

LM Split Systems

Water Source Heat Pump

2 to 6 ton

The fully featured LM Split Systems include a standard two-stage scroll compressor and an ECM (Electronically Commutated Motor) for best-in-class efficiency and comfort.

LM SPLIT SYSTEMS	PART LOAD		FULL LOAD	
	UP TO 26.4 EER GLHP	UP TO 6.1 COP WSHP	UP TO 19.3 EER GLHP	UP TO 5.3 COP WSHP



Commercial Sales Catalog
boschheatingandcooling.com

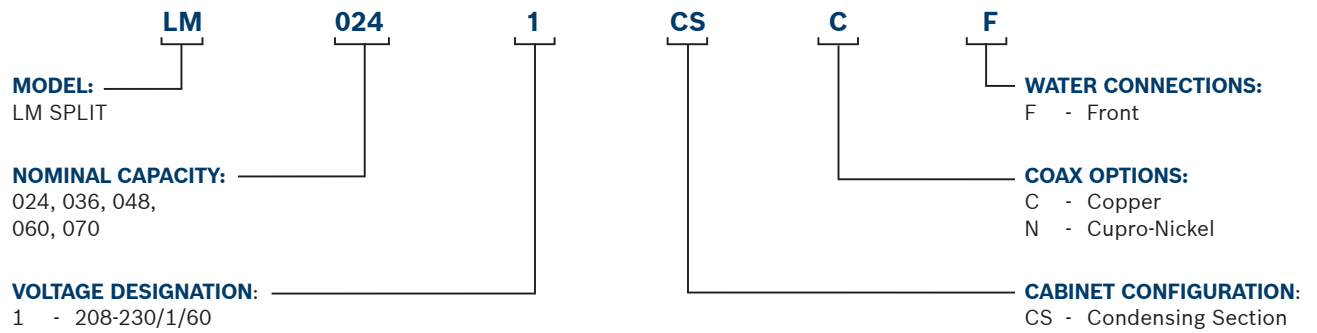


BOSCH
Invented for life

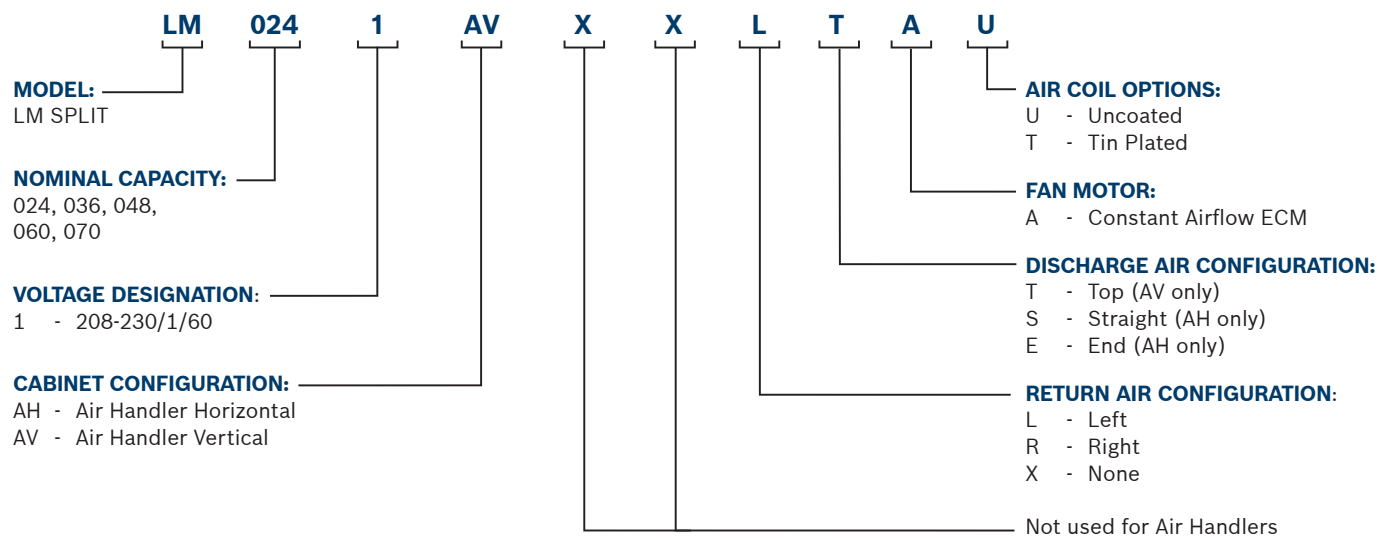
Table of Contents

MODEL NOMENCLATURE.....	2	Earth Coupling Options	13
EQUIPMENT PAIRING	2	Vertical Ground Loop System	14
CERTIFIED PERFORMANCE DATA	3	Horizontal Ground Loop System	14
FHP EQUIPMENT	4	Surface Water, Lake or Pond System	15
ABOUT BOSCH THERMOTECHNOLOGY		Well Water System	15
IN NORTH AMERICA	4	TYPICAL HEAT PUMP OPERATION	15
LM SPLIT SYSTEMS	5	Cooling Mode	15
Quality	5	Heating Mode	15
Advantages of FHP Technology.....	5	TYPICAL UNIT INSTALLATION	16
Increased Flexibility in Installation	5	Unit Location	16
Quiet Operation	5	Vertical Unit Installation.....	16
Serviceability	6	Horizontal Unit Installation	16
LM SPLIT MODELS 024 - 070.....	6	Ductwork and Sound	
FEATURES, FUNCTIONS AND BENEFITS	6	Attenuation Considerations	17
Cabinet	6	Piping.....	18
Unit Configurations	6	Condensate Drain Piping	18
Filter Racks and Unit Options.....	6	Operating Limits – Cooling & Heating.....	18-19
Optional MERV-8 and MERV-13 Filters.....	6	EQUIPMENT SELECTION	19
ECM Constant Airflow.....	7	ANTIFREEZE CORRECTION DATA.....	20
Blower Housing	7	WATERSIDE PRESSURE DROP	20
Refrigerant Circuit.....	7	CAPACITY DATA	21-30
Evaporator Coil.....	7	LM024 – Part Load (600 CFM).....	21
UNIT PROTECTION MODULE (UPM)	8	LM024 – Full Load (900 CFM).....	22
UPM Control Board Features.....	8	LM036 – Part Load (1050 CFM))	23
DDC CONTROLS (OPTION).....	9	LM036 – Full Load (1225 CFM).....	24
DDC Room Sensors.....	9	LM048 – Part Load (1100 CFM)	25
DDC Zone Sensors	10	LM048 – Full Load (1700 CFM)	26
ADDITIONAL FEATURES	10	LM060 – Part Load (1500 CFM).....	27
Hanging Brackets.....	10	LM060 – Full Load (2000 CFM)	28
Water Connections.....	10	LM070 – Part Load (1600 CFM)	29
ADDITIONAL OPTIONS	11	LM070 – Full Load (2200 CFM)	30
Air Side Pressure Drop.....	11	ELECTRICAL DATA.....	31
Flow Proving Switch.....	11	Condensing Section.....	31
Energy Management Switch (EMS)	11	Air Handler Section	31
Smart Start Control	11	Electric Heat Option.....	32
ACCESSORIES	12	BLOWER MOTOR PERFORMANCE.....	33
Thermostats.....	12	ECM Constant Air Flow (Variable Speed)	33
Hose Kits.....	12	PHYSICAL DATA.....	34
SYSTEMS	13	CONDENSING SECTION DIMENSIONS	35
Water Source Cooling Tower/Boiler Systems	13	VERTICAL AIR HANDLER DIMENSIONS.....	35
Geothermal Systems	13	HORIZONTAL AIR HANDLER DIMENSIONS	36
		GUIDE SPECIFICATIONS.....	37-Back Cover

Condensing Section Model Nomenclature



Air Handler Model Nomenclature



Equipment Pairing

Model	Pair Air Handler	
	Unit 1	Unit 2
LM024-1CS	LM024-1AVX	LM024-1AHX
LM036-1CS	LM036-1AVX	LM036-1AHX
LM048-1CS	LM048-1AVX	LM048-1AHX
LM060-1CS	LM060-1AVX	LM060-1AHX
LM070-1CS	LM070-1AVX	LM070-1AHX

NOTES: 1. Liquid and suction line sizes should be sized according to the tables in the IOM, not according to the king valve connection size.
 2. Refrigerant line sizes shall not exceed 75ft in length (equivalent).
 3. All units require a BiFlow filter drier. Filter drier must be UL listed for R410A with a minimum rated working pressure of 680 psi.

Certified Performance Data

AHRI/ANSI 13256-1 Performance Data															
Model				Water Loop Heat Pump				Ground Water Loop Heat Pump				Ground Loop Heat Pump			
				Cooling 86 °F		Heating 68 °F		Cooling 59 °F		Heating 50 °F		Cooling 77 °F		Heating 32 °F	
Condensing Section	Air Handler Section	GPM	Load	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP
LM024-1CS	LM024-1AV	6	Full	23100	15.3	26400	5.2	28530	24.9	22200	4.5	26200	19.3	17700	3.8
			Partial	17200	16.8	19900	5.5	21600	32.7	16200	4.6	20000	26.4	13800	3.9
LM036-1CS	LM036-1AV	9	Full	36100	15	44100	5.1	40900	22.5	35200	4.5	37900	17.3	27400	3.8
			Partial	27000	17.9	32000	6.1	30600	30.2	25250	4.9	29300	25.4	22400	4.4
LM048-1CS	LM048-1AV	12	Full	46900	14.9	56800	5.3	52800	21.7	46600	4.6	48900	17.1	37800	3.9
			Partial	35600	18.2	40400	5.5	39400	30.3	34200	4.7	38400	26	30200	4.2
LM060-1CS	LM060-1AV	15	Full	56100	14.1	74500	5	64500	20.5	60500	4.4	58900	16.1	49000	3.8
			Partial	42800	16	54500	5.7	49600	27	44200	4.7	47900	23.3	39400	4.2
LM070-1CS	LM070-1AV	18	Full	65500	13.9	77700	4.5	74300	20.5	65700	4.1	68500	16	53200	3.5
			Partial	50400	15.4	58600	4.8	58200	26.3	48500	4.1	55800	22.2	43700	3.7

Ratings based upon AHRI/ANSI 13256-1 with 1" disposable filter

Subject to change without prior notice.



FHP Equipment

Specializing in efficient green technology for commercial heating and cooling products. FHP products are one of the leading Geothermal and Water Source heat pumps in the market, which assures that you are buying a unit that you can trust. Bosch Thermotechnology Corp. is dedicated to providing highly efficient heating and cooling solutions to the private and public sectors.

Bosch Thermotechnology Corp. is always on the forefront of product development and innovative design to optimize the performance of FHP units. Our products are designed and manufactured to the highest quality, reflecting the no-compromise standards for which FHP and Bosch are renowned in order to provide our customers with the highest level of satisfaction and comfort. The variety of options, energy efficiency, and uncompromising quality of all FHP products makes them the ideal choice for the commercial new construction market and the ease of designing into tight retrofit spaces of buildings.

FHP's engineering efforts have been focused on providing a greener world for future generations. Faced with today's tough environmental challenges and with global warming, Bosch Thermotechnology Corp. is more committed than ever to develop solutions which utilize sustainable energy

sources in order to conserve our planet's resources. With our heat pumps, you not only will save money on energy bills but also help create a better world.

The LM Split System water-to-air heat pump is the result of our almost 40+ years of research and development experience in the US heat pump market. It is the most flexible geothermal technology available today, designed for reliability, reducing installation costs and provide the building with comfort and the cost savings expected from FHP.

About Bosch Thermotechnology Corp. in North America

Bosch Thermotechnology Corp. is a leading source of high quality heating and cooling systems in North America. The company offers tankless, point-of-use water heaters, solar thermal systems, Bosch and Buderus conventional and condensing boilers, heat pump water heaters, Bosch and FHP geothermal heat pumps as well as controls and accessories for every product line. Bosch Thermotechnology Corp. is committed to reinventing energy efficiency by offering smart products that work together as integrated systems, which enhance quality of life in an ultra efficient and environmentally friendly manner.



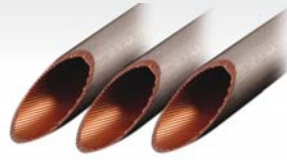
Proven and Tested Technologies

FHP heat pumps are made by highly trained and skilled workers in the FHP factory based in Fort Lauderdale, Florida. They are manufactured with rigorous standards and factory testing ensuring trustworthy operation over the life of the unit. Bosch's ISO 9001 and ISO 14001 certified facilities provide consistent quality in every unit built.





2-Stage Scroll Compressors



Tin Electro-Plated Copper Tubing



Closed Cell Foam Insulation

LM Split Systems

The LM split system water to air heat pumps offer high efficiency and high capacity with standard features like two speed scroll compressors and ECM fan motors, giving you the flexibility, performance and quiet operation needed to exceed the expectations of your clients.

Quality

The LM Split System features Tin-Plated coated evaporator coils as an option, stainless steel drain pans to ensure a long and life and a galvanized steel cabinet which provides an anti-corrosive finish as standard. Rigorous factory testing helps to ensure no hassles from the start while FHP's 40+ years of experience in designing heat pumps is your assurance of the highest quality product.

Advantages of FHP Technology

- ▶ Best-in-class efficiency
- ▶ 2-stage capacity compressor
- ▶ Field configurable supply air
- ▶ Simple installation and operation
- ▶ Low installation costs
- ▶ Lower operating costs
- ▶ Flexibility and comfort
- ▶ Energy efficiency
- ▶ Space savings
- ▶ Superior quality
- ▶ Quiet operation



Increased Flexibility in Installation

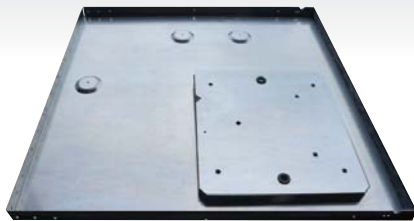
The LM split condensing section can be placed up to 75' one-way remotely from the air handler section which allows for the installation to be in locations where space may be limited. Additionally, this orientation allows installing the condensing section, which is the major contributor to noise and vibration, to be away from occupied areas. Multiple condensing units may be centrally located to facilitate servicing.

The location of the LM Split air handlers can be concealed within a variety of areas inside the building where it will connect to air and ventilation ducts to deliver comfortable air. Air handling sections are available in vertical or horizontal configurations from 2 through 6 tons so there is a unit to meet your every need.

Quiet Operation

The ECM (Electronically Commutated Motor) motors on this unit are extremely quiet. The air flow can be adjusted to suit a specific installation and ensure your highest level of comfort.

Noise reduction is a critical consideration of the unit design. All LM Split condensing sections have a unique floating base construction with the compressor mounted on a heavy steel plate which rests on a high density rubber pad on the base of the unit. In addition, compressors are mounted on rubber grommets. This double isolation, unique to FHP equipment and standard in all LM Split Systems, prevents vibration and noise transmission from the compressor to the unit structure resulting in exceptionally quiet operation. The condensing section may have a 1/2" closed cell foam insulation which aids in sound attenuation.

**Standard****MERV-8 or MERV-13
Filter Option****2" 4-Sided
Filter Rack**

The LM Split air handler section offers the ½" thick, closed cell foam insulation as an option on all unit sizes and will also aid the indoor air quality (IAQ) of commercial buildings by reducing sound and avoiding the possibility of glass fibers in the airstream.

Serviceability

All units are designed to be serviced from the front of the unit. Schrader valves for high and low pressure gauges are standard, and the electrical box components are easily accessible for diagnosing and servicing the unit.

Large removable panels aid in servicing the unit, when necessary. Separate electrical knockouts in the unit corner post allow for easy and safe routing of high and low voltage lines to the inside of the cabinet.

LM Split System Models 024 - 070

The new, fully featured LM Split Systems come standard with two stage scroll compressor and an ECM blower motor for best-in-class efficiency and comfort. 5 Split Systems are available from 2 through 6 tons

Features, Functions and Benefits

Cabinet

The LM cabinetry is constructed using heavy-gauge, galvanized steel. This type of steel provides superior corrosion protection for units installed indoors. All interior surfaces for the air handler section are lined with ½" thick, 1.5lb/cu ft density micromat multi-density, coated fiberglass insulation for thermal insulation and acoustical attenuation. As an option, closed cell foam is available. This is a ½" thick high density, closed cell rubber foam insulation which is fiber free, cleanable and further aids in extra quiet operation by reducing casing

radiated noise levels from the unit. Closed cell foam insulation is standard on all interior surfaces of the condensing section unless designated for outdoor applications; then there is an option for no insulation. Protection against corrosion is a feature in the LM Split System. The stainless steel drain pan will last the lifetime of the unit while helping to resist corrosion and will avoid cracking that may occur with steel or plastic materials.

Unit Configurations

All air handler sections are available in horizontal and vertical configurations. Additionally, several options of return air and supply air are offered as standard, providing configuration flexibility.

Filter Racks and Options

Units come standard with a 1" construction filter and a 2" four-sided filter rack. The 2" four-sided filter rack along with an optional 2" pleated filter greatly improves air filtration. Filter doors allow for easy routine maintenance and changing of the air filter. A 1" return duct collar is integral to the filter rack eliminating the need for field mounted duct collars.

MERV-8 and MERV-13 Filters

The optional MERV-8 or -13 filter is a premium choice for air filtration on commercial HVAC projects. The MERV rated filter is a cost effective way of upgrading air quality while maintaining low pressure drop and sustaining long service life. This filter effectively removes 96% of airborne matter, such as fine particulates, bacteria, smoke, gases and odors, and allergens including dust mites, pollen, mold spores, dust and smog. MERV-13 rated filters are a minimum requirement on LEED® projects.



ECM
Constant Airflow



Blower Housing
(with Removable Inlet Ring)



Tin-Plated with
Coated Fin Evaporator Coil

ECM Constant Airflow Fan Motor

The LM Split System offers a high efficiency ECM, available in 1/3hp to 1hp, providing constant airflow over a wide static pressure range up to 1 in.w.g. Featured in all unit sizes, this blower motor is a great choice in high filtration applications, such as with a MERV-13 pleated filter. The motor has a soft start/stop feature helping to keep noise to a minimum.

Passive dehumidification can be achieved with the constant airflow ECM by reducing nominal airflow as much as 15%. This control feature lowers air coil temperature and prevents over-cooling of the space when in dehumidification mode.

Blower Housing

A removable inlet ring is a standard feature of the blower housing on all unit sizes. The removable inlet ring helps facilitate motor removal without having to remove the fan housing from the cabinet.

Refrigerant Circuit

Units are designed using the optimum combination of compressor, water and air coils to provide peak performance. Units are rated to withstand 600 PSIG working refrigerant pressure and 400 PSIG working water pressure. Heavy duty heat pump compressors are used in all units. Two capacity scroll compressors offer optimum performance for each unit size. Refrigerant to water heat exchangers are a coaxial tube-in-tube type that provides a robust construction, that aids in ensuring years of trouble free operation. Coaxial coils are selected and designed for peak performance, offering the best combination of low water pressure drop and maximum heat transfer in both the cooling and heating modes. Standard coaxial coils have a copper interior water tube and a steel outer shell.

Subject to change without prior notice.

Offered as an option is our cupro-nickel coils for applications that may have water quality of lower quality.

In geothermal applications where fluid temperatures can drop below the dew point of the surrounding air, the LM split system is prepared with insulation to prevent water coils and refrigerant piping from sweating. Air side refrigerant coils have copper tubes, aluminum fins and side plates to prevent corrosion. The air coils are state-of-the-art, employing lanced fin and rifled tubing for maximum heat transfer.

Large face areas result in lower face velocity reducing sound while ensuring high latent heat removal for maximum dehumidification in the cooling mode. A pilot operated four-way reversing valve in the refrigeration circuit allows the unit to operate in either the heating or cooling mode. All FHP units have the reversing valve energized in cooling mode. This will ensure you are not left without heat in the middle of winter, should the reversing valve coil fail.

A thermal expansion valve (TXV) is a key element to a heat pump; it is a component in the air conditioning system that controls the amount of refrigerant flow in the system. LM Split Systems have one TXV located in the condensing section and another TXV in the air handling section ensuring optimal refrigerant flow and performance.

Evaporator Coil

Air handling sections come standard with a copper tube aluminum fin evaporator coil. Available as an option is our Tin-Plated evaporator coil protection; this will protect the evaporator coil from most forms of corrosive elements in the airstream and add life expectancy to the entire system.



Coax Coil



UPM Control Board

Unit Protection Module (UPM)

Each LM Split System is factory provided with a Unit Protection Module (UPM) that controls the unit operation and monitors the safety controls that protect the unit. The UPM interfaces with the thermostat or a human-machine interface (HMI). The main purpose of the UPM is to protect the compressors by monitoring the different states of switches and sensors. This module provides time delays and protects the unit against freezing of the water to refrigerant and air to refrigerant heat exchangers as well as condensate overflow when the appropriate sensors are installed.

UPM Control Board Features

- ▶ **Anti-Short Cycle Timer** – 5 minute delay on break timer to prevent compressor short cycling.
- ▶ **Random Start** – Each controller has a unique random start delay ranging from 270 to 300 seconds after power is applied to the board. This will prevent the simultaneous start of multiple units after a power outage.
- ▶ **Low Pressure Bypass Timer** – The low pressure switch is bypassed for 120 seconds after a call for compressor operation to prevent nuisance low pressure lockouts during cold start-up in the heating mode.
- ▶ **Brownout/Surge/Power Interruption Protection** – Prevents compressor operation should the voltage drop below 10% of unit rated value. The unit will restart once the voltage is within tolerance and the random start has timed out.
- ▶ **Malfunction (Alarm) Output** – The controller has a set of contacts for remote fault indication. This can be either a steady output or can be set to pulse with the fault code—Two connections are available – one to provide a 24 volt output, the other to provide a dry contact.
- ▶ **Test Service Mode** – A dip switch setting is provided to reduce all time delay settings to 10 seconds maximum during troubleshooting for verification of unit operation.
- ▶ **LED Fault Indication** – Two LED indicators are provided as follows:
 - ▶ **Green:** Power LED indicates 18 – 30 VAC present at the board.
 - ▶ **Red:** Fault indicator with blink codes identifying the particular fault. This information is available via the malfunction (alarm) output contacts.
 - 1 Blink** - High Pressure
 - 2 Blinks** - Low Pressure
 - 3 Blinks** - Low Fluid Temperature
 - 4 Blinks** - Condensate Overflow
 - 5 Blinks** - Brownout condition
- ▶ **Intelligent Reset**—If a fault condition is initiated, the 5 minute delay on break time period is initiated and the unit will restart after this delay expires. The UPM is configurable for either 2 or 4 fault occurrences before going into a hard lockout. The selection is made through a dip switch setting on the board. If the fault condition still exists or reoccurs twice or four times within one hour, the unit will go into a hard lockout and requires a manual lockout reset. A condensate overflow fault will, however, put the unit into a hard lockout immediately.
- ▶ **Lockout Reset**—A hard lockout can be reset by turning the unit thermostat off and then back on or by shutting off unit power at the circuit breaker. The method of reset is selectable by the dip switch on the board.



DDC Control Board



**RS Base
DDC Sensor**



**RS Plus
DDC Sensor**



**RS Pro
DDC Sensor**

DDC Controls (Option)

The optional FHP factory mounted DDC Controller is preprogrammed and installed on the unit with the Unit Protection Module (UPM) to be job site ready. The unit will operate in a 100% stand-alone control mode or connect to a Building Automation System (BAS) using open protocols BACnet™, Modbus, N2 or LonWorks® (with an optional Lon card). Stand-alone DDC modules must use remote intelligent sensors and are to be programmed by the FHP Bosch BACview® controller only.

Zone temperatures, leaving air temperatures and water temperatures can be monitored from the central control computer and unit fault indication displayed.

Available inputs/outputs include:

- ▶ Discharge air temperature
- ▶ Leaving water temperature
- ▶ Fan run time
- ▶ Override time remaining
- ▶ Night setback status
- ▶ Percent of units cooling
- ▶ Percent of units heating
- ▶ Cooling set point
- ▶ Heating set point
- ▶ Status of all the alarms
- ▶ Space temperature
- ▶ Occupied heating and cooling set points
- ▶ Continuous or cycle fan during occupied mode

- ▶ Command for occupied or unoccupied mode
- ▶ Command for override of the unoccupied mode (unit resorts to occupied set points)
- ▶ Set point adjustment

DDC Room Sensors

To complement the controller, FHP offers a line of intelligent space sensors, which provide precision measurement and communication capabilities in an attractive low profile enclosure. A hidden communications jack provides access to the HVAC control system for commissioning and maintenance. These space sensors will monitor, sense and provide local control for the room.

Models available include:

- ▶ **The RS Pro** has a large LCD display and easy-to-use occupant controls for set point adjustment.
- ▶ **The RS Plus** offers a local set point adjustment and override to an occupied mode and LED indication of current status.
- ▶ **The RS Standard** which has no local temperature set point adjustment.

A BACview® hand held diagnostic tool is available to allow local access to display and modify user defined properties without any computer software.



**BACview® Hand Held
Diagnostic Tool**



ZS Base
DDC Zone Sensor (ZS)



ZS Plus
DDC Zone Sensor (ZS)



ZS Pro
DDC Zone Sensor (ZS)

DDC Zone Sensors*

The Pro Zone Sensor (ZS) has an LCD screen that can display the current temperature and set temperature. It can also display relative humidity and CO₂ settings as well as their current readings. It comes with a button for additional information that can be displayed.

The Pro ZS can be ordered in any of the following combinations:

- ▶ Temperature setting only
- ▶ Temperature with relative humidity settings
- ▶ Temperature, relative humidity, and CO₂ settings

The Plus Zone Sensor (ZS) has a little different look to it. It has a occupied indicator that identifies the sensor to be operating in occupied conditions. It comes with a slide bar for some manual temperature control in the occupied mode. The +/- setting can be adjusted during commissioning.

The Plus ZS can be ordered with the following:

- ▶ Temperature setting only

The Base Zone Sensor (ZS) is limited to sensing capabilities only without local controllability.

The Base ZS can be ordered in any of the following combinations:

- ▶ Temperature sensor
- ▶ Temperature and relative humidity sensor

* Available now through special handling sheet in applications department. Will replace Room Sensor (RS) later in 2014 CY.

Additional Features

- ▶ 75 VA Transformer
- ▶ Thermal Expansion Valves (TXV)
- ▶ No insulation (CS optional for outdoor application)



TXV Valve

Hanging Brackets

All horizontal air handling units come standard with hanging bracket kits for suspending the unit from field supplied hanger rods. These kits include heavy duty steel brackets and rubber grommets for sound and vibration isolation from the building structure.



Hanging Brackets
(Standard for Horizontal units)

Water Connections

All water connections are heavy duty bronze FPT fittings securely fastened to the unit corner post. This allows connecting to a flexible hose kit without the use of a backup wrench making for easier, faster installation.



**Schrader Charging Valves
for Servicing**



**Flow Proving Switch
(Fluid Differential Pressure Switch)**



**2-Way Valve with
Actuator**

Additional Options

- ▶ 5, 10, 15, 20 kW Electric Heaters
- ▶ Compressor Monitor Relay
- ▶ Pump Relay
- ▶ Closed Cell Foam Fiber Free Insulation
- ▶ Comfort Alert Module
- ▶ Wire for 208 Volt
- ▶ Straight Cooling Unit
- ▶ Blower Monitor Current Sensor
- ▶ LonWorks DDC
- ▶ Multi-Protocol (BacNet, Modbus, N2)

Air Side Pressure Drop

Refer to Bosch Select Tools selection software for blower performance and to determine if the unit requires an optional fan upgrade.*

*See fhp-mfg.com for BST Software.

Flow Proving Switch

The function of the flow proving switch (or also referred to as a differential pressure switch) is to prevent or stop compressor operation should the water supply fail. This will prevent the unit from locking out on a safety requiring a manual reset to restart. The benefit of the DPS will be realized by reduced service labor time while adding additional safety and protection to the unit. This is especially beneficial on buildings with large quantities of units. This will minimize any unneeded service calls and allow for your unit to be protected. This optional control is internally mounted and factory installed. The switch is piped between the water entering and

leaving connections. Should the pressure drop across the water-to-refrigerant heat exchanger fall below set value, the switch will open de-energizing the compressor. The blower operation will not be affected by this option.

Energy Management Switch (EMS)

This switch allows you to connect to an energy management system that can turn the unit off and on.

Smart Start Control

A factory installed start assist device that reduces inrush current as much as 65% and helps extend compressor life by reducing wear and tear on the whole system.

- ▶ Reduce wear and tear on compressor during startup
- ▶ Integrated current limit
- ▶ Rated operational voltage: 230 VACrms, 50/60 Hz
- ▶ Rated operational current: up to 32A; AC-53b
- ▶ Integral bypassing of semiconductors
- ▶ Built-in transient over-voltage protection
- ▶ Under-voltage protection after ramp up
- ▶ Factory installed or field installed accessory
- ▶ EMC Compliant
- ▶ Optional auxiliary alarm relay output
- ▶ Relay Protection
- ▶ UL, cUL listed
- ▶ Optimized algorithm for high pressure starts
- ▶ Integrated protection against short-cycling



Thermostats



Hose Kit

Accessories

Thermostats

The unit control may be as simple as a single stage thermostat or the unit may have a DDC controller integrated into the building management system. All external low voltage control wiring is made to the thermostat terminal located in the unit electrical box. Thermostats may be manual change over, auto change over, programmable or non-programmable depending on the requirements of the project. A full line of thermostats are available from Bosch Thermotechnology Corp. as an accessory.

Hose Kits

Hose kits are recommended between the unit and system loop piping. This will help eliminate the transmission of vibration and noise from the unit to the space. Hoses are fire rated fiber reinforced EPDM Stainless Steel braid hoses with swivel connections. Maximum working pressure 400 PSI for sizes ½" – 1" and 300 PSI for sizes

1 ¼" - 2". A variety of hose kits are available depending on the job requirement.

Kit 1 – Hose only either 24" or 36" long.

Kit 2 - Hose kit 1 with ball valves on the supply and return hoses. Valves have P/T (pressure/temperature) ports to facilitate pressure and temperature readings.

Kit 3 - Hose kit 2 with an automatic flow control valve. The design flow rate is preset at the factory per the design conditions and will automatically limit the flow to this value. This will greatly facilitate balancing of the fluid loop and ensuring each unit gets the required flow.

Kit 4 - Hose kit 3 with a Y-strainer and blow down valve on the supply side. The filter screen is 20 mesh, 304 stainless steel to help prevent dirt and debris from entering the water coil.

Kit 5 - Hose kit 3 with a 24 v 2 position solenoid valve. This could be used to shut off flow to the unit when there is not a call for heating or cooling. A typical application would be with VFD pumping.

Kit 6 - Hose kit 4 with a 24 v 2 position solenoid valve. Hose kit options are available in the accessories section of the BST selection software.

Systems

LM Split Systems may be used in a variety of different applications depending on the system design. An overview of tower/boiler and geothermal systems is given below. There could be several variations and combinations of these systems.

Cooling Tower/Boiler Systems



Water source heat pumps with cooling tower/boiler systems have been used for many years and are recognized as having a low installation cost and providing more energy efficient operation than most other systems on the market.

In a typical building, each office or space would receive its own heat pump. This ensures that the unit will independently satisfy the heating or cooling requirements for that space irrespective of the requirements of any other space. Unlike some other systems, this offers individual control and enhanced comfort in all areas.

All the units are connected to a common water loop containing, in addition to the heat pumps, a cooling tower, boiler, a primary and standby pump and a loop water temperature controller. In the summer cooling mode, the units are cooling and rejecting heat to the water loop. This heat is then rejected to the atmosphere through a cooling tower. In winter, heat is taken from the loop and, together with the compressor's heat of compression, used to heat the space. The heat removed from the loop is then replenished by the boiler. The loop water temperature controller

will keep the fluid within certain temperature limits typically 70°F in winter and 85°F in summer by cycling either the cooling tower or boiler operation.

In today's modern buildings the interior core usually has a net cooling requirement year round irrespective of the outside temperature. This is due to the internal heat gains from people, office equipment and lighting. The heat from heat pumps operating in cooling is rejected to the common water loop and is absorbed by heat pumps on the building's perimeter that are in the heating mode. In effect the system is transferring energy around the building areas from where it is in excess to those areas where it is needed. In many instances we find a balanced system where the heat generated in the interior space is sufficient to heat the perimeter, resulting in neither the cooling tower nor boiler operating. This concept, unique to a water source system, provides the most energy efficient system on the market.

Geothermal Systems

The earth has a tremendous capacity of storing thermal energy, which can be utilized to heat or cool a building.

A geothermal system offers all the benefits of a cooling tower and boiler system with the additional advantage of having overall greater energy efficiency. As the cost of energy increases, geothermal installations are becoming the system of choice by developers and design engineers.

There are several alternative methods of utilizing the energy contained in a geothermal system, giving the design engineer several options for selecting the one that is right for a particular application.

Earth Coupling Options

Ground Loop Systems (Closed Loop)

Lengths of high density polyethylene piping are buried in the earth either in vertical bore holes or horizontal trenches depending on the space available.

Fluid from the loop inside the building circulates through these pipes either rejecting heat to the ground when there is a net cooling requirement or absorbing heat from the ground when heating is the dominant requirement.

The temperature of the earth below 6 feet is relatively constant and is not affected by the ambient temperature. For this reason, the ground temperature is cooler than the summer ambient and warmer than the winter ambient in most regions. Geothermal systems are able to operate effectively in extreme ambient conditions exceeding 100°F in summer and -30°F in winter. This is one of the reasons why geothermal systems have such an advantage over other systems. An additional advantage is that no fossil fuels are used, reducing the carbon emission of the building.

Even in areas which are cooling or heating dominant a hybrid system can be used with a downsized cooling tower or boiler. This system will reduce the installed cost significantly with only a modest impact on overall operating efficiency.

Geothermal systems may cost more to install but the savings in energy and low maintenance costs more than off set this with payback times typically five years or even less.

Vertical Ground Loop System



This method is used mainly in commercial buildings or where space for a loop field is limited. Vertical holes 100 to 400 feet deep are drilled in the ground, and a single loop of high density polyethylene pipe with a U-tube at the bottom is installed. The bore hole is then sealed with grout to ensure good contact for heat transfer with the soil. The size of the project will determine how many bore holes are required. The vertical ground loops are then connected to a horizontal header pipe that carries fluid to the building and circulated to each heat pump. The Earth's temperature is stable below the surface which is an advantage for this system and provides for the greater efficiency. Vertical ground loop fields may be located under buildings or parking lots. The life expectancy is in excess of 50 years.

Horizontal Ground Loop System



This type is cost effective on smaller projects or where there is sufficient space for the loop field. Trenches, three to six feet deep are dug in which a series of high density polyethylene pipes are laid. These loops are manifolded and connected to the loop inside the building which feeds the heat pumps. The fluid is then circulated, absorbing or rejecting heat to the earth depending on the requirement for heating or cooling.

Typical Heat Pump System

Surface Water, Lake or Pond System



This type of design is economical when a project is located near a body of water. Fluid circulates through polyethylene piping in a closed system, just as it does through ground loops, but in this case, underwater. The pipes may be coiled in a slinky to fit more surface into a given amount of space. The lake needs to be a minimum size and depth depending on the building load. Lake loops have no adverse impact on the aquatic system. Specialized lake heat exchangers are also available for this application. New technology is emerging for stainless steel and titanium heat exchangers.

Well Water System



This type of installation is only possible if there is sufficient ground water available in a well. The water must be of good quality. Local codes may limit the use of this system in certain areas. The arrangement is referred to as an open system which means that water

is pumped directly from the source into the geothermal unit and then discharged either into a return well or a body of water. The water quality is unaffected other than a change in the temperature. Refer to the installation manuals for water quality guidelines.

Typical Heat Pump Operation

Cooling Mode

In the cooling mode, hot high pressure refrigerant gas is pumped from the compressor to the water-to-refrigerant heat exchanger via the reversing valve. Water, or an anti-freeze solution, flowing through the water-to-refrigerant heat exchanger transfers heat from the refrigerant to the fluid raising the fluid temperature while condensing the hot gas into a liquid. This liquid refrigerant then flows through a metering device, where the refrigerant is expanded to a cold liquid, to the air-to-refrigerant heat exchanger coil.

The air-to-refrigerant heat exchanger cools and dehumidifies air by evaporating the liquid refrigerant. The cooling cycle is completed when the refrigerant flows as a low pressure gas through the reversing valve and back to the suction side of the compressor. Cool dehumidified air is circulated to the space maintaining comfort conditions.

Heating Mode

During the heating mode, the high pressure refrigerant gas is pumped from the compressor to the air-to-refrigerant heat exchanger coil via the reversing valve. In the air-to-refrigerant heat exchanger coil, the heat is removed by the air that passes over the coil surface, and the hot gas condenses into a liquid.

The heated air is ducted to the space and provides heating for the building. The refrigerant liquid then flows through a metering device to the water-to-refrigerant heat exchanger. Water, or an anti-freeze solution, circulates through this heat exchanger and is cooled by the evaporating refrigerant which evaporates into a gas. The heating cycle is completed when the refrigerant flows as a low pressure gas through the reversing valve and back to the suction side of the compressor.

Typical Unit Installation

Unit Location

The refrigerant line sets can be installed up to 75' (equivalent) with refrigerant copper tubing between CS & A/H sections to provide flexibility in installation locations. Any mechanical device will, at some point in time require servicing and repair. With this in mind sufficient space must be provided around the unit for service personnel to perform maintenance or repair.

LM Split Systems are not designed for outdoor installation. Avoid locations where the unit may be exposed to freezing conditions or where the humidity levels could cause condensation on the unit panels, for example, when exposed to outdoor ambient conditions.

Vertical Air Handler Unit Installation

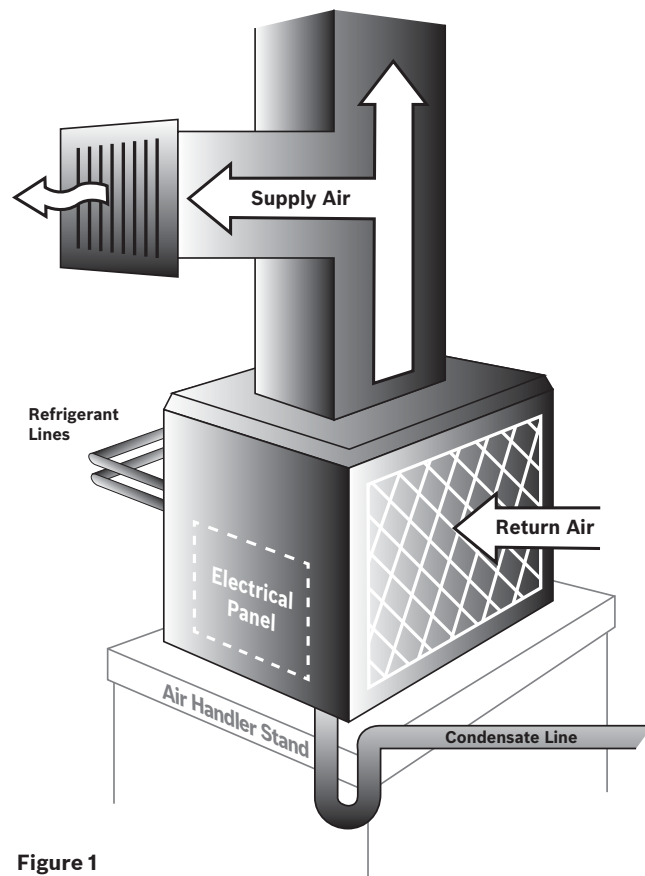


Figure 1

Vertical units are normally installed in a closet or mechanical plant room.

If installed in a closet or other confined space, ensure adequate space for return air to the unit.

Sufficient space must be provided for filter replacement and access to the compressor and blower for service.

Units should be set on a piece of rubber, neoprene or other vibration absorbing material at least $\frac{1}{3}$ " to $\frac{1}{2}$ " thick. The pad should extend $\frac{3}{4}$ " over the entire base of the unit.

Avoid direct line of sight to the unit. Install a sound baffle over any door that has a return air grille.

Horizontal Air Handler Unit Installation

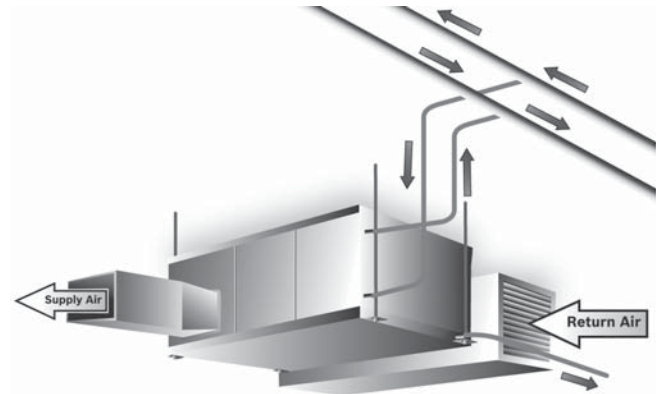


Figure 2

Horizontal units are typically suspended above the ceiling by four (field supplied) $\frac{3}{8}$ " threaded rods fastened to the unit by the factory supplied hanger bracket kits. The kits include rubber isolators to help prevent transmission of vibration and noise to the building structure. Units should be located directly below a structural member, so that it is securely anchored.

A horizontal unit should be positioned to allow for removal of the filters and access panels. Allow at least 18" clearance on each side of the unit for service and 36" in front of the unit for maintenance access. The filter needs to be slid out and sufficient space must be provided to allow this.

Do not install the unit above any piping or electrical raceways. The unit should be able to be removed to the floor without major rearrangement of other mechanical or ceiling components.

Consideration needs to be made as to the location of the units. Avoid installing units directly above occupied spaces (e.g. above office desks or classrooms). This will minimize possible disruption to the occupants if maintenance or service is required as well as keeping a potential source of noise out of the area. If possible, units should be installed above the hallway drop ceiling in schools, and the supply and return air is routed directly into classrooms. Local code may require fire dampers to be used in this application.

Ductwork and Sound Attenuation Considerations

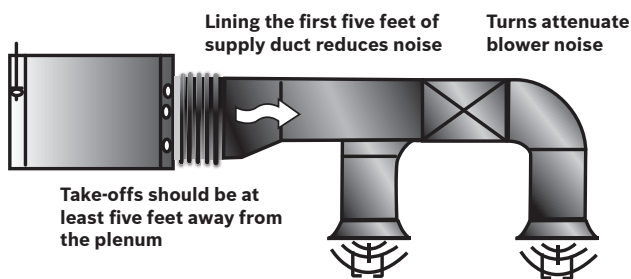


Figure 3 Supply Air Ducting

Sound is becoming an increasingly important factor in all HVAC installations. The LM Split System has been designed to minimize sound, but sound acoustical design plays an important part of the sound level in the space.

Most of the problems associated with HVAC generated sound can be avoided by paying close attention to duct design and equipment placement. A discharge flange is provided on all horizontal unit models for fastening of ductwork. We recommend using a flexible collar between the discharge flange and the duct transformation to reduce vibration transmission from the cabinet and to simplify disconnection of the unit from the ceiling ductwork.

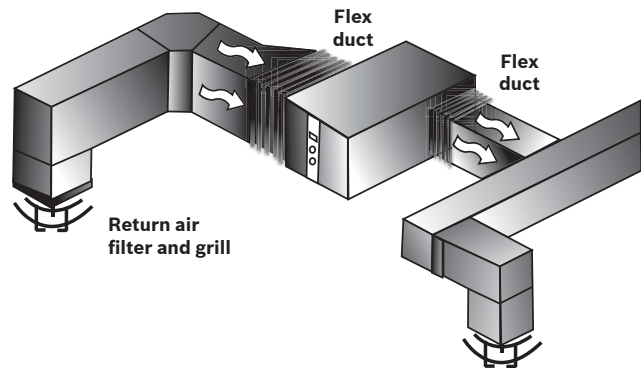


Figure 4 Return Air Ducting

Return air to the unit could be either free return or ducted. The filter rack is provided with a 1" flange should a ducted return be used. We recommend using a flexible collar between the return flange and the duct transformation to reduce vibration transmission from the cabinet and to simplify disconnection of the unit from the ductwork.

Sound is transmitted down the ductwork and it is important to avoid direct line of sight between the unit and the space, both on the return or supply side. To accomplish this, design the duct runs with two 90° turns.

As a general recommendation, duct interiors should have an acoustic / thermal lining of least ½" thick over the entire duct run or a minimum of the first 5 feet of the supply trunk.

Line the last five diameters of duct before each outlet with a one-inch thick sound blanket. Line elbows and transition pieces, as well as a short distance upstream and downstream of the fittings.

Elbows, tees and dampers can create turbulence or distortion in the airflow. Using aerodynamic fittings will help in reducing this effect. Place a straight length of duct, 5 to 10 times the duct width, before the next fitting to smooth out airflow.

Diffusers that are located in the bottom of a trunk duct can also produce noise.

Balancing dampers should be located several duct widths upstream from an air outlet.

Ductwork should be mounted and supported using isolation devices that absorb vibration.

Applications such as Hotel, Motel, Dormitory or Nursing Home that use a single duct discharge are susceptible to noise. These applications typically have low static pressures and short duct lengths. In these applications the discharge duct must be fully lined and have a square elbow without turning vanes. A velocity not exceeding 500 to 600 fpm is recommended. Return air for these applications should enter through a sidewall grille and route up the stud space to a ceiling plenum.

For horizontal heat pumps mounted in the ceiling plenum, an insulated return plenum is sometimes placed at the return air opening to further attenuate line-of-sight sound transmission through return openings.

Piping

The water loop system is typically designed using a “reverse return” piping system which includes a flow control device so that flow requirements are met for each zone.

A high pressure stainless steel flexible hose kit is recommended to connect the unit to the building’s hard piping and acts as a sound attenuator for both the unit operating noise and hydraulic pumping noise. One end of the hose has a swivel fitting to facilitate removal of the unit for replacement or service.

Hose kits come in several configurations, but in all cases should include supply and return shutoff ball valves to allow removal of a unit without the need to shut down

the entire heat pump system. The hose kit may contain either a manual or automatic flow control that may be preset to ensure correct water flow to the unit.

Pressure / Temperature ports should be included in these fittings to allow the service technician to measure water flow and temperatures when checking unit operation.

Condensate Drain Piping

Condensate piping can be made of steel, copper or PVC pipe. In most cases, PVC pipe eliminates the need to wrap insulation around the pipe to prevent sweating.

A 3/4" FPT condensate drain connection is installed in the unit. The condensate piping must be trapped at the unit and pitched away from the unit not less than 1/4" per foot. A vent is required after the trap so that the condensate will drain away from the unit. The vent can also act as a cleanout if the trap becomes clogged. As a precaution, a secondary drain pan shall be installed below the unit to capture any condensate overflow should the trap become clogged. The condensate drain should not be directly piped to a drain/waste/vent stack. See local codes for the correct application of condensate piping to drains.

Operating Limits

The LM Split Systems are capable of operating over a wide range of conditions. For operation in a geothermal application or any other installation where the loop fluid temperature may drop below the ambient dew point, the extended range option is recommended. This consists of additional insulation on the piping to prevent condensation.

- ▶ Maximum and minimum fluid conditions are at unit rated flow rate.
- ▶ Maximum and minimum operating limits may not be combined. If one value is at either maximum or minimum, the other two should be at normal operating range.
- ▶ Entering fluid temperatures below 45°F in the heating mode require antifreeze.

Equipment Selection

To ensure that you get the optimal performance from your FHP heat pump it is important that they be selected accurately to match your design conditions.

Prior to making equipment selections the zone conditions need to be determined. Bosch Thermotechnology Corp. recommends using a building load program to determine the heating and cooling loads.

The catalog provides a wide range of entering air and water conditions that will meet most applications. The unit performance can be determined by referring to the data tables from page 21 to 30.

Our Bosch Select Tools Selection Software (BST) is designed to provide you with a fast and accurate selection based on your specific conditions. This software is available through the commercial website. You may click on the BST link and request an account.

Unit Operating Limits—LM Split Systems

Operating Limits – Cooling & Heating	Extended Range Option
Cooling	
Minimum ambient air temperature °F	50
Maximum ambient air temperature °F	100
Minimum evaporator entering air db/wb °F	68/57
Rated air coil entering air db/wb °F	80/67
Maximum evaporator entering air db/wb °F	95/85
Minimum water coil entering fluid temperature °F	50
Water loop typical coil entering fluid range temperature °F	70/90
Maximum water coil entering fluid temperature °F	110
Heating	
Minimum ambient air temperature °F	40
Maximum ambient air temperature °F	85
Minimum evaporator entering air db °F	50
Rated air coil entering air °F	68
Maximum evaporator entering air db °F	80
Normal water coil entering fluid range °F	25-80*
Minimum water coil entering Fluid °F	20*

* Antifreeze solution is required at these fluid temperatures.

Antifreeze Correction Data

Antifreeze Correction							
Antifreeze Type	Antifreeze %	Cooling			Heating		WPD Correction Factor EWT 30 °F
		EWT 90 °F			EWT 30 °F		
		Total Cap.	Sens. Cap	Power	Htg. Cap	Power	
Water	0	1.000	1.000	1.000	1.000	1.000	1.000
Propylene Glycol	5	0.997	0.997	1.004	0.989	0.997	1.060
	10	0.994	0.994	1.006	0.986	0.995	1.125
	15	0.990	0.990	1.009	0.978	0.988	1.190
	25	0.983	0.983	1.016	0.960	0.979	1.300
Methanol	5	0.997	0.997	1.003	0.990	0.997	1.060
	10	0.996	0.996	1.005	0.979	0.993	1.100
	15	0.994	0.994	1.008	0.970	0.990	1.140
Ethanol	5	0.998	0.998	1.002	0.981	0.994	1.160
	10	0.996	0.996	1.004	0.960	0.988	1.230
	15	0.992	0.992	1.006	0.944	0.983	1.280
	25	0.986	0.986	1.009	0.917	0.974	1.400
Ethylene Glycol	5	0.997	0.997	1.003	0.993	0.998	1.060
	10	0.995	0.995	1.004	0.986	0.996	1.120
	15	0.992	0.992	1.005	0.980	0.993	1.190
	25	0.988	0.988	1.009	0.970	0.990	1.330
	30	0.985	0.985	1.012	0.965	0.987	1.400

Waterside Pressure Drop

Mixture of 15% methanol / water solution.

Model	Wtr. Flow Rate (GPM)	Wtr. PD w/o Int. Valve (PSI)
LM024	3	0.7
	4	1.2
	5	1.7
	6	2.4
	7	3.2
	8	4.0
LM036	6	1.1
	8	1.8
	10	2.7
	12	3.7
	14	4.9
LM048	16	6.2
	6	1.1
	8	1.8
	10	2.7
	12	3.7
LM060	14	4.9
	16	6.2
	7.5	1.1
	10	1.9
	12.5	2.8
LM070	15	3.9
	17.5	5.2
	20	6.6
	7.5	1.1
	10	1.9
LM070	12.5	2.8
	15	3.9
	17.5	5.2
	20	6.6

Model	Wtr. Flow Rate (GPM)	CFM	ESP (in Water)	Blower Watts (W)	
FULL LOAD	LM024	6	900	0.5	250
	LM036	9	1225	0.6	450
	LM048	12	1700	0.6	741
	LM060	15	2000	0.6	867
	LM070	18	2200	0.6	940

Model	Wtr. Flow Rate (GPM)	CFM	ESP (in Water)	Blower Watts (W)	
PART LOAD	LM024	6	600	0.5	138
	LM036	9	1050	0.6	325
	LM048	12	1100	0.6	300
	LM060	15	1500	0.6	450
	LM070	18	1600	0.6	500

Capacity Data

LM024 – Part Load (600 CFM)

Cooling									Heating						
Entering Fluid Temp (°F)	Water Flow (GPM)	Pressure Drop PSI (FOH)	Entering Air Temp (db/wb) °F	Total Capacity (MBTUH)	Sensible Capacity (MBTUH)	Heat of Rejection (MBTUH)	Power Input (kW)	EER	Entering Fluid Temp (°F)	Pressure Drop PSI (FOH)	Entering Air Temp (°F)	Total Capacity (MBTUH)	Heat of Absorption (MBTUH)	Power Input (kW)	COP
50	2.5	0.7 (1.7)	75/63	20.7	15.6	23.1	0.8	27.2							
			80/67	22.1	16.1	24.6	0.8	29.4							
			85/71	23.6	16.6	26.2	0.7	31.6							
	4	1.3 (2.9)	75/63	21.0	15.8	23.5	0.7	28.8							
			80/67	22.5	16.4	25.0	0.7	31.1							
			85/71	24.0	16.9	26.6	0.7	33.7							
	5	2.6 (5.9)	75/63	21.4	15.9	23.8	0.7	30.3							
			80/67	22.9	16.4	25.4	0.7	33.0							
			85/71	24.5	17.1	27.0	0.7	35.8							
30	0.8 (1.9)	60	11.9	8.5	1.0	3.5									
			70	11.9	7.8	1.1	3.1								
			80	11.6	7.0	1.3	2.7								
	1.4 (3.2)	60	12.5	8.9	1.0	3.6									
			70	12.2	8.1	1.1	3.1								
			80	11.9	7.4	1.3	2.7								
	2.9 (6.6)	60	13.0	9.4	1.0	3.7									
			70	12.6	8.6	1.1	3.2								
			80	12.3	7.7	1.3	2.8								
40	0.8 (1.8)	60	14.0	10.3	1.0	4.0									
			70	13.5	9.5	1.1	3.5								
			80	13.3	8.8	1.3	3.0								
	1.3 (3.1)	60	14.6	11.2	1.0	4.2									
			70	14.0	10.0	1.2	3.6								
			80	13.8	9.2	1.3	3.2								
	2.8 (6.4)	60	15.0	11.4	1.0	4.3									
			70	14.5	10.7	1.2	3.7								
			80	14.2	9.7	1.3	3.2								
50	0.8 (1.8)	60	16.0	12.6	1.0	4.6									
			70	15.7	11.7	1.2	4.0								
			80	15.5	11.0	1.3	3.5								
	1.3 (3)	60	16.7	13.3	1.0	4.7									
			70	16.3	12.4	1.2	4.1								
			80	16.0	11.5	1.3	3.6								
	2.6 (6.1)	60	17.4	13.9	1.0	4.9									
			70	16.9	13.0	1.2	4.3								
			80	16.6	12.1	1.3	3.7								
60	0.7 (1.7)	60	18.8	15.5	1.0	5.3									
			70	17.8	13.5	1.2	4.5								
			80	18.1	13.5	1.3	4.1								
	1.3 (2.9)	60	19.0	15.6	1.0	5.3									
			70	18.5	14.7	1.2	4.7								
			80	18.1	13.6	1.3	4.1								
	2.6 (5.9)	60	19.7	16.3	1.0	5.5									
			70	19.1	15.4	1.2	4.8								
			80	18.7	14.3	1.3	4.2								
70	0.7 (1.6)	60	21.2	18.3	1.0	6.0									
			70	19.5	15.6	1.2	4.9								
			80	19.7	14.7	1.3	4.4								
	1.2 (2.8)	60	21.7	18.3	1.0	6.1									
			70	20.8	17.1	1.2	5.2								
			80	20.3	15.7	1.3	4.5								
	2.5 (5.7)	60	22.1	18.8	1.0	6.2									
			70	21.5	17.7	1.2	5.4								
			80	21.0	16.6	1.3	4.7								
80	0.7 (1.6)	60	21.9	20.1	1.0	6.2									
			70	21.9	17.9	1.2	5.5								
			80	22.0	17.7	1.3	4.9								
	1.2 (2.7)	60	22.9	18.9	1.0	6.5									
			70	23.3	19.8	1.2	5.9								
			80	21.5	18.5	1.3	4.9								
	2.4 (5.5)	60	24.5	20.8	1.0	7.0									
			70	23.8	20.0	1.2	6.0								
			80	23.3	19.0	1.3	5.2								
90	0.6 (1.4)	75/63	15.8	13.6	1.3	11.7									
			80/67	16.9	14.2	1.3	12.6								
			85/71	18.1	14.8	1.3	13.5								
	1.0 (2.4)	75/63	16.0	13.6	1.3	12.2									
			80/67	17.2	14.3	1.3	13.1								
			85/71	18.4	14.9	1.3	14.1								
	2.2 (5)	75/63	16.2	13.9	1.3	12.7									
			80/67	17.3	14.0	1.3	13.4								
			85/71	18.6	14.5	1.3	14.4								
100	0.6 (1.4)	75/63	14.7	13.2	1.5	9.8									
			80/67	15.9	13.7	1.5	10.5								
			85/71	16.9	14.4	1.5	11.2								
	1.0 (2.4)	75/63	14.9	13.2	1.5	10.1									
			80/67	16.0	13.9	1.5	10.9								
			85/71	17.2	14.4	1.5	11.7								
	2.1 (4.9)	75/63	15.1	13.5	1.4	10.4									
			80/67	16.2	13.6	1.5	11.1								
			85/71	17.4	14.8	1.4	12.1								

Extended Range - Anti-freeze required

AHRI/ISO13256-1 certified performance is rated at entering air conditions of 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.

Tabulated unit performance does not include fan or pump power corrections required for AHRI/ISO standard performance ratings.

Unit performance may be interpolated. Extrapolation is not allowed.

For conditions other than rating conditions provided, consult the BST selection software.

Ratings below 40°F are with a methanol solution.

The results reported herein are estimates based on testing by FHP. Variations in the installation and operational environment may alter performance. Bosch disclaims all warranties, express and implied, that the performance will be as reported, including the warranty of merchantability and fitness for purpose. In addition, continuous research and development may result in a change to an appliances design and specifications, which Bosch may change without notice. Before purchase, confirm the design specifications of the appliance.



Capacity Data

LM036 – Part Load (1050 CFM)

Cooling									Heating						
Entering Fluid Temp (°F)	Water Flow (GPM)	Pressure Drop PSI (FOH)	Entering Air Temp (db/wb) °F	Total Capacity (MBTUH)	Sensible Capacity (MBTUH)	Heat of Rejection (MBTUH)	Power Input (kW)	EER	Entering Fluid Temp (°F)	Pressure Drop PSI (FOH)	Entering Air Temp (°F)	Total Capacity (MBTUH)	Heat of Absorption (MBTUH)	Power Input (kW)	COP
50	4	1.4 (3.2)	75/63	29.5	23.6	33.8	1.2	23.8							
			80/67	31.7	24.7	36.0	1.2	25.8							
			85/71	33.9	25.5	38.4	1.2	28.1							
	6	2.3 (5.4)	75/63	29.9	23.8	34.2	1.2	24.6							
			80/67	32.1	24.9	36.5	1.2	26.9							
			85/71	34.5	25.8	38.9	1.2	29.3							
	8	4.8 (11.1)	75/63	30.3	24.0	34.6	1.2	25.3							
			80/67	32.5	25.0	36.9	1.2	27.6							
			85/71	34.9	25.8	39.5	1.2	30.3							
30	0.7 (1.7)	60	19.6	13.7	1.6	3.6									
		70	19.3	12.5	1.8	3.2									
		80	18.8	11.4	2.0	2.8									
	1.3 (2.9)	60	20.1	14.2	1.6	3.7									
		70	19.7	13.0	1.8	3.3									
		80	19.3	11.9	2.0	2.9									
	2.6 (6.1)	60	20.7	14.8	1.6	3.8									
		70	20.2	13.5	1.8	3.4									
		80	19.7	12.2	2.0	2.9									
40	0.7 (1.7)	60	22.6	16.8	1.6	4.1									
		70	22.2	15.5	1.8	3.7									
		80	21.7	14.3	2.0	3.2									
	1.2 (2.8)	60	23.2	17.5	1.6	4.3									
		70	22.8	16.2	1.8	3.8									
		80	22.3	14.8	2.0	3.3									
	2.5 (5.8)	60	24.0	18.2	1.6	4.4									
		70	23.4	16.8	1.8	3.9									
		80	22.9	15.4	2.0	3.4									
50	0.7 (1.6)	60	26.1	20.5	1.6	4.8									
		70	25.5	19.1	1.8	4.2									
		80	24.9	17.6	2.0	3.7									
	1.2 (2.7)	60	26.9	21.4	1.6	4.9									
		70	26.3	19.8	1.8	4.3									
		80	25.7	18.4	2.0	3.8									
	2.4 (5.6)	60	27.8	22.2	1.6	5.1									
		70	27.1	20.6	1.8	4.4									
		80	26.4	19.5	2.0	3.9									
60	0.7 (1.6)	60	29.6	24.0	1.6	5.4									
		70	28.9	22.5	1.8	4.7									
		80	28.3	21.0	2.0	4.1									
	1.1 (2.6)	60	30.6	25.0	1.6	5.5									
		70	29.8	23.4	1.8	4.9									
		80	29.1	21.8	2.0	4.3									
	2.4 (5.5)	60	31.6	26.1	1.6	5.7									
		70	30.8	24.4	1.8	5.0									
		80	30.0	22.7	2.0	4.4									
70	0.7 (1.5)	60	33.2	27.7	1.6	6.0									
		70	32.4	26.1	1.8	5.3									
		80	31.7	24.4	2.0	4.6									
	1.1 (2.5)	60	34.3	28.9	1.6	6.2									
		70	33.5	27.2	1.8	5.4									
		80	32.7	25.4	2.0	4.7									
	2.3 (5.3)	60	35.6	30.2	1.6	6.5									
		70	34.7	28.4	1.8	5.6									
		80	33.8	26.6	2.0	4.9									
80	0.7 (1.5)	60	36.9	31.5	1.6	6.7									
		70	36.0	29.9	1.8	5.9									
		80	35.3	28.0	2.0	5.1									
	1.1 (2.5)	60	38.2	33.0	1.6	7.0									
		70	37.3	31.2	1.8	6.1									
		80	36.5	29.3	2.0	5.3									
	2.2 (5.1)	60	39.8	34.5	1.6	7.2									
		70	38.7	32.6	1.8	6.3									
		80	37.8	30.7	2.0	5.4									
85	1.2 (2.8)	75/63	24.7	21.3	29.3	1.7	14.2								
		80/67	26.6	22.4	31.4	1.7	15.4								
		85/71	28.5	23.5	33.5	1.7	16.6								
	2.1 (4.8)	75/63	25.0	21.6	29.6	1.7	14.8								
		80/67	26.9	22.6	31.6	1.7	16.0								
		85/71	28.9	23.6	33.8	1.7	17.3								
	4.3 (9.9)	75/63	25.4	21.8	29.9	1.6	15.5								
		80/67	27.4	22.8	32.0	1.6	16.8								
		85/71	29.4	23.9	34.2	1.6	18.2								
90	1.2 (2.8)	75/63	23.9	21.1	28.7	1.8	13.0								
		80/67	25.8	22.2	30.7	1.8	14.1								
		85/71	27.7	23.2	32.8	1.8	15.2								
	2.0 (4.7)	75/63	24.3	21.3	29.0	1.8	13.6								
		80/67	26.2	22.3	31.0	1.8	14.7								
		85/71	28.1	23.3	33.2	1.8	15.8								
	4.2 (9.7)	75/63	24.6	21.4	29.3	1.7	14.2								
		80/67	26.6	22.5	31.4	1.7	15.4								
		85/71	28.6	23.6	33.5	1.7	16.7								
100	1.2 (2.7)	75/63	22.5	20.5	27.6	2.1	10.9								
		80/67	24.3	21.5	29.6	2.1	11.8								
		85/71	26.1	22.5	31.6	2.1	12.7								
	2.0 (4.6)	75/63	22.8	20.6	27.9	2.0	11.3								
		80/67	24.6	21.6	29.9	2.0	12.3								
		85/71	26.5	22.8	31.9	2.0	13.2								
	4.1 (9.5)	75/63	23.1	20.8	28.1	2.0	11.8								
		80/67	25.0	21.8	30.2	1.9	12.9								
		85/71	27.0	22.8	32.3	1.9	13.9								
110	1.1 (2.6)	75/63	21.0	19.8	26.7	2.3	9.1								
		80/67	22.7	20.9	28.5	2.3	9.8								
		85/71	24.5	21.9	30.5	2.3	10.5								
	1.9 (4.4)	75/63	21.3	19.9	26.9	2.3	9.4								
		80/67	23.1	21.0	28.8	2.3	10.2								
		85/71	24.8	22.2	30.7	2.3	11.0								
	4.0 (9.2)	75/63	21.6	20.1	27.1	2.2	9.8								
		80/67	23.4	21.1	29.1	2.2	10.7								
		85/71	25.3	22.2	31.1	2.2	11.6								

Extended Range - Anti-freeze required

AHRI/ISO13256-1 certified performance is rated at entering air conditions of 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.

Tabulated unit performance does not include fan or pump power corrections required for AHRI/ISO standard performance ratings.

Unit performance may be interpolated. Extrapolation is not allowed.

For conditions other than rating conditions provided, consult the BST selection software.

Ratings below 40°F are with a methanol solution.

The results reported herein are estimates based on testing by FHP. Variations in the installation and operational environment may alter performance. Bosch disclaims all warranties, express and implied, that the performance will be as reported, including the warranty of merchantability and fitness for purpose. In addition, continuous research and development may result in a change to an appliances design and specifications, which Bosch may change without notice. Before purchase, confirm the design specifications of the appliance.



Capacity Data

LM070 – Part Load (1600 CFM)

Cooling									Heating						
Entering Fluid Temp (°F)	Water Flow (GPM)	Pressure Drop PSI (FOH)	Entering Air Temp (db/wb) °F	Total Capacity (MBTUH)	Sensible Capacity (MBTUH)	Heat of Rejection (MBTUH)	Power Input (kW)	EER	Entering Fluid Temp (°F)	Pressure Drop PSI (FOH)	Entering Air Temp (°F)	Total Capacity (MBTUH)	Heat of Absorption (MBTUH)	Power Input (kW)	COP
50	7.5	0.9 (2.1)	75/63	56.2	41.8	64.0	2.4	23.3							
			80/67	60.1	43.2	68.0	2.4	25.0							
			85/71	64.1	44.5	72.2	2.4	26.8							
	10	1.5 (3.5)	75/63	57.1	42.2	64.8	2.3	24.7							
			80/67	61.1	43.7	68.9	2.3	26.7							
			85/71	65.3	44.9	73.2	2.3	28.7							
	15	3.2 (7.3)	75/63	58.1	42.6	65.6	2.2	26.2							
			80/67	62.2	44.1	69.8	2.2	28.4							
			85/71	66.5	45.4	74.2	2.2	30.8							
30	1.9 (4.3)	60	37.7	26.3	3.2	3.4									
		70	37.2	24.3	3.6	3.0									
		80	36.8	22.9	4.0	2.7									
	3.1 (7.2)	60	38.6	26.8	3.3	3.5									
		70	38.9	25.8	3.6	3.2									
		80	38.8	23.9	4.0	2.8									
	6.5 (15)	60	39.5	28.4	3.3	3.6									
		70	39.1	26.2	3.6	3.2									
		80	38.7	24.3	4.0	2.8									
40	1.8 (4.2)	60	43.0	31.1	3.3	3.8									
		70	42.3	29.0	3.7	3.4									
		80	41.8	26.9	4.1	3.0									
	3.0 (7)	60	44.2	32.7	3.3	3.9									
		70	43.4	30.4	3.7	3.5									
		80	43.1	27.4	4.1	3.1									
	6.3 (14.5)	60	45.5	35.6	3.3	4.0									
		70	45.1	32.8	3.7	3.6									
		80	40.7	30.1	4.0	3.0									
50	1.7 (4)	60	49.7	37.8	3.4	4.3									
		70	49.4	37.6	3.7	3.9									
		80	48.5	34.8	4.2	3.4									
	2.9 (6.7)	60	51.2	39.3	3.4	4.5									
		70	49.6	37.4	3.7	3.9									
		80	48.2	27.6	4.2	3.4									
	6.1 (14)	60	52.0	39.6	3.4	4.5									
		70	48.5	39.0	3.7	3.9									
		80	50.6	36.0	4.2	3.5									
60	1.7 (3.9)	60	55.9	44.1	3.4	4.8									
		70	55.7	44.1	3.8	4.3									
		80	54.7	41.8	4.2	3.8									
	2.8 (6.5)	60	57.8	46.2	3.4	4.9									
		70	55.9	43.2	3.8	4.3									
		80	51.7	43.7	4.1	3.7									
	5.9 (13.5)	60	61.3	49.7	3.5	5.2									
		70	58.0	44.4	3.8	4.4									
		80	53.7	43.1	4.1	3.8									
70	1.6 (3.8)	60	62.8	50.9	3.5	5.3									
		70	61.6	48.5	3.9	4.7									
		80	61.5	47.3	4.3	4.2									
	5.7 (6.3)	60	65.5	53.6	3.5	5.5									
		70	63.2	51.0	3.9	4.8									
		80	61.2	51.3	4.3	4.1									
	5.7 (13.1)	60	67.9	55.3	3.5	5.7									
		70	67.1	53.0	3.9	5.0									
		80	60.5	49.8	4.2	4.2									
80	1.6 (3.6)	60	69.5	57.8	3.5	5.8									
		70	68.3	54.8	3.9	5.1									
		80	67.2	52.4	4.4	4.5									
	2.6 (6.1)	60	72.5	60.1	3.6	6.0									
		70	71.7	57.0	4.0	5.3									
		80	69.1	54.0	4.4	4.6									
	5.5 (12.6)	60	76.2	67.5	3.6	6.2									
		70	74.6	62.8	4.0	5.4									
		80	71.8	56.6	4.4	4.8									
100	0.8 (1.8)	75/63	43.3	36.3	55.0	4.2	10.3								
		80/67	46.6	37.8	58.5	4.2	11.1								
		85/71	49.9	39.4	62.1	4.2	11.8								
	1.3 (3)	75/63	44.0	36.5	55.4	4.1	10.8								
		80/67	47.3	38.2	58.9	4.1	11.6								
		85/71	50.7	39.7	62.6	4.1	12.4								
	2.7 (6.2)	75/63	44.6	36.8	55.8	4.0	11.2								
		80/67	48.0	38.4	59.4	4.0	12.1								
		85/71	51.4	40.3	63.0	4.0	13.0								
110	0.7 (1.7)	75/63	40.5	35.4	53.4	4.7	8.6								
		80/67	43.7	36.8	56.9	4.7	9.2								
		85/71	46.8	38.7	60.3	4.7	9.9								
	1.3 (2.9)	75/63	41.0	35.6	53.7	4.6	8.9								
		80/67	44.3	37.0	57.2	4.6	9.6								
		85/71	47.6	38.9	60.7	4.6	10.4								
	2.6 (6.1)	75/63	41.5	35.8	54.0	4.5	9.2								
		80/67	44.8	37.5	57.5	4.5	10.0								
		85/71	48.3	39.2	61.1	4.5	10.8								

Extended Range - Anti-freeze required

AHRI/ISO13256-1 certified performance is rated at entering air conditions of 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.

Tabulated unit performance does not include fan or pump power corrections required for AHRI/ISO standard performance ratings.

Unit performance may be interpolated. Extrapolation is not allowed.

For conditions other than rating conditions provided, consult the BST selection software.

Ratings below 40°F are with a methanol solution.

The results reported herein are estimates based on testing by FHP. Variations in the installation and operational environment may alter performance. Bosch disclaims all warranties, express and implied, that the performance will be as reported, including the warranty of merchantability and fitness for purpose. In addition, continuous research and development may result in a change to an appliances design and specifications, which Bosch may change without notice. Before purchase, confirm the design specifications of the appliance.



Capacity Data

LM070 – Full Load (2200 CFM)

Cooling									Heating						
Entering Fluid Temp (°F)	Water Flow (GPM)	Pressure Drop PSI (FOH)	Entering Air Temp (db/wb) °F	Total Capacity (MBTUH)	Sensible Capacity (MBTUH)	Heat of Rejection (MBTUH)	Power Input (kW)	EER	Entering Fluid Temp (°F)	Pressure Drop PSI (FOH)	Entering Air Temp (°F)	Total Capacity (MBTUH)	Heat of Absorption (MBTUH)	Power Input (kW)	COP
50	9	0.9 (2.1)	75/63	70.7	54.4	83.3	3.9	18.2							
			80/67	75.5	55.9	88.5	4.0	19.0							
			85/71	80.3	58.1	93.7	4.0	19.9							
	12	1.5 (3.5)	75/63	72.3	54.7	84.5	3.8	19.3							
			80/67	77.0	56.8	89.7	3.8	20.2							
			85/71	82.2	58.7	95.2	3.9	21.2							
	18	3.2 (7.3)	75/63	73.7	54.2	85.7	3.6	20.5							
			80/67	78.7	57.4	91.0	3.7	21.5							
			85/71	84.1	59.3	96.8	3.7	22.7							
60	9	0.9 (2)	75/63	67.9	53.3	81.1	4.2	16.2							
			80/67	72.5	55.0	86.1	4.3	17.0							
			85/71	77.2	57.0	91.1	4.3	17.9							
	12	1.5 (3.4)	75/63	69.3	53.7	82.2	4.0	17.1							
			80/67	74.1	55.5	87.3	4.1	18.0							
			85/71	78.9	57.7	92.5	4.2	19.0							
	18	3.1 (7.1)	75/63	70.8	54.2	83.3	3.9	18.1							
			80/67	75.7	56.1	88.6	4.0	19.1							
			85/71	80.7	58.4	94.0	4.0	20.2							
70	9	0.9 (2)	75/63	65.1	51.9	79.0	4.5	14.4							
			80/67	69.4	53.9	83.7	4.6	15.1							
			85/71	74.1	55.5	88.8	4.7	15.9							
	12	1.4 (3.3)	75/63	66.4	52.4	80.0	4.4	15.2							
			80/67	70.9	54.5	84.8	4.4	16.0							
			85/71	75.6	56.5	89.9	4.5	16.9							
	18	3.0 (6.9)	75/63	67.8	52.9	81.0	4.2	16.0							
			80/67	72.4	55.1	86.0	4.3	16.9							
			85/71	77.3	57.1	91.2	4.3	18.0							
80	9	0.8 (1.9)	75/63	62.2	49.2	76.9	4.9	12.7							
			80/67	66.4	52.4	81.5	5.0	13.4							
			85/71	70.8	54.3	86.3	5.0	14.1							
	12	1.4 (3.2)	75/63	63.4	49.7	77.8	4.7	13.4							
			80/67	67.6	53.2	82.4	4.8	14.1							
			85/71	72.4	54.9	87.5	4.8	14.9							
	18	2.9 (6.6)	75/63	64.7	51.5	78.7	4.6	14.1							
			80/67	69.1	53.8	83.4	4.6	14.9							
			85/71	74.0	55.5	88.7	4.7	15.8							
85	9	0.8 (1.9)	75/63	60.7	49.8	75.9	5.1	11.9							
			80/67	64.8	51.8	80.5	5.2	12.5							
			85/71	69.0	54.2	85.0	5.2	13.2							
	12	1.3 (3.1)	75/63	61.8	49.3	76.6	4.9	12.5							
			80/67	66.1	52.3	81.3	5.0	13.2							
			85/71	70.4	54.7	86.0	5.0	14.0							
	18	2.8 (6.5)	75/63	63.0	49.8	77.4	4.8	13.2							
			80/67	67.5	52.8	82.3	4.8	14.0							
			85/71	71.9	55.6	87.0	4.9	14.8							
90	9	0.8 (1.8)	75/63	59.1	49.5	74.8	5.3	11.1							
			80/67	63.3	51.2	79.4	5.4	11.8							
			85/71	67.3	53.6	83.8	5.4	12.4							
	12	1.3 (3.1)	75/63	60.2	49.9	75.5	5.2	11.7							
			80/67	64.4	52.0	80.1	5.2	12.4							
			85/71	68.7	54.1	84.8	5.2	13.1							
	18	2.8 (6.4)	75/63	61.4	48.9	76.4	5.0	12.3							
			80/67	65.7	52.2	81.1	5.1	13.0							
			85/71	70.2	54.6	85.8	5.1	13.8							
100	9	0.8 (1.8)	75/63	56.1	46.9	73.0	5.8	9.7							
			80/67	60.1	50.0	77.4	5.8	10.3							
			85/71	64.1	52.0	81.8	5.9	10.9							
	12	1.3 (3)	75/63	57.1	47.4	73.6	5.6	10.2							
			80/67	61.3	50.5	78.1	5.7	10.8							
			85/71	65.4	52.5	82.6	5.7	11.5							
	18	2.7 (6.2)	75/63	58.1	47.8	74.2	5.5	10.6							
			80/67	62.4	50.9	78.9	5.5	11.4							
			85/71	66.8	52.9	83.5	5.5	12.1							
110	9	0.7 (1.7)	75/63	53.0	45.6	71.3	6.3	8.4							
			80/67	56.8	47.4	75.6	6.4	8.9							
			85/71	60.6	49.3	79.7	6.4	9.4							
	12	1.3 (2.9)	75/63	53.9	46.0	71.8	6.2	8.8							
			80/67	57.8	48.1	76.0	6.2	9.3							
			85/71	61.8	51.3	80.4	6.2	9.9							
	18	2.6 (6.1)	75/63	54.9	46.1	72.4	6.0	9.1							
			80/67	59.0	49.6	76.8	6.0	9.8							
			85/71	63.1	51.7	81.2	6.0	10.4							

Extended Range - Anti-freeze required

AHRI/ISO13256-1 certified performance is rated at entering air conditions of 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.

Tabulated unit performance does not include fan or pump power corrections required for AHRI/ISO standard performance ratings.

Unit performance may be interpolated. Extrapolation is not allowed.

For conditions other than rating conditions provided, consult the BST selection software.

Ratings below 40°F are with a methanol solution.

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Electrical Data

Condensing Section

Model	Voltage Code	Voltage/ Phase/Hz	Voltage Min/ Max	Compressor			Min. Circuit Amps	HARC Breaker
				Quantity	RLA	LRA		
LM024	1	208-230/1/60	197/253	1	11.7	58.3	14.6	25
LM036	1	208-230/1/60	197/253	1	15.3	83.0	19.1	30
LM048	1	208-230/1/60	197/253	1	21.2	104.0	26.5	45
LM060	1	208-230/1/60	197/253	1	27.1	152.9	33.9	60
LM070	1	208-230/1/60	197/253	1	29.7	179.2	37.1	60

UNIT POWER SUPPLY: A voltage variation of +/- 10% of nameplate rating is acceptable.

Air Handler Section

Model	Voltage Code	Voltage/ Phase/Hz	Voltage Min/Max	Quantity	Blower Motor FLA	Min. Circuit Amps	HARC Breaker
LM024	1	208-230/1/60	197/253	1	2.8	3.5	15
LM036	1	208-230/1/60	197/253	1	4.3	5.4	15
LM048	1	208-230/1/60	197/253	1	6.8	8.5	15
LM060	1	208-230/1/60	197/253	1	9.1	11.4	20
LM070	1	208-230/1/60	197/253	1	9.1	11.4	20

NOTES: 208/230V units shipped with transformer wired for 230V—for 208V remove orange transformer primary lead and replace with red lead. All blower motors are single phase.

UNIT POWER SUPPLY: A voltage variation of +/- 10% of nameplate rating is acceptable. Phase imbalance shall not exceed 2%.

Electrical Data for Units with Electric Heat Option

Air Handler Section – with Constant Airflow Motor

Model	EH Rated kW	Stage	Heater Watts		Heater AMPS			Circuit	MCA		MOP	
			240	208	240V	208V	Motor FLA (A)		Fuses	240V	208V	240V
LM024	4.8	1	4800	3600	20.0	17.3	2.8	-	28.5	25.1	30	30
LM036	4.8	1	4800	3600	20.0	17.3	4.3	-	30.4	27.0	35	35
LM036	9.6	1	9600	7200	40.0	34.6	4.3	-	55.4	48.6	60	60
LM048	4.8	1	4800	3600	20.0	17.3	6.8	-	33.5	30.1	35	35
LM048	9.6	1	9600	7200	40.0	34.6	6.8	-	58.5	51.8	60	60
LM048	14.4	2	14400	10800	60	51.9	6.8	2 X 30	83.5	73.4	90	80
								2 X 60	-			
LM060	4.8	1	4800	3600	20.0	17.3	9.1	-	36.4	33.0	40	35
LM060	9.6	1	9600	7200	40.0	34.6	9.1	-	61.4	54.6	70	60
LM060	14.4	2	14400	10800	60	51.9	9.1	2 X 30	86.4	76.3	90	80
								2 X 60	-			
LM060	19.2	2	19200	14000	80	69.2	9.1	2 X 30	111.4	97.9	125	100
								2 X 60	-			
LM070	4.8	1	4800	3600	20.0	17.3	9.1	-	36.4	33.0	40	35
LM070	9.6	1	9600	7200	40.0	34.6	9.1	-	61.4	54.6	70	60
LM070	14.4	2	14400	10800	60	51.9	9.1	2 X 30	86.4	76.3	90	80
								2 X 60	-			
LM070	19.2	2	19200	14000	80	69.2	9.1	2 X 30	111.4	97.9	125	100
								2 X 60	-			

NOTES: 208/230V units shipped with transformer wired for 230V—for 208V remove orange transformer primary lead and replace with red lead. All blower motors are single phase.

UNIT POWER SUPPLY: A voltage variation of +/- 10% of nameplate rating is acceptable. Phase imbalance shall not exceed 2%.

Blower Motor Performance

ECM Constant Airflow (Variable Speed)

Model	Available External Static Pressure (in. wc. wet coil and standard filter included)													
	Fan Speed	Rated Airflow	Adjust	Tap	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
LM024 Part Load	Hi	600	+	A	600	600	600	600	600	600	600	600	-	-
	Med	500	Normal	A	500	500	500	500	500	500	500	500	-	-
	Low	425	-	A	425	425	425	425	425	425	425	425	-	-
LM024 Full Load	Hi	900	+	A	900	900	900	900	900	900	900	900	-	-
	Med	750	Normal	A	750	750	750	750	750	750	750	750	-	-
	Low	650	-	A	650	650	650	650	650	650	650	650	-	-
LM036 Part Load	Hi	1200	+	A	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
	Med	1050	Normal	A	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050
	Low	900	-	A	900	900	900	900	900	900	900	900	900	900
LM036 Full Load	Hi	1400	+	A	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
	Med	1225	Normal	A	1225	1225	1225	1225	1225	1225	1225	1225	1225	1225
	Low	1050	-	A	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050
LM048 Part Load	Hi	1100	+	B	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
	Med	925	Normal	B	925	925	925	925	925	925	925	925	925	925
	Low	800	-	B	800	800	800	800	800	800	800	800	800	800
LM048 Full Load	Hi	1700	+	B	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
	Med	1500	Normal	B	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
	Low	1275	-	B	1275	1275	1275	1275	1275	1275	1275	1275	1275	1275
LM060 Part Load	Hi	1725	+	A	1725	1725	1725	1725	1725	1725	1725	1725	1725	1725
	Med	1500	Normal	A	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
	Low	1275	-	A	1275	1275	1275	1275	1275	1275	1275	1275	1275	1275
LM060 Full Load	Hi	2300	+	A	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300
	Med	2000	Normal	A	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
	Low	1700	-	A	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
LM070 Part Load	Hi	1850	+	A	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
	Med	1600	Normal	A	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
	Low	1500	-	A	1525	1525	1525	1525	1525	1525	1525	1525	1525	1525
LM070 Full Load	Hi	2300	+	A	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300
	Med	2200	Normal	A	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250
	Low	1900	-	A	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900

NOTE: Air flow is 70% of tabulated values during fan only operation. Air flow is 85% of tabulated value during passive dehumidification mode when enabled.

Physical Data

LM Split Systems	LM024	LM036	LM048	LM060	LM070
Condensing Section					
Compressor Type (Qty 1)	Scroll	Scroll	Scroll	Scroll	Scroll
Factory Charge, R410A (oz)*	80	86	93	115	127
Liquid Line Sweat Connection (in)	3/8	3/8	3/8	3/8	3/8
Suction Line Sweat Connection (in)	7/8	7/8	7/8	1	1
Water Connection Size					
Water Connection Size, FPT	3/4	1.0	1.0	1.0	1.0
Coaxial Coil Volume (gal)	0.33	0.62	0.62	1.07	1.07
Max Water Working Pressure (PSIG/ KPa)	450/3100	450/3100	450/3100	450/3100	450/3100
Cabinet					
Weight - Operating (lbs)	172	172	172	237	237
Weight - Shipping (lbs)	189	189	189	261	261
Air Handler					
Condensate Connection Size, FPT	3/4	3/4	3/4	3/4	3/4
ECM Fan Motor & Blower					
Fan Motor Type	ECM Constant Airflow	ECM Constant Airflow	ECM Constant Airflow	ECM Constant Airflow	ECM Constant Airflow
Fan Motor (HP)	0.33	0.50	0.75	1.00	1.00
Blower Wheel Size (Dia. x W)	9 X 7	9 X 7	10 X 8	11 X 9	12 X 9
Vertical Cabinet (AV)					
Air Coil Dimensions (H x W)	24 X 21	24 X 21	24 X 27	24 X 27	32 x 27
Standard Filter - 1" Throwaway (L x H)	24 X 24 (1)	24 X 24 (1)	24 X 30 (1)	24 X 30 (1)	16 X 30 (2)
Optional Filter - 2" MERV-8 or 13 Throwaway (L x H)	20x20	24x24	24x30	24x30	16x30 @2
Weight - Operating (lbs)	117	136	173	200	221
Weight - Shipping (lbs)	145	167	213	246	272
Horizontal Air Handler					
Air Coil Dimensions (H x W)	18 X 28	18 X 28	20 X 32 1/2	20 X 32 1/2	20 X 43
Standard Filter - 1" Throwaway (L x H)	20 X 30 (1)	20 X 30 (1)	20 X 34 1/2 (1)	20 X 34 1/2 (1)	20 X 24 (2)
Optional Filter - 2" MERV-8 or 13 Throwaway (L x H)	16x25	18x30	20x34.5	20x34.5	20x24 @2
Weight - Shipping (lbs)	152	175	220	253	279
Weight - Operating (lbs)	124	143	180	207	228

NOTE: *Factory charge is based on 25 ft of lineset with lineset diameter according to line sizing table. Charge adjustments will need to be made for linesets of differing length and/or diameters. Additional charge must also be added for factory supplied filter drier. All charge rates MUST ALWAYS to be confirmed and adjusted if necessary by subcooling and superheat measurements (even with a 25 ft lineset and default factory charge). See section on charging according to subcooling and superheat.

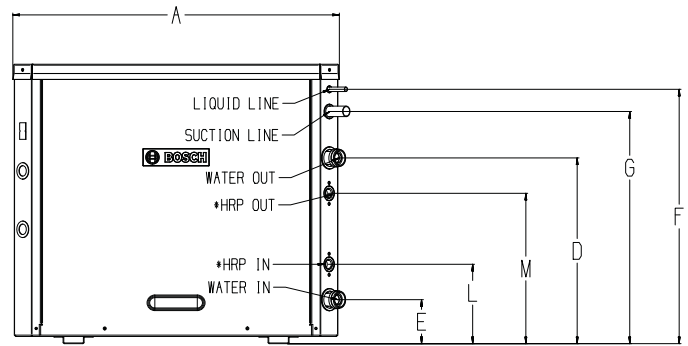
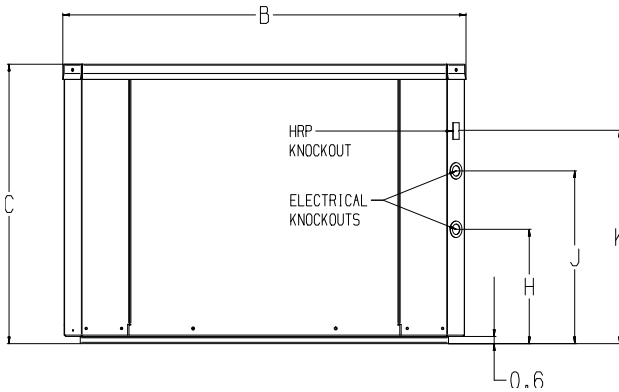
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Condensing Section Dimensions

Model	A	B	C	D	E	F	G	H	J	Water Connections
	Width	Depth	Height	Water Out	Water In	Liquid Connection	Suction Connection	Electrical Knockout		
LM024-CS	24	27.4	21.5	12.7	3.7	3/8" @ 19.4	7/8" @ 17.6	8.6	13.5	3/4" F.P.T
LM036-CS	24	27.4	21.5	15.5	3.5	3/8" @ 19.4	7/8" @ 17.6	8.6	13.5	1" F.P.T
LM048-CS	24	27.4	21.5	15.5	3.5	3/8" @ 19.4	7/8" @ 17.6	8.6	13.5	1" F.P.T
LM060-CS	27	33.4	23.3	15.5	3.7	3/8" @ 21.2	1" @ 19.4	9.5	14.4	1" F.P.T
LM070-CS	27	33.4	23.3	15.5	3.7	3/8" @ 21.2	1" @ 19.4	9.5	14.4	1" F.P.T

NOTES: All dimensions within +/- 0.125
All dimensions in Inches

Specifications subject to change without notice.

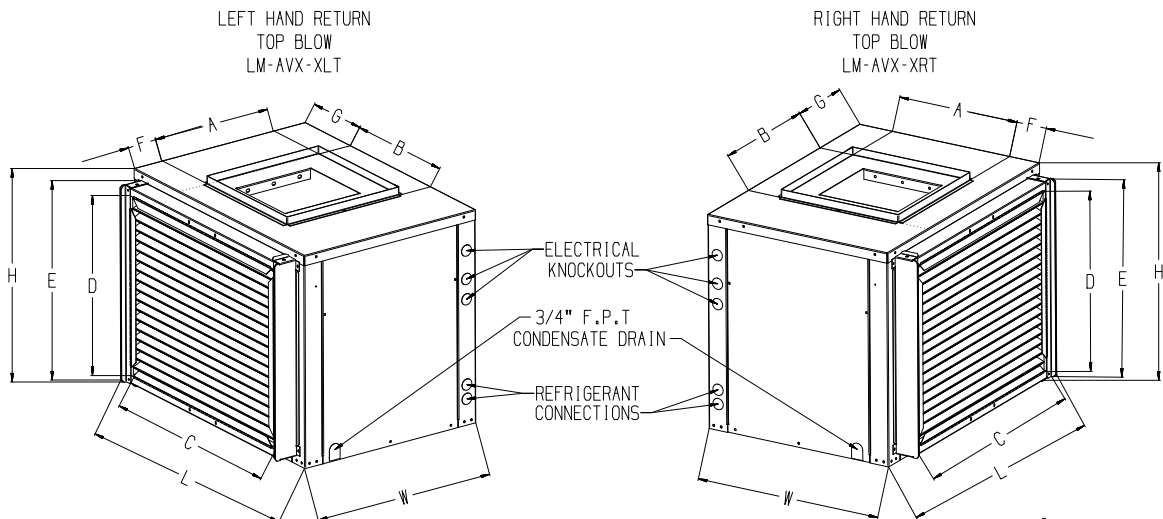


Vertical Air Handler Dimensions

Overall unit dimensions do not include filter rack or duct flanges.

Model	L	W	H	C	D	E	A	B	G	F	F	Recommended Replacement Nominal Filter Size
	Length	Width	Height	R/A Duct Flange Width	R/A Duct Flange Height	Filter Rack Height	Top Blow Units (XLT & XRT)					
							S/A Duct Collar		XLT	XRT		
LM024	26.00	21.5	25.75	22.00	22.25	24.00	15.75	13.75	6.13	5.25	4.00	24x24x1
LM036	26.00	21.5	25.75	22.00	22.25	24.00	15.75	13.75	6.13	5.25	4.00	24x24x1
LM048	32.75	24.0	25.75	28.50	22.25	24.00	15.75	15.75	8.38	5.50	3.50	24x30x1
LM060	33.25	26.0	27.75	28.50	22.25	24.00	17.75	17.75	8.37	6.25	4.00	24x30x1
LM070	33.25	26.0	35.75	28.50	30.25	32.00	17.75	17.75	8.37	6.25	4.00	16x30x1 (2)

NOTES: All dimensions in inches unless otherwise noted. All dimensions within +/- 0.125". Specifications subject to change without notice.
1" filter rack extends 1.23" beyond the side of the unit. 2" filter rack extends 2.89" beyond the side of the unit.
The 2" filter rack is 4 sided with a filter access door on each end and can accept either a 1" or 2" filter.



Subject to change without prior notice.

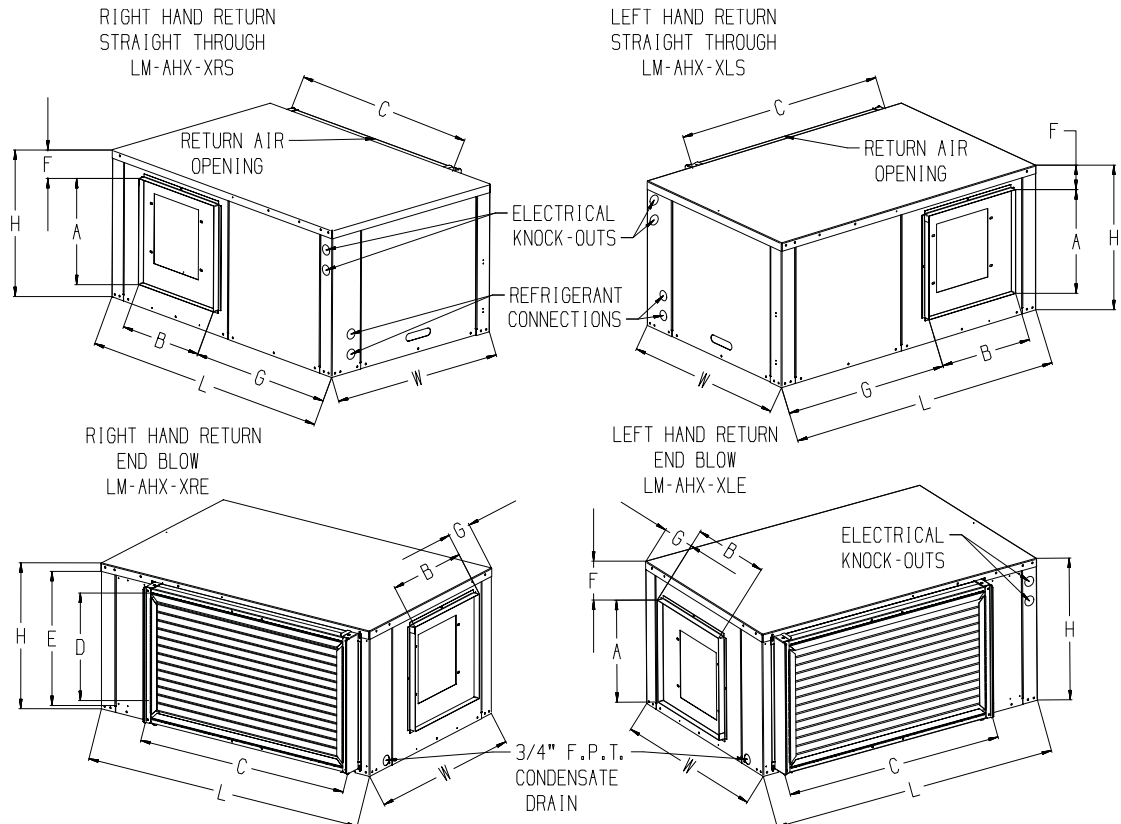
Horizontal Air Handler Dimensions

Overall unit dimensions do not include filter rack or duct flanges.

Model	L	W	H	A	B	C	D	E	F	G	F	G	F	G	F	G	Recommended Replacement Nominal Filter Size
	Length	Width	Height	S/A Duct Height	S/A Duct Width	R/A Duct FLG Width	R/A Duct FLG Height	Filter Rack Height	Left Hand Return End Blow (XLE)		Right Hand Return End Blow (XRE)		Left Hand Return Straight Through (XLS)		Right Hand Return Straight Through (XRS)		
LM024	33.00	26.00	21.75	15.75	13.75	30.00	16.00	18.00	1.25	4.13	2.00	4.13	1.38	10.63	1.88	10.63	20x30x1
LM036	33.00	26.00	21.75	15.75	13.75	30.00	16.00	18.00	1.25	4.13	2.00	4.13	1.38	10.63	1.88	10.63	20x30x1
LM048	38.50	30.00	21.75	15.75	15.75	33.50	18.50	20.50	2.63	4.00	2.63	4.00	2.63	11.38	2.63	11.38	20x34.5x1
LM060	38.50	30.00	21.75	17.75	17.75	33.50	18.50	20.50	1.50	4.13	1.75	4.13	1.75	10.38	1.50	10.38	20x34.5x1
LM070	49.50	30.00	21.75	17.75	17.75	44.00	18.50	20.50	1.50	4.13	1.75	4.13	1.75	15.63	1.50	15.63	20x24x1 (2)

NOTES: All dimensions within $\pm 0.125"$. All condensate drain connections are 3/4" FPT. Horizontal units can be field converted between end blow and straight through supply air configurations. Specifications subject to change without notice.
 1" filter rack extends 1.23" beyond the side of the unit. 2" filter rack extends 2.89" beyond the side of the unit.
 The 2" filter rack is 4 sided with a filter access door on each end and can accept either a 1" or 2" filter.
 Refrigerant line connections are located directly behind refrigerant line knockouts.

The local electric codes may require 36" or more clearance at the electrical control box.



Guide Specifications

General

Units shall be performance certified to ISO standard 13256-1 for WaterLoop Heat Pump, Ground Water Heat Pump and Ground Loop Heat Pump applications. Units shall conform to UL 1995 standard and certified to CAN/CSA C22.1 No 236 by Intertek-ETL safety on all models. Each unit shall be run tested at the factory. Each unit shall be pallet mounted, stretch wrapped and covered with cardboard. The units shall be manufactured in an ISO9001:2000 certified facility. Refer to Bosch Thermotechnology Corp. limited product warranty for details on warranty coverage.

The units shall be designed to operate with entering fluid temperatures between 50°F (10°C) and 110°F (43.3°C) in cooling and temperatures between 25°F (-3.9°C) and 80°F (26.6°C) in heating as manufactured by FHP Manufacturing in Fort Lauderdale, Florida.

Standard Construction

The LM Split condensing section cabinet is fabricated with 1mm white pre-painted steel with closed cell foam insulation as a standard feature. The LM Split air handler section is manufactured with galvanized steel and fiberglass insulation as standard feature. The cabinet is specifically designed to aid in corrosion protection.

Air Handler: The interior shall be insulated with ½" (12.7mm) thick glass fiber. Two blower compartment access panels shall be removable with supply and return ductwork in place. A duct collar shall be provided on the supply air opening. A filter rack with a 2" (50.8 mm) thick disposable filters and a 1" (25.4mm) return air duct collar shall be provided with each unit. As an option, air filters shall be pleated, with a MERV-8 or MERV-13 rating. Units shall have a stainless steel condensate drain pans.

Condensing Section: All unit installations shall allow sufficient service access to replace the compressor without unit removal. The compressor shall have a floating base pan to minimize noise transmissions. Each unit also comes standard with a heavy duty, multi-density compressor blanket for exceptional

noise containment and as a thermal insulator for wires and components surrounding the compressor.

Refrigeration Circuits

All units shall contain a sealed refrigerant circuit including a two stage scroll compressor, two internal checking thermal expansion valve metering devices, one in the air handler and one in the condensing section, finned tube air-to-refrigerant heat exchanger, refrigerant reversing valve, refrigerant service shut off valves, and service ports. Compressor shall be high efficiency two stage scroll type, designed for heat pump duty, quiet operation and mounted on rubber vibration isolators. Compressor motors shall be equipped with overload protection. Refrigerant reversing valves shall be pilot operated sliding piston type with replaceable encapsulated magnetic coils energized only during the cooling cycle. The finned tube coil shall be constructed of lanced aluminum fins not exceeding fourteen fins per inch bonded to rifled copper tubes in a staggered pattern not less than three rows deep and have a 600 PSIG (4140 kPa) working pressure. Coils shall have standard uncoated and as a option the Tin-Plated Copper Tubing will aid in protecting the evaporator coil from many forms of corrosive elements in the airstream. The coaxial water-to-refrigerant heat exchanger shall be constructed of a convoluted copper (optional cupronickel) inner tube and steel outer tube with a designed refrigerant working pressure of 600 PSIG (4140 kPa) and a designed water side working pressure of no less than 400 PSIG (2750 kPa). The water-to-refrigerant heat exchanger and all refrigerant piping shall be insulated with closed-cell polyvinyl chloride foam to prevent condensation at low fluid temperatures.

Fan and Motor Assembly

The fan shall be direct drive centrifugal forward curved type with a dynamically balanced wheel. The housing and wheel shall be designed for quiet low velocity operation. The blower fan housing is assembled with a removable inlet ring that allows for quick removal and servicing of fan motor without disconnecting the supply air duct work. The fan motor shall be a constant airflow (CFM) type ECM motor with internal programming factory set for the specific unit

Guide Specifications

and featuring soft start/stop and a delay off feature for maximum efficiency and quiet operation. Air flow rates shall be varied according to the staging of the unit. There will further be provisions for adjusting the air delivery of the motor and blower by +/- 15% from rated air flow.

Electrical

Controls and safety devices will be factory wired and mounted within the unit. Controls shall include optional comfort alert module, compressor contactor, 24V transformer, reversing valve coil and solid state lock-out controller unit protection module (UPM). The UPM board shall include the following features: diagnostic LED's, low pressure bypass time delay (to prevent nuisance low pressure lock-outs during operation with low fluid temperatures), anti short cycle time delay, random start time delay and one time intelligent reset. When the safety controls are activated the lock-out circuit shall reset itself the first time. If the safety controls are subsequently activated 2 or 4 times (field configurable) within one hour, then the lock-out circuit shall disable the compressor until it is reset at the thermostat or main circuit breaker to prevent compressor operation during fault conditions. A lock-out indicating terminal shall be provided in the low voltage circuit. Safety devices include a low pressure cutout set a 40 PSIG (280 kPa) for loss of charge protection (freezestat and/or high discharge gas temperature sensor is not acceptable) and a high pressure cutout control set at 600 PSIG (4140 Kpa).

The ECM motor interface board shall provide a screw type terminal block for thermostat connection, LED's to indicate thermostat status and air delivery. It shall also provide a means of changing the motor program to any of up to four pre-programmed options. Direct wiring of the motor control harness to the thermostat is not acceptable.

A terminal block with screw terminals shall be provided for control wiring. An optional energy management relay to allow unit control by an external source can be factory installed.

Piping

The supply and return water connections are located on the front of the unit. Supply, return water and condensate drain connections shall be brass female pipe thread fittings and mounted flush to cabinet exterior.

Internal Electric Heat (Optional)

208/230-1-60 volt units shall be equipped with optional factory installed internal electric resistance heat for auxiliary and emergency heat. Electric heater must be Intertek (ETL) approved for safety when installed in the unit. External heater packages or heater packages not specifically listed for use with the unit are unacceptable. Electric heater packages shall include a heater collar mounted to the blower outlet, individual thermal overload protected heater elements no greater than 5kW each and magnetic contactors. An empty heater collar is standard in all units. Heating elements are available as an after sale product and can be added at any time if purchased without this option.

Factory Installed Options

A comfort alert module shall be installed in the unit to assist in service diagnostics (sizes 024-070 only).

Smart Start Control: A factory installed start assist device that reduces inrush current on start up and extends compressor longevity.

DDC Controls: Unit shall be equipped with a factory installed DDC control capable of interfacing with BACnet™, Modbus, N2 or Lon works® (with optional card). The controller shall be pre-programmed to control the unit and monitor the safety controls. The unit shall be able to operate as a standalone or be integrated into the building management system. A leaving water and leaving air sensor shall be installed in the unit. Wall sensors shall be available for controlling zone temperature.

Flow Proving Switch: Prevents unit operation if there is no fluid flow. This factory installed, internally mounted device shall be rated at 600 psi and disable the compressor if a lack of water-flow occurs.

Guide Specifications

Additional Factory Options

All units shall be connected by hoses and have a maximum working pressure 400 PSI for sizes ½" – 1" and 300 PSI for sizes 1¼ – 2". A variety of hose kits are available depending on the job requirement. Kits 2 through 6 include supply and return ported ball shut-off valves with P/T ports. Hose kit options are available in the accessories section of the BST selection software.

Kit 1 – Hose kit either 24" or 36" long.

Kit 2 – Hose kit with ball valves on the supply and return hoses. Valves shall have P/T ports to facilitate pressure and temperature readings.

Kit 3 – Hose kit with automatic flow control valve. The design flow rate is preset at the factory per the specified design conditions and shall automatically limit the flow to this value. This shall facilitate balancing of the fluid loop and allow each unit the required flow.

Kit 4 – Hose kit with an automatic flow control valve and a Y-strainer and blow down valve on the supply side. The filter screen is 20 mesh, 304 stainless steel.

This shall prevent dirt and debris from entering the water coil.

Kit 5 – Hose kit with an automatic flow control valve and a 24V, 2-position solenoid valve on the return. This shall be used to shut off flow to the unit when there is not a call for heating or cooling. (Typically used with a VFD pumping.)

Kit 6 – Hose kit with an automatic flow control valve, Y-strainer/BD valve on the return. 24V, automatic flow valve, blow down valve and two position solenoid valve.

Thermostats

The unit control may be as simple as a single stage thermostat or the unit may have a DDC controller integrated into the building management system. All external low voltage control wiring is made to the thermostat terminal located in the unit electrical box. Thermostats may be manual change over, auto change over, programmable or non-programmable depending on the requirements of the project. A full line of thermostats are available from Bosch Thermostat Technology Corp. as an accessory.

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