

TECHNICAL DATA

Technical data

Model Y-HB154 V4			154
Nominal cooling capacity °F/(°C) *	A95/W45 (A35/W7)	Btu (kW)	154,000 (45.0)
Nominal heating capacity °F/(°C) *	A45/W95 (A7/W35)	Btu (kW)	177,000 (51.7)
Temperature difference *	Cooling / heating	°F (K)	9(5) / 18(10)
Rated volume flow	Cooling, at 5 K spread	GPM (m³/h)	33.9 (7.7)
	Heating, at 5 K spread	GPM (m³/h)	39.2 (8.9)
Internal pressure loss	VJ4, cooling	psi (kPa)	2.0 (14)
	VJ4, heating	psi (kPa)	2.7 (19)
External pressure increase	VPJ4, heating	psi (kPa)	11.6 (80)
Power consumption	VPJ4	kW	0.7
	VJ4	kW	0.2
Power supply	V / Ph / Hz		208-230 / 1 / 60
Fuse ***	A		10
Control range	-		infinitely variable, 20-100 %
Water outlet temperature ****	Cooling	°F (°C)	+43 to 64 (+6 to +18)
	Heating	°F (°C)	+81 to 122 (+27 to +50)
Environmental conditions		°F (°C) / % r.h.	+41 to 95 (+5 to +35) / < 90
Safety valve response pressure		psi (bar)	44 (3)
Max. water-side operating overpressure		psi (bar)	87 (6)
Max. refrigerant-side operating overpressure		psi (bar)	611 (42)
Connections, water-side		Inch (mm)	1-1/2 (38.1)
Refrigerant connections	Liquid pipe / suction pipe	Inch (mm)	3/4(19) / 1-3/8 (35)
Dimensions	H x W x D	Inch (mm)	36.6 x 20.7 x 30.9 (930 x 525 x 785)
Weight		Lbs (kg)	364 (165)
Sound pressure level		dB(A)	35

* Capacities are calculated for a standard indoor/outdoor unit combination with a 25ft (7.5 m) piping length and 0 ft level difference. Please observe correction tables if specifications are different. Capacity was measured in accordance with YANMAR standard under EN16905 condition.

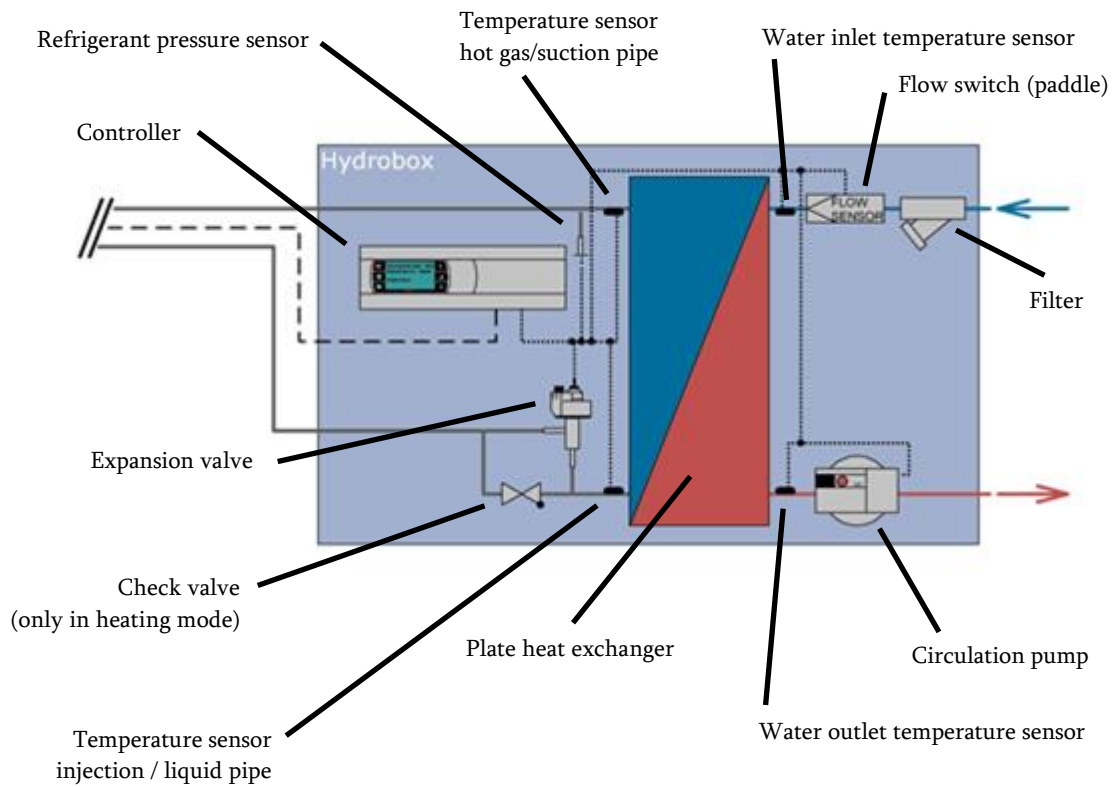
** The temperature differences can be adjusted between 9-18 °F (5-10 K).

*** These are recommendations. The dimensioning and implementation must be carried out in accordance with local regulations.

**** It must be ensured that the recommended buffer temperatures are at least 46 – 50 °F ((8-10 °C) (cooling) or at most 115°F-118 (46-48 °C) (heating).

CONSTRUCTION

Schematic diagram

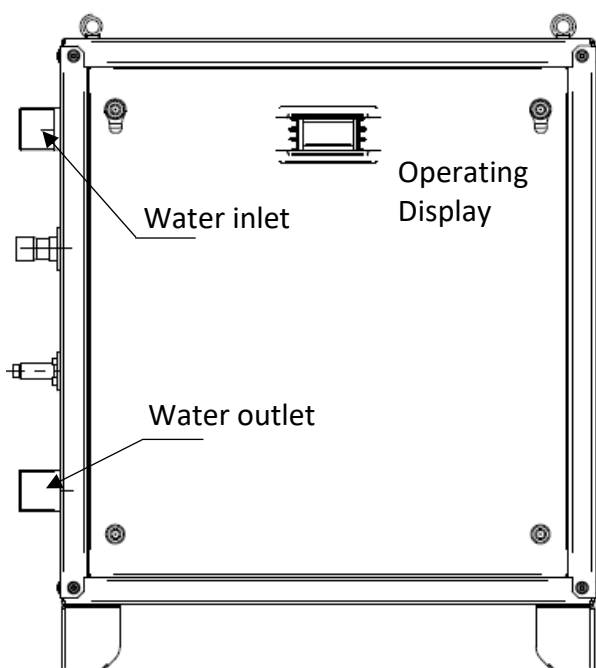


Note on Schrader connection: no service port!

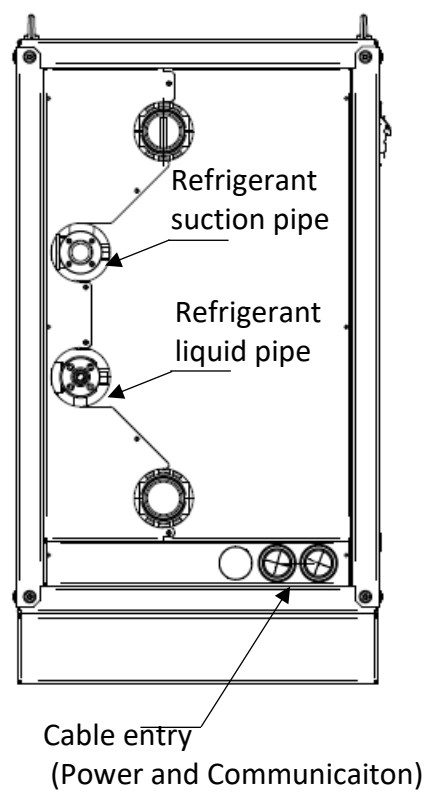
The Schrader port is only conceived for the production process and must not be used for service purposes.

Dimensions

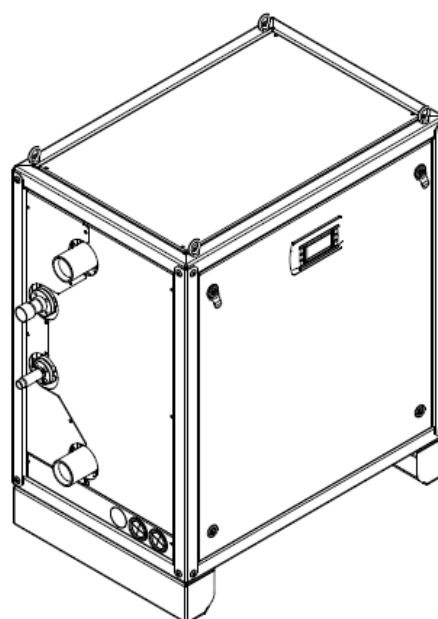
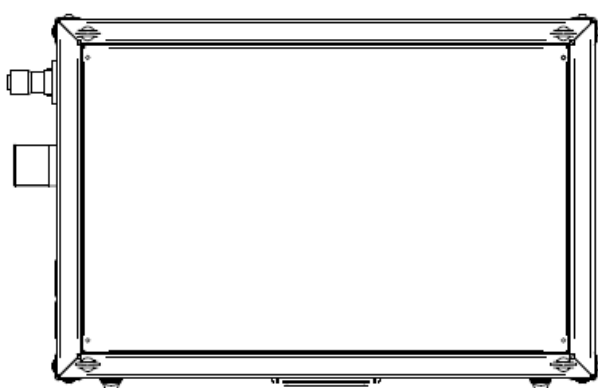
Front

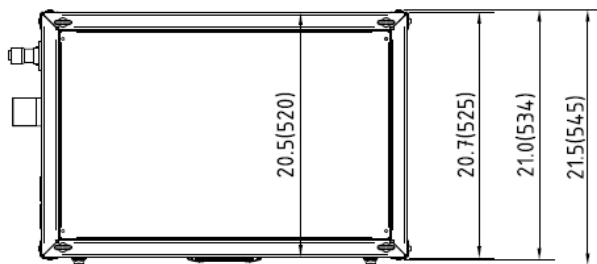
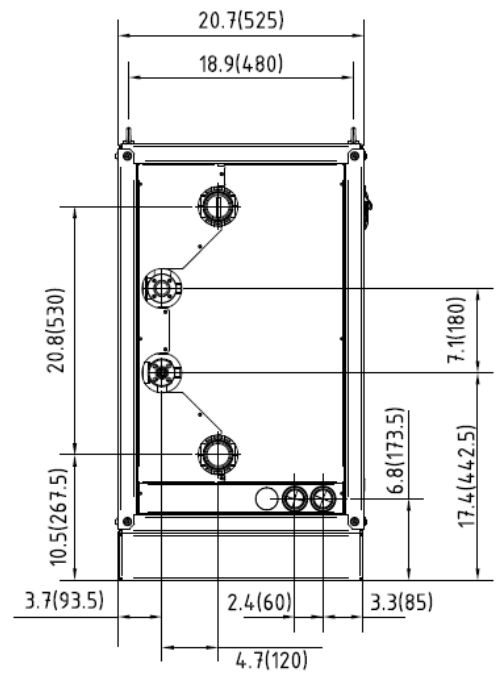
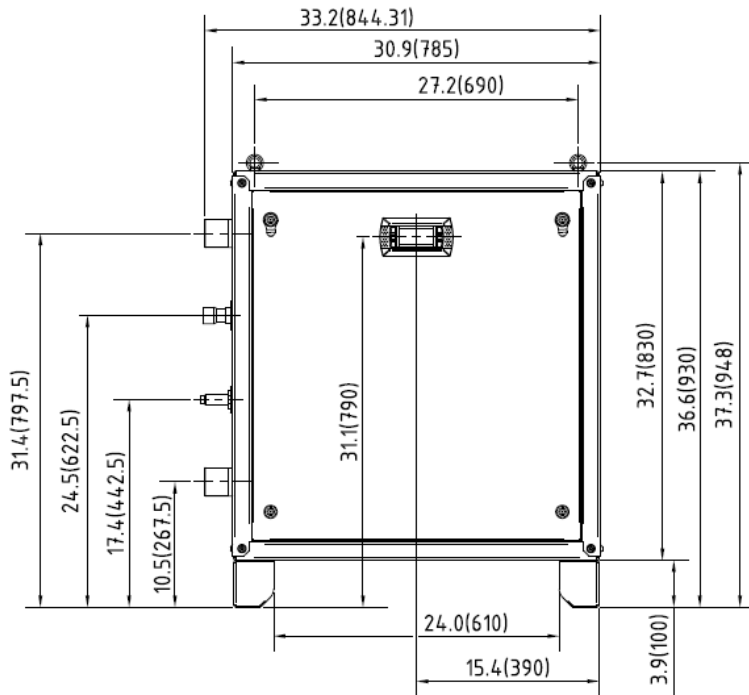


Right Side



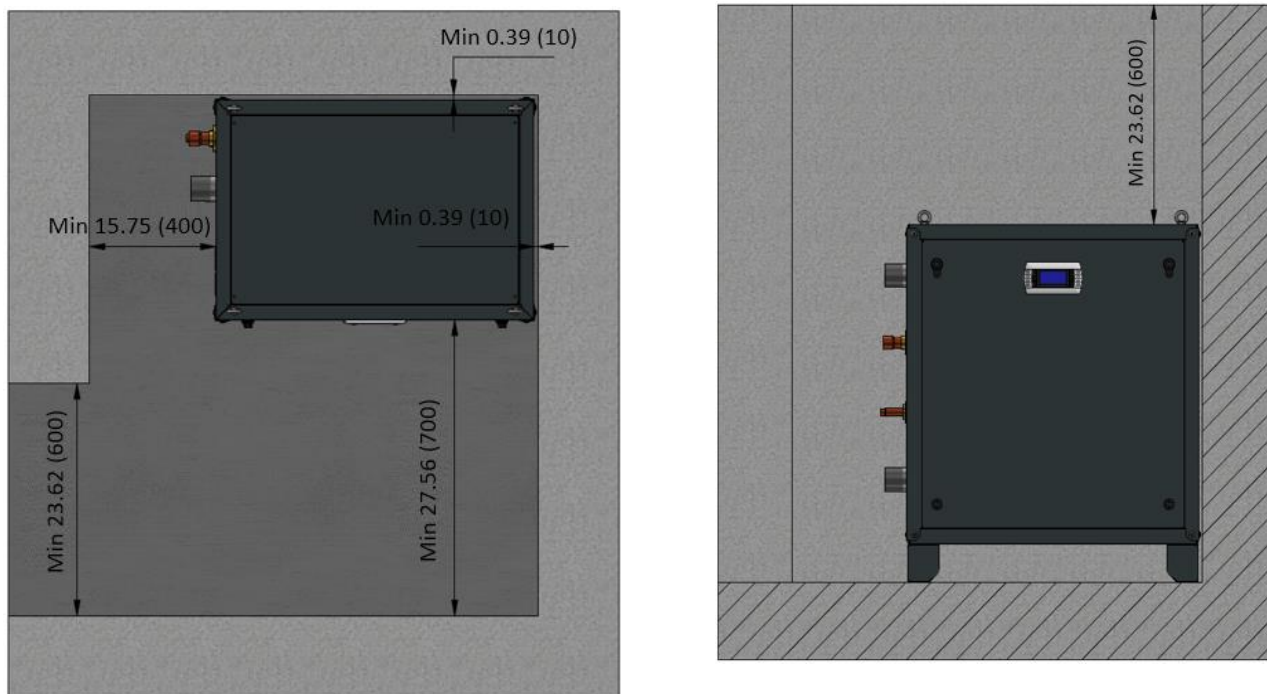
Top





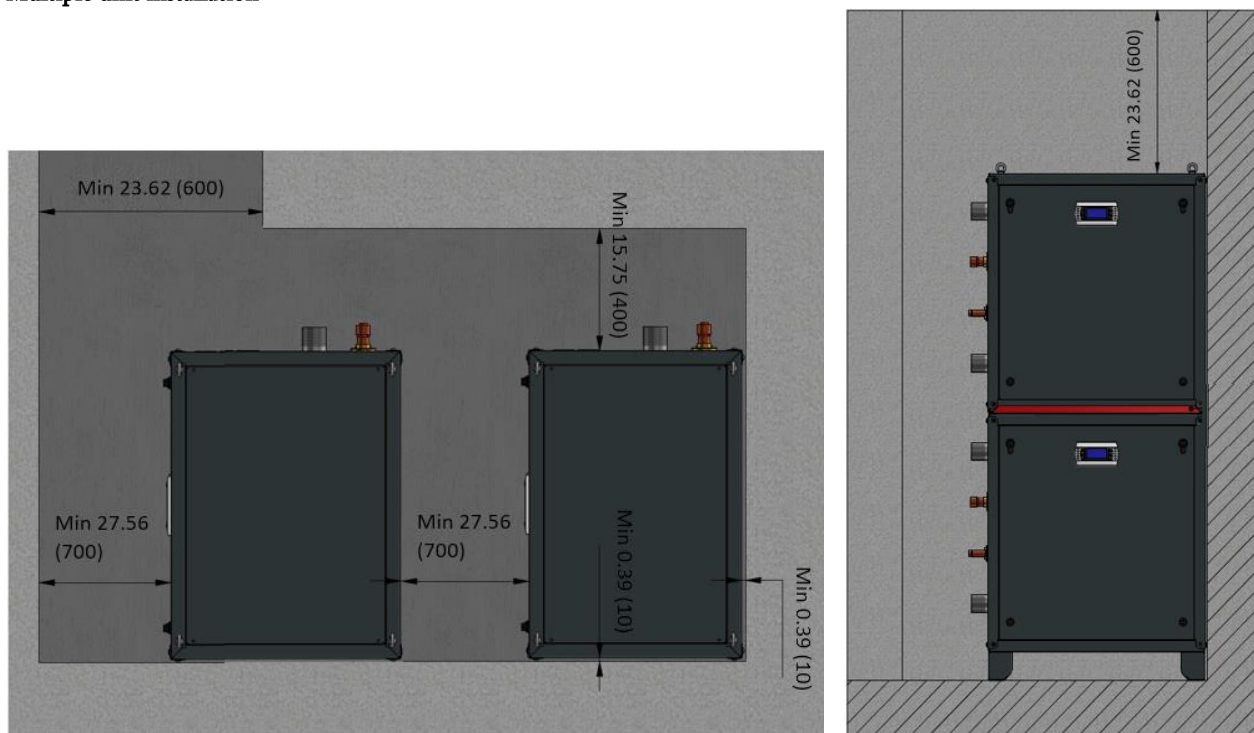
Servicing space requirements

Single unit installation



In order to fix the Hydroboxes on the top device remove the adjustable feet and pierce the cover plate on the lower device. Attach a non-slip rubber mat or similar material between the devices. Secure the devices with M12 threaded screws.

Multiple unit installation



Capacity tables

Cooling Capacity

Ambient temp.		Water outlet temp. (F)											
		44.6			50.0			55.4			59.0		
DB	WB	Capacity	Gas consumption	EER	Capacity	Gas consumption	EER	Capacity	Gas consumption	EER	Capacity	Gas consumption	EER
F	F	BTU/h	BTU/h	-	BTU/h	BTU/h	-	BTU/h	BTU/h	-	BTU/h	BTU/h	-
32.0	-	171,000	126,000	1.32	186,000	128,000	1.41	204,000	131,000	1.51	215,000	133,000	1.57
41.0	-	171,000	126,000	1.32	186,000	128,000	1.41	204,000	131,000	1.51	215,000	133,000	1.57
50.0	-	171,000	126,000	1.32	186,000	128,000	1.41	204,000	131,000	1.51	215,000	133,000	1.57
59.0	-	171,000	126,000	1.32	186,000	128,000	1.41	204,000	131,000	1.51	215,000	133,000	1.57
68.0	-	171,000	126,000	1.32	186,000	128,000	1.41	204,000	131,000	1.51	215,000	133,000	1.57
77.0	-	171,000	126,000	1.32	186,000	128,000	1.41	204,000	131,000	1.51	215,000	133,000	1.57
86.0	-	162,000	135,000	1.17	176,000	136,000	1.25	193,000	140,000	1.34	204,000	142,000	1.39
91.4	-	157,000	140,000	1.09	170,000	142,000	1.17	186,000	145,000	1.25	197,000	147,000	1.30
95.0	-	154,000	143,000	1.04	166,000	145,000	1.12	182,000	149,000	1.19	192,000	151,000	1.24
104.0	-	143,000	152,000	0.92	156,000	154,000	0.99	171,000	158,000	1.05	180,000	160,000	1.10

Note: The EERs also consider the electrical power consumption of the gas engine heat pump and proportionally of the HB (overcoming the internal pressure loss).

Note: Capacity was measured in accordance with YANMAR standard under EN16905 condition

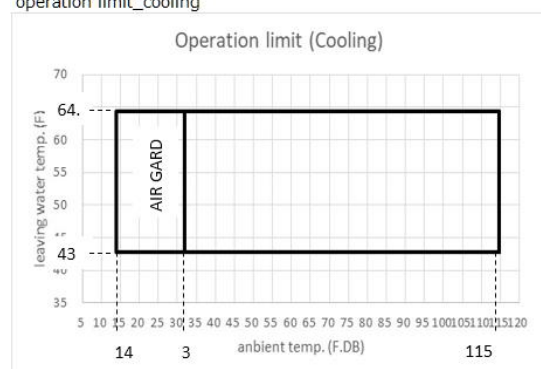
Heating capacity

Ambient temp.		Water outlet temp. (F)											
		95.0			104.0			113			122.0		
DB	WB	Capacity	Gas consumption	EER	Capacity	Gas consumption	EER	Capacity	Gas consumption	EER	Capacity	Gas consumption	EER
F	F	BTU/h	BTU/h	-	BTU/h	BTU/h	-	BTU/h	BTU/h	-	BTU/h	BTU/h	-
5.0	4.5	139,000	162,000	0.84	138,000	181,000	0.75	128,000	186,000	0.68	117,000	186,000	0.62
10.4	8.8	155,000	167,000	0.91	154,000	186,000	0.81	139,000	186,000	0.73	127,000	186,000	0.67
14.0	13.1	166,000	170,000	0.95	162,000	186,000	0.85	146,000	186,000	0.77	133,000	186,000	0.70
19.4	18.3	165,000	158,000	1.02	164,000	176,000	0.91	156,000	186,000	0.82	142,000	186,000	0.75
35.6	34.2	172,000	156,000	1.08	171,000	174,000	0.96	165,000	186,000	0.87	151,000	186,000	0.79
44.6	42.8	176,000	134,000	1.27	175,000	149,000	1.14	174,000	165,000	1.03	173,000	180,000	0.94
50.0	47.8	191,000	133,000	1.39	190,000	148,000	1.25	189,000	163,000	1.13	188,000	178,000	1.03
59.0	56.7	197,000	130,000	1.47	196,000	145,000	1.32	195,000	160,000	1.19	194,000	175,000	1.08

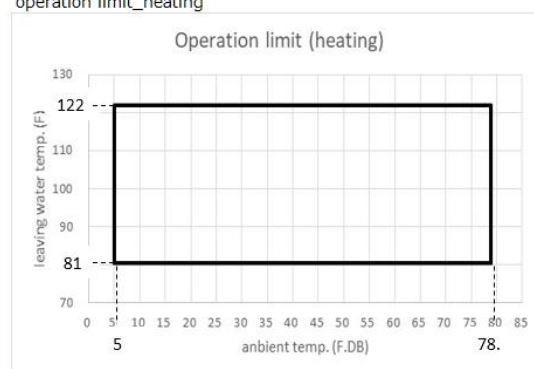
Note: The EERs also consider the electrical power consumption of the gas engine heat pump and proportionally of the HB (overcoming the internal pressure loss).

Note: Capacity was measured in accordance with YANMAR standard under EN16905 condition

operation limit_cooling



operation limit_heating



If a previously installed air conditioning system is replaced (even if only the heat exchanger is replaced), it is necessary first to carry out an analysis of the water quality and check for possible corrosion. Corrosion can also be present in water systems even if there are no initial indications thereof.

If the water quality decreases, the water quality should be adequately adjusted before replacing the system.

- On the water side, the system must be flushed in the direction of flow prior to initial start-up and maintenance.
- We recommend checking, and if necessary, cleaning, the dirt filter after the first 14 days operating time.
- In order to avoid damage to the system, it may be necessary, depending on the system, to provide additional dirt filters.
- Regular checks of the dirt filters are necessary depending on the water quality.
- It is mandatory to adhere to local regulations regarding the water treatment for the hydraulic modules!

Use of glycol

Adding glycol to the water changes the freezing point of the water. Ethylene glycol is usually used. The admixture of glycol changes the heating and cooling capacity. Correction tables can be provided by the glycol manufacturer. The admixture of glycol is approved up to 35 vol.%. The conveyor capacity of the circulation pump changes depending on the mixture proportions. Correction values relating to the conveyor capacity can be requested from YANMAR.



Caution:

- The heat and cooling capacity changes owing to the different condensation and evaporation temperatures.
- Observe the safety data sheets of the glycol manufacturers.

REFRIGERANT AND DRAIN PIPES

In order to avoid the formation of droplets, insulate the refrigerant and drain pipe adequately against condensation. When using refrigerant pipes, make sure that insulating material with a thermal resistance of more than 212 °F (100 °C), a specific weight for polyethylene foam of 1.9-2.7 lb/ft³ (30-60 kg/m³) and sufficient strength is used. Both the liquid and gas pipes must be insulated (observe manufacturer's instructions).


This also applies to all pipes that run through rooms.

If the system is used in buildings under environmental conditions with a high temperature and high humidity, it may be necessary to use larger dimensions (condensate pipe) and insulating material thicknesses than are used as standard.

Drain piping

A condensate collection tray (V = 2 G (7.8 l)) having a discharge nozzle (outer diameter 1-1/8 (29 mm)) is in the Hydrobox. The drain is located on the left-hand side. In order to produce the drain by means of an on-site pipe (hose), the housing has a pre-cut opening option on all four sides (see 4.2 Dimensions). Make sure that the condensate line is angled in the direction of the waste water outlet (ratio of more than 1/100). Do not fit any collection vessels or unforeseen equipment on the route. Use a suitable drain pipe e.g. hard vinyl chloride pipe VP-25 as outlet pipe.

Refrigerant pipes

	<p>WARNING</p> <p>The planning, installation, implementation and connection of refrigerant pipes is always the task of approved and competent personnel of the corresponding trade. These experts must have permission to handle refrigerant pipes.</p>
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All pipes must also be planned and arranged so that they are protected against external influences and hazards. Furthermore, when used correctly, the implementation of the system must not result in any dangers for the user.

The piping must be in accordance with the instructions in the installation manual.

All soldering work on the refrigerant pipes of the gas engine heat pump and Hydrobox must be carried out in accordance with the guidelines in this manual and the installation instructions of the YANMAR gas engine heat pump. Dry nitrogen must be used to flow through the pipes to be soldered.

If you disregard these guidelines, the warranty is prematurely invalidated, and the result may be damage to the device and malfunctions.

Note on Schrader port: no service connection!


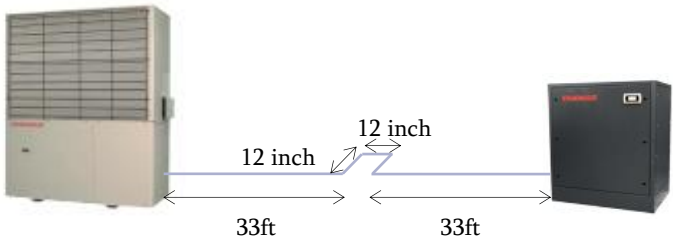
The Schrader port is only conceived for the production process and must not be used for service purposes.



Caution:

- Prior to soldering the refrigerant pipes, wrap the pipes on the system body and the insulation with damp cloths to prevent heat shrinking and burning.
- Make sure that the flame does not come into contact with the system body.
- Make sure that non-oxidising brazing methods are used for brazing to guarantee that foreign matter or moisture does not penetrate the pipe.
- Pipe clamps must be attached to fix the refrigerant pipe.
- Use refrigerant pipes made of phosphorus deoxidised copper C1220 (Cu-DHP) according to specifications of DIN-EN 12735-1 (corresponding to JIS H3300), seamless pipes and pipes made of copper and copper alloy (refrigerator quality).

- **Make sure that the inner and outer surfaces of the pipes are clean and free of dangerous copper, oxides, dust/dirt, metalworking residues, oils, moisture or other impurities.**
Impurities on the inner side of the refrigerant pipes can result in the refrigerant residual oil being ruined.
- **Never use refrigerant pipes that have already been in use.**
The large quantity of chlorine in traditional refrigerants and refrigerant oil in the present pipe leads to a reduction in quality of the new refrigerant.
- **Store the pipe to be used in a closed room during installation and leave both ends of the pipe sealed until right before brazing.**
If dust, dirt or water get into the refrigerant circuit, the oil quality is reduced, which can lead to failure of the compressor.
- **If refrigerant gas escapes during the installation work, thoroughly ventilate the room and leave it immediately.**
If the refrigerant gas encounters open fire, poisonous gas is released.
If the refrigerant escapes quickly and in a concentrated manner, the result may be shortness of breath, cryogenic burns and environmental pollution.

	<p>The linear expansion owing to the highly varying temperatures of the pipes must be considered during the planning and laying. The expansion may be up to 1/2 inch (1.3 cm) per 33 ft (10 m)!</p> <p>Horizontal expansion bends must be provided every 10 m in the case of a straight, continuous pipe (offset 12 inch x 12 inch).</p> <div data-bbox="619 1003 1294 1240">  </div>
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Precautions for devices with R410A



Warning / caution:

- **Refrigerants and oil**

The old refrigerant and the refrigerant oil in the present pipe contain large amounts of chlorine which can reduce the quality of the refrigerant oil of the new system.

R410A is a high-pressure refrigerant and can burst the existing pipes.

- **Do not pour in any refrigerant other than the one specified on the system (R410A) when installing and laying the system.**

If another refrigerant is mixed with R410A, the chlorine contained in the refrigerant may cause a quality degradation of the refrigerant oil.

If the original refrigerant is mixed with another refrigerant or with air, the refrigerant circuit may malfunction, and the system may be seriously damaged.

- **Store the pipe used in the installation in a closed room and keep both ends closed right up until the brazing (keep bends and other pipe connectors in a plastic bag).**

If dust, dirt or water gets into the refrigerant circuit, the quality of the oil may deteriorate, and the compressor may malfunction.

- **Use liquid refrigerant to fill the system.**

Using gaseous refrigerant to fill the system changes the composition of the refrigerant such that the performance may drop off.

- **Use a vacuum pump with a reverse flow one-way valve.**

The oil of the vacuum pump may flow back into the refrigerant circuit and then leads to a reduction in quality of the refrigerant oil.

- **Do not use the following devices, which are used for other refrigerants: filling hose, gas leak detector, refrigerant fill level indicators, drainage station.**

Mixing different refrigerant and refrigerant oil with R410A may lead to the deterioration of the refrigerant.

The refrigerant oil may deteriorate if water is mixed into R410A.

Suitable detectors must be used to detect gas leaks.

- **Do not use a filling cylinder.**

The refrigerant may decompose if a filling cylinder is used.

- **Exercise the utmost care when using the pressure gauge station.**

If dust, dirt or water gets into the refrigerant circuit, the quality of the refrigerant may deteriorate.

- **After completion of the installation work, ensure that no refrigerant gas is escaping.**

Toxic gas may be formed if refrigerant gas escapes and comes into contact with a fan heater, an oven or other heat sources.

If the refrigerant escapes quickly and in a concentrated manner, the result may be shortness of breath, cryogenic burns and environmental pollution.

- **Do not touch the refrigerant pipe during or straight after operation.**

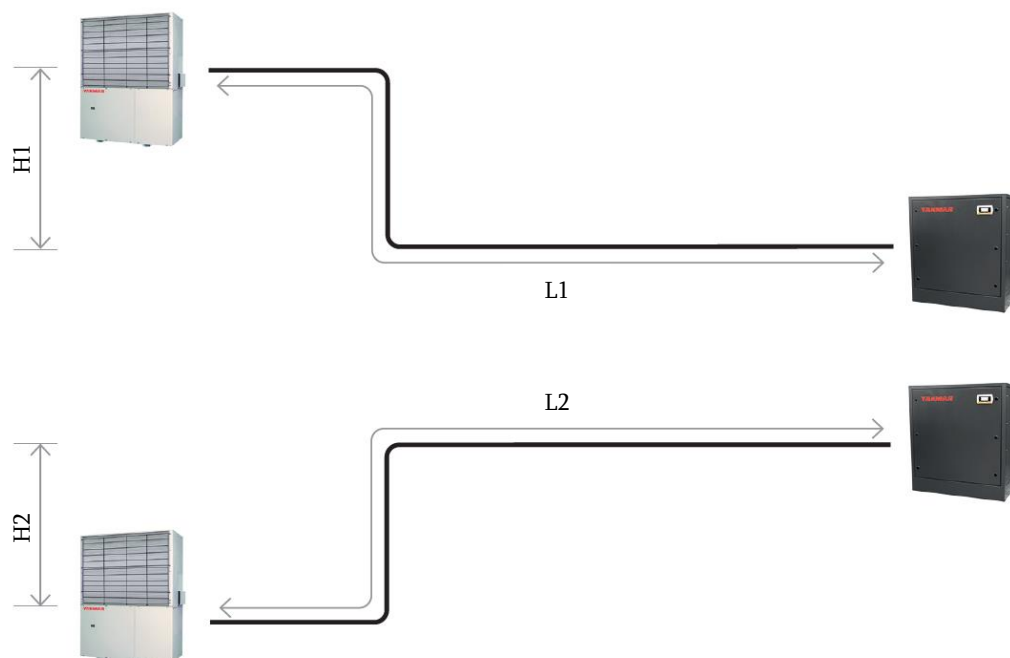
During and straight after operation, the refrigerant pipes (depending on the through-flow of the refrigerant), the compressor and other parts of the circuit are sometimes hot and sometimes cold – you may burn your hands or suffer frost-related injuries, if you touch the refrigerant pipe.

Dimensions of the refrigerant pipes

Model	(Braze-joint) connection		Connection pipes	
	Liquid pipe	Suction pipe	Liquid pipe	Suction pipe
154	3/4 (19 mm)	1-3/8 (35 mm)	5/8 (15.9 mm)	1-1/8 (28.6 mm)

The liquid and suction pipe must be insulated with suitable insulating material.

The refrigerant pipes must be designed and set up in accordance with the provisions described here.



All models Y-HB ... V(P)J3.1				
L1	Maximum permitted pipe length	actual	ft (m)	180 (55)
L2		equivalent	ft (m)	220 (67)
H1	Maximum permitted height difference		ft (m)	82 (25)
H2			ft (m)	82 (25)



Note:

- The Hydrobox, AHU kit and VRF indoor units cannot be operated simultaneously on a gas engine heat pump. The models Y-HB 154 can only be operated in single operation.
- Never exceed the maximum permitted pipe lengths. Failure to comply with these provisions may result in malfunctions and damage to the devices and also invalidates the warranty for the gas engine heat pump and the Hydrobox.

Additional refrigerant charge



Note:

- Only supply the system with liquid refrigerant. If, however, you supply gaseous refrigerant, there may be decomposition and therefore power losses or device malfunctions.
- Always use calibrated scales for adjusting the fill quantity.
- Always store refrigerant-related tools separately to avoid mixing different refrigerant oils. Never use refrigerant pressure gauges and tubes which were used for a refrigerant other than R410A

Calculate the required refrigerant fill quantity according to the following equation. Pipe length and diameter of the pressure line are required for the calculation:

Additional charge = correction quantity + (pipe length x correction factor)

$$R = A + (L \times f)$$

Model	Correction quantity A Lbs (kg)	Correction factor f Lbs/ft
154	12.6 (5.7)	0.114 (0.17kg/m)

All YANMAR gas engine heat pumps are factory-filled with 26.0 lbs (11.8 kg) refrigerant R410A!

Calculation example:

Model Y-HB 154	Correction quantity A	= 12.6
	Pipe length L	= 50 ft
	Correction factor f	= 0.114 lbs/ft

→ **Additional charge R** = 12.6 + (50 ft x 0.114) = **18.3 Lbs**

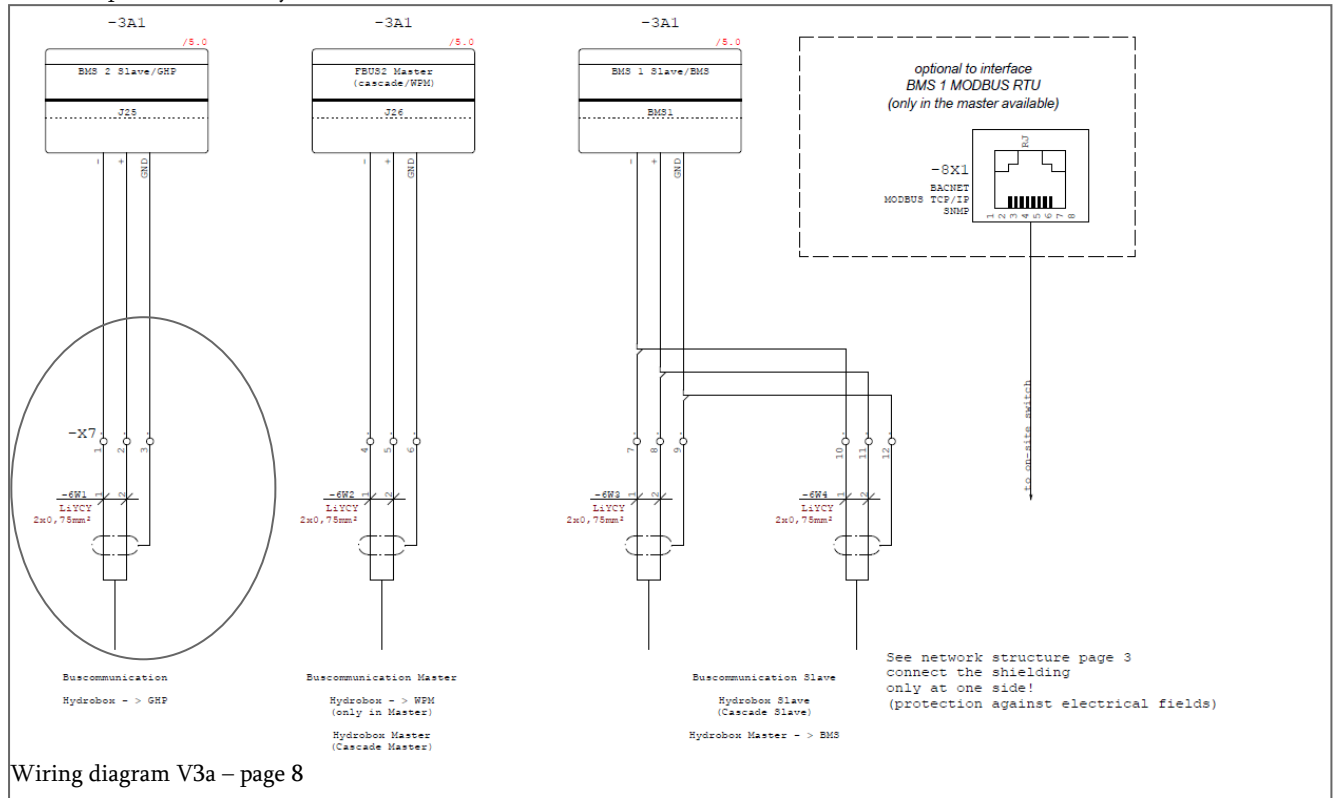
Communication Hydrobox / gas engine heat pump

Communication wire (connection between Hydrobox and gas engine heat pump)

Maximum cable length: 230ft (70 m)

Recommended cable: up to 164ft (50 m) AWG18, shielded
up to 230ft (70 m) AWG17, shielded

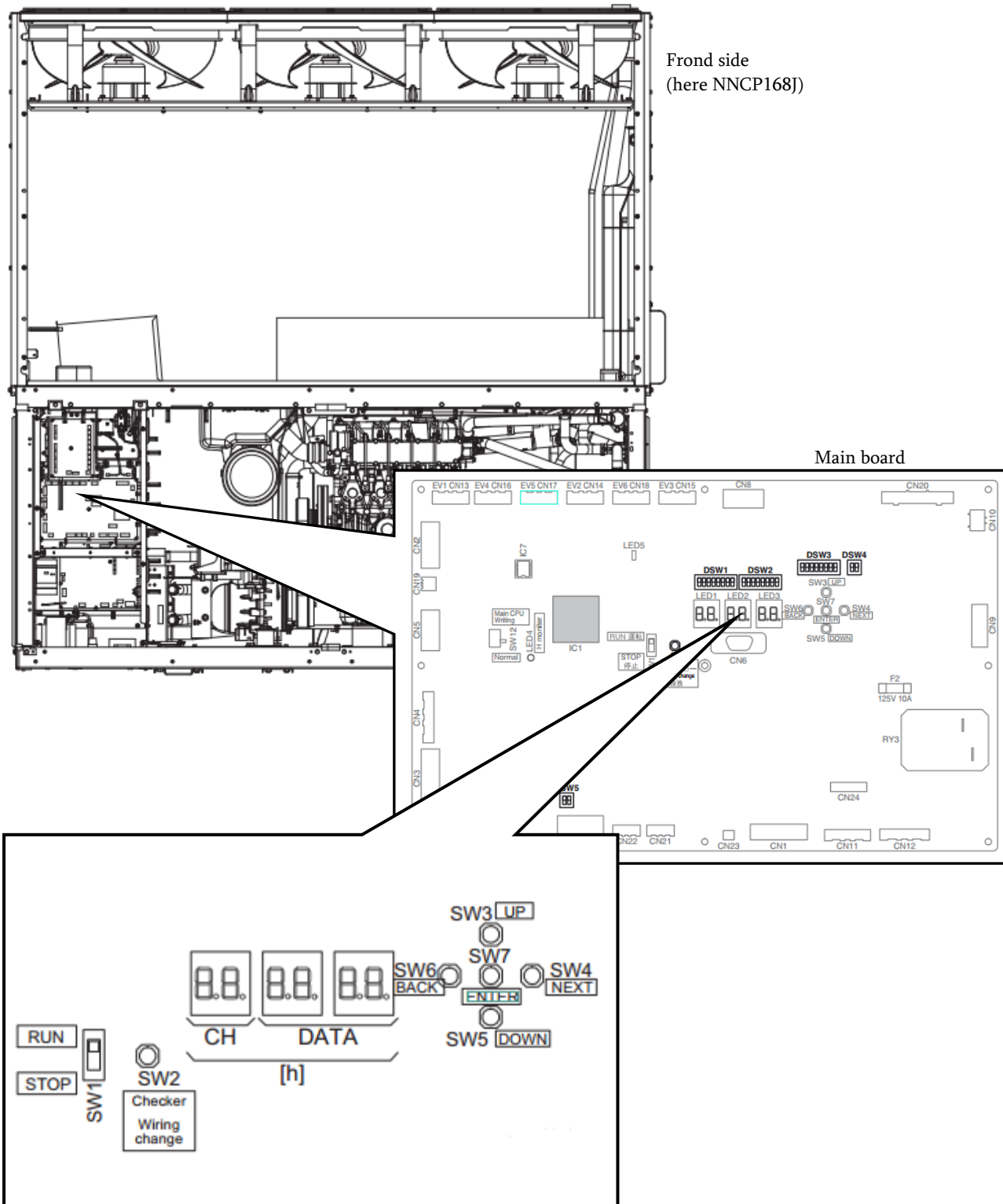
Terminal position in the Hydrobox



Wiring diagram V3a – page 8

Configuration of the gas engine heat pump

Various DIP switches (microswitches) must be set on the control board of the gas engine heat pump.




Caution:

Set the microswitches prior to initial start-up in the de-energised state. Otherwise, the setting is not applied and there may be malfunctions.

DSW1 – microswitch for adjusting the installed pipe length

DSW 1								SWNo	>98ft (30m)	>98- 264ft (30- 80m)	>263- 423ft (80- 130m)	>263- 423ft (80- 130m)	>427ft (130m)
ON								1	OFF (Facotry setting)	ON	OFF	OFF	ON
2								2	OFF (Facotry setting)	OFF	ON	ON	ON

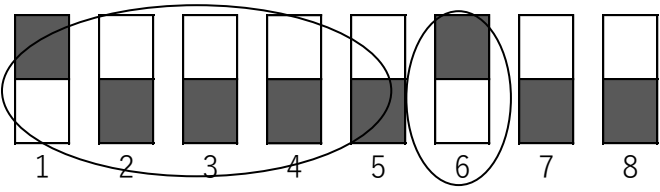
Note: Refrigerant pipe lengths over 55 m are not permitted in use with the Hydrobox!

DSW2 – microswitch for adjusting the type of communication of the optional devices

DSW 2								SWNo	HB	
ON								1	ON	OFF (Facotry setting)
								3	OFF (Facotry setting)	
								4	OFF (Facotry setting)	
								5	OFF (Facotry setting)	

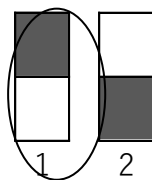
Note: This setting is only activated if the DSW4-1 is switched on.

DSW3 – microswitch for adjusting the connected system

DSW 3								SWNo		RESS Address			
<div>ON</div>  <div>1 2 3 4 5 6 7 8</div>								1-5		-			
								SWNo		RESS		PC Checker	
								6		ON		OFF	

Note: When connected with Service laptop, DW3-6=OFF for PC Checker

DSW4 – microswitch for adjusting the connected system

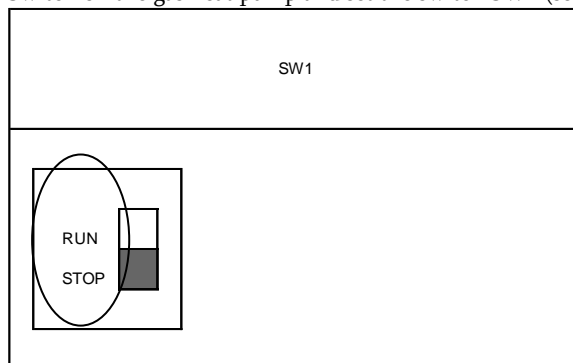
DSW 4		SWNo		HB			
<div>ON</div>  <div>1 2</div>		1		ON		OFF (Facotry setting)	

MSW46-2 – software switch for adjusting the capacity control

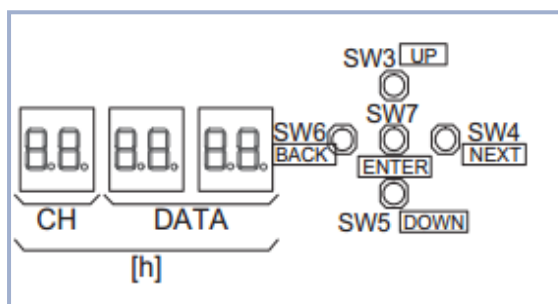


Caution:

Switch on the gas heat pump and set the switch SW1 (see pg. 50) prior to the initial start-up from RUN to STOP.



The software switch MSW46-2 must then be set.



NNCP168J Natural Gas Heat Pump Outdoor Unit

II. Outdoor Units

Specifications

Standard GHP

Specifications

		Model	Unit	NNCP096J	NNCP120J	NNCP144J	NNCP168J
Capacity *1	Nominal	Cooling @95°F(35°C)	Btu/h (kW)	96,000 (28.1)	120,000 (35.2)	144,000 (42.2)	168,000 (49.2)
		Heating @47°F(8.3°C)	Btu/h (kW)	108,000 (31.6)	135,000 (39.6)	160,000 (49.6)	198,000 (58.0)
	Rated	Cooling @95°F(35°C)	Btu/h (kW)	97,000 (28.4)	119,000 (34.9)	137,000 (40.1)	163,000 (47.8)
		Heating @47°F(8.3°C)	Btu/h (kW)	106,000 (31.1)	134,000 (39.3)	156,000 (45.7)	189,000 (55.4)
		Heating @17°F(-8.3°C)	Btu/h (kW)	106,000 (31.1)	137,000 (40.1)	164,000 (48.1)	178,000 (52.2)
Indoor units connection		Total capacity of indoor units	%	80-130	70-130	60-130	60-130
		Maximum No. of units connectable	-	16	20	24	29
Electrical characteristics		Power supply	V	Single phase 208/230/240			
		Frequency	Hz	60			
Power consumption		Cooling @95°F(35°C)	kW	0.89	0.89	0.89	0.86
		Heating @47°F(8.3°C)	kW	0.79	0.79	0.79	0.95
MCA (Min, Circuit Ampacity)			A	15.7			16.1
MOP (Max,Over-current Protection)			A	22.7			23.2
Fuel consumption		Cooling @95°F(35°C)	Btu/h(kW)	63,000 (18.5)	93,000 (27.2)	119,000 (34.9)	168,000 (49.2)
		Heating @47°F(8.3°C)	Btu/h(kW)	68,000 (19.9)	96,000 (28.1)	117,000 (34.3)	147,000 (43.1)
Gas engine		Manufactuer	-	Yanmar			
		Model	-	3GPH88-GH			
Specified lubricant			-	Yanmar genuine GHP oil			
Cooling water		Specified coolant	-	Yanmar genuine LLC (for GHP)			
		Freezing temp.	°F (°C)	-31 (-35)			
Sound pressure level *2			dB(A)	54	55	57	58
Fan		Type	-	Propeller fan			
		Number of units	-	2			
		Rated air flow	CFM (m³/min)	12713 (360)			13419 (380)
		Motor output	w	370×2			
Refrigerant		Type	-	R410A			
		Charge	lbs(kg)	26.0(11.8)			
Piping size	Refrigerant	Gas pipe	in.(mm)	7/8 (ø22.2)	1 (ø25.4)	1 1/8 (ø28.6)	
		Liquid pipe	in.(mm)	3/8 (ø9.5)	1/2 (ø12.7)		5/8 (ø15.9)
	Fuel Gas pipe		NPT	3/4			
	Exhaust vent (Outside diameter)		in.(mm)	2-3/8 (60.5)			
	Drain pipe (Inside diameter)		in.(mm)	19/32 (15.0)			
Allowable refrigerant piping length (Equivalent length / Real length)			ft(m)	656/558 (200/170)			
Total piping length			ft(m)	2100 (640) or less			
Allowable piping length (after the first branch)			ft(m)	295 (90) or less			
Allowable height differ- ence between indoor and outdoor units		Abobe outdoor units	ft(m)	164 (50) or less			
		Below outdoor units	ft(m)	164 (50) or less			
Allowable height difference between indoor units			ft(m)	49.2 (15) or less			
External coating color (Munsel No.)				Yanmar warm ivory (5Y7.5/1)			
Dimensions*3		Height	in.(mm)	85-7/16 (2160)			
		Width	in.(mm)	66-9/16 (1690)			
		Depth	in.(mm)	31-1/2 (800)			
Weight			lbs(kg)	1896 (860)			1940 (880)

*1. Test conditions

External piping length: 100.0 ft. (30.5 m) equivalent piping length and 0 ft. (0 m) level difference. Tested by YANMAR

Cooling	Cooling capacity	Indoor suction air temp	80.0 °FD.B. (26.7 °CD.B.)/67.0 °FW.B. (19.4 °CW.B.)				
		Outdoor suction air temp	95 °FD.B. (35 °CD.B.)/75.0 °FW.B. (23.9 °CW.B.)				
Heating	Heating capacity	Indoor suction air temp	70.0 °FD.B. (21.1 °CD.B.)/60.0 °FW.B. (15.6 °CW.B.)				
		Outdoor suction air temp	47.0 °FD.B. (8.3 °CD.B.)/43.0 °FW.B. (6.1 °CW.B.)				

These are units are outside the scope of AHRI Standard 1230.

*2. The operating noise levels shown above were measured at a distance of 3.3 ft. (1 m) to the front face of each unit and at a height of 4.9 ft. (1.5 m), and then converted into an anechoic room equivalent level.

The noise level of the installed unit is usually higher than the indicated value due to influences of ambient noise and echo.

*3. The external dimensions shown above are exclusive of piping, pipe joints and certain protrusions.

II. Outdoor Units

Dimensional Outline Drawing

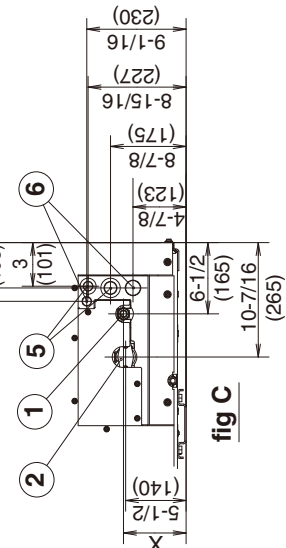
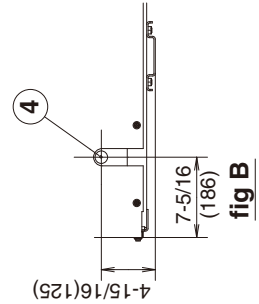
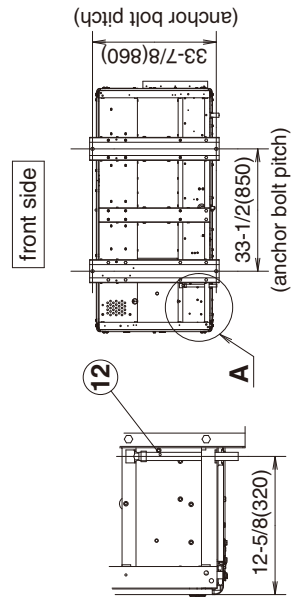
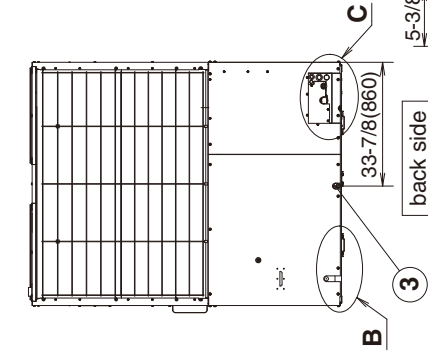
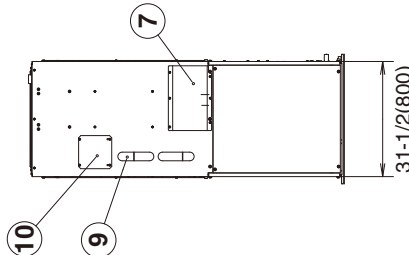
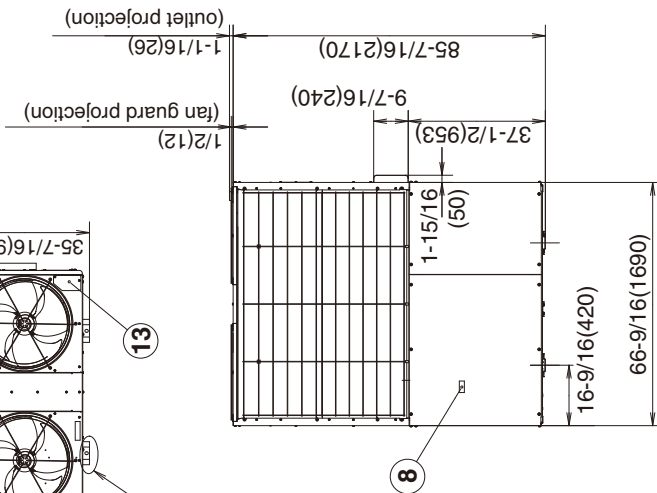
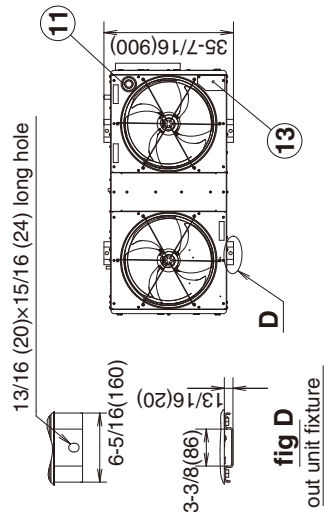
Standard GHP

Outside Dimensions Diagram

in.(mm)

■ NNCP096J, 120J, 144J, 168J

No	Description	P096	P120	P144	P168
1	Refrigerant liquid piping connector	3/8 (ø9.5)	1/2 (ø12.7)	1/2 (ø12.7)	5/8 (ø15.9)
2	Refrigerant gas piping connector	7/8 (ø22.2)	1 (ø25.4)	1 (ø25.4)	1 1/8 (ø28.6)
3	Exhaust drain piping connector	1 1/8 (ø28.6)	1 1/8 (ø28.6)	1 1/8 (ø28.6)	1 1/8 (ø28.6)
4	Fuel gas piping connector	1 1/8 (ø28.6)	1 1/8 (ø28.6)	1 1/8 (ø28.6)	1 1/8 (ø28.6)
5	Electrical wiring port	1-3/32(ø8) / 1-13/32(ø36) Grommet	1-3/32(ø8) / 1-13/32(ø36) Grommet	1-3/32(ø8) / 1-13/32(ø36) Grommet	1-3/32(ø8) / 1-13/32(ø36) Grommet
6	Electrical wiring port for options	1-21/32(ø17) / 1-3/32(ø8)	1-21/32(ø17) / 1-3/32(ø8)	1-21/32(ø17) / 1-3/32(ø8)	1-21/32(ø17) / 1-3/32(ø8)
7	Air inlet				
8	Hour meter				
9	Cooling water tank level				
10	Cooling water fill port cover A				
11	Exhaust vent				
12	Drain condensate piping connector				
13	Cooling water fill port cover B				



Concrete foundation

VI. Installation Installation Procedure

Refer to the foundation drawings to execute foundation work for the outdoor unit; the foundation must be strong enough to support the weight of the outdoor unit and more than 3-15/16 (100 mm) higher than the floor surface to protect it from rainwater and dust. Provide a drain ditch around the foundation and give it a 1/50 downward pitch to lead drain to the drain port.

Note

1. The standard blend ratio of concrete must be cement 1: sand 2: ballast 4., and reinforced by inserting 10 ϕ steel bars at an interval of approx. 300 mm.
2. The foundation surface must be leveled with a finishing coat of mortar. The end face of the foundation must be chamfered.
3. When mounting the foundation on a concrete floor, broken stones are not required, however the concrete surface must be rugged.
4. Provide a drain ditch around the foundation to complete draining from the machine.
5. If the foundation is provided on the rooftop, special care must be given to the strength of the floor and the floor must be waterproof.
6. When installing in locations (sand, clay or loam layer) with less ground proof stress, be sure to do the work for reinforcing the ground.
7. In order to prevent the outdoor unit from falling over, make the foundation level and hard.
8. If anti-seismic installation is required, reconsider the foundation dimensions and fixing bolts according to the designated anti-seismic design standards.
9. When installing on the rooftops, verandas, etc., in locations like residential areas where noise and vibration can be a problem, use Anti-vibration mount.
10. Refer to the instruction for Anti-vibration mount regarding the its installation. Make sure to confirm the dimensions of the outside unit before installation.

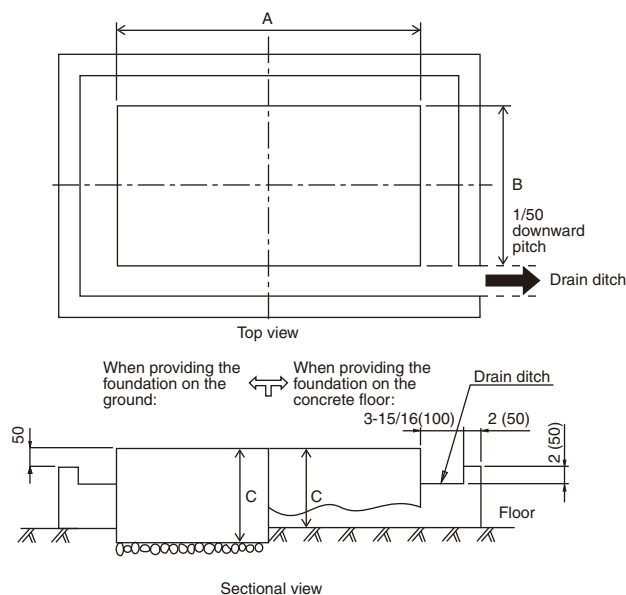
(1) When providing the foundation on the ground:

Installation classification	Outdoor unit capacity	A dimensions inch. (mm)	B dimensions inch. (mm)	C dimensions inch. (mm)
Foundation on the ground	P096 P120 P144 P168	66-9/16 (1690) or more	51-3/16 (1300) or more	Depending on the weight of equipment on the ground
Foundation on the concrete floor	P096 P120 P144 P168	66-9/16 (1690) or more	51-3/16 (1300) or more	7-7/8 (200) or more

* These dimensions are set to prevent the foundation mounted on the ground from floating with a horizontal force of 0.4 G and a vertical force of 0.2 G.

If the results of seismic and wind-proof strength analysis exceed the numerical values listed above, follow the result of calculation.

* When installing outdoor unit options, follow the result of calculation.



Installation Procedure

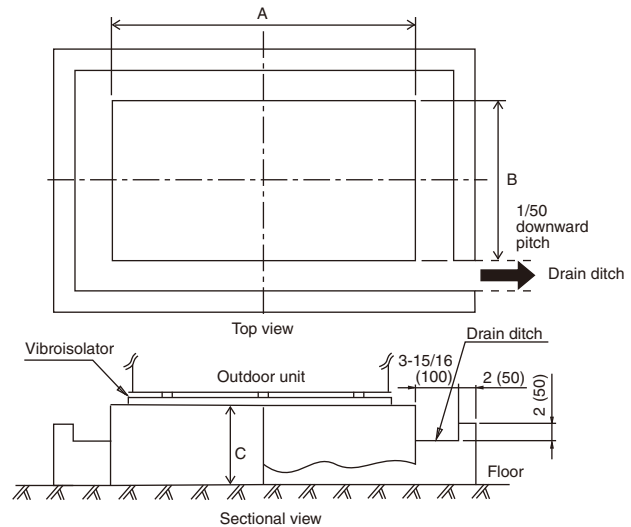
When using Anti-vibration mount:
When installing on rooftops, verandas, etc., in locations like residential areas where noise and vibration can be a problem, use Anti-vibration mount. Select the vibroisolating grade and specifications according to the use and purposes of rooms below, and other environmental requirements. Give the case where noise and vibration can be a problem enough consideration.

Provide a concrete foundation on the floor surface on which to install Anti-vibration mount according to the concrete foundation drawing given below.

- Adjust the contact surface by inserting shims to make it level.
- For details, follow the operation manual supplied by an Anti-vibration mount manufacturer.

Installation classification	Outdoor unit capacity	A dimensions inch. (mm)	B dimensions inch. (mm)	C dimensions inch. (mm)
Vibration-proofing device + Concrete foundation	P096	66-9/16 (1690) or more	61-1/16 (1550) or more	7-7/8 (200) or more
	P120	66-9/16 (1690) or more	63 (1600) or more	7-7/8 (200) or more
	P144	82-1/8 (2100) or more	65 (1650) or more	7-7/8 (200) or more
	P168			

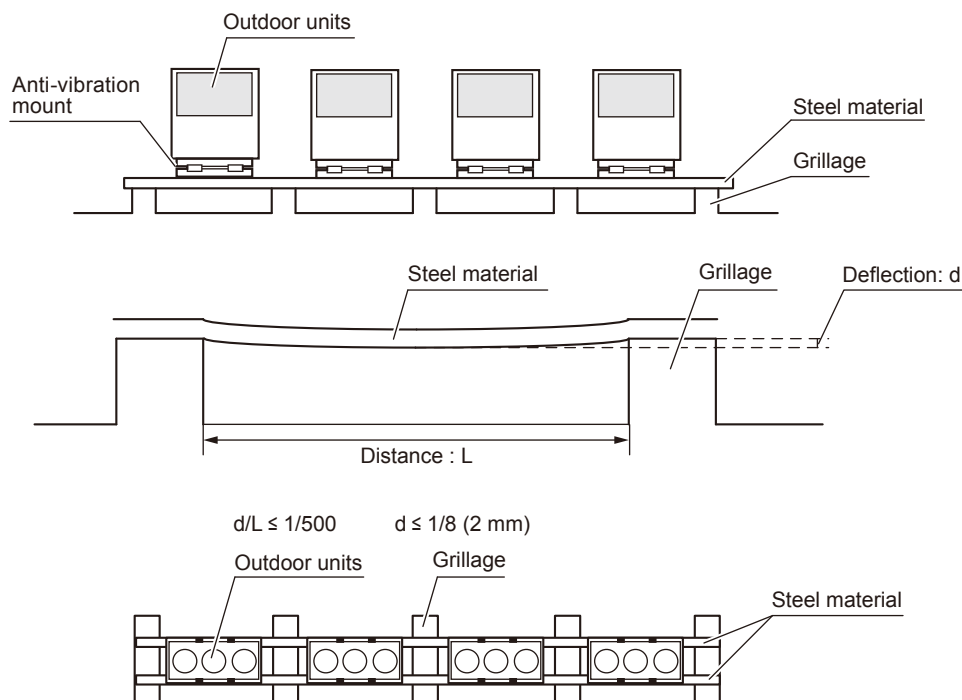
- * The above dimensions are those that work to prevent the foundation provided on the rooftop from floating with a horizontal force of 1.0 G and a vertical force of 0.5 G.
- * If the findings from the results of the consideration for anti-seismic and windproof strength outnumber the numerical values listed above, follow the result of calculation.
- * When installing outdoor unit options, follow the result of calculation.



3) Installation of grillage foundation

When installing a grillage foundation, make sure the deflection of steel materials is 1/500 or less of the length between grillages and max. of 1/8 (2 mm) or less.

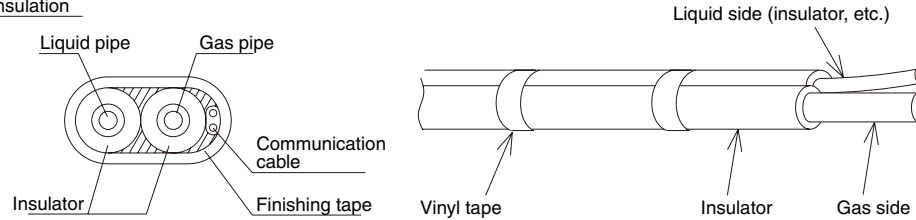
[Installation example of grillage foundation]



Thermal insulation

- The piping on both gas and liquid sides must be insulated.
- Material: Fiberglass or 3/8 inch. (10 mm) or thicker heat-resistant polyethylene foam, with a thermal resistance of 249°F (120°C) or more for the gas lines and 158°F (70°C) or more for the liquid lines.

Dual Thermal Insulation



Caution: Also use the included thermal insulation material to insulate the recessed connection parts of the flare nuts for the gas and liquid pipes of the indoor unit.

- For best results when attaching the heat resistant insulation, first fasten it temporarily with plastic tape approximately every 7-7/8 inch. (200 mm). (Refer to the diagram above.)
- The points where the pipes pass through walls must be well insulated to avoid discoloration from condensation.
- Make sure that any opening section in the heat insulation foam is closed completely when you wrap it with the tape. Also, do not wrap tape around the heat insulation too tightly. If the tape is wound too tightly the insulation will be crushed, reducing its efficiency.
- When attaching the communication cable from the indoor unit to the refrigerant piping, run the cable outside the heat insulation. If the communication cable is run inside, it will be in contact with the refrigerant piping and can be damaged by heat, causing poor insulation of the cable or even a short circuit.
- Wrap the insulated refrigerant piping and the communication cable with finishing tape, starting from the unit on the lowest level. (If you start taping from a higher level, rainwater can get into the tape through the tape overlaps that face up.)
- When winding, overlap the finishing tape carefully so that the heat insulation on the refrigerant pipe is covered completely.
- Fix the starting and ending points of the finishing tape with plastic tape.
- Make sure the communication cable is not in contact with a stop valve or any pipes that are not heat insulated.
- Consider the issue of dew condensation and other factors, so that the layer of heat insulation you use is thick enough to deal with these conditions.

Fuel Gas Piping Work

For the piping leading to the outdoor unit, fit the metal devices shown in the figure below.

- Use carbon steel for the gas pipe.
- Use a reinforced gas hose (approved for gas) with a joint fixture for liquefied petroleum gas to link the fuel gas piping to the outdoor unit.
- As needed, depending on the degree of contamination inside the fuel pipe due to piping work, install a strainer between the reinforced gas hose and the shut-off valves.
- The outdoor unit, particularly when installed on a vibration-proof stand, shakes a lot at start-up. Pay attention to where you layout the reinforced gas hose.
- To seal the threads, use a liquid sealant such as Tight Seal. Do not use seal tape, which may get caught in the valve seat of the gas regulator, resulting in a gas leak.
- After you have finished connecting the pipes, use a soap solution to check the connections for leaks.
- The gas supply pressure at the outdoor unit inlet should be adjusted to meet the conditions specified in the table below.

Unit: in.WC (kPa)

	Natural gas
Max. gas pressure	10.04 (2.5)
Standard gas pressure	8.03 (2.0)
Min. gas pressure	4.02 (1.0)

- When required by national or regional legislation, a low gas pressure switch has to be mounted in the safety loop.
- The overall installation shall comply with standards ANSI Z223.1: Natural gas Code and any applicable local codes. For installations in Canada, the installation shall comply with CAN/CGA-B149.1, or CAN/CGA-B149.2, Natural gas Code.
- The gas piping for the outdoor unit is installed as shown below.
- Do not apply pressure of over 14.05 in.WC (3.5 kPa) when testing the fuel gas line for leaks. Doing so could damage the unit's internal regulator.

