Therma V

Monobloc, R32

MFL66101103

LG TOTAL HVAC SOLUTION PROVIDER

ENGINEERING PRODUCT DATA BOOK

LG Life's Good

Region : EU

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Therma V
General Information

Model Line Up

1. Model line up

1.1 Indoor Unit

Product	Phase	Chassis	Model Name
Control Unit	-	-	PHCSL0 [PHCSL0]
Cascade Control Unit	-	-	PHCML0 [PHCML0]

1.2 Outdoor Unit

Product	Phase	Chassis	Capacity Index (kW)	Model Name
Monobloc	3	UXC	51.0	ZHBW518A0 [HM513MR UXC0]

Note

* : Actual system capacity would be different accordance with combination of outdoor unit.
Cascade Control Unit can be combined with a minimum of 2 outdoor units and a maximum of 8 outdoor units.

Control Unit

1. Specifications
2. List of Functions
3. Accessory Compatibility List
4. Dimensions
5. Wiring Diagrams

1. Specifications

Category		Unit	PHCSL0 [PHCSL0]
Major	**Minor**		
Classification	Chassis	-	Accessory
Operation range(Leaving Water)	Cooling (min. ~ max.)	℃(DB)	5 ~ 27
	Heating (min. ~ max.)	℃(DB)	25 ~ 60(65*)
	Domestic hot water (min. ~ max.)	℃(DB)	25 ~ 55(80*)
Power supply	Case 1	V, Φ, Hz	220-240, 1, 50
Current	Current (max.)	A	0.6
Recommended circuit breaker(ELCB)	-	A	10
Connecting cable	Power supply cable (H07RN-F)	mm² × cores	0.75 x 3C
	Communication cable (H07RN-F)	mm² × cores	1.0 - 1.5 x 2C
Dimensions	Net (W x H x D)	mm	420 x 490 x 141
	Shipping (W x H x D)	mm	466 x 580 x 184
Weight	Net	kg	6.8
	Shipping	kg	9.2
Exterior	Color of chassis	-	Essence White
	RAL Code of chassis	-	RAL 9003

Note

1. Due to our policy of innovation some specifications may be changed without notification.
2. Wiring cable size must comply with the applicable local and national codes. And "Electric characteristics" chapter should be considered for electrical work and design. Especially the power cable and circuit breaker should be selected in accordance with that.
3. * The leaving water temperature of 65℃ is possible only when a backup heater is installed. DHW 55~80℃ Operating is available only when the booster heater is operating.

2. List of functions

Category	Functions	PHCSL0 [PHCSL0]
Reliability	Self diagnosis	O
Convenience	Auto Restart	O
	Child Lock	O
	Group Control	X
	Sleep Timer	O
	Turn On/Off Reservation	O
	Schedule	O
	Low Noise Operation	O
Installation	Electric Backup Heater	X
	Domestic Hot Water Tank heater	Accessory(3rd party)
Water Product functions	Water Pump Pre-run / Over-run control	O
	Water Pump Forced Operation	O
	Water Pump Speed Control	-
	Water Flow Detection by Flow Sensor	X
	Water Flow Detection by Flow Switch	O
	Water Flow Control	X
	Water Pressure Monitoring	X
	Thermostat Interface (230V AC)	O
	Thermostat Interface (24V AC)	X
	One Point Dry Contact Input (CN-EXT)	O
	Digital Output For External Pump	O
	Digital inputs for energy saving (Ready for Smart Grid)	O
	Communication with LG ESS by Modbus	O
	Anti-Condensation on Floor (cooling)	O
	Anti-Freezing Control	O
	Anti-overheating Of Water Pipe	O
	Emergency Operation	O
	Weather dependent operation with thermostat	O
	Seasonal auto mode (heating and cooling)	O
	DHW(Domestic Hot Water) Tank Kit	X
	Scheduler (DHW Tank Heater)	O
	Timer (DHW Tank Heater)	O
	Quick DHW Tank Heating	O
	DHW Recirculation	O
	Tank Disinfection	-
	Electric Heater Capacity Control	-
	Solar thermal function	Accessory(3rd party)
	Screed Drying Mode	O
	Current Flow Rate Monitoring	-
	Energy Monitoring	O
Special Functions	Wi-Fi Control	Accessory
	Modbus connectivity (without gateway)	O
	Remote room temperature sensing	X
	Outdoor Temperature sensing	Accessory
	2nd Circuit (Mixing Circuit)	Accessory(3rd party)
	2-Remo control	X

Note

1. O : Applied, X : Not applied
   Accessory : Ordered and purchased separately the accessory package referring to the model name provided and install at field.
   Accessory line-ups varies by region, so check your local catalogue or local sales material.
2. Solar thermal system requires the 3rd party accessory, PT-1000 sensor. (field supply)

3. Accessory Compatibility List

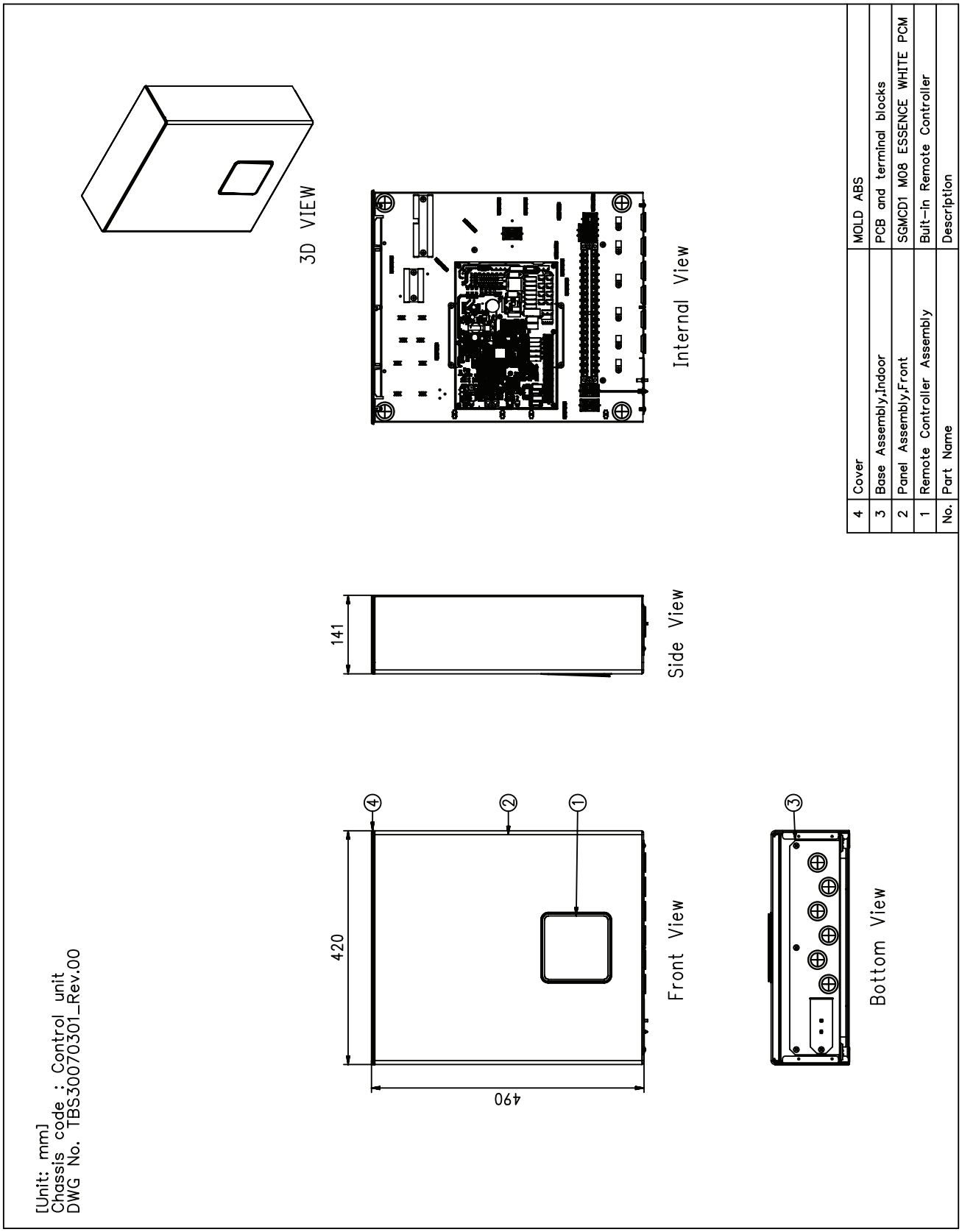
Category	Accessory Name	Model Name	Descriptions	PHCSL0 [PHCSL0]
Remote Controller	Wired - RS3 (Standard III)	PREMTW101	White	O
Dry Contact	Simple	PDRYCB000	1 input port, AC 220 - 240V	O
	Thermostat	PDRYCB320	8 input port, For 3rd Party Thermostat (Analog Input)	O
Integration Device	Remote Temperature sensor	PQRSTA0	Room temperature sensor, NTC 10kΩ, include casing	X
	Group Control wire	PZCWRCG3	Cable Assembly for group control (Y-type cable : 0.25m,cable : 9.6m)	X
ETC	Extension wire	PZCWRC1	Extension wire for IDU-wired remote controller (9.6m)	O
	2-Remo Control wire	PZCWRC2	Y-type cable to connect additional Remote Controller as slave	X
	Wi-Fi Modem	PWFMDD200	Device to use ThinQ app include connection cable	O
	Wi-Fi Extension cable	PWYREW000	USB Extension cable : 10 m	O
	Meter Interface	PENKTH000	Interface to connect 3rd-party heat and/or watt meter to indoor unit by S0 or Modbus	O
Special Kit	Solar-Thermal kit	PHLLA*	Limit Temperature : 96 ℃	O
	IDU Drain Pan	PHDPB	For Hydro Unit	X
		PHDPC	For Hydro Unit	X
	DHW tanks (Single coil)	OSHW-200F	200 L	X
		OSHW-300F	300 L	X
		OSHW-500F	500 L	X
	DHW tanks (Double coil)	OSHW-300FD	300 L	X
	DHW Heater kit	PHLTA	For Hydro Unit and Control Unit(except for HN1639 NK3)	X
		PHLTC	For Hydro Unit (HN1639 NK3)	X
	Wall mounted outdoor air temp. sensor	PHATS0	For measuring outside temperature	O
	Thermistor for Water Tank (Buffer Tank, DHW Tank)	PHRSTA0	Included in DHW Tank kit	O
	Thermostatic Mixing valve	OSHA-MV	3/4" DN20	X
		OSHA-MV1	1" DN25	X
	3way valve	OSHA-3V	Diverting valve between space heating and DHW heating	X
	Thermistor for 2nd Circuit or E/Heater	PRSTAT5K10	NTC 5kΩ sensor needed to control mixing circuit or if 3rd party backup heater is used	O
	Backup Heater	HA031M E1	1Ø, 3kW (For Monobloc and Control Unit)	-
		HA061M E1	1Ø, 6kW (For Monobloc and Control Unit)	-
		HA063M E1	3Ø, 6kW (For Monobloc and Control Unit)	-
		HA031M E2	1Ø, 3kW (For Monobloc and Control Unit)	-
		HA061M E2	1Ø, 6kW (For Monobloc and Control Unit)	-
		HA063M E2	3Ø, 6kW (For Monobloc and Control Unit)	-
		HA061B E1	1Ø, 6kW (For Hydrosplit, HN1600MB NK0)	-
		HA061C E1	1Ø, 6kW (For Hydrosplit, HN1600MC NK1)	-
		HA063B E1	3Ø, 6kW (For Hydrosplit, HN1600MB NK0)	-
		HA063C E1	3Ø, 6kW (For Hydrosplit, HN1600MC NK1)	-
	Cover plate	PDC-HK10	For Combi Unit and Hydro Unit Type indoor units	O

Note

1. O: Possible, X: Impossible, - : Not applicable, Embedded : Included with product.
2. Some advanced functions controlled by individual controller cannot be operated.
3. If there is a difference in development time between the product and the remote controller, some functions cannot be operated.
4. Meter interface cannot be connected at the same time with 3rd-party controller.
5. * : It includes double-sensor for solar tank. The collector sensor (PT1000) needs to be supplied locally.
6. If you need more detail, please refer to the control(***BECON***) PDB or the manual of product. (http://partner.lge.com > Select Your Region : Home> Doc.Library> Product > Control(BECON)).

4. Dimensions

■ PHCSL0 [PHCSL0]

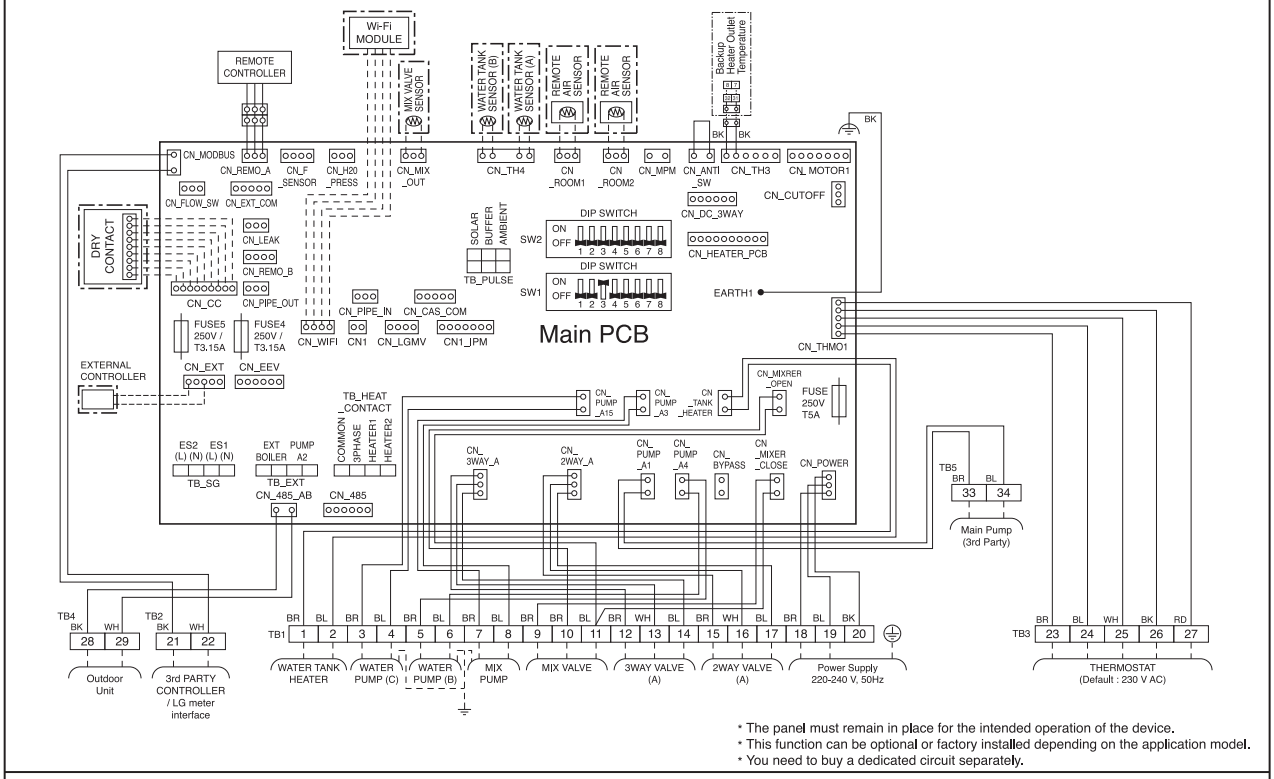


No.	Part Name	Description
4	Cover	MOLD ABS
3	Base Assembly,Indoor	PCB and terminal blocks
2	Panel Assembly,Front	SGMCD1 M08 ESSENCE WHITE PCM
1	Remote Controller Assembly	Buit-in Remote Controller

5. Wiring Diagram

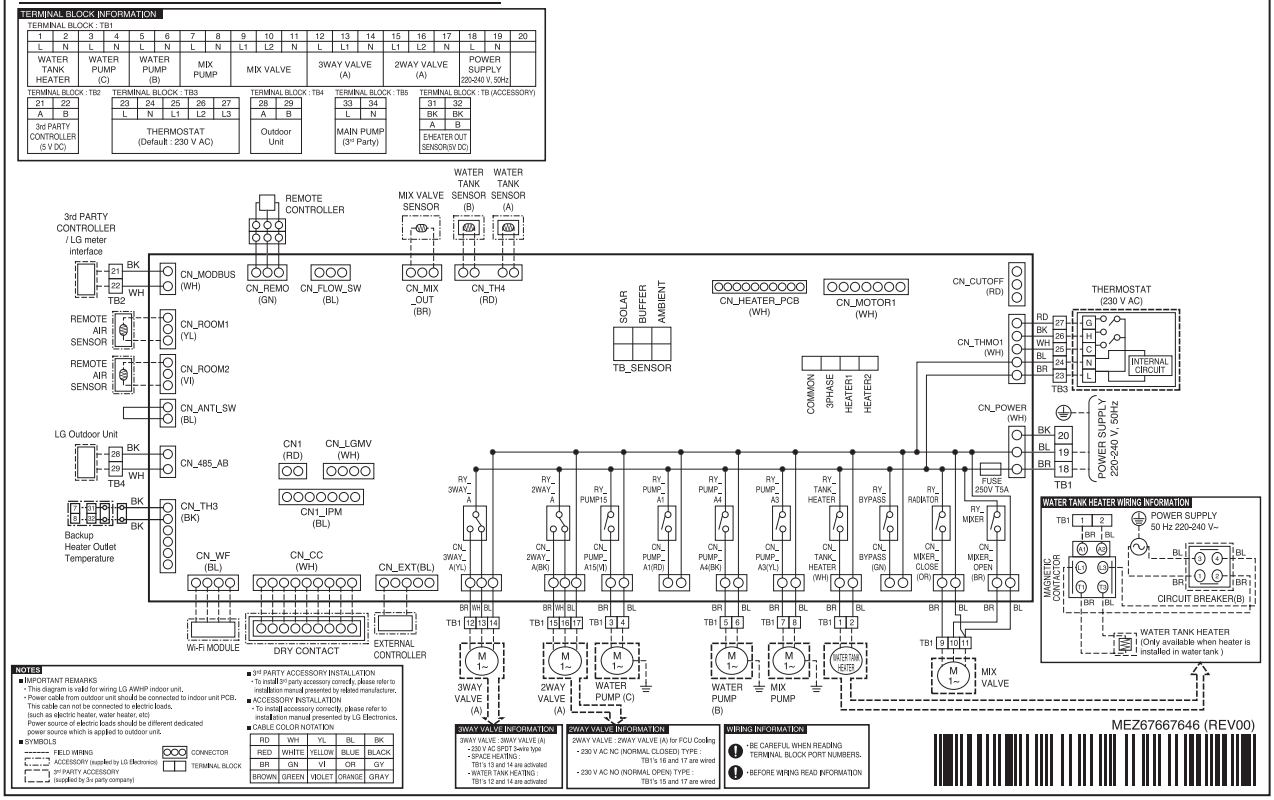
■ PHCSL0 [PHCSL0]

CIRCUIT DIAGRAM : INDOOR UNIT



* The panel must remain in place for the intended operation of the device.
* This function can be optional or factory installed depending on the application model.
* You need to buy a dedicated circuit separately.

EXTERNAL CIRCUIT DIAGRAM : INDOOR UNIT



Cascade Control Unit

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1. Specifications

Category		Unit	PHCML0 [PHCML0]
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Classification	Chassis	-	Accessory
Operation range(Leaving Water)	Cooling (min. ~ max.)	℃(DB)	5~27
	Heating (min. ~ max.)	℃(DB)	25 ~ 60(65*)
	Domestic hot water (min. ~ max.)	℃(DB)	25 ~ 55(80*)
Power supply	Case 1	V, Φ, Hz	220-240, 1, 50
Current	Current (max.)	A	0.6
Recommended circuit breaker(ELCB)	-	A	10
Connecting cable	Power supply cable (H07RN-F)	mm² × cores	0.75 x 3C
	Communication cable (H07RN-F)	mm² × cores	1.0 - 1.5 x 2C
Dimensions	Net (W x H x D)	mm	420 x 490 x 141
	Shipping (W x H x D)	mm	466 x 580 x 184
Weight	Net	kg	7.1
	Shipping	kg	9.6
Exterior	Color of chassis	-	Essence White
	RAL Code of chassis	-	RAL 9003

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3. * The leaving water temperature of 65℃ is possible only when a backup heater is installed. DHW 55~80°C Operating is available only when the booster heater is operating.

2. List of functions

Category	Functions	PHCML0 [PHCML0]
Reliability	Self diagnosis	O
Convenience	Auto Restart	O
	Child Lock	O
	Group Control	X
	Sleep Timer	O
	Turn On/Off Reservation	O
	Schedule	O
	Low Noise Operation	O
Installation	Electric Backup Heater	Accessory(3rd party)
	Domestic Hot Water Tank heater	Accessory(3rd party)
Water Product functions	Water Pump Pre-run / Over-run control	O
	Water Pump Forced Operation	O
	Water Pump Speed Control	-
	Water Flow Detection by Flow Sensor	X
	Water Flow Detection by Flow Switch	O
	Water Flow Control	-
	Water Pressure Monitoring	X
	Thermostat Interface (230V AC)	O
	Thermostat Interface (24V AC)	-
	One Point Dry Contact Input (CN-EXT)	O
	Digital Output For External Pump	O
	Digital inputs for energy saving (Ready for Smart Grid)	O
	Communication with LG ESS by Modbus	O
	Anti-Condensation on Floor (cooling)	O
	Anti-Freezing Control	O
	Anti-overheating Of Water Pipe	O
	Emergency Operation	O
	Weather dependent operation with thermostat	O
	Seasonal auto mode (heating and cooling)	O
	DHW(Domestic Hot Water) Tank Kit	X
	Scheduler (DHW Tank Heater)	O
	Timer (DHW Tank Heater)	O
	Quick DHW Tank Heating	O
	DHW Recirculation	O
	Tank Disinfection	X
	Electric Heater Capacity Control	-
	Solar thermal function	Accessory(3rd party)
	Screed Drying Mode	O
	Current Flow Rate Monitoring	X
	Energy Monitoring	O
Special Functions	Wi-Fi Control	Accessory
	Modbus connectivity (without gateway)	O
	Remote room temperature sensing	X
	Outdoor Temperature sensing	Accessory
	2nd Circuit (Mixing Circuit)	Accessory(3rd party)
	2-Remo control	X

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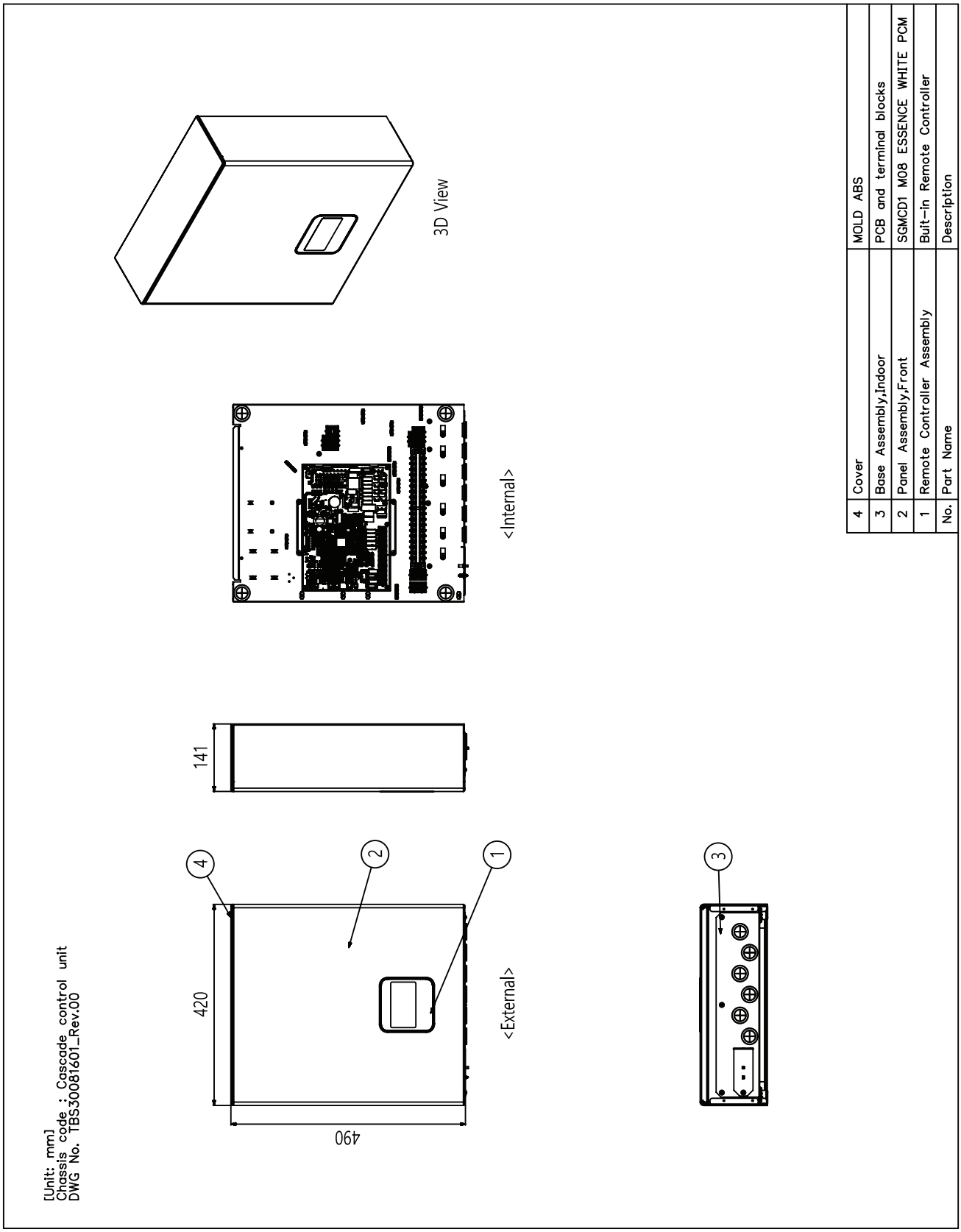
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Dry Contact	Simple	PDRYCB000	1 input port, AC 220 - 240V	O
	Thermostat	PDRYCB320	8 input port, For 3rd Party Thermostat (Analog Input)	O
Integration Device	Remote Temperature sensor	PQRSTA0	Room temperature sensor, NTC 10kΩ, include casing	X
	Group Control wire	PZCWRCG3	Cable Assembly for group control (Y-type cable : 0.25m,cable : 9.6m)	X
ETC	Extension wire	PZCWRC1	Extension wire for IDU-wired remote controller (9.6m)	O
	2-Remo Control wire	PZCWRC2	Y-type cable to connect additional Remote Controller asslave	X
	Wi-Fi Modem	PWFMDD200	Device to use ThinQ app include connection cable	O
	Wi-Fi Extension cable	PWYREW000	USB Extension cable : 10 m	O
	Meter Interface	PENKTH000	Interface to connect 3rd-party heat and/or watt meter to indoor unit by S0 or Modbus	O
Special Kit	Solar-Thermal kit	PHLLA*	Limit Temperature : 96 ℃	O
	IDU Drain Pan	PHDPB	For Hydro Unit	X
		PHDPC	For Hydro Unit	X
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	Thermistor for Water Tank (Buffer Tank, DHW Tank)	PHRSTA0	Included in DHW Tank kit	O
	Thermostatic Mixing valve	OSHA-MV	3/4" DN20	O
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	Thermistor for 2nd Circuit or E/Heater	PRSTAT5K10	NTC 5kΩ sensor needed to control mixing circuit or if 3rd party backup heater is used	O
	Backup Heater	HA031M E1	1Ø, 3kW (For Monobloc and Control Unit)	X
		HA061M E1	1Ø, 6kW (For Monobloc and Control Unit)	X
		HA063M E1	3Ø, 6kW (For Monobloc and Control Unit)	X
		HA031M E2	1Ø, 3kW (For Monobloc and Control Unit)	X
		HA061M E2	1Ø, 6kW (For Monobloc and Control Unit)	X
		HA063M E2	3Ø, 6kW (For Monobloc and Control Unit)	X
		HA061B E1	1Ø, 6kW (For Hydrosplit, HN1600MB NK0)	X
		HA061C E1	1Ø, 6kW (For Hydrosplit, HN1600MC NK1)	X
		HA063B E1	3Ø, 6kW (For Hydrosplit, HN1600MB NK0)	X
		HA063C E1	3Ø, 6kW (For Hydrosplit, HN1600MC NK1)	X
	Cover plate	PDC-HK10	For Combi Unit and Hydro Unit Type indoor units	X

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6. If you need more detail, please refer to the control(***BECON***) PDB or the manual of product. (http://partner.lge.com > Select Your Region : Home> Doc.Library> Product > Control(BECON)).

4. Dimensions

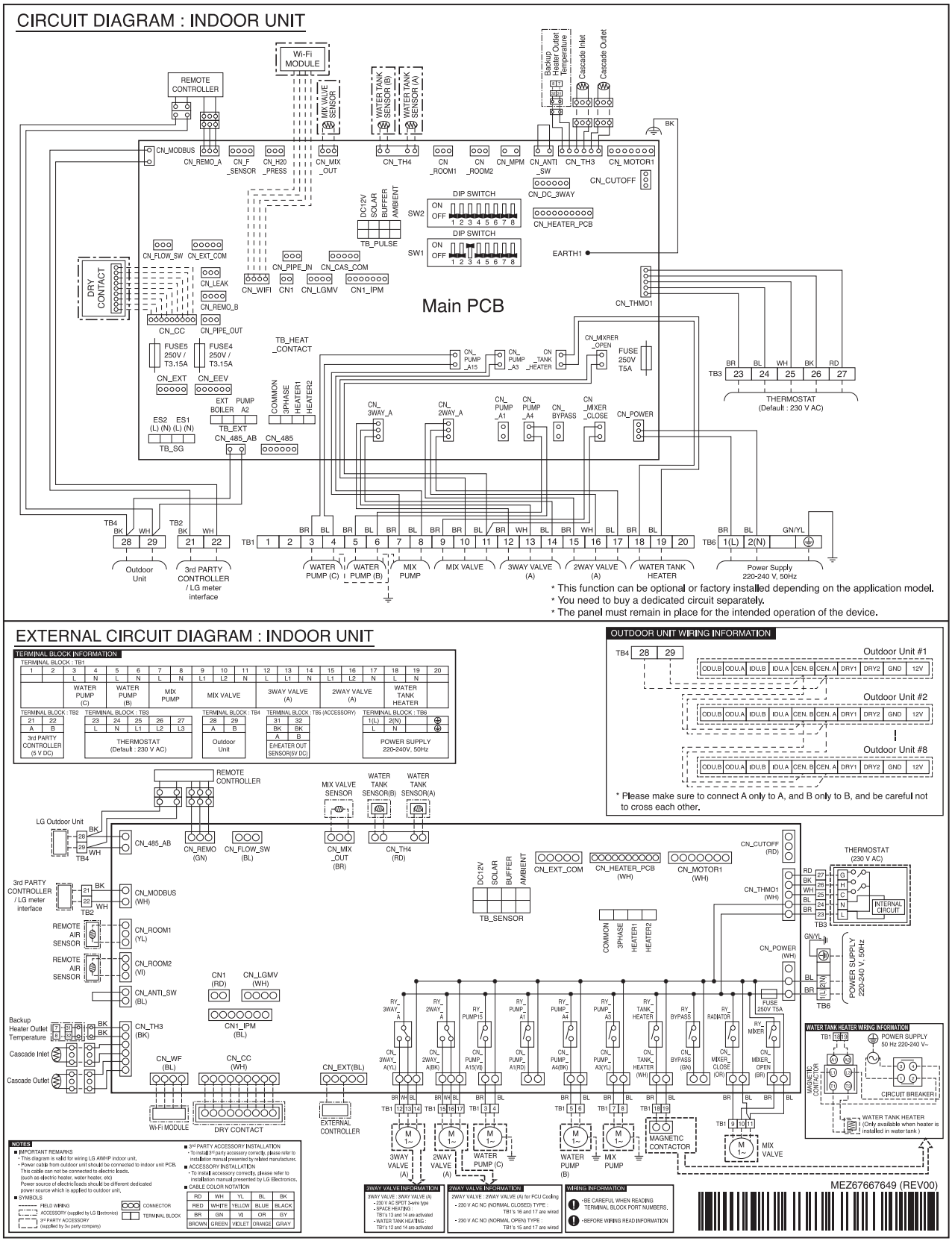
■ PHCML0 [PHCML0]



No.	Part Name	Description
4	Cover	MOLD ABS
3	Base Assembly,Indoor	PCB and terminal blocks
2	Panel Assembly,Front	SGMCD1 M08 ESSENCE WHITE PCM
1	Remote Controller Assembly	Buit-in Remote Controller

5. Wiring Diagram

■ PHCML0 [PHCML0]



Monobloc

1. Specifications
2. List of Functions
3. Accessory Compatibility List
4. Dimensions
5. Piping Diagrams
6. Wiring Diagrams
7. Performance Data
8. Operation Range
9. Sound levels
10. Hydraulic Performance

1. Specifications

■ 3Φ Models

Performance specifications					ZHBW518A0 [HM513MR UXC0]
-	-	Outdoor temp. (°CDB)	Leaving water temp. (°C)	-	
Capacity	Heating	7	35	kW	51.0
			45	kW	51.0
			55	kW	51.0
		2	35	kW	51.0
		-7	35	kW	51.0
			55	kW	40.0
		-15	35	kW	46.4
	Cooling	35	18	kW	51.0
			7	kW	51.0
Power input	Heating	7	35	kW	11.86
			45	kW	14.60
			55	kW	17.70
		2	35	kW	15.00
		-7	35	kW	20.40
			55	kW	24.00
		-15	35	kW	20.90
	Cooling	35	18	kW	11.33
			7	kW	16.45
COP	Heating	7	35	W/W	4.30
			45	W/W	3.50
			55	W/W	2.88
		2	35	W/W	3.40
		-7	35	W/W	2.50
			55	W/W	1.67
EER	Cooling	35 / 24	18	W/W	4.50
			7	W/W	3.10
SEER			18	W/W	7.30
			7	W/W	5.00
Seasonal space heating eff. class			35	-	A++
			55	-	A++
Seasonal space heating efficiency (η_S)			35	%	167
			55	%	125
SCOP(average climate)			35	W/W	4.26
			55	W/W	3.21
Water flow rate	Rated(at ΔT 5℃)			ℓ /min	146
Minimum Flow Rate	Flow switch trigger point			ℓ /min	100
Operation range (outdoor temperature)	Cooling	Min.~Max.		°C(DB)	-15 ~ 48
	Heating	Min.~Max.		°C(DB)	-25 ~ 35
Operation range (Leaving Water)	Cooling	Min.~Max.		°C(DB)	5 ~ 27
	Heating	Min.~Max.		°C(DB)	25 ~ 60(65*)
	Domestic Hot water	Min.~Max.		°C(DB)	25 ~ 55(80*)

Electrical specifications			ZHBW518A0 [HM513MR UXC0]
Power supply	Case 1	V, Ø, Hz	380-415, 3, 50
	Limit range of voltage	V	342~456
Running current	Heating(Rated)	A	17.3
	Cooling(Rated)	A	24.0
Peak control running current	Heating	A	21 - 42 (50% - 100%)
	Cooling	A	21 - 42 (50% - 100%)
Recommended circuit breaker(ELCB)		A	50
Standby power consumption		W	20
Connecting cable	Power supply cable (included Earth, H07RN-F)	mm^2 x cores	10.0 x 5C
	Communication cable (H07RN-F)	mm^2 x cores	1.0 - 1.5 x 2C

Technical specifications			ZHBW518A0 [HM513MR UXC0]
Compressor	Type	-	Hermetically Sealed Scroll
	Model x No.	-	JQC096MAE x 1
	Piston displacement	cm^3/rev	87.6
	Motor type	-	BLDC
Refrigerant	Type	-	R32
	Precharged amount	kg	10
	GWP	-	675
	t-CO2 eq.	-	6.75
	Control type	-	Electronic expansion valve

1. Specifications

Technical specifications				ZHBW518A0 [HM513MR UXC0]
Refrigerant oil	Type		-	FW68D
	Charged volume		cc x No.	1,500
Fan	Type		-	Propeller
	Air flow rate (rated)		㎥/min	430.0
Fan motor	Type		-	BLDC
	Output		W x No.	1,500 x 2
Heat exchanger	Rows x columns x FPI		-	3 x 58 x 17
	No.		EA	2
	Fin type		-	Wide Louver Plus
Heat exchanger (refrigerant to water)	Type		-	Brazed plate HEX
	No.		-	1
	Number of plate		EA	104
	Water volume		ℓ	5.6
Sound pressure level	Heating(Rated, @10m)		dB(A)	54
	Cooling(Rated, @10m)		dB(A)	58
Sound power level	Heating	Low noise	dB(A)	75
		Rated	dB(A)	82
		Daytime max.	dB(A)	89
	Cooling	Rated	dB(A)	86
Water connecting pipes	Inlet		inch	Male PT 1-1/2" according to ISO 7-1 (tapered pipe threads)
	Outlet		inch	Male PT 1-1/2" according to ISO 7-1 (tapered pipe threads)
Dimensions	Net(W x H x D)		mm	1,640 x 1,690 x 825
	Shipping(W x H x D)		mm	1,670 x 1,820 x 860
Weight	Net		kg	335.0
	Shipping		kg	353.0
Exterior	Color of chassis		-	Morning Gray / Dawn Gray
	RAL Code of chassis		-	RAL 7038 / RAL 7037

Note

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2. Wiring cable size must comply with the applicable local and national codes. And "Electric characteristics" chapter should be considered for electrical work and design. Especially the power cable and circuit breaker should be selected in accordance with that.
3. Sound power level is measured in accordance with EN 12102-1 and ISO 9614.
   - Rated : This mode is measured on the rated condition in the semi-anechoic rooms. Therefore, these values may vary depending on operation conditions.
   - Daytime max : This mode is measured based on max. fan RPM and max. compressor Hz. that can be reached under outdoor air temperature 2°C.
   - Low noise : This mode lowers noise by limiting the compressor Hz. and fan RPM, and thus the performance may be limited.
4. Performances are accordance with EN14511 and reflect ErP testing conditions. The values indicated above are the declared values at rated conditions acc. ErP regulation. For max. capacities, please refer to Performance Data.
5. This product contains Fluorinated greenhouse gases.
6. SCOP is in accordance with EN14825.
7. Rated running currents are based on the declared values under the following conditions.
   - Heating : Outdoor Temp. 7°CDB / 6°CWB, Leaving Water Temp. 35℃
   - Cooling : Outdoor Temp. 35°C(DB) / 24°C(WB), Leaving Water Temp. 7°C
8. All installation sites must be equipped with an earth leakage circuit breaker (ELCB).
9. * The leaving water temperature of 65℃ is possible only when a backup heater is installed. DHW 55~80℃ Operating is available only when the booster heater is operating.

2. List of functions

Category	Functions	ZHBW518A0 [HM513M UXC0]
Reliability	Defrost / Deicing	O
	High pressure switch	O
	Low pressure switch	X
	Phase protection	O
	Restart delay (3-minutes)	O
	Self diagnosis	O
	Soft start	O
Convenience	Test function	X
	Low Noise Operation	O
	Wiring Error Check	X
	Peak Control	O
	Mode Lock	X
	Forced Cooling Operation (Outdoor Unit)	X
	Base Pan Heater	O
	SLC(Smart Load Control)	X
Network function	Network solution(LGAP)	O

Note
1. O : Applied, X : Not applied

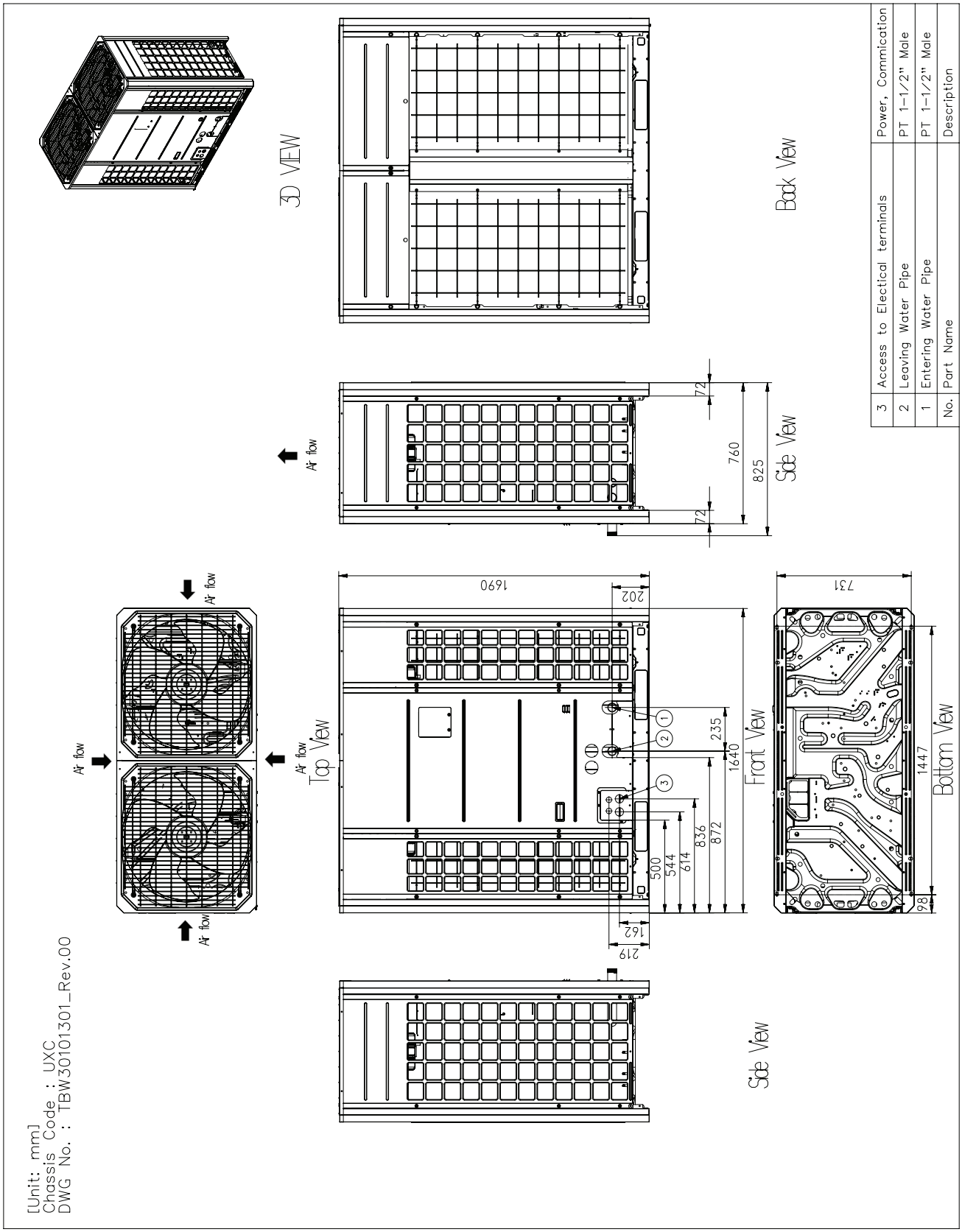
3. Accessory Compatibility List

Category		Product	Remark	ZHBW518A0 [HM513MR UXC0]
Central Controller	AC EZ	PQCSZ250S0	AC EZ	X
	AC Ez Touch	PACEZA000	AC Ez Touch	X
	AC Smart	PACS5A000	AC Smart 5	X
	ACP	PACP5A000	ACP 5	O
	AC Manager **	PACM5A000	AC Manager 5	X
Gateway	IDU PI485	PHNFP14A0	Without case	X
		PSNFP14A0	With case	X
	ODU PI485	PP485A00T	PI 485 Gateway	X
		PMNFP14A1	PI 485 Gateway (Produced before 1st of Sep. of 2021)	X
	BACnet	PQNFB17C0	ACP BACnet	X
	Lonworks	PLNWKB000	ACP Lonworks	X
	Modbus	PMBUSB00A	-	O
	Cloud Gateway	PWFMDB200	Cloud (ThinQ, BECON)	X
ETC	PDI	PPWRDB000	PDI Standard	X
		PQNUD1S40	PDI Premium	X
	ACS IO Module	PEXPMB000	-	X

Note
1. O: Possible, X: Impossible, - : Not applicable
2. ** : ACP or AC Smart is needed.
3. If you need more detail, please refer to the manual of product.
   (http://partner.lge.com > Select Your Region : Home> Doc.Library> Product > Control(BECON))
4. In Cascade, ACP is not applicable

4. Dimensions

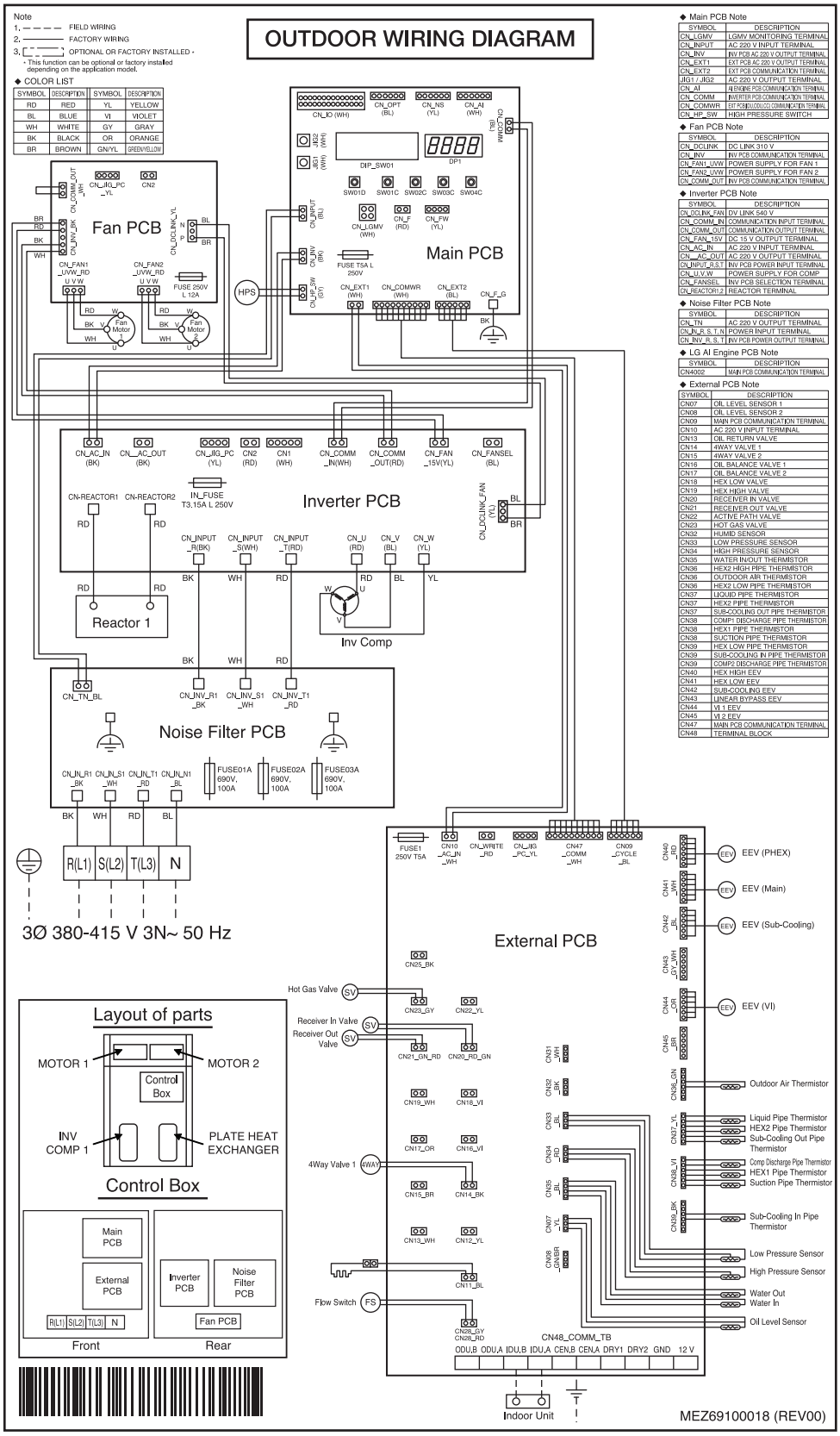
■ ZHBW518A0 [HM513MR UXC0]



No.	Part Name	Description
3	Access to Electical terminals	Power, Commication
2	Leaving Water Pipe	PT 1-1/2" Male
1	Entering Water Pipe	PT 1-1/2" Male

5. Wiring Diagram

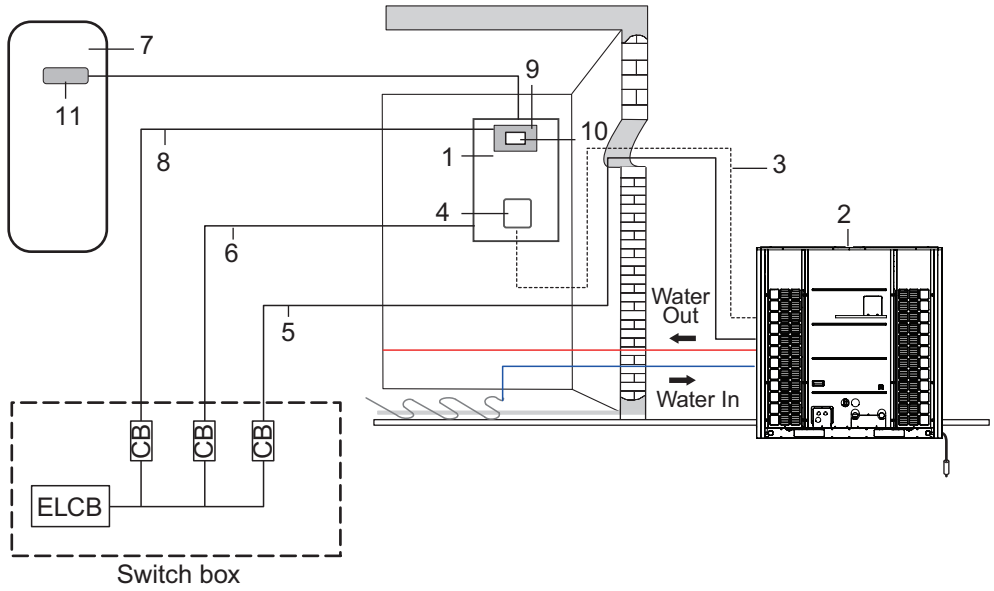
■ ZHBW518A0 [HM513MR UXC0]



5. Wiring Diagram

■ Field Wiring

◆ For Control Unit type



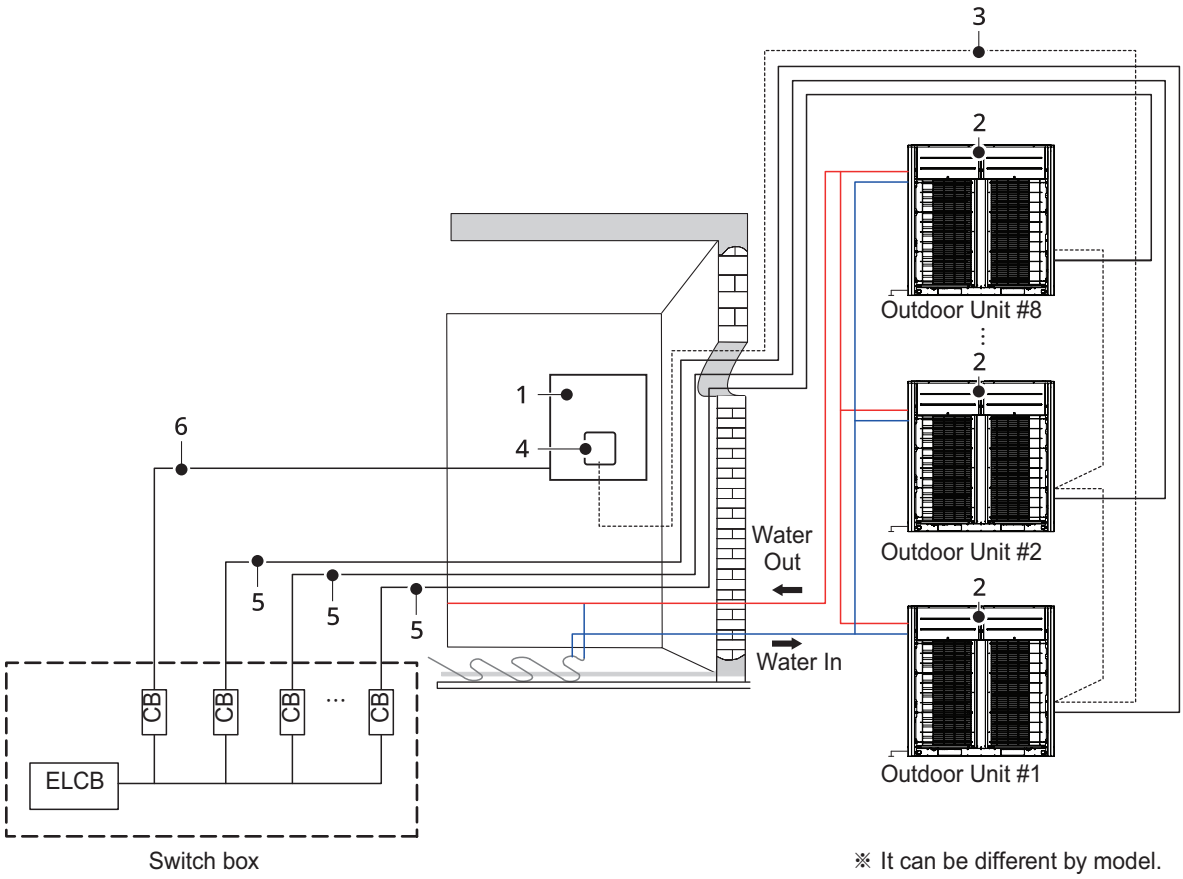
No.	Name	No.	Name
1	Control unit	8	Power supply DHW boost heater *
2	Outdoor unit	9	DHW tank kit *
3	Communication cable	10	Circuit breaker for DHW boost heater *
4	Remote controller	11	DHW boost heater *
5	Power supply outdoor unit	* Optional ELCB : Earth-leakage circuit breaker CB : Circuit breaker	
6	Power supply indoor unit		
7	DHW tank *		

Note

1. Voltage supplied to the unit terminals should be within the minimum and maximum range.
2. Maximum allowable voltage unbalance between phase is 2%.
3. All installation sites must be equipped with an earth leakage circuit breaker (ELCB).

5. Wiring Diagram

◆ For Cascade Control Unit type



※ It can be different by model.

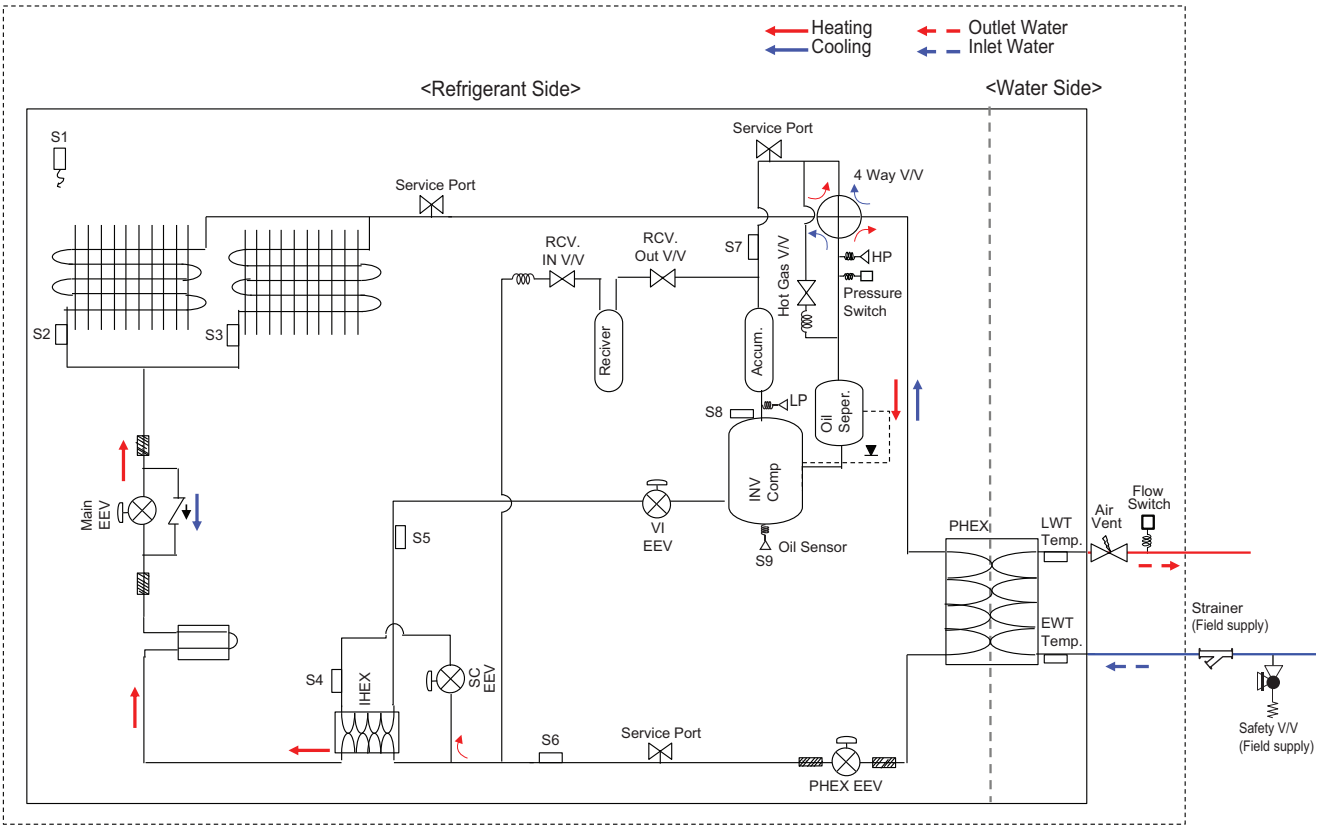
No.	Name	No.	Name
1	Cascade Control unit	6	Power supply indoor unit
2	Outdoor unit	* Optional ELCB : Earth-leakage circuit breaker CB : Circuit breaker	
3	Communication cable		
4	Remote controller		
5	Power supply outdoor unit		

Note

1. Voltage supplied to the unit terminals should be within the minimum and maximum range.
2. Maximum allowable voltage unbalance between phase is 2%.
3. All installation sites must be equipped with an earth leakage circuit breaker (ELCB).

6. Piping Diagram

■ ZHBW518A0 [HM513MR UXC0]



Category	Symbol	Meaning
Refrigerant side	S1	Outdoor air temp. sensor
	S2	Left HEX temp. sensor
	S3	Right HEX temp. sensor
	S4	IHEX in temp. sensor
	S5	IHEX out temp. sensor
	S6	Liquid temp. sensor
	S7	Suction temp. sensor
	S8	Discharge temp. sensor
	S9	Oil sensor
	LP	Low pressure sensor
	HP	High pressure sensor
Water side	LWT	Leaving water temp. sensor
	EWT	Entering water temp. sensor

7. Capacity Tables

7.1 Heating Operation

■ Maximum Capacity (Include defrost effect)

◆ ZHBW518A0 [HM513MR UXC0]

Outdoor Temp. [°C DB]	Water flow rate 146 LPM													
	LWT 30 °C		LWT 35 °C		LWT 40 °C		LWT 45 °C		LWT 50 °C		LWT 55 °C		LWT 60°C	
	TC	COP	TC	COP	TC	COP	TC	COP	TC	COP	TC	COP	TC	COP
-25	30.3	1.81	29.3	1.71	25.3	1.41	19.2	1.10						
-22	34.0	1.95	32.0	1.86	27.0	1.63	23.0	1.40						
-20	37.1	2.05	36.8	1.97	35.3	1.78	32.8	1.60	29.6	1.45				
-17	43.2	2.19	42.5	2.12	41.8	2.01	40.6	1.90	39.0	1.80				
-15	47.3	2.29	46.4	2.22	46.1	2.16	45.8	2.09	45.3	2.03	40.0	1.96		
-12	49.5	2.57	49.2	2.50	47.9	2.40	47.8	2.29	46.3	2.19	41.9	2.08		
-10	51.0	2.76	51.0	2.68	49.2	2.55	49.1	2.42	47.0	2.29	43.1	2.16	36.0	1.81
-7	51.0	3.05	51.0	2.96	51.0	2.79	51.0	2.62	48.0	2.45	45.0	2.28	42.0	2.11
-2	51.0	3.52	51.0	3.34	51.0	3.15	51.0	2.97	51.0	2.78	51.0	2.60	47.5	2.41
2	51.0	3.90	51.0	3.60	51.0	3.52	51.0	3.43	51.0	3.19	51.0	2.95	51.0	2.71
7	51.0	4.66	51.0	4.30	51.0	4.06	51.0	3.82	51.0	3.59	51.0	3.35	51.0	3.11
10	51.0	5.04	51.0	4.72	51.0	4.48	51.0	4.24	51.0	3.89	51.0	3.53	51.0	3.18
15	51.0	5.69	51.0	5.41	51.0	5.18	51.0	4.94	51.0	4.39	51.0	3.85	51.0	3.30
20	51.0	6.33	51.0	6.10	51.0	5.87	51.0	5.64	51.0	4.90	51.0	4.16	51.0	3.42
25	51.0	6.80	51.0	6.47	51.0	6.11	51.0	5.76	51.0	5.02	51.0	4.28	51.0	3.53
30			51.0	6.83	51.0	6.36	51.0	5.88	51.0	5.14	51.0	4.39	51.0	3.65
35					51.0	6.60	51.0	6.00	51.0	5.26	51.0	4.51	51.0	3.77

Note

1. DB : Dry bulb temperature(℃), LWT : Leaving water temperature(℃), LPM : Liter per minute (ℓ /min)
2. TC : Total capacity(kW), EER: Energy efficiency ratio(kW/kW), COP : Coefficient of performance (kW/kW)
3. Direct interpolation is permissible. Do not extrapolate.
4. Measuring procedure follows EN14511.
   - Rated values are based on standard conditions, and it can be found on specifications.
   - Above table values may not be matched according to installation condition. Except for rated value, the performance is not guaranteed.
   - In accordance with the test standard(or nations), the results may vary.

7. Capacity Tables

7.2 Cooling Operation

■ Maximum Capacity

◆ ZHBW518A0 [HM513MR UXC0]

Outdoor Temperature [°C DB]	Water flow rate 146 LPM																	
	LWT 5 °C		LWT 7 °C		LWT 10 °C		LWT 13 °C		LWT 15 °C		LWT 18 °C		LWT 20 °C		LWT 22 °C		LWT 27 °C	
	TC	EER	TC	EER	TC	EER	TC	EER	TC	EER	TC	EER	TC	EER	TC	EER	TC	EER
-15	51.0	5.58	51.0	5.61	51.0	5.62	51.0	5.69	51.0	5.72	51.0	5.85	51.0	5.74	51.0	5.81	51.0	6.05
-10	51.0	5.22	51.0	5.32	51.0	5.32	51.0	5.38	51.0	5.46	51.0	5.57	51.0	5.54	51.0	5.60	51.0	5.82
-5	51.0	5.04	51.0	5.08	51.0	5.09	51.0	5.14	51.0	5.21	51.0	5.30	51.0	5.35	51.0	5.40	51.0	5.60
0	51.0	4.75	51.0	4.79	51.0	4.82	51.0	4.92	51.0	4.97	51.0	5.05	51.0	5.16	51.0	5.21	51.0	5.40
10	51.0	3.30	51.0	3.51	51.0	3.82	51.0	4.14	51.0	4.35	51.0	4.66	51.0	4.87	51.0	5.08	51.0	5.21
20	51.0	3.18	51.0	3.35	51.0	3.69	51.0	4.03	51.0	4.26	51.0	4.60	51.0	4.75	51.0	4.90	51.0	5.05
30	51.0	3.07	51.0	3.18	51.0	3.55	51.0	3.92	51.0	4.16	51.0	4.53	51.0	4.63	51.0	4.72	51.0	4.88
35	48.0	3.01	51.0	3.10	51.0	3.48	51.0	3.86	51.0	4.12	51.0	4.50	51.0	4.57	51.0	4.63	51.0	4.80
40	46.5	2.41	48.8	2.78	51.0	3.07	51.0	3.36	51.0	3.55	51.0	3.84	51.0	3.89	51.0	3.95	51.0	4.08
45	44.0	2.21	48.5	2.45	50.5	2.65	51.0	2.85	51.0	2.98	51.0	3.18	51.0	3.22	51.0	3.26	51.0	3.36
48	42.5	2.16	43.8	2.26	45.8	2.40	48.3	2.54	51.0	2.64	51.0	2.78	51.0	2.81	51.0	2.85	51.0	2.93

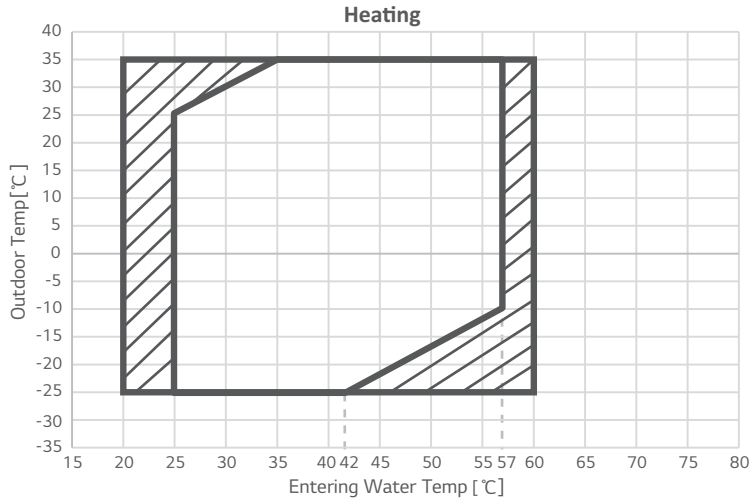
Note

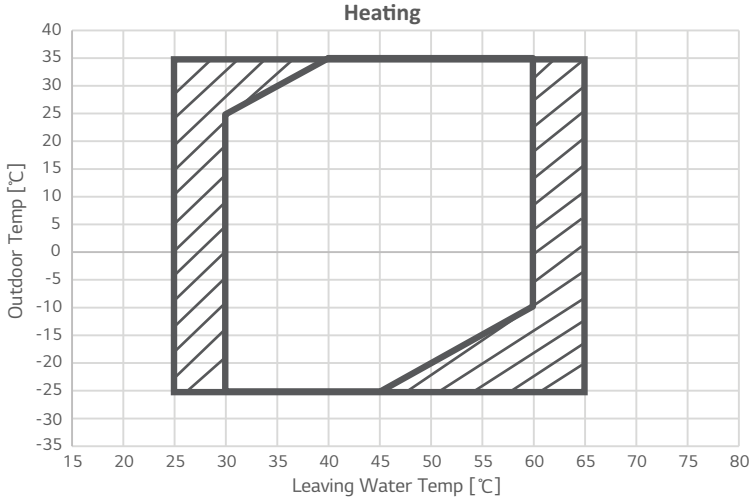
1. DB : Dry bulb temperature(℃), LWT : Leaving water temperature(℃), LPM : Liter per minute (ℓ /min)
2. TC : Total capacity(kW), EER: Energy efficiency ratio(kW/kW), COP : Coefficient of performance (kW/kW)
3. Direct interpolation is permissible. Do not extrapolate.
4. Measuring procedure follows EN14511.
   - Rated values are based on standard conditions, and it can be found on specifications.
   - Above table values may not be matched according to installation condition. Except for rated value, the performance is not guaranteed.
   - In accordance with the test standard(or nations), the results may vary.

8. Operation Limits

8.1 Heating

■ ZHBW518A0 [HM513MR UXC0]





3rd Party Backup heater required to achieve temp.

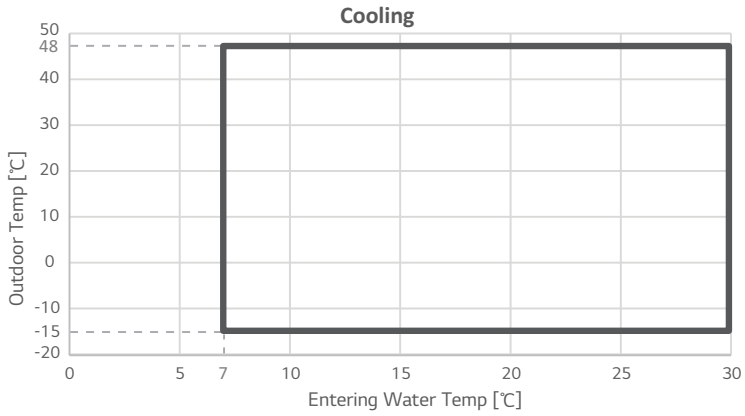
Note

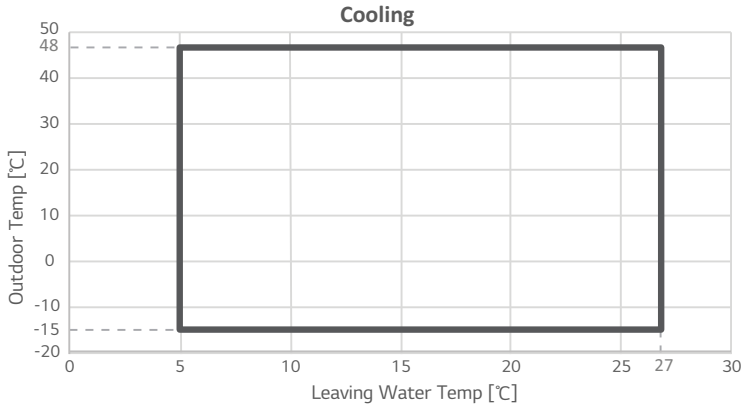
- DHW operation without electric heater : max. 55°C
- DHW operation with electric heater : max. 80 °C

8. Operation Limits

8.2 Cooling

■ ZHBW518A0 [HM513MR UXC0]



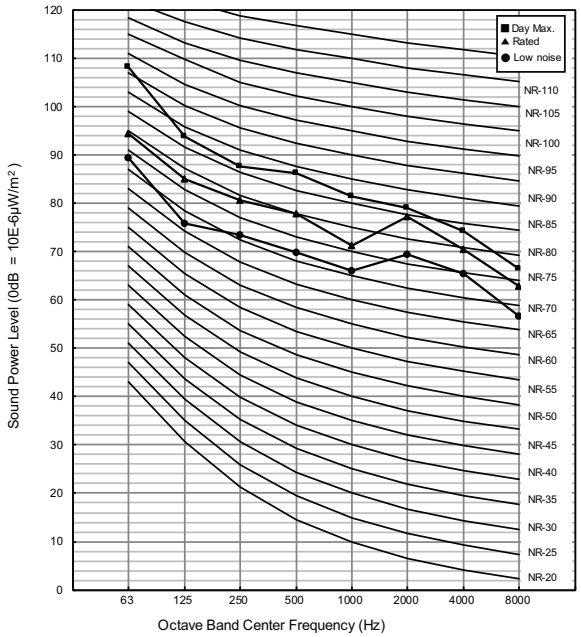


9. Sound levels

9.1 Sound Power Level

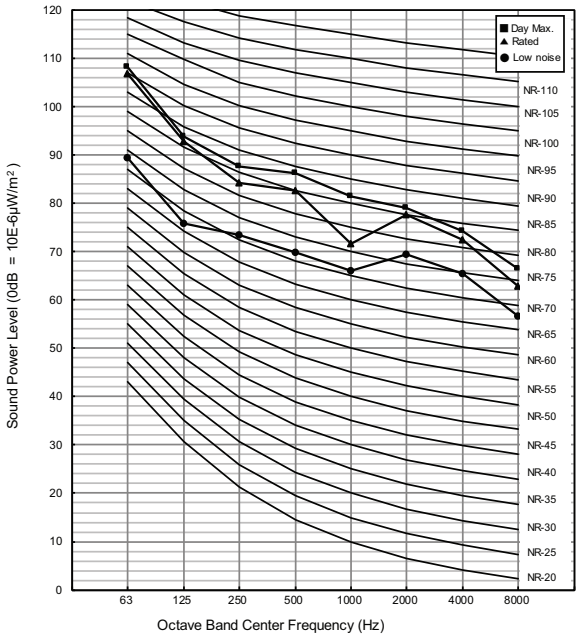
ZHBW518A0 [HM513MR UXC0]

[Heating]



Octave Band [Hz]	63	125	250	500	1000	2000	4000	8000	*Overall [dB(A)]*
Day Max. [dB]	108.2	93.9	87.7	86.3	81.4	79.1	74.3	66.5	89.0
Rated [dB]	94.4	85.1	80.6	77.9	71.2	77.3	70.4	62.8	82.0
Low noise [dB]	89.4	75.8	73.4	69.9	66.0	69.5	65.4	56.6	75.0

[Cooling]



Octave Band [Hz]	63	125	250	500	1000	2000	4000	8000	*Overall [dB(A)]*
Day Max. [dB]	108.2	93.9	87.7	86.3	81.4	79.1	74.3	66.5	89.0
Rated [dB]	106.9	92.8	84.2	82.6	71.6	77.6	72.5	62.8	86.0
Low noise [dB]	89.4	75.8	73.4	69.9	66.0	69.5	65.4	56.6	75.0

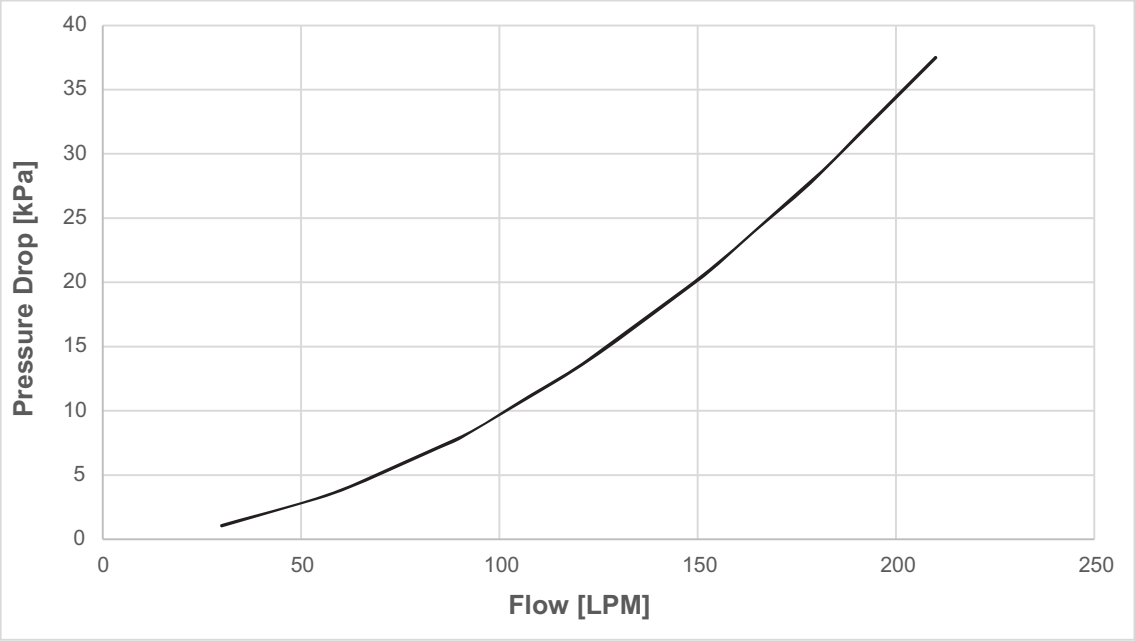
Model		Heating / Cooling [dB(A)]		
Outdoor Unit	**Indoor Unit**	**Rated**	**Low Noise**	**Daytime Max**
ZHBW518A0 [HM513MR UXC0]	PHCSL0 [PHCSL0]	82.0 / 86.0	75.0 / 75.0	89.0 / 89.0

Note

1. Data is valid at diffuse field condition.
2. Reference acoustic intensity 0dB = 10E-6μW/m^2
3. Sound power level is measured on the rated condition in the reverberation rooms. Refer to the Model Specifications for nominal conditions(Power source and Ambient temperature, etc)
4. Sound levels can be increased in accordance with installation and operating conditions.
5. Sound level will vary depending on a range of factors such as the construction (acoustic absorption coefficient) of particular installed place in which the equipment in installed.
6. Sound power level is measured in accordance with EN 12102-1 and ISO 9614.
   - Rated : This mode is measured on the rated condition in the semi-anechoic rooms. Therefore, these values may vary depending on operation conditions.
   - Daytime max : This mode is measured based on max. fan RPM and max. compressor Hz. that can be reached under outdoor air temperature 2°C.
   - Low noise : This mode lowers noise by limiting the compressor Hz. and fan RPM, and thus the performance may be limited.

10. Hydraulic Performance

■ Pressure Drop



Installation

Installation of Outdoor Unit

1. Information of Refrigerant

■ Refrigerant R32

- The refrigerant R32 has a lower GWP (Global Warming Potential) value, and higher efficiency than R410A.
- The Ozone Depletion Potential (ODP) of R32 is 0, and Global Warming Potential(GWP) is 675.
- Refrigerant piping consists of copper/steel pipes, joints, and other fittings. All components must be selected and installed in conformity with the standards pertaining to the Refrigeration Safety Regulation.
- Same piping as for R410A can be used.

⚠ WARNING

- This product contains fluorinated greenhouse gases (Refrigerant type : R32).
  DO NOT LEAK refrigerant gases into the atmosphere.
- The refrigerant R32 is a Slightly Flammable gas. It does not leak normally. If the refrigerant leaks in the installed place and is in contact with a flaming source, it may cause fire, or a harmful gas.
- If there is some leak, turn off any combustion devices, ventilate the installed place, and contact the dealer from which you purchased the unit. Do not use the unit until the refrigerant leaked is repaired.
- Only use R32 as refrigerant. Other substances may cause explosions and accidents.

⚠ CAUTION

- The wall thickness of the piping should comply with the relevant local and national regulations for the designed pressure.
- Any unapproved pipe must not be used.
- Do not heat pipes more than necessary to prevent them from softening.

2. Selection of the best Location

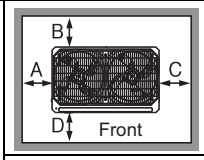
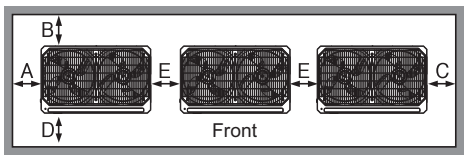
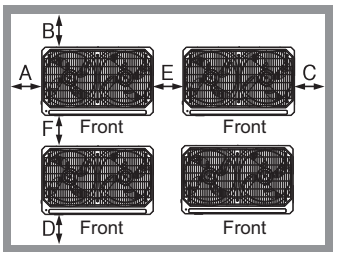
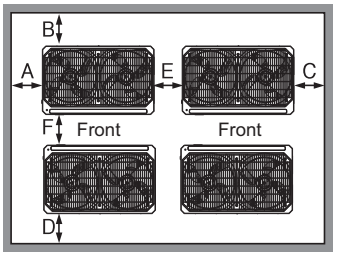
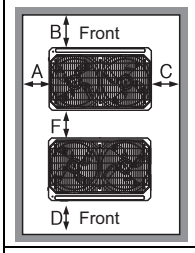
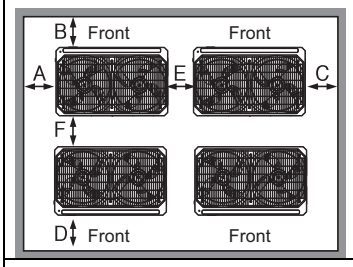
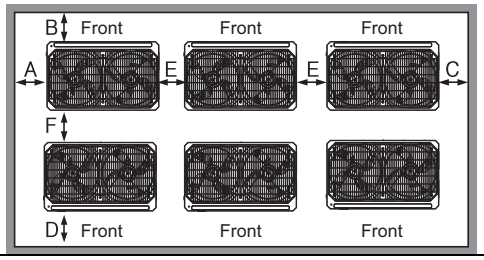
Select space for installing outdoor unit, which will meet the following conditions:

- No direct thermal radiation from other heat sources
- No possibility of annoying neighbors due to noise of unit
- No exposition to strong wind
- With strength which bears weight of unit
- Note that drain flows out of unit when heating
- Because of the possibility of fire, do not install unit to the space where generation, inflow, stagnation, and leakage of combustible gas is expected.
- Avoid unit installation in a place where acidic solution and spray (sulfur) are often used.
- Do not use unit under any special environment where oil, steam and sulfuric gas exist.
- It is recommended to fence round the outdoor unit in order to prevent any person or animal from accessing the outdoor unit.
- If installation site is area of heavy snowfall, then the following directions should be observed.
  - Make the foundation as high as possible.
  - Fit a snow protection hood.
- Select installation location considering following conditions to avoid bad condition when additionally performing defrost operation.
  1. Install the outdoor unit at a place well ventilated and having a lot of sunshine in case of installing the product at a place with a high humidity in winter (near beach, coast, lake, etc).
     (Ex) Rooftop where sunshine always shines.
  2. Performance of heating will be reduced and pre-heat time of the indoor unit may be lengthened in case of installing the outdoor unit in winter at following location:
     1) Shade position with a narrow space
     2) Location with much moisture in neighboring floor.
     3) Location with much humidity around.
     4) Location where liquid gathers since the floor is not even.

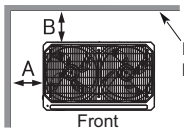
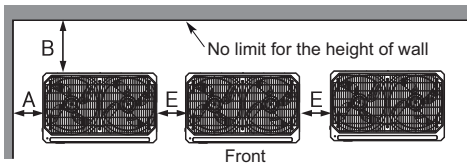
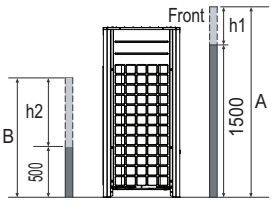
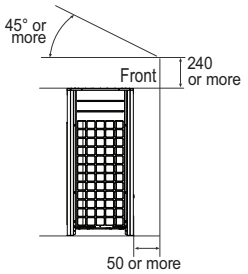
2. Selection of the best Location

2.1 Best Location

- During the installation of the unit, consider service, inlet, and outlet and acquire the minimum space as shown in the figures below. Side space should be more than 49mm for operating of Auto Dust Removal mode.

Category	Installation Space	Case 1 (10mm≤Side Space≤49mm)	Case 2 (Side Space≥49mm)
4 sides are walls		A ≥ 10 B ≥ 300 C ≥ 10 D ≥ 500	A ≥ 50 B ≥ 100 C ≥ 50 D≥ 500
		A ≥ 10 B ≥ 300 C ≥ 10 D ≥ 500 E ≥ 20	A ≥ 50 B ≥ 100 C ≥ 50 D ≥ 500 E ≥ 100
		A ≥ 10 B ≥ 300 C ≥ 10 D ≥ 500 E ≥ 20 F ≥ 600	A ≥ 50 B ≥100 C ≥ 50 D ≥ 500 E ≥ 100 F ≥ 500
		A ≥ 10 B ≥300 C ≥ 10 D ≥ 300 E ≥ 20 F ≥ 500	A ≥ 50 B ≥100 C ≥ 50 D ≥ 100 E ≥ 100 F ≥ 500
Rear to Rear		A ≥ 10 B ≥500 C ≥ 10 D ≥ 500 F ≥ 900	A ≥ 50 B ≥500 C ≥ 50 D ≥ 500 F ≥ 600
		A ≥ 10 B ≥500 C ≥ 10 D ≥ 500 E ≥ 20 F ≥ 1200	A ≥ 50 B ≥500 C ≥ 50 D ≥ 500 E ≥ 100 F ≥ 900
		A ≥ 10 B ≥500 C ≥ 10 D ≥ 500 E ≥ 20 F ≥ 1800	A ≥ 50 B ≥500 C ≥ 50 D ≥ 500 E ≥ 100 F ≥ 1200

2. Selection of the best Location

Category	Installation Space	Case 1 (10mm≤Side Space≤49mm)	Case 2 (Side Space≥49mm)
Only 2 sides are walls		A ≥ 10 B ≥ 300	-
		A ≥ 10 B ≥ 300 E ≥ 20	-
Limitations on the height of the wall (Refer to 4 side walls)	 	• The height of the wall on the front side must be 1500mm or less. • The height of the wall on the rear side must be 500mm or less. • There is no limit to the wall on the side. • If the height of the walls on the front and the rear side are higher than the limit, there must be additional space on the front and the rear side. – Additional Space on the front side by 1/2 of h1. – Additional Space on the rear side by 1/2 of h2 – h1 = A(Actual height) - 1500 – h2 = B(Actual height) - 500	

■ Seasonal wind and cautions in winter

- Sufficient measures are required in a snow area or severe cold area in winter so that product can be operated well.
- Get ready for seasonal wind or snow in winter even in other areas.
- Install a suction and discharge duct not to let in snow or rain.
- Install the outdoor unit in such a way that it should not come in contact with snow directly. If snow piles up and freezes on the air suction hole, the system may malfunction. If it is installed at snowy area, attach the hood to the system.
- The raised support platform must be high enough to allow the unit to remain above possible snow drifts, and must be higher than the maximum anticipated snowfall for the location.
- Where snow accumulated on the upper part of the Outdoor Unit by more than 10cm(3-15/16inch), always remove snow for operation.

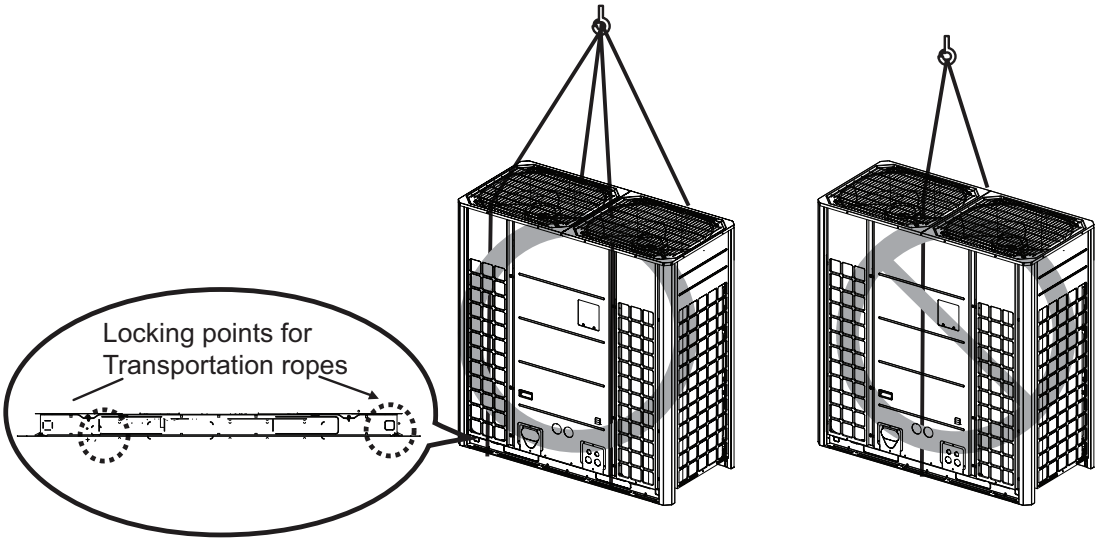
⚠ CAUTION

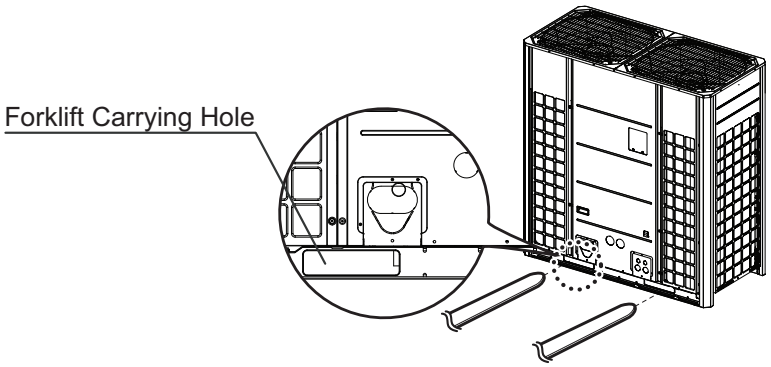
1. Don't install the suction hole and discharge hole of the Outdoor Unit facing the seasonal wind.

2. Selection of the best Location

2.2 Lifting Method

- When carrying the suspended, unit pass the ropes under the unit and use the two suspension points each at the front and rear.
- Always lift the unit with ropes attached at four points so that impact is not applied to the unit.
- Attach the ropes to the unit at an angle of 40° or less.





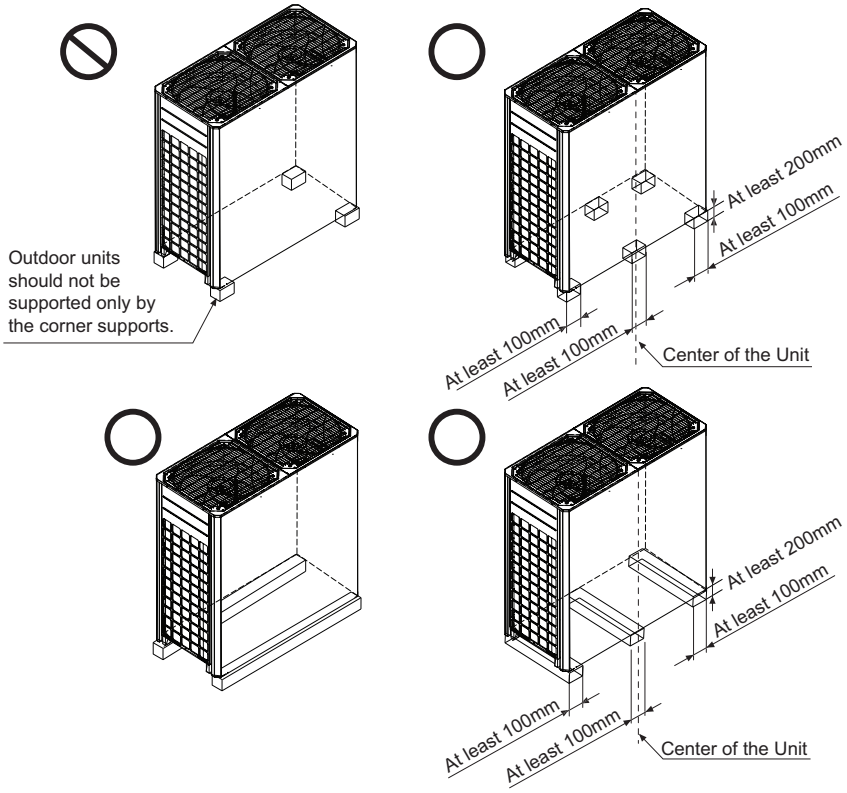
⚠ CAUTION

Be very careful while carrying the product.

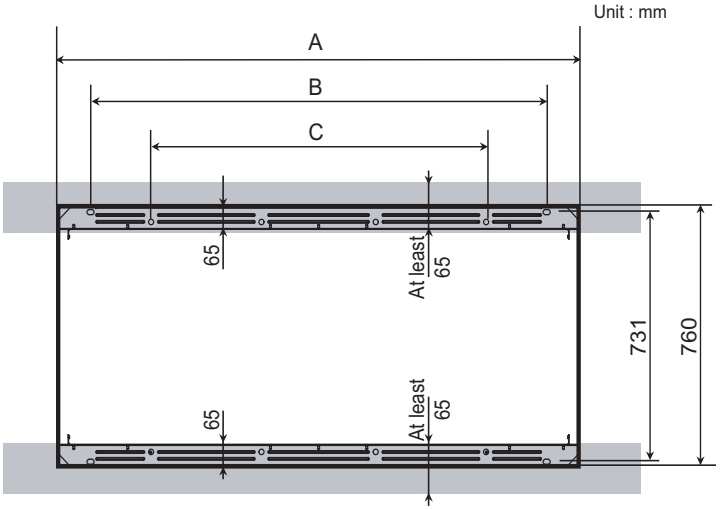
- Do not have only one person carry product if it is more than 20 kg.
- PP bands are used to pack some products. Do not use them as a mean for transportation because they are dangerous.
- Do not touch heat exchanger fins with your bare hands. Otherwise you may get a cut in your hands.
- Tear plastic packaging bag and scrap it so that children cannot play with it. Otherwise plastic packaging bag may suffocate children to death.
- When carrying in Outdoor Unit, be sure to support it at four points. Carrying in and lifting with 3-point support may make Outdoor Unit unstable, resulting in a fall.
- Use 2 belts of at least 8 m long.
- Place extra cloth or boards in the locations where the casing comes in contact with the sling to prevent damage.
- Hoist the unit making sure it is being lifted at its center of gravity.

3. Foundation for Installation

- Install at places where it can endure the weight and vibration/noise of the outdoor unit.
- The outdoor unit support block at the bottom shall have width of at least 100mm under the units legs before being fixed.
- The outdoor unit support block hould have minimum height of 200mm.
- Anchor bolts must be inserted at least 75mm.



3.1 The location of the Anchor bolts

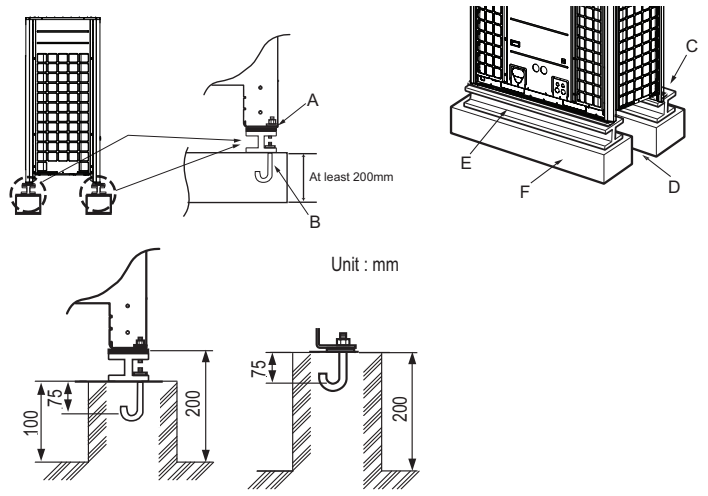


Chassis	A (mm)	B (mm)	C (mm)
UXC	1,640	1,438	1,056

3. Foundation for Installation

3.2 Foundation for Installation

- Fix the unit tightly with bolts as shown below so that unit will not fall down due to earthquake or gust.
- Use the H-beam support as a base support
- Noise and vibration may occur from the floor or wall since vibration is transferred through the installation part depending on installation status. Thus, use anti-vibration materials (cushion pad) fully (The base pad shall be more than 200mm)



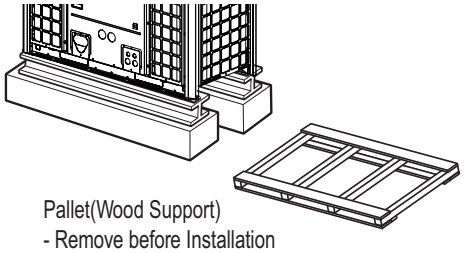
- A : The corner part must be fixed firmly. Otherwise, the support for the installation may be bent.
- B : Get and use M10 Anchor bolt.
- C: Put Cushion Pad between the outdoor unit and ground support for the vibration protection in wide area.
- D: Space for pipes and wiring (Pipes and wirings for bottom side)
- E : H-beam support
- F: Concrete support

⚠ WARNING

- Install where it can sufficiently support the weight of the outdoor unit.
  If the support strength is not enough, the outdoor unit may drop and hurt people.
- Install where the outdoor unit may not fall in strong wind or earthquake.
  If there is a fault in the supporting conditions, the outdoor unit may fall and hurt people.
- Please take extra cautions on the supporting strength of the ground, liquid outlet treatment(treatment of the liquid flowing out of the outdoor unit in operation), and the passages of the pipe and wiring, when making the ground support.
- Do not use tube or pipe for liquid outlet in the Base pan. Use drainage instead for liquid outlet. The tube or pipe may freeze and the liquid may not be drained.

⚠ CAUTION

- Be sure to remove the MDF(wood support) of the bottom side of the outdoor unit Base Pan before fixing the bolt. It may cause the unstable state of the outdoor settlement, and may cause freezing of the heat exchanger resulting in abnormal operations.
- Be sure to remove the MDF(wood support) of the bottom side of the outdoor unit before welding. Not removing MDF causes hazard of fire during welding.



Pallet(Wood Support)
- Remove before Installation

4. Water Control

4.1 Water quality

Water quality should be complied with EN 98/83 EC Directives.

⚠ CAUTION

- If the product is installed at existing hydraulic water loop, it is important to clean hydraulic pipes to remove sludge and scale.
- Installing sludge strainer in the water loop is very important to prevent performance degrade.
- Chemical treatment to prevent rust should be performed by installer.
- It is strongly recommended to install an additional filter on the heating water circuit. Especially to remove metallic particles from the heating piping, it is advised to use a magnetic or cyclone filter, which can remove small particles. Small particles may damage the unit and will NOT be removed by the standard filter of the heat pump system.
- Water quality check should be implemented before completing the installation of system.
  Detailed guide can be found in the table as below.

Water contents	Value			
pH	7.5~9.0			
Conductivity	10~500 uS/cm			
TDS (Total dissolved solids)	8~400 ppm			
Alkalinity (HCO_3^-)	60~300 (mg/L)			
Total hardness	4 ~ 8.5 °dH			
	71.4 ~ 151.7 (mg/L)			
Iron (Fe)	≤ 0.2 (mg/L)			
Sulphate (SO_4^{2-})	≤ 100 (mg/L)			
Nitrite (NO_3^-)	≤ 100 (mg/L)			
Free chlorine (Cl_2)	≤ 1 (mg/L)			
Chlorides (Cl^-)	ppm		STS316	STS304
	pH7	15℃	3,000	180
		40℃	500	50
		60℃	200	30
		80℃	125	20
	pH9	15℃	18,000	700
		40℃	2,600	250
		60℃	1,000	170
		80℃	550	130

4. Water Control

4.2 Frost protection

In areas of the country where entering water temperatures drop below 0 °C, the water pipe must be protected by using an approved antifreeze solution. Consult your AWHP unit supplier for locally approved solutions in your area. Calculate the approximate volume of water in the system. And add six liters to this total volume to allow for the water contained in AWHP unit.

Antifreeze type	Antifreeze mixing ratio (by volume)					
	0°C	-5°C	-10°C	-15°C	-20°C	-25°C
Methanol	0%	6%	12%	16%	24%	30%
Ethylene glycol	0%	12%	20%	30%	-	-
Propylene glycol	0%	17%	25%	33%	-	-

If you use frost protection function, change DIP switch setting and input the temperature condition in Installation mode of remote controller. Refer to ‘CONFIGURATION > DIP Switch Setting > DIP Switch Information > Option Switch 3‘ and ‘INSTALLER SETTING > Antifreezing Temperature’.

⚠ CAUTION

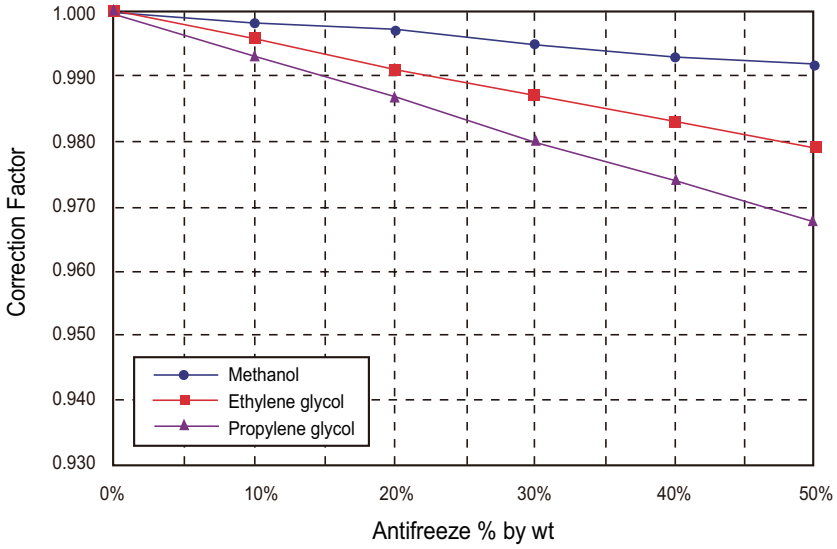
- Use only one of the above antifreeze.
- If a antifreeze is used, pressure drop and capability degradation of the system can be occurred.
- If one of antifreezes is used, corrosion can be occurred. So please add corrosion inhibitor.
- Please check the concentration of the antifreeze periodically to keep same concentration.
- When the antifreeze is used (for installation or operation), take care to ensure that antifreeze must not be touched.
- Ensure to respect all laws and norms of your country about antifreeze usage.

4. Water Control

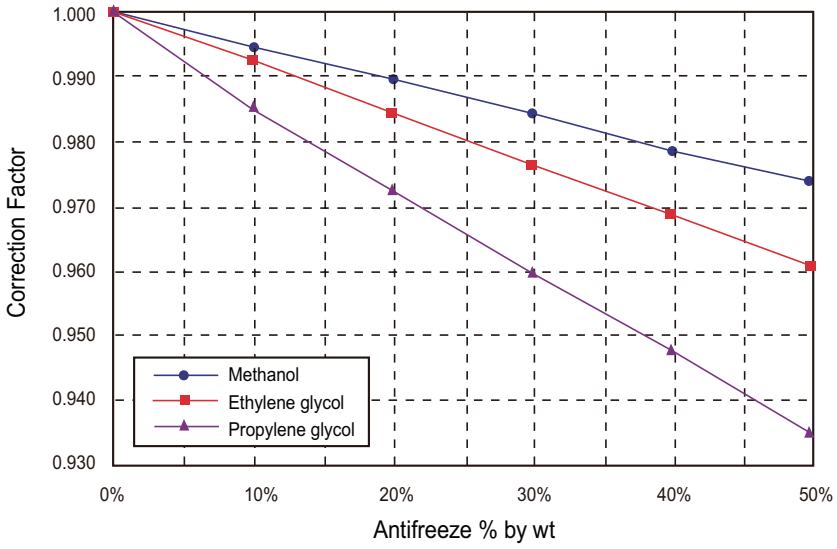
4.3 Capacity correction factor by antifreeze

Antifreeze Type	Item	Antifreeze % by wt				
		10%	20%	30%	40%	50%
Methanol	Cooling	0.998	0.997	0.995	0.993	0.992
	Heating	0.995	0.990	0.985	0.979	0.974
	Pressure Drop	1.023	1.057	1.091	1.122	1.160
Ethylene glycol	Cooling	0.996	0.991	0.987	0.983	0.979
	Heating	0.993	0.985	0.977	0.969	0.961
	Pressure Drop	1.024	1.068	1.124	1.188	1.263
Propylene glycol	Cooling	0.993	0.987	0.980	0.974	0.968
	Heating	0.966	0.973	0.960	0.948	0.935
	Pressure Drop	1.040	1.098	1.174	1.273	1.405

◆ **Correction factor of cooling capacity**



◆ **Correction factor of heating capacity**



5. Water Piping System

■ Water piping and water circuit connection

Followings should be considered before beginning water circuit connection

- Service space should be secured.
- Water pipes and connections should be cleaned using water.
- Space for installing external water pump should be provided if internal water pump capacity is not enough for installation field.
- Never connect electric power while proceeding water charging.

■ Water piping and water circuit connection

1. Definition of terms are as follow :
   - Water piping : Installing pipes where water is flowing inside the pipe.
   - Water circuit connecting : Making connection between the unit and water pipes or between pipes and pipes.
2. While installing water pipes, followings should be considered :
   - While inserting or putting water pipes, close the end of the pipe with pipe cap to avoid dust entering.
   - When cutting or welding the pipe, always be careful that inner section of the pipe should not be defective. For example, no weldments or no burrs are found inside the pipe.
   - The safety valve set to 10 bar should be installed on the discharge pipe of 3rd party water pump to protect the system.
   - The strainer should be installed on the return pipe to protect the plate heat exchanger. Magnetic filter is highly recommended.
   - Drain piping should be provided in case of water discharge by the operation of the safety valve. This situation can be happened when the internal pressure is over 10 bar and water inside the unit will be discharged to drain hose.
3. While connecting water pipes, followings should be considered :
   - Pipe fittings (e.g. L-shape elbow, T-shape tee, diameter reducer, etc) should be tightened strongly to be free from water leakage.
   - Connected sections should be leakage-proof treatment by applying teflon tape, rubber bushing, sealant solution, etc.
   - Appropriate tools and tooling methods should be applied to prevent mechanical breakage of the connections.
   - Operation time of flow control valve(e.g. 3way valve or 2way valve) should be less than 90 seconds.
   - Drain hose should be connected with drain piping.

■ Water condensation on the floor

If underfloor cooling is performed, it is very important to keep leaving water temperature higher than 16 ℃. Otherwise, dew condensation can occur on the floor.If floor is in humid environment, do not set leaving water temperature below 18 °C.

■ Water condensation on the radiator

While cooling operation, cold water may not flow to the radiator. If cold water enters to the radiator, dew generation on the surface of the radiator can be occurred. Use 2way-valve to block circuits from cooling operation.

■ Water condensation on the floor

While cooling operation, condensed dew can drop down to the bottom of the unit. The condensing water must be sufficiently drained from the unit and dissipated frost-free.



Air Solution

LG Electronics Inc, 128, Yeoui-daero,
Yeongdeungpo-gu, Seoul, Korea
(07336)

http://partner.lge.com

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