

U.S. FAN INTERNATIONAL®

USAF Series Sound Power Levels



U.S. FAN INTERNATIONAL®
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Licensed to bear the AMCA Seal for Sound and Air Performance

**USS92B
January 2001**



U.S. Fan International® certifies that the USAF Series 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 data refer to catalog USC92.

INTRODUCTION

This catalog is a supplement to catalog USC92.

This catalog uses procedures in accordance with AMCA Standards. Tests have been conducted using AMCA Standard 300, Figure #3, Fan Outlet Sound Testing. Sound power level ratings are in decibels, referred to 10^{-12} watts calculated per AMCA Standard 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data". Values shown are for outlet sound power levels (L_{wo}) for installation type 'B', free inlet, ducted outlet. Ratings include the effects of duct end correction.

In order to use this catalog the user must understand two concepts, that of specific sound power and VP/SP as follows:

Specific sound power is the means by which a fan's overall sound can be reduced to a set of base numbers which still represent the "signature" of the original fan. This is provided in the form of decibels produced from a fan delivering one CFM at one inch pressure over a frequency range of eight octave bands. In order to predict the sound of another geometrically similar fan, the specific sound power level spectrum for that type of fan and its operating point location on the fan curve is found. The acoustic energy corresponding to the new fan is added back into the "base signature". This acoustic energy is called the "capacity fraction (L_{wf})". Therefore, the general equation is:

$$L_{wo} = L_{wko} + L_{wf} \text{ Where: } L_{wo} = \text{Outlet sound power of fan}$$
$$L_{wko} = \text{Outlet specific sound power for a particular fan design}$$
$$L_{wf} = \text{Capacity fraction which is } 10 \log(\text{CFM}) + 20 \log(\text{pressure})$$

The specific sound power of a fan changes with operating point location on the fan curve. Therefore, a means must be devised to identify the specific sound power levels which correspond to the operating point for which sound is being desired. This is done using the term VP/SP in that regardless of speed, fan size or density, the VP/SP ratio remains constant and defines the same corresponding operating point for the base fan as well as the new fan.

The capacity fraction (L_{wf}) and VP/SP ratio can easily be found using Tables I and II. It is important to note that the VP/SP ratio requires both the VP and SP values to be at the same density. Because it is necessary that SP values be known at standard conditions in order to use catalog USC92, it is convenient to determine the VP/SP ratio at standard conditions using Table I. However, the acoustic energy (capacity fraction - L_{wf}) is a function of the SP at the actual operating conditions of the new fan. Therefore, use the SP corresponding to the actual operating conditions in Table II or you will obtain the wrong values of sound power.

SAMPLE CALCULATION

This catalog is a supplement to the air performance catalog USC92. The sample calculation which follows is a continuation of the sample selection located on page 11 of USC92.

A size 60 SWSI fan must deliver 37,278 CFM (17.59 m³/sec) at 1½ inches Wg. (373 Pa) static pressure. The fan must perform at an altitude of 4000 feet (1219 m) with air entering the fan inlet at 300°F (148.8°C).

1. DETERMINE THE AERODYNAMIC RATING

The aerodynamic rating is found using the procedures found on page 11 of catalog USC92. The final rating at actual operating conditions is:

37,278 CFM (17.59 m³/sec), 1.5" Wg. (373 Pa) static pressure, 497 RPM and 11.47 HP (8.57 kW).

2. DETERMINE THE VP/SP RATIO

From page 24 of catalog USC92, the outlet velocity may be read directly from the catalog or calculated using the outlet area provided at the top of the page. The outlet area is 20.71 sq. ft. (1.92 m²).

$$\text{Outlet velocity} = \frac{37,278 \text{ CFM} (17.59 \text{ m}^3/\text{sec})}{20.71 \text{ sq. ft.} (1.92 \text{ m}^2)}$$
$$= 1800 \text{ ft/min} (9.14 \text{ m/sec}).$$

The SP at standard conditions is 2.48" Wg. (616.5 Pa).

From Table I, for 1800 ft/min and 2.5" Wg., the VP/SP is .08.

3. DETERMINE THE CAPACITY FRACTION (L_{wf})

The static pressure at the actual operating conditions is 1.5" Wg. By interpolation of the CFM of 37,278, the L_{wf} is 49 dB.

4. DETERMINE THE SPECIFIC SOUND POWER (L_{wko}) FOR THE FAN SIZE AND SPEED DESIRED.

The size 16 SW fan will run at 497 RPM and operate at a VP/SP of .08. For the listed speed NEAREST the desired speed and INTERPOLATING for values of VP/SP, determine the values of L_{wko} .

For a speed of 500 RPM and a VP/SP of .08, the values of L_{wko} are:

OCTAVE BAND

1	2	3	4	5	6	7	8
44	36	33	30	24	21	17	13

5. DETERMINE OUTLET SOUND POWER LEVELS (L_{wo}) dB re 10^{-12} Watts

OCTAVE BAND

	1	2	3	4	5	6	7	8
L_{wki}	44	36	33	30	24	21	17	13
L_{wf}	49	49	49	49	49	49	49	49
L_{wo}	93	85	82	79	73	70	66	62

VP/SP RATIO TA BLE I
Standard Conditions

Velocity	Static Pressure																																							
	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7	8	9	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40		
600	.09	.06	.04	.04	.03	.03	.02	.02	.01	.01	.01	.01	.01	.01																										
800	.16	.11	.08	.06	.05	.05	.04	.03	.02	.02	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01																				
1000	.25	.17	.12	.10	.08	.07	.06	.05	.04	.03	.02	.02	.02	.02	.01	.01	.01	.01	.01	.01	.01																			
1200	.36	.24	.18	.14	.12	.10	.09	.07	.06	.04	.04	.03	.03	.02	.02	.02	.02	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01										
1400	.49	.33	.24	.20	.16	.14	.12	.10	.08	.06	.05	.04	.03	.03	.03	.02	.02	.02	.02	.02	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01										
1600	.64	.43	.32	.26	.21	.18	.16	.13	.11	.08	.06	.05	.05	.04	.04	.03	.03	.03	.02	.02	.02	.02	.02	.01	.01	.01	.01	.01	.01	.01	.01									
1800	.81	.54	.40	.32	.27	.23	.20	.16	.13	.10	.08	.07	.06	.05	.04	.04	.03	.03	.03	.03	.02	.02	.02	.02	.01	.01	.01	.01	.01	.01	.01	.01	.01							
2000	1.00	.67	.50	.40	.33	.29	.25	.20	.17	.12	.10	.08	.07	.06	.06	.05	.05	.04	.04	.04	.03	.03	.02	.02	.02	.02	.02	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	
2200		.80	.60	.48	.40	.34	.30	.24	.20	.15	.12	.10	.09	.08	.07	.06	.05	.05	.04	.04	.03	.03	.03	.03	.02	.02	.02	.02	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	
2400		.96	.72	.57	.48	.41	.36	.29	.24	.18	.14	.12	.10	.09	.08	.07	.06	.06	.05	.04	.04	.04	.03	.03	.02	.02	.02	.02	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	
2600			.84	.67	.56	.48	.42	.34	.28	.21	.17	.14	.12	.11	.09	.08	.07	.06	.06	.05	.05	.04	.04	.03	.03	.02	.02	.02	.02	.02	.02	.01	.01	.01	.01	.01	.01	.01	.01	
2800			.98	.78	.65	.56	.49	.39	.33	.24	.20	.16	.14	.12	.11	.10	.09	.08	.08	.07	.06	.05	.05	.04	.03	.03	.03	.02	.02	.02	.02	.02	.02	.02	.02	.01	.01	.01	.01	
3000				.90	.75	.64	.56	.45	.37	.28	.22	.19	.16	.14	.12	.11	.10	.09	.09	.08	.07	.06	.06	.05	.04	.04	.03	.03	.03	.02	.02	.02	.02	.02	.02	.02	.02	.01	.01	
3200				1.00	.85	.73	.64	.51	.43	.32	.26	.21	.18	.16	.14	.13	.12	.11	.10	.08	.07	.06	.05	.05	.04	.04	.03	.03	.03	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	
3400					.96	.82	.72	.58	.48	.36	.29	.24	.21	.18	.16	.14	.13	.12	.11	.10	.09	.08	.07	.06	.05	.05	.04	.04	.03	.03	.03	.03	.02	.02	.02	.02	.02	.02	.02	
3600					.92	.81	.65	.54	.40	.32	.27	.23	.20	.18	.16	.15	.13	.12	.12	.10	.09	.08	.07	.06	.05	.04	.04	.04	.03	.03	.03	.03	.03	.03	.03	.02	.02	.02	.02	
3800						.90	.72	.60	.45	.36	.30	.26	.23	.20	.18	.16	.15	.14	.13	.11	.10	.09	.08	.06	.06	.05	.05	.05	.04	.04	.03	.03	.03	.03	.03	.03	.02	.02	.02	
4000						1.00	.80	.67	.50	.40	.33	.29	.25	.22	.20	.18	.17	.15	.14	.12	.11	.10	.08	.07	.06	.06	.05	.05	.05	.04	.04	.03	.03	.03	.03	.03	.03	.02	.02	
4200							.88	.73	.55	.44	.37	.31	.28	.24	.22	.20	.18	.17	.16	.14	.12	.11	.09	.08	.07	.06	.06	.05	.05	.05	.04	.04	.03	.03	.03	.03	.03	.02	.02	
4400							.97	.80	.60	.48	.40	.34	.30	.27	.24	.22	.20	.19	.17	.15	.13	.12	.10	.09	.08	.07	.06	.05	.05	.04	.04	.04	.04	.04	.04	.03	.03	.03	.03	
4600								.88	.66	.53	.44	.38	.33	.29	.26	.24	.22	.20	.19	.16	.15	.13	.11	.09	.08	.07	.07	.06	.05	.05	.05	.04	.04	.04	.04	.04	.03	.03	.03	
4800								.96	.72	.57	.48	.41	.36	.32	.29	.26	.24	.22	.21	.18	.16	.14	.12	.10	.09	.08	.07	.07	.06	.06	.06	.05	.05	.04	.04	.04	.04	.04	.04	
5000									.78	.62	.52	.45	.39	.35	.31	.28	.26	.24	.22	.19	.17	.16	.13	.11	.10	.09	.08	.07	.07	.06	.06	.06	.05	.05	.05	.04	.04	.04	.04	
5200										.84	.67	.56	.48	.42	.37	.34	.31	.28	.26	.24	.21	.19	.17	.14	.12	.11	.09	.08	.08	.07	.06	.06	.06	.05	.05	.05	.04	.04	.04	
5400											.91	.73	.61	.52	.45	.40	.36	.33	.30	.28	.26	.23	.20	.18	.15	.13	.11	.10	.09	.08	.08	.07	.06	.06	.06	.05	.05	.05	.05	
5600											.98	.78	.65	.56	.49	.43	.39	.36	.33	.30	.28	.24	.22	.20	.16	.14	.12	.11	.10	.10	.09	.08	.07	.07	.06	.06	.05	.05	.05	
5800												.84	.70	.60	.52	.47	.42	.38	.35	.32	.30	.26	.23	.21	.17	.15	.13	.12	.10	.10	.09	.08	.07	.07	.06	.06	.06	.05	.05	
6000												.90	.75	.64	.56	.50	.45	.41	.37	.35	.32	.28	.25	.22	.19	.16	.14	.12	.11	.10	.09	.09	.08	.07	.07	.06	.06	.06	.06	

CAPACITY FRACTION (L_{wt}) TABLE II

CFM	Static Pressure at Operating Conditions																																							
	½"	¾"	1"	1¼"	1½"	1¾"	2"	2½"	3"	3½"	4"	4½"	5"	5½"	6"	6½"	7"	8"	9"	10"	12"	14"	16"	18"	20"	22"	24"	26"	28"	30"	32"	34"	36"	38"	40"					
100	8	11	14	16	18	19	20	22	24	26	28	30	31	32	33	34	35	36	36	37	38	39	40	42	43	44	45	46	47	48	48	49	50	50	51	51	52	52		
150	10	13	16	18	19	21	22	24	25	28	30	31	33	34	35	36	37	37	38	39	40	41	42	43	45	46	47	48	49	49	50	51	51	52	52	53	53	54		
200	11	14	17	19	21	22	23	25	27	29	31	33	34	35	36	37	38	39	39	40	41	42	43	45	46	47	48	49	50	51	51	52	53	53	54	54	55	55		
300	13	16	19	21	22	24	25	27	28	31	33	34	36	37	38	39	40	40	41	42	43	44	45	46	48	49	50	51	52	52	53	54	54	55	55	56	56	57		
500	15	18	21	23	24	26	27	29	31	33	35	37	38	39	40	41	42	43	43	44	45	46	47	49	50	51	52	53	54	55	55	56	57	57	58	58	59	59		
750	17	20	23	25	26	28	29	31	32	35	37	38	40	41	42	43	44	44	45	46	47	48	49	50	52	53	54	55	56	56	57	58	58	59	59	60	60	61		
1000	18	21	24	26	28	29	30	32	34	36	38	40	41	42	43	44	45	46	46	47	48	49	50	52	53	54	55	56	57	58	58	59	60	60	61	61	62	62		
1500	20	23	26	28	29	31	32	34	35	38	40	41	43	44	45	46	47	47	48	49	50	51	52	53	55	56	57	58	59	59	60	61	61	62	62	63	63	64		
2000	21	24	27	29	31	32	33	35	37	39	41	43	44	45	46	47	48	49	49	50	51	52	53	55	56	57	58	59	60	61	61	62	63	63	64	64	65	65		
3000	23	26	29	31	32	34	35	37	38	41	43	44	46	47	48	49	50	50	51	52	53	54	55	56	58	59	60	61	62	62	63	64	64	65	65	66	66	67		
5000	25	28	31	33	34	36	37	39	41	43	45	47	48	49	50	51	52	53	53	54	55	56	57	59	60	61	62	63	64	65	65	66	67	67	68	68	69	69		
7500	27	30	33	35	36	38	39	41	42	45	47	48	50	51	52	53	54	54	55	56	57	58	59	60	62	63	64	65	66	66	67	68	68	69	69	70	70	71		
10000	28	31	34	36	38	39	40	42	44	46	48	50	51	52	53	54	55	56	56	57	58	59	60	62	63	64	65	66	67	68	68	69	70	71	71	72	72	73		
15000	30	33	36	38	39	41	42	44	45	48	50	51	53	54	55	56	57	57	58	59	60	61	62	63	65	66	67	68	69	70	71	71	72	72	73	73	74	74		
20000	31	34	37	39	41	42	43	45	47	49	50	51	53	54	55	56	57	58	59	60	61	62	63	65	66	67	68	69	70	71	71	72	73	73	74	74	75	75		
30000	33	36	39	41	42	44	45	47	48	51	53	54	56	57	58	60	60	61	62	63	64	65	66	68	69	70	71	72	72	73	74	74	75	75	76	76	77			
50000	35	38	41	43	44	46	47	49	51	53	55	57	58	59	60	61	62	63	64	65	66	67	69	70	71	72	73	74	75	76	77	77	78	78	79	79	80			
75000	37	40	43	45	46	48	49	51	52	55	57	58	60	61	62	63	64	64	65	66	67	68	69	70	72	73	74	75	76	76	77	78	79	79	80	80	81			
100000	38	41	44	46	48	49	50	52	54	56	58	60	61	62	63	64	65	66	66	67	68	69	70	72	73	74	75	76	77	78	78	79	80	80	81	81	82			
150000	40	43	46	48	49	51	52	54	55	58	60	61	63	64	65	66	67	68	69	70	71	72	73	75	76	77	78	79	80	81	81	82	82	83	83	84				
200000	41	44	47	49	51	52	53	55	57	59	61	63	64	65	66	67	68	69	70	71	72	73	75	76	77	78	79	80	81	81	82	83	83	84	84	85	85			

OUT LET SPECIFIC SOUND POWER LEVELS IN DECIBELS REFERRED TO 10^{-12} WATTS (L_{wko})

SIZE 18-24 SW																																																
RPM	VP/SP = .03								VP/SP = .05								VP/SP = .10								VP/SP = .20								VP/SP = .40								VP/SP = .80							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
500	41	35	33	31	30	26	22	18	40	33	30	28	27	23	19	15	44	38	35	31	30	27	24	21	49	43	40	37	34	33	32	31	54	48	46	42	40	38	36	34	58	53	50	46	44	43	42	41
600	41	36	33	31	30	27	23	19	40	35	31	28	27	23	19	16	44	39	36	32	30	28	25	22	49	44	41	38	35	33	32	31	54	49	46	43	40	38	36	34	58	54	51	47	44	43	42	41
800	42	39	34	32	31	29	25	21	41	38	32	29	28	26	22	18	45	42	37	34	31	29	26	23	50	47	42	39	36	34	33	32	55	52	47	45	41	39	37	35	59	56	52	49	45	44	43	42
1000	42	41	35	33	31	30	26	22	42	40	33	30	28	27	23	19	45	44	38	35	31	30	27	24	51	49	43	40	37	34	33	32	56	54	48	46	42	40	38	36	59	58	53	50	46	44	43	42
1200	45	41	36	33	31	30	27	23	45	40	35	31	28	27	24	20	48	44	39	36	32	30	28	25	54	49	46	41	38	35	33	32	59	54	49	46	43	40	38	36	62	58	54	51	47	44	43	42
1500	48	42	38	34	32	31	28	24	49	41	37	32	29	28	25	21	52	45	41	37	33	31	29	26	58	50	46	42	39	36	34	33	62	55	51	47	44	41	39	37	65	59	55	52	48	45	44	43
1800	51	42	40	35	33	31	29	25	53	42	39	32	30	28	26	22	56	45	43	37	34	31	29	26	61	51	48	42	39	36	34	33	65	56	53	48	45	42	40	38	68	59	57	52	49	46	44	43
2100	53	43	41	35	33	31	30	26	55	43	40	33	30	28	27	23	58	46	44	38	35	31	30	27	63	52	49	43	40	37	34	33	67	57	54	48	46	42	40	38	70	60	58	53	50	46	44	43
2400	53	45	41	36	33	31	30	27	55	45	40	35	31	28	27	24	58	48	44	39	36	32	30	28	63	54	49	44	41	38	35	33	67	59	54	49	46	43	40	38	70	62	58	54	51	47	44	43
3000	53	48	42	38	34	32	31	28	55	49	41	37	32	29	28	25	58	52	45	41	37	33	31	29	63	58	50	46	42	39	36	34	67	62	55	51	47	44	41	39	70	65	59	55	52	48	45	44
3600	53	51	42	40	35	33	31	29	55	53	42	39	32	30	28	26	58	56	45	43	37	34	31	29	63	61	51	48	42	39	36	34	67	65	56	53	48	45	42	40	70	68	59	57	52	49	46	44

Size 27-33 SW																																																
RPM	VP/SP = .03								VP/SP = .05								VP/SP = .10								VP/SP = .20								VP/SP = .40								VP/SP = .80							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
300	48	40	36	35	27	23	16	7	48	40	37	36	27	22	15	7	50	42	41	40	31	23	17	9	52	45	44	42	33	25	19	11	55	49	47	45	36	28	21	14	59	51	51	49	40	32	24	17
400	49	44	37	35	30	25	19	10	48	42	37	36	30	23	19	10	50	45	41	40	34	25	19	11	53	49	44	43	36	29	31	15	56	51	47	45	39	30	24	17	59	55	52	50	43	35	26	20
500	50	46	39	36	32	26	21	13	49	45	38	37	33	25	21	13	51	47	41	40	37	27	21	14	54	51	45	44	39	31	23	17	57	54	48	46	42	33	27	20	60	57	52	51	46	37	29	23
600	49	48	40	36	35	27	22	16	50	47	39	37	36	26	22	15	52	49	41	40	38	29	23	16	55	53	45	44	42	33	26	19	58	56	48	47	45	37	29	22	61	59	52	51	49	40	32	25
800	48	49	44	37	35	29	24	18	51	48	42	37	36	29	24	18	51	50	46	41	39	33	25	19	54	53	49	44	43	36	28	21	57	57	50	47	46	40	32	24	62	59	54	51	49	43	35	28
1000	47	50	46	39	36	33	25	20	49	49	45	38	37	32	25	21	50	51	49	42	40	36	28	22	53	54	51	45	44	39	31	24	56	58	53	48	47	43	34	26	60	60	57	52	50	47	38	30
1200	46	49	48	40	36	35	27	22	46	49	47	39	37	35	26	22	49	52	51	43	41	40	31	24	52	55	53	45	44	42	33	26	56	59	56	49	48	46	37	29	58	61	59	52	51	50	41	32
1500	45	48	48	42	36	35	30	23	46	49	49	43	37	36	30	23	48	52	52	45	41	40	34	25	51	54	54	49	44	42	33	28	56	60	57	51	48	48	41	32	58	62	61	55	51	50	45	35
1800	44	47	49	44	37	36	33	24	45	48	50	45	38	37	34	24	47	51	53	47	40	41	37	26	50	53	55	51	44	44	40	30	55	59	59	54	48	49	45	34	57	61	62	58	51	51	49	28
2100	44	47	50	46	37	36	36	24	45	48	51	47	38	38	37	25	47	50	53	49	40	41	40	27	50	53	56	52	44	45	43	31	54	58	60	56	48	50	48	36	57	60	63	60	51	53	51	40
2400	43	46	49	48	40	36	36	28	44	47	50	49	40	38	37	28	46	49	52	51	43	41	40	31	50	53	56	54	46	45	44	35	53	57	59	58	50	49	49	39	56	59	62	62	54	53	51	43
3000	42	45	48	50	42	36	35	30	43	46	49	50	42	37	36	31	45	48	51	53	45	41	40	35	49	52	55	56	48	44	44	38	52	55	58	60	52	48	48	42	55	58	61	63	56	52	51	46

Size 37-81 SW																																																
RPM	VP/SP = .03								VP/SP = .05								VP/SP = .10								VP/SP = .20								VP/SP = .40								VP/SP = .80							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
200	35	32	29	25	21	17	13	9	33	30	26	22	18	14	10	6	37	35	30	24	20	16	12	8	40	38	33	27	23	19	15	11	44	42	37	31	27	23	19	15	50	47	43	38	34	30	26	22
300	37	34	31	27	24	20	16	12	37	32	29	24	21	17	13	9	40	36	34	27	23	19	15	11	43	39	37	30	26	22	18	14	47	43	41	34	30	26	22	18	52	49	46	41	37	33	29	25
400	40	35	32	29	25	21	17	13	40	33	30	26	22	18	14	10	43	37	35	30	24	20	16	12	47	40	38	33	27	23	19	15	50	44	42	37	31	27	23	19	55	50	47	43	38	34	30	26
500	43	36	33	31	26	23	19	15	43	35	31	28	23	20	16	12	46	38	36	33	26	22	18	14	49	41	39	36	29	25	21	17	53	45	43	40	33	29	25	21	58	51	48	45	40	36	32	28
600	44	37	34	31	27	24	20	16	44	37	32	29	24	21	17	13	47	40	36	34	27	23	19	15	50	43	39	37	30	26	22	18	54	47	43	41	34	30	26	22	59	52	49	46	41	37	33	29
700	45	39	34	32	28	24	21	17	45	39	33	29	25	21	18	14	48	42	37	34	29	24	20	16	51	45	40	37	32	27	23	19	55	49	44	41	36	31	27	23	59	54	49	46	42	38	34	30
800	45	41	35	32	29	25	21	17	47	40	33	30	26	22	18	14	50	43	37	35	30	24	20	16	53	47	40	38	33	27	23	19	55	50	44	42	37	31	27	23	60	56	50	47	43	38	34	30
1000	47	43	36	33	31	26	23	19	49	43	35	31	28	23	20	16	52	46	38	36	33	26	22	18	55	49	41	39	36	29	25	21	57	53	45	43	40	33	29	25	61	58	51	48	45	40	36	32
1200	47	44	37	34	31	27	24	20	49	44	37	32	29	24	21	17	52	47	40	36	34	27	23	19	55	50	43	39	37	30	26	22	57	54	47	43	41	34	30	26	61	59	52	49	46	41	37	33
1500	47	45	40	35	32	29	25	21	49	46	40	33	30	26	22	18	52	49	43	37	35	30	24	20	55	52	46	40	38	33	27	23	57	55	50	44	42	37	31	27	61	60	55	50	47	43	38	34
1800	47	46	42	35	33	30	25	22	49	48	42	34	30	27	22	19	52	51	45	38	35	31	25	21	55	54	48	41	38	34	28	24	57	56	52	45	42	38	32	28	61	60	57	50	47	44	39	35

OUT LET SPECIFIC SOUND POWER LEVELS IN DECIBELS REFERRED TO 10^{-12} WATTS (L_{wko})

Size 18-24 DW																																																
RPM	VP/SP = .03								VP/SP = .05								VP/SP = .10								VP/SP = .20								VP/SP = .40								VP/SP = .80							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
500	44	39	35	33	29	26	24	22	43	37	32	30	26	23	21	19	45	39	34	31	27	24	21	18	47	43	37	33	29	24	20	16	53	48	43	40	36	31	24	17	59	54	49	46	42	36	30	24
600	43	42	35	34	30	26	24	22	42	41	33	31	27	23	21	19	44	43	35	33	29	25	22	19	46	46	39	35	30	26	22	18	52	51	44	42	38	32	25	18	58	57	50	48	43	38	32	26
800	41	46	36	35	32	27	25	23	41	45	34	32	29	24	22	20	43	47	36	34	30	26	23	20	45	49	40	36	32	27	23	19	51	55	45	43	39	35	28	21	57	61	51	49	45	40	34	28
1000	43	44	39	35	33	29	26	24	44	43	37	32	30	26	23	21	46	45	39	34	31	27	24	21	48	47	43	37	33	29	24	20	53	53	48	43	40	36	31	24	59	59	54	49	46	42	36	30
1200	45	43	42	35	34	30	26	24	46	42	41	33	31	27	23	21	47	44	43	35	33	29	25	22	49	46	46	39	35	30	26	22	55	52	51	44	42	38	32	25	61	58	57	50	48	43	38	32
1500	47	41	45	35	35	32	27	25	49	41	44	43	33	29	24	22	50	43	46	35	34	30	26	23	52	45	49	40	36	32	27	23	57	51	54	44	43	39	35	28	63	57	60	50	49	45	40	34
1800	47	42	45	37	35	33	28	25	49	43	44	36	32	30	25	22	50	45	46	38	34	31	27	24	52	47	48	42	37	33	28	24	57	52	54	46	43	40	36	30	63	58	60	52	49	46	41	35
2100	47	44	44	40	35	33	29	26	49	45	43	38	32	30	26	23	50	46	45	40	34	32	28	24	52	48	47	44	38	34	29	25	57	54	53	49	43	41	37	31	63	60	59	55	49	47	42	37
2400	47	45	43	42	35	34	30	26	49	46	42	41	33	31	27	23	50	47	44	43	35	33	29	25	52	49	46	46	39	35	30	26	57	55	52	51	44	42	38	32	63	61	58	57	50	48	43	38
3000	47	47	41	45	35	35	32	27	49	49	41	44	43	33	29	24	50	50	43	46	35	34	30	26	52	52	45	49	40	36	32	27	57	57	51	54	44	43	39	35	63	63	57	60	50	49	45	40
3600	47	47	42	45	37	35	33	28	49	49	43	44	36	32	30	25	50	50	45	46	38	34	31	27	52	52	47	48	42	37	33	28	57	57	52	54	46	43	40	36	63	63	58	60	52	49	46	41

Size 27-33 DW																																																
RPM	VP/SP = .03								VP/SP = .05								VP/SP = .10								VP/SP = .20								VP/SP = .40								VP/SP = .80							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
300	37	32	32	29	23	19	15	11	35	30	29	26	20	16	12	8	38	33	30	27	22	18	14	10	43	37	34	31	26	22	18	14	48	43	40	36	31	27	23	19	54	49	46	43	38	34	30	26
400	38	33	32	30	25	21	17	13	37	31	29	27	22	18	14	10	40	34	31	29	24	20	16	12	44	39	36	33	28	24	20	16	49	44	41	38	33	29	25	21	56	50	47	45	40	36	32	28
500	37	35	32	31	27	22	18	14	37	33	29	28	24	19	15	11	40	36	32	29	25	21	17	13	44	41	36	33	29	25	21	17	49	46	42	39	34	30	26	22	56	52	48	45	41	37	33	29
600	37	37	32	32	29	23	19	15	36	35	30	29	26	20	16	12	40	38	33	30	27	22	18	14	45	43	37	34	31	26	22	18	50	48	43	40	36	31	27	23	55	54	49	46	43	38	34	30
800	37	38	33	32	30	25	21	17	37	37	31	29	27	22	18	14	41	40	34	31	29	24	20	16	46	44	39	36	33	28	24	20	51	49	44	41	38	33	29	25	57	56	50	47	45	40	36	32
1000	39	37	36	32	31	27	22	18	40	37	33	29	28	24	19	15	44	40	36	32	29	25	21	17	48	44	41	36	33	29	25	21	53	49	46	42	39	34	30	26	56	56	52	48	45	41	37	33
1200	41	37	37	32	32	29	23	19	42	36	35	30	29	26	20	16	46	40	38	33	30	27	22	18	50	45	43	37	34	31	26	22	55	50	48	43	40	36	31	27	62	55	54	49	46	43	38	34
1500	42	37	38	33	32	30	25	20	44	37	37	31	29	27	22	17	48	41	40	34	31	28	23	19	51	46	44	39	35	32	27	23	56	51	49	44	41	37	32	28	64	56	56	50	47	44	39	35
1800	42	38	38	34	32	31	26	21	44	39	37	32	29	28	23	18	48	43	40	35	32	29	25	20	51	47	44	40	36	33	29	24	56	52	49	45	42	38	34	29	64	58	56	51	48	45	41	36
2100	42	39	37	35	32	31	27	22	44	41	37	34	30	28	24	19	48	45	40	37	33	30	26	21	51	48	44	41	37	34	30	25	56	53	49	46	42	39	35	30	64	60	56	53	48	46	42	37
2400	42	41	37	37	32	32	29	23	44	42	36	35	30	29	26	20	48	46	40	38	33	30	27	22	51	50	45	43	37	34	31	26	56	55	50	48	43	40	36	31	64	62	55	54	49	46	43	38
3000	42	42	37	38	33	32	30	25	44	44	37	37	31	29	27	22	48	48	41	40	34	31	28	23	51	51	46	44	39	35	32	27	56	56	51	49	44	41	37	32	64	64	56	56	50	47	44	39

Size 37-81 DW																																																
RPM	VP/SP = .03								VP/SP = .05								VP/SP = .10								VP/SP = .20								VP/SP = .40								VP/SP = .80							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
200	42	40	37	32	28	23	19	14	42	40	38	33	28	24	19	15	43	41	39	34	30	25	20	16	43	41	39	35	30	26	21	17	46	42	42	39	33	27	22	16	50	48	45	43	37	31	24	18
300	46	41	39	34	30	26	21	17	46	41	40	35	31	26	22	17	46	42	41	36	32	27	22	18	48	43	41	38	33	29	24	20	49	46	43	41	36	30	25	19	53	49	46	44	39	33	26	20
400	51	42	40	37	32	28	23	19	50	42	40	38	32	28	23	19	52	43	41	39	34	30	25	20	54	43	41	39	35	31	26	22	54	47	44	42	38	33	27	21	57	50	47	45	41	35	29	23
500	50	45	41	38	34	30	25	21	50	45	40	38	34	30	26	21	51	45	41	39	35	31	26	22	53	46	42	40	37	33	27	24	54	49	45	43	40	36	29	23	57	52	48	46	43	37	31	25
600	49	47	41	39	36	32	27	23	49	46	40	39	35	31	27	23	50	47	41	39	36	32	27	23	52	49	43	41	38	34	29	25	54	51	46	43	41	37	31	25	57	54	49	47	44	39	33	27
700	48	49	41	39	37	33	29	25	48	47	40	39	36	32	28	24	49	48	41	39	37	33	28	24	51	51	43	42	39	35	30	26	54	53	46	44	42	38	32	26	56	56	50	48	45	41	35	29
800	50	51	43	40	39	34	30	26	42	49	41	40	38	33	29	25	50	50	42	40	39	34	30	25	50	52	43	42	40	36	31	27	53	54	47	45	43	39	34	28	56	57	50	49	46	42	40	30
1000	51	52	44	41	40	34	30	26	51	51	43	41	40	34	30	25	50	51	43	42	40	35	31	26	49	53	44	42	40	37	32	28	52	55	48	46	43	41	35	30	55	57	50	49	46	43	38	31
1200	50	52	47	42	40	36	33	28	51	51	46	42	42	38	32	27	50	51	46	42	41	37	32	28	49	52	48	43	41	39	34	29	51	54	52	46	44	42	37	31	54	56	54	49	47	44	40	34
1500	49	51	49	43	41	38	34	29	51	52	49	43	43	40	34	30	49	51	49	43	41	38	33	29	48	51	51	44	42	39	35	30	51	54	54	47	45	43	39	33	53	56	55	50	48	45	41	36
1800	49	51	51	43	41	39	34	30	51	53	50	43	44	42	36	32	48	50	52	43	41	40	34	30	47	50	54	44	42	40	36	31	50	53	56	47	45	43	40	34	53	55	57	50	48	45	42	37



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