

YANMAR



GAS POWERED
HEAT RECOVERY MODULAR CHILLER

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YANMAR

Yanmar has been a leader in the field of engine based technology since the company was founded in 1912, and over the years Yanmar has earned recognition as a world class innovator and global manufacturing company.

The company was founded on a vision of technological innovation to save energy and to help people live better lives, and with the world facing key issues such as energy supply, global warming and food supply, this vision has become more relevant than ever. This is reflected in the many fields such as agricultural machinery, marine engines and craft, construction machinery and energy systems where Yanmar system products contribute to human society around the globe. These products are backed up by the global Yanmar sales and aftersales support network which is dedicated to ensuring that Yanmar users get the maximum benefit from their Yanmar system and that they are glad they chose Yanmar.



Introduction

The Yanmar modular gas powered air-cooled chiller is available in both Heat Pump and Heat Recovery options.

The Heat Recovery option permits engine hot water production during cooling operation, during heating operation the engine heat is used to avoid heating performance loss and defrost cycles.

Benefits

- Energy Saving
- Low emissions
- Easy Installation
- Capacity Control
- Heat Recovery
- Modular Connection
- Reliability & Redundancy
- Peak Demand Reduction
- Low noise
- Air Cooled Package Unit
- Strong Heating Performance
- Precise LWT control

Application Uses

Suitable for most HVAC and industrial process applications

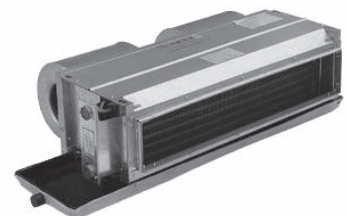
Air Handling Units



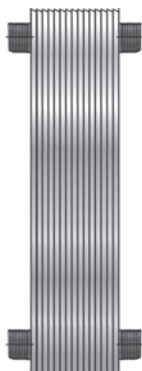
Chilled Beams



Fan Coil Units



Heat Exchanger



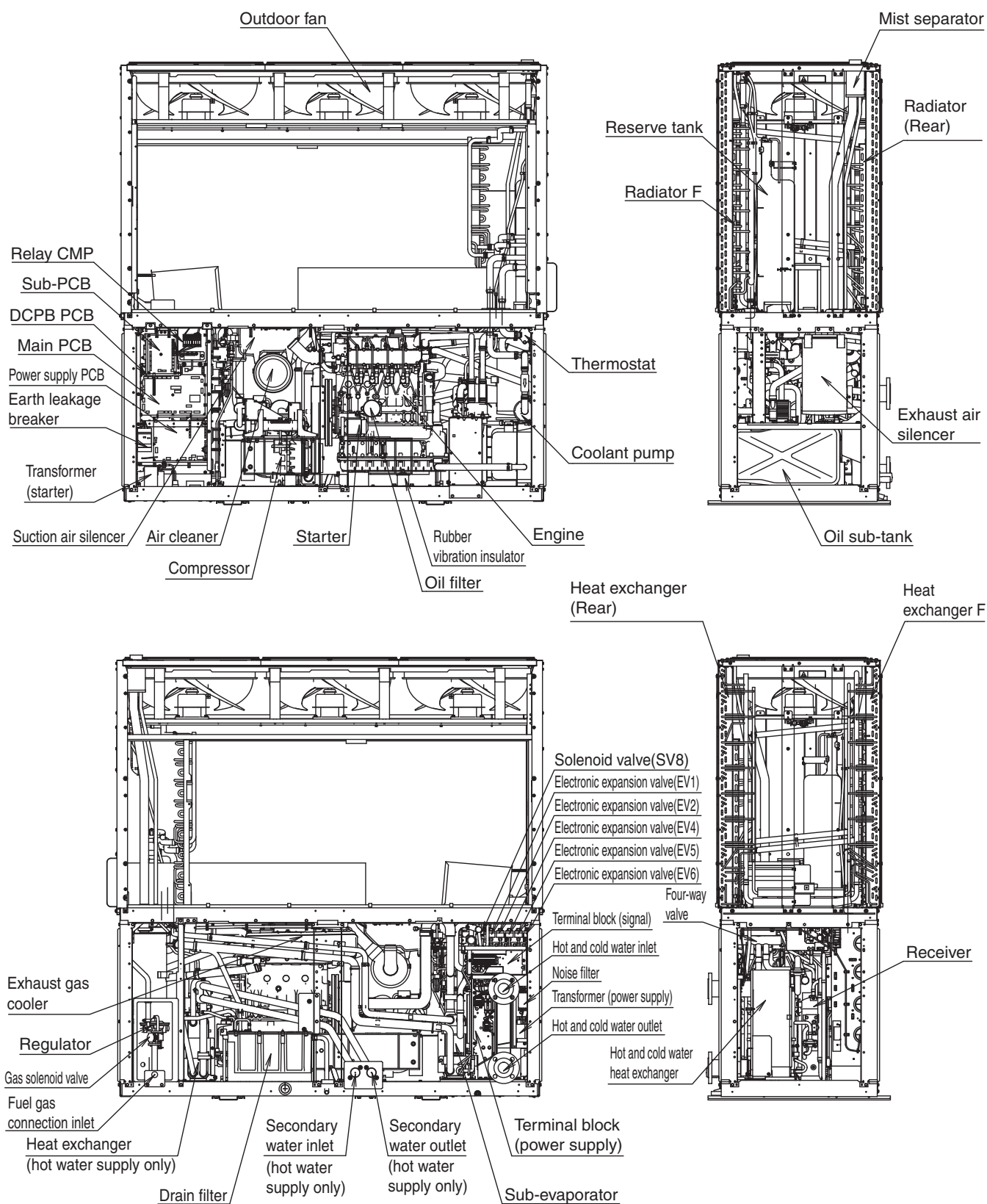
Radiators



Storage Tank



Structure & Components



Specification

Model				ACWP710J
Maximum No. of Chiller Modules connectable				8
Nominal capacity	Cooling		kW	71.0
	Heating		kW	80.0
Nominal water flow	Water flow rate		L/min (Range)	203 (152 ~ 230)
	Water pressure drop		kPa (Range)	10 (6~ 13)
	Minimum Water Volume (System)		L	600
	Hot water (at rated cooling capacity)	Quantity of exhaust heat recovery	Cooling	kW
Hot water Outlet temperature		°C	~ 70	
Hot water flow volume		L/min	43 (20~60)	
Water pressure drop		kPa	17 (4~33)	
Electrical characteristics	Power supply		V	Single Phase 240V / 50Hz
	Starting current		A	25
	Operating current	Cooling	A	7.60
		Heating	A	6.91
	Power consumption	Cooling	kW	1.66
		Heating	kW	1.51
	Power Factor	Cooling	%	91.0
		Heating	%	91.0
Control (Low level)	Outputs		Operation, Mode, HW, Alarm, Remote Monitoring	
	Inputs		Operation, Mode, Set Point, Pump Interlock, Pump Anomaly, Flow Switch	
Fuel consumption (HHV)	Natural gas	Cooling	kW / MJ	72.5 / 261
		Heating	kW / MJ	57 / 205
	Propane gas	Cooling	kW	70.8
		Heating	kW	55.7
	Butane gas	Cooling	kW	81.6
		Heating	kW	63.8
Usable Range	Cooling	LWT	°C	5 ~ 15
		Ambient DB	°C	0 ~ 46 (0~10 with Airguard)
	Heating	LWT	°C	35 ~ 55
		Ambient DB	°C	-10 ~ 26
Gas engine	Type		-	Vertical series water-cooled 4-cycle engine
	Model		-	4GPH88
	Number of cylinders		-	4
	Rated speed	Cooling	min-1	2300
		Heating	min-1	1850
	Starting method		-	AC/DC conversion system DC starter
Engine Lubricant	Recommended lubricant		-	Yanmar genuine GHP oil
	Lubricant quantity		L	58
Engine Cooling water	Recommended coolant		-	Yanmar genuine LLC(H209)
Engine Cooling-water pump	Type		-	DC Inverter Type
	Motor output		w	180
Compressor	Type		-	Scroll type
	Displacement	Compressor 1/2	cc/rev	120 / 120
		Cooling	min-1	4198 / 4198
	Rated speed (Compressor 1/2)	Heating	min-1	3377 / 3377
	Power transmission system		-	Ribbed Drive Belt
	Refrigerant Oil		-	Yanmar genuine refrigerating machine oil FVC68D
	Charge		L	5.3
	Heater	Compressor 1/2	w	40 / 40
Heat Exchanger	Air/Refrigerant heat exchanger		-	Louvre fin coil type
	Exhaust gas/Refrigerant heat exchanger		-	Brazed Plate type
	Engine radiator		-	Louvre fin coil type
	Water/Refrigerant heat exchanger		-	Brazed Plate type
Air blower	Type		-	Propeller fan / DC Inverter
	Number of units		-	3
	Rated air flow		m3/min	570
	Motor output		W	370x3
Operating sound	Sound pressure level @ 1m		dB(A)	62
	Sound power level @ 1m		dB(A)	90
Refrigerant	Type		-	R410A
	Charge		kg	11.8
Refrigerant control system			-	Electric expansion valve
Defrost system			-	Waste heat utilization from engine,Four-way valve
Water connection	Heat exchanger pipe	Inlet + Outlet	-	Rc2
		Position	-	Back
	Hot water recovery pipe	Inlet + Outlet	-	Rc1
		Position	-	Back
Gas connection	Inlet		-	R3/4
	Position		-	Back
Exhaust gas connection	Exhaust vent(outside dia.)		mm	60.5
	Exhaust vent position		-	Top
	Drain pipe(inside dia.)		mm	15
	Drain pipe position		-	Back
Dimensions	Height x Width x Depth		mm	2170 x 2100 x 800
Weight			kg	1050
Maintenance interval			Hr / Yr	10,000 / 5
External coating colour (munsel no.)			-	Yanmar warm ivory(5Y7.5/1)
Accessories			-	Flange, 50A Rc2 x2

(1) The following conditions are applied to the values of rated cooling and heating capacities, electrical properties, and fuel consumption

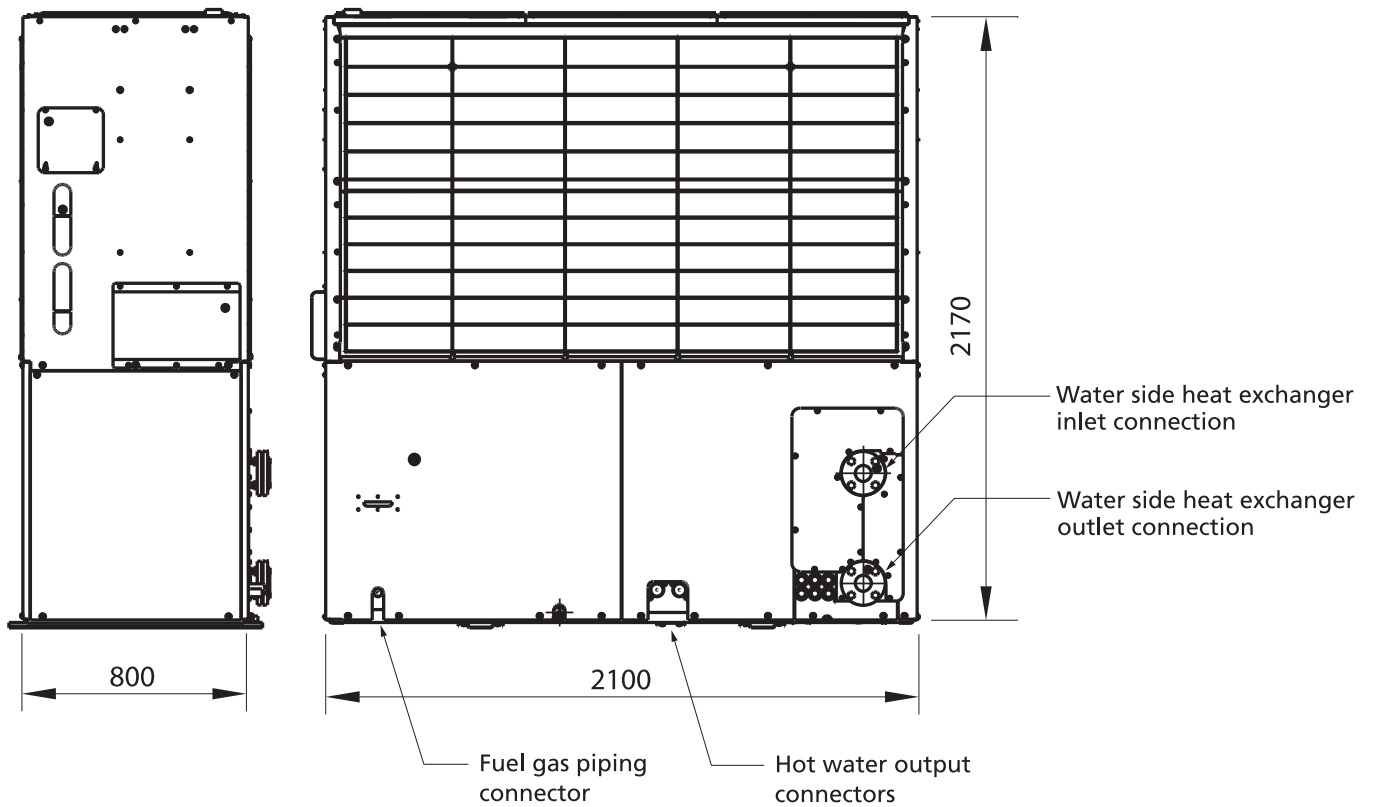
For cooling: Cold water inlet: 12 °C; Cold water outlet: 7 °C; Temperature of suction air to machine: 35°C D. B.; Standard flow rate: 203 L/min

For heating: Cold water inlet: 40 °C; Cold water outlet: 45 °C; Temperature of suction air to machine: 7°C D. B., 6 °C W.B.; Standard flow rate: 203 L/min

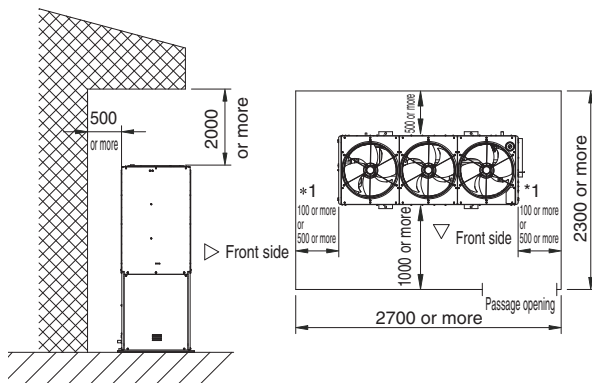
(2) The hot water supply (remaining heat) values are those during rated cooling operation and at standard flow rate of 43 L/min

(3) The dimensions values for piping/wiring connections are with protrusions excluded

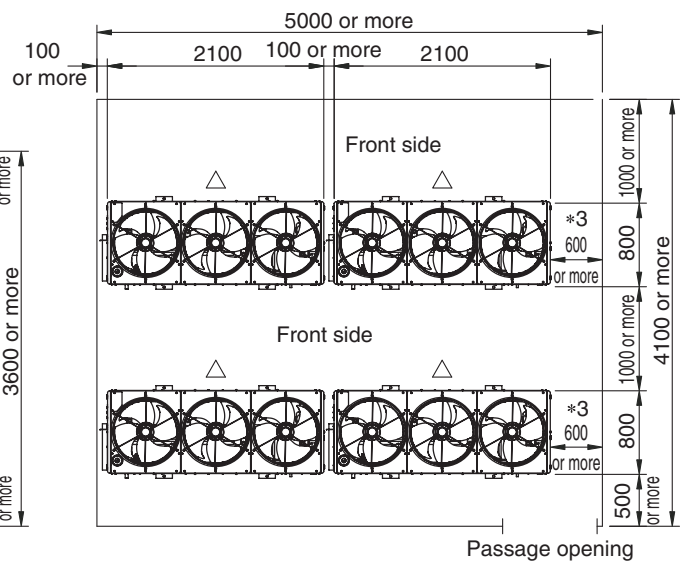
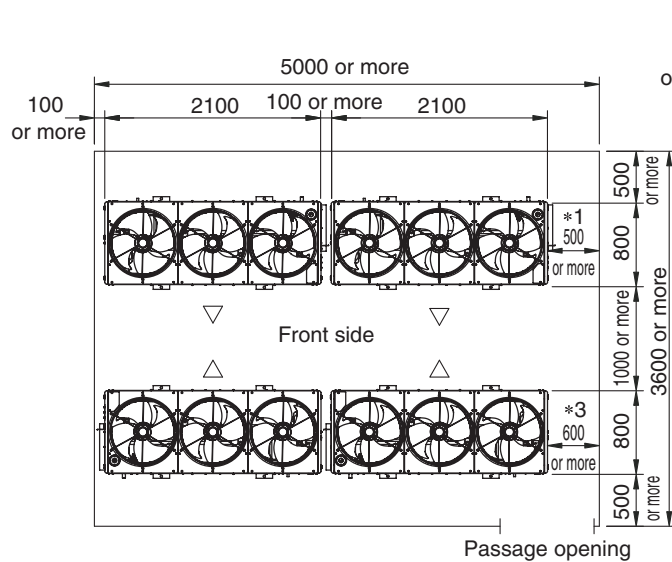
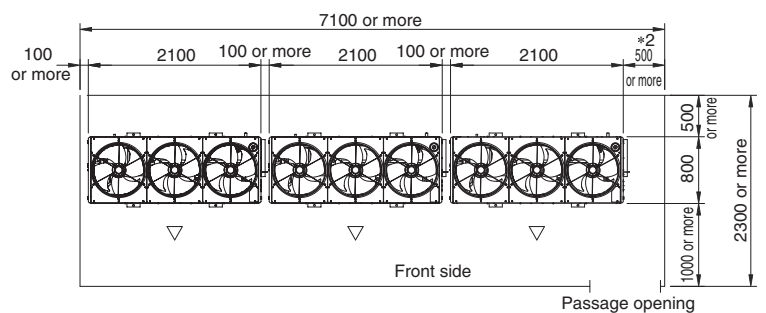
Dimensions

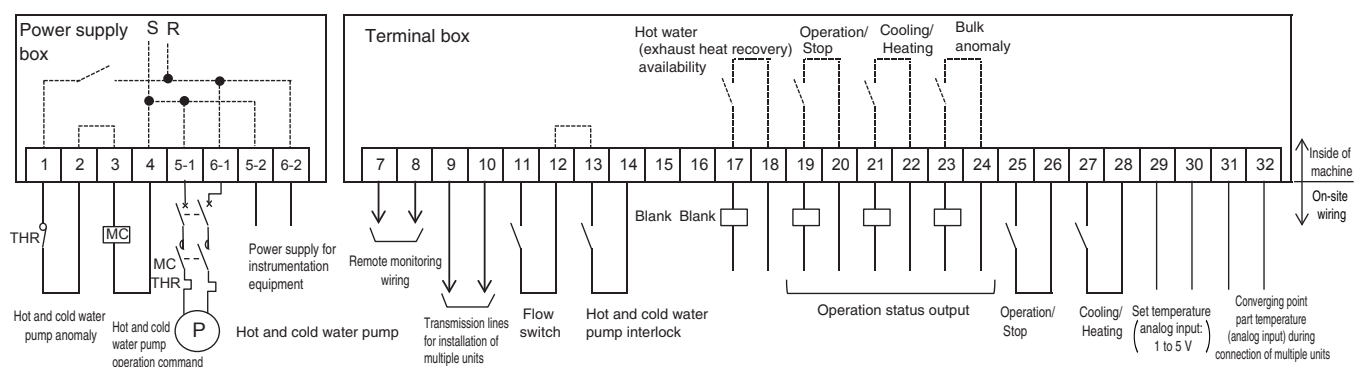


[Individual installation]



[Continuous installation]





Terminal No.	Name	Type	Signal type	Contact specifications	Application
1 - 2	Hot and cold water pump thermal relay	Input	Non-voltage contact Level signal	240 V 50Hz	Connect to the thermal relay contact of cold and hot water pump OFF: error Cold and hot water pump electromagnetic contactor ON/OFF
3 - 4	Hot and cold water pump operation command	Output	AC240 V motor rated	Total within 10A	Connect to the electromagnetic contactor coil terminal of the cold and hot water pump Cold and hot water pump electromagnetic contactor ON/OFF
5-1 - 6-1	Hot and cold water pump power supply	Output	AC240 V Pump Motorrated output 750 W or less		When using single phase power from outdoor units Do not use in case of three-phase pump. Or do not use when pump is driven by power on site.
5-2 - 6-2	Power supply for instrumentation equipment	Output	AC240 V		(Option) Converter CMP power
7 - 8	Remote monitoring wiring	-	Communication		0.75 - 1.25sq two core shielded cable
9 - 10	Wiring for control of multiple units	-	Communication		Max 8 units, MAX200m
11 - 12	Flow switch	Input	Non-voltage contact Level signal	12 VDC, 20 mA (minute electric current contact)	Flow switch input When the flow switch is OFF, the chiller unit will stop operating. * Flow switch optional settings available
13 - 14	Hot and cold water pump interlock	Input	Non-voltage contact Level signal	12 VDC, 20 mA (minute electric current contact)	ON: Pump run OFF: Pump stop When the run signal of cold and hot water pump is OFF, the chiller unit will stop operating.
15 - 16	Blank	-	-		
17 - 18	Hot water (exhaust heat recovery) availability	Output	Non-voltage a contact Level signal When waste heat is recoverable, contact ON will be output.	MAX 380 VAC/5 A, MAX 125 VDC/5 A/	When waste heat is recoverable, contact ON will be output. ON: Hot-water supply (remaining heat is used) available OFF: Hot-water supply (remaining heat is used) not available
19 - 20	Operation status signal	Output	Non-voltage a contact Level signal	MAX 380 VAC/5 A, MAX 125 VDC/5 A/	ON: running OFF: stopped
21 - 22	Mode signal	Output	Non-voltage a contact Level signal	MAX 380 VAC/5 A, MAX 125 VDC/5 A/	ON: when heating OFF: when cooling
23 - 24	Bulk anomaly signal	Output	Non-voltage a contact Level signal	MAX 380 VAC/5 A, MAX 125 VDC/5 A/	ON: when error occurs OFF: in normal * Refer to the details described later
25 - 26	Operation command	Input	Non-voltage contact Level signal	12 VDC, 20 mA (minute electric current contact)	ON: Run command OFF: Stop command Validated when LOCAL/REMOTE switch of the chiller unit is set to REMOTE.
27 - 28	Mode change	Input	Non-voltage contact Level signal	12 VDC, 20 mA (minute electric current contact)	ON: heating OFF: cooling Validated when LOCAL/REMOTE switch of the chiller unit is set to REMOTE.
29 - 30	Flow pipe set temperature signal	Input	Analog signal	DC1-5V	Cold/hot water supply setting temperature Analog signal input * Analog signal converter Optional settings available (converter CMP is required)
31 - 32	Flow pipe converging point temperature	Input	Analog signal	DC1-5V	(when multiple units are installed) Collection part temperature detection * Thermometric resistor signal transmitter Optional settings available (converter CMP is required)

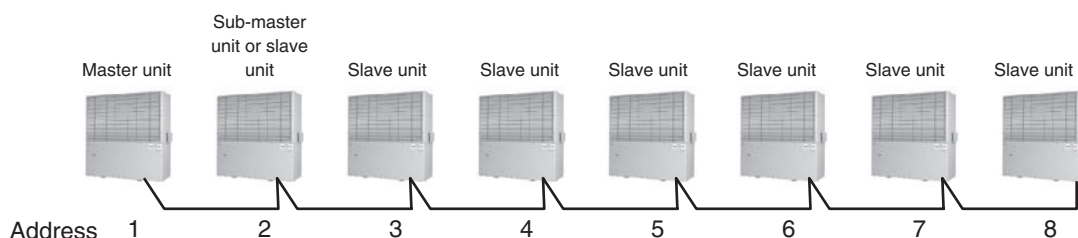
Control

The microprocessor controls the system operations, taking receipt of various inputs and outputs from the refrigerant system, engine and environment. The microprocessor provides refrigerant pressure control, compressor staging & sequencing, engine optimisation, diagnostic display and protection. The chiller can be controlled manually (Local) using the internal switches or via a DDC controller/ BMS (Remote).

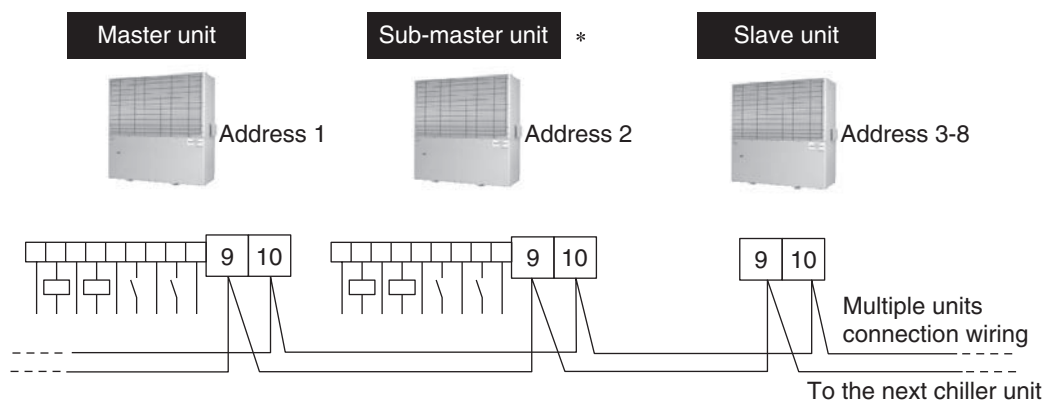
The set LWT (Leaving Water Temperature) for Cooling (5~15°C) and Heating (35~55°C) can be set through the outdoor PCB or adjusted by the DDC/ BMS. The LWT differential can be set for both Cooling and Heating operation at 0.5°C / 1.0°C / 2.0°C / 4.0°C. The LWT is maintained by regulating the engine rpms in line with the LWT, RWT and differential settings. Compressors are rotated in a lead lag format for even wear and staged in combination with the load and engine rpms. The chiller will automatically control the external pump for cooling and heating water and provide a signal output when engine HW recovery is available.

The multiple unit control system will sequentially start and stage each chiller to optimise efficiency. In multiple unit configurations, wiring connections are made to the master and sub master unit only in combination with a common LWT sensor.

Multiple units control

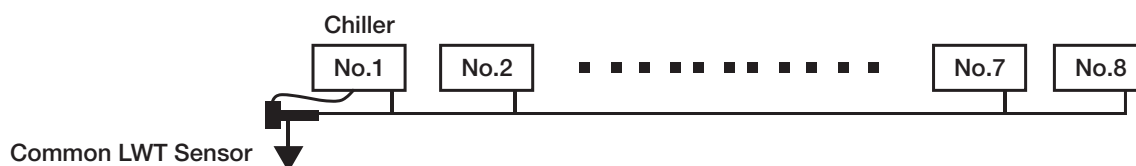


With sub-master unit

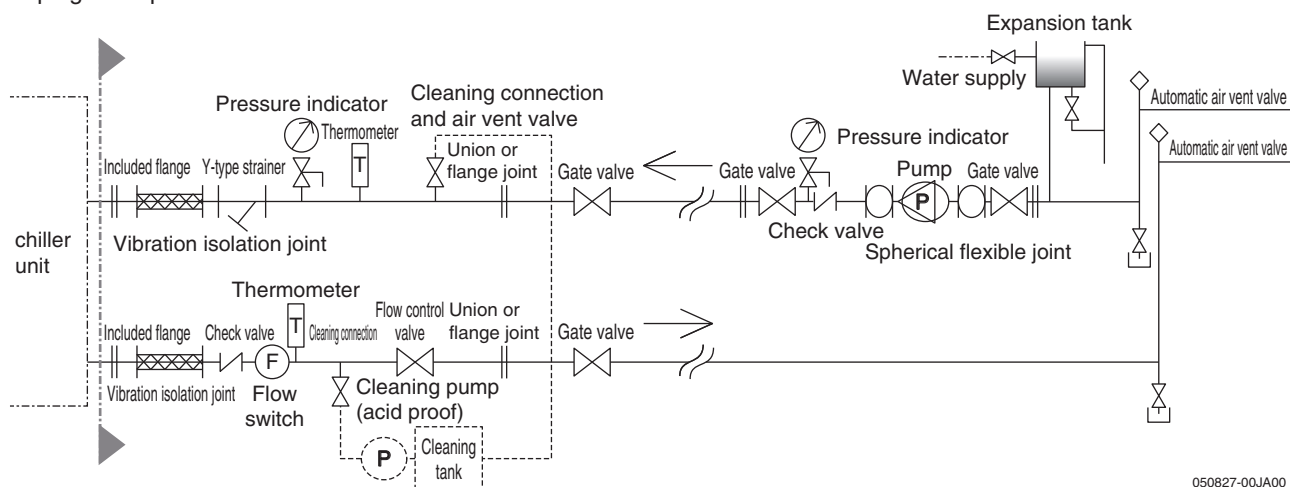


Sub-master unit: This unit will be a substitute for the master unit during maintenance. It usually operates as a slave unit.

When multiple units are combined, install a common LWT sensor on the field piping and connect to the master unit input terminal

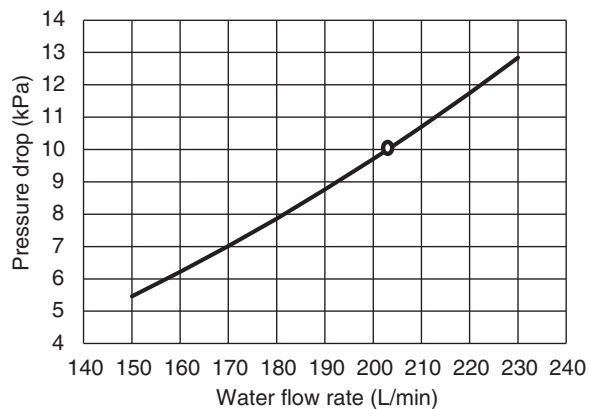


● Piping Example



- **Included flange specification** : Rc2 (outlet, inlet pipe), tightening torque: $135 \pm 15\%$ (N·m)
- **Electrolytic corrosion** : When using dissimilar metal, piping may suffer from corrosion or pitting corrosion due to electrolytic corrosion.
- **Vibration isolation joint** : Install vibration isolation joint adjacent to equipment connecting port. (flange material: SUS)
- **Strainer** : Make sure to install SUS40 mesh strainer to the equipment inlet side to prevent foreign matter from entering into heat exchanger.

Head loss

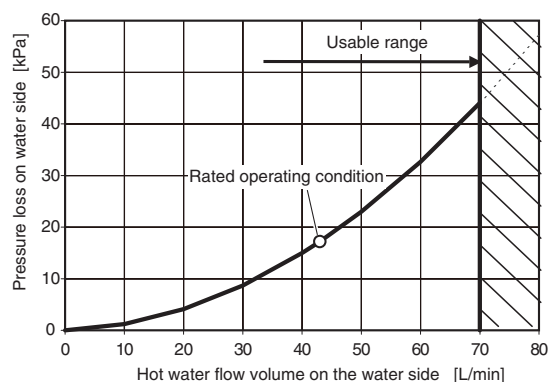


Flow rate (L/min)	150	160	170	180	190	200	203	210	220	230
Pressure drop (kPa)	5	6	7	8	9	10	10	11	12	13

*Rated operating condition

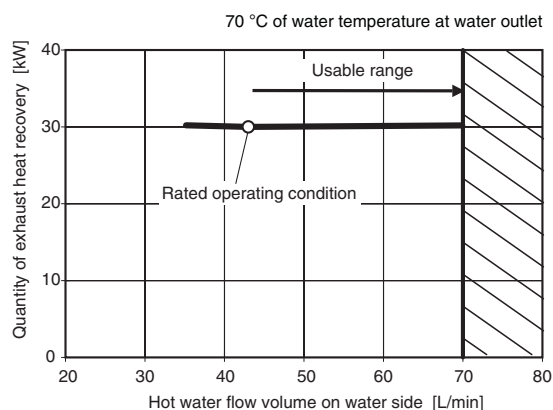
Hot Water (Heat Recovery)

1) Pressure loss on water side



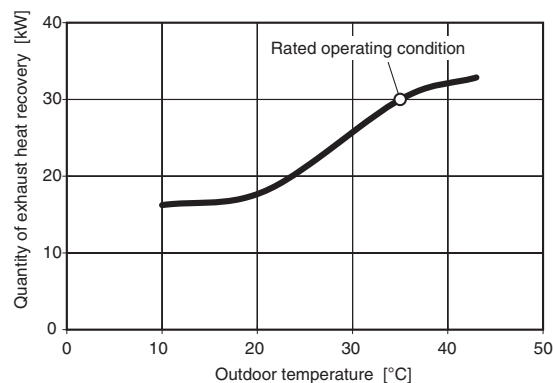
2) Exhaust heat recovery vs hot water flow

35 °C of Outdoor temperature,
Cold water inlet 12°C, Outlet 7°C,
Cold water flow rate 203 L/min



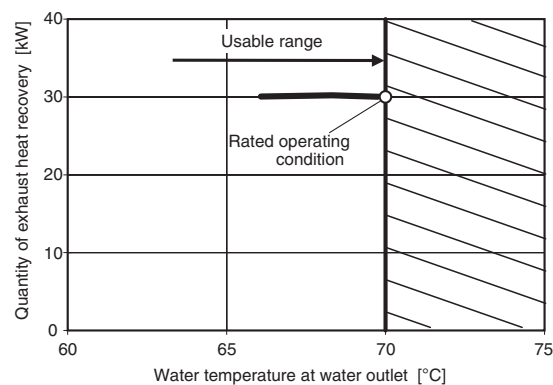
3) Exhaust heat recovery vs outdoor temperature

Cold water inlet 12°C, Outlet 7°C, Cold water flow rate 203 L/min
43 L/min of hot water flow volume on water side
70 °C of water temperature at water outlet



4) Maximum water temperature at water outlet

35 °C of Outdoor temperature,
Cold water inlet 12°C, Outlet 7°C,
Cold water flow rate 203 L/min
43 L/min of hot water flow volume on water side



Capacity Tables

Cooling Capacity Table

Outdoor Temperature		Leaving water temp. [degC]									
		5		7		10		13		15	
DB	WB	Capacity	Gas consump.	Capacity	Gas consump.	Capacity	Gas consump.	Capacity	Gas consump.	Capacity	Gas consump.
degC	degC	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW
0	-	74.6	60.6	79.4	62.2	85.4	62.9	90.7	63.4	93.5	63.6
5	-	74.6	60.6	79.4	62.2	85.4	62.9	90.7	63.4	93.5	63.6
10	-	74.6	60.6	79.4	62.2	85.4	62.9	90.7	63.4	93.5	63.6
15	-	74.6	60.6	79.4	62.2	85.4	62.9	90.7	63.4	93.5	63.6
20	-	74.6	60.6	79.4	62.2	85.4	62.9	90.7	63.4	93.5	63.6
25	-	74.6	60.6	79.4	62.2	85.4	62.9	90.7	63.4	93.5	63.6
30	-	70.6	64.6	75.1	66.3	80.8	67.1	85.8	67.6	88.5	67.9
35	-	66.7	70.6	71.0	72.5	76.3	73.4	81.0	74.0	83.6	74.2
40	-	62.4	76.7	66.4	78.7	71.4	79.7	75.8	80.3	78.2	80.6

Heating Capacity Table

Outdoor Temperature		Leaving water temp. [degC]									
		35		40		45		50		55	
DB	WB	Capacity	Gas consump.	Capacity	Gas consump.	Capacity	Gas consump.	Capacity	Gas consump.	Capacity	Gas consump.
degC	degC	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW
-10	-10.5	66.1	68.8	65.5	71.3	64.9	73.7	-	-	-	-
-7	-7.6	72.3	70.6	71.6	73.1	70.9	75.6	-	-	-	-
2	1.2	87.9	72.1	87.1	74.6	86.3	77.2	60.5	56.4	-	-
7	6	72.3	53.2	71.7	55.1	71.0	57.0	63.3	53.5	55.6	50.1
10	8.8	75.8	52.5	75.1	54.3	74.4	56.2	66.4	52.8	58.3	49.4
15	13.7	81.7	51.2	80.9	53.0	80.2	54.8	69.4	50.7	58.5	46.6
20	15	87.5	50.0	86.7	51.7	85.9	53.5	72.4	48.6	58.8	43.8

Cooling Capacity @ Part Load (100/75/50/25)

Outdoor Temperature				Leaving water temp. [degC]											
DB	WB			5				10				15			
degC	degC	Item		100	75	50	25	100	75	50	25	100	75	50	25
0	--	Capacity	kW	74.6	56.0	37.3	18.7	85.4	64.1	42.7	21.4	93.5	70.1	46.8	23.4
		Gas	kW	60.6	42.5	23.7	13.5	62.9	44.2	24.6	14	63.6	44.6	24.9	14.2
5	--	Capacity	kW	74.6	56.0	37.3	18.7	85.4	64.1	42.7	21.4	93.5	70.1	46.8	23.4
		Gas	kW	60.6	42.5	23.7	13.5	62.9	44.2	24.6	14	63.6	44.6	24.9	14.2
10	--	Capacity	kW	74.6	56.0	37.3	18.7	85.4	64.1	42.7	21.4	93.5	70.1	46.8	23.4
		Gas	kW	60.6	42.5	23.7	13.5	62.9	44.2	24.6	14	63.6	44.6	24.9	14.2
15	--	Capacity	kW	74.6	56.0	37.3	18.7	85.4	64.1	42.7	21.4	93.5	70.1	46.8	23.4
		Gas	kW	60.6	42.5	23.7	13.5	62.9	44.2	24.6	14	63.6	44.6	24.9	14.2
20	--	Capacity	kW	74.6	56.0	37.3	18.7	85.4	64.1	42.7	21.4	93.5	70.1	46.8	23.4
		Gas	kW	60.6	42.5	23.7	13.5	62.9	44.2	24.6	14	63.6	44.6	24.9	14.2
25	--	Capacity	kW	74.6	56.0	37.3	18.7	85.4	64.1	42.7	21.4	93.5	70.1	46.8	23.4
		Gas	kW	60.6	42.5	23.7	13.5	62.9	44.2	24.6	14	63.6	44.6	24.9	14.2
30	--	Capacity	kW	70.6	53.0	35.3	17.7	80.8	60.6	40.4	20.2	88.5	66.4	44.3	22.1
		Gas	kW	64.6	45.3	25.3	14.4	67.1	47.1	26.3	14.9	67.9	47.7	26.6	15.1
35	--	Capacity	kW	66.7	50.0	33.4	16.7	76.3	57.2	38.2	19.1	83.6	62.7	41.8	20.9
		Gas	kW	68.6	48.2	26.9	15.3	71.3	50.1	27.9	15.9	72.1	50.6	28.2	16
40	--	Capacity	kW	62.4	46.8	31.2	15.6	71.4	53.6	35.7	17.9	78.2	58.7	39.1	19.6
		Gas	kW	72.6	51	28.4	16.2	75.5	53	29.6	16.8	76.3	53.6	29.9	17

Heating Capacity @ Part Load (100/75/50/25)

Outdoor Temperature				Leaving water temp. [degC]											
DB	WB			35				45				55			
degC	degC	Item		100	75	50	25	100	75	50	25	100	75	50	25
-10	-10.5	Capacity	kW	66.1	49.6	33.1	16.5	64.9	48.7	32.5	16.2	-	-	-	-
		Gas	kW	68.8	48.3	27	15.3	73.7	51.7	28.9	16.4	-	-	-	-
-7	-7.6	Capacity	kW	72.3	54.2	36.2	18.1	70.9	53.2	35.5	17.7	-	-	-	-
		Gas	kW	70.6	49.6	27.7	15.7	75.6	53.1	29.6	16.8	-	-	-	-
2	1.2	Capacity	kW	87.9	65.9	44.0	22.0	86.3	64.7	43.2	21.6	-	-	-	-
		Gas	kW	72.1	50.6	28.2	16	77.2	54.2	30.2	17.2	-	-	-	-
7	6	Capacity	kW	72.3	54.2	36.2	18.1	71.0	53.3	35.5	17.8	55.6	52.8	27.8	13.9
		Gas	kW	53.2	37.3	20.8	11.8	57.0	40	22.3	12.7	50.1	47.6	19.6	11.1
10	8.8	Capacity	kW	75.8	56.9	37.9	19.0	74.4	55.8	37.2	18.6	58.3	55.4	29.2	14.6
		Gas	kW	52.5	36.9	20.6	11.7	56.2	39.5	22	12.5	49.4	46.9	19.4	11
15	13.7	Capacity	kW	81.7	61.3	40.9	20.4	80.2	60.2	40.1	20.1	58.5	55.6	29.3	14.6
		Gas	kW	51.2	35.9	20.1	11.4	54.8	38.5	21.5	12.2	46.6	44.3	18.3	10.4
20	15	Capacity	kW	87.5	65.6	43.8	21.9	85.9	64.4	43.0	21.5	58.8	55.9	29.4	14.7
		Gas	kW	50.0	35.1	19.6	11.1	53.5	37.6	21	11.9	43.8	41.6	17.2	9.7

Yanmar Energy Systems Products.



Micro Cogeneration



Gas Powered VRF



Gas Generators

GasAircon Australia

Phone 1800 052 464

www.gasaircon.com.au