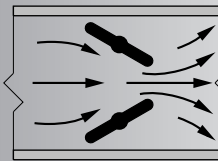


## DUAL DUCT VARIABLE OR CONSTANT AIR VOLUME

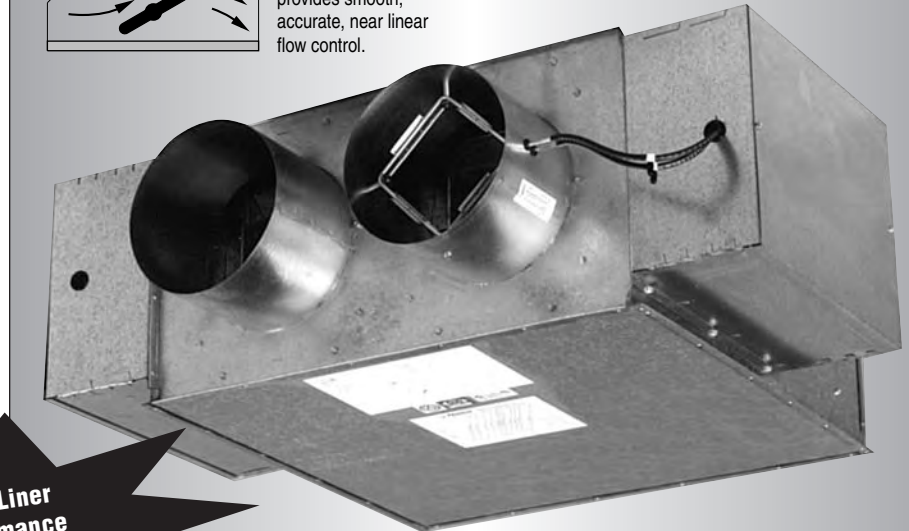
**3200 SERIES**  
• 1 : 12 MIXING

### Models:

- 3210 Without Attenuator**
- 3230 With Compact Mixing Attenuator**



Opposed blade valve configuration minimizes noisy turbulence and provides smooth, accurate, near linear flow control.



Model 3230

**Steri-Liner  
Performance  
Tested**

**Dual Duct** terminal units utilize pressure independent controls for accurate temperature and volume control. Nailor dual duct terminals are designed to precisely regulate and vary the volume of both the hot and cold deck of a dual duct system in response to thermostat demand. Many control sequences are possible with today's sophisticated controls. Each deck can be set to reset between a minimum and maximum air volume limit with numerous possibilities for hot and cold air mixing and proportioning.

Nailor has **three types** of dual duct terminal units. When no mixing is required, Model 3210 may be used. Essentially, two single duct terminal units working in tandem. When blending of hot and cold air is required, the Model 3230 comes with an integral compact mixing attenuator section which provides some attenuation of discharge noise and through the use of internal baffles, mixing of the hot and cold airstreams. The compact design of the 3230 lends itself to applications where there are tight space limitations, while still meeting or exceeding industry standard sound and mixing requirements. Minimum mixing efficiency is 1 in 12. That means there is less than a 1°F (0.55°C) temperature variation at the discharge for each 12°F (6.66°C) temperature difference between the hot and cold decks.

For the most demanding applications see model 3240 "Blendmaster™".

### STANDARD 3230 FEATURES:

- 1 in 12 minimum mixing efficiency.
- 22 ga. (0.86) zinc coated steel casing, mechanically sealed, low leakage construction.
- Special extra-low leakage opposed blade damper design with blade and jamb seals. Damper leakage is less than 1% of nominal flow at 6" w.g. (1.5 kPa) per ASHRAE Standard 130. 90° rotation. 1/2" (13) dia. plated steel driveshaft. An indicator mark at the end of the driveshaft shows damper position.
- Low leakage casing. Less than 1% of rated airflow at 6" w.g. (1.5 kPa).
- Designed for pneumatic, analog electronic or digital pressure

independent control.

- Multi-point averaging 'Diamond Flow' sensors standard for all applications; ensure accurate flow control.
- Gauge taps provided for field calibration and balancing.
- Downstream total flow sensing available for maximum control accuracy.
- Available in ten unit sizes to handle from 215 – 4050 cfm (101 – 1912 l/s).
- Unequal inlet sizes are an available option.
- Independently tested and certified to ARI 880 using Steri-Liner insulation, the preferred choice

for the majority of dual duct applications.

### Options:

- 3/4" (19) dual density fiberglass insulation. Exposed edges are coated to prevent erosion. Meets the requirements of NFPA 90A and UL 181.
- Model 3230 is available with a bottom access door.
- Other 'IAQ' insulations are available.



ARI Standard 880  
A Participating Corporation  
in the ARI 880  
Certification program.



## Dimensions

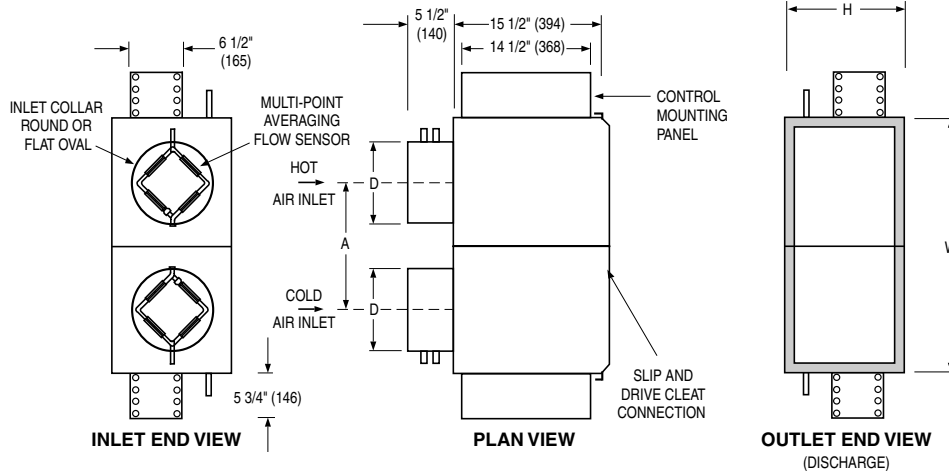
### Model 3210 • Without Attenuator • Non-Mixing Applications

- Variable volume cold and variable volume hot deck control. Zero minimum. No mixing.
- Multi-point flow sensors in each inlet provide accurate flow control.
- Opposed blade dampers control each deck independently. 45° rotation. Right hand CW to close. Left hand CCW to close.

- Rectangular discharge with slip and drive connection.
- Choice of right or left hand cold deck location. Hand of unit is determined by location of cold deck looking in direction of airflow. Right hand unit illustrated.
- For performance data, use single duct Model Series 3000 data on pages B7 – B12.

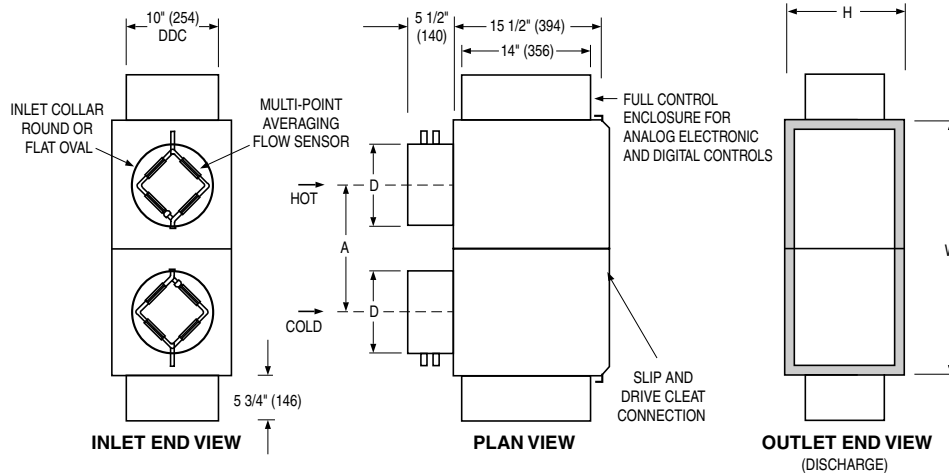
## Pneumatic Controls

- Universal pneumatic control mounting panel features double wall stand-off construction for strength and rigidity. Controls mounting screws do not penetrate casing.



## Analog Electronic and Digital Controls

- A full NEMA 1 controls enclosure is provided for factory mounted controls. Optional for field mounted controls.



## Dimensional Data

| Imperial Units (inches) |           |    |        |    |                       |
|-------------------------|-----------|----|--------|----|-----------------------|
| Unit Size               | cfm Range | W  | H      | A  | Inlet Size            |
| 4                       | 0 – 215   | 21 | 10     | 11 | 3 7/8 Round           |
| 5                       | 0 – 310   | 21 | 10     | 11 | 4 7/8 Round           |
| 6                       | 0 – 500   | 21 | 10     | 11 | 5 7/8 Round           |
| 7                       | 0 – 710   | 25 | 12 1/2 | 13 | 6 7/8 Round           |
| 8                       | 0 – 1000  | 25 | 12 1/2 | 13 | 7 7/8 Round           |
| 9                       | 0 – 1300  | 29 | 12 1/2 | 15 | 8 7/8 Round           |
| 10                      | 0 – 1435  | 29 | 12 1/2 | 15 | 9 7/8 Round           |
| 12                      | 0 – 2185  | 37 | 12 1/2 | 19 | 12 1/16 x 9 1/16 Oval |
| 14                      | 0 – 2745  | 49 | 12 1/2 | 25 | 16 1/16 x 9 1/16 Oval |
| 16                      | 0 – 3730  | 57 | 12 1/2 | 29 | 19 3/16 x 9 1/16 Oval |

| Metric Units (mm) |           |      |     |     |                |
|-------------------|-----------|------|-----|-----|----------------|
| Unit Size         | l/s Range | W    | H   | A   | Inlet Size     |
| 4                 | 0 – 101   | 533  | 254 | 279 | 98 Round       |
| 5                 | 0 – 146   | 533  | 254 | 279 | 124 Round      |
| 6                 | 0 – 236   | 533  | 254 | 279 | 149 Round      |
| 7                 | 0 – 335   | 635  | 318 | 330 | 175 Round      |
| 8                 | 0 – 472   | 635  | 318 | 330 | 200 Round      |
| 9                 | 0 – 614   | 737  | 318 | 381 | 225 Round      |
| 10                | 0 – 677   | 737  | 318 | 381 | 251 Round      |
| 12                | 0 – 1031  | 940  | 318 | 483 | 329 x 249 Oval |
| 14                | 0 – 1296  | 1245 | 318 | 635 | 408 x 249 Oval |
| 16                | 0 – 1761  | 1448 | 318 | 737 | 487 x 249 Oval |

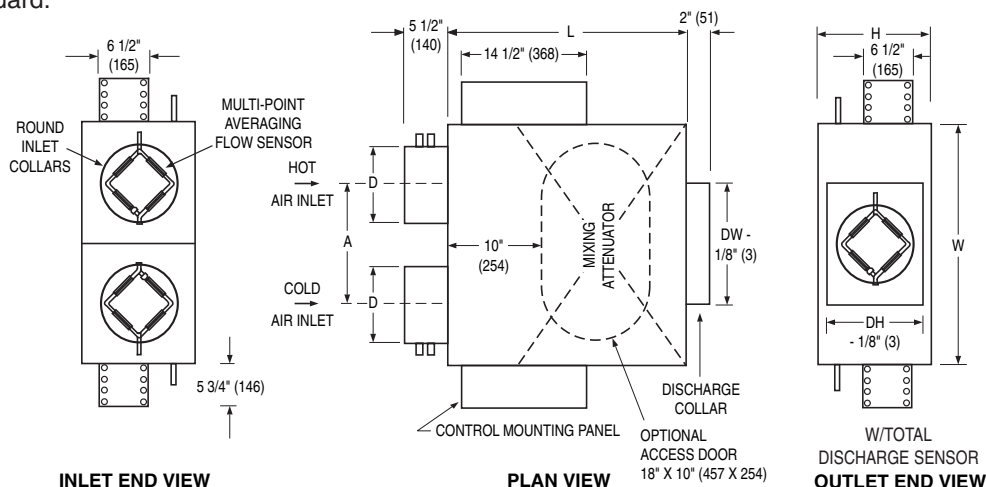
## Dimensions

### Model 3230 • Compact Mixing Attenuator • Mixing Application

- Variable volume or constant volume operation.
- Rectangular discharge collar optimally sized for duct run out.
- Integral mixing attenuator construction reduces insulation seams and reduces casing leakage.
- Multi-point 'Diamond Flow' Sensor available in three location configurations to suit exact control sequence requirement.
- Solid mixing baffles standard.
- Unique low leakage opposed blade dampers control each deck independently. 90° rotation. Right hand CW to close. Left hand CCW to close.
- When unequal sized inlets are used, the casing will be governed by the larger inlet size.
- Choice of right or left hand cold deck location. Hand of unit is determined by location of cold deck looking in direction of airflow. Right hand unit illustrated.

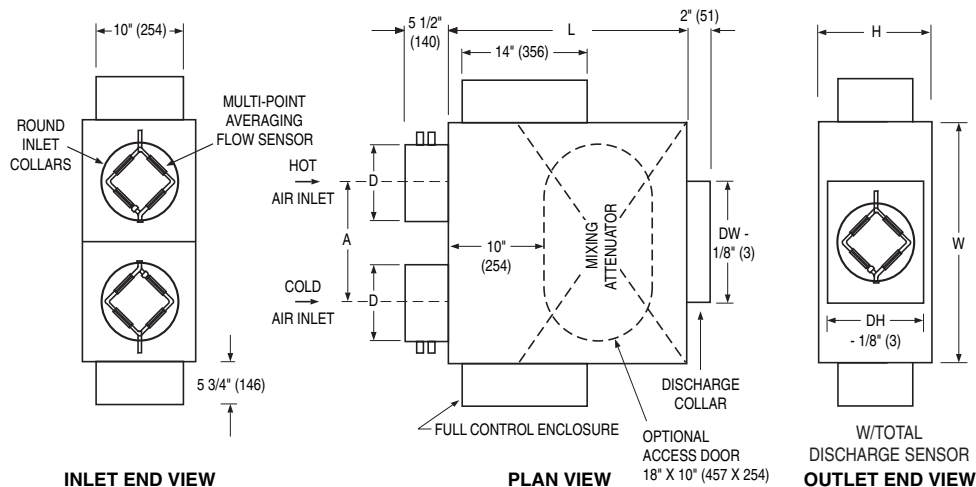
### Pneumatic Controls

- Universal pneumatic control mounting panel features double wall stand-off construction for strength and rigidity. Controls mounting screws do not penetrate casing.



### Analog Electronic and Digital Controls

- A full NEMA 1 controls enclosure is provided for factory mounted controls. Optional for field mounted controls.



### Dimensional Data

| Imperial Units (inches) |              |           |    |        |    |        |                |
|-------------------------|--------------|-----------|----|--------|----|--------|----------------|
| Unit Size               | Inlet Dia. D | cfm Range | W  | H      | L  | A      | Outlet DW x DH |
| 4                       | 3 7/8        | 0 - 215   | 24 | 10     | 24 | 11     | 8 x 8          |
| 5                       | 4 7/8        | 0 - 310   |    |        |    |        |                |
| 6                       | 5 7/8        | 0 - 500   |    |        |    |        |                |
| 7                       | 6 7/8        | 0 - 710   | 24 | 12 1/2 | 24 | 11     | 10 x 10        |
| 8                       | 7 7/8        | 0 - 1000  |    |        |    |        |                |
| 9                       | 8 7/8        | 0 - 1300  | 34 | 14     | 34 | 16 7/8 | 14 x 12        |
| 10                      | 9 7/8        | 0 - 1435  |    |        |    |        |                |
| 12                      | 11 7/8       | 0 - 2150  |    |        |    |        |                |
| 14                      | 13 7/8       | 0 - 3060  | 42 | 18     | 38 | 20 7/8 | 22 x 16        |
| 16                      | 15 7/8       | 0 - 4050  |    |        |    |        |                |

| Metric Units (mm) |              |           |      |     |     |     |                |
|-------------------|--------------|-----------|------|-----|-----|-----|----------------|
| Unit Size         | Inlet Dia. D | l/s Range | W    | H   | L   | A   | Outlet DW x DH |
| 4                 | 98           | 0 - 101   | 610  | 254 | 610 | 279 | 203 x 203      |
| 5                 | 124          | 0 - 146   |      |     |     |     |                |
| 6                 | 149          | 0 - 236   |      |     |     |     |                |
| 7                 | 175          | 0 - 335   | 610  | 318 | 610 | 279 | 254 x 254      |
| 8                 | 200          | 0 - 472   |      |     |     |     |                |
| 9                 | 225          | 0 - 614   | 864  | 356 | 864 | 410 | 356 x 305      |
| 10                | 251          | 0 - 677   |      |     |     |     |                |
| 12                | 302          | 0 - 1015  |      |     |     |     |                |
| 14                | 353          | 0 - 1444  | 1067 | 457 | 965 | 511 | 559 x 406      |
| 16                | 403          | 0 - 1912  |      |     |     |     |                |

DUAL DUCT TERMINAL UNITS

## Performance Data • NC Level Application Guide Model 3230 • With Mixing Attenuator and Steri-Liner Insulation

| Inlet Size | Airflow<br>cfm    l/s |      | NC Levels @ Inlet pressure (ΔPs) shown |                    |                    |                    |                    |                    |          |                    |                    |                    |                    |                    |    |    |
|------------|-----------------------|------|--|--------------------|--------------------|--------------------|--------------------|--------------------|----------|--------------------|--------------------|--------------------|--------------------|--------------------|----|----|
|            |                       |      | DISCHARGE                              |                    |                    |                    |                    |                    | RADIATED |                    |                    |                    |                    |                    |    |    |
|            |                       |      | Min. ΔPs                               | 0.5" w.g. (125 Pa) | 1.0" w.g. (250 Pa) | 1.5" w.g. (375 Pa) | 2.0" w.g. (500 Pa) | 3.0" w.g. (750 Pa) | Min. ΔPs | 0.5" w.g. (125 Pa) | 1.0" w.g. (250 Pa) | 1.5" w.g. (375 Pa) | 2.0" w.g. (500 Pa) | 3.0" w.g. (750 Pa) |    |    |
| 4          | 200                   | 94   | 0.11                                   | 28                 | -                  | -                  | -                  | -                  | 20       | 22                 | -                  | -                  | -                  | -                  | -  | 22 |
|            | 150                   | 71   | 0.06                                   | 16                 | -                  | -                  | -                  | -                  | -        | -                  | 28                 | -                  | -                  | -                  | -  | -  |
|            | 100                   | 47   | 0.03                                   | 7                  | -                  | -                  | -                  | -                  | -        | -                  | -                  | -                  | -                  | -                  | -  | 20 |
|            | 75                    | 35   | 0.02                                   | 4                  | -                  | -                  | -                  | -                  | -        | -                  | -                  | -                  | -                  | -                  | -  | -  |
|            | 50                    | 24   | 0.01                                   | 2                  | -                  | -                  | -                  | -                  | -        | -                  | -                  | -                  | -                  | -                  | -  | -  |
| 5          | 300                   | 142  | 0.22                                   | 54                 | -                  | -                  | -                  | 24                 | 27       | 27                 | -                  | -                  | 20                 | 25                 | 25 | 29 |
|            | 250                   | 118  | 0.15                                   | 37                 | -                  | -                  | -                  | -                  | 22       | 23                 | -                  | -                  | -                  | -                  | 20 | 23 |
|            | 200                   | 94   | 0.10                                   | 24                 | -                  | -                  | -                  | -                  | -        | 20                 | -                  | -                  | -                  | -                  | -  | 22 |
|            | 125                   | 59   | 0.04                                   | 9                  | -                  | -                  | -                  | -                  | -        | -                  | -                  | -                  | -                  | -                  | -  | 23 |
|            | 75                    | 35   | 0.01                                   | 3                  | -                  | -                  | -                  | -                  | -        | -                  | -                  | -                  | -                  | -                  | -  | -  |
| 6          | 500                   | 236  | 0.49                                   | 122                | -                  | -                  | 23                 | 28                 | 31       | 35                 | 20                 | 23                 | 25                 | 30                 | 33 | 35 |
|            | 400                   | 189  | 0.31                                   | 77                 | -                  | -                  | 20                 | 25                 | 28       | 28                 | -                  | -                  | 23                 | 27                 | 27 | 30 |
|            | 300                   | 142  | 0.17                                   | 42                 | -                  | -                  | -                  | -                  | 22       | 23                 | -                  | -                  | -                  | 20                 | 23 | 25 |
|            | 200                   | 94   | 0.07                                   | 17                 | -                  | -                  | -                  | -                  | -        | -                  | -                  | -                  | -                  | -                  | 20 | 25 |
|            | 100                   | 47   | 0.02                                   | 5                  | -                  | -                  | -                  | -                  | -        | -                  | -                  | -                  | -                  | -                  | -  | -  |
| 7          | 650                   | 307  | 0.48                                   | 119                | -                  | 20                 | 32                 | 38                 | 40       | 44                 | 20                 | 23                 | 33                 | 39                 | 43 | 49 |
|            | 550                   | 260  | 0.33                                   | 83                 | -                  | -                  | 28                 | 34                 | 37       | 40                 | -                  | -                  | 29                 | 35                 | 40 | 45 |
|            | 335                   | 158  | 0.11                                   | 28                 | -                  | -                  | 23                 | 29                 | 29       | 32                 | -                  | -                  | 32                 | 34                 | 38 | 40 |
|            | 225                   | 106  | 0.05                                   | 12                 | -                  | -                  | -                  | -                  | -        | -                  | -                  | -                  | 24                 | 25                 | 28 | 30 |
|            | 110                   | 52   | 0.01                                   | 2                  | -                  | -                  | -                  | -                  | -        | -                  | -                  | -                  | 20                 | 22                 | 24 | 27 |
| 8          | 850                   | 401  | 0.71                                   | 177                | 22                 | *                  | 29                 | 37                 | 39       | 45                 | 25                 | *                  | 33                 | 38                 | 42 | 50 |
|            | 700                   | 330  | 0.47                                   | 117                | -                  | -                  | 32                 | 36                 | 38       | 43                 | -                  | 22                 | 32                 | 38                 | 42 | 49 |
|            | 500                   | 236  | 0.23                                   | 57                 | -                  | -                  | 25                 | 28                 | 29       | 33                 | -                  | 20                 | 30                 | 36                 | 40 | 44 |
|            | 350                   | 146  | 0.11                                   | 27                 | -                  | -                  | 22                 | 28                 | 29       | 30                 | -                  | -                  | 31                 | 34                 | 36 | 39 |
|            | 200                   | 94   | 0.03                                   | 8                  | -                  | -                  | -                  | -                  | -        | -                  | -                  | -                  | 23                 | 25                 | 27 | 30 |
| 9          | 1050                  | 495  | 0.31                                   | 76                 | -                  | -                  | 28                 | 35                 | 39       | 43                 | -                  | 23                 | 34                 | 39                 | 42 | 48 |
|            | 900                   | 425  | 0.22                                   | 54                 | -                  | -                  | 27                 | 34                 | 38       | 42                 | -                  | 22                 | 33                 | 38                 | 40 | 47 |
|            | 675                   | 319  | 0.11                                   | 28                 | -                  | -                  | 23                 | 28                 | 28       | 28                 | -                  | -                  | 27                 | 30                 | 34 | 32 |
|            | 450                   | 212  | 0.04                                   | 11                 | -                  | -                  | -                  | 22                 | 20       | -                  | -                  | -                  | 20                 | 23                 | 28 | 25 |
|            | 225                   | 106  | 0.01                                   | 2                  | -                  | -                  | -                  | -                  | -        | -                  | -                  | -                  | -                  | -                  | -  | -  |
| 10         | 1350                  | 637  | 0.48                                   | 119                | -                  | 20                 | 29                 | 35                 | 38       | 45                 | 24                 | 25                 | 34                 | 38                 | 43 | 48 |
|            | 1100                  | 519  | 0.31                                   | 77                 | -                  | -                  | 28                 | 35                 | 37       | 40                 | -                  | 22                 | 33                 | 37                 | 40 | 47 |
|            | 800                   | 378  | 0.16                                   | 40                 | -                  | -                  | 25                 | 30                 | 30       | 33                 | -                  | -                  | 30                 | 35                 | 35 | 36 |
|            | 550                   | 260  | 0.07                                   | 17                 | -                  | -                  | -                  | 25                 | 23       | 20                 | -                  | -                  | 22                 | 25                 | 30 | 26 |
|            | 250                   | 118  | 0.01                                   | 3                  | -                  | -                  | -                  | -                  | -        | -                  | -                  | -                  | -                  | -                  | -  | -  |
| 12         | 1950                  | 920  | 0.75                                   | 187                | 27                 | *                  | 32                 | 36                 | 40       | 46                 | 29                 | *                  | 33                 | 36                 | 40 | 47 |
|            | 1600                  | 755  | 0.49                                   | 122                | -                  | 21                 | 30                 | 36                 | 39       | 44                 | 21                 | 22                 | 30                 | 36                 | 40 | 45 |
|            | 1200                  | 566  | 0.26                                   | 65                 | -                  | -                  | 28                 | 34                 | 36       | 40                 | -                  | -                  | 29                 | 35                 | 38 | 42 |
|            | 800                   | 376  | 0.11                                   | 27                 | -                  | -                  | 21                 | 28                 | 30       | 34                 | -                  | -                  | 26                 | 30                 | 32 | 35 |
|            | 400                   | 189  | 0.03                                   | 8                  | -                  | -                  | -                  | -                  | 20       | 22                 | -                  | -                  | -                  | -                  | 22 | 25 |
| 14         | 2700                  | 1274 | 0.63                                   | 157                | 25                 | *                  | 30                 | 34                 | 36       | 40                 | 26                 | *                  | 30                 | 34                 | 36 | 40 |
|            | 2100                  | 991  | 0.37                                   | 92                 | -                  | -                  | 26                 | 32                 | 35       | 37                 | -                  | 20                 | 25                 | 31                 | 35 | 38 |
|            | 1600                  | 755  | 0.21                                   | 52                 | -                  | -                  | 23                 | 28                 | 30       | 35                 | -                  | -                  | 24                 | 30                 | 30 | 35 |
|            | 1050                  | 496  | 0.08                                   | 20                 | -                  | -                  | -                  | 20                 | 25       | 30                 | -                  | -                  | -                  | 24                 | 25 | 30 |
|            | 550                   | 260  | 0.02                                   | 5                  | -                  | -                  | -                  | -                  | -        | -                  | -                  | -                  | -                  | -                  | -  | -  |
| 16         | 3425                  | 1616 | 1.05                                   | 261                | 33                 | *                  | *                  | 36                 | 39       | 37                 | 33                 | *                  | *                  | 35                 | 38 | 42 |
|            | 2750                  | 1298 | 0.66                                   | 164                | 20                 | *                  | 28                 | 33                 | 35       | 37                 | 25                 | *                  | 27                 | 34                 | 35 | 40 |
|            | 2050                  | 967  | 0.37                                   | 92                 | -                  | -                  | 21                 | 25                 | 27       | 30                 | -                  | -                  | 25                 | 30                 | 32 | 36 |
|            | 1375                  | 649  | 0.16                                   | 40                 | -                  | -                  | -                  | -                  | 22       | 25                 | -                  | -                  | 20                 | 26                 | 28 | 29 |
|            | 700                   | 330  | 0.04                                   | 10                 | -                  | -                  | -                  | -                  | -        | -                  | -                  | -                  | -                  | -                  | -  | 20 |

### Performance Notes:

1. NC levels are calculated based on procedures as documented on page C7.
2. Dash (-) in space indicates NC level less than 20.
3. Asterisk (\*) in space indicates that the minimum inlet static pressure requirement is greater than 0.5" w.g. (125 Pa) or 1.0" w.g. (250 Pa) at rated airflow.

## Performance Data Explanation

### Sound Power Levels vs. NC Levels

The **Nailor 3200 Series** dual duct terminal unit performance data is presented in two forms.

The laboratory obtained discharge and radiated sound power levels in octave bands 2 through 7 (125 through 4000 Hz center frequency) for each unit size at various flow rates and inlet static pressures is presented. This data is derived in accordance with ANSI/ASHRAE Standard 130-1996 and ARI Standard 880-98. This data is "raw" with no attenuation deductions and includes ARI Certification standard rating points.

Nailor also provides an "NC Level" table as an application aid in terminal selection, which include attenuation allowances as explained below. The suggested attenuation allowances are typical and are not representative of specific job site conditions. It is recommended that the sound power level data be used and a detailed NC calculation be performed using the procedures outlined in ARI 885-98 for accurate space sound levels.

### Explanation of NC Levels

Tabulated NC levels are based on attenuation values as outlined in ARI Standard 885-98 "Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets." ARI Standard 885-98, Appendix E provides typical sound attenuation values for air terminal discharge sound and air terminal radiated sound.

As stated in ARI-885-98, Appendix E, "These values can be used as a quick method of estimating space sound levels when a detailed evaluation is not available. The typical attenuation values are recommended for use by manufacturers to estimate application sound levels. In product catalogs, the end use environments are not known and the following factors are provided as typical attenuation values. Use of these values will allow better comparison between manufacturers and give the end user a value which will be expected to be applicable for many types of space."

Please refer to the Performance Data Caveat on page A17 of this catalog.

### Radiated Sound

Table E1 of Appendix E provides typical radiated sound attenuation values for three types of ceiling: Type 1 – Glass Fiber; Type 2 – Mineral Fiber; Type 3 – Solid Gypsum Board.

Since Mineral Fiber tile ceilings are the most common construction used in commercial buildings, these values have been used to tabulate Radiated NC levels.

The following table provides the calculation method for the radiated sound total attenuation values based on ARI Standard 885-98.

|                                    | Octave Band |           |           |           |           |           |
|------------------------------------|-------------|-----------|-----------|-----------|-----------|-----------|
|                                    | 2           | 3         | 4         | 5         | 6         | 7         |
| Environmental Effect               | 2           | 1         | 0         | 0         | 0         | 0         |
| Ceiling/Space Effect               | 16          | 18        | 20        | 26        | 31        | 36        |
| <b>Total Attenuation Deduction</b> | <b>18</b>   | <b>19</b> | <b>20</b> | <b>26</b> | <b>31</b> | <b>36</b> |

The ceiling/space effect assumes the following conditions:

1. 5/8" (16) tile, 20 lb/ft<sup>3</sup> (313 kg/m<sup>3</sup>) density.
2. The plenum is at least 3 feet (914) deep.
3. The plenum space is either wide (over 30 feet [9 m]) or lined with insulation.
4. The ceiling has no significant penetration directly under the unit.

### Discharge Sound

Table E1 of Appendix E provides typical discharge sound attenuation values for three sizes of terminal unit.

1. Small box; Less than 300 cfm (142 l/s)  
(Discharge Duct 8" x 8" [203 x 203]).
2. Medium box; 300 – 700 cfm (142 – 330 l/s)  
(Discharge Duct 12" x 12" [305 x 305]).
3. Large box; Greater than 700 cfm (330 l/s)  
(Discharge Duct 15" x 15" [381 x 381]).

These attenuation values have been used to tabulate Discharge NC levels applied against the terminal airflow volume and not terminal unit size.

The following tables provide the calculation method for the discharge sound total attenuation values based on ARI Standard 885-98.

| Small Box<br>< 300 cfm                    | Octave Band |           |           |           |           |           |
|---|-------------|-----------|-----------|-----------|-----------|-----------|
|   | 2           | 3         | 4         | 5         | 6         | 7         |
| Environmental Effect                      | 2           | 1         | 0         | 0         | 0         | 0         |
| 5 ft. (1.5 m) 1" (25) Duct Lining         | 2           | 6         | 12        | 25        | 29        | 18        |
| Branch Power Division (1 outlet)          | 0           | 0         | 0         | 0         | 0         | 0         |
| 5 ft. (1.5 m), 8 in. dia. (200) Flex Duct | 6           | 10        | 18        | 20        | 21        | 12        |
| End Reflection                            | 9           | 5         | 2         | 0         | 0         | 0         |
| Space Effect                              | 5           | 6         | 7         | 8         | 9         | 10        |
| <b>Total Attenuation Deduction</b>        | <b>24</b>   | <b>28</b> | <b>39</b> | <b>53</b> | <b>59</b> | <b>40</b> |

| Medium Box<br>300 - 700 cfm               | Octave Band |           |           |           |           |           |
|---|-------------|-----------|-----------|-----------|-----------|-----------|
|   | 2           | 3         | 4         | 5         | 6         | 7         |
| Environmental Effect                      | 2           | 1         | 0         | 0         | 0         | 0         |
| 5 ft. (1.5 m) 1" (25) Duct Lining         | 2           | 4         | 10        | 20        | 20        | 14        |
| Branch Power Division (2 outlets)         | 3           | 3         | 3         | 3         | 3         | 3         |
| 5 ft. (1.5 m), 8 in. dia. (200) Flex Duct | 6           | 10        | 18        | 20        | 21        | 12        |
| End Reflection                            | 9           | 5         | 2         | 0         | 0         | 0         |
| Space Effect                              | 5           | 6         | 7         | 8         | 9         | 10        |
| <b>Total Attenuation Deduction</b>        | <b>27</b>   | <b>29</b> | <b>40</b> | <b>51</b> | <b>53</b> | <b>39</b> |

| Large Box<br>>700 cfm                     | Octave Band |           |           |           |           |           |
|---|-------------|-----------|-----------|-----------|-----------|-----------|
|   | 2           | 3         | 4         | 5         | 6         | 7         |
| Environmental Effect                      | 2           | 1         | 0         | 0         | 0         | 0         |
| 5 ft. (1.5 m) 1" (25) Duct Lining         | 2           | 3         | 9         | 18        | 17        | 12        |
| Branch Power Division (3 outlets)         | 5           | 5         | 5         | 5         | 5         | 5         |
| 5 ft. (1.5 m), 8 in. dia. (200) Flex Duct | 6           | 10        | 18        | 20        | 21        | 12        |
| End Reflection                            | 9           | 5         | 2         | 0         | 0         | 0         |
| Space Effect                              | 5           | 6         | 7         | 8         | 9         | 10        |
| <b>Total Attenuation Deduction</b>        | <b>29</b>   | <b>30</b> | <b>41</b> | <b>51</b> | <b>52</b> | <b>39</b> |

1. Flexible duct is non-metallic with 1" (25) insulation.
2. Space effect (room size and receiver location) 2500 ft.<sup>3</sup> (69 m<sup>3</sup>) and 5 ft. (1.5 m) distance from source.

For a complete explanation of the attenuation factors and the procedures for calculating room NC levels, please refer to the acoustical engineering guidelines at the back of this catalog and ARI Standard 885-98.

## Performance Data • Discharge Sound Power Levels Model 3230 • With Mixing Attenuator and Steri-Liner Insulation

| Inlet Size | Airflow<br>cfm /s | Min. inlet<br>ΔPs<br>"w.g. Pa | Sound Power Octave Bands @ Inlet pressure shown |    |      |    |    |    |           |                       |    |    |    |    |    |    |                       |    |    |    |    |    |    |                       |    |    |    |    |    |    |                       |    |    |    |    |    |    |                       |    |  |  |  |  |  |
|------------|-------------------|-------------------------------|---|----|------|----|----|----|-----------|-----------------------|----|----|----|----|----|----|-----------------------|----|----|----|----|----|----|-----------------------|----|----|----|----|----|----|-----------------------|----|----|----|----|----|----|-----------------------|----|--|--|--|--|--|
|            |                   |                               | Min. ΔPs  |    |      |    |    |    |           | 0.5" w.g. (125Pa) ΔPs |    |    |    |    |    |    | 1.0" w.g. (250Pa) ΔPs |    |    |    |    |    |    | 1.5" w.g. (375Pa) ΔPs |    |    |    |    |    |    | 2.0" w.g. (500Pa) ΔPs |    |    |    |    |    |    | 3.0" w.g. (750Pa) ΔPs |    |  |  |  |  |  |
|            |                   |                               | 2   | 3  | 4    | 5  | 6  | 7  | 2         | 3                     | 4  | 5  | 6  | 7  | 2  | 3  | 4                     | 5  | 6  | 7  | 2  | 3  | 4  | 5                     | 6  | 7  | 2  | 3  | 4  | 5  | 6                     | 7  | 2  | 3  | 4  | 5  | 6  | 7                     |    |  |  |  |  |  |
| 4          | 200 94            | 0.11 28                       | 42  | 41 | 35   | 30 | 23 | -  | 49        | 50                    | 43 | 40 | 33 | 28 | 53 | 56 | 47                    | 45 | 40 | 37 | 55 | 58 | 50 | 46                    | 42 | 45 | 58 | 61 | 53 | 49 | 45                    | 47 | 58 | 62 | 55 | 51 | 46 | 46                    |    |  |  |  |  |  |
|            | 150 71            | 0.06 16                       | 40  | 39 | 32   | 27 | -  | -  | 47        | 48                    | 40 | 37 | 29 | 25 | 51 | 54 | 44                    | 42 | 36 | 34 | 53 | 56 | 47 | 43                    | 38 | 42 | 56 | 59 | 52 | 46 | 41                    | 44 | 56 | 60 | 54 | 50 | 42 | 43                    |    |  |  |  |  |  |
|            | 100 47            | 0.03 7                        | 39  | 30 | 21   | -  | -  | -  | 44        | 43                    | 35 | 33 | 25 | 25 | 47 | 49 | 40                    | 36 | 31 | 40 | 49 | 52 | 45 | 40                    | 33 | 41 | 50 | 54 | 49 | 42 | 35                    | 39 | 50 | 54 | 50 | 50 | 39 | 40                    |    |  |  |  |  |  |
|            | 75 35             | 0.02 4                        | -   | -  | -    | -  | -  | -  | -         | 40                    | 33 | 25 | -  | -  | -  | 41 | 38                    | 33 | 25 | 33 | -  | 37 | 31 | 29                    | 28 | 28 | 41 | 40 | 36 | 33 | 30                    | 32 | 43 | 43 | 41 | 37 | 32 | 36                    |    |  |  |  |  |  |
|            | 50 24             | 0.01 2                        | -   | -  | -    | -  | -  | -  | -         | -                     | 40 | 33 | 25 | -  | -  | -  | 41                    | 38 | 33 | 25 | 33 | -  | 37 | 31                    | 29 | 28 | 28 | 41 | 40 | 36 | 33                    | 30 | 32 | 43 | 43 | 41 | 37 | 32                    | 36 |  |  |  |  |  |
| 5          | 300 142           | 0.22 54                       | 49  | 50 | 46   | 42 | 33 | 30 | 53        | 54                    | 49 | 47 | 41 | 35 | 58 | 60 | 54                    | 51 | 45 | 40 | 62 | 65 | 57 | 54                    | 49 | 45 | 63 | 67 | 59 | 56 | 52                    | 49 | 63 | 67 | 60 | 56 | 52 | 52                    |    |  |  |  |  |  |
|            | 250 118           | 0.15 37                       | 43  | 42 | 37   | 32 | 25 | -  | 50        | 51                    | 45 | 42 | 35 | 29 | 54 | 57 | 49                    | 47 | 42 | 38 | 56 | 59 | 52 | 48                    | 44 | 46 | 59 | 62 | 55 | 51 | 47                    | 48 | 59 | 63 | 57 | 53 | 48 | 47                    |    |  |  |  |  |  |
|            | 200 94            | 0.10 24                       | 41  | 40 | 34   | 29 | -  | -  | 48        | 49                    | 42 | 39 | 31 | 26 | 52 | 55 | 46                    | 44 | 38 | 35 | 54 | 57 | 49 | 45                    | 40 | 43 | 57 | 60 | 54 | 48 | 43                    | 45 | 57 | 61 | 56 | 52 | 41 | 41                    |    |  |  |  |  |  |
|            | 125 59            | 0.04 9                        | 40  | 31 | 23   | -  | -  | -  | 45        | 44                    | 37 | 35 | 27 | 26 | 48 | 50 | 42                    | 38 | 33 | 41 | 50 | 53 | 47 | 42                    | 35 | 42 | 51 | 55 | 51 | 44 | 37                    | 40 | 51 | 55 | 52 | 52 | 41 | 41                    |    |  |  |  |  |  |
|            | 75 35             | 0.01 3                        | -   | -  | -    | -  | -  | -  | -         | 41                    | 35 | 27 | -  | -  | -  | 42 | 40                    | 35 | 27 | 34 | -  | 38 | 33 | 31                    | 30 | 29 | 42 | 41 | 38 | 35 | 32                    | 33 | 44 | 44 | 43 | 39 | 34 | 37                    |    |  |  |  |  |  |
| 6          | 500 236           | 0.49 122                      | 57  | 58 | 53   | 50 | 44 | 40 | 58        | 59                    | 54 | 51 | 46 | 42 | 63 | 64 | 58                    | 55 | 51 | 46 | 66 | 68 | 62 | 58                    | 54 | 49 | 67 | 71 | 64 | 60 | 55                    | 52 | 70 | 74 | 67 | 62 | 59 | 57                    |    |  |  |  |  |  |
|            | 400 189           | 0.31 77                       | 51  | 52 | 48   | 44 | 35 | 32 | 55        | 56                    | 51 | 49 | 43 | 37 | 60 | 62 | 56                    | 53 | 47 | 42 | 64 | 67 | 59 | 56                    | 51 | 47 | 65 | 69 | 61 | 58 | 54                    | 51 | 65 | 69 | 62 | 58 | 54 | 54                    |    |  |  |  |  |  |
|            | 300 142           | 0.17 42                       | 45  | 44 | 39   | 34 | 27 | -  | 52        | 53                    | 47 | 44 | 37 | 31 | 56 | 59 | 51                    | 49 | 44 | 40 | 58 | 61 | 54 | 50                    | 46 | 48 | 61 | 64 | 57 | 53 | 49                    | 50 | 61 | 65 | 59 | 55 | 50 | 49                    |    |  |  |  |  |  |
|            | 200 94            | 0.07 17                       | 42  | 33 | 26   | -  | -  | -  | 47        | 46                    | 40 | 38 | 31 | 28 | 50 | 52 | 45                    | 41 | 37 | 43 | 52 | 55 | 50 | 45                    | 39 | 44 | 53 | 57 | 53 | 47 | 41                    | 42 | 53 | 57 | 55 | 55 | 45 | 43                    |    |  |  |  |  |  |
|            | 100 47            | 0.02 5                        | -   | -  | -    | -  | -  | -  | -         | 42                    | 37 | 29 | -  | -  | -  | 43 | 42                    | 37 | 29 | 35 | -  | 39 | 35 | 33                    | 32 | 30 | 43 | 42 | 40 | 37 | 34                    | 34 | 45 | 45 | 45 | 41 | 36 | 38                    |    |  |  |  |  |  |
| 7          | 650 307           | 0.48 119                      | 55  | 58 | 51   | 46 | 41 | 37 | 58        | 62                    | 54 | 50 | 45 | 42 | 71 | 71 | 63                    | 56 | 51 | 47 | 74 | 76 | 67 | 60                    | 55 | 52 | 74 | 78 | 69 | 61 | 56                    | 53 | 77 | 82 | 73 | 64 | 60 | 58                    |    |  |  |  |  |  |
|            | 550 260           | 0.33 83                       | 52  | 55 | 48   | 43 | 38 | 34 | 55        | 59                    | 51 | 47 | 42 | 39 | 68 | 68 | 60                    | 53 | 48 | 44 | 71 | 73 | 64 | 57                    | 52 | 49 | 71 | 75 | 66 | 58 | 53                    | 50 | 74 | 79 | 70 | 61 | 57 | 55                    |    |  |  |  |  |  |
|            | 335 158           | 0.11 28                       | 42  | 42 | 35   | 30 | 25 | 6  | 55        | 57                    | 49 | 42 | 37 | 32 | 62 | 64 | 55                    | 48 | 43 | 40 | 65 | 69 | 60 | 51                    | 47 | 44 | 65 | 69 | 61 | 51 | 47                    | 45 | 65 | 71 | 63 | 53 | 49 | 48                    |    |  |  |  |  |  |
|            | 225 106           | 0.05 12                       | -   | 30 | -    | -  | -  | -  | 48        | 50                    | 41 | 33 | 29 | 28 | 52 | 55 | 46                    | 37 | 33 | 35 | 52 | 56 | 48 | 40                    | 36 | 35 | 55 | 60 | 52 | 43 | 39                    | 39 | 55 | 59 | 52 | 45 | 41 | 42                    |    |  |  |  |  |  |
|            | 110 52            | 0.01 2                        | -   | 27 | -    | -  | -  | -  | 46        | 47                    | 38 | 30 | 26 | 26 | 50 | 52 | 43                    | 33 | 30 | 33 | 50 | 53 | 45 | 37                    | 33 | 33 | 53 | 57 | 49 | 40 | 36                    | 37 | 53 | 56 | 49 | 42 | 38 | 40                    |    |  |  |  |  |  |
| 8          | 850 401           | 0.71 177                      | 61  | 65 | 57   | 53 | 48 | 45 | * * * * * | 68                    | 70 | 62 | 57 | 53 | 49 | 76 | 77                    | 68 | 62 | 57 | 74 | 76 | 67 | 60                    | 55 | 52 | 77 | 80 | 71 | 64 | 59                    | 56 | 79 | 84 | 75 | 67 | 62 | 59                    |    |  |  |  |  |  |
|            | 700 330           | 0.47 117                      | 55  | 58 | 51   | 46 | 41 | 37 | 58        | 62                    | 54 | 50 | 45 | 42 | 71 | 71 | 63                    | 56 | 51 | 47 | 74 | 76 | 67 | 60                    | 55 | 52 | 74 | 78 | 69 | 61 | 56                    | 53 | 77 | 82 | 73 | 64 | 60 | 58                    |    |  |  |  |  |  |
|            | 500 236           | 0.23 57                       | 43  | 46 | 38   | 33 | 29 | 23 | 57        | 58                    | 50 | 43 | 38 | 33 | 65 | 67 | 58                    | 50 | 46 | 43 | 66 | 69 | 60 | 51                    | 47 | 44 | 65 | 69 | 61 | 51 | 47                    | 44 | 67 | 73 | 65 | 54 | 50 | 49                    |    |  |  |  |  |  |
|            | 350 165           | 0.11 27                       | 42  | 42 | 35   | 30 | 25 | 6  | 55        | 57                    | 49 | 42 | 37 | 32 | 62 | 64 | 55                    | 48 | 43 | 40 | 65 | 69 | 60 | 51                    | 47 | 44 | 65 | 69 | 61 | 51 | 47                    | 45 | 65 | 71 | 63 | 53 | 49 | 48                    |    |  |  |  |  |  |
|            | 200 94            | 0.01 2                        | -   | 30 | -    | -  | -  | -  | 48        | 50                    | 41 | 33 | 29 | 28 | 52 | 54 | 46                    | 37 | 33 | 35 | 52 | 56 | 48 | 40                    | 36 | 35 | 55 | 60 | 52 | 43 | 39                    | 39 | 55 | 59 | 52 | 45 | 41 | 42                    |    |  |  |  |  |  |
| 9          | 1050 495          | 0.31 76                       | 55  | 54 | 48   | 41 | 37 | 34 | 62        | 62                    | 53 | 45 | 41 | 39 | 68 | 69 | 61                    | 51 | 48 | 46 | 74 | 75 | 66 | 55                    | 53 | 51 | 77 | 78 | 68 | 58 | 55                    | 55 | 79 | 82 | 73 | 62 | 59 | 59                    |    |  |  |  |  |  |
|            | 900 425           | 0.22 54                       | 54  | 53 | 47   | 40 | 36 | 33 | 61        | 61                    | 52 | 44 | 40 | 38 | 67 | 68 | 60                    | 50 | 47 | 45 | 73 | 74 | 65 | 54                    | 52 | 50 | 76 | 77 | 67 | 57 | 54                    | 54 | 78 | 81 | 72 | 61 | 58 | 58                    |    |  |  |  |  |  |
|            | 675 319           | 0.11 28                       | 44  | 38 | 31   | 28 | 22 | -  | 56        | 58                    | 48 | 38 | 35 | 33 | 62 | 64 | 55                    | 44 | 42 | 42 | 66 | 68 | 59 | 48                    | 46 | 46 | 65 | 68 | 59 | 49 | 47                    | 47 | 66 | 68 | 59 | 51 | 49 | 54                    |    |  |  |  |  |  |
|            | 450 212           | 0.04 11                       | 41  | 31 | 23   | -  | -  | -  | 53        | 54                    | 44 | 34 | 31 | 29 | 57 | 58 | 49                    | 38 | 36 | 37 | 62 | 63 | 54 | 43                    | 41 | 41 | 60 | 62 | 53 | 43 | 41                    | 43 | 59 | 60 | 51 | 44 | 43 | 49                    |    |  |  |  |  |  |
|            | 225 106           | 0.01 2                        | 44  | 31 | -    | -  | -  | -  | 46        | 46                    | 36 | 29 | 28 | 27 | 49 | 50 | 40                    | 33 | 33 | 36 | 52 | 54 | 45 | 37                    | 38 | 39 | 54 | 55 | 45 | 39 | 41                    | 43 | 51 | 53 | 44 | 40 | 44 | 46                    |    |  |  |  |  |  |
| 10         | 1350 637          | 0.48 119                      | 64  | 62 | 56   | 48 | 45 | 43 | 64        | 63                    | 57 | 49 | 46 | 44 | 70 | 71 | 63                    | 53 | 50 | 48 | 75 | 75 | 67 | 57                    | 54 | 52 | 78 | 79 | 70 | 60 | 57                    | 56 | 84 | 85 | 74 | 64 | 61 | 61                    |    |  |  |  |  |  |
|            | 1100 519          | 0.31 77                       | 55  | 54 | 48   | 41 | 37 | 34 | 62        | 62                    | 53 | 45 | 41 | 39 | 68 | 69 | 61                    | 51 | 48 | 46 | 74 | 75 | 66 | 55                    | 53 | 51 | 77 | 78 | 68 | 58 | 55                    | 55 | 79 | 82 | 73 | 62 | 59 | 59                    |    |  |  |  |  |  |
|            | 800 378           | 0.16 40                       | 46  | 43 | 37   | 28 | 22 | -  | 57        | 59                    | 49 | 40 | 36 | 34 | 66 | 68 | 58                    | 48 | 45 | 44 | 69 | 71 | 62 | 51                    | 49 | 48 | 69 | 72 | 62 | 52 | 50                    | 49 | 71 | 74 | 65 | 55 | 53 | 53                    |    |  |  |  |  |  |
|            | 500 236           | 0.07 17                       | 42  | 33 | 25   | -  | -  | -  | 54        | 56                    | 46 | 36 | 33 | 31 | 58 | 60 | 51                    | 40 | 38 | 39 | 63 | 65 | 56 | 45                    | 43 | 43 | 61 | 64 | 55 | 45 | 43                    | 45 | 60 | 62 | 53 | 46 | 45 | 48                    |    |  |  |  |  |  |
|            | 250 118           | 0.01 3                        | 44  | 31 | -    | -  | -  | -  | 46        | 46                    | 36 | 29 | 28 | 27 | 49 | 50 | 40                    | 33 | 33 | 36 | 52 | 54 | 45 | 37                    | 38 | 39 | 54 | 55 | 45 | 39 | 41                    | 43 | 51 | 53 | 44 | 40 | 44 | 47                    |    |  |  |  |  |  |
| 12         | 1950 920          | 0.75 187                      | 69  | 69 | 60   | 54 | 50 | 48 | * * * * * | 73                    | 72 | 65 | 57 | 54 | 52 | 77 | 76                    | 68 | 59 | 57 | 77 | 76 | 68 | 59                    | 57 | 55 | 80 | 80 | 71 | 62 | 60                    | 57 | 84 | 85 | 75 | 66 | 64 | 61                    |    |  |  |  |  |  |
|            | 1600 755          | 0.50 124                      | 64  | 62 | 55   | 47 | 44 | 42 | 65        | 64                    | 56 | 49 | 46 | 44 | 72 | 71 | 62                    | 54 | 52 | 49 | 77 | 76 | 66 | 58                    | 55 | 53 | 80 | 79 | 70 | 61 | 58                    | 56 | 82 | 84 | 73 | 64 | 62 | 59                    |    |  |  |  |  |  |
|            | 1200 566          | 0.26 65                       | 55  | 52 | 46   | 38 | 35 | 33 | 64        | 61                    | 52 | 45 | 42 | 39 | 71 | 69 | 59                    | 51 | 48 | 46 | 74 | 74 | 63 | 54                    | 52 | 49 | 77 | 77 | 66 | 57 | 55                    | 53 | 79 | 80 | 69 | 59 | 58 | 57                    |    |  |  |  |  |  |
|            | 800 378           | 0.11 27                       | 47  | 41 | 34   | 28 | 25 | -  | 60        | 58                    | 48 | 40 | 37 | 34 | 64 | 64 | 53                    | 45 | 42 | 40 | 69 | 69 | 58 | 49                    | 47 | 45 | 71 | 72 | 60 | 51 | 49                    | 47 | 73 | 75 | 64 | 54 | 52 | 51                    |    |  |  |  |  |  |
|            | 400 189           | 0.03 8                        | -   | 32 | 25   | -  | -  | -  | 52        | 52                    | 40 | 32 | 30 | 29 | 56 | 57 | 46                    | 37 | 34 | 36 | 60 | 61 | 49 | 40                    | 38 | 39 | 61 | 62 | 51 | 43 | 41                    | 41 | 63 | 65 | 53 | 46 | 44 | 46                    |    |  |  |  |  |  |
| 14         | 2700 1274         | 0.63 157                      | 72  | 67 | 61   | 55 | 52 | 49 | * * * * * | 75                    | 72 | 65 | 58 | 55 | 53 | 77 | 75                    | 68 | 61 | 58 | 77 | 75 | 68 | 61                    | 58 | 56 | 79 | 77 | 70 | 62 | 60                    | 59 | 81 | 81 | 73 | 64 | 64 | 64                    |    |  |  |  |  |  |
|            | 2100 991          | 0.37 92                       | 66  | 60 | 54   | 48 | 45 | 42 | 68        | 62                    | 56 | 50 | 46 | 43 | 72 | 69 | 61                    | 54 | 52 | 51 | 75 | 73 | 64 | 56                    | 56 | 56 | 76 | 75 | 66 | 58 | 58                    | 58 | 78 | 78 | 69 | 60 | 61 | 61                    |    |  |  |  |  |  |
|            | 1600 755          | 0.21 52                       | 56  | 50 | 45</ |    |    |    |           |                       |    |    |    |    |    |    |                       |    |    |    |    |    |    |                       |    |    |    |    |    |    |                       |    |    |    |    |    |    |                       |    |  |  |  |  |  |

## Performance Data • Radiated Sound Power Levels Model 3230 • With Mixing Attenuator and Steri-Liner Insulation

| Inlet Size | Airflow<br>cfm l/s |      | Min. inlet<br>ΔPs<br>"w.g. Pa | Sound Power Octave Bands @ Inlet pressure shown |    |    |    |    |                       |           |    |    |    |                       |    |    |    |    |                       |    |    |    |    |                       |    |    |    |    |                       |    |    |    |    |    |    |    |    |    |    |
|------------|--------------------|------|-------------------------------|---|----|----|----|----|-----------------------|-----------|----|----|----|-----------------------|----|----|----|----|-----------------------|----|----|----|----|-----------------------|----|----|----|----|-----------------------|----|----|----|----|----|----|----|----|----|----|
|            |                    |      |                               | Min. ΔPs  |    |    |    |    | 0.5" w.g. (125Pa) ΔPs |           |    |    |    | 1.0" w.g. (250Pa) ΔPs |    |    |    |    | 1.5" w.g. (375Pa) ΔPs |    |    |    |    | 2.0" w.g. (500Pa) ΔPs |    |    |    |    | 3.0" w.g. (750Pa) ΔPs |    |    |    |    |    |    |    |    |    |    |
|            |                    |      |                               | 2   | 3  | 4  | 5  | 6  | 7                     | 2         | 3  | 4  | 5  | 6                     | 7  | 2  | 3  | 4  | 5                     | 6  | 7  | 2  | 3  | 4                     | 5  | 6  | 7  | 2  | 3                     | 4  | 5  | 6  | 7  | 2  | 3  | 4  | 5  | 6  | 7  |
| 4          | 200                | 94   | 0.11 28                       | -   | 34 | 32 | 26 | 28 | -                     | 49        | 42 | 35 | 28 | 28                    | -  | 53 | 47 | 39 | 31                    | 29 | 27 | 53 | 49 | 41                    | 32 | 32 | 33 | 55 | 51                    | 43 | 34 | 34 | 35 | 56 | 53 | 46 | 38 | 36 | 37 |
|            | 150                | 71   | 0.06 16                       | -   | 32 | 29 | 23 | 57 | -                     | 47        | 40 | 32 | 25 | 24                    | -  | 51 | 45 | 36 | 28                    | 25 | 24 | 51 | 47 | 38                    | 29 | 28 | 30 | 53 | 29                    | 42 | 31 | 30 | 32 | 54 | 51 | 45 | 37 | 32 | 34 |
|            | 100                | 47   | 0.03 7                        | -   | -  | 27 | 24 | 23 | -                     | 45        | 38 | 29 | 22 | -                     | -  | 47 | 41 | 33 | 24                    | 24 | 25 | 48 | 45 | 37                    | 26 | 25 | 33 | 47 | 44                    | 42 | 30 | 25 | 30 | 48 | 47 | 46 | 39 | 30 | 34 |
|            | 75                 | 35   | 0.02 4                        | -   | -  | -  | -  | -  | -                     | -         | 35 | 24 | -  | -                     | -  | -  | 41 | 35 | 21                    | -  | -  | -  | 40 | 38                    | 29 | 23 | 27 | -  | 41                    | 37 | 30 | 27 | 30 | -  | 41 | 37 | 30 | 29 | 35 |
|            | 50                 | 24   | 0.01 2                        | -   | -  | -  | -  | -  | -                     | -         | 35 | 24 | -  | -                     | -  | -  | 41 | 35 | 21                    | -  | -  | -  | 40 | 38                    | 29 | 23 | 27 | -  | 41                    | 37 | 30 | 27 | 30 | -  | 41 | 37 | 30 | 29 | 35 |
| 5          | 300                | 142  | 0.22 54                       | 47  | 41 | 37 | 32 | 30 | 26                    | 54        | 47 | 43 | 35 | 30                    | 25 | 57 | 52 | 46 | 37                    | 34 | 30 | 60 | 56 | 49                    | 40 | 38 | 34 | 60 | 56                    | 49 | 39 | 39 | 37 | 62 | 59 | 51 | 42 | 41 | 41 |
|            | 250                | 118  | 0.15 37                       | -   | 35 | 34 | 28 | 30 | -                     | 50        | 43 | 37 | 30 | 30                    | -  | 54 | 48 | 41 | 33                    | 31 | 28 | 54 | 50 | 43                    | 34 | 34 | 34 | 56 | 52                    | 45 | 36 | 36 | 36 | 57 | 54 | 48 | 40 | 38 | 38 |
|            | 200                | 94   | 0.10 24                       | -   | 33 | 31 | 25 | -  | -                     | 48        | 41 | 34 | 27 | 26                    | -  | 52 | 46 | 38 | 30                    | 27 | 25 | 52 | 48 | 40                    | 31 | 30 | 31 | 54 | 50                    | 44 | 33 | 32 | 33 | 55 | 52 | 47 | 39 | 34 | 35 |
|            | 120                | 59   | 0.04 9                        | -   | -  | 29 | 26 | 25 | -                     | 46        | 39 | 31 | 24 | 20                    | -  | 48 | 42 | 35 | 26                    | 26 | 26 | 49 | 46 | 39                    | 28 | 27 | 34 | 48 | 45                    | 44 | 32 | 27 | 31 | 49 | 48 | 47 | 41 | 32 | 35 |
|            | 75                 | 35   | 0.01 3                        | -   | -  | -  | -  | -  | -                     | -         | 36 | 36 | -  | -                     | -  | -  | 42 | 37 | 23                    | -  | -  | -  | 41 | 40                    | 31 | 25 | 28 | -  | 42                    | 39 | 32 | 29 | 31 | -  | 42 | 39 | 32 | 31 | 36 |
| 6          | 500                | 236  | 0.49 122                      | 56  | 49 | 46 | 39 | 36 | 33                    | 58        | 52 | 48 | 42 | 37                    | 33 | 62 | 57 | 52 | 43                    | 39 | 35 | 64 | 60 | 54                    | 45 | 42 | 38 | 65 | 62                    | 55 | 46 | 44 | 40 | 66 | 64 | 57 | 47 | 46 | 45 |
|            | 400                | 189  | 0.31 77                       | 49  | 43 | 39 | 34 | 32 | 28                    | 56        | 49 | 45 | 37 | 32                    | 27 | 59 | 54 | 48 | 39                    | 36 | 32 | 62 | 58 | 51                    | 42 | 40 | 36 | 62 | 58                    | 51 | 41 | 41 | 39 | 64 | 61 | 53 | 44 | 43 | 43 |
|            | 300                | 142  | 0.17 42                       | -   | 37 | 36 | 30 | 32 | -                     | 52        | 45 | 39 | 32 | 32                    | -  | 56 | 50 | 43 | 35                    | 33 | 30 | 56 | 52 | 45                    | 36 | 36 | 36 | 58 | 54                    | 47 | 38 | 38 | 38 | 59 | 56 | 50 | 42 | 40 | 40 |
|            | 200                | 94   | 0.07 17                       | -   | -  | 32 | 29 | 29 | -                     | 48        | 41 | 34 | 27 | 24                    | -  | 50 | 44 | 38 | 29                    | 30 | 28 | 51 | 48 | 42                    | 31 | 31 | 36 | 50 | 47                    | 46 | 35 | 31 | 33 | 51 | 50 | 51 | 44 | 36 | 37 |
|            | 100                | 47   | 0.02 5                        | -   | -  | -  | -  | -  | -                     | -         | 37 | 28 | -  | -                     | -  | -  | 43 | 39 | 25                    | -  | -  | -  | 42 | 42                    | 33 | 27 | 29 | -  | 42                    | 42 | 33 | 27 | 29 | -  | 43 | 41 | 34 | 31 | 32 |
| 7          | 650                | 307  | 0.48 119                      | 57  | 52 | 42 | 36 | 30 | -                     | 56        | 54 | 43 | 37 | 32                    | 28 | 66 | 62 | 50 | 41                    | 36 | 32 | 70 | 67 | 57                    | 45 | 42 | 38 | 72 | 71                    | 61 | 49 | 46 | 41 | 76 | 76 | 65 | 52 | 50 | 46 |
|            | 550                | 260  | 0.33 83                       | 54  | 49 | 39 | 33 | 27 | -                     | 53        | 51 | 40 | 34 | 29                    | 25 | 63 | 59 | 47 | 38                    | 33 | 29 | 67 | 64 | 54                    | 42 | 39 | 35 | 69 | 68                    | 58 | 46 | 43 | 38 | 73 | 73 | 62 | 49 | 47 | 43 |
|            | 335                | 158  | 0.11 28                       | -   | -  | 25 | -  | -  | -                     | 55        | 51 | 41 | 30 | 26                    | -  | 62 | 61 | 51 | 38                    | 34 | 30 | 63 | 63 | 53                    | 40 | 37 | 32 | 65 | 66                    | 56 | 43 | 40 | 36 | 65 | 69 | 59 | 46 | 43 | 40 |
|            | 225                | 106  | 0.05 12                       | -   | -  | -  | -  | -  | -                     | 50        | 48 | 38 | 24 | -                     | -  | 56 | 55 | 45 | 32                    | 29 | 26 | 56 | 56 | 46                    | 33 | 31 | 29 | 57 | 58                    | 48 | 35 | 33 | 30 | 59 | 60 | 50 | 37 | 36 | 34 |
|            | 110                | 52   | 0.01 2                        | -   | -  | -  | -  | -  | -                     | 48        | 45 | 35 | 21 | -                     | -  | 54 | 52 | 42 | 29                    | 26 | 24 | 54 | 53 | 43                    | 30 | 28 | 27 | 55 | 55                    | 45 | 32 | 30 | 28 | 57 | 57 | 47 | 34 | 33 | 32 |
| 8          | 850                | 401  | 0.71 177                      | 59  | 56 | 45 | 40 | 37 | 32                    | * * * * * | 65 | 63 | 51 | 43                    | 39 | 35 | 70 | 68 | 56                    | 46 | 42 | 38 | 72 | 71                    | 60 | 49 | 45 | 41 | 77                    | 77 | 66 | 54 | 51 | 47 |    |    |    |    |    |
|            | 700                | 330  | 0.47 117                      | 57  | 52 | 42 | 36 | 30 | -                     | 56        | 54 | 43 | 37 | 32                    | 28 | 66 | 62 | 50 | 41                    | 36 | 32 | 70 | 67 | 57                    | 45 | 42 | 38 | 72 | 71                    | 61 | 49 | 46 | 41 | 76 | 76 | 65 | 52 | 50 | 46 |
|            | 500                | 236  | 0.23 57                       | 50  | 42 | 33 | 28 | -  | -                     | 58        | 52 | 41 | 33 | 28                    | -  | 64 | 60 | 51 | 38                    | 35 | 30 | 67 | 65 | 56                    | 43 | 40 | 35 | 69 | 70                    | 59 | 46 | 43 | 39 | 72 | 72 | 62 | 50 | 47 | 43 |
|            | 350                | 165  | 0.11 27                       | -   | -  | 25 | -  | -  | -                     | 55        | 51 | 41 | 30 | 26                    | -  | 62 | 61 | 51 | 38                    | 34 | 30 | 63 | 63 | 53                    | 40 | 37 | 32 | 65 | 66                    | 56 | 43 | 40 | 36 | 65 | 69 | 59 | 46 | 43 | 40 |
|            | 200                | 94   | 0.03 8                        | -   | -  | -  | -  | -  | -                     | 50        | 48 | 38 | 24 | -                     | -  | 56 | 55 | 45 | 32                    | 29 | 26 | 56 | 56 | 46                    | 33 | 31 | 29 | 57 | 58                    | 48 | 35 | 33 | 30 | 59 | 60 | 50 | 37 | 36 | 34 |
| 9          | 1050               | 495  | 0.31 76                       | 55  | 49 | 42 | 39 | 33 | 25                    | 58        | 54 | 44 | 42 | 36                    | 30 | 66 | 63 | 51 | 46                    | 40 | 35 | 70 | 67 | 55                    | 48 | 43 | 38 | 73 | 70                    | 58 | 51 | 46 | 41 | 75 | 75 | 62 | 55 | 49 | 46 |
|            | 900                | 425  | 0.22 54                       | 54  | 48 | 41 | 38 | 32 | 24                    | 57        | 53 | 43 | 41 | 35                    | 29 | 65 | 62 | 50 | 45                    | 39 | 34 | 69 | 66 | 54                    | 47 | 42 | 37 | 72 | 69                    | 57 | 50 | 45 | 40 | 74 | 74 | 61 | 54 | 48 | 45 |
|            | 675                | 319  | 0.11 28                       | 45  | 40 | 34 | 31 | -  | -                     | 49        | 46 | 37 | 32 | -                     | -  | 59 | 57 | 45 | 39                    | 32 | 29 | 62 | 60 | 49                    | 42 | 35 | 32 | 64 | 63                    | 52 | 45 | 38 | 35 | 63 | 62 | 52 | 46 | 40 | 38 |
|            | 450                | 212  | 0.04 11                       | -   | -  | -  | -  | -  | -                     | 52        | 49 | 37 | 30 | -                     | -  | 54 | 52 | 40 | 34                    | 27 | 25 | 56 | 54 | 43                    | 36 | 29 | 27 | 60 | 58                    | 47 | 41 | 34 | 31 | 57 | 56 | 47 | 41 | 36 | 34 |
|            | 225                | 94   | 0.01 2                        | -   | -  | -  | -  | -  | -                     | -         | 42 | 30 | 26 | -                     | -  | 48 | 46 | 35 | 31                    | 28 | 27 | 48 | 48 | 38                    | 33 | 31 | 29 | 48 | 49                    | 39 | 36 | 35 | 33 | 50 | 51 | 43 | 38 | 37 | 36 |
| 10         | 1350               | 637  | 0.48 119                      | 60  | 55 | 48 | 45 | 39 | 33                    | 61        | 56 | 48 | 46 | 40                    | 34 | 67 | 63 | 53 | 48                    | 44 | 38 | 70 | 67 | 56                    | 51 | 47 | 41 | 74 | 71                    | 59 | 53 | 48 | 44 | 77 | 76 | 64 | 56 | 51 | 47 |
|            | 1100               | 519  | 0.31 77                       | 55  | 49 | 42 | 39 | 33 | 25                    | 58        | 54 | 44 | 42 | 36                    | 30 | 66 | 63 | 51 | 46                    | 40 | 35 | 70 | 67 | 55                    | 48 | 43 | 38 | 73 | 70                    | 58 | 51 | 46 | 41 | 75 | 75 | 62 | 55 | 49 | 46 |
|            | 800                | 378  | 0.16 40                       | 45  | 40 | 34 | 31 | -  | -                     | 45        | 40 | 34 | 31 | -                     | -  | 62 | 60 | 48 | 41                    | 35 | 30 | 67 | 64 | 53                    | 45 | 39 | 34 | 66 | 65                    | 54 | 47 | 40 | 36 | 67 | 65 | 55 | 49 | 42 | 39 |
|            | 550                | 260  | 0.07 17                       | -   | -  | -  | -  | -  | -                     | 53        | 51 | 39 | 32 | -                     | -  | 55 | 54 | 42 | 36                    | 29 | 27 | 57 | 56 | 45                    | 38 | 31 | 29 | 61 | 60                    | 49 | 43 | 36 | 33 | 58 | 58 | 49 | 43 | 38 | 36 |
|            | 250                | 118  | 0.01 3                        | -   | -  | -  | -  | -  | -                     | -         | 42 | 30 | 26 | -                     | -  | 48 | 46 | 35 | 31                    | 28 | 27 | 48 | 48 | 38                    | 33 | 31 | 29 | 48 | 49                    | 39 | 36 | 35 | 33 | 50 | 51 | 43 | 38 | 37 | 36 |
| 12         | 1950               | 920  | 0.75 187                      | 64  | 60 | 51 | 50 | 46 | 40                    | * * * * * | 67 | 62 | 53 | 51                    | 48 | 43 | 70 | 66 | 55                    | 52 | 49 | 45 | 74 | 69                    | 58 | 53 | 50 | 47 | 78                    | 75 | 62 | 55 | 52 | 50 |    |    |    |    |    |
|            | 1600               | 755  | 0.50 124                      | 58  | 53 | 47 | 46 | 41 | 33                    | 59        | 54 | 47 | 46 | 41                    | 33 | 65 | 61 | 50 | 48                    | 44 | 37 | 71 | 66 | 54                    | 49 | 46 | 42 | 73 | 69                    | 57 | 50 | 47 | 44 | 76 | 74 | 61 | 53 | 49 | 48 |
|            | 1200               | 566  | 0.26 65                       | 50  | 45 | 40 | 38 | 31 | -                     | 56        | 51 | 43 | 41 | 36                    | 28 | 64 | 60 | 48 | 43                    | 39 | 34 | 68 | 65 | 52                    | 45 | 42 | 38 | 69 | 67                    | 55 | 47 | 43 | 41 | 72 | 71 | 58 | 51 | 46 | 45 |
|            | 800                | 378  | 0.11 27                       | -   | 37 | 32 | 28 | -  | -                     | 53        | 49 | 37 | 33 | 28                    | -  | 61 | 58 | 46 | 39                    | 34 | 32 | 63 | 60 | 49                    | 41 | 36 | 35 | 64 | 62                    | 50 | 44 | 37 | 37 | 65 | 65 | 53 | 48 | 41 | 42 |
|            | 400                | 189  | 0.03 8                        | -   | -  | -  | -  | -  | -                     | -         | 41 | 30 | 25 | -                     | -  | 53 | 50 | 39 | 33                    | 29 | 30 | 54 | 52 | 41                    | 36 | 31 | 33 | 55 | 54                    | 43 | 38 | 34 | 35 | 57 | 56 | 45 | 44 | 39 | 40 |
| 14         | 2700               | 1274 | 0.63 157                      | 64  | 56 | 48 | 40 | 36 | 33                    | * * * * * | 66 | 59 | 51 | 41                    | 38 | 36 | 69 | 63 | 55                    | 44 | 42 | 40 | 71 | 65                    | 58 | 47 | 45 | 43 | 73                    | 70 | 62 | 51 | 49 | 48 |    |    |    |    |    |
|            | 2100               | 991  | 0.37 92                       | 58  |    |    |    |    |                       |           |    |    |    |                       |    |    |    |    |                       |    |    |    |    |                       |    |    |    |    |                       |    |    |    |    |    |    |    |    |    |    |