MULTI V™

HYDRO KIT

MEDIUM TEMPERATURE (K2) ENGINEERING MANUAL

Variable Refrigerant Flow

ZRNH*K2AA Series**

(42,000 and 96,000 Btu/h)

PROPRIETARY DATA NOTICE

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This document is for reference and product application purposes only and does not constitute design, engineering, or installation services.

A summary list of safety precautions is on page 6.

Technical materials such as submittals, catalogs, installation, owner's, and service manuals are available at https://www.lghvac.com.

The product's full Limited Warranty terms and conditions and arbitration requirements are available at https://www.lghvac.com.

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TABLE OF SYMBOLS

A2L	*Indicates that this appliance uses a flammable refrigerant. If the refrigerant leaks and exposed to an external ignition source, there is a risk of fire.*
DANGER	*Indicates a hazardous situation that, if not avoided, WILL RESULT IN DEATH OR SERIOUS INJURY.[1]*
WARNING	*Indicates a hazardous situation that, if not avoided, COULD RESULT IN DEATH OR SERIOUS INJURY.[1]*
CAUTION	*Indicates a hazardous situation that, if not avoided, COULD RESULT IN MINOR OR MODERATE INJURY.[1]*
NOTICE	*Indicates information considered important, but not hazard-related; indicates situations that may result in equipment or property damage accidents.[1]*
	This symbol indicates an action that should not be performed.

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

A2L 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.

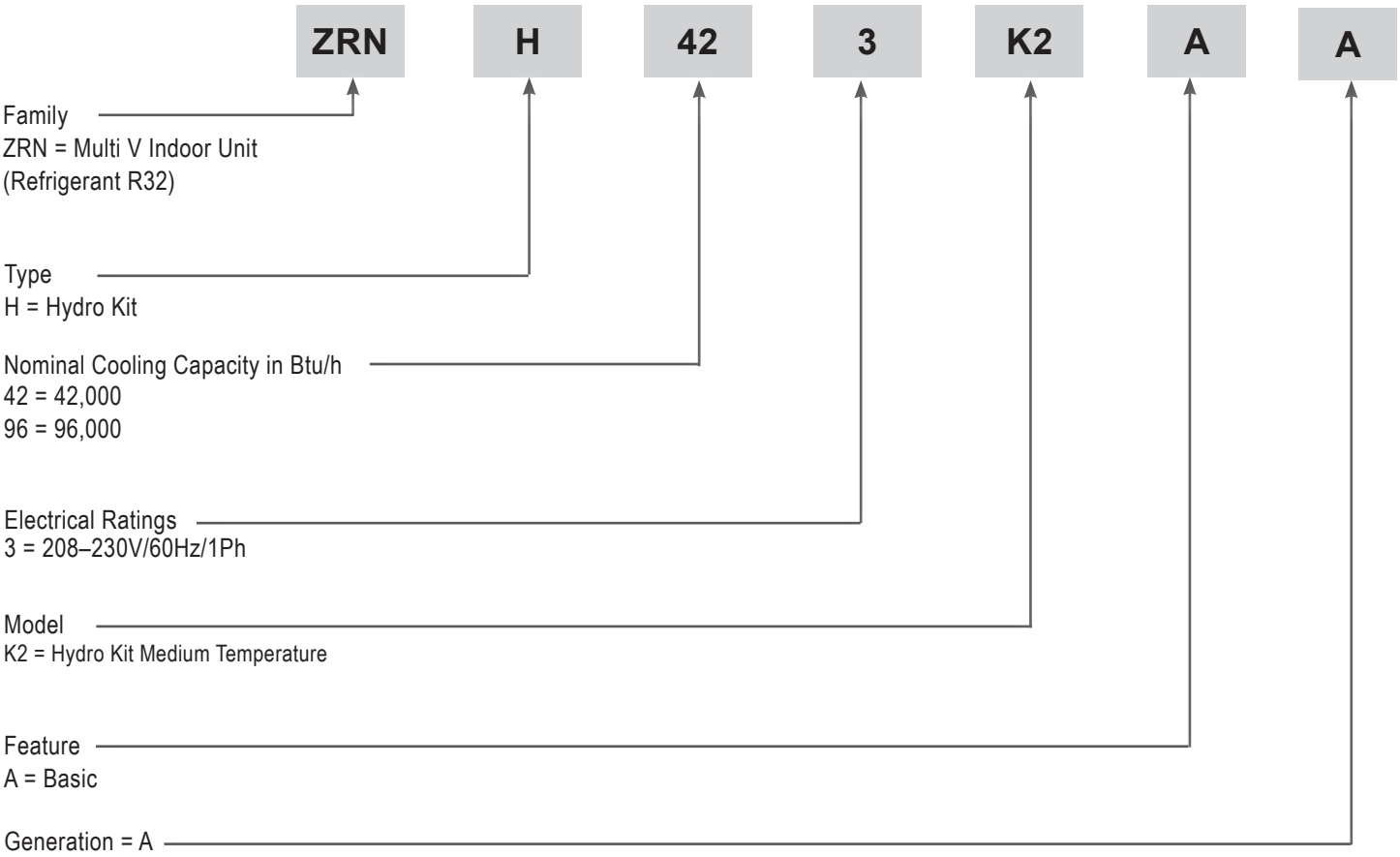
WARNING

- *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.*

UNIT NOMENCLATURE



PRODUCT DATA

FEATURES AND BENEFITS

Hydro Kit Wall Mounted Controller

The LG Hydro Kit is an indoor refrigerant-to-water heat exchanger that integrates with LG's Multi V VRF (Variable Refrigerant Flow) systems. It extracts heat energy from the air conditioning cycle to produce hot or chilled water for domestic water heating, radiant floor heating, fan coil units, and snow-melt systems. Every Hydro Kit is shipped with a Hydro Kit controller.

Versatile Control Strategies

The Hydro Kit operation can be controlled based on the temperature of the leaving water, hot water tank temperature, or the temperature of the conditioned space. The Hydro Kit interfaces with a wide selection of field-provided thermostats and sensors. To control the Hydro Kit operation based on conditioned space temperature, LG provides the designer connectivity for one of four types of sensing devices; field provided 208-230 VAC, 24 VAC thermostats, LG remote wall-mounted room sensors, or field-provided mechanical-type thermostats.

User Functions

- On / Off
- Set water storage tank temperature
- Set leaving water temperature.
- Set freeze protection temperature
- Diagnostics error code displayed
- Schedule override: User interface provides a button that makes water tank storage heating a priority over comfort heating.
- Celsius or Fahrenheit display
- Hydronic heat circulating pump test run / enable / disable

Outdoor Air Temperature Reset

The Hydro Kit controller can monitor changes in the outside ambient air temperature and reset the temperature of the water circulating through the cooling / heating system to lower system operating cost and maintain room temperature.

Scheduling

This energy saving feature can be used to control the Hydro Kit's hours of operation and system priority. The Hydro Kit wall-mounted controller has a convenient seven-day scheduling program that provides the system user with the flexibility to assign which days and hours of a week Hydro Kit operation is enabled / disabled. The user can also assign which days, or hours of each day, storage tank hot water heating has priority and which hours conditioned space heating or cooling has priority.

Multi V Equipment Compatibility

The Hydro Kit controller shares the same communications bus with other Multi V indoor units.

R32 ZRNH-K2AA Hydro Kit models are fully compatible with R32 Multi V i, R32 Multi V Water 5, and R32 Multi V S with LGRED (except 24K unit). ZRNH-K2AA Hydro Kit models can be used with related central control products including AC Smart, ACP, and others.

R32 ZRNH-K2AA Hydro Kit models ARE NOT compatible with R32 single-zone or multi-zone products.

BMS System Integration

Operating data is passed to the BMS host computer through the LG BACNet® or LonWorks® gateway products sold separately. All LG BMS gateway devices are IP addressable and can be accessed via the internet from any computer.

BACnet is a registered trademark of ASHRAE. LonWorks is a registered trademark of Echelon Corp.

Convenient Terminal Strip

The Hydro Kit's third-party accessories terminal strip provides the installer with screw terminals for connecting field-supplied accessories such as circulating pumps, isolation and flow control valves.

Heat Exchanger

Each unit is provided with a heavy duty, compact, brazed-plate and frame stainless steel heat exchanger. With a waterside working pressure rating of 640 psig, concerns related to the working pressure are greatly reduced.

A field provided 30 or 50 mesh strainer must be installed at the water inlet pipe connection to protect plate type heat exchanger. Always install the strainer on the horizontal pipe section.

FEATURES AND BENEFITS

Table 1: Hydro Kit Functions, Features, and Benefits.

Category	Functions, Features, and Benefits	ZRNH**3K2AA
Reliability	Hot Start	X
	Self Diagnosis	O
Convenience	Auto Mode	X
	Auto Dry Operation	X
	Auto Restart	O
	Child Lock	O
	Forced Operation	X
	Group Control	O
	Sleep Timer	O
	Turn On/Off Reservation	O
	Schedule	O
	Two Thermistor Control	X
Special Functions	Wi-Fi Control	Accessory (Sold Separately)
	Leak Detection System	O
Hydro Kit Functions	Anti-Condensation on Floor (cooling)	O
	Anti-Freezing Control	O
	Anti-overheating Of Water Pipe	O
	Thermostat Interface (230V AC)	O
	Thermostat Interface (24V AC)	X
	Domestic Hot Water (DHW) Tank Kit	O
	Silent Operation	O
	Emergency Operation	O
	Weather dependent operation with thermostat	X
	Scheduler (DHW Tank Heater) O	O
	Timer (DHW Tank Heater)	X
	Quick DHW Tank Heating	O
	Electric Heater Capacity Control	X
	Screed Drying Mode	O
	One Point Dry Contact Input (CN-EXT)	O
	Tank Disinfection	O
	Digital Output For External Pump	O
	Water Flow Detection by Flow Sensor	O
	Water Pump Forced Operation	O
	ODU Cycle Priority (Heating Priority)	O

O : Applied, X : Not applied
Accessory: Field-installed, ordered and purchased separately.

ACCESSORIES

Table 3: Included Accessories (Verify that all accessories are inside the box before proceeding with installation).

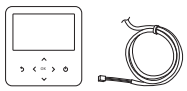
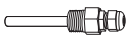
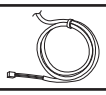
Model No.	Description	Quantity	Image
AKB74855345	Hydro Kit Unit Remote Controller / Cable (CN-REMO Connection)	1	
MEG61846102	Sensor Well / Holder (Indirect Tank Well Connection)	1	
EBG61325701	Water Tank Temperature Sensor (CN-TH4 Connection)	1	
N / A	Owner's and Installation Manual	1	
N / A	CN_EXT Cable	1	
N / A	Conduit Mounting Plate	2	
N / A	Remote Controller Screw	4	
N / A	Conduit Mounting Plate Screw	4	

Table 2: LG Optional Accessories (Sold Separately.)

Category	Accessory Name	Model Name	Description	ZRNH**3K2AA
Dry Contact	Simple	PDRYCB100	1 input port, AC 24V	O
	Communication	PDRYCB320	8 input port, For Third-Party Thermostat (Analog Input)	O
		PDRYCB400	2 Points Dry Contact (For Setback)	O
		PDRYCB500	For Third-Party Controller (Modbus RTU)	O
Safety Measures	R32 Alarm Kit	PLDCAA0S	-	O
	R32 Shut Off Valve	PRHPZ010A	-	O
Other	Wi-Fi Modem	PWFMDD202	Enables Remote System Operation From Smart Phone	O
	Zigbee Dongle	PWLGWB100	Communicates with Third-Party Zigbee Devices	O
	Remote Air Sensor	PQRSTA0	Control Using Air Temperature	O
Control Cable	Remote Controller Extension Cable	PZCWRC1	Remote Controller Extension Cable: 31.5 feet (9.6m)	O
	Group Control Wire	PZCWRCG3	Group Control Y-type Cable: 0.82 feet (0.25m)	O
Hydro Kit	Solar Thermal Kit	PHLLA	Solar Heating System Interface	O
	Domestic Hot Water Tank Kit	PHLTB	Domestic Hot Water Tank Interface	O
	Domestic Hot Water Tank Temperature Sensor	PHRSTA0	Sensor Replacement	O

1. Some functions may not be supported by the remote controller.
2. If using the Wi-Fi controller, some advanced functions controlled by the remote controller cannot operate.

NOTICE

Maximum combined current draw of all connected accessories must be equal to or less than 5 Amps@ 208-230/60/1. Refer to wiring diagrams for detailed terminal block information.

Table 4: LG Optional Central Controllers / Gateways (Sold Separately).

Controller	Model No.
LG MultiSITE™ Communications Manager	PBACM9000
AC Smart™ 5	PACS5A000
ACP 5	PACP5A000
ACP LonWorks®	PLNWKB100

LonWorks® is a registered trademark of Echelon Corporation.

Table 5: Third-Party Accessories (Sold Separately).

Type	Description	Specifications
Solar Heating System	To generate auxiliary heating energy for a water tank.	Solar collection
Thermostat	To control using an air temperature.	Heating-Only type (230 V AC) Cooling / Heating Type (230 V AC with Mode selection switch)
Mix Kit	To use a mixing circuit.	• Mixing valve • Mix pump • Mix Valve Sensor
Third-Party Controller	To connect external controller using Modbus protocol	-
Three-Way valve and actuator	(A): To control water flow for hot water heating or floor heating / To control water flow when installing third-party boiler.	3 wire, SPDT (Single Pole Double Throw) type, 230 V AC
Two-Way valve and actuator	To control water flow for a fan coil unit.	Two wire, NO (Normally Open) or NC (Normally Closed) type, 230 V AC
Third-Party ESS	To control the operation mode according to the energy storage state.	-

NOTICE

Maximum combined current draw of all connected accessories must be equal to or less than 5 Amps@ 208-230/60/1. Refer to wiring diagrams for detailed terminal block information.

Hydro Kit Water Heating / Cooling

General

Multi V systems consist of an outdoor unit or water source unit, one or more indoor units or Hydro Kits, integrated system controls, and an interconnecting field-provided refrigerant pipe network containing various fittings including Y-branch kits and Header kits supplied by LG. LG components are manufactured in a facility that meets or exceeds International Organization for Standardization (ISO) 9001 and 14001. The units are listed by ETL and bear the ETL listed mark.

Casing

The Hydro Kit case is comprised of a 14-gauge coated metal frame with 20-gauge sheet metal panels. Exterior panels are cleaned and finished with a weather resistant baked enamel finish. A removable front corner panel is provided to allow access to all major components and control devices. All refrigerant and water pipe connections are on the right side of the unit.

Hydro Kit Refrigerant to Water Heat Exchanger

The water heat exchanger is a stainless steel, type SUS316, refrigerant / water plate heat exchanger designed to operate at a maximum working pressure of 640 psig. The heat exchanger water-side volume is 0.31 gallons for ZRNH423K2AA and 0.58 gallons for ZRNH963K2AA.

Heat Exchanger Protection

- A field-installed 30 / 50 mesh strainer
- Internal, factory installed, flow switch
- Heat exchanger freeze protection algorithm
- Overheating protection algorithm

Microprocessor Controls

The Hydro Kit includes an integrated microprocessor controller capable of performing functions necessary to control Hydro Kit operations based on the leaving water and / or hot water tank temperature setpoint. Entering and leaving water pipe temperature sensors are factory-mounted internally to the unit case. A factory provided remote (wall-mounted) Hydro Kit controller and a hot water tank sensor / well are included for field installation. The Hydro Kit operation can be optionally controlled by sensing the conditioned space air temperature using an LG-provided remote temperature sensor (sold separately) or a field-provided manual changeover conventional thermostat.

Hydro Kit Controller

The remote wall-mounted Hydro Kit controller is provided with every unit. Power for the controller is provided via the communications cable from the Hydro Kit unit. The controller has a white resin case with a backlit LCD screen that displays the temperature setpoint, unit run-status and mode of operation (heating / cooling).

User can use the control to switch unit ON/OFF. On the main screen, user can press left / right arrows to select the required function / move to menu screen and control using up / down arrows.

On the main screen, enter the monitoring screen by pressing the [Back] button.

On the monitoring screen, the following information can be checked:

- Room temperature
- Water inlet / outlet temperature
- Water pump operation
- Outdoor temperature
- DHW tank temperature

The controller is used to program the Hydro Kit microprocessor resident operating parameters. Scheduling information resides on the controller.

Water Storage Tank Sensor and Well

The Hydro Kit is provided with a stainless steel 1/2 MPT hot water storage tank sensor-well that must be field installed in the wall of the indirect water storage tank (if the tank does not include one already). The sensor comes with a 39-foot cable with plug connectors.

Field-Provided Components Interface

The Hydro Kit is equipped with a factory mounted terminal block with screw type connectors provided to connect waterside control devices and accessories including:

- 208-230V Pump on/off control interface
- Power/control interface for a conventional 208-230 VAC or mechanical type conditioned space temperature sensing thermostat
- Power/control interface for a three-way valve to switch water flow duty between heating the water tank and the indirect water storage conditioned space hydronic heating / cooling equipment.

Communications Cable

All communication cable to be a minimum of 18 AWG, 2-conductor, stranded, and shielded cable (RS-485). Cable insulation must be per project requirements.

MECHANICAL SPECIFICATIONS

External Control Component Connectivity

The Hydro Kit is equipped with a factory-mounted terminal block with screw type connectors provided to connect waterside control devices and accessories.

- 208-230V water pump on / off interface
- Power and control interface for a conventional 208-230 VAC or mechanical type conditioned space temperature sensing thermostat
- Power and control interface for a two-way valve to enable / disable indirect water storage tank heating operation

Control Functions

- Display: Degrees Fahrenheit or Celsius
- Auto restart
- Heating water temperature setpoint
- Heating water temperature deadband
- Indirect water storage tank heating operation timer (disable / enable adjustable from 0 to 10 hours)
- Enable/disable indirect water storage heating operation (requires a field-provided two-way valve)
- Outdoor air temperature based heating water temperature reset
- Water circuit pump on / off control
- Emergency operation (external sensor failure override)
- Group control (up to 16 Hydro Kits may be controlled by a single Hydro Kit controller)
- Radiant floor system condensation prevention (requires a field-provided three-way valve)
- Water pump forced operation
- Self diagnostics
- Child lock

Cold Surface Insulation

All cold surfaces are insulated to minimize the possibility of condensation forming on the components of the refrigeration circuit.

Auto Changeover Operation

Auto changeover from (heating / cooling) controlled by conditioned space temperature and requires the installation of the Hydro Kit remote controller and the optional LG remote sensor. Auto changeover operation is limited when used in conjunction with a heat pump outdoor or water source unit. Auto changeover is not available when the conditioned space temperature is controlled using a field-provided conventional thermostat.

Additional Field Provided Components Interface

- In addition to using an optional field provided 208-230VAC or mechanical thermostat to sense the conditioned space temperature, it is also permissible to use a conventional 24-volt thermostat on the K2 Heating Cooling model.
- Power / control interface for an optional, field-provided, three-way valve. The valve is used to isolate the flow of water to a portion of the water circuit where condensation will present a problem while the Hydro Kit is producing chilled water.
- Radiant floor system condensation prevention (requires a field provided two-way valve)
- Secondary heating source (i.e. solar) heating circuit water pump on/off control
- Secondary heating source (i.e. solar) heating circuit three-way valve power / control interface

Additional Control Functions

- Outdoor air temperature based chilled water temperature reset
- Leaving chilled water temperature setpoint
- Leaving chilled water deadband
- Chilled water device condensation protection temperature setpoint (cease cooling operation if the water temperature drops to / under the setpoint temperature).

SPECIFICATIONS

Table 6: Hydro Kit Specifications Table.

	Medium Temperature Hydro Kit	
	ZRNH423K2AA	ZRNH963K2AA
Capacity Index	**42**	**96**
Cooling Mode Performance		
Rated Capacity[1] (Btu/h)	42,100	95,900
Entering Water Temp. Range (°F)	50 to 95	50 to 95
Leaving Water Temp. Range (°F)	41 to 77	41 to 77
Indoor Air Temp. Setpoint Range (°F)	64 to 86	64 to 86
Heating Mode Performance		
Rated Capacity[1] (Btu/h)	47,200	107,500
Entering Water Temp. Range (°F)	50 to 122	50 to 122
Leaving Water Temp. Range (°F)	68 to 122	68 to 122
Indoor Air Temp. Setpoint Range (°F)	64 to 86	64 to 86
Hot Water Tank Setpoint Range (°F)	86 to 122	86 to 122
Unit Data		
Refrigerant Type	R32	R32
Refrigerant Control	EEV	EEV
Sound Pressure[2] dB(A) Cooling / Heating	26 / 26	26 / 26
Net Unit Weight (lbs.)	71.2	82.2
Shipping Weight (lbs.)	78.9	89.9
Heat Rejected to Equipment Room (Btu/h)	Negligible	Negligible
Oil Type	---	---
Heat Exchanger		
Material / Type	316 Stainless / Brazed Plate	316 Stainless / Brazed Plate
Rated Water Flow (GPM)	10.4	24.3
Rated Pressure Drop[3] (ft-wg)	13.7	23.1
Range of Flow (GPM)	5.3 to 10.4	8 to 24.3
Water Side Volume (U.S. Gallons)	0.31	0.58
Water Side Design Pressure (psig)	640	640
Piping		
Liquid Line (in., O.D.)	3/8 Braze	3/8 Braze
Vapor Line (in., O.D.)	5/8 Braze	7/8 Braze
Condensate Line (in., O.D.)	1-MPT	1-MPT
Water Inlet / Outlet (in. O.D.)	1-MPT	1-MPT

[1]All capacities are net with a Combination Ratio between 95–100%.

[2]Sound pressure levels are tested in an anechoic chamber under ISO Standard 3745.

[3]Water only (no antifreeze).

"The combination ratio range for dedicated use (all Hydro Kit units) is 50% - 100%. The combination ratio range for mixed use (Hydro Kit mixed with indoor units) is 50% - 130%.

Electrical Data

Table 7: Hydro Kit Unit Electrical Data.

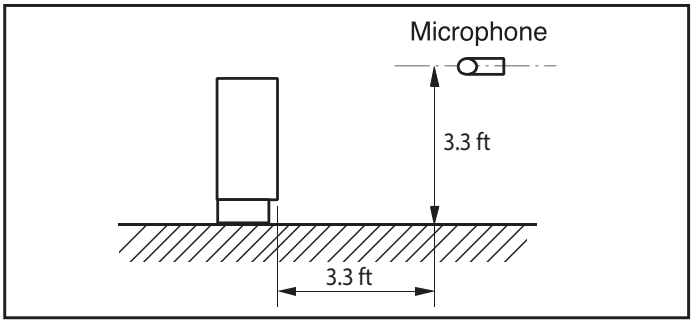
Model	Voltage Range	MCA	MOP	Rated Amps (A)	Power Supply			Power Input (kW)	
					Hz	Volts	Phase	Cooling	Heating
ZRNH423K2AA	187-253	0.17	15	0.13	60	208-230	1	0.01	0.01
ZRNH963K2AA									

MCA = Minimum Circuit Ampacity MOP = Maximum Overcurrent Protection

Power wiring cable is field provided and must comply with the applicable local and national codes.

Sound Pressure Level Data

Figure 1: Sound Pressure Measurement Location.

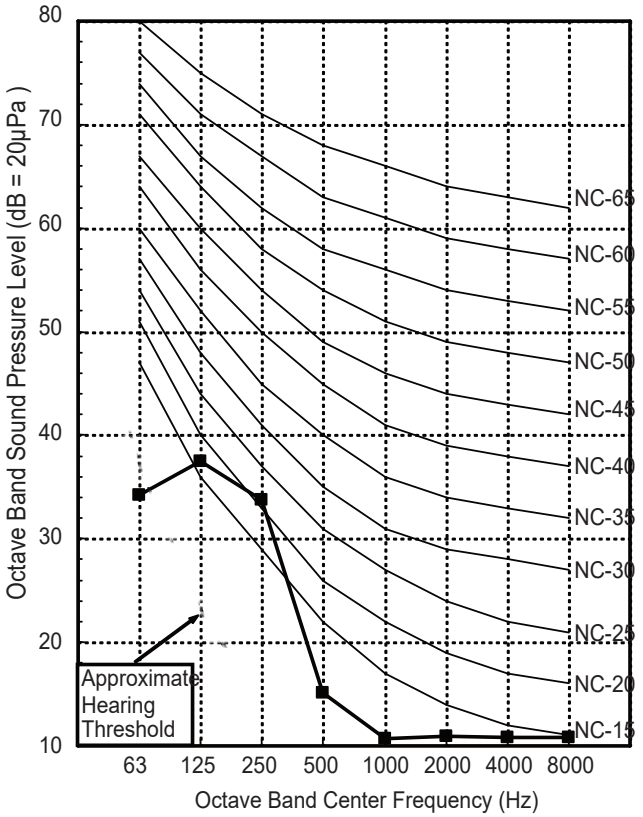


- Measurement taken 3.3' above finished floor, and at a distance of 3.3' from face of unit.
- Measurements taken with no attenuation and units operating at full load normal operating condition.
- Sound level will vary depending on a range of factors such as construction (acoustic absorption coefficient) 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: Hydro Kit Unit Sound Pressure Level.

Models	Sound Pressure Level dB (A)
ZRHN423K2AA, ZRHN963K2AA	26

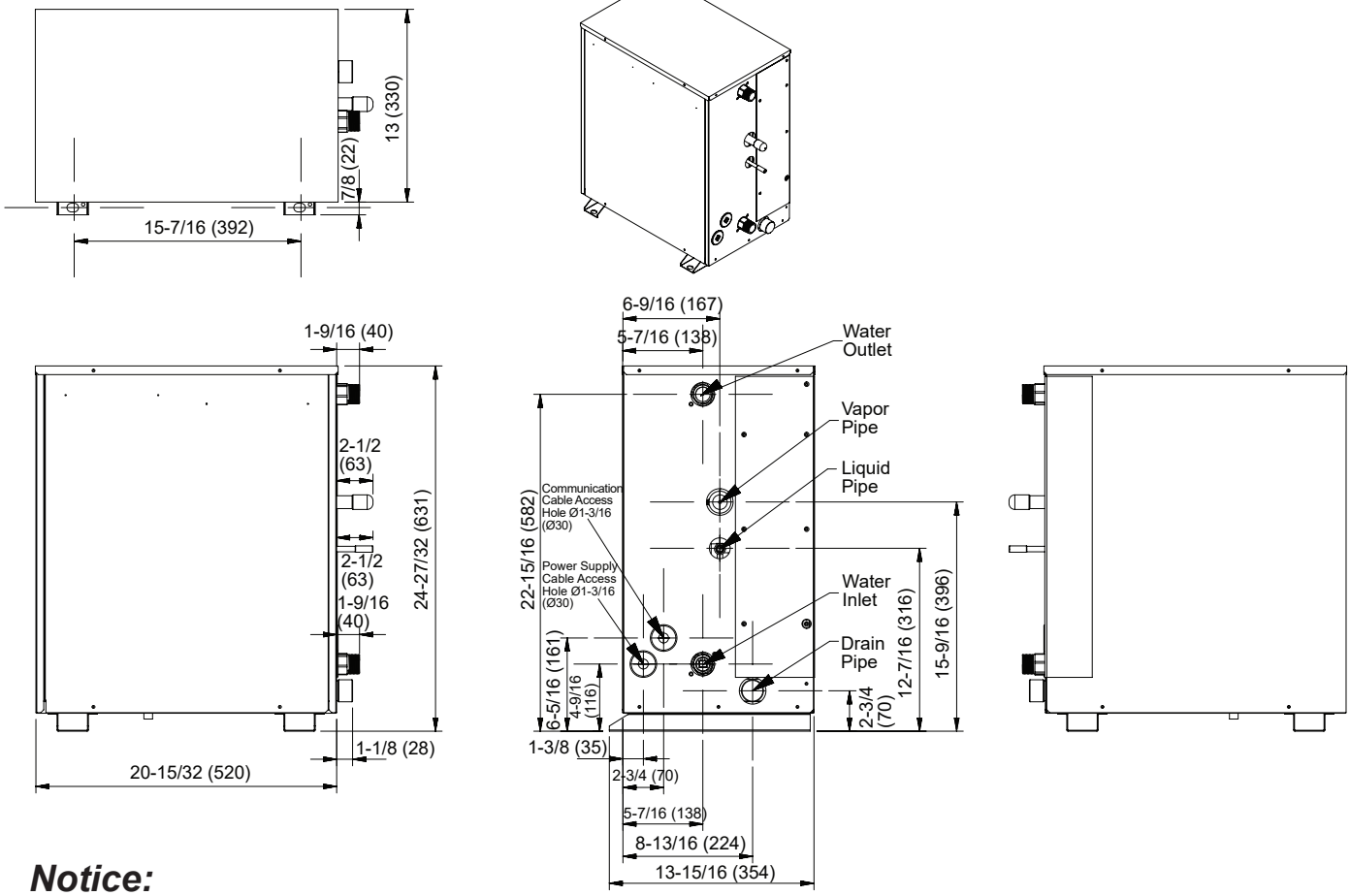
Figure 2: ZRHN423-963K2AA Sound Pressure Level Diagram.



DIMENSIONS

ZRNH423K2AA, ZRNH963K2AA

Unit: Inches (mm)



Notice:

1. The unit must be installed in compliance with the installation manual.
2. Power to the unit must be grounded in accordance with all applicable state, local, and national regulations and codes.
3. All field-supplied electrical components and materials must comply all applicable state, local, national, and international regulations and codes.

INSTALLATION / CLEARANCE REQUIREMENTS

Selecting the Best Location

⚠ DANGER

To avoid the possibility of fire, ⃠ do not install the unit in an area where combustible gas will generate, flow, stagnate, or leak. Failure to do so will cause serious bodily injury or death. Before beginning installation, read the safety summary at the beginning of this manual.

Select a location that meets the following conditions:

Do's

- Install the Hydro Kit indoors.
- Where the floor is solid and has enough structural strength to bear four times the weight of the Hydro Kit.
- Verify that the Hydro Kit is installed on a level plane.
- Place the Hydro Kit where drainage can be obtained easily, and in a location to minimize the length of the condensate drain piping.
- Include enough space for service access.
- Locate the Hydro Kit in a location where it can be easily connected to the outdoor unit / heat recovery unit.

⃠ Do Not's

- *Do not install the unit near high-frequency generators or in a location where it will be impacted by electrical noise.*
- *Do not install the unit where it will be subjected to direct thermal radiation from other heat sources.*
- *Do not install the unit in a location where acidic solution and spray (sulfur) are often used.*
- *Do not use the unit in environments where sulfuric gas is present.*
- *Do not install the unit near a heat or steam source, or where considerable amounts of oil, iron powder, or flour are used. (These materials will 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.)*
- *Do not install the unit near a doorway.*

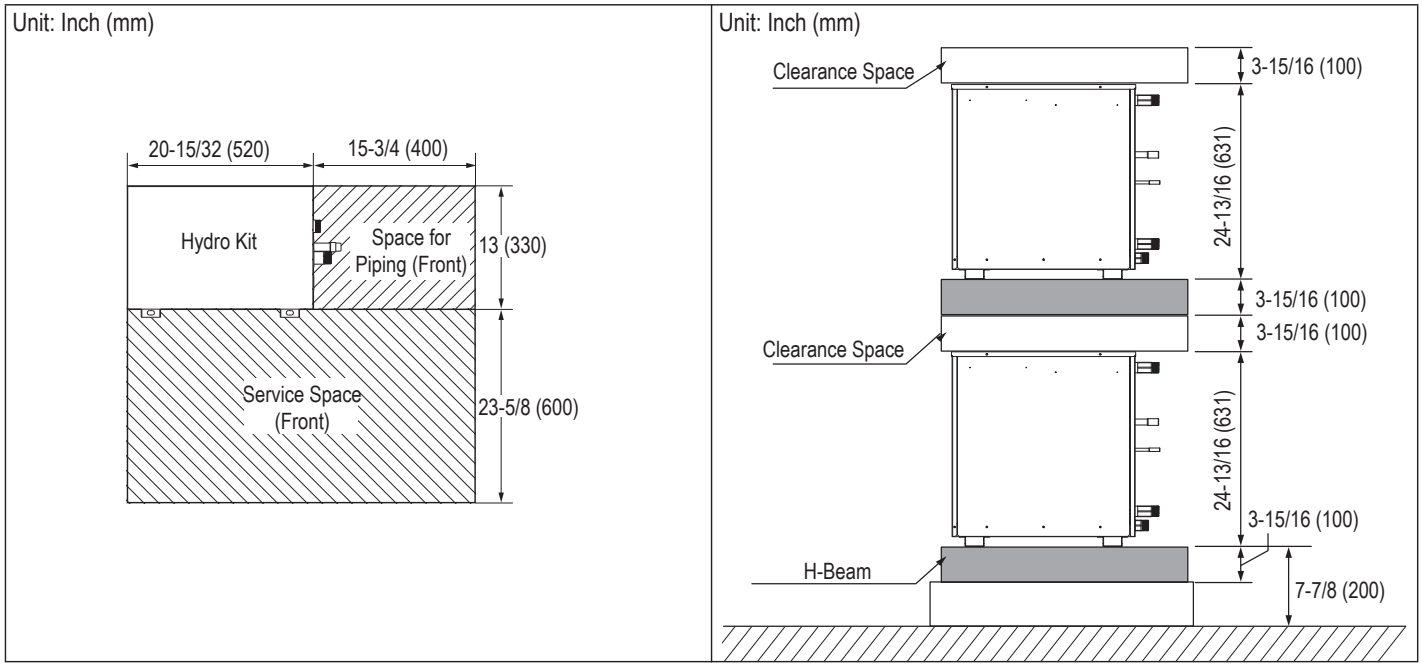
The unit will be damaged, will malfunction, and / or will not operate as designed if installed in any of the conditions listed.

NOTICE

- *⃠ Hydro Kits must not be placed in an environment where the Hydro Kits 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 Hydro Kits are installed, proper air make up or supply and/or adequate ventilation should be provided.*
- *If the unit is installed near a body of water, the installation parts are at risk of corroding. Appropriate anti-corrosion methods must be taken for the unit and all installation parts.*

CLEARANCE AND FOUNDATION REQUIREMENTS

Figure 3: Clearance Requirements.



Foundation

- Tightly attach the Hydro Kit with bolts as shown below so that the unit will not fall.
- Noise and vibration could transfer to the floor or walls, so install rubber anti-vibration isolation pads between the mounting feet and the base. The base pad must be more than 8 inches (200 mm).

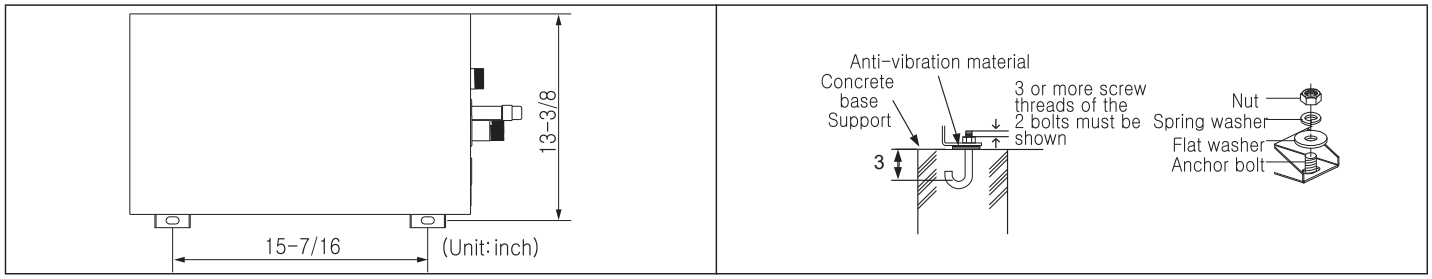
⚠ WARNING

- *Ensure that the floor / chosen location has enough strength to support the weight of the Hydro Kit. If it does not have sufficient strength, the Hydro Kit will fall and cause physical injury or death.*
- *Ensure the Hydro Kit is firmly attached to the foundation. Any deficiency in installation will cause unit to fall, resulting in physical injury or death.*

NOTICE

- *Ensure that the floor / chosen location has enough strength to support the weight of the Hydro Kit. If it does not have sufficient strength, the Hydro Kit will fall and cause damage to the unit.*
- *Ensure the Hydro Kit is firmly attached to the foundation. Any deficiency in installation will cause unit to fall, resulting in damage to the unit.*

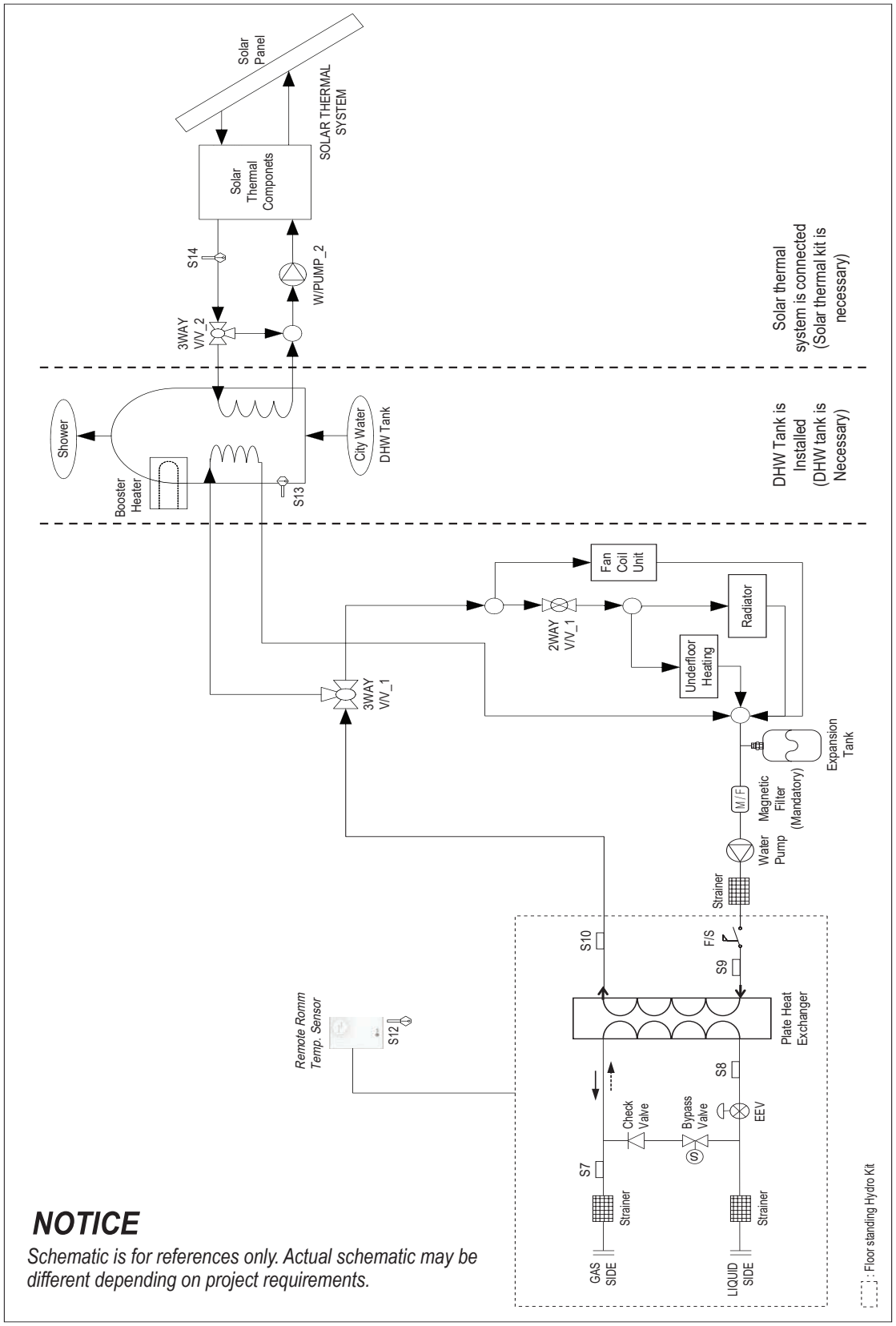
Figure 4: Foundation Requirements.



Product Data

PIPING DIAGRAM

ZRNH423K2AA, ZRNH963K2AA



NOTICE

Schematic is for references only. Actual schematic may be different depending on project requirements.

*Air Temperature sensor is an optional accessory and is sold separately based on design requirements.

PIPING DIAGRAM

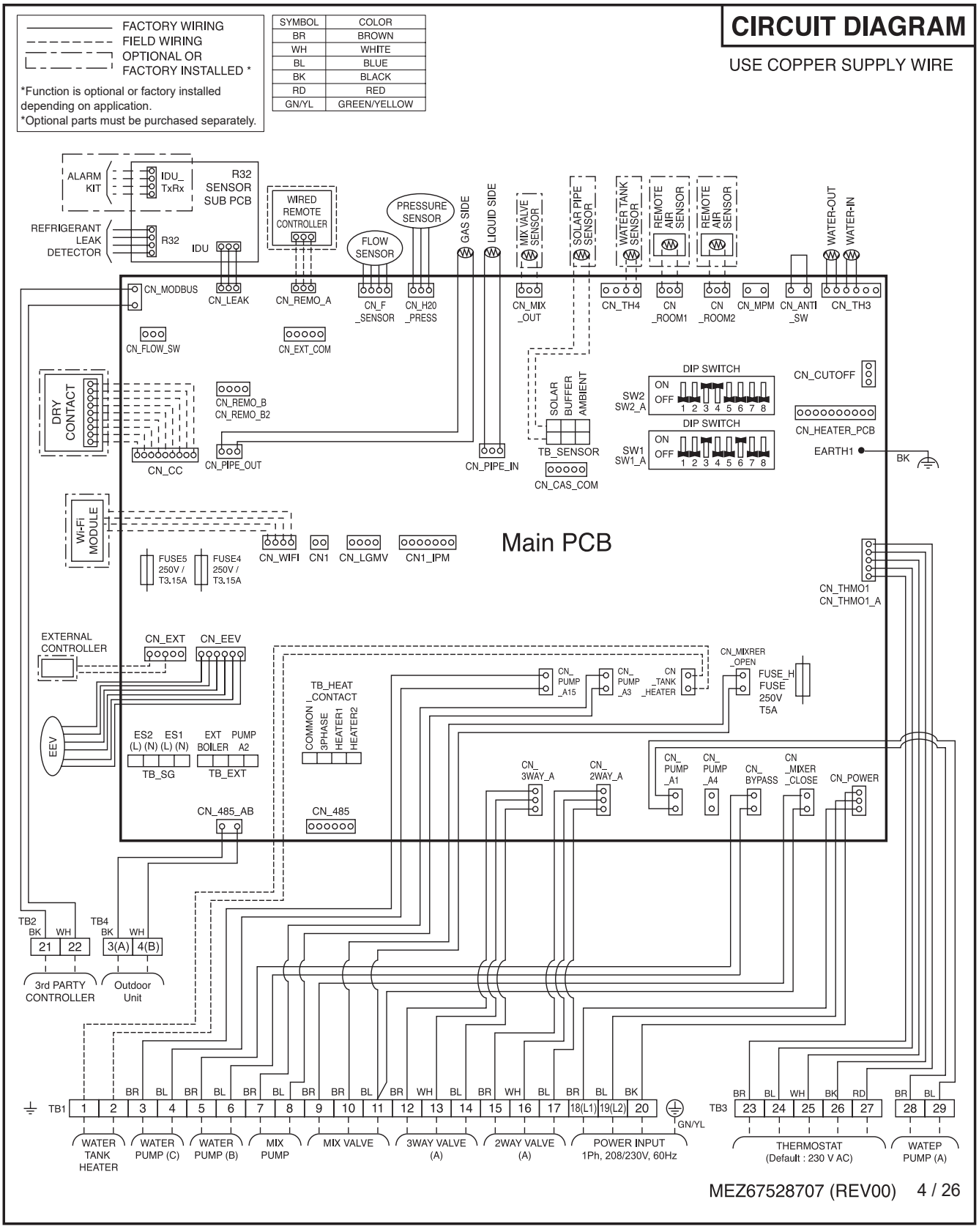
ZRNH423K2AA, ZRNH963K2AA

Table 9: Hydro Kit Piping Schematic Legend.

Category	Symbol	Description	PCB Connection	Remarks
Indoor Unit	S7	Refrigerant Temperature Sensor (Gas side).	CN_PIPE/OUT	Meaning is expressed based on Cooling mode
	S8	Refrigerant Temperature Sensor (Liquid side).	CN_PIPE/IN	
	S9	Entering Water Temperature Sensor.	CN_TH3 (WATER IN) (PHEX OUT) (WATER OUT)	S9, S10 are connected at 6 pin type connector CN_TH3.
	S10	Leaving Water Temperature Sensor.		
	F/S	Flow Sensor	CN_FLOW1	To monitor water flow in the system.
	S12	Remote Air sensor (Room 1/Direct circuit)	CN_ROOM	Optional accessory (sold separately)
	CTR/PNL	Control Panel (or 'Remote Controller')	CN_REMO	Pre built-in at indoor unit
Space Heating / Cooling	2WAY V/V_1	To block underfloor heating from cooling water	CN_2WAY_A	Third-party accessory and field installation (sold separately), Two-wire NO or NC type two-way valve is supported.
DHW Heating	DHW TANK	Water TANK	No Connector	Accessory and field installation (sold separately). Generating and storing DHW by Hydro kit or built-in backup heater
	Cold WATER	Water to be heated by Indoor unit and Booster Heater of W/TANK	No Connector	Field Installation
	SHOWER	Water supplied to end-user	No Connector	Field Installation
	S13	W/TANK water temperature sensor	CN_TH4	S13 and S15 are connected at four-pin type connector CN_TH4. S13 is a part of DHW tank kit. S14 is a part of solar thermal kit
Solar Heating	S14	Solar-heated water temperature sensor		
	3WAY V/V_2	Flow control for water which is heated and circulated by SOLAR THERMAL SYSTEM. Flow direction switching between SOLAR THERMAL SYSTEM and W/TANK.	CN_3WAY_B	Third-party accessory and field installation (sold separately). SPDT type three-way valve is supported.
	W_PUMP/2	External Water Pump	CN_W/PUMP_B	Third-party accessory and field installation (sold separately). If water pump of SOLAR THERMAL SYSTEM is incapable of circulation, external water pump can be used.
	SOLAR THERMAL SYSTEM	This system can include following components: Solar panel, Sensors, Thermostats, Interim heat exchanger, Water pump, etc., To use hot water heated by SOLAR THERMAL SYSTEM, end-user must install Solar Kit accessory provided by LG.	No Connector	Third-party accessory and field installation (sold separately).
Common	Expansion Tank	Expansion Tank	No Connector	Absorb volume change of heated water,
	M / F	Magnetic Filter	No Connector	Third-party accessory and field installation (sold separately).
	3WAY V/V_1	Flow control for water which is leaving from indoor unit. Flow direction switching between underfloor and water tank.	CN_3WAY_A	Third-party accessory and field installation (sold separately). SPDT type three-way valve is supported.
	Water Pump	Water Pump	Pump(A)	Sold Separately
	Strainer	Strainer	No Connector	Third-party accessory and field installation (sold separately).

WIRING DIAGRAM

ZRNH423K2AA, ZRNH963K2AA



SELECTION PROCESS FOR AIR-SOURCE SYSTEMS (R32 MULTI V I AND MULTI V S W LGRED)

Applying Correction Factors on page 22

Operation Limits on page 30

Capacity Correction Factor by Temperature

Capacity Calculation Methods

Hydro Kit Capacity + Indoor Unit Capacity = Total Capacity

$Q_{ODU} \times (I_{HK} / I_{TOTAL}) \times F_{TC,T\_HK} \times F_{TC,W\_HK} \times F_{TC,C\_HK} \times F_{TC,P\_ODU} \times F_{TC,D\_ODU}$ = Hydro Kit Capacity

Q_{ODU} = Air-Source by Air or temperature, and capacity ratio at standard indoor temperature. Standard indoor temperature is 80.6°F DB / 66.2°F WB on cooling mode, 68°F DB on heating mode. Refer to the R32 Multi V i or R32 Multi V S with LGRED capacity tables.

F_{TC,T_HK} = Capacity Correction Factor by Outdoor Air Temperature (See Figures 5 and 12).
F_{TC,W_HK} = Capacity Correction Factor by Water Flow Rate (See Figures 6 and 7, and Figures 13 and 14).
F_{TC,C_HK} = Capacity Correction Factor by Combination Ratio (See Pages 30 and 31).
FT_{C,P_ODU} = Capacity Correction Factor by Refrigerant Piping Length (Refer to the correction factors of the outdoor unit. For Hydro Kit applications, it will always be one [1]).
F_{TC,D_ODU} = Capacity Correction factor by Defrost Operation (Air-Source Units Only; Refer to the correction factors of the outdoor unit).
I_{HK} = Capacity Index for Hydro Kit (See Page 13).
I_{TOTAL} = Sum of Capacity Index for Hydro Kits Combined with Indoor Units (See Table 14).

Power Input Calculation Methods

Hydro Kit Power Input + Indoor Unit Power Input = Total Power Input

$P_{IODU} \times (I_{HK} / I_{TOTAL}) \times F_{PI,T\_HK} \times F_{PI,W\_HK} \times F_{PI,C\_HK}$ = Hydro Kit Power Input

P_{IODU} = Air-Source Power Input by Air temperature, and capacity ratio at standard indoor temperature. Standard indoor temperature is 80.6°F DB / 66.2°F WB on cooling mode, 68°F DB on heating mode.

F_{PI,T_HK} = Power Input Correction Factor by Outdoor Air Temperature (See Figures 9 and 16).
F_{PI,W_HK} = Power Input Correction Factor by Water Flow Rate (See Figures 10 and 11, and Figures 17 and 18).
F_{PI,C_HK} = Power Input Correction Factor by Combination Ratio (See Pages 30 and 31).
I_{HK} = Capacity Index for Hydro Kit (See Page 13).
I_{TOTAL} = Sum of Capacity Index for Hydro Kits Combined with Indoor Units (See Table 14).

When calculating at maximum and minimum temperatures of the outdoor unit capacity range and power input, use the same temperature values for both.

For example, when calculating Heating PI with capacity table of R32 Multi V i in Heat Pump operation at 59°F DB, use the same value of PI at 59°F DB.

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SELECTION PROCESS

Hydro Kits with R32 Multi V i and R32 Multi V S with LGRED Air-Source Systems

Applying Cooling Capacity and Power Input Correction Factors

To apply and choose a Hydro Kit for use with R32 Multi V i and R32 Multi V S (except 24K unit) Air-Source systems, the designer needs to know the corrected cooling capacity (Btu/h), the cooling power input (kW), the corrected heating capacity (Btu/h), the heating power input (kW), water pressure drop through the heat exchanger (ft.-w.g.), and combination ratio limits. The following pages present the necessary steps and processes to obtain all the information needed.

Calculating Corrected Cooling Capacity

To obtain the corrected cooling capacity at design conditions, first see the "Hydro Kit Specifications Table" on page 13, and find the rated cooling capacity of the chosen Hydro Kit. Use the charts on the following pages for the three (3) additional factors needed to determine the corrected cooling capacity:

- Factor A = Outdoor Ambient Air DB Temperature (°F) (R32 Multi V i or R32 Multi V S with LGRED Air-Source).
- Factor B = Water Flow Rate (GPM).
- Factor C = Antifreeze Additive (% by Weight).

Then, to calculate, use:
Rated Capacity (Btu/h) x Factor A x Factor B x Factor C = Corrected Cooling Capacity (Btu/h).

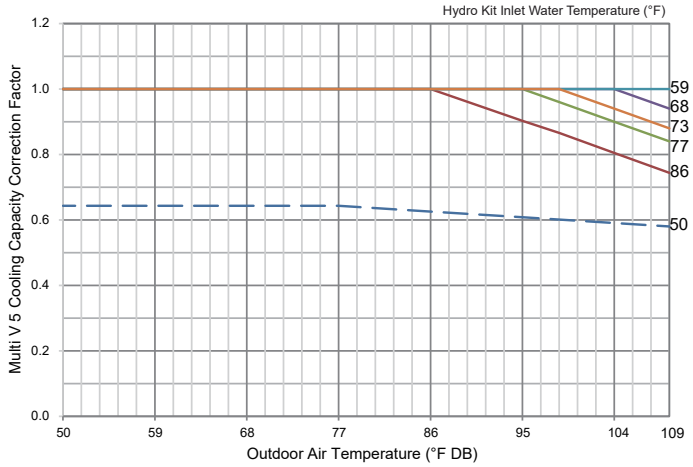
Cooling Capacity Correction Charts for R32 Multi V i and R32 Multi V S with LGRED Air-Source Units

Factor A: Outdoor Ambient Air DB Temperature (°F)

For use in projects with a design outdoor ambient air temperature above 50°F.

1. Find the design outdoor air temperature on the chart.
2. Find the Hydro Kit design inlet water temperature.
3. Use the intersecting datapoint to find the cooling capacity correction factor by air-source unit outdoor ambient air temperature.

Figure 5: R32 Multi V i and R32 Multi V S with LGRED Air-Source Cooling Capacity Correction Factor Chart.



SELECTION PROCESS

MULTI V HYDRO KIT

Hydro Kits with R32 Multi V i and R32 Multi V S with LGRED Air-Source Systems

Applying Cooling Capacity and Power Input Correction Factors

Factor B: Water Flow Rate (GPM)

1. Find the cooling design water flow rate (GPM) on the chart for the proposed Hydro Kit model below.
2. Find the Hydro Kit water flow rate.
3. Use the intersecting datapoint to find the cooling capacity correction factor by water flow rate.

Figure 6: ZRNH423K2AA Water Flow Rate Cooling Capacity Correction Factor.

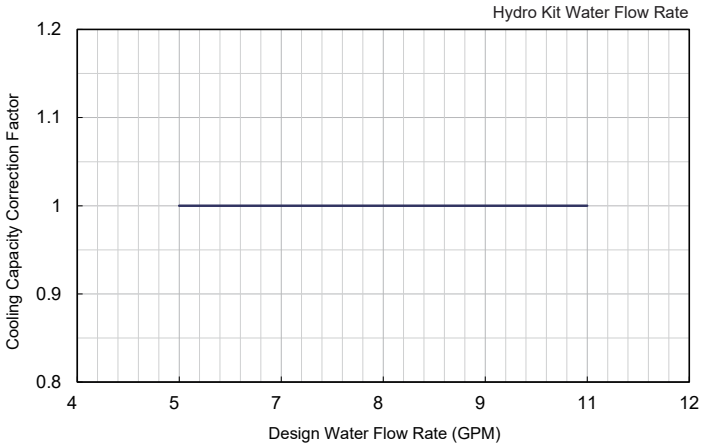
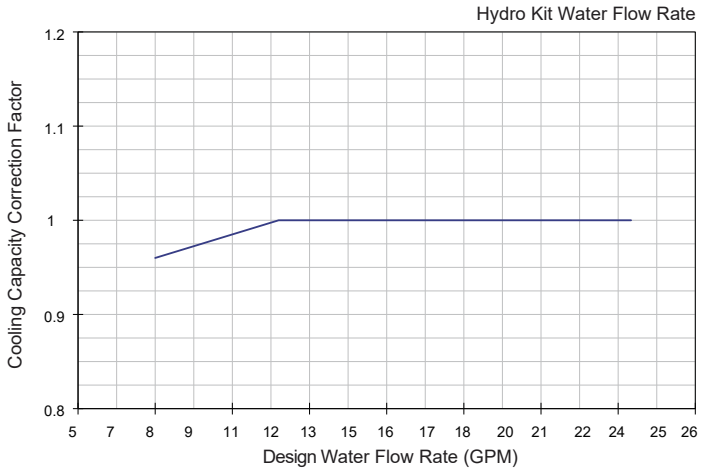


Figure 7: ZRNH963K2AA Water Flow Rate Cooling Capacity Correction Factor.



Factor C: Antifreeze Additive (% by Weight)

If the water flowing through the Hydro Kit heat exchanger has the potential to freeze, an antifreeze agent such as ethylene glycol, propylene glycol, or methanol must be added to the water circuit. The antifreeze will reduce the ability of the Hydro Kit to exchange heat energy, and this reduction must be taken into account.

1. Find the antifreeze percent by weight on the chart.
2. Find the antifreeze being considered.
3. Use the intersecting datapoint to find the cooling capacity correction factor. See also table below for cooling capacity correction factor datapoints at specific antifreeze concentration level percentages.

Figure 8: Cooling Capacity Correction by % Antifreeze.

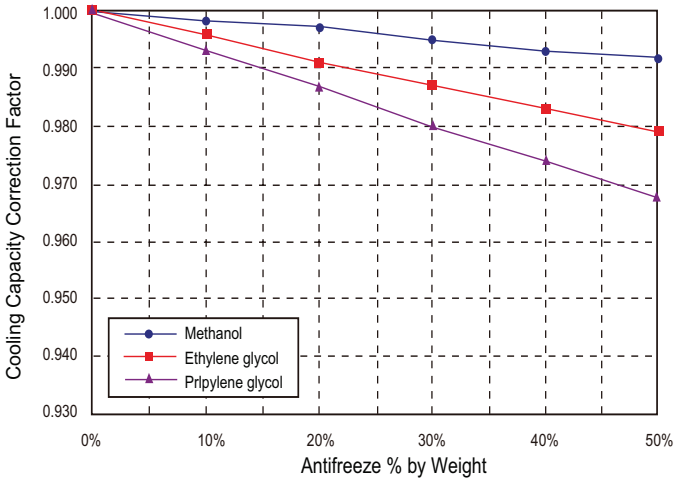


Table 10: Cooling Capacity Correction by % Antifreeze Chart.

Type	Antifreeze Concentration Level (% by Weight)				
	10%	20%	30%	40%	50%
Methanol	0.998	0.997	0.995	0.993	0.992
Ethylene Glycol	0.996	0.991	0.987	0.983	0.979
Propylene Glycol	0.993	0.987	0.980	0.974	0.968

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Calculating Corrected Cooling Power Input

To obtain the corrected cooling power input, first see the "Hydro Kit Electrical Data Table" on page 14, and find the rated cooling power input of the chosen Hydro Kit. Use the charts on the following pages for the two (2) additional factors needed to determine the corrected cooling power input:

- Factor D = Outdoor Ambient Air DB Temperature (°F) (R32 Multi V i or R32 Multi V S with LGRED Air-Source).
- Factor E = Water Flow Rate (GPM).

Then, to calculate, use:

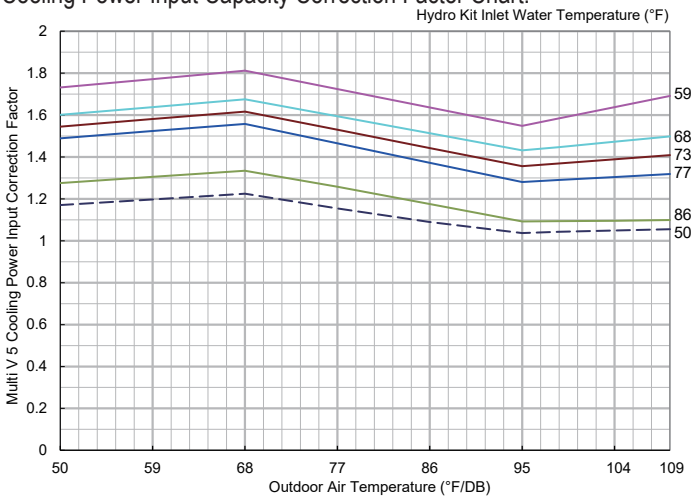
Rated Capacity (kW) x Factor D x Factor E = Corrected Cooling Power Input (kW)

Cooling Power Input Charts for R32 Multi V i and R32 Multi V S with LGRED Air-Source Units

Factor D: Outdoor Ambient Air DB Temperature (°F)

1. Find the design outdoor air temperature on the chart at right.
2. Find the Hydro Kit inlet water temperature.
3. Use the intersecting datapoint to find the cooling power input correction factor.

Figure 9: R32 Multi V i and R32 Multi V S with LGRED Air-Source Cooling Power Input Capacity Correction Factor Chart.



Factor E: Water Flow Rate (GPM)

1. Find the cooling design water flow rate (GPM) on the chart for the proposed Hydro Kit model below.
2. Find the Hydro Kit water flow rate.
3. Use the intersecting datapoint to find the cooling power input correction factor by water flow rate.

Figure 10: ZRNH423K2AA Water Flow Rate Power Input Cooling Correction Factor.

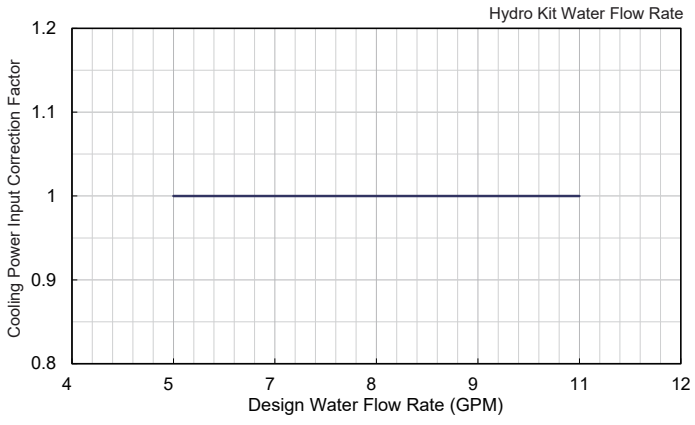
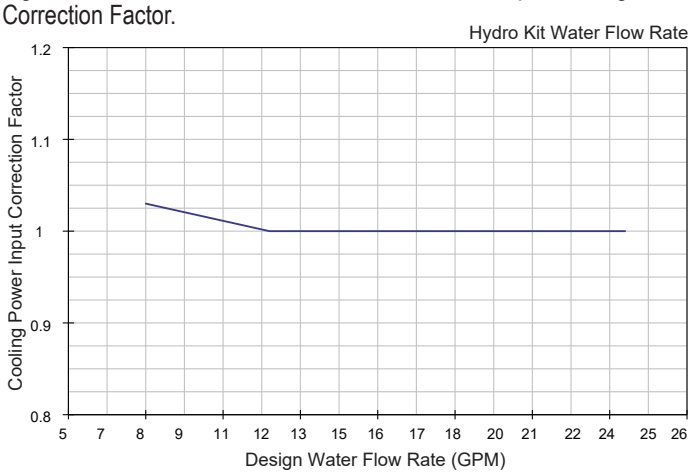


Figure 11: ZRNH963K2AA Water Flow Rate Power Input Cooling Correction Factor.



SELECTION PROCESS

MULTI V HYDRO KIT

Hydro Kits with R32 Multi V i and R32 Multi V S with LGRED Air-Source Systems

Applying Heating Capacity and Power Input Correction Factors

Calculating Corrected Heating Capacity

To obtain the corrected heating capacity at design conditions, first see the "Hydro Kit Specifications Table" on page 13, and find the rated heating capacity of the chosen Hydro Kit. Use the charts on the following pages for the four (4) additional factors needed to determine the corrected heating capacity:

- Factor A = Outdoor Ambient Air DB Temperature (°F) (R32 Multi V i or R32 Multi V S with LGRED Air-Source).
- Factor B = Water Flow Rate (GPM).
- Factor C = Antifreeze Additive (% by Weight).
- Factor D = Outdoor Unit Coil Frost Accumulation.

Then, to calculate, use:

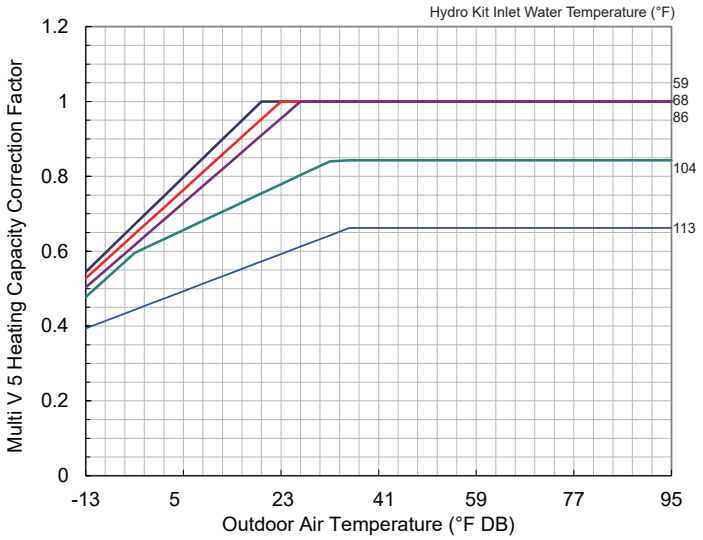
Rated Capacity (Btu/h) x Factor A x Factor B x Factor C x Factor D = Corrected Heating Capacity (Btu/h).

Heating Capacity Correction Charts for R32 Multi V i and R32 Multi V S with LGRED Air-Source Units

Factor A: Outdoor Ambient Air DB Temperature (°F)

1. Find the design outdoor air temperature on the chart.
2. Find the Hydro Kit inlet water temperature.
3. Use the intersecting datapoint to find the heating capacity correction factor by air-source ambient air temperature.

Figure 12: R32 Multi V i and R32 Multi V S with LGRED Air-Source Heating Capacity Correction Factor Chart.



Factor B: Water Flow Rate (GPM)

1. Find the heating design water flow rate (GPM) on the chart for the proposed Hydro Kit model below.
2. Find the Hydro Kit water flow rate.
3. Use the intersecting datapoint to find the heating capacity correction factor by water flow rate.

Figure 13: ZRNH423K2AA Water Flow Rate Heating Capacity Correction Factor.

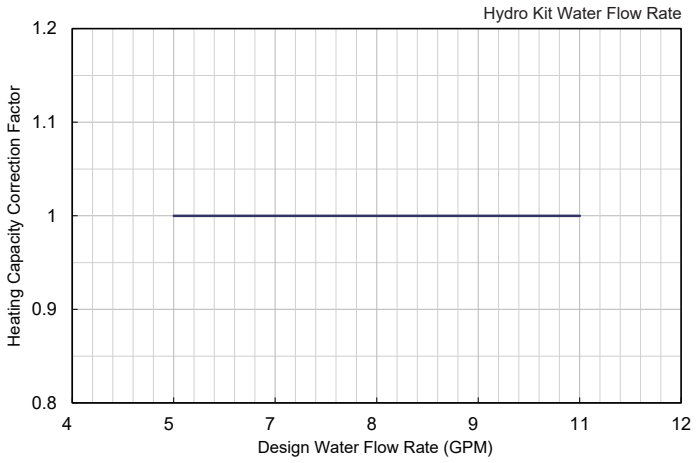
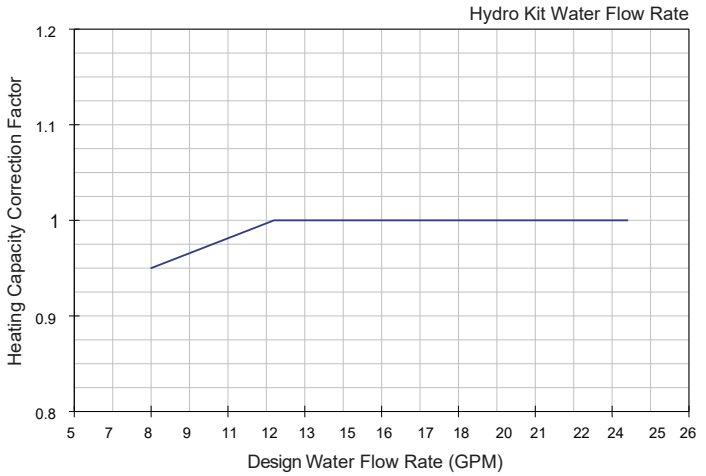


Figure 14: ZRNH963K2AA Water Flow Rate Heating Capacity Correction Factor.



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Factor C: Antifreeze Additive (% by Weight)

If the water flowing through the Hydro Kit heat exchanger has the potential to freeze, an antifreeze agent such as ethylene glycol, propylene glycol, or methanol must be added to the water circuit. The antifreeze will reduce the ability of the Hydro Kit to exchange heat energy, and this reduction must be taken into account.

1. Find the antifreeze percent by weight on the chart.
2. Find the antifreeze being considered.
3. Use the intersecting datapoint to find the heating capacity correction factor. See also table below for heating capacity correction factor datapoints at specific antifreeze concentration level percentages.

Figure 15: Heating Capacity Correction Factor by Water Flow Rate.

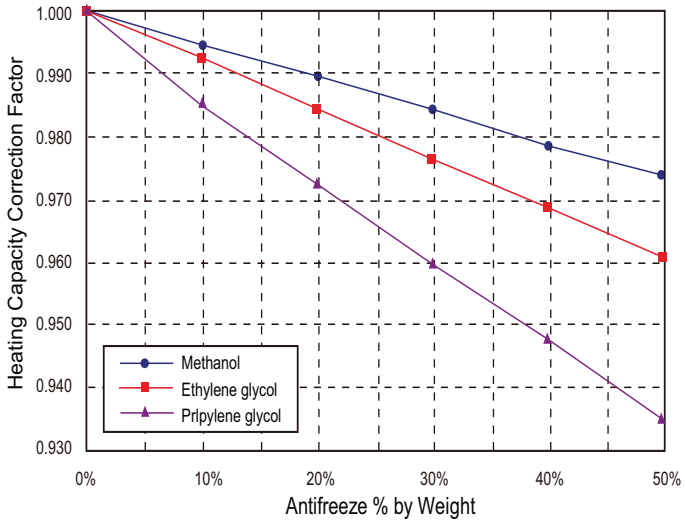


Table 11: Heating Capacity Correction by % Antifreeze Chart.

Type	Antifreeze Concentration Level (% by Weight)				
	10%	20%	30%	40%	50%
Methanol	0.995	0.990	0.985	0.979	0.974
Ethylene Glycol	0.993	0.985	0.977	0.969	0.961
Propylene Glycol	0.966	0.973	0.960	0.948	0.935

Factor D: Outdoor Unit Coil Frost Accumulation.

For air-source systems only. Calculate the Frost Accumulation Correction Factor using the information in the table at right. Applies to both Hydro Kit models.

Table 12: Outdoor Unit Frost Accumulation Capacity Correction Factor.

Coil Inlet Air Temp DB (°F)	19.4	23.0	26.6	32.0	37.4	41.0	44.6
Capacity Correction Factor	0.98	0.95	0.93	0.86	0.93	0.96	1.0

SELECTION PROCESS

MULTI V HYDRO KIT

Hydro Kits with R32 Multi V i and R32 Multi V S with LGRED Air-Source Systems

Applying Heating Capacity and Power Input Correction Factors

Calculating Corrected Heating Power Input

To obtain the corrected heating power input, first see the "Hydro Kit Electrical Data Table" on page 14, and find the rated heating power input of the chosen Hydro Kit. Use the charts on the following pages for the two (2) additional factors needed to determine the corrected heating power input:

- Factor D = Outdoor Ambient Air DB Temperature (°F) (R32 Multi V i or R32 Multi V S with LGRED Air-Source).
- Factor E = Water Flow Rate (GPM).

Then, to calculate, use:

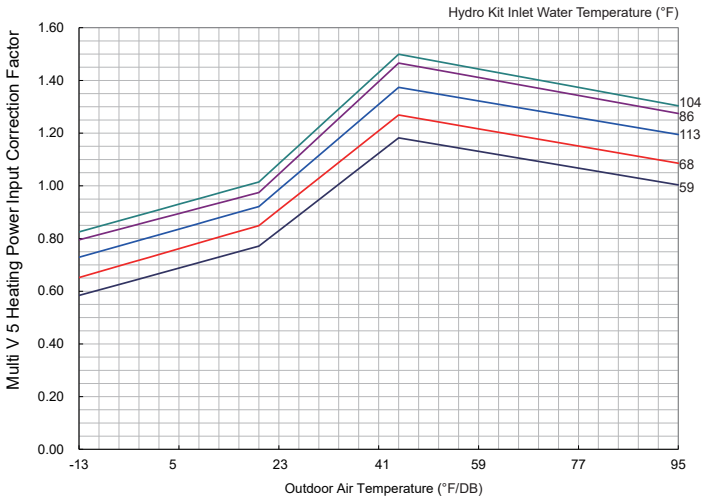
Rated Capacity (kW) x Factor D x Factor E = Corrected Heating Power Input (kW)

Heating Power Input Charts for R32 Multi V i and R32 Multi V S with LGRED Air-Source Units

Factor D: Outdoor Ambient Air DB Temperature (°F)

1. Find the design outdoor air temperature.
2. Find the Hydro Kit inlet water temperature.
3. Use the intersecting datapoint to find the heating power input correction factor.

Figure 16: R32 Multi V i and R32 Multi V S with LGRED Air-Source Heating Power Input Capacity Correction Factor Chart.



Factor E: Water Flow Rate (GPM)

1. Find the heating design water flow rate (GPM) on the chart for the proposed Hydro Kit model below.
2. Find the Hydro Kit water flow rate.
3. Use the intersecting datapoint to find the heating power input correction factor by water flow rate.

Figure 17: ZRNH423K2AA Water Flow Rate Power Input Heating Correction Factor.

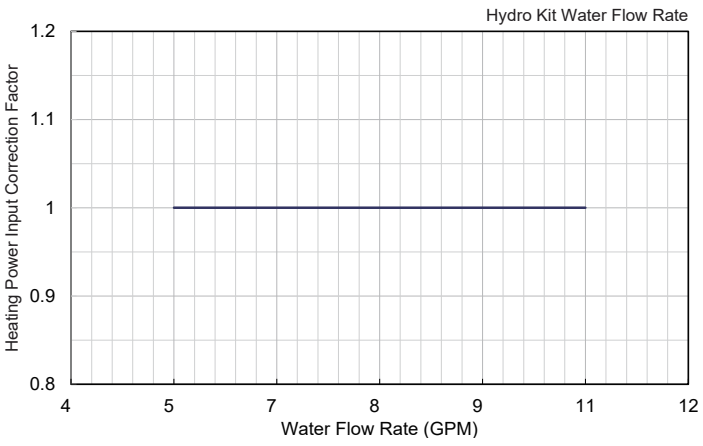
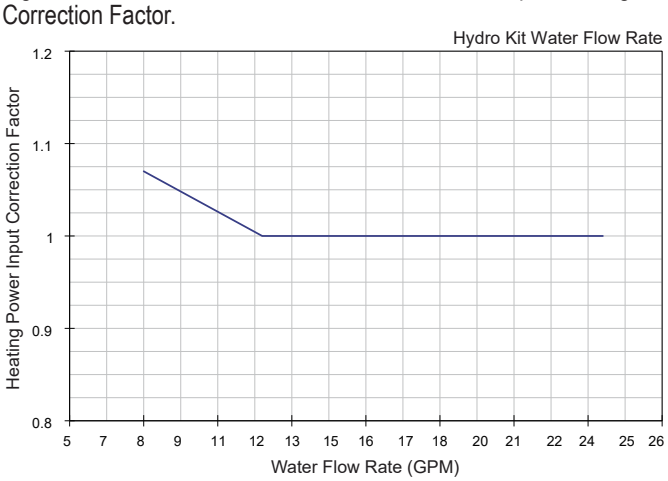


Figure 18: ZRNH963K2AA Water Flow Rate Power Input Heating Correction Factor.



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Calculating the Heat Exchanger Water Pressure Drop

To obtain the Hydro Kit Water Pressure Drop (with antifreeze), use:

Water Pressure Drop x Factor P = Antifreeze / Water Solution Heat Exchanger Waterside Pressure Drop (ft.-w.g.)

Where Factor P = Antifreeze Additive (% by Weight) Waterside Pressure Drop Correction Factor

Determine the system design water flow rate. Because the pump must be sized for the worst case scenario, choose the highest flow rate through the heat exchanger - cooling or heating mode.

1. Find the design water flow (GPM) on the chart for the proposed Hydro Kit model below.
2. Find the Hydro Kit flow rate.
3. Use the intersecting datapoint to find the waterside pressure drop through the heat exchanger using water without any antifreeze.
4. If the application warrants antifreeze, apply the antifreeze pressure drop correction factor found in the table below.
5. Find the type of antifreeze used, and find the percentage of antifreeze by weight for the solution. The intersecting datapoint is the “Anti-freeze Additive (% by Weight) Waterside Pressure Drop Correction Factor” to be used in the formula above.

Figure 19: ZRNH423K2AA Hydro Kit Heat Exchanger Water Pressure Drop.

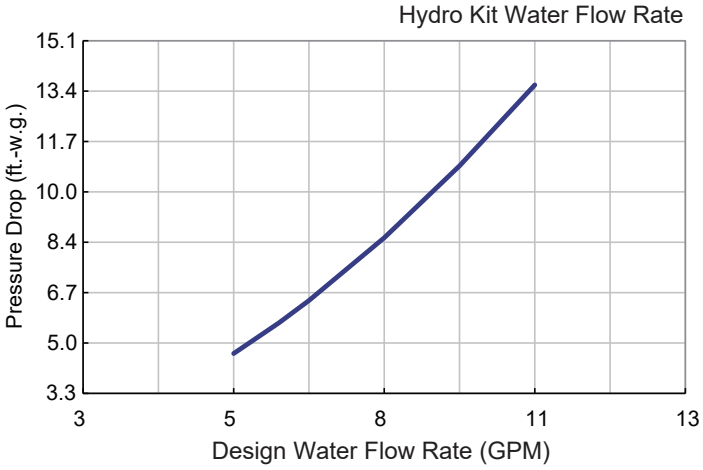


Figure 20: ZRNH963K2AA Hydro Kit Heat Exchanger Water Pressure Drop.

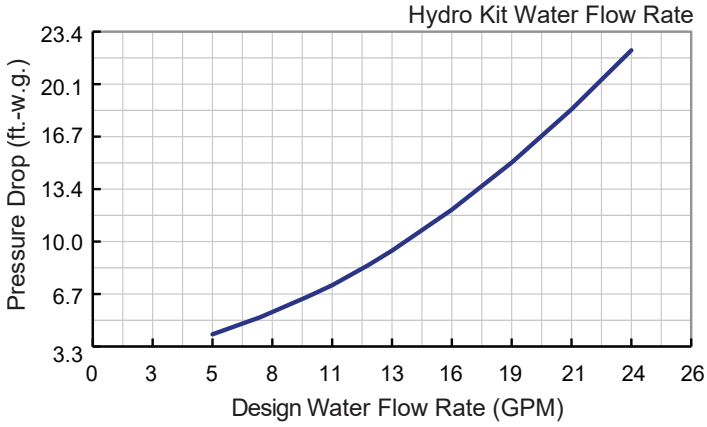


Table 13: Water Pressure Drop Correction Factors.

Type	Antifreeze Concentration Level (% by Weight)				
	10%	20%	30%	40%	50%
Methanol	1.023	1.057	1.091	1.122	1.160
Ethylene Glycol	1.024	1.068	1.124	1.188	1.263
Propylene Glycol	1.040	1.098	1.174	1.273	1.405

SELECTION PROCESS

Hydro Kits with R32 Multi V i and R32 Multi V S with LGRED Air-Source Systems

Combination Ratio Limits

Operation Limits

The Hydro Kit's outdoor ambient temperature operational limitations are defined by the R32 Multi V outdoor unit serving the system. For more information on operation limits, refer to the R32 Multi V i or R32 Multi V S with LGRED Outdoor Engineering Manuals.

Cooling Operation Limits

Figure 21: ZRNH423-963K2AA Cooling Operation Limits with R32 Multi V i and R32 Multi V S with LGRED Heat Pump Operation Outdoor Units.

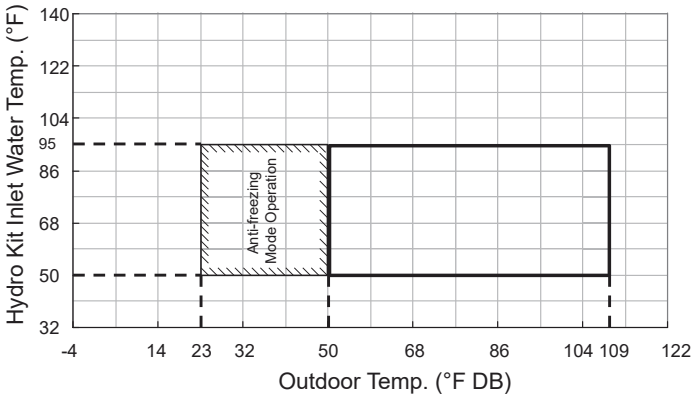
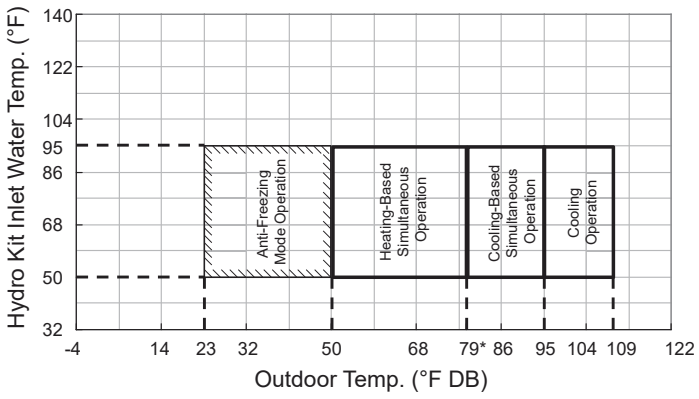


Figure 22: ZRNH423-963K2AA Cooling Operation Limits with R32 Multi V i and R32 Multi V S with LGRED Heat Recovery Operation Outdoor Units.



The 79°F DB corresponds to 60.8°F WB.

Heating Operation Limits

Figure 23: ZRNH423-963K2AA Heating Operation Limits with R32 Multi V i or R32 Multi V S with LGRED Heat Pump Operation Outdoor Units.

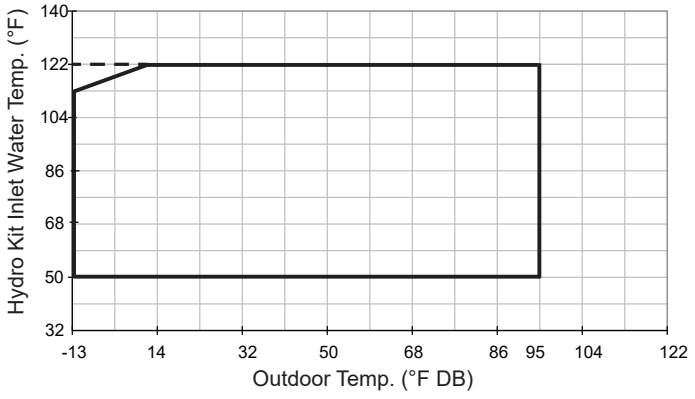
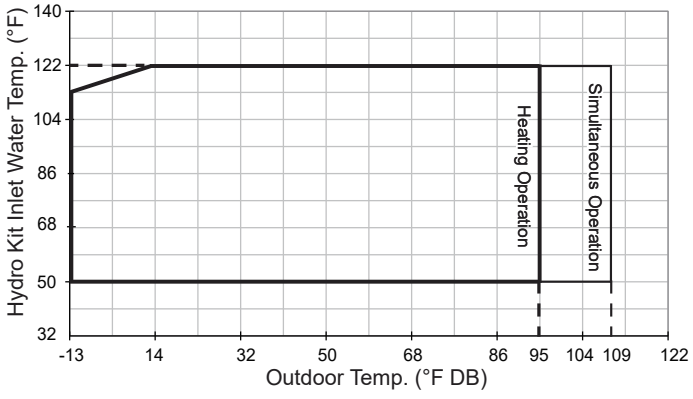


Figure 24: ZRNH423-963K2AA Heating Operation Limits with R32 Multi V i or R32 Multi V S with LGRED Heat Recovery Operation Outdoor Units.



NOTICE

- *If a system is all Hydro Kits, the maximum outdoor temperature operation limit is 95°F.*
- *Simultaneous operation means that some indoor units are operating in heating.*

Combination Ratio Limits

See the charts below for capacity correction and power input correction factors when the combination ratio of Hydro Kits to total combination capacity is considered. See table below for the maximum combination ratios of systems with all Hydro Kits or Hydro Kits combined with indoor units.

Figure 25: ZRNH423-963K2AA Capacity Correction Factor of Hydro Kits to Total Combination Capacity.

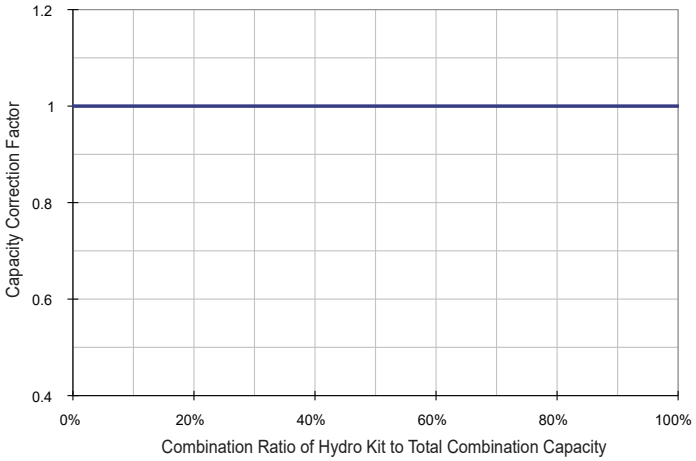


Figure 26: ZRNH423-963K2AA Power Input Correction Factor of Hydro Kits to Total Combination Capacity.

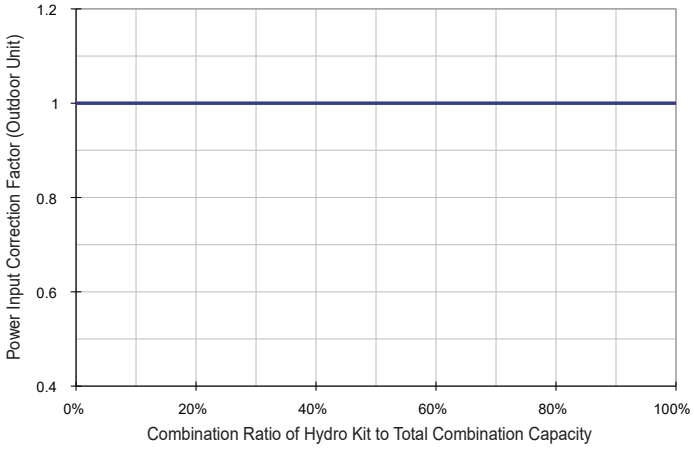


Table 14: Maximum Combination Ratios of Hydro Kits With or Without Indoor Units.

Maximum Combination Ratio (Heat Pump, Heat Recovery)	
Hydro Kit Only	**Hydro Kit + Indoor Unit**
50% - 100%	50% - 130%

1. If the combination ratio of operating indoor units ratio to the outdoor unit rated capacity is more than 130%, the airflow rate or the capacity of all indoor units and the hydro kit reduces to the lower range of operation.
2. The total capacity index of indoor units combined with Hydro Kits corresponds to the maximum combination ratio of the outdoor unit, but the capacity index of just Hydro Kits cannot be more than 100% of the capacity index of the outdoor unit.
3. Hydro Kits cannot be combined with R32 Multi V S with LGRED 24k outdoor units.

SELECTION PROCESS FOR WATER-SOURCE SYSTEMS (R32 MULTI V WATER 5)

Capacity Correction Factor by Temperature

Capacity Calculation Methods

Hydro Kit Capacity + Indoor Unit Capacity = Total Capacity

$Q_{ODU} \times (I_{HK} / I_{TOTAL}) \times F_{TC,T\_HK} \times F_{TC,W\_HK} \times F_{TC,C\_HK} \times F_{TC,P\_ODU} \times F_{TC,D\_ODU}$ = Hydro Kit Capacity

QODU = Water-Source Unit Capacity by Inlet Water temperature, and capacity ratio at standard indoor temperature. Standard indoor temperature is 80.6°F DB / 66.2°F WB on cooling mode, 68°F DB on heating mode. Refer to the capacity tables of the R32 Multi V Water 5 Unit.

F_{TC,T_HK} = Capacity Correction Factor by Water Inlet Temperature (See Figures 27 and 34).
F_{TC,W_HK} = Capacity Correction Factor by Water Flow Rate (Figures 28 and 29, and Figures 35 and 36).
F_{TC,C_HK} = Capacity Correction Factor by Combination Ratio (See Pages 41 and 42).
FT_{C,P_ODU} = Capacity Correction Factor by Refrigerant Piping Length (Refer to the correction factors of the water-source unit. For Hydro Kit applications, it will always be one [1]).
I_{HK} = Capacity Index for Hydro Kit (See Page 13).
I_{TOTAL} = Sum of Capacity Index for Hydro Kits Combined with Indoor Units (See Table 18).

Power Input Calculation Methods

Hydro Kit Power Input + Indoor Unit Power Input = Total Power Input

$P_{IODU} \times (I_{HK} / I_{TOTAL}) \times F_{PI,T\_HK} \times F_{PI,W\_HK} \times F_{PI,C\_HK}$ = Hydro Kit Power Input

P_{IODU} = Water-Source Unit Power Input by Inlet Water temperature, and capacity ratio at standard indoor temperature. Standard indoor temperature is 80.6°F DB / 66.2°F WB on cooling mode, 68°F DB on heating mode.

F_{PI,T_HK} = Power Input Correction Factor by Water Inlet Temperature. (See Figures 31 and 38).
F_{PI,W_HK} = Power Input Correction Factor by Water Flow Rate (See Figures 32 and 33, and Figures 39 and 40).
F_{PI,C_HK} = Power Input Correction Factor by Combination Ratio (See Pages 41 and 42).
I_{HK} = Capacity Index for Hydro Kit (See Page 13).
I_{TOTAL} = Sum of Capacity Index for Hydro Kits Combined with Indoor Units (See Table 18).

SELECTION PROCESS

Hydro Kits with R32 Multi V Water 5 Systems

Applying Cooling Capacity and Power Input Correction Factors

To apply and choose a Hydro Kit for use with R32 Multi V Water 5 systems (by third quarter of 2026), the designer needs to know the corrected cooling capacity (Btu/h), the cooling power input (kW), the corrected heating capacity (Btu/h), the heating power input (kW), water pressure drop through the heat exchanger (ft.-w.g.), and combination ratio limits. The following pages present the necessary steps and processes to obtain all the information needed.

Calculating Corrected Cooling Capacity

To obtain the corrected cooling capacity at design conditions, first see the "Hydro Kit Specifications Table" on page 13, and find the rated cooling capacity of the chosen Hydro Kit. Use the charts on the following pages for the three (3) additional factors needed to determine the corrected cooling capacity:

- Factor A = Inlet Water Temperature (°F) (R32 Multi V Water 5).
- Factor B = Water Flow Rate (GPM).
- Factor C = Antifreeze Additive (% by Weight).

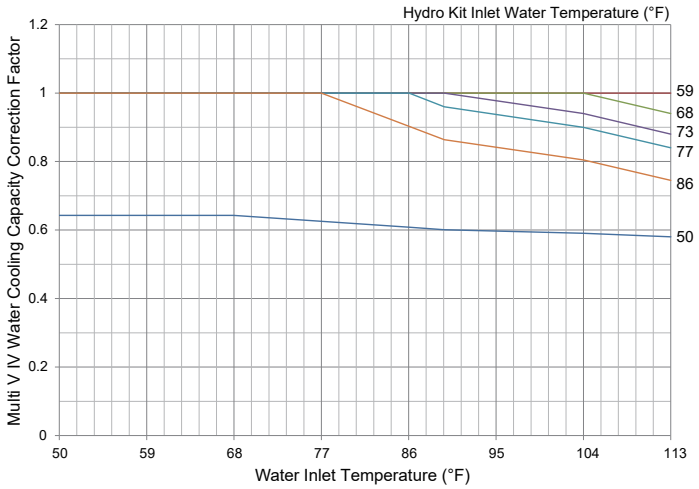
Then, to calculate, use:
Rated Capacity (Btu/h) x Factor A x Factor B x Factor C = Corrected Cooling Capacity (Btu/h).

Cooling Capacity Correction Charts for R32 Multi V Water 5 Units

Factor A: Inlet Water Temperature (°F)

1. Find the water inlet temperature on the chart.
2. Find the Hydro Kit inlet water temperature.
3. Use the intersecting datapoints to find the cooling capacity correction factor by water-source unit inlet water temperature.

Figure 27: R32 Multi V Water 5 Unit Cooling Capacity Correction Factor Chart.



Factor B: Water Flow Rate (GPM)

1. Find the cooling design water flow rate (GPM) on the chart for the proposed Hydro Kit model below.
2. Find the Hydro Kit water flow rate.
3. Use the intersecting datapoint to find the cooling capacity correction factor by water flow rate.

Figure 28: ZRNH423K2AA Water Flow Rate Cooling Capacity Correction Factor.

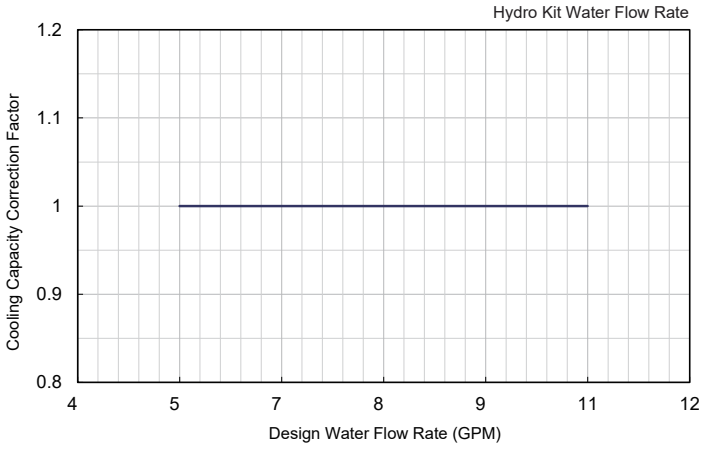
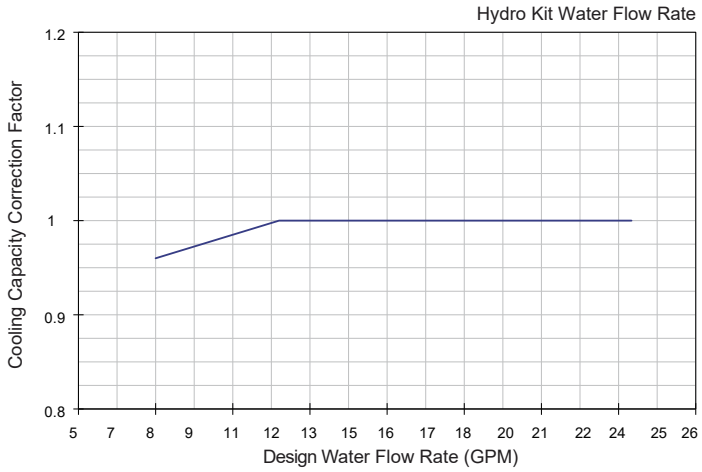


Figure 29: ZRNH963K2AA Water Flow Rate Cooling Capacity Correction Factor.



Factor C: Antifreeze Additive (% by Weight)

If the water flowing through the Hydro Kit heat exchanger has the potential to freeze, an antifreeze agent such as ethylene glycol, propylene glycol, or methanol must be added to the water circuit. The antifreeze will reduce the ability of the Hydro Kit to exchange heat energy, and this reduction must be taken into account.

1. Find the antifreeze percent by weight on the chart.
2. Find the antifreeze being considered.
3. Use the intersecting datapoint to find the cooling capacity correction factor. See also table below for cooling capacity correction factor datapoints at specific antifreeze concentration level percentages.

Figure 30: Cooling Capacity Correction by % Antifreeze.

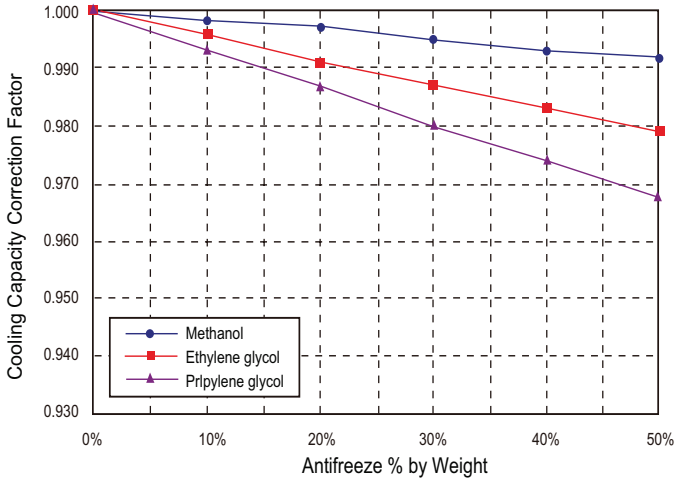


Table 15: Cooling Capacity Correction by % Antifreeze Chart.

Type	Antifreeze Concentration Level (% by Weight)				
	10%	20%	30%	40%	50%
Methanol	0.998	0.997	0.995	0.993	0.992
Ethylene Glycol	0.996	0.991	0.987	0.983	0.979
Propylene Glycol	0.993	0.987	0.980	0.974	0.968

SELECTION PROCESS

Hydro Kits with R32 Multi V Water 5 Systems

Applying Cooling Capacity and Power Input Correction Factors

Calculating Corrected Cooling Power Input

To obtain the corrected cooling power input, first see the "Hydro Kit Electrical Data Table" on page 14, and find the rated cooling power input of the chosen Hydro Kit. Use the charts on the following pages for the two (2) additional factors needed to determine the corrected cooling power input:

- Factor D = Inlet Water Temperature (°F) (R32 Multi V Water 5).
- Factor E = Water Flow Rate (GPM).

Then, to calculate, use:

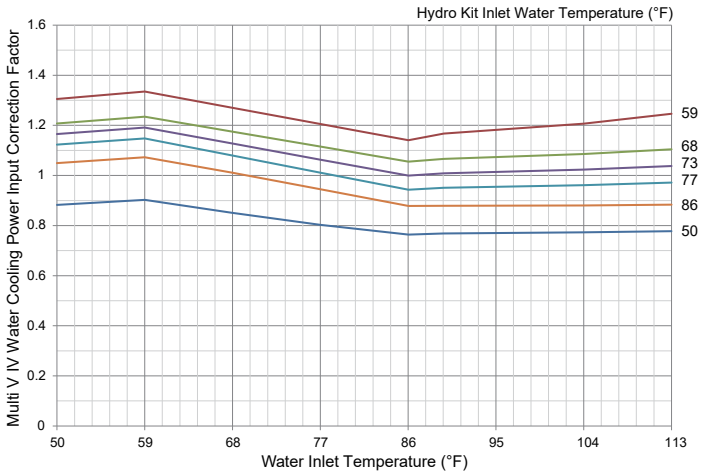
Rated Capacity (kW) x Factor D x Factor E = Corrected Cooling Power Input (kW)

Cooling Power Input Charts for R32 Multi V Water 5 Units

Factor D: Inlet Water Temperature (°F)

1. Find the design water inlet temperature in the chart at right.
2. Find the Hydro Kit inlet water temperature.
3. Use the intersecting datapoint to find the cooling power input correction factor.

Figure 31: R32 Multi V Water 5 Cooling Power Input Capacity Correction Factor Chart.



Factor E: Water Flow Rate (GPM)

1. Find the cooling design water flow rate (GPM) on the chart for the proposed Hydro Kit model below.
2. Find the Hydro Kit water flow rate.
3. Use the intersecting datapoint to find the cooling power input correction factor by water flow rate.

Figure 32: ZRNH423K2AA Water Flow Rate Power Input Cooling Correction Factor.

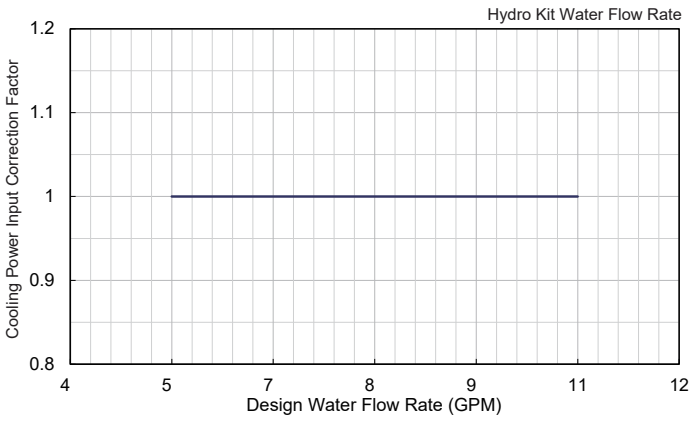
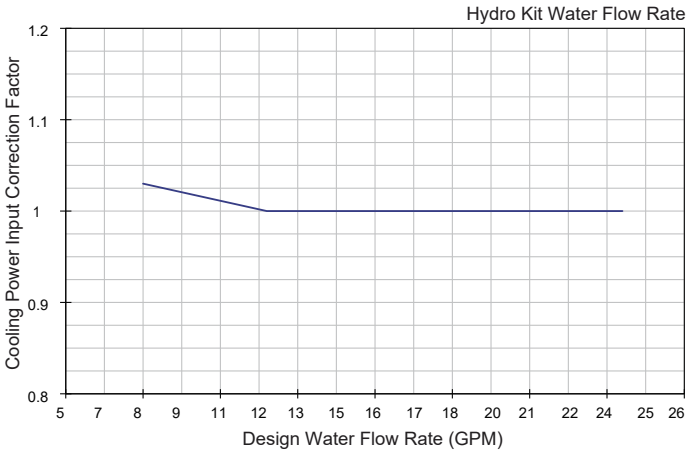


Figure 33: ZRNH963K2AA Water Flow Rate Power Input Cooling Correction Factor.



Calculating Corrected Heating Capacity

To obtain the corrected heating capacity at design conditions, first see the “Hydro Kit Specifications Table” on page 13, and find the rated heating capacity of the chosen Hydro Kit. Use the charts on the following pages for the three (3) additional factors needed to determine the corrected heating capacity:

- Factor A = Inlet Water Temperature (°F) (R32 Multi V Water 5).
- Factor B = Water Flow Rate (GPM).
- Factor C = Antifreeze Additive (% by Weight).

Then, to calculate, use:

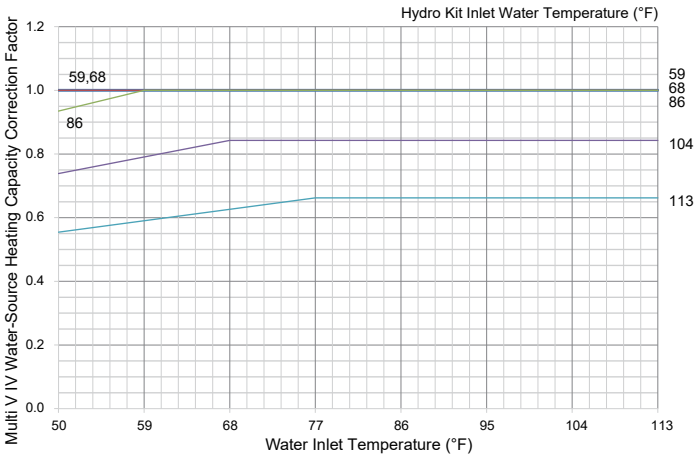
Rated Capacity (Btu/h) x Factor A x Factor B x Factor C = Corrected Heating Capacity (Btu/h).

Heating Capacity Correction Charts for R32 Multi Water 5 Units

Factor A: Inlet Water Temperature (°F)

1. Find the water inlet temperature on the chart.
2. Find the Hydro Kit inlet water temperature.
3. Use the intersecting datapoints to find the heating capacity correction factor by water-source inlet water temperature.

Figure 34: R32 Multi Water 5 Unit Heating Capacity Correction Factor Chart.



Factor B: Water Flow Rate (GPM)

1. Find the heating design water flow rate (GPM) on the chart for the proposed Hydro Kit model below.
2. Find the Hydro Kit water flow rate.
3. Use the intersecting datapoint to find the heating capacity correction factor by water flow rate.

Figure 35: ZRNH423K2AA Water Flow Rate Heating Capacity Correction Factor.

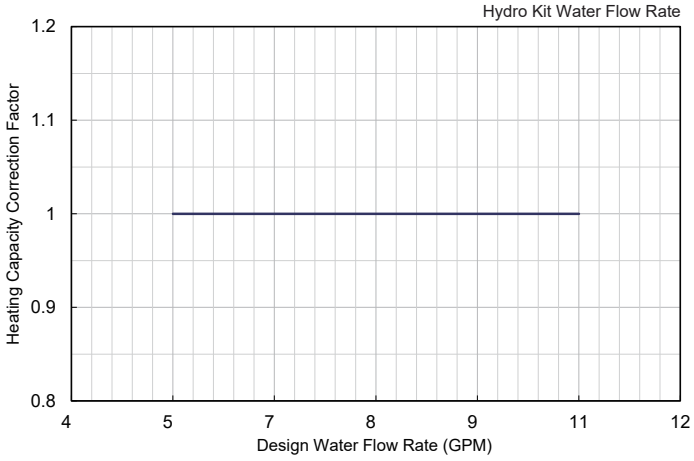
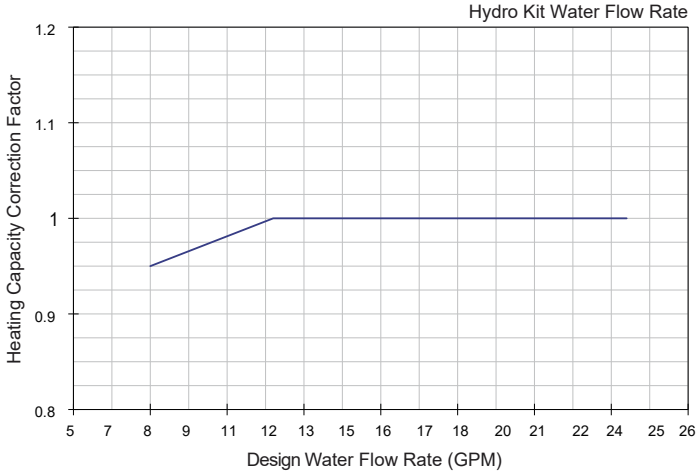


Figure 36: ZRNH963K2AA Water Flow Rate Heating Capacity Correction Factor.



Factor C: Antifreeze Additive (% by Weight)

If the water flowing through the Hydro Kit heat exchanger has the potential to freeze, an antifreeze agent such as ethylene glycol, propylene glycol, or methanol must be added to the water circuit. The antifreeze will reduce the ability of the Hydro Kit to exchange heat energy, and this reduction must be taken into account.

1. Find the antifreeze percent by weight on the chart.
2. Find the antifreeze being considered.
3. Use the intersecting datapoint to find the heating capacity correction factor. See also table below for heating capacity correction factor datapoints at specific antifreeze concentration level percentages.

Figure 37: Heating Capacity Correction Factor by Water Flow Rate.

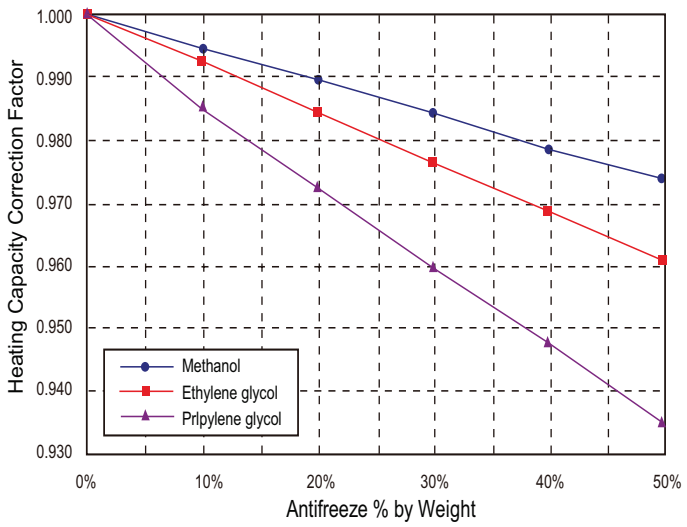


Table 16: Heating Capacity Correction by % Antifreeze Chart.

Type	Antifreeze Concentration Level (% by Weight)				
	10%	20%	30%	40%	50%
Methanol	0.995	0.990	0.985	0.979	0.974
Ethylene Glycol	0.993	0.985	0.977	0.969	0.961
Propylene Glycol	0.966	0.973	0.960	0.948	0.935

Calculating Corrected Heating Power Input

To obtain the corrected heating power input, first see the “Hydro Kit Electrical Data Table” on page 14, and find the rated heating power input of the chosen Hydro Kit. Use the charts on the following pages for the two (2) additional factors needed to determine the corrected heating power input:

- Factor D = Inlet Water Temperature (°F) (R32 Multi V Water 5).
- Factor E = Water Flow Rate (GPM).

Then, to calculate, use:

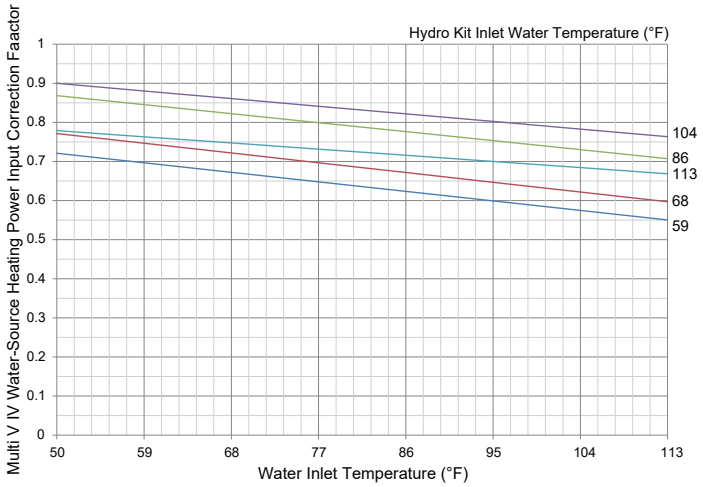
Rated Capacity (kW) x Factor D x Factor E = Corrected Heating Power Input (kW)

Heating Power Input Charts for R32 Multi Water 5 Units

Factor D: Inlet Water Temperature (°F)

1. Find the design water inlet temperature.
2. Find the Hydro Kit inlet water temperature.
3. Use the intersecting datapoint to find the heating power input correction factor.

Figure 38: R32 Multi V Water 5 Unit Heating Power Input Capacity Correction Factor Chart.



Factor E: Water Flow Rate (GPM)

1. Find the heating design water flow rate (GPM) on the chart for the proposed Hydro Kit model below.
2. Find the Hydro Kit water flow rate.
3. Use the intersecting datapoint to find the heating power input correction factor by water flow rate.

Figure 39: ZRNH423K2AA Water Flow Rate Power Input Heating Correction Factor.

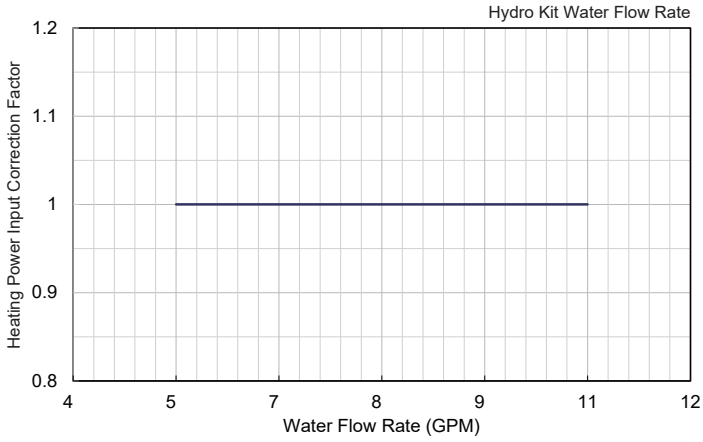
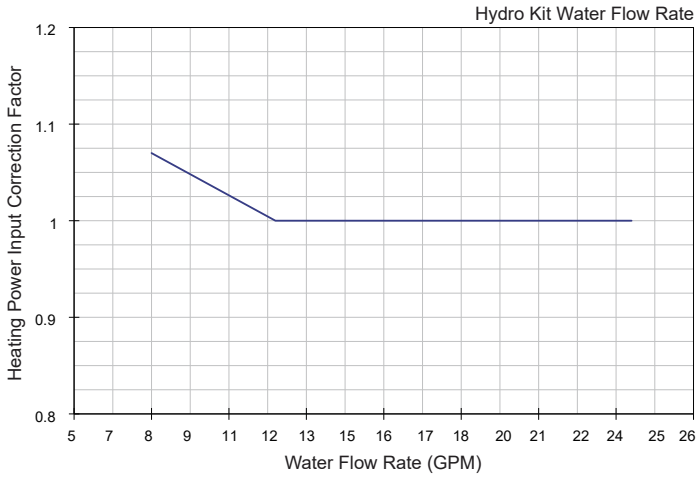


Figure 40: ZRNH963K2AA Water Flow Rate Power Input Heating Correction Factor.



SELECTION PROCESS

Hydro Kits with R32 Multi V Water 5 Systems

Water Pressure Drop

Calculating the Heat Exchanger Water Pressure Drop

To obtain the Hydro Kit Water Pressure Drop (with antifreeze), use:

Water Pressure Drop x Factor P = Antifreeze / Water Solution Heat Exchanger Waterside Pressure Drop (ft.-w.g.)

Where Factor P = Antifreeze Additive (% by Weight) Waterside Pressure Drop Correction Factor

Determine the system design water flow rate. Because the pump must be sized for the worst case scenario, choose the highest flow rate through the heat exchanger - cooling or heating mode.

1. Find the design water flow (GPM) on the chart for the proposed Hydro Kit model below.
2. Find the Hydro Kit flow rate.
3. Use the intersecting datapoint to find the waterside pressure drop through the heat exchanger using water without any antifreeze.
4. If the application warrants antifreeze, apply the antifreeze pressure drop correction factor found in the table below.
5. Find the type of antifreeze used, and find the percentage of antifreeze by weight for the solution. The intersecting datapoint is the “Anti-freeze Additive (% by Weight) Waterside Pressure Drop Correction Factor” to be used in the formula above.

Figure 41: ZRNH423K2AA Hydro Kit Heat Exchanger Water Pressure Drop.

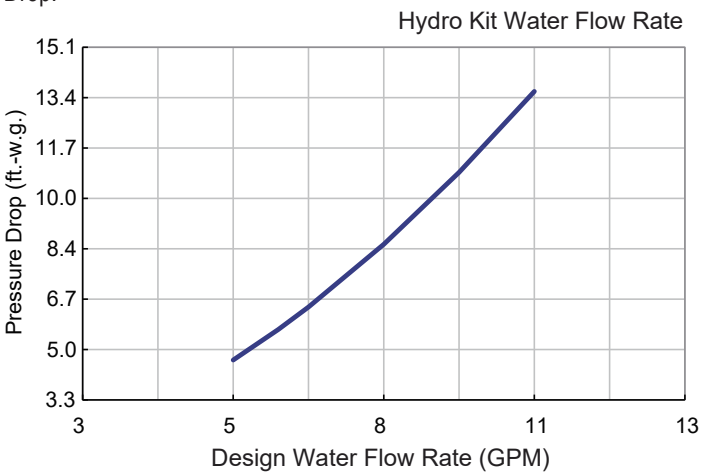


Figure 42: ZRNH963K2AA Hydro Kit Heat Exchanger Water Pressure Drop.

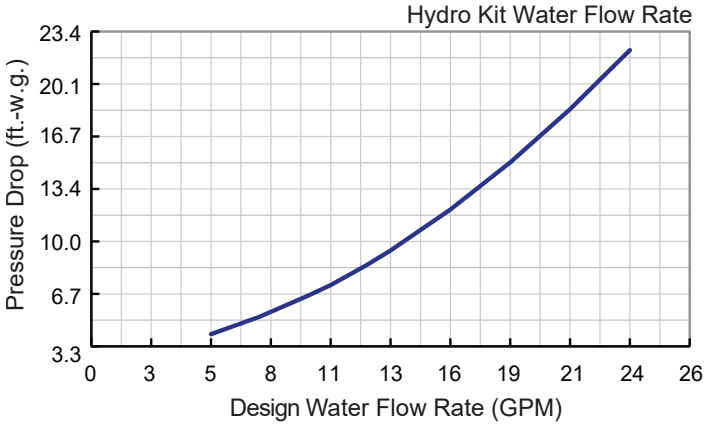


Table 17: Water Pressure Drop Correction Factors.

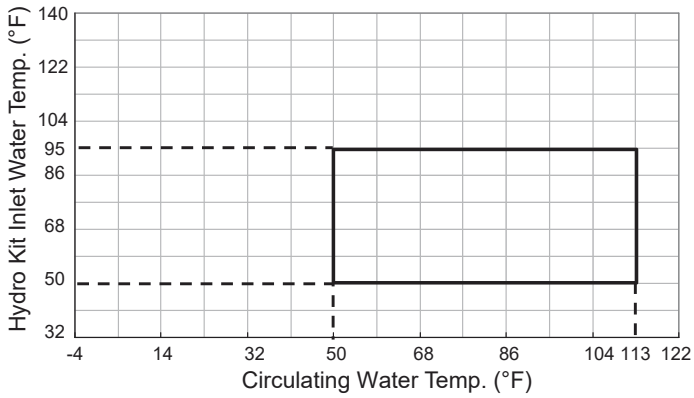
Type	Antifreeze Concentration Level (% by Weight)				
	10%	20%	30%	40%	50%
Methanol	1.023	1.057	1.091	1.122	1.160
Ethylene Glycol	1.024	1.068	1.124	1.188	1.263
Propylene Glycol	1.040	1.098	1.174	1.273	1.405

Operation Limits

The Hydro Kit's condenser circuit water temperature operational limitations are defined by the R32 Multi V unit serving the system. For more information on operation limits, refer to the R32 Multi V Water 5 Engineering Manual.

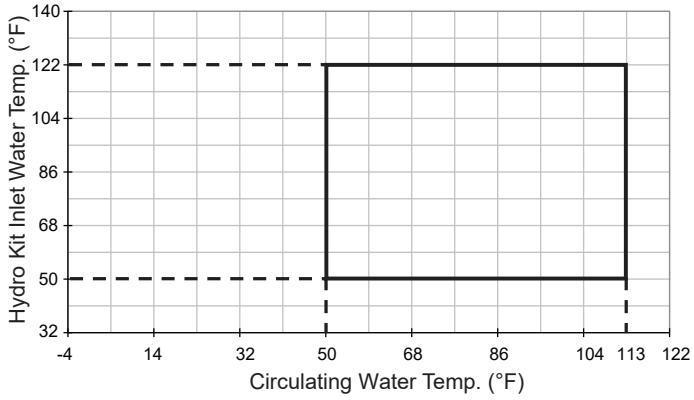
Cooling Operation Limits

Figure 43: ZRNH423-963K2AA Cooling Operation Limits for R32 Multi V Water 5 Units.



Heating Operation Limits

Figure 44: ZRNH423-963K2AA Heating Operation Limits for R32 Multi V Water 5 Units.



Combination Ratio Limits

See the charts below for capacity correction and power input correction factors when the combination ratio of Hydro Kits to total combination capacity is considered. See table below for the maximum combination ratios of systems with all Hydro Kits or Hydro Kits combined with indoor units.

Figure 45: ZRNH423-963K2AA Capacity Correction Factor of Hydro Kits to Total Combination Capacity.

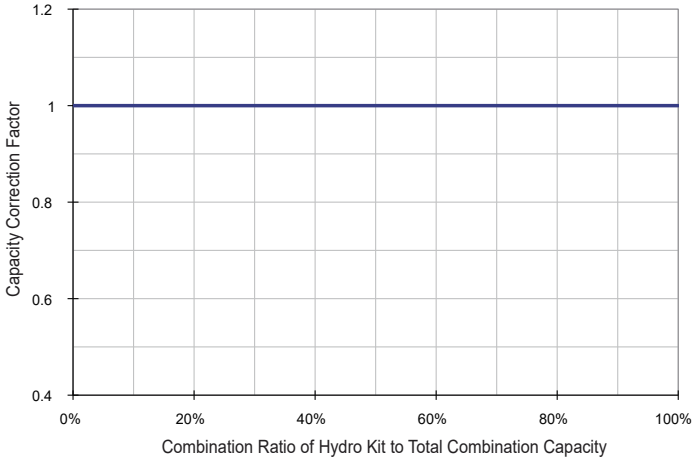


Figure 46: ZRNH423-963K2AA Power Input Correction Factor of Hydro Kits to Total Combination Capacity.

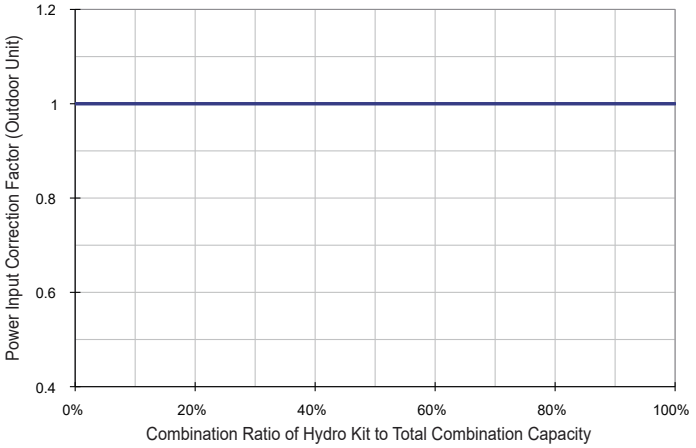


Table 18: Maximum Combination Ratios of Hydro Kits With or Without Indoor Units.

Maximum Combination Ratio (Heat Pump, Heat Recovery)	
Hydro Kit Only	**Hydro Kit + Indoor Unit**
50% - 100%	50% - 130%

1. If the combination ratio of operating indoor units ratio to the outdoor unit rated capacity is more than 130%, the airflow rate or the capacity of all indoor units and the hydro kit reduces to the lower range of operation.
2. The total capacity index of indoor units combined with Hydro Kits corresponds to the maximum combination ratio of the outdoor unit, but the capacity index of just Hydro Kits cannot be more than 100% of the capacity index of the outdoor unit.
3. Hydro Kits cannot be combined with R32 Multi V S with LGRED 24k outdoor units.

LIMITED WARRANTY (USA)

The product's full Limited Warranty terms and conditions and arbitration requirements are available at https://www.lghvac.com.

LG Air Conditioning Technologies

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