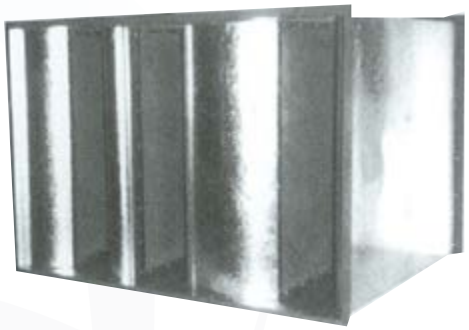
Sound Attenuators

CHAPTER 8



تكنو فاب
TECHNO FAB
الهندسية ENGINEERING

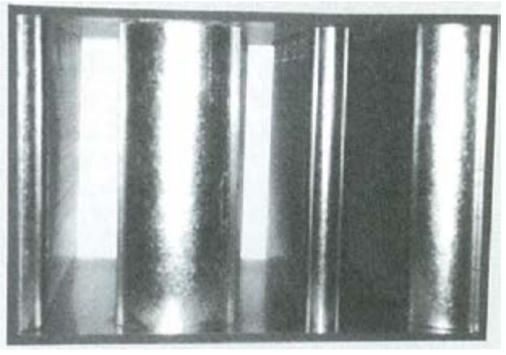
Sound Attenuators

CONTENTS

Low noise Ieve ac ^ e.e-ent has always been one of the key features of building design. In recent years noise control has become an important criteria due to increasing environmental awareness and the effects of noise on health, safety, Comfort and efficiency. Control of the acoustical environment n a building means that all of the factors that may lead to noise problems must be fully considered. This means noise control of HVAC systems, controlling transmission of sound between rooms, protecting hallways, offices and other structures from high noise areas, and providing maximum privacy where needed.

TECHNO FAB ENGINEERING manufacturers new range of Sound Attenuators by adopting latest manufacturing techniques in fabrication and by using Computer Aided Design software for selecting proper and economical attenuators which are vastly used for both HVAC and industrial applications for either reducing or minimizing the generated noise.

TECHNO FAB ENGINEERING manufactures square & rectangular Sound Attenuators, cylindrical Sound Attenuator, Cross Talk Attenuators, which provide effective and predictable noise reduction at substantial savings over other and ordinary methods.



These are factory calibrated and designed by (computer aided design) under given parameter conditions. The use of silencers, which are accurately rated under operating conditions, is a matter of prime importance. Effective, economical application of noise control methods depends upon accurate knowledge of system silencing requirements.

An under silenced job is worthless and an over silenced job is costly. For optimum sizing of Sound Attenuator, selection is made through Computer Aided Design.

Standard Types and Models

Item	Model	Series	Material	Specification	Type	Construction
Sound Attenua-tors	AS	*s- 10	G*;A;S	Sound Attenuator	A-J	Square & Rectangular
	BS	s- 20	G*;A;S	Sound Attenuator	A-F	Square & Rectangular
	CS	s- 30	G*;A;S	Cylindrical Attenuator	A, B,C	Cylindrical
	CT	s- 40	G*;A;S	Cross Talk Attenuator	A,B, C	Cylindrical & Square

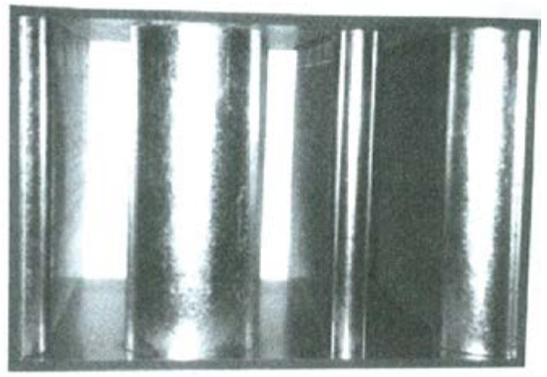
Note

- TECHNO FAB ENGINEERING Standard Construction in natural galvanized finish.
- S+ Stainless Steel construction is for special applications like offshore works
- Non standard Models and types also are available according to site requirements.

Sound Attenuators

MaterialDetails

- All types and models of Sound Attenuator are available in G.I.- galvanized sheet steel coating to Z-22* or Z-27 to the standards JIS 3302 or SS 2989, stainless steel to 3 0 428, 316L in finish, and aluminum, according to the design conditions.
- The respective suffix will indicate the type of material construction.
- G*- Galvanized steel. S- Stainless steel. A – Aluminum.
- All Sound Attenuator units are designed to ensure airtight operations with low leakage factor of +3%3 as per international standards DW 142 class C.



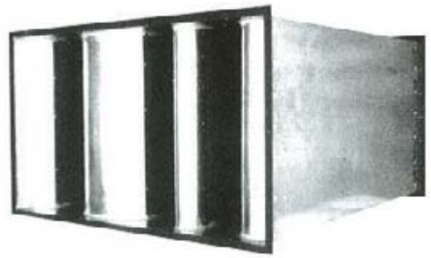
Attenuator Code AS-S10/SS-S20 SeriesModels A-J		2x	3x	4x	5x	6x	7x	8x
Width mm	Height mm	600	900	1200	1500	1800	2100	2400
300	300	.	.	.	.	-	-	-
400	400	.	.	.	.	.	.	-
500	500	.	.	.	9	.	.	.
600	600	.	.	.	.	.	.	.
700	700	9	.	.	.	.	.	.
800	800	.	.	.	.	.	.	.
900	900	.	.	.	.	.	.	.
1000	1000	.	.	.	.	.	.	.
1200	1200	.	.	.	.	.	.	.
1300	1300	.	.	.	.	.	.	.
1400	1400	.	.	.	.	.	.	.
1500	1500	.	.	.	.	.	.	.
1600	1600	.	.	.	.	.	.	.
1700	1700	.	.	.	.	.	.	.
1800	1800	.	.	.	.	.	.	.
1900	1900	-	.	.	.	.	.	.
2000	2000	-	-		.	.	.	.

Note:

- Non Standard Sizes other than mentioned in the table are available on request.

Standard Features

TECHNO FAB ENGINEERING manufactures a variety of models for to suit different applications.



1. AS-S 10 Series

Square and Rectangular Type
Ex: AS - 4D

2. BS-S 20 Series

Square and Rectangular Type
Ex: 8S - 48

3. CS-S 30 Series

Cylindrical Type
Ex: CS - S 38

4. CT-S 40 Series

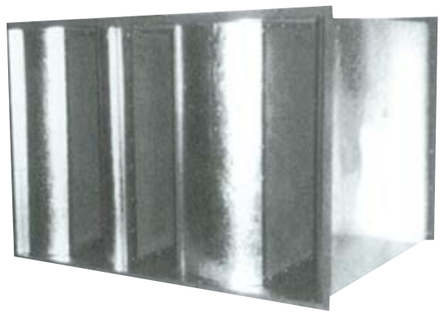
Cross Talk Type
Ex: CT - S 3A

Sound Attenuators -AS

Models: AS ‹x› A- J; U-Type Splitters (G*, A, S) Square and Rectangular Type

TECHNO FAB ENGINEERING Sound Attenuator AS- S10 Series is of square and rectangular type. The standard construction is suitable for use up to a maximum pressure of 2000 Pa.

- Square and rectangular type sound attenuators are designed for handling maximum air capacities at minimum pressure drop.
- The shell noise radiation is minimized by double skin splitter construction.
- The turbulence of the airflow is minimized due to the bell mouth design of the splitter at the entrance of the air inlet.
- Solid, curved splitter faces, minimize noise generation at



the entrance of the air inlet.

- Better economy results by using properly designed TECHNO FAB ENGINEERING factory calibrated I fabricated Sound Attenuators.

Material Details:

AS-810 Series standard construction galvanized finish

- The casing of Sound Attenuators are manufactured from high quality galvanized› sheet steel of thickness 0.8mm* coating to Z-22» or Z-27 to the standards JIS 3302 or SS 2989. (Also can be manufactured from Stainless steel sheet to 304 28,316Lin finish or aluminum construction - Optional).
- End flanges are made of roll formed galvanized* sheet steel angles as standard, Mild steel angles with red oxide*or zinc coated are used for larger units.
- The acoustic material is of an inorganic, incombustible, has a class 1 fire rating to BS 476, and non hygroscopic mineral fiber, which are retained by means of galvanized perforated sheet metal.
- Attenuator splitters are of vermin proof, rot-proof and non-combustible material.
- The acoustic media in the baffles or splitters is protected by galvanized perforated* sheet metal or galvanized wire mesh (Heavy duty diamond mesh) and are fabricated separately prior to assembly in to main casing.
- The attenuators are designed in accordance with BS 4718, silencing for air distribution systems. The insertion losses and generated noise levels for each octave band and the pressure loss of the silencer are calculated through a computer aided software and submitted prior to supply.
- All attenuators are containing an airflow direction sticker and model number on the outer casing.
- All Sound Attenuator units are designed to ensure airtight operations with low leakage factor of + 3 % as per international standards DW 142 class C.
- All Sound Attenuators are lined internally, sealed and manufactured as per international standards.

Air leakage

TECHNO FAB ENGINEERING standard attenuators incorporate sealing and are suitable for DW 142 class C applications. Attenuator constructional integrity is suitable for pressures up to 2000 pa.

Flange Drilling Details

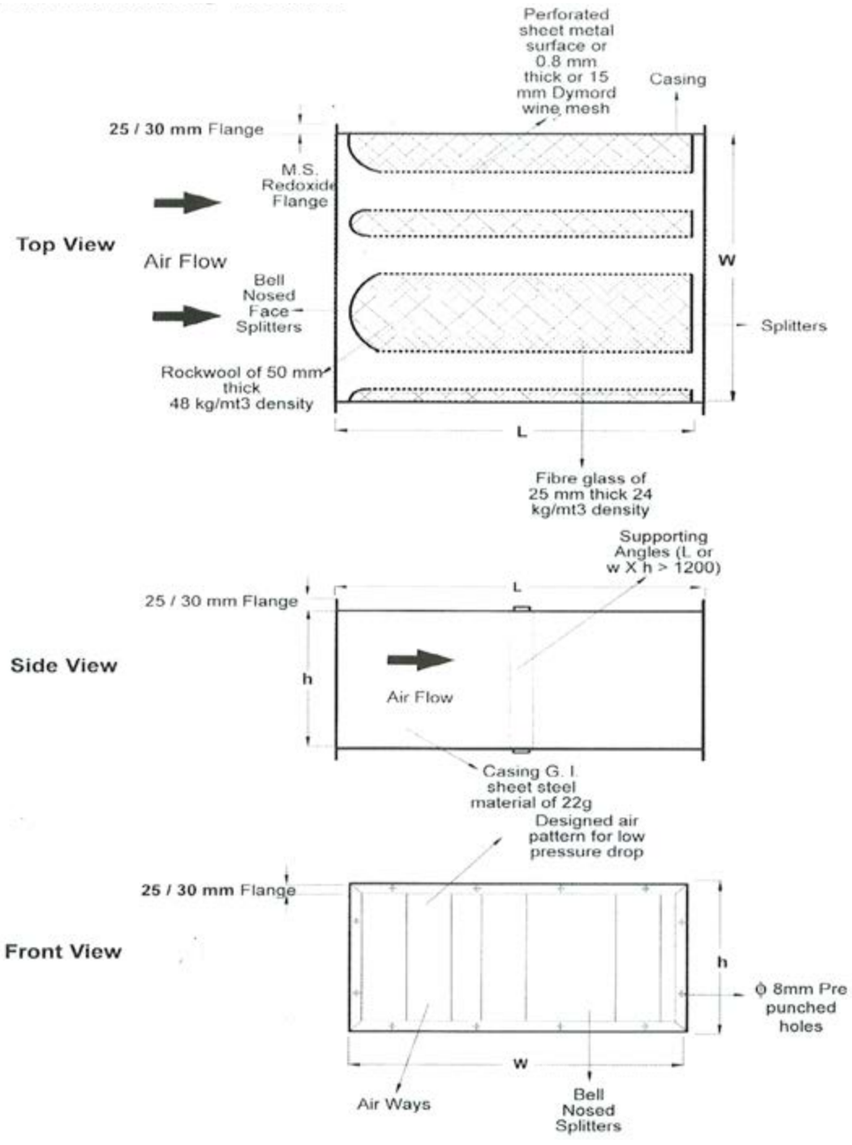
TECHNO FAB ENGINEERING standard attenuators are having flange drillings of 8mm holes at a pitch of 250mm apart. Any alternate specifications can be supplied on customer choice.

S- 10 Series

Sound Attenuators – AS
Models: AS ‹x› A- J; U- Type Splitters (G*, A, S)
Square and Rectangular Type Constructional Details and Dimensions

TECHNO FAB ENGINEERING sound attenuators are carefully designed in consideration of noise problems.

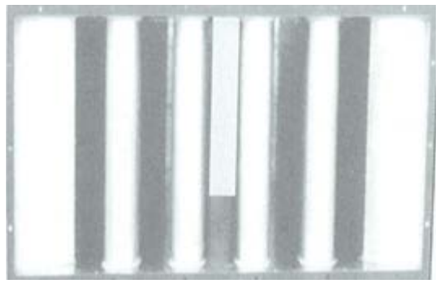
•Compact in Size **•Design Flexibility** **•Short in Lengths**



Sound Attenuators - SS

Models:

BS ‹x› A- F; E- Type Splitters (G*, A, S) Square and Rectangular Type



TECHNO FAB ENGINEERING Sound Attenuator SS - S20 Series is of square and rectangular type. The standard construction is suitable for use up to a maximum pressure of 2000 Pa.

- Square and rectangular type sound attenuators are designed for handling maximum air capacities at minimum pressure drop.
- The shell noise radiation is minimized by double skin splitter construction.
- The turbulence of the airflow is minimized due to the bell mouth design of the splitter at the entrance of the air inlet.
- Solid, curved splitter faces, minimize noise generation at the entrance of the air inlet.
- Better economy results by using properly designed TECHNO FAB ENGINEERING factory calibrated / fabricated Sound Attenuators.

Material Details:

SS -S 20 Series standard construction galvanized finish

- The casing of Sound Attenuators are manufactured from high quality galvanized* sheet steel of thickness 0.8mm* coating to Z-22* or Z-27 to the standards JIS 3302 or SS 2989. (Also can be manufactured from Stainless steel sheet to 304 28, 316L in finish or aluminum construction - Optional). Redoxide* or zinc coated are used for larger units.
- The acoustic material is of an inorganic, incombustible, has a class 1 fire rating to BS 476, and non hygroscopic mineral fiber, which are retained by means of galvanized perforated sheet metal.
- Attenuator splitters are of vermin proof, rot-proof and non-combustible material.
- The acoustic media in the baffles or splitters is protected by galvanized perforated* sheet metal or galvanized wire mesh (Heavy duty diamond mesh) and are fabricated separately prior to assembly in to main casing.
- The attenuators are designed for, silencing for air distribution systems. The insertion losses and generated noise levels for each octave band and the pressure loss of the silencer are calculated through computer aided software and submitted prior to supply.
- All attenuators are containing an airflow direction sticker and model number on the outer casing.
- All Sound Attenuator units are designed to ensure airtight operations with low leakage factor of + 3 %. as per international standards DW 142 class C.
- All Sound Attenuators are lined internally, sealed and manufactured as per international standards.

Air leakage

TECHNO FAB ENGINEERING standard attenuators incorporate sealing and are suitable for DW 142 class C applications. Attenuator constructional integrity is suitable for pressures up to 2000 pa.

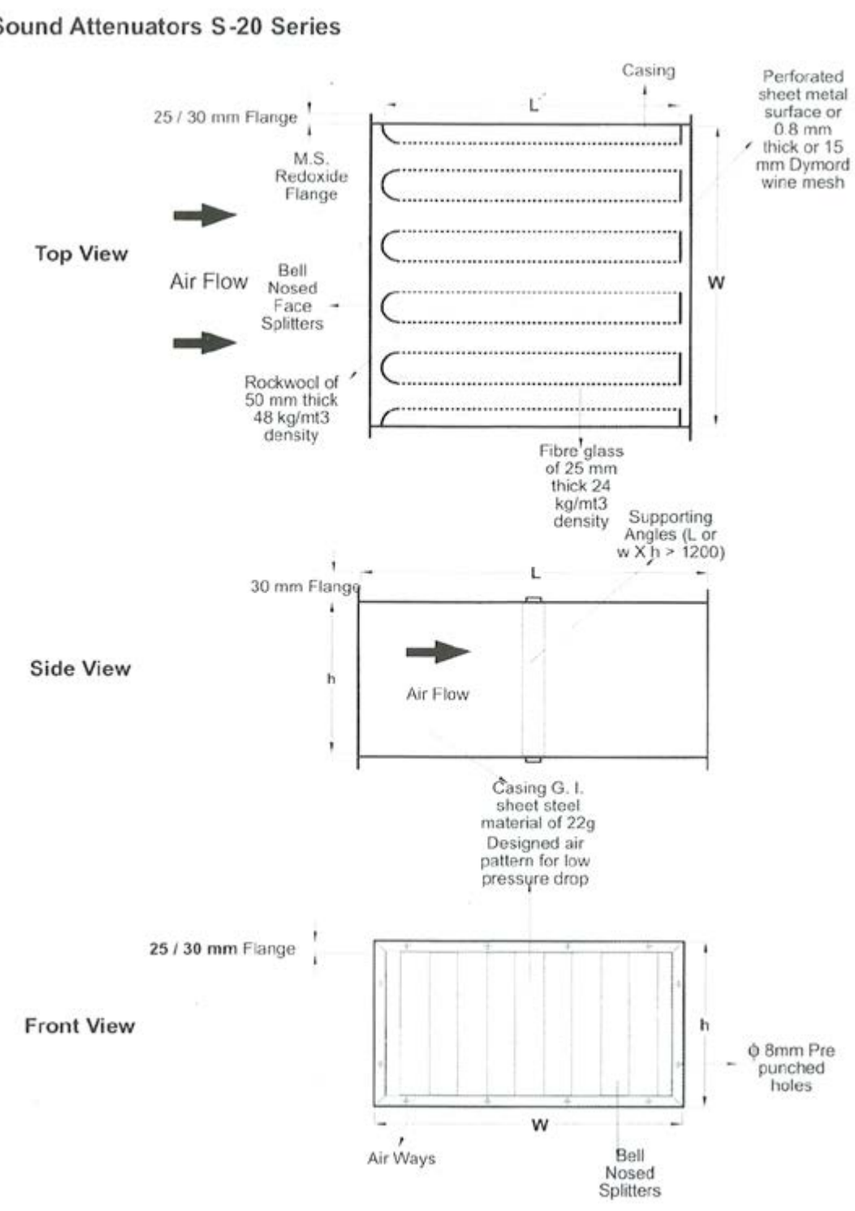
Flange Drilling Details

TECHNO FAB ENGINEERING standard attenuators are having flange drillings of 8mm holes at a pitch of 250mm apart. Any alternate specifications can be supplied on customers choice.

Models: AS ‹x› A - F; E - Type Splitters 1 - 100 mm splitter; 2 - 200 mm splitters. Square and Rectangular Type Constructional Details and Dimensions

TECHNO FAB ENGINEERING sound attenuators are carefully designed in consideration of noise problems.

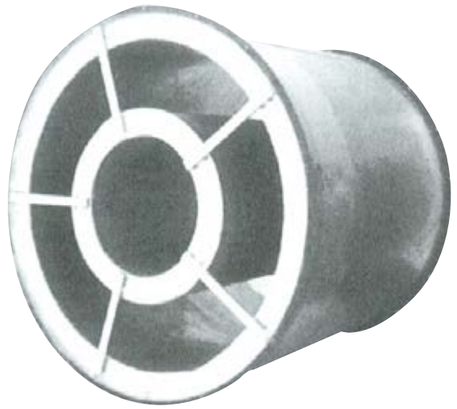
•Compact in Size **•Design Flexibility** **•Short in Lengths**



Sound Attenuators - SS

Models:

CS ‹x› A, B, C (G*, A, S) Cylindrical Type Attenuators



TECHNO FAB ENGINEERING Sound Attenuator CS - S30 Series is of cylindrical type. This Attenuator has been developed with special concern for both «on-fan» and «in-duct» situation and is suitable for use up to a maximum pressure of 1500 Pa.

- The cylindrical type Sound Attenuators are installed inthe duct work between spaces, which must provide noise reduction of air borne noise to at least match the sound transmission loss of the separating structure.
- The cylindrical type Attenuators can be used where there is a demand for large amount of low frequency attenuation.
- All models of Sound Attenuators are shorter in length, smaller in cross-section and easily installable at site.
- designed TECHNO FAB ENGINEERING factory calibrated / fabricated Sound Attenuators.

Material Details:

CS- B 30 Series construction galvanized finish

- The casinThe outer casing of Sound Attenuators are manufactured from high quality galvanized* sheet steel of thickness 0.8mm* coating to Z-22* or Z-27 to the standards JIS 3302 or SS 2989. (Also can be manufactured from Stainless steel sheet to 304 28,316L in finish or aluminum construction- Optional).
- The inner casing is of high quality galvanized perforated sheet steel of thickness 0.6*/ 0.8mm.
- End flanges are made of roll formed galvanized* sheet steel angles as standard, Mild steel angles with red oxide*or zinc coated are used for larger units.
- The acoustic material is of an inorganic, incombustible, has a class 1 fire rating to BS 476, and non hygroscopic mineral fiber, which are retained by means of galvanized perforated sheet metal.
- Attenuator splitters are of vermin proof, rot-proof and non-combustible material.
- Center pods are cone nosed at the air inlet end, and flat at the discharge end.
- The acoustic media in the baffles or splitters is protected by galvanized perforated* sheet metal or galvanized wire mesh (Heavy duty diamond mesh) and are fabricated separately prior to assembly in to main casing.
- The attenuators are designed and, silencing for air distribution systems. The insertion losses and generated noise
- Levels for each octave band and the pressure loss of the silencer are calculated through computer aided software and submitted prior to supply.
- All attenuators are containing an airflow direction sticker and model number on the outer casing.
- All Sound Attenuator units are designed to ensure airtight operations with low leakage factor of + 3 %. as per international standards DW 142 class C.
- All Sound Attenuators are lined internally, sealed and manufactured as per international standards.

Air leakage

TECHNO FAB ENGINEERING standard attenuators incorporate sealing and are suitable for DW 142 class C applications. Attenuator constructional integrity is suitable for pressures up to 2000 pa.

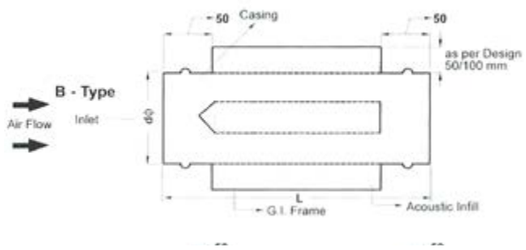
Flange Drilling Details

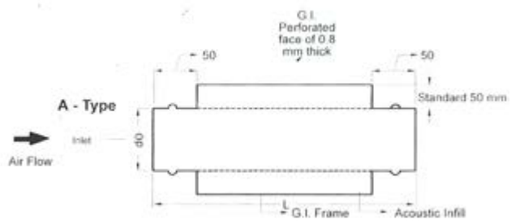
TECHNO FAB ENGINEERING standard attenuators are having flange drillings of 8mm holes at a pitch of 250mm apart. Any alternate specifications can be supplied on customers choice.

Models: CS ‹x› A, B, C (G*, A, S)
Cylindrical Type Attenuators Constructional Details and Dimensions

TECHNO FAB ENGINEERING sound attenuators are carefully designed in consideration of noise problems.

•Compact in Size **•Design Flexibility** **•Short in Length**





The following tables and charts illustrate the necessary for optimizing selection with respect to the fan chosen for specific applications. However the inter relation of fan generated sound power level and attenuator regeneration makes selection more critical. It can be seen that for many industrial applications, which employ high pitch angles and high flow rates, the use of unnecessary long attenuators becomes a waste and uneconomic proportion if the main design criteria lay emphasis on the mid frequency octave bands of noise. However when large amounts of low frequency attenuators are demanded the standard 2D attenuator fulfills this application. Continuous combinations of cylindrical attenuator units, with their negligible pressure loss, increase efficiency, enable high attenuation will be achieved before re-generation becomes Inlet at the controlling factor.

All metal parts have a galvanized finish. The acoustic media is faced with a woven glass cloth to minimize surface erosion and has a class 1 fire rating SS476.

Sound Attenuators- CT

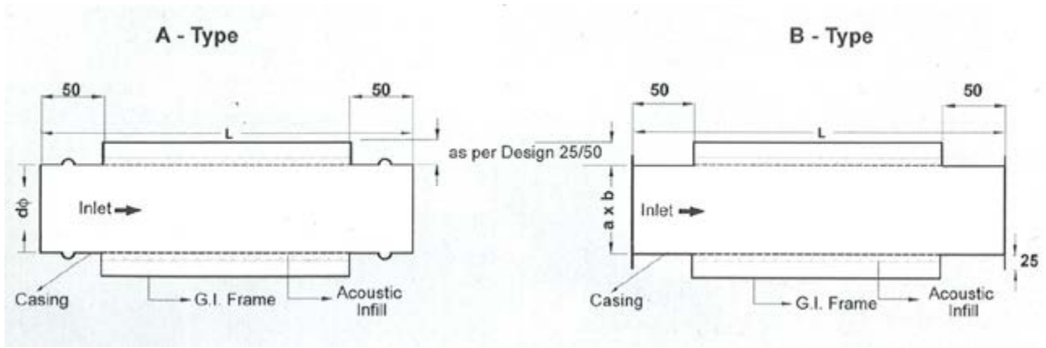
Models:

Models: CT ‹x› A, B, C (G*, A, S) Cross Talk Attenuators

TECHNO FAB ENGINEERING manufactures Cross Talk Attenuators that can be installed in places where speech privacy required or speech noise generated in areas are frequently causing a disturbing and distracting irritation to the staff attempting to concentrate on their work.
TECHNO FAB ENGINEERING Cross Talk Attenuators are installed to provide the optimum background voice sound masking effect for each office zone, there by improved speech privacy and aural comfort.

Material Details:

- **CT- B 40 Series standard construction galvanized finish**
- The outer casing of Sound Attenuators are manufactured SS2989. (Also can be manufactured from Stainless steel sheet to 304 28, 316L in finish or aluminum construction Optional).
- The inner casing is of high quality galvanized perforated sheet steel of thickness 0.6*/0.8mm.
- End flanges are made of roll formed galvanized* sheet steel angles as standard, Mild steel angles with red oxide* or zinc coated are used for larger units.
- The acoustic material is of an inorganic, incombustible, has a class 1 fire rating to BS 476, and non hygroscopic› mineral fiber, which are retained by means of galvanized perforated sheet metal.
- All attenuators are containing an airflow direction sticker and model number on the outer casing.
- All Cross talk Attenuator units are designed to ensure airtight operations with low leakage factor of + 3 %. as per international standards DW 142 class C.



Air leakage

TECHNO FAB ENGINEERING standard attenuators incorporate sealing and are suitable for DW 142 class C applications. Attenuator constructional integrity is suitable for pressures up to 2000 pa.

Flange Drilling Details

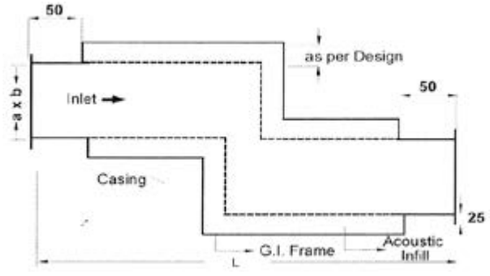
TECHNO FAB ENGINEERING standard attenuators are having flange drillings of 8mm holes at a pitch of 250mm apart. Any alternate

Engineering and Performance Data - AS I BS
CT- S40c Cross Talk Attenuator Zigzag Type

TECHNO FAB ENGINEERING C Type Cross Talk Attenuators are of zigzag type and installed to provide the maximum

Background voice sound masking effect for each office zone, there by improved speech privacy andaural comfort can be obtained.
Performance Notes:

- Airflow given in Liters/second.
- •Pressure given in Pa, indicated in the table is the minimum (pressure drop) static.
- P (Pa) is the difference in static pressure from inlet to discharge.
- Discharge and Radiated NC is based upon the following assumptions:
- Sound levels are for supply air only on basic Sound Attenuator units, without any optional fittings.
- Discharge and Radiated Sound Power Levels mentioned in the following table are Sound Power Levels measured at 8 different frequencies. According to human audible levels of sound frequency between 63 to 8k Hz i.e. between 1 and 8, and after deduction of 1OdB room absorption re 10" watts.
- NC's derived from sound power levels obtained in accordance with ARI Standard 880-94.
- Blank spaces indicate NC's less than 20.
- The P across the unit is the difference in static pressure from inlet to discharge ofthe unit.
- Pressure is given in Pascal, Pa of Water Gauge.
- Discharge or air-borne sound pressure levels NC Lp based on 8 dB room absorption re 10" watts.
- Radiated sound pressure levels NC Lp based on 18dB room absorption (7 dB for ceiling plenum effect, 3 dB for the ceiling and 8 dB for the room).
- NC values are extrapolated based on procedures given by ASHRAE standards.



Sound Attenuators Test Method

- The laboratory test technique consists of feeding monitored noise and air from a source plenum downa matching rectangular duct through the Attenuator, and into a 200 cubic meter acoustic reverberation chamber.
- Employing octave bands of noise from 63HZ to 8000HZ the insertion loss evaluations are obtained from a substitution technique.
- The Attenuator being replaced by an exactly equal length of matching ductwork and noise readings were measured. The static insertion loss is measured without airflow through the Attenuator.
- For the Dynamic Insertion Loss, monitored airflow passes through the Attenuator both with (supply) and against(Extract), the noise flows during the noise measurements.
- However for the airflow rates employed in this brochure no deviations from the static insertion loss, dynamic loss vary as great as 3db, have been observed. Hence only the static insertion loss data is included and is necessary.
- The self generated airflow noise is measured in the reverberation chamber. Octave band sound power aerodynamic pressure losses are recorded during the air flow experiments and related to the corresponding monitored uniform airflow in the supply duct and Attenuator airways.

Note:
The sound powers levels have been derived based on Test methods used are in accordance with 1987
ASHRAE HVAC Systems and applications Hand Book Chapter 52, Page 52.7. Accuracy: This is a prediction method based on an accepted method, which has demonstrated satisfactory results in field applications. However field test results may generate sound pressure levels which differ from these predicted values, as the current state of the art in determining sound power varies in accuracy from 2 dB in mid range 250 to 4KHz bands,
3 to 4 dB in 125 and 8K Hz bands and up to 6 to 8 dB in 63

Engineering and Performance Data – AS

The following tables indicate static insertion losses at 0 m/s. and dynamic insertion losses at 3 m/s. 8 m/s. of air velocities at the air inlet of the attenuators for different models.

Model	Length	Face Velocity	63Hz	125Hz	250Hz	500Hz	1K	2K	4K	8K
AS-2A	600	Om/s Static 3m/s Inlet 8m/s Inlet	6 7 7	9 10 10	14 15 15	19 20 21	32 32 32	31 31 30	23 22 22	21 20 19
AS-3A	900	Om/s Static 3m/s Inlet 8m/s Inlet	8 9 9	12 13 13	18 19 19	25 26 27	42 42 42	41 41 40	29 28 28	24 23 22
AS-4A	1200	Om/s Static 3m/s Inlet 8m/s Inlet	9 10 10	14 15 15	22 23 23	31 32 33	50 50 50	50 50 49	35 34 34	27 26 25
AS-5A	1500	Om/s Static 3m/s Inlet 8m/s Inlet	10 11 11	17 18 18	27 28 28	38 39 40	50 50 50	50 50 49	41 40 40	31 30 29
AS-6A	1800	Om/s Static 3m/s Inlet 8m/s Inlet	11 12 12	20 21 21	32 33 33	44 45 46	50 50 50	50 50 49	46 45 45	34 33 32
AS-7A	2100	Om/s Static 3m/s Inlet 8m/s Inlet	13 14 14	23 24 24	36 37 37	50 51 52	50 50 50	50 50 49	50 49 49	37 36 35
AS-8A	2400	Om/s Static 3m/s Inlet 8m/s Inlet	14 15 15	25 25 26	42 43 43	50 51 52	50 50 50	50 50 49	50 49 49	40 39 38

Model	Length	Face Velocity	63Hz	125Hz	250Hz	500Hz	1 K	2K	4K	8K
AS-2D	600	Om/s Static 3m/s Inlet 8m/s Inlet	5 6 6	7 8 8	10 11 11	13 14 15	23 23 23	17 17 16	16 15 15	12 11 10
AS-3D	900	Om/s Static 3m/s Inlet 8m/s Inlet	6 7 7	9 10 10	13 14 14	17 18 19	29 29 29	22 22 21	18 17 17	14 13 12
AS-4D	1200	Om/s Static 3m/s Inlet 8m/s Inlet	7 8 8	11 12 12	16 17 17	22 23 24	36 36 36	27 27 26	20 19 19	16 15 14
AS-5D	1500	Om/s Static 3m/s Inlet 8m/s Inlet	8 9 9	13 14 14	19 20 20	26 27 28	42 42 42	32 32 31	22 21 21	17 16 15
AS-6D	1800	Om/s Static 3m/s Inlet 8m/s Inlet	9 10 10	16 17 17	22 23 23	31 32 33	49 49 49	37 37 36	24 23 23	19 18 17
AS-7D	2100	Om/s Static 3m/s Inlet 8m/s Inlet	10 11 11	18 19 19	25 26 26	35 36 37	50 50 50	42 42 41	26 25 25	20 19 18
AS-8D	2400	Om/s Static 3m/s Inlet 8m/s Inlet	11 12 12	20 21 21	29 30 30	42 43 44	50 50 50	47 47 46	28 27 27	22 21 20

Model	Length	Face Velocity	63Hz	125Hz	250Hz	500Hz	1 K	2K	4K	8K
AS-2E	600	Om/s Static 3m/s Inlet 8m/s Inlet	6 7 7	8 9 9	11 12 12	14 15 16	25 25 25	20 20 19	16 15 15	13 12 11
AS-3E	900	Om/s Static 3m/s Inlet 8m/s Inlet	7 8 8	10 11 11	15 16 16	20 21 22	32 32 32	26 26 25	19 18 18	15 14 13
AS-4E	1200	Om/s Static 3m/s Inlet 8m/s Inlet	8 9 9	12 13 13	18 19 19	26 27 28	39 39 39	33 33 32	22 21 21	17 16 15
AS-5E	1500	Om/s Static 3m/s Inlet 8m/s Inlet	9 10 10	15 16 16	21 22 22	31 32 33	47 47 47	39 39 38	25 24 24	19 18 17
AS-6E	1800	Om/s Static 3m/s Inlet 8m/s Inlet	10 11 11	17 18 18	25 26 26	37 38 39	50 50 50	46 46 45	28 27 27	21 20 19
AS-7E	2100	Om/s Static 3m/s Inlet 8m/s Inlet	11 12 12	20 21 21	29 30 30	42 43 44	50 50 50	50 50 49	31 30 30	22 21 20
AS-8E	2400	Om/s Static 3m/s Inlet 8m/s Inlet	12 13 13	22 23 23	32 33 33	48 49 50	50 50 50	50 50 49	34 33 33	24 23 22

The following tables indicate static insertion losses at 0 m/s. and dynamic insertion losses at 3 m/s. 8 m/s. of air velocities at the air inlet of the attenuators for different models.

Model	Length	Face Velocity	63Hz	125Hz	250Hz	500Hz	1 K	2K	4K	8K
AS-2F	600	Om/s Static 3m/s Inlet 8m/s Inlet	9 10 10	13 14 14	20 21 21	24 25 26	32 32 32	31 31 30	27 26 26	20 19 18
AS-3F	900	Om/s Static 3m/s Inlet 8m/s Inlet	11 12 12	16 17 17	24 25 25	31 32 33	40 40 40	41 41 40	40 39 39	23 22 21
AS-4F	1200	Om/s Static 3m/s Inlet 8m/s Inlet	12 13 13	19 20 20	29 30 30	38 39 40	50 50 50	49 49 48	39 38 38	27 26 25
AS-5F	1500	Om/s Static 3m/s Inlet 8m/s Inlet	14 15 15	23 24 24	34 35 35	45 46 47	50 50 50	50 50 49	46 45 45	30 29 28
AS-6F	1800	Om/s Static 3m/s Inlet 8m/s Inlet	16 17 17	27 28 28	38 39 39	50 51 52	50 50 50	50 50 49	50 49 49	34 33 32
AS-7F	2100	Om/s Static 3m/s Inlet 8m/s Inlet	18 19 19	30 31 31	42 43 43	50 51 52	50 50 50	54 54 54	50 49 49	37 36 35
AS-8F	2400	Om/s Static 3m/s Inlet 8m/s Inlet	20 21 21	35 36 36	43 47 47	50 51 52	50 50 50	50 50 49	50 49 49	39 38 37

Model	Length	Face Velocity	63Hz	125Hz	250Hz	500Hz	1 K	2K	4K	8K
AS-2G	600	Om/s Static 3m/s Inlet 8m/s Inlet	6 7 7	8 9 9	14 15 15	18 19 20	19 19 19	16 16 15	15 14 14	12 11 10
AS-3G	900	Om/s Static 3m/s Inlet 8m/s Inlet	7 8 8	10 11 11	17 18 18	24 25 26	25 25 25	20 20 19	17 16 16	13 12 11
AS-4G	1200	Om/s Static 3m/s Inlet 8m/s Inlet	8 9 9	12 13 13	21 22 22	30 31 32	32 32 32	25 25 24	19 18 18	15 14 13
AS-5G	1500	Om/s Static 3m/s Inlet 8m/s Inlet	9 10 10	15 16 16	24 25 25	36 37 38	38 38 38	29 29 28	21 20 20	16 15 14
AS-6G	1800	Om/s Static 3m/s Inlet 8m/s Inlet	10 11 11	17 18 18	29 30 30	42 43 44	45 45 45	35 35 34	24 23 23	23 22 21
AS-7G	2100	Om/s Static 3m/s Inlet 8m/s Inlet	11 12 12	9 10 10	32 33 33	48 49 50	50 50 50	36 36 37	25 24 24	19 18 17
AS-8G	2400	Om/s Static 3m/s Inlet 8m/s Inlet	12 13 13	21 22 22	35 36 36	52 53 54	55 55 55	42 42 41	28 27 27	20 21 19

Model	Length	Face Velocity	63Hz	125Hz	250Hz	500Hz	1 K	2K	4K	8K
AS-2J	600	Om/s Static 3m/s Inlet 8m/s Inlet	5 6 6	7 8 8	11 12 12	14 15 16	14 14 14	10 10 9	11 10 10	9 8 7
AS-3J	900	Om/s Static 3m/s Inlet 8m/s Inlet	5 6 6	9 10 10	14 15 15	18 19 20	18 18 18	12 12 11	12 11 11	10 9 8
AS-4J	1200	Om/s Static 3m/s Inlet 8m/s Inlet	6 7 7	10 11 11	17 18 18	22 23 24	22 22 22	14 14 13	13 12 12	11 10 9
AS-5J	1500	Om/s Static 3m/s Inlet 8m/s Inlet	6 7 7	12 13 13	20 21 21	27 28 29	27 27 27	17 17 16	14 13 13	12 11 10
AS-6J	1800	Om/s Static 3m/s Inlet 8m/s Inlet	7 8 8	14 15 15	23 24 24	31 32 33	31 31 31	19 19 17	15 14 14	12 11 10
AS-7J	2100	Om/s Static 3m/s Inlet 8m/s Inlet	7 8 8	16 17 17	27 28 28	35 36 37	36 36 36	21 21 20	16 15 15	13 12 11
AS-8J	2400	Om/s Static 3m/s Inlet 8m/s Inlet	8 9 9	18 19 19	30 31 31	39 40 41	40 40 40	23 23 22	19 18 18	13 12 11

Engineering and Performance Data – AS

The following tables indicate static insertion losses at 0 m/s. and dynamic insertion losses at 3 m/s. 8 m/s. of air velocities at the air inlet of the attenuators for different models.

Model	Length	Face Velocity	63Hz	125Hz	250Hz	500Hz	1 K	2K	4K	8K
AS-2A	600	Om/s Static 3m/s Inlet 8m/s Inlet	3 3 5	4 6 6	6 8 8	12 13 14	28 28 28	21 21 20	18 17 17	8 7 6
AS-3A	900	Om/s Static 3m/s Inlet 8m/s Inlet	4 6 6	6 8 8	12 14 14	18 19 20	34 34 34	31 31 30	27 26 26	13 12 11
AS-4A	1200	Om/s Static 3m/s Inlet 8m/s Inlet	5 7 7	8 10 10	15 17 17	25 26 27	44 44 44	42 42 41	36 35 35	18 17 16
AS-5A	1500	Om/s Static 3m/s Inlet 8m/s Inlet	6. 8 8	10 12 12	18 20 20	32 33 34	50 50 50	50 50 49	46 45 45	22 21 20
AS-6A	1800	Om/s Static 3m/s Inlet 8m/s Inlet	7 9 9	13 15 15	23 25 25	38 39 40	50 50 50	50 50 49	50 49 49	27 26 25
AS-7A	2100	Om/s Static 3m/s Inlet 8m/s Inlet	8 10 10	15 17 17	26 28 28	45 43 47	55 55 55	54 54 54	54 53 53	33 32 31
AS-8A	2400	Om/s Static 3m/s Inlet 8m/s Inlet	9 11 11	18 20 20	30 32 32	52 53 54	60 60 60	59 59 58	56 55 55	36 35 34

Model	Length	Face Velocity	63Hz	125Hz	250Hz	500Hz	1 K	2K	4K	8K
AS-2B	600	Om/s Static 3m/s Inlet 8m/s Inlet	2 3 3	3 4 4	7 8 8	10 11 12	18 18 18	12 12 11	12 11 11	8 7 6
AS-3B	900	Om/s Static 3m/s Inlet 8m/s Inlet	3 4 4	5 6 6	8 9 9	16 17 18	26 26 26	18 17 17	18 17 17	13 12 11
AS-4B	1200	Om/s Static 3m/s Inlet 8m/s Inlet	4 5 5	7 8 8	12 13 13	20 21 22	33 33 33	22 21 21	22 22 21	18 17 16
AS-5B	1500	Om/s Static 3m/s Inlet 8m/s Inlet	4 5 5	8 9 9	13 14 14	26 27 28	40 40 40	28 27 27	28 27 27	22 21 20
AS-6B	1800	Om/s Static 3m/s Inlet 8m/s Inlet	5 6 6	10 11 11	17 18 18	30 31 32	46 46 46	32 32 31	32 31 31	27 28 29
AS-7B	2100	Om/s Static 3m/s Inlet 8m/s Inlet	5 6 6	11 12 12	18 19 19	36 37 38	53 53 53	46 46 45	38 37 37	32 31 30
AS-8B	2400	Om/s Static 3m/s Inlet 8m/s Inlet	6 7 7	13 14 14	22 23 23	40 41 42	60 60 60	53 53 52	42 41 41	37 36 35

Model	Length	Face Velocity	63Hz	125Hz	250Hz	500Hz	1 K	2K	4K	8K
AS-2C	600	Om/s Static 3m/s Inlet 8m/s Inlet	2 3 3	2 3 3	4 5 5	8 9 10	16 16 16	12 12 11	6 7 7	5 4 3
AS-3C	900	Om/s Static 3m/s Inlet 8m/s Inlet	2 3 3	3 4 4	7 8 8	12 13 14	26 26 26	18 18 17	12 11 11	8 7 6
AS-4C	1200	Om/s Static 3m/s Inlet 8m/s Inlet	3 4 4	4 5 5	9 10 10	16 17 18	33 33 33	22 22 21	14 13 13	10 9 8
AS-5C	1500	Om/s Static 3m/s Inlet 8m/s Inlet	3 4 4	7 8 8	12 13 13	20 21 22	40 40 40	28 28 27	18 17 17	22 21 20
AS-6C	1800	Om/s Static 3m/s Inlet 8m/s Inlet	4 5 5	7 8 8	13 14 14	26 27 28	46 46 46	30 30 29	20 19 19	14 13 12
AS-7C	2100	Om/s Static 3m/s Inlet 8m/s Inlet	4 5 5	9 10 10	15 16 16	30 31 32	53 53 53	34 34 33	24 23 23	18 17 16
AS-8C	2400	Om/s Static 3m/s Inlet 8m/s Inlet	5 6 6	10 11 11	18 20 20	36 37 38	60 60 60	40 40 39	26 25 25	24 23 22

The following tables indicate static insertion losses at 0 m/s. and dynamic insertion losses at 3 m/s. 8 m/s. of air velocities at the air inlet of the attenuators for different models.

Model	Length	Face Velocity	63Hz	125Hz	250Hz	500Hz	1 K	2K	4K	8K
AS-2D	600	Om/s Static 3m/s Inlet 8m/s Inlet	4 4 5	6 7 7	12 13 13	20 21 22	30 30 30	26 26 25	21 20 20	13 12 11
AS-3D	900	Om/s Static 3m/s Inlet 8m/s Inlet	6 7 7	12 13 13	18 19 19	30 31 32	38 38 38	34 34 33	30 29 29	20 19 18
AS-4D	1200	Om/s Static 3m/s Inlet 8m/s Inlet	8 9 9	14 14 15	24 25 25	38 39 40	44 44 44	47 47 46	40 39 39	28 27 26
AS-5D	1500	Om/s Static 3m/s Inlet 8m/s Inlet	10 11 11	16 17 17	30 31 31	48 .49 - 50	50 50 50	50 50 49	48 47 47	28 27 26
AS-6D	1800	Om/s Static 3m/s Inlet 8m/s Inlet	12 13 13	18 19 19	36 37 37	50 51 52	50 50 50	50 50 49	50 49 49	30 29 28
AS-7D	2100	Om/s Static 3m/s Inlet 8m/s Inlet	14 15 15	20 21 21	42 43 43	58 59 60	56 56 56	56 55 54	56 55 55	36 35 34
AS-8D	2400	Om/s Static 3m/s Inlet 8m/s Inlet	16 17 17	22 23 23	48 49 49	60 61 62	62 62 62	60 60 59	60 59 59	40 39 38

Model	Length	Face Velocity	63Hz	125Hz	250Hz	500Hz	1 K	2K	4K	8K
AS-2E	600	Om/s Static 3m/s Inlet 8m/s Inlet	3 4 4	6 8 8	9 10 10	15 16 17	26 26 26	19 19 18	13 12 12	9 8 7
AS-3E	900	Om/s Static 3m/s Inlet 8m/s Inlet	5 6 6	8 9 9	15 16 16	24 25 26	30 30 30	24 24 23	20 19 19	13 12 11
AS-4E	1200	Om/s Static 3m/s Inlet 8m/s Inlet	7 8 8	10 11 11	20 21 21	30 31 32	34 34 34	32 32 31	25 24 24	18 17 16
AS-5E	1500	Om/s Static 3m/s Inlet 8m/s Inlet	8 9 9	13 14 14	22 23 23	40 41 42	42 42 42	40 40 39	30 29 29	22 21 20
AS-6E	1800	Om/s Static 3m/s Inlet 8m/s Inlet	9 10 10	15 16 16	46 27 27	47 47 48	44 47 47	32 44 43	24 31 31	26 23 22
AS-7E	2100	Om/s Static 3m/s Inlet 8m/s Inlet	10 11 11	17 18 18	30 31 31	52 53 54	54 54 54	48 48 47	35 34 34	26 25 24
AS-8E	2400	Om/s Static 3m/s Inlet 8m/s Inlet	13 14 14	19 20 20	36 37 37	56 57 58	58 58 58	52 52 51	38 37 37	28 27 26

Model	Length	Face Velocity	63Hz	125Hz	250Hz	500Hz	1 K	2K	4K	8K
AS-2F	600	Om/s Static 3m/s Inlet 8m/s Inlet	2 3 3	4 5 5	7 8 8	12 13 14	18 18 18	14 14 13	8 7 7	5 4 3
AS-3F	900	Om/s Static 3m/s Inlet 8m/s Inlet	4 5 5	7 8 8	11 12 12	20 21 22	22 22 22	18 18 17	13 12 12	7 6 5
AS-4F	1200	Om/s Static 3m/s Inlet 8m/s Inlet	6 7 7	8 9 9	15 16 16	23 24 25	28 28 28	24 24 23	16 15 15	10 9 8
AS-5F	1500	Om/s Static 3m/s Inlet 8m/s Inlet	6 7 7	10 11 11	19 20 20	32 33 34	36 36 36	30 29 28	20 19 19	12 11 10
AS-6F	1800	Om/s Static 3m/s Inlet 8m/s Inlet	8 9 9	12 13 13	22 23 23	36 37 38	42 42 42	32 32 31	22 21 21	14 13 12
AS-7F	2100	Om/s Static 3m/s Inlet 8m/s Inlet	10 11 11	14 15 15	26 27 27	40 41 42	48 48 48	36 36 35	23 22 22	16 15 14
AS-8F	2400	Om/s Static 3m/s Inlet 8m/s Inlet	12 13 13	16 17 17	30 31 31	43 44 45	50 50 50	42 42 41	25 24 24	20 19 18

Engineering and Performance Data- CS

The Fan manufacturer normally supplies in-duct acoustic performance data along with the fan sound spectrum, The In-duct data should be used where the fan is connected to a duct distribution system. When a type CS- S 30 A/B attenuator is directly connected to the free inlet or Discharge of .an axial flow fan whose performance data is quoted only in In-duct terms, these additional figures in attenuation may be added to the values given in the dynamic insertion loss table.

Dynamic insertion loss is not significantly affected by fan speed on either type of attenuator as fan speed is lowered for a given diameter so incident sound power level reduces together with volume flow. Very conveniently, regeneration reduces approximately.

In step with the fan sound power level. Dynamic insertion loss is mainly affected by pitch angle setting on the type CS B 38 With the type CS- B 3A the velocities are greatly reduced, where regeneration then becomes less Important. The pitch angle settings low, mid and high correspond to settings of approximately 100, 200, and 300 on axial flow fans with Adjustable pitch blades. Figures for other blade angle settings may be obtained by interpolation.

Static and Dynamic Insertion Losses to Models CS- S 30 A/ B/ C

The following tables indicate static insertion losses at 0 m/s, and dynamic insertion losses at 3 m/s of air velocities at the air inlet of the attenuators for different models.

Model	Length (mm)	Face Velocity	63Hz	125Hz	250Hz	500Hz	1K	2K	4K	8K
CS-B30A 125Ø	640	Om/s static 3m/s Inlet	3 6	8 12	10 15	20 21	28 28	35 35	21 20	9 18
CS-B30A 160Ø	640	Om/s static 3m/s Inlet	4 6	7 13	9 16	16 17	27 27	26 26	13 16	15 18
CS-1330A 200Ø	640	Om/s static 3m/s Inlet	3 6	8 13	9 15	19 18	32 32	17 17	18 16	13 18
CS-B30A 250Ø	640	Om/s static 3m/s Inlet	3 6	6 12	7 14	15 16	29 29	11 11	15 14	14 13
CS-11330A 315Ø	820	Om/s static 3m/s Inlet	3 6	6 10	6 12	15 16	21 21	15 18	14 13	12 11
CS-1330B 355Ø	820	Om/s static 3m/s Inlet	4 8	6 12	6 14	12 18	21 21	18 18	16 12	12 11
CS-1330S 400Ø	820	Om/s static 3m/s Inlet	4 8	6 12	6 14	12 18	21 21	14 14	14 11	12 10
CS-133013 450Ø	820	Om/s static 3m/s Inlet	5 9	7 14	7 16	12 18	18 18	12 14	12 10	10 10
CS-1330113 500Ø	820	Om/s static 3m/s Inlet	5 9	8 14	8 16	10 14	16 16	12 14	12 10	10 12
CS-S3013 560Ø	820	Om/s static 3m/s Inlet	5 9	8 14	8 15	10 12	13 13	12 12	9 10	8 10
CS-1330C 630Ø	820	Om/s static 3m/s Inlet	6 10	8 14	8 16	10 18	16 16	15 15	12 16	12 16
CS-1330C 710Ø	1240	Om/s static 3m/s Inlet	6 10	9 15	9 16	12 20	12 22	18 18	12 16	12 14
CS-1330C 800Ø	1240	Om/s static 3m/s Inlet	6 11	9 16	12 18	14 22	14 20	16 16	11 14	11 16
CS-1330C 900Ø	1240	Om/s static 3m/s Inlet	6 11	10 16	12 20	14 22	14 20	16 16	11 14	11 16
CS-1330C 1000Ø	1240	Orn/s static 3m/s Inlet	6 11	10 16	14 21	14 22	14 20	15 15	10 12	10 14

Engineering and Performance Data - CT Cross Talk Attenuators

Passive Insertion Losses for Models CT - S 40 A/ B/ C

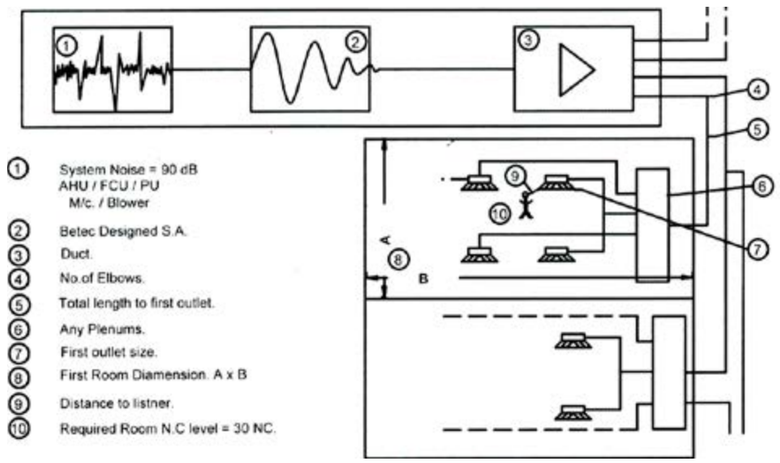
Nominal Size in mm	Model	Length L	Octava Band Mid Frequency Hz.							
			63	125	250	500	1k	2k	4k	4k
150Ø	S- 40A 1200	600 4	2 7	4 9	6 15	10 20	15 18	11 12	8 12	9
200Ø	S- 40A 1200	600 6	4 8	6 12	8 18	12 22	18 22	19 18	16 16	14
250Ø	S- 40A 1200	600 6	4 8	6 11	8 16	11 21	16 21	18 19	15 18	12
300Ø	S-40A 1200	600 8	4 11	6 16	9 30	17 39	26 35	21 32	18 22	12
200x200	S-40B 1200	600 8	4 11	6 16	9 27	17 32	23 32	20 29	18 19	11
250x250	S -40B 1200	600 8	4 11	6 16	9 24	16 23	17 23	16 24	14 17	11
300x300	S-40B 1200	600 8	4 11	6 19	11 30	22 22	21 30	16 24	14 17	11
200x200	S-40C 1200	600 10	5 14	8 22	12 32	20 32	22 31	18 26	16 25	14
250x250	S-40C 1200	600 10	5 12	8 21	12 30	21 31	21 30	18 25	16 24	14
300x300	S-40C 1200	600 10	8 14	9 22	15 28	20 31	19 29	15 18	11 15	9

Weight Chart for Square and Rectangular Attenuators Models AS- 1310 I SS- S20

Attenuator Code AS-S10 / SS-S20 Series Models A-J		Attenuator Length						
		2x	3x	4x	5x	6x	7x	8x
Width mm	Height mm	600	900	1200	1500	1800	2100	2400
300	300	12	17	21	26	31	36	40
400	400	16	24	30	36	44	50	58
500	500	25	35	45	55	66	75	86
600	600	30	42	55	65	80	95	110
700	700	42	60	75	92	115	135	155
800	800	45	66	88	110	135	155	178
900	900	55	80	105	126	155	180	210
1000	1000	60	86	115	145	175	205	235
1200	1200	115	155	195	235	285	230	375
1300	1300	125	165	215	265	325	380	425
1400	1400	145	202	240	300	368	440	515
1500	1500	156	215	280	340	415	475	545
1600	1600	188	268	352	422	532	612	712
1700	1700	202	282	375	466	582	666	775
1800	1800	216	312	408	504	620	712	825
1900	1900	232	336	439	542	670	752	872
2000	2000	244	352	455	565	690	792	930

- All weights are given in kg and are based on standard TECHNO FAB ENGINEERING basic Attenuator Construction.
- Attenuators sizes larger than given in the table are constructed in modular form for easy shipping and handling.

Engineering and Performance Data – AS



1. System Noise = 90 dB AHU / FCU / PU M/c. / Blower
2. Betec Designed S.A.
3. Duct.
4. No.of Elbows.
5. Total length to first outlet.
6. Any Plenums.
7. First outlet size.
8. First Room Diamension. A x B
9. Distance to listner.
10. Required Room N.C level = 30 NC.

Models:

Instructions for Selection of Sound Attenuators
Instructions for Selection of Sound Attenuators by computer software design. Graph 1

Instructions for Selection of Sound Attenuators by simple calculation method Graph 2, 3.4

- Select an attenuator type and code from S10/20 Series Tables, for required acoustic performance. Note that the each type is available in lengths from 300mm to 2400mm.
- Determine the aerodynamic factor ‹K› for the chosen attenuator from adjacent table and Graph 2
- Knowing preferred or specified attenuator pressure drop and aerodynamic factor, determine the attenuator face
- Velocity from graph 3 on the following page.
- From Tables S10/20 Series, check that the chosen attenuator face velocity does not infringe the design noise criterion level due to self generated air flow noise within the attenuator.
- Knowing the air volume to be handled by the attenuator and its face velocity from step 3, determine the attenuator cross section dimensions form graph 3. When extrapolation is necessary choosing the higher line i.e. larger cross section will ensure that the specified pressure drop will not be exceeded.
- Kriowing the face and passage velocities find out the Attenuator self noise generation spectrum from Graph 4

Octave band

A range of frequencies whose upper limit is twice the frequency of the lower limit normally identified by its «centre» frequency which is 1.414 times the lower limit. For ease of use the audible sound! Spectrum is divided into a series of
Preferred octave bands internationally acknowledged as standard.

Insertion loss

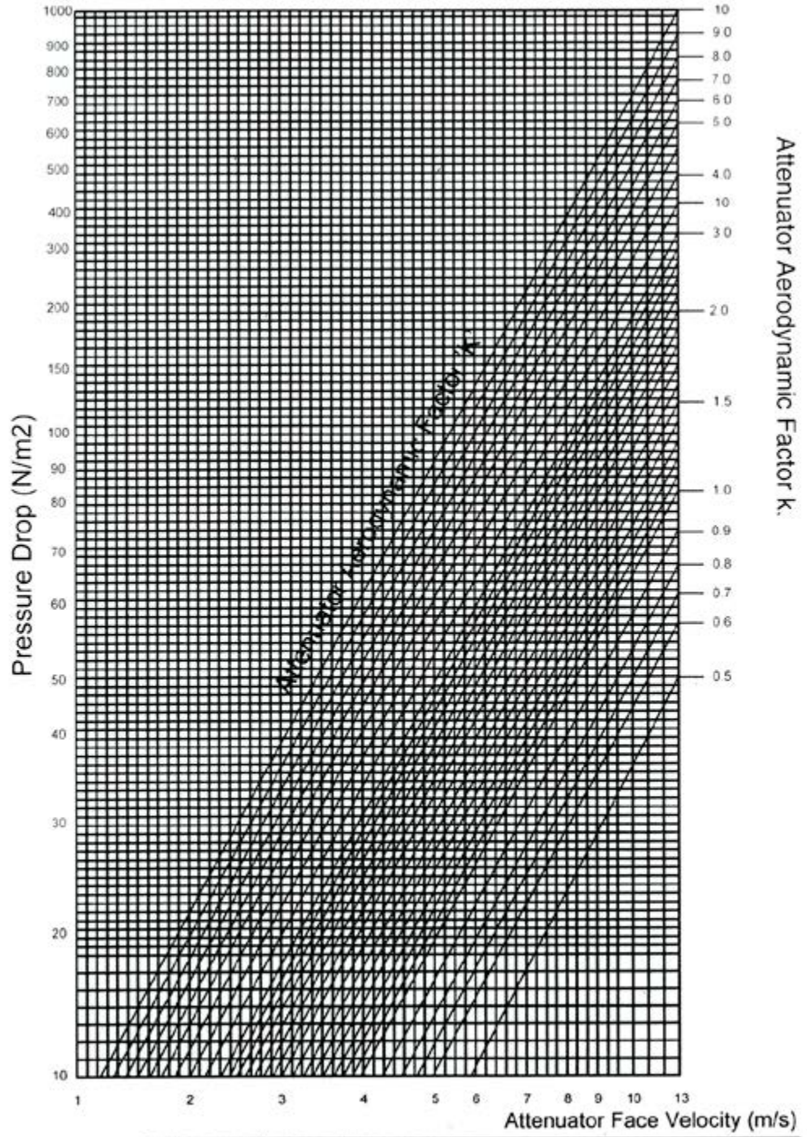
Generally the noise level difference in dB before and after the addition of an attenuator. The insertion loss will usually be different in each octave band so it is necessary to specify the loss in all relevant bands.

Face velocity

The mean air velocity over the entire face area (width x height) of an attenuator. Air volume (m3/s) divided by the face area (ml). In this publication all face velocities are in meters per second (m/s).

Engineering and Performance Data - AS I SS

Instruction for Selection of Sound Attenuators
Procedure for Attenuator Selection Graph 2



Types.	Area NC Level due to Self Noice Generation.						
RAS - AD		NC 25	NC 30	NC 35	NC 40	NC 45	
RAS - LD			NC 25	NC 30	NC 35	NC 40	NC 45
RAS - MD.			NC 25	NC 30	NC 35	NC 40	NC 45

Engineering and Performance Data AS I BS

Instructions for Selection of Sound Attenuators

Pressure drop

Air passing through an attenuator experiences a reduction in its barometric pressure. This effect must be quantified! to ensure that it is compatible with the design and selection of other components in the system. Normally shown as units Pascals (Pa) Newtons per metre squared (N/m2 .

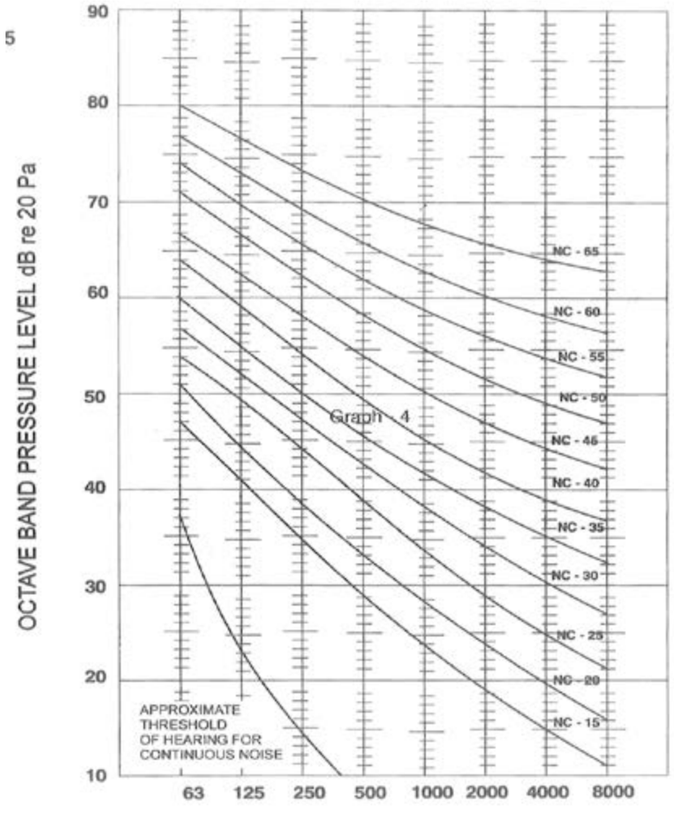
Regeneration

The level of noise due to turbulence created by the passage of air through the attenuator. Generally the higher the pressure drop, the higher the regenerated noise levels. Again, these will usually be different for each octave band so it IS necessary to specify the level fin all relevant bands. The levels will also be different for noise and airflow in the same direction (positive values of face velocity) and for noise and Airflow in opposite directions (negative values of face velocity).

63 Hz Octave band

Figuresfor63 Hz octave band! are not required! as part of SS4718 :1971.The standard does, however' permit figures to be obtained and reported but stresses that these will have a lower degree of accuracy.

5



Graph - 4

Notes

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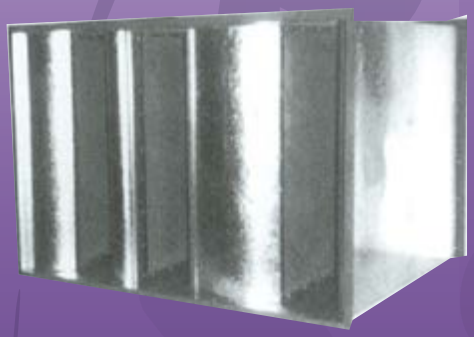

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