

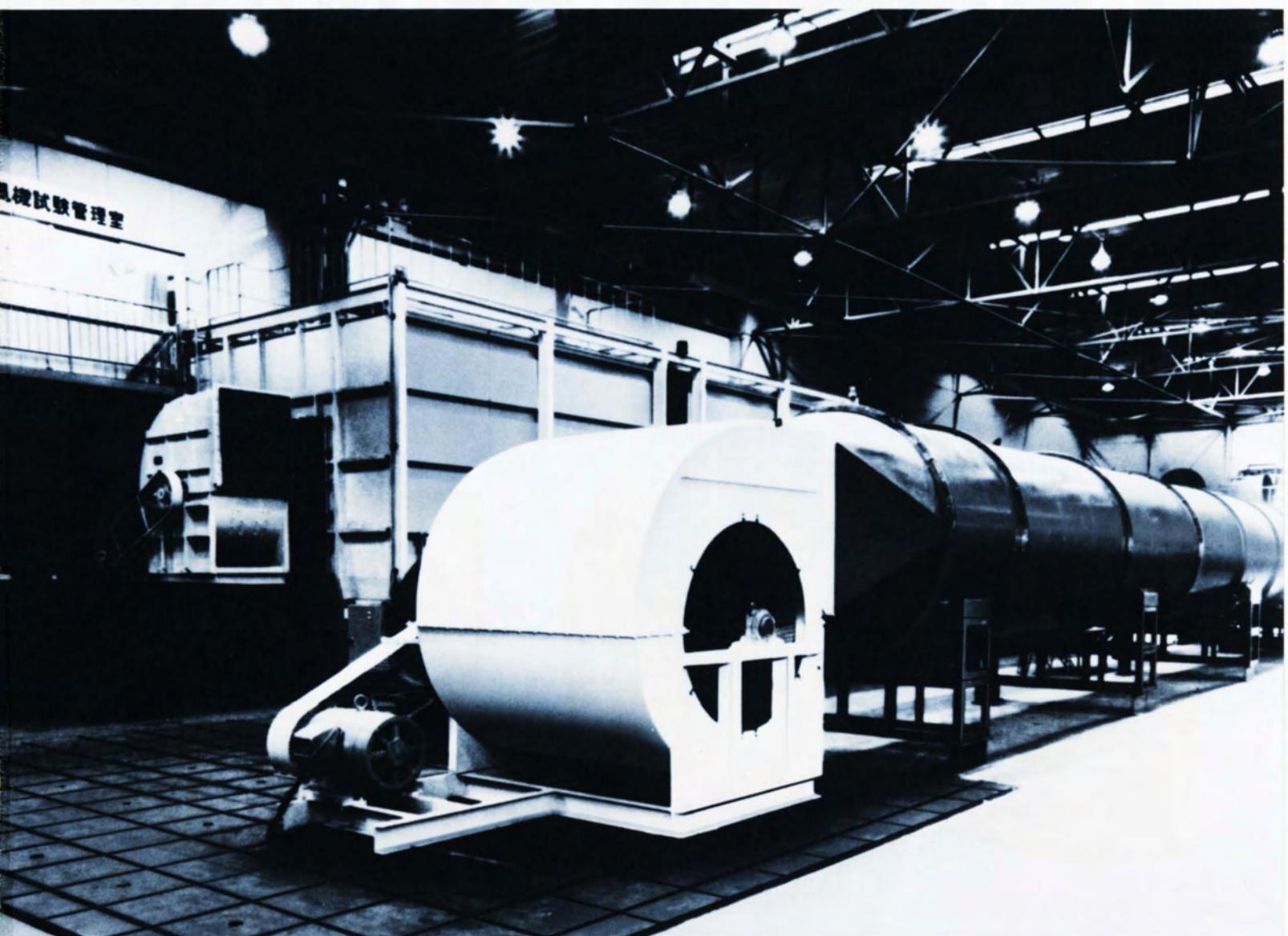
Panasonic Centrifugal Fans





MATSUSHITA ECOLOGY SYSTEMS CO., LTD. is a leading manufacturer in Japan of almost every kind of air moving equipment including several types of air conditioning equipment for the various industrial uses in all kinds of buildings, and contributes to the social development of the world with its products through the commercial activities, complying with the market requirements precisely.

Panasonic Centrifugal Fans



Panasonic Ecology Systems(Thailand)Co.,Ltd. certifies that type FCS-C(Page 14 thru 37), (Page 122 thru 123) and type FCD-C(Page 40 thru 57), (Page 124 thru 125) and type BCS-D(Page 60 thru 77), (Page 126) and type BCD-D(Page 80 thru 97), (Page 127 thru 128) 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.

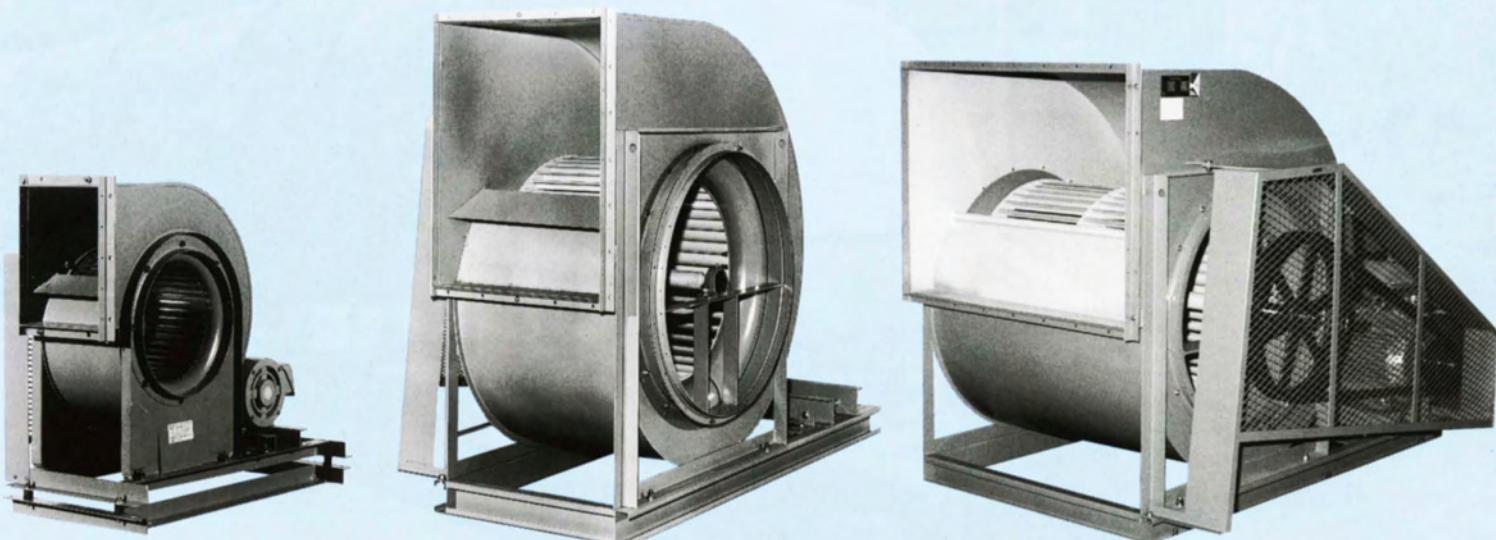


Panasonic Centrifugal

■ Forward Curved Multi-Blade Fan

SWSI **FY-06FCS-C ~ FY-36FCS-C**
(WHEEL DIA 160 ~ 915mm)

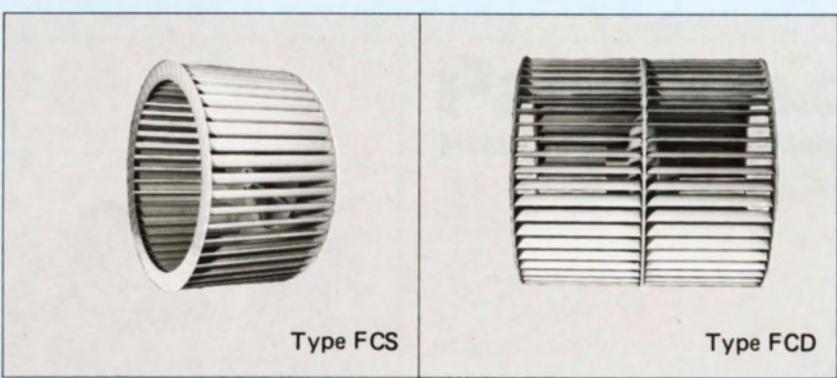
DWDI **FY-12FCD-C ~ FY-36FCD-C**
(WHEEL DIA 302 ~ 915mm)



The Panasonic Centrifugal Fan design provides a twofold choice of impeller, the Type FCS/FCD and Type BCS/BCD, each with its own characteristics and advantages. Together they provide the widest available range for fan selections to meet application requirements.

Type FCS/FCD

Forward Curved Blades Available in Size No. 6 to 36, the advantages of this multi-blade impeller are low running speed and sound level combined with high volume air flow.



Type FCS

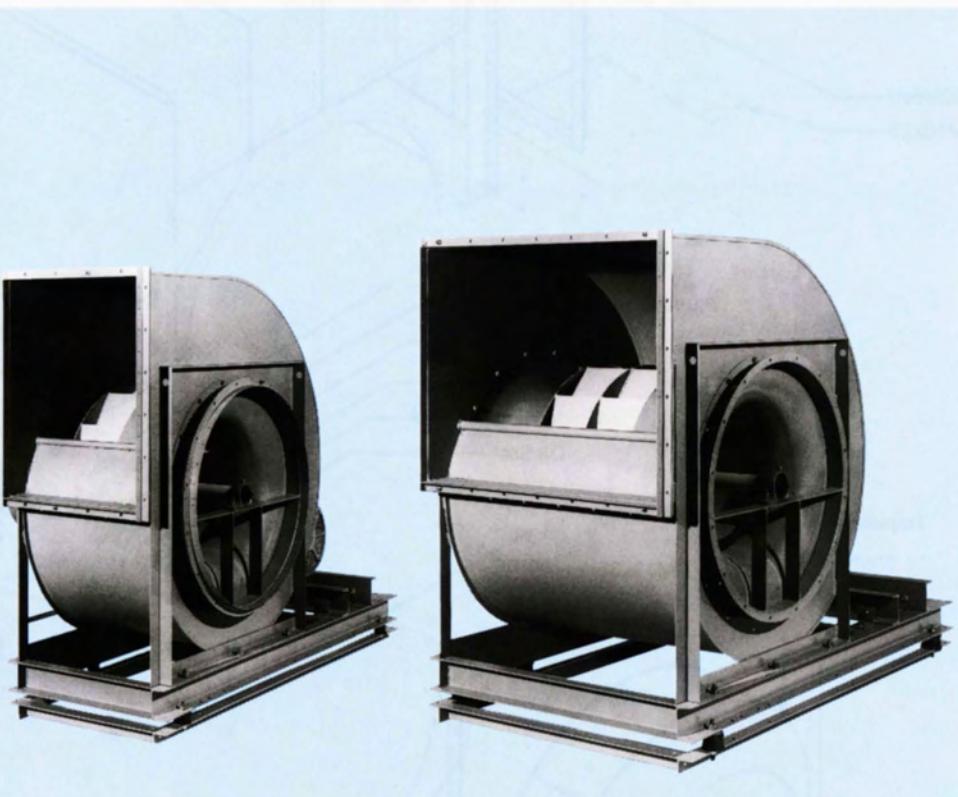
Type FCD

Fans

■ Backward Curved Blade Limit-Load Fan

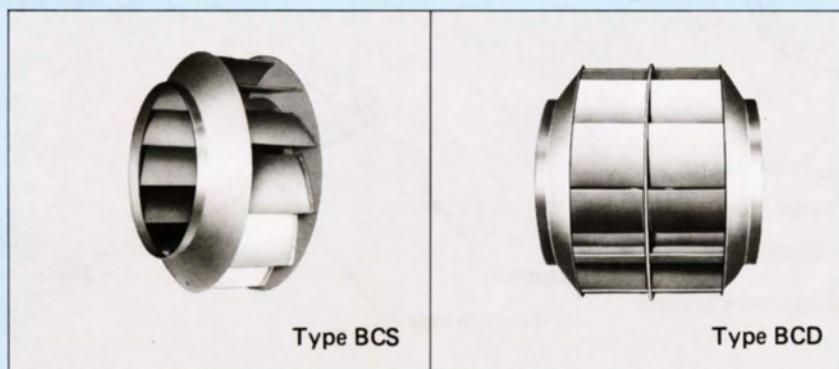
SWSI FY-12BCS-D ~ FY-36BCS-D
(WHEEL DIA 310 ~ 934mm)

DWDI FY-12BCD-D ~ FY-36BCD-D
(WHEEL DIA 310 ~ 934mm)



Type BCS/BCD

Backward Curved Blades Available in Size No.12 to 36, which offer high efficiencies with a non-overloading power characteristic.

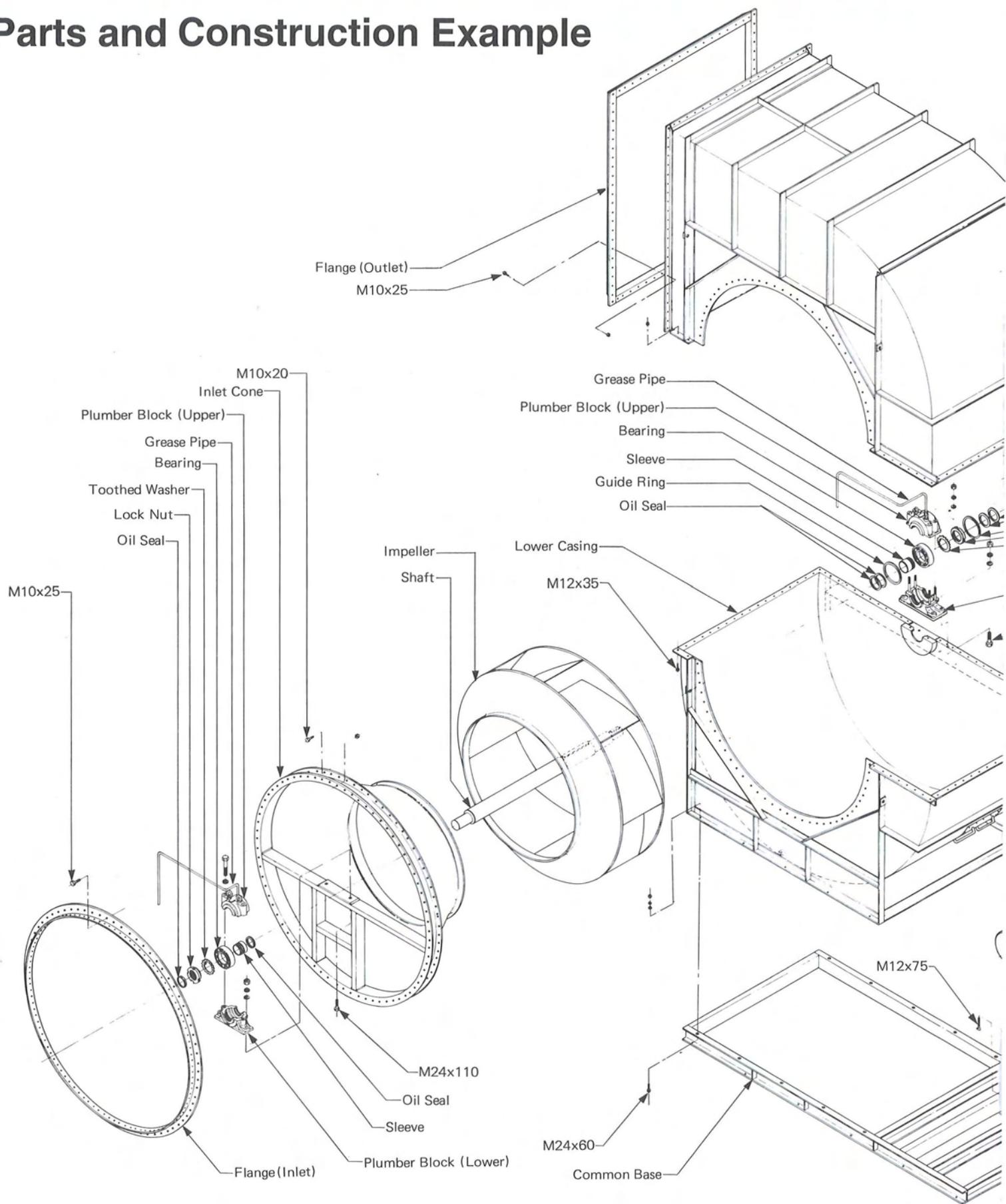


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Panasonic Centrifugal Fans

Parts and Construction Example



STANDARD ACCESSORIES

Bearing

Panasonic fans are furnished with grease-lubricated heavy-duty self-aligning ball bearing in the pillow blocks except FY-06-18FCS-C type fans. For FY-06-18FCS-C type fans, a ball bearing assembly having a single rigid cast iron housing with a ball bearing assembly in each end is standard. Bearings are designed for maintenance-free operation under normal conditions. Large size fans and/or fans for extremely high speeds or heavy thrust loads may be furnished with roller bearings.



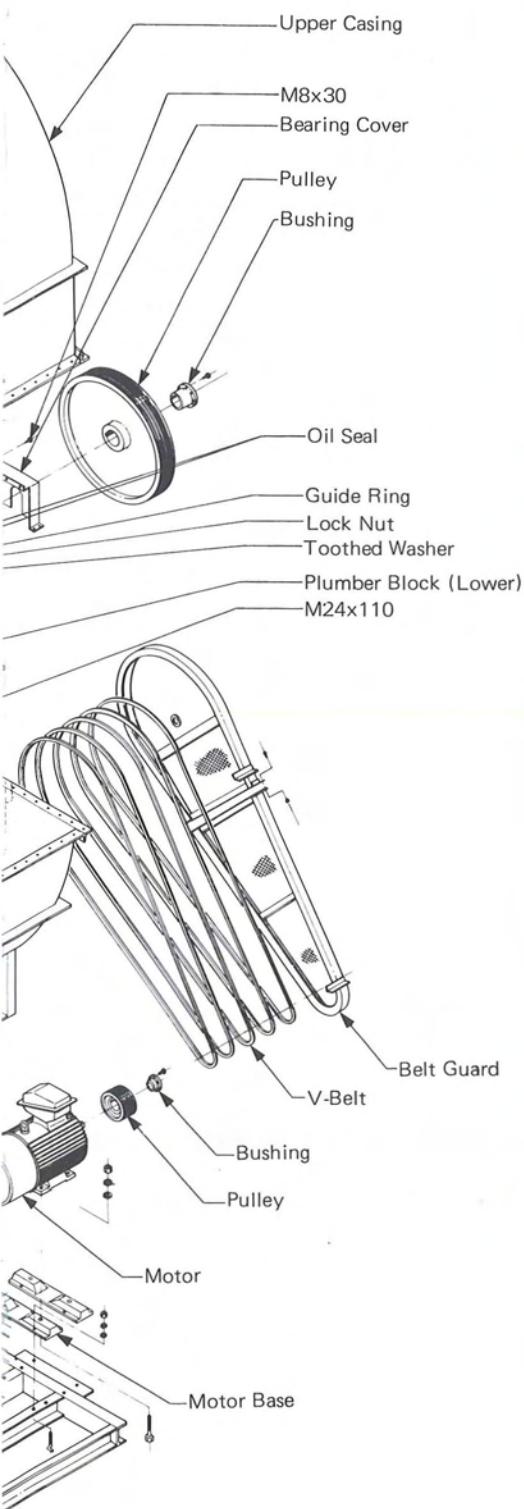
Bearing Unit

Pillow Block

Roller Bearing

Casing

The casing is fabricated from J.I.S. B 8331 steel. It is of continuous welded construction which prevents air leakage, and combines inherent strength, rigidity and reliability. The large rectangular, flanged and drilled outlet can be supplied in any of the directions of discharge shown on page 9. Both single inlet and double width, double inlet casings are available, which have flanged inlets as standard. The casing is supported on rigid steel feet, drilled for bolting to foundations.

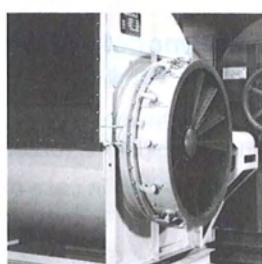


OPTIONAL ACCESSORIES

Drain Hole

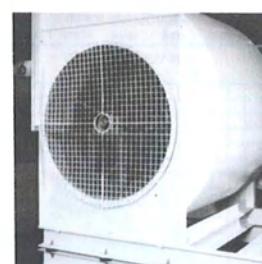
A drain hole will be furnished at the low point of the casing up on your request for outdoor uses. There are two types of drain hole. One is rubber grommet type for small sized fans, and the other is socket joint type.

Adjustable Inlet Vanes



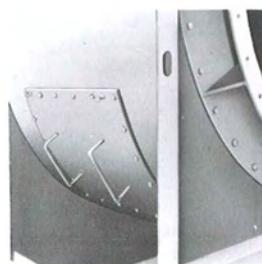
National adjustable inlet vanes greatly reduce power consumption when operation at less than full capacity is required. Air passes through the vanes smoothly, in the direction of wheel rotation, contributing to lower power requirements. These vanes can be manually or automatically controlled.

Inlet Screens



The inlet screen of heavy gauge mesh wire is available where there is no duct connection to the fan inlet. Screen will be bolted to the fan inlet for easy removal. This is an optional feature, which will be supplied up on your order.

Access Doors



Convenient access doors make wheel inspection and housing cleanout easier. A quick opening door with bolts provides rapid access for cleaning of fan interiors.

Anti-Vibration Devices



Vibration isolating rubber and spring will be inserted between the common base and dual platform of the fan. Their vibration conduction factors are 30-70% for rubber type and 5-10% for spring type.

Forward Curved Multi-Blade Fan

Backward Curved Blade Limit-Load Fan

The sound power level ratings shown are in decibels, referred to 10^{-12} watts calculated per AMCA Standard 301. Values shown are for inlet Lwi sound power levels for Installation Type B: free inlet, ducted outlet. Ratings do not include the effects of duct end correction.

Method For Determining Sound Level Ratings

Step1. Find a value of total sound power level closest to the operating point.

Step2. Reduct each area correction from total sound power level.

Example: FY-24FCS-C

operating at 300CMM, 57mmWG, 660rpm, 5.8BkW

Step1. The total value of PWL for operating point is 102(dB).

Step2. The values of correction are shown as below.

(Note: operating point is in area D.)

Frequency (Hz)	63	125	250	500	1000	2000	4000	8000
Total Sound Power Level (dB)					102			
Correction by area D (dB)	-3	-4	-11	-17	-18	-20	-24	-28
① End Reflection Correction (dB)	-7	-3	-1	-0	-0	-0	-0	-0
② Absorption Correction (dB)	-1	-0	-0	-0	-0	-0	-0	-0
③ Sound Power Level (dB)	91	95	90	85	84	82	78	74

Note ; Values of ② are seen from Page 123.

Values of ③ are sound power level at the fan inlet.

Calculation of Sound Pressure Level Ratings

Sound Pressure Level values in Free-Field can be calculated with the following equation, in which "r" is the distance of the points of measurement from the open inlet of the fan.

$$SPL(f) = PWL(f) - 20\log r - 11$$

where $SPL(f)$: Sound Pressure Level (dB) in Free-Field

$PWL(f)$: Sound Power Level (dB) in Free-Field

r : Distance from sound source (m)

Frequency (Hz)	63	125	250	500	1000	2000	4000	8000
③ Sound Power Level (dB)	91	95	90	85	84	82	78	74
④ $-20 \log r - 11$ (dB)					-11			
⑤ Sound Pressure Level (dB)	80	84	79	74	73	71	67	63

$$r = 1 \text{ (m)}$$

$$\therefore -20 \log_{10} 1 - 11 = -11 \dots \text{④}$$

Frequency (Hz)	63	125	250	500	1000	2000	4000	8000
⑤ Sound Pressure Level (dB)	80	84	79	74	73	71	67	63
A-Weighting correction (dB)	-26	-16	-9	-3	0	+1	+1	-1
⑥ A-Weighted Sound Pressure Level (dB) A	54	68	70	71	73	72	68	62

Note ; The Values of ①, ②, ③ and ⑤ are non-duct in Free-Field.

The Calculation Method of SPL(A)

Logarithmic addition of each octave band values to obtain single level value.

A single number SPL(A) is obtained by using the following equation or the tabular method of logarithmic addition as shown in Table1.

$$\begin{aligned}
 \text{By Equation : } \text{SPL(A)} &= 10 \log_{10} \left\{ 10^{\frac{LP_1}{10}} + 10^{\frac{LP_2}{10}} + \dots + 10^{\frac{LP_7}{10}} + 10^{\frac{LP_8}{10}} \right\} \\
 &= 10 \log_{10} \left\{ 10^{\frac{54}{10}} + 10^{\frac{68}{10}} + \dots + 10^{\frac{68}{10}} + 10^{\frac{62}{10}} \right\} \\
 &= 10 \times 7.86 \\
 &\approx 79
 \end{aligned}$$

By Tabular method using factors from Table 2:

List (dB) values from highest to lowest without regard to band sequence	Difference between (1) & (2)	Factor from Table 2	Factor + (1)	Difference between (3) & (4)	Factor from Table 2	Factor + (3)	Difference between (5) & (6)	Factor from Table 2	Factor + • (5) = SPL(A)
Hight ⑥									
(1) 73	1	2.5	(3) 75.5	2.0					
(2) 72					2.1	(5) 77.6			
(1) 71	1	2.5	(4) 73.5						
(2) 70							6.0	1.0	79.0
(1) 68	0	3.0	(3) 71.0	8.4					
(2) 68					0.6	(6) 71.6			
(1) 62	8	0.6	(4) 62.6						
(2) 54									

Table 1

(dB) Difference between two levels	0	1	2	3	4	5	6	7	8	9	≥ 10
No. to add to higher level	3.0	2.5	2.1	1.8	1.5	1.2	1.0	0.8	0.6	0.5	0

Numerical difference values to combine decimal levels (Table2)

Fan sound power levels are the same and/or less than the calculated for -C and -D models.

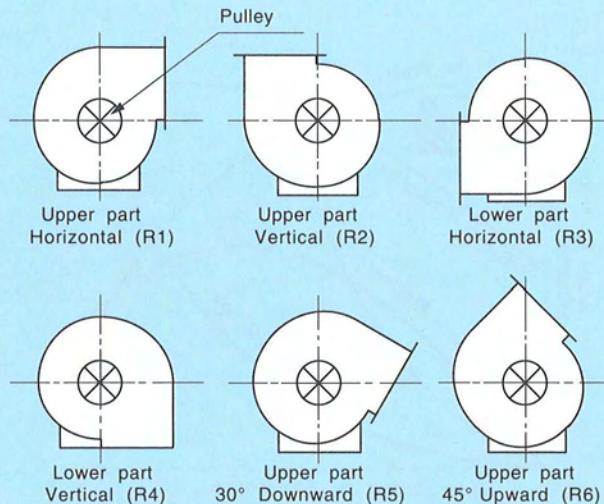
Direction of Rotation and Discharge

Direction of rotation is defined as follows. Clockwise rotation seen from the driving side (pulley side) is called right rotation and counter-clockwise rotation is called left rotation. They are indicated by R and L, respectively. (JIS B 8331)

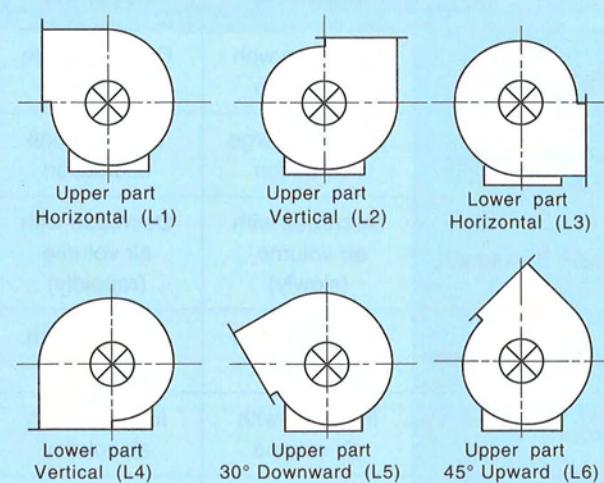
In the case of standard types, there are three kinds of discharge direction, namely upper part horizontal, upper part vertical and lower part horizontal, and they are denoted by figures, 1, 2 and 3, respectively.

Upon your request, we may produce those types of lower part vertical and angled delivery, denoted by 4, 5 and as 6 special made.

Right Rotation (R)



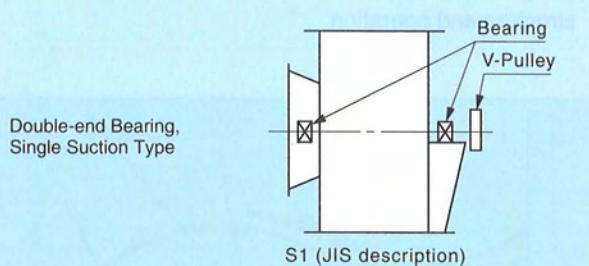
Left Rotation (L)



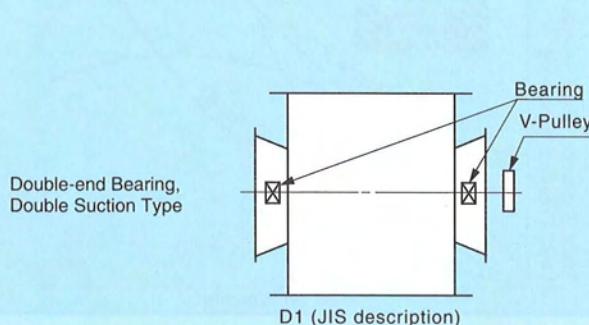
Type of Fans

The following types shown below are standard types classified according to suction method and bearing method.

Forward Curved Multi-blade Fan

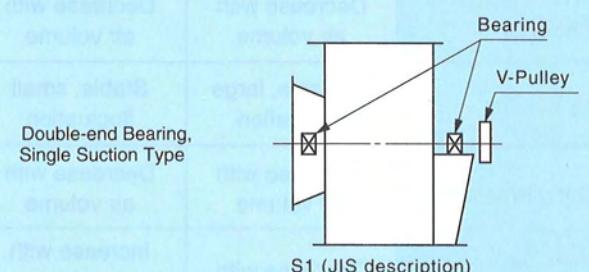


Double-end Bearing,
Single Suction Type

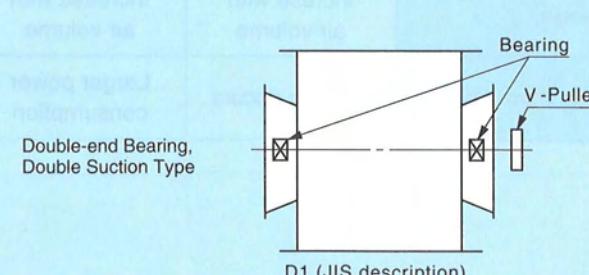


Double-end Bearing,
Double Suction Type

Backward Curved blade Limit-Load Fan



Double-end Bearing,
Single Suction Type

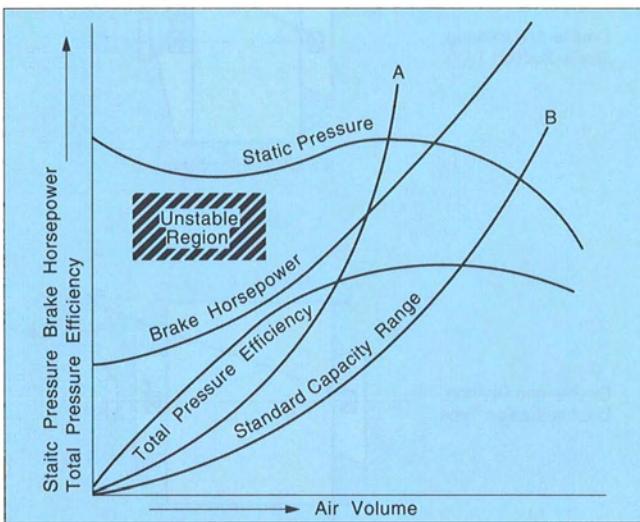


Double-end Bearing,
Double Suction Type

Characteristics and Standard Capacity Range

• Multi-Blade Fan

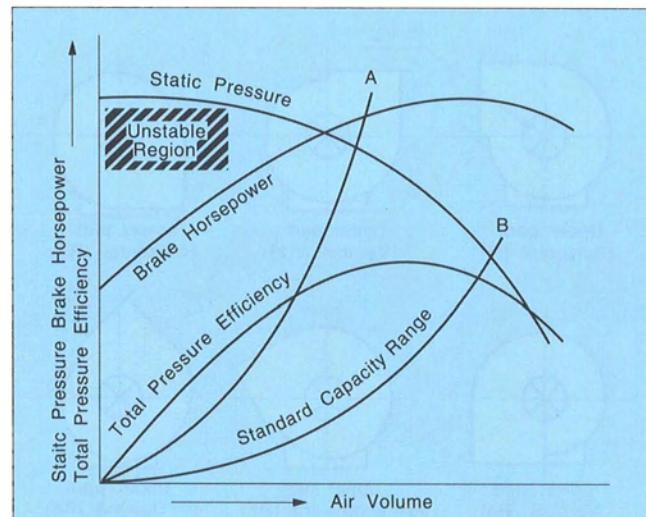
1. The impeller has many forward-curved blades, thus it is low speed and low noise.
2. Just a small area is required for installation because this type is the smallest of all centrifugal fans for the same air volume and static pressure.
3. Easy maintenance and inspection due to simple structure and operation.



Working Region	Left side beyond A	Right side beyond B
Efficiency	Decrease with air volume	Decrease with air volume
Air Volume	Unstable, large fluctuation	Stable, small fluctuation
Static Pressure	Decrease with air volume	Decrease with air volume
Brake Horsepower	Decrease with air volume	Increase with air volume (rapidly)
Noise	Increase with air volume	Increase with air volume
Fan Phenomena	Surging occurs	Larger power consumption

• Limit-Load Fan

1. This type shows the perfect limit load characteristics that is, the required power does not exceed a certain value with the increase of air volume. Always reliable regardless to the change of resistance.
2. The blade is backward curved, producing little air turbulence and noise. It is highly efficient and economical, saving power consumption.
3. Compared with a FORWARD CURVED MULTI-BLADE FAN, this is suitable for higher static pressure (100 to 200 mm. W.G).
4. As the structure is similar to that of a FORWARD CURVED MULTI-BLADE FAN, its maintenance and inspection are easy.



Working Region	Left side beyond A	Right side beyond B
Efficiency	Decrease with air volume	Decrease with air volume
Air Volume	Unstable, large fluctuation	Stable, small fluctuation
Static Pressure	Decrease with air volume (slowly)	Decrease with air volume (rapidly)
Brake Horsepower	Decrease with air volume	Increase with air volume
Noise	Increase with air volume	Increase with air volume
Fan Phenomena	Surging occurs	Larger power consumption

Temperature Limitations

Fans can be used at the temperature from -10°C to +50°C.
In case of more than +50°C, please let us know.

Factors in Fan Selection

When inquiring a fan, please provide information on the following items.

1. Type of Fans
Advise us the fan type among Multi-blade fan and Aerofoil-blade fan.
2. Suction Method
Inform us of the suction method among Double-end Bearing, Single suction Type (S1), Double-end Bearing, Double suction Type (D1) and Single-end Bearing, Single suction Type (S2).
3. Fan Size
4. Air Volume
Indicate by the air volume under the normal suction condition. The unit is to be MCC (The normal suction condition means to suck the moist air of the relative humidity 65% at the temperature 20°C and atmospheric pressure 760 mm Hg. The specific gravity under this condition is considered to be 1.2 Kg/m³.)
5. Fan Static Pressure
Indicate by the static pressure under the normal suction condition. When the working condition differs from the normal suction condition, inform us of the gas temperature, humidity and density, etc. The unit is to be mm.WG.
6. Suction Temperature: () °C
7. Gas Composition and Characteristics.
8. Direction of Rotation and Discharge (Refer to the preceding item)
9. Type, Pole Number, Voltage and Frequency of Motor. The standard motor is a drip-proof type, three phase and 50/60 Hz.
10. Purpose and Place of Installation.
11. Paint Color
The standard color is National Grey (Mancel 10Y 4.5/0.5) Other colors are also available as special made.
12. Accessories
The standard accessories are as follows. Outlet and inlet flange, V-pulley, V-belt, belt cover, common base.

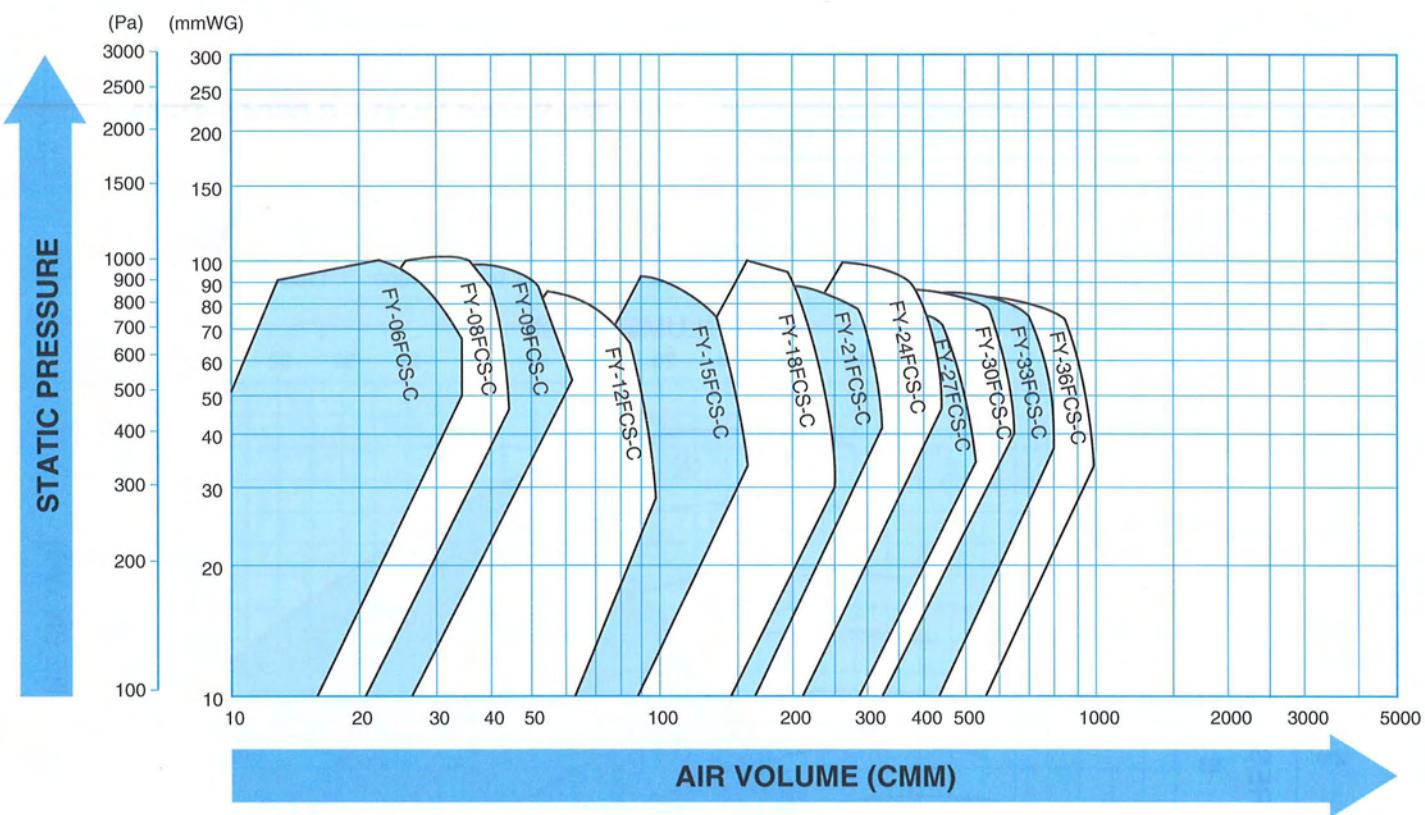
Panasonic CENTRIFUGAL FAN

Forward Curved Multi-Blade Fan SWSI

AIR PERFORMANCE DATA

C

■ Selection Chart



AVAILABLE MODELS

● SWSI CENTRIFUGAL FAN (FORWARD CURVED BLADE)

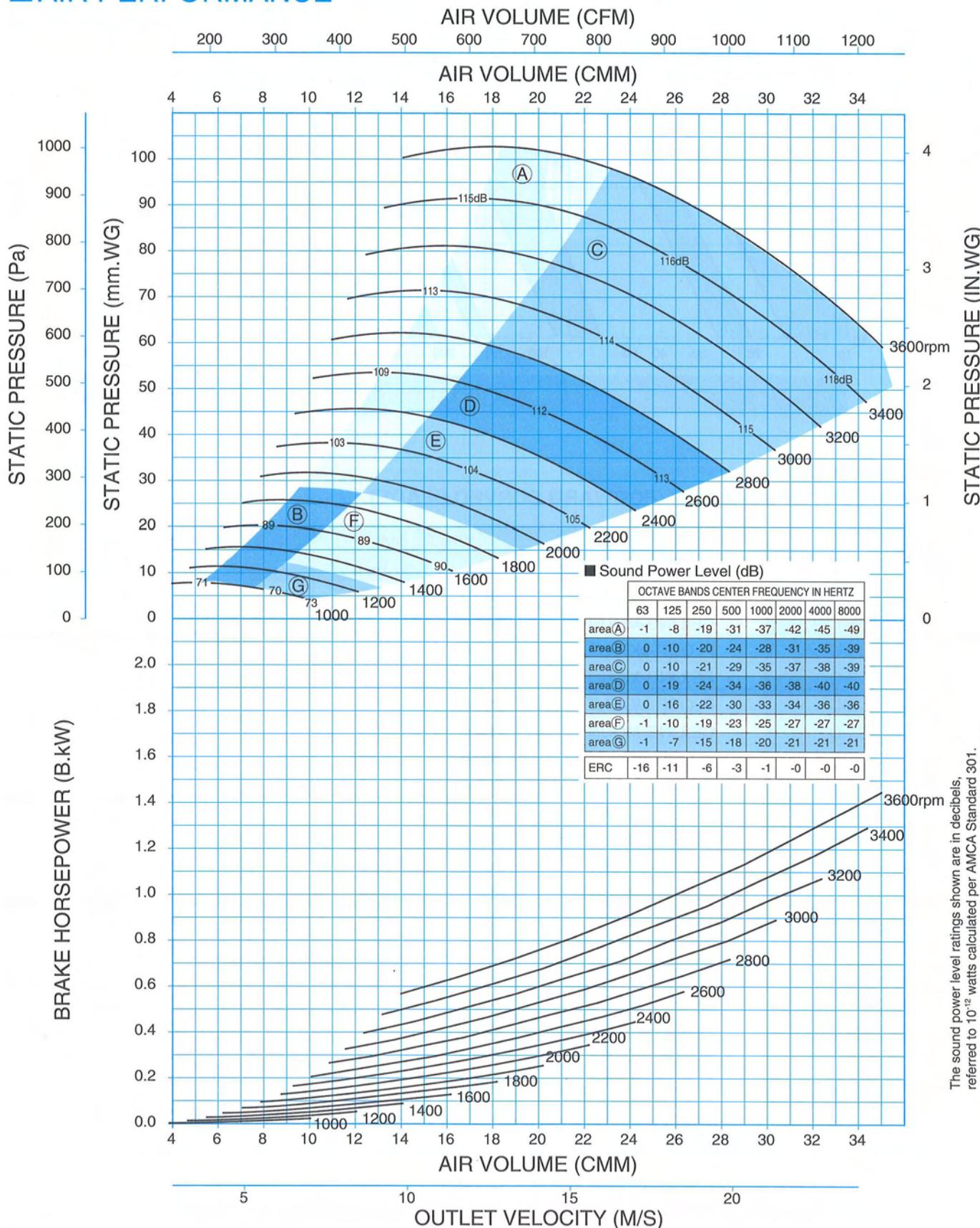
MODEL NO.	SWSI	WHEEL DIA		Approx weight kg
		mm	inch	
FY-06FCS-C	FLOOR-MOUNT	160.0	6	17
FY-06FCS-C	CEILING-MOUNT	160.0	6	14.5
FY-08FCS-C	FLOOR-MOUNT	202.0	8	19
FY-08FCS-C	CEILING-MOUNT	202.0	8	16.5
FY-09FCS-C	FLOOR-MOUNT	254.0	9	23
FY-09FCS-C	CEILING-MOUNT	254.0	9	20
FY-12FCS-C	FLOOR-MOUNT	302.0	12	42
FY-12FCS-C	CEILING-MOUNT	302.0	12	38
FY-15FCS-C	FLOOR-MOUNT	382.0	15	60
FY-15FCS-C	CEILING-MOUNT	382.0	15	55
FY-18FCS-C	FLOOR-MOUNT	464.0	18	105
FY-18FCS-C	CEILING-MOUNT	464.0	18	100
FY-21FCS-C	FLOOR-MOUNT	529.6	21	145
FY-21FCS-C	CEILING-MOUNT	529.6	21	138
FY-24FCS-C	FLOOR-MOUNT	621.6	24	180
FY-24FCS-C	CEILING-MOUNT	621.6	24	170
FY-27FCS-C	FLOOR-MOUNT	686.0	27	285
FY-30FCS-C	FLOOR-MOUNT	762.0	30	330
FY-33FCS-C	FLOOR-MOUNT	838.0	33	415
FY-36FCS-C	FLOOR-MOUNT	915.0	36	490

FY-06FCS-C

Floor-Mount Type

Ceiling-Mount Type

Wheel Diameter = 160.0 mm
 Outlet Area = 0.0238 sq.m
 Tip Speed (m/s) = 0.0084 × RPM

AIR PERFORMANCE

The sound power level ratings shown are in decibels, referred to 10^{-12} watts calculated per AMCA Standard 301. Values shown are for inlet L_{wi} sound power levels for installation. Type B: free inlet, ducted outlet. Ratings do not include the effects of duct end correction.

FY-08FCS-C

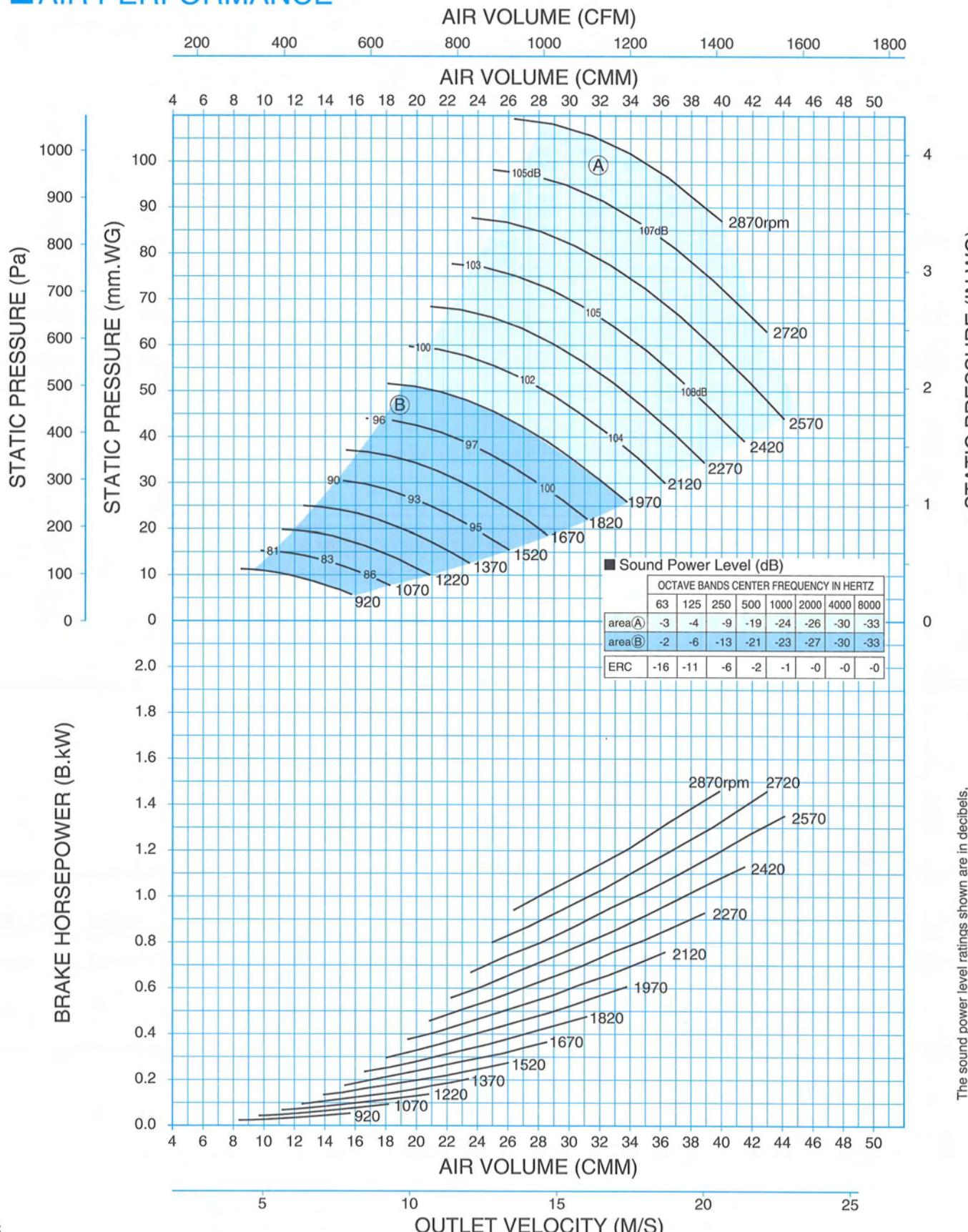
Floor-Mount Type

Ceiling-Mount Type

Wheel Diameter = 202.0 mm

Outlet Area = 0.03255 sq.m

Tip Speed (m/s) = 0.0106 × RPM

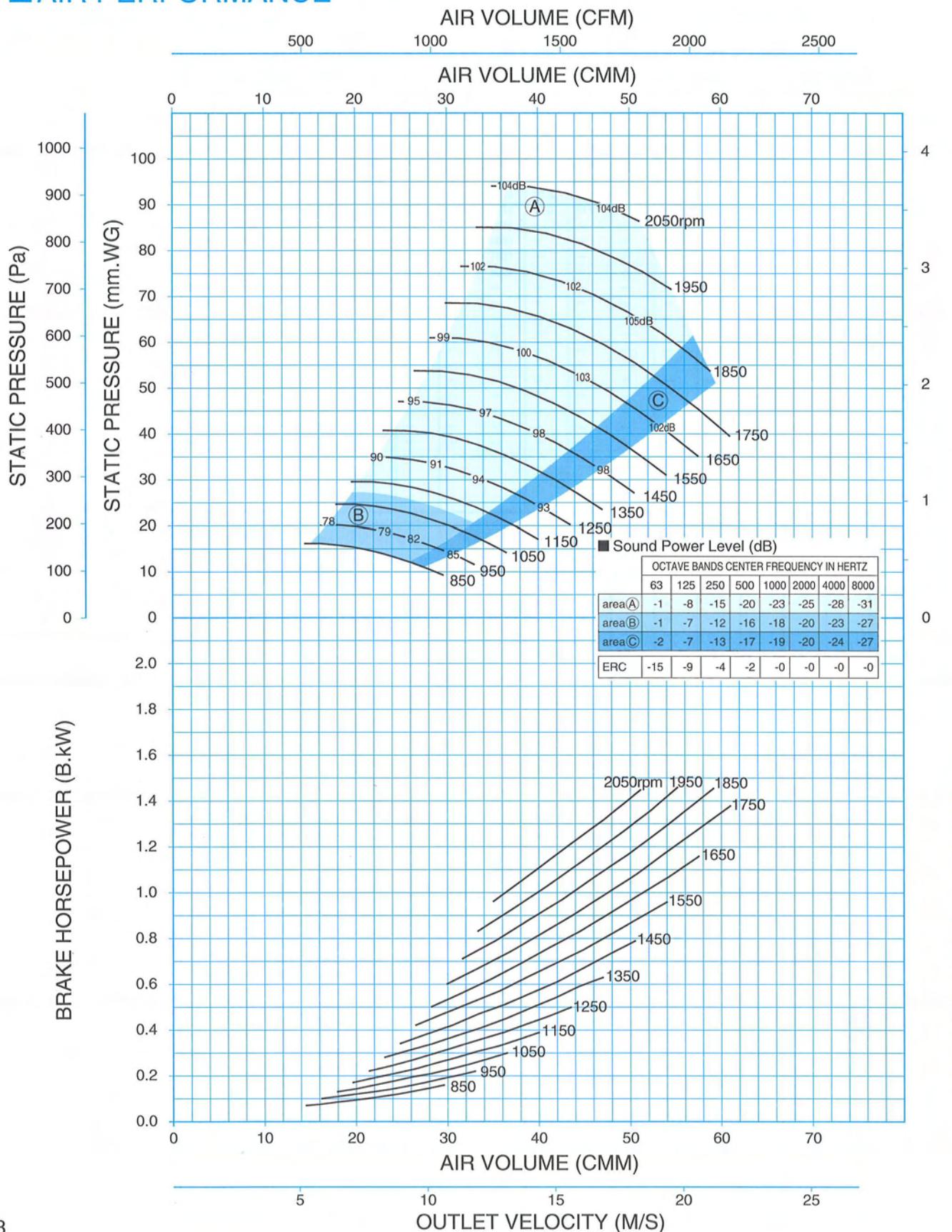
AIR PERFORMANCE

FY-09FCS-C

Floor-Mount Type

Ceiling-Mount Type

Wheel Diameter = 254.0 mm
 Outlet Area = 0.0468 sq.m
 Tip Speed (m/s) = $0.0133 \times \text{RPM}$

AIR PERFORMANCE

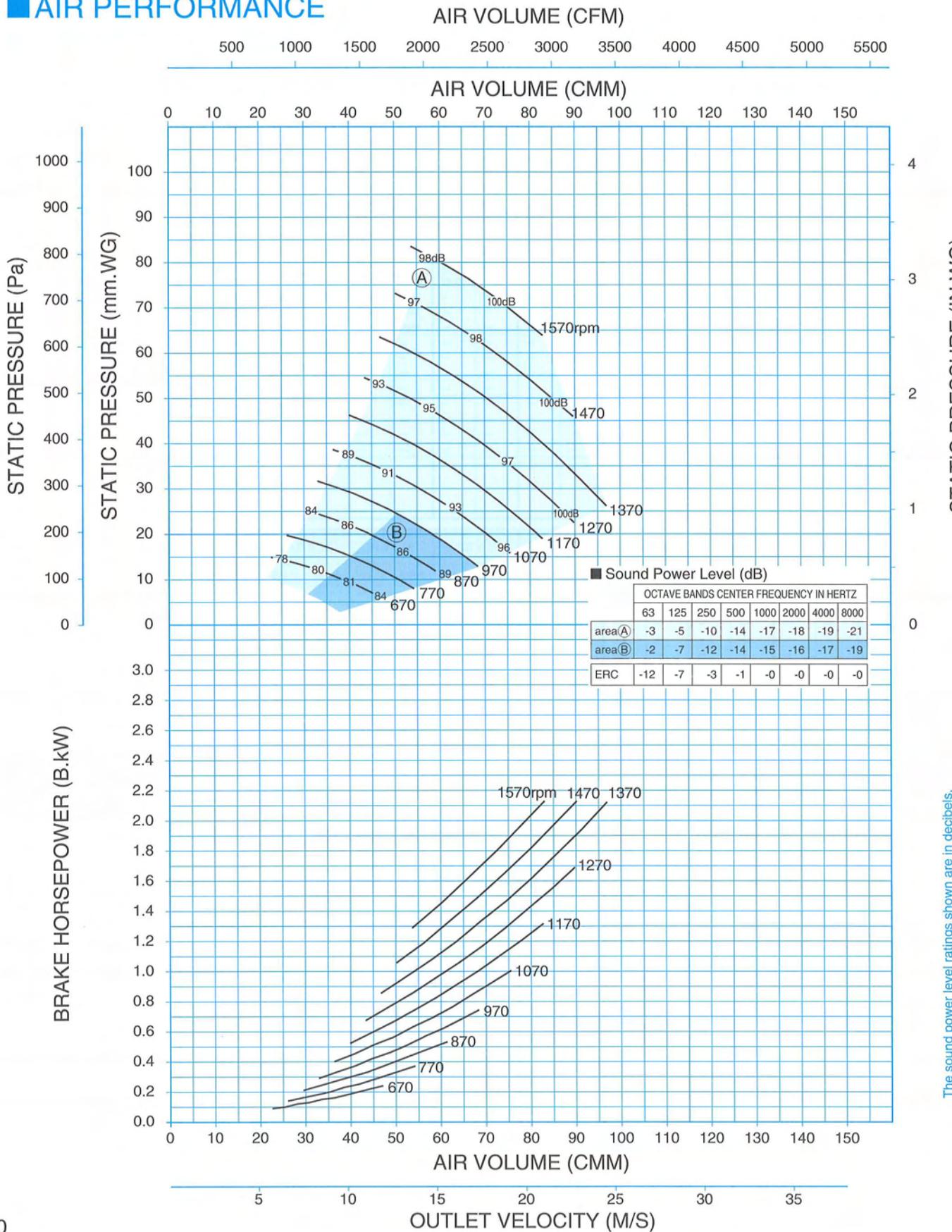
The sound power level ratings shown are in decibels, referred to 10^{-12} watts calculated per AMCA Standard 301. Values shown are for inlet Lwi sound power levels for Installation Type B: free inlet, ducted outlet. Ratings do not include the effects of duct end correction.

FY-12FCS-C

Floor-Mount Type

Ceiling-Mount Type

Wheel Diameter = 302.0 mm
 Outlet Area = 0.066 sq.m
 Tip Speed (m/s) = $0.0158 \times \text{RPM}$

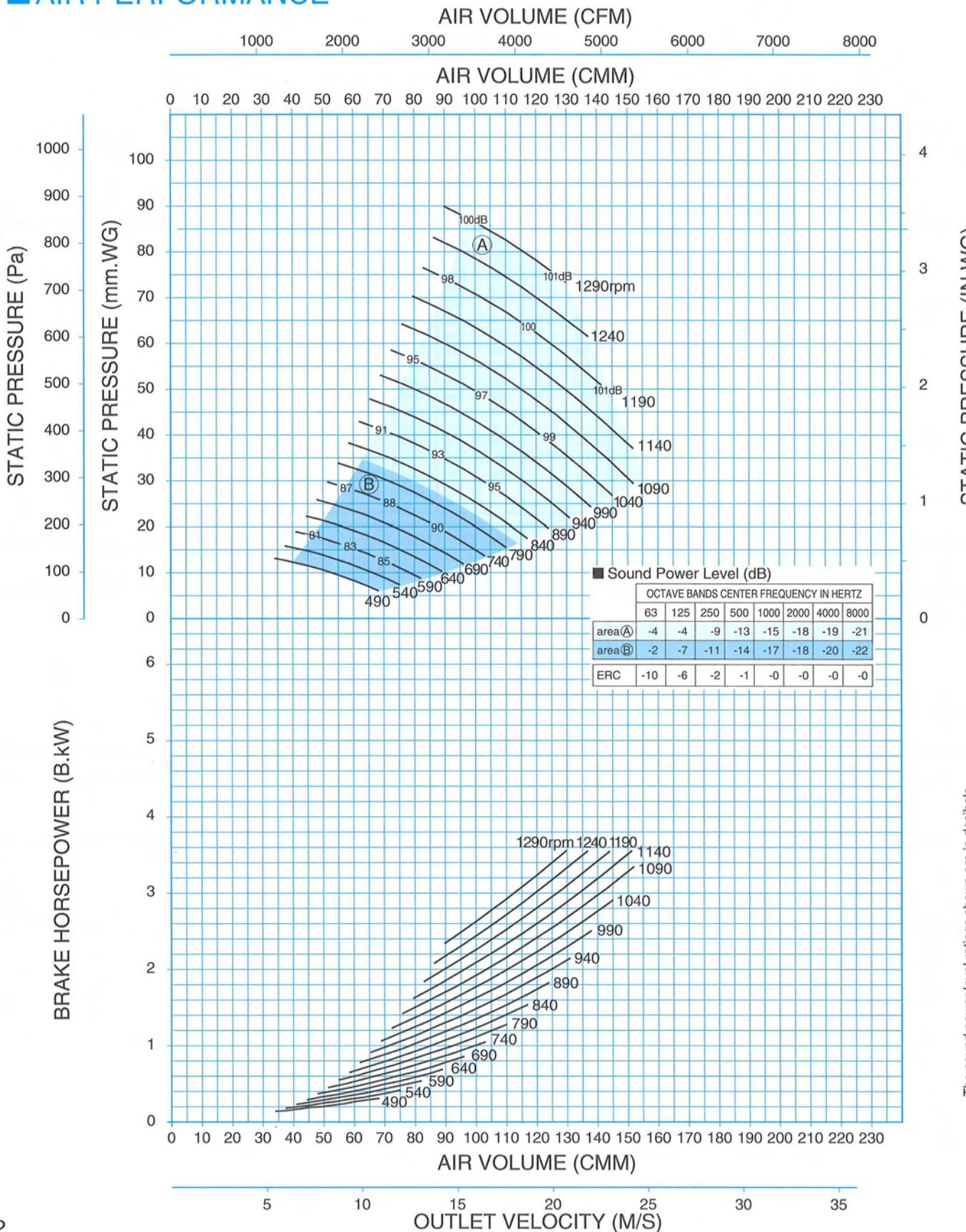
AIR PERFORMANCE

FY-15FCS-C

Floor-Mount Type

Ceiling-Mount Type

Wheel Diameter = 382.0 mm
 Outlet Area = 0.1045 sq.m
 Tip Speed (m/s) = 0.0200 × RPM

AIR PERFORMANCE

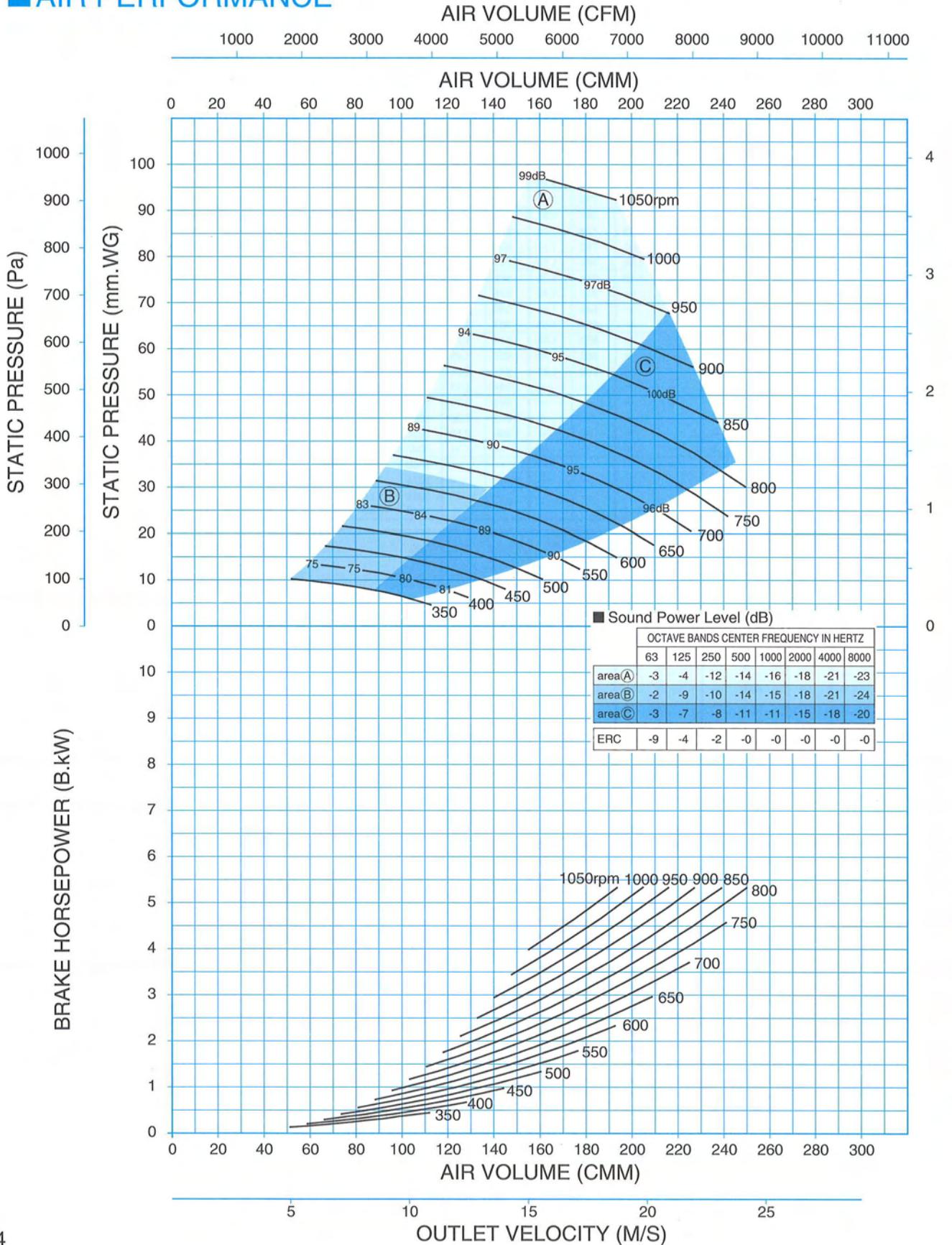
The sound power level ratings shown are in decibels, referred to 10^{12} watts calculated per AMCA Standard 301. Values shown are for inlet Lwi sound power levels for Installation Type B: free inlet, ducted outlet. Ratings do not include the effects of duct end correction.

FY-18FCS-C

Floor-Mount Type

Ceiling-Mount Type

Wheel Diameter = 464.0 mm
 Outlet Area = 0.1728 sq.m
 Tip Speed (m/s) = $0.0243 \times \text{RPM}$

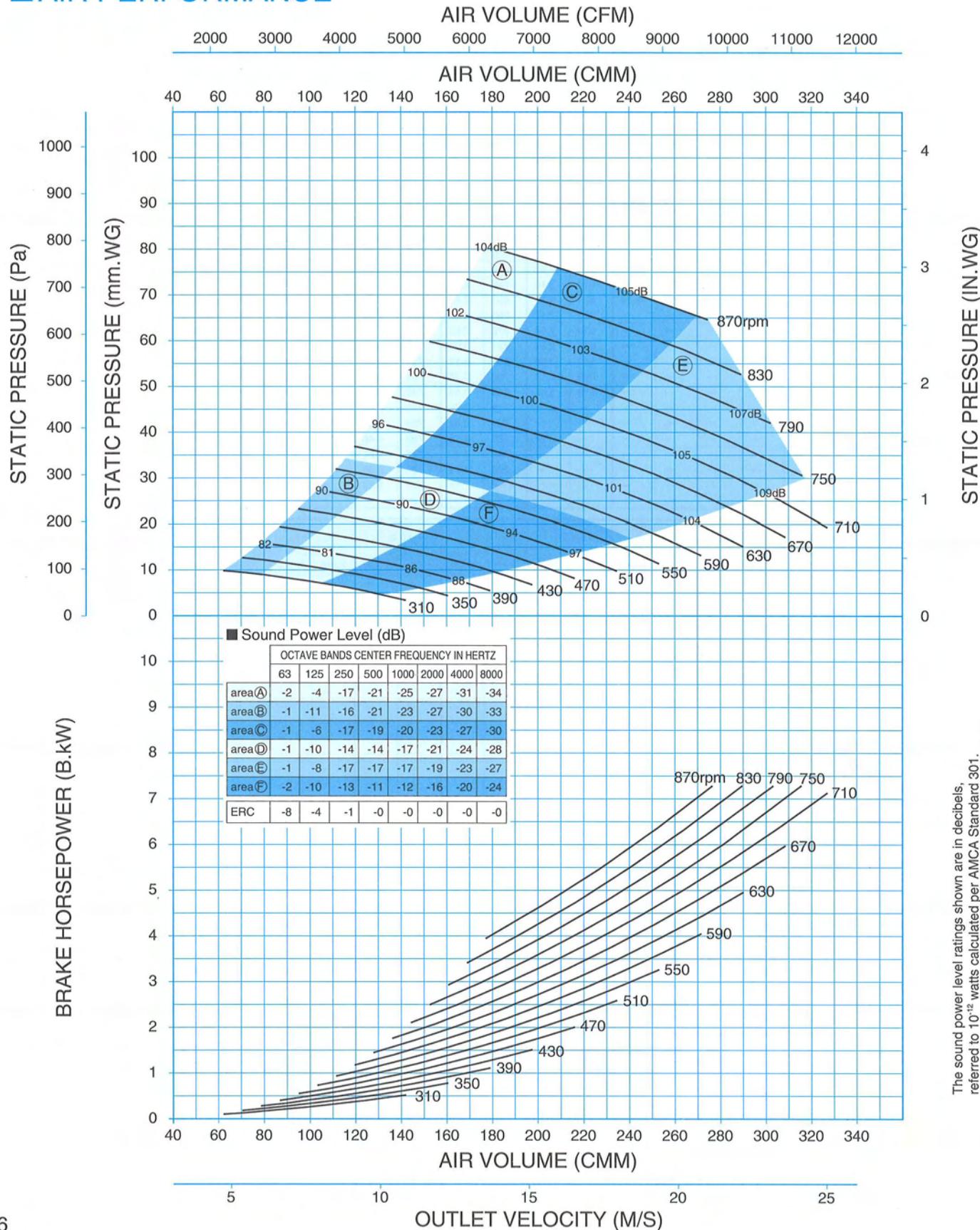
AIR PERFORMANCE

FY-21FCS-C

Floor-Mount Type

Ceiling-Mount Type

Wheel Diameter = 529.6 mm
 Outlet Area = 0.2184 sq.m
 Tip Speed (m/s) = $0.0277 \times \text{RPM}$

AIR PERFORMANCE

The sound power level ratings shown are in decibels, referred to 10^{-12} watts calculated per AMCA Standard 301. Values shown are for inlet LwI sound power levels for installation. Type B: free inlet, ducted outlet. Ratings do not include the effects of duct end correction.

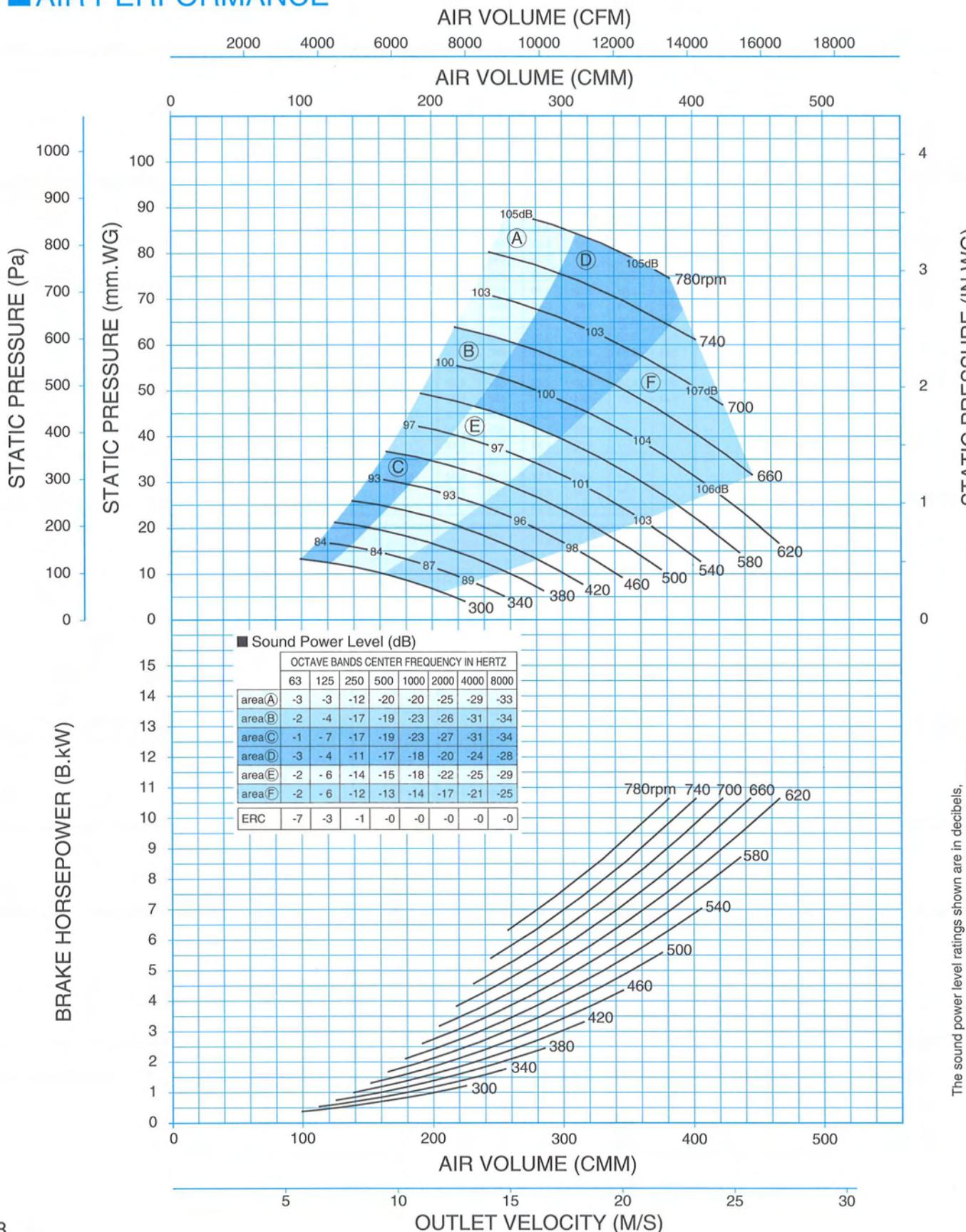
FY-24FCS-C

Floor-Mount Type

Ceiling-Mount Type

Wheel Diameter = 621.6 mm

Outlet Area = 0.288 sq.m

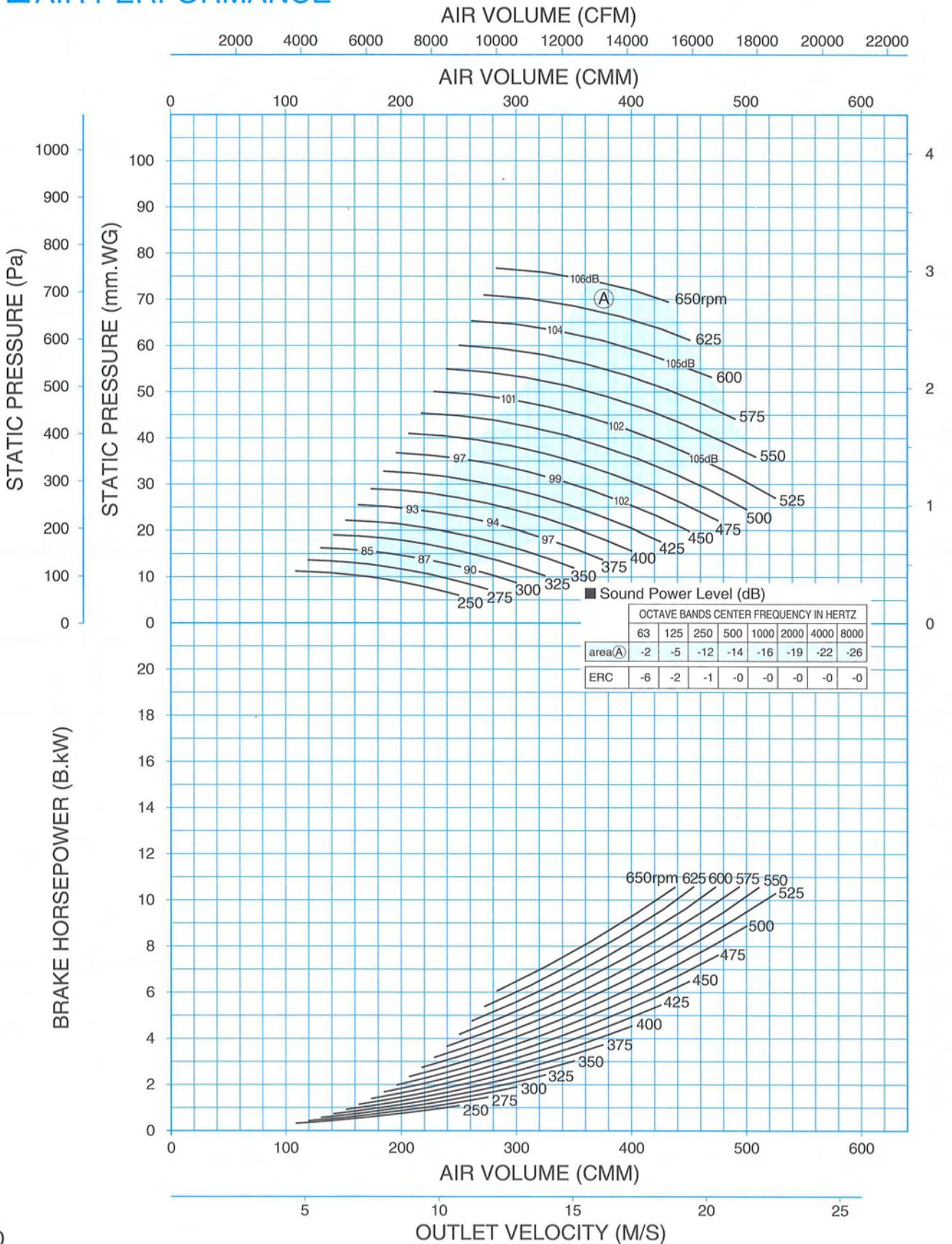
Tip Speed (m/s) = $0.0325 \times \text{RPM}$ **AIR PERFORMANCE**

The sound power level ratings shown are in decibels, referred to 10^{-12} watts calculated per AMCA Standard 301. Values shown are for inlet Lwi sound power levels for Installation Type B: free inlet, ducted outlet. Ratings do not include the effects of duct end correction.

FY-27FCS-C

Floor-Mount Type

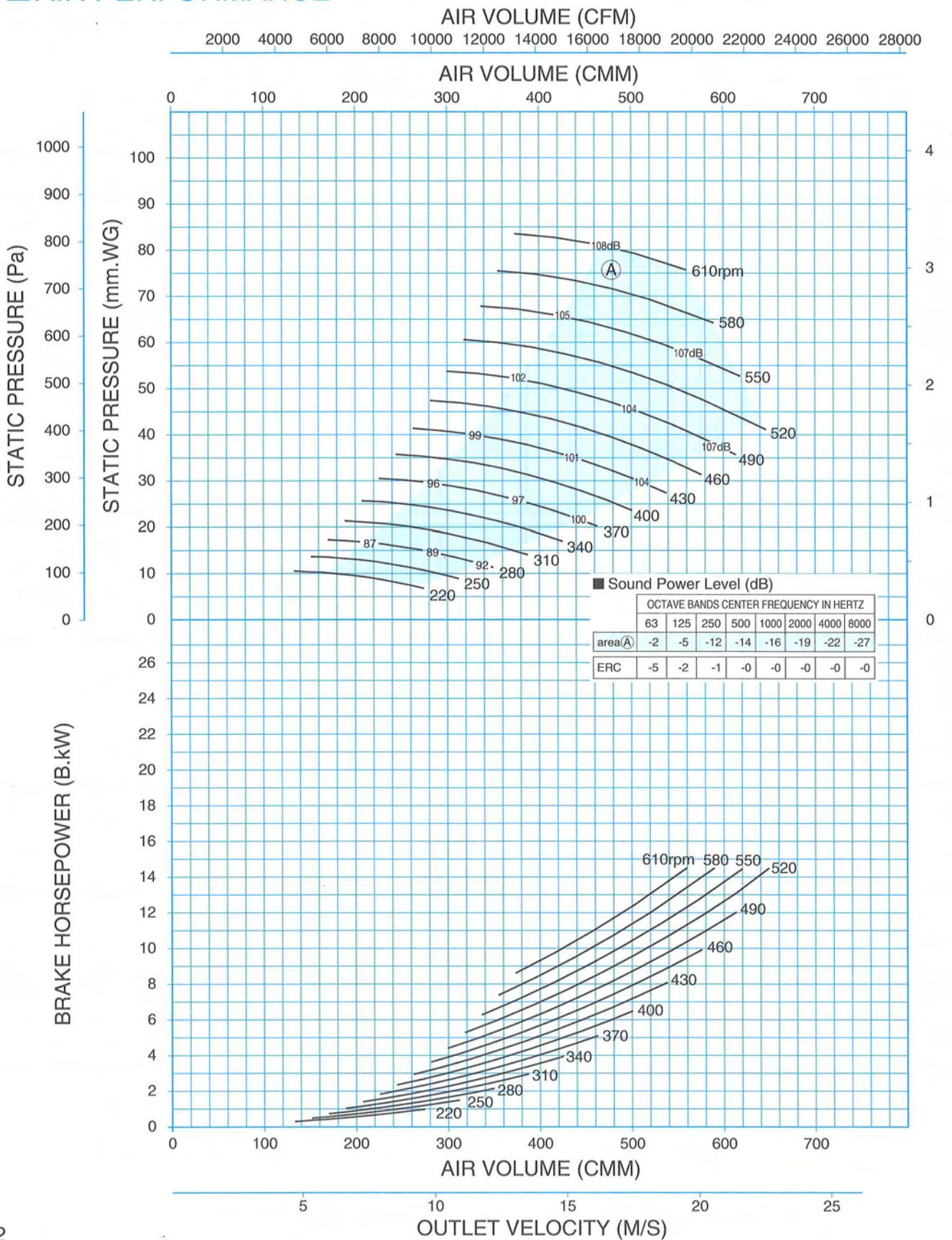
Wheel Diameter = 686.0 mm
 Outlet Area = 0.3888 sq.m
 Tip Speed (m/s) = 0.0359 × RPM

AIR PERFORMANCE

FY-30FCS-C

Floor-Mount Type

Wheel Diameter = 762.0 mm
 Outlet Area = 0.480 sq.m
 Tip Speed (m/s) = $0.0399 \times \text{RPM}$

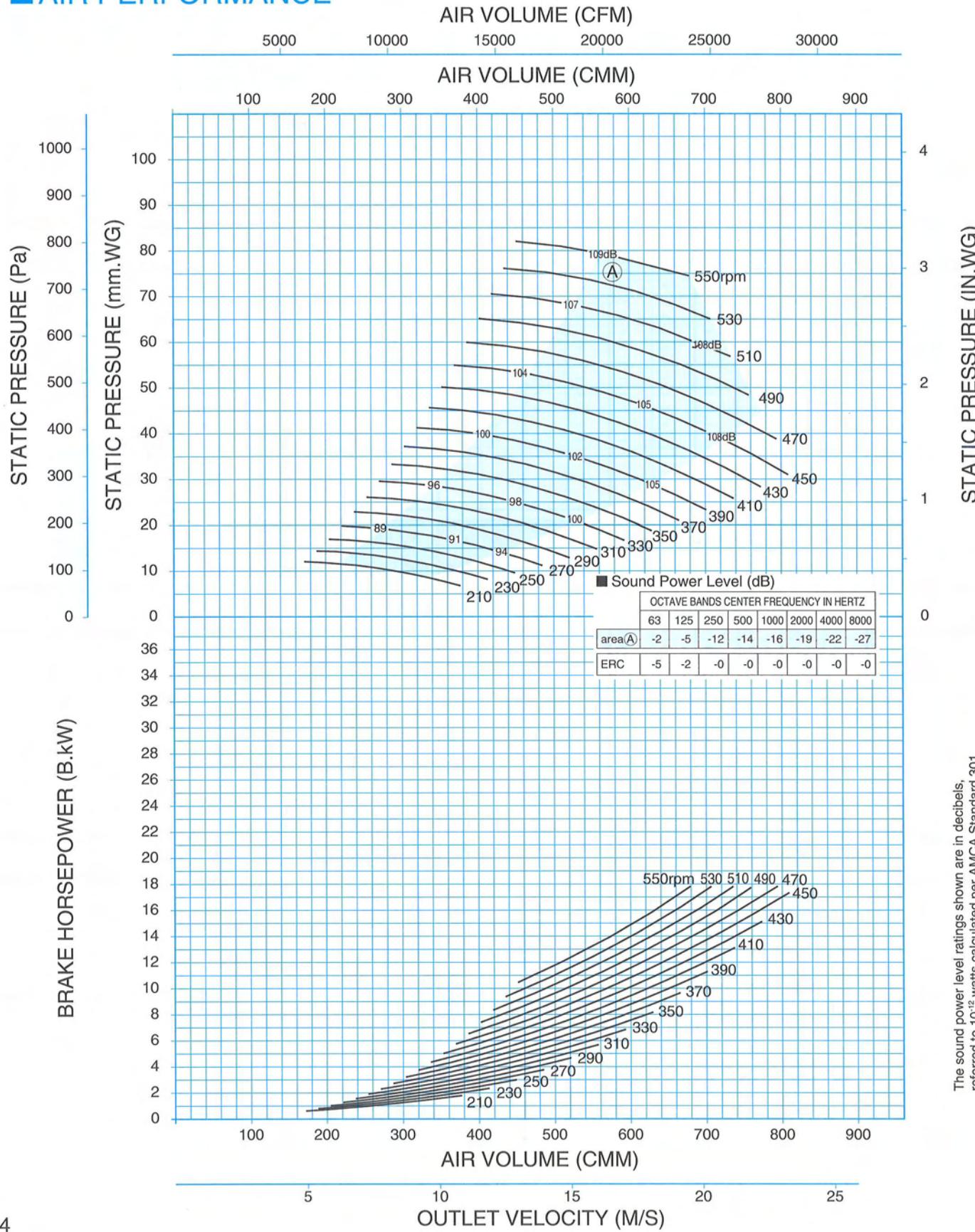
AIR PERFORMANCE

The sound power level ratings shown are in decibels, referred to 10^{-12} watts calculated per AMCA Standard 301. Values shown are for inlet L_{wi} sound power levels for Installation Type B: free inlet, ducted outlet. Ratings do not include the effects of duct end correction.

FY-33FCS-C

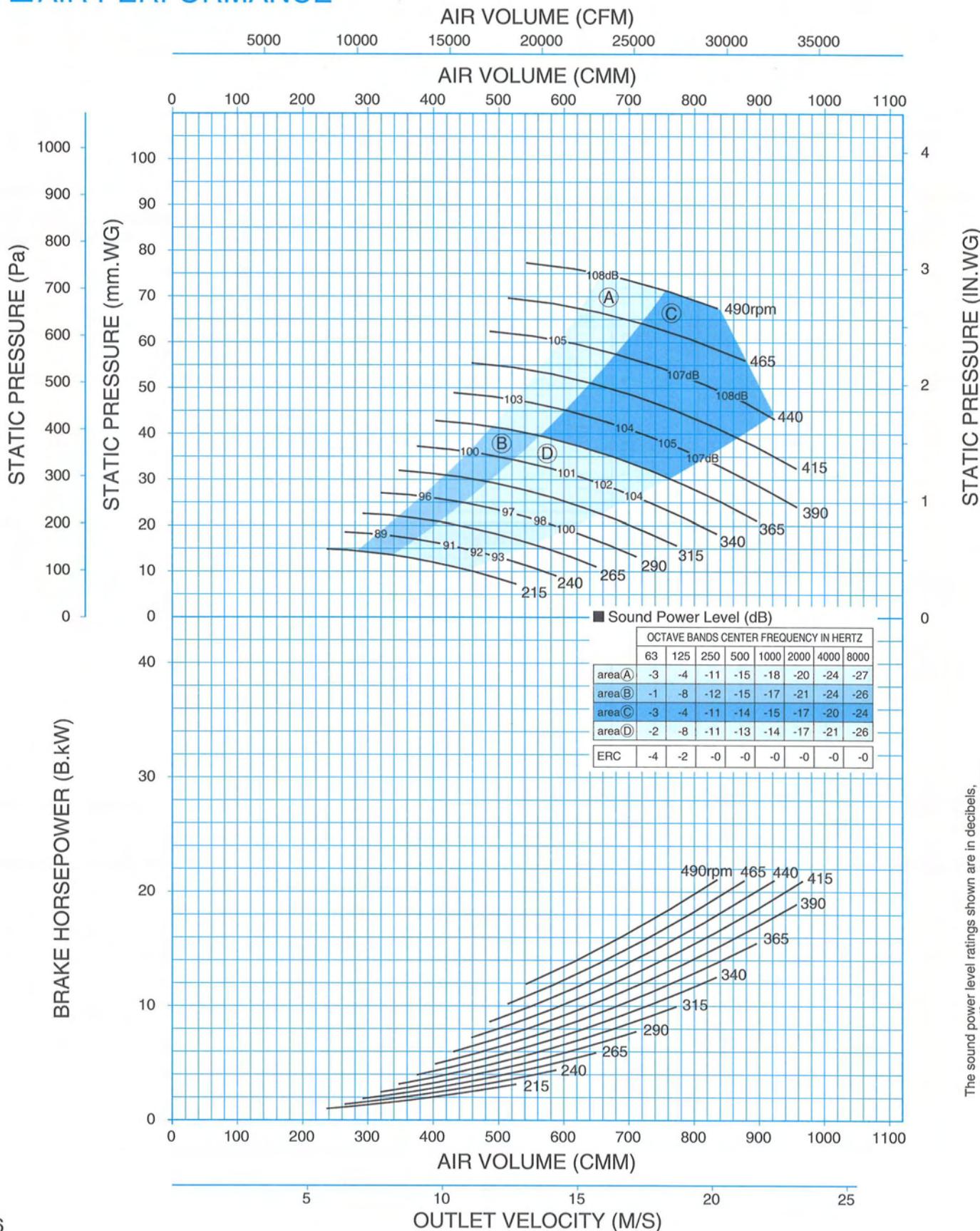
Floor-Mount Type

Wheel Diameter = 838.0 mm
 Outlet Area = 0.5808 sq.m
 Tip Speed (m/s) = 0.0439 × RPM

AIR PERFORMANCE

The sound power level ratings shown are in decibels,
 referred to 10^{-12} watts calculated per AMCA Standard 301.
 Values shown are for inlet Lwi sound power levels for Installation
 Type B: free inlet, ducted outlet.
 Ratings do not include the effects of duct end correction.

AIR PERFORMANCE



The sound power level ratings shown are in decibels, referred to 10^{12} watts calculated per AMCA Standard 301. Values shown are for inlet Lwi sound power levels for installation. Type B: free inlet, ducted outlet. Ratings do not include the effects of duct end correction.

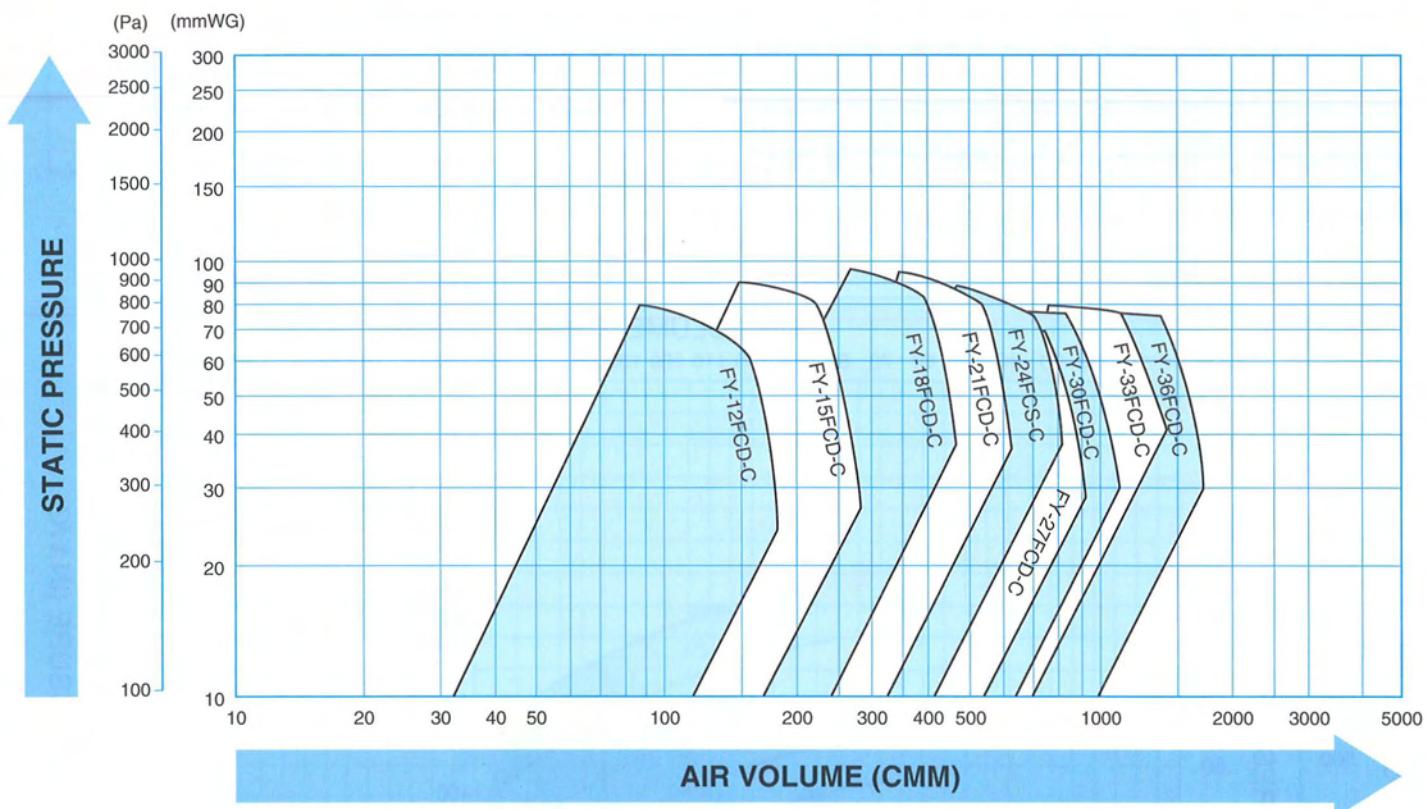
Panasonic CENTRIFUGAL FAN

Forward Curved Multi-Blade Fan DWDI

AIR PERFORMANCE DATA

C

■ Selection Chart



AVAILABLE MODELS

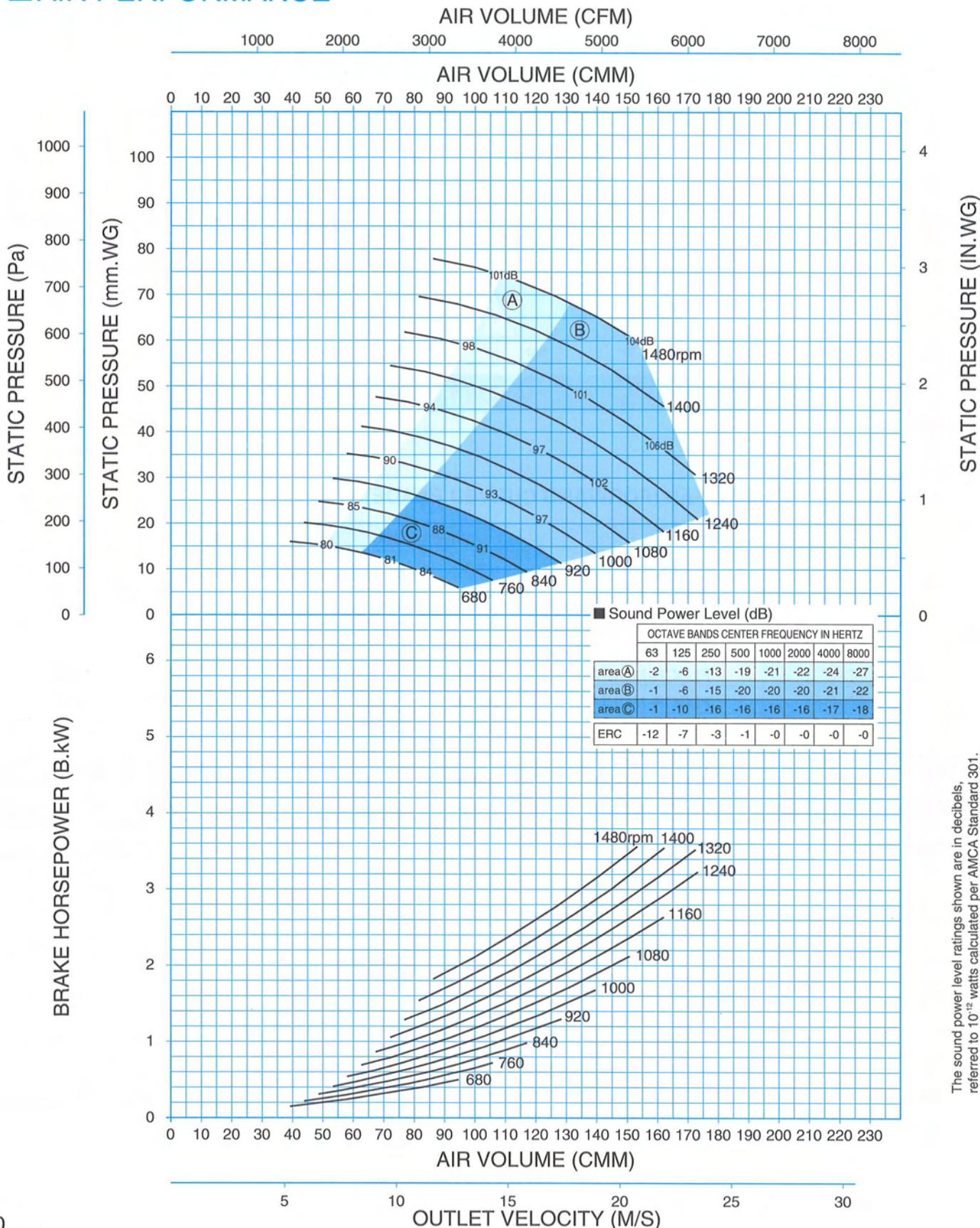
● DWDI CENTRIFUGAL FAN (FORWARD CURVED BLADE)

MODEL NO.	SWSI	WHEEL DIA		Approx weight kg
		mm	inch	
FY-12FCD-C	FLOOR-MOUNT	302.0	12	85
FY-15FCD-C	FLOOR-MOUNT	382.0	15	110
FY-18FCD-C	FLOOR-MOUNT	464.0	18	160
FY-21FCD-C	FLOOR-MOUNT	529.6	21	230
FY-24FCD-C	FLOOR-MOUNT	621.6	24	300
FY-27FCD-C	FLOOR-MOUNT	686.0	27	420
FY-30FCD-C	FLOOR-MOUNT	762.0	30	500
FY-33FCD-C	FLOOR-MOUNT	838.0	33	620
FY-36FCD-C	FLOOR-MOUNT	915.0	36	730

FY-12FCD-C

Floor-Mount Type

Wheel Diameter = 302.0 mm
 Outlet Area = 0.123 sq.m
 Tip Speed (m/s) = $0.0158 \times \text{RPM}$

AIR PERFORMANCE

The sound power level ratings shown are in decibels, referred to 10^{12} watts calculated per AMCA Standard 301. Values shown are for inlet L_{wi} sound power levels for Installation Type B: free inlet, ducted outlet. Ratings do not include the effects of duct end correction.