Air to Water Heat Pump

Market Trends – LG Solutions

THERMA V™

*

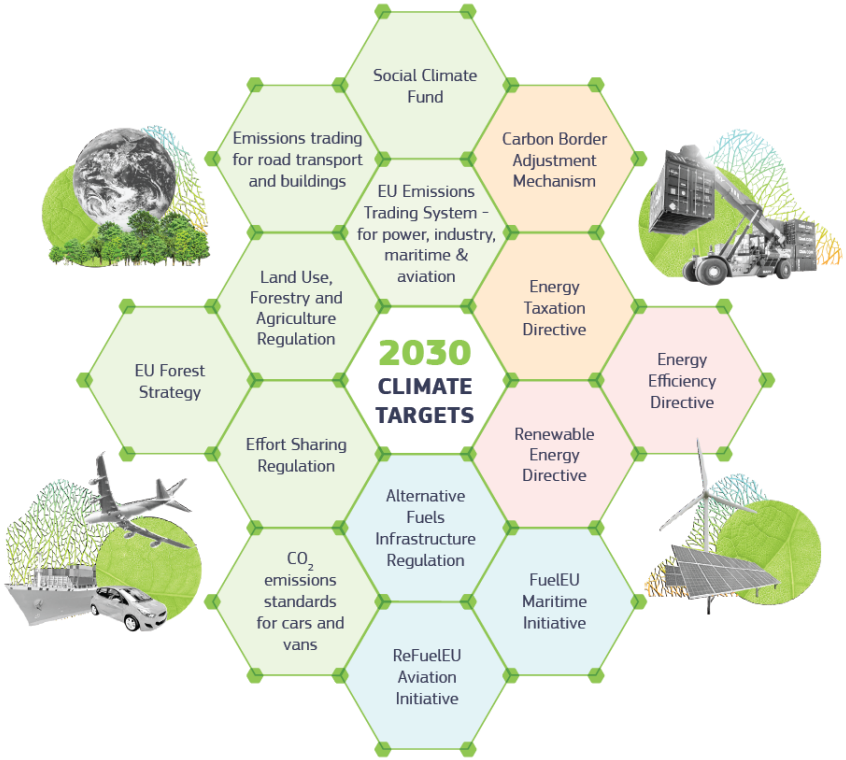
LG Business Solutions

Market Trend

Toward climate-neutral

European Green Deal

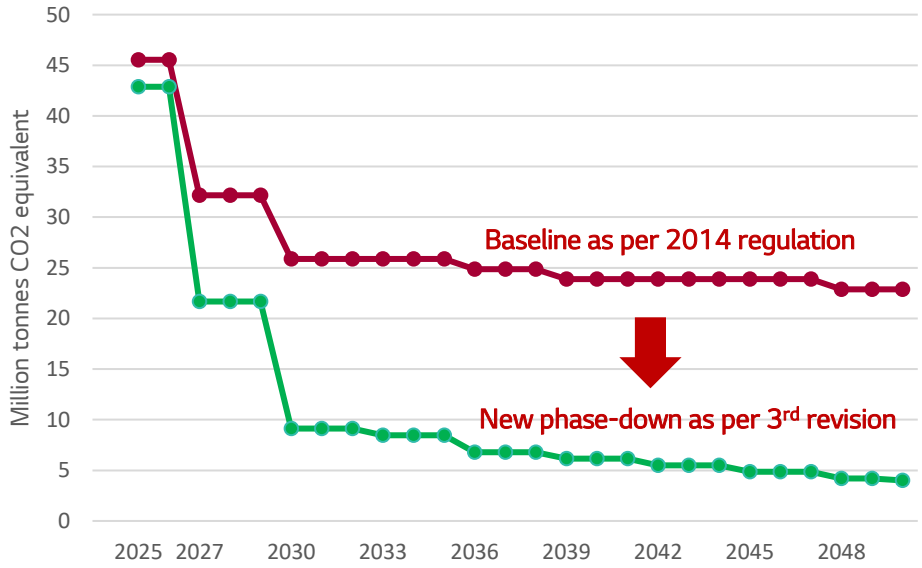
- 55% GHG Reduction by 2030
- Become climate-neutral by 2050



3rd revision of F-gas regulation

- Higher ambition to reduce the amount of HFCs by 98% by 2050 (compared to 2015)
- Compliance with the Montreal Protocol
- Improve enforcement and implementation
- Achieve more comprehensive monitoring

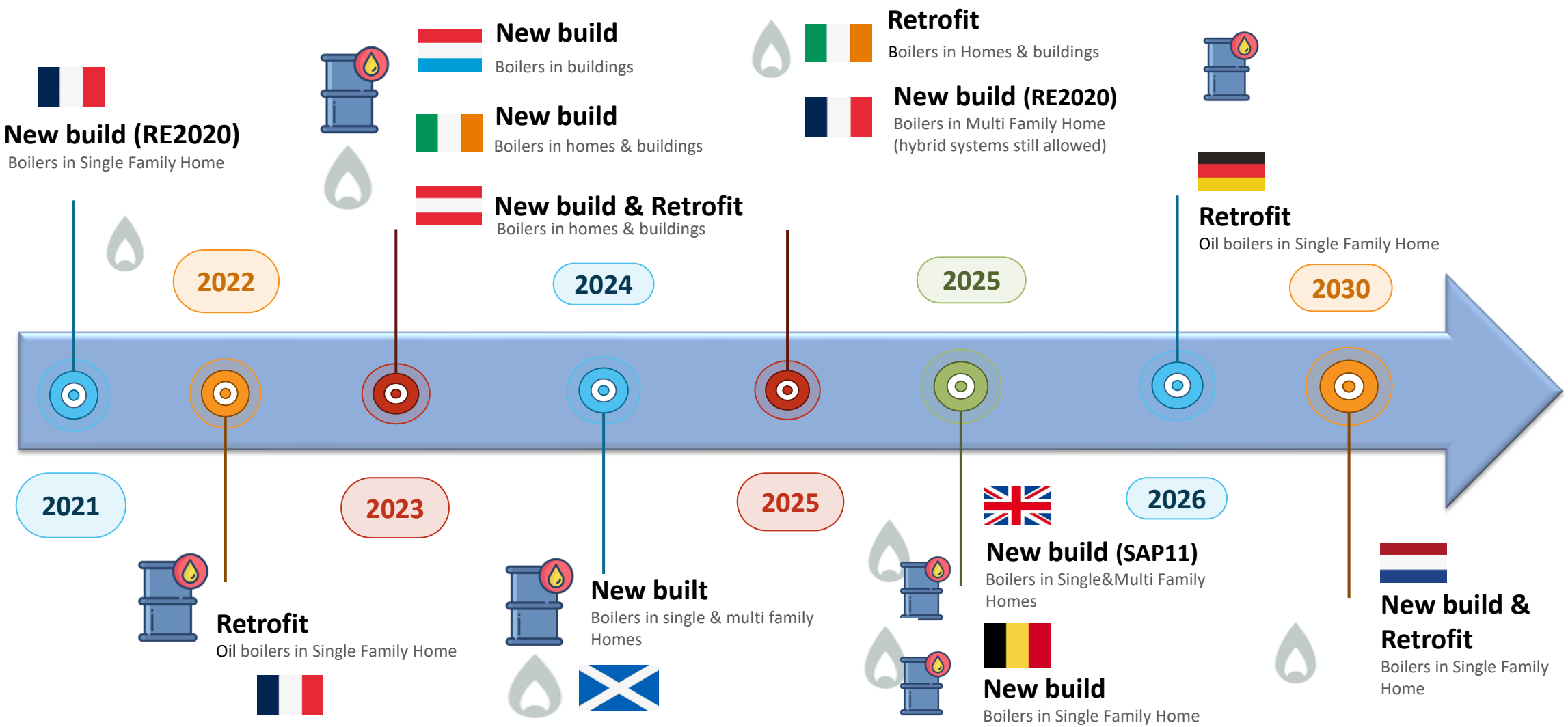
[EU HFC Phase- down 1)]



1) Source : F-Gas Presentation from DG Clima & EHPA on 11/01/2024

Market Trend

Boiler bans and restrictions



As of June, 2023

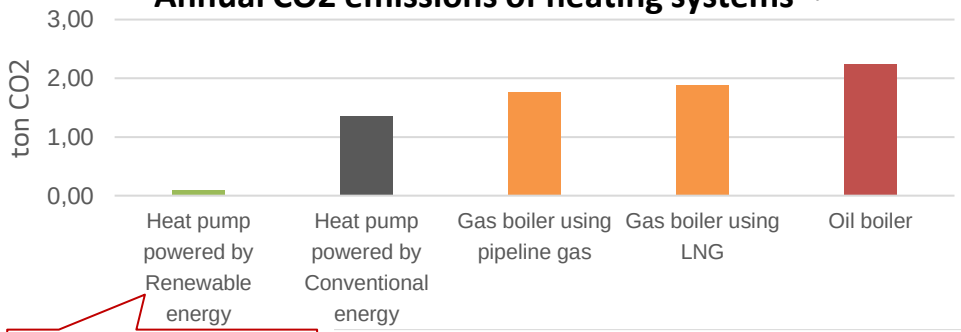
Market Trend

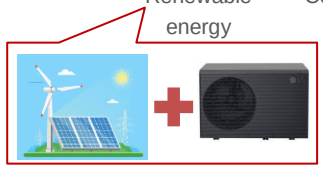
Why Air-to-Water Heat Pump ?

An Air-to-Water Heat Pump harnesses the power of renewable energy, with approximately 80% [1] derived from solar heat stored in the ambient air. This means that even when powered by conventional electricity, it significantly reduces CO2 emissions. **As we transition to more renewable energy sources for electricity, the Air-to-Water Heat Pump becomes even more eco-friendly.**

Air-to-Water Heat Pump

Annual CO2 emissions of heating systems [2]

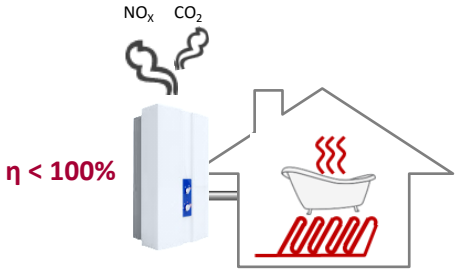




Conventional System

Gas / Oil Boiler

Emissions of environmentally hazardous substances



Gas / Oil Boiler

While 'H2-ready' gas boilers theoretically tap into renewable energy (like 'Green hydrogen'), the conversion losses are considerably higher when compared to the direct use of renewable electricity by heat pumps. Green hydrogen has a vital role in greening high-energy-consuming sectors, but for heating, the heat pump stands out as a more efficient and environmentally friendly solution.

1) Each ratio is general to help understanding, and it is based on SCOP of THERMA V R290 Monobloc under Low Temperature & Average Climate conditions which is higher than 5. The actual efficiency may vary with water and outside temperatures.
2) Exemplary figures from Germany, 2020; 4 persons, 200m2 flat and sourced from BWP (German Heat Pump Association, https://waermepumpe-bwp.de/co2-neutral-heizen/)

Market Trend

Customer Need for Air-to-Water Heat Pump

HOUSE BUILDER

- ✓ Smart home Readiness wants to provide smart home environment to residents
- ✓ High Efficiency wants to reduce operating cost for residents

CONSULTANT

- ✓ High Efficiency wants to meet nZEB regulation
- ✓ Eco-conscious wants to reduce carbon emission
- ✓ Excellent Performance wants stable heating performance without back-up facility

INSTALLER / SERVICE PARTNER

- ✓ Quick Installation wants to install quickly
- ✓ Integrated hydronic components wants to reduce costs due to additional installation of hydronic components
- ✓ Remote Monitoring wants to minimize the number of visits while remotely monitoring product status

END USER

- ✓ Design fits seamlessly with a building's exterior and environment
- ✓ Quiet Operation as quiet as libraries
- ✓ High Efficiency wants to reduce operating cost
- ✓ Easy Control want to control product remotely
- ✓ Robustness wants to reduce maintenance or service works

LG THERMA V

Line-up (Monobloc)

* Natural refrigerant with GWP 3

Product		Water Temp. (C / H)	Refrigerant	Power	Heating Capacity (Cooling Capacity) (Unit : kW)							
					4	5	6	7	9	12	14	16
Therma V Monobloc 	Control Unit	5℃ / 75℃	R290*	1ø 230V				O 7.0 (4.5)	O 9.0 (5.5)	O 12.0 (11.5)	O 14.0 (12.0)	O 16.0 (12.5)
				3ø 400V				O 7.0 (4.5)	O 9.0 (5.5)	O 12.0 (11.5)	O 14.0 (12.0)	O 16.0 (12.5)
	Hydro Unit 			1ø 230V				O 7.0 (4.5)	O 9.0 (5.5)	O 12.0 (11.5)	O 14.0 (12.0)	O 16.0 (12.5)
				3ø 400V				O 7.0 (4.5)	O 9.0 (5.5)	O 12.0 (11.5)	O 14.0 (12.0)	O 16.0 (12.5)
	Combi Unit 			1ø 230V						O 12.0 (11.5)	O 14.0 (12.0)	O 16.0 (12.5)
				3ø 400V						O 12.0 (11.5)	O 14.0 (12.0)	O 16.0 (12.5)
Therma V Monobloc S II 		5℃ / 65℃	R32	1ø 230V		NEW O 5.5 (5.5)		O 7.0 (7.0)	O 9.0 (9.0)	O 12.0 (12.0)	O 14.0 (14.0)	O 16.0 (16.0)
				3ø 400V						O 12.0 (12.0)	O 14.0 (14.0)	O 16.0 (16.0)
Therma V Monobloc S 				1ø 230V		To be EOL O 5.5 (5.5)		O 7.0 (7.0)	O 9.0 (9.0)	O 12.0 (12.0)	O 14.0 (14.0)	O 16.0 (16.0)
				3ø 400V					O 9.0 (9.0)	O 12.0 (12.0)	O 14.0 (14.0)	O 16.0 (16.0)

LG THERMA V

Line-up (Hydrosplit + Split)

Product		Water Temp. (C / H)	Refrigerant	Power	Heating Capacity (Cooling Capacity) (Unit : kW)							
					4	5	6	7	9	12	14	16
Therma V Hydrosplit 	Hydro Unit 	5℃ / 65℃	R32	1ø 230V						O 12.0 (12.0)	O 14.0 (14.0)	O 16.0 (16.0)
				3ø 400V						O 12.0 (12.0)	O 14.0 (14.0)	O 16.0 (16.0)
	Combi Unit 			1ø 230V						O 12.0 (12.0)	O 14.0 (14.0)	O 16.0 (16.0)
				3ø 400V						O 12.0 (12.0)	O 14.0 (14.0)	O 16.0 (16.0)
Therma V Split 	Hydro Unit 	5℃ / 55℃	R32	1ø 230V	O 4.0 (4.0)		O 6.0 (6.0)					
	Combi Unit 			1ø 230V	O 4.0 (4.0)		O 6.0 (6.0)					
	Hydro Unit 	5℃ / 65℃		1ø 230V		O 5.5 (5.5)		O 7.0 (7.0)	O 9.0 (9.0)			
	Combi Unit 			1ø 230V		O 5.5 (5.5)		O 7.0 (7.0)	O 9.0 (9.0)			

LG R290 Monobloc

Overview

Line-up

Capacity	7 kW	9 kW	12 kW	14 kW	16 kW
					
1Ø	○	○	○	○	○
3Ø	○	○	○	○	○

Natural Refrigerant with low GWP

GWP 3

R290 *

* Natural refrigerant with GWP 3

Monobloc concept

No refrigerant work required

Water pipes

Excellent Performance

- ✓ Exceptional efficiency exceeding SCOP 5 (ErP Energy Label A+++ / A+++ 1))
- ✓ Extremely low noise level unit available today (Sound Power Level 49dB(A) @ 12kW)
- ✓ Wide operation range (Water Temp. : Up to 75℃, Ambient Temp. : -28 ~ 35℃)

Three (3) IDU combinations

Control Unit Combination

- Stand-alone concept (No water piping connection)
- Recommended when not using a backup heater

Details for Control Unit

Hydro Unit Combination

- Back-up heater & expansion tank integrated inside the hydro box

Typical Piping Diagram

Combi Unit Combination

- All-in-one solution for domestic hot water supply, space heating and cooling
- 200L Duplex stainless steel tank

Details for Combi Unit

Typical Piping Diagram

Note

1) Based on seasonal space heating efficiency according to EN14825.

LG R290 Monobloc

Major Components

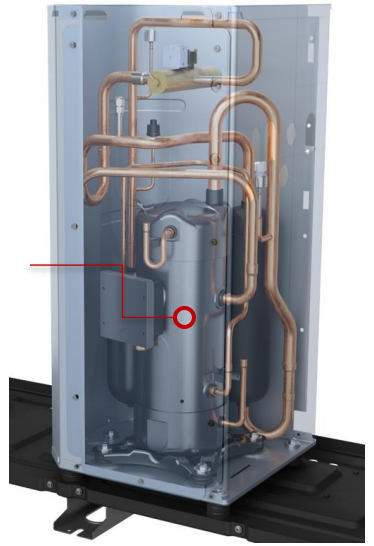
1 Black Fin Heat Exchanger (Air / Ref.)

2 New biomimetic fan

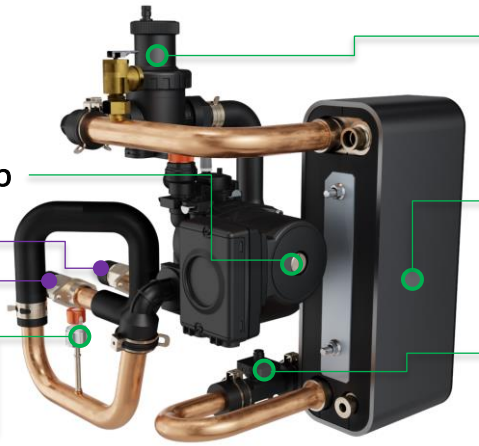
Φ 680

3 Dual Sound Shield

4 New Scroll Compressor



5 Hydronic Components Assembly



Connections

A Leaving water pipe (male PT 1")

B Entering water pipe (male PT 1")

LG R32 Monobloc S II

Overview

Capacity	5 kW	7 kW	9 kW	12 kW	14 kW	16 kW
						
1Ø	○	○	○	○	○	○
3Ø				○	○	○

R32

Monobloc concept

- ✓ No refrigerant work require
  (Plug and Play concept)

European Design

- ✓ Refined grey design that will look great anywhere
  (Design Unity; Share the same design philosophy)

Excellent Performance

- ✓ High efficiency up to SCOP 4.67 (12kW)
  (ErP Energy Label A+++ / A++)
- ✓ Extremely low noise level unit available today
  (Sound Power Level 57dB(A) @ 9kW)
- ✓ Wide operation range
  (Water Temp. : Up to 65℃, Ambient Temp. : -25 ~ 35℃)

Easy Integration

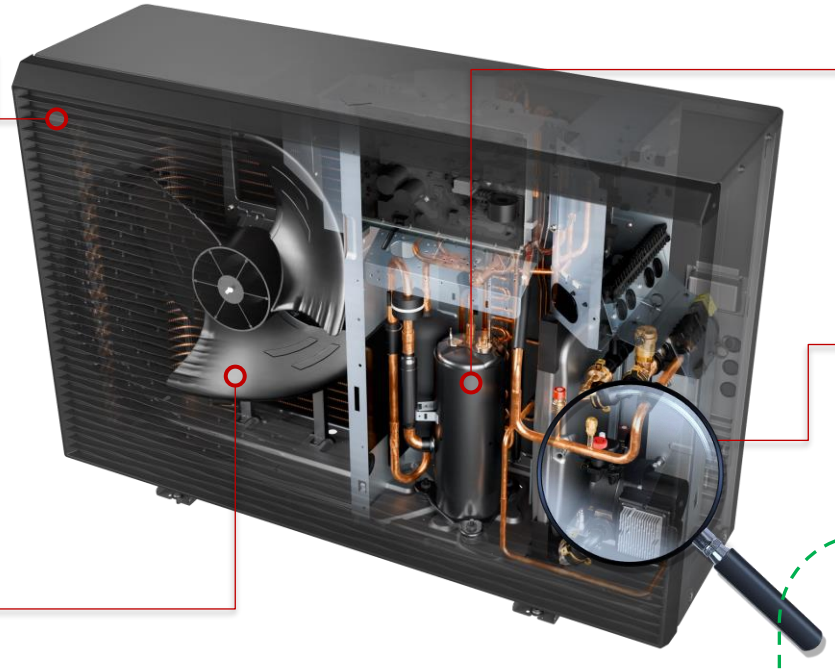
- ✓ Reduce number of outdoor unit foot fixation
  (3 feet → 2 feet for ALL line-ups)
- ✓ Easy access to control panel by opening side panel
  (easy access to PCBs and terminal block)
- ✓ Hybrid logic improvement
- ✓ Cascade ready

LG R32 Monobloc S II

Major Components

1 Black Fin Heat Exchanger (Air / Ref.)

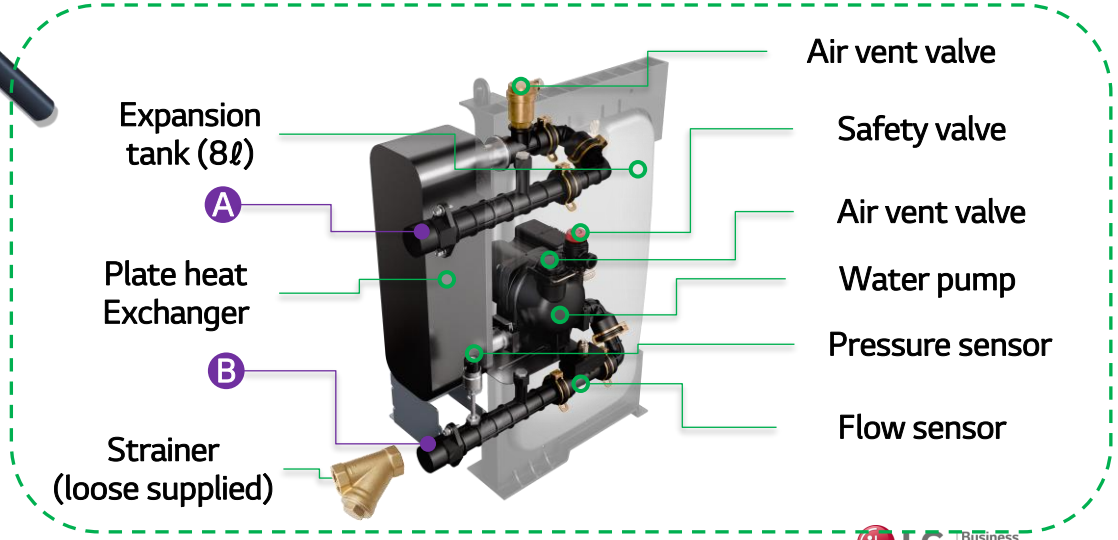
2 Biomimetic Fan



** picture shown 5, 7, and 9kW models. (UN36A)*

3 R1 Compressor

5 Hydronic Components Assembly



Connections

Ⓐ Leaving water pipe (male PT 1")
Ⓑ Entering water pipe (male PT 1")

Why LG Monobloc ?

Summary of LG Monobloc

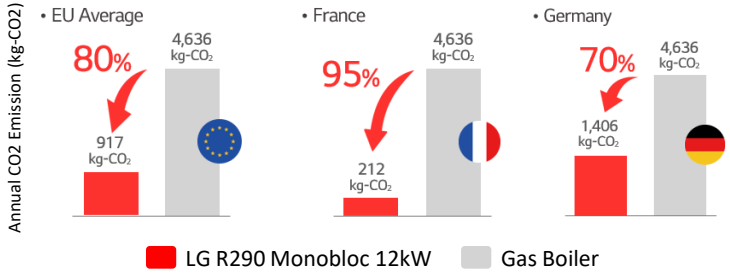
HIGH EFFICENCT OPERATION

- Exceptional efficiency exceeding SCOP 5 [1)]

1) Based on Average Climate and Low Temperature (35℃) condition

- Less Environmental Impact

[Carbon emissions [2)] during usage stage]



2) This was simulated based on the Average Climate and Low Temperature (35℃) condition and this simulation result may differ from actual values since there are many assumptions used. For more detailed assumptions, please refer to the detailed description page (25P) included later in this document.

EXTREMELY QUIET OPERATION

- One of the super-quiet model in the market (R290)

QUIET MARK

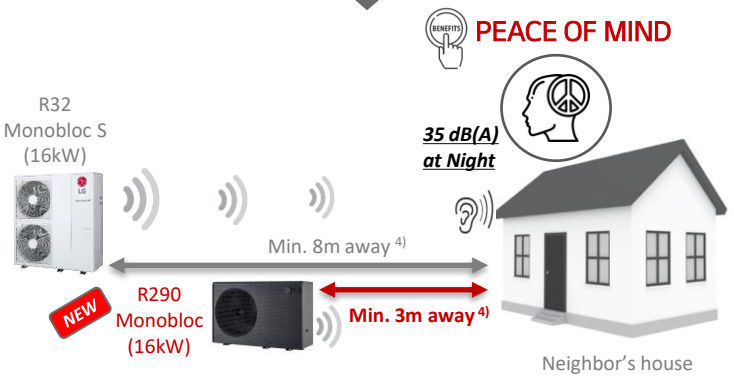
UK & EU only [3)]

Extremely low noise level unit available today

- The sound power level of 49 dB (A) @ 12 kW is outstanding in the market.

Sound power level	R290 Monobloc				
	7 kW	9 kW	12 kW	14 kW	16 kW
Heating / Rated	49	50	49	51	52

3) The certification(Quiet Mark) for R290 Monobloc is valid for UK & EU territories only until Dec. 31st of 2025 and detailed models registered can be found at the website of QUIET MARK.

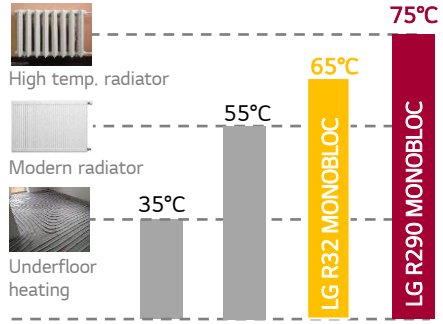


4) Based on the converted sound pressure level from rated Sound Power Level. Minimum distance to be away from neighboring house may vary depending on installation conditions and noise regulations in individual countries.

MORE RELIABLE OPERATION

- Wide operation range

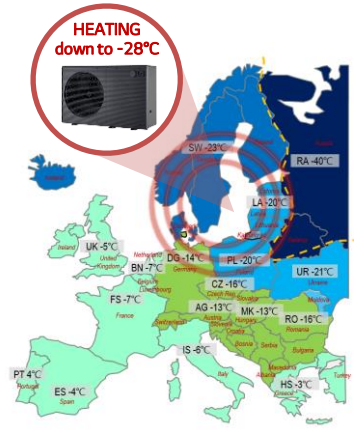
[Water outlet Temp.]



Ultimate solution for replacement and new build

Stable heating operation in All EU countries

[Ambient Temp.]

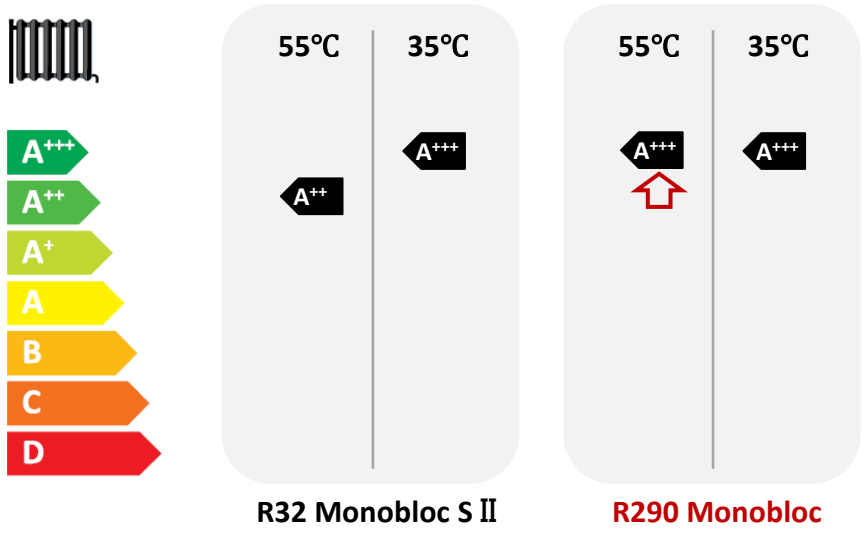


High energy efficiency

ErP Energy Labeling A+++ / A+++ [1] for space heating

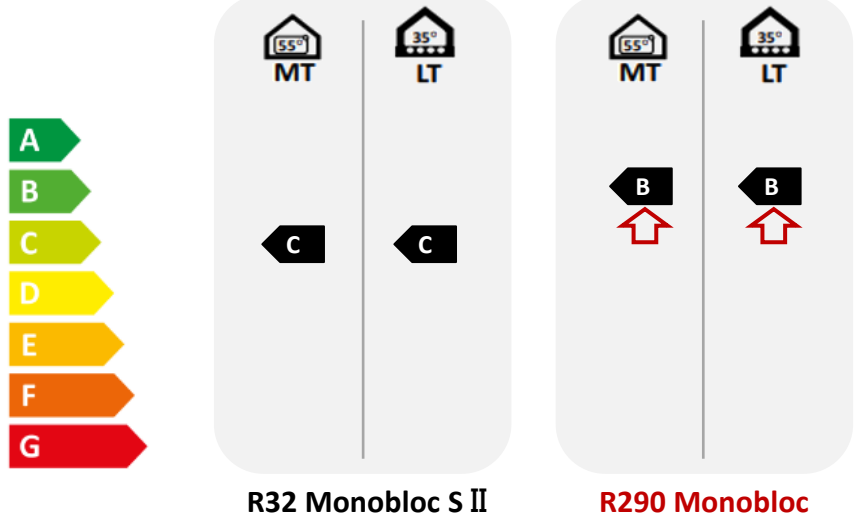
ErP energy labeling (Current ErP)

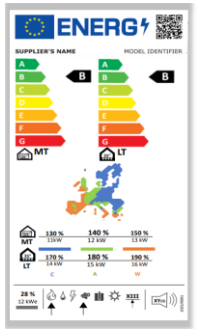
Space Heating



ErP energy labeling (New ErP) [2]

Space Heating





New ErP draft (To be effective from Sep. of 2025)

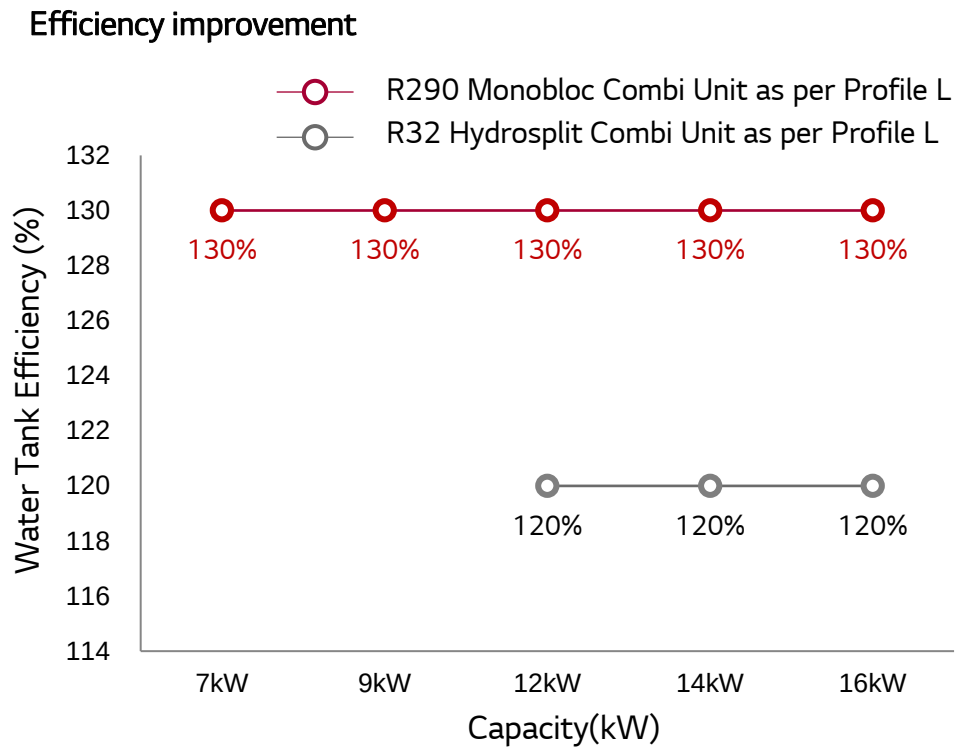
- Enhanced MEPS (MT: 145% / LT: 170%)
- Energy label re-scaling (A+++ to D → A to G)
- Mandatory 3rd party Test
- Change of CC (2.5 → 1.9)
- Measured sound power level under Part load B

1) Seasonal space heating efficiency is based on EN14825 and refer to LG Compliance Information homepage for more detailed information (https://www.lg.com/global/support/cedoc/cedoc).
2) These classes have been converted based on currently announced regulatory standards, so it may be changed at the time when New ErP is actually applied.

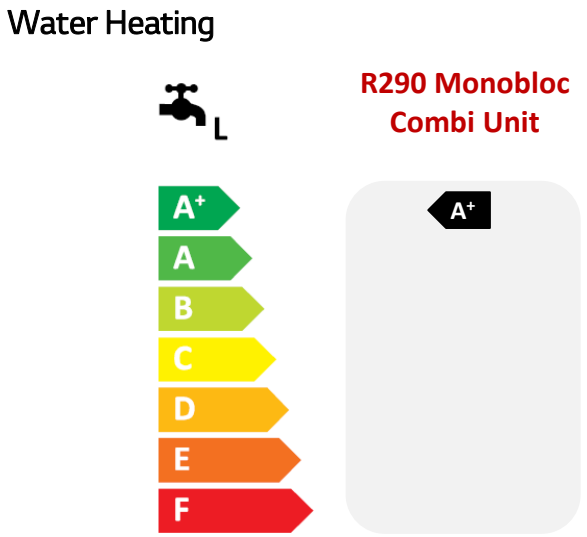
High energy efficiency

ErP Energy Labeling A+[1)] for water heating

Water Heating Efficiency [1)]



ErP energy labeling



As all new buildings in EU countries are nearly Zero-Energy Building(nZEB), Water Heating Efficiency is getting more important. The R290 Monobloc Combi Unit has an A+[1)] water heating efficiency class at Declared load profile L.

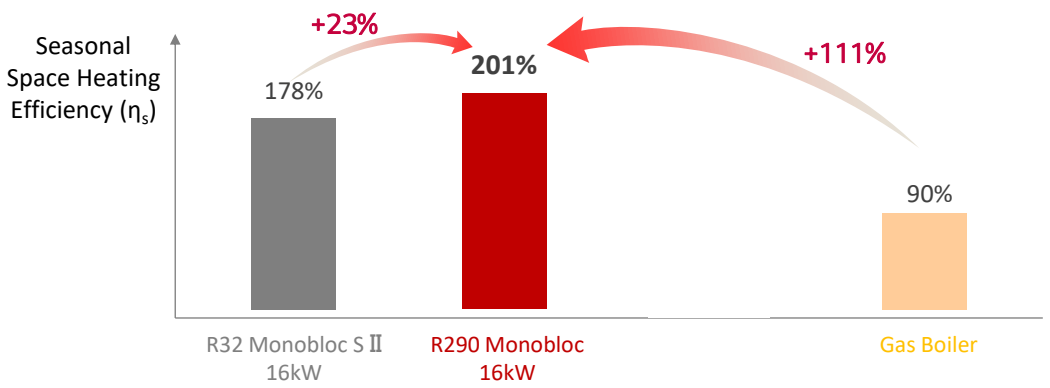
1) Water heating efficiency is based on EN16147 and refer to LG Compliance Information homepage for more detailed information (https://www.lg.com/global/support/cedoc/cedoc).

High energy efficiency

Comparison of seasonal efficiency [1] with alternative options including gas boiler

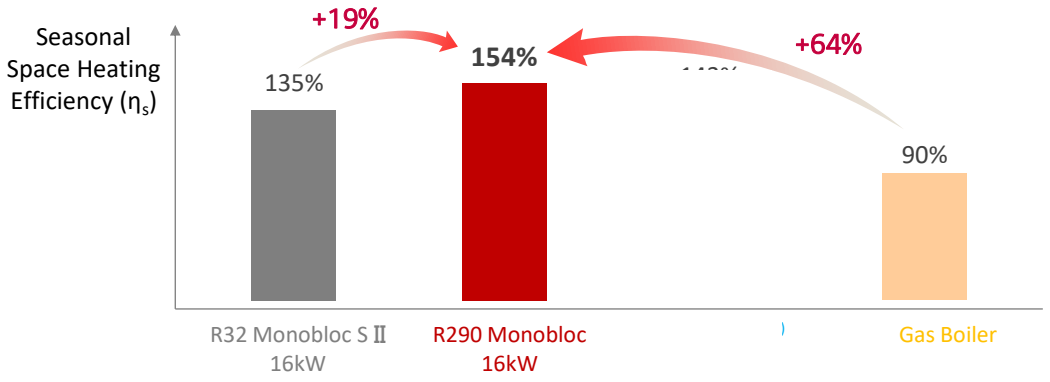
Average Climate [2] - Low Temperature (35℃)

Description	LG Therma V R32 Monobloc S Ⅱ 16kW	LG Therma V R290 Monobloc 16kW	Gas Boiler
Prated (kW)	12	12	12
SCOP	4.53	5.11	N / A
η_s	178%	201%	90% [5]
Annual Energy Consumption [4] (kWh)	5,604 [4]	4,735 [4]	26,884 [5]



Average Climate [2] - Medium Temperature (55℃)

Description	LG Therma V R32 Monobloc S Ⅱ 16kW	LG Therma V R290 Monobloc 16kW	Gas Boiler
Prated (kW)	12	12	12
SCOP	3.45	3.92	N / A
η_s	135%	154%	90% [5]
Annual Energy Consumption [4] (kWh)	7,213 [4]	6,162 [4]	26,770 [5]



1) Space Heating only (DHW operation is not considered)
2) Based on climate bin data of EN14825 and annual operating hours are 4,910 hours for average climate.
3) Annual energy consumption is a value declared together with ErP energy efficiency, but the annual heating demand assumed when calculating ErP Energy efficiency may vary according to the declared Prated value for each model.
5) Efficiency is based on Condensing boiler and Annual Energy Consumption is assumed to cover same annual heating demand with LG Therma V R290 Monobloc 16kW.

New Compressor for R290 refrigerant

Better performance in cold climates

New Compressor for R290 refrigerant

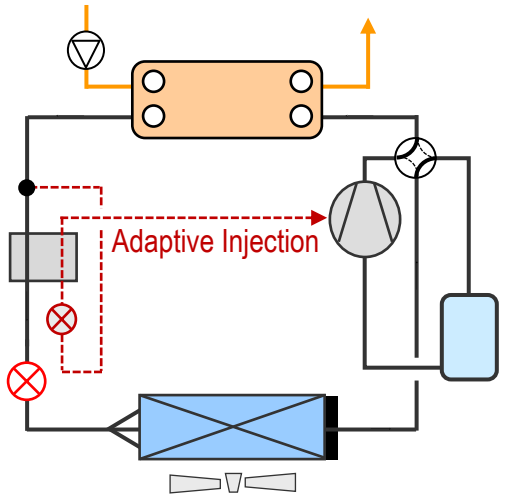
The application of the new compressor is carefully aligned with the unique characteristics of the R290 refrigerant.

Adaptive Injection

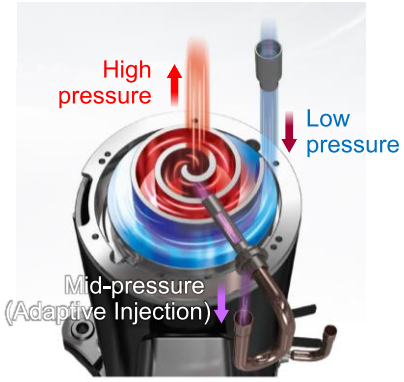
HiPOR™ 1)
(High Pressure Oil Return)

Revolutionary Compressor Design 2)

Adaptive Injection Technology



The Adaptive Injection cycle, tailored for R290 refrigerant, optimizes heating capacity and efficiency.



- Minimum operating temperature
  Down *to -28℃*
- Heating performance
  Improved *20%* 3)
  (vs. Non-adaptive Injection)
- Efficiency
  Improved *5~10%* 3)
  (vs. Non-adaptive Injection)

1) Only for LG R290 Monobloc 12/14/16 kW Models.
2) Only for LG R290 Monobloc 7/9 kW Models.
3) Based on the LG Internal Test

Extremely quiet operation

One of the super-quiet model in the market

The Sound power level of 49 dB(A) @ 12 kW is outstanding in the market.

R290 Monobloc has 7~11dB(A) lower sound power level compared to R32 Monobloc S already recognized as very quite. [1)]

QUIET MARK

Valid for UK & EU territories only [2)]

Sound power level	R290 Monobloc				
	7 kW	9 kW	12 kW	14 kW	16 kW
Sound power level (Heating / Rated [3)])	49	50	49	51	52
Sound power level (Heating / daytime max.[4)])	59	60	59	60	61
Sound power level (Heating / Low noise mode [5)])	48	48	48	50	51

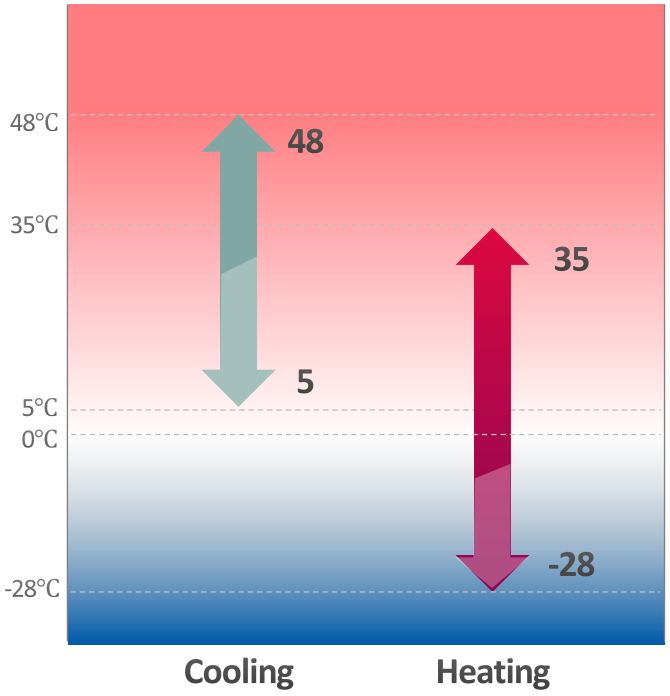
1) R32 Monobloc S 7 kW, 9 kW, and 12kW were certified for quiet mark.
2) The certification(Quiet Mark) for R290 Monobloc is valid for UK & EU territories only until Dec. 31st of 2025 and detailed models registered can be found at the link below. (QUIET MARK – https://www.quietmark.com/products/awarded-products/centralheating/heatpumps)
3) Rated sound power level was measured on the rated condition in accordance with EN 12102-1 and ISO 9614.
4) Daytime Max. sound power level was measured based on max. Fan RPM and max. Compressor Hz. that can be reached under OAT 2℃ in accordance with EN 12102-1 and ISO 9614.
5) Low Noise Mode is a mode that lowers the noise by limiting the compressor Hz. and fan RPM, and thus the performance may be limited. Sound power level of this mode was measured in accordance with EN 12102-1 and ISO 9614.

Wide operation range

Flexible use in all EU regions

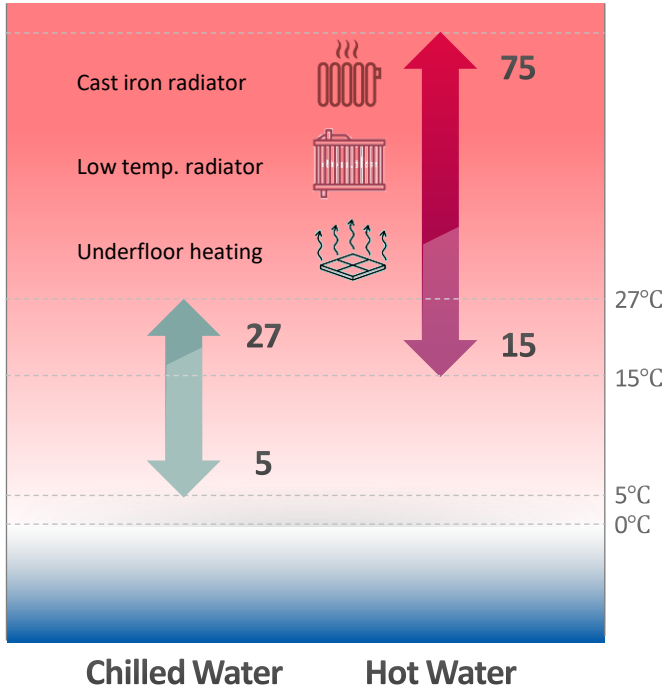
Operating range (OAT)

- ✓ Cooling operation range is 5 ~ 48℃,
- ✓ Heating operation range is -28 ~ 35℃



Water outlet temperature

- ✓ Chilled water outlet temperature is 5 ~ 27℃,
- ✓ Hot water outlet temperature is 15 ~ 75℃

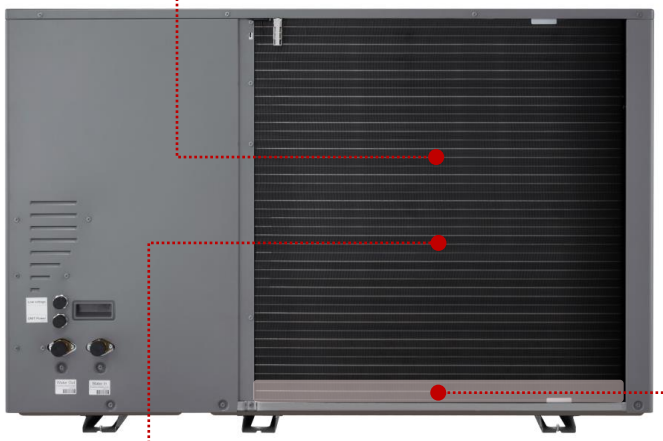


Reliable Heating Operation

Anti-icing and Deicing technologies for R290 & R 32 Monobloc

New

1 Elimination of side panel and rear grille



New

4 Optimized Defrost Operation by dual EEVs & Cycle (R290)

New

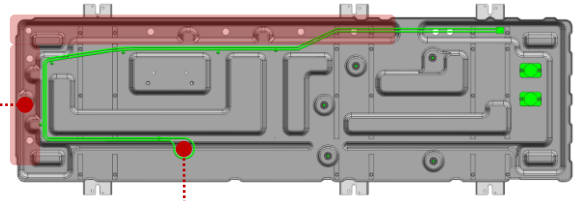
5 Frost-free for bottom pass of Heat Exchanger

2 Corrugated Black Fin Heat Exchanger

Upgraded

3 Increased quantity for drain hole for Heat Exchanger

5 EA → 7 EA



6 Base pan heating (heater)

Reliable Heating Operation

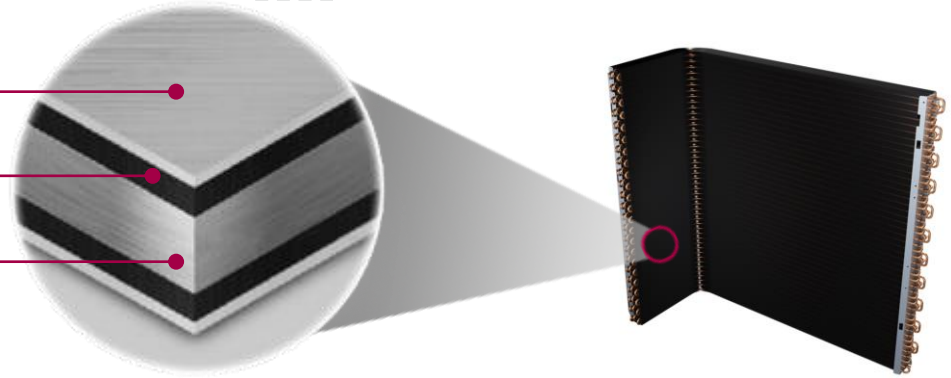
Black Fin Heat Exchanger

The black coating with enhanced epoxy resin is applied for strong protection from various external corrosive conditions such as salt contamination and air pollution including fumes from factories. This improvement in durability prolongs the product's lifespan and lowers both the operational and maintenance costs.

Longer Lifespan, Lower Maintenance Costs

Strengthened corrosion resistant coating

- Hydrophilic film (Water flow)
  The Hydrophilic coating minimizes moisture buildup on the fin.
- Complex Resin(Corrosion resistant)
  The Black coating provides strong protection from corrosion
- Aluminum Fin




Verification
Corrosion Resistance Performance Testing

Reference No.: KR20R946-001

TÜV Rheinland verify that the corrosion improved aluminum fin (Black II) of air conditioner heat exchanger has less than 0.05 % corrosion area after 10000 hours salt spray test.

Holder : LG Electronics Inc. 84, Wanam-ro, Seongsan-gu, Changwon-si, Gyeongsangnam-do, 51554, Korea

Product: Aluminum sheet of air conditioner heat exchanger

Identification: Corrosion improved aluminum fin (Black II)

Applicable Standard: LG(70)-E-1026:2018 ISO 9227:2017, ASTM B117 ISO 10289:1999, KS D 9502:2019

TÜV Rheinland Korea Ltd. – Seoul 07298 – Republic of Korea

※ Verification of Corrosion Resistance Performance Testing
- Date : Dec. 2020.
- Product : Black Fin(fin of outdoor unit heat exchanger)
- Authority : TÜV Rheinland
- Applicable Standard : ISO 9227:2017, **ASTM B117**, ISO 10289:1999, KS D 9502:2019
- Result : less than 0.05% corrosion area after **10,000 hours**
- Reference No. : KR20R946-001


Verification of Corrosion Resistance Performance Testing

Reference No.: 50251080 001

TÜV Rheinland verify that corrosion resistance performance for aluminum sheet of heat exchanger of air conditioner is satisfied requirements at test method B of ISO 21207 standard according to reference no. 50251080 001.

Holder : LG Electronics Inc. 84, Wanam-ro, Seongsan-gu, Changwon-si, Gyeongsangnam-do, 51554, Korea

Product: Aluminum sheet of heat exchanger of air conditioner

Identification: Corrosion improved aluminum fin (Black II)

Applicable Standard: Test method B of ISO 21207 (Salt contaminated condition and Severe industrial or traffic environment)

Claim Verified: Resists 27 years of simulated severe corrosion

Acceptance Criteria: LG(70)-E-1026

TÜV Rheinland Korea Ltd. – Seoul 07298 – Republic of Korea

※ Verification of Corrosion Resistance Performance Testing
- Date : May. 2019.
- Product : Black Fin(aluminum sheet of air conditioner heat exchanger)
- Authority : TÜV Rheinland
- Applicable Standard : Test Method B of ISO21207
- Result : Resists 27 years of simulated severe corrosion
- Reference No. : 50251080 001

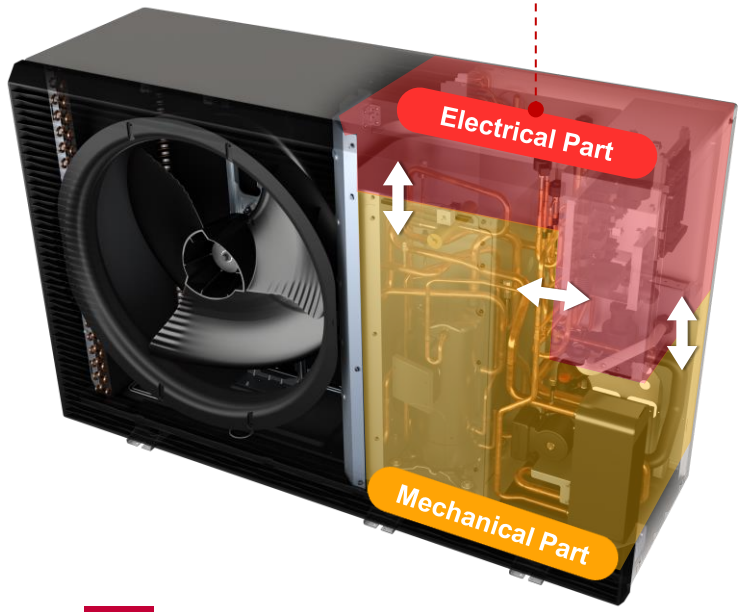
※ Product is not fully treated corrosion resistance. To install near the sea, additional treatment be recommended as corrosion may occur.

Safety Design for R290 Product

Safe from the use of flammable refrigerants

1 Fully Closed Electrical Parts

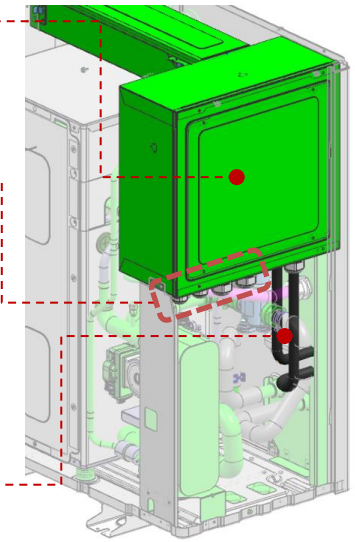
In order to prevent a fire caused by a leaked refrigerant, the electrical parts are basically designed as a sealed type.



1 Sealed Control Box

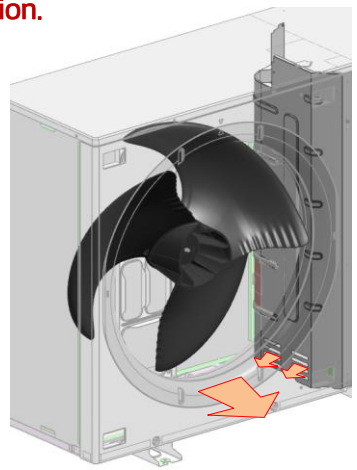
2 Cable Gland

3 Conduit



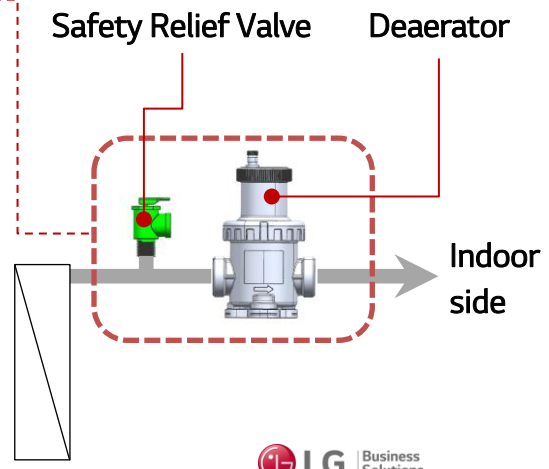
2 Proactive Ventilation before every start-up

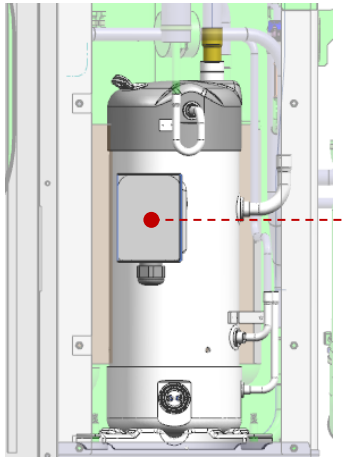
In order to disperse any leaked refrigerant below LFL (Lower Flammability Limit), the fan always operates for a certain period before the compressor operation.



3 Safety Mechanical Design

In order to prevent R290 refrigerant from entering the room together with water in case the plate heat exchanger is damaged, additional Safety Relief valve and Deaerator are installed at water outlet line.





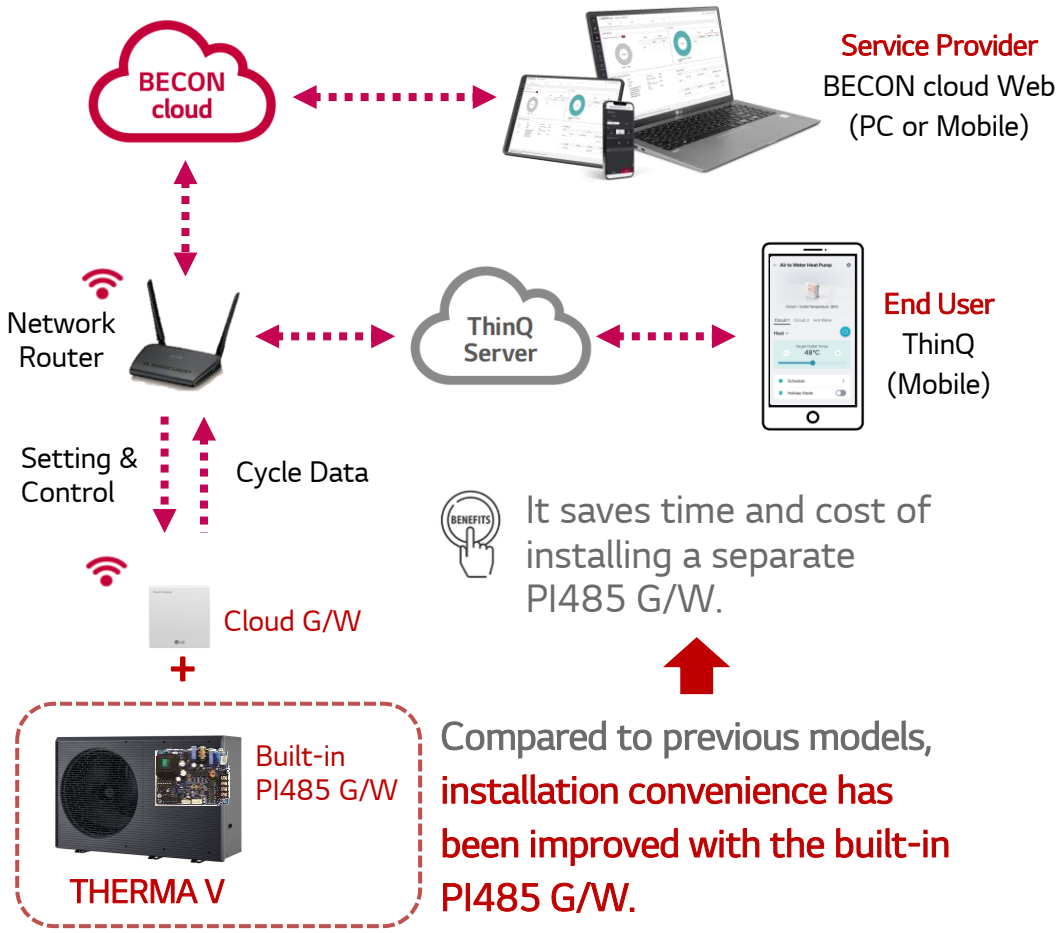
4 Sealed Fitting on Compressor Power Connections

In order to prevent a fire caused by a leaked refrigerant, the Sealed Fitting is also applied to the compressor power connection.

Smart Integration

Upgraded LG BECON cloud

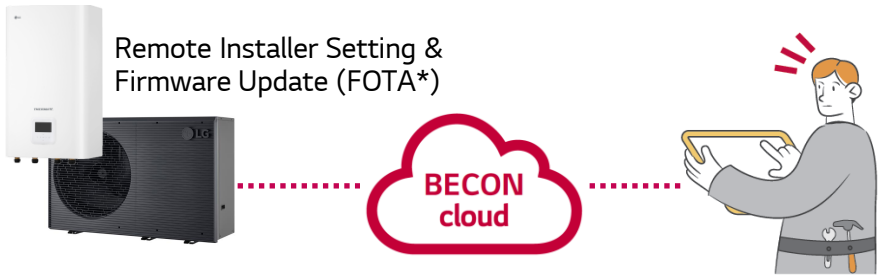
Easy Installation with built-in PI485 G/W



It saves time and cost of installing a separate PI485 G/W.

Compared to previous models, **installation convenience has been improved with the built-in PI485 G/W.**

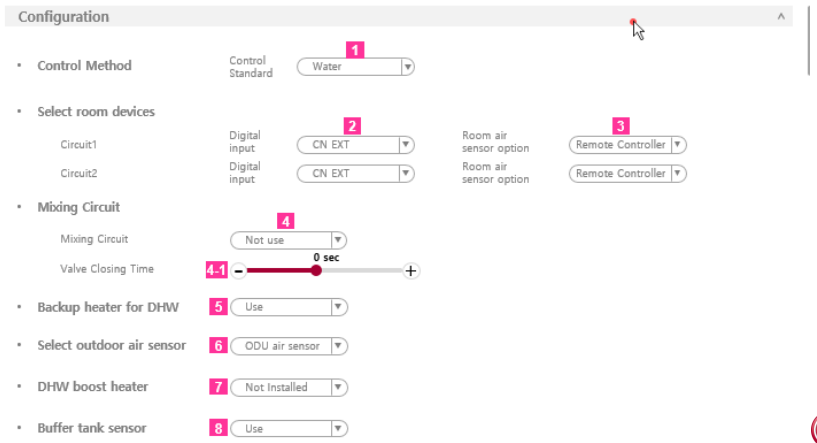
Remote Installer Setting & Firmware Update



* FOTA : Firmware Over The Air

Remote Installer Setting and Firmware Update are now available without the need for on-site visits.

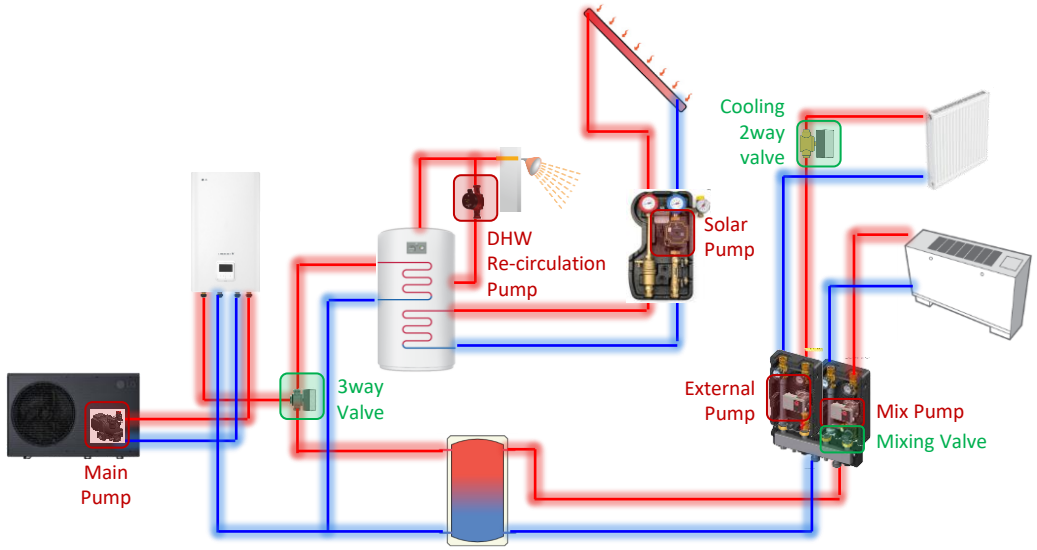
[Remote Installer Setting by LG BECON cloud]



Smart Integration

Upgraded Service functions

Actuator test for Pumps and Valves



During test operation, **air purge for the secondary circuit or solar thermal system can be easily performed**, and also it is easy to check whether **wiring works for pumps and valves are correctly connected.**

Pump test	A1 Main pump
	A2 External pump
	A3 Mix pump
	A4 Solar pump
	A15 DHW Re-circulation pump
Valve test	A5 DHW 3-way-valve
	A6 Mixing valve open
	A7 Mixing valve close
	A12 Cooling 2-way-valve

Monitoring for sensor values and I/O signals

Connected sensor values can be checked on the remote controller without an LGMV connection, and the status of the I/O signal can be checked without a multi-tester, **allowing quick service inspection.**

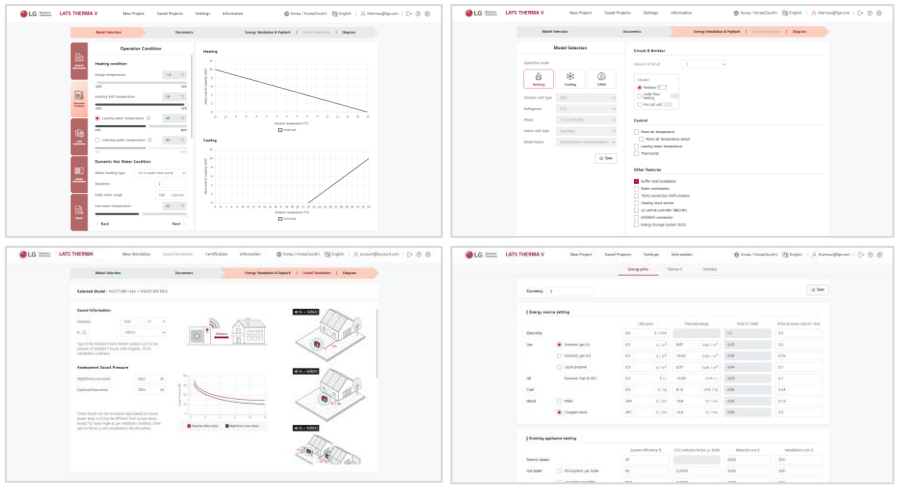
Sensor value	S9 Refrigerant gas
	S10 Refrigerant liquid
	S11 Entering water
	S12 Leaving water
	S13 Backup heater outlet
	S14 DHW tank
	S15 Solar collector
	S16 Solar tank
	S17 Water flow sensor
	S18 Mixing circuit
	S19 Water pressure
	S21 Room temp. Direct circuit
	S22 Room temp. Mixing circuit
	S24 Wall-mounted air sensor
	S25 Buffer tank sensor

Input Status	SG1
	SG2
	CN-EXT
	Antifreeze shortkey
	Thermostat (Heating)
	Thermostat (Cooling)
	Thermostat (DHW)
Output status	A1 Main pump
	A2 External pump
	A3 Mix pump
	A4 Solar pump
	A5 DHW 3-way-valve
	A6 Mixing valve (Open)
	A7 Mixing valve (Close)
	A12 Cooling 2-way-valve
	A15 DHW Re-circulation pump
	A8 Backup heater (Step 1)
	A9 backup heater (Step 2)
	A10 DHW Boost heater
	A11 External boiler

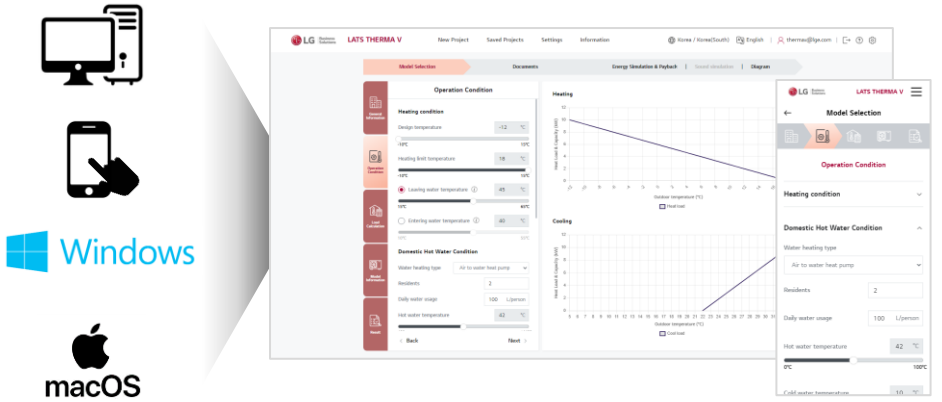
Smart Integration

New LATS THERMA V web

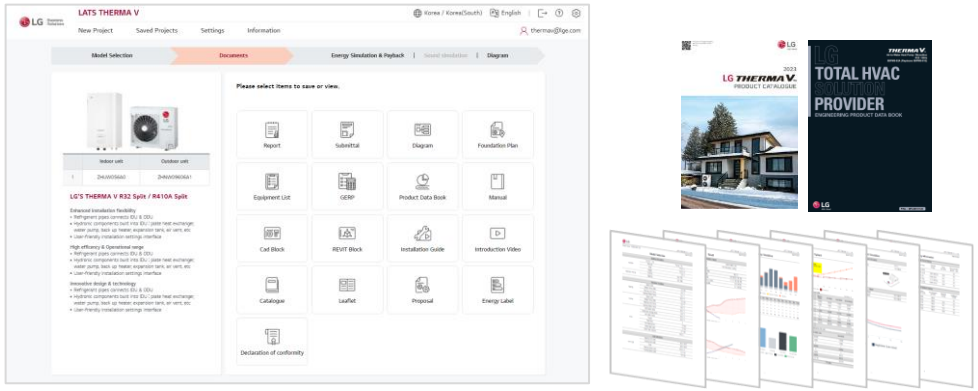
Intuitive and easy-to-use User Interface



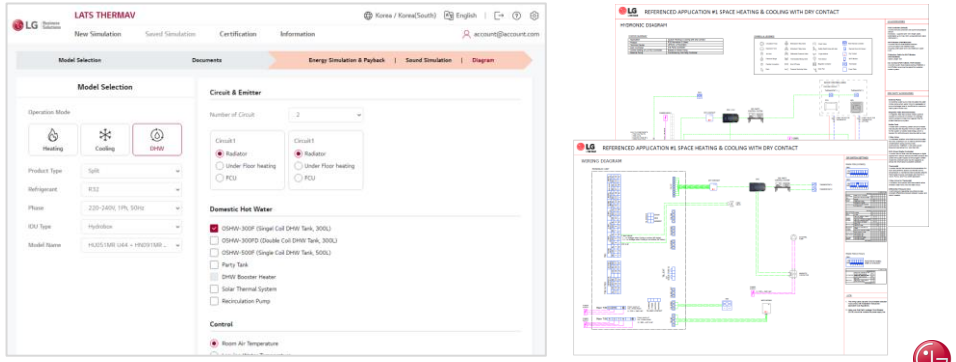
Accessible under various device conditions



Technical & marketing materials available



Schematic Diagram Generator

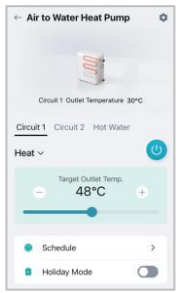


Smart Integration

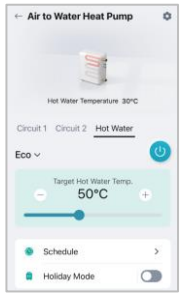
LG ThinQ & Voice Control

Users can control their Therma V via smart internet devices such as Android or iOS smartphones. Moreover, LG ThinQ works with Google assistant voice control in most EU countries, making it possible to control Therma V using a voice control function.

LG Wi-Fi MODEM



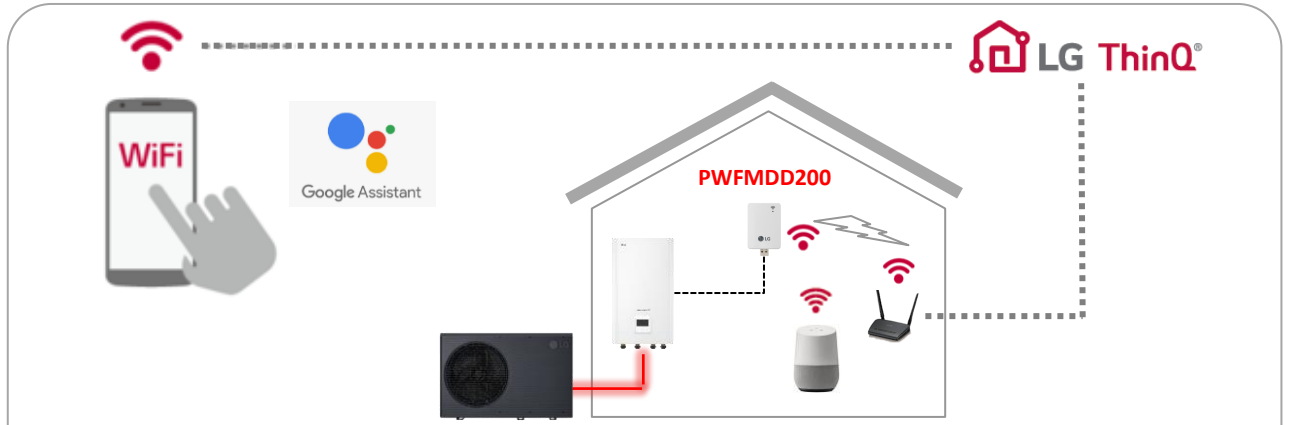
Space Heating Control



Hot Water Control

Energy Monitoring

Access your THERMA V anytime from anywhere



※ Search “LG ThinQ” on Google market or Appstore then download the app.
※ Google assistant voice control may be restricted in use and language in some countries.

Simple operation by LG ThinQ

- On/Off
- Operation Mode Selection
- Current Temperature
- Temperature Setting
- On/Off Reservation Scheduling
- Energy Monitoring
- ESS Monitoring
- Silent Mode Reservation
- Holiday Mode
- Quick DHW Heating

Simple operation by Voice Control

- On/Off
- On/Off - DHW
- Temperature Setting
- Operation Mode Selection
- Monitoring for current Temp. & operation Status

※ To utilize this function, purchase of accessories (provided by LGE or 3rd party) is required.

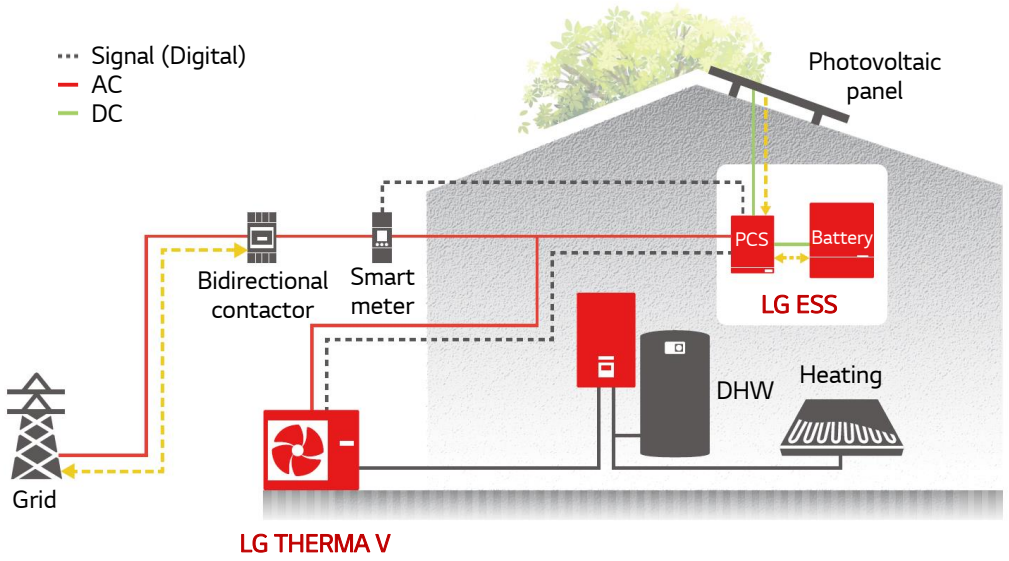
- Mandatory Accessory: PWFMDD200(LG Wi-Fi Modem) - PWYREW000 (10m extension cable) may be necessary depending on installation conditions.

Smart Integration

LG Home Energy Platform

System diagram with LG ESS

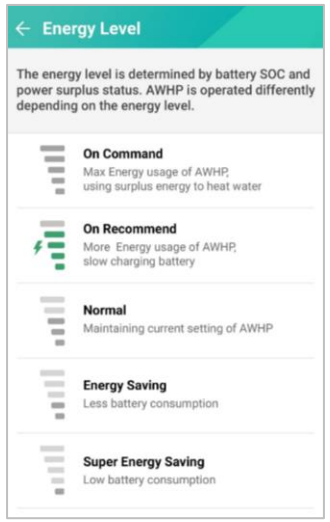
Power your home the smart way and save the energy bill

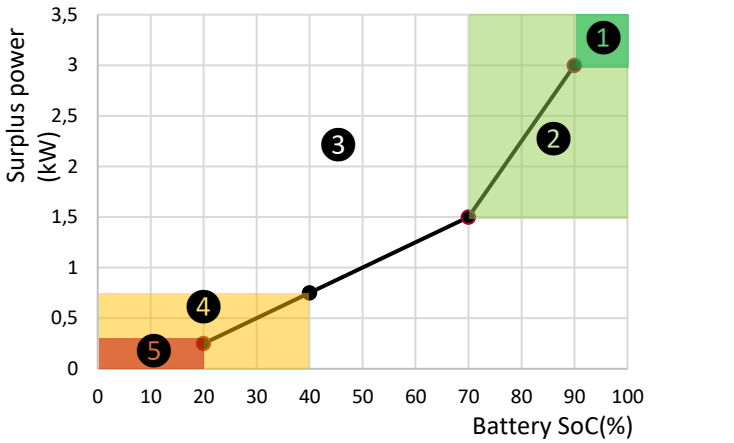


Minimizing energy costs and taking a step closer to achieving the ultimate smart home. LG THERMA V features an energy state function that enables users to maximize their utilization of renewable energy.

※ To utilize this function, purchase of accessories (provided by LGE or 3rd party) is required.

Energy Level (Set by LG ESS)





* SoC : State of Charge, Surplus Power = PV Power - Load Power

Energy Level	Energy State [2]	Set temperature Adjustment (℃)		
		Heating	Cooling	DHW
1 On Command(++)	ES5	+5	-5	+30
2 On Recommend(+)	ES6	+2	-2	+10
3 Normal	ES2	0	0	0
4 Energy Saving(-)	ES7	-2	+2	0
5 Super Energy Saving(--)	ES8	-5	+5	0

1) Above indicated Energy State condition and Adjusting Temp. of AWHP can be changed.

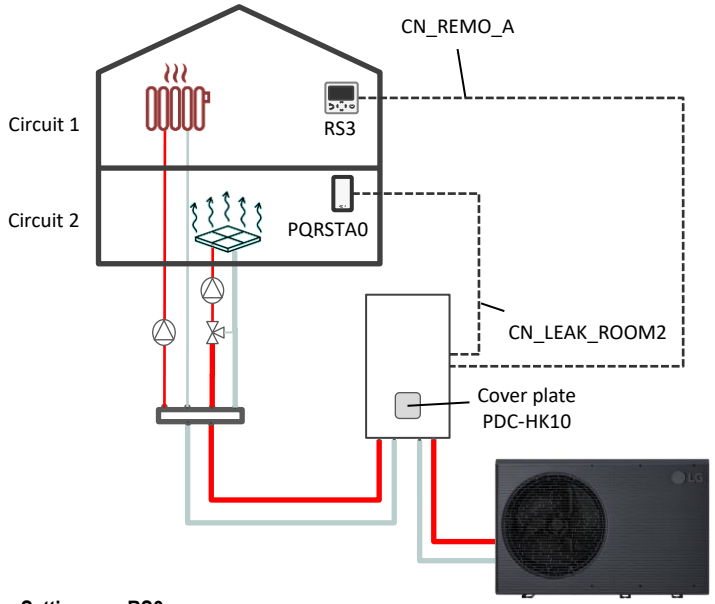
2) For more detail, please refer to the appendix.

Smart Integration

Flexible room devices in 2nd circuit application

Case #1

- Circuit 1: Remote controller
- Circuit 2: Room Sensor (PQRSTA0)

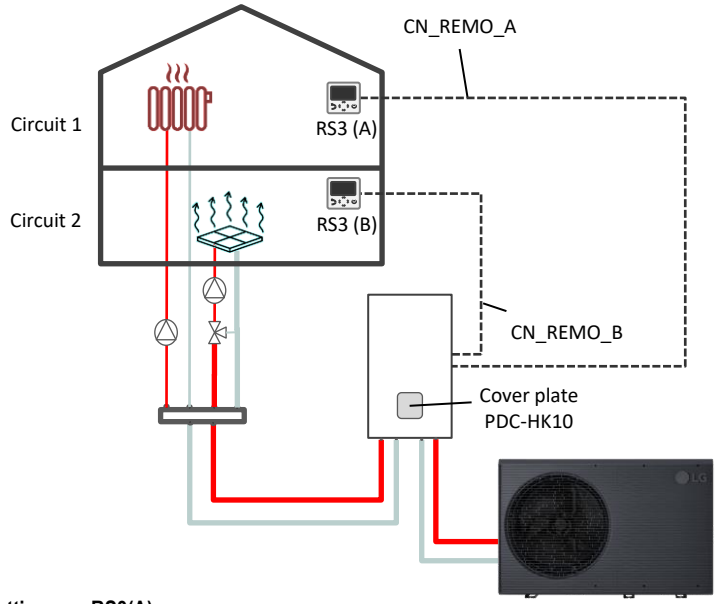


Settings on RS3:

- Configuration/Control method: Air or Air+Water
- Configuration/Select room devices/RMC linked to: Circuit1&2
- Configuration/Select room devices/Circuit 1/Room air sensor option: Remote controller
- Configuration/Select room devices/Circuit 2/Room air sensor option: Room Sensor

Case #2

- Circuit 1: Remote controller (A)
- Circuit 2: Remote controller (B)



Settings on RS3(A):

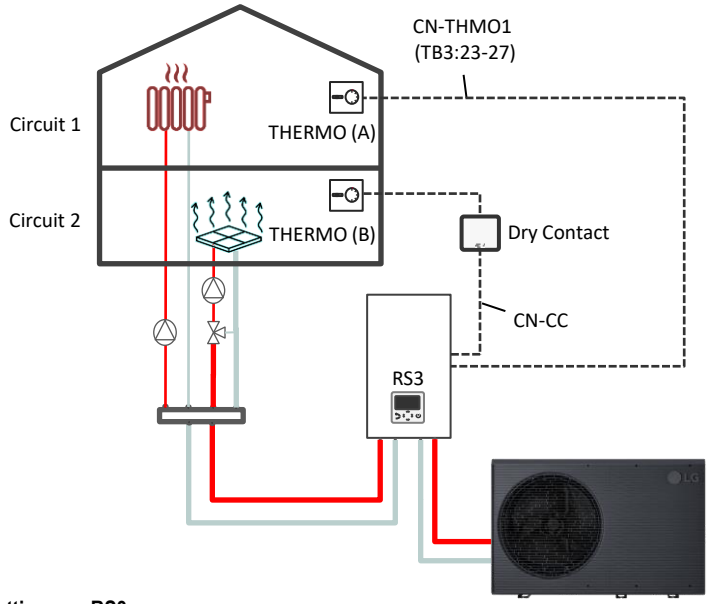
- Configuration/Control method: Air or Air+Water
- Configuration/Select room devices/RMC linked to: Circuit1&2
- Configuration/Select room devices/Circuit 1/Room air sensor option: Remote controller
- Configuration/Select room devices/Circuit 2/Room air sensor option: Remote controller

Settings on RS3(B):

- Configuration/Select room devices/RMC linked to: Circuit2

Case #3

- Circuit 1: 3rd party Room Thermostat (A)
- Circuit 2: 3rd party Room Thermostat (B)



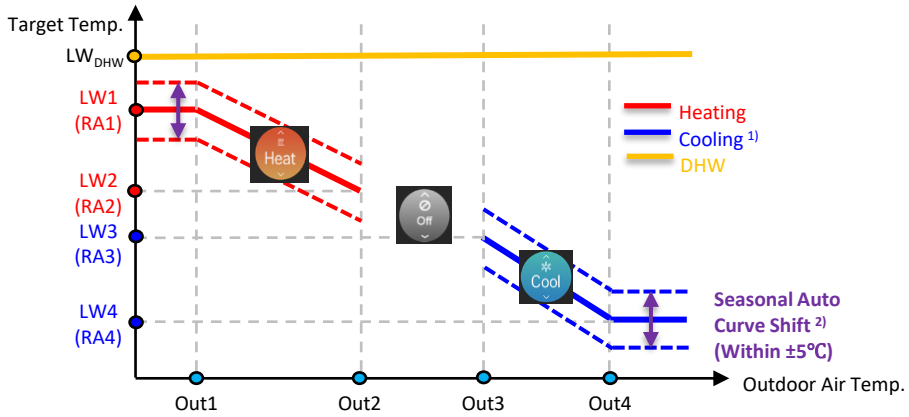
Settings on RS3:

- Configuration/Control method: Water
- Configuration/Select room devices/RMC linked to: Circuit1&2
- Configuration/Select room devices/Circuit 1/Digital input/CN-THMO
- Configuration/Select room devices/Circuit 2/Digital input/CN-CC

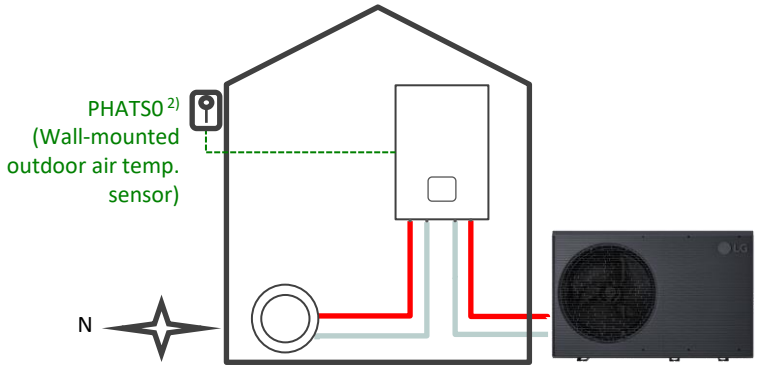
Smart Integration

More Reliable Control

AI Operation with dedicated outdoor temp. sensor

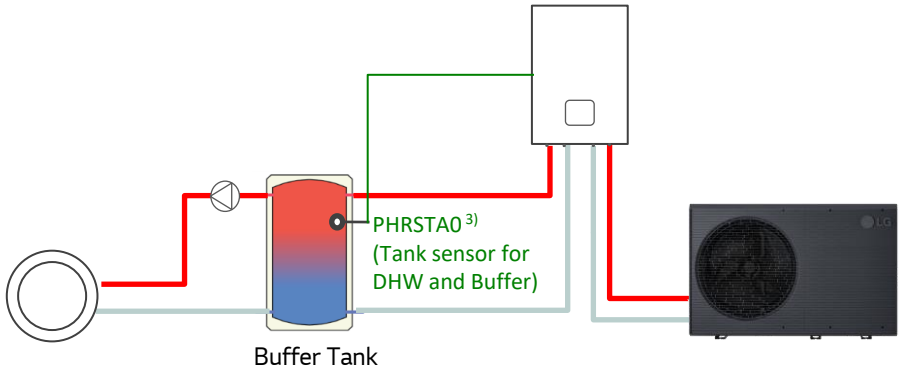


More reliable seasonal auto operation would be possible, if wall-mounted outdoor air temp. sensor (PHATS0) is installed. 1) It is highly recommended to use this sensor – especially when the outdoor unit is exposed to sunlight.



Operation based on Buffer Tank Temp.

New function has been introduced to control cooling and heating operation based on the temperature measured in the buffer tank. This function allows more precise control when a buffer tank is installed.



1) Seasonal Auto Operation is possible regardless of whether a dedicated outdoor temperature sensor is installed. However, if a dedicated sensor is installed, more reliable seasonal auto operation would be possible based on a more accurate temperature.
2) This sensor would be available from May of 2024 and connection wire between sensor and product is not provided.
3) PHRSTA0 can be connected as buffer tank sensor only for models produced after May. 1st of 2024. Previously produced models do not include a conversion cable for buffer tank sensor.

Buffer Tank

In most applications, installation of buffer tank is normally required for the various reasons.

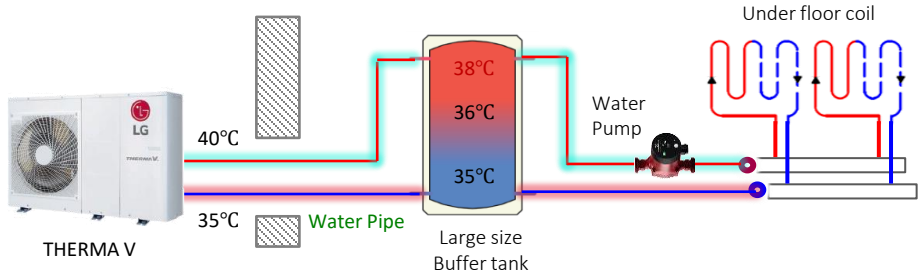
Purpose of installing Buffer tank

1) Energy Buffer during defrost / DHW operation duration
2) Energy Storage using cheaper electricity cost
3) Preventing short cycle (frequent on/off)
4) Improving system operating efficiency

Description	Parallel buffer tank (Hydronic separator)	Serial buffer tank
Ensure enough heat for defrosting	Yes	Yes
Reduce cycling of AWHP	Yes	Yes
Ensure min. flow rate inside primary circuit (No risk of CH14 error)	Yes	No
Bypass when all heat emitters not used	No need	Must Need
Reduce flow noise inside secondary circuit 1)	Yes	No
Simultaneous control of air temperature and wa ter temperature	Perfect Solution	Limited Solution 2)
Buffer can be used as air and mud trap	Yes	Yes
Need for secondary pump	Must need	No need
Hydronic balancing of secondary circuit	Yes	No

Note :
1) This is not so important in new-built; but mainly in renovations, when diameter of piping is very small.
2) Even if the air temperature is not satisfied, there is some case that unit is thermo-off because the water temperature is satisfied.

Schematic Diagram



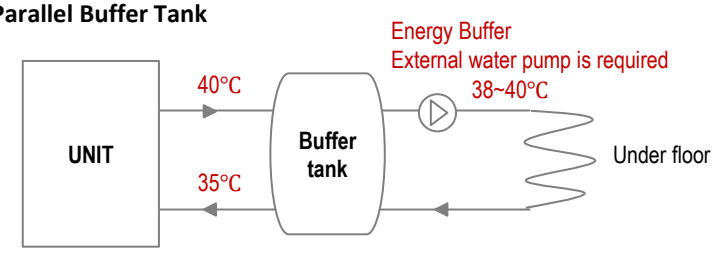
Required Accessory

Model Name	Model Number	Figure	Feature
Buffer Tank	Field Scope		• 50-120 Liter * • Floor standing or wall mountable • Insulated • 4-ports or 2-ports • Equipped with Air-Vent and Drain Valve

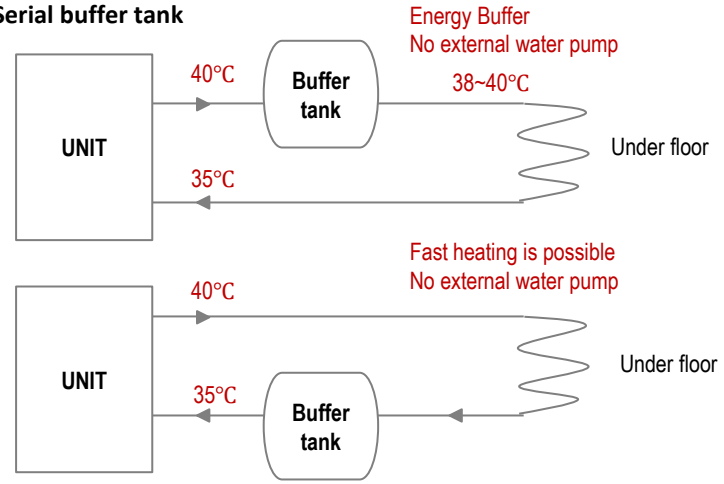
* Buffer tank size may vary depending on product capacity and installation condition.

Various Applications

✓ **Parallel Buffer Tank**



✓ **Serial buffer tank**



Buffer Tank

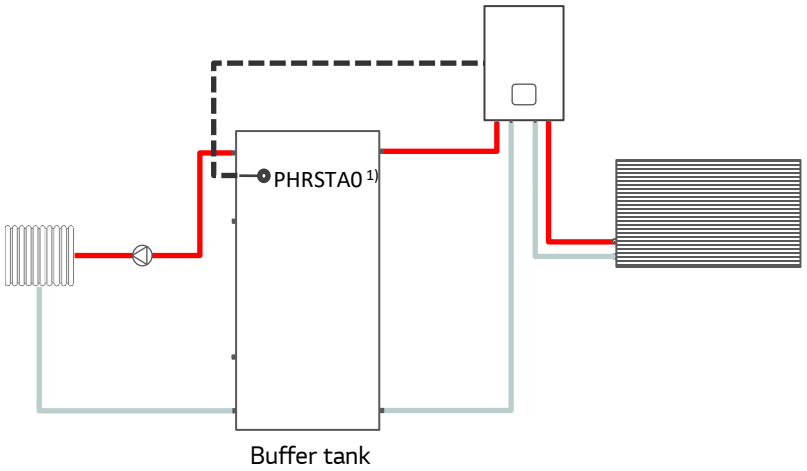
In most applications, installation of buffer tank is normally required for the various reasons.

Buffer Tank Sensor

- In case of R290 Monobloc, a function is introduced to control the temperature of a parallel buffer tank for space heating and cooling.

- Buffer Tank Sensor **(Only for R290 Monobloc)**

  Heating operation is performed by comparing the desired target water temperature (as set by User or defined by weather-dependent function) with the buffer tank temperature. Basically, it supports the same set temperature range and cycle operation as the water temperature control function. In addition, a dedicated hysteresis can be set - separate setting from existing air or water temperature control hysteresis.



Note :
1) To use this function, a dedicated accessory (PHRSTA0) is required.
(PHRSTA0 can be connected as buffer tank sensor only for models produced after Mar. 1st of 2024)

Multi-Zone Control

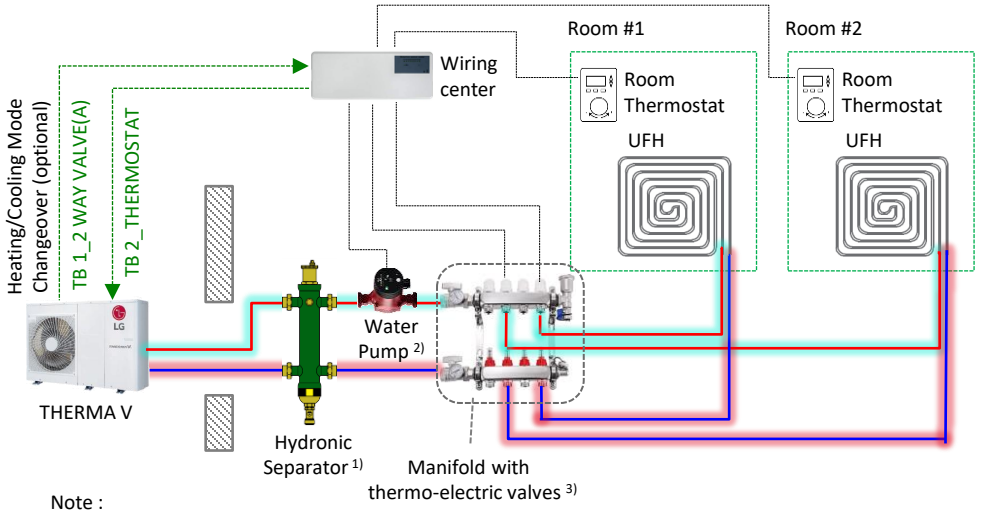
If individual control for multiple rooms is required with one heat pump, LG Therma V can provide the necessary solution in conjunction with the thermostats, valves, etc.

Case 1 – Application with Thermo-electric valves and Wiring Center - Applicable for UFH

Operation

1) The wiring center is connected to each individual thermo-electric valve and room thermostat.
2) Therma V is operating based on Pre-set Target Water Temp only while receiving the Thermostat signal from the wiring center.
3) The operation of thermo-electric valves is controlled by the Thermostat signal.
4) The operation of External Water pump is controlled by the Thermostat signal.

Schematic Diagram

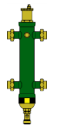


Note :

1) There is the case where the water pump operates while all valves are closed, so one of the hydronic separator, buffer tank, and bypass valve must be installed.
2) If hydronic separator or buffer tank is installed, water pump in the secondary circuit must be installed. The water pump is controlled by the Wiring center to operate only with some valves open. If not, self-controlled water pump must be used.
3) 0 - 10 V (DDC), 24 V and 230 V versions available on the market - continuous (PWM) or discontinuous.

※ *Terminal Block No. may differ depending on the product. Please refer to the PDB or manual for details.*

Required Accessory

Model Name	Model Number	Figure	Feature
Wiring center	Field Scope		• Providing Thermostat-output (“Boiler signal“) to stop heat pump when no heating is needed
Thermo-electric valves	Field Scope		• 0 - 10 V (DDC), 24 V and 230 V versions available on the market • Continuous (PWM) or discontinuous
Room Thermostat	Field Scope		
Hydronic Separator	Field Scope		
Water Pump	Field Scope		• 1Φ, 230V AC • Self-Controlled is recommended

Multi-Zone Control

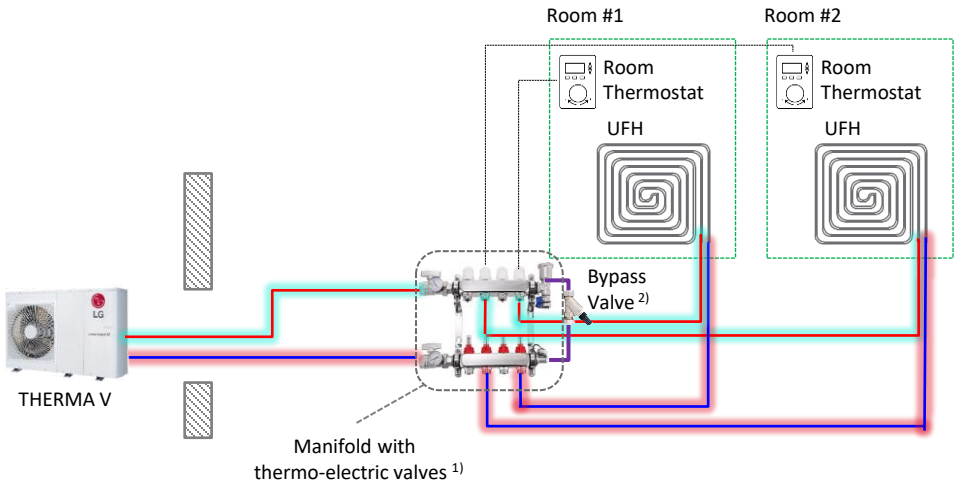
If individual control for multiple rooms is required with one heat pump, LG Therma V can provide the necessary solution in conjunction with the thermostats, valves, etc.

Case 2 – Application with Thermo-electric valves and Room thermostat - Applicable for UFH or Radiator

Operation

1) Therma V and Thermo-electric valves are operating independently.
2) Therma V is operating based on Pre-set Target Water Temp.
3) The operation of Thermo-electric valves is controlled by the Room Thermostats.

Schematic Diagram



Note :
1) 0 - 10 V (DDC), 24 V and 230 V versions available on the market - continuous (PWM) or discontinuous.
2) There is the case where the water pump operates while all valves are closed, so a bypass valve must be installed.

Required Accessory

Model Name	Model Number	Figure	Feature
Thermo-electric valves	Field Scope		• 0 - 10 V (DDC), 24 V and 230 V versions available on the market • Continuous (PWM) or discontinuous
Room Thermostat	Field Scope		
Bypass valve	Field Scope		

Multi-Zone Control

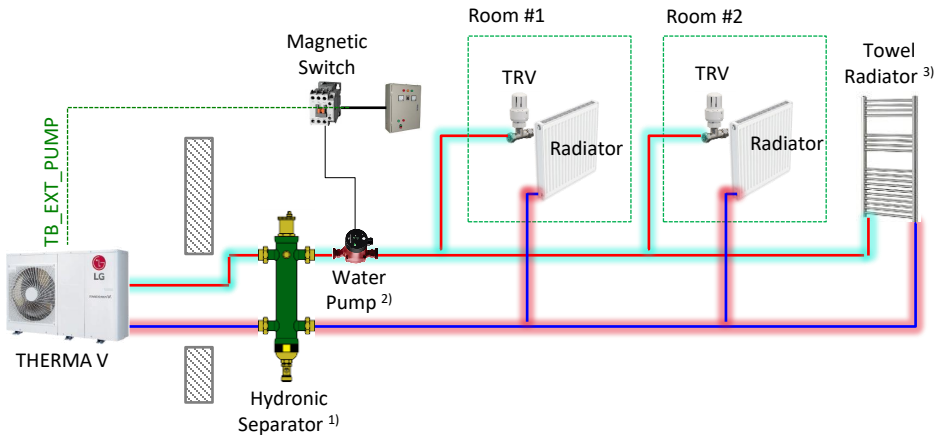
If individual control for multiple rooms is required with one heat pump, LG Therma V can provide the necessary solution in conjunction with the thermostats, valves, etc.

Case 3 – Application with Thermostatic Radiator Valve (TRV) - Applicable for Radiator

Operation

1) Therma V and Thermostatic Radiator Valve (TRV) are operating independently.
2) Therma V is operating based on Pre-set Target Water Temp.
3) The operation of radiator is regulated by the Thermostatic Radiator Valve (TRV).

Schematic Diagram



Note :
1) There is the case where the water pump operates while all valves are closed, so one of the hydronic separator, buffer tank, and bypass valve must be installed.
2) If hydronic separator or buffer tank is installed, water pump in the secondary circuit must be installed.
3) Bypass line (or valve) should be considered in the secondary circuit in case all valves are closed, if water pump is not self-controlled.

※ *Terminal Block No. may differ depending on the product. Please refer to the PDB or manual for details.*

Required Accessory

Model Name	Model Number	Figure	Feature
Thermostatic Radiator Valve (TRV)	Field Scope		
Hydronic Separator	Field Scope		
Water Pump	Field Scope		• 1Φ, 230V AC • Self-Controlled is recommended
Towel Radiator	Field Scope		• Hot Water Type

Multi-Zone Control

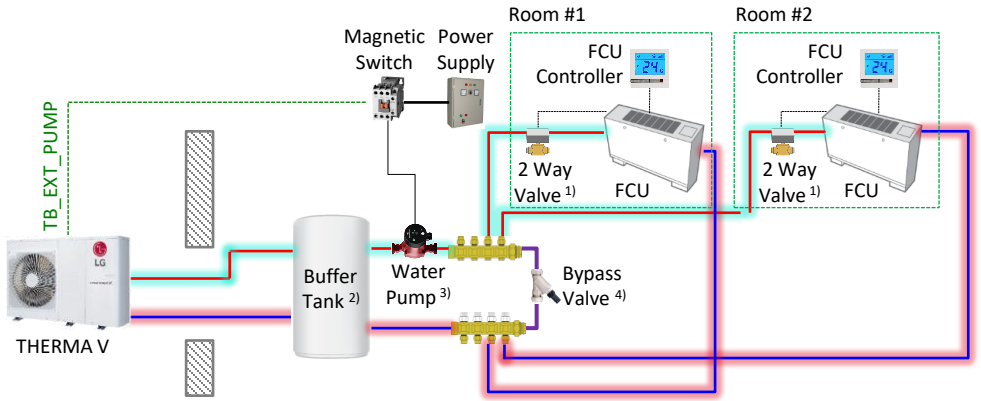
If individual control for multiple rooms is required with one heat pump, LG Therma V can provide the necessary solution in conjunction with the thermostats, valves, etc.

Case 4 – Application with Fan Coil Unit(FCU) and 2 Way Valve - Applicable for FCU

Operation

1) Therma V and FCU are operating independently.
2) Therma V is operating based on Pre-set Target Water Temp.
3) FCU is operating based on Room Air Temp. measured by each FCU controller.

Schematic Diagram



Note :
1) This 2 way valve is built into the FCU or operates by receiving a signal from the FCU. Only during FCU operation, the 2 way valve is open. On the other hand, when the FCU is not running, the valve is closed.
2) There is the case where the water pump operates while all valves are closed, so one of the hydronic separator, buffer tank, and bypass valve must be installed.
3) If hydronic separator or buffer tank is installed, water pump in the secondary circuit must be installed.
4) Bypass line (or valve) should be considered in the secondary circuit in case all valves are closed, if water pump is not self-controlled.

※ *For cooling operation, it is mandatorily required to change dip SW setting for "Cycle" as a "Heating & Cooling".*

※ *Dip SW No. and Terminal Block No. may differ depending on the product. Please refer to the PDB or manual for details.*

Required Accessory

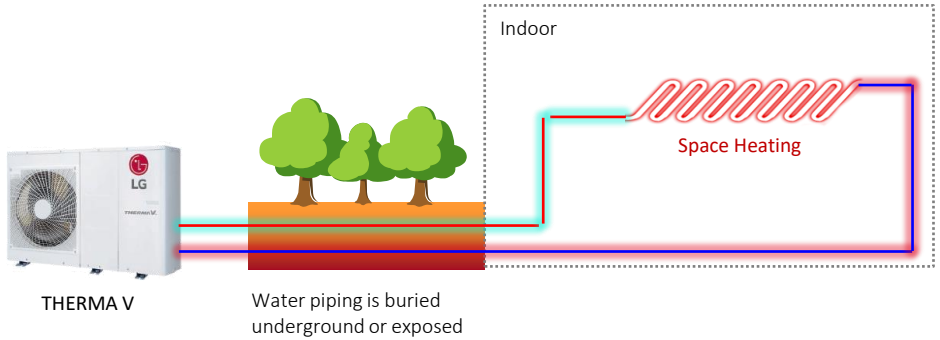
Model Name	Model Number	Figure	Feature
FCU (Fan Coil Unit)	Field Scope		• Including FCU Controller • Available for "Heating only" or "Heating and Cooling" • Built-in 2 way valve or Providing signal for 2 way valve
2 Way Valve	Field Scope		• Optional; In case the FCU does not have a built-in 2-way valve
Water Pump	Field Scope		• 1Φ, 230V AC • Self-Controlled is recommended
Bypass valve	Field Scope		

Anti-freeze Solution

SPACE HEATING ONLY

When concerning about freezing in water system, antifreeze can be added to the circulating water for the heating circuit to prevent water freezing.

▪ Schematic Diagram



▪ Available Antifreezes

Antifreeze Type	Antifreeze mixing ratio (by volume)					
Freezing Temp. 1)	0℃	-5℃	-10℃	-15℃	-20℃	-25℃
Methanol	0%	6%	12%	16%	24%	30%
Ethylene glycol	0%	12%	20%	30%	-	-
propylene glycol	0%	17%	25%	33%	-	-

Note :

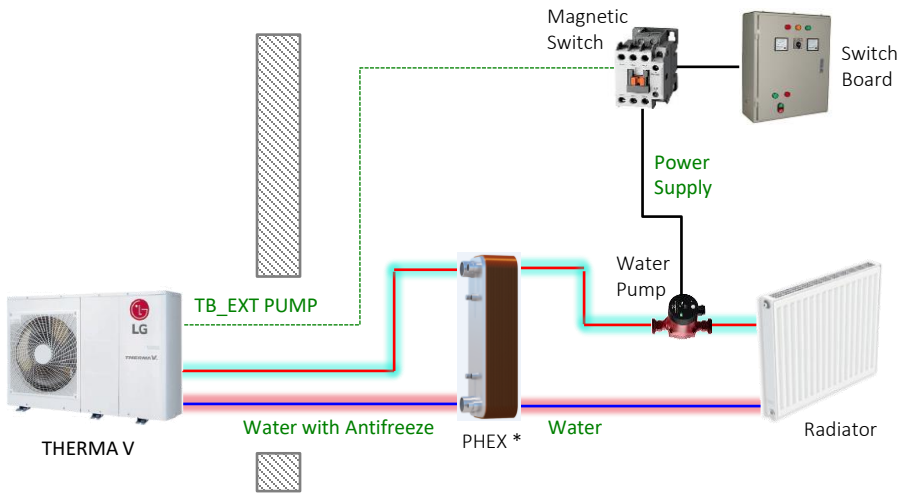
1) By mixing antifreeze with water, the Freezing Temp. of the water is lowered. Therefore, the temperature at which the freeze protection logic starts must be adjusted accordingly in the installer's setting. Furthermore, it is mandatorily required to change dip SW setting for “Antifreeze” and remove bridge at CN_ANTI_SW on indoor PCB.

※ Dip SW No. and Terminal Block No. may differ depending on the product. Please refer to the PDB or manual for details.

※ If an Anti-freeze is used, pressure drop and capability degradation of the system can occur.

※ Please check the concentration of the Anti-freeze periodically to keep the same concentration.

▪ Advanced Application



* Since some antifreeze agents might be harmful to materials used in the heating circuit, it is recommended to use an indirect circuit by installing a suitable plate-heat-exchanger.
This is also able to reduce the amount of antifreeze.

THANK YOU

LG Business Solutions