

E.I. Williams

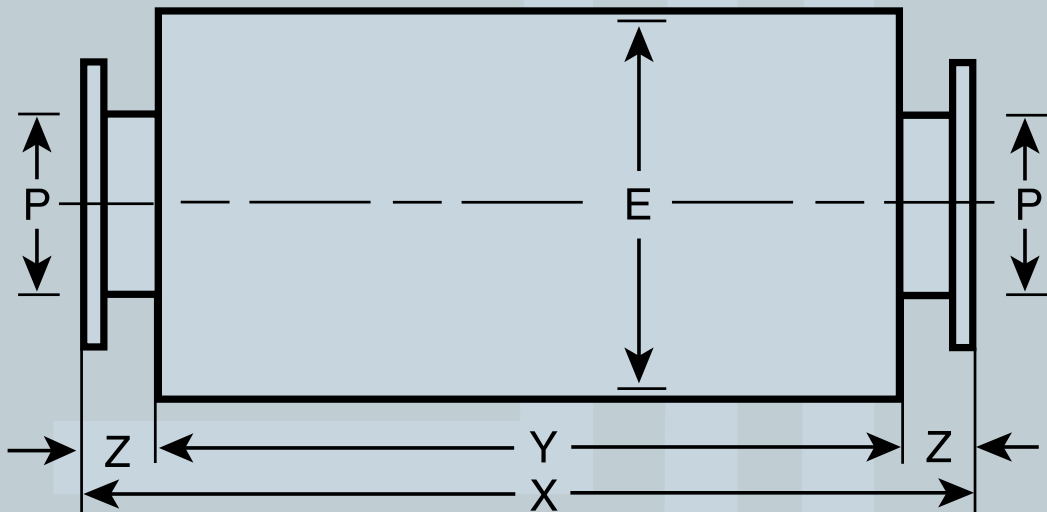
STEEL DIVISION

BUILDING SOUND SOLUTIONS

reference
catalogue

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CENTRIFUGAL COMPRESSOR SILENCERS



INFORMATION ON CENTRIFUGAL COMPRESSOR SILENCERS

Centrifugal compressors are noisy and require noise control. Just as a pump raises the pressure on a liquid, a compressor raises air or gas pressure. Centrifugal compressor noise is produced primarily by blade-tip turbulence which is a function of horse power, speed, discharge pressure, piping velocities, number of stages of compression, type and number of blades etc.

The high speed rotation of vanes or impellers generates noise which primarily consists of discrete tones interdispersed over a broad-band frequency spectrum of lesser intensity. The maximum amplitude occurs at the blade passing frequency and its second harmonic. The high frequency noise generated is in the audible range and requires treatment for achieving noise control.

The importance of proper sizing of intake and discharge piping cannot be overemphasized. Both intake and discharge silencing is normally required. These silencers are absorptive type silencers which are essentially a high frequency, low pressure drop attenuator. It depends on sound absorbing material to dissipate the acoustical energy and are usually straight thru designs. All silencers should be coupled as close as possible to the compressor to prevent excessive pipe radiated noise.

SILENCER SELECTION

The centrifugal compressor silencers are normally selected on the basis of maximum allowable pressure drop at rated flow and the silencing criteria. These silencers are usually sized for around 5000 to 5500 FPM velocity but not exceeding 7500 FPM velocity to prevent excessive self generated noise and aerodynamic noise generation.

While selecting the centrifugal compressor silencer, it must be ensured that the flow area throughout the silencer is sufficient to accommodate the air flow without imposing excessive restriction.

The following table indicates the maximum recommended air flow in CFM for respective silencer size in accordance with the above guidelines.

SIZE	INTAKE SILENCER	CAPACITY (IntakeCFM @ 14.7 PSIA & 70°F)					
		DISCHARGE SILENCER					
		4 PSIG	6 PSIG	8 PSIG	10 PSIG	12 PSIG	15 PSIG
4	475	557	591	622	651	693	727
5	750	879	933	982	1028	1094	1147
6	1075	1260	1337	1408	1473	1568	1644
8	1800	2110	2239	2357	2466	2625	2754
10	2900	3400	3607	3797	3973	4230	4436
12	4200	4925	5224	5455	5754	6126	6425
14	5600	6566	6965	7333	7672	8168	8566
16	7500	8794	9328	9821	10275	10939	11473
18	9500	11139	11816	12440	13015	13856	14532
20	11500	13484	14304	15059	15755	16773	17592
22	14000	16415	17413	18333	19180	20419	21416
24	16500	19346	20523	21607	22605	24065	25240
26	20000	23450	24876	26190	27400	29170	30594
28	23500	27554	29230	30773	32195	34275	35948
30	25750	30192	32028	33720	35277	37556	39390
36	37000	43382	46021	48451	50690	53965	56599
42	52000	60970	64678	68094	71240	75842	79544
48	68000	79730	84578	89046	93160	99178	104020
EST. TEMP	70°F	115°F	140°F	165°F	190°F	200°F	240°F

Select the silencer based on the air flow from above table.

Refer to the formulas given here for calculating the pressure drop for the silencer size selected. Check this pressure drop against the maximum allowable pressure drop. If the pressure drop is too high, select the next larger size and recalculate.

PRESSURE DROP

(These calculations assume air as the flowing gas. For other gases, density and other corrections may be required. Contact our engineers for assistance)

Data Required:

- Air Flow Rate (Actual CFM)
- Temperature (°F)
- Pressure (PSIG)
- Maximum allowable pressure drop (inches of water)

1. Calculate air velocity, FT./MIN.

$$V = \frac{Q}{A}$$

V = Air Velocity FT./MIN.

A = Flow area in sq. ft. for silencer size selected

Q = Air Flow Rate (Actual CFM)

$$\text{Actual CFM} = \text{Standard CFM} \left(\frac{14.7}{P + 14.7} \right) \left(\frac{T + 460}{530} \right)$$

P = Operating pressure, PSIG (if at atmospheric pressure then pressure ratio is unity and may be omitted from above equation)

T = Air Temperature (°F)

2. Calculate pressure drop

$$\Delta P = C \left(\frac{V}{4005} \right)^2 \left(\frac{530}{T + 460} \right) \left(\frac{P + 14.7}{14.7} \right)$$

ΔP = Pressure drop

C = Silencer pressure drop coefficient (0.25 for CL Series & 0.75 for CCS Series)

If this pressure drop is higher than the maximum allowable pressure drop, then select next larger size and recalculate.

TEMPERATURE LIMITS

Various options for acoustical absorption materials are available with temperature limits ranging from 325°F to 1000°F. Please consult our engineers for your specific applications for selecting suitable absorption material suiting to your requirements.

PRESSURE RATING

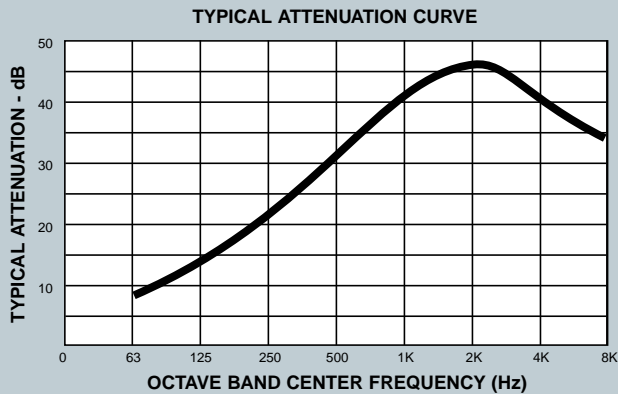
The silencers described herein are designed to a maximum operating pressure of 15 PSIG. For applications where pressure exceeds 15 PSIG, the silencers can be designed to ASME Code, Section 8, Div. 1 for pressure vessel construction. The dimensions are similar to standard models, but the material type and thicknesses are selected to meet code requirements. Consult our engineers for pricing and design information.

ATTENUATION CURVES

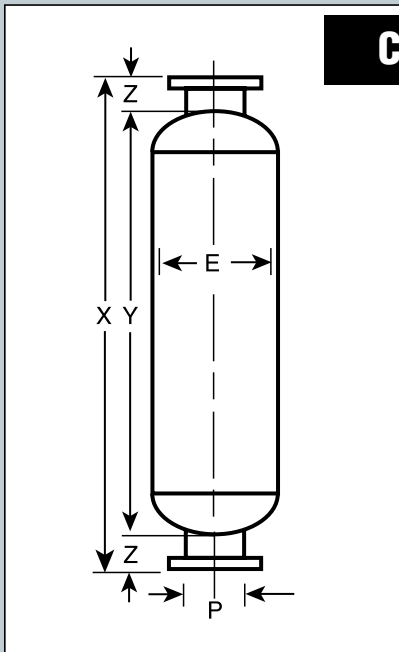
Noise attenuation curve showing insertion loss at each frequency is shown here. This represents the insertion loss for airborne noise under average conditions. The resultant silenced noise level will depend on a number of other factors therefore this curve should be used with discretion and can be used as a guideline for evaluating the noise levels after the silencer installation.

SPECIFICATIONS

CL SERIES ABSORPTIVE SILENCERS



The CL series absorptive silencers are recommended for use on intake and discharge of centrifugal compressors and some low pressure vents (< 15 PSIG) for achieving standard silencing. The design consists of a perforated cylinder encased in an exterior shell. The annular space is packed with an acoustical absorption material. These silencers are designed with a high length to diameter ratio and has a very low pressure drop. The silencer can be installed in horizontal or vertical position. The standard construction is heavy duty all welded carbon steel sheets and plates. The units are provided with male NPT connections or flanged connections drilled to 125 lbs. ANSI specifications. The external surfaces are rust inhibitive primer coated. Custom designs are available to suit specific nozzle orientations. The optional features include side connections, mounting brackets, special paint, special material or ASME code construction.



CL

MODEL	PIPE SIZE P	E	X	Y	Z	WT.
CL-1	1	4	16	12	2	5
CL-1 1/2	1 1/2	4 1/2	23	19	2	8
CL-2	2	6	34	28	3	15
CL-2 1/2	2 1/2	6 1/2	36	30	3	20
CL-3	3	8	43	37	3	25
CL-3 1/2	3 1/2	8	44	38	3	30
CL-4	4	10	53	47	3	55
CL-5	5	12	56	50	3	70
CL-6	6	12	66	60	3	90
CL-8	8	14	68	60	4	140
CL-10	10	16	70	62	4	160
CL-12	12	18	80	72	4	250
CL-14	14	20	92	84	4	350
CL-16	16	22	107	99	4	400
CL-18	18	24	116	108	4	600
CL-20	20	26	128	118	5	700
CL-22	22	28	147	137	5	900
CL-24	24	30	152	142	5	1000

Std. fittings

- up to 3 1/2" size - Male thread nipples
- 4" & 5" sizes - optional - male thread nipples or flanges
- 6" & above - 125 lbs. ANSI flange drilling

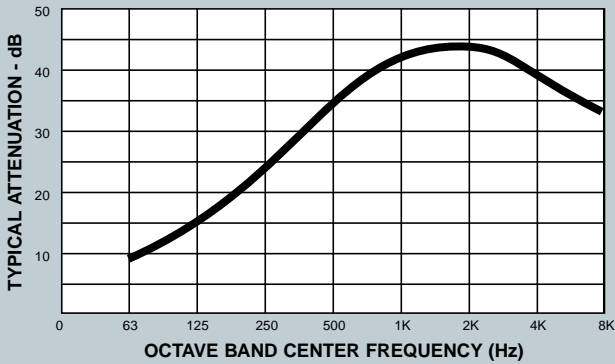
- Dimensions and weights are approximate and may change slightly with production models.
- Dimension in inches.
- Weight in lbs.

We specialize in custom designs and also provide various nozzle orientations to suit your specific requirements.

SPECIFICATIONS

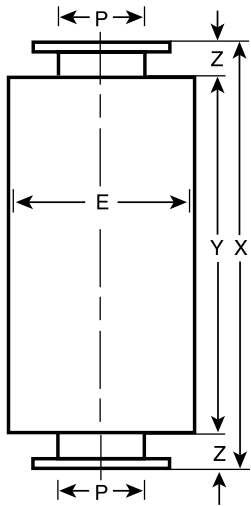
CCS SERIES CENTRIFUGAL COMPRESSOR SILENCERS

TYPICAL ATTENUATION CURVE



The CCS series centrifugal compressor silencers are recommended for use on intake and discharge of centrifugal compressors and some low pressure vents (< 15 PSIG) for maximum silencing. The design consists of two concentric perforated cylinders lined with acoustical absorption material. An acoustically packed center bullet is provided for achieving desired noise reduction. The absorptive packing media is held in place with an adequate layer of protective facing. The silencer can be installed in horizontal or vertical position. The standard construction is heavy duty all welded carbon steel sheets and plates. The units are provided with plain pipe connections or flanged connections drilled to 125 lbs. ANSI specifications. The external surfaces are rust inhibitive primer coated. Custom designs are available to suit specific nozzle orientations. The optional features include side connections, mounting brackets, special paint, special material or ASME code construction.

CCS



MODEL	PIPE SIZE P	E	X	Y	Z	WT.
CCS-4	4	10	23	17	3	40
CCS-5	5	12	27	21	3	60
CCS-6	6	12	31	25	3	80
CCS-8	8	18	38	32	3	150
CCS-10	10	20	44	38	3	225
CCS-12	12	24	56	50	3	325
CCS-14	14	26	62	54	4	450
CCS-16	16	30	68	60	4	600
CCS-18	18	32	74	66	4	725
CCS-20	20	34	80	72	4	950
CCS-22	22	36	88	80	4	1200
CCS-24	24	40	92	84	4	1500
CCS-26	26	42	104	96	4	1750
CCS-28	28	46	116	108	4	2300
CCS-30	30	48	122	112	5	2600
CCS-32	32	54	130	120	5	3100
CCS-36	36	60	140	130	5	4500
CCS-42	42	66	164	154	5	6100
CCS-48	48	74	188	178	5	8200

- Dimensions and weights are approximate and may change slightly with production models.
- Dimension in inches.
- Weight in lbs.

We specialize in custom designs and also provide various nozzle orientations to suit your specific requirements.

OTHER PRODUCTS AVAILABLE:

- **ROTARY POSITIVE BLOWER INTAKE AND DISCHARGE SILENCERS**
reference catalogue 1
- **BASE SILENCERS FOR ROTARY POSITIVE BLOWERS**
reference catalogue 2
- **COMBINATION SILENCERS FOR ROTARY POSITIVE BLOWERS**
reference catalogue 3
- **FAN SILENCERS**
reference catalogue 4
- **CENTRIFUGAL COMPRESSOR SILENCERS**
reference catalogue 5
- **VENT SILENCERS**
reference catalogue 6
- **ENGINE SILENCERS**
reference catalogue 7
- **NOISE ENCLOSURES**
reference catalogue 8

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