

# 2014 ***GHP*** SUPER

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## Product Introduction



# Engineering Library – GHP

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- 02 | Why LG GHP?
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- 03 | BLDC Fan Motor
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- 03 | Indoor Refrigerant Noise Reduction

## Intro

**01** | What is GHP?

**02** | Why LG GHP?

**03** | Line-up

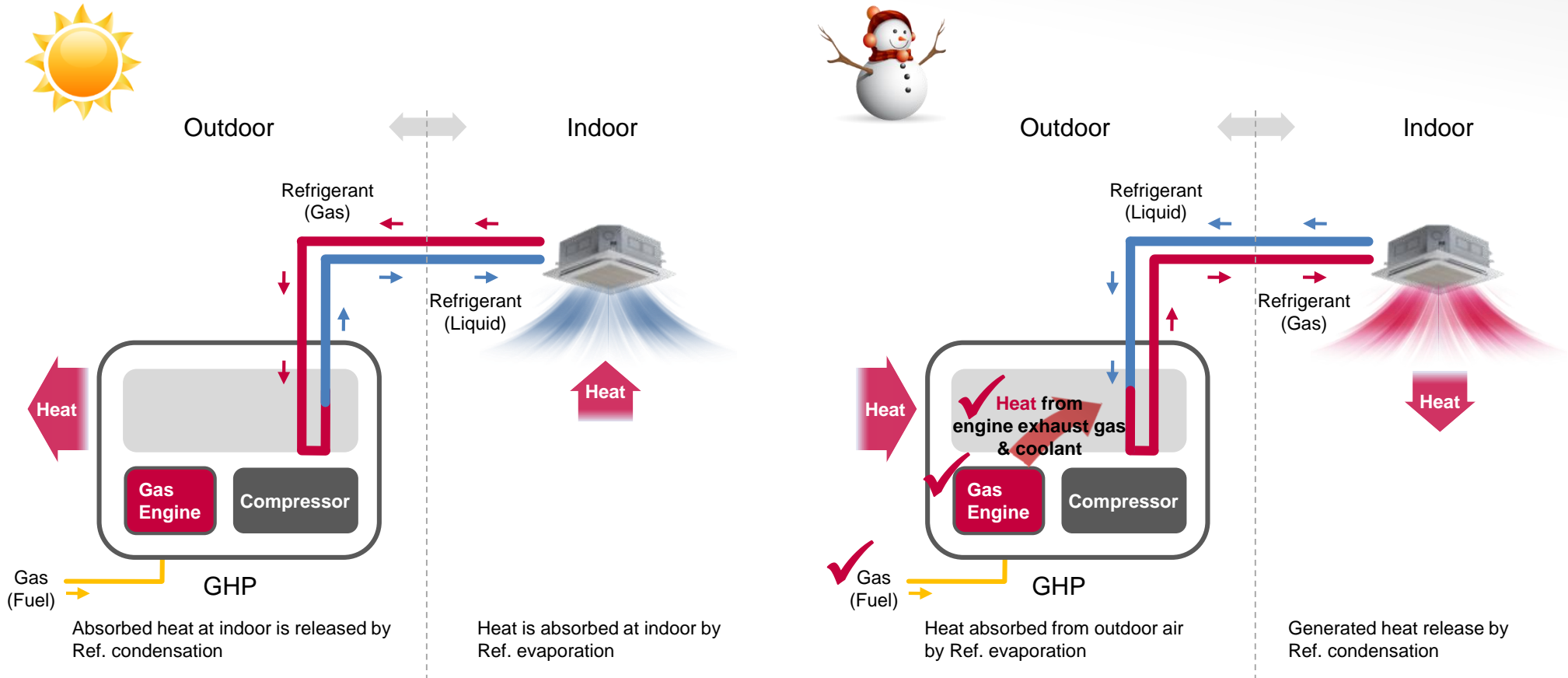


# What is GHP(Gas-engine driven Heat Pump)?

GHP is a kind of VRF driven by gas engine, it is suitable for any buildings using gas conveniently as energy source or better heating needed. Most of system parts & IDU are almost same as EHP system.

## Cooling Mode

## Heating Mode



✓: differences with EHP

# What is GHP(Gas-engine driven Heat Pump)?

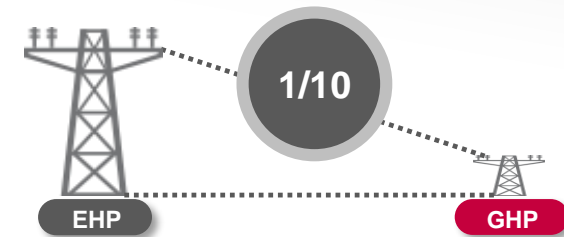
High efficiency operation & Heat recovery : Contented with stability and economic feasibility.

## Target Market

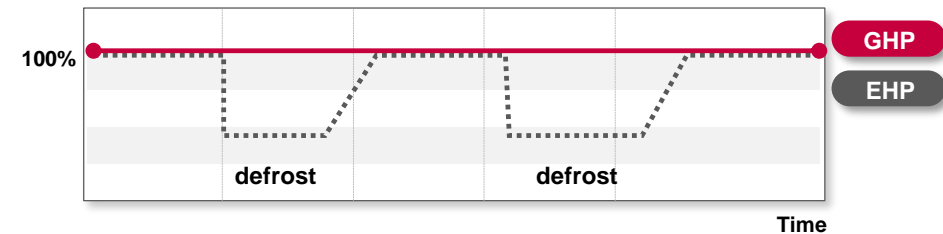
- Insufficient of Electricity supply facilities (Remodeling)
- Low gas price & enough gas infrastructure
- Space need to stable heating operation
- Cold winter areas

## Key Feature

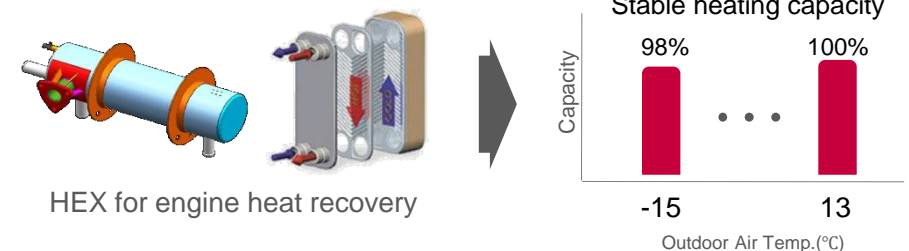
Low power consumption / Low electricity equipment capacity



Without defrost & continuous heating



Engine heat recovery / No heating performance decline



### Common Part (EHP)



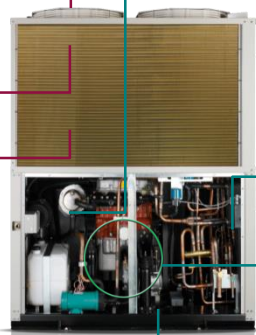
### GHP Exclusive Parts

Exhaust Gas Hex.

Plate Hex.

Engine

GHP Comp.

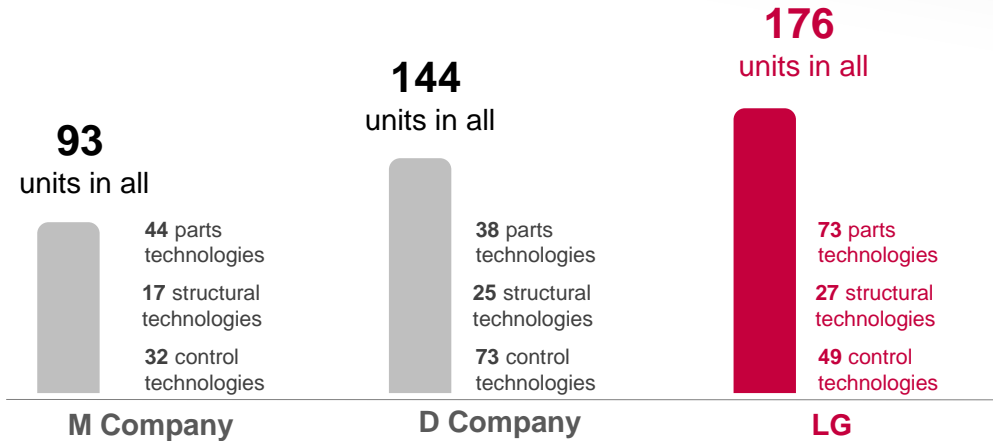


# Why is LG GHP?

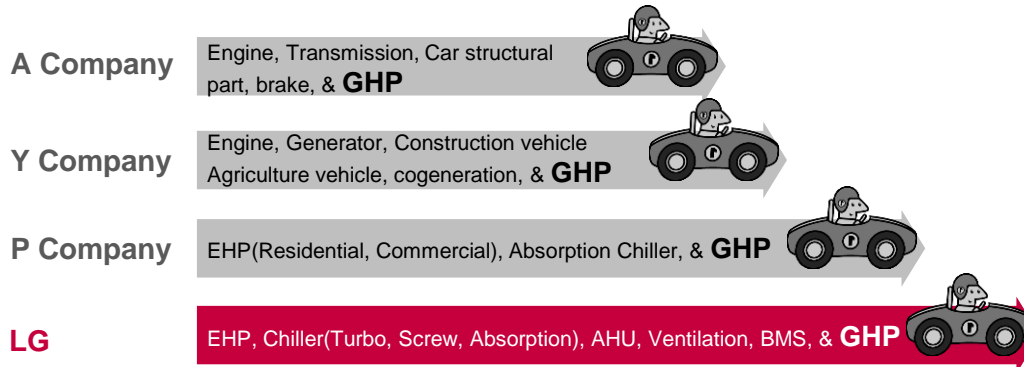
LG GHP is manufactured by LG EHP technology & knowhow of HVAC industry.



## EHP Technology Patent Comparison



## LG is HVAC Company



2nd Generation GHP of LG

## GHP SUPER





- 2014 | Upgraded 2<sup>nd</sup> Gen. GHP (ODU Combination)
- 2012 | 2<sup>nd</sup> Generation GHP
- 2011 | Upgraded 1<sup>st</sup> Gen. GHP
- 2009 | R-410A GHP (1<sup>st</sup> Generation GHP)
- 2005 | R-22 GHP

With single model & series model, GHP Super can be apply to a diverse kinds of building like office, school, and etc.  
IDU of GHP Super can be compatible with Multi V.

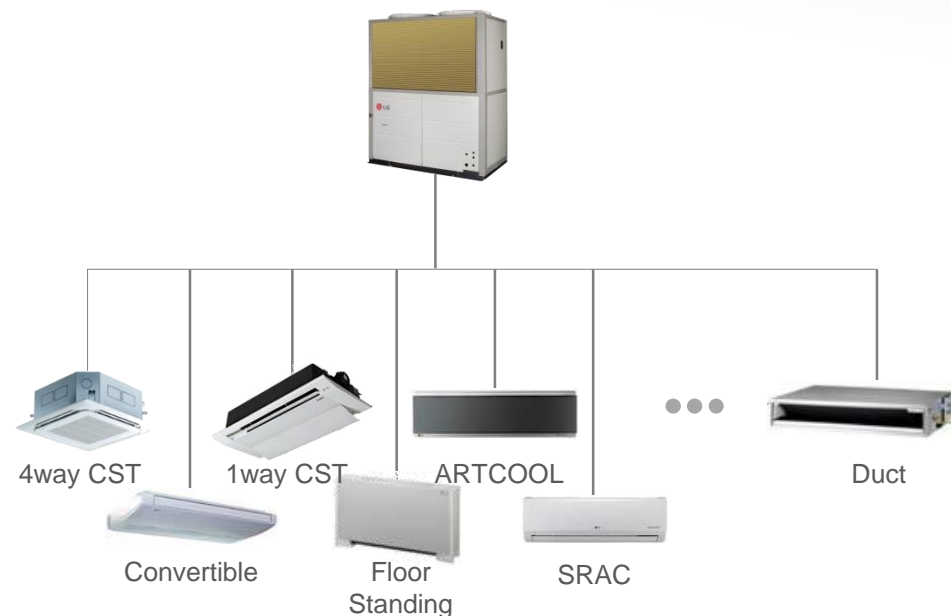
## Line Up

GHP Super has 16, 20, 25HP line-up as single unit.  
As series model, its line-up covers with 32~50HP.

HP	16	20	25	32	36	40	45	50
Feature								
	Single Unit			Series Unit				
				32HP : 16HP+16HP    45HP : 20HP+25HP 36HP : 16HP+20HP    50HP : 25HP+25HP 40HP : 20HP+20HP				
Cooling Capacity (kW)	45	56	71	90	101	112	127	142
Heating Capacity (kW)	50	63	80	100	113	126	143	160

## Combination of IDU

Indoor units combination ratio : 50 ~ 130%



**GHP Super IDU can be compatible with Multi V !!**

\* Except some models & capacities

## Supreme Energy Efficiency

- 01 | COP Comparison
- 02 | High Performance Engine
- 03 | BLDC Fan Motor
- 04 | Gold Wide Louver Fin

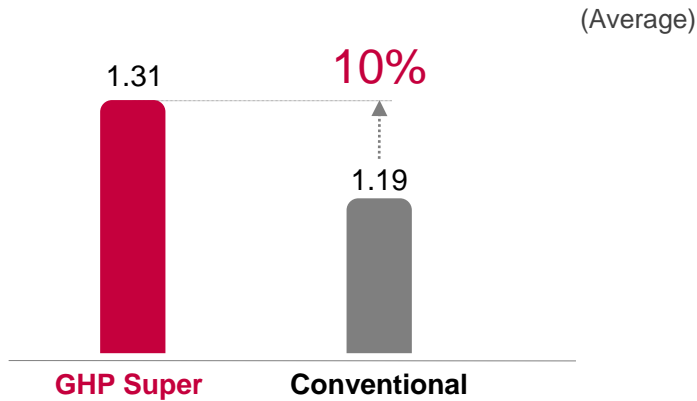




Superior efficiency saves operating cost more. (Cooling COP 10%↑ and Heating COP 9%↑) .

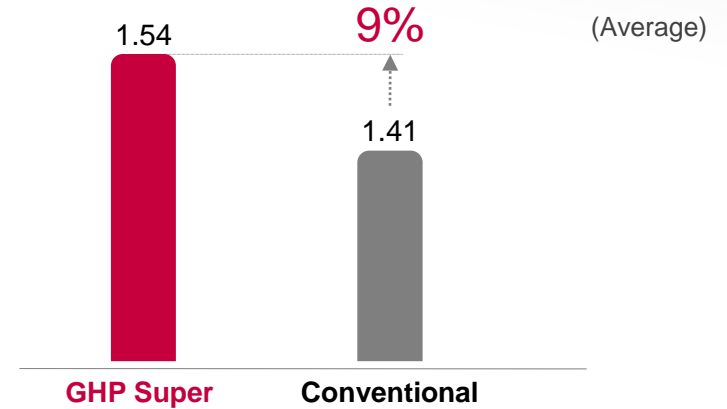
### Cooling Mode

- Cooling COP is 10% higher than conventional on average.

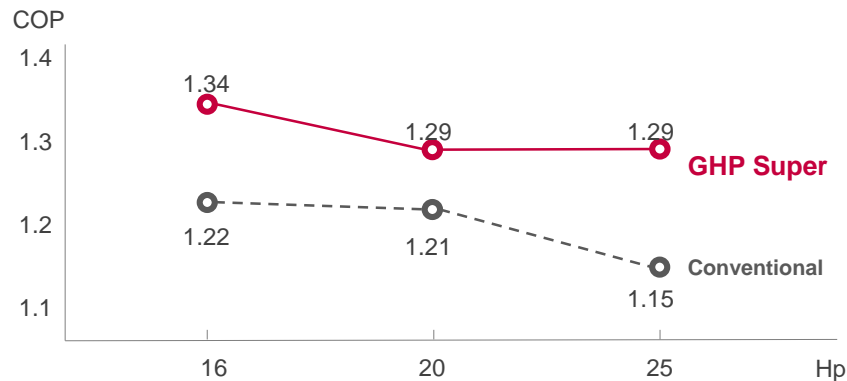


### Heating Mode

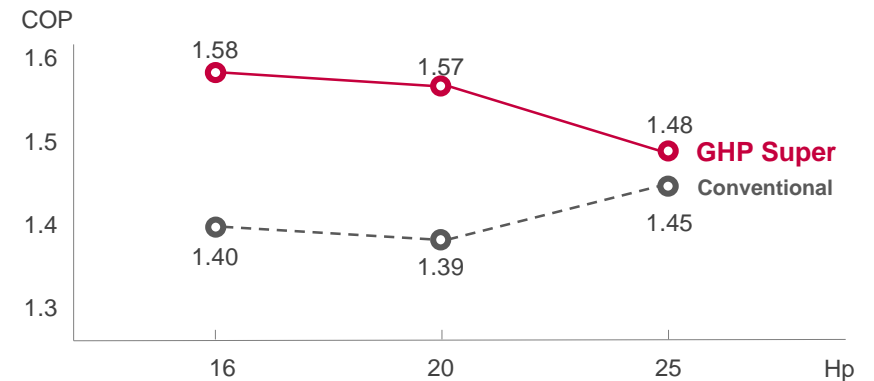
- Heating COP is 9% higher than conventional on average.



- Compare to conventional models, Maximum 12% higher COP



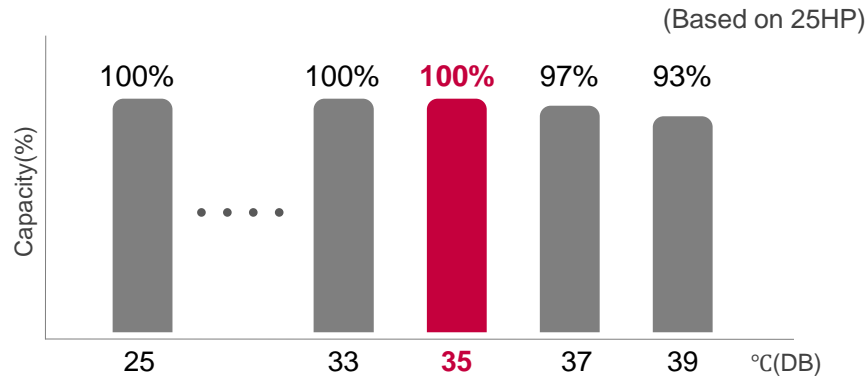
- Compare to conventional models, Maximum 10% higher COP



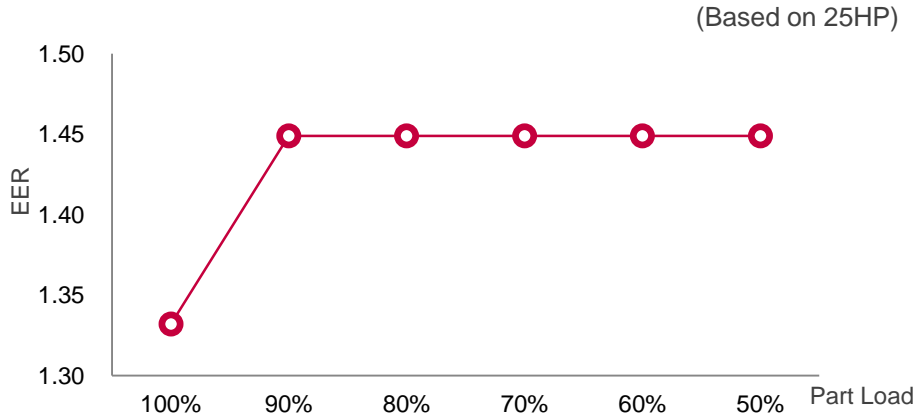
GHP Super can be operated stably regardless outdoor temperature variation and part load condition.

## Cooling Mode

Capacity variation along to outdoor temperature\*



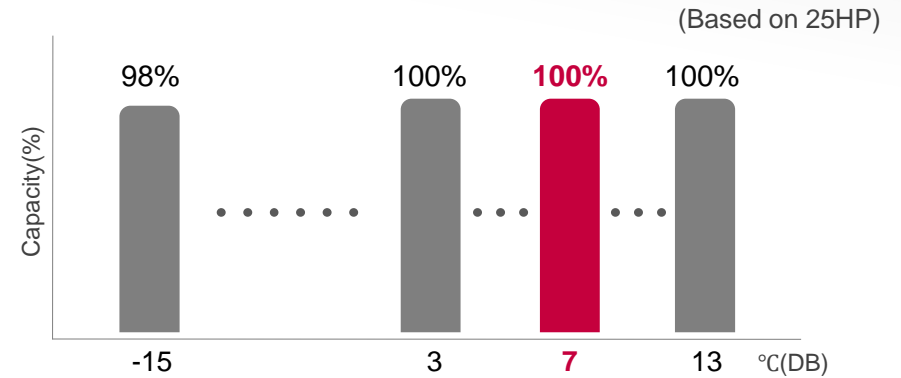
Part Load Efficiency\*\*



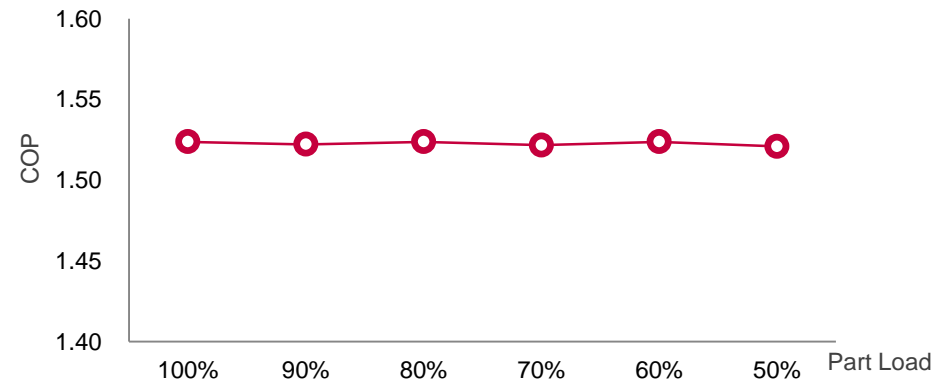
\* IDU 100% Combination / Indoor Temp. 19°C(WB),  
 \*\*Outdoor Temp. 35°C(DB) / Indoor Temp. 19°C(WB)

## Heating Mode

Capacity variation along to outdoor temperature\*\*\*



Part Load Efficiency\*\*\*\*



\*\*\* IDU 100% Combination / Indoor Temp. 20°C(DB),  
 \*\*\*\*Outdoor Temp. 7°C(DB) / Indoor Temp. 20°C(DB)

# High Performance Engine

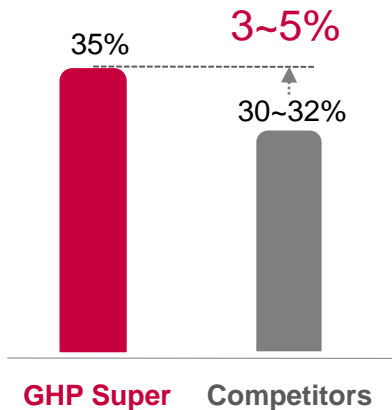
Adapting high efficiency and performance engine, powerful operation is possible with less gas consumption. It's also helpful to reduce CO<sub>2</sub>emission.

## Engine Efficiency

Miller cycle is applied to improve engine efficiency

- Maximum 35% efficiency
- CO<sub>2</sub>reduced by increasing engine efficiency

Engine Efficiency (%)

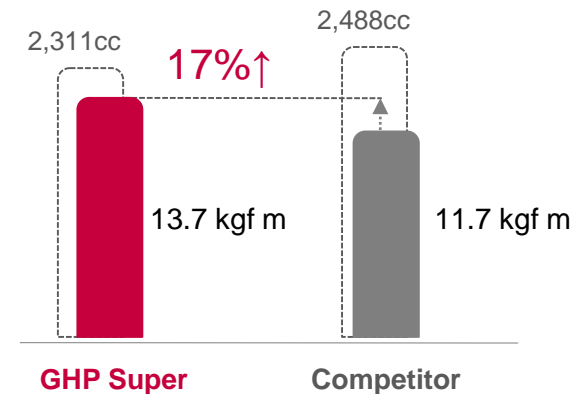


## Engine Performance

High torque on the same level (Displacement 2,311cc)

- 17% high torque compare to competitors
- Possible to transmit more power to compressor

Engine Torque(kgf m) & Displacement(cc)



\* Maximum Torque

\* 밀러 사이클 : 배기밸브 여닫는 타이밍을 배기열을 최적으로 얻을 수 있게 제어한 사이클(miller 개발)

The BLDC Fan motor is more efficient than a conventional AC motor, offering an additional 40% energy savings at low speeds and 20% at high speeds.

## Adopting the BLDC Fan Motor

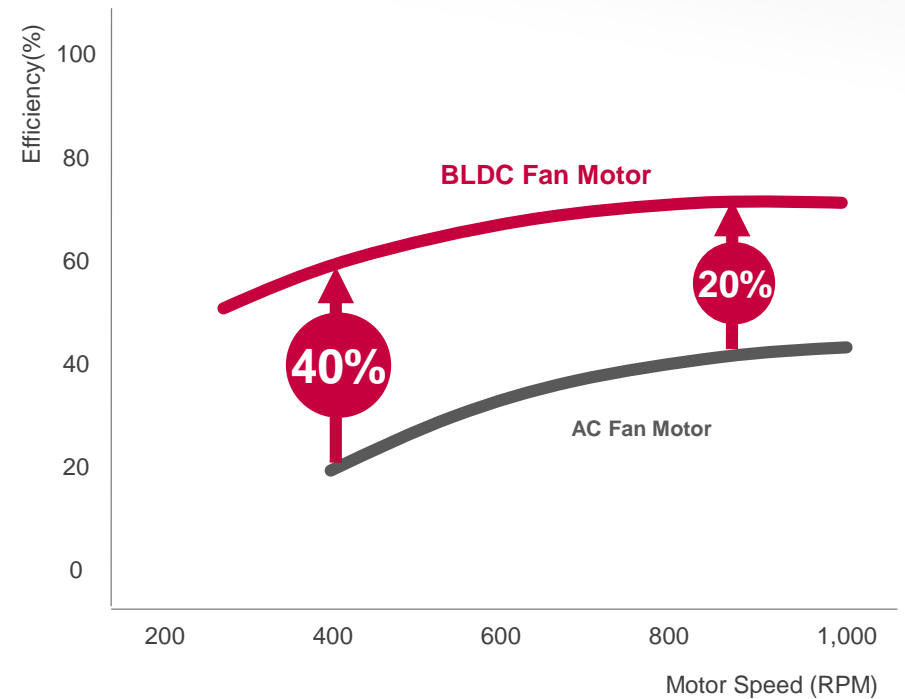


AC Fan motor



BLDC Fan Motor

## Fan Efficiency Improvement

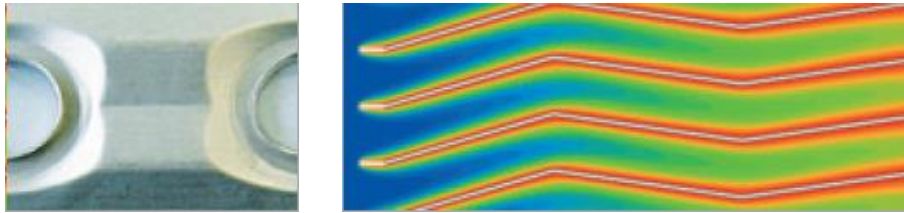


# Gold Wide Louver Fin

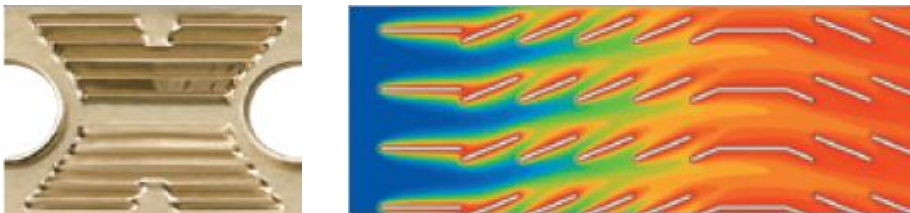
Heat exchange rate is 28% in cooling and 23% in heating increased by Gold Wide Louver Fin-tube HEX

## Adopting the Gold Wide Louver Fin

Corrugate Fin

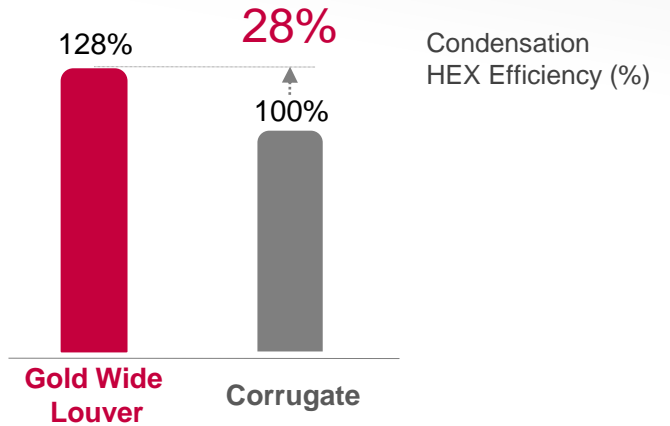


Gold Wide Louver Fin

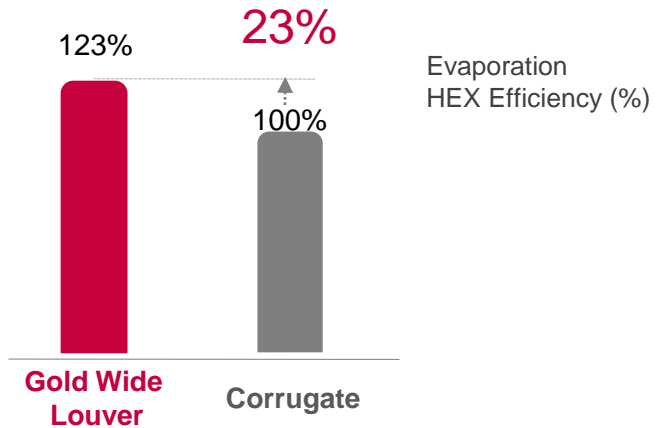


## Heat Exchange Efficiency Improvement

### Cooling



### Heating



## High Operation Reliability

- 01 | Operation Range
- 02 | Heating Performance Improvement Technology
- 03 | Double Coated Gold Fin
- 04 | AI(Artificial Intelligence) Algorithm

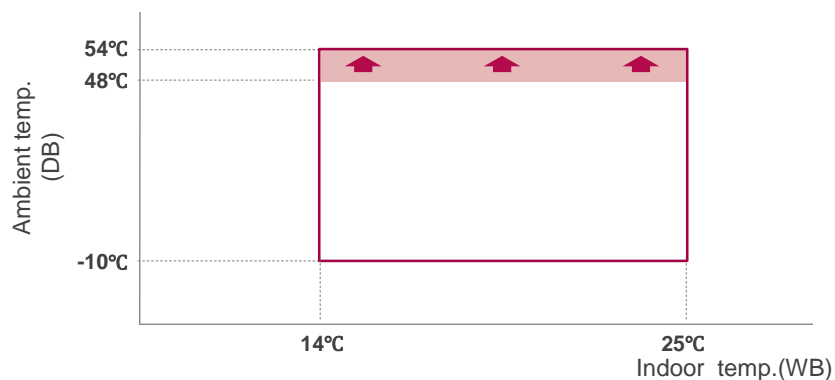
# Operation Range

GHP Super has Wide Operation Range with cooling - 10°C~ 54°C and heating - 25°C~ 18°C. whereas conventional one has cooling - 10°C~ 48°C and heating - 20°C~ 26°C.

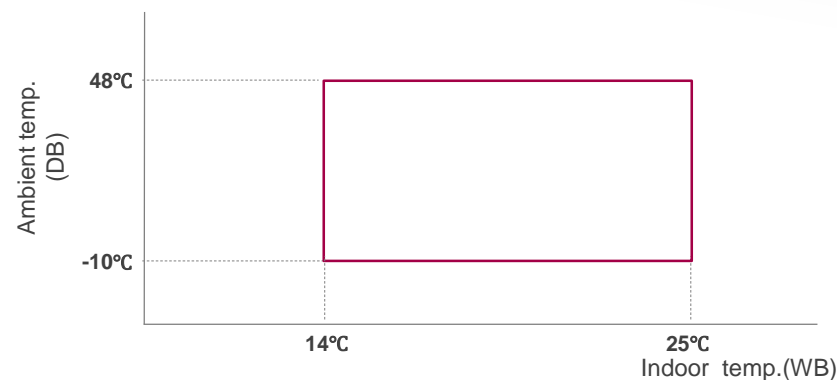
## GHP Super

## Conventional

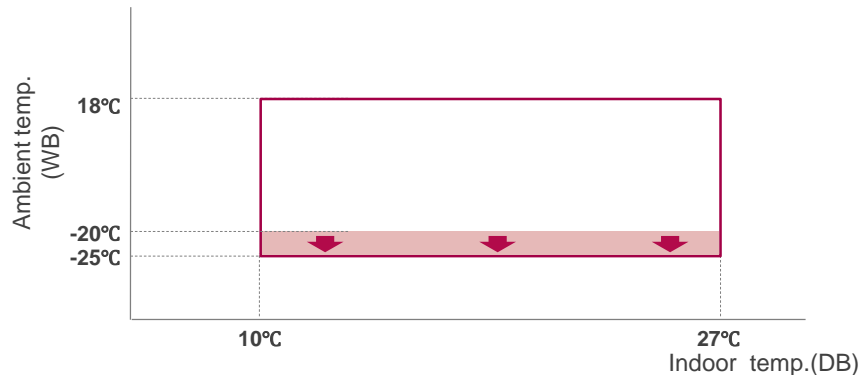
### Cooling operation area



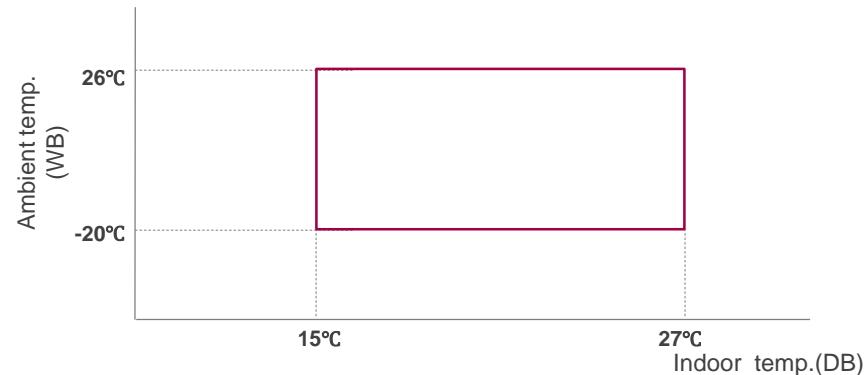
### Cooling operation area



### Heating operation area



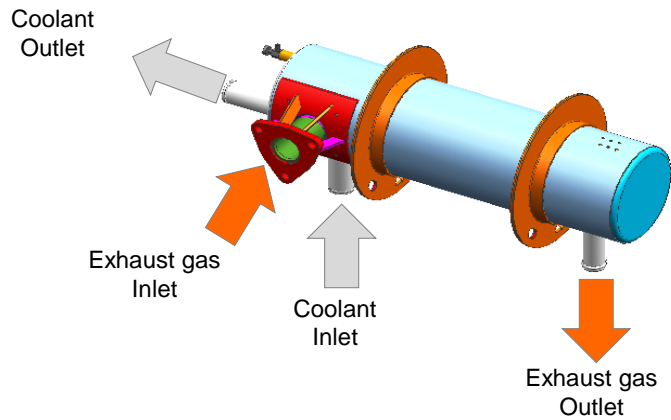
### Heating operation area



# Heating Performance Improvement Technology – Exhaust Gas Heat Exchanger

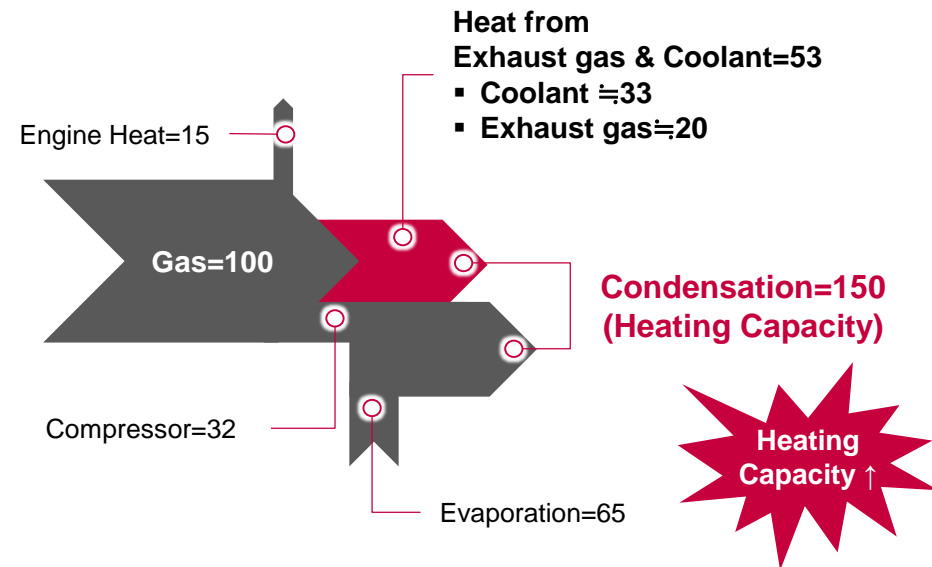
In heating mode, heating performance can be increased 15% by heat from exhaust gas.

## Exhaust Gas Heat Exchanger



- In heating Mode, using heat from exhaust gas
  - Engine warming-up time reduced as engine turn on
  - Supply heat to coolant used as a heat source for evaporation
  - Evaporation heat exchange efficiency and heating performance is increased

## Detail of Heat Equivalent Diagram for HEX





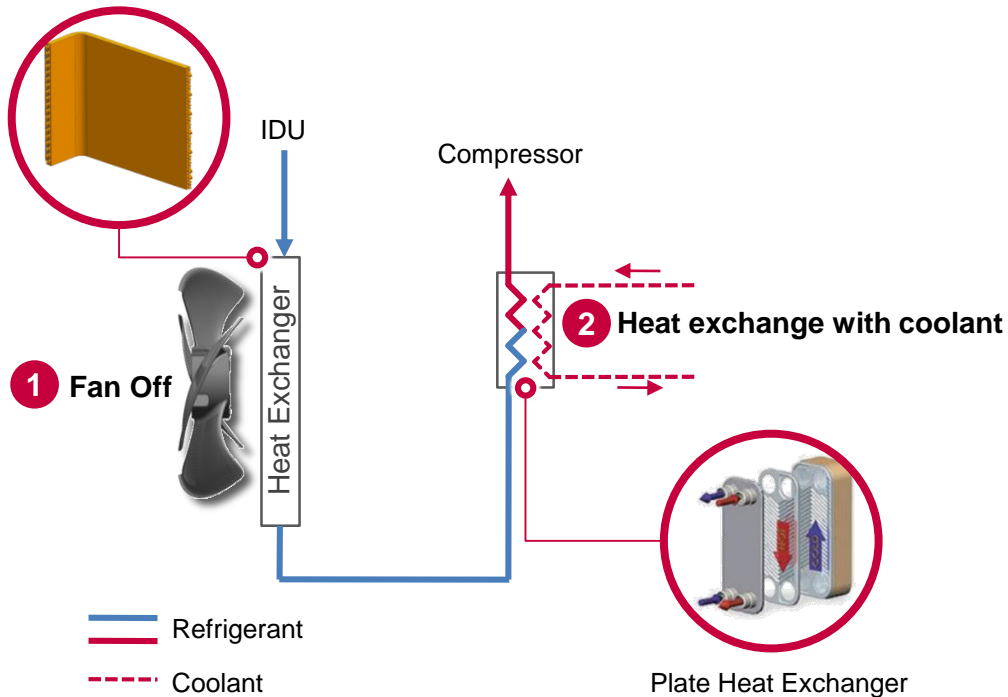
# Heating Performance Improvement Technology – Plate Heat Exchanger

In heating mode, heat exchange efficiency and heating performance is increased by heat exchange with coolant for evaporation not outdoor air.

## Plate Heat Exchanger

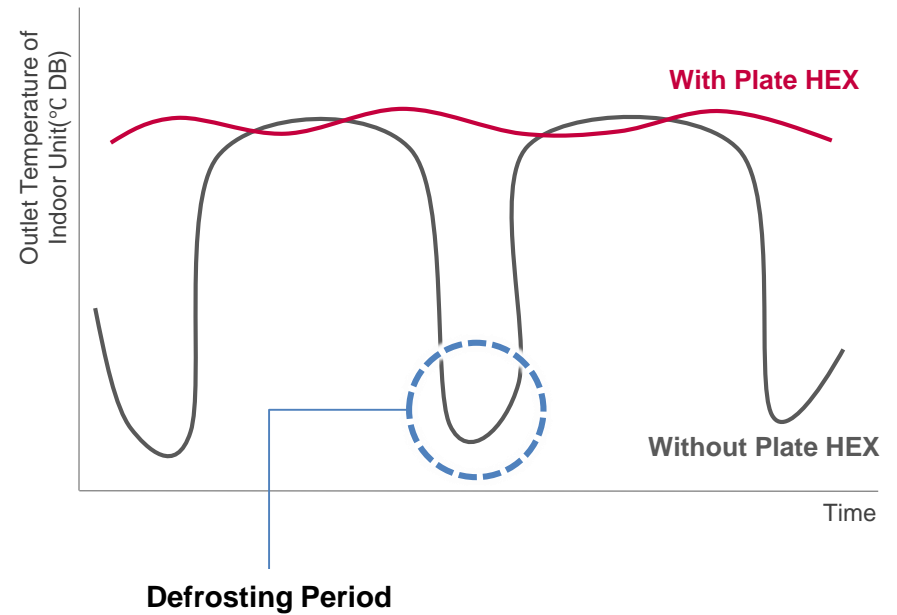
- In heating Mode, if outdoor temperature is below 2°C DB,
  - Fan of outdoor unit is off
  - Exchange heat with coolant(70°C~ 80 °C) for evaporation

Below Outdoor Temp. 2°C DB



## Effect of Plate Heat Exchanger

- Applying the plate HEX(Heat Exchanger)
  - Not need to defrost
  - Able to the continuous heating



# Double Coated Gold Fin

Adapting double coated gold fin, hydrophile property and anti corrosion performance is increased.  
This performance is proved by LG self test that checking conditions for 360 hours after salt water sprayed.

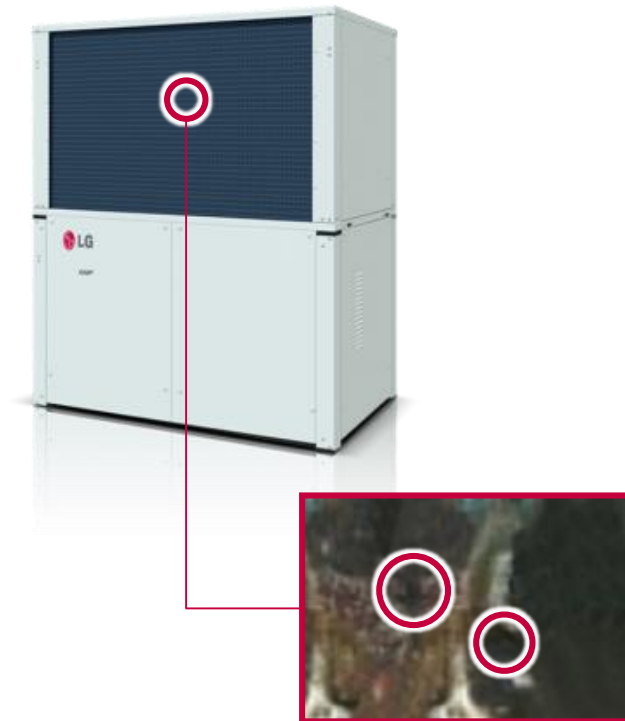
## GHP Super

- Adapting a double coated gold fin
- Hydrophile property
- Anti Corrosion



360 hours after  
salt water sprayed

## Conventional

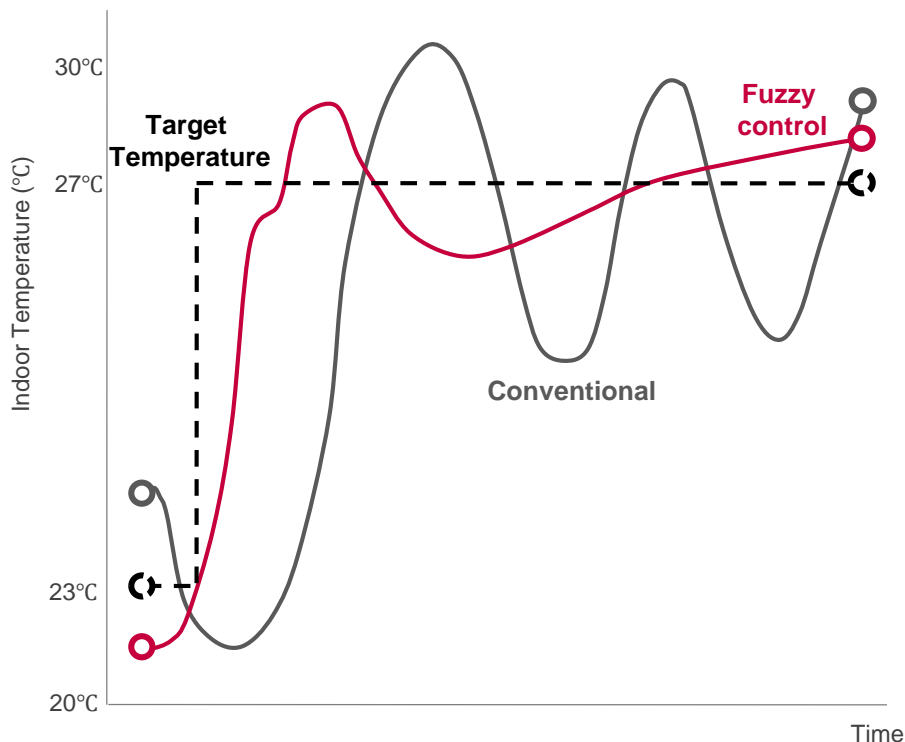


Corroded  
- Hole by corrosion

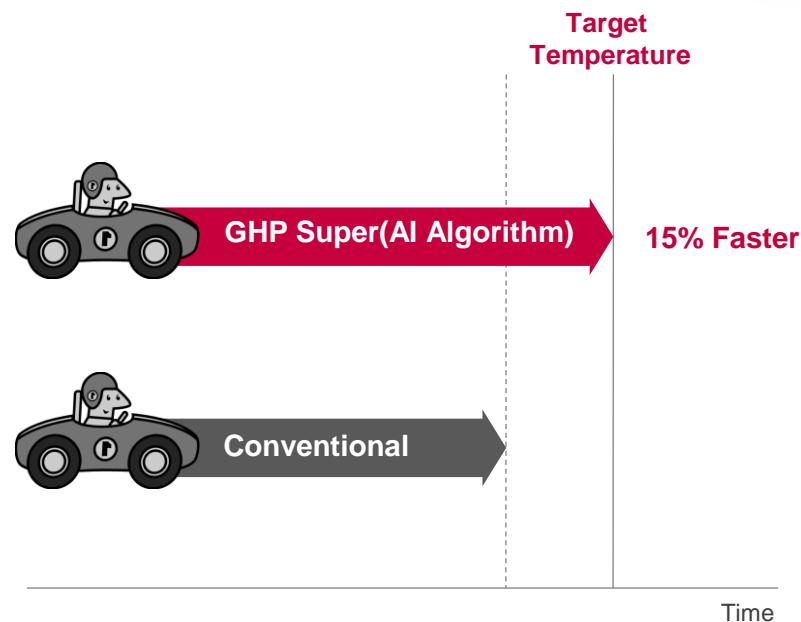
# AI(Artificial Intelligence) Algorithm

Through AI control (FLC : Fuzzy Logic control) algorithm, the reaching time to the target temperature is 15% faster than before. We can present more comfortable and satisfied environment to our customer.

## AI(Fuzzy Logic Control) Algorithm



## Reaching Time to Target Temperature



## Comfortable Surroundings

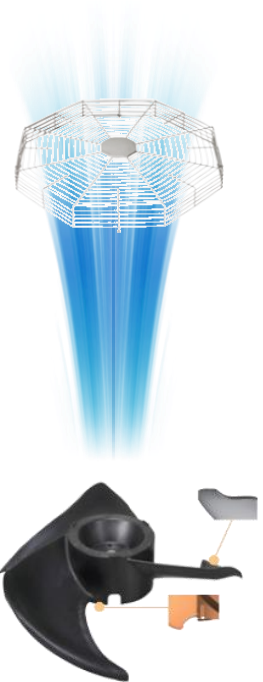
- 01 | Low Noise Design
- 02 | Night Silent Mode
- 03 | Sub Cooling Technology



Each low noise design technology is able to minimized the operation noise.

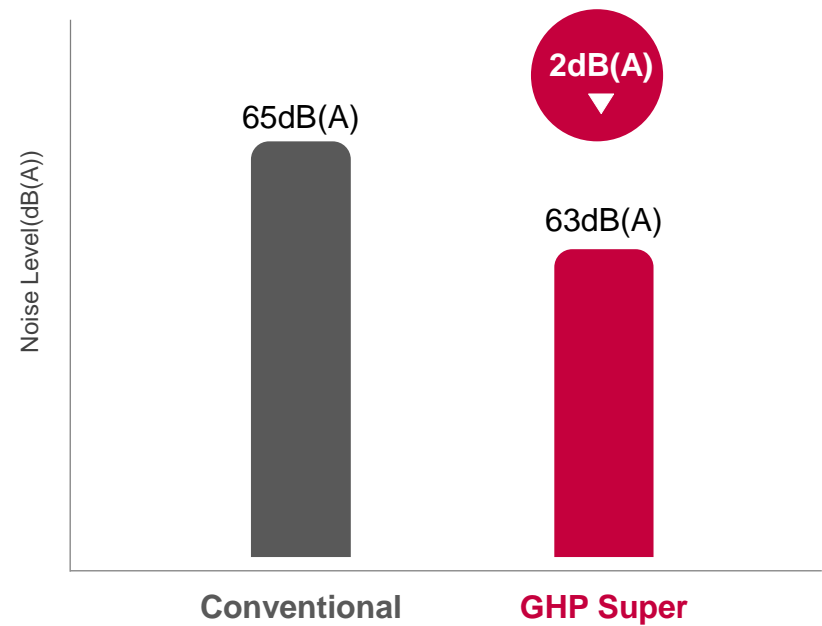
## Each Design for Low Noise

- **Low Noise**
- **High Air flow**



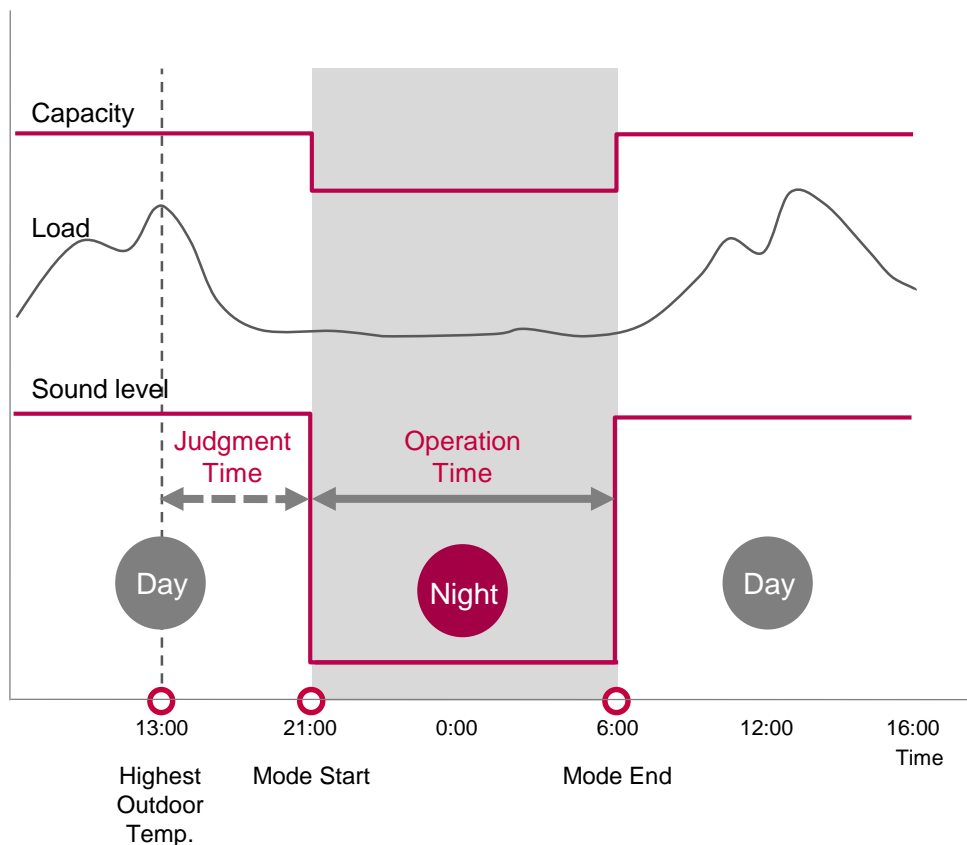
- **Octangle Grille**
  - Anti snow stack
  - Minimized air flow resistance
- **Super Aero Fan**
  - Minimized clearance flow
  - High stiffness design & low noise

## Operation Noise Reduction

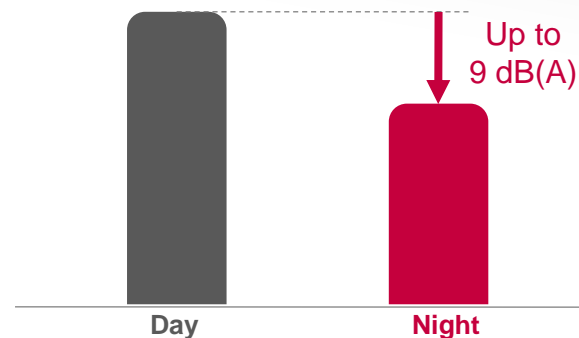


Night Silent operating can reduce noise levels at night time by simply setting the dip switch on the PCB of the outdoor unit.

## Night Silent Mode



## Detail of Mode Operation



### 12 detail modes of Night Silent mode

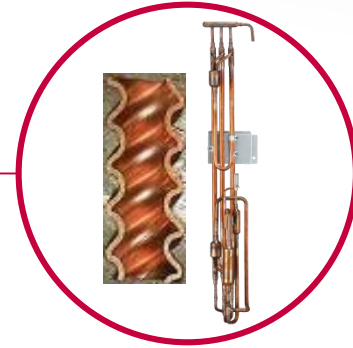
- 4 Operation & Judgment Time setting mode : 9h(8h), 10.5h(6.5h), 12h(5h), continuous night silent mode
- Each Step has 4 different time setting(operation & judgment) modes.

Unit : dB(A)

	Normal	Night Silent Mode
Step1	63	59
Step2	63	57
Step3	63	54

# Indoor Refrigerant Noise Reduction

Adapting sub cooling technology, the indoor refrigerant noise level is reduced by minimizing the flash gas in pipe. It is able to maintain more comfortable indoor environment.

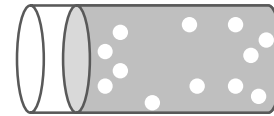


## C.S. I(Cyclone Sub-cool Interchanger) Sub Cooler

- Minimizing flash gas in pipe
- Reduction of indoor refrigerant noise level



**Without C.S.I sub cooler**



➔ Flash gas occurrence in pipe  
Making a refrigerant noise

**With C.S.I sub cooler**



➔ Minimizing flash gas & noise

## Flexible Installation

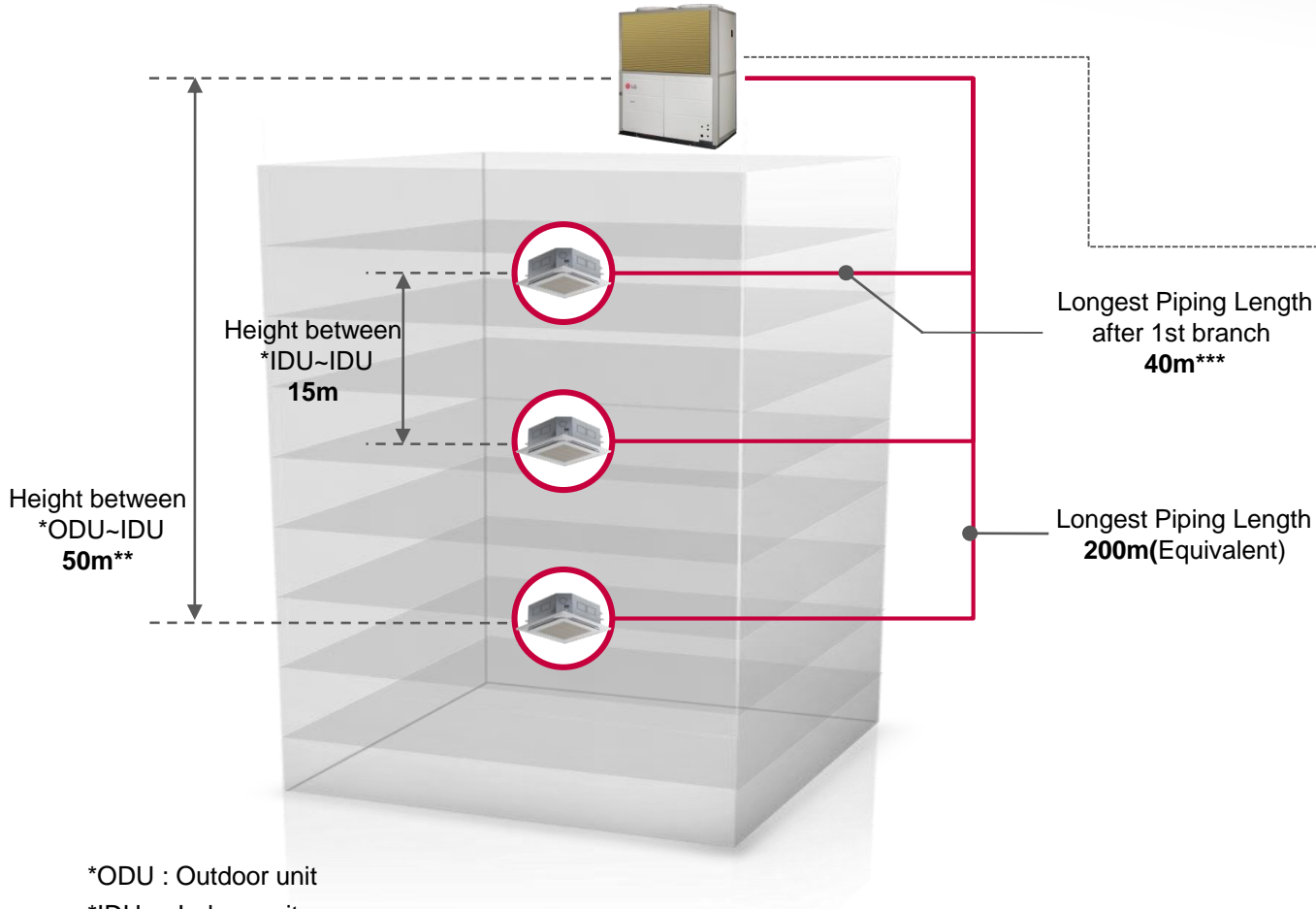
- 01 | Piping Length
- 02 | Weight & Size
- 03 | Various Applications





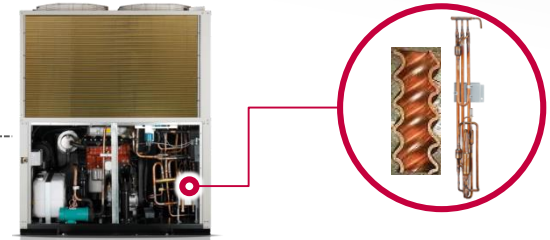
# Piping Length

GHP Super guaranteed the cooling and heating capacity up to 200m(equivalent) piping length by sub-cooling circuit.

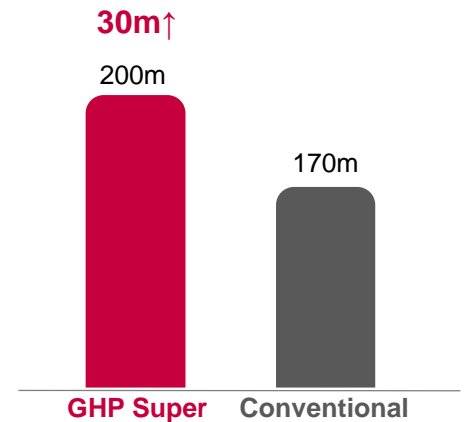


## C.S. I Sub-cooler

- Enables to enhance the system reliability for high elevation or long piping.



## Longest Piping Length



\*ODU : Outdoor unit

\*IDU : Indoor unit

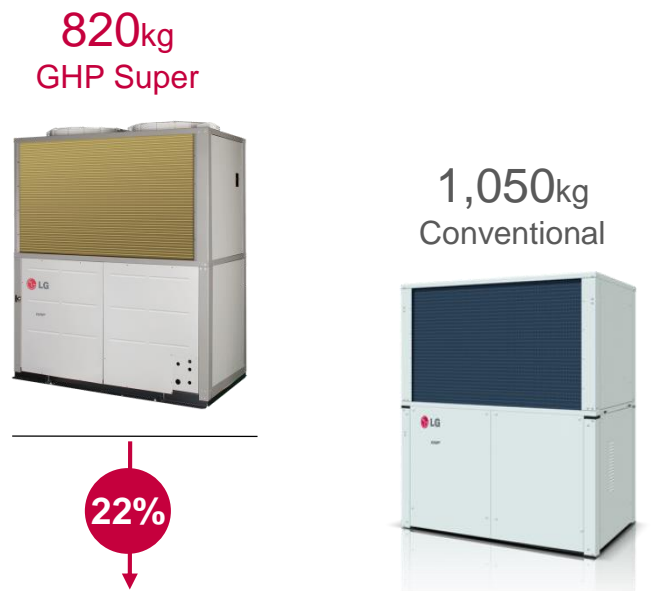
\*\* ODU must be located in upper place than IDU

\*\*\* 90m(Conditional Application)

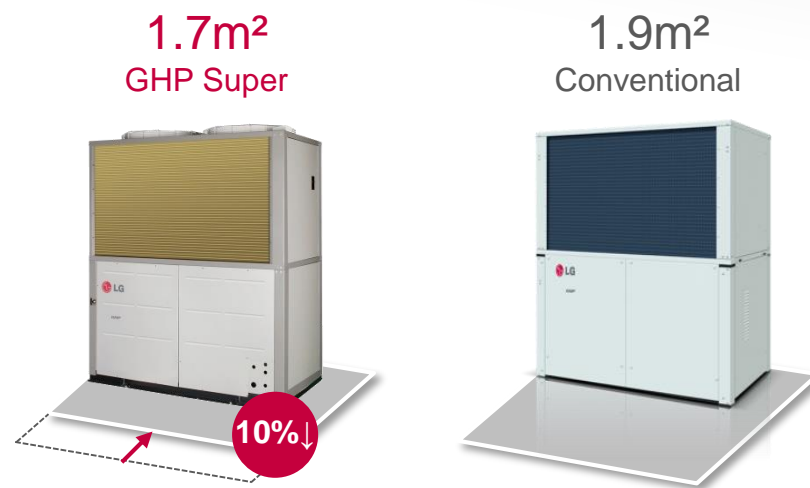
# Weight & Installation Area

Weight & Installation area of GHP Super is decreased by 22% and 10% respectively.

## Weight Comparison



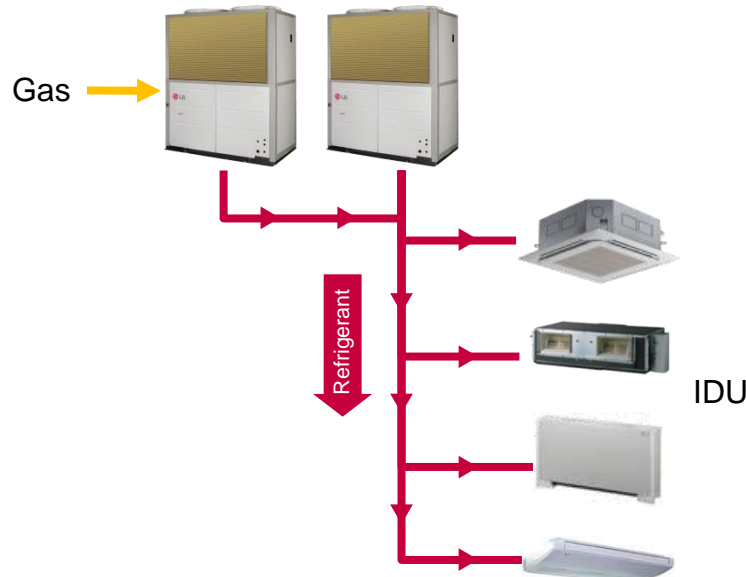
## Installation Area Comparison



# Various Application – DX Type

Through DX Type same with conventional EHP System, it can be cooling & heating in various space like office, class room, retail store, as well as large space like auditorium, lobby and etc.

## Individual Space

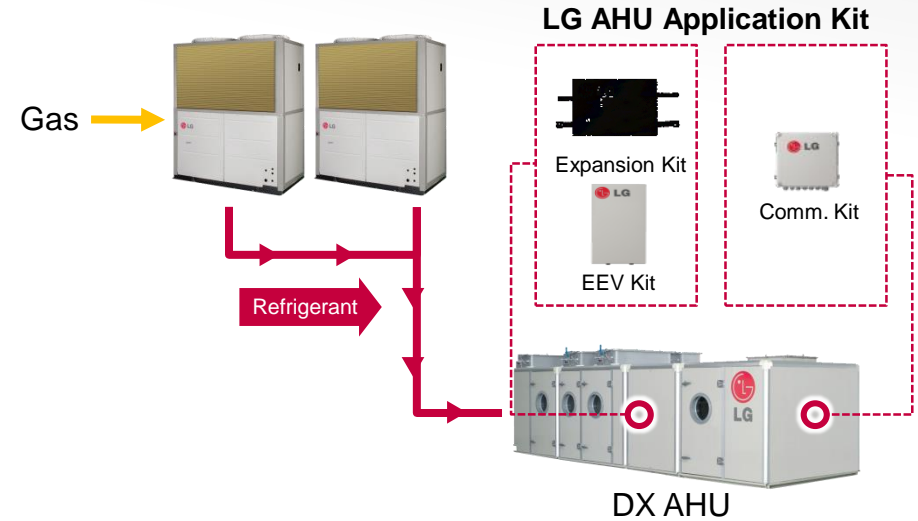


- **GHP ODU + IDU\***
- Office, Retail Store, Classroom
- Common cooling & heating zone

\* Compatible with Multi V



## Large Space



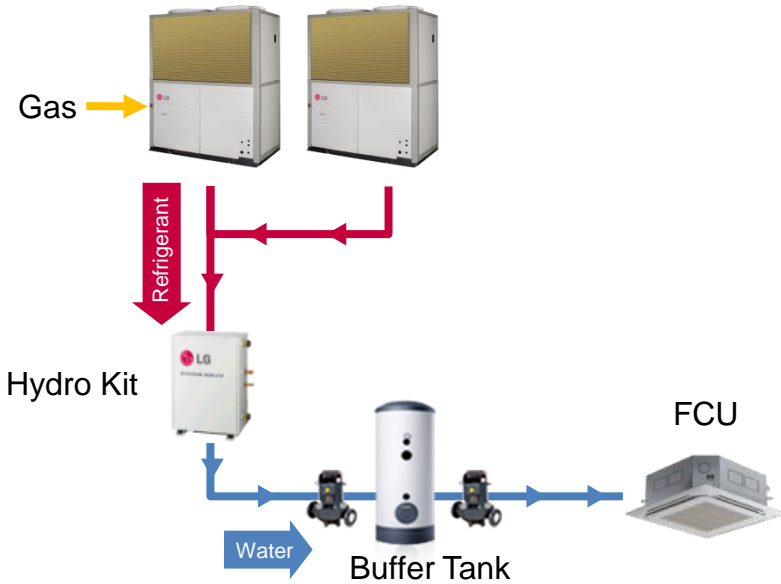
- **GHP ODU + DX AHU**
- Auditorium, Lobby
- Large space, High ceiling
- Need ventilation
- Prevent the outdoor air (need pressure)



# Various Application – Water Type

Water Type is applied to domestic hot water supply needed space and replace the conventional chiller system.

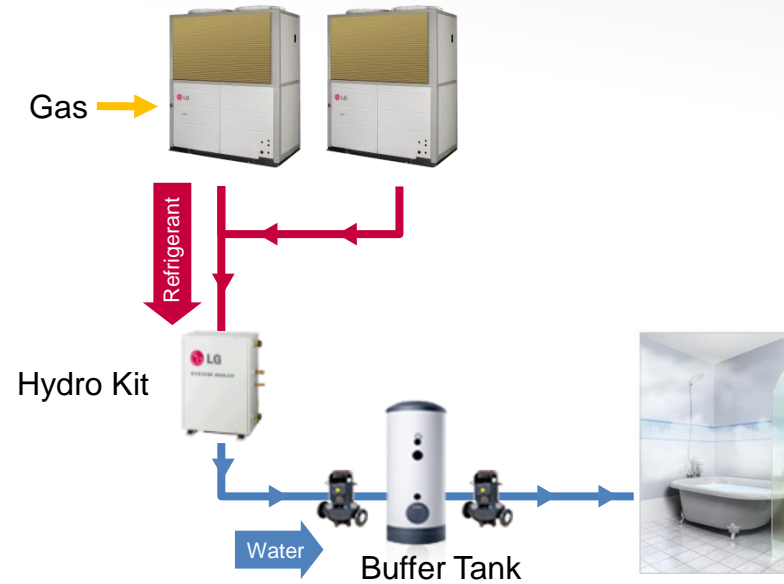
## Individual Space with Water Pipe System



- **GHP ODU + Hydro kit + FCU**
- Office, Retail Store,
- Common cooling & heating zone
- Place needed to be water pipe in indoor, not refrigerant pipe



## Domestic Hot water Supply



- **GHP ODU + Hydro kit**
- Resort, Fitness club
- Need hot water



## Convenient Functions

- 01 | Snowdrift Prevention Function
- 02 | Integrated Control System
- 03 | Pump Down, Pump Out
- 04 | Air Purge Function



## Snowdrift Prevention Function

Prevent malfunction due to snow stack through snowdrift prevention function during stopping.

### GHP Super



**Snowdrift prevention function**

### Conventional



Outdoor temperature less than 3°C  
→ 120 seconds fan operation in every 30 minutes

# Integrated Control System

Integrated control to the hybrid system (GHP Super + Multi V) is possible with using Multi V Controller. Integrated control system is not only saving money but also easy to manage the system.

## • Central Controller for Integrated Control System

### AC Manager Plus

- Central Control Solution
- Maximum 8,192 Indoor Units

### ACP

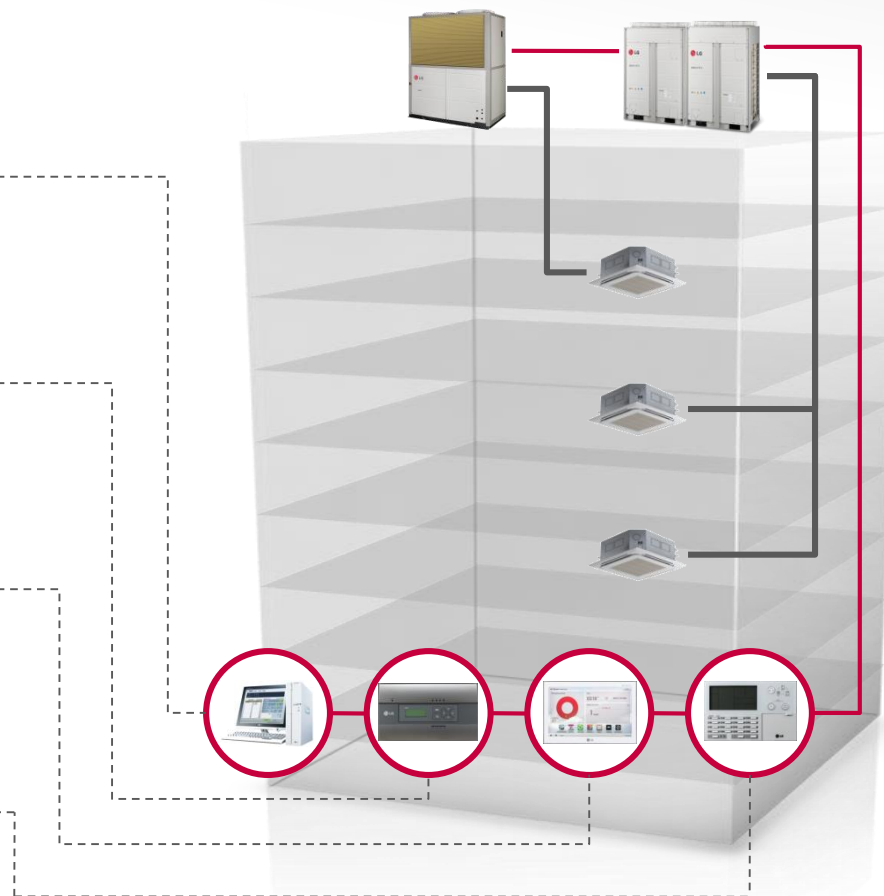
- Central Controller for PC
- Maximum 256 Indoor Units

### AC Smart Premium

- Central Controller for Indoor Unit
- 64 ~ 128 Indoor Units

### AC Ez

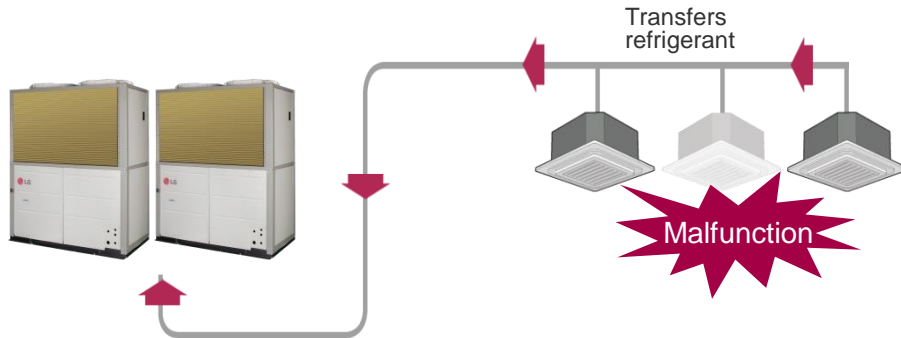
- Central Controller for Indoor Unit
- 32 Units (16 Indoor Units / 16 Ventilation Units)



# Pump Down, Pump Out

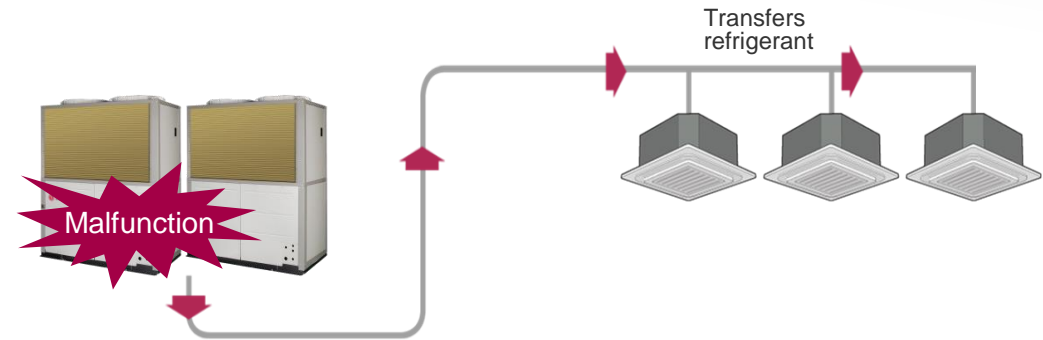
When an outdoor or indoor unit malfunctions, this function automatically collects its refrigerant before servicing. This function is very useful and convenient to repair the malfunction unit.

## Pump Down



When an indoor unit malfunctions, this function collects the refrigerant remaining in the piping line or that unit to an outdoor unit.

## Pump Out

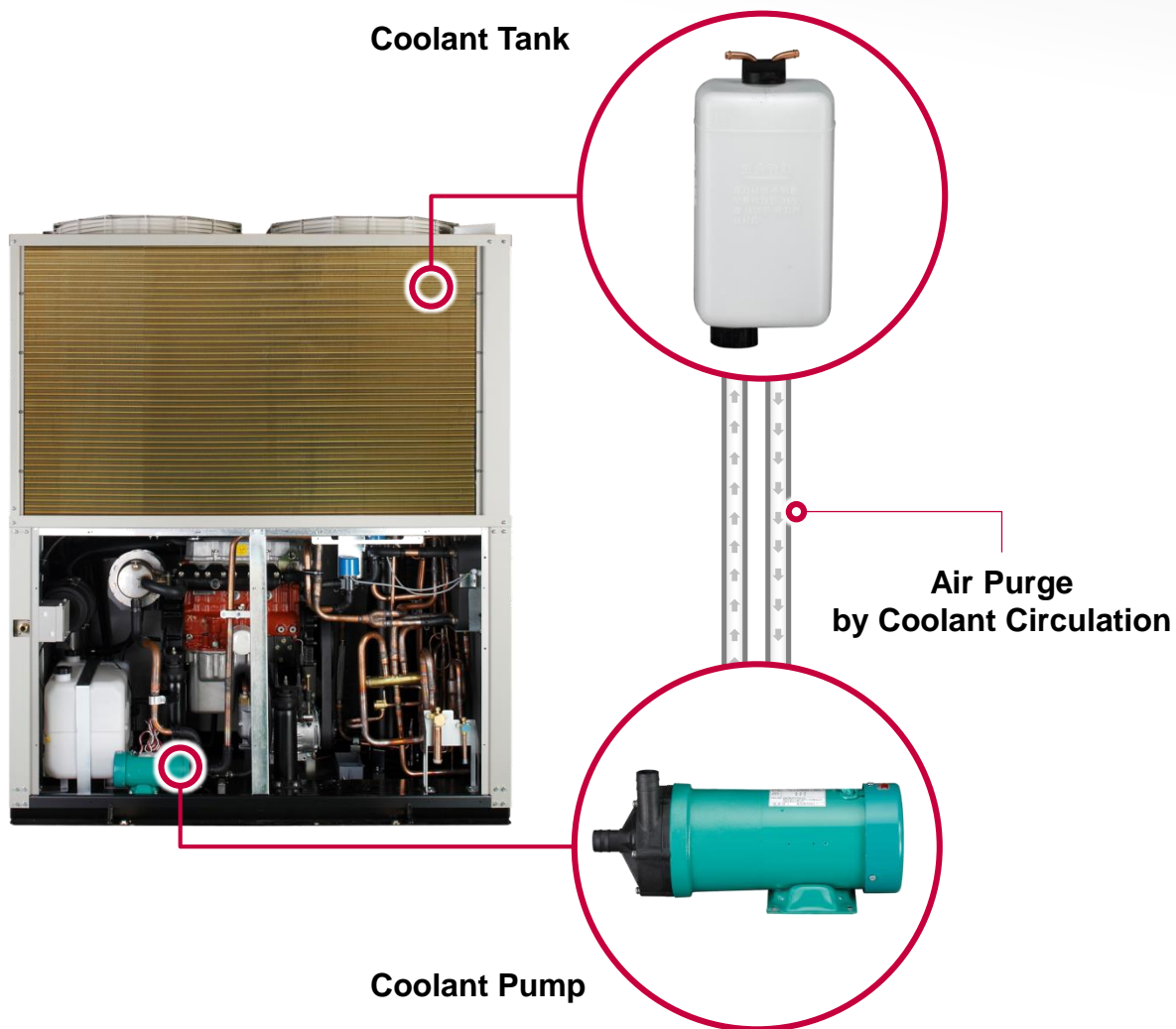


When an outdoor unit malfunctions, this function collects the refrigerant in another indoor unit or a piping line.



# Air Purge Function

It is the useful function to supply coolant after service of engine or coolant system pipe.



## With Air Purge Function

- All steps by automatically
- Just setting Dip Switch & push the start button
  - **So easy!**



## Without Air Purge Function

- All steps by manually
- Turn on the coolant pump
  - Open the 3 way valve
  - Check the coolant circulations
  - Wait 10 minutes.
  - Check to remove the air
  - **Too complicated!**



Type		Contents
Capacity	Single Unit	16, 20,25 HP
	Series Unit	32, 36,40, 45, 50 HP
Gas Type	Type	LNG
	Pressure	2~2.5 kPa
	Standard gas calorific value*	10,400 kcal/Nm <sup>3</sup> (43.54 MJ/Nm <sup>3</sup> )
COP**	Cooling	Rated 1.29~1.34 1.48~1.58
	Heating	
Engine	Displacement	2,311 cc
	RPM	900~2,200 RPM
Compressor		Scroll
Power Supply		220 V, 1Ø, 50,60Hz
Part Load Response Ability		3.3~100%
No. of Max. connectable IDU		16HP : 25 / 20HP : 31 / 25HP : 40
Power Distribution Indicator		Available (Power & Gas Consumption)
Weight *		820 kg
Dimensions(W × H × D)*		1,798 mm × 2,181 mm × 958 mm
Maintenance		10,000 hours ( 5 years ) -. Engine Oil, Filter(Engine, Air), Coolant, Purifying Stone

\* Gas calorific value is the total (high) calorific value based on standard state (0°C, 1atm).

\*\* Based on Single unit



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