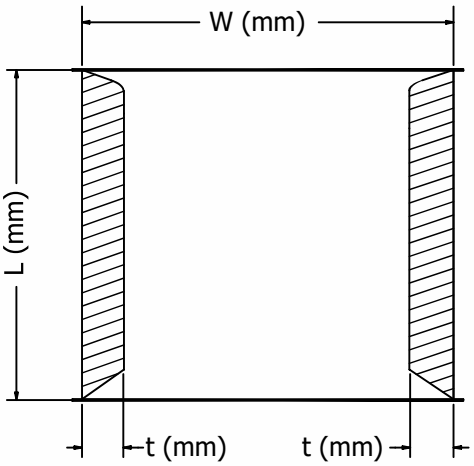
Advanced Materials (Upon Request):

- Casing made of high corrosion-resistant materials (Aluminum, Zam K27, Stainless Steel...), 1.5-2.0mm thick
- Perforated sheet made of high corrosion-resistant materials (Aluminum, Zam K27, Stainless Steel...), 0.75-0.95mm thick
- Water-resistant fiberglass, density 48kg/m³
- Water-resistant rock wool, density 100kg/m³

STRAIGHT DUCT SILENCER (WALL INSIDE)

MODEL: S-RDi





Lenght	Wall thickness	Widht	Height
L (mm)	t (mm)	W (mm)	H (mm)

Duct Connection type	- TDC - C - Bic V30/40/50

Insertion Loss (IL) - *Dash "-" indicates performance data for reverse flow (return) applications.*

Lenght (mm)	Face Velocity m/s	Pressure Drop (Pa)	Dynamic Insertion Loss (dB) / Generated Noise (dB)							
			63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
900	+3.8	15	3	5	11	22	28	21	18	15
	+2.5	8	3	5	11	22	28	21	18	15
	0	0	3	5	11	22	28	21	17	14
	-2.5	8	4	6	12	23	29	21	17	14
	-3.8	15	4	6	12	23	29	21	17	14
1500	+3.8	18	4	8	17	33	42	36	23	19
	+2.5	8	4	8	17	33	43	36	23	19
	0	0	4	8	17	33	43	36	22	18
	-2.5	8	5	9	18	34	44	36	22	18
	-3.8	18	5	9	18	34	44	36	22	18
2100	+3.8	18	6	11	21	43	47	42	27	21
	+2.5	8	6	11	21	43	47	42	27	21
	0	0	6	11	22	43	48	42	27	21
	-2.5	8	7	12	23	44	49	42	27	21
	-3.8	18	7	12	23	44	49	42	27	21
2700	+3.8	20	8	14	25	52	51	48	32	24
	+2.5	10	8	14	26	53	52	48	32	24
	0	0	8	14	26	53	52	48	31	23
	-2.5	10	9	15	27	54	53	48	31	23
	-3.8	20	9	15	28	55	54	48	31	23

Generated Noise (GN)

Lenght (mm)	Face Velocity m/s	Generated Noise (dB)							
		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
All Lengths	+3.8	37	20	22	30	30	25	16	10
	+2.5	28	20	15	23	22	15	10	10
	0	25	20	15	15	10	10	10	10
	-2.5	25	20	24	31	27	22	10	10
	-3.8	33	26	30	35	33	31	21	14

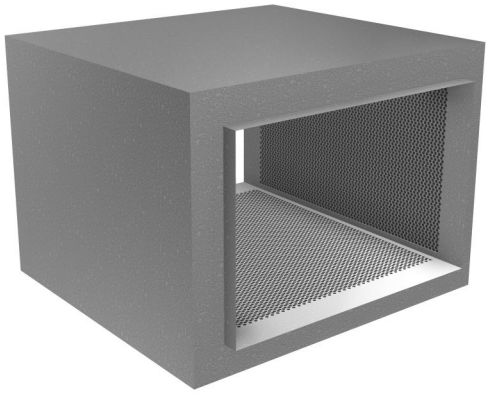
Generated Noise Corrections

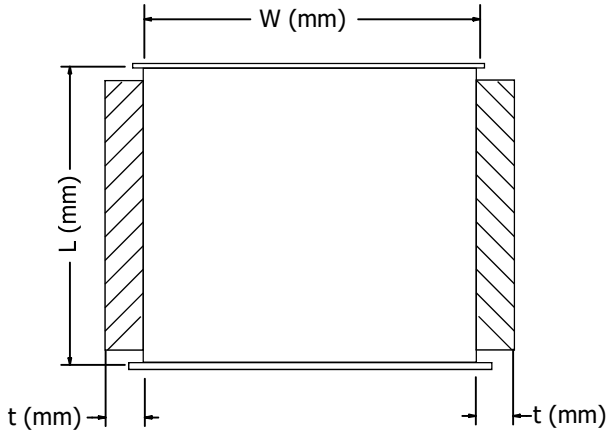
Silencer Face Area (Sqm)	0.05	0.09	0.19	0.37	0.74	1.49	2.97	5.95	11.89
dB Addition or Reduction	-9	-6	-3	0	+3	+6	+9	+12	+15

- Dynamic Insertion Loss is limited to 55 dB due to flanking.
- The performance data above is based on a 0.6 x 0.6 meter component. Others size please contact NSCA.

STRAIGHT DUCT SILENCER (WALL OURSIDE)

MODEL: S-RDo





Lenght	Wall thickness	Widht	Height
L (mm)	t (mm)	W (mm)	H (mm)

Duct Connection type	- TDC - C - Bic V30/40/50

Insertion Loss (IL) - *Dash "-" indicates performance data for reverse flow (return) applications.*

Lenght (mm)	Face Velocity m/s	Pressure Drop (Pa)	Dynamic Insertion Loss (dB) / Generated Noise (dB)							
			63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
900	+3.8	15	3	5	11	22	28	21	18	15
	+2.5	8	3	5	11	22	28	21	18	15
	0	0	3	5	11	22	28	21	17	14
	-2.5	8	4	6	12	23	29	21	17	14
	-3.8	15	4	6	12	23	29	21	17	14
1500	+3.8	18	4	8	17	33	42	36	23	19
	+2.5	8	4	8	17	33	43	36	23	19
	0	0	4	8	17	33	43	36	22	18
	-2.5	8	5	9	18	34	44	36	22	18
	-3.8	18	5	9	18	34	44	36	22	18
2100	+3.8	18	6	11	21	43	47	42	27	21
	+2.5	8	6	11	21	43	47	42	27	21
	0	0	6	11	22	43	48	42	27	21
	-2.5	8	7	12	23	44	49	42	27	21
	-3.8	18	7	12	23	44	49	42	27	21
2700	+3.8	20	8	14	25	52	51	48	32	24
	+2.5	10	8	14	26	53	52	48	32	24
	0	0	8	14	26	53	52	48	31	23
	-2.5	10	9	15	27	54	53	48	31	23
	-3.8	20	9	15	28	55	54	48	31	23

Generated Noise (GN)

Lenght mm	Face Velocity m/s	Generated Noise (dB)							
		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
All Lengths	+3.8	37	20	22	30	30	25	16	10
	+2.5	28	20	15	23	22	15	10	10
	0	25	20	15	15	10	10	10	10
	-2.5	25	20	24	31	27	22	10	10
	-3.8	33	26	30	35	33	31	21	14

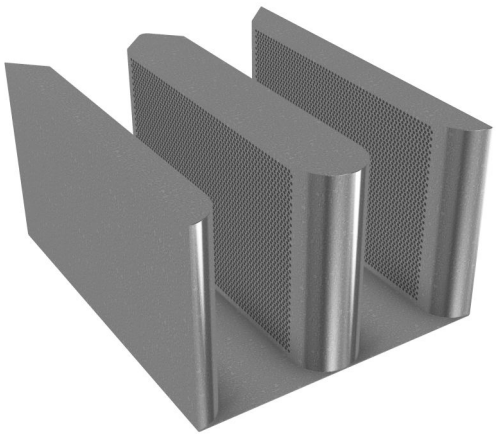
Generated Noise Corrections

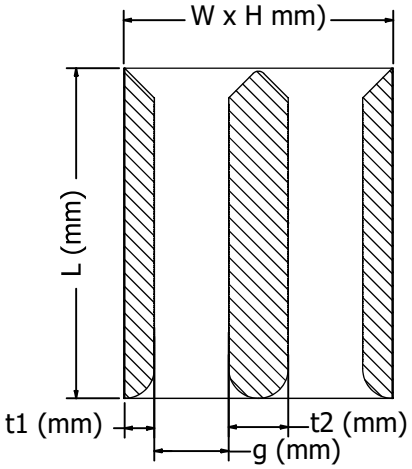
Silencer Face Area (Sqm)	0.05	0.09	0.19	0.37	0.74	1.49	2.97	5.95	11.89
dB Addition or Reduction	-9	-6	-3	0	+3	+6	+9	+12	+15

- Dynamic Insertion Loss is limited to 55 dB due to flanking.
- The performance data above is based on a 0.6 x 0.6 meter component. Others size please contact NSCA.

MULTI SPLITTERS STRAIGHT SILENCER

MODEL: S-RDs





Lenght	Wall	Splitter	Gap	Widht	Height	Duct Connect type	- TDC - C - Bic V30/40/50
L (mm)	t1 (mm)	t2 (mm)	g(mm)	W (mm)	H (mm)		

Outside Dia.(mm)	Octave Band Central Freq.(Hz)	63	125	250	500	1K	2K	4K	8K
	Wind Speed (m/s)	Insertion Loss (dB)							
300	-30	9	13	23	33	39	35	30	20
	-20	9	13	22	32	36	35	31	21
	-10	7	10	19	31	34	35	32	26
	10	4	9	16	30	34	37	33	27
	20	3	8	14	29	33	39	33	27
	30	3	8	13	28	33	40	33	27
600	-30	11	14	24	35	44	34	19	10
	-20	10	12	20	34	43	34	20	11
	-10	8	11	18	34	40	35	22	13
	10	5	11	18	26	36	37	24	20
	20	4	10	17	25	34	37	27	21
	30	4	10	16	23	33	38	27	22
900	-30	12	17	25	37	39	17	17	10
	-20	11	16	22	36	38	19	19	11
	-10	10	15	20	35	37	21	21	12
	10	9	14	19	35	31	23	23	16
	20	8	13	18	33	32	32	24	17
	30	7	12	17	33	32	32	24	18
1200	-30	13	19	26	38	37	19	12	10
	-20	12	18	23	37	36	20	13	11
	-10	11	17	21	36	35	22	14	12
	10	10	16	20	34	35	26	20	16
	20	9	14	19	34	35	27	21	17
	30	8	13	18	33	33	27	22	18
1500	-30	14	20	27	29	34	15	10	9
	-20	13	20	25	28	33	16	11	10
	-10	12	19	24	36	32	18	12	11
	10	11	17	23	35	31	23	17	15
	20	10	15	22	35	31	24	18	16
	30	9	14	21	35	31	24	19	17

- Dynamic Insertion Loss is limited to 55 dB due to flanking.
- The performance data above is based on a 0.6 x 0.6 meter component. Others size please contact NSCA.

POD QUANTITY AND FREE AREA RATE

MODEL: S-RDs

W (mm)	S1 (mm)	S2 (mm)	Air Gaps A (mm)	Thoáng (%)	Air Gaps Q.ty (N)	Splitters Q.ty (M)
450	50	100	125	56%	2	1
500	50	100	150	60%		
550	50	100	175	64%		
600	75	150	150	50%		
650	75	150	175	54%		
700	75	150	200	57%		
750	100	200	175	47%		
800	100	200	200	50%		
850	75	150	133	47%	3	2
900	75	150	150	50%		
950	75	150	167	53%		
1000	75	150	183.3333333	55%		
1050	75	150	200	57%		
1100	75	150	216.6666667	59%		
1150	100	200	183	48%		
1200	100	200	200	50%		
1250	50	100	213	51%	4	3
1300	75	150	175	54%		
1350	75	150	188	56%		
1400	75	150	200	57%		
1450	75	150	213	59%		
1500	100	200	175	47%		
1550	100	200	188	48%		
1600	100	200	200	50%		
1650	100	200	163	49%	5	4
1700	100	200	175	51%		
1750	100	200	188	54%		
1800	100	200	200	56%		
1850	100	200	213	57%		
1900	100	200	225	59%		
1950	100	200	238	61%		
2000	100	200	250	63%		
2050	75	150	192	56%	6	5
2100	75	150	200	57%		
2150	75	150	208	58%		
2200	75	150	216.6666667	59%		
2250	100	200	175	47%		
2300	100	200	183.3333333	48%		
2350	100	200	192	49%		
2400	100	200	200	50%		

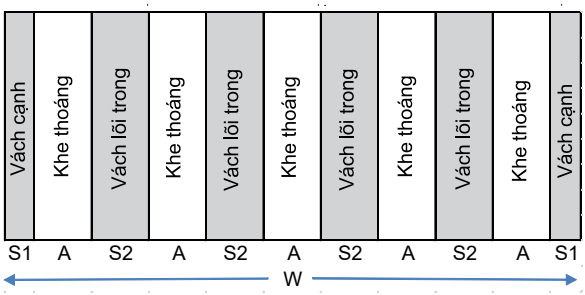
Note: **Splitter thickness S2 = 2 S1**

Air Gap distance A = (W-2S1-M*S2)/N

Free Area = (A*N)/W

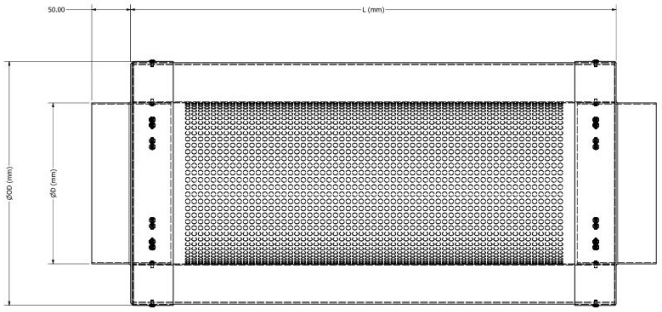
N : No. of Air gap

M: No. of Splitter



UN-POD ROUND SILENCER

MODEL: S-RC1



Norminal diameter: D mm
Length: L mm
Duct conection flange: 50mm

Conection type	- TDC - C - Bic V30/40/50

STATIC INSERTION LOSS (IL)

50mm insulation

Norminal Diameter (mm)	Internal Diameter ØD (mm)	Outside Diameter ØOD (mm)	Length L (mm)	Octave Band	1	2	3	4	5	6	7	8
				Hz	63	125	250	500	1K	2K	4K	8K
					Static Insertion Loss, dB							
80	79	180	300		4	6	11	13	29	35	33	18
80	79	180	600		4	8	15	27	45	50	50	28
80	79	180	900		5	10	19	35	50	50	50	34
80	79	180	1200		5	12	22	42	50	50	50	40
100	99	200	300		3	5	8	14	19	24	30	18
100	99	200	600		4	7	12	26	34	45	50	29
100	99	200	900		4	9	16	34	45	50	50	34
100	99	200	1200		6	12	22	41	50	50	50	41
125	124	225	300		3	4	6	12	16	20	20	14
125	124	225	600		4	5	11	20	30	36	38	23
125	124	225	900		4	7	14	28	42	45	44	26
125	124	225	1200		4	9	17	35	47	50	60	30
160	159	260	300		2	3	5	10	11	16	16	11
160	159	260	600		3	4	7	18	26	34	30	15
160	159	260	900		4	5	10	27	36	45	38	19
160	159	260	1200		5	6	13	34	43	50	46	23
200	199	300	300		2	3	4	8	10	14	13	10
200	199	300	600		3	4	7	14	16	18	15	14
200	199	300	900		4	4	9	18	22	23	17	16
200	199	300	1200		4	5	10	20	28	27	20	18
250	249	350	300		2	3	4	9	15	12	11	10
250	249	350	600		2	3	6	13	19	17	15	14
250	249	350	900		3	4	8	15	22	21	17	16
250	249	350	1200		3	5	10	17	25	24	20	19
315	314	415	600		1	2	6	11	15	13	10	8
315	314	415	900		2	4	9	17	20	16	12	11
315	314	415	1200		2	4	11	24	25	19	14	13
400	399	500	600		1	3	4	7	11	10	8	8
400	399	500	900		2	4	8	12	14	13	11	10
400	399	500	1200		3	5	10	17	17	16	13	12