CATALOG 411
March 2018

Twin City Fan & Blower

SOUND POWER LEVELS

BCSF - Backward Curved High Pressure Composite Fans

Twin City Fan Companies, Ltd. certifies that the fans shown herein are licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and AMCA Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.

For air performance, refer to Catalog 410.

Fan & Blower Twin City

Sound Calculations

The published sound power levels have been determined by laboratory tests in accordance with AMCA Standard 300-05 (Revision '08) and carry the AMCA Seal. The sound power levels shown are decibel (dB) levels referred to 10^{-12} watts. We have listed sound power levels for the eight octave bands with frequency range as shown below.

OCTAVE BAND	1	2	3	4	5	6	7	8
FREQUENCY CENTER	45 to 90	90 to 180	180 to 355	355 to 710	710 to 1400	1400 to 2800	2800 to 5600	5600 to 11200
CENTER FREQUENCY	63	125	250	500	1000	2000	4000	8000

Sound power levels (SPL) for the fans can be easily obtained using Twin City Fan & Blower Fan Selector® Program. The SPL can also be obtained using specific sound power level method described below:

Sound Power Level of a fan =
Specific Sound Power Level (L_{WK}) + Capacity Fraction (M)

Use of this method will be illustrated by the following example:

Calculate sound power levels for:

Model	BCSF	Temp	70°F
Size	330M1	Elevation	0 ft.
CFM	9191	RPM	700
SP	1.5" w.g.	OV	1468

1. How to determine L_{WK}

We have published values for L_{WK} at various speeds and operating points on pages 3 through 6.

The operating point is a ratio of design CFM to the wide open volume (WOV). The WOV equals to CFM for a given RPM at zero static pressure. WOV can be calculated by multiplying fan RPM by the factors (Rf) shown in the table. Thus, WOV volume for 700 RPM = 18.758 x 700 = 13,130 CFM.

SIZE	Rf FACTOR	SIZE	Rf FACTOR	SIZE	Rf FACTOR	SIZE	Rf FACTOR
165M1	2.181	**165M2**	2.050	**165H1**	1.687	**165H2**	1.585
182M1	2.951	**182M2**	2.774	**182H1**	2.283	**182H2**	2.145
200M1	3.884	**200M2**	3.651	**200H1**	3.004	**200H2**	2.823
222M1	5.562	**222M2**	5.228	**222H1**	4.304	**222H2**	4.044
245M1	7.426	**245M2**	6.980	**245H1**	5.746	**245H2**	5.399
270M1	10.186	**270M2**	9.575	**270H1**	7.879	**270H2**	7.406
300M1	13.973	**300M2**	13.134	**300H1**	10.808	**300H2**	10.159
330M1	18.758	**330M2**	17.632	**330H1**	14.510	**330H2**	13.639
365M1	25.382	**365M2**	23.858	**365H1**	19.634	**365H2**	18.455
402M1	34.036	**402M2**	31.993	**402H1**	26.328	**402H2**	24.748
445M1	45.996	**445M2**	43.235	**445H1**	35.580	**445H2**	33.444
490M1	61.409	**490M2**	57.723	**490H1**	47.502	**490H2**	44.651
542M1	83.338	**542M2**	78.336	**542H1**	64.465	**542H2**	60.595
600M1	112.745	**600M2**	105.977	**600H1**	87.213	**600H2**	81.977
660M1	150.064	**660M2**	141.056	**660H1**	116.080	**660H2**	109.112
730M1	203.055	**730M2**	190.866	**730H1**	157.070	**730H2**	147.642

Therefore, operating point falls at 70% (9191 ÷ 13,130) of the WOV. Referring to the L_{WK} table for Size 330M1, the specific sound power levels can be read as follows:

L_{WK}	=	36	37	33	30	30	26	19	12

2. How to determine M

The value of M can be taken from the tables on page 7 once Total Pressure (TP) is calculated.

Total Pressure (TP) = Static Pressure (SP) + Velocity Pressure (VP) (All pressure at operating density.)

VP = (Outlet Velocity ÷ 4005)^2 x density factor.

In our example VP = (1468 ÷ 4005)^2 x 1.00 = 0.134.

Therefore, TP = 1.5 + 0.134 = 1.634.

Thus, for 9191 CFM and 1.634" TP, M works out to be 44.

M can also be calculated using the formula, M = 10 log CFM + 20 log TP.

3. Combining L_{WK} and M gives sound power levels.

Thus, **Octave Band**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
SPL =	36	37	33	30	30	26	19	12
	44	44	44	44	44	44	44	44
	80	81	77	74	74	70	63	56

Inlet L_{WK} Values (L_{WKi}) for BCSF 165M1-200M1, 165M2-200M2, 165H1-200H1, 165H2-200H2

RPM	% WOV	OCTAVE BAND								LwkiA
		1	2	3	4	5	6	7	8	
3100	90	44	46	45	50	46	41	31	26	50
	80	38	42	42	47	42	37	28	24	47
	70	34	39	41	46	40	34	26	23	45
	60	33	37	40	46	38	32	26	24	45
	50	33	37	40	46	38	32	26	24	45
2800	90	45	46	47	50	46	41	31	26	51
	80	39	42	43	47	42	36	27	23	47
	70	36	40	42	46	39	33	26	23	45
	60	35	38	42	46	37	32	25	23	45
	50	35	38	42	46	37	32	25	23	45
2500	90	47	47	50	52	48	41	31	27	52
	80	41	42	46	48	42	35	27	23	48
	70	39	41	45	46	39	33	26	22	45
	60	38	40	45	46	37	31	25	22	45
	50	38	40	45	46	37	31	25	22	45
2200	90	48	47	52	53	49	40	32	27	53
	80	43	43	48	48	43	34	27	22	48
	70	41	41	47	46	39	32	25	21	46
	60	41	41	47	45	37	30	24	20	45
	50	41	41	47	45	37	30	24	20	45
1900	90	49	47	54	54	51	39	31	27	55
	80	44	43	49	47	43	33	25	21	48
	70	43	42	48	45	39	31	23	20	45
	60	43	41	48	43	37	29	22	19	44
	50	43	41	48	43	37	29	22	19	44
1600	90	49	50	54	54	48	37	30	26	54
	80	44	45	49	46	41	31	24	20	47
	70	43	45	48	43	37	29	22	19	44
	60	43	44	48	42	35	28	21	18	43
	50	43	44	48	42	35	28	21	18	43
1300	90	48	54	54	53	45	35	29	25	52
	80	43	49	49	45	38	29	23	19	46
	70	42	48	48	42	34	27	21	18	43
	60	42	48	48	40	33	25	20	17	42
	50	42	48	48	40	33	25	20	17	42
1000	90	47	54	54	52	40	32	28	24	51
	80	43	49	48	43	34	26	22	18	44
	70	42	48	45	40	31	24	20	16	41
	60	41	48	44	38	30	23	19	15	40
	50	41	48	44	38	30	23	19	15	40
700	90	53	54	53	46	36	30	26	22	48
	80	48	49	45	39	30	24	20	16	41
	70	47	48	42	35	27	22	18	14	38
	60	47	48	40	34	26	21	17	14	37
	50	47	48	40	34	26	21	17	14	37
400	90	54	54	48	37	30	26	23	19	43
	80	49	46	41	31	24	20	16	12	36
	70	48	43	37	29	22	19	15	11	33
	60	48	42	35	28	21	18	14	11	32
	50	48	42	35	28	21	18	14	11	32

1. The calculated sound power levels from these ratings are in decibels, referenced to 10^{-12} watts calculated per AMCA Standard 301.
2. The A-weighted sound ratings obtained have been calculated per AMCA 301.
3. Values shown are for inlet LwiA sound power levels for: Installation Type B: free inlet, ducted outlet.
4. The AMCA Certified Ratings Seal applies to LwiA ratings only.
5. Ratings do not include the effects of duct end correction.

Inlet L_{WK} Values (L_{WKi}) for BCSF 222M1-245M1, 222M2-245M2, 222H1-245H1, 222H2-245H2

RPM	% WOV	OCTAVE BAND								LwkiA
		1	2	3	4	5	6	7	8	
2800	90	44	44	43	42	42	41	38	31	47
	80	41	40	38	37	37	36	33	27	42
	70	38	37	35	34	34	32	29	24	39
	60	36	35	34	32	32	29	27	22	37
	50	36	35	34	32	32	29	27	22	37
2500	90	44	44	42	42	41	42	37	30	47
	80	41	40	38	37	37	36	32	26	42
	70	38	36	35	34	34	32	28	23	39
	60	36	35	34	32	32	29	26	21	36
	50	36	35	34	32	32	29	26	21	36
2200	90	44	44	42	42	40	42	35	29	47
	80	41	39	38	37	36	36	31	25	42
	70	38	36	35	34	33	31	28	22	38
	60	36	34	34	32	31	29	26	20	36
	50	36	34	34	32	31	29	26	20	36
1900	90	45	44	42	42	40	42	34	27	47
	80	41	39	38	38	36	36	30	24	42
	70	39	36	35	35	33	31	27	21	38
	60	37	34	35	33	31	29	25	19	36
	50	37	34	35	33	31	29	25	19	36
1600	90	46	43	44	43	41	41	34	26	47
	80	43	39	40	39	37	36	30	23	42
	70	40	37	38	37	34	32	28	21	39
	60	39	36	37	35	32	30	26	19	38
	50	39	36	37	35	32	30	26	19	38
1300	90	48	41	45	41	42	41	33	25	47
	80	45	38	42	37	38	36	31	22	43
	70	42	35	40	34	36	32	28	19	40
	60	41	35	39	33	34	31	27	17	38
	50	41	35	39	33	34	31	27	17	38
1000	90	46	43	45	41	42	38	30	21	46
	80	43	40	42	37	38	34	27	18	42
	70	40	38	41	34	35	31	25	15	39
	60	39	38	40	33	33	30	24	14	38
	50	39	38	40	33	33	30	24	14	38
700	90	42	45	42	42	41	34	26	17	44
	80	38	42	38	38	36	31	23	13	40
	70	36	41	36	36	33	29	20	10	38
	60	36	40	34	34	31	28	18	8	36
	50	36	40	34	34	31	28	18	8	36
400	90	45	44	42	41	36	27	18	10	41
	80	42	41	38	37	32	24	15	6	37
	70	41	39	35	34	30	22	12	2	35
	60	40	38	33	32	28	20	10	0	33
	50	40	38	33	32	28	20	10	0	33
100	90	42	41	36	27	18	10	1	-8	31
	80	38	37	32	24	15	6	-4	-13	27
	70	35	34	30	22	12	2	-8	-17	25
	60	33	32	28	20	10	0	-10	-20	23
	50	33	32	28	20	10	0	-10	-20	23

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3. Values shown are for inlet LwiA sound power levels for: Installation Type B: free inlet, ducted outlet.
4. The AMCA Certified Ratings Seal applies to LwiA ratings only.
5. Ratings do not include the effects of duct end correction.

Inlet L_{WK} Values (L_{WKi}) for BCSF 270M1-300M1, 270M2-300M2, 270H1-300H1, 270H2-300H2

RPM	% WOV	OCTAVE BAND								LwkiA
		1	2	3	4	5	6	7	8	
1900	90	45	42	43	41	40	44	37	32	48
	80	43	38	40	37	36	37	31	28	42
	70	41	36	38	35	32	32	28	25	39
	60	39	35	36	33	30	29	26	24	36
	50	39	35	36	33	30	29	26	24	36
1700	90	45	41	43	40	40	45	35	32	48
	80	43	37	40	36	36	37	30	28	42
	70	41	35	38	33	33	32	27	25	38
	60	39	35	36	31	31	29	25	24	36
	50	39	35	36	31	31	29	25	24	36
1500	90	45	41	43	39	41	44	34	32	48
	80	42	37	40	35	36	36	29	28	41
	70	39	35	38	32	33	31	26	25	38
	60	39	35	36	30	30	28	25	24	36
	50	39	35	36	30	30	28	25	24	36
1300	90	44	42	43	41	42	41	33	31	47
	80	39	39	40	37	36	35	29	27	41
	70	37	37	38	34	32	30	26	24	38
	60	37	36	36	32	30	28	25	23	36
	50	37	36	36	32	30	28	25	23	36
1100	90	44	43	44	40	43	39	32	29	46
	80	38	40	40	35	36	33	28	26	40
	70	36	38	38	32	32	29	26	23	37
	60	36	38	35	30	30	28	25	22	35
	50	36	38	35	30	30	28	25	22	35
900	90	44	43	44	39	43	37	31	28	46
	80	38	40	40	34	36	32	27	24	40
	70	36	38	37	31	32	28	25	22	36
	60	36	37	35	29	30	27	24	21	35
	50	36	37	35	29	30	27	24	21	35
700	90	43	44	44	41	41	35	30	28	45
	80	39	40	40	35	35	30	26	23	39
	70	37	38	37	31	31	27	24	21	36
	60	37	35	35	29	29	26	23	20	34
	50	37	35	35	29	29	26	23	20	34
500	90	43	44	38	44	38	31	29	26	44
	80	40	40	34	37	32	28	25	22	38
	70	39	37	31	32	29	26	23	19	34
	60	38	35	29	30	28	25	22	18	33
	50	38	35	29	30	28	25	22	18	33
300	90	44	41	43	40	33	29	27	25	41
	80	40	37	36	34	29	26	23	20	35
	70	37	34	32	30	26	23	20	17	32
	60	35	32	30	28	26	22	19	16	31
	50	35	32	30	28	26	22	19	16	31
100	90	40	42	36	30	28	26	23	21	35
	80	35	35	31	27	24	21	18	16	30
	70	31	31	28	25	22	19	15	12	28
	60	29	29	27	24	21	17	14	11	26
	50	29	29	27	24	21	17	14	11	26

1. The calculated sound power levels from these ratings are in decibels, referenced to 10^{-12} watts calculated per AMCA Standard 301.
2. The A-weighted sound ratings obtained have been calculated per AMCA 301.
3. Values shown are for inlet LwiA sound power levels for: Installation Type B: free inlet, ducted outlet.
4. The AMCA Certified Ratings Seal applies to LwiA ratings only.
5. Ratings do not include the effects of duct end correction.

Inlet L_{WK} Values (L_{WKi}) for BCSF 330M1-890M1, 330M2-890M2, 330H1-890H1, 330H2-890H2

RPM	% WOV	OCTAVE BAND								LwkiA
		1	2	3	4	5	6	7	8	
1500	90	40	39	49	45	42	43	36	27	49
	80	36	34	45	41	36	36	30	23	43
	70	34	32	42	38	33	31	26	20	40
	60	34	32	40	36	30	28	24	18	37
	50	34	32	40	36	30	28	24	18	37
1300	90	40	38	49	43	42	43	33	26	48
	80	36	34	45	38	36	36	28	22	42
	70	34	32	42	34	32	30	25	19	38
	60	34	32	40	32	30	27	23	17	36
	50	34	32	40	32	30	27	23	17	36
1100	90	40	43	48	41	41	40	31	23	46
	80	36	39	44	36	35	34	27	20	41
	70	34	36	40	33	31	29	24	17	37
	60	35	35	39	30	29	26	22	16	35
	50	35	35	39	30	29	26	22	16	35
900	90	40	47	45	39	41	37	29	21	45
	80	37	41	40	35	35	32	25	17	39
	70	35	38	36	31	31	28	22	15	36
	60	36	37	35	29	29	26	20	14	34
	50	36	37	35	29	29	26	20	14	34
700	90	43	47	41	38	40	35	26	18	43
	80	38	41	36	34	34	29	22	14	38
	70	36	37	33	30	30	26	19	12	34
	60	36	36	31	28	28	24	18	11	32
	50	36	36	31	28	28	24	18	11	32
500	90	47	45	39	40	38	30	22	14	42
	80	41	40	35	34	32	26	18	11	36
	70	37	36	31	30	28	23	16	8	32
	60	36	35	29	29	27	21	15	8	31
	50	36	35	29	29	27	21	15	8	31
300	90	47	40	39	39	33	24	16	9	39
	80	41	36	34	33	28	20	13	5	33
	70	37	32	30	29	25	18	10	3	30
	60	36	30	29	28	23	17	10	3	29
	50	36	30	29	28	23	17	10	3	29
100	90	38	41	37	27	19	12	4	-3	31
	80	33	35	31	23	16	8	0	-7	26
	70	30	31	27	21	13	6	-1	-9	23
	60	28	29	26	19	12	6	-1	-8	21
	50	28	29	26	19	12	6	-1	-8	21

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M Capacity Fraction

CFM	TOTAL PRESSURE AT DENSITY																		
	1/4	3/8	1/2	5/8	3/4	7/8	1	1¼	1½	2	2½	3	3½	4	4½	5	5½	6	6½
100	8	11	14	16	18	19	20	22	24	26	28	30	31	32	33	34	35	36	36
150	10	13	16	18	19	21	22	24	25	28	30	31	33	34	35	36	37	37	38
200	11	14	17	19	21	22	23	25	27	29	31	33	34	35	36	37	38	39	39
300	13	16	19	21	22	24	25	27	28	31	33	34	36	37	38	39	40	40	41
500	15	18	21	23	24	26	27	29	31	33	35	37	38	39	40	41	42	43	43
750	17	20	23	25	26	28	29	31	32	35	37	38	40	41	42	43	44	44	45
1000	18	21	24	26	28	29	30	32	34	36	38	40	41	42	43	44	45	46	46
1500	20	23	26	28	29	31	32	34	35	38	40	41	43	44	45	46	47	47	48
2000	21	24	27	29	31	32	33	35	37	39	41	43	44	45	46	47	48	49	49
3000	23	26	29	31	32	34	35	37	38	41	43	44	46	47	48	49	50	50	51
5000	25	28	31	33	34	36	37	39	41	43	45	47	48	49	50	51	52	53	53
7500	27	30	33	35	36	38	39	41	42	45	47	48	50	51	52	53	54	54	55
10000	28	31	34	36	38	39	40	42	44	46	48	50	51	52	53	54	55	56	56
15000	30	33	36	38	39	41	42	44	45	48	50	51	53	54	55	56	57	57	58
20000	31	34	37	39	41	42	43	45	47	49	51	53	54	55	56	57	58	59	59
30000	33	36	39	41	42	44	45	47	48	51	53	54	56	57	58	59	60	60	61
50000	35	38	41	43	44	46	47	49	51	53	55	57	58	59	60	61	62	63	63
75000	37	40	43	45	46	48	49	51	52	55	57	58	60	61	62	63	64	64	65
100000	38	41	44	46	48	49	50	52	54	56	58	60	61	62	63	64	65	66	66
150000	40	43	46	48	49	51	52	54	55	58	60	61	63	64	65	66	67	67	68
200000	41	44	47	49	51	52	53	55	57	59	61	63	64	65	66	67	68	69	69

CFM	TOTAL PRESSURE AT DENSITY																		
	7	8	9	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
100	37	38	39	40	42	43	44	45	46	47	48	48	49	50	50	51	51	52	52
150	39	40	41	42	43	45	46	47	48	49	49	50	51	51	52	52	53	53	54
200	40	41	42	43	45	46	47	48	49	50	51	51	52	53	53	54	54	55	55
300	42	43	44	45	46	48	49	50	51	52	52	53	54	54	55	55	56	56	57
500	44	45	46	47	49	50	51	52	53	54	55	55	56	57	57	58	58	59	59
750	46	47	48	49	50	52	53	54	55	56	56	57	58	58	59	59	60	60	61
1000	47	48	49	50	52	53	54	55	56	57	58	58	59	60	60	61	61	62	62
1500	49	50	51	52	53	55	56	57	58	59	59	60	61	61	62	62	63	63	64
2000	50	51	52	53	55	56	57	58	59	60	61	61	62	63	63	64	64	65	65
3000	52	53	54	55	56	58	59	60	61	62	62	63	64	64	65	65	66	66	67
5000	54	55	56	57	59	60	61	62	63	64	65	65	66	67	67	68	68	69	69
7500	56	57	58	59	60	62	63	64	65	66	66	67	68	68	69	69	70	70	71
10000	57	58	59	60	62	63	64	65	66	67	68	68	69	70	70	71	71	72	72
15000	59	60	61	62	63	65	66	67	68	69	69	70	71	71	72	72	73	73	74
20000	60	61	62	63	65	66	67	68	69	70	71	71	72	73	73	74	74	75	75
30000	62	63	64	65	66	68	69	70	71	72	72	73	74	74	75	75	76	76	77
50000	64	65	66	67	69	70	71	72	73	74	75	75	76	77	77	78	78	79	79
75000	66	67	68	69	70	72	73	74	75	76	76	77	78	78	79	79	80	80	81
100000	67	68	69	70	72	73	74	75	76	77	78	78	79	80	80	81	81	82	82
150000	69	70	71	72	73	75	76	77	78	79	79	80	81	81	82	82	83	83	84
200000	70	71	72	73	75	76	77	78	79	80	81	81	82	83	83	84	84	85	85

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