



## **R32 SINGLE ZONE ART COOL MIRROR ENGINEERING MANUAL**



**KSUAK091A (9,000 Btu/h)  
KSUAK121A (12,000 Btu/h)**



**KSUAK181A (18,000 Btu/h)**

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A summary list of safety precautions is on page 6.

**For more technical materials such as submittals, catalogs, installation, owner's, and service manuals, visit [www.lghvac.com](http://www.lghvac.com).**

Proper sizing and installation of equipment is critical to achieve optimal performance. Split system air conditioners and heat pumps (excluding ductless systems) must be matched with appropriate coil components to meet ENERGY STAR® criteria. Ask your contractor for details or visit [www.energystar.gov](http://www.energystar.gov).

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# LG AIR CONDITIONER TECHNICAL SOLUTION (LATS)

## LG Air Conditioner Technical Solution (LATS) Software

A properly designed and installed refrigerant piping system is critical to the optimal performance of LG air-conditioning systems. To assist engineers, LG offers, free of charge, LG Air Conditioner Technical Solution (LATS) software—a total design solution for LG air conditioning systems. Contact your LG Rep for the best software program for your application.

### NOTICE

To reduce the risk of designing an improper applied system or one that will not operate correctly, LG requires that LATS software be used on all projects.

### Formats

LATS is available to LG customers in two user interfaces: LATS HVAC and LATS Revit. Both LATS formats are available through [www.myLGHVAC.com](http://www.myLGHVAC.com), or contact an LG Sales Representative.

**LATS HVAC** is a Windows®-based application that aids engineers in designing LG Variable Refrigerant Flow (VRF), Multi F / Multi F MAX, Single-Zone, DOAS, and Energy Recovery Ventilator (ERV) systems.

*\*Windows® is a registered mark of Microsoft® Corporation.*

**LATS Revit** integrates the LG LATS program with Revit® software\*\*. It permits engineers to layout and validate LG VRF, Multi F / Multi F MAX, Single-Zone, and DOAS directly into Revit drawings.

*\*\*Revit® is a registered mark of Autodesk, Inc.*

### Features

All LG product design criteria have been loaded into the program, making LATS simple to use: double click or drag and drop the component choices. Build systems in Tree Mode where the refrigerant system can be viewed. Switch to a Schematic diagram to see the electrical and communications wiring.

LATS software permits the user to input region data, indoor and outdoor design temperatures, modify humidity default values, zoning, specify type and size of outdoor units and indoor units, and input air flow and external static pressure (ESP) for ducted indoor units.

The program can also:

- Import building loads from a separate Excel file.
- Present options for outdoor unit auto selection.
- Automatically calculate component capacity based on design conditions for the chosen region.
- Verify if the height differences between the various system components are within system limits.
- Provide the correct size of each refrigerant piping segment and LG Y-Branches and Headers.
- Adjust overall piping system length when elbows are added.
- Check for component piping limitations and flag if any parameters are broken.
- Factor operation and capacity for defrost operation.
- Calculate refrigerant charge, noting any additional trim charge.
- Suggest accessories for indoor units and outdoor units.
- Run system simulation.

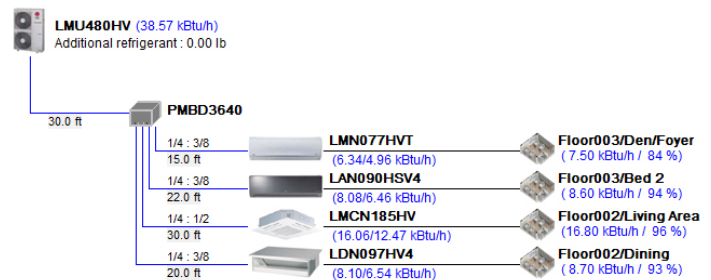
### NOTICE

Features depend on which LATS program is being used, and the type of system being designed. Contact your LG representative for the best software program for your application.

### NOTICE

Any field changes, such as re-routing, shortening or lengthening a pipe segment, adding or eliminating elbows and/or fittings, re-sizing, adding, or eliminating indoor units, changing the mounting height, or moving the location of a device or fitting during installation must be done with caution and ALWAYS VERIFIED in LATS SOFTWARE BEFORE supplies are purchased or installed. Doing so will lead to a more profitable installation, reduce the potential for rework, and will reduce the potential for multiple visits to the job site to complete the system set up.

Figure 1: Example of a LATS Tree Diagram.



# LG AIR CONDITIONER TECHNICAL SOLUTION (LATS)

## LATS Generates a Complete Project Report

LATS software also generates a report containing project design parameters, cooling and heating design data, system component performance, and capacity data. The report includes system combination ratio and refrigerant charge calculations; and provides detailed bill of material, including outdoor units, indoor units, control devices, accessories, refrigerant pipe sizes segregated by building, by system, by pipe size, and by pipe segments. LATS can generate an Excel GERP report that can be imported into the LG SOPS pricing and ordering system.

## Proper Design to Install Procedure

LG encourages a two report design-to-install-procedure. After the design engineer determines building / zone loads and other details, the engineer opens the LATS program and inputs the project's information. When the design is complete, the "Auto Piping" and "System Check" functions must be used to verify piping sizes, limitations, and if any design errors are present. If errors are found, engineers must adjust the design, and run Auto Piping and System Check again. When the design passes the checks, then the engineer prints out a project "Shop Drawing" (LATS Tree Diagram) and provides it to the installing contractor. The contractor must follow the LATS Tree Diagram when building the piping system, but oftentimes the design changes on the building site:

- Architect has changed location and/or purpose of room(s).
- Outdoor unit cannot be placed where originally intended.
- Structural elements prevent routing the piping as planned.
- Air conditioning system conflicts with other building systems (plumbing, gas lines, etc.).

The contractor must mark any deviation from the design on the Shop Drawing, including as-built straight lines and elbows. This "Mark Up" drawing must be returned to the design engineer or Rep, who must input contractor changes into the LATS file. (Copy the original LATS software file, save and rename as a separate file, and modify all piping lengths by double-clicking on each length and editing information.) Like the shop drawing, the Auto Piping and System Check must also be run on this new "As Built" drawing. The design engineer or Rep must then provide the final As Built file to the contractor. The Mark Up version must be compared to the As Built version for:

- Differences in pipe diameter(s). If incorrect diameters have been installed, the piping must be changed out. If pipe diameters have changed, check if Y-Branches will also need to be changed.
- Changes to outdoor unit and indoor unit capacities. Capacities changes will impact line length changes.
- Additional refrigerant charge quantity ("Trim Charge"). Trim charge will change if piping lengths and diameters change. The As Built version must reflect installed piping lengths to ensure correct trim charge.

All documents submitted by the contractor, as well as the Shop Drawing and the As Built Drawing files must be provided for commissioning purposes. Model and serial numbers for all system components must also be submitted. If the steps previously detailed are not followed, and all documents are not provided to the commissioning agent, the project runs the risk of not being commissioned and voiding any limited warranty LG offers on the equipment.

## NOTICE






**Any field changes, such as re-routing, shortening or lengthening a pipe segment, adding or eliminating elbows and/or fittings, re-sizing, adding, or eliminating indoor units, changing the mounting height, or moving the location of a device or fitting during installation must be done with caution and ALWAYS VERIFIED in LATS SOFTWARE BEFORE supplies are purchased or installed. Doing so will lead to a more profitable installation, reduce the potential for rework, and will reduce the potential for multiple visits to the job site to complete the system commissioning.**



# TABLE OF CONTENTS

<b>LG Air Conditioner Technical Solution</b> .....	<b>3</b>
<b>Table of Symbols</b> .....	<b>5</b>
<b>Product Data</b> .....	<b>7-30</b>
Nomenclature .....	8
Pairing Table .....	9
Mechanical Specifications .....	10
General Data .....	11-12
Electrical Data .....	13
Functions, Controls, Options .....	14
Accessories .....	15-16
Outdoor Unit Dimensions .....	17-18
Outdoor Unit Center of Gravity / Corner Weight .....	19
Indoor Unit Dimensions .....	20-21
Air Flow, Temp. Distribution Graphs .....	22-25
Outdoor Unit Acoustic Data .....	26-27
Indoor Unit Acoustic Data .....	28-30
<b>Performance Data</b> .....	<b>31-45</b>
Cooling Capacity .....	32-34
Maximum Cooling Capacity .....	35-37
Heating Capacity .....	38-40
Maximum Heating Capacity .....	41-43
Correction Factors .....	44
Check Selection .....	45
<b>Application Guidelines</b> .....	<b>46-55</b>
Indoor Unit Placement / Clearance Considerations .....	47-48
Outdoor Unit Placement / Clearance Considerations .....	49-52
Installing Outdoor Units Indoors .....	53-55
<b>Refrigerant Piping Design</b> .....	<b>56-66</b>
Refrigerant Flow Diagrams .....	57-58
Connection Limitations and System Layout .....	59
Additional Refrigerant Charge .....	60
Refrigerant Piping System Engineering .....	61-66
<b>Electrical</b> .....	<b>67-76</b>
General Guidelines .....	68
Wiring Diagrams .....	69-71
Power Supply / Power Wiring .....	72
Communication / Connection Cable .....	73-74
Controllers .....	75-76
<b>Limited Warranty</b> .....	<b>77</b>

# TABLE OF SYMBOLS

	Indicates that this appliance uses a flammable refrigerant. If the refrigerant leaks and is exposed to an external ignition source, there is a risk of fire.
 <b>DANGER</b>	Indicates a hazardous situation that, if not avoided, <b>WILL RESULT IN DEATH OR SERIOUS INJURY</b> . <sup>1</sup>
 <b>WARNING</b>	Indicates a hazardous situation that, if not avoided, <b>COULD RESULT IN DEATH OR SERIOUS INJURY</b> . <sup>1</sup>
 <b>CAUTION</b>	Indicates a hazardous situation that, if not avoided, <b>COULD RESULT IN MINOR OR MODERATE INJURY</b> . <sup>1</sup>
<b>NOTICE</b>	Indicates information considered important, but not hazard-related; indicates situations that may result in equipment or property damage accidents. <sup>1</sup>
	This symbol indicates an action that should not be performed.

<sup>1</sup>Signal words, symbols, and definitions taken from American National Standards Institute (ANSI) Z535.6. See <https://www.ansi.org/> for more information.



## R32 Refrigerant



LG Electronic split system heating and air conditioning (HVAC) products now contain R32 refrigerant. While R32 refrigerant is slightly flammable, it has a higher efficiency, a lower Global Warming Potential (GWP) value, and is more environmentally friendly than R410A.

R32 Ozone Depletion Potential (ODP) Value: 0.



R32 Global Warming Potential (GWP) Value: 675.

The amount of refrigerant depends on outdoor unit to indoor unit configuration. All refrigerant piping system components (copper piping, joints, and other fittings) must be selected and installed to conform with Refrigeration Safety Regulation standards. Use LG Air Conditioner Technical Solution (LATS) Software to verify the refrigerant amount needed for each installation.

### WARNING

- This HVAC system contains fluorinated greenhouse gases in the form of R32 refrigerant.  Do not leak refrigerant gas into the atmosphere.
- Only use R32 as the refrigerant in these HVAC systems. If other substances are added, it may cause an explosion.
- R32 refrigerant is slightly flammable. When handled properly, it does not leak. If the refrigerant leaks in the installation area and comes in contact with a flame, it may generate a fire and / or harmful gas.
- If a leak occurs, immediately turn off any combustion devices, ventilate the installation area, and contact the dealer / contractor where the HVAC unit was purchased.  Do not operate the unit until the refrigerant leaked is repaired.

### CAUTION

- Piping wall thickness must comply with all applicable local, state, and federal regulations for the design pressures listed by the manufacturer.  Unapproved piping must not be used.
- To prevent piping from softening,  do not heat the piping more than necessary.

# PRODUCT DATA

**Nomenclature on page 8**

**Pairing Table on Page 9**

**Mechanical Specifications on page 10**

**General Data on page 11**

**Electrical Data on page 13**

**Functions, Controls, and Options on page 14**

**Accessories on page 15**

**Outdoor Unit Dimensions on page 17**

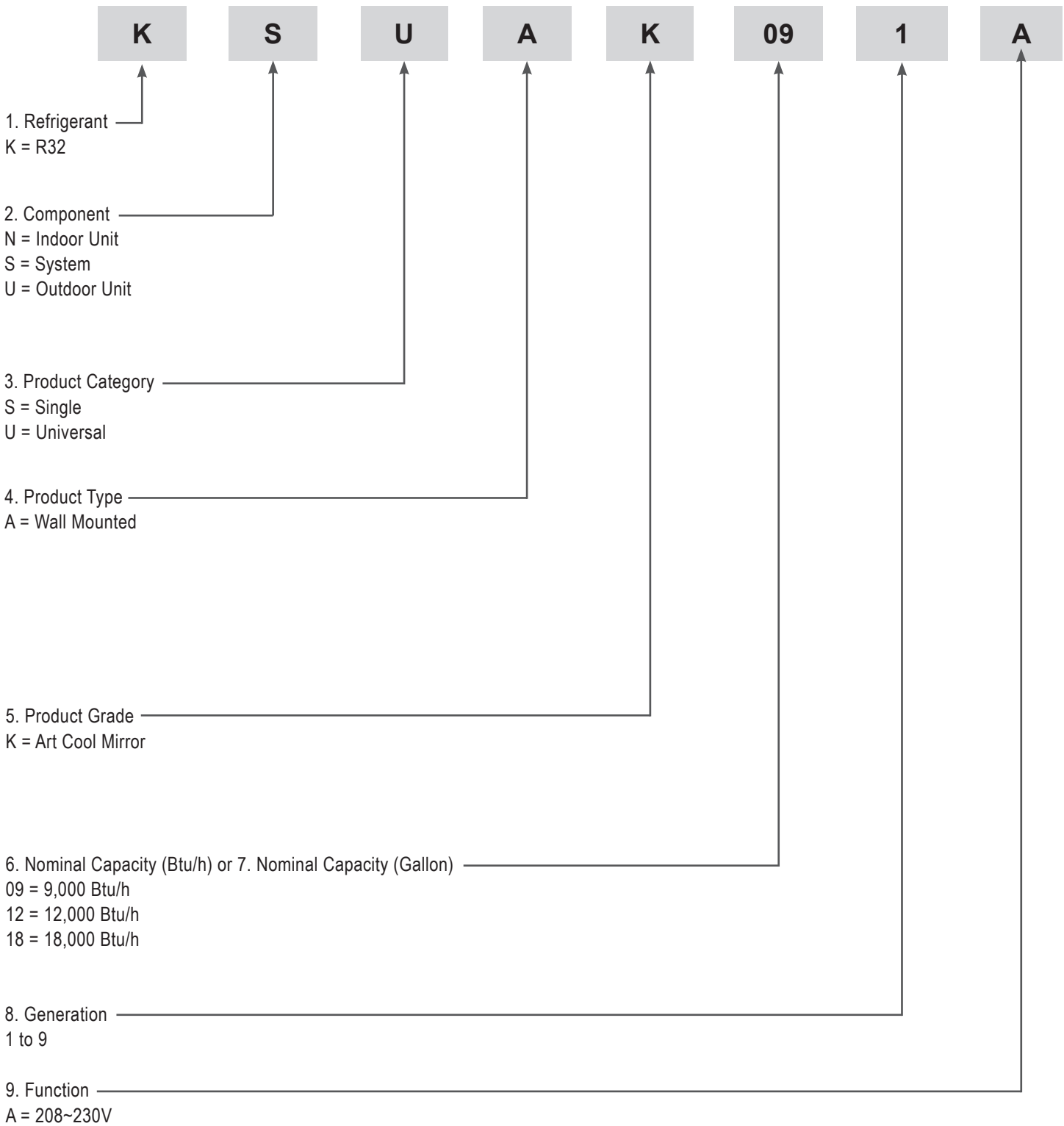
**Outdoor Unit Center of Gravity / Corner Weight on page 19**

**Indoor Unit Dimensions on page 20**

**Air Flow, Temperature Distribution Graphs on page 22**

**Acoustic Data on page 26**







# UNIT NOMENCLATURE



# PAIRING TABLE

The following table shows the available outdoor and indoor unit, along with the factory provided controller.

Table 1: R32 Single Zone Art Cool Mirror System Pairing Table

Outdoor Unit Model	Indoor Unit Model	Wireless Remote Controller
<b>KUSAB091A, KUSAB121A</b> 	<b>KNUAK091A, KNUAK121A</b> 	<b>AKB76044208</b> 
<b>KUSAB181A</b> 	<b>KNUAK181A</b> 	<b>AKB76044208</b> 

# MECHANICAL SPECIFICATIONS

## General

LG Single Zone Art Cool Mirror Wall Mount systems are comprised of a single outdoor unit connected to a single indoor unit with a single refrigerant circuit.

These single zone systems can operate in either cooling or heating mode. These systems are capable of changing mode within a maximum time of three (3) minutes to ensure temperature can be properly maintained.

LG Single Zone Art Cool Mirror systems are manufactured in a facility registered to ISO 9001 and ISO 14001, which is a set of standards applying to environmental protection set by the International Organization for Standardization (ISO). The units are listed by Intertek Electrical Testing Laboratories (ETL) and bear the ETL label. Wiring in these units are in accordance with the National Electrical Code (NEC).

## Temperature Operating Ranges

### Outdoor Unit

Operating ranges for outdoor units of 14°F to 118°F DB for cooling and -4°F to +65°F WB for heating.

### Indoor Unit

Operating ranges for indoor units of 53°F to 75°F WB for cooling and 60°F to 86°F DB for heating.

Installing an optional Low Ambient Wind Baffle Kit will allow operation down to 0°F in cooling mode for these single zone systems.

## Casing / Frame

Outdoor unit is constructed with pre-coated metal (PCM). Indoor unit is constructed of heavy duty Acrylonitrile Butadiene Styrene (ABS) and High Impact Polystyrene (HIPS) plastic.

## Refrigerant System

The refrigeration system consists of a single refrigeration circuit and uses R32 refrigerant. The outdoor unit is provided with factory installed components, including a refrigerant strainer, four-way reversing valve, electronic controlled expansion valve (EEV), high and low side charging ports, service valves, and interconnecting piping.

### R32 Refrigerant Leak Detector

The indoor unit has a built-in R32 refrigerant leak detection sensor designed to communicate with release mitigation devices and third party alarms, and transmit a system error code upon detection of a refrigerant leak or sensor failure / expiration.

### Shut-off Valve

LG single-port shutoff valve (PRHPZ010A; sold separately) is available as an accessory.

### Refrigeration Oil Control

Heat pump outdoor units have a centrifugal oil separator and controls to ensure sufficient oil supply is maintained, and that oil does not travel with the refrigerant.

Figure 2: R32 Single Zone Art Cool Mirror Wall Mount Indoor Unit.



## Compressors

The outdoor unit is equipped with one hermetic digitally controlled inverter driven twin rotary compressor to modulate capacity (modulation in 1 Hz increments). Frequency ranges for the outdoor units are as follows:

KUSAB091A = 10- 95 Hz

KUSAB121A = 10-95 Hz

KUSAB181A = 10-93 Hz

Overcurrent protection and vibration isolation are integrated with the compressor.

## Outdoor Unit Coil

Heat pump outdoor unit coils are made of a nonferrous construction with louvered fins on copper tubing, and are protected with an integral coil guard. Coil fans have a factory applied corrosion resistant GoldFin™ material with hydrophilic coating.

Outdoor units include a factory-installed drain pan heater.

## Fans and Motors

The outdoor unit includes one direct fan drive, variable speed propeller type fan. The Brushless Digitally Controlled (BLDC) fan motor has inherent protection, permanently lubricated bearings, and variable speed with a maximum speed up to 840 rpm (9/12k units) and 700 rpm (18k units). Raised guards are provided to limit contact with moving parts. The outdoor unit has horizontal discharge airflow.

## Electrical

These units are available in 208-230V, 60 Hz, 1-phase power supply. These units are capable of operating within voltage limits of  $\pm 10\%$  rated voltage, and include overcurrent protection.

## Controls

The indoor unit casing has a factory-standard, integral, infrared sensor designed to communicate with the supplied LG wireless handheld remote controller. An optional LG supplied wired controller is available as an additional accessory. Communication between the indoor unit and the outdoor unit is accomplished through 18 AWG two-core, stranded, shielded communication cable. Indoor units have built-in Wi-Fi and can be controlled by LG's ThinQ app on a smart device. A field-supplied Wi-Fi network and smart device are required. The ThinQ app is free, and is available for Android™ and iOS. (Android is a trademark of Google LLC.)

# GENERAL DATA

Table 2: R32 Single Zone Art Cool Mirror System Specifications.

System (Model) (Indoor Unit / Outdoor Unit)		KSUAK091A (KNUAK091A / KUSAB091A)	KSUAK121A (KNUAK121A / KUSAB121A)	KSUAK181A (KNUAK181A / KUSAB181A)
Cooling Capacity (Min/Rated/Max) (Btu/h)		1,023 ~ 9,000 ~ 12,625	1,023 ~ 12,000 ~ 14,100	3,070 ~ 18,000 ~ 24,210
Cooling Power Input <sup>1</sup> (Min/Rated/Max) (kW)		0.20 ~ 0.60 ~ 1.40	0.20 ~ 0.93 ~ 1.60	0.30 ~ 1.38 ~ 2.65
EER2 (@95°F)		14.95	12.80	13.00
SEER2		23.8	22.5	23.0
Heating Capacity (Min/Rated/Max) (Btu/h)		1,023 ~ 10,900 ~ 17,061	1,023 ~ 13,600 ~ 19,040	3,070 ~ 21,600 ~ 30,020
Heating Power Input <sup>1</sup> (Min/Rated/Max) (kW)		0.19 ~ 0.71 ~ 1.80	0.19 ~ 1.04 ~ 1.97	0.66 ~ 1.83 ~ 3.30
COP (@47°F)		4.50	3.83	3.46
HSPF2		10.9	10.5	10.0
Maximum Heating Capacity (Btu/h)				
Outdoor 17°F (WB) / Indoor 70°F (DB)		11,200 (103%)	12,400 (91%)	18,600 (86%)
Outdoor 5°F (WB) / Indoor 70°F (DB)		9,500 (87%)	10,000 (74%)	15,120 (70%)
Outdoor -4 °F (WB) / Indoor 70°F (DB)		7,810 (72%)	8,010 (59%)	12,160 (56%)
ENERGY STAR / Cold Climate		Yes / Yes	Yes / Yes	Yes / Yes
Power Supply (To Outdoor Unit; V / Hz / Ø)		208-230 / 60 / 1		
Power Supply Wiring (Outdoor Unit) <sup>2</sup> (No. x AWG)		3 x 14	3 x 14	3 x 12
Power Wiring / Communication Wiring <sup>2</sup> (ODU to IDU ) (No. x AWG)		3 x 14 / 2 x 18	3 x 14 / 2 x 18	3 x 14 / 2 x 18
Indoor Unit Data				
Operating Range	Cooling (°F WB)	53 to 75		
	Heating (°F DB)	60 to 86		
Temperature Setting Range	Cooling (°F)	64 to 86		
	Heating (°F)	60 to 86		
Sound Pressure <sup>3</sup> dB(A)	Cooling (H/M/L/Sleep)	41 / 35 / 25 / 21	41 / 35 / 25 / 21	47 / 42 / 37 / 31
	Heating (H/M/L)	41 / 35 / 26	41 / 35 / 26	47 / 42 / 37
Net Dimensions (W x H x D) (in.)		32-15/16 x 12-1/8 x 7-9/16	32-15/16 x 12-1/8 x 7-9/16	39-9/32 x 13-19/32 x 8-11/32
Shipping Dimensions (W x H x D) (in.)		35-5/16 x 15-11/32 x 10	35-5/16 x 15-11/32 x 10	42-1/16 x 16-23/32 x 10-31/32
Indoor Unit Net / Shipping Weight (lbs.)		22.7 / 24.5	22.7 / 24.5	27.8 / 33.5
Indoor Unit Exterior Color Codes		Munsell 7.5PB 0.2 / 20 (RAL 9005)		
Fan Type x Qty.		Cross Flow x 1	Cross Flow x 1	Cross Flow x 1
Fan Motor Output (W) x Qty.		30	30	58
Fan Motor / Drive		Brushless Digitally Controlled / Direct		
Airflow Rate (CFM)	Cooling (Max/H/M/L)	459 / 388 / 318 / 194	459 / 388 / 318 / 194	706 / 530 / 477 / 371
	Heating (Max/H/M/L)	459 / 388 / 318 / 229	459 / 388 / 318 / 229	706 / 547 / 494 / 371
Dehumidification Rate (pts./hr.)		2.7	2.75	5.5

EEV: Electronic Expansion Valve IDU: Indoor Unit ODU: Outdoor Unit

This data is rated 0 ft above sea level with 24.6 of refrigerant line per indoor unit and a 0 ft level difference outdoor and indoor units.

Cooling capacity rating obtained with air entering the indoor unit at 80°F dry bulb (DB) and 67°F wet bulb (WB) and outdoor ambient conditions of 95°F dry bulb (DB) and 75°F wet bulb (WB).

Heating capacity rating obtained with air entering the indoor unit at 70°F dry bulb (DB) and 59°F wet bulb (WB) and outdoor ambient conditions of 47°F dry bulb (DB) and 43°F wet bulb (WB).

<sup>1</sup>Power Input is rated at high speed.

<sup>2</sup>All power supply wiring to the outdoor unit is field supplied, solid or stranded. The power wiring and the communication wiring from the outdoor unit to the indoor unit is field supplied and must be stranded, shielded or unshielded (if shielded, it must be grounded to the chassis of the outdoor unit only). All wiring must comply with applicable local and national codes.

<sup>3</sup>Sound Pressure levels are tested in an anechoic chamber under ISO Standard 3745.



# GENERAL DATA

Table 3: R32 Single Zone Art Cool Mirror System Specifications, continued.

System (Model) (Indoor Unit / Outdoor Unit)		KSUAK091A (KNUAK091A / KUSAB091A)	KSUAK121A (KNUAK121A / KUSAB121A)	KSUAK181A (KNUAK181A / KUSAB181A)
Outdoor Unit Data				
Operating Range <sup>1</sup>	Cooling (°F DB)	14 to 118		
	Heating (°F WB)	-4 to +65		
Sound Pressure <sup>2</sup> dB(A) (Cool/Heat)		47 / 51	47 / 51	55 / 55
Max. External Static Pressure (in.wg)		0.0329	0.0329	0.0409
Net Dimensions (W x H x D) (in.)		30-5/16 x 21-15/32 x 11-11/32	30-5/16 x 21-15/32 x 11-11/32	37-13/32 x 32-3/4 x 13
Shipping Dimensions (W x H x D) (in.)		36-7/32 x 23-5/32 x 15-9/32	36-7/32 x 23-5/32 x 15-9/32	44-7/8 x 36-5/32 x 18-5/32
Outdoor Unit Exterior Color Codes		Munsell 9.54Y 8.34 / 1.31 (RAL 9001)		
Net / Shipping Weight (lbs.)		68.8 / 75.6	68.8 / 75.6	127.9 / 145.5
Fan Type x Qty.		Propeller x 1	Propeller x 1	Propeller x 1
Fan Motor Output (W) x Qty.		43	43	124
Fan Motor / Drive		Brushless Digitally Controlled / Direct		
Airflow Rate Max. (CFM)		1,165	1,165	2,119
Compressor (Type x Qty.)		Twin Rotary x 1	Twin Rotary x 1	Twin Rotary x 1
Heat Exchanger		Copper Tube / Aluminum Fin and Gold Fin™ Coated / Hydrophilic		
Material and Fin Coating		Copper Tube / Aluminum Fin and Gold Fin™ Coated / Hydrophilic		
Rows / Columns / Fin per inch x Qty.		(2 x 24 x 18) x 1	(2 x 24 x 18) x 1	(2 x 38 x 17) x 1
Refrigerant		R32 / EEV		
Type <sup>3</sup> / Control		R32 / EEV		
Pre-Charge (oz.)		28.9	28.9	51.1
Additional Charge (oz/ft)		0.16	0.16	0.32
Piping				
Liquid (in.)	Connection / Pipe Size	1/4 / 1/4	1/4 / 1/4	3/8 / 3/8
Vapor (in.)	Connection / Pipe Size	3/8 / 3/8	3/8 / 3/8	5/8 / 5/8
Condensation Line (OD, ID, in.)		27/32, 5/8	27/32, 5/8	27/32, 5/8
Pipe Length <sup>4</sup> (Min./Standard/Max.) (ft)		9.8 / 24.6 / 82	9.8 / 24.6 / 82	9.8 / 24.6 / 114.8
Piping Length <sup>4</sup> (no add'l refrigerant, ft)		41	41	24.6
Max Elevation Difference (ft)		49.2	49.2	49.2

EEV: Electronic Expansion Valve IDU: Indoor Unit ODU: Outdoor Unit

This data is rated 0 ft above sea level with 24.6 of refrigerant line per indoor unit and a 0 ft level difference outdoor and indoor units.

Cooling capacity rating obtained with air entering the indoor unit at 80°F dry bulb (DB) and 67°F wet bulb (WB) and outdoor ambient conditions of 95°F dry bulb (DB) and 75°F wet bulb (WB).

Heating capacity rating obtained with air entering the indoor unit at 70°F dry bulb (DB) and 59°F wet bulb (WB) and outdoor ambient conditions of 47°F dry bulb (DB) and 43°F wet bulb (WB).

<sup>1</sup>Optional Low Ambient Wind Baffle Kit allows operation down to 0°F in cooling mode.

<sup>2</sup>Sound Pressure levels are tested in an anechoic chamber under ISO Standard 3745.

<sup>3</sup>Take appropriate actions at the end of HVAC equipment life to recover, recycle, reclaim or destroy R32 refrigerant according to applicable regulations (40 CFR Part 82, Subpart F) under section 608 of CAA.

<sup>4</sup>Piping lengths are equivalent.

# ELECTRICAL DATA

Table 4: R32 Single Zone Art Cool Mirror Electrical Data Table.

Nominal Tons	Unit Model No.	Hertz	Voltage	Voltage Range (Min. to Max.)	MCA	MOP	Compressor Quantity	LRA	Compressor Motor RLA	Outdoor Fan Motor		Indoor Fan Motor
										W	FLA	FLA
3/4	KSUAK091A	60	208 - 230	187 - 253	12.0	15.0	1	9.0	8.3	43	0.4	0.4
1	KSUAK121A				12.0	15.0	1	9.0	8.3	43	0.4	0.4
1-1/2	KSUAK181A				19.0	30.0	1	17.0	14.3	124	0.78	0.4

Voltage tolerance is ±10%.  
Maximum allowable voltage unbalance is 2%.  
MCA = Minimum Circuit Ampacity.  
LRA = Locked Motor Amps  
RLA = Rated Load Amps.

FLA = Full Load Amps.  
W: Fan Motor Rated Output (W)  
Maximum Overcurrent Protection (MOP) is calculated as follows: (Largest motor FLA x 2.25) + (Sum of other motor FLA) rounded down to the nearest standard fuse size.

# FUNCTIONS, CONTROLS, OPTIONS

Table 5: R32 Single Zone Art Cool Mirror System Functions, Controls, Options Table.

System Model No.		KSUAK091A	KSUAK121A	KSUAK121A
Airflow	Air Supply Outlet	1	1	1
	Airflow Direction Control (Left / Right)	5 Steps	5 Steps	5 Steps
	Airflow Direction Control (Up / Down)	6 Steps	6 Steps	6 Steps
	Auto Swing (Left / Right)	√	√	√
	Auto Swing (Up / Down)	√	√	√
	Fan Speed Airflow Steps (Fan / Cool / Heat)	6 / 6 / 6	6 / 6 / 6	6 / 6 / 6
	Natural Wind (Auto Wind)	√	√	√
	Jet Cool / Jet Heat (Power Wind)	√ / √	√ / √	√ / √
	Comfort Air	√	√	√
Air Purifying	Prefilter (Washable / Anti-fungal <sup>1</sup> )	√	√	√
	3M Micro Dust Filter	√	√	√
Functions	Hot Start	√	√	√
	Self Diagnostics	√	√	√
	Defrost	√	√	√
	Dry (Dehumidification) Operation	√	√	√
	Auto Changeover	√	√	√
	Auto Cleaning (Coil Dry)	√	√	√
	Auto Restart Operation	√	√	√
	Child Lock1	√	√	√
	Forced Operation	√	√	√
	Sleep Mode	12 hrs.	12 hrs.	12 hrs.
	Timer (24 Hour On / Off)	√	√	√
	Weekly Timer1	√	√	√
	Two Thermistor Control1	√	√	√
	Low Ambient Operation	√	√	√
	Overheat Protection	√	√	√
	Smart Diagnosis	√	√	√
	Indoor Unit Display Type	Number Display	Number Display	Number Display
	Indoor Unit Display Light	On / Off	On / Off	On / Off
	Energy Saving	√	√	√
	Mode Lock	Cooling / Heating Only	Cooling / Heating Only	Cooling / Heating Only
Central Controllers	AC Smart 5	PACS5A000	PACS5A000	PACS5A000
	ACP 5	PACP5A000	PACP5A000	PACP5A000
	PI-485	PMNFP14A1	PMNFP14A1	PMNFP14A1
Remote Controllers	MultiSITE™ CRC1/CRC1+	PREMTBVC0/1	PREMTBVC0/1	PREMTBVC0/1
	Premium Remote Controller	PREMTA000	PREMTA000	PREMTA000
	Programmable Wired Remote Controller	PREMTB10U	PREMTB10U	PREMTB10U
Integration Solution	MultiSITE Communications Manager	PBACNBTR0A	PBACNBTR0A	PBACNBTR0A
Building Network Unit	LonWorks® Gateway	ZHWLONWK0	ZHWLONWK0	ZHWLONWK0
	AC Smart BACnet® Gateway	PBACNA000	PBACNA000	PBACNA000
Other	Dry Contact	PDRYCB100, PDRYCB300, PDRYCB320, PDRYCB400		
	Wind Baffle Kit	ZLABGP01A	ZLABGP01A	ZLABGP04A
	Wi-Fi <sup>2</sup>	√	√	√
	Drain Pan Heater	√	√	√
	Smart Inverter Monitoring System (SIMS)	√	√	√
	R32 Refrigerant Detection Sensor	√	√	√

√ = Standard feature

o = Optional accessory (must be purchased separately)

X = Not available

<sup>1</sup> Primary washable filters.

<sup>2</sup> Requires wired remote controller.

Not all controllers can support all features. Contact your LG representative for details.

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## LG Monitoring View (LGMV) Diagnostic Software and Cable

LG Monitoring View (LGMV) is a maintenance and troubleshooting tool for Multi V™ air conditioning systems. LGMV formats are available for computer or mobile phone use.

The main screen for LGMV allows the user to view the following real time data:

- Actual inverter compressor speed
- Target inverter compressor speed
- Actual outdoor fan speed
- Target outdoor unit fan speed
- Actual superheat
- Target superheat
- Actual subcooler circuit superheat
- Target subcooler circuit superheat
- Main EEV position
- Subcooling EEV position
- Inverter compressor current transducer value
- Outdoor air temperature
- Actual high pressure/saturation temperature
- Actual low pressure/saturation temperature
- Suction temperature
- Inverter compressor discharge temperature
- Constant speed compressor discharge temperature
- Front outdoor coil pipe temperature
- Back outdoor coil pipe temperature
- Liquid line pipe temperature
- Subcooler inlet temperature
- Subcooler outlet temperature
- Average indoor unit (IDU) pipe temperature
- Inverter compressor operation indicator light
- Four-way reversing valve operation indicator light
- Pressure graph showing actual low pressure and actual high pressure levels
- Error code display
- Operating mode indicator
- Target high pressure
- Target low pressure
- PCB (printed circuit board) version
- Software version
- Installer name
- Model no. of outdoor units
- Site name
- Total number of connected indoor units
- Communication indicator lights
- Indoor unit capacity
- Indoor unit operating mode
- Indoor unit fan speed
- Indoor unit EEV position
- Indoor unit room temperature
- Indoor unit inlet pipe temperature
- Indoor unit outlet pipe temperature
- Indoor unit error code

Additional screens can be accessed by tabs on the main screen

### 1. Cycleview: Graphic of internal components including

- Compressors showing actual speeds
- EEVs
- Indoor Units
- Liquid injection valves
- Temperature and pressure sensors
- Four-way reversing valve
- Outdoor fans showing status and speeds

### 2. Graph:

Full screen graph of actual high and low pressures and high and low pressure limits. A sliding bar enables user to go back in time and view data.

### 3. Control IDU: Enables user to turn on all IDUs default setpoints of 86°F in heat mode or 64°F in cool mode.

### 4. Setting: Converts metric values to imperial values.

### 5. Making Data: Recording of real time data to a separate file created to be stored on the user's computer.

### 6. Loading Data: Recorded data from a saved ".CSV" file can be loaded to create an LGMV session.

### 7. Electrical Data: Screen is changed to show the following:

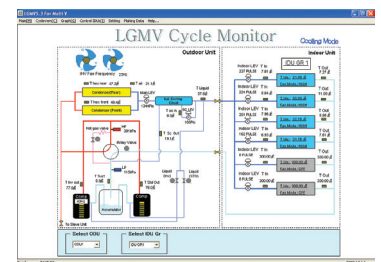
- Inverter compressor
- Constant compressor
- Amps / Volts / Power Hz
- Current transducer value
- Inverter control board fan Hz
- Phase

In lieu of connecting to the outdoor unit, user has the option to connect to the indoor unit with a connector kit. When connected through the indoor unit, user will not be able to record data.

This software can be used to both pre-set-up new systems and troubleshoot existing systems. LGMV data can be recorded to a ".CSV" file and emailed to an LG representative to assist with diagnostic evaluations.

**LGMV is available in different formats. Contact your LG Sales Representative for system requirements and for more information.**

Figure 3: Sample Cycleview (Computer View Example).



# ACCESSORIES

## ThinQ

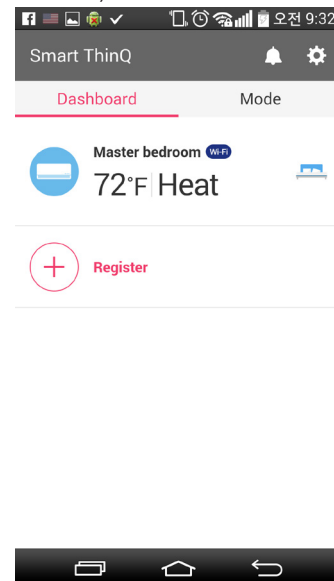
LG ThinQ is a built-in Wi-Fi module, along with a free smart phone app that provides monitoring and remote control capabilities for certain LG single zone systems. The app has the following features and benefits:

- Sign in to the app using LG credentials, or using Google® or Facebook® login credentials. Users only have to log in to the app once; the app remembers login details for subsequent logins.
- View current temperature settings of the air conditioning unit and change temperature, fan speed, and air flow direction from anywhere in the house or at a remote location (through the use of wireless connection). Multiple users can control the household air conditioning unit remotely.
- Monitor filter usage of the unit.
- Set up weekly schedules to start and stop air conditioner activity.
- Set up the unit to run in different Modes, depending on the user's schedule. Set up specific temperatures for when the user is home, away on vacation, or sleeping.
- Troubleshoot problems, and view tips on general maintenance of the system using the Smart Diagnosis function.

*\*Google is a registered trademark of Google Inc.; Facebook is a registered trademark of Facebook.*

**Contact your LG Sales Representative or visit [www.lghvac.com](http://www.lghvac.com) for system requirements, how to download the app, a user's manual, or other information.**

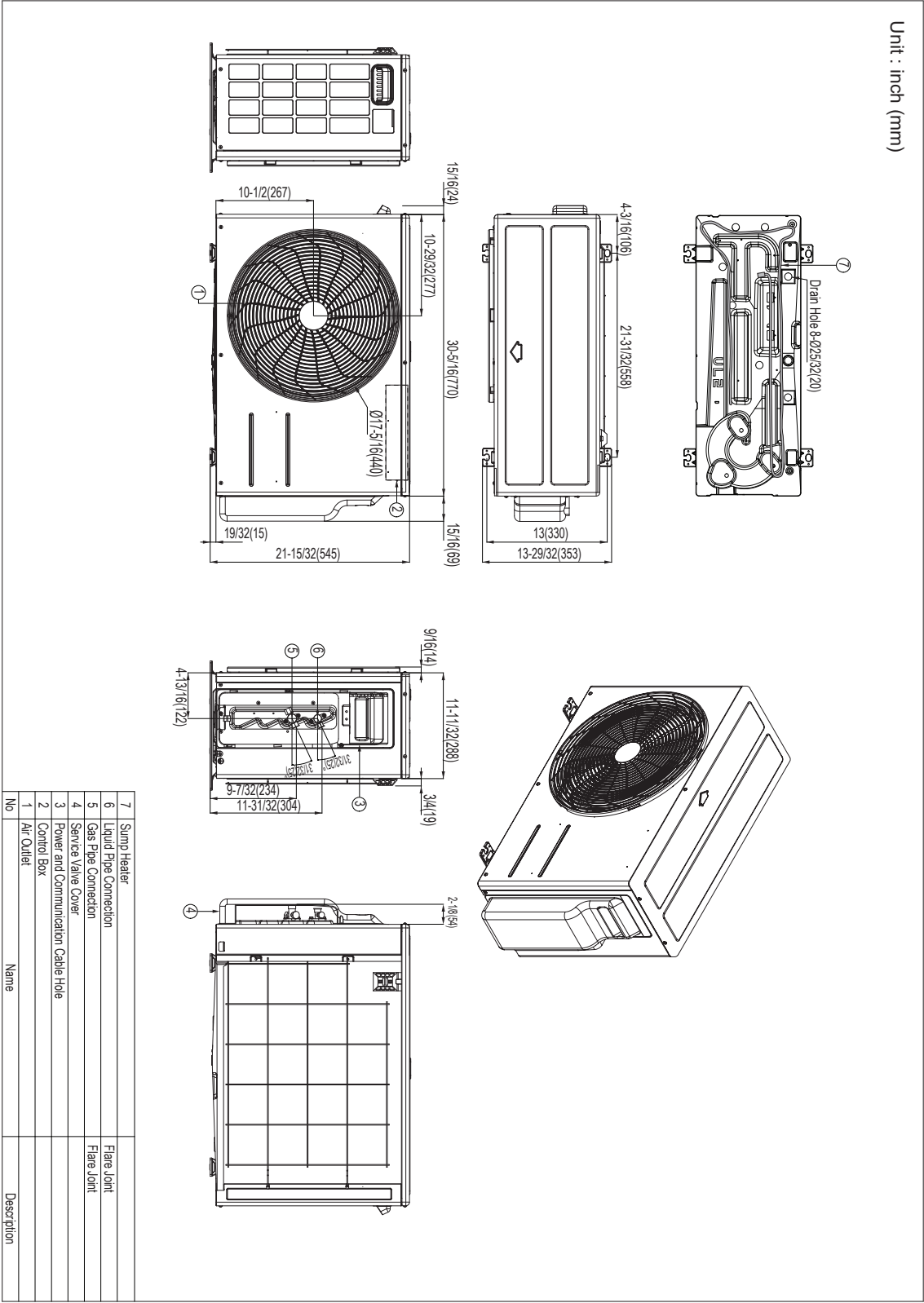
Figure 4: Example of an LG ThinQ Screen (appearances may differ depending on version of software).



# OUTDOOR UNIT DIMENSIONS

KUSAB091A, KUSAB121A

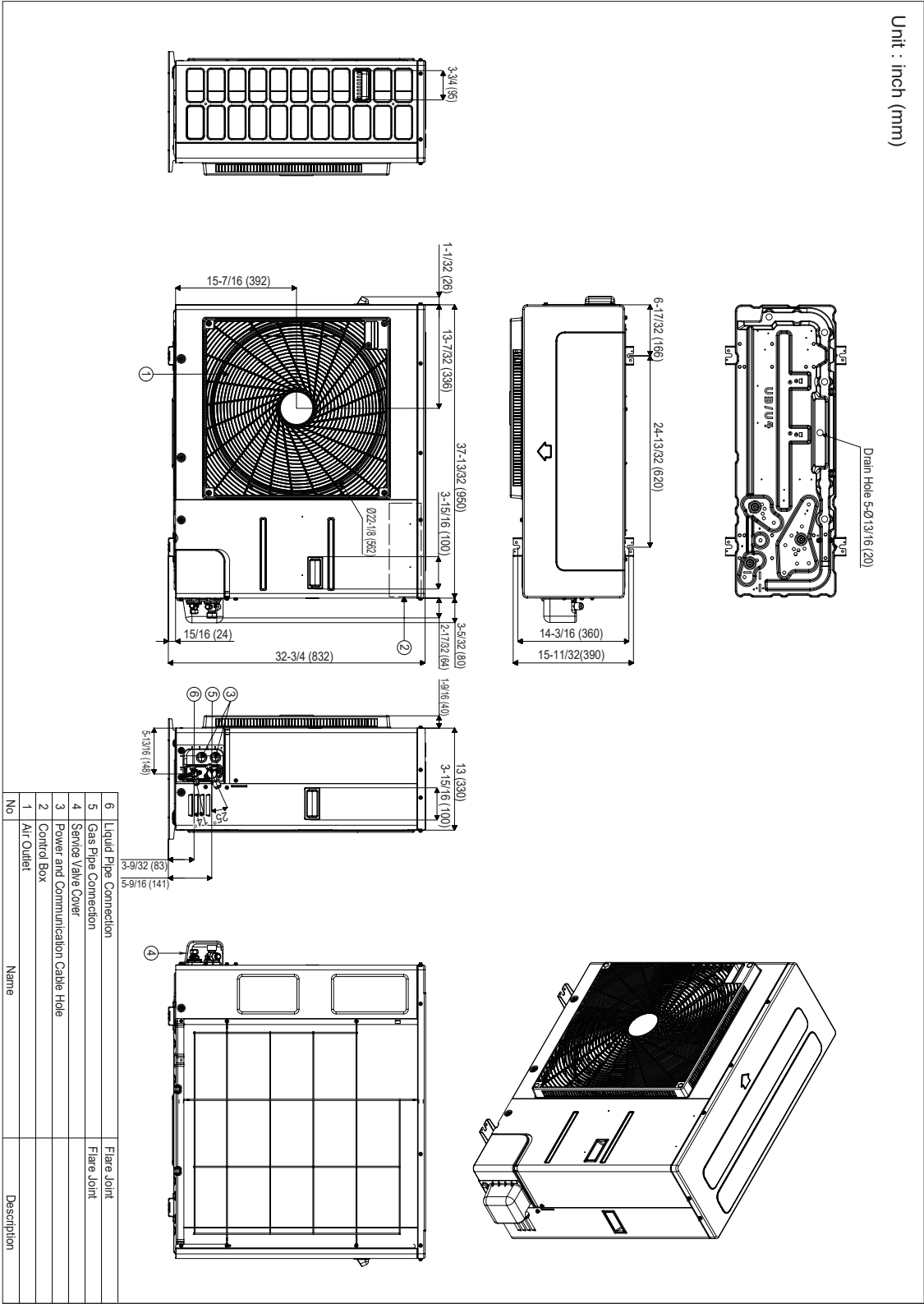
Figure 5: KUSAB091A, KUSAB121A Outdoor Unit Dimensions.



# OUTDOOR UNIT DIMENSIONS

## KUSAB181A

Figure 6: KUSAB181A Outdoor Unit Dimensions.





# OUTDOOR UNIT CENTER OF GRAVITY / CORNER WEIGHT

Figure 7: Center of Gravity and Corner Weight Dimensions Diagram.

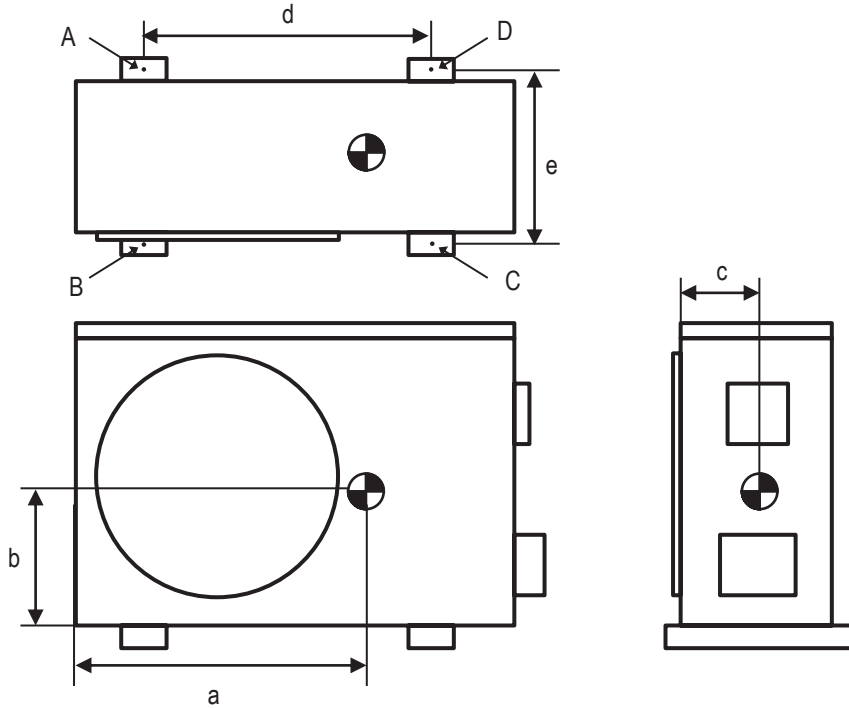


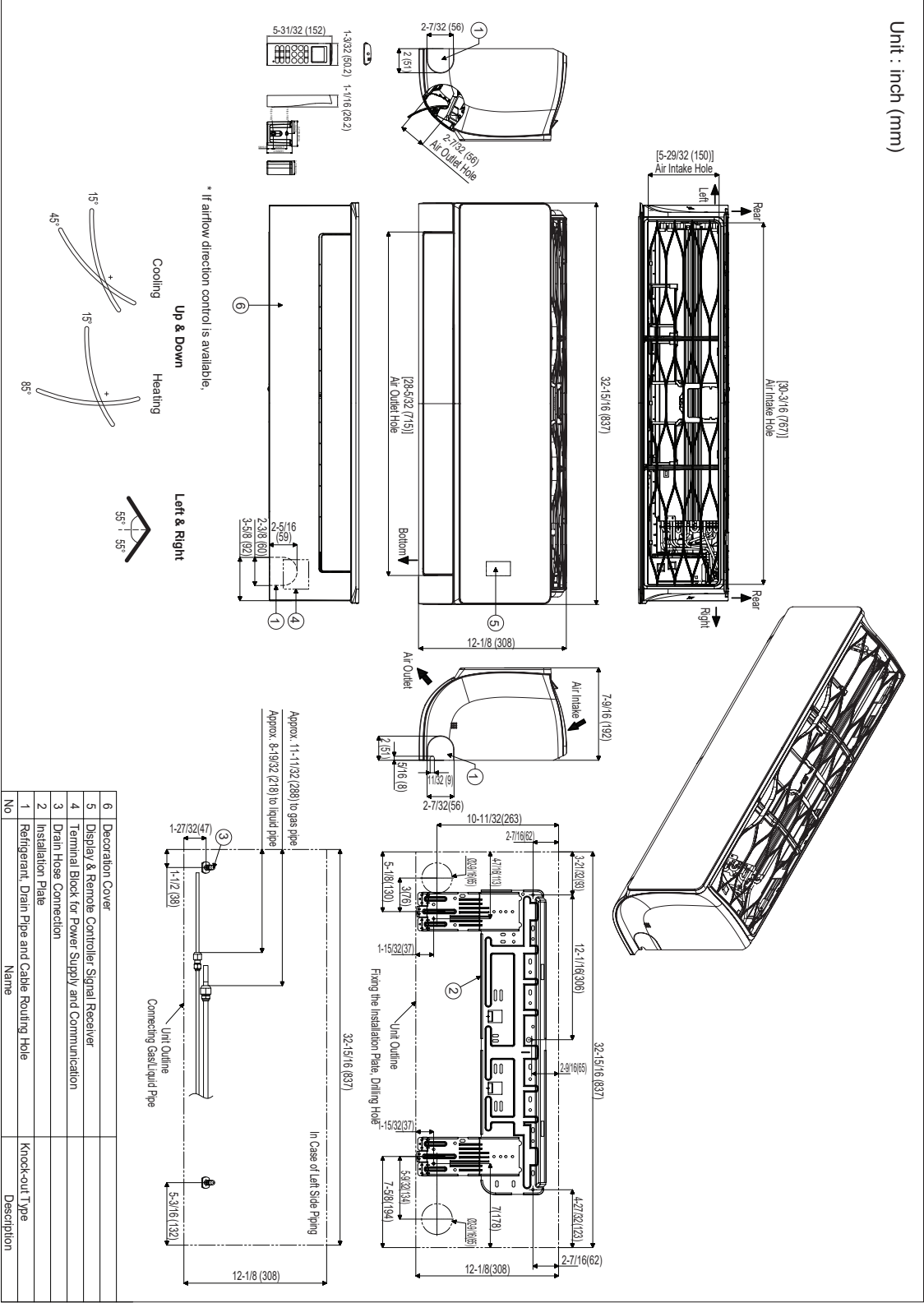
Table 6: Center of Gravity and Corner Weight Dimensions.

Model	Weight (lb.)		Center of Gravity (inch)			Leg (inch)		Corner Weight (lb.)			
	Shipping	Net	a	b	c	d	e	A	B	C	D
KUSAB091A, KUSAB121A	75.6	68.8	19-31/32	9-11/32	5-21/32	21-31/32	13	8.8	10.2	25.0	24.8
KUSAB181A	145.5	127.9	23-7/32	12-19/32	5-29/32	24-13/32	14-3/16	17.6	23.1	46.3	40.8

# INDOOR UNIT DIMENSIONS

## KNUAK091A, KNUAK121A

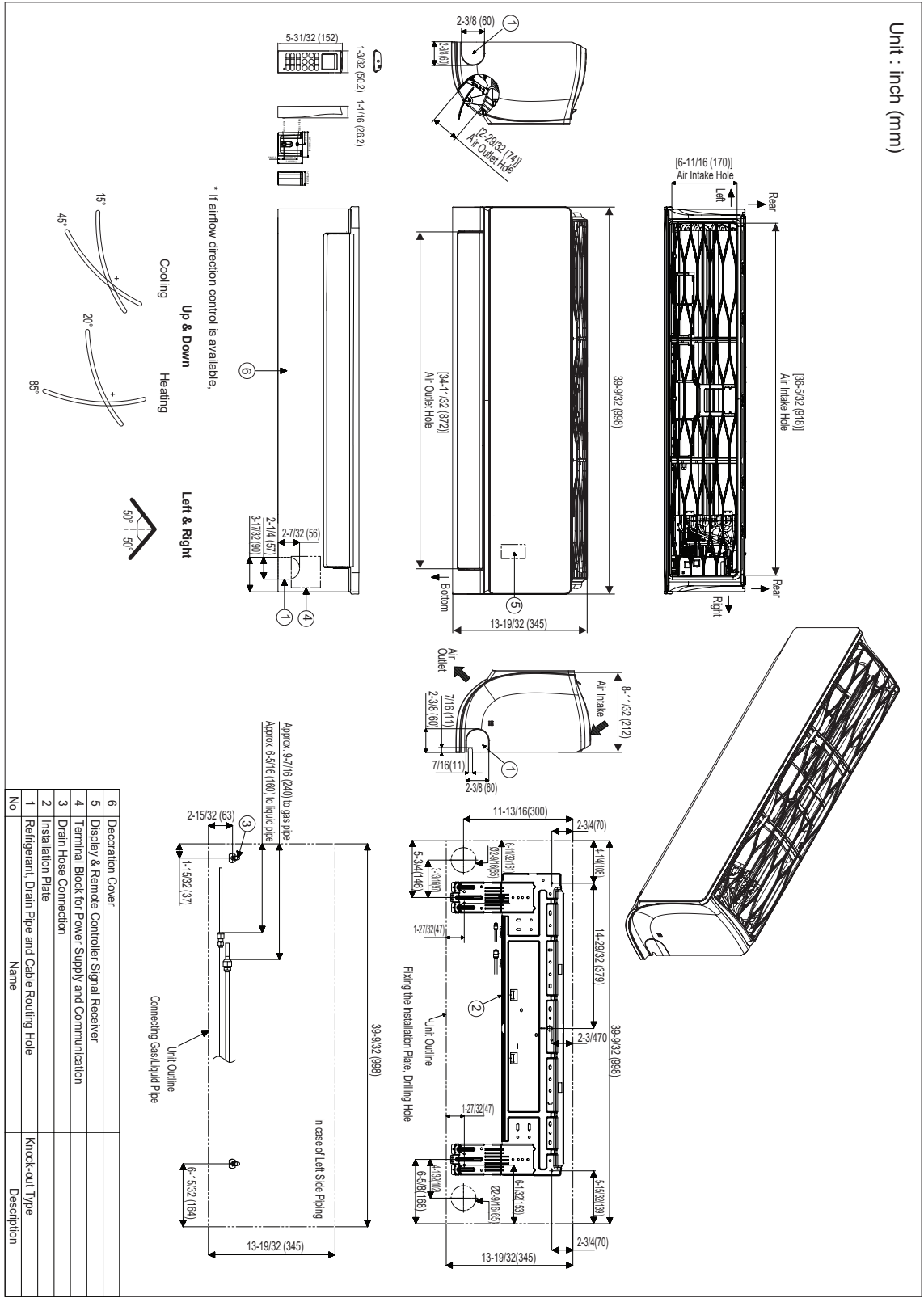
Figure 8: KNUAK091A, KNUAK121A Indoor Unit Dimensions.



# INDOOR UNIT DIMENSIONS

KNUAK181A

Figure 9: KNUAK181A Indoor Unit Dimensions.

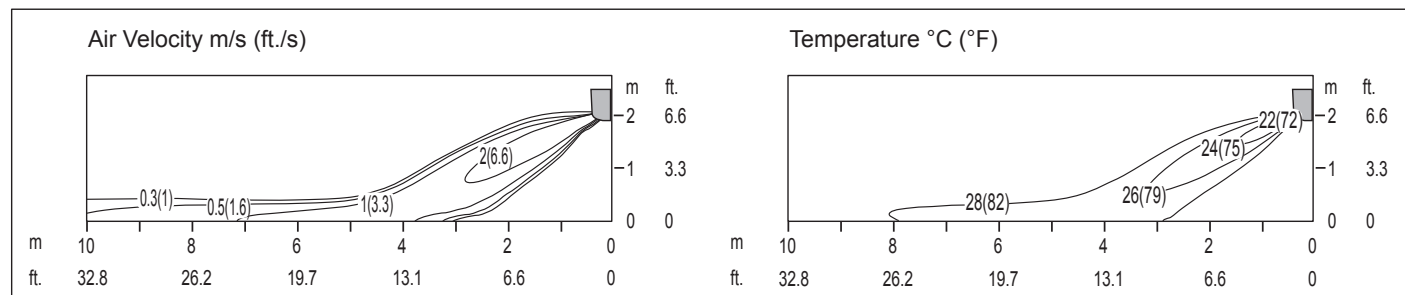


# AIR FLOW

## Indoor Unit Air Flow / Temperature Distribution

Figure 10: KNUAK091A, KNUAK121A Cooling Air Velocity and Temperature Distribution Charts.

### Cooling

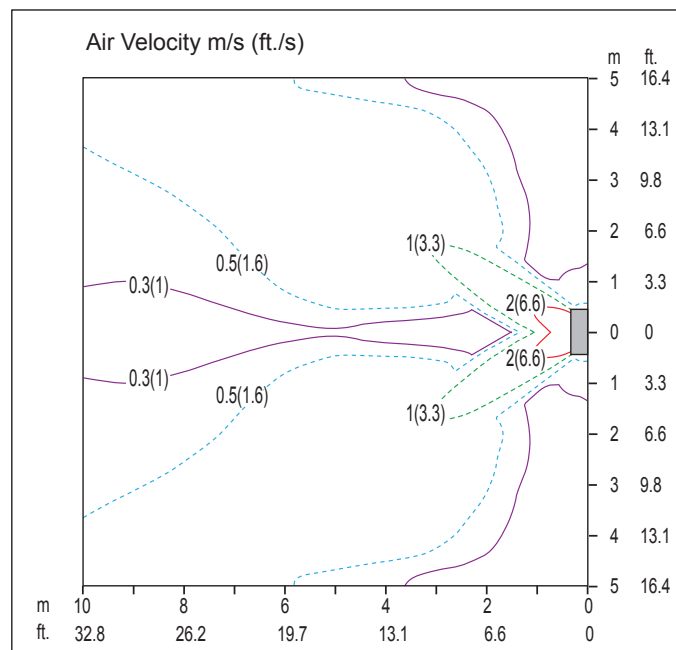
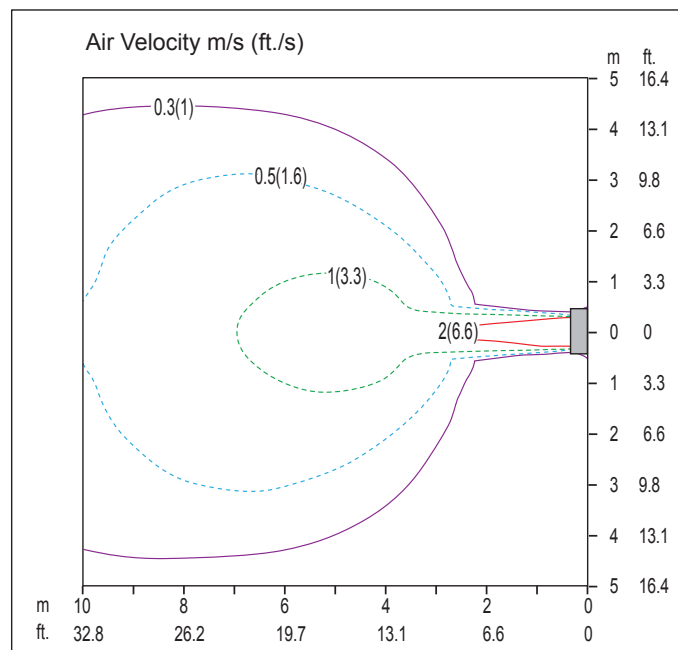


### Side View

Discharge Angle : 35° (From the floor ▼)

Vertical Louver : Center

Fan Speed : Power



### Top View

Discharge Angle : 35° (From the floor ▼)

Vertical Louver : Center

Fan Speed : Power

Air Speed 0.3 m/s (1 ft./s) Range : 13.0 m (42.7 ft.)

### Top View

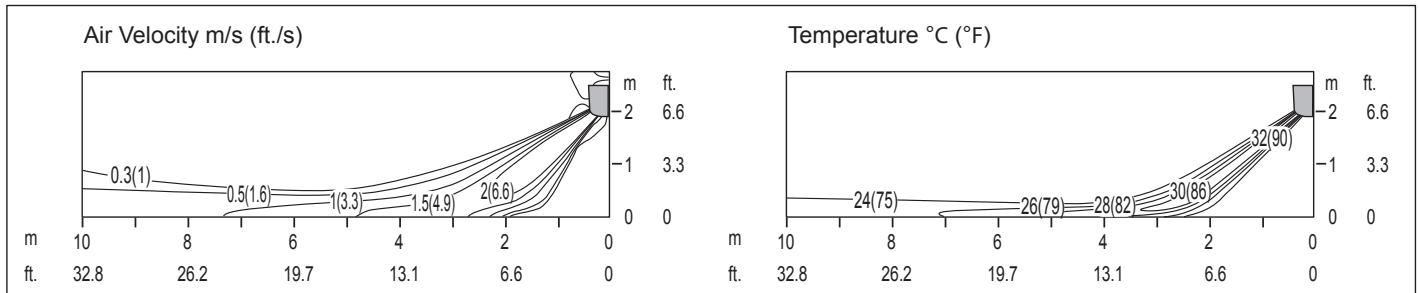
Discharge Angle : 35° (From the floor ▼)

Vertical Louver : Left & Right

Fan Speed : Power

Figure 11: KNUAK091A, KNUAK121A Heating Air Velocity and Temperature Distribution Charts.

### Heating

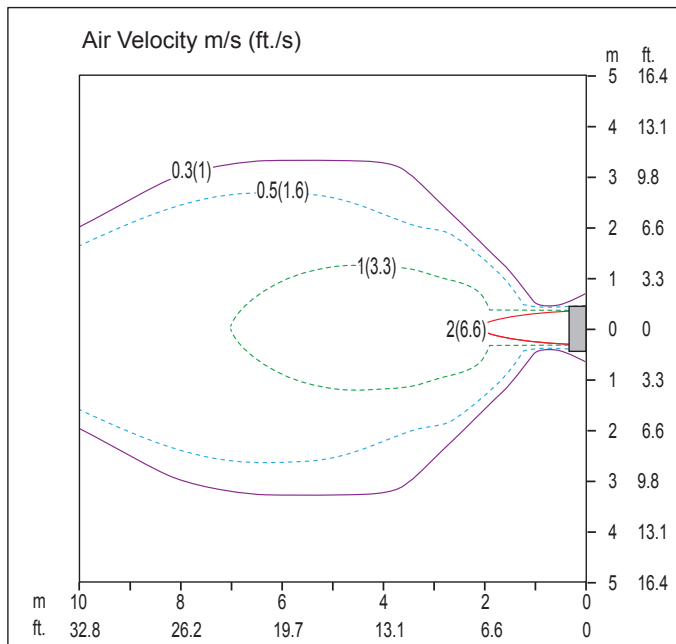


### Side View

Discharge Angle : 55° (From the floor ➤)

Vertical Louver : Center

Fan Speed : Power



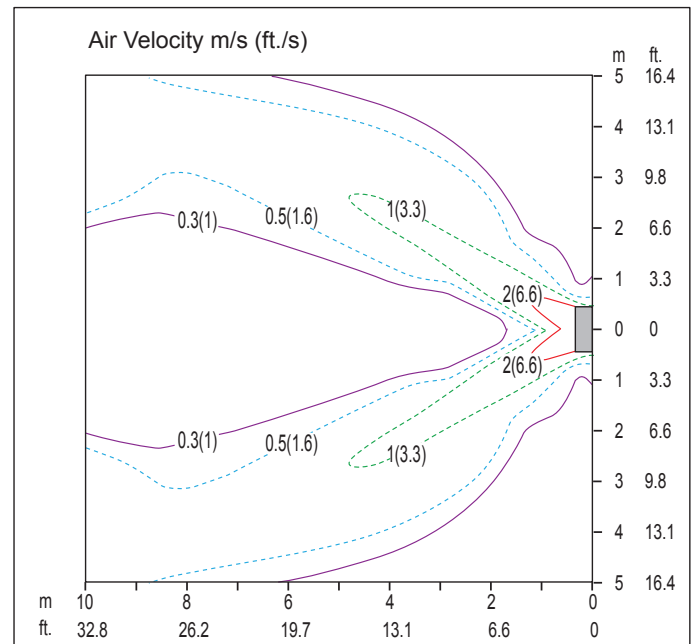
### Top View

Discharge Angle : 55° (From the floor ➤)

Vertical Louver : Center

Fan Speed : Power

Air Speed 0.3 m/s (1 ft./s) Range : 13.5 m (44.3 ft.)



### Top View

Discharge Angle : 55° (From the floor ➤)

Vertical Louver : Left & Right

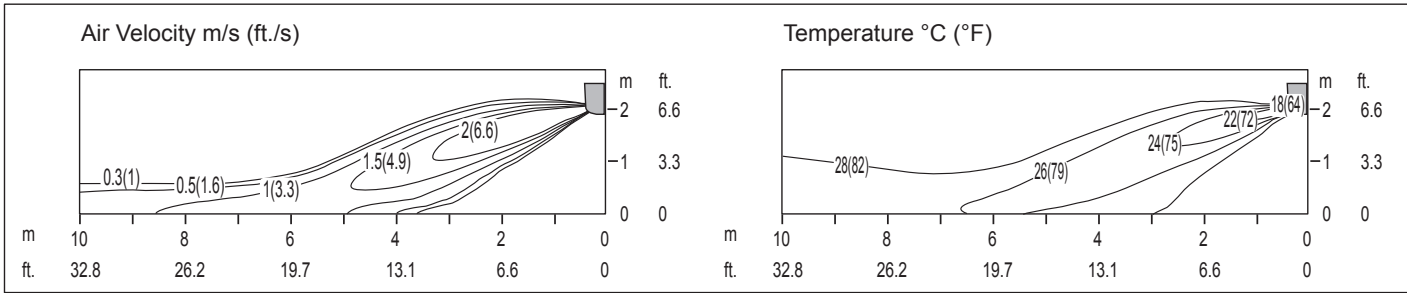
Fan Speed : Power

# AIR FLOW

## Indoor Unit Air Flow / Temperature Distribution

Figure 12: KNUAK181A Cooling Air Velocity and Temperature Distribution Charts.

### Cooling

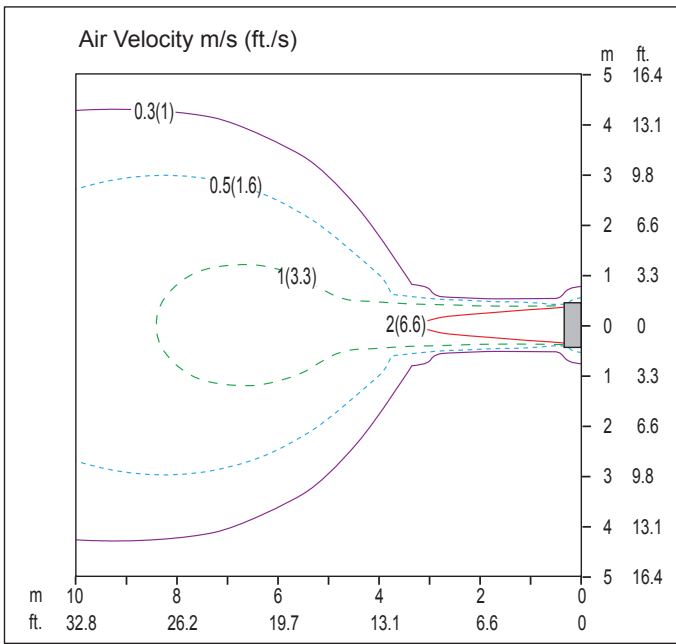


### Side View

Discharge Angle : 25° (From the floor 🏠 )

Vertical Louver : Center

Fan Speed : Power



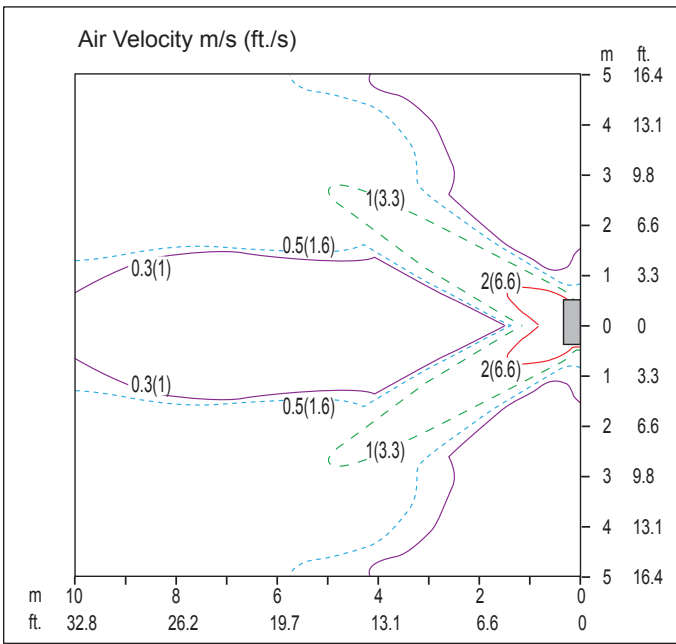
### Top View

Discharge Angle : 25° (From the floor 🏠 )

Vertical Louver : Center

Fan Speed : Power

Air Speed 0.3 m/s (1 ft./s) Range : 15.7 m (51.5 ft.)



### Top View

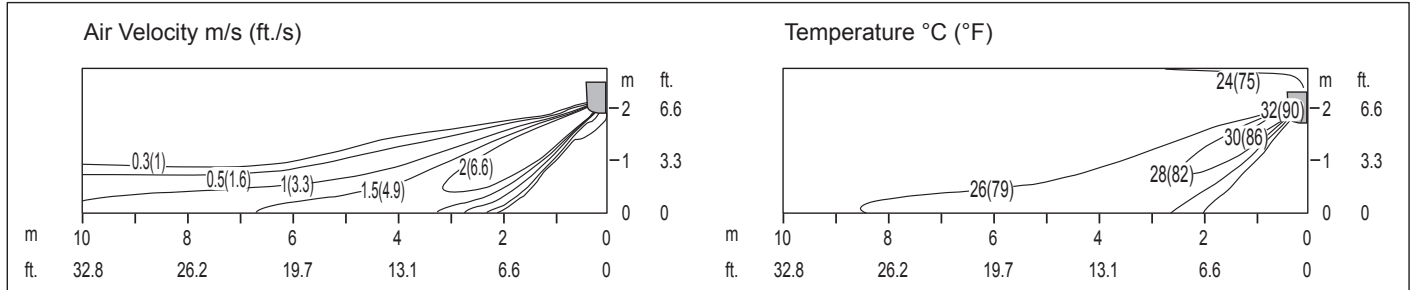
Discharge Angle : 25° (From the floor 🏠 )

Vertical Louver : Left & Right

Fan Speed : Power

Figure 13: KNUAK181A Heating Air Velocity and Temperature Distribution Charts.

### Heating

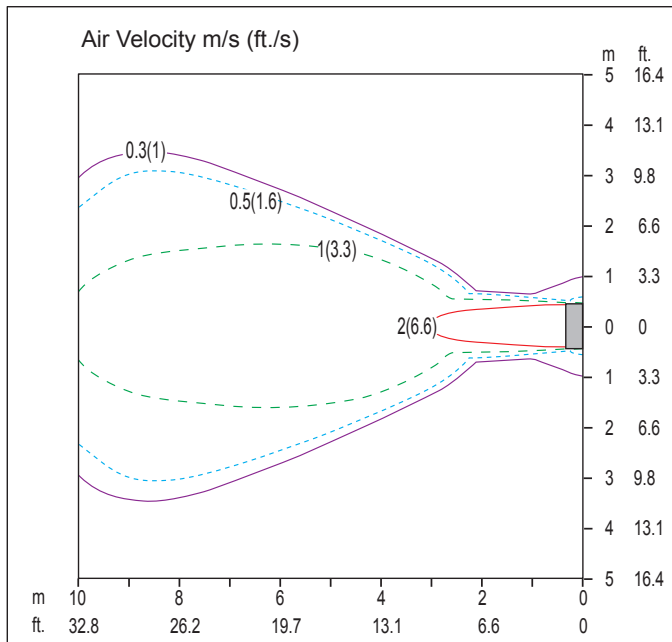


### Side View

Discharge Angle : 45° (From the floor ▼)

Vertical Louver : Center

Fan Speed : Power



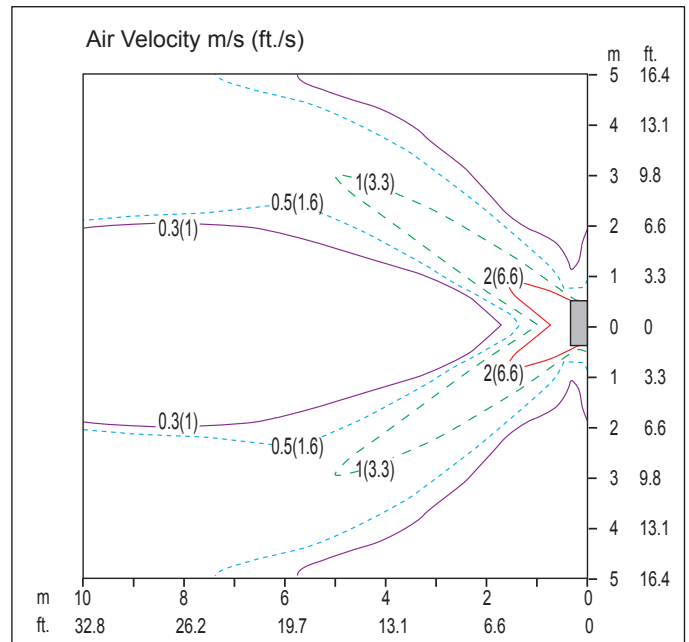
### Top View

Discharge Angle : 45° (From the floor ▼)

Vertical Louver : Center

Fan Speed : Power

Air Speed 0.3 m/s (1 ft./s) Range : 18.3 m (60.0 ft.)



### Top View

Discharge Angle : 45° (From the floor ▼)

Vertical Louver : Left & Right

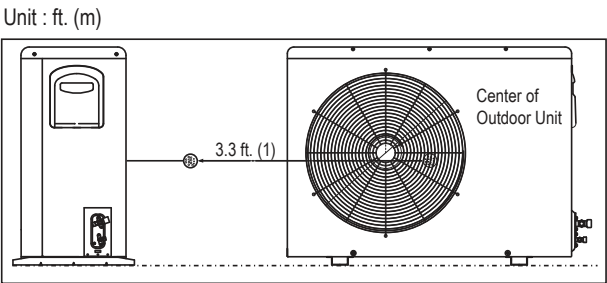
Fan Speed : Power



# ACOUSTIC DATA

## Sound Pressure for Outdoor Units

Figure 14: Art Cool Mirror Outdoor Unit Sound Pressure Level Measurement Location.



- Measurements are taken 3.3 ft away from the front of the unit.
- Sound pressure levels are measured in dB(A) with a tolerance of  $\pm 1$ .
  - Data is valid at nominal operation conditions. Operating conditions are assumed to be standard.
  - Reference acoustic pressure 0dB=20 $\mu$ Pa
  - Sound pressure levels are tested in an anechoic chamber under ISO Standard 3745, and may be different according to the test condition or equipment.
  - Sound level will vary depending on a range of factors including the construction (acoustic absorption coefficient) of a particular room in which the unit was installed.

Table 7: R32 Art Cool Mirror Outdoor Unit Sound Pressure Levels.

Model	Sound Pressure Levels (dB[A])	
	Cooling (Max.)	Heating (Max.)
KUSAB091A	47	51
KUSAB121A	47	51
KUSAB181A	55	55

Figure 15: KUSAB091A, KUSAB121A Outdoor Unit Cooling Sound Pressure Level Diagram.

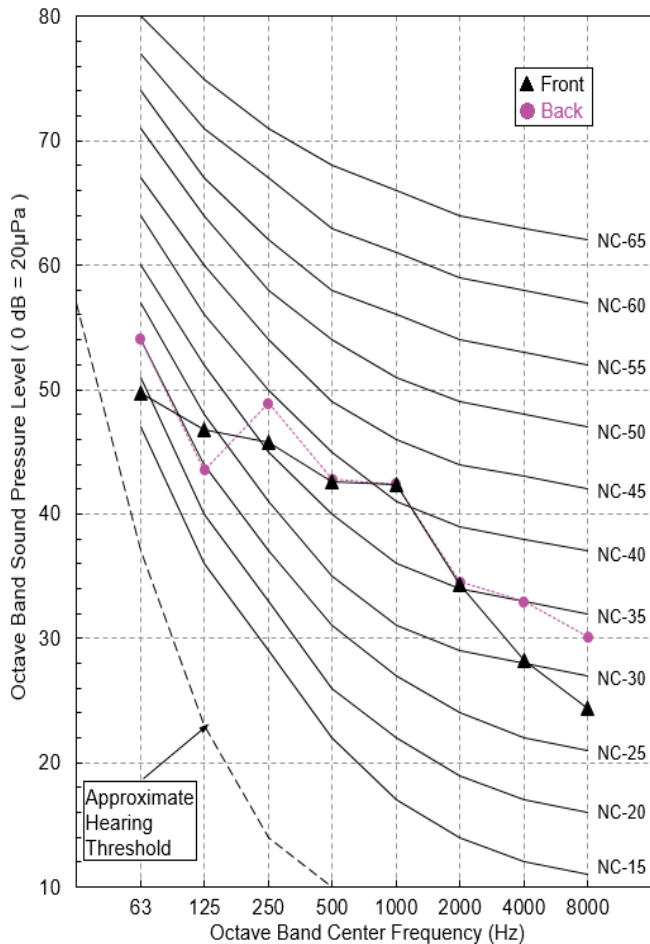
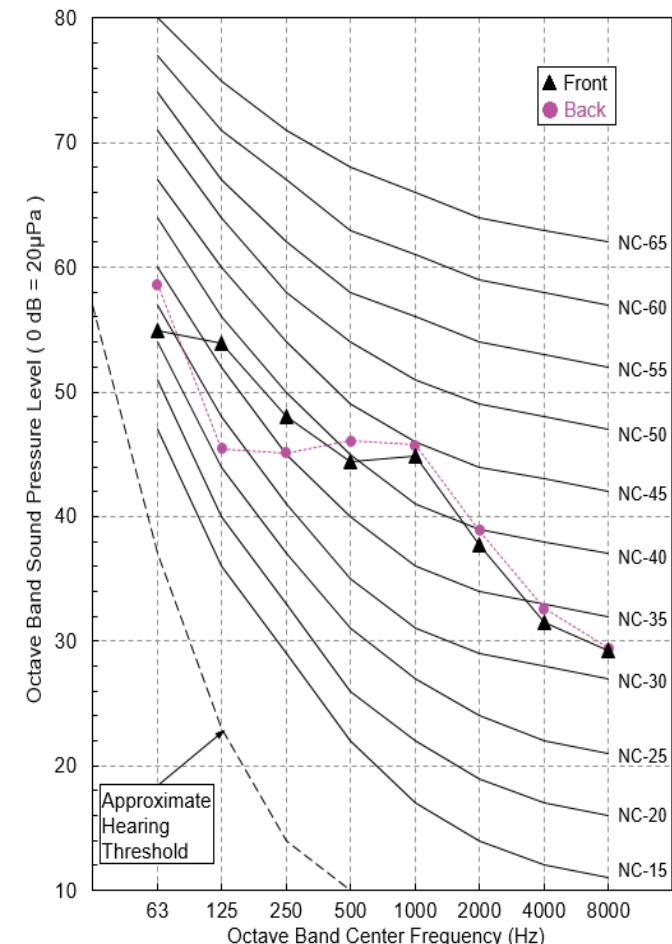


Figure 16: KUSAB091A, KUSAB121A Outdoor Unit Heating Sound Pressure Level Diagram.



# ACOUSTIC DATA

## Sound Pressure for Outdoor Units

Figure 17: KUSAB181A Outdoor Unit Cooling Sound Pressure Level Diagram.

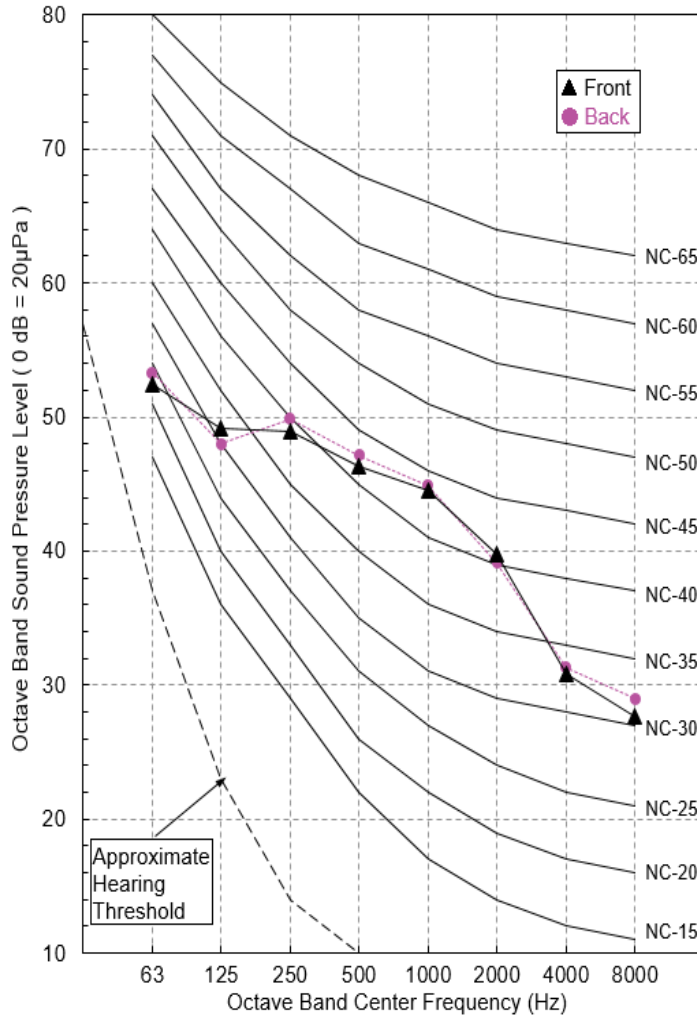
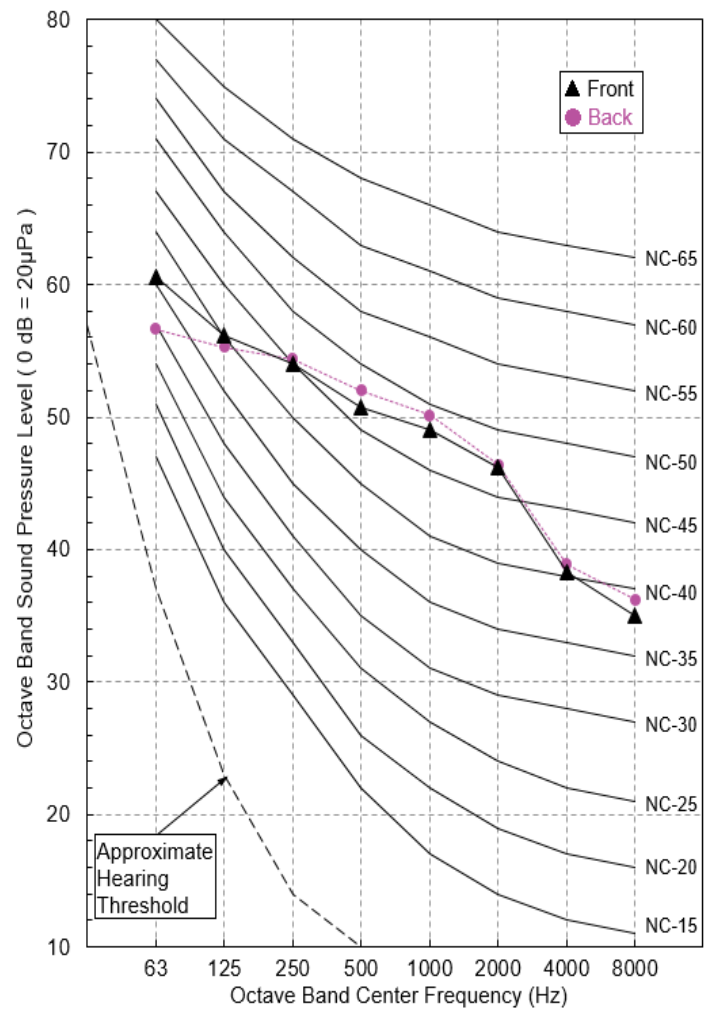


Figure 18: KUSAB181A Outdoor Unit Heating Sound Pressure Level Diagram.

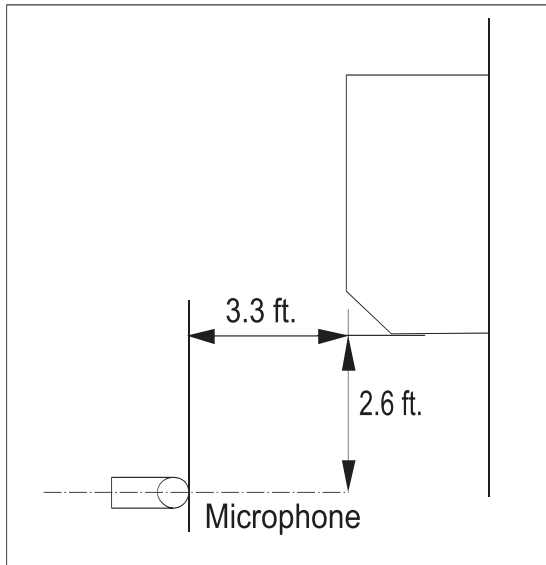


Product Data

# ACOUSTIC DATA

## Sound Pressure for Indoor Units

Figure 19: Art Cool Mirror Indoor Unit Sound Pressure Level Measurement Location.



- Measurement taken 2.6 ft. below the bottom of the unit and at a distance of 3.3 ft. from the face of the unit.
- Measurements taken with no attenuation and units operating at full load normal operating condition.
- Sound level will vary depending on a range of factors such as construction (acoustic absorption coefficient) of particular area in which the equipment is installed.
- Sound power levels are measured in dB(A)±1.
- Tested in anechoic chamber per ISO Standard 3745.

Table 8: R32 Art Cool Mirror Indoor Unit Sound Levels (dB[A]).

Model	Sound Pressure Levels (dB[A])					
	Cooling			Heating		
	H	M	L	H	M	L
KNUAK091A	41	35	25	41	35	26
KNUAK121A	41	35	25	41	35	26
KNUAK181A	47	42	37	47	42	37

# ACOUSTIC DATA

## Sound Pressure for Indoor Units

Figure 20: KNUAK091A, KNUAK121A Indoor Unit Cooling Sound Pressure Level Diagram.

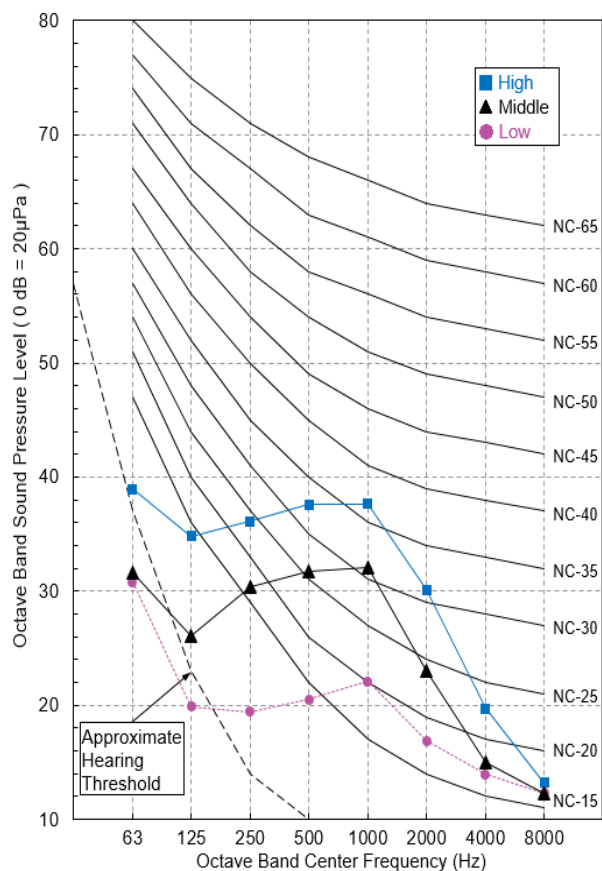
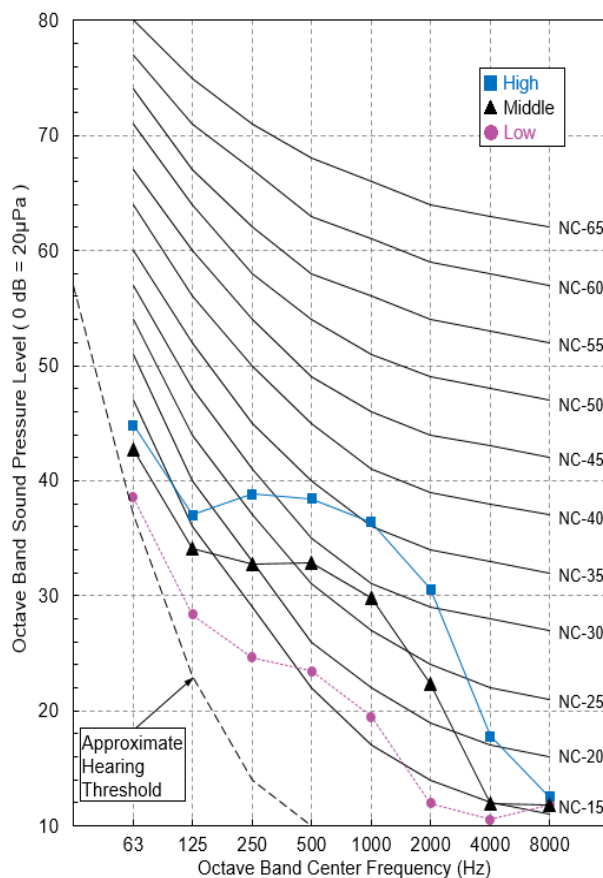


Figure 21: KNUAK091A, KNUAK121A Indoor Unit Heating Sound Pressure Level Diagram.



# ACOUSTIC DATA

## Sound Pressure for Indoor Units

Figure 22: KNUAK181A Indoor Unit Cooling Sound Pressure Level Diagram.

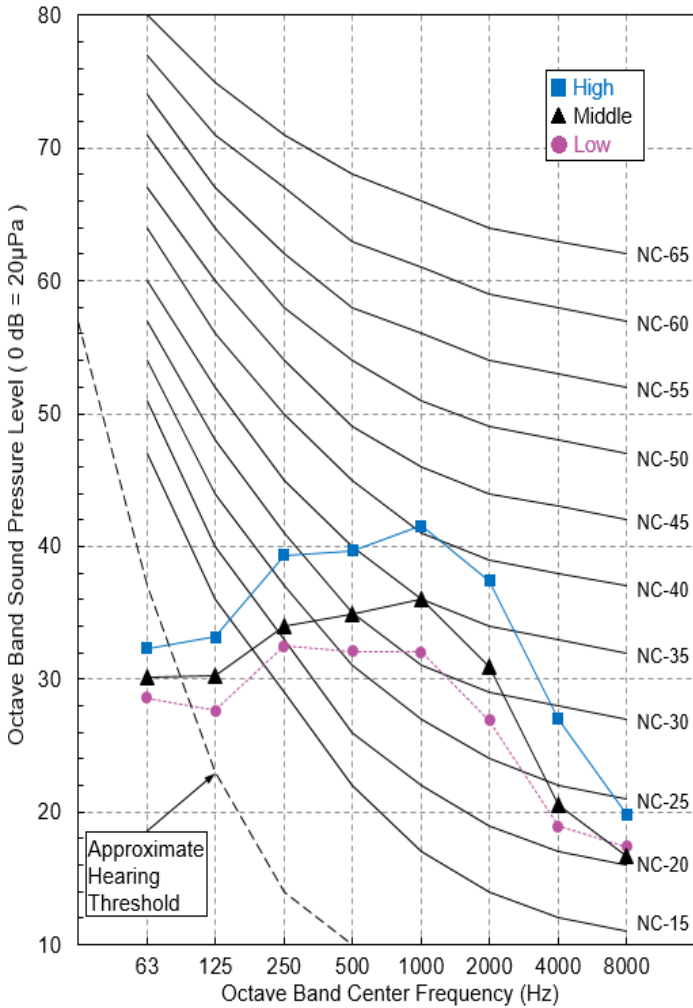
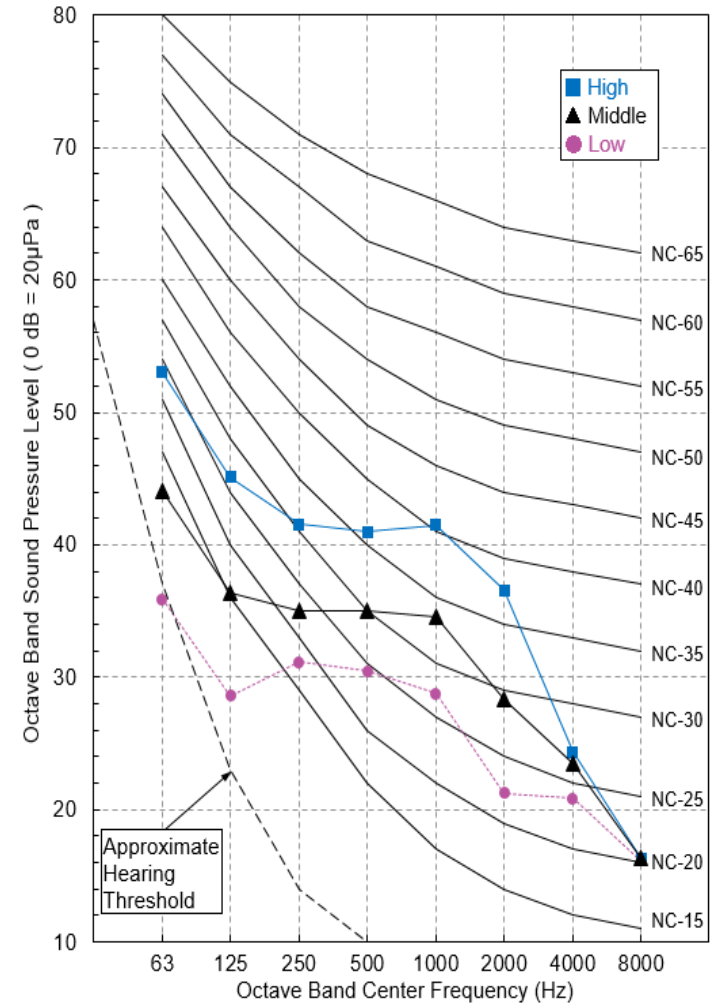


Figure 23: KNUAK181A Indoor Unit Heating Sound Pressure Level Diagram.



# PERFORMANCE DATA

**Cooling Capacity on page 32**

**Maximum Cooling Capacity on page 35**

**Heating Capacity on page 38**

**Maximum Heating Capacity on page 41**

**Correction Factors on page 44**

**Check Selection on page 45**

# COOLING CAPACITY

KSUAK091A (KNUAK091A / KUSAB091A)

Table 9: KSUAK091A (KNUAK091A / KUSAB091A) Cooling Capacities.

Outdoor Air Temp. (°F DB)	Indoor Air Temperature (°F DB / °F WB)																				
	64 / 53			68 / 57			72 / 61			77 / 64			80 / 67			86 / 72			90 / 75		
	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI
0	5.45	4.52	0.23	6.81	4.82	0.28	8.18	5.11	0.32	9.88	5.47	0.37	10.91	5.69	0.41	11.66	8.04	0.43	12.17	9.60	0.44
5	5.34	4.46	0.24	6.68	4.75	0.29	8.02	5.04	0.33	9.69	5.40	0.39	10.70	5.61	0.42	11.44	7.92	0.45	11.94	9.46	0.46
7	5.38	4.50	0.25	6.73	4.79	0.29	8.08	5.08	0.34	9.76	5.45	0.39	10.77	5.67	0.43	11.52	8.00	0.45	12.02	9.55	0.47
10	5.44	4.56	0.25	6.80	4.86	0.30	8.16	5.15	0.34	9.86	5.52	0.40	10.88	5.74	0.44	11.64	8.11	0.46	12.14	9.68	0.48
14	5.51	4.65	0.27	6.89	4.95	0.31	8.27	5.25	0.36	10.00	5.62	0.42	11.03	5.85	0.46	11.80	8.26	0.49	12.31	9.86	0.50
23	5.96	4.79	0.26	7.17	5.10	0.31	8.38	5.41	0.37	9.90	5.80	0.44	10.80	6.03	0.48	11.65	7.98	0.51	12.22	9.27	0.53
25	6.03	4.87	0.27	7.21	5.17	0.32	8.39	5.47	0.37	9.87	5.85	0.44	10.75	6.07	0.48	11.60	7.98	0.51	12.16	9.24	0.53
30	6.21	5.06	0.29	7.31	5.34	0.34	8.42	5.62	0.39	9.80	5.97	0.45	10.63	6.18	0.49	11.46	7.97	0.52	12.02	9.17	0.54
35	6.38	5.25	0.31	7.41	5.51	0.36	8.44	5.77	0.40	9.73	6.09	0.46	10.50	6.28	0.50	11.33	7.96	0.53	11.88	9.09	0.55
40	6.55	5.45	0.34	7.50	5.68	0.38	8.46	5.91	0.42	9.66	6.20	0.47	10.38	6.38	0.51	11.19	7.96	0.54	11.73	9.01	0.56
45	6.71	5.64	0.36	7.59	5.85	0.40	8.48	6.06	0.44	9.59	6.32	0.49	10.25	6.48	0.51	11.06	7.95	0.55	11.59	8.93	0.57
50	6.86	5.83	0.38	7.68	6.02	0.42	8.50	6.21	0.45	9.52	6.44	0.50	10.13	6.58	0.52	10.92	7.94	0.56	11.45	8.85	0.58
55	7.01	6.02	0.41	7.76	6.19	0.44	8.51	6.35	0.47	9.44	6.56	0.51	10.00	6.69	0.53	10.78	7.94	0.57	11.31	8.77	0.59
60	7.16	6.22	0.43	7.84	6.36	0.46	8.52	6.50	0.49	9.37	6.68	0.52	9.88	6.79	0.54	10.65	7.93	0.57	11.16	8.69	0.60
65	7.15	6.19	0.45	7.80	6.37	0.47	8.45	6.54	0.50	9.26	6.76	0.53	9.75	6.89	0.55	10.53	7.98	0.58	11.05	8.70	0.60
70	7.15	6.17	0.46	7.77	6.37	0.49	8.39	6.58	0.51	9.16	6.84	0.54	9.63	6.99	0.56	10.41	8.02	0.59	10.93	8.71	0.61
75	7.14	6.14	0.48	7.73	6.38	0.50	8.32	6.62	0.52	9.06	6.91	0.55	9.50	7.09	0.57	10.29	8.07	0.60	10.82	8.72	0.62
80	7.14	6.11	0.49	7.70	6.38	0.51	8.26	6.65	0.53	8.96	6.99	0.56	9.38	7.19	0.58	10.17	8.11	0.61	10.70	8.72	0.62
85	7.14	6.09	0.51	7.67	6.39	0.53	8.20	6.69	0.54	8.86	7.07	0.57	9.25	7.30	0.58	10.05	8.15	0.61	10.59	8.73	0.63
90	7.14	6.06	0.52	7.64	6.39	0.54	8.13	6.73	0.56	8.75	7.15	0.58	9.13	7.40	0.59	9.94	8.20	0.62	10.47	8.73	0.64
95	7.15	6.03	0.53	7.61	6.39	0.55	8.07	6.76	0.57	8.65	7.22	0.59	<b>9.00</b>	<b>7.50</b>	<b>0.60</b>	9.82	8.24	0.63	10.36	8.73	0.65
100	6.92	5.83	0.54	7.39	6.21	0.56	7.86	6.59	0.58	8.45	7.07	0.60	8.80	7.36	0.61	9.59	8.05	0.64	10.11	8.51	0.66
105	6.69	5.63	0.56	7.17	6.02	0.57	7.65	6.42	0.59	8.25	6.92	0.61	8.61	7.21	0.63	9.36	7.86	0.65	9.86	8.29	0.67
110	6.46	5.43	0.57	6.95	5.84	0.59	7.44	6.25	0.60	8.05	6.76	0.63	8.41	7.07	0.64	9.13	7.67	0.67	9.61	8.07	0.69
115	6.30	5.31	0.58	6.78	5.71	0.60	7.26	6.12	0.62	7.86	6.62	0.64	8.22	6.93	0.65	8.93	7.52	0.68	9.40	7.91	0.70
118	6.21	5.23	0.59	6.68	5.64	0.60	7.16	6.04	0.62	7.75	6.54	0.65	8.10	6.84	0.66	8.80	7.42	0.69	9.27	7.81	0.71

DB: Dry Bulb Temperature (°F) WB: Wet Bulb Temperature (°F) TC: Total Capacity (kBtu/h)  
SHC: Sensible Heating Capacity (kBtu/h) PI: Power Input (kW) (includes compressor, indoor fan motor and outdoor fan motor)

1. All capacities are net, evaporator fan motor heat is deducted.
2. Low Ambient Wind Baffle Kit (sold separately) allows operation down to 0°F.

3. Direct interpolation is permissible. ⚠ Do not extrapolate.  
Capacity as rated: 0 ft. above sea level with 25 ft. of refrigerant piping.  
0 ft. level difference between outdoor and indoor units.  
Cooling capacity rating obtained with air entering the indoor unit at 80°F dry bulb (DB) and 67°F wet bulb (WB), and outdoor ambient conditions of 95°F dry bulb (DB) and 75°F wet bulb (WB).



# COOLING CAPACITY

## KSUAK121A (KNUAK121A / KUSAB121A)

Table 10: KSUAK121A (KNUAK121A / KUSAB121A) Cooling Capacities.

Outdoor Air Temp. (°F DB)	Indoor Air Temperature (°F DB / °F WB)																				
	64 / 53			68 / 57			72 / 61			77 / 64			80 / 67			86 / 72			90 / 75		
	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI
0	7.27	6.03	0.36	9.08	6.42	0.43	10.90	6.81	0.50	13.18	7.30	0.58	14.54	7.59	0.63	15.55	10.72	0.67	16.22	12.80	0.69
5	7.13	5.94	0.38	8.91	6.33	0.45	10.70	6.71	0.52	12.93	7.20	0.61	14.26	7.49	0.66	15.25	10.56	0.70	15.91	12.62	0.72
7	7.18	6.00	0.39	8.97	6.39	0.46	10.77	6.78	0.53	13.01	7.26	0.61	14.36	7.55	0.67	15.36	10.66	0.70	16.02	12.73	0.73
10	7.25	6.08	0.39	9.06	6.48	0.46	10.88	6.87	0.54	13.15	7.36	0.62	14.51	7.66	0.68	15.52	10.81	0.72	16.19	12.91	0.74
14	7.44	6.27	0.40	9.31	6.68	0.48	11.17	7.09	0.55	13.50	7.60	0.64	14.90	7.90	0.70	15.93	11.15	0.74	16.62	13.32	0.76
23	8.05	6.46	0.40	9.68	6.88	0.48	11.31	7.30	0.56	13.35	7.82	0.66	14.58	8.13	0.73	15.72	10.75	0.77	16.49	12.50	0.81
25	8.14	6.56	0.41	9.73	6.97	0.49	11.32	7.37	0.57	13.31	7.88	0.67	14.51	8.19	0.73	15.65	10.75	0.78	16.40	12.46	0.81
30	8.37	6.82	0.44	9.86	7.19	0.52	11.35	7.57	0.60	13.21	8.03	0.69	14.33	8.31	0.75	15.45	10.73	0.80	16.20	12.34	0.83
35	8.59	7.07	0.48	9.98	7.41	0.55	11.37	7.76	0.62	13.11	8.19	0.71	14.15	8.44	0.76	15.26	10.71	0.81	16.00	12.22	0.84
40	8.81	7.32	0.52	10.10	7.63	0.58	11.39	7.95	0.65	13.00	8.34	0.73	13.97	8.57	0.78	15.06	10.69	0.83	15.79	12.11	0.86
45	9.02	7.57	0.55	10.21	7.85	0.61	11.40	8.14	0.67	12.90	8.49	0.75	13.79	8.70	0.79	14.87	10.68	0.84	15.59	11.99	0.88
50	9.22	7.82	0.59	10.32	8.08	0.64	11.42	8.33	0.70	12.79	8.64	0.77	13.61	8.83	0.81	14.68	10.66	0.86	15.39	11.87	0.89
55	9.42	8.08	0.63	10.42	8.30	0.68	11.43	8.52	0.72	12.68	8.80	0.78	13.43	8.96	0.82	14.48	10.64	0.87	15.18	11.76	0.91
60	9.61	8.33	0.67	10.52	8.52	0.71	11.43	8.71	0.75	12.57	8.95	0.80	13.25	9.09	0.84	14.29	10.62	0.89	14.98	11.64	0.92
65	9.59	8.29	0.69	10.46	8.52	0.73	11.33	8.76	0.77	12.42	9.05	0.82	13.07	9.22	0.85	14.12	10.68	0.90	14.81	11.65	0.93
70	9.58	8.25	0.72	10.41	8.53	0.75	11.24	8.80	0.79	12.27	9.15	0.84	12.90	9.35	0.86	13.94	10.73	0.91	14.64	11.65	0.95
75	9.56	8.21	0.74	10.35	8.53	0.77	11.14	8.85	0.81	12.12	9.24	0.85	12.72	9.48	0.88	13.77	10.78	0.93	14.48	11.65	0.96
80	9.55	8.17	0.76	10.30	8.53	0.80	11.04	8.89	0.83	11.98	9.34	0.87	12.54	9.61	0.89	13.60	10.84	0.94	14.31	11.65	0.97
85	9.54	8.13	0.79	10.25	8.53	0.82	10.95	8.93	0.85	11.83	9.44	0.89	12.36	9.74	0.91	13.43	10.89	0.95	14.14	11.65	0.98
90	9.53	8.08	0.81	10.20	8.53	0.84	10.86	8.98	0.87	11.68	9.53	0.90	12.18	9.87	0.92	13.26	10.94	0.97	13.98	11.65	0.99
95	9.53	8.04	0.83	10.15	8.53	0.86	10.76	9.02	0.88	11.54	9.63	0.92	<b>12.00</b>	<b>10.00</b>	<b>0.94</b>	13.09	10.99	0.98	13.82	11.64	1.01
100	9.26	7.77	0.84	9.89	8.28	0.87	10.52	8.79	0.90	11.31	9.43	0.93	11.78	9.82	0.95	12.83	10.74	0.99	13.53	11.36	1.02
105	8.98	7.51	0.85	9.63	8.04	0.88	10.27	8.57	0.91	11.08	9.23	0.94	11.57	9.63	0.96	12.57	10.50	1.01	13.25	11.07	1.03
110	8.71	7.25	0.87	9.37	7.80	0.89	10.03	8.35	0.92	10.85	9.03	0.96	11.35	9.45	0.98	12.32	10.25	1.02	12.96	10.79	1.05
115	8.54	7.10	0.88	9.19	7.64	0.91	9.83	8.18	0.94	10.64	8.85	0.97	11.13	9.26	0.99	12.09	10.05	1.04	12.73	10.58	1.06
118	8.43	7.00	0.89	9.08	7.54	0.92	9.72	8.08	0.94	10.52	8.75	0.98	11.00	9.15	1.00	11.95	9.93	1.04	12.59	10.45	1.07

DB: Dry Bulb Temperature (°F) WB: Wet Bulb Temperature (°F) TC: Total Capacity (kBtu/h)  
 SHC: Sensible Heating Capacity (kBtu/h) PI: Power Input (kW) (includes compressor, indoor fan motor and outdoor fan motor)  
 1. All capacities are net, evaporator fan motor heat is deducted.  
 2. Low Ambient Wind Baffle Kit (sold separately) allows operation down to 0°F.

3. Direct interpolation is permissible. ⚠ Do not extrapolate.  
 Capacity as rated: 0 ft. above sea level with 25 ft. of refrigerant piping.  
 0 ft. level difference between outdoor and indoor units.  
 Cooling capacity rating obtained with air entering the indoor unit at 80°F dry bulb (DB) and 67°F wet bulb (WB), and outdoor ambient conditions of 95°F dry bulb (DB) and 75°F wet bulb (WB).

# COOLING CAPACITY

## KSUAK181A (KNUAK181A / KUSAB181A)

Table 11: KSUAK181A (KNUAK181A / KUSAB181A) Cooling Capacities.

Outdoor Air Temp. (°F DB)	Indoor Air Temperature (°F DB / °F WB)																				
	64 / 53			68 / 57			72 / 61			77 / 64			80 / 67			86 / 72			90 / 75		
	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI
0	10.90	8.68	0.54	13.63	9.25	0.64	16.36	9.81	0.74	19.77	10.51	0.86	21.81	10.93	0.93	23.33	15.43	0.98	24.34	18.43	1.02
5	10.69	8.56	0.56	13.37	9.11	0.67	16.04	9.67	0.77	19.39	10.36	0.90	21.40	10.78	0.98	22.88	15.21	1.03	23.87	18.17	1.07
7	10.76	8.64	0.57	13.46	9.20	0.67	16.15	9.76	0.78	19.52	10.46	0.91	21.54	10.88	0.99	23.04	15.35	1.04	24.04	18.34	1.08
10	10.87	8.76	0.58	13.60	9.32	0.68	16.32	9.89	0.79	19.72	10.60	0.92	21.76	11.03	1.00	23.27	15.56	1.06	24.28	18.59	1.09
14	11.04	8.97	0.61	13.81	9.56	0.72	16.57	10.14	0.83	20.03	10.86	0.97	22.10	11.30	1.05	23.63	15.95	1.11	24.66	19.05	1.15
23	11.95	9.25	0.59	14.37	9.85	0.72	16.80	10.45	0.84	19.83	11.20	0.99	21.64	11.64	1.09	23.34	15.40	1.16	24.48	17.90	1.21
25	12.09	9.40	0.61	14.45	9.98	0.73	16.82	10.56	0.85	19.77	11.29	1.00	21.54	11.72	1.10	23.23	15.39	1.17	24.36	17.84	1.22
30	12.44	9.76	0.66	14.65	10.30	0.78	16.86	10.84	0.89	19.63	11.51	1.03	21.29	11.91	1.12	22.96	15.37	1.19	24.07	17.68	1.24
35	12.78	10.13	0.72	14.84	10.62	0.82	16.91	11.12	0.93	19.49	11.73	1.06	21.04	12.10	1.14	22.69	15.35	1.21	23.79	17.52	1.26
40	13.11	10.50	0.77	15.03	10.95	0.87	16.95	11.40	0.96	19.34	11.96	1.08	20.78	12.30	1.16	22.41	15.33	1.23	23.50	17.36	1.28
45	13.43	10.86	0.82	15.20	11.27	0.91	16.98	11.67	1.00	19.20	12.18	1.11	20.53	12.49	1.18	22.14	15.32	1.25	23.21	17.20	1.30
50	13.74	11.23	0.88	15.37	11.59	0.96	17.01	11.95	1.04	19.05	12.41	1.14	20.28	12.68	1.20	21.86	15.30	1.27	22.92	17.04	1.33
55	14.04	11.60	0.93	15.54	11.91	1.01	17.03	12.23	1.08	18.90	12.63	1.17	20.02	12.87	1.22	21.59	15.28	1.30	22.63	16.88	1.35
60	14.33	11.96	0.99	15.69	12.24	1.05	17.05	12.51	1.12	18.75	12.85	1.19	19.77	13.06	1.24	21.32	15.26	1.32	22.34	16.72	1.37
65	14.32	11.91	1.03	15.62	12.25	1.08	16.92	12.58	1.14	18.54	13.00	1.22	19.52	13.25	1.26	21.07	15.34	1.34	22.11	16.74	1.39
70	14.31	11.86	1.06	15.55	12.26	1.12	16.79	12.65	1.17	18.34	13.15	1.24	19.27	13.44	1.28	20.83	15.43	1.35	21.88	16.75	1.40
75	14.30	11.81	1.09	15.48	12.26	1.15	16.65	12.72	1.20	18.13	13.29	1.26	19.01	13.63	1.30	20.59	15.51	1.37	21.64	16.76	1.42
80	14.29	11.75	1.13	15.41	12.27	1.18	16.52	12.79	1.23	17.92	13.44	1.29	18.76	13.83	1.32	20.35	15.59	1.39	21.41	16.76	1.44
85	14.29	11.69	1.16	15.34	12.27	1.21	16.40	12.85	1.25	17.72	13.58	1.31	18.51	14.02	1.34	20.11	15.67	1.41	21.18	16.77	1.45
90	14.29	11.63	1.19	15.28	12.28	1.24	16.27	12.92	1.28	17.51	13.73	1.33	18.25	14.21	1.36	19.87	15.74	1.43	20.95	16.77	1.47
95	14.29	11.57	1.23	15.22	12.28	1.27	16.15	12.99	1.31	17.31	13.87	1.36	<b>18.00</b>	<b>14.40</b>	<b>1.39</b>	19.63	15.82	1.45	20.72	16.77	1.49
100	13.87	11.21	1.26	14.81	11.95	1.30	15.76	12.69	1.34	16.94	13.61	1.39	17.65	14.16	1.42	19.22	15.50	1.48	20.27	16.39	1.52
105	13.44	10.86	1.28	14.41	11.62	1.32	15.37	12.39	1.37	16.58	13.35	1.42	17.30	13.92	1.45	18.81	15.17	1.51	19.82	16.01	1.55
110	13.02	10.51	1.31	14.00	11.30	1.35	14.99	12.09	1.40	16.22	13.09	1.45	16.96	13.68	1.48	18.40	14.85	1.54	19.37	15.63	1.58
115	12.74	10.30	1.34	13.71	11.09	1.38	14.67	11.87	1.43	15.88	12.85	1.48	16.61	13.44	1.51	18.04	14.59	1.58	18.99	15.35	1.62
118	12.57	10.18	1.36	13.53	10.96	1.40	14.49	11.74	1.44	15.68	12.71	1.50	16.40	13.30	1.53	17.82	14.43	1.60	18.77	15.19	1.64

DB: Dry Bulb Temperature (°F) WB: Wet Bulb Temperature (°F) TC: Total Capacity (kBtu/h)  
 SHC: Sensible Heating Capacity (kBtu/h) PI: Power Input (kW) (includes compressor, indoor fan motor  
 and outdoor fan motor)

1. All capacities are net, evaporator fan motor heat is deducted.
2. Low Ambient Wind Baffle Kit (sold separately) allows operation down to 0°F.

3. Direct interpolation is permissible. ⚠ Do not extrapolate.  
 Capacity as rated: 0 ft. above sea level with 25 ft. of refrigerant piping.  
 0 ft. level difference between outdoor and indoor units.  
 Cooling capacity rating obtained with air entering the indoor unit at 80°F dry bulb (DB) and 67°F wet  
 bulb (WB), and outdoor ambient conditions of 95°F dry bulb (DB) and 75°F wet bulb (WB).

# MAXIMUM COOLING CAPACITY

## KSUAK091A (KNUAK091A / KUSAB091A)

Table 12: KSUAK091A (KNUAK091A / KUSAB091A) Maximum Cooling Capacities.

Outdoor Air Temp. (°F DB)	Indoor Air Temperature (°F DB / °F WB)																				
	64 / 53			68 / 57			72 / 61			77 / 64			80 / 67			86 / 72			90 / 75		
	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI
0	7.64	5.94	0.54	9.56	6.32	0.64	11.47	6.71	0.74	13.86	7.19	0.87	15.30	7.48	0.94	16.36	10.55	0.99	17.07	12.60	1.03
5	7.50	5.85	0.57	9.37	6.23	0.67	11.25	6.61	0.78	13.60	7.09	0.91	15.01	7.37	0.99	16.05	10.40	1.04	16.74	12.43	1.08
7	7.55	5.91	0.58	9.44	6.29	0.68	11.33	6.67	0.79	13.69	7.15	0.92	15.11	7.44	1.00	16.16	10.50	1.05	16.86	12.54	1.09
10	7.63	5.99	0.58	9.54	6.38	0.69	11.45	6.76	0.80	13.83	7.25	0.93	15.26	7.54	1.01	16.32	10.64	1.07	17.03	12.71	1.11
14	7.49	6.08	0.58	9.37	6.47	0.68	11.25	6.86	0.79	13.59	7.35	0.92	15.00	7.65	1.00	16.04	10.80	1.06	16.74	12.90	1.09
23	8.13	6.27	0.57	9.78	6.68	0.69	11.43	7.08	0.81	13.50	7.59	0.96	14.74	7.89	1.04	15.89	10.44	1.11	16.67	12.13	1.16
25	8.24	6.37	0.59	9.85	6.77	0.71	11.46	7.16	0.82	13.47	7.65	0.97	14.68	7.95	1.05	15.83	10.44	1.12	16.60	12.10	1.17
30	8.49	6.63	0.64	10.00	6.99	0.75	11.51	7.36	0.86	13.40	7.81	1.00	14.53	8.08	1.08	15.67	10.43	1.15	16.43	12.00	1.20
35	8.74	6.88	0.70	10.15	7.21	0.80	11.56	7.55	0.90	13.33	7.97	1.03	14.38	8.22	1.10	15.51	10.43	1.18	16.26	11.90	1.22
40	8.98	7.13	0.75	10.29	7.44	0.84	11.61	7.74	0.94	13.25	8.13	1.06	14.24	8.36	1.13	15.35	10.42	1.20	16.10	11.80	1.25
45	9.22	7.39	0.81	10.43	7.66	0.89	11.65	7.94	0.98	13.18	8.28	1.09	14.09	8.49	1.15	15.19	10.42	1.23	15.93	11.70	1.28
50	9.45	7.64	0.86	10.57	7.89	0.94	11.70	8.13	1.02	13.10	8.44	1.12	13.94	8.63	1.18	15.04	10.41	1.25	15.76	11.60	1.30
55	9.68	7.89	0.92	10.71	8.11	0.99	11.74	8.33	1.06	13.02	8.60	1.15	13.80	8.76	1.20	14.88	10.40	1.28	15.60	11.50	1.33
60	9.90	8.15	0.98	10.84	8.34	1.04	11.77	8.52	1.10	12.95	8.76	1.18	13.65	8.90	1.23	14.72	10.40	1.30	15.43	11.39	1.35
65	9.91	8.12	1.02	10.81	8.35	1.08	11.71	8.58	1.14	12.83	8.86	1.21	13.50	9.03	1.25	14.58	10.46	1.33	15.30	11.41	1.38
70	9.92	8.09	1.06	10.78	8.36	1.11	11.64	8.63	1.17	12.71	8.97	1.24	13.36	9.17	1.28	14.44	10.52	1.35	15.17	11.42	1.40
75	9.93	8.06	1.09	10.75	8.37	1.15	11.57	8.68	1.20	12.60	9.07	1.26	13.21	9.30	1.30	14.31	10.58	1.37	15.04	11.43	1.42
80	9.95	8.02	1.13	10.73	8.38	1.18	11.51	8.73	1.23	12.48	9.17	1.29	13.06	9.44	1.33	14.17	10.64	1.39	14.91	11.45	1.44
85	9.97	7.99	1.17	10.71	8.39	1.21	11.45	8.78	1.26	12.37	9.28	1.32	12.92	9.58	1.35	14.04	10.70	1.42	14.79	11.45	1.46
90	10.00	7.95	1.20	10.69	8.39	1.25	11.38	8.83	1.29	12.25	9.38	1.34	12.77	9.71	1.38	13.90	10.76	1.44	14.66	11.46	1.48
95	10.03	7.91	1.24	10.68	8.40	1.28	11.33	8.88	1.32	12.14	9.48	1.37	<b>12.63</b>	<b>9.85</b>	<b>1.40</b>	13.77	10.82	1.46	14.54	11.47	1.50
100	9.71	7.71	1.26	10.37	8.22	1.30	11.03	8.73	1.34	11.86	9.36	1.39	12.36	9.74	1.42	13.46	10.66	1.48	14.19	11.27	1.52
105	9.39	7.51	1.28	10.07	8.04	1.32	10.74	8.57	1.36	11.59	9.23	1.41	12.09	9.63	1.44	13.15	10.50	1.50	13.85	11.07	1.54
110	9.08	7.31	1.29	9.77	7.86	1.33	10.45	8.42	1.38	11.31	9.11	1.43	11.83	9.52	1.46	12.83	10.33	1.52	13.51	10.88	1.56
115	8.87	7.21	1.31	9.54	7.76	1.35	10.21	8.31	1.39	11.05	9.00	1.45	11.56	9.41	1.48	12.56	10.22	1.54	13.22	10.75	1.59
118	8.74	7.15	1.32	9.41	7.70	1.36	10.07	8.25	1.41	10.90	8.94	1.46	11.40	9.35	1.49	12.39	10.15	1.56	13.05	10.68	1.60

DB: Dry Bulb Temperature (°F) WB: Wet Bulb Temperature (°F) TC: Total Capacity (kBtu/h)  
 SHC: Sensible Heating Capacity (kBtu/h) PI: Power Input (kW) (includes compressor, indoor fan motor and outdoor fan motor)

1. All capacities are net, evaporator fan motor heat is deducted.  
 2. Low Ambient Wind Baffle Kit (sold separately) allows operation down to 0°F.

3. Direct interpolation is permissible. ⚠ Do not extrapolate.  
 Capacity as rated: 0 ft. above sea level with 25 ft. of refrigerant piping.  
 0 ft. level difference between outdoor and indoor units.  
 Cooling capacity rating obtained with air entering the indoor unit at 80°F dry bulb (DB) and 67°F wet bulb (WB), and outdoor ambient conditions of 95°F dry bulb (DB) and 75°F wet bulb (WB).

# MAXIMUM COOLING CAPACITY

## KSUAK121A (KNUAK121A / KUSAB121A)

Table 13: KSUAK121A (KNUAK121A / KUSAB121A) Maximum Cooling Capacities.

Outdoor Air Temp. (°F DB)	Indoor Air Temperature (°F DB / °F WB)																				
	64 / 53			68 / 57			72 / 61			77 / 64			80 / 67			86 / 72			90 / 75		
	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI
0	8.54	6.63	0.62	10.67	7.06	0.74	12.81	7.49	0.85	15.48	8.03	0.99	17.09	8.35	1.08	18.27	11.79	1.14	19.06	14.08	1.18
5	8.37	6.54	0.65	10.47	6.96	0.77	12.57	7.38	0.89	15.19	7.91	1.04	16.76	8.23	1.13	17.92	11.62	1.19	18.70	13.88	1.23
7	8.43	6.60	0.66	10.54	7.03	0.78	12.65	7.45	0.90	15.29	7.99	1.05	16.88	8.31	1.14	18.05	11.73	1.20	18.83	14.00	1.24
10	8.52	6.69	0.67	10.65	7.12	0.79	12.78	7.55	0.91	15.45	8.10	1.07	17.05	8.42	1.16	18.23	11.89	1.22	19.02	14.20	1.26
14	8.14	6.60	0.66	10.18	7.03	0.78	12.22	7.46	0.90	14.77	7.99	1.05	16.30	8.31	1.14	17.43	11.73	1.20	18.19	14.01	1.25
23	8.86	6.84	0.65	10.66	7.28	0.78	12.46	7.73	0.92	14.71	8.28	1.09	16.06	8.61	1.19	17.32	11.39	1.27	18.16	13.24	1.32
25	8.98	6.96	0.67	10.73	7.39	0.80	12.49	7.82	0.94	14.68	8.36	1.10	16.00	8.68	1.20	17.26	11.39	1.28	18.10	13.21	1.33
30	9.27	7.25	0.73	10.92	7.65	0.86	12.57	8.05	0.98	14.63	8.54	1.14	15.87	8.84	1.23	17.11	11.41	1.31	17.94	13.12	1.37
35	9.55	7.54	0.79	11.10	7.91	0.91	12.64	8.27	1.03	14.57	8.73	1.17	15.73	9.01	1.26	16.96	11.43	1.34	17.79	13.04	1.40
40	9.83	7.83	0.86	11.27	8.17	0.96	12.71	8.50	1.07	14.51	8.92	1.21	15.59	9.17	1.29	16.82	11.44	1.37	17.63	12.96	1.43
45	10.11	8.13	0.92	11.45	8.43	1.02	12.78	8.73	1.12	14.46	9.11	1.24	15.46	9.34	1.32	16.67	11.46	1.40	17.47	12.87	1.46
50	10.38	8.42	0.99	11.62	8.69	1.07	12.85	8.96	1.16	14.40	9.30	1.28	15.32	9.51	1.34	16.52	11.47	1.43	17.32	12.78	1.49
55	10.65	8.71	1.05	11.78	8.95	1.13	12.92	9.19	1.21	14.34	9.49	1.31	15.19	9.67	1.37	16.37	11.48	1.46	17.16	12.69	1.52
60	10.91	9.01	1.12	11.95	9.22	1.19	12.98	9.42	1.26	14.27	9.68	1.35	15.05	9.84	1.40	16.23	11.49	1.49	17.01	12.60	1.55
65	10.94	8.99	1.16	11.93	9.24	1.23	12.93	9.50	1.30	14.17	9.81	1.38	14.91	10.00	1.43	16.10	11.58	1.51	16.90	12.63	1.57
70	10.97	8.97	1.21	11.93	9.27	1.27	12.88	9.57	1.33	14.07	9.94	1.41	14.78	10.17	1.46	15.98	11.67	1.54	16.78	12.67	1.60
75	11.01	8.95	1.25	11.92	9.30	1.31	12.83	9.64	1.37	13.96	10.08	1.44	14.64	10.34	1.49	15.86	11.75	1.57	16.67	12.70	1.62
80	11.05	8.92	1.29	11.92	9.32	1.35	12.78	9.71	1.40	13.86	10.21	1.47	14.51	10.50	1.51	15.74	11.84	1.59	16.56	12.73	1.64
85	11.10	8.90	1.33	11.91	9.34	1.39	12.73	9.78	1.44	13.76	10.33	1.50	14.37	10.67	1.54	15.62	11.92	1.62	16.45	12.76	1.67
90	11.14	8.87	1.38	11.92	9.36	1.43	12.69	9.85	1.47	13.66	10.46	1.54	14.24	10.83	1.57	15.50	12.00	1.64	16.34	12.78	1.69
95	11.20	8.84	1.42	11.92	9.38	1.46	12.65	9.92	1.51	13.56	10.59	1.57	<b>14.10</b>	<b>11.00</b>	<b>1.60</b>	15.38	12.08	1.67	16.23	12.81	1.72
100	10.85	8.60	1.43	11.60	9.17	1.48	12.34	9.73	1.53	13.26	10.44	1.58	13.82	10.86	1.62	15.05	11.89	1.69	15.87	12.57	1.74
105	10.51	8.36	1.45	11.27	8.95	1.50	12.02	9.54	1.54	12.97	10.28	1.60	13.53	10.72	1.63	14.71	11.69	1.71	15.50	12.33	1.75
110	10.17	8.13	1.46	10.94	8.74	1.51	11.71	9.36	1.56	12.68	10.13	1.62	13.25	10.59	1.65	14.38	11.49	1.72	15.14	12.09	1.77
115	9.95	8.01	1.48	10.70	8.62	1.53	11.46	9.23	1.58	12.40	9.99	1.63	12.97	10.45	1.67	14.09	11.34	1.74	14.83	11.94	1.79
118	9.81	7.93	1.49	10.56	8.54	1.54	11.31	9.15	1.59	12.24	9.91	1.64	12.80	10.37	1.68	13.91	11.25	1.76	14.65	11.84	1.81

DB: Dry Bulb Temperature (°F) WB: Wet Bulb Temperature (°F) TC: Total Capacity (kBtu/h)  
 SHC: Sensible Heating Capacity (kBtu/h) PI: Power Input (kW) (includes compressor, indoor fan motor and outdoor fan motor)

1. All capacities are net, evaporator fan motor heat is deducted.
2. Low Ambient Wind Baffle Kit (sold separately) allows operation down to 0°F.

3. Direct interpolation is permissible. ⚠ Do not extrapolate.  
 Capacity as rated: 0 ft. above sea level with 25 ft. of refrigerant piping.  
 0 ft. level difference between outdoor and indoor units.

Cooling capacity rating obtained with air entering the indoor unit at 80°F dry bulb (DB) and 67°F wet bulb (WB), and outdoor ambient conditions of 95°F dry bulb (DB) and 75°F wet bulb (WB).

# MAXIMUM COOLING CAPACITY

## KSUAK181A (KNUAK181A / KUSAB181A)

Table 14: KSUAK181A (KNUAK181A / KUSAB181A) Maximum Cooling Capacities.

Outdoor Air Temp. (°F DB)	Indoor Air Temperature (°F DB / °F WB)																				
	64 / 53			68 / 57			72 / 61			77 / 64			80 / 67			86 / 72			90 / 75		
	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI
0	14.66	11.39	1.03	18.33	12.12	1.22	22.00	12.86	1.41	26.59	13.79	1.64	29.34	14.34	1.78	31.38	20.24	1.88	32.73	24.17	1.95
5	14.38	11.22	1.08	17.98	11.95	1.27	21.58	12.68	1.47	26.08	13.59	1.72	28.78	14.13	1.87	30.78	19.95	1.97	32.11	23.83	2.04
7	14.48	11.33	1.09	18.10	12.06	1.29	21.73	12.80	1.49	26.26	13.71	1.74	28.97	14.26	1.89	30.99	20.13	1.99	32.33	24.05	2.06
10	14.63	11.48	1.11	18.29	12.23	1.31	21.95	12.97	1.51	26.53	13.90	1.77	29.27	14.46	1.92	31.30	20.41	2.02	32.66	24.38	2.09
14	14.44	11.25	1.11	18.05	11.97	1.32	21.67	12.70	1.52	26.19	13.61	1.78	28.90	14.16	1.93	30.91	19.99	2.04	32.24	23.87	2.11
23	15.66	11.67	1.09	18.84	12.42	1.32	22.02	13.18	1.55	25.99	14.12	1.84	28.38	14.69	2.01	30.61	19.42	2.14	32.09	22.57	2.23
25	15.86	11.87	1.13	18.96	12.60	1.36	22.06	13.34	1.58	25.94	14.25	1.86	28.26	14.80	2.03	30.48	19.44	2.16	31.96	22.53	2.25
30	16.34	12.37	1.23	19.25	13.05	1.44	22.16	13.73	1.65	25.79	14.58	1.91	27.97	15.09	2.07	30.17	19.48	2.21	31.63	22.40	2.30
35	16.81	12.88	1.33	19.53	13.50	1.53	22.25	14.13	1.72	25.65	14.92	1.97	27.68	15.39	2.12	29.85	19.52	2.25	31.30	22.27	2.35
40	17.28	13.38	1.44	19.81	13.96	1.62	22.34	14.53	1.80	25.50	15.25	2.03	27.39	15.68	2.16	29.54	19.55	2.30	30.97	22.14	2.39
45	17.73	13.89	1.54	20.07	14.41	1.71	22.42	14.93	1.87	25.35	15.58	2.08	27.11	15.97	2.21	29.23	19.59	2.35	30.64	22.00	2.44
50	18.17	14.40	1.65	20.33	14.87	1.80	22.49	15.33	1.95	25.19	15.91	2.14	26.82	16.26	2.25	28.91	19.62	2.39	30.31	21.86	2.49
55	18.60	14.91	1.76	20.58	15.32	1.89	22.56	15.73	2.03	25.04	16.24	2.19	26.53	16.55	2.29	28.60	19.65	2.44	29.98	21.71	2.54
60	19.02	15.43	1.87	20.82	15.78	1.99	22.63	16.13	2.10	24.88	16.58	2.25	26.24	16.84	2.34	28.29	19.68	2.49	29.65	21.57	2.58
65	19.03	15.40	1.94	20.76	15.84	2.05	22.49	16.27	2.16	24.65	16.81	2.30	25.95	17.13	2.38	28.01	19.84	2.52	29.39	21.64	2.62
70	19.05	15.37	2.01	20.70	15.89	2.11	22.35	16.40	2.22	24.42	17.04	2.35	25.66	17.43	2.43	27.74	20.00	2.57	29.14	21.71	2.66
75	19.08	15.34	2.08	20.65	15.94	2.18	22.22	16.53	2.28	24.19	17.27	2.40	25.37	17.72	2.47	27.48	20.15	2.61	28.88	21.77	2.69
80	19.10	15.31	2.15	20.60	15.98	2.24	22.09	16.66	2.33	23.96	17.50	2.45	25.08	18.01	2.52	27.21	20.30	2.65	28.63	21.83	2.73
85	19.14	15.27	2.21	20.55	16.02	2.30	21.96	16.78	2.39	23.73	17.73	2.50	24.79	18.30	2.56	26.94	20.45	2.69	28.37	21.89	2.77
90	19.18	15.22	2.28	20.51	16.06	2.36	21.84	16.91	2.44	23.50	17.96	2.54	24.50	18.59	2.61	26.67	20.60	2.73	28.12	21.94	2.81
95	19.22	15.17	2.35	20.47	16.10	2.42	21.72	17.03	2.50	23.28	18.19	2.59	<b>24.21</b>	<b>18.88</b>	<b>2.65</b>	26.41	20.75	2.77	27.87	21.99	2.85
100	18.58	14.64	2.38	19.84	15.61	2.45	21.11	16.57	2.53	22.70	17.77	2.63	23.65	18.49	2.68	25.75	20.24	2.80	27.16	21.40	2.88
105	17.93	14.12	2.41	19.22	15.11	2.48	20.51	16.11	2.56	22.12	17.35	2.66	23.08	18.10	2.72	25.10	19.73	2.83	26.44	20.81	2.91
110	17.29	13.60	2.43	18.60	14.62	2.51	19.91	15.65	2.59	21.54	16.94	2.69	22.52	17.71	2.75	24.44	19.22	2.86	25.72	20.22	2.94
115	16.84	13.27	2.47	18.12	14.28	2.54	19.40	15.29	2.62	21.00	16.56	2.72	21.96	17.32	2.78	23.85	18.79	2.90	25.11	19.78	2.98
118	16.58	13.07	2.49	17.84	14.07	2.56	19.10	15.07	2.64	20.67	16.33	2.74	21.62	17.08	2.80	23.49	18.54	2.93	24.74	19.51	3.01

Performance Data

DB: Dry Bulb Temperature (°F) WB: Wet Bulb Temperature (°F) TC: Total Capacity (kBtu/h)  
 SHC: Sensible Heating Capacity (kBtu/h) PI: Power Input (kW) (includes compressor, indoor fan motor and outdoor fan motor)  
 1. All capacities are net, evaporator fan motor heat is deducted.  
 2. Low Ambient Wind Baffle Kit (sold separately) allows operation down to 0°F.

3. Direct interpolation is permissible. ⚠ Do not extrapolate.  
 Capacity as rated: 0 ft. above sea level with 25 ft. of refrigerant piping.  
 0 ft. level difference between outdoor and indoor units.  
 Cooling capacity rating obtained with air entering the indoor unit at 80°F dry bulb (DB) and 67°F wet bulb (WB), and outdoor ambient conditions of 95°F dry bulb (DB) and 75°F wet bulb (WB).

# HEATING CAPACITY

KSUAK091A (KNUAK091A / KUSAB091A)

Table 15: KSUAK091A (KNUAK091A / KUSAB091A) Heating Capacities.

Outdoor Air Temp.		Indoor Air Temperature (°F DB)													
°F DB	°F WB	60		64		68		70		72		75		86	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
-3	-4	5.73	0.54	5.56	0.53	5.50	0.53	5.45	0.53	5.41	0.53	5.30	0.52	5.17	0.52
0	-1	6.24	0.59	6.05	0.59	5.99	0.59	5.93	0.58	5.89	0.58	5.77	0.57	5.63	0.57
1	0	6.32	0.60	6.13	0.59	6.07	0.59	6.01	0.59	5.96	0.59	5.84	0.58	5.70	0.58
6	5	6.60	0.62	6.40	0.61	6.34	0.61	6.28	0.61	6.23	0.61	6.10	0.60	5.96	0.60
10	9	6.89	0.64	6.69	0.63	6.62	0.63	6.55	0.63	6.50	0.63	6.37	0.62	6.22	0.62
16	14	7.11	0.64	6.90	0.64	6.83	0.64	6.76	0.63	6.71	0.63	6.57	0.63	6.42	0.63
17	15	7.16	0.65	6.94	0.64	6.87	0.64	6.81	0.64	6.75	0.64	6.62	0.63	6.46	0.63
19	17	7.26	0.66	7.04	0.66	6.97	0.66	6.90	0.65	6.84	0.65	6.71	0.65	6.55	0.65
24	23	7.90	0.67	7.66	0.67	7.58	0.67	7.51	0.66	7.45	0.66	7.30	0.65	7.13	0.65
32	30	8.92	0.69	8.65	0.68	8.56	0.68	8.48	0.67	8.41	0.67	8.24	0.67	8.05	0.67
41	38	10.59	0.71	10.27	0.70	10.16	0.70	10.06	0.69	9.99	0.69	9.79	0.69	9.55	0.69
43	40	11.04	0.71	10.70	0.71	10.60	0.71	10.49	0.70	10.41	0.70	10.20	0.69	9.96	0.69
47	43	11.47	0.72	11.12	0.71	11.01	0.71	<b>10.90</b>	<b>0.71</b>	10.82	0.71	10.60	0.70	10.35	0.70
53	50	11.65	0.73	11.30	0.72	11.18	0.72	11.07	0.71	10.99	0.71	10.77	0.71	10.51	0.71
59	53	11.91	0.73	11.55	0.73	11.43	0.73	11.32	0.72	11.23	0.72	11.00	0.71	10.74	0.71
64	57	12.16	0.75	11.79	0.74	11.67	0.74	11.56	0.73	11.47	0.73	11.24	0.73	10.97	0.73
70	61	12.39	0.76	12.02	0.75	11.89	0.75	11.78	0.74	11.69	0.74	11.45	0.74	11.18	0.74
75	65	12.56	0.77	12.18	0.76	12.06	0.76	11.94	0.75	11.85	0.75	11.61	0.75	11.34	0.75

DB: Dry Bulb Temperature (°F) WB: Wet Bulb Temperature (°F) TC: Total Capacity (kBtu/h)

PI: Power Input (kW) (includes compressor, indoor fan motor and outdoor fan motor)

1. All capacities are net, evaporator fan motor heat is deducted.

2. Direct interpolation is permissible. ⓪ Do not extrapolate.

Capacity as rated: 0 ft. above sea level with 25 ft. of refrigerant piping.

0 ft. level difference between outdoor and indoor units.

Heating capacity rating obtained with air entering the indoor unit at 70°F dry bulb (DB) and 60°F wet bulb (WB), and outdoor ambient conditions of 47°F dry bulb (DB) and 43°F wet bulb (WB).

# HEATING CAPACITY

## KSUAK121A (KNUAK121A / KUSAB121A)

Table 16: KSUAK121A (KNUAK121A / KUSAB121A) Heating Capacities.

Outdoor Air Temp.		Indoor Air Temperature (°F DB)													
°F DB	°F WB	60		64		68		70		72		75		86	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
-3	-4	7.06	0.72	6.85	0.71	6.78	0.71	6.71	0.71	6.66	0.71	6.53	0.70	6.37	0.70
0	-1	7.69	0.79	7.46	0.79	7.38	0.79	7.31	0.78	7.25	0.78	7.11	0.77	6.94	0.77
1	0	7.79	0.80	7.55	0.79	7.48	0.79	7.40	0.79	7.35	0.79	7.20	0.78	7.03	0.78
6	5	8.14	0.83	7.89	0.82	7.81	0.82	7.73	0.81	7.67	0.81	7.52	0.80	7.34	0.80
10	9	8.50	0.86	8.24	0.85	8.15	0.85	8.07	0.84	8.01	0.84	7.85	0.83	7.66	0.83
16	14	8.76	0.86	8.50	0.86	8.41	0.86	8.33	0.85	8.26	0.85	8.10	0.84	7.91	0.84
17	15	8.82	0.87	8.56	0.86	8.47	0.86	8.39	0.86	8.32	0.86	8.15	0.85	7.96	0.85
19	17	8.94	0.89	8.67	0.88	8.58	0.88	8.50	0.87	8.43	0.87	8.26	0.86	8.07	0.86
24	23	10.22	0.94	9.91	0.93	9.81	0.93	9.71	0.92	9.63	0.92	9.44	0.91	9.22	0.91
32	30	12.31	1.01	11.94	1.00	11.82	1.00	11.70	0.99	11.61	0.99	11.38	0.98	11.11	0.98
41	38	13.78	1.05	13.37	1.04	13.23	1.04	13.10	1.03	13.00	1.03	12.74	1.02	12.44	1.02
43	40	13.98	1.05	13.56	1.04	13.42	1.04	13.29	1.03	13.18	1.03	12.92	1.02	12.61	1.02
47	43	14.31	1.06	13.88	1.05	13.74	1.05	<b>13.60</b>	<b>1.04</b>	13.50	1.04	13.23	1.03	12.91	1.03
53	50	14.75	1.09	14.30	1.08	14.16	1.08	14.02	1.07	13.91	1.07	13.63	1.06	13.31	1.06
59	53	15.10	1.10	14.64	1.09	14.49	1.09	14.35	1.08	14.24	1.08	13.95	1.07	13.62	1.07
64	57	15.42	1.12	14.95	1.11	14.80	1.11	14.65	1.10	14.54	1.10	14.25	1.09	13.91	1.09
70	61	15.71	1.14	15.23	1.13	15.08	1.13	14.93	1.12	14.82	1.12	14.52	1.10	14.17	1.10
75	65	15.93	1.15	15.45	1.14	15.29	1.14	15.14	1.13	15.02	1.13	14.72	1.12	14.37	1.12

DB: Dry Bulb Temperature (°F) WB: Wet Bulb Temperature (°F) TC: Total Capacity (kBtu/h)  
 PI: Power Input (kW) (includes compressor, indoor fan motor and outdoor fan motor)

1. All capacities are net, evaporator fan motor heat is deducted.
2. Direct interpolation is permissible. ⓪ Do not extrapolate.

Capacity as rated: 0 ft. above sea level with 25 ft. of refrigerant piping.  
 0 ft. level difference between outdoor and indoor units.

Heating capacity rating obtained with air entering the indoor unit at 70°F dry bulb (DB) and 60°F wet bulb (WB), and outdoor ambient conditions of 47°F dry bulb (DB) and 43°F wet bulb (WB).



# HEATING CAPACITY

KSUAK181A (KNUAK181A / KUSAB181A)

Table 17: KSUAK181A (KNUAK181A / KUSAB181A) Heating Capacities.

Outdoor Air Temp.		Indoor Air Temperature (°F DB)													
°F DB	°F WB	60		64		68		70		72		75		86	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
-3	-4	11.06	1.15	10.72	1.14	10.61	1.14	10.51	1.13	10.43	1.13	10.22	1.12	9.98	1.12
0	-1	12.04	1.26	11.67	1.25	11.55	1.25	11.44	1.24	11.35	1.24	11.13	1.23	10.86	1.23
1	0	12.19	1.28	11.82	1.26	11.70	1.26	11.59	1.25	11.50	1.25	11.27	1.24	11.00	1.24
6	5	12.74	1.32	12.35	1.31	12.23	1.31	12.11	1.29	12.01	1.29	11.77	1.28	11.49	1.28
10	9	13.30	1.36	12.89	1.35	12.76	1.35	12.64	1.34	12.54	1.34	12.29	1.32	12.00	1.32
16	14	13.72	1.38	13.30	1.36	13.17	1.36	13.04	1.35	12.94	1.35	12.68	1.34	12.38	1.34
17	15	13.81	1.39	13.39	1.38	13.26	1.38	13.13	1.36	13.03	1.36	12.76	1.35	12.46	1.35
19	17	14.00	1.42	13.57	1.41	13.44	1.41	13.30	1.39	13.20	1.39	12.94	1.38	12.63	1.38
24	23	16.08	1.53	15.59	1.52	15.43	1.52	15.28	1.50	15.16	1.50	14.86	1.49	14.50	1.49
32	30	19.50	1.71	18.91	1.70	18.72	1.70	18.53	1.68	18.39	1.68	18.02	1.66	17.60	1.66
41	38	21.98	1.83	21.32	1.81	21.10	1.81	20.89	1.80	20.73	1.80	20.32	1.78	19.83	1.78
43	40	22.33	1.84	21.65	1.83	21.43	1.83	21.22	1.81	21.06	1.81	20.64	1.79	20.15	1.79
47	43	22.72	1.87	22.04	1.85	21.81	1.85	<b>21.60</b>	<b>1.83</b>	21.43	1.83	21.00	1.81	20.50	1.81
53	50	23.02	1.90	22.32	1.88	22.09	1.88	21.87	1.86	21.71	1.86	21.27	1.84	20.76	1.84
59	53	23.52	1.92	22.80	1.90	22.57	1.90	22.35	1.88	22.18	1.88	21.73	1.86	21.22	1.86
64	57	24.02	1.95	23.29	1.93	23.05	1.93	22.82	1.91	22.65	1.91	22.20	1.90	21.67	1.90
70	61	24.47	1.98	23.73	1.96	23.49	1.96	23.26	1.94	23.08	1.94	22.62	1.92	22.08	1.92
75	65	24.81	2.01	24.06	1.99	23.82	1.99	23.58	1.97	23.40	1.97	22.93	1.95	22.39	1.95

DB: Dry Bulb Temperature (°F) WB: Wet Bulb Temperature (°F) TC: Total Capacity (kBtu/h)

PI: Power Input (kW) (includes compressor, indoor fan motor and outdoor fan motor)

1. All capacities are net, evaporator fan motor heat is deducted.
2. Direct interpolation is permissible. ⓧ Do not extrapolate.

Capacity as rated: 0 ft. above sea level with 25 ft. of refrigerant piping.  
0 ft. level difference between outdoor and indoor units.

Heating capacity rating obtained with air entering the indoor unit at 70°F dry bulb (DB) and 60°F wet bulb (WB), and outdoor ambient conditions of 47°F dry bulb (DB) and 43°F wet bulb (WB).



# MAXIMUM HEATING CAPACITY

## KSUAK091A (KNUAK091A / KUSAB091A)

Table 18: KSUAK091A (KNUAK091A / KUSAB091A) Heating Capacities.

Outdoor Air Temp.		Indoor Air Temperature (°F DB)													
°F DB	°F WB	60		64		68		70		72		75		86	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
-3	-4	7.92	1.26	7.87	1.26	7.84	1.27	7.81	1.27	7.76	1.28	7.64	1.31	7.28	1.39
0	-1	8.37	1.27	8.30	1.28	8.25	1.29	8.22	1.29	8.16	1.31	8.02	1.34	7.61	1.43
1	0	8.55	1.28	8.48	1.29	8.42	1.30	8.39	1.31	8.32	1.32	8.17	1.34	7.72	1.40
6	5	9.73	1.35	9.63	1.37	9.55	1.38	9.50	1.39	9.41	1.38	9.19	1.37	8.20	1.31
10	9	10.41	1.39	10.29	1.41	10.20	1.42	10.15	1.43	10.02	1.42	9.73	1.40	8.49	1.33
16	14	11.13	1.44	11.00	1.45	10.90	1.47	10.84	1.48	10.66	1.46	10.25	1.44	9.04	1.33
17	15	11.30	1.44	11.16	1.46	11.06	1.48	11.00	1.49	10.80	1.47	10.37	1.44	9.08	1.31
19	17	11.51	1.46	11.37	1.48	11.26	1.49	11.20	1.50	10.99	1.47	10.50	1.42	9.06	1.26
24	23	12.59	1.53	12.44	1.54	12.32	1.54	12.25	1.54	11.96	1.51	11.28	1.45	9.27	1.26
32	30	14.32	1.61	14.15	1.61	14.01	1.62	13.94	1.62	13.52	1.57	12.57	1.50	9.71	1.24
41	38	16.26	1.63	16.07	1.66	15.92	1.69	15.84	1.70	15.31	1.64	14.11	1.53	10.54	1.16
43	40	16.70	1.65	16.50	1.68	16.34	1.71	16.26	1.73	15.69	1.65	14.41	1.54	10.59	1.14
47	43	17.57	1.66	17.36	1.72	17.19	1.77	<b>17.10</b>	<b>1.80</b>	16.47	1.71	15.05	1.59	10.80	1.11
53	50	18.02	1.69	17.80	1.75	17.62	1.80	17.52	1.82	16.82	1.72	15.27	1.58	10.61	1.03
59	53	18.25	1.66	18.23	1.72	18.22	1.79	18.21	1.82	17.46	1.72	15.78	1.57	10.71	1.04
64	57	18.40	1.62	18.12	1.65	17.90	1.67	17.78	1.69	17.06	1.60	15.45	1.48	10.60	1.01
70	61	18.46	1.55	18.14	1.55	17.88	1.55	17.73	1.55	17.02	1.47	15.43	1.35	10.64	0.93
75	65	18.41	1.42	18.04	1.46	17.74	1.49	17.57	1.51	16.85	1.43	15.22	1.31	10.34	0.87

DB: Dry Bulb Temperature (°F) WB: Wet Bulb Temperature (°F) TC: Total Capacity (kBtu/h)  
PI: Power Input (kW) (includes compressor, indoor fan motor and outdoor fan motor)

1. All capacities are net, evaporator fan motor heat is deducted.
2. Direct interpolation is permissible. Ⓣ Do not extrapolate.

Capacity as rated: 0 ft. above sea level with 25 ft. of refrigerant piping.  
0 ft. level difference between outdoor and indoor units.

Heating capacity rating obtained with air entering the indoor unit at 70°F dry bulb (DB) and 60°F wet bulb (WB), and outdoor ambient conditions of 47°F dry bulb (DB) and 43°F wet bulb (WB).

# MAXIMUM HEATING CAPACITY

KSUAK121A (KNUAK121A / KUSAB121A)

Table 19: KSUAK121A (KNUAK121A / KUSAB121A) Heating Capacities.

Outdoor Air Temp.		Indoor Air Temperature (°F DB)													
°F DB	°F WB	60		64		68		70		72		75		86	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
-3	-4	8.12	1.30	8.07	1.31	8.03	1.31	8.01	1.31	7.96	1.33	7.83	1.35	7.46	1.44
0	-1	8.58	1.32	8.51	1.33	8.46	1.33	8.43	1.34	8.36	1.36	8.22	1.38	7.80	1.48
1	0	8.77	1.32	8.69	1.33	8.63	1.35	8.60	1.36	8.53	1.37	8.38	1.38	7.91	1.44
6	5	10.24	1.42	10.14	1.44	10.05	1.46	10.00	1.47	9.90	1.46	9.68	1.44	8.64	1.39
10	9	11.16	1.49	11.04	1.51	10.93	1.53	10.88	1.54	10.74	1.52	10.43	1.50	9.11	1.43
16	14	12.21	1.57	12.07	1.59	11.95	1.61	11.88	1.63	11.69	1.60	11.24	1.57	9.91	1.46
17	15	12.43	1.58	12.28	1.61	12.16	1.63	12.10	1.64	11.89	1.62	11.41	1.58	9.99	1.44
19	17	12.74	1.62	12.59	1.63	12.47	1.65	12.40	1.66	12.16	1.63	11.63	1.58	10.03	1.39
24	23	13.95	1.69	13.79	1.70	13.65	1.70	13.58	1.70	13.25	1.67	12.51	1.61	10.28	1.39
32	30	15.88	1.77	15.70	1.77	15.55	1.78	15.46	1.78	15.00	1.73	13.94	1.65	10.77	1.37
41	38	18.06	1.79	17.85	1.82	17.68	1.85	17.59	1.87	17.00	1.80	15.67	1.68	11.70	1.28
43	40	18.54	1.80	18.33	1.84	18.15	1.87	18.06	1.89	17.43	1.81	16.01	1.69	11.76	1.25
47	43	19.52	1.82	19.29	1.88	19.10	1.94	<b>19.00</b>	<b>1.97</b>	18.30	1.88	16.72	1.73	11.99	1.22
53	50	20.02	1.85	19.78	1.91	19.57	1.97	19.46	1.99	18.69	1.89	16.97	1.72	11.79	1.13
59	53	20.28	1.82	20.26	1.89	20.25	1.95	20.24	1.99	19.40	1.88	17.53	1.72	11.90	1.13
64	57	20.44	1.78	20.14	1.80	19.89	1.83	19.75	1.85	18.96	1.75	17.16	1.62	11.78	1.11
70	61	20.51	1.70	20.15	1.70	19.86	1.69	19.70	1.69	18.91	1.61	17.14	1.48	11.83	1.02
75	65	20.46	1.55	20.05	1.59	19.71	1.64	19.52	1.66	18.72	1.57	16.91	1.44	11.49	0.95

DB: Dry Bulb Temperature (°F) WB: Wet Bulb Temperature (°F) TC: Total Capacity (kBtu/h)

PI: Power Input (kW) (includes compressor, indoor fan motor and outdoor fan motor)

1. All capacities are net, evaporator fan motor heat is deducted.

2. Direct interpolation is permissible. Ⓣ Do not extrapolate.

Capacity as rated: 0 ft. above sea level with 25 ft. of refrigerant piping.

0 ft. level difference between outdoor and indoor units.

Heating capacity rating obtained with air entering the indoor unit at 70°F dry bulb (DB) and 60°F wet bulb (WB), and outdoor ambient conditions of 47°F dry bulb (DB) and 43°F wet bulb (WB).

# MAXIMUM HEATING CAPACITY

KSUAK181A (KNUAK181A / KUSAB181A)

Table 20: KSUAK181A (KNUAK181A / KUSAB181A) Heating Capacities.

Outdoor Air Temp.		Indoor Air Temperature (°F DB)													
°F DB	°F WB	60		64		68		70		72		75		86	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
-3	-4	12.32	2.15	12.25	2.16	12.19	2.16	12.16	2.17	12.07	2.19	11.88	2.23	11.32	2.38
0	-1	13.01	2.18	12.91	2.19	12.83	2.21	12.78	2.21	12.69	2.24	12.48	2.28	11.84	2.44
1	0	13.30	2.18	13.19	2.21	13.10	2.23	13.05	2.24	12.95	2.26	12.71	2.29	12.01	2.39
6	5	15.47	2.39	15.32	2.42	15.19	2.45	15.12	2.47	14.97	2.45	14.62	2.42	13.05	2.33
10	9	16.82	2.53	16.63	2.56	16.48	2.59	16.39	2.61	16.19	2.59	15.72	2.55	13.72	2.43
16	14	18.34	2.71	18.12	2.75	17.95	2.78	17.85	2.80	17.56	2.77	16.89	2.71	14.89	2.52
17	15	18.66	2.73	18.44	2.77	18.26	2.82	18.16	2.84	17.85	2.79	17.13	2.73	14.99	2.49
19	17	19.11	2.81	18.89	2.84	18.70	2.87	18.60	2.88	18.24	2.82	17.44	2.74	15.05	2.42
24	23	21.20	2.92	20.95	2.93	20.75	2.94	20.64	2.94	20.13	2.87	19.00	2.77	15.62	2.40
32	30	24.54	3.02	24.26	3.03	24.02	3.04	23.89	3.05	23.17	2.96	21.54	2.82	16.65	2.34
41	38	28.30	3.02	27.97	3.08	27.71	3.14	27.56	3.17	26.64	3.04	24.56	2.85	18.34	2.16
43	40	29.14	3.05	28.80	3.11	28.52	3.17	28.37	3.20	27.38	3.06	25.15	2.85	18.47	2.10
47	43	30.82	3.05	30.46	3.15	30.16	3.25	<b>30.00</b>	<b>3.30</b>	28.89	3.14	26.41	2.91	18.94	2.04
53	50	31.62	3.11	31.23	3.20	30.91	3.29	30.73	3.34	29.52	3.16	26.79	2.89	18.61	1.89
59	53	32.02	3.05	31.99	3.16	31.97	3.27	31.96	3.33	30.64	3.15	27.68	2.88	18.79	1.90
64	57	32.27	2.98	31.80	3.02	31.41	3.07	31.19	3.09	29.93	2.94	27.10	2.71	18.60	1.85
70	61	32.38	2.85	31.82	2.84	31.36	2.84	31.11	2.83	29.86	2.69	27.07	2.48	18.67	1.71
75	65	32.30	2.60	31.65	2.67	31.12	2.74	30.82	2.77	29.55	2.63	26.70	2.41	18.15	1.59

DB: Dry Bulb Temperature (°F) WB: Wet Bulb Temperature (°F) TC: Total Capacity (kBtu/h)

PI: Power Input (kW) (includes compressor, indoor fan motor and outdoor fan motor)

1. All capacities are net, evaporator fan motor heat is deducted.

2. Direct interpolation is permissible. ⓪ Do not extrapolate.

Capacity as rated: 0 ft. above sea level with 25 ft. of refrigerant piping.

0 ft. level difference between outdoor and indoor units.

Heating capacity rating obtained with air entering the indoor unit at 70°F dry bulb (DB) and 60°F wet bulb (WB), and outdoor ambient conditions of 47°F dry bulb (DB) and 43°F wet bulb (WB).

# CORRECTION FACTORS

## Cooling / Heating Correction Factors

For single zone systems, calculate the equivalent length of the liquid line from the outdoor unit to the indoor unit. Also, determine the elevation difference of the indoor unit above or below the outdoor unit. Find corresponding cooling or heating capacity correction factors as shown below. Multiply the correction factors by the cooling or heating capacity obtained from the capacity table using design conditions. The resultant is the NET cooling or heating capacity.

## Refrigerant Line Length Derates

For air-cooled systems, a capacity correction factor will have to be applied to account for the length of the system's refrigerant pipe. Rate of change in capacity due to increased piping lengths is shown below.

Table 21: R32 Single Zone Art Cool Mirror System Cooling and Heating Capacity Coefficient Factors.

Piping Length (ft.)		16.4	24.6	32.8	49.2	65.6	82.0	98.4	114.8	131.2	147.6	164.0
<i>Cooling Capacity Coefficient Factor</i>												
Rate of Capacity Change (%)	KSUAK091A (9,000 Btu/h)	100	100	98.2	94.6	91.1	87.5	-	-	-	-	-
	KSUAK121A (12,000 Btu/h)	100	100	98.2	94.6	91.1	87.5	-	-	-	-	-
	KSUAK181A (18,000 Btu/h)	100	100	99.1	97.3	95.5	93.6	91.8	90.0	-	-	-
<i>Heating Capacity Coefficient Factor</i>												
Rate of Capacity Change (%)	KSUAK091A (9,000 Btu/h)	100	100	99.1	97.3	95.6	93.8	-	-	-	-	-
	KSUAK121A (12,000 Btu/h)	100	100	99.1	97.3	95.6	93.8	-	-	-	-	-
	KSUAK181A (18,000 Btu/h)	100	100	99.5	98.6	97.7	96.8	95.9	95.0	-	-	-

## Equivalent Piping Length for Piping Components

Table 22: Equivalent Piping Length for Elbows.

Component	Size (Inches)													
Elbow (ft.)	1/4	3/8	1/2	5/8	3/4	7/8	1	1-1/8	1-1/4	1-3/8	1-1/2	1-5/8	1-3/4	2-1/8
	0.5	0.6	0.7	0.8	1.2	1.3	1.5	1.6	1.8	2.0	2.1	2.3	2.5	2.8

## Altitude Correction Factor

The impact of air density must be considered on systems installed at a significant altitude above sea level, therefore, locally accepted altitude correction factors must be applied.

# CORRECTION FACTORS / CHECK SELECTION

## Defrost Correction Factor for Heating Operation

The outdoor unit heating capacity will need to be adjusted for frost accumulation on air-cooled systems. If design day conditions are below the dewpoint of the surrounding air, frost will not be a problem and no correction factor is needed. In certain weather conditions, however, frost will form and accumulate on the air-cooled outdoor unit coil and impact the coils ability to transfer heat. If significant frost accumulates on the outdoor unit coil, a defrost algorithm will start automatically. The timing between defrost periods is determined by the system's ability to achieve a target head pressure value.

Capacity and AHRI ratings tables do not factor in capacity reduction when frost has accumulated on the condenser coil, nor during defrost operation.

Integrated heating capacity values can be obtained using the formula:

$$A = B \times C$$

Where:

A = Integrated Heating Capacity.

B = Value found in the Capacity Table.

C = Correction Factor for Frost Accumulation Factor (from table at right).

### NOTICE

*There will be a temporary reduction in capacity when frost / ice accumulates on the outside surface of the outdoor unit heat exchanger. The level of capacity reduction depends on a number of factors, for example, outdoor temperature (°F DB), relative humidity (RH), and the amount of frost present.*

Table 23: Outdoor Unit Frost Accumulation Factor (Heating)<sup>1</sup>.

Entering DB (°F)	19.4	23.0	26.6	32.0	37.4	41.0	44.6
Derate Factor	0.98	0.95	0.93	0.86	0.93	0.96	1.0

<sup>1</sup>At 85% outdoor air relative humidity.

The frost accumulation factor does not account for effects of snow accumulation restricting airflow through the outdoor unit coil.

## Check the Indoor and Outdoor Unit Selection(s)

Compare the corrected cooling and heating capacities to the load calculations. Is each capacity sufficient for the zone it serves?

For each indoor unit, the corrected capacity must be at least equal to the total of the cooling design load (plus ventilation load, if applicable) for the space(s) served by the indoor unit. For each indoor unit, the corrected capacity also must be at least equal to the total of the heating design load (plus ventilation load, if applicable) for the space(s) and / or thermal zones served by the indoor unit.

The outdoor unit selected must be large enough to offset the total cooling load for all spaces it serves (account for ventilation air cooling load if the ventilation air has not been pretreated to room neutral conditions). The outdoor unit must also be large enough to offset the total heating load for all spaces it serves.

If the corrected heating capacity ratio exceeds 100%, reselect the equipment, or change the system design by moving some of the load to another system.

## System Sizing Check Formulas

### 1. Outdoor Unit Rated Capacity.

$Q_{\text{odu(rated)}}$  (From capacity tables).

### 2. Outdoor Unit Capacity at $T_i$ , $T_o$ Temperature.

$Q_{\text{odu}(T_i, T_o)}$  (From capacity tables).

### 3. Outdoor Unit Capacity Coefficient Factor.

$$F_{(T_i, T_o)} = Q_{\text{odu}(T_i, T_o)} / Q_{\text{odu(rated)}}$$

### 4. Piping Correction Factor (From Capacity Coefficient Factor Tables).

$F_{(\text{length})}$  for each piping length

### 5. Individual Indoor Unit Combination Capacity.

$$Q_{\text{idu (combi)}} = Q_{\text{odu(rated)}} \times Q_{\text{idu(rated)}} / Q_{\text{idu(rated-total)}}$$

### 6. Individual Indoor Unit Actual Capacity.

$$Q_{\text{idu (actual)}} = Q_{\text{odu(combi)}} \times F_{(T_i, T_o)} \times F_{(\text{length, altitude})}$$

## Conclusions and Recommendations

- Understand the design safety factors.
- Reference load calculations for actual cooling and heating capacities (applies in 99% of applications – consider total load when latent load is greater than 30%).
- Verify that the sensible load of the zone is satisfied.
- Use caution when sizing to meet listed capacity specifications for the scheduled manufacturer's equipment.

If further system design assistance is needed, or you have a unique application you would like to discuss, contact an LG sales rep.

# APPLICATION GUIDELINES

**Placement / Clearance Considerations for Indoor Units on page 47**

**Placement / Clearance Considerations for Outdoor Units on page 49**

**Installing Outdoor Units Indoors on page 53**

# PLACEMENT / CLEARANCE CONSIDERATIONS

Indoor Units

## Selecting the Best Location for the Indoor Unit

### NOTICE

Follow recommended best practices when choosing an indoor location for the single zone indoor unit.

### Dos

Select a location for installing the indoor units that will meet the following conditions:

- Place the unit where air circulation will not be blocked.
- Locate the indoor unit in a location that is level, with enough strength to bear the weight of the indoor unit(s), and where it can be easily connected to the outdoor unit.
- Place the unit where drainage can be obtained easily and to minimize the length of the condensate drain piping; include space for drainage to ensure condensate flows properly out of the unit when it is in cooling mode.
- Include enough space around the indoor unit so that it is accessible for maintenance and service purposes. Include enough space to be able to clean the filter.
- Place the unit in a location where electrical noise / electromagnetic waves will not impact operation. Maintain proper distances between the indoor units and electric wires, audio and visual appliances, breaker / circuit panels, etc.
- Place the unit where operating sound from the unit will not disturb occupants.
- Confirm that there is enough space for and between the indoor unit and any mounting hardware.

### Do Not

- No obstacles to air circulation around the unit; keep proper distances from ceilings, doorways, floor, walls, etc.
- The unit should not be installed near a heat or steam source, or where considerable amounts of oil, iron powder, or flour are used. (These materials may generate condensate, cause a reduction in heat exchanger efficiency, or the drain to malfunction. If this is a potential problem, install a ventilation fan large enough to vent out these materials.)
- Avoid installing the unit near high-frequency generators or near any equipment that generates an electromagnetic field (minimum 3-1/3 feet away).

## WARNING

The unit must not be installed where oil, sulfuric acid and flammable or corrosive gases are generated, vented into, or stored. There is risk of fire, explosion, and physical injury or death.

### NOTICE

Indoor units (IDUs) must not be placed in an environment where the IDUs will be exposed to harmful volatile organic compounds (VOCs) or in environments where there is improper air make up or supply or inadequate ventilation. If there are concerns about VOCs in the environment where the IDUs are installed, proper air make up or supply and / or adequate ventilation should be provided. Additionally, in buildings where IDUs will be exposed to VOCs consider a factory-applied epoxy coating to the fan coils for each IDU.

If the unit is installed near a body of water, certain components are at risk of being corroded. Appropriate anti-corrosion methods should be taken for the unit and all components.

**The unit will be damaged, will malfunction, and / or will not operate as designed if installed in any of the conditions listed.**

Figure 24: Single Zone Art Cool Mirror Wall Mount Indoor Unit Clearance Requirements.

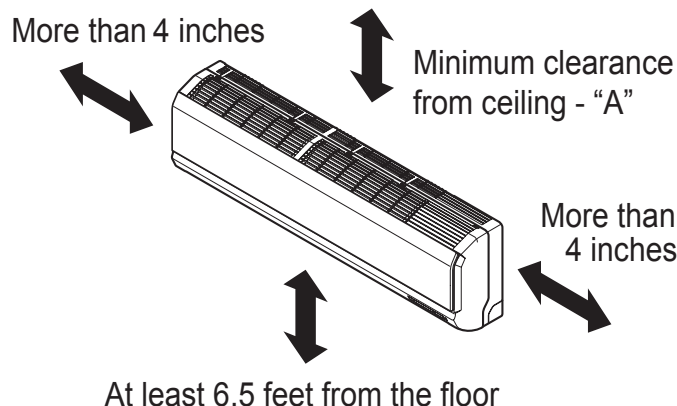


Table 24: Single Zone Art Cool Mirror Wall Mount Indoor Unit Ceiling Clearances.

"A" Ceiling Clearance (inches)	Indoor Unit Model(s)
5	KNUAK091A, KNUAK121A
8	KNUAK181A

# PLACEMENT / CLEARANCE CONSIDERATIONS

## Indoor Units

### Installing in an Area Exposed to Unconditioned Air

In some installation applications, areas (floors, walls) in some rooms will be exposed to unconditioned air (room will be above or next to an unheated garage or storeroom). To countermeasure:

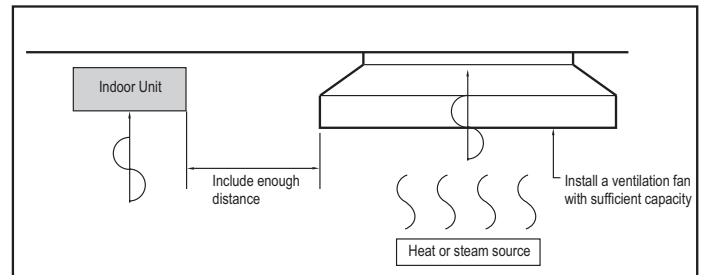
- Verify that carpet is or will be installed (carpet will increase the temperature by three degrees).
- Add insulation between the floor joists.
- Install radiant heat or another type of heating system to the floor.

### Installing in an Area with High Humidity Levels

If the environment is prone to humidity levels of 80% or more (near the ocean, lakes, etc.) or where steam could collect in the plenum:

- Install additional insulation to the indoor unit (glass wool insulation >13/32 inches thick).
- Install additional insulation to the refrigerant piping (insulation >13/16 inches thick).
- Seal all gaps between the indoor unit and the ceiling tiles (make the area air tight) so that humidity does not transfer from the plenum to the conditioned space. Also, add a ceiling grille for ventilation.

Figure 25: Installing Near a Heat or Steam Source.





# PLACEMENT / CLEARANCE CONSIDERATIONS

## Outdoor Units

### Selecting the Best Location for the Outdoor Unit

#### ⚠ DANGER

- ⚡ Do not install the unit in an area where combustible gas will generate, flow, stagnate, or leak. These conditions can cause a fire, resulting in bodily injury or death.
- ⚡ Do not install the unit in a location where acidic solution and spray (sulfur) are often used as it can cause bodily injury or death.
- ⚡ Do not use the unit in environments where oil, steam, or sulfuric gas are present as it can cause bodily injury or death.

#### ⚠ WARNING

When deciding on a location to place the outdoor unit, be sure to choose an area where run-off from defrost will not accumulate and freeze on sidewalks or driveways, which will create unsafe conditions. Properly install and insulate any drain hoses to prevent the hose from freezing, cracking, leaking, and causing unsafe conditions from frozen condensate.

Install a fence to prevent pests from crawling into the unit or unauthorized individuals from accessing it. Pests and unauthorized individuals can damage internal components which can cause a fire, electric shock, physical injury or death. Follow the placement guidelines set forth in "Clearance Requirements".

Select a location for installing the outdoor unit that will meet the following conditions:

#### Dos

- Where there is enough strength to bear the weight of the unit.
- A location that allows for optimum air flow and is easily accessible for inspection, maintenance, and service.
- Where piping between the outdoor unit and indoor unit is within allowable limits.
- Include space for drainage to ensure condensate flows properly out of the unit when it is in heating mode. ⚡ Avoid placing the outdoor unit in a low-lying area where water could accumulate.
- If the outdoor unit is installed in a highly humid environment (near an ocean, lake, etc.), ensure that the site is well-ventilated and has a lot of natural light (Example: Install on a rooftop).

#### ⚡ Do Nots

- Where it will be subjected to direct thermal radiation from other heat sources, or an area that would expose the outdoor unit to heat or steam like discharge from boiler stacks, chimneys, steam relief ports, other air conditioning units, kitchen vents, plumbing vents, and other sources of extreme temperatures.
- Where high-frequency electrical noise / electromagnetic waves will affect operation.
- Where operating sound from the unit will disturb inhabitants of surrounding buildings.
- Where the unit will be exposed to direct, strong winds.
- Where the discharge of one outdoor unit will blow into the inlet side of an adjacent unit (when installing multiple outdoor units).

#### NOTICE

The indoor unit may take longer to provide heat, or heating performance will be reduced in winter if the outdoor unit is installed:

1. In a narrow, shady location.
2. Near a location that has a lot of ground moisture.
3. In a highly humid environment.
4. In an area in which condensate does not drain properly.

### Outdoor Unit Condensate Drain Piping

Outdoor unit requires condensate drain piping. Condensate drain pipe is constructed with materials approved by local code. See section on outdoor unit placement.

# PLACEMENT / CLEARANCE CONSIDERATIONS

## Outdoor Units

### Planning for Snow and Ice

To ensure the outdoor unit operates properly, certain measures are required in locations where there is a possibility of heavy snowfall or severe windchill or cold:

1. Prepare for severe winter wind chills and heavy snowfall, even in areas of the country where these are unusual phenomena.
2. Position the outdoor unit so that its airflow fans are not buried by direct, heavy snowfall. If snow piles up and blocks the airflow, the system will malfunction.
3. Remove any snow that has accumulated four (4) inches or more on the top of the outdoor unit.
4. In climates that will experience significant snow buildup, mount the outdoor unit on a raised, field-provided platform or stand. The raised support platform must be high enough to allow the unit to remain above possible snow drifts, and must be higher than the maximum anticipated snowfall for the location.
5. Design the mounting base to prevent snow accumulation on the platform in front or back of the unit frame.
6. Provide a field fabricated snow protection hood to keep snow and ice and/or drifting snow from accumulating on the coil surfaces.
7. To prevent snow and heavy rain from entering the outdoor unit, install the condenser air inlets and outlets facing away from direct winds.
8. Consider tie-down requirements in case of high winds or where required by local codes.

#### ⚠ CAUTION

When deciding on a location to place the outdoor unit, be sure to choose an area where run-off from defrost will not accumulate and freeze on sidewalks or driveways, which will create unsafe conditions.

#### NOTICE

Choose an area where run-off from defrost mode will not accumulate and freeze on sidewalks or driveways. Properly install and insulate any drain hoses to prevent the hose from freezing, cracking, leaking, and damaging the outdoor unit.

### Tie-Downs, Lightning Protection, and Wind Protection

#### Tie-Downs

- The strength of the roof must be checked before installing the outdoor units.
- The strength of the outdoor unit frames is adequate to be used with field-provided wind restraint tie-downs.
- If the installation site is prone to high winds or earthquakes, when installing on the wall or roof, securely anchor the mounting base using a field-provided tie-down configuration approved by a local professional engineer.
- The overall tie-down configuration must be approved by a local professional engineer.

#### NOTICE

Always refer to local code when using a wind restraint system.

#### Lightning Protection

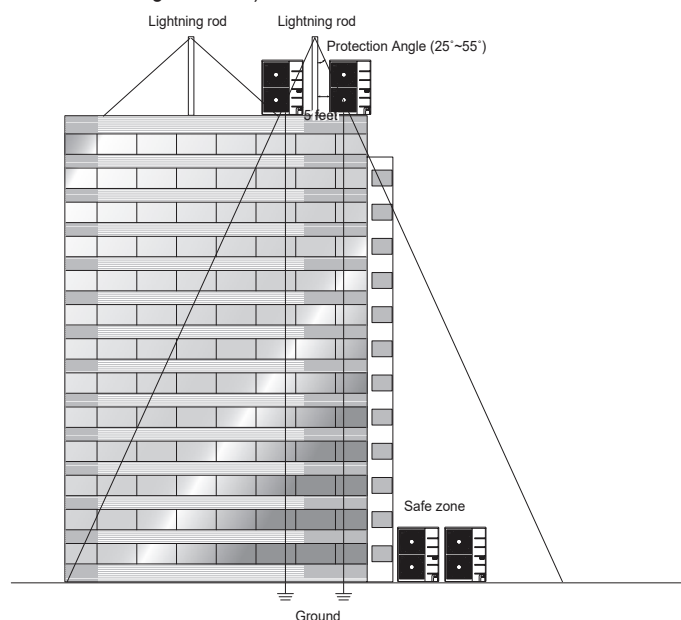
- To protect the outdoor unit from lightning, it must be placed within the specified lightning safety zone.

Table 25: Safety Zone Specifications.

Building Height (feet)	66	98	148	197
Protection Angle (°)	55	45	35	25

- Power cable and communication cable must be installed five (5) feet away from lightning rod.
- A high-resistance ground system must be included to protect against induced lightning or indirect strike.

Figure 26: Lightning Protection Diagram (Outdoor Unit Appearances Differ According to Model).



#### NOTICE

If the building does not include lightning protection, the outdoor unit will be damaged from a lightning strike. Inform the customer of this possibility in advance.

# PLACEMENT / CLEARANCE CONSIDERATIONS

## Outdoor Units

### Oceanside Applications

#### Wind Protection

If the outdoor unit is placed on a roof, position it with the compressor end (no coil surface) in the direction of the prevailing wind as shown in the figure at right. In cooler climates, it may be beneficial to position the unit in direct sunlight to assist with defrost operations.

If the outdoor unit is not placed on a roof, place it on the leeward side of the building or in a location where the unit will not be exposed to constant wind.

If placement exposes the unit to constant wind activity, construct a wind break in front of the unit. Follow the placement guidelines set forth in "Clearance Requirements".

Figure 27: Prevailing Wind Direction.

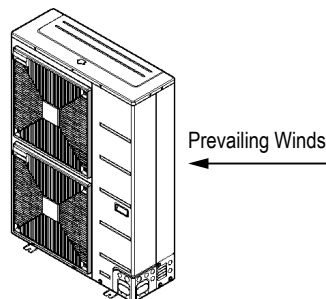
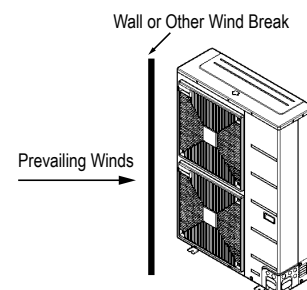


Figure 28: Leeward Side of the Building.



Figure 29: Wind Break.



### Oceanside Application Precautions

#### NOTICE

*Ocean winds will cause corrosion, particularly on the condenser and evaporator fins, which, in turn could cause product malfunction or inefficient performance.*

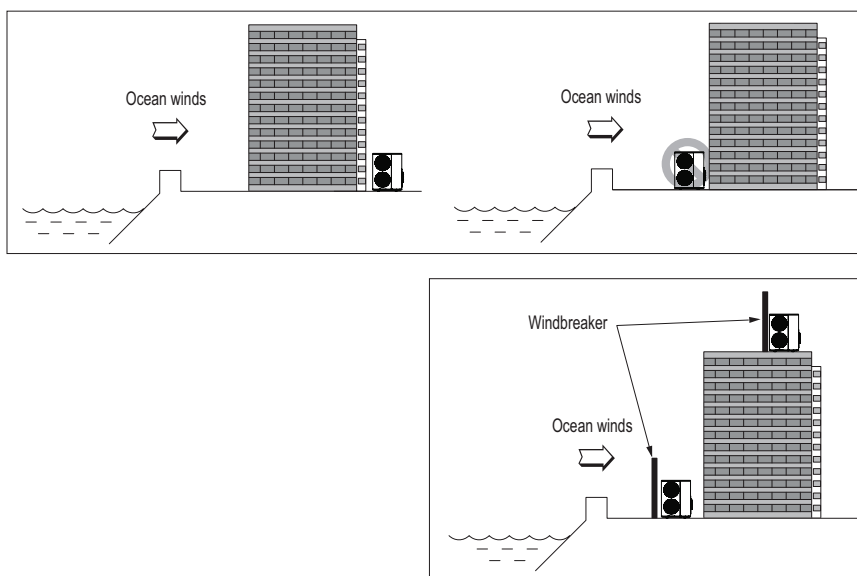
- ⚠ Avoid installing the outdoor unit where it would be directly exposed to ocean winds.
- Install the outdoor unit on the side of the building opposite from direct ocean winds.
- Select a location with good drainage.
- Periodically clean dust or salt particles off of the heat exchanger with water.

If the outdoor unit must be placed in a location where it would be subjected to direct ocean winds, install a concrete windbreaker strong enough to block any winds. Windbreaker height and width must be more than 150% of the outdoor unit, and be installed at least 14 to 28 inches away from the outdoor unit to allow for airflow (depending on the location and outdoor unit size).

#### NOTICE

*Additional anti-corrosion treatment may need to be applied to the outdoor unit at oceanside locations.*

Figure 30: Oceanside Placement Using a Building as Shield, and Placement Using a Windbreaker.



# PLACEMENT / CLEARANCE CONSIDERATIONS

## Outdoor Units

### Minimum Allowable Clearance and Service Access Requirements

Proper clearance for the outdoor unit coil is critical for proper unit operation. When installing the outdoor unit, consider service, inlet and outlet and minimum allowable space requirements as illustrated in the diagrams on the following pages.

- Include enough space for airflow and for service access. If installing multiple outdoor units, ⚠ avoid placing the units where the discharge of one unit will blow into the inlet side of an adjacent unit.
- If an awning is built over the unit to prevent direct sunlight or rain exposure, make sure that the discharge air of the outdoor unit isn't restricted.
- ⚠ No obstacles to air circulation around the unit; keep proper distances from ceilings, fences, floor, walls, etc. (Install a fence to prevent pests from damaging the unit or unauthorized individuals from accessing it.)

### Minimum Clearance Requirements for Single Fan Outdoor Units

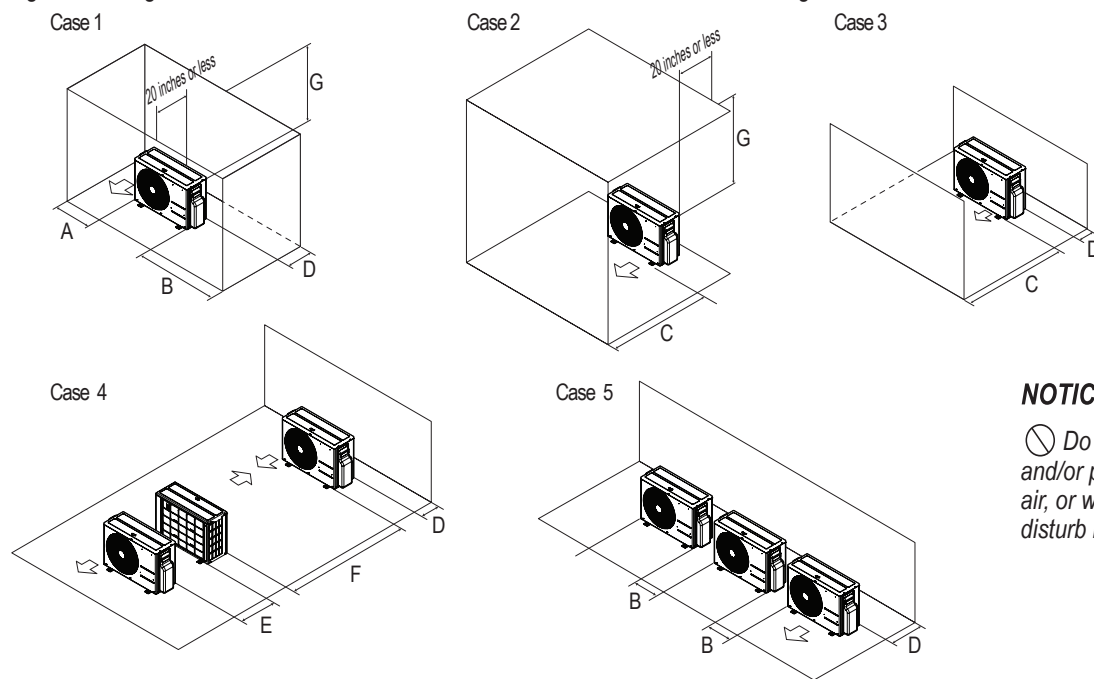
Specific clearance requirements in the diagram below are for single fan outdoor units. The figure below shows the overall minimum clearances that must be observed for safe operation and adequate airflow around the outdoor unit.

When placing the outdoor unit under an overhang, awning, sunroof or other "roof-like structure", observe the clearance requirements (as shown in Cases 1 and 2) for height in relation to the unit. To have successful service access to the outdoor unit, see the figure below for minimum spacing. When installing multiple outdoor units, see Cases 4 and 5 for correct spacing requirements.

#### NOTICE

*If the outdoor unit is installed between standard and minimum clearances, capacity decreases approximately 10%.*

Figure 31: Single Fan Outdoor Unit Service Access and Allowable Clearances Diagram.



#### NOTICE

⚠ Do not place the unit where animals and/or plants will be in the path of the warm air, or where the warm air and/or noise will disturb neighbors.

Table 26: Single Fan Outdoor Unit Service Access and Allowable Clearances Diagram Legend.

Unit: Inch		A	B	C	D	E	F	G
Case 1	Standard	12	24	-	12	-	-	-
	Minimum	4	10	-	4	-	-	40
Case 2	Standard	-	-	20	-	-	-	-
	Minimum	-	-	14	-	-	-	40
Case 3	Standard	-	-	20	12	-	-	-
	Minimum	-	-	14	4	-	-	-
Case 4	Standard	-	-	-	12	24	-	-
	Minimum	-	-	-	4	8	79	-
Case 5	Standard	-	24	-	12	-	-	-
	Minimum	-	10	-	4	-	-	-

# INSTALLING OUTDOOR UNITS INDOORS

## Installing Outdoor Units Indoors

Single Zone outdoor units are engineered to be mounted outdoors and include technology designed to minimize the negative effects of winter weather's freezing rain, sleet, and snow. Some building projects, however, necessitate placing the HVAC outdoor units indoors:

- Lack of ground space.
- Lack of an appropriate outdoor location that meets system design requirements.
- When mounting on the roof is not an option due to a lack of roof space.
- Roof warranty will be voided if mechanical equipment is placed on the membrane.
- On retrofit projects, a former chiller / boiler / air handler equipment room, mechanical area, or penthouse already exists.
- To curtail the potential need for redundant zone heating devices such as wall-fin radiators or duct heaters.
- In extremely cold environments where there is a significant amount of run-time at temperatures well below freezing outside the outdoor unit ambient air temperature range published in this engineering manual.

## Benefits of Installing Outdoor Units Indoors

- Shelters the outdoor unit from direct exposure to prevailing winds that decrease the heating capability of the outdoor unit.
- Protects equipment from freezing precipitation and / or potential ice build-up that could hinder unit operation.
- Maintains coil heat transfer efficiency by reducing the number of and shortening the cycle time for defrost operation.
- Easier maintenance and servicing during inclement weather.
- When mounted in a fully enclosed space, limiting the ambient air temperature will allow the Single Zone system designer to eliminate oversizing.
- The outdoor unit to compensate for loss of capacity at low ambient temperatures.
- Will also curtail the need to provide inefficient redundant zone heating devices such as wall-fin radiators and second-stage ancillary heating devices.

## Design Considerations Include:

- Enclosure types and elements such as louvers (see next page), rain hoods, dampers and controls, heating methods and sizing of heating devices.
- Heating strategies.
- Duct design.
- Condensate handling.

## General Guidelines

- Follow ASHRAE 62.1 design guidelines.
- Depending on the project / application, a roof over the outdoor units in combination with a wind break will be all that is necessary.
- Consider the potential for snow accumulation near louvers / roof openings. Outside air intakes and discharge ducts / louvers must be engineered to clear anticipated snow accumulation levels by at least one (1) foot.
- In situations where operation is anticipated at temperatures lower than the product's minimum operating temperature, ancillary heat must be provided to heat the outdoor unit coils to ensure continuous compressor operation and heating.

It may be necessary to use a field-fabricated air guide to prevent discharge air from short-cycling back to the coil inlet.

- Consider the direction of prevailing winds and opening placement. If possible, locate inlet openings upwind of discharge openings and other exhaust outlets.
- When inlet and outlet openings are placed on the same wall, minimum distance between the two openings must be approximately three (3) feet (minimum distance varies significantly with variations in outlet opening face velocity).
- If roof-mounted ventilation openings are used, strategically locate the inlet ventilation opening(s) upwind of the outlet opening(s).
- Discharge and supply ductwork must be designed to avoid weather related long periods of water entrainment and the potential for microbial growth.

# INSTALLING OUTDOOR UNITS INDOORS

Provide a means to drain the condensate generated during heating mode and defrost cycle in addition to rainwater that infiltrates the inlet louver enclosed area.

- Install a field-provided drain pan under the outdoor units and provide a path to a nearby floor drain.
- If the ambient air temperature is expected to drop below 32°F in the enclosure, heat the bottom surface of the pan, drain line, and floor drain so that the condensate does not freeze before reaching the drain.

## ⚠ CAUTION

When deciding on a location to place the outdoor unit, be sure to choose an area where run-off from defrost will not accumulate and freeze on walkways, which will create unsafe conditions.

Allow for ventilation intake and exhaust air based on maximum outdoor unit fan capacity.

- Select the size, type and orientation of architectural louvers with adequate “net free area” face velocity to ensure the total external static pressure from the outdoor unit fan does not exceed design limitations (see specification data tables).
- ⚠ No obstructions must be placed in front of the louver that could hamper the free flow (throw) of air.
- Roof top openings and / or discharge and supply louvers must be equipped with screens to prevent bird and insect infiltration.

## NOTICE

For louver recommendations, see below and on the next page.

As always, the best solution for each project balances acceptable heating performance (considering local weather conditions), capital costs, life cycle energy consumption, and limitations set forth by local building codes.

## Louver Recommendations for Outdoor Unit Enclosure

1. Outdoor Unit Enclosure: Manual Door Open Type.
2. Louver Angle: No More Than 15° Horizontally.
3. Space Between Louvers: More than four (4) inches (Recommend).
4. Louver Shape: Wing or Plane Type.

## NOTICE

- Open Rate and Inlet must be taken into consideration when designing the louvered outdoor unit enclosure.
- ⚠ Do not use “S” type louvers.

## NOTICE

### If the Louver Open Rate is Too Small

1. Noise can occur because of the increased air velocity passing through the louver blade.
2. Noise can occur from louver blade vibrations.
3. A drop in outdoor unit fan performance (excess static pressure can cause a drop in outdoor unit performance and heat exchanger efficiency).
4. If the louver open rate is too small or there is insufficient air flow exchange, the air conditioner might stop operating.

Figure 32: Louver Recommendations.

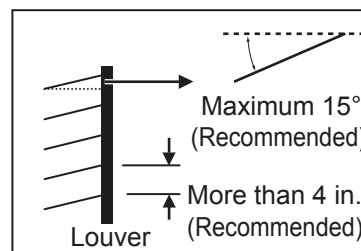
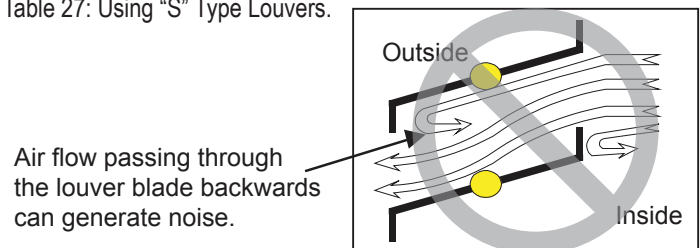


Table 27: Using “S” Type Louvers.

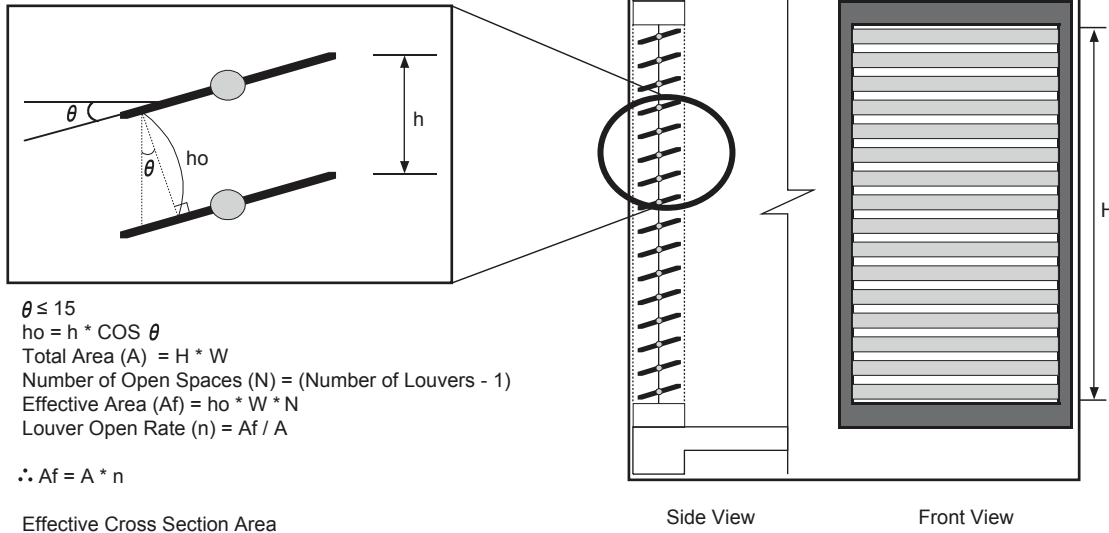




# INSTALLING OUTDOOR UNITS INDOORS

## Open Rate by Louver Radian

Figure 33: Open Rate by Louver Radian Formula.



## Confirming Air Flow Rate / Total Opening Rate

- Example: KUSAB181A (For illustrative purposes only).

- Discharge Airflow Rate: 2,119 ft.<sup>3</sup>/min.

- Velocity of Outlet Air: 15.1 ft./s

- Velocity of Inlet Air: 6.5 ft./s

- Open Rate = 80% or More

$$\text{Open Rate} = \frac{\text{Effective Face Area (Af)}}{\text{Total Face Area (A)}}$$

- Inlet airflow must match or exceed discharge airflow.

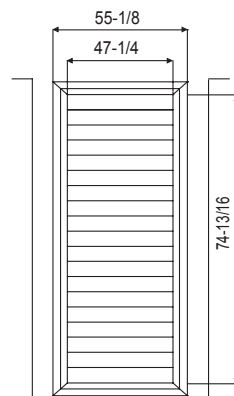
- Separate inlet airflow from discharge airflow to prevent recirculation.

## Formula

- Total Louver Dimension (Excluding Frame) (A) = 3.9 feet x 6.2 feet = 24.2 ft.<sup>2</sup>
- Area Blocked by Outdoor Unit (Discharge) (B) = 2.6 feet x 2.8 feet = 7.41 ft.<sup>2</sup>
- Inlet Louver Dimension (A - B) = 16.8 ft.<sup>2</sup>
- Equivalent Inlet Dimension (Open Rate 80%) = 16.8 ft.<sup>2</sup> x 0.8 = 13.44 ft.<sup>2</sup>
- Equivalent Inlet Airflow = 13.44 ft.<sup>2</sup> x 6.5 ft./s x 60 sec./min. = 5,242 ft.<sup>3</sup>/min.
- Equivalent Inlet Airflow / Discharge Airflow = 5,242 ft.<sup>3</sup>/min. / 2,119 ft.<sup>3</sup>/min. = 247% (Within Allowable Limits)

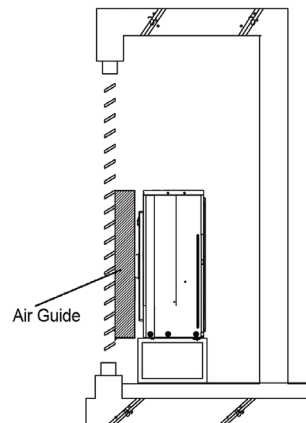
Figure 34: Example of Installing Outdoor Unit Indoors.

### Louver Dimensions

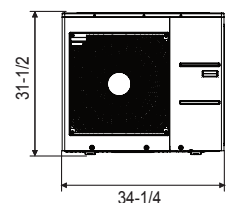


Unit: Inch

### Air Guide Duct on Outdoor Unit



### Outdoor Unit Dimensions



# REFRIGERANT PIPING DESIGN

**Refrigerant Flow Diagrams on page 57**

**Connection Limitations and System Layout on page 59**

**Additional Refrigerant Charge on page 60**

**Refrigerant Piping System Engineering on page 61**



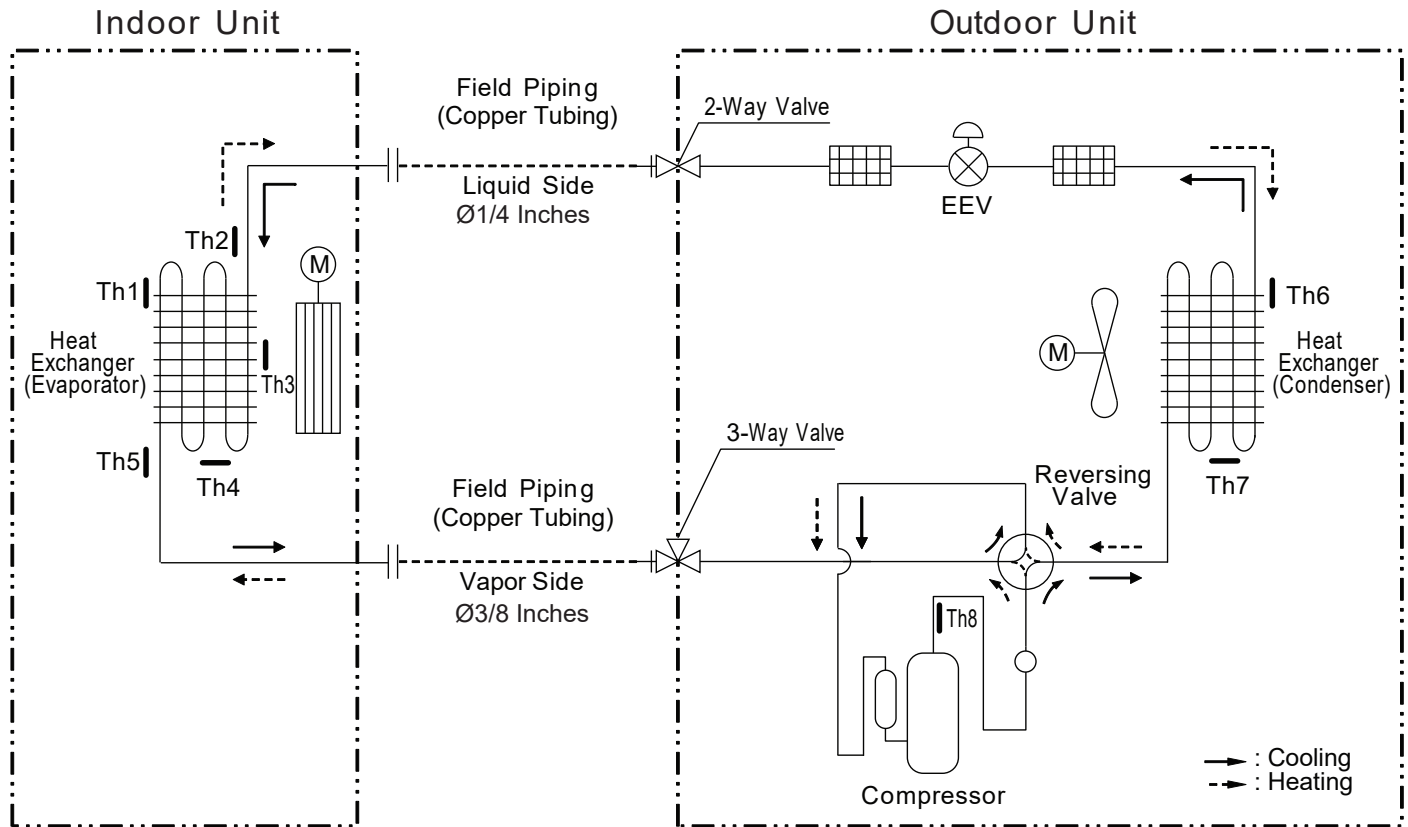
# REFRIGERANT FLOW DIAGRAMS

KSUAK091A, KSUAK121A Units

## NOTICE

Various tools are available to assist in properly designing LG R32 split systems. Refer to the “R32 Application Guide”; the “Simple Calculator for Capacity, Refrigerant Charge and ESP”; the “LG Air Conditioner Technical Solutions” (LATS) software program; and the local LG Sales Representative.

Figure 35: R32 Art Cool Mirror KSUAK091A, KSUAK121A Units Refrigerant Flow Diagram.



Refrigerant Piping Design

Table 29: R32 Art Cool Mirror KSUAK091A, KSUAK121A Units Thermistor Details.

Thermistor	Description	PCB Connector
TH1	Indoor air temperature thermistor	CN-TH1 (Indoor)
TH2	Evaporator inlet temperature thermistor	
TH3	Evaporator middle temperature thermistor	
TH4	Water level sensor (optional)	CN-TH2 (Indoor)
TH5	Evaporator outlet temperature thermistor	
TH6	Outdoor air temperature thermistor	C_PIPE/AIR (Outdoor)
TH7	Condensing temperature thermistor	
TH8	Discharge pipe temperature thermistor	D_PIPE (Outdoor)

Table 28: R32 Art Cool Mirror KNUAK091A, KNUAK121A Indoor Unit Refrigerant Piping and Connection Sizes.

Model No.	Piping Size		Connection Port Size	
	Liquid (inch)	Vapor (inch)	Liquid (inch)	Vapor (inch)
KNUAK091A	Ø1/4	Ø3/8	Ø1/4	Ø3/8
KNUAK121A	Ø1/4	Ø3/8	Ø1/4	Ø3/8

# REFRIGERANT FLOW DIAGRAMS

## KSUAK181A Indoor Units

### NOTICE

Various tools are available to assist in properly designing LG R32 split systems. Refer to the “R32 Application Guide”; the “Simple Calculator for Capacity, Refrigerant Charge and ESP”; the “LG Air Conditioner Technical Solutions” (LATS) software program; and the local LG Sales Representative.

Figure 36: R32 Art Cool Mirror KSUAK181A Unit Refrigerant Flow Diagram.

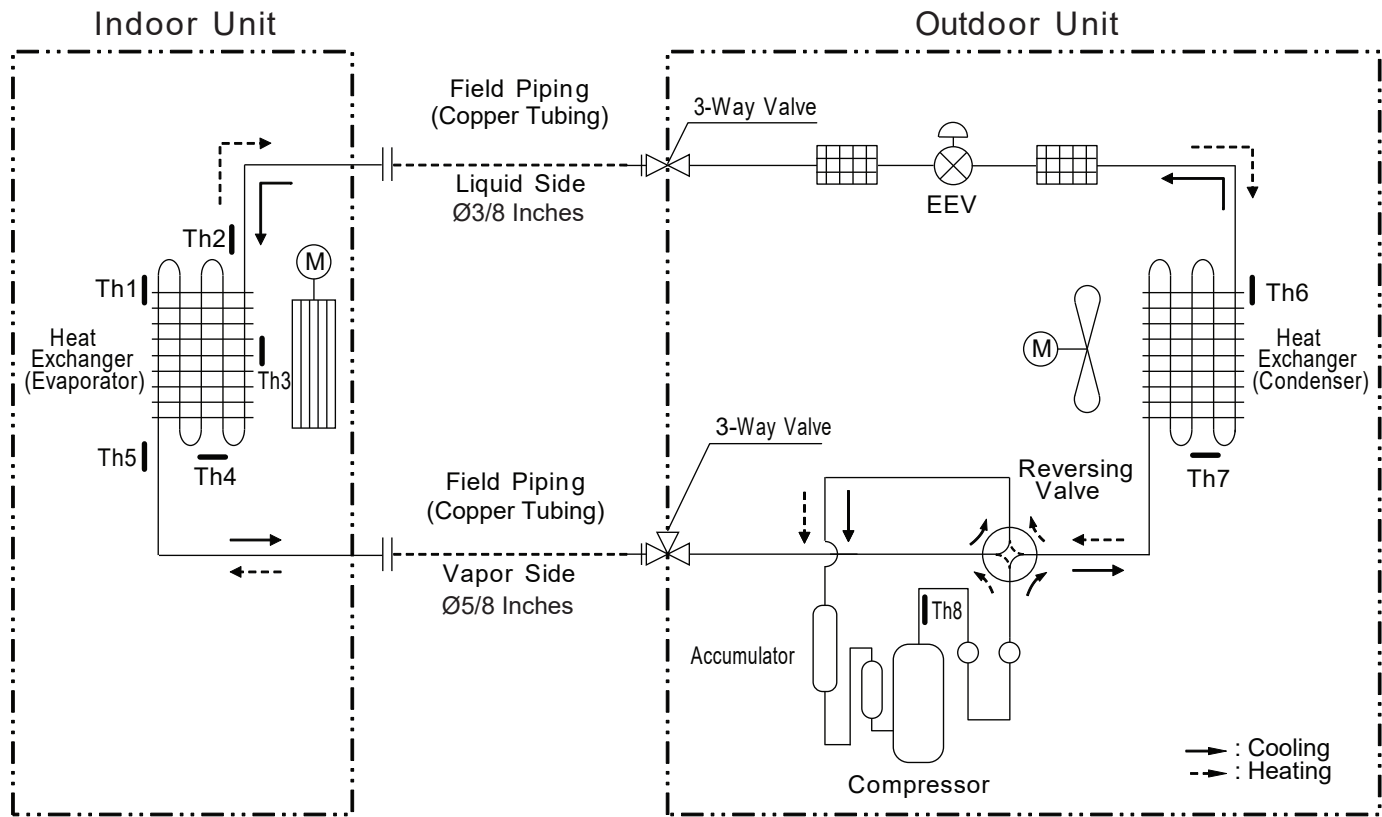


Table 30: R32 Art Cool Mirror KSUAK181A Units Thermistor Details.

Thermistor	Description	PCB Connector
TH1	Indoor air temperature thermistor	CN-TH1 (Indoor)
TH2	Evaporator inlet temperature thermistor	
TH3	Evaporator middle temperature thermistor	CN-TH3 (Indoor)
TH4	Water level sensor (optional)	CN-TH2 (Indoor)
TH5	Evaporator outlet temperature thermistor	
TH6	Outdoor air temperature thermistor	C_PIPE/AIR (Outdoor)
TH7	Condensing temperature thermistor	
TH8	Discharge pipe temperature thermistor	D_PIPE (Outdoor)

Table 31: R32 Art Cool Mirror KNUAK181A Indoor Unit Refrigerant Piping and Connection Sizes.

Model No.	Piping Size		Connection Port Size	
	Liquid (inch)	Vapor (inch)	Liquid (inch)	Vapor (inch)
KNUAK181A	Ø3/8	Ø5/8	Ø3/8	Ø5/8

# CONNECTION LIMITATIONS / SYSTEM LAYOUT

## NOTICE

Various tools are available to assist in properly designing LG R32 split systems. Refer to the “R32 Application Guide”; the “Simple Calculator for Capacity, Refrigerant Charge and ESP”; the “LG Air Conditioner Technical Solutions” (LATS) software program; and the local LG Sales Representative.

## Connection Limitations

Single zone systems consist of one outdoor unit and one indoor unit. One of the most critical elements of a single zone system is the refrigerant piping. If the connection piping is not within allowable limits, there will be reliability, performance, noise, and vibration issues. The table below lists pipe length limits that must be followed in the design of a Single Zone Art Cool Mirror refrigerant pipe system. Refer to the figure for maximum length and elevation of piping.

## NOTICE

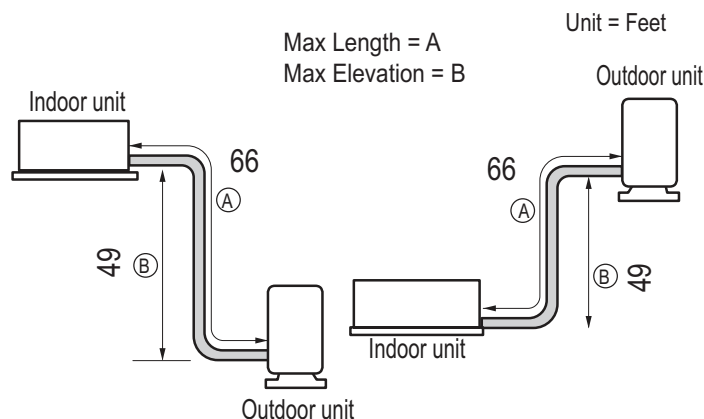
Depending on system and proposed / installed pipe length, it may be required to calculate maximum refrigerant charge to determine if the system complies with applicable regulations / standards. For residential applications, a refrigerant charge less than 4.1 lbs. complies with ASHRAE 15.2 and does not require additional calculation/consideration of maximum refrigerant charge for release in a space.

Table 32: R32 Single Zone Art Cool Mirror Refrigerant Piping System Limitations.

System Model No.		KSUAK091A (KNUAK091A / KUSAB091A)	KSUAK121A (KNUAK121A / KUSAB121A)	KSUAK181A (KNUAK181A / KUSAB181A)
Liquid Piping (in.)	Connection / Pipe Size	Ø1/4	Ø1/4	Ø3/8
Vapor Piping (in.)	Connection / Pipe Size Vapor	Ø3/8	Ø3/8	Ø5/8
Pipe Length (ELF = Equivalent Length of pipe in Feet)	Standard Piping Length	24.6	24.6	24.6
	Piping Length with No Additional Refrigerant	41	41	24.6
	Longest total equivalent piping length	82	82	114.8
	Shortest total equivalent piping length	9.8	9.8	9.8
	Distance between fittings and indoor units or outdoor units	≥20 inches	≥20 inches	≥20 inches
Elevation (All Elevation Limita- tions are Measured in Actual Feet)	If outdoor unit is above indoor unit	49.2	49.2	49.2
	If outdoor unit is below indoor unit	49.2	49.2	49.2
Additional Refrigerant Needed (oz/ft)		0.16	0.16	0.32

## System Layout

Figure 37: Typical Art Cool Mirror System Layout.



# ADDITIONAL REFRIGERANT CHARGE

## NOTICE

Various tools are available to assist in properly designing LG R32 split systems. Refer to the "R32 Application Guide"; the "Simple Calculator for Capacity, Refrigerant Charge and ESP"; the "LG Air Conditioner Technical Solutions" (LATS) software program; and the local LG Sales Representative.

## Additional Refrigerant Charge

Each outdoor unit is factory charged (nameplate charge) for the evaporator as well as a standard foot line (for each single zone system; listed in the specification tables). Any time a line set is used longer than the "chargeless" foot line set length, the refrigerant charge has to be adjusted.

The charge must be adjusted on the ounces of R32 (listed in the specification tables) per foot based on how many feet of piping are added. The factory charge accommodates pipe lengths up to the standard length without requiring refrigerant removal.

See table below for information on the additional refrigerant charges necessary for longer piping lengths. Refer to the previous page for maximum piping length and elevation.

Table 33: R32 Single Zone Art Cool Mirror Additional Refrigerant by Piping Length (oz.).

System Model No.	Refrigerant Piping Length (feet)											
	16.4	24.6	32.8	41	49.2	65.6	82	98.4	114.8	131.2	147.6	164.0
KSUAK091A (9,000 Btu/h)	0	0	0	0	1.3	3.9	6.6	-	-	-	-	-
KSUAK121A (12,000 Btu/h)	0	0	0	0	1.3	3.9	6.6	-	-	-	-	-
KSUAK181A (18,000 Btu/h)	0	0	2.6	5.3	7.9	13.2	18.4	23.7	28.9	-	-	-

- Values are in ounces (oz.).
- Capacity is based on standard length; maximum allowance length is based on reliability.
- Equivalent pipe length = actual pipe length + number of bends x 0.3.
- Calculation:  $X \text{ oz.} = ([\text{Refrigerant Piping Length}] - [\text{Chargeless Length}]) \times \text{Additional Refrigerant}$ .

### Example for KSUAK181A:

A 50 foot line set is used: Additional 25.4 feet x 0.32 per foot = Add 8.13 oz of refrigerant.

## NOTICE

If the unit charge is unknown, reclaim, evacuate, and weigh in the correct charge using the unit nameplate (capacity) charge adjusting for line sets longer than "chargeless" feet. This will prevent any interruptions to unit operation and possible damage.

# REFRIGERANT PIPING SYSTEM ENGINEERING

## NOTICE

Various tools are available to assist in properly designing LG R32 split systems. Refer to the "R32 Application Guide"; the "Simple Calculator for Capacity, Refrigerant Charge and ESP"; the "LG Air Conditioner Technical Solutions" (LATS) software program; and the local LG Sales Representative.

## Selecting Field-Supplied Copper Piping

### NOTICE

Always follow local codes when selecting and installing copper pipe and piping system components.

Approved piping for use with LG Single Zone products will be marked "R32 RATED" along the length of the pipe. Piping wall thickness must meet local code requirements and be approved for a maximum operating pressure of 626 psi. When bending piping, try to keep the number of bends to a minimum, and use the largest radii possible to reduce the equivalent length of installed piping; also, bending radii greater than ten (10) piping diameters can minimize pressure drop. Be sure no traps or sags are present.

### For Single Zone Systems

LG prefers the use of ACR copper piping rated at the system working pressure was used.

### NOTICE

Always properly support the piping as per the instructions in the Pipe Supports section.

Table 34: ACR Rated Copper Tubing Material.

Type	Seamless Phosphorous Deoxidized
Class	UNS C12200 DHP
Straight Lengths	H58 Temper
Coils	O60 Temper

Table 35: Piping Tube Thicknesses.

OD (in.)	1/4	3/8	1/2	5/8	3/4	7/8	1-1/8	1-3/8	1-5/8
Material	Rigid or Soft ACR Rated for R32								
Min. Bend Radius (in.)	0.563	0.9375	1.5	2.25	3.0	3.0	3.5	4.0	4.5
Min. Wall Thickness (in.)	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.040	0.050

Table 36: ACR Copper Tubing Dimensions and Physical Characteristics<sup>1-3</sup>.

Nominal Pipe Outside Diameter (in.)	Actual Outside Diameter (in.)	Tempered (Hard Drawn)			Annealed (Soft)		
		Nominal Wall Thickness (in.)	Weight (lb. / ft.)	Cubic ft. per Linear ft.	Nominal Wall Thickness (in.)	Weight (lb. / ft.)	Cubic ft. per Linear ft.
1/4	0.250	--	--	--	0.030	0.081	0.00020
3/8	0.375	0.030	0.126	0.00054	0.032	0.134	0.00053
1/2	0.500	0.035	0.198	0.00101	0.032	0.182	0.00103
5/8	0.625	0.040	0.285	0.00162	0.035	0.251	0.00168
3/4	0.750	0.042	0.362	0.00242	0.042	0.362	0.00242
7/8	0.875	0.045	0.455	0.00336	0.045	0.455	0.00336
1-1/8	1.125	0.050	0.655	0.00573	0.050	0.655	0.00573
1-3/8	1.375	0.055	0.884	0.00875	0.055	0.884	0.00875

<sup>1</sup>All dimensions provided are in accordance with ASTM B280 – Standard.

<sup>2</sup>Design pressure = 626 psig.

<sup>3</sup>The Copper Tube Handbook: Industry Standard Guide for the Design and Installation of Copper Piping Systems; Copper Development Association Inc., Copper Alliance; [https://www.copper.org/publications/pub\\_list/pdf/copper\\_tube\\_handbook.pdf](https://www.copper.org/publications/pub_list/pdf/copper_tube_handbook.pdf).

## NOTICE

- Commercially available piping often contains dust and other materials. Always blow it clean with a dry inert gas.
- Prevent dust, water or other contaminants from entering the piping during installation.

# REFRIGERANT PIPING SYSTEM ENGINEERING

## NOTICE

Various tools are available to assist in properly designing LG R32 split systems. Refer to the "R32 Application Guide"; the "Simple Calculator for Capacity, Refrigerant Charge and ESP"; the "LG Air Conditioner Technical Solutions" (LATS) software program; and the local LG Sales Representative.

## Copper Expansion and Contraction

Under normal operating conditions, the vapor pipe temperature of a Single Zone System can vary as much as 280°F. With this large variance in pipe temperature, the designer must consider pipe expansion and contraction to avoid pipe and fitting fatigue failures.

Refrigerant pipe along with the insulation jacket form a cohesive unit that expands and contracts together. During system operation, thermal heat transfer occurs between the pipe and the surrounding insulation.

If the pipe is mounted in free air space, no natural restriction to movement is present if mounting clamps are properly spaced and installed. In extreme cases, the restrictive force of surface friction between insulating jackets could become so great that natural expansion ceases and the pipe is "fixed" in place. In this situation, opposing force caused by change in refrigerant fluid / vapor temperature can lead to pipe/fitting stress failure.

The refrigerant pipe support system must be engineered to allow free expansion to occur. When a segment of pipe is mounted between two fixed points, provisions must be provided to allow pipe expansion to naturally occur. The most common method is the inclusion of expansion Loop or U-bends. Each segment of pipe has a natural fixed point where no movement occurs. This fixed point is located at the center point of the segment assuming the entire pipe is insulated in a similar fashion. The natural fixed point of the pipe segment is typically where the expansion Loop or U-bend must be.

Linear pipe expansion can be calculated using the following formula:  
$$LE = C \times L \times (T_r - T_a) \times 12$$

LE	=	Anticipated linear tubing expansion (in.)
C	=	Constant (For copper = $9.2 \times 10^{-6}$ in./in.°F)
L	=	Length of pipe (ft.)
$T_r$	=	Refrigerant pipe temperature (°F)
$T_a$	=	Ambient air temperature (°F)
12	=	Inches to feet conversion (12 in./ft.)

1. From the "Linear Thermal Expansion of Copper Tubing in Inches" Table on the next page, find the row corresponding with the actual length of the straight pipe segment.
2. Estimate the minimum and maximum temperature of the pipe. In the column showing the minimum pipe temperature, look up the anticipated expansion distance. Do the same for the maximum pipe temperature.
3. Calculate the difference in the two expansion distance values. The result will be the anticipated change in pipe length.

### General Example:

A system is installed and the design shows that there is a 100 foot straight segment of tubing between an indoor unit and the outdoor unit. In heating, this pipe transports hot gas vapor to the indoor units at 120°F. In cooling, the same tube is a suction line returning refrigerant vapor to the outdoor unit at 40°F. Look up the copper tubing expansion at each temperature and calculate the difference.

### Vapor Line

Transporting Hot Vapor: 100 ft. pipe at 120°F = 1.40 in.

Transporting Suction Vapor: 100 ft. pipe at 40°F = 0.40 in.

Anticipated Change in Length: 1.40 in. – 0.40 in. = 1.00 in.

### Liquid Line

The liquid temperature remains relatively the same temperature; only the direction of flow will reverse. Therefore, no significant change in length of the liquid line is anticipated.

When creating an expansion joint, the joint height must be a minimum of two times the joint width. Although different types of expansion arrangements are available, the data for correctly sizing an Expansion Loop is provided in the "Radii of Coiled Expansion Loops and Developed Lengths of Expansion Offsets" Table on the next page. Use soft copper with long radius bends on longer runs or long radius elbows for shorter pipe segments. Using the anticipated linear expansion (LE) distance calculated, look up the Expansion Loop or U-bend minimum design dimensions. If other types of expansion joints are chosen, design per ASTM B-88 Standards.

See table on next page for precalculated anticipated expansion for various pipe sizes and lengths of refrigerant tubing.

### To find the anticipated expansion value:

1. From the table on the next page, find the row corresponding with the actual feet of the straight pipe segment.
2. Estimate the minimum and maximum temperature of the pipe.
3. In the column showing the minimum pipe temperature, look up the anticipated expansion distance corresponding to the segment length. Do the same for the maximum pipe temperature.
4. Calculate the difference in the two expansion distance values. The result will be the change in pipe length.

# REFRIGERANT PIPING SYSTEM ENGINEERING

## NOTICE

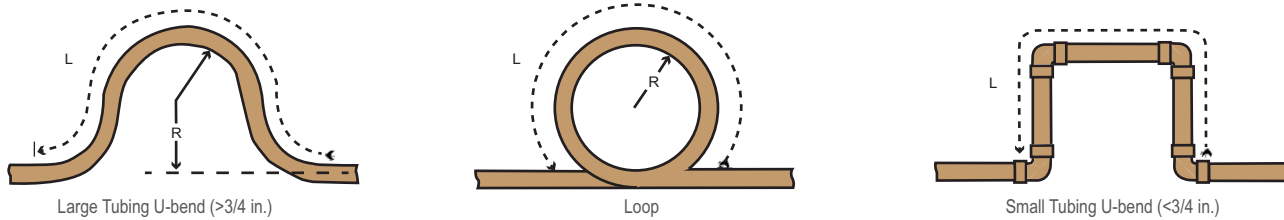
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Table 37: Linear Thermal Expansion of Copper Tubing in Inches.

Pipe Length <sup>1</sup>	Fluid Temperature °F																			
	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	100°	105°	110°	115°	120°	125°	130°
10	0.04	0.04	0.05	0.06	0.06	0.07	0.08	0.08	0.09	0.09	0.10	0.10	0.11	0.11	0.11	0.12	0.13	0.14	0.15	0.15
20	0.08	0.08	0.10	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.22	0.23	0.26	0.28	0.29	0.30
30	0.12	0.12	0.15	0.18	0.20	0.21	0.23	0.24	0.26	0.27	0.29	0.30	0.32	0.33	0.32	0.35	0.39	0.42	0.44	0.45
40	0.16	0.16	0.20	0.24	0.26	0.28	0.30	0.32	0.34	0.36	0.38	0.40	0.42	0.44	0.43	0.46	0.52	0.56	0.58	0.60
50	0.20	0.20	0.25	0.30	0.33	0.35	0.38	0.40	0.43	0.45	0.48	0.50	0.53	0.55	0.54	0.58	0.65	0.70	0.73	0.75
60	0.24	0.24	0.30	0.36	0.39	0.42	0.45	0.48	0.51	0.54	0.57	0.60	0.63	0.66	0.65	0.69	0.78	0.84	0.87	0.90
70	0.28	0.28	0.35	0.42	0.46	0.49	0.53	0.56	0.60	0.63	0.67	0.70	0.74	0.77	0.76	0.81	0.91	0.98	1.02	1.05
80	0.32	0.32	0.40	0.48	0.52	0.56	0.60	0.64	0.68	0.72	0.76	0.80	0.84	0.88	0.86	0.92	1.04	1.12	1.16	1.20
90	0.36	0.36	0.45	0.54	0.59	0.63	0.68	0.72	0.77	0.81	0.86	0.90	0.95	0.99	0.97	1.04	1.17	1.26	1.31	1.35
100	0.40	0.40	0.50	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00	1.05	1.10	1.08	1.15	1.30	1.40	1.45	1.50
120	0.48	0.48	0.60	0.72	0.78	0.84	0.90	0.96	1.02	1.08	1.14	1.20	1.26	1.32	1.30	1.38	1.56	1.68	1.74	1.80
140	0.56	0.56	0.70	0.84	0.91	0.98	1.05	1.12	1.19	1.26	1.33	1.40	1.47	1.54	1.51	1.61	1.82	1.96	2.03	2.10
160	0.64	0.64	0.80	0.96	1.04	1.12	1.20	1.28	1.36	1.44	1.52	1.60	1.68	1.76	1.73	1.84	2.08	2.24	2.32	2.40
180	0.72	0.72	0.90	1.08	1.17	1.26	1.35	1.44	1.53	1.62	1.71	1.80	1.89	1.98	1.94	2.07	2.34	2.52	2.61	2.70

<sup>1</sup>Pipe length baseline temperature = 0°F. <sup>2</sup>Expansion of Carbon, Copper and Stainless Steel Pipe, "The Engineers' Toolbox," [www.engineeringtoolbox.com](http://www.engineeringtoolbox.com).

Figure 38: Coiled Expansion Loops and Offsets (Plan View).



## NOTICE

All expansion loops and offsets must be installed in the horizontal plane to prevent the possibility of trapping oil. Loops and offsets in vertical risers must also be installed in a horizontal plane.

Table 38: Radii of Coiled Expansion Loops and Developed Lengths of Expansion Offsets. (See The Copper Tube Handbook: Industry Standard Guide for the Design and Installation of Copper Piping Systems; Copper Development Association Inc., Copper Alliance; [https://www.copper.org/publications/pub\\_list/pdf/copper\\_tube\\_handbook.pdf](https://www.copper.org/publications/pub_list/pdf/copper_tube_handbook.pdf) for additional information.)

Anticipated Linear Expansion (LE) (inches)		Nominal Tube Size (OD) inches			
		1/4	3/8	1/2	3/4
1/2	R <sup>1</sup>	6	7	8	9
	L <sup>2</sup>	38	44	50	59
1	R <sup>1</sup>	9	10	11	13
	L <sup>2</sup>	54	63	70	83
1-1/2	R <sup>1</sup>	11	12	14	16
	L <sup>2</sup>	66	77	86	101
2	R <sup>1</sup>	12	14	16	19
	L <sup>2</sup>	77	89	99	117
2-1/2	R <sup>1</sup>	14	16	18	21
	L <sup>2</sup>	86	99	111	131
3	R <sup>1</sup>	15	17	19	23
	L <sup>2</sup>	94	109	122	143
3-1/2	R <sup>1</sup>	16	19	21	25
	L <sup>2</sup>	102	117	131	155
4	R <sup>1</sup>	17	20	22	26
	L <sup>2</sup>	109	126	140	166

<sup>1</sup>R = Centerline Length of Pipe.

<sup>2</sup>L = Centerline Minimum Radius (inches).



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# REFRIGERANT PIPING SYSTEM ENGINEERING

## NOTICE

Various tools are available to assist in properly designing LG R32 split systems. Refer to the “R32 Application Guide”; the “Simple Calculator for Capacity, Refrigerant Charge and ESP”; the “LG Air Conditioner Technical Solutions” (LATS) software program; and the local LG Sales Representative.

Proper system operation depends on the installer using utmost care while assembling the piping system. The following pages are an overview of best practices when installing the refrigerant piping system.

## NOTICE

LG Electronics U.S.A., Inc., is not responsible for any piping calculations, refrigerant leaks, degradation of performance, any other potential problems or damages caused by the interconnecting piping, their joint connections, isolation valves, or introduced debris inside the piping system.

### ⊘ No Pipe Size Substitutions

Use only the pipe size selected by the information in this manual. Using a different size is prohibited and will result in a system malfunction or failure to work at all.

### ⊘ No In-line Refrigeration Components

Components such as oil traps, solenoid valves, filter-driers, sight glasses, tee fittings, and other after-market accessories are ⊘ not permitted on the refrigerant piping system between the outdoor units and the indoor units. LG Single Zone systems are provided with redundant systems that make sure oil is properly returned to the compressor. Sight-glasses and solenoid valves will cause vapor to form in the liquid stream. Over time, driers will deteriorate and introduce debris into the system. The designer and installer must verify the refrigerant piping system is free of traps, sagging pipes, sight glasses, filter driers, etc.

## Field-Provided Isolation Ball Valves

LG maintains a neutral position on using isolation valves in LG HVAC refrigerant piping systems. LG does not endorse any manufacturer of isolation valves. It is recognized that installing isolation valves will simplify future maintenance requirements, and, if used, considerations must be taken including, but not limited to, the following:

- Pressure drops for any component used, including isolation valves, must be known in equivalent pipe length and calculated into the total and segment equivalent piping lengths and compared to product design limitations.
- In all cases, materials must be suitable for the application and any applicable codes, including, but not limited to, diameter and wall thickness continuity per ACR standards.

Failure to do so will cause significant performance degradation. Proper leak checks must be performed. Using isolation valves does not automatically void any LG product warranty, however, a limited warranty will be voided in whole or part if any field supplied accessory fail in any way that causes product failure.

## Using Elbows

Field-supplied elbows are allowed if they are long radius and designed for use with R32 refrigerant. The designer and installer, however, must be cautious with the quantity and size of fittings used, and must account for the additional pressure losses in equivalent pipe length calculation for each branch. The equivalent pipe length of each elbow must be added to each pipe segment in the LATS program.

## Pipe Bends

When bending soft copper, use long radius bends. Refer to the “Radii of Coiled Expansion Loops and Developed Lengths of Expansion Offsets” table on the previous page for minimum radius specifications.



# REFRIGERANT PIPING SYSTEM ENGINEERING

## NOTICE


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## Obstacles

When an obstacle, such as an I-beam or concrete T, is in the path of the planned refrigerant pipe run, it is best practice to route the pipe over the obstacle. If adequate space is not available to route the insulated pipe over the obstacle, then route the pipe under the obstacle. In either case, it is imperative the length of the horizontal section of pipe above or below the obstacle be a minimum of three (3) times the longest vertical rise (or fall) at either end of the segment.

## Pipe Supports

A properly installed pipe system must be adequately supported to avoid pipe sagging. Sagging pipes become oil traps that lead to equipment malfunction.

Pipe supports must  never touch the pipe wall; supports must be installed outside (around) the primary pipe insulation jacket. Insulate the pipe first because pipe supports must be installed outside (around) the primary pipe insulation jacket. Clevis hangers must be used with shields between the hangers and insulation. Field provided pipe supports must be designed to meet local codes. If allowed by code, use fiber straps or split-ring hangers suspended from the ceiling on all-thread rods (fiber straps or split ring hangers can be used as long as they do not compress the pipe insulation). Place a second layer of insulation over the pipe insulation jacket to prevent chafing and compression of the primary insulation within the confines of the support pipe clamp.

A properly installed pipe system will have sufficient supports to avoid pipes from sagging during the life of the system. As necessary, place supports closer for segments where potential sagging could occur. Maximum spacing of pipe supports must meet local codes. If local codes do not specify pipe support spacing, pipe must be supported:

- Maximum of five (5) feet on center for straight segments of pipe up to 3/4 inches outside diameter size.
- Maximum of six (6) feet on center for pipe up to one (1) inch outside diameter size.
- Maximum of eight (8) feet on center for pipe up to two (2) inches outside diameter size.

Wherever the pipe changes direction, place a hanger within twelve (12) inches on one side and within twelve (12) to nineteen (19) inches of the bend on the other side.

Support piping at indoor unit(s) as shown.

Figure 40: Pipe Hanger Details.

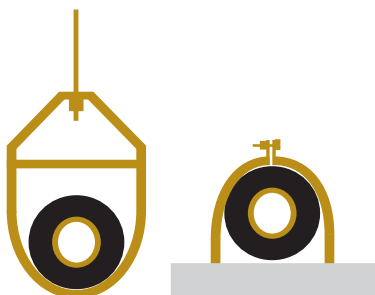


Figure 41: Typical Pipe Support Location—Change in Pipe Direction.

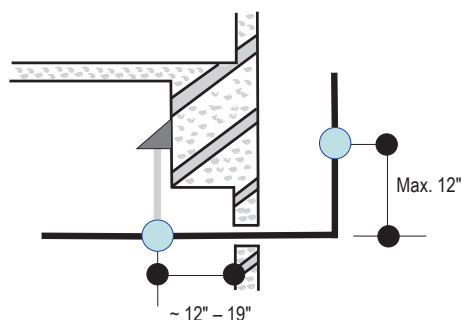
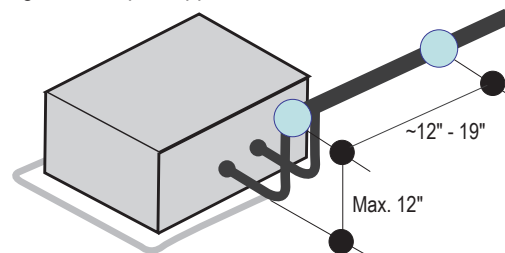


Figure 42: Pipe Support at Indoor Unit.



## NOTICE

Use a 4" + long sheet curved sheet metal saddles between hanger bracket and insulation to promote linear expansion/contraction.

# REFRIGERANT PIPING SYSTEM ENGINEERING

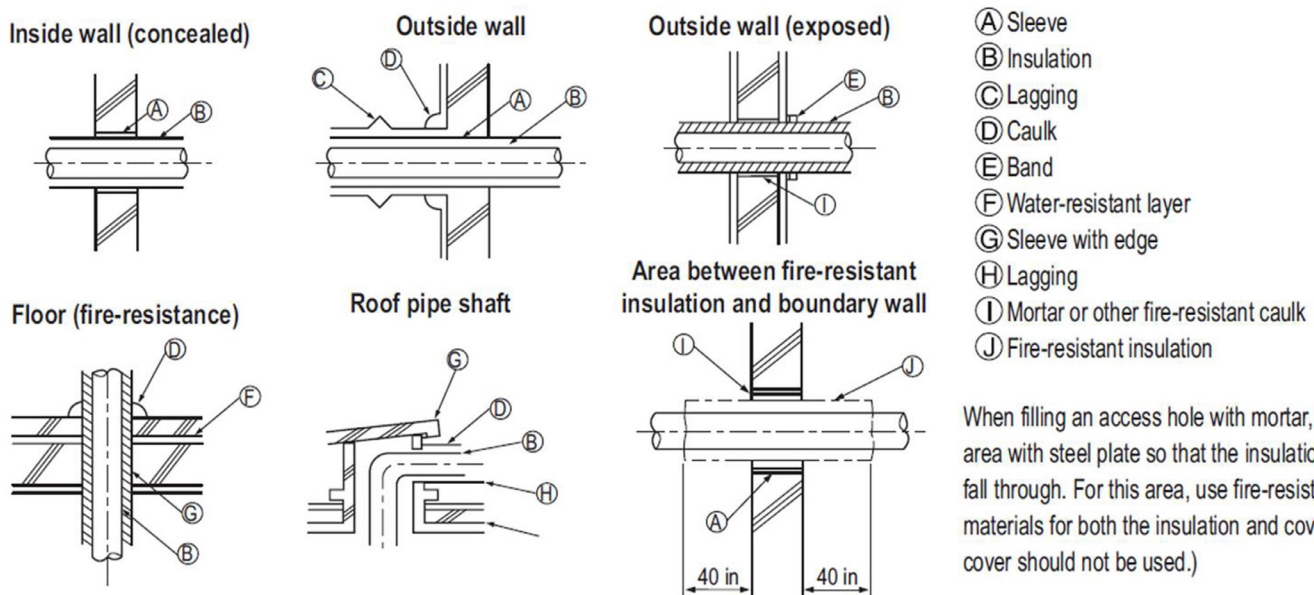
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## Pipe Sleeves at Penetrations

LG recommends that all pipe penetrations through walls, floors, and pipes buried underground be properly insulated and routed through an appropriate wall sleeve of sufficient size to prevent compression of refrigerant pipe insulation and free movement of the pipe within the sleeve. Use 4" + curved sheet metal saddles between the bottom surface of the pipe and the bottom surface of the penetration.

Figure 43: Pipe Sleeve Options.



## NOTICE

Diameter of penetrations must be determined by pipe diameter plus the thickness of the insulation.

# ELECTRICAL

**General Guidelines on page 68**

**Wiring Diagrams on page 69**

**Power Supply / Power Wiring on page 72**

**Communication / Connection Cable on page 73**

**Controllers on page 75**



# GENERAL GUIDELINES

## General Electrical Guidelines

### WARNING

- *Separately wire the high and low voltage lines. There is a risk of electric shock, physical injury, or death.*
- *Use heat-proof electrical wire capable of withstanding temperatures up to 167°F to avoid wiring malfunction and electrical shock, which may cause physical injury or death.*
- *Power wiring and communication cables must be firmly attached to the terminals; connect the wiring so that the wires cannot be easily pulled out. Loose wiring may cause unit malfunction, the wires to burnout or the terminal to overheat and catch fire. There is a risk of electric shock, physical injury or death.*
- *Terminal screws will become loose during transport. Properly tighten the terminal connections during installation or risk electric shock, physical injury, or death.*
- *Use outdoor and waterproof connection cable rated up to 300V for the connection between the indoor and outdoor unit to avoid electrical shock, which may cause physical injury or death.*

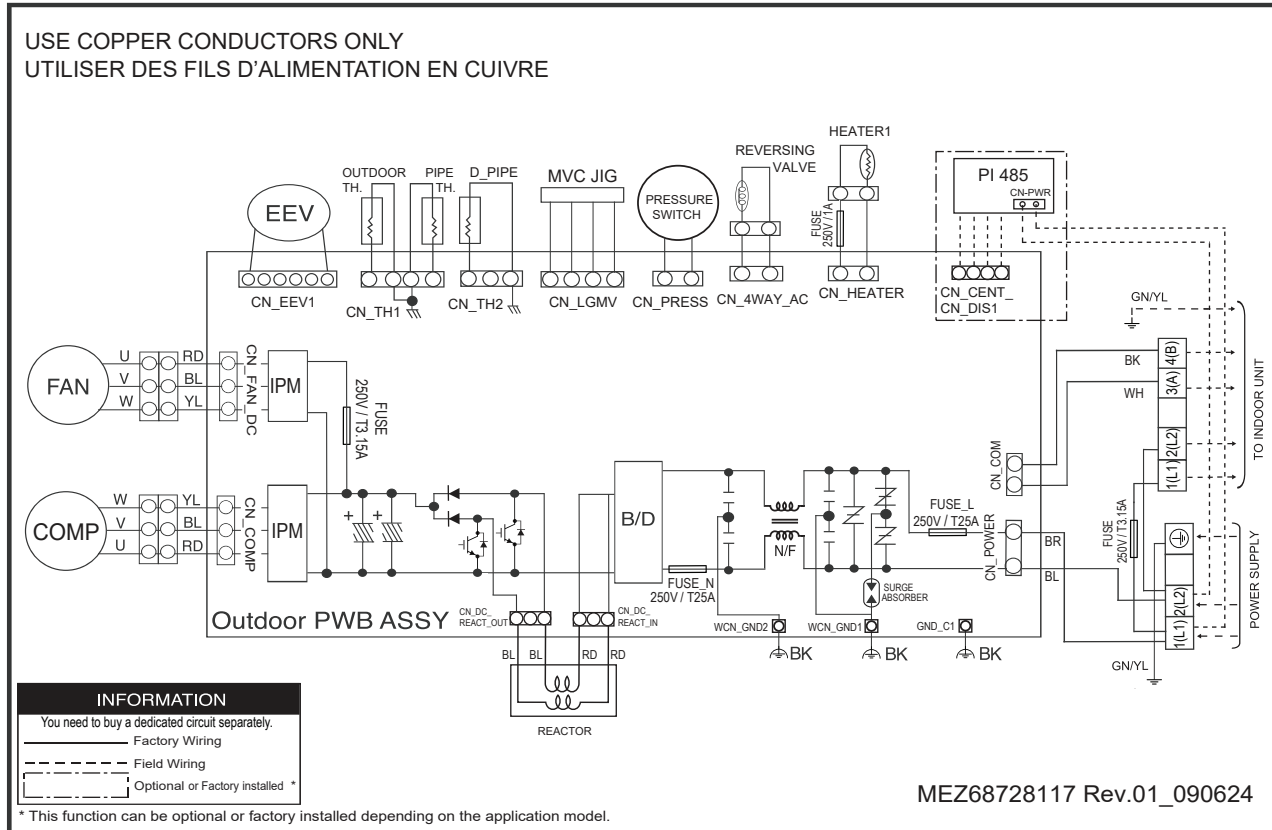
### NOTICE

- *Separately wire the high and low voltage lines to avoid damage to units.*
-  *Do not install power wiring to the outdoor unit and the communication / connection (power) cable to the indoor unit in the same conduit. Use separate conduits.*
- *Local codes may require field-installed disconnect switches from outdoor unit to indoor unit.*
- *Use heat-proof electrical wire capable of withstanding temperatures up to 167°F to avoid damage to unit.*
- *Always use a circuit breaker or time delay fuse when connecting electrical wiring to the unit.*
- *Power wiring and communication cables must be firmly attached to the terminals. Loose wiring may cause unit malfunction, the wires to burnout or the terminal to overheat and catch fire. There is a risk of equipment malfunction or property damage.*
- *Terminal screws will become loose during transport. Properly tighten the terminal connections during installation or risk equipment malfunction or property damage. There is a risk of equipment malfunction or property damage.*
- *Use outdoor and waterproof connection cable rated up to 300V for the connection between the indoor and outdoor unit to avoid damage to the unit.*
- *Comply with local codes while running wire from the indoor unit to the outdoor unit.*
-  *Do not allow wire to touch refrigerant piping, the compressor or any moving parts since it can lead to mechanical failure.*

# WIRING DIAGRAMS

## KUSAB091A, KUSAB121A Outdoor Units

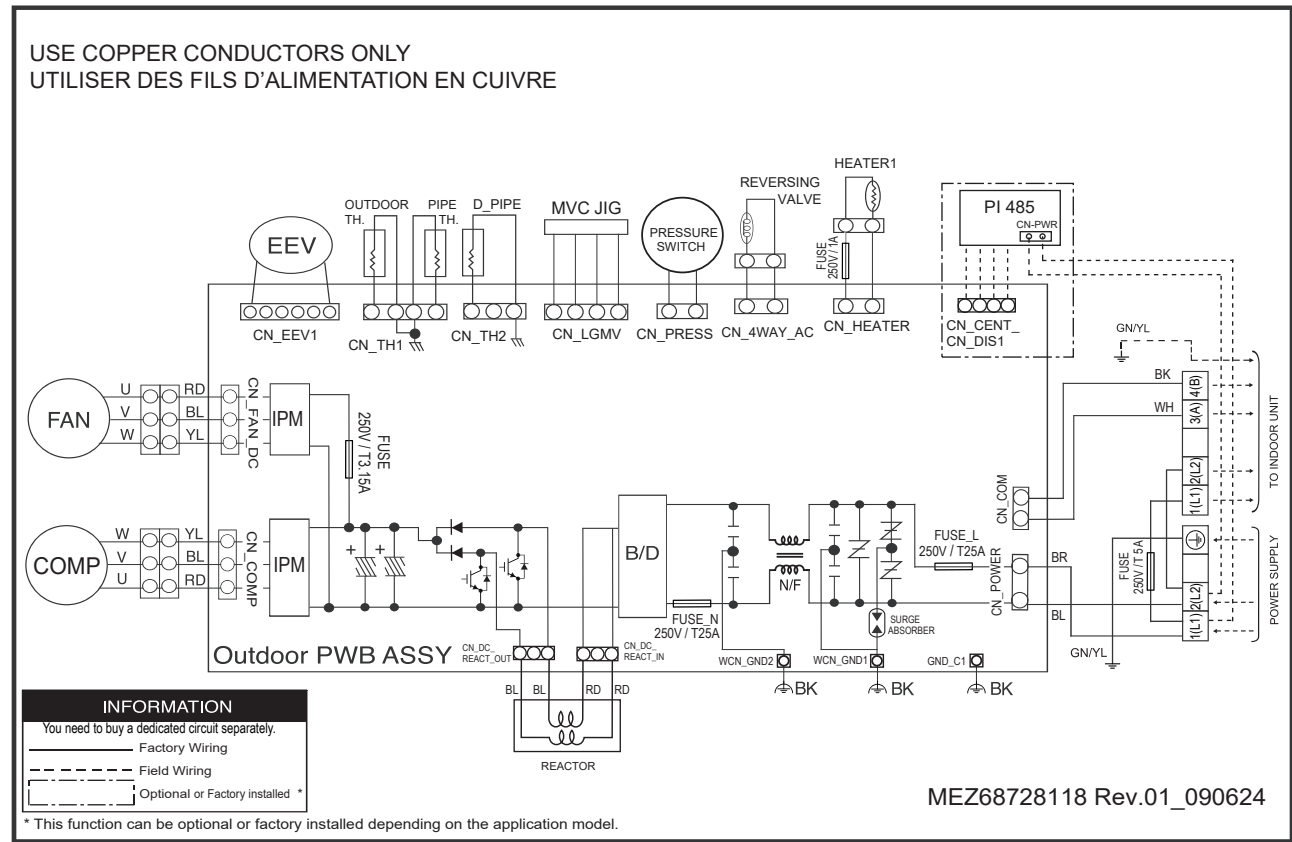
Figure 44: KUSAB091A, KUSAB121A Outdoor Units Wiring Diagram.



# WIRING DIAGRAMS

## KUSAB181A Outdoor Units

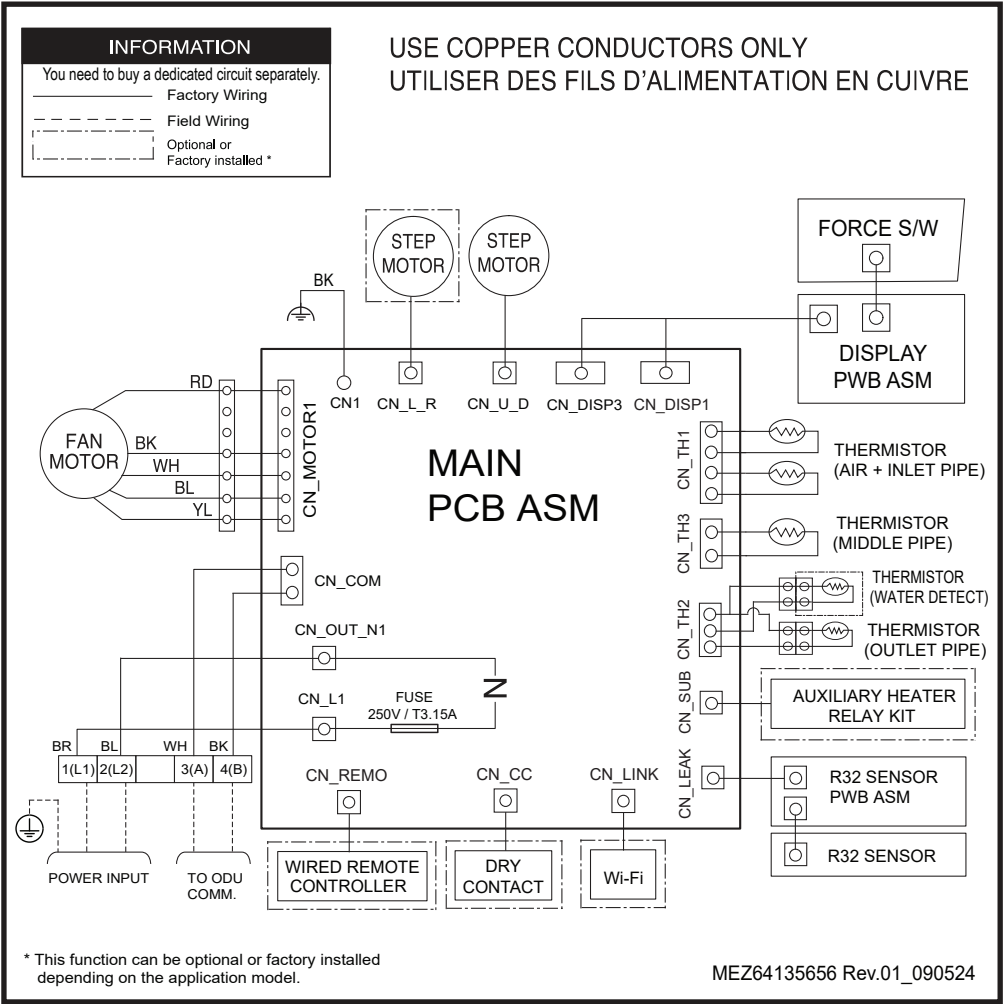
Figure 45: KUSAB181A Outdoor Units Wiring Diagram.



# WIRING DIAGRAMS

## KNUAK091A, KNUAK121A, KNUAK181A Indoor Units

Figure 46: KNUAK091A, KNUAK121A, KNUAK181A Indoor Unit Wiring Diagram.



# POWER SUPPLY / POWER WIRING

## Power Supply / Power Wiring

- LG single zone systems operate at 1Ø, 208-230V, 60Hz; confirm power source specifications.
- Follow manufacturer's circuit diagrams displayed on the inside of the control box cover.
- It is recommended that a circuit breaker is installed, especially if conditions could become wet or moist.
- Include a disconnect in the power wiring system. Add an air gap contact separation of at least 1/8 inch in each active (phase) conductor.
- Power wiring to the outdoor unit(s) must be solid or stranded, and must comply with all National Electrical Code (NEC), UL, and local electrical codes.
- Power wiring to the outdoor unit(s) must be solid or stranded; and must comply with all National Electrical Code (NEC), UL, and local electrical codes.
- Power supply to the outdoor unit must be selected based on NEC and local codes. Maximum allowable voltage fluctuation  $\pm 10\%$  or nameplate rated value. Confirm that the electrical capacity is sufficient.

Figure 47: Circuit Breaker.

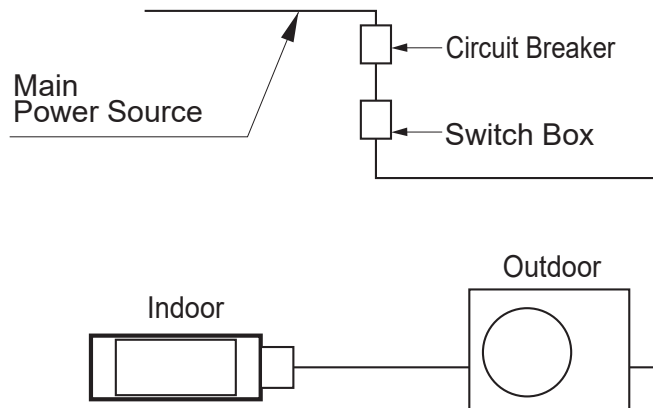
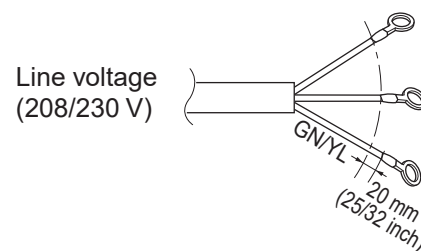


Figure 49: Power Wiring Example.

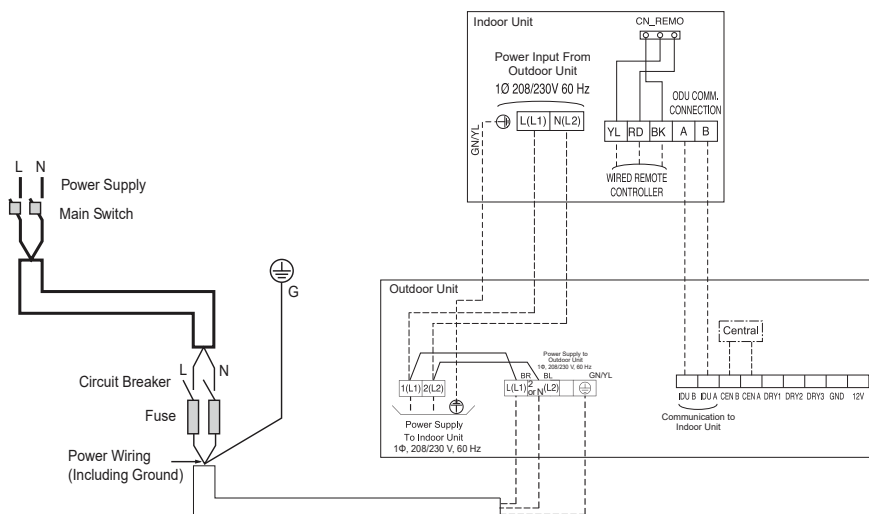


A voltage drop will cause the following problems:

- Magnetic switch vibration, fuse breaks, or disturbance to the normal function of an overload protection device.
- Compressor will not receive the proper starting current.

- Any openings where the field wiring enters the cabinet must be completely sealed.
- Properly ground the outdoor unit and the indoor unit per National Electrical Code (NEC) and local codes.
- The indoor unit is powered by the outdoor unit. See the next page for communication / connection (power) cable specifications from the outdoor unit to the indoor unit.
- Ground wire must be longer than the common power / communication wires.
- Always match color codes of each wire and follow wiring diagram.

Figure 48: General R32 Single Zone System Power / Communications System Schematic (Appearances May Vary)





# COMMUNICATION / CONNECTION CABLE

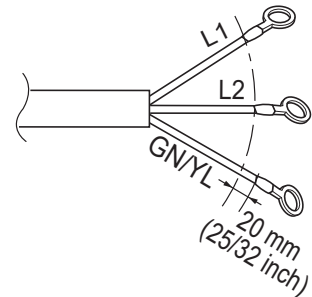
## Communication / Connection (Power) Cable Specifications from Outdoor Unit to Indoor Unit

- Power wiring from the single zone outdoor unit to the indoor unit must use a minimum of 14 AWG, three (3) conductor, stranded, shielded or unshielded (if shielded, must be grounded to the chassis of the outdoor unit only), and must comply with applicable local and national codes.
- Communication wiring from the single zone outdoor unit to the indoor unit must be a minimum of 18 AWG, two (2) conductor, stranded, shielded or unshielded (if shielded, must be grounded to the chassis of the outdoor unit only), and must comply with applicable local and national codes.
- Use of stranded, shielded or unshielded wire is allowed for lengths up to the published maximum pipe length, plus recommended slack at both ends.
- Insulation material as required by local code.
- Firmly attach the cable; provide slack but secure in a way to prevent external forces from being imparted on the terminal block.
- Wiring must be completed without splices.

Figure 50: R32 Single Zone Outdoor Unit to Indoor Unit Wiring and Communications Cable Diagram.

### Power Wiring

Line voltage  
(208/230 V)



### Communication Wiring

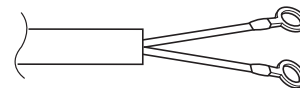
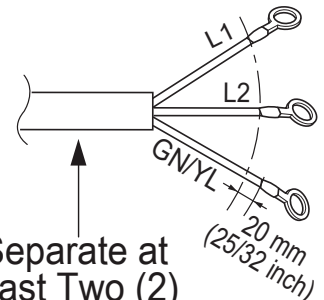


Figure 51: R32 Single Zone Outdoor Unit to Indoor Unit Wiring and Communications Cable Diagram (GREATER THAN 130 feet).

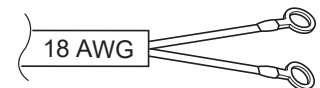
### Power Wiring

Line voltage  
(208/230 V)



Separate at  
least Two (2)  
inches

### Communication Wiring



When the power and communication wire length between the outdoor unit and indoor is GREATER THAN 130 feet:



- Use minimum 14 AWG Communication Wiring
- OR
- Separate the power wiring cable AT LEAST two (2) inches away from the communication wiring cable.

### ⚠ WARNING

All power wiring and communication cable installation must be performed by trained service providers working in accordance with local, state, and National Electrical Code (NEC) / UL / ETL federal regulations related to electrical equipment and wiring, and following the manufacturer product diagrams, requirements, and instructions in this manual. Failure to do so will lead to electric shock which can cause physical injury or death.

# COMMUNICATION / CONNECTION CABLE

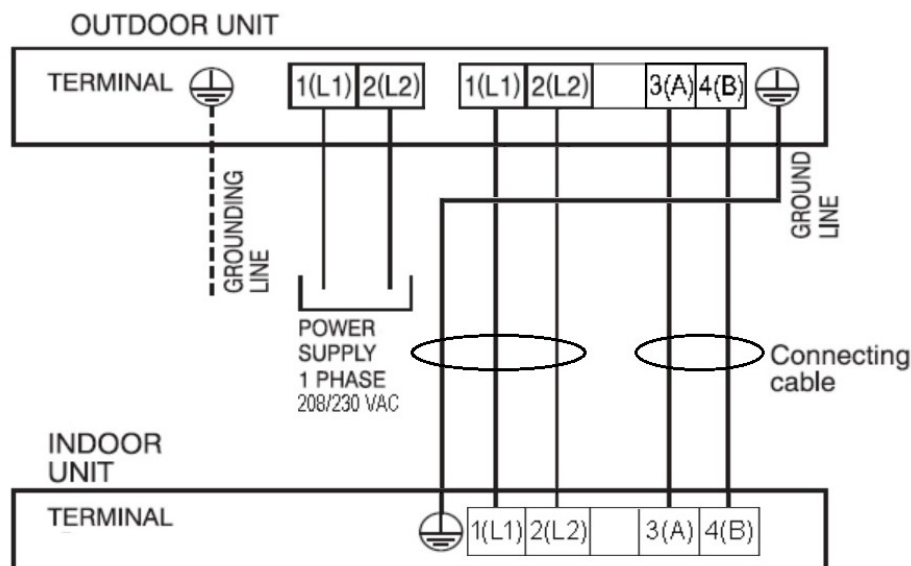
## NOTICE

- Always verify the communication cable is connected to a communications terminal on the Single Zone unit.  Never apply line voltage power to the communication cable connection. If contact is made, the PCBs will be damaged.
- The shield of the communications wiring connecting the outdoor unit to the indoor unit must be grounded only to the outdoor unit frame.
- Tie the shield of each cable segment together using a wire nut at the indoor unit. Maintain polarity throughout the communication network.
- Position the incoming power to the outdoor unit away from the power wiring and communications wiring from the outdoor unit to the indoor unit.
-  Never use a common multiple-core communications cable.

## NOTICE

- Make sure the communications cable / power wiring from the outdoor unit to the indoor unit and the power wiring to the outdoor unit are separate, otherwise, the outdoor unit operation will be affected by electrical noise and will malfunction or fail.
- Use a conduit for the communications cable / power wiring from the outdoor unit to the indoor units.

Figure 52: KSUAK091A, KSUAK121A, KSUAK181A System Electrical Connections.



## Controller Options

R32 Single Zone Art Cool Mirror systems include a wireless handheld remote controller (Part No. AKB73757604). Optional LG-supplied wired controllers are available. See “Functions, Controls, Options”, or contact an LG representative for more information.

### Wireless Handheld Remote Controller features:

- Display Panel: Displays operation conditions.
- On / Off Buttons: Turns system operation on and off.
- Mode Button: Selects the operation mode: Cooling, Auto, Dehumidification, Heating, or Fan.
- Temp. (Temperature) Up / Down Buttons: Adjusts the desired room temperature in the different modes.
- Fan Speed Button (+ / -): Sets desired fan speed.
- Reset: Resets / Initializes the handheld remote control settings.

### NOTICE

Each function will display on the LED for about three (3) seconds when the power is first cycled on.

Figure 53: AKB76044208 Wire-less Handheld Remote Controller.



### Wired Controller Connections

Art Cool Mirror wall mounted indoor units have a Molex plug on the PCB for wired controller connection (CN-REMO). To connect the wall mounted indoor units to the wired controllers, choose from either a 30-foot LG Wired Remote Extension Cable (PZCWRC1), or an LG Multi-Harness Cable (EAD63886215) and field-supplied wiring. The cables are separate purchases.

### NOTICE

When using field-supplied controller cable, make sure to connect the yellow to yellow (communications wire), red to red (12V power wire), and black to black (ground wire) terminals from the remote controller to the indoor unit terminal blocks.

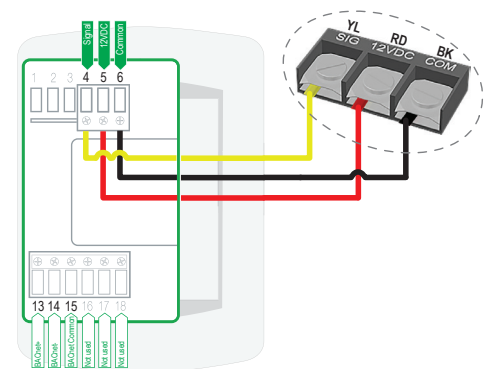
Figure 54: PZCWRC1 LG Wired Remote Extension Cable.



Figure 55: EAD63886215 LG Multi-Harness Cable



Figure 56: Example of Wired Controller Terminals.



# CONTROLLERS

## Wired Controller Placement

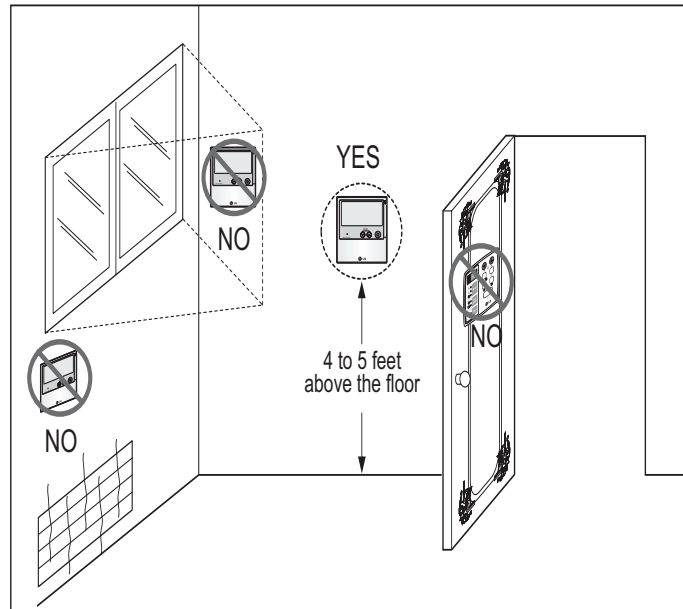
Wired controllers include a sensor to detect room temperature. To maintain comfort levels in the conditioned space, the wired controller must be installed in a location away from direct sunlight, high humidity, and where it could be directly exposed to cold air. Controller must be installed four (4) to five (5) feet above the floor where its LED display can be read easily, in an area with good air circulation, and where it can detect an average room temperature.



Do not install the wired controller near or in:

- Drafts or dead spots behind doors and in corners.
- Hot or cold air from ducts.
- Radiant heat from the sun or appliances.
- Concealed pipes and chimneys.
- An area where temperatures are uncontrolled, such as an outside wall.

Figure 57: Proper Location for the Wired Controller.



## Assigning the Thermistor for Temperature Detection

Each indoor unit includes a return air thermistor assigned to sense the temperature. If a wired controller is installed, there is a choice of sensing temperature with either the indoor unit return air thermistor or the thermistor in the wired controller. It is also an option to set both thermistors to sense temperature so that indoor unit bases its operation on the first thermistor to reach the designated temperature differential. For applicable indoor units, an optional Remote Temperature Sensor can be used in lieu of the return air thermistor—either alone or in conjunction with a wired controller thermistor as previously described.

# LIMITED WARRANTY (USA)

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**“The product’s full Limited Warranty terms and conditions and arbitration requirements are available at <https://www.lghvac.com>.”**

*Inverter*



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