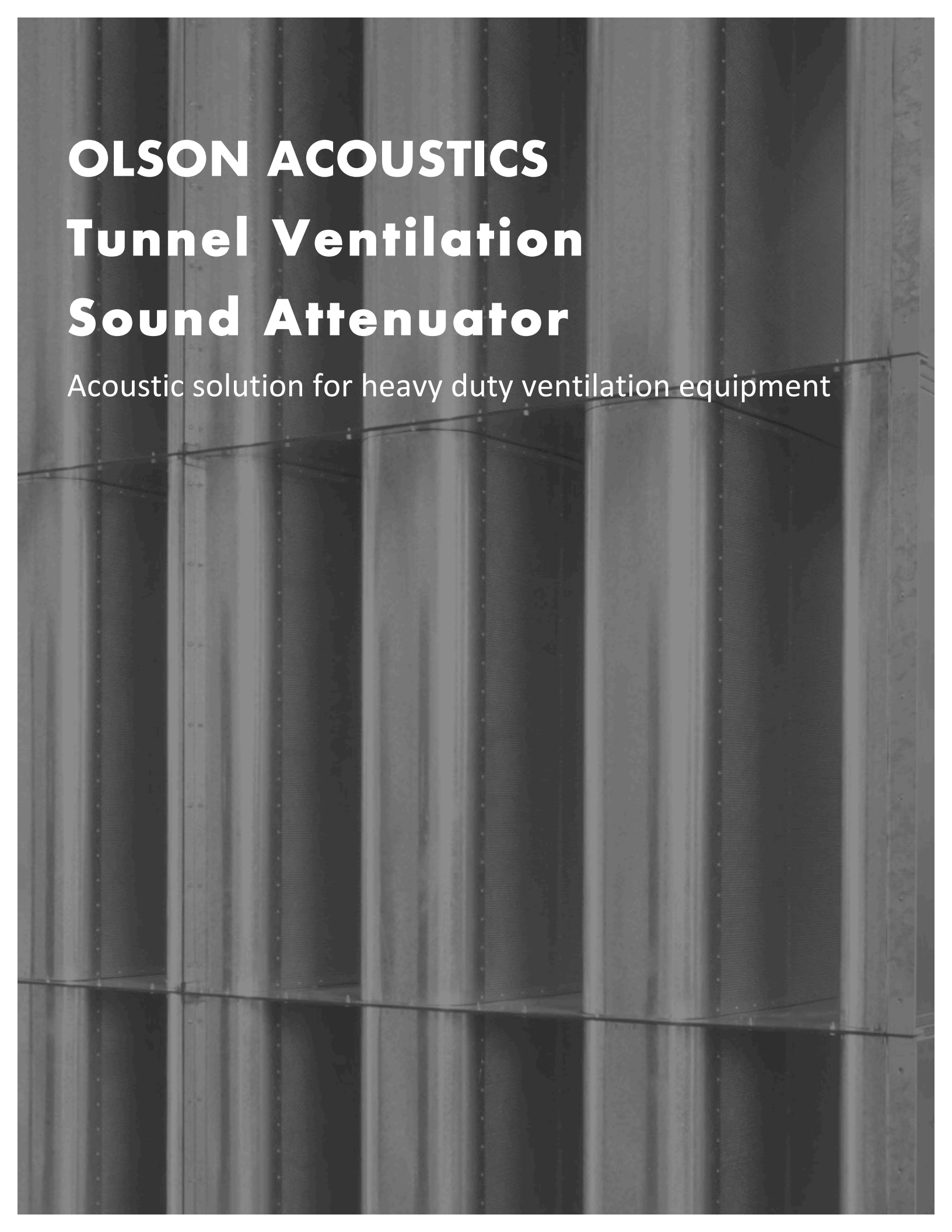




OLSON ACOUSTICS

Tunnel Ventilation

Sound Attenuator

Acoustic solution for heavy duty ventilation equipment



Taipei underground railway - 19m width x 4.5m height, consists of 45 modules sound attenuators installed in concrete tunnel shaft

CONTENT

Introduction	3
HABT40 Performance Data	4
MAB40 Performance Data	5
SABT30 Performance Data	6
HPB Performance Data	7
MPB Performance Data	8
SPB Performance Data	9



Introduction

Sound attenuation is an important consideration in the design of the tunnel ventilation system due the large volume of air required for normal operation to keep the tunnel in habitable condition. Especially during an emergency where large amount of hot gases that is generated from a fire that need to be extracted to keep the tunnel in safe condition for evacuation of passengers and for access of firefighting and rescue personnel.

Tunnel fan generate tremendous quantity of air and pressure and very high noise level is generated as a result. A high-performance sound attenuator is required to reduce the fan noise to acceptable level as specified by local authority so as not to disturb the neighbourhood. Due to the high level of noise reduction required, the sound attenuator adopted is typically the splitter type and is usually of very long length to achieve a high level of attenuation needed.

Couple with very high air volume, the pressure drop through the sound attenuator can be very substantial if not properly designed resulting in very high initial equipment cost and energy consumption. However, an alternative solution may be adopted with the use of a combination of rectangular splitter sound attenuators, circular and diffuser type sound attenuators and sound absorbers appropriately positioned along the ventilation tunnel system for maximum absorption without incurring excessive pressure drop.

Tunnel length required for ventilation may be significantly reduced, thereby saving in precious space and significant reduction in cost of structure. Additional attenuation may be achieved with the use of the acoustic louvers at the discharge end of the tunnel.

OLSON Acoustics (OA) has the full range of sound attenuator, sound absorbers and acoustic louvers to achieve the required ambient sound level at the tunnel ventilation discharge. Where ventilation tunnel length is very short, a comprehensive solution consisting of all of the components may be used to solve the noise emission problem at the discharge. At OA, we are able to tune the sound attenuator to your need and provide complete solution to your noise problem.

Features

- Aerodynamically designed splitter with rounded/ taper inlet and discharge present low resistance to airflow and lower generated sound
- Designed for Bi-directional air flow
- Splitter thickness sized to achieve higher attenuation at low frequency
- High Quality Material & Construction
- Silencers tested in accordance to ASTM E477-06a

Design

- Max single module size: 1500 W x 1125 H x 2400 L mm.
- Length available in increment of 300 mm from 1200 to 3600 mm. Other length available on request.
- Recommended max face velocity: up to 7 to 10 m/s
- Operating temperature up to 50°C continuous, 250°C for two hours
- Operating pressure up to 2000 Pa

Precise Construction

- Aerodynamically shaped acoustic splitters installed within steel casing.
- Silencer casing is constructed of 1.2 mm pre-galvanised steel plate and fixed with 38mm or 50 mm by 2.5 mm thick flanges for single module construction.
- Casing joints are sealed with silicon sealant to prevent air leakage.
- Each splitter is precisely constructed with standard framework, riveted to 0.8 mm perforated metal and filled with 32 kg/m3 glasswool for accurate fixing to the casing.
- All parts of the silencers are precisely cut and pre-punched with holes with latest CNC machine required for fast assembly and precise construction.
- All assembly are completed using riveting technique.
- For larger size, the silencer will be constructed in multiple modules for assembly on site by the installer.
- For multiple module construction, double thickness 2.5mm thick cold formed angle flanges will be supplied loose for site installation.

HABT40 Model

Insertion Loss Performance Data

Model	Length (mm)	Velocity (m/s)	Press. Loss (Pa)	Insertion Loss in DB						
				125	250	500	1K	2K	4K	8K
HABT40-120	1200	0	-	9	18	30	30	23	16	13
		5	45	8	16	29	30	24	16	13
		7.5	103	8	15	27	29	24	17	14
HABT40-150	1500	0	-	13	23	36	37	28	19	15
		5	54	12	21	34	36	29	19	15
		7.5	114	11	19	32	35	29	20	16
HABT40-180	1800	0	-	17	27	41	43	33	21	16
		5	62	15	25	39	41	34	22	17
		7.5	125	14	23	36	37	34	22	18
HABT40-210	2100	0	-	19	32	45	46	39	23	17
		5	68	17	29	43	44	39	24	18
		7.5	132	16	27	41	43	39	24	19
HABT40-240	2400	0	-	20	36	48	49	44	24	17
		5	74	18	33	46	47	44	26	19
		7.5	140	17	31	41	40	39	26	20
HABT40-270	2700	0	-	22	40	50	52	48	27	19
		5	81	20	37	48	50	49	29	21
		7.5	150	19	34	46	49	49	29	22
HABT40-300	3000	0	-	24	44	52	54	51	30	20
		5	88	22	41	50	51	53	31	22
		7.5	160	21	40	48	50	50	31	23

Generated Sound Power Level - dB re 10⁻¹² Watts

Model	Length (mm)	Face Velocity (m/s)	Center Octave Band Frequency (Hz)						
			125	250	500	1K	2K	4K	8K
HABT40-120	1200	5	33	29	30	34	35	25	11
		7.5	47	44	46	45	50	47	36
HABT40-150	1500	5	35	31	31	34	34	25	11
		7.5	48	46	47	46	50	47	36
HABT40-180	1800	5	36	32	32	34	33	24	11
		7.5	49	48	47	47	49	47	36
HABT40-210	2100	5	35	31	32	34	33	25	12
		7.5	49	47	47	47	50	47	37
HABT40-240	2400	5	33	30	32	34	33	25	12
		7.5	49	45	46	46	50	47	37
HABT40-270	2700	5	35	32	32	34	34	26	13
		7.5	51	47	47	47	50	48	38
HABT40-300	3000	5	36	34	32	34	34	26	14
		7.5	52	48	48	48	50	48	38

MABT Model

Insertion Loss Performance Data

Model	Length (mm)	Velocity (m/s)	Press. Loss (Pa)	Insertion Loss in DB						
				125	250	500	1K	2K	4K	8K
MABT-120	1200	0	-	8	15	24	24	19	13	11
		5	34	7	13	24	24	20	13	11
		7.5	77	7	12	22	24	20	14	12
MABT-150	1500	0	-	11	19	29	30	23	16	12
		5	41	10	17	28	29	24	16	12
		7.5	86	9	16	26	28	24	16	13
MABT-180	1800	0	-	14	22	33	35	27	17	13
		5	47	12	20	32	33	28	18	14
		7.5	94	12	19	29	30	28	18	15
MABT-210	2100	0	-	16	26	36	37	32	19	14
		5	51	14	24	35	36	32	20	15
		7.5	99	13	22	33	35	32	20	16
MABT-240	2400	0	-	16	29	39	40	36	20	14
		5	56	15	27	37	38	36	21	16
		7.5	105	14	25	33	32	32	21	16
MABT-270	2700	0	-	18	32	40	42	39	22	16
		5	61	16	30	39	40	40	24	17
		7.5	113	16	28	37	40	40	24	18
MABT-300	3000	0	-	20	36	42	44	41	24	16
		5	66	18	33	40	41	43	25	18
		7.5	120	17	32	39	40	40	25	19

Generated Sound Power Level - dB re 10⁻¹² Watts

Model	Length (mm)	Face Velocity (m/s)	Center Octave Band Frequency (Hz)						
			125	250	500	1K	2K	4K	8K
MABT-120	1200	5	26	23	23	27	27	20	9
		7.5	37	34	36	35	39	37	28
MABT-150	1500	5	27	24	24	27	27	20	9
		7.5	37	36	37	36	39	37	28
MABT-180	1800	5	28	25	25	27	26	19	9
		7.5	38	37	37	37	38	37	28
MABT-210	2100	5	27	24	25	27	26	20	9
		7.5	38	37	37	37	39	37	29
MABT-240	2400	5	26	23	25	27	26	20	9
		7.5	38	35	36	36	39	37	29
MABT-270	2700	5	27	25	25	27	27	20	10
		7.5	40	37	37	37	39	37	30
MABT-300	3000	5	28	27	25	27	27	20	11
		7.5	41	37	37	37	39	37	30

SABT30 Model

Insertion Loss Performance Data

Model	Length (mm)	Velocity (m/s)	Press. Loss (Pa)	Insertion Loss in DB						
				125	250	500	1K	2K	4K	8K
SABT30-120	1200	0	-	7	14	23	23	18	12	10
		5	27	6	12	22	23	18	12	10
		7.5	62	6	12	21	22	18	13	11
SABT30-150	1500	0	-	10	18	27	28	21	15	12
		5	32	9	16	26	27	22	15	12
		7.5	68	9	15	24	27	22	15	12
SABT30-180	1800	0	-	13	21	31	33	25	16	12
		5	37	12	19	30	31	26	17	13
		7.5	75	11	18	27	28	26	17	14
SABT30-210	2100	0	-	15	24	34	35	30	18	13
		5	41	13	22	33	33	30	18	14
		7.5	79	12	21	31	33	30	18	15
SABT30-240	2400	0	-	15	27	36	37	33	18	13
		5	44	14	25	35	36	33	20	15
		7.5	84	13	24	31	30	30	20	15
SABT30-270	2700	0	-	17	30	38	39	36	21	15
		5	49	15	28	36	38	37	22	16
		7.5	90	15	26	35	37	37	22	17
SABT30-300	3000	0	-	18	33	39	41	39	23	15
		5	53	17	31	38	39	40	24	17
		7.5	96	16	30	36	38	38	24	18

Generated Sound Power Level - dB re 10⁻¹² Watts

Model	Length (mm)	Face Velocity (m/s)	Center Octave Band Frequency (Hz)						
			125	250	500	1K	2K	4K	8K
SABT30-120	1200	5	22	19	20	22	23	17	7
		7.5	31	29	30	30	33	31	24
SABT30-150	1500	5	23	20	20	22	22	17	7
		7.5	32	30	31	30	33	31	24
SABT30-180	1800	5	24	21	21	22	22	16	7
		7.5	32	32	31	31	32	31	24
SABT30-210	2100	5	23	20	21	22	22	17	8
		7.5	32	31	31	31	33	31	24
SABT30-240	2400	5	22	20	21	22	22	17	8
		7.5	32	30	30	30	33	31	24
SABT30-270	2700	5	23	21	21	22	22	17	9
		7.5	34	31	31	31	33	32	25
SABT30-300	3000	5	24	22	21	22	22	17	9
		7.5	34	32	32	32	33	32	25

HPB Model

Insertion Loss Performance Data

Model	Length (mm)	Velocity (m/s)	Press. Loss (Pa)	Insertion Loss in DB						
				125	250	500	1K	2K	4K	8K
HPB-120	1200	0	-	12	23	36	43	45	33	25
		5	80	11	22	35	42	44	32	25
		7.5	200	11	22	35	41	44	32	25
HPB-150	1500	0	-	15	29	43	48	51	39	30
		5	110	15	28	42	47	46	38	30
		7.5	210	15	28	41	46	45	38	30
HPB-180	1800	0	-	19	32	43	49	53	43	33
		5	140	16	31	41	48	50	41	32
		7.5	230	14	30	42	47	48	42	32
HPB-210	2100	0	-	22	36	44	51	55	47	36
		5	160	20	34	43	50	53	48	34
		7.5	240	19	32	43	49	50	44	33
HPB-240	2400	0	-	25	40	45	52	58	51	41
		5	170	22	38	44	51	55	49	40
		7.5	250	21	36	44	50	52	48	38
HPB-300	3000	0	-	27	44	46	53	59	54	46
		5	180	26	42	45	52	56	52	44
		7.5	260	25	40	45	52	54	50	42

Generated Sound Power Level - dB re 10⁻¹² Watts

Model	Length (mm)	Face Velocity (m/s)	Center Octave Band Frequency (Hz)						
			125	250	500	1K	2K	4K	8K
HPB-120	1200	5	42	42	38	39	36	38	29
		7.5	52	53	51	49	51	51	49
HPB-150	1500	5	42	42	38	39	36	38	29
		7.5	52	53	51	49	51	51	49
HPB-180	1800	5	41	40	38	38	35	38	30
		7.5	51	51	51	48	50	51	50
HPB-210	2100	5	42	41	38	37	35	39	30
		7.5	52	52	51	47	50	52	50
HPB-240	2400	5	42	41	38	37	34	37	30
		7.5	52	52	51	47	49	50	50
HPB-300	3000	5	42	41	38	37	34	37	30
		7.5	52	52	51	47	49	50	50

MPB Model

Insertion Loss Performance Data

Model	Length (mm)	Velocity (m/s)	Press. Loss (Pa)	Insertion Loss in DB						
				125	250	500	1K	2K	4K	8K
MPB-120	1200	0	-	8	16	26	39	38	27	19
		5	55	8	15	26	38	38	26	18
		7.5	100	8	15	26	37	38	26	17
MPB-150	1500	0	-	10	20	33	46	47	33	23
		5	65	10	19	32	45	46	32	23
		7.5	130	10	19	32	45	46	32	24
MPB-180	1800	0	-	12	23	36	47	50	37	26
		5	70	11	22	35	46	49	37	25
		7.5	150	11	21	34	46	49	37	25
MPB-210	2100	0	-	13	25	39	49	53	41	28
		5	75	13	24	37	48	52	41	28
		7.5	160	13	24	36	48	52	41	28
MPB-240	2400	0	-	15	28	43	52	57	45	31
		5	80	15	27	42	51	56	45	31
		7.5	170	15	27	40	50	56	45	31
MPB-300	3000	0	-	17	32	47	55	58	48	33
		5	85	16	30	45	53	57	46	32
		7.5	180	15	28	43	52	57	45	31

Generated Sound Power Level - dB re 10⁻¹² Watts

Model	Length (mm)	Face Velocity (m/s)	Center Octave Band Frequency (Hz)						
			125	250	500	1K	2K	4K	8K
MPB-120	1200	5	40	39	34	34	34	38	28
		7.5	50	50	47	44	49	51	48
MPB-150	1500	5	40	39	34	34	34	38	28
		7.5	50	50	47	44	49	51	48
MPB-180	1800	5	40	39	34	34	34	37	28
		7.5	50	50	47	44	49	50	48
MPB-210	2100	5	40	34	34	34	34	37	28
		7.5	50	45	47	44	49	50	48
MPB-240	2400	5	40	39	34	36	34	37	28
		7.5	50	50	47	46	49	50	48
MPB-300	3000	5	40	39	34	36	34	37	28
		7.5	50	50	47	46	49	50	48

SPB Model

Insertion Loss Performance Data

Model	Length (mm)	Velocity (m/s)	Press. Loss (Pa)	Insertion Loss in DB						
				125	250	500	1K	2K	4K	8K
SPB-120	1200	0	-	7	11	24	37	30	21	18
		5	18	6	11	24	37	29	20	18
		7.5	45	6	11	24	37	29	20	18
SPB-150	1500	0	-	8	14	31	45	36	24	22
		5	20	7	14	30	44	35	23	21
		7.5	50	7	14	30	44	35	22	20
SPB-180	1800	0	-	9	19	33	47	39	25	21
		5	21	8	19	32	46	38	24	21
		7.5	52	8	19	32	45	38	23	21
SPB-210	2100	0	-	9	24	36	49	43	26	21
		5	22	9	23	34	48	42	26	21
		7.5	55	9	22	33	47	41	26	21
SPB-240	2400	0	-	10	29	39	51	45	28	20
		5	23	9	28	37	50	44	27	21
		7.5	58	9	28	36	49	44	27	22
SPB-300	3000	0	-	11	32	42	53	47	29	22
		5	25	10	30	40	52	46	28	21
		7.5	60	9	29	39	51	45	27	20

Generated Sound Power Level - dB re 10⁻¹² Watts

Model	Length (mm)	Face Velocity (m/s)	Center Octave Band Frequency (Hz)						
			125	250	500	1K	2K	4K	8K
SPB-120	1200	5	37	33	27	30	28	31	21
		7.5	47	44	40	40	43	44	41
SPB-150	1500	5	37	33	27	30	28	31	21
		7.5	47	44	40	40	43	44	41
SPB-180	1800	5	37	38	27	30	28	31	21
		7.5	47	49	40	40	43	44	41
SPB-210	2100	5	37	32	27	30	27	31	21
		7.5	47	43	40	40	42	44	41
SPB-240	2400	5	37	32	27	30	27	31	21
		7.5	47	43	40	40	42	44	41
SPB-300	3000	5	37	32	27	30	27	31	21
		7.5	47	43	40	40	42	44	41

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