

**Engineering Data**

**ED 18529-1**

Group: **WSHP**

Type: **Sound Ratings**

Date: **May 2020**

**Vertical Stack Water Source Heat Pumps Products**  
**Sound Power Ratings**



**Model VHF**

**Model VHC/VHW**

This page left blank intentionally

# Contents

<b>Introduction</b> .....	4	<b>Field Installation Guidelines</b> .....	10
<b>System Analysis</b> .....	4	Cabinet Isolation .....	11
<b>Analysis Summary and Output Reports</b> .....	4	Supply Air Diffusers .....	11
Getting a Copy .....	6	Vibration Isolation Pad .....	11
<b>Sound Power Fundamentals</b> .....	6	<b>Sound Power Data</b> .....	12
What is the difference between Sound Pressure and Sound Power?.....	7	Model WVHC/VHW, WVHF with PSC Motor.....	12
Noise Criteria (NC) and Room Criteria (RC).....	7	Model WVHC/VHW, WVHF with EC Motor.....	13
Standard AHRI 350-2015 - Sound Performance Rating of Non-Ducted Indoor Air-Conditioning Equipment . . .	7	Model WVHC/VHW, WVHF with EC Motor and Hydronic Heat .....	14
<b>Sound Performance - Where Design Matters</b> .....	8		
Acoustic Lined Discharge Air Plenum .....	8		
Fan Speed Selection .....	8		
Compressor Mass Plate .....	9		
Compressor Sound Enclosure .....	9		
Return Air Panels .....	10		

## Introduction

An exceptional level of Indoor Environmental Quality (IEQ) and personal comfort should be goals for all HVAC designs. Sound quality and the associated sound levels are a few of the many key parameters in measuring personal comfort. To deliver this type of comfort, acoustic consultants may have to be involved for complex and acoustically sensitive applications such as performing arts centers, theaters, and large gathering spaces. However, it is the HVAC designer and the project architect working together who are most likely tasked with creating a comfortable acoustic environment. Given the potentially significant noise contributions from the HVAC system, the HVAC designer must be equipped with specialized tools to help facilitate important acoustic design decisions.

Daikin has developed several tools to assist the design team in evaluating the acoustic performance of HVAC systems. The Application Guide – HVAC Acoustic Fundamentals<sup>1</sup> is a detailed technical reference manual with comprehensive acoustic fundamentals combined with typical HVAC system acoustic analysis guidance. When used in conjunction with Daikin's Acoustic Analyzer™ software and published sound power data from the manufacturer, the design team can estimate the room sound levels. These tools can help to estimate the affect of the HVAC equipment sound levels both in the space and outside of the building. The information generated by the Acoustic Analyzer™ software can help determine if the resulting room sound levels can meet the specifications or if further acoustic attenuation, alternative HVAC equipment or building modifications are necessary.

## System Analysis

Three types of acoustic analyses can be performed with Daikin's Acoustic Analyzer™ software. These include outdoor sound, zoned comfort systems and central systems. This Engineering Document focuses on the Vertical Stack Water Source Heat Pump sound power data and the resulting indoor sound levels based on a zoned comfort system. However, the Acoustic Analyzer™ software can be used to evaluate the acoustic performance of the following other system types:

- **Outdoor Sound** – this is used to estimate sound levels at the property line or at an adjacent building. The sound source is typically an air-cooled chiller, rooftop unit or cooling tower.
- **Zoned (Decentralized) Comfort Systems** – this is used to estimate sound levels of indoor equipment that resides in or near the occupied space. These include systems that reside in the occupied space (i.e. console water source heat pumps) and units that are ducted away from or above the occupied space (i.e. vertical stack, horizontal and vertical water source heat pumps). The Acoustic Analyzer™ software takes the room effect, duct breakout, return and discharge air noise, and radiated sound pathways into consideration.
- **Central Systems** – this is used to estimate sound levels from HVAC equipment that serve multiple spaces such as a chilled water air handler with multiple VAV boxes in several zones. This analysis tends to be based on larger equipment with greater sound power levels. The Acoustic Analyzer™ divides central systems into two categories; “Large” for applications with open office spaces and “Defined” for all other applications. The Acoustic Analyzer™ can perform several acoustic evaluations of a central system, including:
  - Supply and return duct sound. A special feature allows the mechanical room to be included in the return air path. This is specifically meant for vertical self-contained systems that often use the mechanical room as the return air plenum.
  - Diffuser sound.
  - Terminal unit radiated sound.
  - Sound transmitted through a wall.
  - Sound breakout from any node on the supply or return duct.

The “Zoned (Decentralized) Comfort Systems” analysis should be the basis for evaluating the occupied space sound levels for the vertical stack water source heat pump systems.

## Analysis Summary and Output Reports

To assist the design team in making decisions regarding the proposed system, the Acoustic Analyzer™ provides an easy to follow summary of the calculated results. The summary report provides the basic acoustic analysis information including the room effect calculations, attenuation guidance, and a plot of the resulting sound criteria.

The sound criteria can be determined based on Noise Criteria (NC), Room Criteria (RC) or Noise Rating (NR). An example of the NC evaluation and report is shown on [page 5](#).

<sup>1</sup> Daikin Application Guide – HVAC Acoustic Fundamentals, AG 31-010

**Figure 1: Examples of The NC Evaluation and Report**

Version 1.1

Daikin Acoustic Analysis		Run name	
Job name	Enfinity Vertical Stack WSP Acoustics Analysis Sample Job	Run name	Cooling High Speed
Customer name	Daikin Applied Application Engineering Tess Fieschko	HVAC unit	WHC-015
Operator		Analysis type	Zoned comfort system In space

Summary			
Requested NC level	35	Estimated NR level	37
Attenuation required	Yes	Estimated RC level	36 (H)
Estimated NC level	36	Estimated dBA	42

Room Data			
Room length	20 ft	Total surface area	992 ft <sup>2</sup>
Room width	12 ft	Receiver room equation	Thompson
Room height	8 ft	People	2
Floor area	240 ft <sup>2</sup>	Chairs	2
Room volume	1920 ft <sup>3</sup>		

Wall, Floor and Ceiling Properties				
Surface	Area	Type	Glass area	Closed curtains
Wall 1	25 ft <sup>2</sup>	Drywall on brck wall	0 ft <sup>2</sup>	Yes
Wall 2	15 ft <sup>2</sup>	Drywall on brck wall	0 ft <sup>2</sup>	No
Wall 3	25 ft <sup>2</sup>	Drywall on brck wall	0 ft <sup>2</sup>	No
Wall 4	15 ft <sup>2</sup>	Drywall on brck wall	0 ft <sup>2</sup>	No
Floor	240 ft <sup>2</sup>	Carpet on foam rubber		
Ceiling	240 ft <sup>2</sup>	Suspended ceiling, 2 to 3" acoustic tile		

Wall Floor and Ceiling Sound Absorption Properties										
Band (Hz)	16	31	63	125	250	500	1k	2k	4k	8k
Wall 1 sound absorption coef.	-	0.00	0.01	0.01	0.02	0.02	0.03	0.04	0.05	0.04
Wall 2 sound absorption coef.	-	0.00	0.01	0.01	0.02	0.02	0.03	0.04	0.05	0.04
Wall 3 sound absorption coef.	-	0.00	0.01	0.01	0.02	0.02	0.03	0.04	0.05	0.04
Wall 4 sound absorption coef.	-	0.00	0.01	0.01	0.02	0.02	0.03	0.04	0.05	0.04
Ceiling sound absorption coef.	-	0.29	0.49	0.73	0.71	0.76	0.89	0.75	0.58	0.45
Floor sound absorption coef.	-	0.03	0.06	0.08	0.27	0.39	0.34	0.48	0.63	0.50
Room constant	-	243	425	610	628	525	630	665	628	533

Important: Daikin disclaims any responsibility for actions based on this program. See Software License and Disclaimer.

Page 1 of 4

DAIKIN

©2003-13 Daikin Applied. www.DaikinApplied.com

Version 1.1

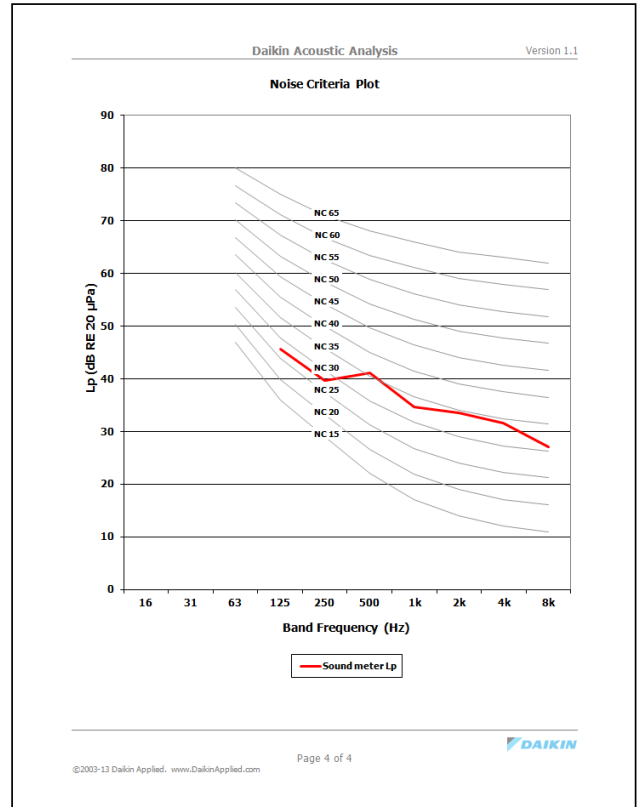
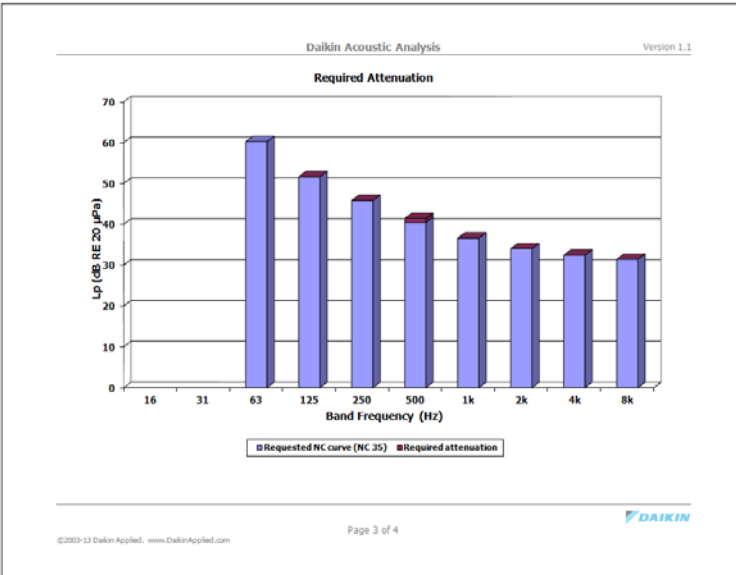
Acoustic Performance										
Band (Hz)	16	31	63	125	250	500	1k	2k	4k	8k
HVAC unit Lp	-	-	-	55	48	48	42	41	39	34
Environmental correction factor	-	-	4	2	1	0	0	0	0	0
Room Effect at Room Center, Receiver Measuring Height	-	-	-	-	-	-	-	-	-	-
Room effect	-	4	6	7	7	7	7	8	7	7
Lp (dB RE 20 µPa) - Distance 5 ft	-	-	-	46	40	41	35	33	32	27
Sound meter Lp	-	-	-	60	52	46	40	37	32	31
Requested NC curve (NC 35)	-	-	-	0	0	1	0	0	0	0
Required attenuation	-	-	-	0	0	0	1	0	0	0

Page 2 of 4

DAIKIN

©2003-13 Daikin Applied. www.DaikinApplied.com



## Getting a Copy

For a demo of the Acoustic Analyzer™ software, please visit [www.DaikinApplied.com](http://www.DaikinApplied.com) and follow these simple steps. Click on the Design Tools link from the left side bar. Click on the Software link from the drop down list. On the Software page, click on the Acoustic Analyzer™ Software Demo link.

To order a copy of the software, simply contact your local Daikin sales representative. Use the Sales Locator link on the Software page to find the closest Daikin sales Representative near you.

## Sound Power Fundamentals

### What is the Difference between Sound and Noise?

Sound pressure is what causes our ear drums to vibrate and what is captured by a microphone to make an audio recording. “Noise” however, is what many people consider an annoyance, a distraction or even a painful reminder of excessive sound pressure. Noise, simply put, can cause an undesirable affect if not properly managed. However, this noise can create a subtle background sound level that can improve the indoor environmental quality if properly designed into the building.

In HVAC systems, noise can lead to uncomfortable indoor environmental quality. However, this same “noise” if properly controlled or attenuated can enhance the comfort of a building by creating subtle background noise. While other noises both inside and outside of the occupied space can affect the indoor noise levels, the HVAC system designer should strive to ensure that the noise levels produced by the HVAC system are appropriate for the space. To do so, the sound pressure must be determined.

### What is Sound Pressure?

Sound pressure is a measure of the dynamic pressure that causes local pressure fluctuations in the air molecules. These fluctuations can be measured in Pascals (symbol is Pa) or when expressed in decibels (symbol is dB) the term is known as Sound Pressure Level. This pressure is what is measured by a microphone or perceived by our ear drums.

Sound pressure is very much dependent on the acoustic environment where it is measured or heard. As an example, a room with hard surfaces such as hardwood floors, gypsum wall boards and hard ceilings will have a significantly different measured sound pressure from a room with “soft” absorbent surfaces such as carpets, wall hangings and acoustic tile ceilings. Other factors include the effects of reflective surfaces, distance to the receiver or microphone, room surface treatments, the quantity and location of sound absorbing materials, physical barriers, and the influence of other sound sources in the space. All of these influences should be considered when assessing the acoustic performance of an HVAC system in a particular occupied space.

### What is Sound Power?

Sound Power, Pac is a measure of the sonic energy over a unit of time for a given sound source emitted by the source in all directions. This represents the acoustic property of the sound source expressed in watts. Sound power expressed in decibels (dB) is known the Sound Power Level, Lw expressed in a very low base level of energy given as 0.000000000001 or 10-12 W. Most important is that sound power is the acoustic “signature” of the particular sound source. This signature is totally independent of any affect that a room might have on the resulting sound pressure measured in that space.

Sound power is determined in a controlled acoustic environment under tightly controlled laboratory conditions. These laboratories can be reverberant or anechoic rooms with sophisticated sound intensity measurement instrumentation. Sound power can vary dramatically under different operating conditions such as fan speed, static pressure, compressor loading and thermal conditions under which the HVAC system is operating. For this reason, sound power is determined in accordance with ARI Sound Standards to ensure uniformity between different manufacturers of similar equipment types. All reputable HVAC manufacturers should publish sound power data for their equipment to assist the system designer in assessing the resulting acoustic affect for a given application.

Table 1 provides a comparison between several different sound sources.

**Table 1: Sound Power Sources**

Situation and Sound Source	Sound Power Pac watts	Sound Power Level Lw dB re 10-12 W
Rocket engine	1,000,000 W	180 dB
Turbojet engine	10,000 W	160 dB
Siren	1,000 W	150 dB
Heavy truck engine or loudspeaker rock concert	100 W	140 dB
Machine gun	10 W	130 dB
Jackhammer	1 W	120 dB
Excavator, trumpet	0.3 W	115 dB
Chain saw	0.1 W	110 dB
Helicopter	0.01 W	100 dB
Loud speech	0.001 W	90 dB
Usual talking	10-5 W	70 dB
Refrigerator	10-7 W	50 dB

**What is the difference between Sound Pressure and Sound Power?**

Understanding the difference between sound pressure and sound power is very important when assessing the acoustical performance of the HVAC system. As mentioned above, sound power is the acoustic signature of the equipment, while sound pressure is the resulting measure of what your ear will hear. From the sound power data provided by the manufacturer, an acoustic analysis can be performed using software tools such as the Acoustic Analyzer™. Sound power data is entered into the acoustic analysis tool along with the room properties to calculate the resulting room sound pressure level.

**Noise Criteria (NC) and Room Criteria (RC)**

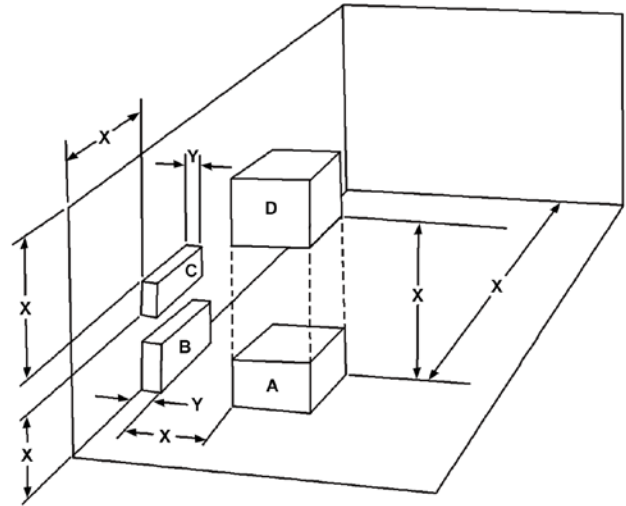
In order to understand the potential effect of HVAC-related sound on the building occupants, several criteria have been established to rate or measure the sound to determine its acceptability. To do so, an estimate of both the perceived loudness and the sound quality of the noise should be understood. By using the calculated sound pressure level, the Noise Criteria (NC) or Room Criteria (RC) can be used to determine its acceptability depending on the nature of the application and the desired effect. In general, NC is a single-number rating that is somewhat sensitive to the relative loudness and speech interference properties of a given sound spectrum<sup>2</sup>. The RC method is a family of criterion curves and a rating procedure that assesses background noises in spaces, both on the basis of its effect on speech, and on subjective sound quality<sup>3</sup>. Both criteria have advantages and disadvantages when attempting to characterize HVAC system generated background noise. The HVAC designer should become fully knowledgeable of the assessment criteria and desired outcome before drawing conclusions regarding the suitability of any solution or a given application. In some cases, seeking the advice of a professional acoustical consultant may be necessary to achieve the desired acoustic performance for the application.

**Standard AHRI 350-2015 - Sound Performance Rating of Non-Ducted Indoor Air-Conditioning Equipment**

For applications where the units return air panel is located in the occupied space and the supply air is discharged through a supply grille also located in the occupied space, Standard AHRI 350-2015 is most appropriate in establishing the sound power levels. This standard is used for units designed for furred-in applications or for applications with minimal duct work operating at free-delivery conditions without enclosures or ductwork.

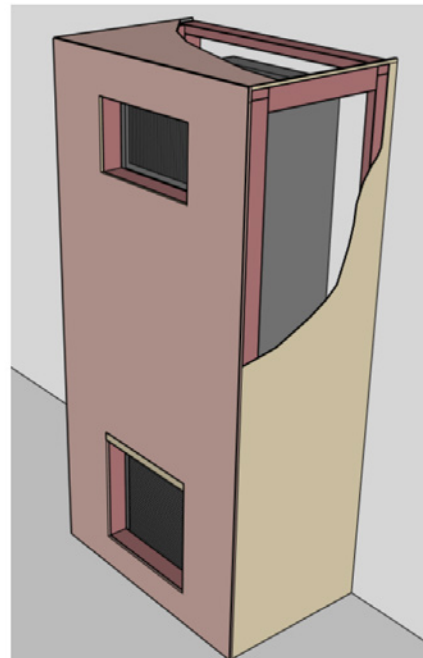
Figure 2 illustrates the test configuration “B” based on Standard AHRI 350-2015.

**Figure 2: Non-Ducted Configuration “B”**



- A** = Location for equipment used away from a wall
- B** = Location for equipment used against or through the wall on the floor
- C** = Location for equipment mounted against or through the wall
- D** = Location for equipment suspended or fastened to ceiling
- X** = 5.0 ft. (1.5m) minimum to adjoining room surface(s) other than mounting plane
- Y** = Manufacturer’s recommended minimum

**Figure 3: Typical Concealed Vertical Stack Unit**



<sup>2</sup> 2007 ASHRAE Handbook – HVAC Applications, Sound and Vibration Control, “NC: Noise Criteria Method” page 47.31  
<sup>3</sup> 2007 ASHRAE Handbook – HVAC Applications, Sound and Vibration Control, “RC: Room Criteria Method” page 47.31  
<sup>4</sup> Standard AHRI 350-2015 - Sound Performance Rating of Non-ducted Indoor Air Conditioning and Heat Pump Equipment, Section 1.1 Purpose

## Sound Performance - Where Design Matters

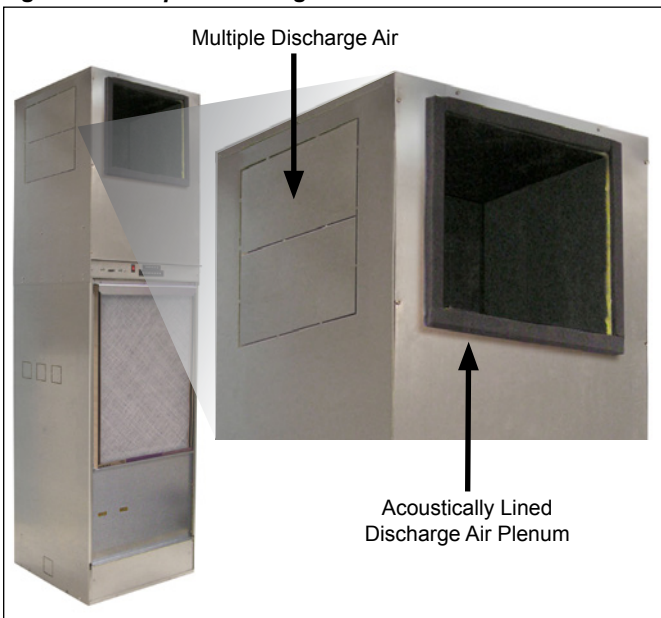
Quiet HVAC equipment does not just happen. It's designed and built into every unit. Daikin's Vertical Stack Water Source Heat Pump ultra quiet operation comes from decades of HVAC equipment expertise, rigorous attention to details and tenacious acoustic testing right from the start. The smallest of acoustic design details for each new product are painstakingly evaluated from an acoustic signature perspective. The product design evaluations take place in Daikin's reverberant sound lab where close attention is given to the acoustic details of each new product. To affirm and validate the performance, 3rd party acoustic testing facilities are engaged to attest that acoustic performance aligns with published sound power data.

Daikin's Vertical Stack Water Source Heat Pumps include many acoustic enhancements to the most crucial areas of the design, that have proven to have the greatest impact on reducing sound levels.

### Acoustic Lined Discharge Air Plenum

Allows for multiple discharge configurations to direct noise away from occupants. The plenum's acoustic liner has been specifically selected to absorb higher frequency sounds typical of centrifugal fan systems. These features minimize the fan noise of Daikin's vertical stack water source heat pumps.

**Figure 4: Multiple Discharge & Acoustically Lined Plenum**

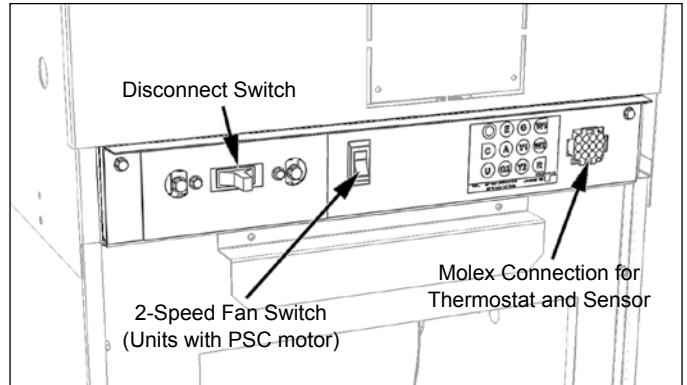


## Fan Speed Selection

### Units With Standard PSC Motor

Units with a PSC motor have a two-speed fan switch, conveniently located on the front of the cabinet and allows for easy fan speed selection. The low fan speed can reduce sound levels associated with the discharge air noise and cabinet vibration.

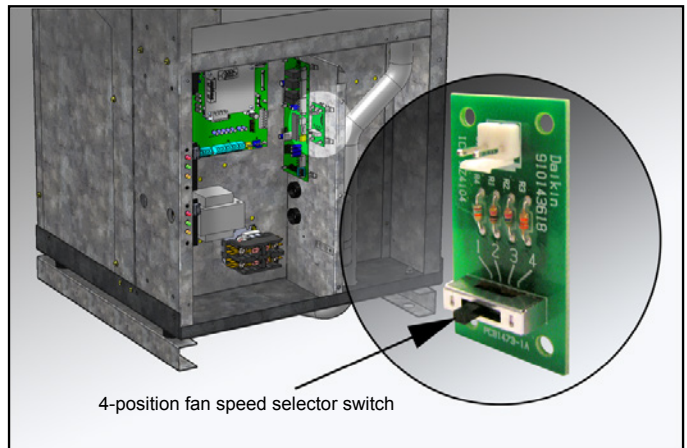
**Figure 5: 2-Speed Fan Switch**



### Units With Optional EC Motor

Units with an EC motor have a 4-position fan speed selector switch located in the control box and allows for adjusting the amount of air delivery (cfm) based on demands of the application. Lower fan speed settings mean reduced sound levels associated with discharge air and cabinet vibration.

**Figure 6: 4-Position Fan Speed Selector Switch**

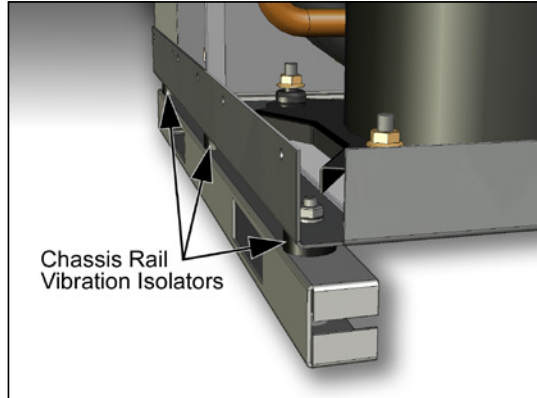




## Chassis Vibration Isolators

Vibration isolators are integral to the chassis support rails to help minimize noise and vibration transmission to the building floor and surrounding structure.

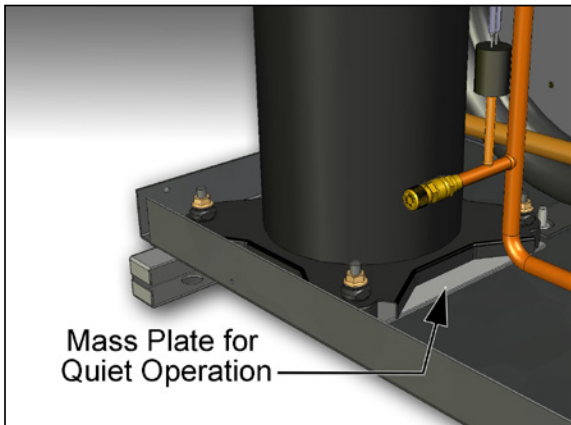
**Figure 7: Chassis Rail Vibration Isolators**



## Compressor Mass Plate

High efficiency rotary and scroll compressors can be provided with an optional mass plate to reduce sound levels for quiet operation. A specially designed vibration isolation system further reduces compressor vibrations. This system uses a neoprene grommet to separate the compressor mounting plate and the chassis support rails. To further reduce sound levels, unit sizes 024 through 036 can be ordered to include an optional compressor blanket.

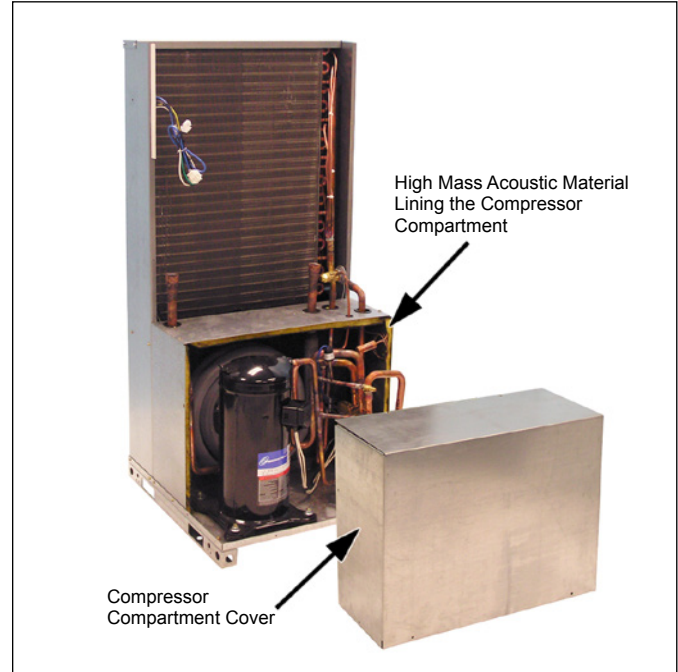
**Figure 8: Compressor Mass Plate**



## Compressor Sound Enclosure

A high mass compressor enclosure is lined with a high mass acoustic material to absorb and contain the lower frequency sound typical of compression.

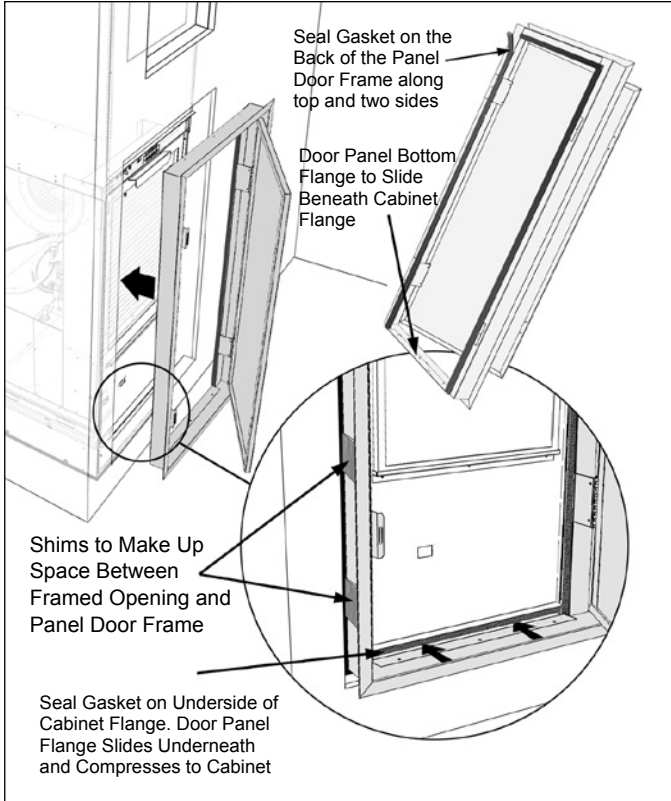
**Figure 9: Compressor Compartment Insulated Enclosure**



**Return Air Panels**

The acoustic liner installed behind the panel is specifically designed to absorb noise typical of a centrifugal fan system. However, this liner helps to reduce both compressor and fan noise. The heavy gauge steel return air panel creates an acoustic barrier to deflect low frequency noise from the compressor. The gasket seal between the return air panel and the wall assembly minimizes vibration transmission to the wall. All of these features are designed into each return air panel to absorb or deflect sound while minimizing transmission to the building structure. See Figure 10.

**Figure 10: Hinged Perimeter Return Air Panel Shown**

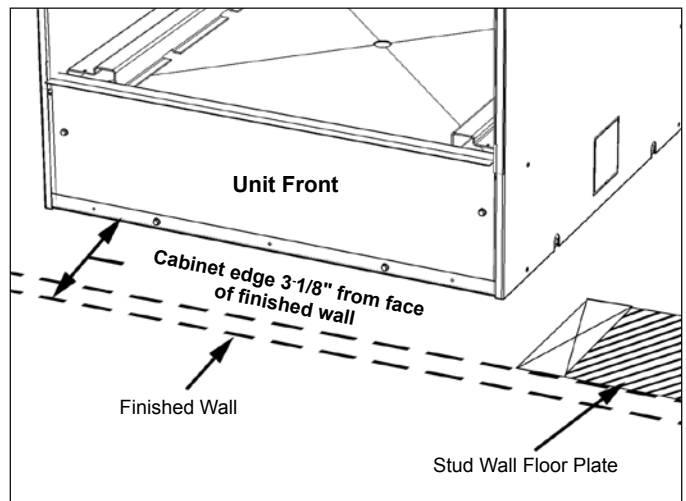


**Field Installation Guidelines**

It is always important to ensure that each unit is installed with the utmost attention to detail. Most importantly, follow the manufacturer’s installation instructions! These installation guidelines should be followed to minimize vibration transmission to the building structure and to lessen discharge air and casing radiated sound levels.

One of the most critical installation steps that will affect performance and level of sound is the distance from the front of the unit to the face of the finished wall. This critical dimension, 3-1/8" when followed, result in the discharge air diffuser foam seal and the return air panel door gasket meet and seal properly to the cabinet, (Figure 12).

**Figure 12: Set The Cabinet Front 3-1/8" From The Face of The Finished Wall**



**Stainless Steel Braided Hoses**

Daikin sells a variety of flexible supply, return and condensate hoses and hose assemblies to connect the chassis water lines to the risers. Flexible braided stainless steel hoses reduce vibration transmission between the chassis and the riser pipe system. This ensures the risers are acoustically isolated from unit vibrations.

See catalog 1196-x for the complete hose and hose kit offering.

**Figure 11: Flexible, Steel Braided Supply and Return Hoses**



**Cabinet Isolation**

Minimize vibration transmission to the building structure by following these important steps:

- Never fir-in the walls so there is direct contact with the unit cabinet
- Never install gypsum wall board or any wall system component directly in contact with the unit cabinet or return air panel
- Ensure wall studs do not physically touch the unit cabinet
- Use flexible electrical conduit to make electrical connections to the unit electrical box
- Ensure the conduit only contacts the unit cabinet at the electrical knock-out point

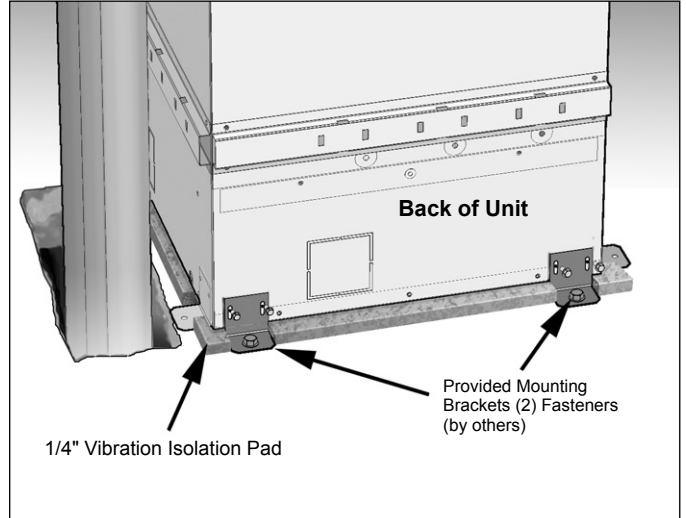
**Supply Air Diffusers**

All supply air diffusers should be installed with a minimum 1/2" foam seal applied between the diffuser perimeter and the unit cabinet. This prevents air leakage into the wall cavity and minimizes vibration transmission from the discharge air plenum, (Figure 14).

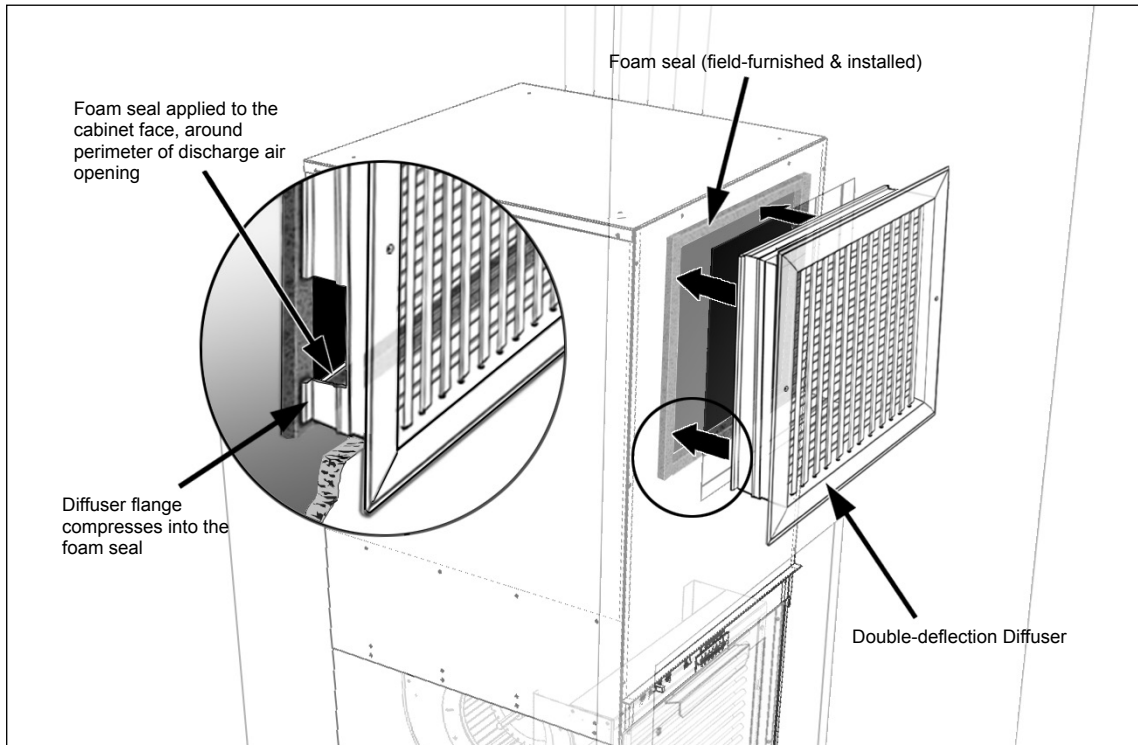
**Vibration Isolation Pad**

Minimize vibration transmission to the floor by installing a 1/4" (minimum) thickness vibration isolation pad under the unit cabinet as shown in Figure 13.

**Figure 13: Minimize Floor Transmission with 1/4" Vibration Isolation Pad**



**Figure 14: Supply Air Diffusers**



## Sound Power Data

### Model WVHC/VHW, WVHF with PSC Motor

Table 2: Sound Power Data – Vertical Stack WSHP - Model - WVHC/VHW, WVHF with PSC Motor

Size	Configuration(1)	Fan Speed	ARI-350-2015 Sound Data, Sound Power (dB) re 1 pW							dBA
			125	250	500	1000	2000	4000	8000	
009	Fan Only	Low	52	51	48	44	39	35	31	50
		High	54	53	50	46	42	36	32	52
	Cooling	Low	56	53	49	45	40	36	32	51
		High	58	55	52	48	44	40	35	54
	Heating	Low	57	53	49	44	40	36	32	51
		High	58	54	50	46	42	38	33	52
012	Fan Only	Low	52	51	48	44	39	35	31	50
		High	54	53	50	46	42	36	32	52
	Cooling	Low	56	53	49	45	40	36	32	51
		High	58	55	52	48	44	40	35	54
	Heating	Low	57	53	49	44	40	36	32	51
		High	58	54	50	46	42	38	33	52
015	Fan Only	Low	56	54	51	47	42	38	34	46
		High	59	57	54	50	45	40	35	46
	Cooling	Low	60	56	52	48	44	39	34	54
		High	61	58	55	51	47	43	38	57
	Heating	Low	61	57	53	49	44	39	34	55
		High	62	59	55	51	46	41	36	57
018	Fan Only	Low	56	54	51	47	42	38	34	53
		High	59	57	54	50	45	40	35	53
	Cooling	Low	60	56	52	48	44	39	34	54
		High	61	58	55	51	47	43	38	57
	Heating	Low	61	57	53	49	44	39	34	55
		High	62	59	55	51	46	41	36	57
021	Fan Only	Low	60	59	57	53	49	45	41	59
		High	63	62	60	57	53	48	43	62
	Cooling	Low	66	62	58	55	50	46	41	60
		High	68	65	62	58	54	50	46	64
	Heating	Low	65	61	57	53	49	44	40	59
		High	67	64	61	57	53	49	45	63
024	Fan Only	Low	60	59	57	53	49	45	41	59
		High	63	62	60	57	53	48	43	62
	Cooling	Low	63	60	56	52	48	44	39	58
		High	65	63	60	56	52	48	44	62
	Heating	Low	64	60	56	52	48	43	38	58
		High	65	62	59	55	51	47	42	61
030	Fan Only	Low	67	66	63	59	54	49	45	65
		High	70	68	65	62	58	53	47	67
	Cooling	Low	68	65	63	59	55	51	46	65
		High	70	68	65	62	58	53	47	67
	Heating	Low	68	64	61	58	54	50	45	64
		High	70	67	64	60	56	52	47	66
036	Fan Only	Low	67	66	63	59	54	49	45	65
		High	70	68	65	62	58	53	47	67
	Cooling	Low	68	65	63	59	55	51	46	65
		High	70	68	65	62	58	53	47	67
	Heating	Low	68	64	61	58	54	50	45	64
		High	70	67	64	60	56	52	47	66

**Notes:** (1) Cooling and heating conditions per ISO Standard 13256-1 water-loop rating conditions for 1-inch filter, dry coil.  
Data based on sound measurements made in a reverberant room on representative units in accordance with ARI Standard 350-2015.

(2) Mounted per ARI 350-2015, Section 4.2.2 "Position B".

## Model WVHC/VHW, WVHF with EC Motor

Table 3: Sound Power Data – Vertical Stack WSHP - Model - WVHC/VHW, WVHF with EC Motor<sup>(2)</sup>

Size	Configuration <sup>(1)</sup>	Fan Speed	ARI-350-2015 Sound Data, Sound Power (dB) re 1 pW							dBA
			125	250	500	1000	2000	4000	8000	
009	Fan Only	2	48	47	45	41	36	31	27	46
		3	49	48	46	42	38	33	29	48
	Cooling	2	51	48	43	38	34	31	28	45
		3	52	50	46	43	39	35	31	49
	Heating	2	52	49	46	42	37	33	29	48
		3	53	50	47	44	40	35	31	49
012	Fan Only	2	50	49	47	43	38	33	29	48
		3	51	50	48	44	40	36	32	50
	Cooling	2	53	49	45	40	36	32	30	47
		3	54	53	50	47	43	38	33	50
	Heating	2	54	51	48	44	39	35	31	50
		3	55	52	49	46	42	37	33	51
015	Fan Only	2	44	43	40	36	30	25	22	41
		3	51	49	47	43	37	32	30	48
	Cooling	2	55	51	47	42	37	33	29	49
		3	58	54	50	46	41	36	32	52
	Heating	2	59	54	50	45	40	35	31	52
		3	60	56	52	48	44	39	34	54
018	Fan Only	2	53	52	49	45	39	34	31	50
		3	58	56	53	49	43	38	35	54
	Cooling	2	61	57	53	48	43	38	33	55
		3	63	59	55	51	46	41	36	55
	Heating	2	63	59	55	50	45	40	36	57
		3	65	62	58	54	50	45	40	60
021	Fan Only	2	46	44	41	37	31	27	24	43
		3	49	47	45	40	35	31	28	46
	Cooling	2	59	55	51	46	41	36	31	53
		3	60	57	53	48	43	38	33	55
	Heating	2	58	54	50	46	41	36	31	52
		3	60	57	53	49	45	40	35	55
024	Fan Only	2	52	50	47	43	38	33	30	49
		3	55	53	51	47	41	37	34	52
	Cooling	2	63	59	55	50	45	40	35	57
		3	64	61	57	52	47	43	38	59
	Heating	2	61	57	53	49	44	39	34	55
		3	63	60	56	52	48	43	39	58
030	Fan Only	2	60	58	55	51	47	42	35	57
		3	65	63	60	56	52	48	42	62
	Cooling	2	66	63	59	55	51	46	41	61
		3	68	65	62	58	55	51	45	64
	Heating	2	65	63	59	55	51	46	40	61
		3	68	65	62	58	54	50	44	64
036	Fan Only	2	65	63	60	57	53	48	42	62
		3	69	67	63	60	57	53	48	66
	Cooling	2	69	66	63	59	55	51	46	65
		3	71	68	65	63	60	55	50	68
	Heating	2	69	66	63	59	55	51	45	65
		3	71	68	65	63	59	55	50	68

- Notes:** (1) Cooling and heating conditions per ISO Standard 13256-1 water-loop rating conditions for 1-inch filter and dry coil.  
(2) EC motors are programmed for soft starts and stops to reduce sound levels. Speed and torque is automatically adjusted to deliver constant airflow over a wide range of external static pressure for quiet operation.  
(3) Mounted per ARI 350-2015, Section 4.2.2 "Position B".

## Model WVHC/VHW, WVHF with EC Motor and Hydronic Heat

Table 4: Sound Power Data – Vertical Stack WSHP - Model - WVHC/VHW, WVHF with EC Motor<sup>(2)</sup>

Size	Configuration(1)	Fan Speed	ARI-350-2015 Sound Data, Sound Power (dB) re 1 pW							dBA
			125	250	500	1000	2000	4000	8000	
009	Fan Only	3	49	48	46	42	38	33	29	48
		4	51	50	48	43	38	33	29	49
	Cooling	3	52	50	46	43	39	35	31	49
		4	53	51	48	45	41	36	31	50
	Heating	3	53	50	47	44	40	35	31	49
		4	55	52	49	45	41	36	31	51
012	Fan Only	3	51	50	48	44	40	36	32	50
		4	53	51	50	45	40	35	30	51
	Cooling	3	54	51	48	44	40	36	33	50
		4	54	53	50	47	43	38	33	52
	Heating	3	55	52	49	46	42	37	33	51
		4	56	54	51	47	43	43	36	53
015	Fan Only	3	51	49	47	43	37	32	30	48
		4	55	53	51	47	42	37	32	53
	Cooling	3	58	54	50	46	41	36	32	52
		4	59	56	53	49	44	39	34	55
	Heating	3	60	56	52	48	44	39	34	54
		4	61	59	55	51	47	42	36	57
018	Fan Only	3	58	56	53	49	43	38	35	54
		4	62	59	57	54	48	43	38	59
	Cooling	3	63	59	55	51	46	41	36	55
		4	66	63	60	56	52	47	43	62
	Heating	3	65	62	58	54	50	45	40	60
		4	68	65	62	58	54	50	45	64
021	Fan Only	3	49	47	45	40	35	31	28	46
		4	54	52	50	46	41	36	31	51
	Cooling	3	60	57	53	48	43	38	33	55
		4	61	58	55	52	47	42	37	57
	Heating	3	60	57	53	49	45	40	35	55
		4	62	60	56	52	48	43	38	58
024	Fan Only	3	55	53	51	47	41	37	34	52
		4	59	57	55	52	46	41	36	57
	Cooling	3	64	61	57	52	47	43	38	59
		4	64	61	58	54	50	45	40	60
	Heating	3	63	60	56	52	48	43	39	58
		4	65	63	59	55	51	46	41	61
030	Fan Only	3	65	63	60	56	52	48	42	62
		4	69	66	62	59	56	52	46	65
	Cooling	3	68	65	62	58	55	51	45	64
		4	70	68	64	61	58	54	49	67
	Heating	3	68	65	62	58	54	50	44	64
		4	71	68	64	61	57	53	49	67
036	Fan Only	3	69	67	63	60	57	53	48	66
		4	72	69	66	64	61	57	52	69
	Cooling	3	71	68	65	63	60	55	50	68
		4	74	72	69	65	62	58	54	71
	Heating	3	71	68	65	63	59	55	50	68
		4	74	71	68	64	61	57	53	70

- Notes:** (1) Cooling and heating conditions per ISO Standard 13256-1 water-loop rating conditions for 1-inch filter and dry coil.  
(2) EC motors are programmed for soft starts and stops to reduce sound levels. Speed and torque is automatically adjusted to deliver constant airflow over a wide range of external static pressure for quiet operation.  
(3) Mounted per ARI 350-2015, Section 4.2.2 "Position B".

This page left blank intentionally



### ***Daikin Applied Training and Development***

Now that you have made an investment in modern, efficient Daikin equipment, its care should be a high priority. For training information on all Daikin HVAC products, please visit us at [www.DaikinApplied.com](http://www.DaikinApplied.com) and click on Training, or call 540-248-9646 and ask for the Training Department.

### ***Warranty***

All Daikin equipment is sold pursuant to its standard terms and conditions of sale, including Limited Product Warranty. Consult your local Daikin Applied representative for warranty details. Refer to Form 933-430285Y. To find your local Daikin Applied representative, go to [www.DaikinApplied.com](http://www.DaikinApplied.com).

### ***Aftermarket Services***

To find your local parts office, visit [www.DaikinApplied.com](http://www.DaikinApplied.com) or call 800-37PARTS (800-377-2787).  
To find your local service office, visit [www.DaikinApplied.com](http://www.DaikinApplied.com) or call 800-432-1342.

This document contains the most current product information as of this printing. For the most up-to-date product information, please go to [www.DaikinApplied.com](http://www.DaikinApplied.com).

Products manufactured in an ISO Certified Facility.