Heat Pump system design and operation for best performance, lowest running costs and best performance.

System design considerations

Ultimate Renewables Supplies aim to help the installer supply the most efficient heat pump systems with the highest comfort levels. To achieve this system design must be compatible with the thermodynamic properties of the equipment, the distribution system and the area to be heated. Heat pumps operate best at lower temperatures, the higher the desired temperature the lower the performance and comfort levels will be. To achieve the best performance and comfort levels the heat pump must replace lost heat within the property and not attempt to catch up for off periods. To achieve this, we recommend an open system design where in properties up to 150 square metres all emitters except the bedrooms should be left without control. The heat pump with the aid of it's internal temperature sensor will maintain the internal temperature of the property in the common areas at a level determined by the user on the screen. All units sold by ultimate renewables have this facility and most easily altered by the end user. In areas where there is high thermal gain it is recommended that multiple emitters be installed and at least half I left open zone and the remainder controlled buy a modulating thermostat or actuator. On off controls should never be used with a heat pump.

In larger buildings where thick screed under floor heating is installed it is recommended that partial control of the areas is practised where approximately 50% of the emitters or circuits are controlled by a modulating thermostat or actuator and the remainder be left open zone. This allows for some measure of control without significantly reducing the performance of the system. In all properties the maximum and minimum flow rates Mentioned below (Page 2 and 3)must be adhered to and confirmed at commissioning. If these flow rates are not confirmed the performance and efficiency of the heat pump will be significantly affected.

System control

In low thermal mass buildings with fast reacting heating systems, for instance new build, with radiators, it is recommended to use the internal thermostat to control the temperature this allows a fast reacting system that will produce the lowest operating costs with the highest performance levels.

In high thermal mass buildings with either thick under floor heating or solid walls and radiators it is recommended to use weather compensation starting at a low level and moving up until comfort levels are achieved. Additional modulating controls can be introduced however the more control added the lower the performance level will be and the higher the running costs will be.

The systems with the highest performance level and the lowest running costs have the least interference from external sources allowing the heat pump to modulate the system and itself producing the very best performance levels.

Installation of the heat pump.

Installing the Outdoor Unit

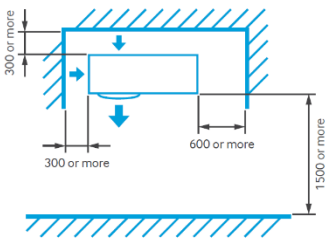
Position the outdoor unit so that the air flows into an open area, where there are no plants and animals. If the unit is to be installed within a mile of the sea you need to have the unit coated suing Blygold, ask us for details.
Install the outdoor unit on a flat, stable surface, it needs to be securely mounted at least 100mm off the ground on rubber feet.
The unit must be bolted down for security using 10mm bolts and Zebedee's.
The unit must have adequate drainage away from the unit; it can produce up to 6 L / hour of condensate. If you are installing the unit at height, you can install a drain pan under the unit but its best to let the unit drain into the ground.

Unit sizes

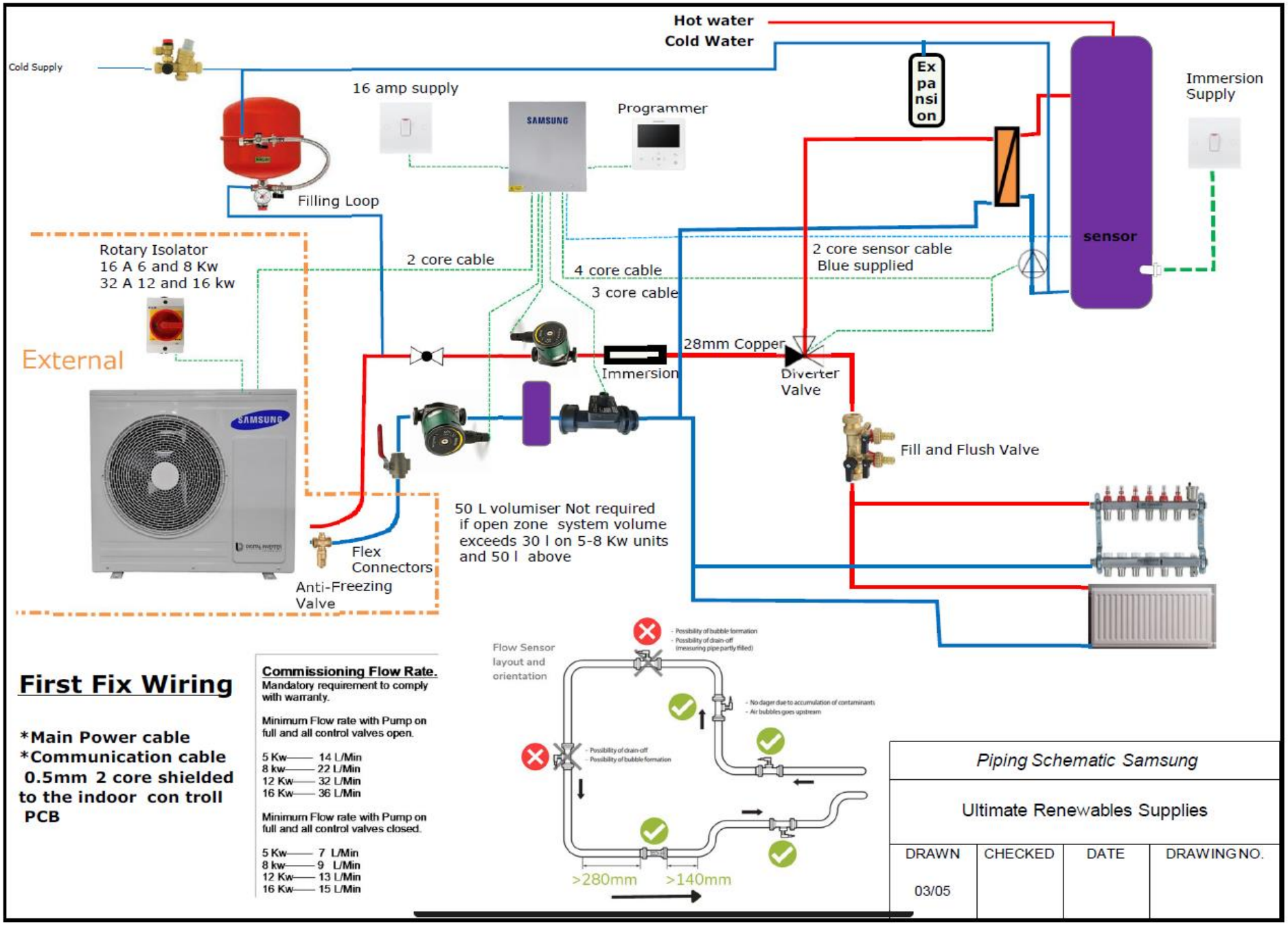
12 and 16 Kw units	- 1420mm (h) 940mm (w) 330mm (d) 103kg
8Kw unit	- 998mm (h) 940mm (w) 330mm (d) 75kg
5 Kw Unit	- 798mm (h) 880mm (w) 310mm (d) 59kg

The space around the unit is very important.

300mm to the left-hand side (facing the front of the unit),
600mm to the right of the unit,
300mm to the rear of the unit and 1500mm to the front of the unit.



Installation guidelines



First Fix Wiring

***Main Power cable**
***Communication cable 0.5mm 2 core shielded to the indoor con troll PCB**

Commissioning Flow Rate.
Mandatory requirement to comply with warranty.

Minimum Flow rate with Pump on full and all control valves open.

5 Kw—— 14 L/Min
8 kw—— 22 L/Min
12 Kw—— 32 L/Min
16 Kw—— 36 L/Min

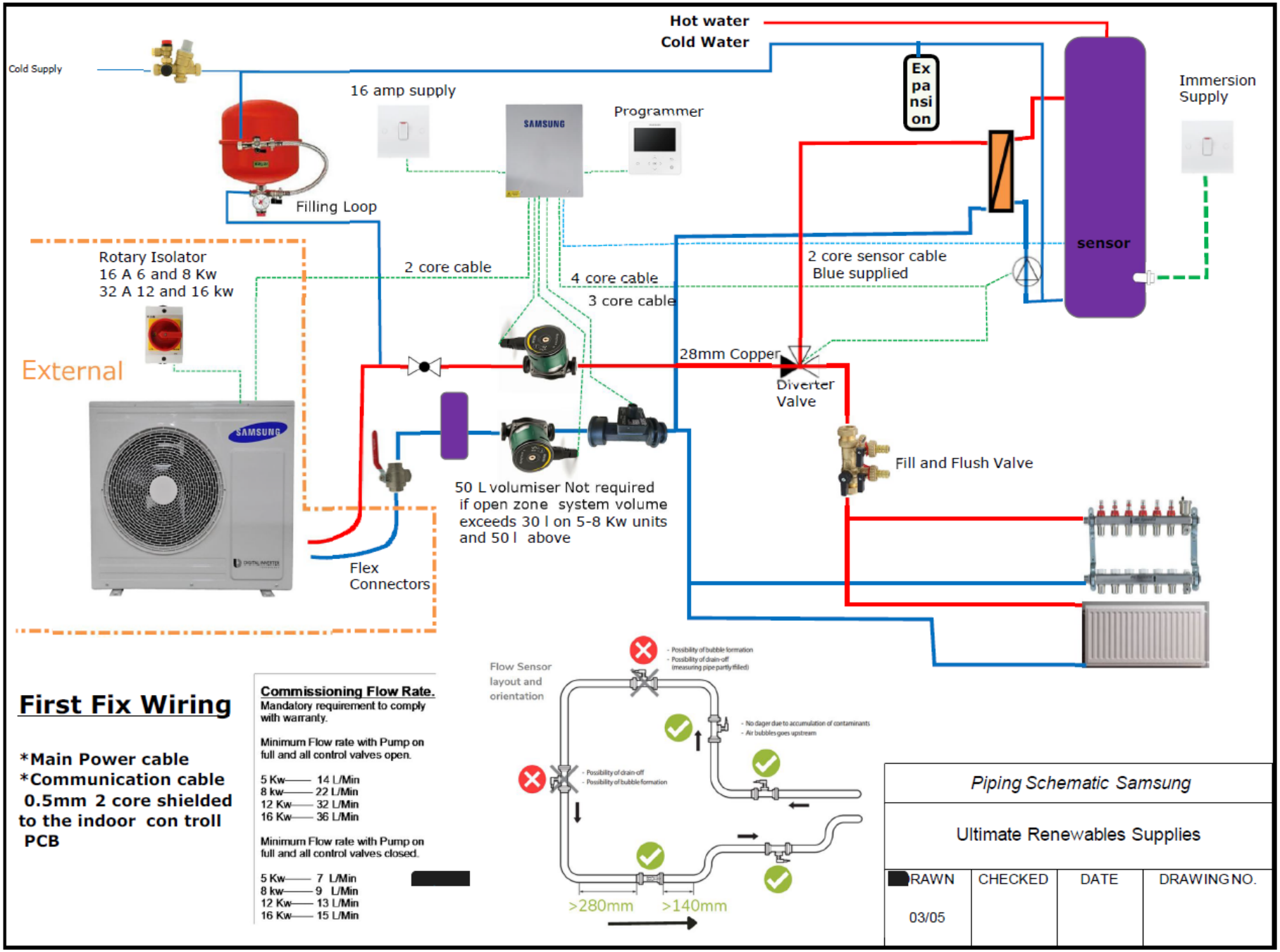
Minimum Flow rate with Pump on full and all control valves closed.

5 Kw—— 7 L/Min
8 kw—— 9 L/Min
12 Kw—— 13 L/Min
16 Kw—— 15 L/Min

Piping Schematic Samsung

Ultimate Renewables Supplies

DRAWN	CHECKED	DATE	DRAWING NO.
03/05			



First Fix Wiring

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Minimum Flow rate with Pump on full and all control valves closed.

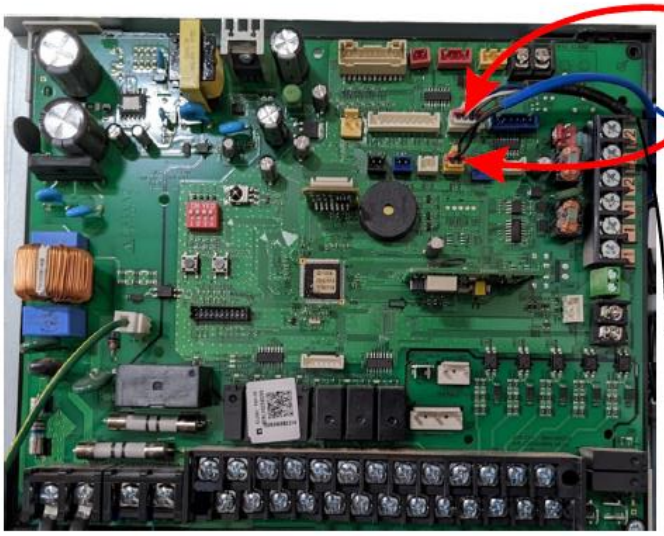
5 Kw—— 7 L/Min
8 kw—— 9 L/Min
12 Kw—— 13 L/Min
16 Kw—— 15 L/Min

Piping Schematic Samsung

Ultimate Renewables Supplies

DRAWN	CHECKED	DATE	DRAWING NO.
03/05			

Samsung Gen 6 Wiring

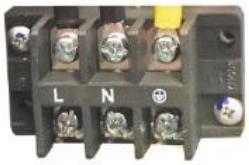


Flow sensor plug
Hot water sensor plug

16 Amp Supply

Domestic Hot Water Sensor Blue Cable supplied,

B1 B3 B5 B7 B9 B11 B13 B15 B17 B19 B21 B23 B25 B27
B2 B4 B6 B8 B10 B12 B14 B16 B18 B20 B22 B24 B26 B28



Power Supply 240v
5kW - 16A
8kW - 25A
12, 14, 16kW - 32A

N - B15
L - B20
SL-B17

2 port Diverting valve
AB to Heat Pump
A to Central Heating
B to Hot Water Cylinder

N - B15
Grey On
Valve

Hot Water Charge Pump

Controller

Commissioning Flow Rate.
Mandatory requirement to comply with warranty.

Minimum Flow rate with Pump on full and all control valves open.

5 Kw------ 12 L/Min
8 kw------ 16 L/Min
12 Kw----- 22 L/Min
16 Kw----- 28 L/Min

Minimum Flow rate with Pump on full and all control valves closed.

5 Kw------ 9 L/Min
8 kw------ 9 L/Min
12 Kw----- 14 L/Min
16 Kw----- 14 L/Min

N - B5
L - B8

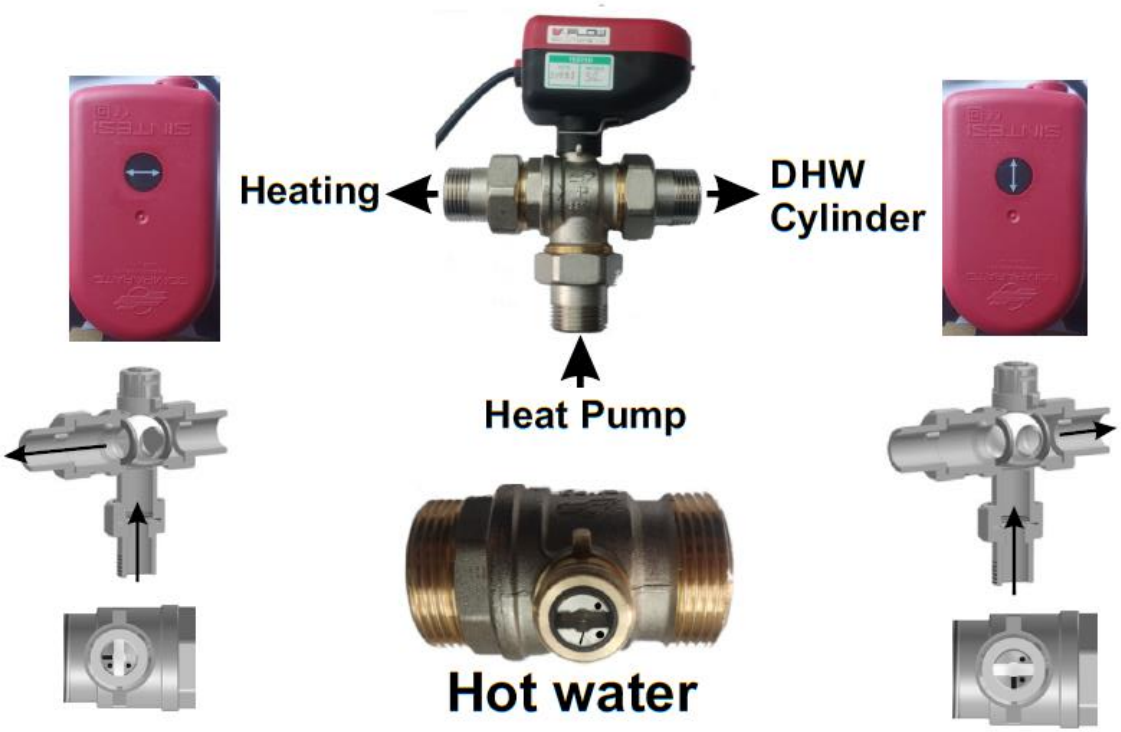
Primary Circulator

Flow Sensor

Switch Valve to 2 Port

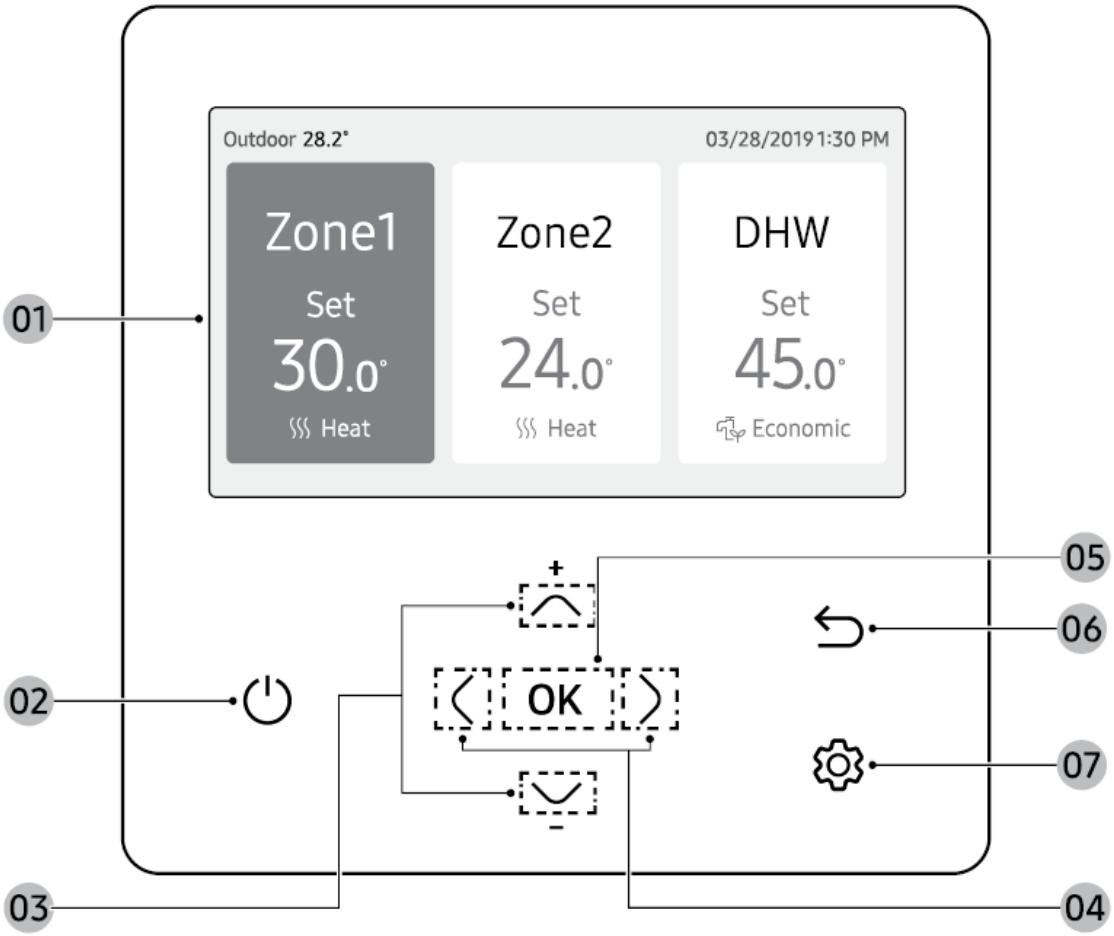
Immersion Timer
Field Supply

Installing the motorised valve



System programming

The controller



1	**Operation status display** - Displays the operation/function settings and statuses.
2	**Operation On/Off button (LED display)** - Turns the Air to Water Heat Pump power On/Off
3	**Up/Down button** - Moves between items vertically or changes the set temperature.
4	**Left/Right button** - Moves between items horizontally or changes the item value.
5	**OK button** - Saves your new settings.
6	**Save & Return button** - Saves your new settings and returns to the previous step.
7	**Option button** - Selects the detailed setting function.

Setting up the controller for the first time.

User Settijngs

How to set the Options

1 Press the ⚙ button.
2 Press the ∧ ∨ or 〈 〉 button to select Option, and then press the **OK** button.
3 See the following pages to select the desired menu.

Step 1	Step 2	Step 3	Step 4	Step 5	Description	Default
Button Lock						
Error List					-	-
Indoor Unit Information					-	-
User Mode	Language				Differs depending on the language	First value for the language pack
	Daylight Saving Time					
	Lock					
	Wired remote controller	LED			ON/OFF	ON
		Button Mute			ON/OFF	OFF
		Current Time	Date	Date Format	YYYY/MM/DD, DD/MM/YYYY, MM/DD/YYYY	DD/MM/YYYY
				Year/Month/ Day	2000 to 2099/1 to 12/1 to 31	2019.01.01
			Time	Time Format	12-Hour/24-hour	12-Hour
				Hour/ Minute/ AM/PM	0 to 12/0 to 60/AM.PM	PM 12 Hour 00 Minute
		Reset Remote Controller				
		Display Setting	Brightness		10 to 100%	100%
			Screen Saver	Timer	10 to 60 seconds	30sec
				Brightness	0, 10, 30, 50, 70%	30%
	Smart Reset					
	Reset All User modes					
	Service Time Check					

Current Time Setting (Example)

1 Press the ⚙ button.
2 Press the ∧ ∨ or 〈 〉 button to select **Option**, and then press the **OK** button.
3 Press the ∧ ∨ or 〈 〉 button to select **User mode**, and then press the **OK** button.
4 Press the ∧ ∨ or 〈 〉 button to select **Wired remote controller**, and then press the **OK** button.
5 Press the ∧ ∨ or 〈 〉 button to select **Current time**, and then press the **OK** button.
6 Press the ∧ ∨ or 〈 〉 button to select **Time**, and then press the **OK** button.
7 Press the ∧ ∨ or 〈 〉 button to select Time format, Hour, Minute, and AM/PM, and then press the **OK** button.

Installation/Service mode

Additional functions of the Wired Remote Controller

1 If you want to use the various additional functions for your Wired Remote Controller, press the ∧ and ∨ buttons at the same time for more than 3 seconds on the home screen.

- The password entry screen appears.

2 Enter the password, 0202, and then press the **OK** button.

- The settings screen for installation/service mode appears.

3 See the list of additional functions for the Wired Remote Controller on the next page, and then select the desired menu.

- Once you have entered the setting screen, the current setting appears.
- Refer to the chart for data setting.
- Using the ∧ / ∨ buttons, change the settings and press the > button to move to the next setting.
- Press the **OK** button to save the new setting.
- Press the ⮌ button to move to the Home screen.

NOTE

- While setting the data, you can press the ⮌ button to move to the Home screen after checking the saving status at a pop-up screen.

Step 1	Step 2	Step 3	Description	Default	Option (refer to end Of table)	Recommendation
Service Timer						
Quiet Mode Automatic Time						
Indoor Zone Option	Cool/Heat Selection		Cool & Heat/Heat only	Cool & Heat		
	Main/Sub Wired Remote			Main		
	Zone Selection			Zone 1		
	Standard Temperature		Water Outlet/Indoor	Water Outlet	A	Indoor
					B	Water Outlet
	Temperature Unit		Celsius(°C): 1°C/0.5°C/.01°C/	0.5°C		
	Temperature Sensor Selection		Wired Remote Controller/External Temperature Sensor	Wired Remote Controller	C	Wired Remote Controller
					D	External Temperature Sensor
	Room Temperature Calibration	Reference Temperature	-9 to 40°C			
		Calibration Value	-9 to 40°C	0°C		
	Indoor Zone Status Information	Central :	ON/OFF			
		Normal Power :	ON/OFF	-		
		Mode :	Heat/Cool/Auto	-		
		DHW Power :	ON/OFF	-		
		DHW Mode :	Economic/Standard/ Power/Forced	-		
		Water Pump :	ON/OFF	-		
		BUH :	ON/OFF	-		
		BSH :	ON/OFF	-		
		Flow sensor :	lpm	-		
		Inverter Pump :	0% ~ 100%	-		
		EEV Step :	0~2000Step	-		
		Thermostat 1 :	ON/OFF	-		
		Thermostat 2 :	ON/OFF	-		
		DHW Thermostat :	ON/OFF	-		

Options :

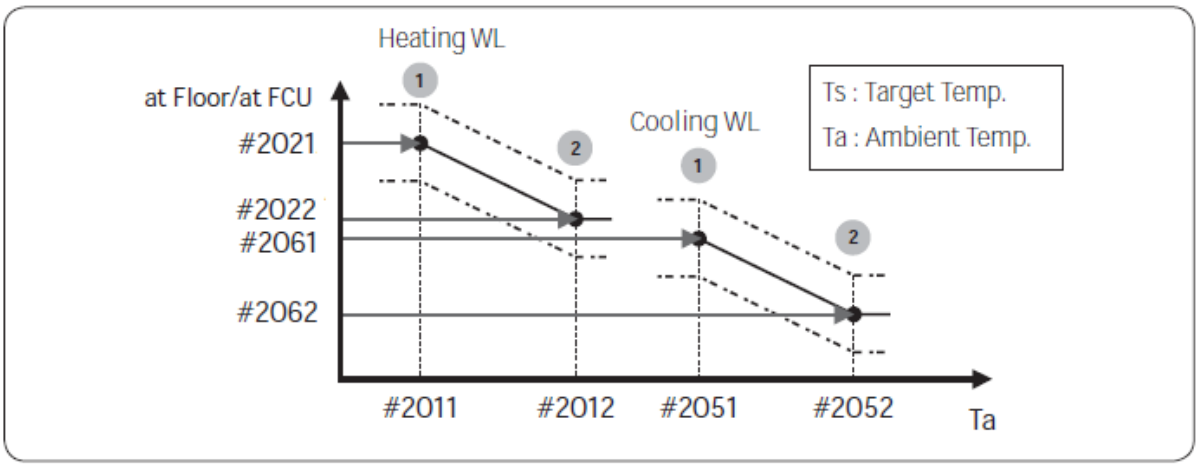
A: Low thermal mass, radiator installations (the controller is the thermostat)
B: High thermal mass, thick under floor or radiators and thick solid walls, Whether compensation.
C: The remote controller is the room thermostat.
D: The remote controller can be hidden away and the house temperature can be controlled by a remote sensor (Red sensor supplied with the unit).

Step 1	Step 2	Step 3	Description	Default	Option (refer to end Of table)	Recommendati
Connection Information	Number of Connection					
	View Master Indoor Unit					
	Master Indoor Zone Information	Serial No. :		-		
		Indoor Unit Eva In Temp. (Teva_in) :	Temperature	-		
		Indoor Unit Eva Out Temp.(Teva_ out) :	Temperature	-		
		Indoor Unit PHE IN(Tw1) :	Temperature	-		
		Indoor Unit PHE OUT(Tw2) :	Temperature	-		
		DHW Tank Temp. (Tt) :	Temperature	-		
		DHW Mode :	Economic/Standard/ Power/Forced	-		
Device Information						
Reset All Service Modes	Erase All Service mode data					
	Initialize a remote controller					
Power Master Reset 1)*						

Step 1	Step 2	Step 3	Description		Default °C	Option (refer to end Of table)	Recommendation °C
Field Setting Value	Remote Controller Setting Range Code 10**	Cooling	Water Out Temperature for Cooling	Max	25		25
				Min	16		18
			Room Temperature for cooling	Max	30		30
				Min	18		20
		Heating	Water Out Temperature for Heating	Max	65		55
				Min	25		20
			Room Temperature for Heating	Max	30		30
				Min	16		16
		DHW	DHW tank Temperature	Max	55		55
				Min	40		40

Step 1	Step 2	Step 3	Description		Default °C	Option (refer to end Of table)	Recommendation °C
Field Setting Value	Water Law Code (Weather Compensation) 20**	Heating	Outdoor Temperature for Heating Water Law	Max (Point 1)	-10	A	-3
				Min (Point 2)	15	A	18
				Max (Point 1)	-10	B	-3
				Min (Point 2)	15	B	18
			Water out Temperature for Heating	Max (Point 1)	40	A	50
				Min (Point 2)	25	A	22
				Max (Point 1)	40	B	40
				Min (Point 2)	25	B	22
			Heating Water Law Selection				1
		Cooling	Outdoor Temperature for Cooling Water Law	Max (Point 1)	25	A	25
				Min (Point 2)	40	A	40
				Max (Point 1)	25	B	25
				Min (Point 2)	40	B	40
			Water out Temperature for Cooling	Max (Point 1)	25	A	20
				Min (Point 2)	18	A	18
				Max (Point 1)	25	B	20
				Min (Point 2)	18	B	18

Water law or weather compensation Mus be set at startup.
Cooling is not recommended with radiators but will work with fan coils and under floor heating to supply some cooling effect.
A: Radiators
B: Under floor heating.



Step 1	Step 2	Step 3	Description		Default °C	Option (refer to end Of table)	Recom mendation
Field Setting Value Field Setting Value	Water Law Code (Weather Compensation) 20**	External Room Thermistor	Use with wired external thermistor only		0	A	4
						B	4
		Remote Controller Room Temp. Control	Use when wired remote controller is used to control the room temperature		4	A	4
						B	4
	A: New build, very low thermal mass with radiators.B: Higher thermal mass buildings with radiators of thin screed under floor heating						
	Domestic Hot Water Tank Code 30**	DHW	DHW mode activate	DHW mode	1		1
		Heat Pump	Max. Temp.		55		55
			Stop °C		0		0
			Start °C		5		5
			Min. Operating Time Min		5		
			Max. Operating Time Min		30		60
			Operation Interval Hour		3		0.5
		Booster Heater	On/Off		1		1
			Delay Time				
			Overshoot				
		Disinfection	On/Off		1		0 (OFF)
			Interval		Fri (5)	All (7)	Fri (5)
			Start Time		23		23
			Target Temp		70		55-60
			Duration		10		10
			Max time		8		8
		Forced DHW Operation					
		Solar Panel/ DHW Thermostat					
		3-way Valve			0(Room)	Option 1 (Tank)	0 (Room)
		Addition Function	Energy metering	Backup Heater 1step capacity	2		2
				Backup Heater 2step capacity	2		2
				Booster Heater capacity	3		3
	Heating Code 40**	Heating	Heat Pump	Heating / DHW priority			
				Low Outdoor Temp. for Heating Priority			
				Heating Off Temp .	35		19
			Backup Heater				
			Backup Boiler				
			Mixing valve				
			Inverter Pump	Application	1		1
				Target Δ T	5		5
				Control factor	2		2
		Addition Function	Zone control				

Step 1	**Step 2**	**Step 3**	**Description**		**Default °C**	**Option (refer to end Of table)**	**Recom mendation**
Field Setting Value Field Setting Value	Others Code 50**	Outing Mode					
		DHW Saving					
		Power Peak Control					
		Frequency Ratio Control					
		Additional Function	Not supported				

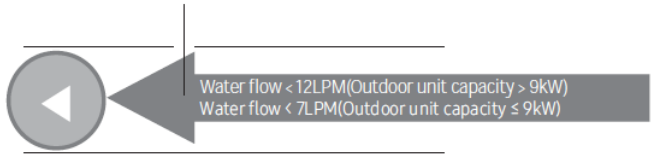
Troubleshooting

Common error codes.

653	Wired remote controller thermistor SHORT or OPEN
899	Zone1 Water Outlet Thermistor SHORT or OPEN
901	Water Inlet thermistor SHORT or OPEN
903	Water Outlet thermistor SHORT or OPEN
904	Water TANK thermistor SHORT or OPEN
601	Communication error between remote controller and the Hydro unit
604	Tracking error between remote controller and the Hydro unit
654	Memory (EEPROM) Read/Write Error(Wired remote controller data error)
911	Low flow rate error • in case of low flow rate in 30 sec during water pump signals is ON(Starting) • in case of low flow rate in 15 sec during water pump signals is ON(After starting)
912	Normal flow rate error • in case of normal flow rate in 10min during water pump signal is OFF

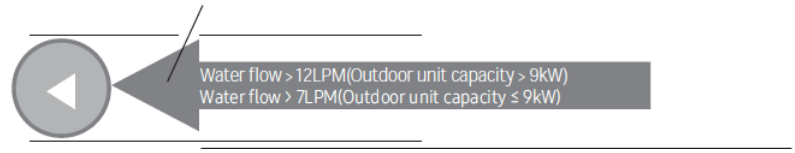
E911

- Water pump ON (Low flow rate) : NOT enough water flow



E912

- Water pump OFF (Normal flow rate)



Full error code listing

Display	Explanation	Error Source
101	Hydro Unit / Outdoor Unit communication connection error	Hydro Unit
120	Short- or open-circuit error of the room temperature sensor of the Zone 2 indoor unit (detected only when the room thermostat is used)	Hydro Unit
121	Short- or open-circuit error of the room temperature sensor of the Zone 1 indoor unit (detected only when the room thermostat is used)	Hydro Unit
122	EVA Inlet temp sensor SHORT or OPEN	Hydro Unit
123	EVA Outlet temp sensor SHORT or OPEN	Hydro Unit
162	EEPROM Error	Hydro Unit
198	Error of Terminal Block's Thermal Fuse(Open)	Hydro Unit
201	Hydro Unit / Outdoor Unit communication error(Matching error)	Hydro Unit/Ourdoor Unit
202	Hydro Unit / Outdoor Unit communication error(3 min)	Hydro Unit/Ourdoor Unit
203	Communication error between INVERTER and MAIN MICOM (4 min)	Outdoor Unit
221	Outdoor Unit air temperature sensor error	Outdoor Unit
231	Condenser temperature sensor error	Outdoor Unit
251	Discharge temperature sensor error	Outdoor Unit
320	OLP sensor error	Outdoor Unit
403	Detection of freezing (During cooling operation)	Outdoor Unit
404	Protection of Outdoor Unit when it is overload (during Safety Start, Normal operation state)	Outdoor Unit
407	Comp down due to high pressure	Outdoor Unit
416	Discharge of a compressor is overheated	Outdoor Unit
419	OUTDOOR UNIT EEV operation error	Outdoor Unit
425	Power source line missing error (only for 3-phase model)	Outdoor Unit
440	Heating operation blocked (outdoor temperature over35 °C)	Outdoor Unit
441	Cooling operation blocked (outdoor temperature under9 °C)	Outdoor Unit
458	OUTDOOR UNIT fan1 error	Outdoor Unit
461	[Inverter] Compressor startup error	Outdoor Unit
462	[Inverter] Total current error/PFC over current error	Outdoor Unit

463	OLP is overheated	Outdoor Unit
464	[Inverter] IPM over current error	Outdoor Unit
465	Compressor overload error	Outdoor Unit
466	DC LINK over/low voltage error	Outdoor Unit
467	[Inverter] Compressor rotation error	Outdoor Unit
468	[Inverter] Current sensor error	Outdoor Unit
469	[Inverter] DC LINK voltage sensor error	Outdoor Unit
470	Outdoor unit EEPROM Read/Write Error	Outdoor Unit
471	Outdoor unit EEPROM Read/Write Error(OTP error)	Outdoor Unit
474	IPM(IGBT Module) or PFCM temperature sensor Error	Outdoor Unit
475	Outdoor Unit Fan2 error	Outdoor Unit
484	PFC Overload Error	Outdoor Unit
485	Input current sensor error	Outdoor Unit
500	IPM is overheated	Outdoor Unit
554	Gas leak error	Outdoor Unit
590	Inverter EEPROM Checksum error	Outdoor Unit
601	Communication error between the Hydro Unit and wired remote controller	Hydro Unit
Display	**Explanation**	**Error Source**
604	Communication tracking error between the Hydro Unit and wired remote controller	Hydro Unit
653	Wired remote controller temp sensor SHORT or OPEN	Hydro Unit, Wired Remote
654	Memory(EEPROM) Read/Write Error(Wired remote Controller data error)	Hydro Unit, Wired Remote
899	Short- or open-circuit error of the Zone 1 water-out temperature sensor	Hydro Unit
900	Short- or open-circuit error of the Zone 2 water-out temperature sensor	Hydro Unit
901	Water inlet (PHE) temperature sensor error(open/short)	Hydro Unit
902	Water outlet (PHE) temperature sensor error(open/short)	Hydro Unit
903	Water outlet (backup heater) temperature sensor error	Hydro Unit
904	DHW tank temperature sensor error	Hydro Unit
906	Refrigerant gas inlet (PHE) temperature sensor (open/short)	Outdoor Unit
911	Low flow rate error • in case of low flow rate in 30 sec during water pump signals is ON(Starting)	Hydro Unit
912	Normal flow rate error • in case of normal flow rate in 10min during water pump signal is OFF	Hydro Unit
916	Mixing valve sensor error	Hydro Unit
919	Error that the set temperature for disinfection operation is not reached, or, after reaching, the temperature fails to continue for the requested time	Hydro Unit
920	FSV SD card data error	Hydro Unit

Maintenance of the unit

- In order to ensure optimal availability of the unit, a number of checks and inspections on the unit and the field wiring have to be carried out at regular intervals, preferably yearly.
  This maintenance should be carried out by SAMSUNG local technician. Besides keeping the remote controller clean by means of a soft damp cloth, no maintenance is required by the operator.

WARNING

- During longer periods of standstill, e.g. during summer with a heating only application, it is very important NOT TO SWITCH OFF THE POWER SUPPLY towards the unit.
- Switching off the power supply stops the automatic repetitive movement of the motor in order to prevent it from getting jammed.