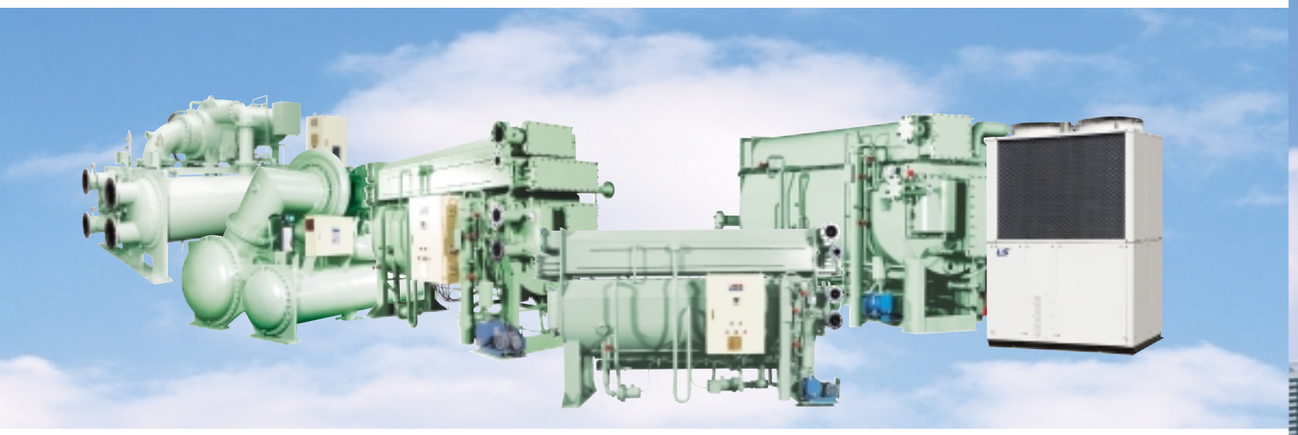


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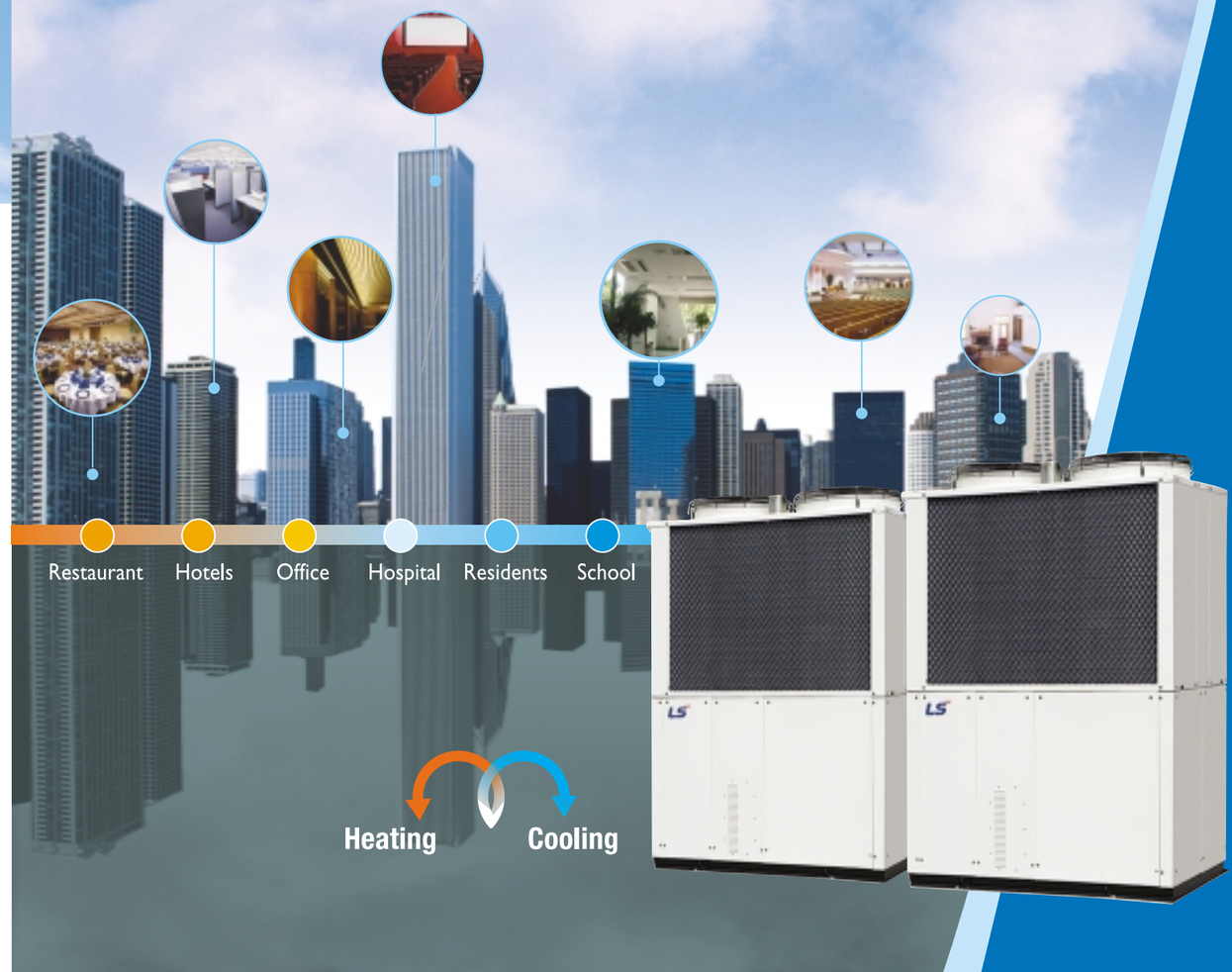
LS GHP 001-1000-0603
Printed in Korea




# LS GHP

## Gas Engine-driven Heat Pump



# Leading Solution

LG Cable, LG Industrial Systems and LG-Nikko Copper, Gaon Cable, E1 and Kukdong City Gas are starting with a new name, *Leading Solution, LS.*

LS
- Cable
- Machinery
- Industrial System

LG
- Electronics
- Telecommunication
- Chemical

GS
- Construction
- Energy
- Service

**Mar.** 2005 LS group spun out from LG Holdings
2002 HST Tractor developed with EATON technology
1999 LG Machinery combined with LG Cable Ltd.
1998 ITI Technical Cooperation for Tractor Reliability Technology

LG
LUCKY GOLD STAR

**Jan.** 1995 LG group renamed from Lucky-Gold-Star group
LG Machinery renamed from Gold Star Heavy Industry
1984 MHI(Mitsubishi Heavy Industry) Engine Technical Cooperation MAM(Mitsubishi Agricultural Machinery) Tractor Technical Cooperation
1983 Technical Cooperation with Sanyo Electric Double Effect Absorption Chiller

LUCKY GOLD STAR

**Jan.** 1984 Lucky-Gold-Star Group Conglomerated

GOLD STAR
Electronice('58) & Cable('62)

1983 Gold Star Heavy Industry established Gold Star acquired Tractor business with Gunpo plant from KHIC.
1977 KHIC(Korea heavy Industries & Construction Co.) started tractor business in Gunpo Plant with FLAT(current CNH) technology
1968 KHIC started HVAC business in Gunpo plant
1962 Gold Star Cable Ltd. Established
1958 Gold Star Electronics Ltd. established

LUCKY
LUCKY
Chemical('47) & Energy('67)

1947 Lucky Chemical company established

## New Dream, New Start

To become a leader in the competitive global market, LG has been divided into three groups, electronics and chemicals for LG, energy and machineries distribution for GS, Industrial electric · electronic materials for LS based on their business specialties.

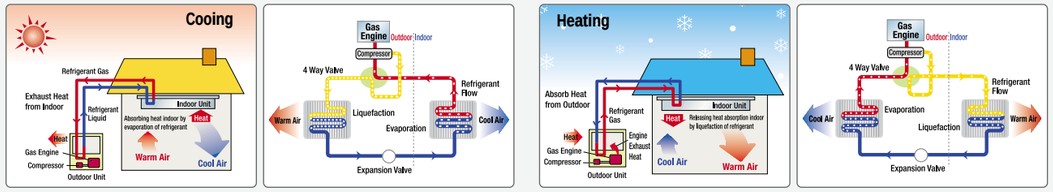
LS' main companies, such as LS cable, LS industrial systems, LS-Nikko copper, Gaon cable, E1 and Kukdong City gas, are ranked as No.1 in their respective industry. However, LS won't just sit back, satisfied with being the best in Korea. We will pave the way for becoming the world's best in Industrial electric · electronics and material industry with the new CI, LS.

## Your good partner LG Cable is making a fresh start as LS Cable

LS Cable is No.1 cable maker in Korea and its business fields are telecommunication, electric power, components & materials and machinery. Also, LS Cable is creating new businesses particularly in component and materials industry. LS Cable makes its best to accomplish the vision, 'Your No.1 Creative Partner' and be one of the world leaders with high technology and best level of service.

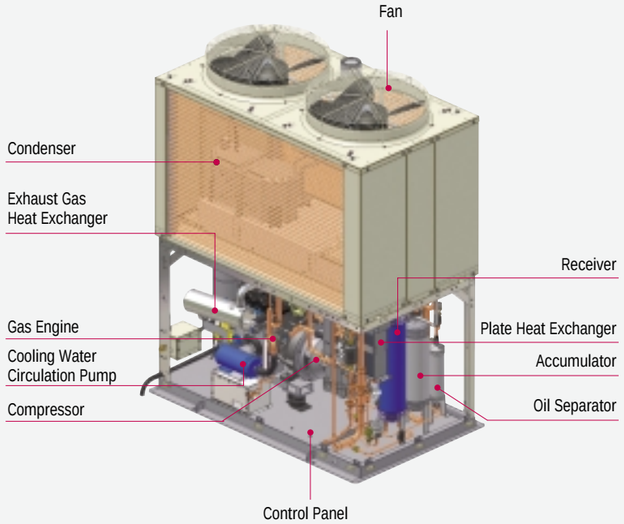
## What is GHP?

EHP, electric heat pump, is operated by driving electric compressor which has about 35% energy efficiency. However, GHP, gas engine driven heat pump, is operated by driving gas engine.
GHP, as a gas cooing and heating system, distribute refrigerant from outdoor unit to indoor unit through engine-driven compressor.




## LS GHP

### Outdoor Unit



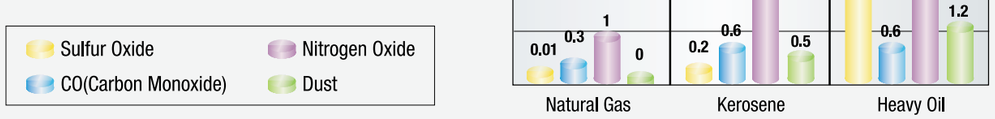

### Features

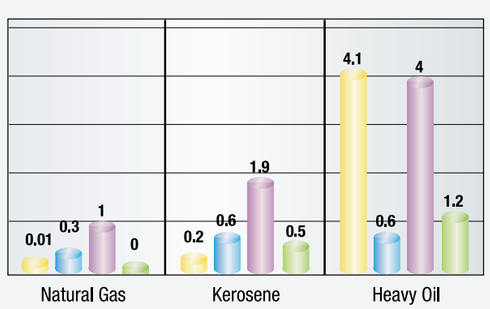
- 20HP(Cooling 56kW, Heating 67kW) 16HP(Cooling 45kW, Heating 54kW)
- COP 1.25 (Average for Cooling and Heating)
- Maximum 16 Connections of Indoor Units
- Adopts exclusively designed Gas Engine
- Individual and Central Control

### Clean Energy

GHP consume Natural Gas which is clean fuel and safe energy that has higher ignition point and lower explosive risk

Pollutant Comparison (g/10000kcal)



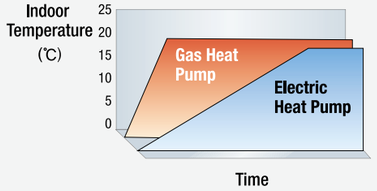



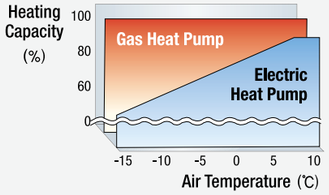





### Powerful Heating

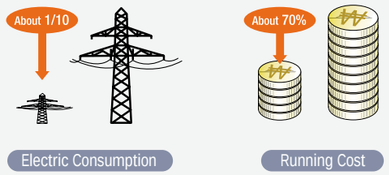
- Exhaust heat from the engine is converted to heating energy.
- No need of defrost control and fast reach comfortable temperature.



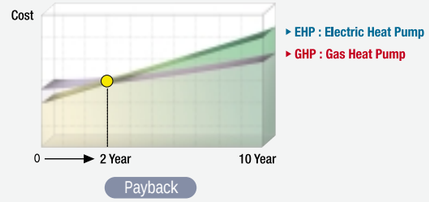

### Economical Operation

- Low running cost (Low electric consumption)
- No need of substation










### Environmental Friendly

The gas has 20% higher energy efficiency than electricity and reduce the CO2 and NOx emissions around 30% .

### Efficient Energy Control

**EHP vs. GHP**

Sourced by Korea Energy Management Corporation (JULY. 2005)

| EHP | GHP |
|---|---|
| Unstable heating operation at minus ambient temperature | More stable heating operation even at minus ambient temperature |
| Temperature of hot wind is low | Temperature of hot wind is high |
| Need defrosting to raise heat efficiency of evaporator | No defrosting |
| Low response against heating demand. | Fast response against heating demand. |
| Noise Level<br>• Outdoor unit maximum 46db<br>• Indoor unit maximum 52db | Noise Level<br>• Outdoor unit maximum 41db<br>• Indoor unit maximum 45db |

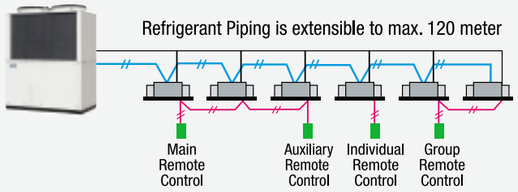
**Energy Efficiency Comparison**

| Type | Gas Cooling | Electric Cooling | Remarks |
|---|---|---|---|
| Primary Energy | Gas | Gas | |
| Input Energy | Gas | Electricity | |
| Energy Conversion Efficiency | - | 35%<br>(High calorific value) | Statistics standard of Korea Electric Power Corporation (02') |
| COP | 1.0 - 1.35<br>(High calorific value) | 2.5 - 3.5 | |
| **Overall Efficiency** | **1.0 - 1.35** | **0.88 - 1.23** | **Energy conversion efficiency x Machine efficiency** |

## High Performance, High Efficiency

Easy installation & Maintenance, Low operation cost

**Multi Control System (Max. 16 Indoor Units with 1 Outdoor Unit)**




### Gas Supply Pressure

kpa/mmAq

| | |
|---|---|
| **Type** | LNG |
| **Maximum** | 2.5/250 |
| **Standard** | 2.0/200 |
| **Minimum** | 1.5/150 |

### GHP Outdoor Unit Model Name

| K1 Series | LSGP | O | 560 | K1 | N | |
|---|---|---|---|---|---|---|
| | LS GHP | Outdoor Unit 'O' of Outdoor | Rated Cooling Capa. *1/10 kW | Series (Development Number) | Gas Type L : LNG P : LPG | Option ex) For Cold Region |

### Specifications

| TYPE | | | | 450 | 560 |
|---|---|---|---|---|---|
| Horse Power | | | | 16 | 20 |
| Model No. (LSGP-) | | | | O450K 1 | O560K 1 |
| Electric Power | | | | 3 Phase, 380V, 60Hz | 3 Phase, 380V, 60Hz |
| Capacity | | Cooling | kW | 45.0 | 56.0 |
| | | Heating | kW | 54.0 | 67.0 |
| Dimensions ( H x W x L ) | | | mm | 2,232 x 1,728 x 1,005 | 2,232 x 1,728 x 1,005 |
| Weight | | | kg | 970 | 990 |
| Electric Character-istics | Cooling | Running Current | A | 2.5 | 2.5 |
| | | Power Consumption | kW | 1.5 | 1.5 |
| | | Power Ratio | % | 91 | 91 |
| | Heating | Running Current | A | 2.5 | 2.5 |
| | | Power Consumption | kW | 1.5 | 1.5 |
| | | Power Ratio | % | 90 | 90 |
| | Starting Current | | A | 30 | 30 |
| Fuel Consumption | | Cooling | kW | 40.1 | 49.5 |
| | | Heating | kW | 37.0 | 47.5 |
| | | Low Temperature Heating | kW | 47.1 | 55.5 |
| Compressor | | Refrigerant Oil | / | 5 | 5 |
| | | Crank Case Heater | W | 70 | 70 |
| Engine | | Lubricating Oil | / | 50 | 50 |
| | | Revolution | rpm | 800 ~ 1,800 | 800 ~ 2,000 |
| | | Rated Output | kW | 12.1 | 15.0 |
| | | Starting Motor | | DC12V, 1.7kW | DC12V, 1.7kW |
| | | Starting System | | AC / DC Conversion, DC Starter | AC / DC Conversion, DC Starter |
| | | Coolant Charging Volume | / | 40 | 40 |
| | | Concentration and Freezing Temperature | | 50V/V% -35 ℃ | 50V/V% -35 ℃ |
| Engine Coolant-Pump-Motor Rated Output | | | kW | 0.42 | 0.42 |
| Refrigerant Volume | | | kg | 22 | 22 |
| Air Suction Port | | | | Front / Rear | Front / Rear |
| Air Discharge Port | | | | Upper | Upper |
| Pipe Dimensions | | Refrigerant Gas Pipe | | ∅ 38.1 (Soldering) | ∅38.1 (Soldering) |
| | | Refrigerant Liquid Pipe | | ∅ 19.05 (Soldering) | ∅19.05 (Soldering) |
| | | Fuel Gas Pipe | | R 3/4 (Male Screw) | R 3/4 (Male Screw) |
| | | Exhaust Drain Pipe | | ∅ 27 (Hose) | ∅ 27 (Hose) |
| Noise Level ( in operation) | | | dB(A) | 60 | 60 |
| Fan | | Type x Number of Units | | Propeller Fan x 2 | Propeller Fan x 2 |
| | | Rated Air Volume | m³/min | 300 | 300 |
| | | Rated Output of Motor | kW | 0.45 x 2 | 0.45 x 2 |
| Drain Filtering Heater | | | W | 50 | 50 |
| Fuel Heater | | | W | 50 | 50 |
| Refrigerant Heater | | | W | 250 | 250 |
| Painting Color | | | | Ivory | Ivory |

(*) Cooling and heating capacity are rated capacity.
Capacity is based on : Cooling mode - Indoor unit 27 ℃ DB, 19.5 ℃, WB / Outdoor unit 35 ℃ DB, 24 ℃ WB
Heating mode - Indoor unit 20 ℃ DB / Outdoor unit 7 ℃ DB, 6 ℃ WB





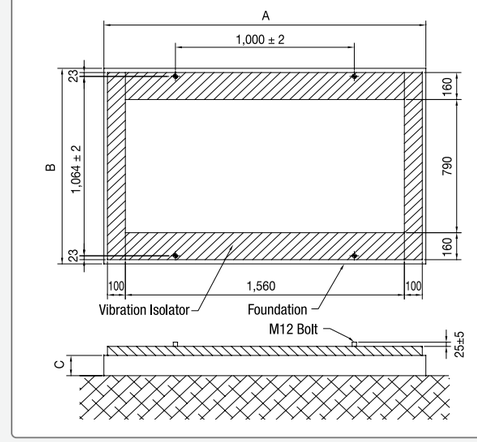
## Installation Notice

- Fix the unit on the foundation through vibration isolator.
- Do not use rubber bushing which is not efficient.
- It is strongly recommended to use vibration isolator for rooftop installation.

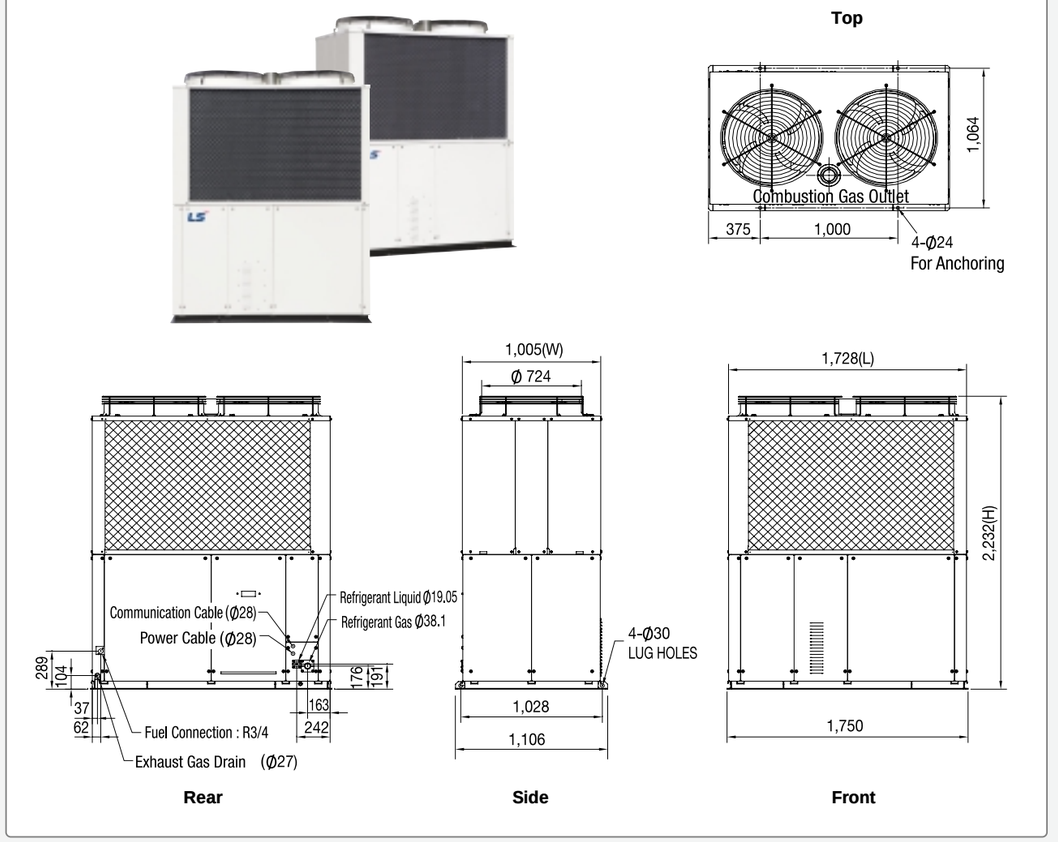
## Dimension (mm)

| Installation Division | A | B | C |
|---|---|---|---|
| Ground Installation | 1,800 | 1,160 | 120 |
| Rooftop Installation (Vibration Isolator) | 2,000 | 2,000 | 140 |

## Foundation




## Outline

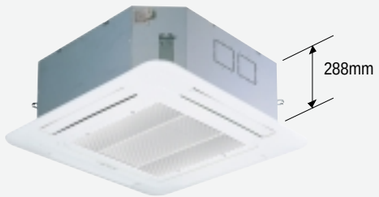


**LSRB -** N60AT, N72AT, N83AT, N100AT, N110AT, N145AT

## Stylish & Elegant Interior Design

## Compact Design

Thin and compact design permits smaller installation space.

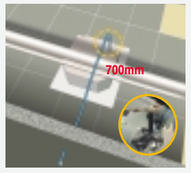


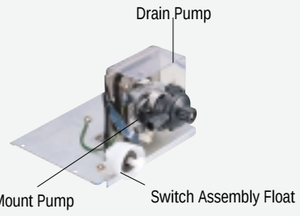

## High-Efficient Antibiotic Filter

High-efficient antibiotic filter prevent a dust and germ and front-grill construction allows convenient and easy cleaning.

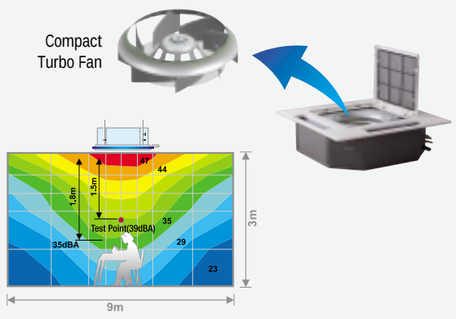
## Built-in Automatic Drain Pump

Built-in drain pump simplify piping work and enable efficient drainage due to max. 700 meter of elevation piping.



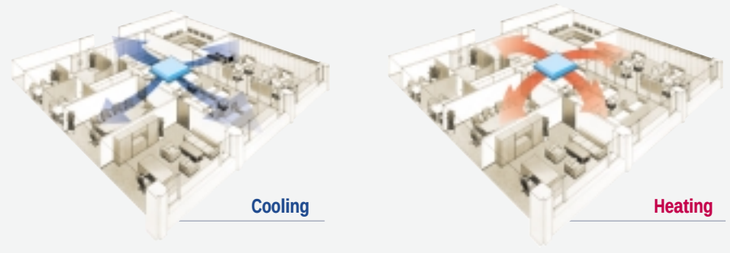




## High-Efficiency Turbo-Fan




## Powerful Cooling and Heating

Applying wide auto-louver which can blow equal wind from the four directions of the ceiling to every nook and corner as powerful ventilation, and reduce the temperature difference in the room.








## Outline

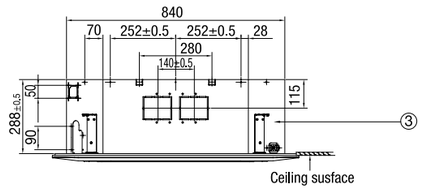
**TYPE 60~145**

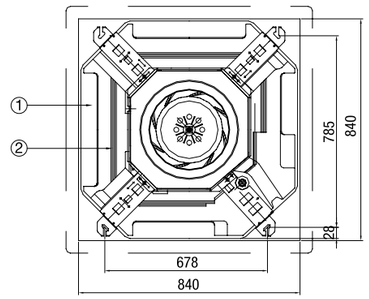
**Main Parts**

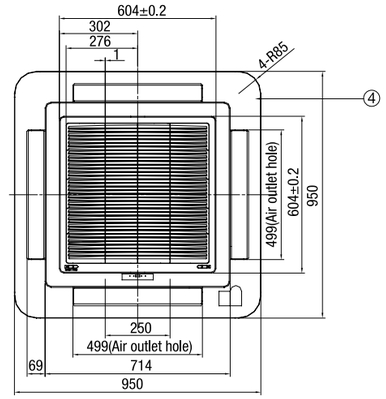
| | |
|---|---|
| 1 | BASE ASSY, INDOOR |
| 2 | DRAIN ASSY |
| 3 | CABINET ASSY |
| 4 | FRONT PANEL ASSY |

**NOTE**

1. Indoor unit~Outdoor unit : CVV-SB 1.25 x 2C
   Main power : CV 2.0 x 3C
2. Service valve (Gas pipe) : ∅15.88
3. Service valve (Liquid pipe) : ∅9.52
4. Drain pipe : ∅32 / Soft PVC




## Specifications

| Model No. [ LSRB- ] | | | 4 Way Ceiling Cassette | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | N60AT | N72AT | N83AT | N100AT | N110AT | N145AT |
| | | |  | | | | | |
| Electric Power | | | 1 Phase, 220V, 60Hz | | | | | |
| Cooling Capacity | | kW | 6,000 | 7,200 | 8,300 | 10,000 | 11,000 | 14,500 |
| | | kcal/h | 5,160 | 6,200 | 7,100 | 8,600 | 9,460 | 12,500 |
| Heating Capacity | | kW | 7,200 | 8,640 | 9,960 | 12,000 | 13,200 | 17,400 |
| | | kcal/h | 6,190 | 7,440 | 8,520 | 10,320 | 11,350 | 15,000 |
| Power Consumption | Cooling | kW | | 0.14 | | | 0.18 | |
| | Heating | kW | | 0.14 | | | 0.18 | |
| Running Current | Cooling | A | | 0.69 | | | 0.72 | |
| | Heating | A | | 0.69 | | | 0.72 | |
| Blower | Type | - | Turbo | | | | | |
| | Quantity | CMM | 17 | 19 | 21 | 23 | 25 | 34/32/29 |
| Refrigerant | | - | R-22 | | | | | |
| Body Size ( H x W x L) | | mm | 288 x 840 x 840 | | | | | |
| Panel Size ( H x W x L) | | mm | 30 x 950 x 950 | | | | | |
| Type of Filter | | - | Long Life (Wrinkles) | | | | | |
| Weight (Including Panel) | | kg | 32 | | | | | |
| Drain | Material | - | PVC | | | | | |
| | External Diameter | Ø/mm | 32 | | | | | |
| | Insulation | mm | 10 | | | | | |
| Pipe | Liquid/Gas Pipe | Ø/mm | 9.52 / 15.88 | | | | 9.52 / 19.05 | |
| Cable | Between Indoor and Outdoor Unit | mm | CVV-SB 1.25 x 2C | | | | | |
| Power Line | Indoor Unit | $mm^2$ | CV 2.0 x 3C | | | | | |

(*) Cooling and heating capacity are rated capacity.
Capacity is based on : Cooling mode - Indoor unit 27℃ DB, 19.5℃, WB / Outdoor unit 35℃ DB, 24℃ WB
Heating mode - Indoor unit 20℃ DB / Outdoor unit 7℃ DB, 6℃ WB

# LSRB | 1 Way Ceiling Cassette Type

**LSRB -** N23AC, N32AC, N40AC

## Stylish & Elegant Interior Design

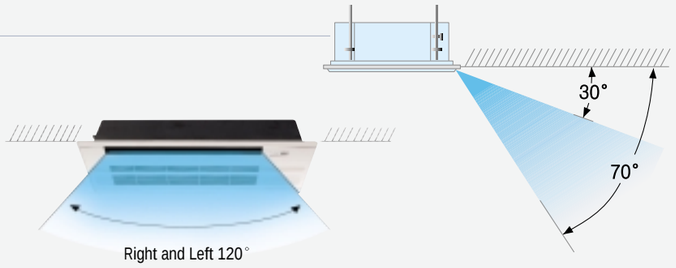
## Compact Design

The super thin and compact design allows to save installation space.



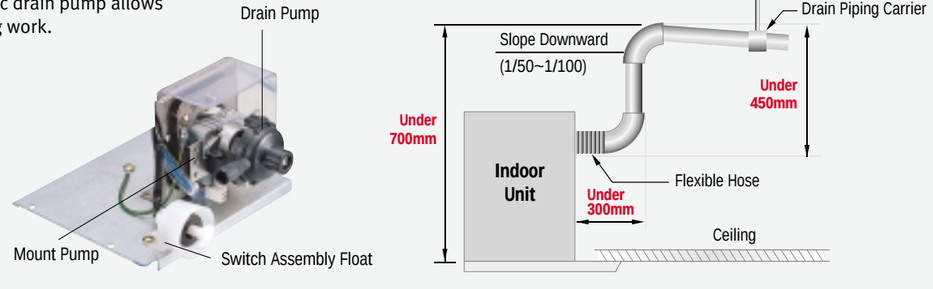

## Wide Auto-Louver

Up and down auto-louver and wide type airstream control allow to minimize the temperature declination in the room and provide with more comfortable condition.




## Built-in Automatic Drain Pump

Built-in automatic drain pump allows easy drain piping work.








## Outline

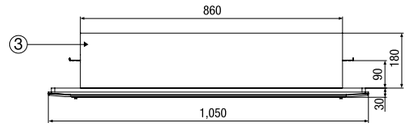
**TYPE 23~40**

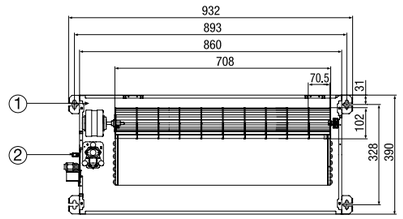
**Main Parts**

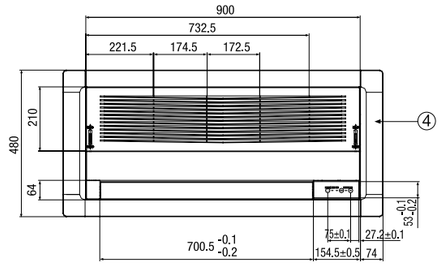
| | |
|---|---|
| 1 | BASE ASSY, INDOOR |
| 2 | DRAIN ASSY |
| 3 | CABINET ASSY |
| 4 | FRONT PANEL ASSY |

**NOTE**

1. Indoor unit~Outdoor unit : CVV-SB 1.25 x 2C
   Main power : CV 2.0 x 3C
2. Service valve (Gas pipe) : ∅12.7
3. Service valve (Liquid pipe) : ∅6.35
4. Drain pipe : ∅32 / Soft PVC




## Specifications

| Model No. [ LSRB- ] | | | 1 Way Ceiling Cassette | | |
|---|---|---|---|---|---|
| | | | N23AC | N32AC | N40AC |
| | | |  | | |
| Electric Power | | | 1 Phase, 220V, 60Hz | | |
| Cooling Capacity | | kW | 2,300 | 3,200 | 4,000 |
| | | kcal/h | 2,000 | 2,750 | 3,440 |
| Heating Capacity | | kW | 2,760 | 3,840 | 4,800 |
| | | kcal/h | 2,4/00 | 3,300 | 4,120 |
| Power Consumption | Cooling | kW | 0.05 | | |
| | Heating | kW | 0.05 | | |
| Running Current | Cooling | A | 0.22 | | |
| | Heating | A | 0.22 | | |
| Blower | Type | - | C.F.F | | |
| | Quantity | CMM | 6.5 | 7.5 | 10.5 |
| | Input | W | 14 | | |
| Refrigerant | | - | R-22 | | |
| Body Size ( H x W x L) | | mm | 180 x 860 x 390 | | |
| Panel Size ( H x W x L) | | mm | 30 x 1,050 x 480 | | |
| Type of Filter | | - | Long Life (Wrinkles) | | |
| Weight (Including Panel) | | kg | 17 (14+3) | | |
| Drain | Material | - | PVC | | |
| | External Diameter | ∅/mm | 32 | | |
| | Insulation | mm | 10 | | |
| Pipe | Liquid/Gas Pipe | ∅/mm | 6.35 / 12.7 | | |
| Cable | Between Indoor and Outdoor Unit | mm | CVV-SB 1.25 x 2C | | |
| Power Line | Indoor Unit | mm² | CV 2.0 x 3C | | |

(*) Cooling and heating capacity are rated capacity.
Capacity is based on : Cooling mode - Indoor unit 27℃ DB, 19.5℃, WB / Outdoor unit 35℃ DB, 24℃ WB
Heating mode - Indoor unit 20 ℃ DB / Outdoor unit 7 ℃ DB, 6℃ WB

# LSRB | Ceiling-Concealed Duct Type

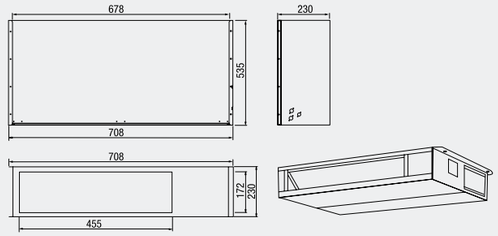
**LSRB-** N23AL, N32AL, N40AL

**LSRB-** N52AB, N60AB, N72AB, N83AB, N110AB

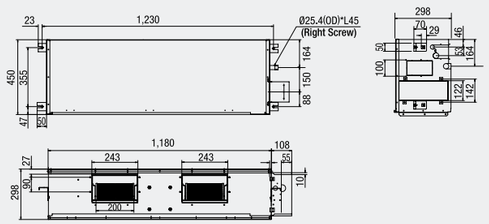
**LSRB-** N145AB

## Outline

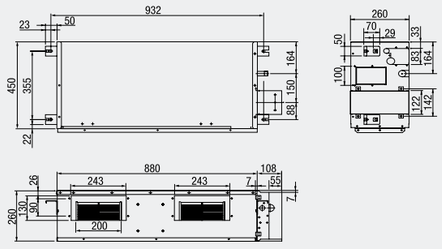
### TYPE 23~40



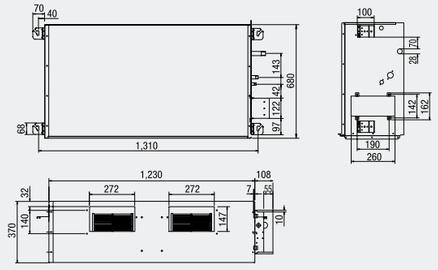

### TYPE 52~72




### TYPE 83~110




### TYPE 145




## Specifications

| Model No. [ LSRB- ] | | | Ceiling-Concealed Duct Type | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | N23AL | N32AL | N40AL | N52AB | N60AB | N72AB | N83AB | N110AB | N145AB |
| Electric Power | | | 1 Phase, 220V, 60Hz | | | | | | | | |
| Cooling Capacity | | kW | 2,300 | 3,200 | 4,000 | 5,200 | 6,000 | 7,200 | 8,300 | 11,000 | 14,500 |
| | | kcal/h | 2,000 | 2,750 | 3,440 | 4,450 | 5,160 | 6,200 | 7,100 | 9,460 | 12,500 |
| Heating Capacity | | kW | 2,760 | 3,840 | 4,800 | 6,240 | 7,200 | 8,640 | 9,960 | 13,200 | 17,400 |
| | | kcal/h | 2,400 | 3,300 | 4,120 | 5,340 | 6,190 | 7,440 | 8,520 | 11,350 | 15,000 |
| Power Consumption | Cooling | kW | 0.068 | | | 0.18 | | | 0.33 | | 0.88 |
| | Heating | kW | 0.068 | | | 0.18 | | | 0.33 | | 0.88 |
| Running Current | Cooling | A | - | | | 0.92 | | | 1.42 | | 4 |
| | Heating | A | - | | | 0.92 | | | 1.42 | | 4 |
| Blower | Type | - | SIROCCO | | | CENTRIFUGAL | | | | | |
| | Quantity | CMM | 7.5 | 9.3 | 10.5 | 15.3 | 15.8 | 16 | 25.3 | 29.6 | 47.5 |
| | | | 6 | 8.5 | 9.5 | 13.6 | 13.9 | 14.1 | 21.8 | 26.3 | 39.5 |
| | | | 5.5 | 6 | 7.5 | 10.3 | 10.7 | 11.1 | 17.6 | 23.6 | 32 |
| | Available Static Pressure | mmAg | 2 | | | 8 | | | 8 | | 15 |
| Refrigerant | | - | R-22 | | | | | | | | |
| Body Size ( H x W x L) | | mm | 230 x 708 x 535 | | | 260 x 880 x 450 | | | 298 x 1,180 x 450 | | 370x1,230x680 |
| Weight (Including Panel) | | kg | 32 | | | 35 | | | 38 | | 70 |
| Drain | Material | - | - | | | PVC | | | | | |
| | External Diameter | Ø/mm | - | | | 32 | | | | | |
| | Insulation | mm | - | | | 10 | | | | | |
| Pipe | Liquid/Gas Pipe | Ø/mm | 6.35 / 12.7 | | | 9.52 / 15.88 | | | | | 9.52/19.05 |
| Cable | Between Indoor and Outdoor Unit | mm | CVV - SB 1.25 x 2C | | | | | | | | |
| Power Line | Indoor Unit | mm² | CV 2.0 x 3C | | | | | | | | |

(*) Cooling and heating capacity are rated capacity.
Capacity is based on : Cooling mode - Indoor unit 27℃ DB, 19.5℃, WB / Outdoor unit 35℃ DB, 24℃ WB
Heating mode - Indoor unit 20℃ DB / Outdoor unit 7℃ DB, 6℃ WB



# LSRB | Wall-Mount Type

Gas Cooling / Heating System

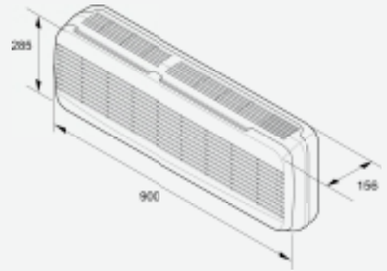
**LSRB -** N23AR, N40AR, N52AR

## Saving of Installation Space & Silent Operation

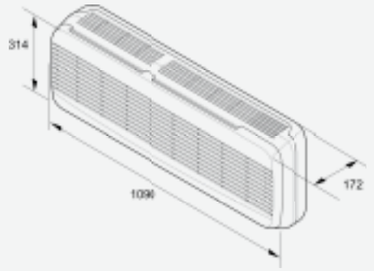
- ***Low Cost*** : This is completely economical for lower price than installed several air-conditioner and also needless extra installed stand.
- ***Saving Installed Space*** : One outdoor unit which connects several indoor unit can save the innovative installed space.
- ***Silent Running*** : Noise in air-conditioner by minimized wind would become silent as good as at the library by means of silent running.

## Outline

### TYPE 23~40




### TYPE 52




## Specifications

| Model No. [ LSRB- ] | | | Wall-Mounted Type | | | |
|---|---|---|---|---|---|---|
| | | | N23AR | N32AR | N40AR | N52AR |
| Electric Power | | | 1 Phase, 220V, 60Hz | | | |
| Cooling Capacity | | W | 2,300 | 3,200 | 4,000 | 5,200 |
| | | | 2,000 | 2,750 | 3,440 | 4,450 |
| Heating Capacity | | W | 2,760 | 3,840 | 4,800 | 6,240 |
| | | | 2,400 | 3,300 | 4,120 | 5,340 |
| Power Consumption | Cooling | kW | 0.04 | | | 0.054 |
| | Heating | kW | 0.04 | | | 0.054 |
| Running Current | Cooling | A | 0.2 | | | 0.3 |
| | Heating | A | 0.2 | | | 0.3 |
| Blower | Type | - | C.F.F | | | |
| | Quantity | CMM | 6.8 | 9 | 10 | 12 |
| Refrigerant | | - | R-22 | | | |
| Body Size ( H x W x L) | | mm | 285 x 900 x 156 | | | 314 x 1,090 x 172 |
| Type of Filter | | - | Antifungal Filter | | | |
| Weight (Including Panel) | | kg | 9 | | | 12 |
| Drain | Material | - | PVC | | | |
| | External Diameter | Ø/mm | 16 | | | |
| | Insulation | mm | 10 | | | |
| Pipe | Liquid/Gas Pipe | Ø/mm | 6.35 / 12.7 | | | 9.52 / 15.88 |
| Cable | Between Indoor and Outdoor Unit | mm | CVV - SB 1.25 x 2C | | | |
| Power Line | Indoor Unit | mm² | CV 2.0 x 3C | | | |

(*) Cooling and heating capacity are rated capacity.
Capacity is based on : Cooling mode - Indoor unit 27℃ DB, 19.5℃, WB / Outdoor unit 35℃ DB, 24℃ WB
Heating mode - Indoor unit 20℃ DB / Outdoor unit 7℃ DB, 6℃ WB

# Controller

## System Controller

### Features

■ **Power**

Single-phase 220V

■ **Input / Output**

- Remote Control Input (DC24V)
  Overall Run / Stop, Day Timer
- Remote Control Output (No Voltage Contact)
  Overall Run / Alarming (External Power within DC30V)

■ **Distance of Wiring**

- Max. 1km

## Control Function

| Item | | | Content |
|---|---|---|---|
| Function | Operation | Run / Stop | Run / Stop |
| | | Temperature Setting | Temperature Setting Change |
| | | Wind Direction Setting | Wind Direction Change |
| | | Wind Velocity Setting | Wind Velocity Change |
| | | Display | Condition for Indoor and Outdoor Unit |
| | | Ventilation Control | Run / Stop |
| | | Concentrated Address Setting | Address Setting of Each System Controller |
| | | Operation Mode Change | Mode Change of Cooling / Heating / Ventilation |
| | External Input & Output | External Input | Run / Stop Signal Input (DC24V) |
| | | External Output | Run / Stop / Abnormal Status Output (No Voltage DC30V, less than 100mA) |
| | | Communication | RS 485 (MODBUS) |
| System Control | Number of Control | Number of Indoor Unit | Max. 64 Units |
| | | Indoor Unit / Group | Max. 16 Units |

## Control mode can be selected with 10 patterns of operational condition

| Mode | | Operating Mode | |
|---|---|---|---|
| | | Concentrated Control Mode | Remote Control Mode |
| Control Number Mode | Overall Mode | Overall * Ex) 1 | Overall |
| | Zone 1 Mode | Zone 1 * Ex) 2 | Zone 1 |
| | Zone 2 Mode | Zone 2 | Zone 2 * Ex) 3 |
| | Zone 3 Mode | Zone 3 * Ex) 4 | Zone 3 |
| | Zone 4 Mode | Zone 4 | Zone 4 * Ex) 5 |

**Operating Mode : Concentrated control mode, Remote control mode**

- **Concentrated Control Mode** : System controller is used as a concentrated controller
- **Remote Control Mode** : System controller is used as a remote controller

**Control Number Mode : Overall mode, Zone 1 • 2 • 3 • 4 mode**

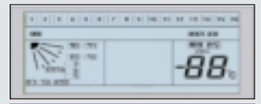
- **Overall Mode** : Can be selected by Overall, Zone, Group
- **Zone 1 • 2 • 3 • 4 Mode** : Indoor unit of one zone can be selected



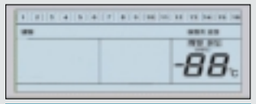


## Wired Remote Controller

### Display

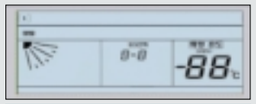


All sides • ceiling rack, two sides • high ceiling one sides



Fill-up at ceiling • fill-up duct one sides cassette

Wall-hanging

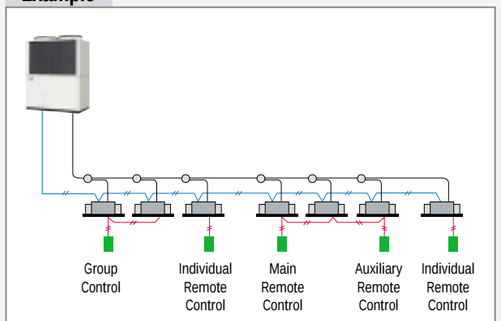


Group control display

※ Group Control Function : Max. 8 Indoor units are controlled through 1 wired remote controller

## Automatic Louver

**Example**

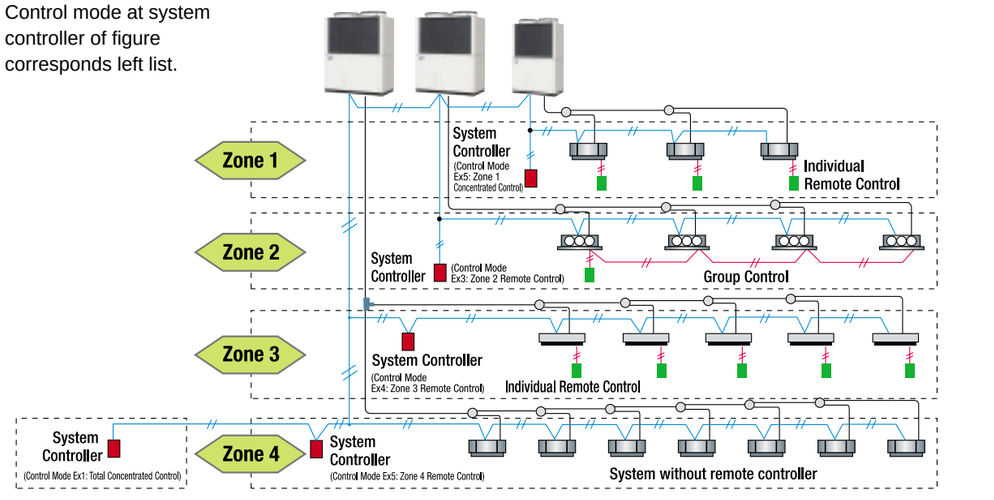



## Control Function

| Item | | | Content |
|---|---|---|---|
| Func-tion | Operation | Start/Stop | Start/Stop control of indoor unit |
| | | Temperature Set | Start/Stop control of indoor unit |
| | | Running Mode Change | Cooling/heating/dehumidification/ ventilation mode |
| | | Wind Direction Set | Louver position change |
| | | Wind Velocity Set | Wind velocity change |
| | | Display | Indoor/outdoor unit condition |
| | | Fan Control | Start/Stop ventilated fan of indoor unit |
| | | Concentrated Address Set | Setting address at each system controller |
| | | Reservation Set | Run/stop time setting |
| | Number of Control | Number of Indoor Unit | Max. 8 units |
| Connection | Power & Communication | | Nonpolar 2 wires |

**Example**

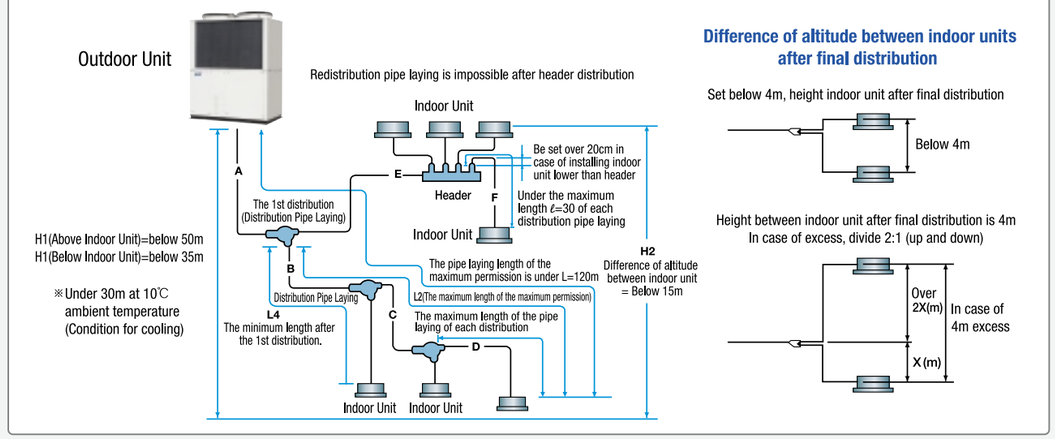
※ Control mode at system controller of figure corresponds left list.



# Design • Construction



## Refrigerant Pipe Layout



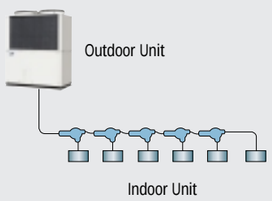

## Limit of the Refrigerant Piping Length

| Item | | Outdoor Unit | Type 560 |
|---|---|---|---|
| Individual Running of the Indoor Unit | | | O |
| Capacity Ratio of the Indoor Unit per the Outdoor Unit | | | 50 ~ 200% |
| The Minimum Capacity of the Possible Connect Indoor Unit | | | 23 Type |
| The Maximum Number of the Possible Connect Indoor Unit (by classification) | | | 16 EA |
| The Maximum Permission Length of the Pipe (L)* | | A+B+C+D | Under 120m (Equivalent length under 145m) |
| After the First Distribution (Different between maximum and minimum length from the first distribution) | | L2 - L4 | Under 30m |
| The Maximum Length of the Pipe (Laying Each Distribution) | | I | Under 30m |
| Difference of Altitude Between Indoor Unit and Outdoor Unit | Outdoor above Indoor Unit | H1 | Under 50m |
| | Outdoor below Indoor Unit | H1 | Under 35m(Under 30m in case running at below 10 ℃ temperature) |
| Difference of Altitude Between Indoor Units | | H2 | Under 15m |
| The Maximum Length Between the First and Last T Type Pipe | | | Under 2m |

* The minimum pipe laying length between indoor and out door unit : over 7m

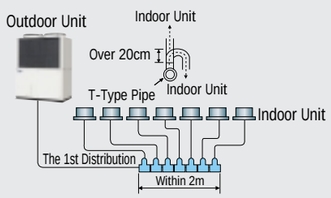
## Distribution Method of the Refrigerant Pipe

### Line Distribution Method



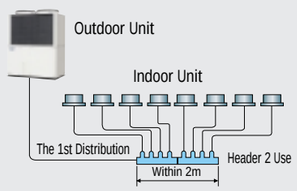

### T-type Distribution Method

**Notice 1** : Redistribution is impossible after T-type pipe distribution.
**Notice 2** : Keep the header headed to upper side of horizontality in case of installing the indoor unit lower than T-type pipe.
**Notice 3** : Keep the total length of the distribution parts as under 2m



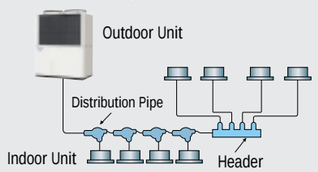

### Header Distribution Method

**Notice 1** : 4 distribution per each header. In case of over 5 for header method, keep the following picture.(connect two headers)
**Notice 2**: Header headed to upper of horizontality in case of installing the indoor unit lower than header.



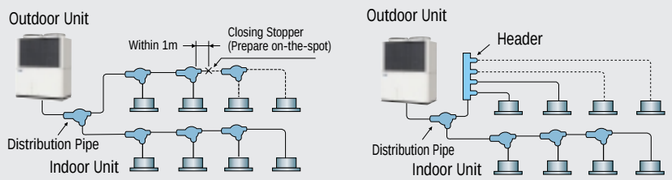

### Header+Compositive Distribution Method of the Distribution Pipe

**Notice** : Redistribution is impossible after the header distributes.



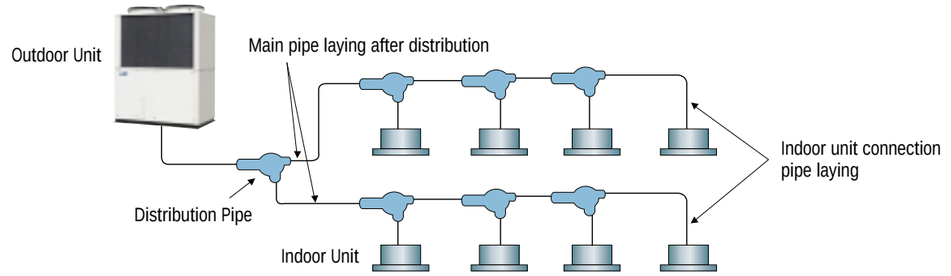

### Easy Installing of More Indoor Unit

**Notice** : Additional installation to existing system keep its total capacity over 50% of outdoor unit capacity.






## Size of the Distribution Pipe




## Size Selection of the Distribution Pipe Laying

| Type | Size of the outdoor pipe laying | | Main pipe laying after distribution | | | | | Indoor unit connection pipe laying | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | The sum total of connected indoor unit (kW) | | | | | | | | | |
| | | | 112.0~35.6 | 35.5~28.1 | 28.0~14.3 | 14.2~9.0 | 9.0 미만 | 28.0 | 22.4 | 16.0~9.0 | 8.0~4.5 | 3.6~2.8 |
| **Type 450, Type 560** | Gas | ∅38.1 | ∅38.1 | ∅31.75 | ∅28.58 | ∅19.05 | ∅15.88 | ∅28.58 | ∅25.4 | ∅19.05 | ∅15.88 | ∅12.7 |
| | Liquid | ∅19.05 | ∅19.05 | ∅15.88 | ∅12.7 | ∅ 9.52 | ∅9.52 | ∅12.7 | ∅12.7 | ∅9.52 | ∅9.52 | ∅9.52 |

## Size of the Refrigerant Pipe Laying

| Type | Size of the outdoor unit pipe laying | |
|---|---|---|
| | Gas pipe | Liquid pipe |
| ■ Outdoor Unit | | |
| Type 450, Type 560 | ∅38.1 | ∅19.05 |
| ■ Indoor Unit | | |
| Type 22~36 | ∅12.7 | ∅9.52 |
| Type 45~80 | ∅15.88 | ∅9.52 |
| Type 90~160 | ∅19.05 | ∅9.5 |
| Type 224 | ∅25.4 | ∅12.7 |
| Type 280 | ∅28.58 | ∅12.7 |
| Type 355 | ∅31.75 | ∅15.88 |
| Type 450 | ∅31.75 | ∅19.05 |
| Type 560 | ∅38.1 | ∅19.05 |
| Type 900 | ∅31.75 x 2 | ∅19.05 x 2 |

## Refrigerant Charge

### ■ Refrigerant charge amount

| Liquid pipe size(mm) | Charge amount per 1m(g/m) |
|---|---|
| ∅9.52 | 75 |
| ∅12.7 | 125 |
| ∅15.88 | 220 |
| ∅19.05 | 330 |

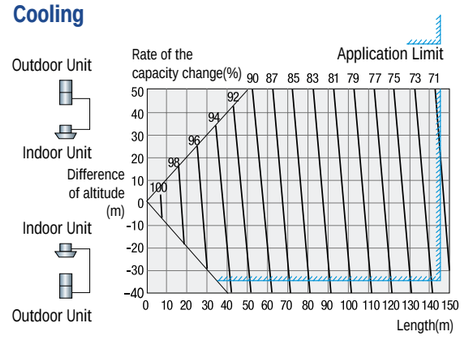
### ■ Refrigerant charge amount in case of liquid Pipe

330 x (a) + 220 x (b) + 125 x (c) +75 x (d)

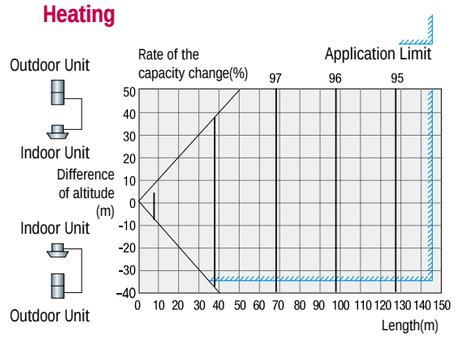
(a) : Liquid pipe total length of ∅19.05 (m)
(b) : Liquid pipe total length of ∅15.88 (m)
(c) : Liquid pipe total length of ∅12.70 (m)
(d) : Liquid pipe total length of ∅9.52 (m)

## Capacity Change According to the Length of the Refrigerant Pipe

### Cooling




### Heating



# Caution

## Ensure Enough Space for Maintenance

**1. Maximum 3 units possibly connected in series.**

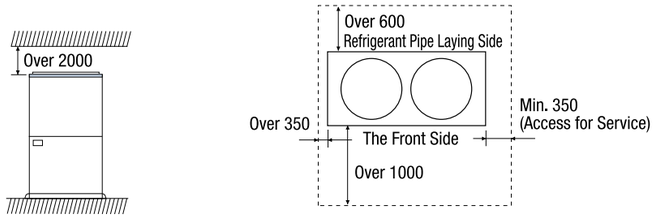
Install outdoor unit as per following the figure with ensuring service space in order to increase ability of the heat exchange at the airy place

**2. In case of installing outdoor unit over 8 units.**

In case of installing outdoor unit over 8 units in non-ventilated place or being wall around, then be sure that the discharged gas must not be inhaled to the system again.

### ■ Separate Installation (All Kinds in Common)

Unit : mm

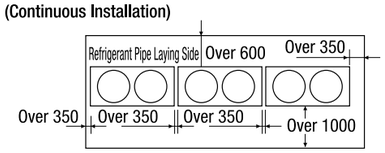



### ■ Plural Installation (All Kinds in Common)

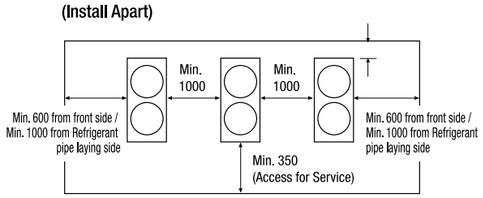
Unit : mm

**[ Service Space for Installation ]**

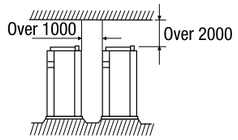
(Continuous Installation)




(Install Apart)

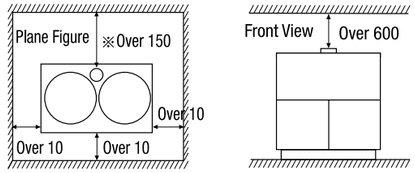



**[ Distance between the Upper Part and the Barrier ]**




**[ Safety Distance of the Combustible circumstances ]**

※ Safety Distance at an Exhaust Pipe




※ Please, ensure the above measure in installing.

## Do not install outdoor unit at the following places

▶ **Place without maintenance space**

You may use many machines and tools for maintenance. So unless you have enough space for it, you will be in trouble about services and maintenance.

▶ **Unventilated place**

Installation at the unventilated place like closed space is strictly prohibited because it can causes accident or function of machine.

▶ **Side of the street lamp and a line of trees**

Many kinds of insects are gathering at the street lamp. Also installation near a line of trees can bring something wrong and normal operation is impossible because the machine can inhale leaves through louver.

▶ **Additional caution**

In the place of chemical area, near exhaust gas chimney, strong windy area, near seashore, or next to wall(not the type of sound absorbing wall), the special options like anti-corrosion or soundproof material must be adopted to the outdoor unit.
In case of installing the unit on the ground levels, please make sure that other pollutant like a drop of water or oil remnants must not drop to the outdoor unit.



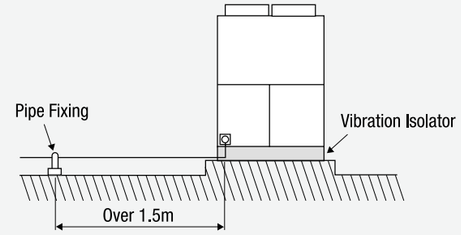


## Caution while Carrying Outdoor Unit

1. When you move outdoor unit, work it on the palette(carrier prepare) or use a lift hole onto (prepared at field) the Lug Hole of the base of the outdoor unit.
2. While carrying in, Lug Hole is surely used for load equally.
3. While carrying in, be careful with the upper frame of outdoor unit in order not to be scratched and transform at trim.
4. When you bring in outdoor unit, do not lay down its sideways. It is going to be a reason of the disorder and damage.

## About Vibration Isolator

1. Installation outdoor unit on the roof in where close to living room or conference room can cause vibration to downstair. The outdoor unit requires a vibration isolator and also use flexible hose to protect the refrigerant pipe from vibration.
2. Refrigerant pipe should be fixed over 1.5m apart from outdoor unit.
3. Please follow the instruction manual of the vibration for proper installation.




## About Condensed Water Drain Pipe from Exhaust Gas of Outdoor Unit

1. If you lay the drain pipe of condensed water from exhaust gas to drain well which is closed with cover, then the exhaust gas might inflow into building. So please make sure that the drain pipe must be connected to open space.
2. Do not use the drain of the outdoor unit and the drain of the indoor unit pipe in common.
3. In case of installing outdoor unit on the roof of the building, please extend the drain pipe to the waterway of rain following the figure No.2.
4. Please keep the slope of drain above 1/50 slope and keep the pipe straight.
5. In the event of connecting several outdoor unit at the just one drain pipe, open the pipeline sections of drain to the air so that a exhaust gas will not flow backward. If a exhaust gas flows backward, you may fail to start.
6. In the event of being concerned about the drain pipe freezing at the intense cold region, prepare antifreeze for example electric heater .
7. Install at the good position for the condensed water drainage.
8. Materials of the drain pipe should be made of the vinyl chloride or stainless.

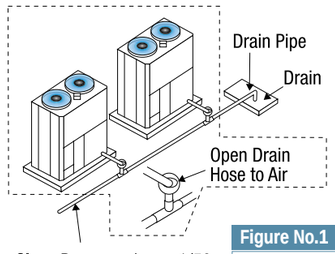



**Figure No.1**

When exhausted drain is connected with the drain

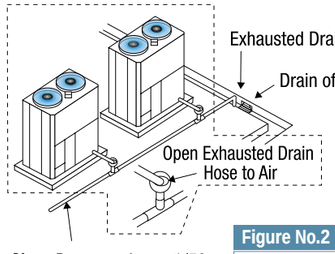
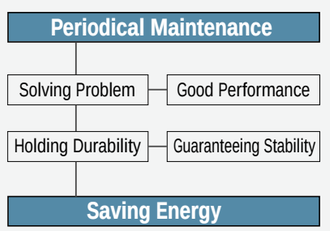



**Figure No.2**

When exhausted drain is connected with the rain drain

## GHP-Periodical Maintenance is surly necessary.




**Main Items of the Periodical Maintenance**

1. Exchanging engine oil
2. Checking level of cooling water
3. Inspecting chain of engine
4. Confirming a safety of device
5. Inspecting and controlling running condition and data capture.

***GHP should be checked regularly alike a car in order to use efficiently.***

GHP needs to be inspected regularly for preventing troubles and holding ability because the power sources come from the gas engine.
The contract of the periodical maintenance of LS GHP, is required for good maintenance.