



[Patent 5,663,535]

▼ Model AXPA

The Carnes Model AXPA Clean Air Silencer has been designed and engineered to reduce discharge sound levels of Clean Air Terminal Units. The Model AXPA is a “reactive type” silencer which attenuates discharge noise levels from air terminals and other devices without the use of sound absorptive materials such as fiberglass, mineral wool, etc. This eliminates indoor air quality concerns when using the Model AXPA Silencer.

Most other manufactured sound attenuators require a considerable amount of straight duct upstream to achieve any reduction in sound levels. The straight duct is necessary to allow the air flow to become uniform after being discharged from a VAV terminal unit. Most HVAC systems today have limited space available and additional upstream duct is not permitted or cost effective. The Model AXPA Silencer does not require additional straight duct upstream because it is designed and tuned specifically to straighten the air pattern and attenuate sound directly after the VAV damper.

The Model AXPA Silencer has an integral air flow straightening section upstream of the sound attenuating section. The air flow straightening

section consists of a short piece of straight duct upstream of a long radius elliptical flow nozzle to minimize turbulence (self noise) and to reduce pressure drop of the silencer. This unique feature allows for direct coupling of the Model AXPA Silencer to the Clean Air Terminal Unit without the use of any transitions or flow straightening ducts.

Through extensive acoustic tuning and laboratory testing conducted in accordance with AHRI Standard 880, the Model AXPA Silencer has proven to effectively reduce discharge sound levels of air terminals. The testing and rating (per AHRI 880) was conducted with the Model AXPA Silencer connected directly to the Clean Air Terminal Unit. This unique testing configuration provides the designer with real world test results, eliminating questions regarding the VAV damper effect on the silencer performance.

All Model AXPA Silencers include a removable access door. This access door allows for periodic cleaning of the sound attenuating cavity. Model AXPA Clean Air Silencers combined with the Clean Air Terminals are an excellent choice for hospital, clean room and laboratory applications.

Features Include:

- No insulation or sound absorptive material in the airstream makes this unit an excellent choice for clean-room, hospital and laboratory applications.
- Low pressure drop design.
- Convenient slip and drive connection on inlet and outlet. Sized to match Clean Air Terminal Units.
- Sturdy 22 gauge galvanized steel construction.
- Gasketed access panel to allow for cleaning.
- Tuned for direct connection to air terminals. No need for additional air straightening duct upstream.
- Air flow capacities to 4200 CFM.
- Optional hanger brackets (Unattached).
- Optional 1” external thermally insulated casings must meet **UL** Test 181 for erosion resistance and **NFPA** 90A requirements for 250°F continuous temperature.
- Shipped separately (consult factory for shipping attached).

**Models AVC, AVW and AVE with and without AXPA Clean Air Silencer
Sound Data (Discharge Noise Criteria)**

Discharge Sound Power

Inlet Size (In.)	CFM	Minimum ΔP_s (Damper Full Open)			Min. ΔP_s		1.0" ΔP_s		1.5" ΔP_s		3.0" ΔP_s	
		AVC AVE	AVW 1-Row	AVW 2-Row	AVC AVE	AVW	AVC AVE	AVW	AVC AVE	AVW	AVC AVE	AVW
		w/AXPA	w/AXPA	w/AXPA	w/AXPA	w/AXPA	w/AXPA	w/AXPA	w/AXPA	w/AXPA	w/AXPA	w/AXPA
5	75	.028	.032	.036	--	--	10	11	10	12	11	14
	100	.051	.055	.064	--	--	11	13	12	13	13	15
	200	.192	.211	.233	--	10	15	16	16	18	18	22
	300	.431	.466	.515	11	12	19	20	21	22	23	27
	350	.554	.615	.685	11	13	19	20	21	22	23	27
6	110	.020	.026	.036	--	--	11	12	12	13	14	16
	200	.071	.087	.122	--	--	13	14	14	15	17	22
	300	.149	.186	.250	10	11	16	16	18	19	21	27
	400	.253	.316	.417	10	12	16	16	18	20	21	27
	500	.395	.490	.636	11	13	18	19	20	21	25	28
7	140	.010	.021	.035	--	--	13	13	13	15	15	22
	200	.023	.040	.068	--	--	14	14	14	16	18	23
	400	.093	.146	.243	--	--	15	16	16	16	19	24
	600	.208	.322	.528	10	11	18	19	19	20	21	27
	700	.261	.397	.658	10	11	18	19	19	21	21	27
8	185	.009	.023	.050	--	--	13	14	14	15	20	20
	400	.039	.083	.204	--	--	14	15	15	16	21	21
	600	.083	.171	.430	10	10	16	16	18	19	23	23
	800	.138	.273	.693	10	11	16	16	18	19	23	23
	1000	.212	.399	1.032	11	12	16	16	18	19	23	24
10	300	.008	.027	.047	--	--	14	14	15	18	22	25
	500	.013	.057	.105	--	--	14	14	15	18	22	25
	800	.024	.119	.231	--	--	15	15	16	18	22	25
	1200	.047	.242	.468	--	10	17	17	19	19	23	26
	1500	.069	.360	.713	--	10	17	18	19	19	23	26
12	430	.001	.020	.056	--	--	13	17	14	19	18	23
	800	.003	.054	.156	--	--	13	17	15	19	19	24
	1200	.005	.105	.318	--	10	14	17	17	20	22	27
	1800	.007	.216	.656	--	11	15	18	17	20	23	27
	2300	.009	.323	.997	10	13	15	18	19	20	25	28
14	600	.004	.033	.060	--	--	14	15	15	18	22	24
	1000	.006	.065	.134	--	--	14	15	15	18	22	24
	1600	.011	.143	.305	--	--	14	16	16	19	22	25
	2400	.024	.303	.657	10	12	15	16	19	20	27	27
	3100	.036	.461	.990	10	13	15	16	19	20	27	27
16	780	.005	.026	.058	--	--	13	13	14	14	19	20
	1600	.016	.081	.203	--	--	14	13	15	15	20	22
	2400	.041	.176	.461	10	11	15	15	18	18	23	25
	3600	.089	.353	.917	12	13	15	15	18	18	23	25
	4200	.120	.466	1.188	13	16	15	16	18	19	25	26

- NOTES:**
1. ΔP_s static pressure difference from inlet to discharge.
 2. ΔP_s is the minimum pressure required to deliver CFM shown with the primary damper in wide open position.
 3. Dash (--) indicates NC level less than 10.

NC levels are derived from tests conducted in accordance with AHRI Standard 880-2008 and are calculated in accordance with AHRI Standard 885-2008 as application data. NC is not part of the AHRI certification program.

- Discharge NC levels are based on —
- a) 5 foot rectangular duct.
 - b) 5 foot lined flex duct (8" diameter).
 - c) Space effect factor (2400 ft³) at 5 feet from outlet.
 - d) End reflection.
 - e) Environmental adjustment factor.

Models AVC, AVE with AXPA Clean Air Silencer
Sound Data (Sound Power by Octave Band)

Discharge Sound Power

Inlet Unit Size (In.)	CFM	Minimum ΔP_s							1.0" ΔP_s							1.5" ΔP_s							3.0" ΔP_s						
		Sound Power (db) by Octave Band							Sound Power (db) by Octave Band							Sound Power (db) by Octave Band							Sound Power (db) by Octave Band						
		ΔP_s	(2)	(3)	(4)	(5)	(6)	(7)	(2)	(3)	(4)	(5)	(6)	(7)	(2)	(3)	(4)	(5)	(6)	(7)	(2)	(3)	(4)	(5)	(6)	(7)			
5	75	.028	33	24	18	18	16	19	45	34	30	34	38	37	46	36	33	38	42	41	48	40	38	43	48	47			
	100	.051	36	27	22	22	20	22	49	37	33	36	39	37	50	40	35	39	43	41	52	44	40	45	49	48			
	200	.192	44	34	30	32	32	29	57	46	39	40	42	39	59	48	42	43	46	43	61	52	46	48	52	49			
	300	.431	48	38	36	37	38	33	62	51	43	42	43	40	64	53	45	45	47	44	66	57	50	51	53	50			
	350	.554	50	40	38	39	41	34	64	52	44	42	44	40	66	55	47	46	48	44	68	58	51	51	54	51			
6	110	.020	32	21	18	17	15	18	48	37	31	35	36	33	50	41	35	39	40	37	53	47	41	45	47	43			
	200	.071	40	30	26	25	25	24	54	42	36	39	40	37	56	46	40	42	43	41	60	52	46	48	50	47			
	300	.149	45	35	31	31	32	28	59	46	40	41	42	39	61	49	43	45	46	43	64	55	50	51	52	49			
	400	.253	49	40	34	35	37	31	62	48	42	43	43	41	64	52	46	46	47	44	67	58	52	52	54	51			
	500	.395	51	43	37	38	41	33	64	50	44	44	45	42	66	54	48	48	48	46	70	60	54	54	55	52			
7	140	.010	33	21	18	17	16	20	52	42	38	38	38	37	53	45	43	41	42	41	55	51	50	48	48	47			
	200	.023	37	26	22	23	22	24	55	44	39	39	40	38	56	47	44	42	44	42	58	53	52	49	50	48			
	400	.093	44	34	32	33	33	31	61	48	42	40	43	41	62	51	46	44	47	45	64	57	54	51	53	51			
	600	.208	49	38	37	39	40	35	64	50	43	42	45	43	65	53	48	45	49	47	67	59	55	52	55	53			
	700	.261	51	40	39	41	42	37	65	51	44	42	46	44	66	54	48	46	50	47	68	60	56	52	56	54			
8	185	.009	35	22	18	17	15	17	53	46	40	41	41	40	55	49	45	45	44	43	59	55	53	51	50	49			
	400	.039	43	32	30	29	30	29	59	49	42	42	45	44	61	53	47	46	48	47	64	59	55	52	54	53			
	600	.083	47	38	37	36	38	35	62	51	43	42	47	46	64	55	48	46	50	49	67	61	55	53	56	55			
	800	.138	49	41	42	40	43	39	64	52	44	43	48	47	66	56	48	46	51	51	69	62	56	53	57	56			
	1000	.212	52	44	45	44	48	42	65	53	44	43	49	48	67	57	49	47	52	52	70	63	57	53	58	58			
10	300	.008	33	19	16	15	15	17	55	46	45	53	48	45	57	50	49	57	52	49	60	57	57	65	59	56			
	500	.013	37	26	24	24	23	23	59	49	46	53	50	48	61	53	50	57	54	52	64	60	58	65	61	58			
	800	.024	41	31	31	32	31	27	63	51	46	53	51	50	65	55	51	57	55	54	68	62	59	64	62	61			
	1200	.047	45	37	37	39	38	32	66	53	47	53	52	52	68	57	52	57	56	56	71	64	60	64	63	63			
	1500	.069	46	39	41	43	42	34	68	54	48	53	53	53	70	58	52	57	57	57	73	65	60	64	64	64			
12	430	.001	35	20	16	17	13	14	55	45	42	51	46	43	58	49	46	55	50	46	64	56	53	62	56	52			
	800	.003	41	29	28	29	27	26	59	49	44	51	50	47	63	53	48	55	53	51	68	60	55	62	59	57			
	1200	.005	46	35	36	36	36	34	62	51	46	51	52	51	66	55	50	55	55	54	71	62	57	62	61	60			
	1800	.007	50	42	44	44	46	41	66	54	48	51	54	54	69	58	52	55	58	57	75	65	59	62	63	63			
	2300	.009	53	45	49	48	52	46	67	55	49	51	56	56	71	59	53	55	59	59	76	66	60	62	65	65			
14	600	.004	33	20	15	16	13	15	57	50	47	53	49	47	61	54	52	57	52	50	67	60	59	64	58	56			
	1000	.006	41	29	26	26	24	24	61	52	48	53	51	51	64	56	53	57	55	54	70	62	60	64	61	60			
	1600	.011	47	37	35	36	35	32	64	54	49	53	54	54	68	58	53	58	57	58	74	64	61	65	63	63			
	2400	.024	53	44	44	44	44	39	67	55	50	54	56	57	71	59	54	58	59	61	77	66	62	65	65	66			
	3100	.036	57	48	49	49	49	44	69	56	50	54	57	59	73	60	55	58	61	63	79	67	62	65	67	68			
16	780	.005	38	23	14	17	12	14	59	49	44	52	50	49	62	53	47	56	53	52	68	59	53	63	58	57			
	1600	.016	49	36	31	32	31	31	64	53	48	53	54	54	67	57	52	57	57	57	72	63	58	64	61	62			
	2400	.041	55	44	41	41	42	41	66	56	50	53	56	57	70	59	54	58	59	60	75	66	60	65	63	65			
	3600	.089	62	51	50	50	52	51	69	58	53	54	58	60	72	62	56	58	61	63	78	68	62	65	66	68			
	4200	.120	64	54	54	53	56	54	70	59	54	54	59	61	73	63	57	58	62	64	79	69	63	65	66	69			

- NOTES:**
1. Based on tests conducted in accordance with AHRI Standard 880-2008.
 2. ΔP_s static pressure difference from inlet to discharge.
 3. ΔP_s is the minimum pressure required to deliver CFM shown with primary damper in wide open position.



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Model AVW with AXPA Clean Air Silencer
Sound Data (Sound Power by Octave Band)

Discharge Sound Power

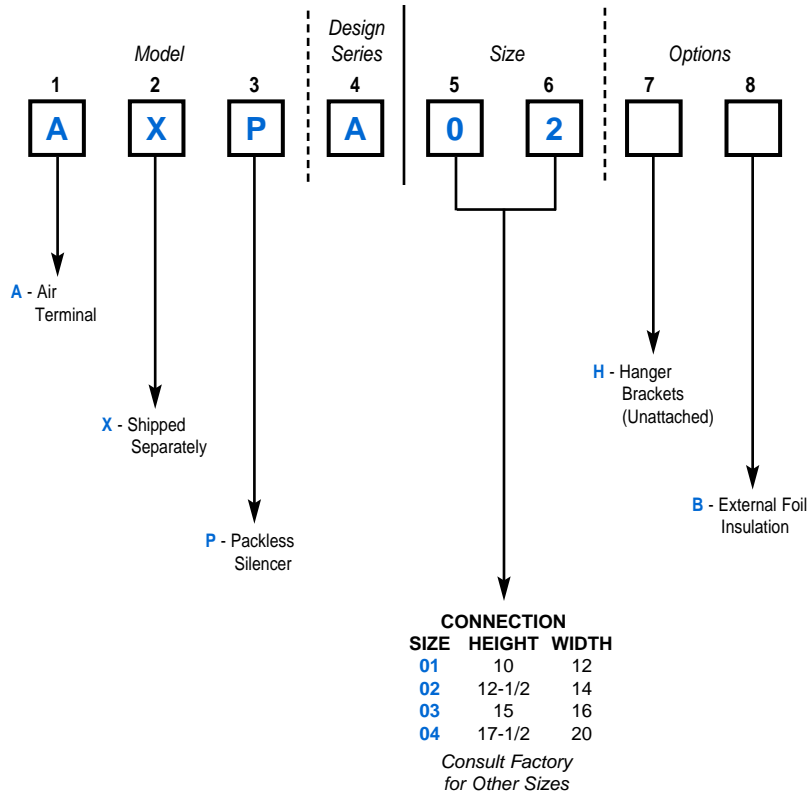
Inlet Unit Size (In.)	CFM	Minimum ΔP_s							1.0" ΔP_s							1.5" ΔP_s							3.0" ΔP_s						
		Sound Power (db) by Octave Band							Sound Power (db) by Octave Band							Sound Power (db) by Octave Band							Sound Power (db) by Octave Band						
		ΔP_s	(2)	(3)	(4)	(5)	(6)	(7)	(2)	(3)	(4)	(5)	(6)	(7)	(2)	(3)	(4)	(5)	(6)	(7)	(2)	(3)	(4)	(5)	(6)	(7)			
5	75	.036	34	22	16	19	15	17	49	40	32	37	37	38	49	43	35	41	42	42	50	47	41	47	49	49			
	100	.064	37	25	20	22	20	21	52	43	34	39	40	39	52	46	38	43	44	44	53	50	44	49	51	51			
	200	.233	46	35	29	31	31	29	59	50	41	44	45	44	60	53	44	47	50	48	60	57	50	54	57	55			
	300	.515	50	40	35	36	38	34	63	54	44	46	48	46	64	57	48	50	53	50	65	61	54	56	60	57			
	350	.685	52	42	37	38	40	36	65	56	46	47	50	47	65	58	49	51	54	51	66	62	56	57	61	58			
6	110	.036	33	21	15	15	16	19	49	41	33	39	42	39	51	45	38	43	46	43	54	52	45	50	52	49			
	200	.122	41	32	26	26	30	30	55	46	40	43	46	43	57	50	44	47	50	47	60	57	51	54	56	53			
	300	.250	46	39	33	34	39	37	59	49	44	46	49	47	61	54	48	50	52	50	64	61	55	56	59	56			
	400	.417	50	44	38	40	46	42	62	52	47	48	51	49	64	56	51	52	54	52	67	63	58	58	60	58			
	500	.636	52	48	42	44	51	46	65	54	49	49	52	50	67	58	54	53	56	54	70	65	61	60	62	60			
7	140	.035	30	22	18	16	18	20	52	46	43	43	45	44	53	50	47	47	49	48	55	57	55	54	56	55			
	200	.068	35	27	23	22	24	26	55	48	44	44	47	46	56	52	49	48	51	50	58	58	56	55	58	57			
	400	.243	44	36	35	35	37	37	62	51	47	46	51	50	62	55	51	50	55	54	64	62	59	57	62	61			
	600	.528	50	41	41	42	44	43	65	53	48	48	53	52	66	57	53	52	57	56	67	64	60	58	64	63			
	700	.658	52	43	44	45	47	46	66	54	49	48	54	52	67	58	53	52	58	56	69	65	61	59	65	63			
8	185	.050	34	21	16	19	14	14	49	49	38	43	46	44	51	51	43	47	49	48	53	55	51	54	55	56			
	400	.204	43	33	29	31	30	28	56	53	41	45	48	46	57	55	46	49	51	51	60	59	54	56	57	58			
	600	.430	47	39	36	37	38	35	59	55	43	46	49	47	60	57	48	50	52	52	63	61	56	57	58	59			
	800	.693	50	44	41	42	44	40	61	56	45	46	50	48	63	59	49	50	53	53	65	63	57	58	59	60			
	1000	1.032	52	47	44	45	49	44	63	58	46	47	50	49	65	60	50	51	54	53	67	64	58	58	60	61			
10	300	.047	41	21	17	16	18	21	55	49	47	54	52	51	57	53	52	59	56	54	59	60	60	66	63	61			
	500	.105	44	28	26	26	28	29	58	51	49	55	54	54	60	55	53	59	58	58	62	62	61	66	65	64			
	800	.231	47	36	34	36	38	37	61	53	50	55	56	57	62	57	55	60	60	61	65	64	63	67	67	67			
	1200	.468	49	42	42	44	47	43	63	55	51	56	58	60	65	59	56	60	62	63	67	66	64	67	69	70			
	1500	.713	50	45	45	48	52	47	64	56	52	56	59	61	66	60	56	60	63	65	69	67	64	68	70	71			
12	430	.056	32	21	19	20	16	17	63	51	44	53	51	48	64	55	49	57	55	51	67	61	56	64	61	56			
	800	.156	42	33	30	33	32	34	64	54	48	54	56	54	66	58	52	58	59	57	69	65	60	65	65	63			
	1200	.318	49	41	38	41	43	44	65	57	50	54	59	58	68	61	54	58	62	62	70	67	62	65	68	67			
	1800	.656	55	49	46	49	54	55	67	59	52	55	62	63	69	63	57	59	65	66	72	69	64	66	71	71			
	2300	.997	59	54	50	54	61	61	68	61	53	55	63	65	69	64	58	59	67	68	72	71	65	66	73	74			
14	600	.060	38	24	17	17	15	16	61	53	53	50	53	53	64	56	55	56	57	57	68	62	58	67	65	63			
	1000	.134	45	34	27	31	30	32	63	56	55	51	55	57	66	59	57	58	60	61	70	65	60	69	68	68			
	1600	.305	51	43	37	43	44	46	65	58	56	53	58	61	68	61	58	59	62	65	72	67	61	70	70	72			
	2400	.657	57	51	45	54	56	58	67	60	57	54	60	65	70	63	59	60	64	69	74	69	63	71	72	75			
	3100	.990	60	56	50	61	64	65	68	61	58	55	61	67	71	64	60	61	66	71	75	70	64	72	74	77			
16	780	.058	37	22	14	15	13	16	59	49	43	51	54	54	62	54	47	56	57	57	67	61	54	64	62	61			
	1600	.203	49	37	31	32	34	38	63	54	48	53	58	60	66	58	52	57	61	63	71	66	58	65	66	67			
	2400	.461	56	45	40	42	47	50	66	57	50	53	60	63	68	61	54	58	63	66	73	69	61	66	68	70			
	3600	.917	64	53	50	52	59	62	68	60	53	54	62	67	71	64	57	59	66	69	76	71	63	67	71	74			
	4200	1.188	66	57	54	55	63	66	69	61	54	54	63	68	72	65	57	59	66	71	77	72	64	67	72	75			

- NOTES:**
1. Based on tests conducted in accordance with AHRI Standard 880-2008.
 2. ΔP_s static pressure difference from inlet to discharge.
 3. ΔP_s is the minimum pressure required to deliver CFM shown with primary damper in wide open position.



A Participating Member
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Certification Program

[Patent 5,663,535]



RECOMMENDED SPECIFICATION - Model AXPA Clean Air Silencer

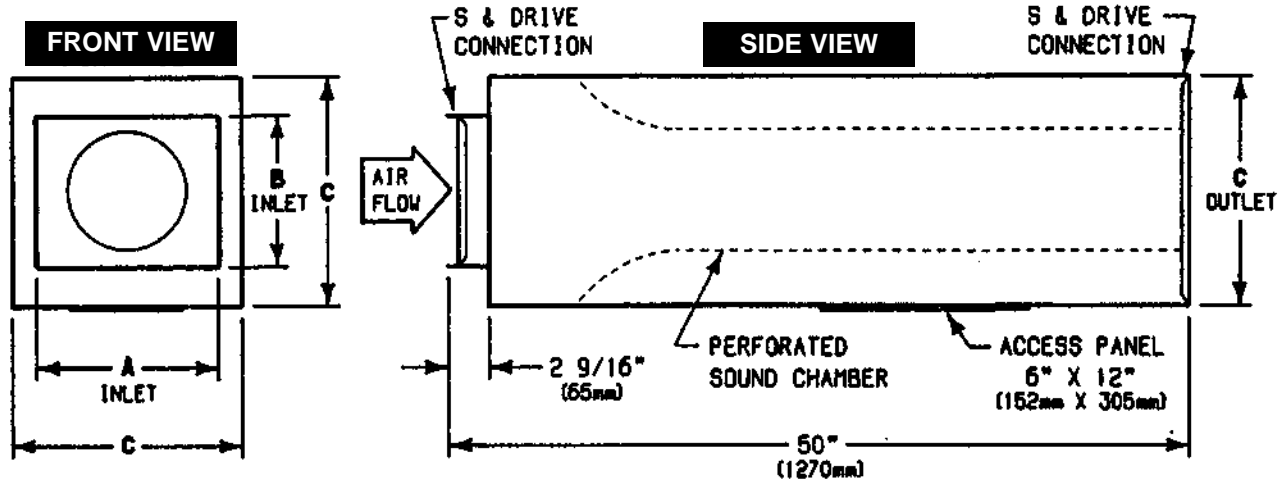
GENERAL

Furnish and install Carnes Clean Air Silencers Model AXPA of the size, capacity and performance as shown on plans. The air pressure drop and sound levels for the silencers and terminal units shall not exceed the values shown on plans. All units shall be tested in accordance with AHRI Standard 880, and will provide catalog performance without the need for additional duct to straighten air flow.

CONSTRUCTION

The silencer casing shall be constructed of 22 gauge galvanized steel, with slip and drive duct connections. The AXPA Silencer shall be designed for direct connection to Clean Air Terminal Units without using upstream transitions or flow straightening ducts.

Provide gasketed access door to allow cleaning of internal chambers. **No sound absorptive or fill material** shall be used inside the silencer. Optional external insulation shall be a minimum 1" thick with a continuous 4 lb./cu. ft. density. The external face of insulation shall be fiber reinforced foil. The insulation must meet **UL Test 181** for erosion resistance and **NFPA 90A** requirements for 250°F continuous temperature. There shall be **NO INSULATION** in the airstream.



CLEAN AIR SILENCER					
DIMENSIONS LISTED IN INCHES (Millimeters)					
UNIT SIZE		INLET		OUTLET	WEIGHT LBS. [Kg.]
AXPA	AV	A	B	C x C	
01	07 - 08	12 (305)	10 (254)	15-1/8 (384)	40 [18]
02	10	14 (356)	12-1/2 (318)	20-1/8 (511)	55 [25]
03	12	16 (405)	15 (381)	20-1/8 (511)	55 [25]
04	14	20 (508)	17-1/2 (445)	24-1/8 (613)	70 [32]

Consult factory for other sizes.