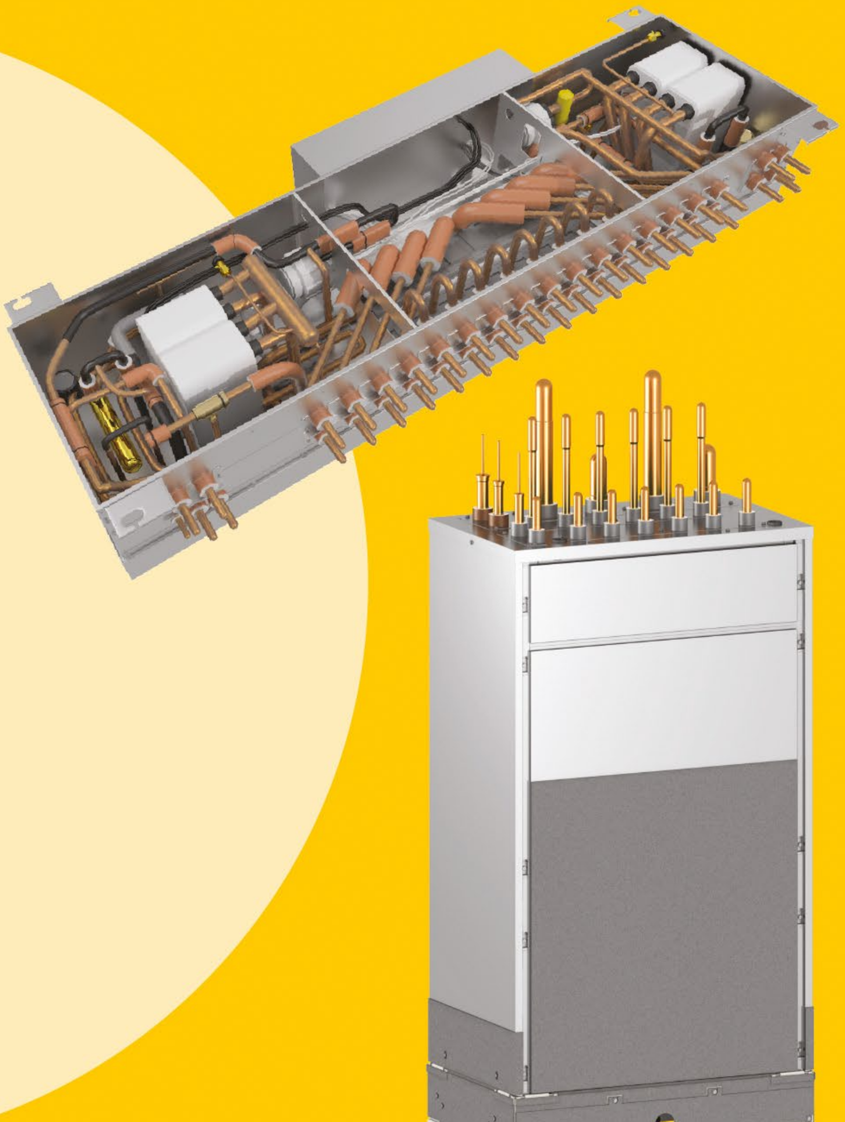
CITY MULTI | HVRF

MITSUBISHI ELECTRIC

City Multi Hybrid VRF

Information Pack



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CITY MULTI | HVRF i

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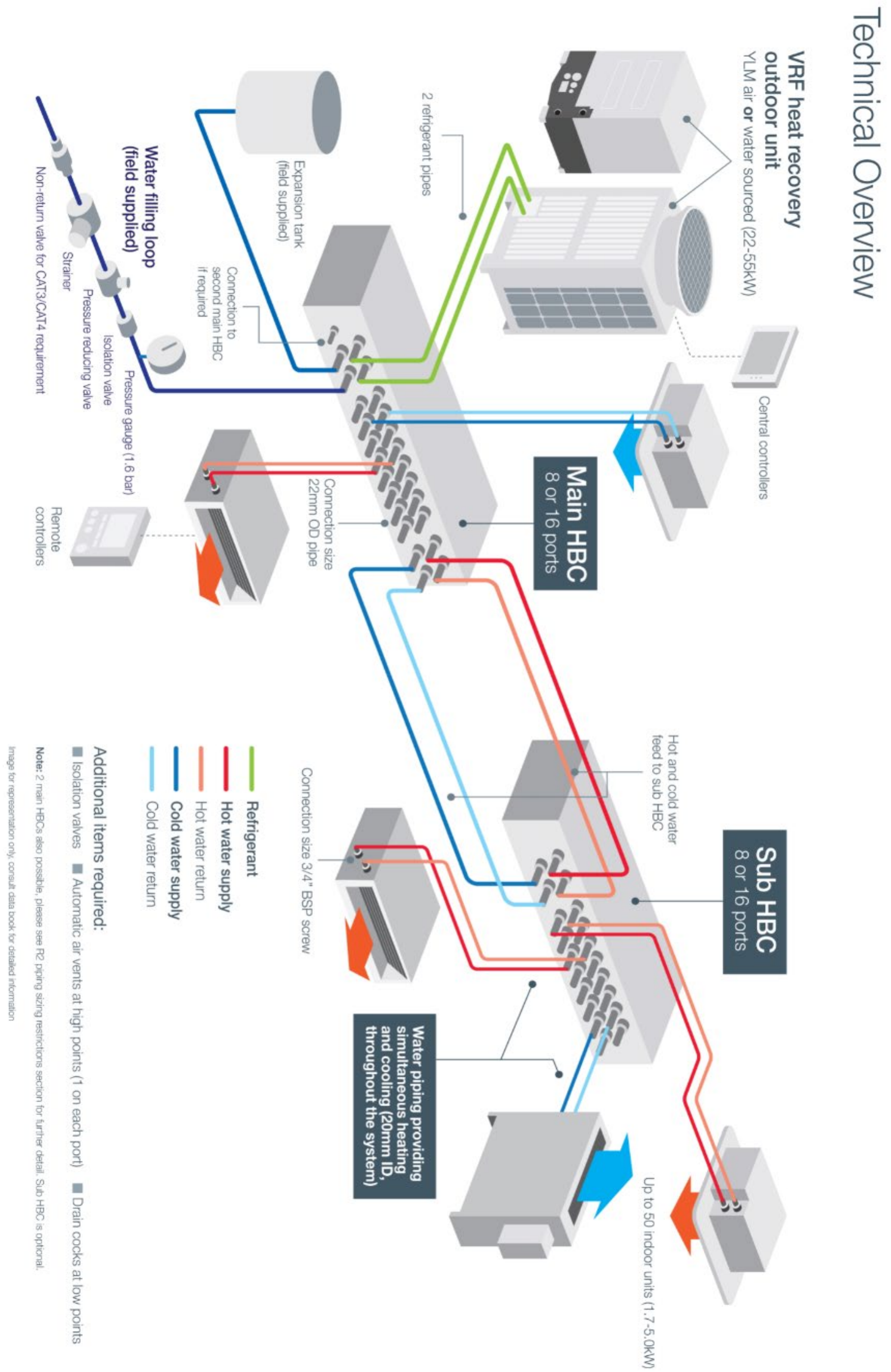
Disclaimer

This document is for guidance only and as such should be used in addition to the latest installation and service manuals for the products mentioned here. Furthermore, external guidance, such as WRAS & BSRIA, can be changed without notice. Therefore it is the installation companies and system designer's responsibility to seek guidance on this.

1. Horizontal HBC

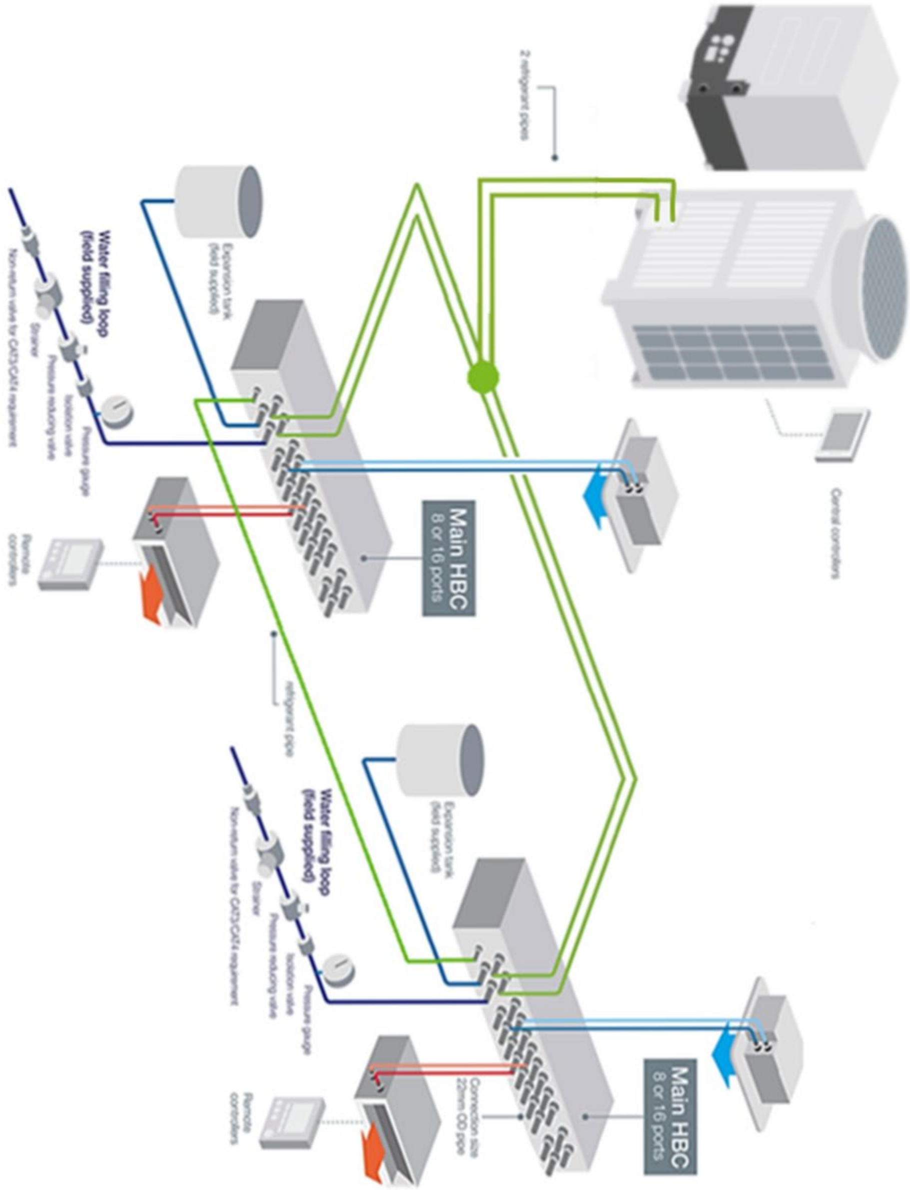
The following sections provide a technical overview that is unique to the Horizontal HVRF system.

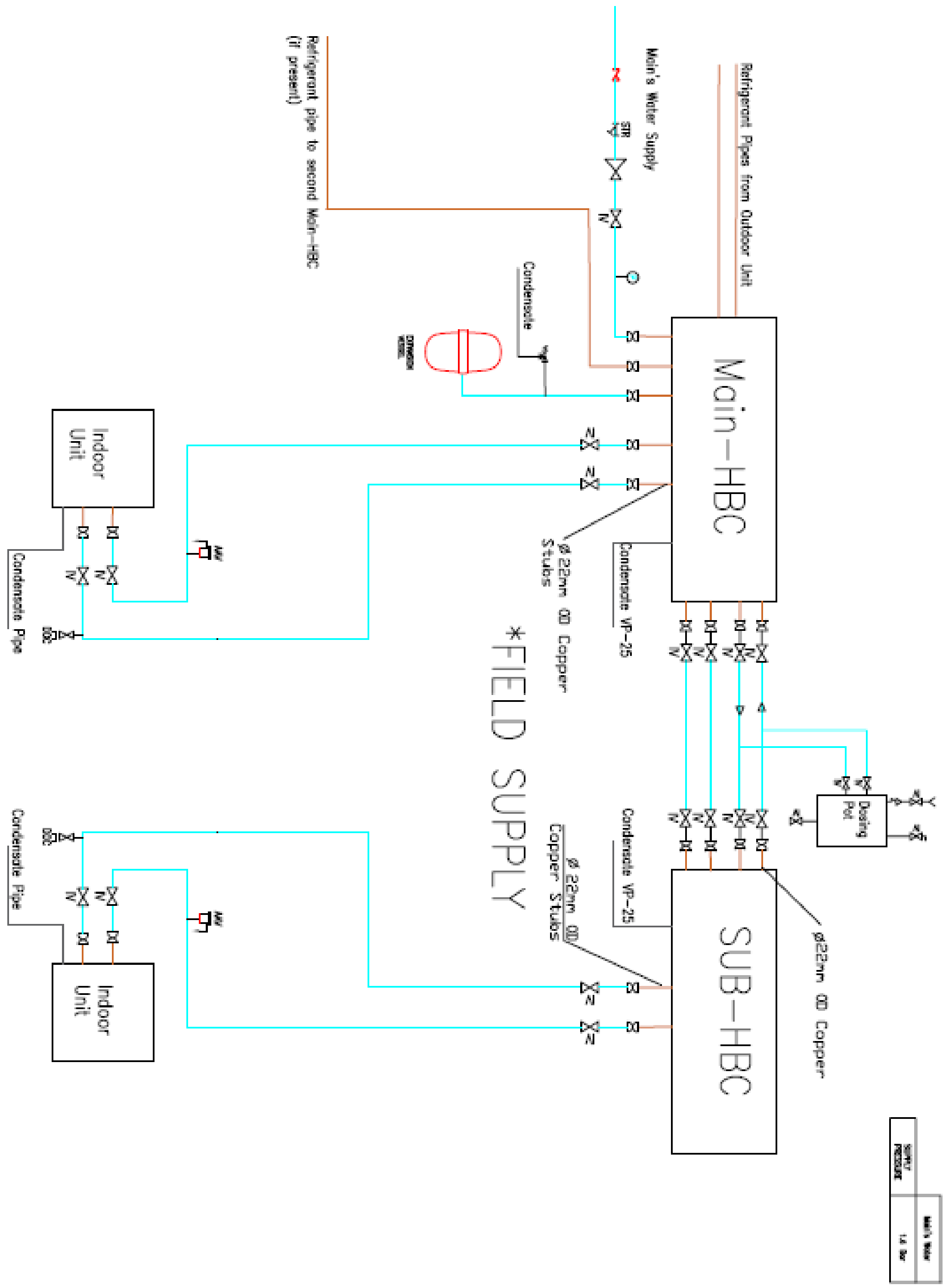
1.1. Schematic Overview

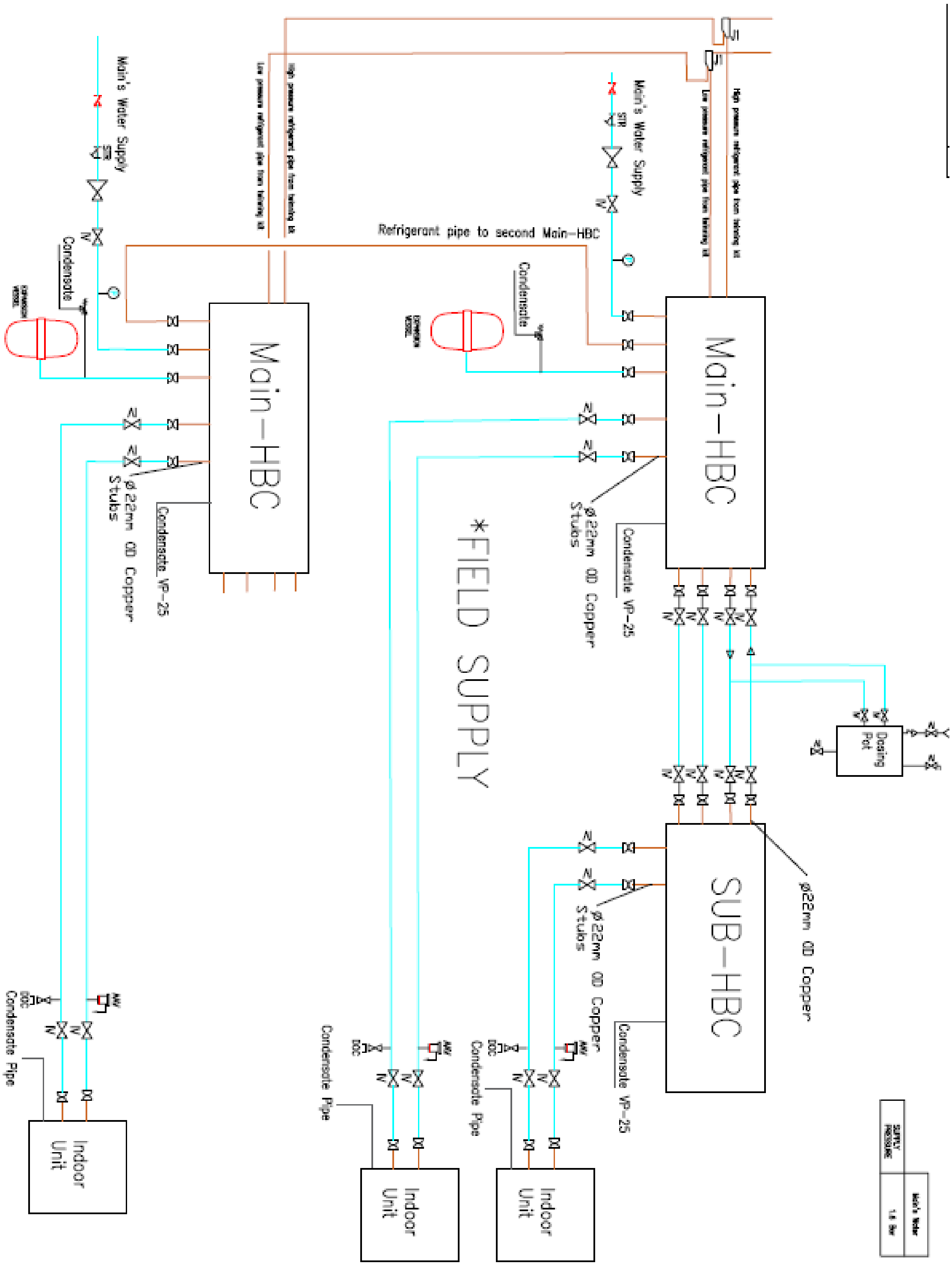


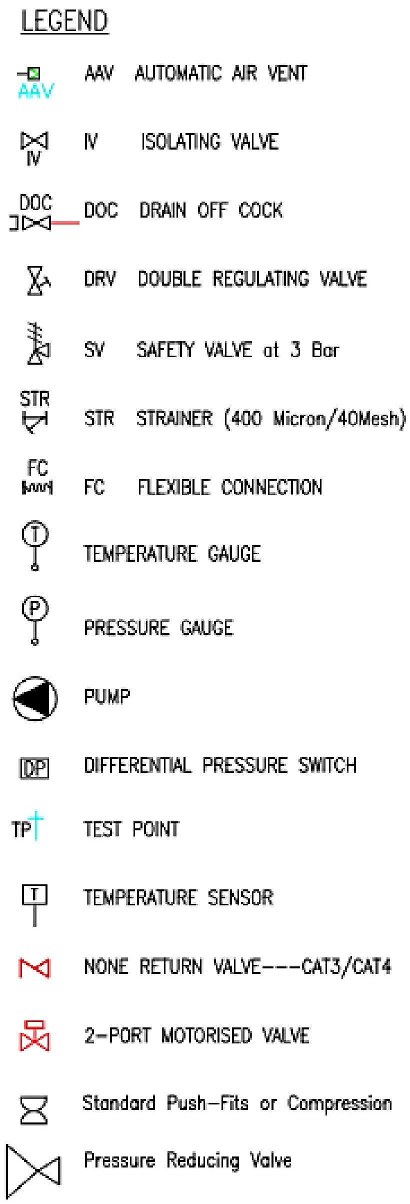
Technical Overview

2 Main HBC Boxes on same system




Refrigerant Pipes from Outdoor Unit
Main's Water Supply
Refrigerant pipe to second Main-HBC (if present)
Condensate
Main-HBC
Indoor Unit
Condensate VP-25
ø 22mm OD Copper Stubs
Condensate Pipe
*FIELD SUPPLY
Dosing Pot
Condensate VP-25
ø 22mm OD Copper Stubs
ø22mm OD Copper
SUB-HBC
Indoor Unit
Condensate Pipe


Main-HBC
Main-HBC
SUB-HBC
*FIELD SUPPLY
Refrigerant pipe to second Main-HBC
Main's Water Supply
Main's Water Supply
Condensate
Condensate
Condensate VP-25
Condensate VP-25
Condensate VP-25
ø22mm OD Copper Stubs
ø22mm OD Copper Stubs
ø22mm OD Copper Stubs
ø22mm OD Copper
Dosing Pot
Condensate Pipe
Condensate Pipe
Condensate Pipe
Indoor Unit
Indoor Unit
Indoor Unit

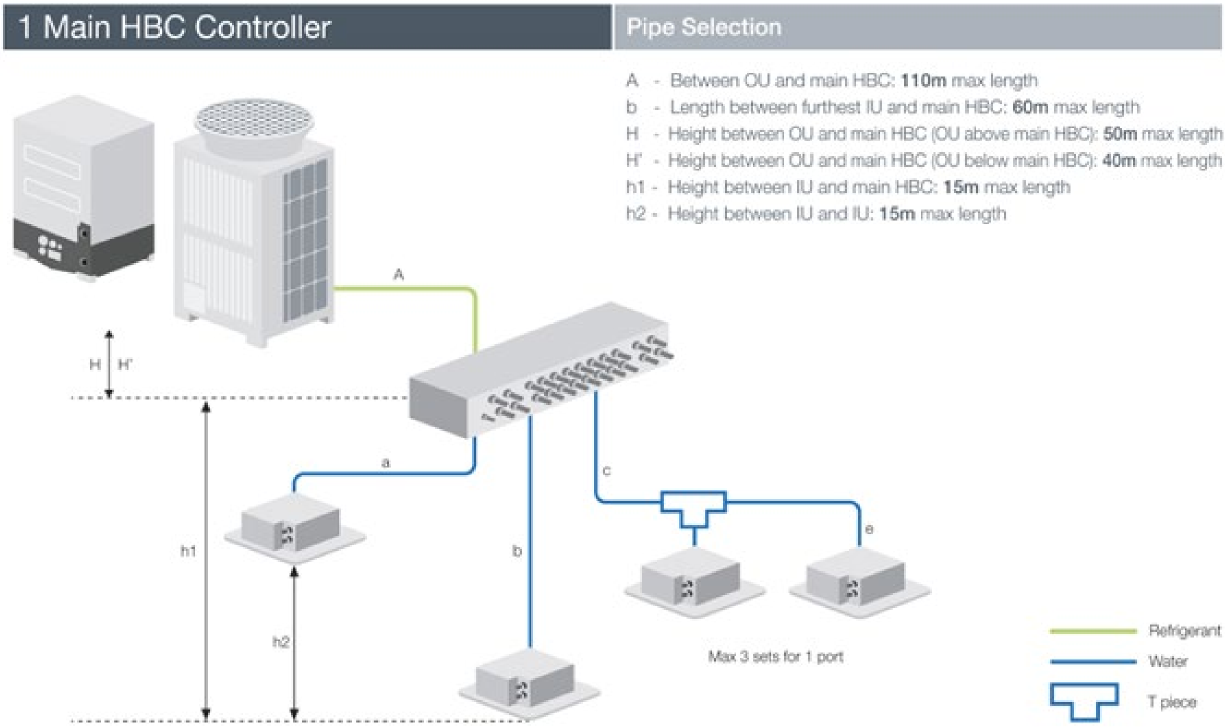


Please see dosing section for system dosing installation configurations.

1.2. Water pipework limitation (Excluding equivalent lengths)

Please note, the height between the OU and HBC can be increased by switching SW3-7 to On in the HBC unit (master).

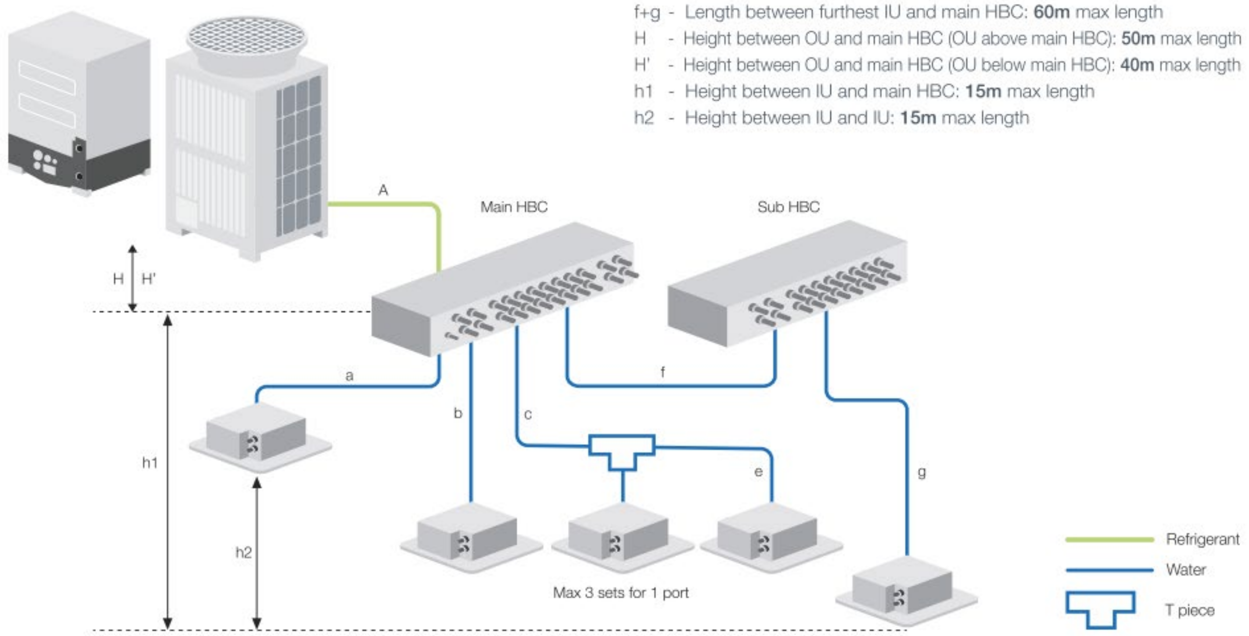
This will increase the height when the HBC is above the OU to 90M and increase the height difference when the HBC is below the OU to 60M



1 Main HBC Controller and 1 Sub HBC

Pipe Selection

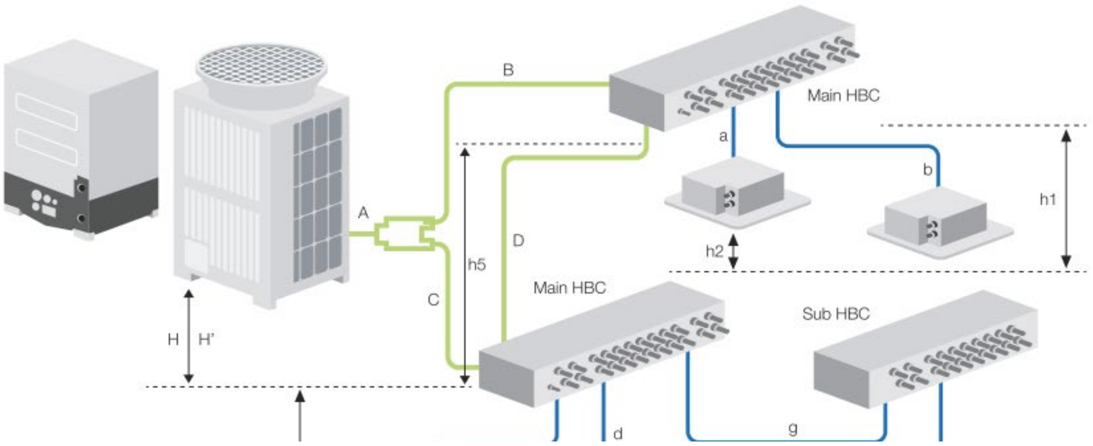
- A - Between OU and main HBC: **110m** max length
- f+g - Length between furthest IU and main HBC: **60m** max length
- H - Height between OU and main HBC (OU above main HBC): **50m** max length
- H' - Height between OU and main HBC (OU below main HBC): **40m** max length
- h1 - Height between IU and main HBC: **15m** max length
- h2 - Height between IU and IU: **15m** max length



2 Main HBC Controller and 1 Sub HBC

Pipe Selection

- A+B+C - Between OU and main HBC: **110m** max length
- b+g+h - Length between furthest IU and main HBC: **60m** max length
- H - Height between OU and main HBC (OU above main HBC): **50m** max length
- H' - Height between OU and main HBC (OU below main HBC): **40m** max length
- h1+h3 - Height between IU and main HBC: **15m** max length
- h2+h4 - Height between IU and IU: **15m** max length
- h5 - Height between main HBC and main HBC: **15m** max length
- D - Length between main HBC and main-HBC: **40m** max length



* When the total indoor unit capacity exceeds 130% of outdoor unit capacity the max height figures shown are reduced from 15M to 10M.

1.3. Water pipework size

The table below illustrates the maximum equivalent lengths for each indoor unit size. Please note the equivalent lengths above does not consider any bends or elbows.

Unit Size	MLC ID	MLC OD	DN Copper	Max Equivalent Pipe Length (m)	Min Insulation (mm)
10	12	16	DN15	60	6
15	15.5	20	DN22	60	9
20	15.5	20	DN22	60	9
25	20	25	DN22	60	9
32	20	25	DN22	60	9
40	20	25	DN22	60	9
50	20	25	DN22	60	9
63	32.6	40	DN35	60	13
80	32.6	40	DN35	60	13

We have allowed some smaller size pipes with shorter pipe runs to improve flexibility as per the table below:

Unit Size	MLC ID	MLC OD	DN Copper	Max Equivalent Pipe Length (m)	Min Insulation (mm)
25	15.5	20	DN22	40	9
32	15.5	20	DN22	25	9
63	26	32	DN28	45	13
80	26	32	DN28	30	13

The equivalent length will vary for each manufacturer and is also dependent of the type of fitting. Guidance is provided below:

Fitting	Equivalent Length Reduction (m)
Swept bend radius > 1.5 x pipe diameter	0.55
Non-full bore connector	1
Elbow (bend < 1.5 x pipe diameter)	4

Table 1. Equivalent length for water pipe fittings

The equivalent pipe length reductions need only be counted once, i.e. count the fittings on the flow direction only, then apply the equivalent length reduction.

The insulation level has been calculated at the Hybrid VRF operating temperatures using the calculation method stated in BS EN 12241:2008. All elbows, connections and exposed components should be covered with insulation. Armaflex insulation, class O type, is used in commercial applications.

Thicker insulation maybe required for condensation control depending on the environment. As per the part L building regulations the selected pipe work insulation should meet the maximum permissible heat loss for domestic/non-domestic environments, along with the pipe sizes themselves.
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1.4. Horizontal HBC pump load sharing (Index Limitation)

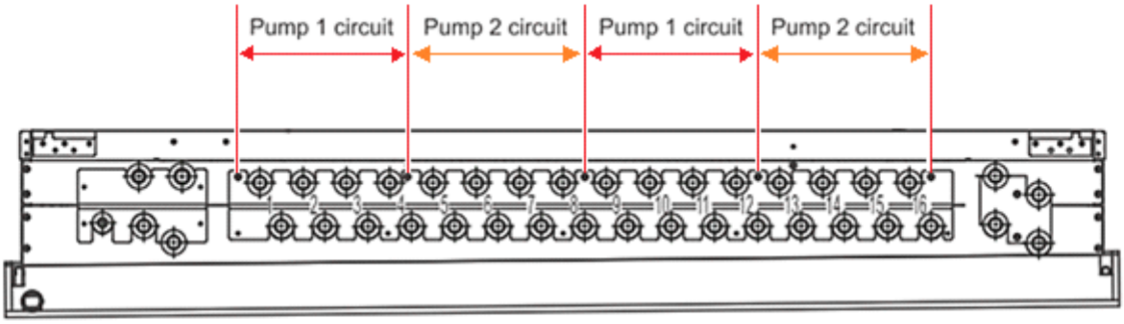
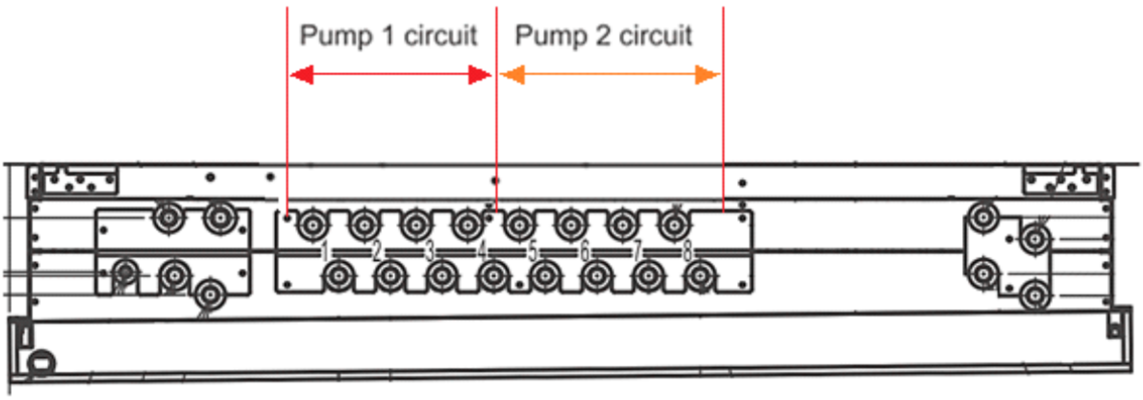


Fig. 3-2-B

HBC has two pumps. Each pump can accommodate the capacity of indoor unit's equivalent to P188.Make sure that the total capacity of the indoor units connected to "ports 1 through 4 and 9 through 12" or "5 through 8 and 13 through 16" should not exceed P188.

On an 8 way HBC pump 1 serves ports 1-4 and pump 2 serves ports 5-8



Load share the FCU index on the HBC i.e. distribute the index equally across both pump circuits

Correct example of load sharing across the HBC with equal capacity across both pumps.

Key: Blue pump1 Red pump 2. (as shown in below schematic)

Capacity equal on both pumps that is below P188

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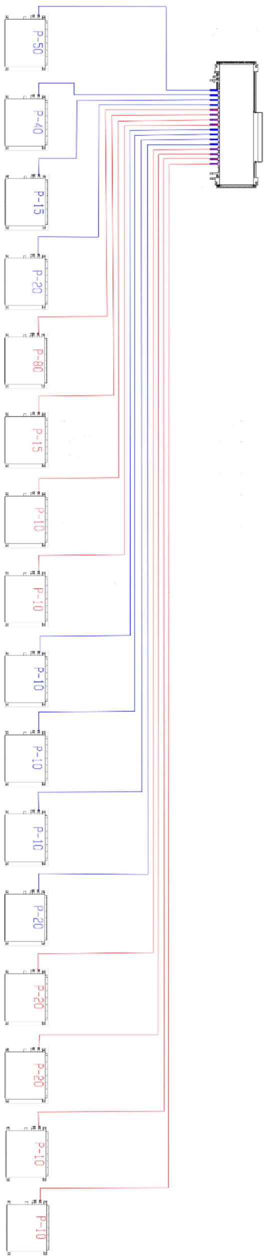
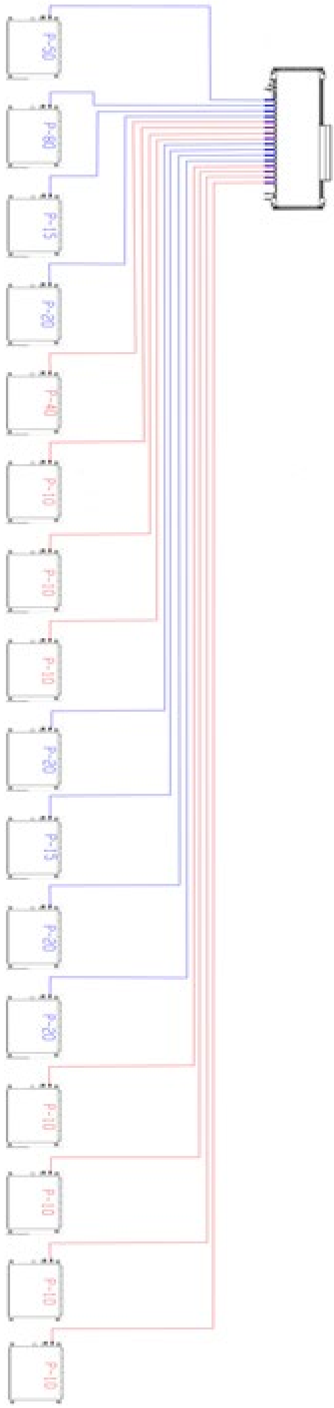


Incorrect example of capacity unequal across pumps using the same fan coil sizes.
Pump1 (blue) = P240
Pump 2 (red) = P110

An unequal capacity on the pumps will result in a reduction of capacity from the fan coil units, a reduction of efficiency and an increase in noise from the HBC.



An unequal capacity on the pumps will result in a reduction of capacity from the fan coil units, a reduction of efficiency and an increase in noise from the HBC.

1.5. Refrigeration Pipe Size & Components

Outdoor unit to HBC refrigeration pipe size

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Use of one HBC controller

Unit model		HBC controller		
		Model name	High pressure side	Low pressure side
Outdoor unit side	PURY-(E)M200	CMB-WM108V-AA CMB-WM1016V-AA	ø15.88 (Brazed)	ø19.05 (Brazed)
	PURY-(E)M250			ø22.2 (Brazed)
	PURY-(E)M300			
	PURY-(E)M350			ø28.58 (Brazed)

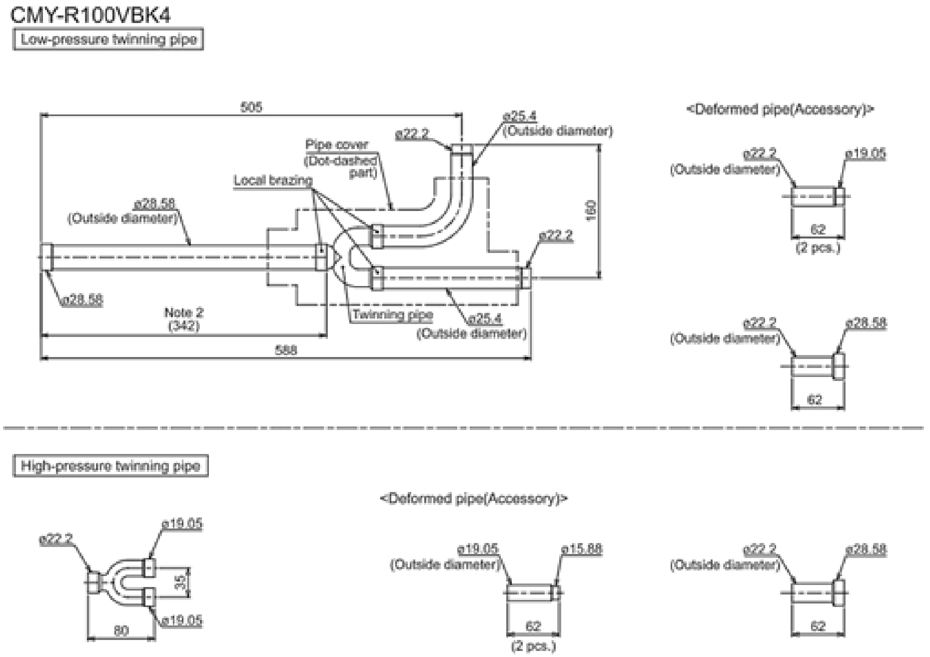
Use of two HBC controllers

Unit model		HBC controller				
		Model name	Between outdoor unit and twinning pipe		Between twinning pipe and HBC	
			High pressure side	Low pressure side	High pressure side	Low pressure side
Outdoor unit side	PURY-(E)M300	CMB-WM108V-AA CMB-WM1016V-AA	ø15.88 (Brazed)	ø22.2 (Brazed)	ø15.88 (Brazed) for each HBC controller	ø19.05 (Brazed) for each HBC controller
	PURY-(E)M350			ø28.58 (Brazed)		
	PURY-(E)M400		ø19.05 (Brazed)			
	PURY-(E)M450					ø22.2 (Brazed) for each HBC controller
	PURY-(E)M500					

<u>**SINGLE OUTDOOR UNITS UP SIZE 500 ONLY, MODULUAR SYSTEMS NOT SUPPORTED**</u>

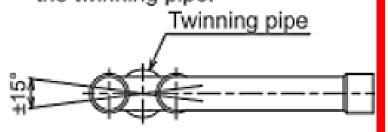
If 2 master HBC's are used, they must use the correct joint kit (field supply) plus the interconnecting balance line. Mitsubishi Electric Twinning Kit CMY-R100VBK4 can be used, this will allow the Low Pressure pipes and High pressure pipes to be piped to each Main HBC.

Should be place horizontal to ground. (Essential for balanced refrigerant flow if twined)



Horizontal to ground (Essential)

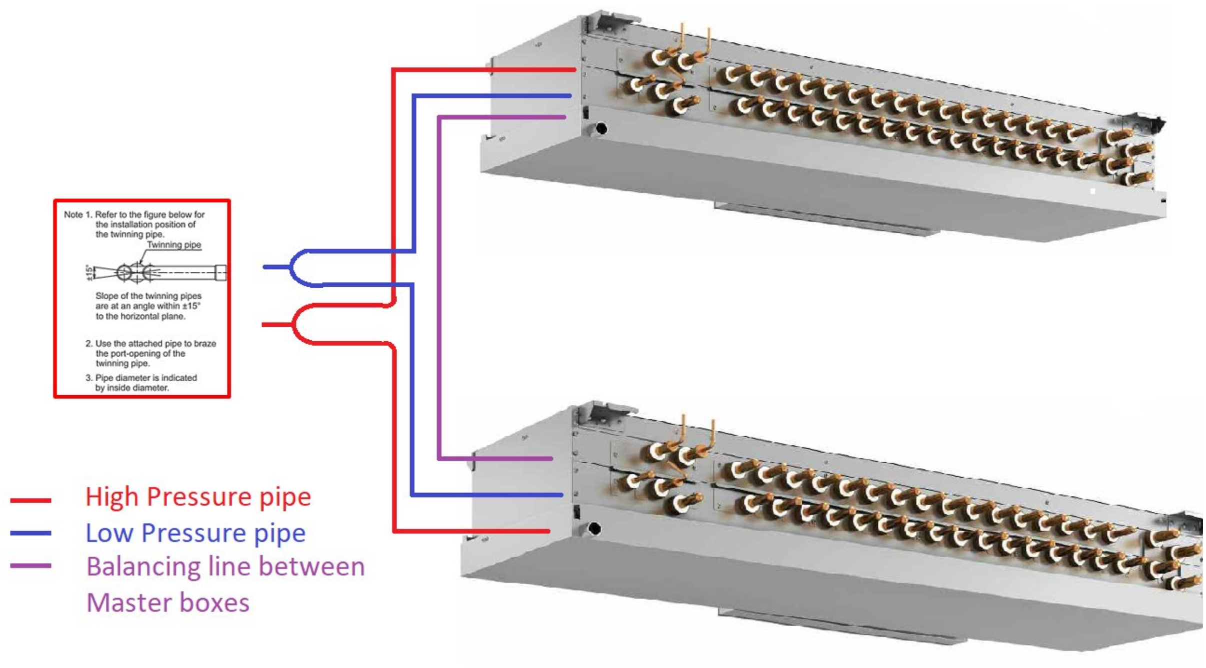
Note 1. Refer to the figure below for the installation position of the twinning pipe.



Slope of the twinning pipes are at an angle within ±15° to the horizontal plane.

2. Use the attached pipe to braze the port-opening of the twinning pipe.

3. Pipe diameter is indicated by inside diameter.



<u>Balance pipe between 2 x Main HBC on the same refrigerant circuit</u>
<u>Make sure this is added to refrigeration calculations, 5/8 size.</u>

Depending on the operation conditions, the HBC generates noise caused by the internal valve actuation, refrigerant flow and pressure changes even when operating normally. Therefore please install the HBC in a place, such as ceilings of a corridor or plant rooms etc.

Install the HBC where noise will not be an issue at least 5 m away from any indoor units (The HBC is not designed for outside mounting)

1.6. Additional Refrigerant Calculation

Calculation formula (PURY-(E) M)
The amount of refrigerant to be added depends on the size and the length of field high pressure piping between the Outdoor unit and Vertical HBC. (Unit in m [ft.])

The below examples is based on a Φ15.88 [5/8"] high pressure pipe:

1) When the distance between HBC and outdoor unit is longer than 10m:
Amount of added refrigerant (kg) = (0.09xL1) +α1

2) When the distance between HBC and outdoor unit is 10m or shorter:
Amount of added refrigerant (kg) = (0.11xL1) +α1

Round up the calculation result to the nearest 0.1kg.

L1: Length of Φ15.88 [5/8"] high pressure pipe (m)
α1 : Additional charge for Outdoor unit & Vertical HBC

The basic formula for other high-pressure pipe are shown below:

<Formula>

- When the piping length from the outdoor unit to the farthest HBC controller is 10 m or shorter

Amount of additional charge (kg)	=	High-pressure pipe ø22.2 total length × 0.23 (kg/m)	+	High-pressure pipe ø19.05 total length × 0.16 (kg/m)	+	High-pressure pipe ø15.88 total length × 0.11 (kg/m)

- When the piping length from the outdoor unit to the farthest HBC controller is longer than 10 m

Amount of additional charge (kg)	=	High-pressure pipe ø22.2 total length × 0.19 (kg/m)	+	High-pressure pipe ø19.05 total length × 0.13 (kg/m)	+	High-pressure pipe ø15.88 total length × 0.09 (kg/m)

+

Outdoor unit model	Amount (kg)
(E)M200	1.0
(E)M250	1.0
(E)M300	0
(E)M350	0
(E)M400	0
(E)M450	0
(E)M500	0

+

Amount (kg/HBC controller)
2.8

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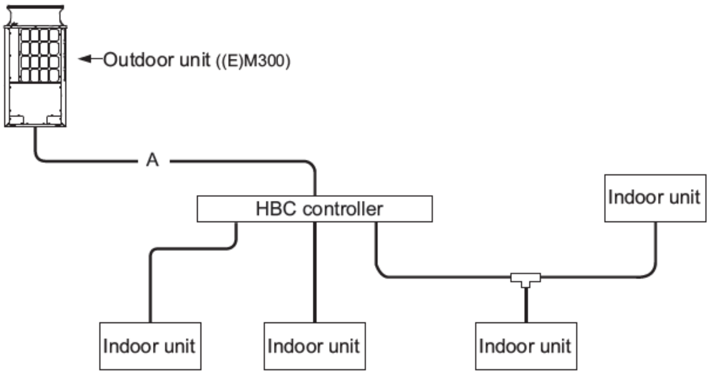
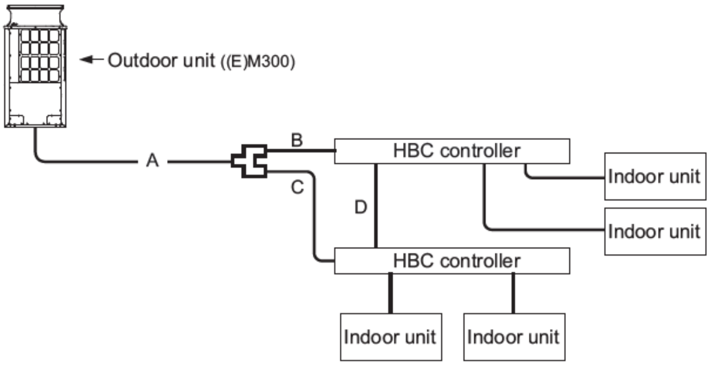
Refrigerant charging calculation

Example





■ Sample calculation

Indoor 1: 50 A: ø15.88 42 m
2: 50
3: 50
4: 40
Outdoor M250

The total length of each liquid line is as follows:
ø15.88: A = 42 m, α_1 = 2.8
Therefore,
<Calculation example>
Additional refrigerant charge
= 42 × 0.09 + 2.8
= 6.58 kg
≒ 6.6 kg
* All pipe work except A is water pipe work.

Indoor 1: 50 A:ø15.88 18 m
2: 50 B:ø15.88 5 m
3: 50 C:ø15.88 10 m
4: 50 D:ø15.88 8 m
Outdoor M300

The total length of each liquid line is as follows:
ø15.88: A = 18 m, ø15.88: B + C + D = 23m, α_1 = 2.8
Therefore,
<Calculation example>
Additional refrigerant charge
= 18 × 0.09 + (5 + 10 + 8) × 0.09 + 2.8 × 2
= 9.29 kg
≒ 9.3 kg
* All pipe work except A, B, C, D is water pipe work.

* The liquid line length refers to the high-pressure line when using the online refrigerant charge calculator

■ Limitation of the amount of refrigerant to be charged

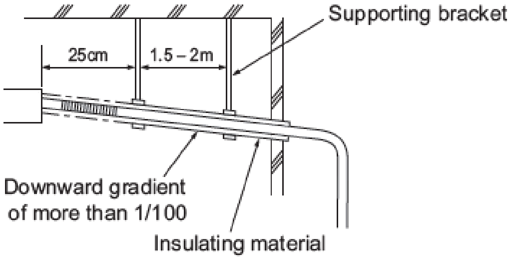
The above calculation result of the amount of refrigerant to be charged must become below the value in the table below.

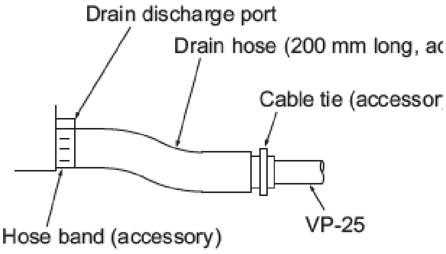
Total index of the outdoor units			M200 YNW	M250 YNW	M300 YNW	M350 YNW	M400 YNW	M450 YNW	M500 YNW	EM200 YNW	EM250 YNW	EM300 YNW	M350 YNW	EM400 YNW	EM450 YNW	EM500 YNW
Maximum refrigerant charge	Factory charged	kg	5.2	5.2	5.2	8.0	8.0	10.8	10.8	5.2	5.2	5.2	8.0	8.0	10.8	10.8
	Charged on site	kg	13.5	13.5	15.5	15.5	19.5	19.5	19.5	13.5	13.5	15.5	15.5	19.5	19.5	19.5
	Total for system	kg	18.7	18.7	20.7	23.5	27.5	30.3	30.3	18.7	18.7	20.7	23.5	27.5	30.3	30.3

Please refer to the installation manual supplied with the unit for any revisions to the calculation.

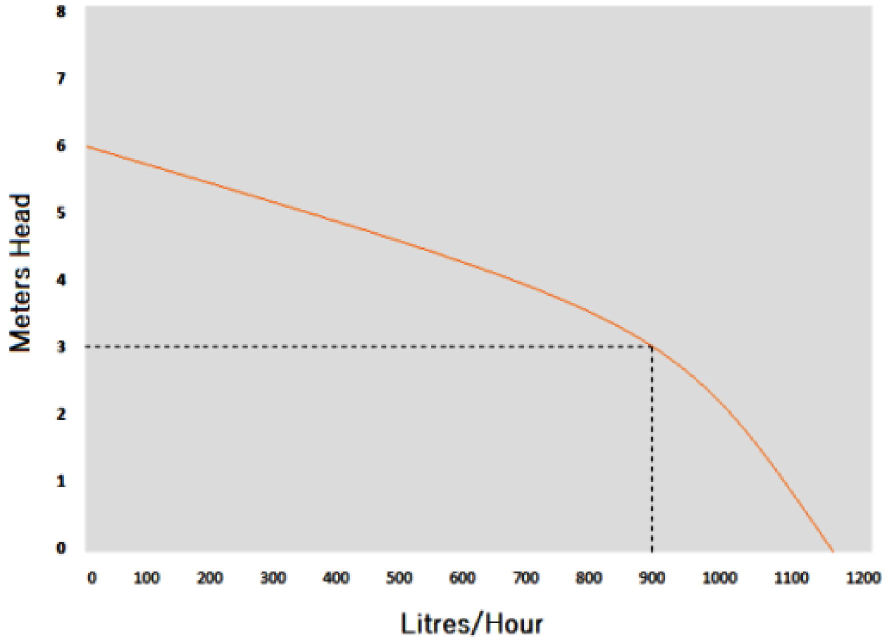
1.7. Horizontal HBC Drain

The drain pipe size can be increased but **do not** reduce anywhere.





Gravity drain is preferred but if it is not possible then a suitable condensate pump can be used, it is recommended that the pump can deliver a minimum of 900L/H at the expected head required on site.



Normal condensate levels from the HBC in normal operation will approximately be 2.5 litre per hour.

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1.8. Horizontal HBC service space

Allow enough space for access to carry out the commissioning process and any future maintenance.

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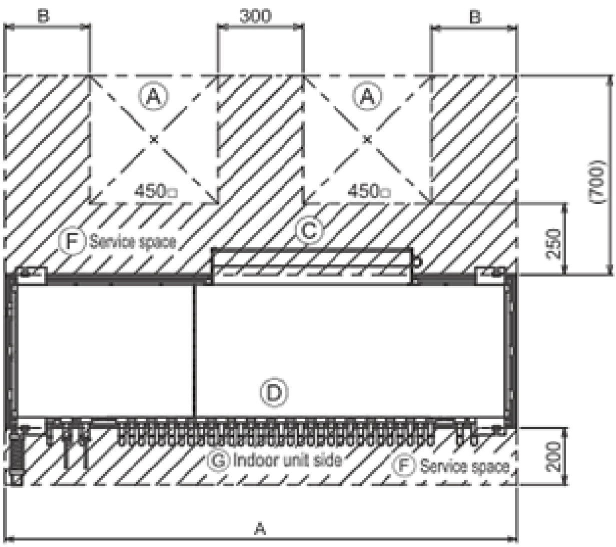

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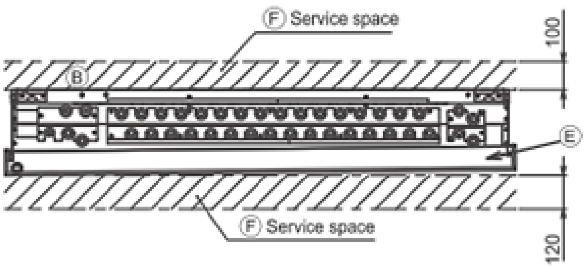
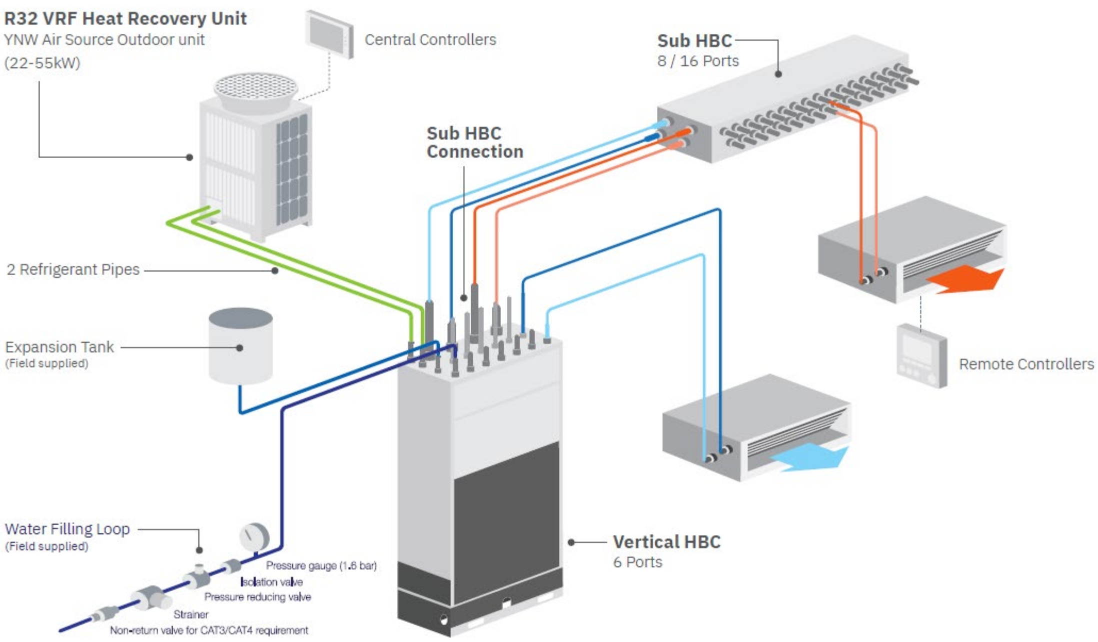


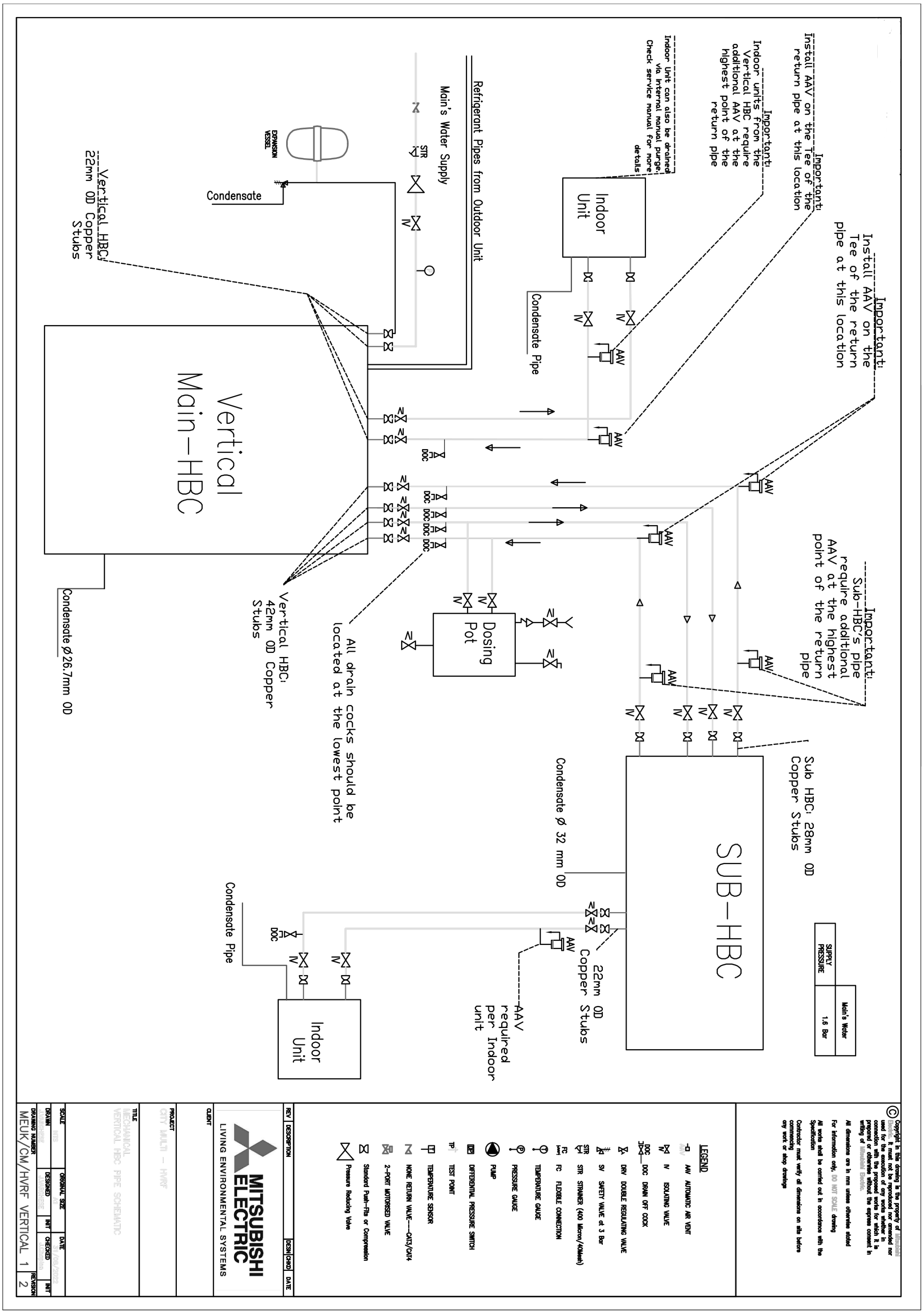
HBC	A (mm)	B (mm)
CMB-WM108V-AA	1520	160
CMB-WM1016V-AA	1800	300

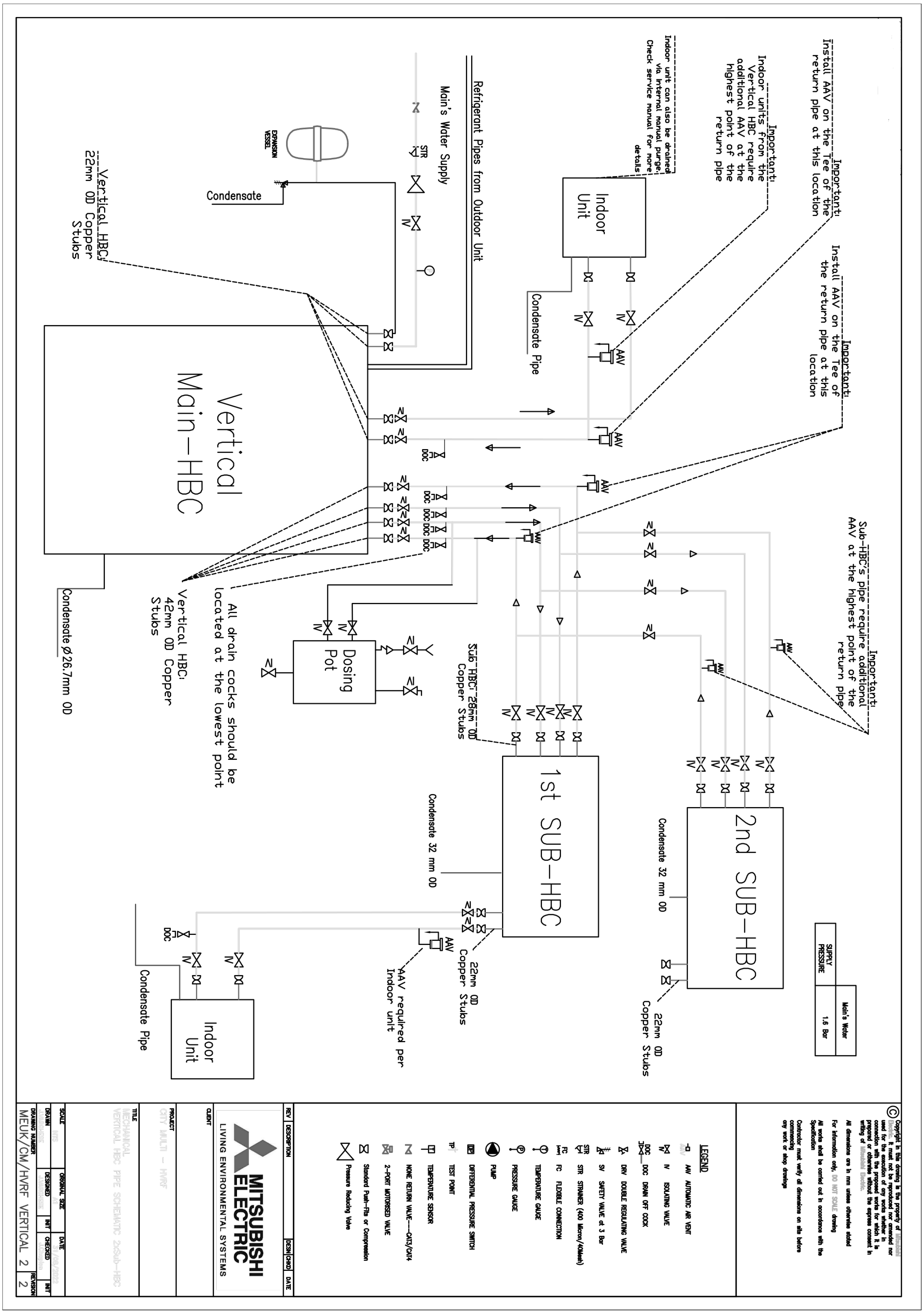
2. Vertical HBC

The following sections provide a technical overview that is unique to the Vertical HVRF system.

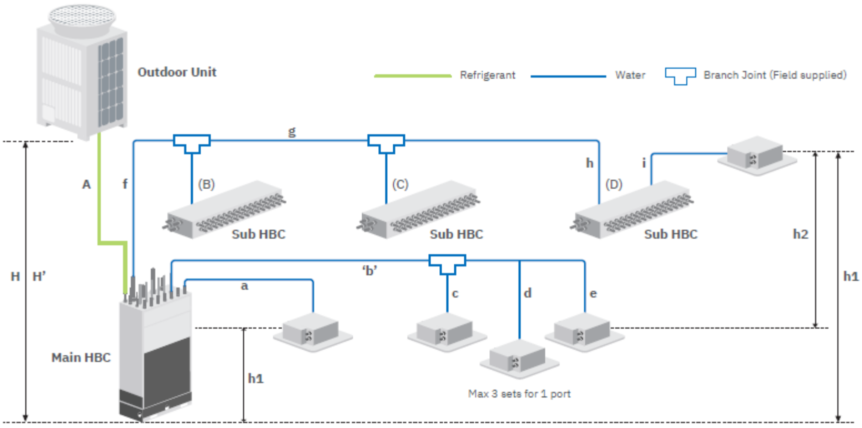


2.1. Vertical HBC




Vertical Main-HBC
1st SUB-HBC
2nd SUB-HBC
Indoor Unit
Indoor Unit
Dosing Pot
Refrigerant Pipes from Outdoor Unit
Main's Water Supply
Condensate
Condensate Pipe
Condensate Pipe
Condensate ø26.7mm OD
Condensate 32 mm OD
Condensate 32 mm OD
Vertical HBC: 22mm OD Copper Stubs
Vertical HBC: 42mm OD Copper Stubs
Sub HBC: 28mm OD Copper Stubs
22mm OD Copper Stubs
22mm OD Copper Stubs
All drain cocks should be located at the lowest point
Important: Install AAV on the Tee of the return pipe at this location
Important: Install AAV on the Tee of the return pipe at this location
Important: Indoor units from the Vertical HBC require additional AAV at the highest point of the return pipe
Important: Sub-HBC's pipe require additional AAV at the highest point of the return pipe
Indoor unit can also be drained via internal manual purge. Check service manual for more details
AAV required per Indoor unit
SUPPLY PRESSURE | Main's Water | 1.6 Bar
LEGEND
AAV AUTOMATIC AIR VENT
IV ISOLATING VALVE
DOC DRAIN OFF COCK
DRV DOUBLE REGULATING VALVE
SV SAFETY VALVE at 3 Bar
STR STRAINER
FC FLEXIBLE CONNECTION
TEMPERATURE GAUGE
PRESSURE GAUGE
PUMP
DIFFERENTIAL PRESSURE SWITCH
TEST POINT
TEMPERATURE SENSOR
NONE RETURN VALVE
2-PORT MOTORISED VALVE
Standard Push-Fits or Compression
Pressure Reducing Valve
MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS
PROJECT CITY MULTI - HVRF
TITLE MECHANICAL VERTICAL HBC PIPE SCHEMATIC
DRAWING NUMBER MEUK/CM/HVRF VERTICAL 2

2.2 Water pipework limitation (Excluding equivalent lengths)



A - Between outdoor unit and main HBC: **110m max length**
f+g+h+i - Water pipework between indoor units and main HBC: **60m max length**
H - Height between outdoor unit and main HBC (Outdoor unit above main HBC): **50m max length**[*1]
H' - Height between outdoor unit and main HBC (Outdoor unit below main HBC): **40m max length**[*2]
h1 - Height between indoor units and main HBC: **15 (10)m max length**[*3]
h2 - Height between indoor units and indoor units: **15 (10)m max length**[*3]

*1 90m is available depending on the model and installation conditions. For more detailed information. contact your local distributor
*2 60m is available depending on the model and installation conditions. For more detailed information. contact your local distributor.
*3 Values in( ) are applied when indoor total capacity exceeds 130% of outdoor unit capacity.

2.3. Water pipework size for indoor units

The table below illustrates the maximum equivalent lengths for each indoor unit size. Please note the equivalent lengths does not consider any bends or elbows.

Indoor Unit Size	I.D (mm)	MLC O.D (mm)	DN Copper (mm)	Insulation (mm)
10	12	16	15	6
15	15.5	20	22	9
20	15.5	20	22	9
25	15.5	20	22	9
32	19.9	25	22	9
40	19.9	25	22	9
50	19.9	25	22	9
63	25.2	32	28	13
80	25.2	32	28	13

For layouts where the farthest indoor unit is less than 40m or 20m from the vertical HBC, the internal pipe diameter can be reduced further. This function is highlighted in the New Design Tool.

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2.4. Refrigeration Pipe Size

Only one Vertical HBC (Main) can be connected per outdoor unit, therefore the refrigerant layout is only between the outdoor unit and Vertical HBC.

More indoors unit can be connected to this layout by using multiple Sub-HBC which are connected to the Vertical HBC via 4 pipe water connection.

Unit model		HBC		
		Model name	High pressure side	Low pressure side
Outdoor unit side	PURY-(E)M200	(HBC) CMB-WM350F-AA	ø15.88 (Brazing)	ø19.05 (Brazing)
	PURY-(E)M250		ø15.88 (Brazing)	ø22.2 (Brazing)
	PURY-(E)M300		ø15.88 (Brazing)	ø22.2 (Brazing)
	PURY-(E)M350		ø15.88 (Brazing)	ø28.58 (Brazing)
	PURY-(E)M400	(HBC) CMB-WM500F-AA	ø19.05 (Brazing)	ø28.58 (Brazing)
	PURY-(E)M450		ø19.05 (Brazing)	ø28.58 (Brazing)
	PURY-(E)M500		ø19.05 (Brazing)	ø28.58 (Brazing)

SINGLE OUTDOOR UNITS UP SIZE 500 ONLY, MODULUAR SYSTEMS NOT SUPPORTED

Depending on the operation conditions, the vertical HBC generates noise caused by the internal valve actuation, refrigerant flow and pressure changes even when operating normally. Therefore please install the HBC in a maintenance room, plant rooms etc.

Install the HBC where noise will not be an issue at least 5 m away from any indoor units (The HBC is not designed for outside mounting)

2.5. Additional Refrigerant Calculation

Calculation formula (PURY-(E) M)

The amount of refrigerant to be added depends on the size and the length of field high pressure piping between the Outdoor unit and Vertical HBC. (Unit in m [ft.])

The below examples is based on a Φ15.88 [5/8"] high pressure pipe:

1) When the distance between HBC and outdoor unit is longer than 10m:
Amount of added refrigerant (kg) = (0.09xL1) +α1

2) When the distance between HBC and outdoor unit is 10m or shorter:
Amount of added refrigerant (kg) = (0.11xL1) +α1

Round up the calculation result to the nearest 0.1kg.

L1: Length of Φ15.88 [5/8"] high pressure pipe (m)
α1 : Additional charge for Outdoor unit & Vertical HBC

The basic formula for other high-pressure pipe are shown below:
.

<Formula>

• When the piping length from the outdoor unit to the farthest HBC controller is 10 m or shorter

Amount of additional charge (kg)	=	High-pressure pipe ø22.2 total length × 0.23 (kg/m)	+	High-pressure pipe ø19.05 total length × 0.16 (kg/m)	+	High-pressure pipe ø15.88 total length × 0.11 (kg/m)

• When the piping length from the outdoor unit to the farthest HBC controller is longer than 10 m

Amount of additional charge (kg)	=	High-pressure pipe ø22.2 total length × 0.19 (kg/m)	+	High-pressure pipe ø19.05 total length × 0.13 (kg/m)	+	High-pressure pipe ø15.88 total length × 0.09 (kg/m)

\+

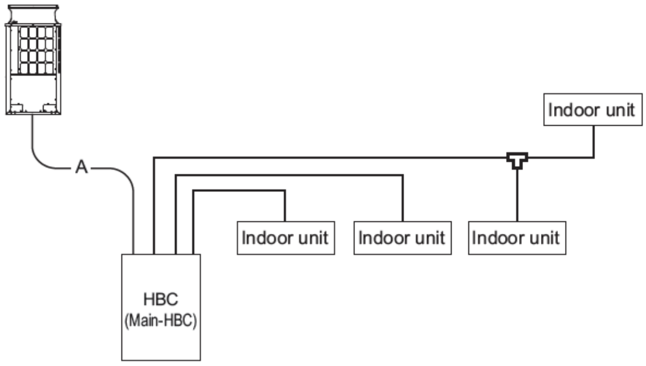
Outdoor unit model	Amount (kg)
(E)M200	1.0
(E)M250	1.0
(E)M300	0
(E)M350	0
(E)M400	0
(E)M450	0
(E)M500	0

* Amount of refrigerant to be charged for single-module units

\+

HBC model	Amount (kg)
350F	5.6
500F	5.6

Example



■ Sample calculation

Indoor 1: 50 A: ø15.88 42 m
2: 50
3: 50
4: 40
Outdoor M250

The total length of each liquid line is as follows:
ø15.88: A = 42 m, α1 = 5.6
Therefore,
<Calculation example>
Additional refrigerant charge
= 42 × 0.09 + 5.6
= 9.38 kg
≒ 9.4 kg
* All pipe work except A is water pipe work.

* The liquid line length refers to the high-pressure line when using the online refrigerant charge calculator

■ Limitation of the amount of refrigerant to be charged

The above calculation result of the amount of refrigerant to be charged must become below the value in the table below.

Total index of the outdoor units			M200 YNW	M250 YNW	M300 YNW	M350 YNW	M400 YNW	M450 YNW	M500 YNW	EM200 YNW	EM250 YNW	EM300 YNW	M350 YNW	EM400 YNW	EM450 YNW	EM5 YN
Maximum refrigerant charge	Factory charged	kg	5.2	5.2	5.2	8.0	8.0	10.8	10.8	5.2	5.2	5.2	8.0	8.0	10.8	10
	Charged on site	kg	13.5	13.5	15.5	15.5	19.5	19.5	19.5	13.5	13.5	15.5	15.5	19.5	19.5	19
	Total for system	kg	18.7	18.7	20.7	23.5	27.5	30.3	30.3	18.7	18.7	20.7	23.5	27.5	30.3	30

Please refer to the installation manual supplied with the unit for any revisions to the calculation.

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2.6. Vertical HBC Index Limitation

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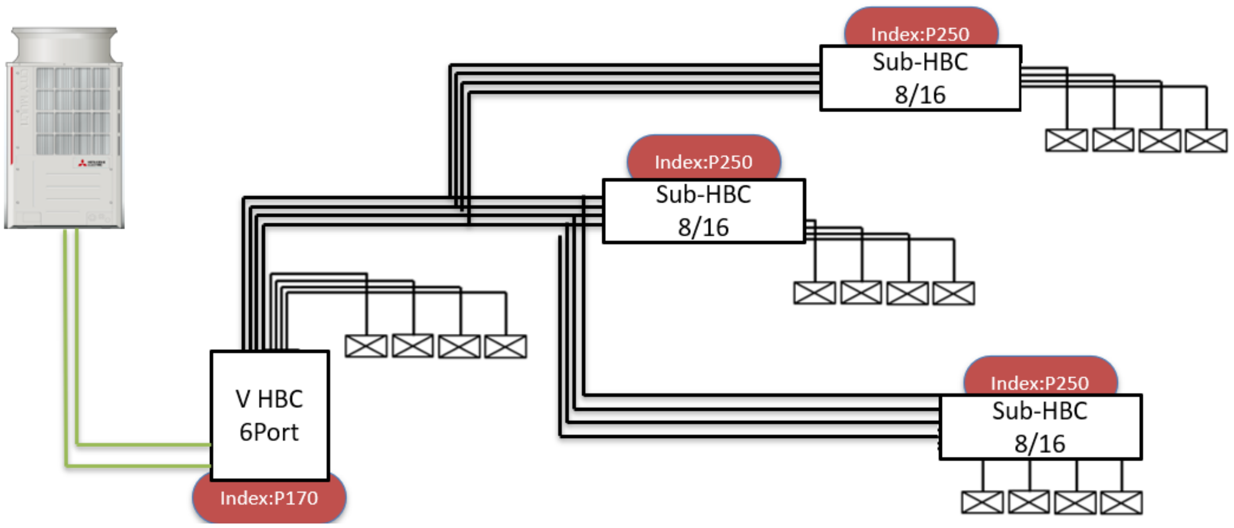
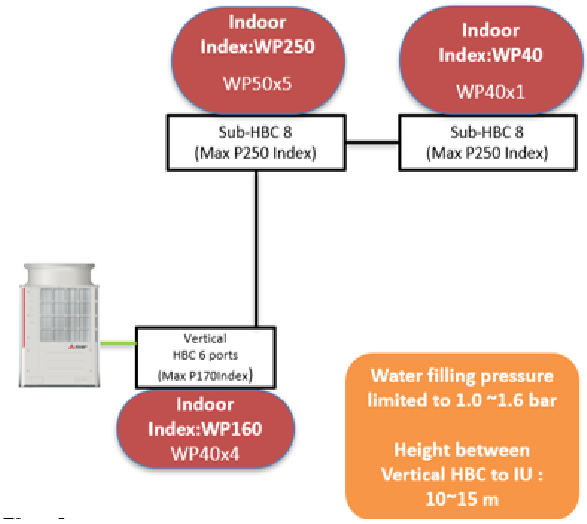


The Vertical HBC and Sub-HBCs have index limitations. The total number of indoor units loaded onto each HBC should be within the index limitation, as shown in the example below:

OU : PURY-M450-YNW

System Diversity : 100% , Index 450

IU	QTY	Index
WP40-VMA	5	200
WP50-VMA	5	250
TOTAL	**10**	**450**



As standard, the water filling pressure is limited to 1.6 bars and the index on the Vertical HBC and Sub-HBC is limited to P170 and P250 respectively.
The example below shows, how to calculate the index on these HBCs

The index on the Vertical & Sub-HBC can be increased to P200 and P350 respectively via Dip-SW.

However, the water filling pressure is limited to 1.2 bars and the height between the Vertical HBC and the indoor unit is limited to 11m.

The software on these HBC boxes should be Ver 11.03 or above.

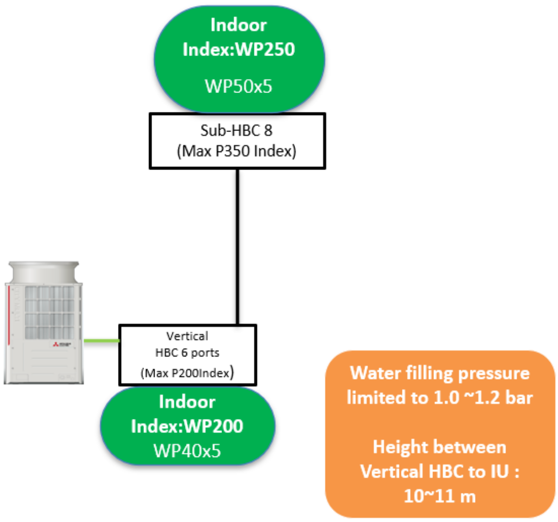
(A) Main-HBC
Total indoor units capacity: W/WP/WL170 or less (DipSW001-8 = OFF)
W/WP/WL200 or less (DipSW001-8 = ON) *

(B), (C), (D) Sub-HBC
Total indoor units capacity: W/WP/WL250 or less (DipSW001-8 = OFF)
W/WP/WL350 or less (DipSW001-8 = ON) *

OU : PURY-M450-YNW

System Diversity : 100% , Index 450

IU	QTY	Index
WP40-VMA	5	200
WP50-VMA	5	250
TOTAL	**10**	**450**



2.7. Vertical HBC Drain

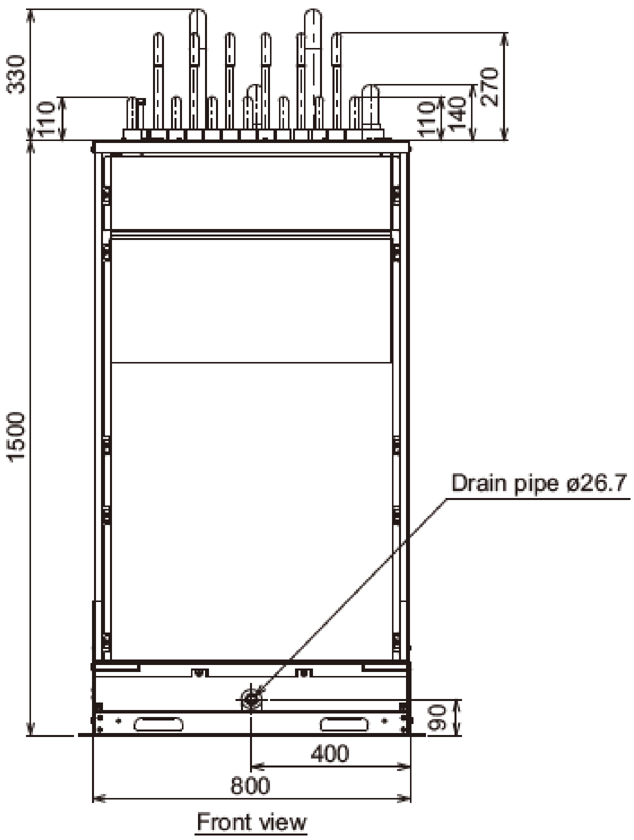
The drain pan is located at the base of the unit and the piping orientation can be to suit the installation location. As standard the drain pipe connection is on the front side of the unit.

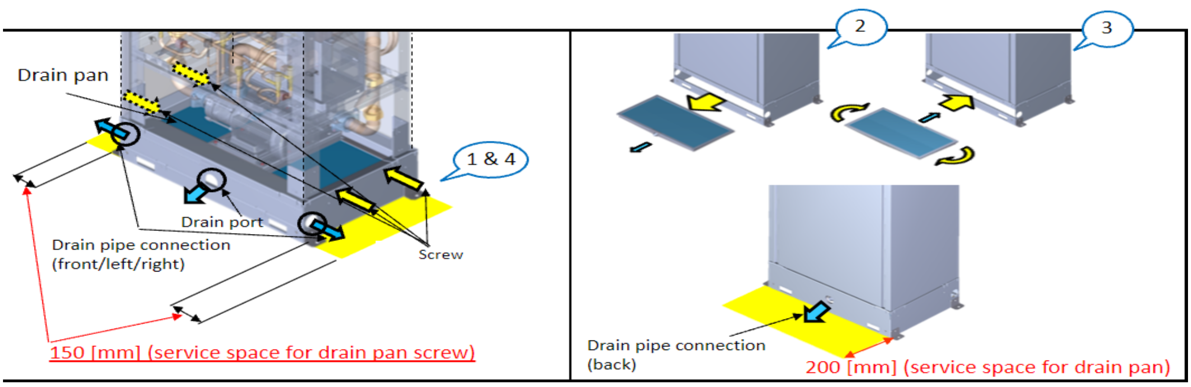
By changing the direction of the drain pan, it is possible to connect the drain pipe from the back side. In case of removing the drain pan after the unit is installed, please secure a service space of 150 mm to the left and right sides.

Install the drain pipe at steep angle as practically possible and minimize the straight line, with a downward inclination of between 1/100 and 1/200.

Gravity drain is preferred but if it is not possible then a suitable condensate pump can be used, it is recommended that the pump can deliver a minimum of 900L/H at the expected head required on site.

Normal condensate levels from the HBC in normal operation will approximately be 2.5 litre per hour.





Drain pan

- Drain hose can be connected to the front or left/right side of the drain pan as default.
- For the left or right side connection, elbow for drain port is needed (field supply).

Drain hose connection position change

1. Take out the screws from side.
2. Pull out the drain pan from front.
3. Turn the drain pan 180°and put it back.
4. Tighten the side screws.

**If HBC is installed along the wall, the drain pan direction should be changed in advance.

2.8. Vertical HBC Service Space

700mm service space is required from the front of the unit.

During commissioning; the PCB board, pumps and strainers are accessible from the front of the unit.

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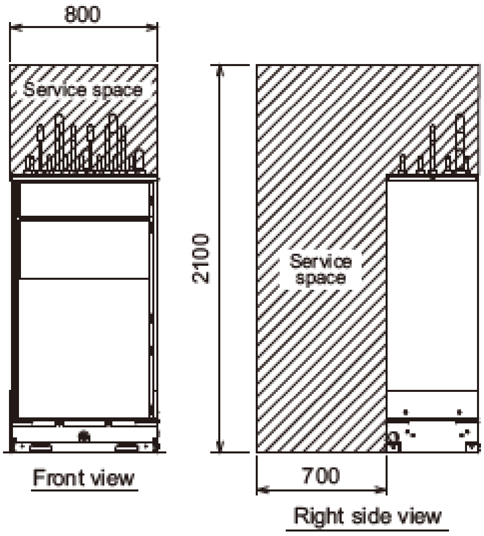


3. Installation

3.1. Water Supply Components

1 x Backflow protection device (CAT 3/4/5)

1 x Strainer (field Supply)

1 x Pressure Reducing Valve (set between 1.0 - 1.6 bar) (field Supply)

1 x Isolation Valve (field Supply)

1 x Pressure Gauge (field Supply) (please ensure this is installed after the isolation valve so system pressure will be shown)

Please select the appropriate size and install an expansion tank (field supply), please install Expansion vessel as close as possible to the same height of the HBC.

The MEU-UK calculation in the installation manual is based on the expansion vessel installed at the same height as the HBC. If the vessel is installed at a different height then please calculate this using the expansion vessel manufacturer's calculation.

Check the pressure for the expansion vessel is adequate for 1.0 - 1.6bar or system design pressure.

If the HBC and all Indoor unit are on the same floor, use 1 bar. Otherwise recommend 1.6 bars.

The maximum operating pressure of the expansion vessel should be 10Bar

.

3.2. Back Flow Protection

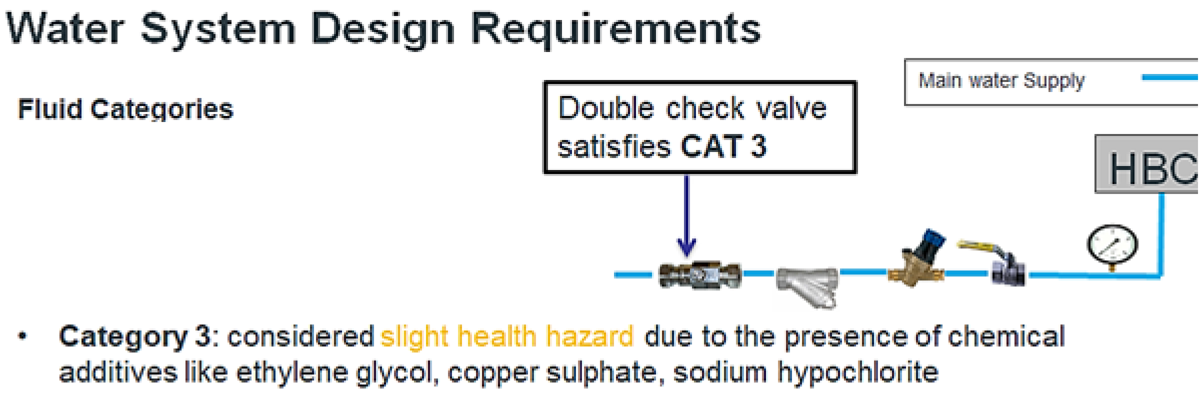
Category 3, 4 and 5 Filling Loops
Water companies regulate their own water supplies but use WRAS guidance as a basis for devising their own guidance. It is important to communicate with the water company when installing equipment that connects to the water supply.

Note about category 4 and category 5 backflow protection

Category 4 and category 5 backflow prevention devices require advanced notification to the water supplier, 10 days before the commencement of work (under WRAS guidance). They may also require commissioning by an approved contractor and have on-going maintenance requirements. Where the building owner hasn't done this in advance it becomes the installing contractor's responsibility. When a response to the notification hasn't been given in the 10 day time frame it is generally assumed that the work can commence, but work still must comply with the relevant regulations.
Note that this is WRAS guidance, and each individual water company may have a different stance.
Pro-active communication with your local water company is strongly advised.

Category 3

Temporary filling loop with double check valve (filling loop removed between fills).



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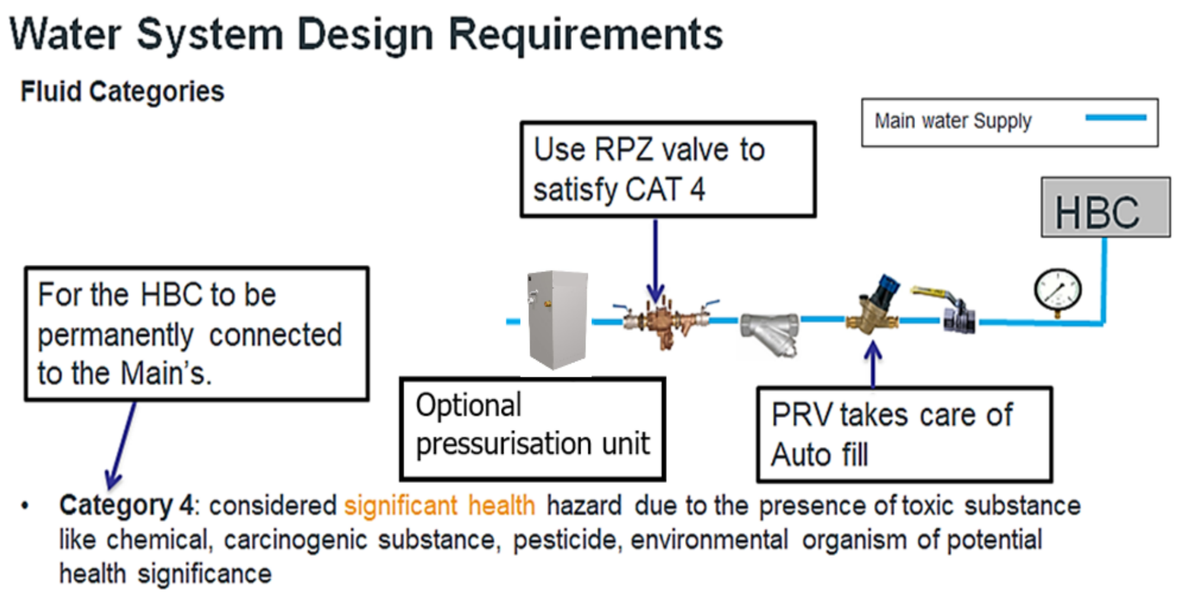
Category 4

Fluid Cat 4 can be an RPZ valve Type BA device (requires an annual maintenance)
Some automatic pressurization units comply with category 4 requirements (see page below) in which case will require annual maintenance by a component person to ensure correct operation.
If the pressurization units satisfies the CAT 4 regulations then a RPZ valve is not required.



When installing multiple systems, it may be preferable to install a common water loop to the building, and then just individual PRV, isolation valve and pressurization.
Example page 11

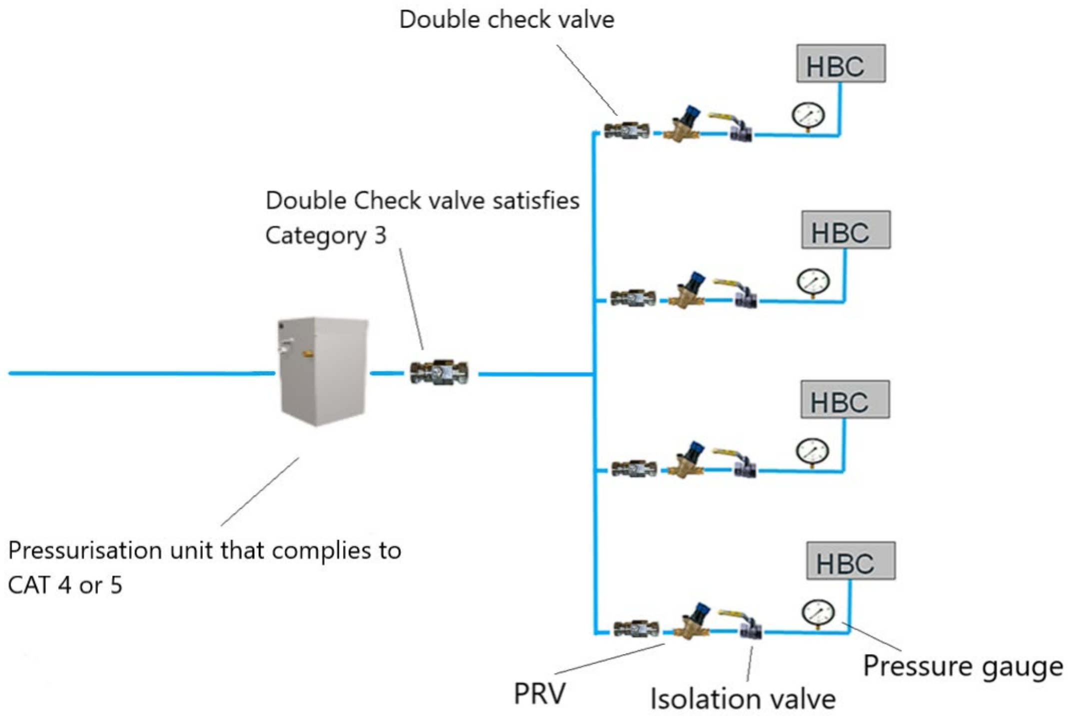
The use of CAT4 devices allows for permanent connection to the mains water supply.
.

Category 5

For category 5 protection, a break tank with a Type AA, AB or AD air gap is required.
A pressurisation unit, if CAT 5 approved, can be used in this case.

HVRF common water supply to multiple HBC

Using Category 3/4/5 as an example
.



In the example above, a double check valve is installed to each HBC to avoid any mixing of the concentration of inhibitors between systems.

The example illustrates the use of both a pressurisation unit (CAT4 or 5) and a double check valve (CAT 3). Both are not needed, only one that adheres to the requirement on site is required. This is for the purpose of illustration only.

3.3. Water Pipework

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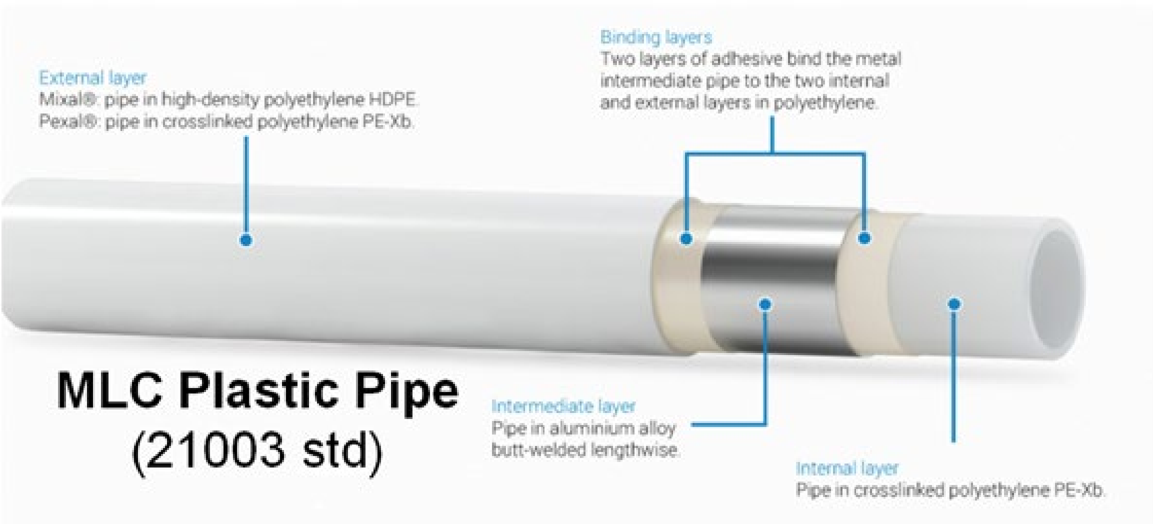
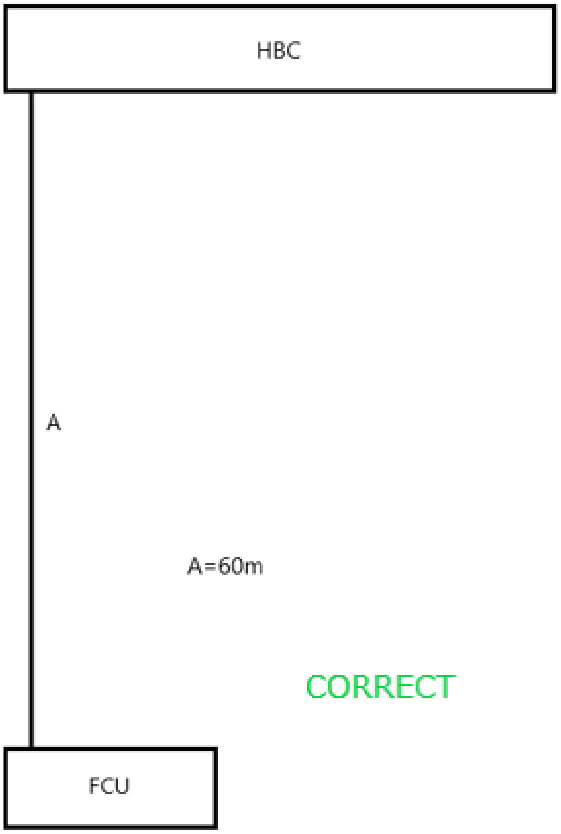


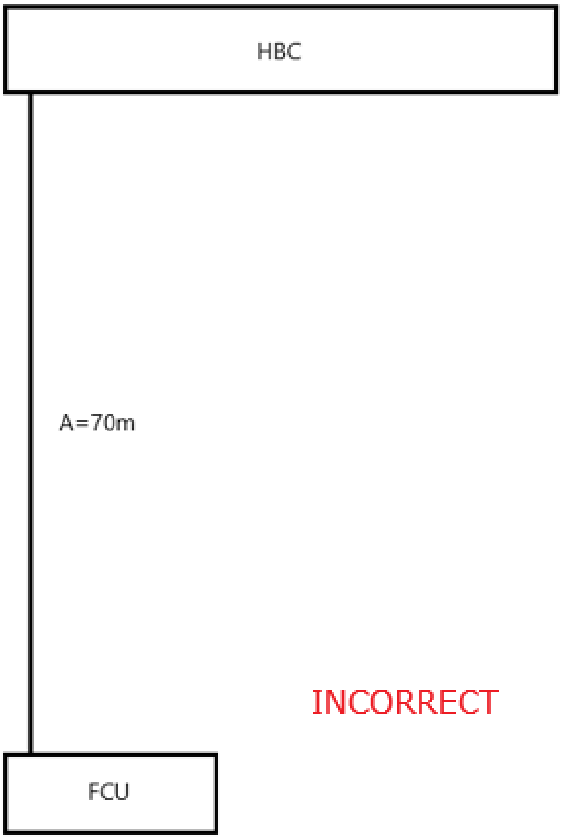
Use Copper or MLC pipe that conforms to standard EN ISO 21003. It must be able to withstand pressure of at least 10 bar. Only use copper press fittings, compression fittings or plastic fittings and do not use any steel, iron or brass fittings that contains zinc.
The diameter of ports on the HBC is 22mm O.D.

3.4. Water pipework equivalent length examples

Example of equivalent lengths in practice.

Installation 1 with no fittings used





Installation 2 with fittings used

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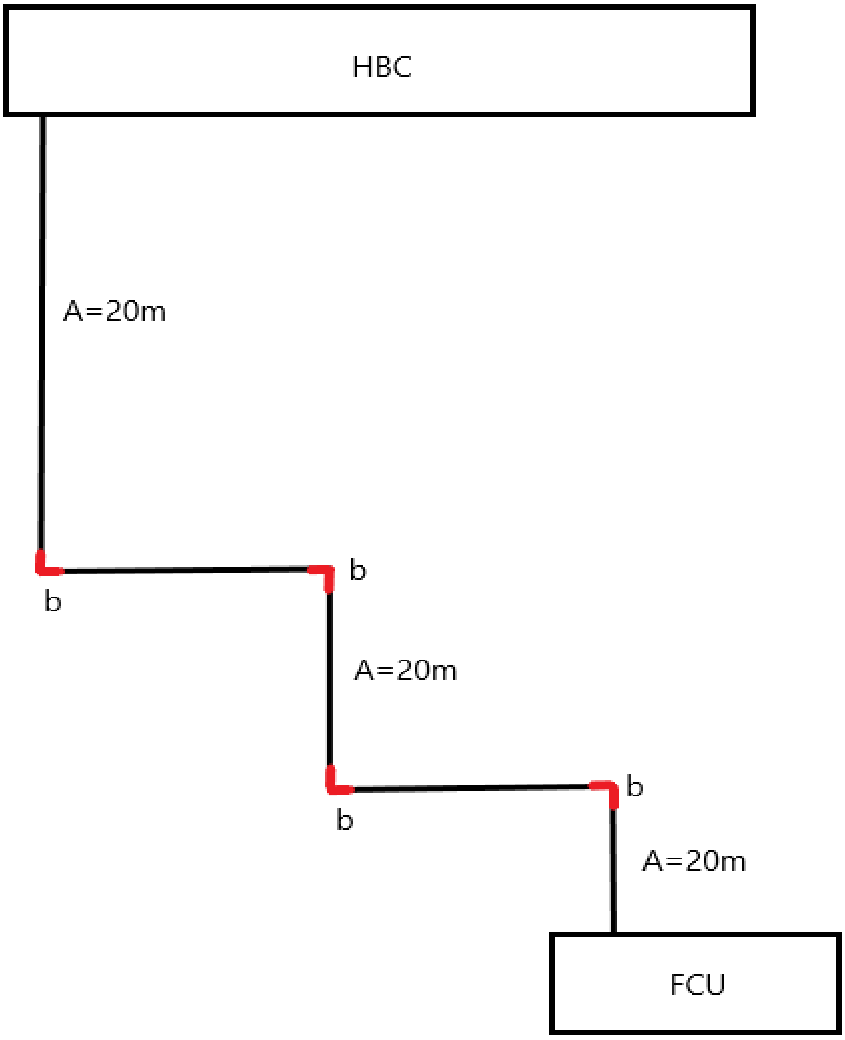
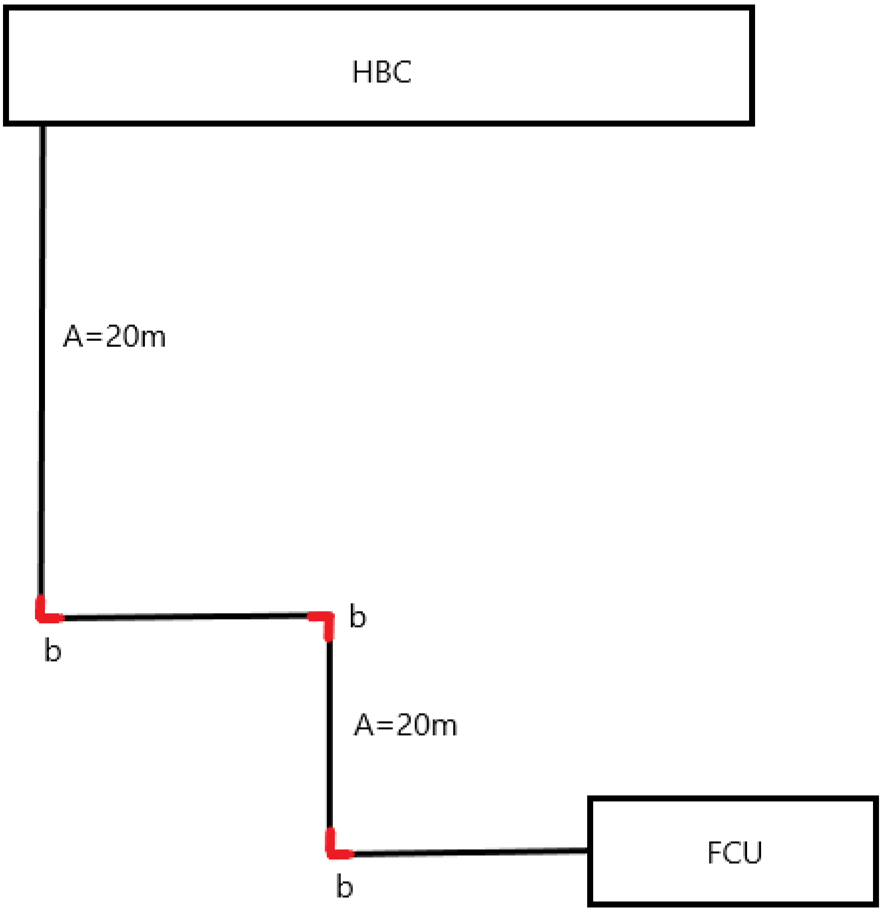


L_{eq}=A+A+A = 60m+b+b+b+b = 76m
Based on equivalent length of 90˚ elbow of 4m
Please note each manufacturer will have different equivalent lengths.

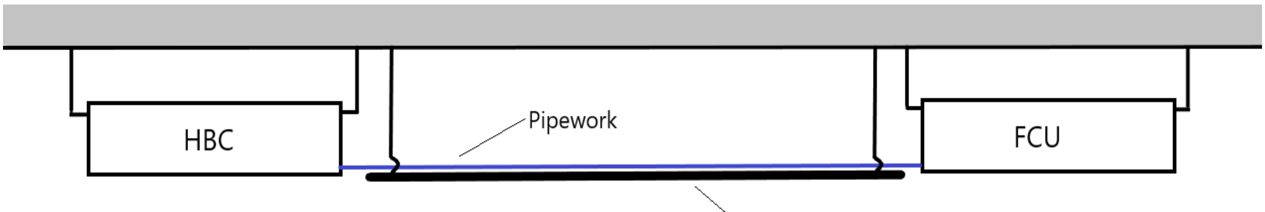
CITY MULTI HVRF i



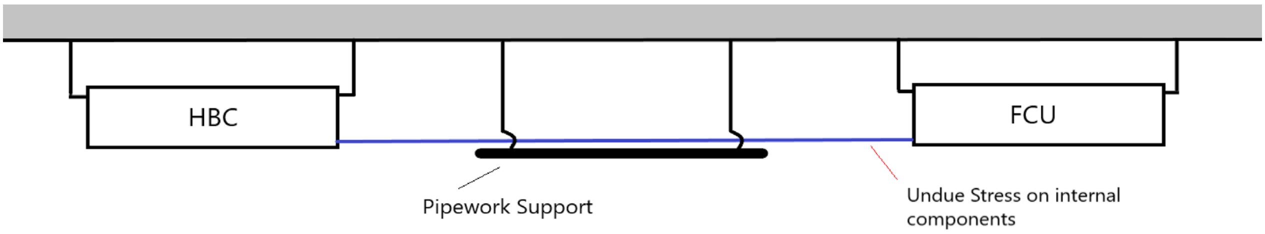
L_{eq}=A+A = 40m+b+b+b = 52m
Based on equivalent length of 90˚ elbow of 4m
Please note each manufacturer will have different equivalent lengths.

Please support the pipe work as close as possible to both the fan coil units and HBC controller to avoid undue stress on the internal components.

.



Correct method



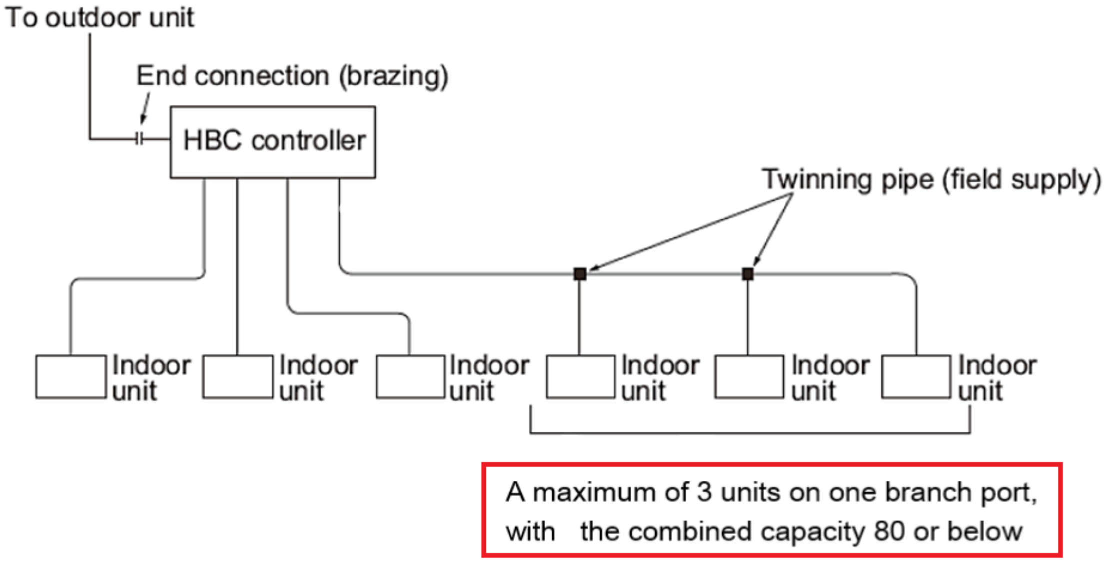
Incorrect method

Refer to the pipework manufacturers guidance on the distance required to safely support the pipework.

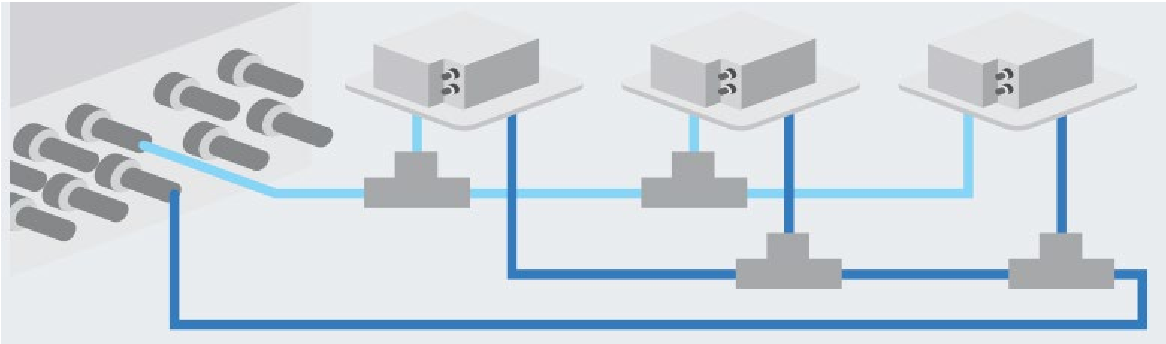
When using compression fittings please refer to the fittings manufacturers' guidance on sealants. Note that plumbers paste is not MEUK's preferred method.

3.5. Reverse-Return configuration

The maximum index on one port (3 FCU max on a single port, less than P80)
.



A flow return method must be used to ensure correct water resistance to each unit when using a single port.



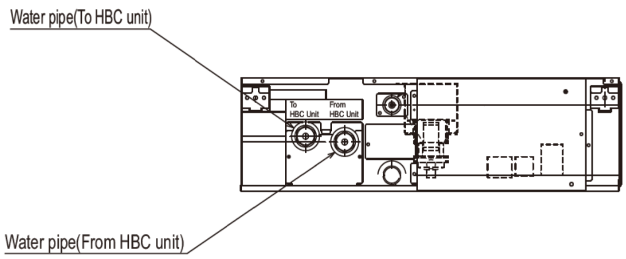
These must be connected to the same controls group and will operate in the same mode. In addition, these must also be the same model size.

3.6. Indoor Unit Pipe Inlet and Outlets

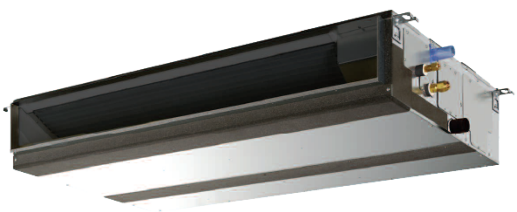
Please note that the flow and return connection orientation differ on models

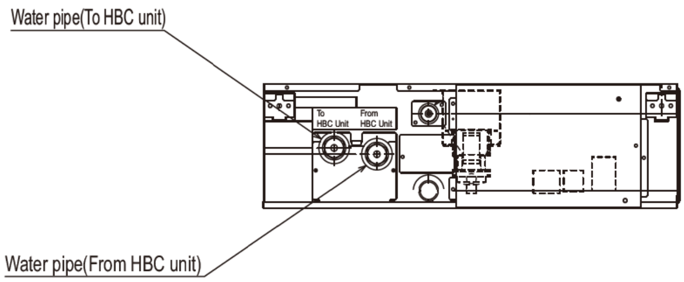
Legend
To HBC unit = Water Return
From HBC unit = Water Flow

Ceiling Concealed Ducted **PEFY-WP-VMS1-E**
(Ultra Thin)



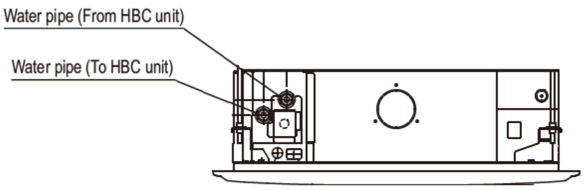
Ceiling Concealed Ducted **PEFY-WP-VMA-E**





4-Way Blow Ceiling Cassette

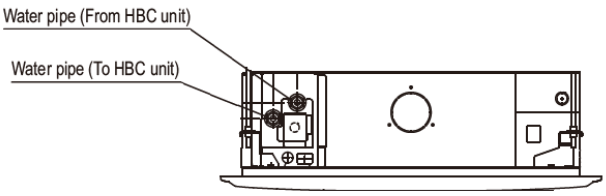
PLFY-WL-VEM-E



4-Way Blow Ceiling Cassette

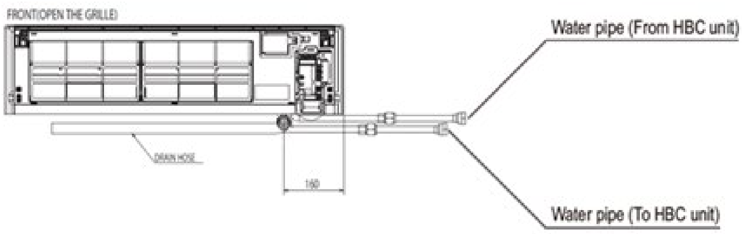
PLFY-WL-VFM-E

(600 x 600)

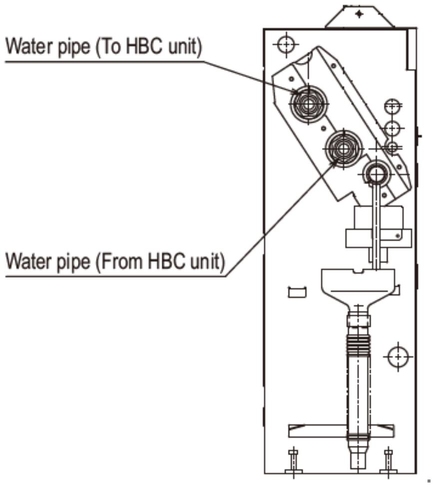


Wall Mounted

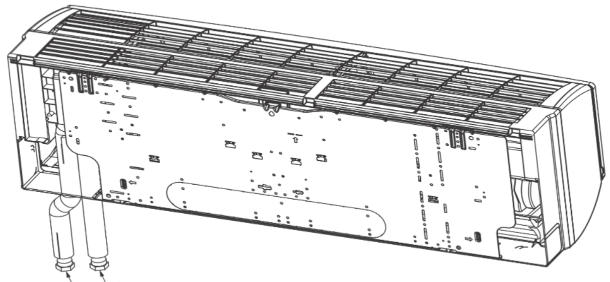
PKFY-WL-VLM-E



Floor Standing PFFY-WP-VLRMM-E



Wall Mounted PKFY-WL-VKM



Please refer to the installation manual appropriate for the model to determine the pipe size
The table below show the connections available to each model type

HVRF Indoor Units Port Connection Joint (Flow & Return)

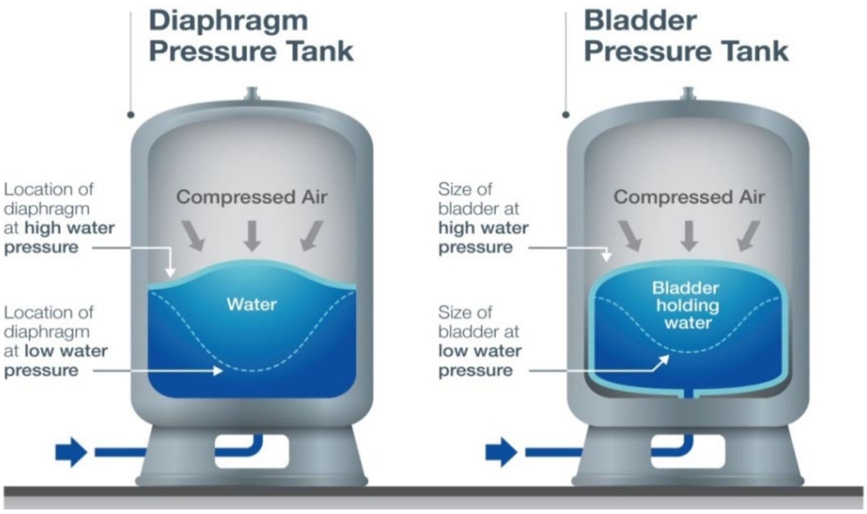
Indoor Units		Pipe O.D. (mm)	Thread (Female)
	PLFY-WL32VEM-E	22	N/A
	PLFY-WL40VEM-E	22	N/A
	PLFY-WL50VEM-E	22	N/A
	PLFY-WL63VEM-E	22	N/A
	PLFY-WL80VEM-E	22	N/A
	PLFY-WL15VFM-E	22	N/A
	PLFY-WL20VFM-E	22	N/A
	PLFY-WL25VFM-E	22	N/A
	PLFY-WL32VFM-E	22	N/A
	PLFY-WL40VFM-E	22	N/A
	PEFY-WP10VMS1-E	N/A	3/4 screw
	PEFY-WP15VMS1-E	N/A	3/4 screw
	PEFY-WP20VMS1-E	N/A	3/4 screw
	PEFY-WP25VMS1-E	N/A	3/4 screw
	PEFY-WP32VMS1-E	N/A	3/4 screw
	PEFY-WP40VMS1-E	N/A	3/4 screw
	PEFY-WP50VMS1-E	N/A	3/4 screw
	PEFY-WP20VMA-E	N/A	3/4 screw
	PEFY-WP25VMA-E	N/A	3/4 screw
	PEFY-WP32VMA-E	N/A	3/4 screw
	PEFY-WP40VMA-E	N/A	3/4 screw
	PEFY-WP50VMA-E	N/A	3/4 screw
	PEFY-WP63VMA-E	N/A	1-1/4 screw
	PEFY-WP80VMA-E	N/A	1-1/4 screw
	PKFY-WL10VLM-E	N/A	3/4 screw
	PKFY-WL15VLM-E	N/A	3/4 screw
	PKFY-WL20VLM-E	N/A	3/4 screw
	PKFY-WL25VLM-E	N/A	3/4 screw
	PKFY-WL40VLM-E	N/A	3/4 screw
	PKFY-WL50VLM-E	N/A	3/4 screw
	PKFY-WL63VKM-E	N/A	1-1/4 screw
	PKFY-WL80VKM-E	N/A	1-1/4 screw
	PFFY-WP20-VLRMM-E	N/A	3/4 screw
	PFFY-WP25-VLRMM-E	N/A	3/4 screw
	PFFY-WP32-VLRMM-E	N/A	3/4 screw
	PFFY-WP40-VLRMM-E	N/A	3/4 screw
	PFFY-WP50-VLRMM-E	N/A	3/4 screw

3.7. Expansion Vessel

We recommend using bladder type expansion vessels where the water or glycol mix only comes in contact with the rubber bladder and not the metal parts of the expansion vessel.

The benefit of using a bladder type expansion vessel is to allow for removal of any air that may be trapped inside the expansion vessel under the diaphragm crevice.

One expansion vessel per Main box is required



Expansion Vessel Selection

Water supply pressure (= **expansion tank air pressure**) selection

0.1 ≦ 0.01 + (Water pipe work head pressure, m) x 0.01 ≦ 0.16 MPa

Calculation of the system water volume

G litres = (**HBC** vol(10litres) + **IC** vol(Total) + **Pipe** vol) x 1.1

Pipe = π x (Din/2)^2 x L x 1000
(L is length of all water pipe)

PEFY-WP20 = 0.7 L
PEFY-WP25,32 = 1.0 L
PEFY-WP40,50 = 1.8 L

The expansion coefficient of water when expanding from 5℃ to 60℃:

ε=0.0171 *Please choose εfor brine depending on the brine type and temperature range used.

εbrine = Max density / min density - 1

Tank volume = εG／(1-(Water supply pressure + 0.1) / 0.29) x 1.2

1.2→air temp difference margin/water pressure difference margin

(Unit: L) (Unit: L)

Unit Model	Water Volume	Unit Model	Water Volu
PEFY-WP10VMS1-E	0.4	PEFY-WP20VMA-E	0.7
PEFY-WP15VMS1-E	0.7	PEFY-WP25VMA-E	1.0
PEFY-WP20VMS1-E	0.9	PEFY-WP32VMA-E	1.0
PEFY-WP25VMS1-E	0.9	PEFY-WP40VMA-E	1.8
PEFY-WP32VMS1-E	1.0	PEFY-WP50VMA-E	1.8
PEFY-WP40VMS1-E	1.0	PEFY-WP63VMA-E	2.0
PEFY-WP50VMS1-E	1.7	PEFY-WP80VMA-E	2.6
PLFY-WL32VEM-E	1.8	PLFY-WL10VFM-E	0.5
PLFY-WL40VEM-E	1.8	PLFY-WL15VFM-E	0.5
PLFY-WL50VEM-E	1.8	PLFY-WL20VFM-E	0.9
		PLFY-WL25VFM-E	0.9
		PLFY-WL32VFM-E	0.9
PKFY-WL10VLM-E	0.6	PFFY-WP20VLRMM-	0.9
PKFY-WL15VLM-E	0.6	PFFY-WP25VLRMM-	1.3
PKFY-WL20VLM-E	0.7	PFFY-WP32VLRMM-	1.3
PKFY-WL25VLM-E	0.7	PFFY-WP40VLRMM-	1.5
PKFY-WL32VLM-E	1.0	PFFY-WP50VLRMM-	1.5
PKFY-WL40VLM-E	1.1		

FIG 1.0

Please install Expansion tank at same height level of HBC

Examples

Use the below formula for the supply water pressure to be used

Water supply pressure range to be used

$0.1\,(MPa) \leq 0.01 + 0.01 \times A \leq 0.16(MPa)$

$A = Head\ pressure(m) between\ the\ HBC\ and\ highest\ indoor\ unit$

$0.01 + 0.01 \times 0 = 0.01$= Correct (same height)

$0.01 + 0.01 \times 1 = 0.01 =$ *Correct* (1m height difference)

$0.01 + 0.01 \times 15$=0.16= Correct (15m height difference)

$0.01 + 0.01 \times 20 = 0.21 =$ *Incorrect* based on $\leq 0.16(MPa)$ (20m height difference)

Calculation of the system water volume Example 1

Based on 1.6 supply pressure and 22mmOD(17.7ID) Plastic pipe x3 sized 10 & x3 50 sized unit with 100m Total pipe length

$G\ litres = (HBC(10Litres) + ICvol(Total) + Pipe\ vol) \times 1.1$

$G\ litres = 10 + 6.3 + 24.6 \times 1.1 = 43.36$

$\textbf{Breakdown}\ G\ Litres = Water\ Volume\ of\ HBC + ICvol(from\ Fig\ 1.0) +$
$Pipe\ vol(see\ calculation\ below)\ \times 1.1$

Pipe volume calculation

Pipe = $\pi \times (Din \div 2)$^2 $\times\, l \times 1000$

Pipe = $\pi \times (17.7 \div 2)^2 \times 100 \times 1000 = 24.6L$

$(Din = Pipe\ diameter\ internal)$

To determine volume of expansion vessel

Tank volume = $\varepsilon G \div (1 - (Water\ supply\ pressure + 0.1) \div 0.29) \times 1.2$

$\varepsilon = The\ expansion\ coefficent\ of\ water\ (0.0171)$

$If\ using\ brine, \varepsilon brine = Max\ density \div \min density - 1$

$G = 43.36$ (output from water volume calculation)

Tank volume =$0.0171 \times 43.36 = 0.7414$

Tank volume =$(1 - 1.6 + 1) \div 2.9 = 0.1379$

Tank volume = $(0.7414) \div (0.1379) \times 1.2 = 6.45L$

(1.2=Air temperature difference/water pressure difference margin)

Calculation of the system water volume Example 2

Based on 1.0 supply pressure and 22mmOD(17.7ID) Plastic pipe x3 sized 10 & x3 50 sized unit with 100m Total pipe length

$Glitres = (HBC(10Litres) + ICvol(Total) + Pipe\ vol) \times 1.1$

$Glitres = 10 + 6.3 + 24.6 \times 1.1 = 43.36$

$\textbf{Breakdown}\ G\ Litres = Water\ Volume\ of\ HBC + ICvol(from\ Fig\ 1.0) +$
$Pipe\ vol(see\ calculation\ below)\ \times 1.1$

Pipe volume calculation

Pipe = $\pi \times (Din \div 2)$^2 $\times\, l \times 1000$

Pipe = $\pi \times (17.7 \div 2)^2 \times 100 \times 1000 = 24.6L$

$Din = Pipe\ diameter\ internal$

To determine volume of expansion vessel

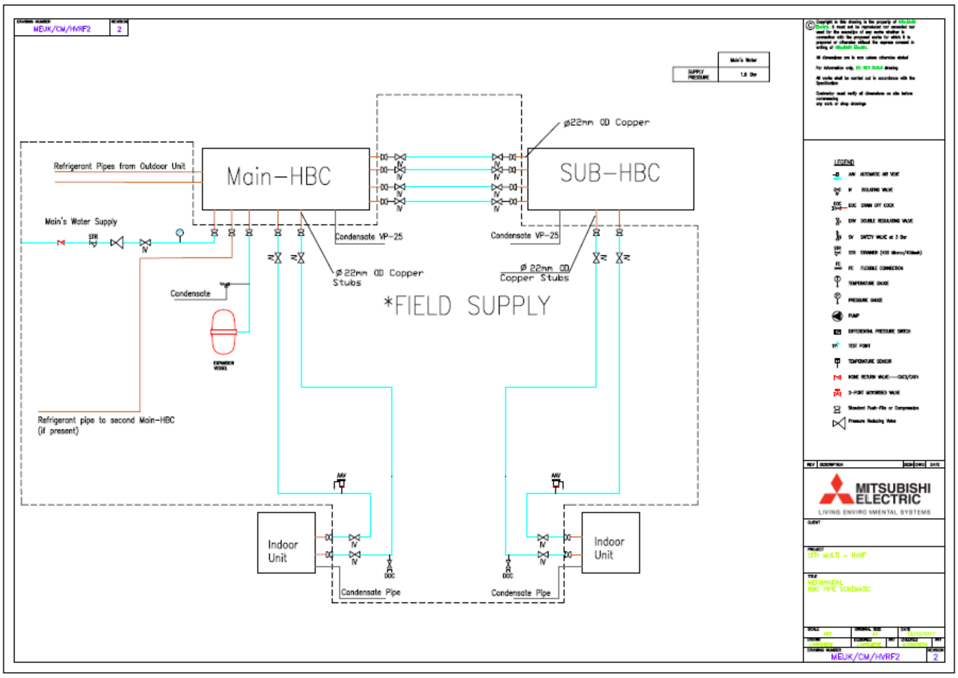
Tank volume = $\varepsilon G \div (1 - (Water\ supply\ pressure + 0.1) \div 0.29) \times 1.2$
$\varepsilon = The\ expansion\ coefficent\ of\ water\ (0.0171)$
$If\ using\ brine, \varepsilon brine = Max\ density \div \min density - 1$
$G = 43.36$ (output from water volume calculation)
Tank volume $= 0.0171 \times 43.36 = 0.7414$
Tank volume$= (1 - 1.0 + 1) \div 2.9 = 0.3448$
Tank volume = $(0.7414) \div (0.3448) \times 1.2 = 2.58L$
(1.2=Air temperature difference/water pressure difference margin)

3.8 Pressure Testing Guidance (Water Side)

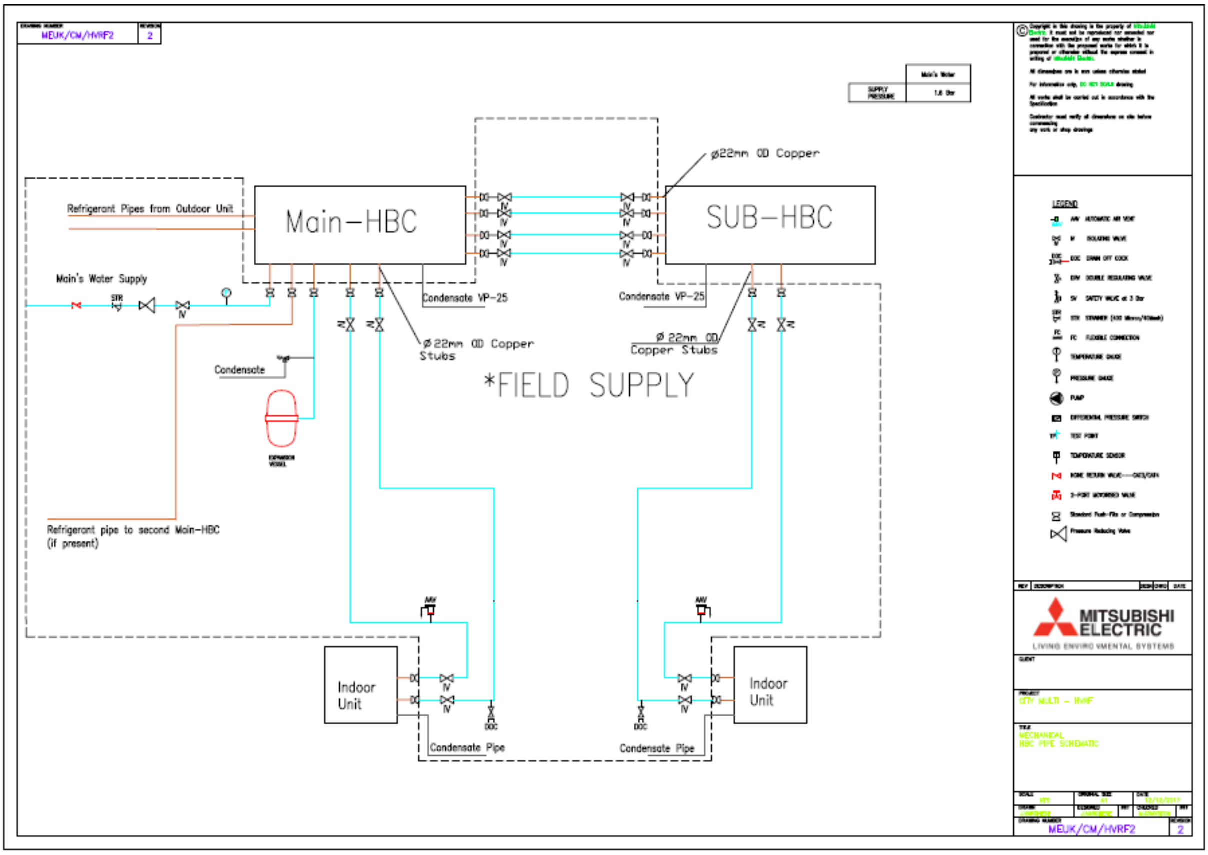
The water circuit of the HVRF system have to be pressure tested to 3 bars.
The Main-HBC has an internal pressure relief valve that is rated at 3.7 bars, therefore please don't pressurize the system above 3 bars.
The below guidance uses water as medium to pressure test the system.
Before pressure testing, it is recommended to fill and manually purge all indoor units as it makes it easier to identify any leaks between the joints and also removes the excess air that is trapped in the system.

Filling & Manually Purging

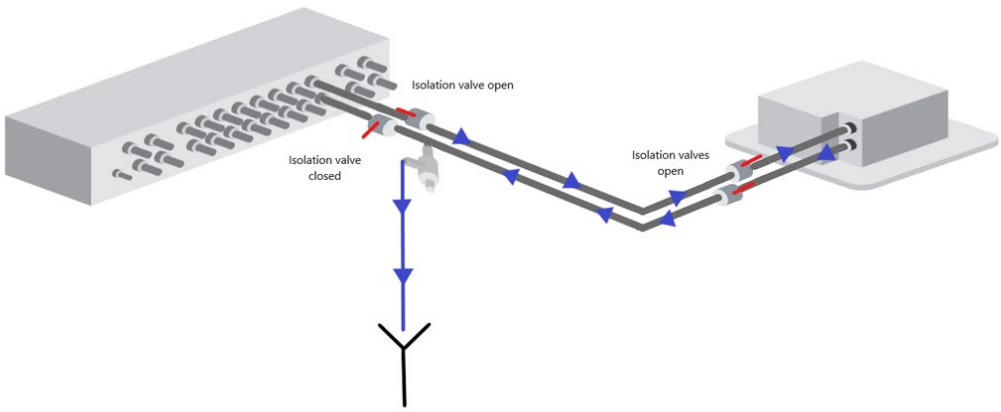
- Before opening the Main's water isolation valve, make sure all the Indoor units isolation valve at the HBC is closed off (circled in red).



- As highlighted in the picture below, make sure the pressure gauge is reading 3 bars



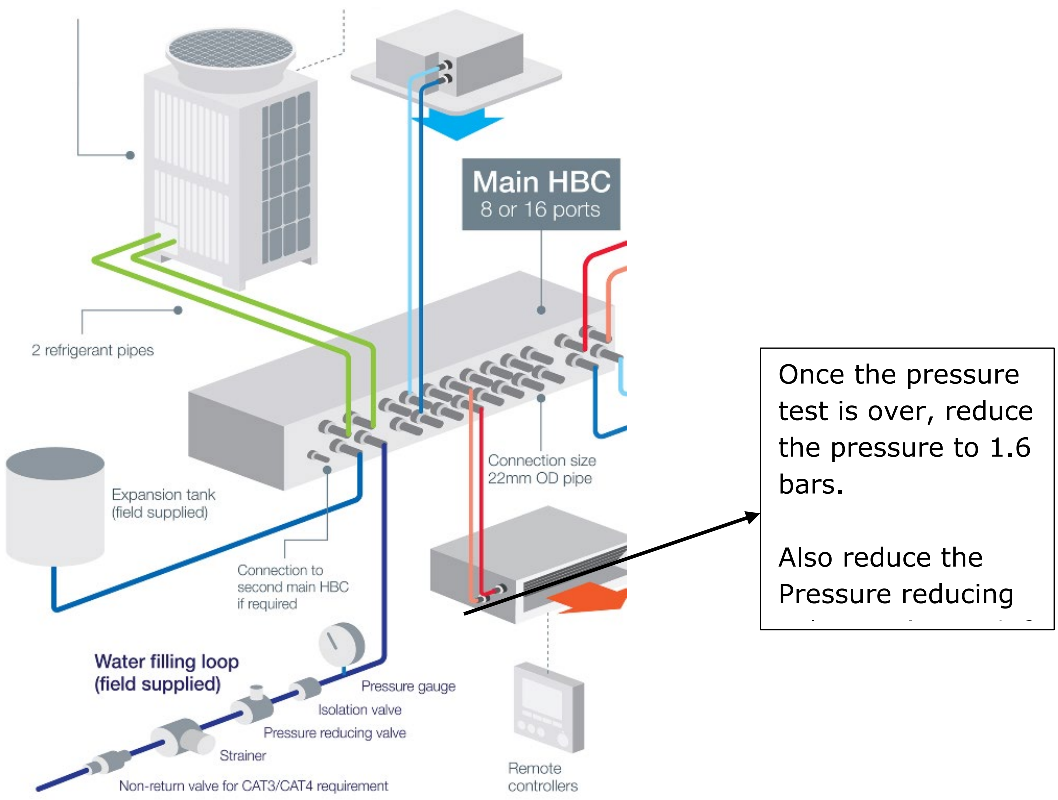
- As shown in the below picture, when filling the system for the first time it is recommended that a hose is connected to the drain off on the first inlet port with the inlet isolating valve remaining closed, open the outlet isolation valve to fill the circuit with water. Carry out this process for a minimum of 10 minutes or until such time as all the air has been removed for this leg. Once the air is removed close the drain off, open the inlet isolation valve and then repeat for each remaining indoor units.



- This ensures each leg can be purged from one central point on the system whilst monitoring the water pressure and considerably reduces the chance of error during the commissioning process if each leg has been manually purged first.
  In addition, this also ensures that the orientation of pipework (flow & return) is correct.

Pressure testing

- Once all the indoor units are properly filled & manually purged, close the Main's Water supply and make sure the pressure gauge at HBC can maintain 3 bars for 1 hour.
- If 3 bar could be maintained and if there is no visible leakage throughout the test, then the pressure test is complete.
- Vent off excess pressure of the system and the return the pressure gauge to normal filling pressure of 1.6 bars (If the highest indoor units is less than 10m from the Main-HBC, then this pressure could be reduced to 1 bar).



Ensure that adequate drainage is available during this process, depending on pipe runs etc., a large amount of water may be used.

Furthermore, ensure the water pressure is adequate to maintain the flushing process.

Please see the Debris & Air Vent operation section for full details.

Similar procedure can also be implemented for the Vertical HBC layout.

3.9. Water Treatment

Water quality

Refer to the HVRF data-book or BSRIA guidance for water quality. The table below shows the water standards for fill water quality recommended by BSRIA. It is recommended to test the water regularly to check the chemical and bacteria levels.

Parameter	Suggested Range
Sulphate	< 250 mg/l
Chloride	< 250 mg/l
pH	6.0 - 8.5 pH Units
Hardness	As recommended by water treatment specialist 70 mg $CaCO_3$ or less (factory specification)
TVC	< 10,000 per ml
Pseudomonads	< 1000 per 100 ml

If the above limits cannot be satisfied, please use the approved inhibitors to control corrosion and bacterial growth etc.

Approved inhibitors
The list of approved additives that have been tested and approved for use in HVRF is shown below.

Inhibitor names	Application
Kilfrost SF 50	Corrosion inhibitor
Kilfrost ALV	Frost protection, corrosion inhibitor, and anti-bacterial properties
Kilfrost Cooltrans Plus RP	Corrosion inhibitor and frost protection
Fernox F1	Corrosion inhibitor
Fernox HP-5	Protects against corrosion, lime scale and bacterial contamination with antifreeze

Check the environmental regulations concerning the use and disposal of glycol or other additives. The HBC drain and any other drainage points must be connected to a foul water drain.
It is strongly advised to add a corrosion inhibitor.

3.10. System Dosing

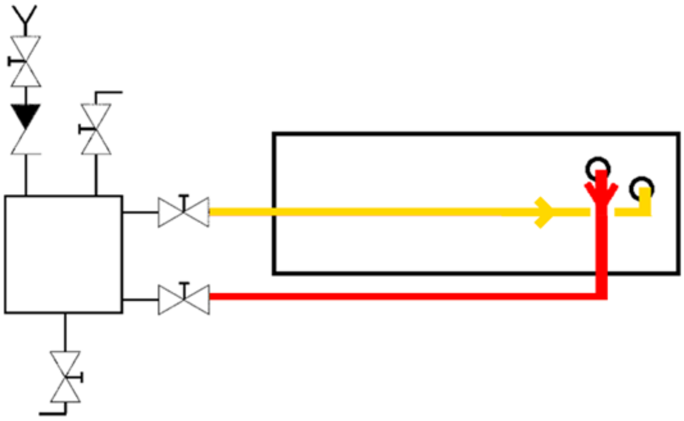
The easiest way to add chemicals into the system is via a dosing pot. There are a few locations that this could be installed depending on where the system is to be installed.

Use dosing pots that have a non-return valve after the funnel to avoid backflow of chemicals through the funnel. The drain of the dosing pot must be connected to a foul water drain or appropriate drain for disposal of the waste liquid.

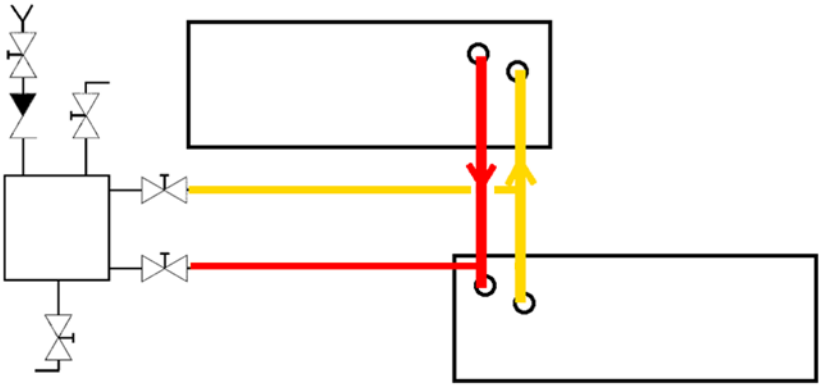
Traditional dosing pots are manufactured in mild steel which is then shot blasted and powder coated. The use of dosing pots which are manufactured in stainless steel is recommended. The benefits are a longer life and no corrosion on the outside case or chipped paint.

Dosing pot locations in order of preference

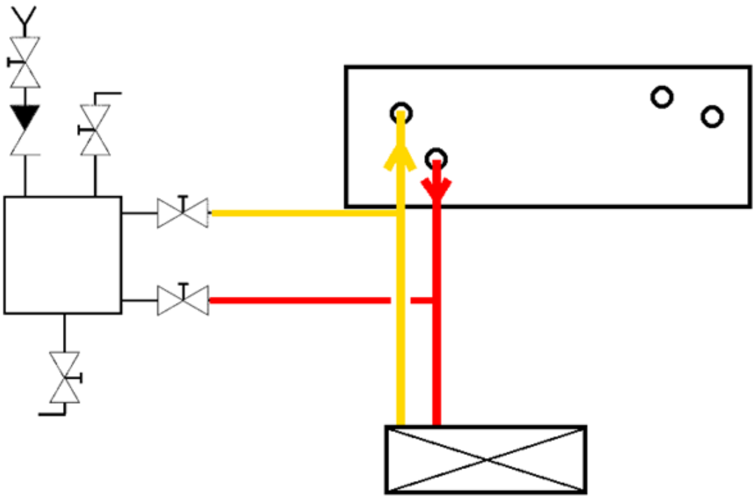
- The flow and return of the main/sub HBC box, whether a sub-HBC is connected or not
- The flow and return of an indoor unit
- Water supply to the HBC



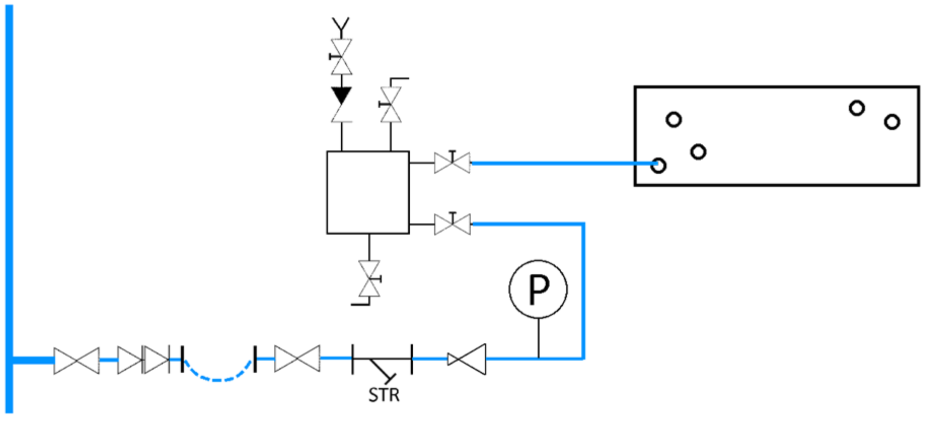
Connection of dosing pot to flow/return of sub-HBC connection, without sub-HBC.



Connection of dosing pot to flow/return of sub-HBC connection with sub-HBC connected



Connection of dosing pot to flow/return of indoor unit



Connection of dosing pot to water supply (not preferred method)

Dosing the system

Please note only dose the system once the system has been fully commissioned

Fill the system with water and commission the system as per the guidelines outlined in HVRF Debris and Air operation document.

If the dosing pot has been installed on the sub-HBC heating flow/return, make sure that the system is in heating and that some fan coils are operating before dosing the system. Conversely, if installed on the cooling flow/return, put the system into
Cooling before dosing. If the dosing pot has been installed onto the flow/return of a fan coil unit, operate the fan-coil before dosing.

If the dosing pot has been installed on the water supply use the following procedure:

1) Drain the water from the dosing pot.

2) Pour in the glycol concentrate into the dosing pot inlet. Usually dosing pot will either have and automatic air vent or manual air vent fitted.

3) Make sure to remove the air from the dosing pot prior to opening the inlet and outlet valves.

4) Once the inlet and outlet valves have been opened partial draining will be needed from an indoor unit's drain cock. Water to be drained until the glycol can be seen in the water being drained.

5) The process of topping up with glycol concentrate and then draining from the next indoor is to be repeated until the required quantity that satisfies the recommended concentration percentage has been added to the system.

6) Run test cool and test heat operation on all indoor units connected to the HBC for 1-2 hours to allow the glycol concentrate to mix with water.

7) Take a sample from and indoor unit drain cock into a clean container.

8) Use a refractometer to measure the concentration.

Please note the above process may differ depending on the dosing manufacture, therefore please refer to the dosing manufactures instructions for full detailed guidance.

3.11. R32 – Refrigerant Charge Limit Regulation

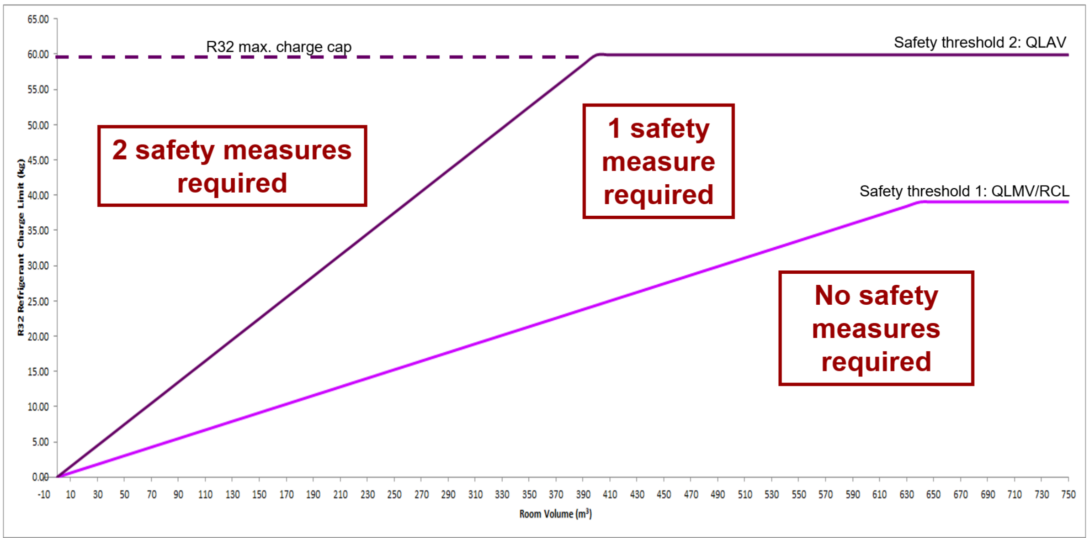
It is the responsibility of the designer or installing contractor to make sure that the project fully complies with the refrigerant charge limit regulation

All calculations relating to refrigerant charge limit regulation must be done by the design liability holder to ensure that refrigerant charge limit regulation is adhered to at all times.

Mitsubishi Electric take no responsibility for any designs and or calculations and offer advice only based on our views on best practice with regard to the design and installation of heat pumps systems and any ancillary items associated with the air conditioning systems.

Please be advised that the refrigerant charge limit regulation documentation should be followed at all times and should be kept updated as and when revised versions are released.

The graph below illistrates the necessity of safety measures required based on room volume against the R32 refrigerant charge limit.



The vaules given here are for guidance only

The saftey measures are listed in the example on page 63 & 64

Please contact MEUK Pre-Sales for refrigerant charge compliance and guidance.
Tools are availble to assist in this matter.

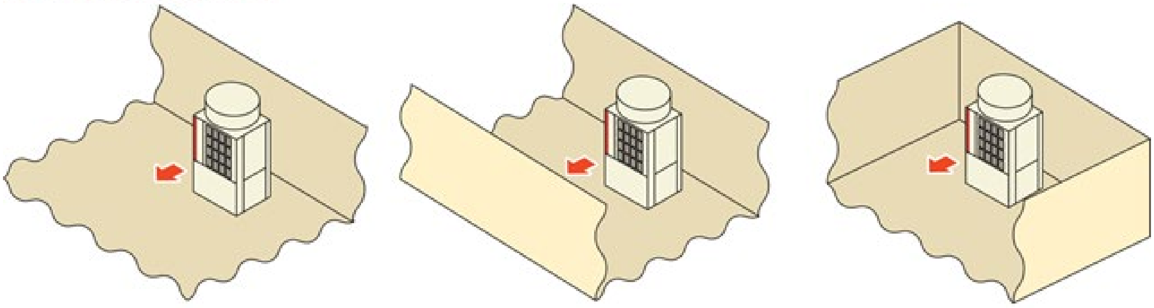
3.12. Outdoor Unit Installation Examples

• Install the unit in a place where at least one of four side is open.

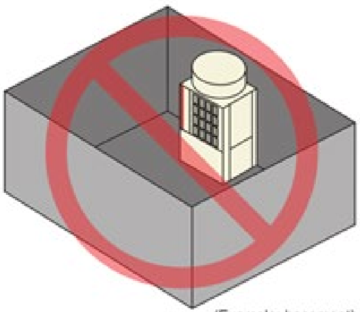
*The figure shows an outdoor unit as an example.

Figure 1

Correct installation



Wrong installation



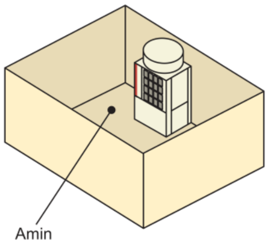
(Example: basement)

If the unit needs to be installed in a space where all four sides are blocked, confirm that one of these situations (A, B, or C) is satisfied.

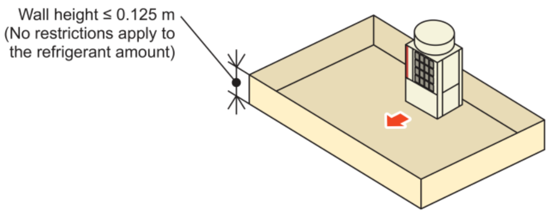
A Secure sufficient installation space (minimum installation area: Amin).

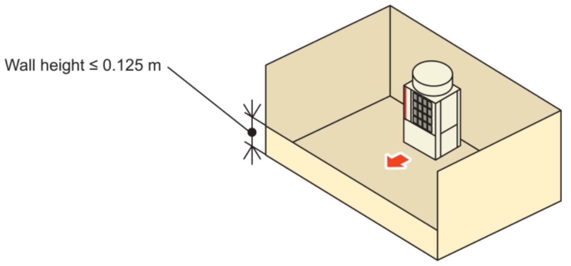
Install the unit in a space with an installation area of Amin or more, corresponding to the refrigerant amount (M).
(M = factory-charged refrigerant + refrigerant to be added on site)

M [kg]	Amin [m^2]
10	112
20	223
30	334
40	445
50	556
60	667

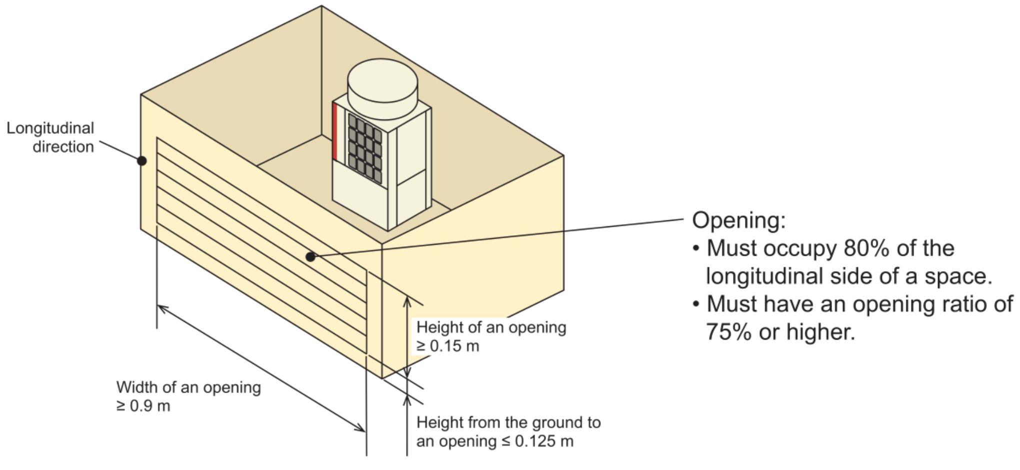


B Install the unit in a space with a wall height of ≤ 0.125 m.





C Create an appropriate ventilation open area.



(Example: space with a louver)

3.13. R32 – Horizontal HBC Installation examples with safety measures

Please ensure that the R32 HBC is installed as per EN378 guidelines.

For occupied spaces, please consider the volume of the room and the total system charge as this will dictate the number of safety measures required for that space.

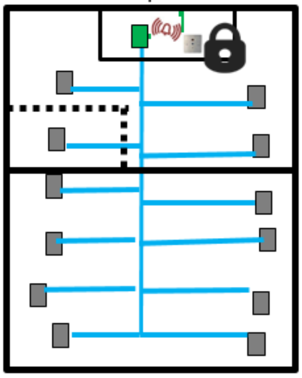
The below examples show the typical location of an R32 HBC:

Example 1: Authorised Access (Category C)

Example 2: General Access (Category A)

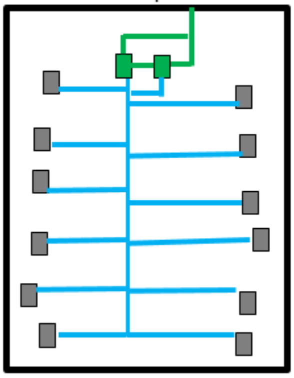
Example 3: Supervised Access & HBC is installed in basement (Category B)

Example 1



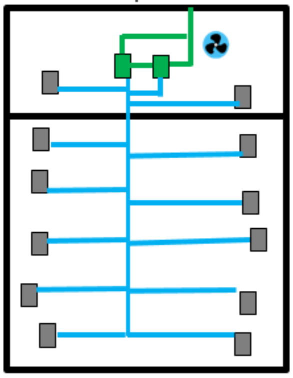
- PURY-M350YNW-A1 – total system charge = 19.8kg
- HBC installed inside locked cupboard within occupied cellular office space
- Occupancy category C – less than 1 person per $10m^2$
- No calculations or additional measures required
- We are recommending use of leak detector and alarm as best practice

Example 2



- PURY-EM500YNW-A1 – total system charge = 29.9kg
- HBC installed in open plan library @ 3m height
- Occupancy category A – calculations required
- Room: Length = 18m; Width = 15m; Height = 3.5m
- Area = $270m^2$; capped @ $250m^2$
- Height capped @ 3m
- Volume for calculation = $750m^3$

Example 3



- PURY-M200YNW-A1
- Total system charge = 13.5kg
- HBC installed in basement photocopy room @ 1.6m
- Occupancy category B – calculations required
- Room Length = 6m; Width = 15m; Height = 2.8m – Area = $90m^2$
- Height capped @ 1.6m – volume = $144m^3$
- Fan must be installed at low level

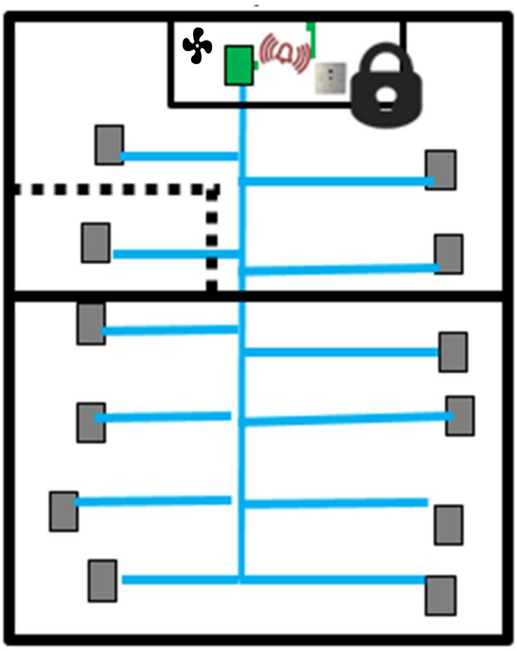
3.14. R32 Vertical HBC Installation examples with safety measures

Please ensure that the R32 HBC is installed as per EN378 guidelines.

Vertical HBC can be installed into an authorised access space.

For vertical HBC it is essential to install a leak detector with alarm and mechanical ventilation.

The ventilation can be continuous or turned on by the detector.



3.15. Strength Pressure Test of R32 Pipework

R32 Outdoor Units with pipe sizes 28.58 mm (1 1/8”) needs to pressure tested to 1.43 x its maximum allowable pressure (PS).

Refrigerant pipe size for R32 Horizontal HBC Refrigerant pipe size for R32 Horizontal HBC

Use of one HBC controller

Unit model		HBC controller		
		Model name	High pressure side	Low pressure side
Outdoor unit side	PURY-(E)M200	CMB-WM108V-AA CMB-WM1016V-AA	ø15.88 (Brazed)	ø19.05 (Brazed)
	PURY-(E)M250			ø22.2 (Brazed)
	PURY-(E)M300			
	PURY-(E)M350			ø28.58 (Brazed)

Use of two HBC controllers

Unit model		HBC controller				
		Model name	Between outdoor unit and twinning pipe		Between twinning pipe and HBC	
			High pressure side	Low pressure side	High pressure side	Low pressure side
Outdoor unit side	PURY-(E)M300	CMB-WM108V-AA CMB-WM1016V-AA	ø15.88 (Brazed)	ø22.2 (Brazed)	ø15.88 (Brazed) for each HBC controller	ø19.05 (Brazed) for each HBC controller
	PURY-(E)M350			ø28.58 (Brazed)		
	PURY-(E)M400		ø19.05 (Brazed)			
	PURY-(E)M450					ø22.2 (Brazed) for each HBC controller
	PURY-(E)M500					

Refrigerant pipe size for Vertical HBC

Unit model		HBC		
		Model name	High pressure side	Low pressure side
Outdoor unit side	PURY-(E)M200	(HBC) CMB-WM350F-AA	ø15.88 (Brazing)	ø19.05 (Brazing)
	PURY-(E)M250		ø15.88 (Brazing)	ø22.2 (Brazing)
	PURY-(E)M300		ø15.88 (Brazing)	ø22.2 (Brazing)
	PURY-(E)M350		ø15.88 (Brazing)	ø28.58 (Brazing)
	PURY-(E)M400	(HBC) CMB-WM500F-AA	ø19.05 (Brazing)	ø28.58 (Brazing)
	PURY-(E)M450		ø19.05 (Brazing)	ø28.58 (Brazing)
	PURY-(E)M500		ø19.05 (Brazing)	ø28.58 (Brazing)

4. Commissioning

4.1. Check List for Horizontal HBC system

Check List			
		Complete	Advised
Outdoor	Install location satisfies requirements		
	Refrigerant pipe work within parameters		
	Y piece, twining kit installed, if required **Y piece must be installed horizontal to ground**		
	Power supply meets requirements		
	System pressure tested and additional refrigerant calculated & added		
	SW 5-1 ON if central control used		
	R32 system, does it comply with charge limit regulations		
HBC	Install location meets requirements		
	HBC drain pan supported		
	Ensure FCU index load sharing across ports		
	HBC balance pipe installed, if master HBC used & added to calculation, 5/8 pipe size		
Water side	CAT 3 or greater back flow protection		
	Expansion vessel installed and sized correctly, one per HBC		
	Expansion vessel at same height as HBC		
	Pipe work to FCU within parameters		
	Pipe work correct size for FCU model		
	Isolation valves flow & return to FCU and sub HBC		
	Drain cock installed at HBC for air purge		
	Drain cock near FCU & sub HBC for maintenance		
	AAV fitted to each FCU leg at highest point		
	Glycol added if pipe work environment dictates		
	Support pipework to FCU's		
	Drain pipe, should not be reduced, adequate fall. 1/100		
	Water quality satisfies requirements, report recorded		
	Corrosion inhibitor added Type: Amount:		
	Multi Layered Composite (MLC) type pipework used		
Commissioning	Water pipework pressure tested to 3 Bar		
	Water working pressure @ 1.0 ~1.6bar		
	Debris & air purge complete		
	System address set		

Please ensure all points, if applicable, have been met before carrying out the commissioning process.

4.2. Horizontal HBC Debris & Air Removal Procedure

Check list before running the debris and air vent operation

□Power supply connected to the Outdoor units, Indoor units and HBC.

(Minimum 12 hours for the outdoor unit)

□Refrigerant pipework vacuumed and charged with additional refrigerant.

□Control wiring and remote controller wiring completed.

□All units (OC, HBC, and IC) are addressed as per MEUK specification.

□Water pipe work to each HBC and Indoor unit is completed.

□Water pipe work is pressure tested to 1.5 x operating pressure = 3 bar.

□Drain/Condensate pipe work is completed and tested.

□Water pipework is same as the schematic layout i.e. isolation valves, drain cocks, automatic air vents, pressure gauge (HBC water supply pipe), pressure reducing valve (HBC water supply pipe) etc.

□Expansion Vessel sized and installed.

□CAT3/CAT4/CAT5 filling loop (Water Regulation). **Seek local water authority authorisation if above CAT3**

□Water supply pressure is 1.0 to 1.6 bar to each HBC.

Note: 1 to 1.6 bar of supply pressure is applicable. The expansion vessel should be sized to this supply pressure.

□No leakage at water pipes, AAV, drain cocks, connectors etc.

□Notice sent to Water Supplier about the installation.

□**Each Indoor unit is manually purged / filled via the external Drain Cock Points. Please see section 1.2.**

Filling Indoor units

1. Open the isolation valve of the filling loop on the Main-HBC.

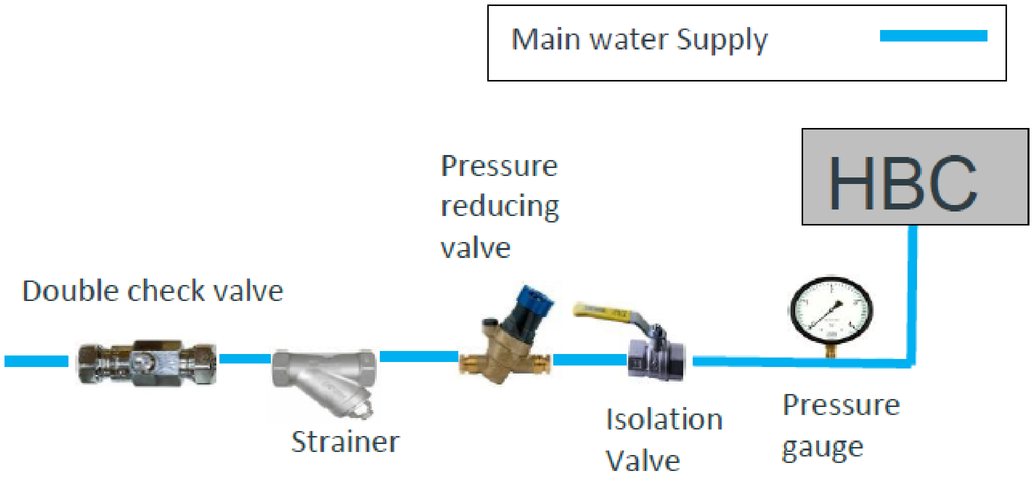
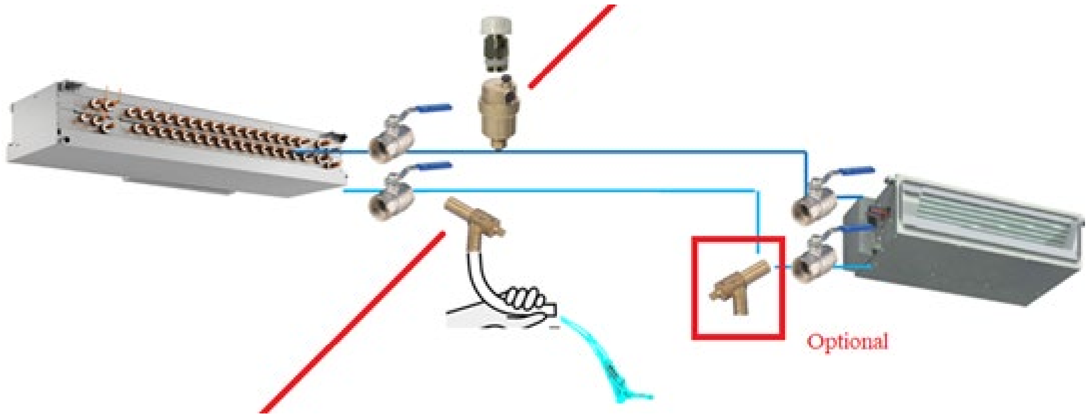


Fig. 1

2. Open the isolation valve of each indoor unit and then manually purge each indoor unit via the external drain cock which is located on the lowest pipe as shown below

The AAV should be installed at the highest point for each circuit.
Ensure AAV is NOT installed on the suction side of the water circulation pump



It is recommended that a drain cock is installed at each HBC for each return port used; this is useful in flushing each circuit individually prior to commissioning. In addition, this will also ensure the orientation of the pipe is correct i.e. no crossed flow and return pipes leading to two flow/return pipes to a FCU.

Please install a drain cock at the lowest point on the system.

The drain cock installed at the FCU is optional if not at the lowest point. This is for future maintenance purposes.

Debris Operation

1. Switch on the Indoor units, HBC and the Outdoor unit.

Note: If Sub-HBC is present, switch this on also.
2. The service monitor/LED screen on the HBC initially will display the system information (software version, refrigerant type, unit address etc.). Wait till the last two segments have two lines i.e. LD7 and LD8 as shown on figure 3;

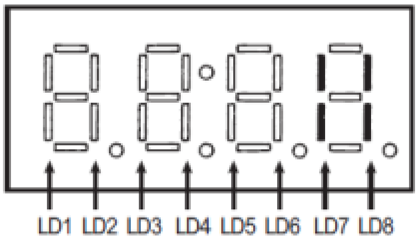


Fig. 3

Note: If Sub-HBC is present, the LED 8 will only have the line.

Note: For example; if the LED shows 2502 18: it means there is a drain pump error on the indoor unit addressed No.18. Switch off the remote controller of the indoor unit No.18 and after this the LED will show the two lines on LD7 and LD8 as shown in Figure 3.

3. Set DIP 5-1 and DIP 5-2 from OFF to ON.

Note: This opens all the valves in the supply and return header of the HBC. It also ignores the drain flow error (2502) from the float sensor on the HBC for 9 hours.

4. set the Isolation valve on the water supply pipe (to the HBC) to the flow position.

5. As shown on figure 4; open the maintenance panel and open the 2 x air purge valves in the Main-HBC (and also sub-HBC if present). Make sure the Main-HBC's condensate/drain pipe has the correct gradient.

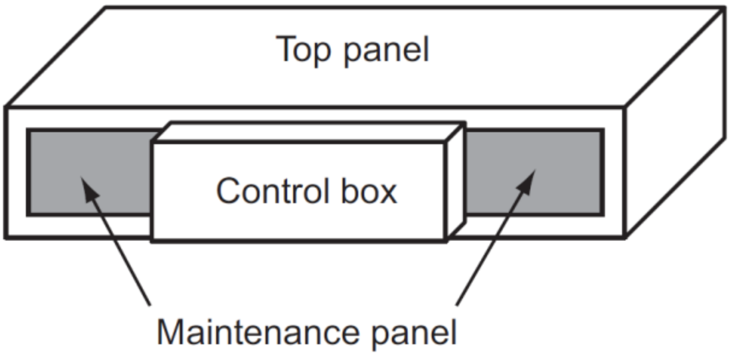


Fig. 4

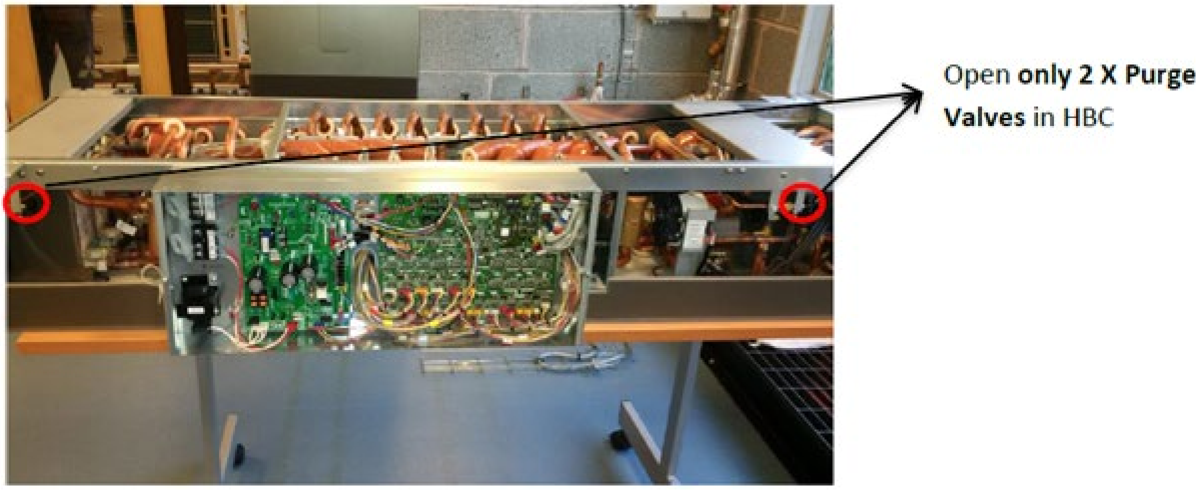


Fig. 5

6. Make sure water is coming from the air purge valve of the HBC, before going to Step7

Note:
If there is too much water coming into the drain pan/tray either in the HBC then only partially-open the air purge valve?

7. Set SW 4-1 from OFF to ON and LED screen will shows “AIR 1”.

Note:

The Debris removal operation will now start and will take approximately **40 minutes** to finish. During this time the LED screen will change to “AIR 1” and then to “AIR 2” and “AIR E” finally.

“AIR1” means; that the water pumps in the HBC box will start and stop to adjust the flow rate indoor to gather the existing air in the system so that it can discharge this to automatic air vents or air purge valve.

“AIR 2” means; the pump will operate in a fixed flow rate to collect all the debris in the system. This debris will then accumulate on each strainers of the HBC. If ‘ERR’ appears; turn off the power supply to HBC, set SW 4-1 from ON to OFF, and also turn off the power supply to the Outdoor Unit. Wait for 1 minute and then turn the power ON to the HBC & Outdoor unit and restart from step 6.

8. Once the “AIR E” is on the display of the LED screen, close the isolation valve of the water supply pipe leading to the HBC.

9. Set the SW 4-1 from ON to OFF.

10. Set the SW 4-6 from OFF to ON and switch OFF the power supply to the HBC.

11. As shown on figure 5, open the first strainer in the HBC (this is the closest to the water supply). Remove the strainer, clean it and refit it back.

Fig. 6

12. Open the second strainer in the HBC (farthest away from the water supply); clean it and refit it back.

13. Make sure that both strainers are re-installed.

14. Switch ON the power supply to the HBC.

15. Set the SW 4-6 from ON to OFF.

16. The debris operation is completed.

Note:

If the debris operation is carried out in the future for maintenance reasons, please carry out the air vent operation after this procedure.
This is because once the strainers are removed (for cleaning), air then re-enters the system.

Air Vent Operation

1. Open the isolation valve of the water supply pipe leading to the HBC.

2. Switch ON the power supply to the HBC.

3. Set the SW 4-3 from OFF to ON.
Note: *If the air vent operation is carried out in the future for maintenance reasons, please start the air vent operation from section 1.3; (Step 2 to 6) first.*

4. The LED screen will now indicate “AIR 1”, “AIR 2”, “AIR 3”, “AIR 4” and “AIR E” in over 140 - 380 minutes (this time mainly depends on the indoor units connected to the HBC).
Note:
“AIR1” means; that the water pumps in the HBC box will start and stop to adjust the flow rate indoor to gather the existing air in the system so that it can discharge this to automatic air vents or air purge valve.

"AIR2" means; that the water pumps in the HBC box will operate in a fixed flow rate to remove any residual air by sending water to all indoor units.

"AIR3" means; that the water pumps in the HBC box will operate in fixed flow rate to remove any residual air by sending water to each indoor unit. This will take 10 minutes per one branch.

"AIR4" means; the saturated air in the circulating water will be removed by performing heating operation for all indoor units thereby raising the temperature of the water.

If 'ERR' appears; turn off the power supply to HBC, set SW 4-3 from ON to OFF, and also turn off the power supply to the Outdoor Unit. Wait for 1 minute and then turn the power ON to the HBC & Outdoor unit and restart from step 1.

5. Once "AIR E" appears on the LED screen, set SW 4-3 from ON to OFF.

6. Close the 2 x air purge valve in the HBC.

7. Close the isolation valve of the water supply pipe leading to the HBC.

Check the pressure gauge on the Expansion Vessel is reading 1.6 bars as shown in figure 4

.

Pressure gauge should read 1.6 bars

Fig.

8. Please set SW 4-5 from OFF to ON. This will operate the water pumps.

9. If the pump is noisy, it means there is still air in the system. Set SW 4-5 from ON to OFF and restart from step 1.

10. If the pump is not noisy, set SW 4-5 from ON to OFF and then set SW 5-1 and SW5-2 from ON to OFF.

11. Make sure all Automatic/Manual air Vents have been sealed-off.
    If not the system will reduce pressure over time.

The air vent operation is completed.

4.3. Check List for Vertical HBC system

Check List			
		Complete	Advised
Outdoor	Install location satisfies requirements		
	Refrigerant pipe work within parameters		
	Power supply meets requirements		
	System pressure tested and additional refrigerant calculated & added		
	SW 5-1 ON if central control used		
	R32 system, does it comply with charge limit regulations		
HBC	Install location meets requirements		
	HBC drain pan supported		
Water side	CAT 3 or greater back flow protection		
	Expansion vessel installed and sized correctly, one per Vertical HBC		
	Pipe work to FCU within parameters		
	Pipe work correct size for FCU model		
	Isolation valves flow & return to FCU and Sub- HBC		
	Drain cock installed at HBC for air purge		
	Drain cock near FCU & Sub-HBC for maintenance		
	AAV's installed on the Tee of all return pipes from the Vertical HBC		
	AAV fitted to each FCU leg at highest point		
	Index on Vertical HBC and Sub-HBC is checked, and Dip-SW is activated if required		
	Glycol added if pipe work environment dictates		
	Support pipework to FCU's		
	Drain pipe, should not be reduced, adequate fall. 1/100		
	Water quality satisfies requirements, report recorded		
	Corrosion inhibitor added Type: Amount:		
	Multi Layered Composite (MLC) type pipework used		
Commissioning	Water pipework pressure tested to 3 Bar		
	Water working pressure @ 1.0 ~1.6bar		
	Debris & air purge complete		
	System address set		

4.4. Vertical HBC system Debris & Air Removal Procedure

1.1 <u>Check list before running the debris and air vent operation</u>

☐ Power supply connected to the Outdoor units, Indoor units and HBC.

☐ Refrigerant pipework vacuumed and charged with additional refrigerant.*

☐ Control wiring and remote controller wiring completed.

☐ All units (OC,HBC,IC) are addressed as per MEUK specification.

☐ Water pipe work to each HBC and Indoor unit is completed.

☐ Water pipe work is pressure tested to 1.5 x operating pressure = 3 bar.

☐ Drain/Condensate pipe work is completed.

☐ Water pipework is same as the Vertical HBC schematic layout i.e. isolation valves, drain cocks, automatic air vents, pressure gauge (HBC water supply pipe), pressure reducing valve (HBC water supply pipe) etc.

☐ Expansion Vessel sized and installed as per the filling pressure.

☐ CAT3/CAT4/CAT5 filling loop (Water Regulation). Seek local water authority authorisation if above CAT3

☐ Water supply pressure is 1.0 to 1.6 bar to each Vertical HBC
Note: 1 to 1.6 bar of supply pressure is applicable. The expansion vessel should be sized to this supply pressure.

☐ No leakage at water pipes, AAV, drain cocks, connectors etc.

☐ Notice sent to Water Supplier about the installation.

☐ **Each Indoor unit is manually purged/filled via the external Drain Cock Points. Please see section 1.3**

☐ **AAV's installed on the Tee of all return pipes from the Vertical HBC. Please see section 1.2**

☐ **Index on Vertical HBC and Sub-HBC is checked, and Dip-SW is activated as per section 1.4.**

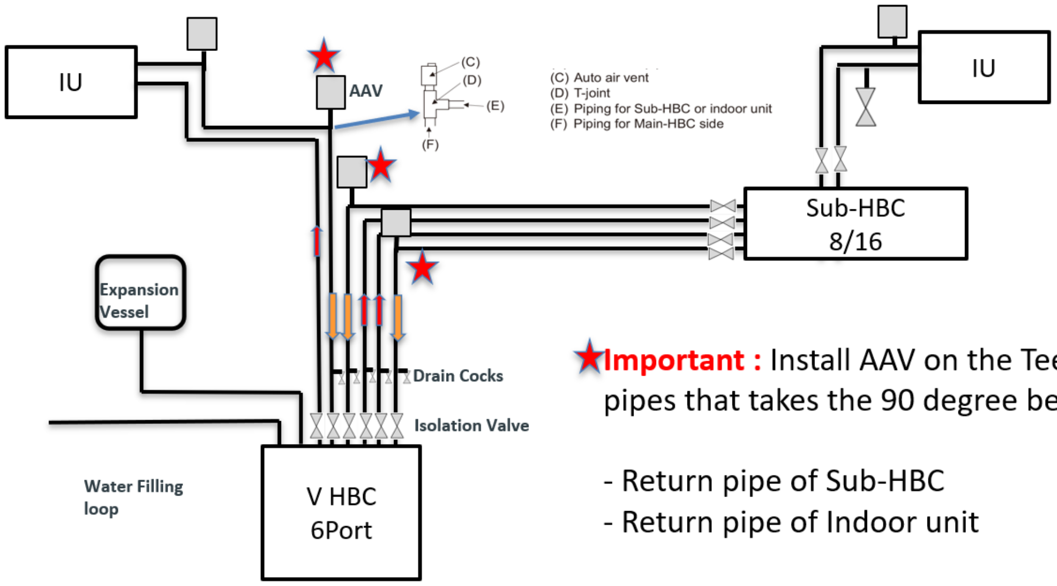
Note:

***Debris removal (Air1 to Air2) and Air vent operation (Air1 to Air3) can be performed before completing the refrigerant piping work, evacuation of refrigerant circuits, and refrigerant charging. This is explained on section 1.7.**

1.2 Vertical HBC Automatic Air Vent Check

- Please check if these critical AAV's are located on the return of pipe of the Sub-HBC & Indoor units that are connected to the Vertical HBC.

- Pumps seals will be damaged if these AAV's are not installed at these critical locations.



★**Important :** Install AAV on the Tee of the return pipes that takes the 90 degree bend.

- Return pipe of Sub-HBC
- Return pipe of Indoor unit

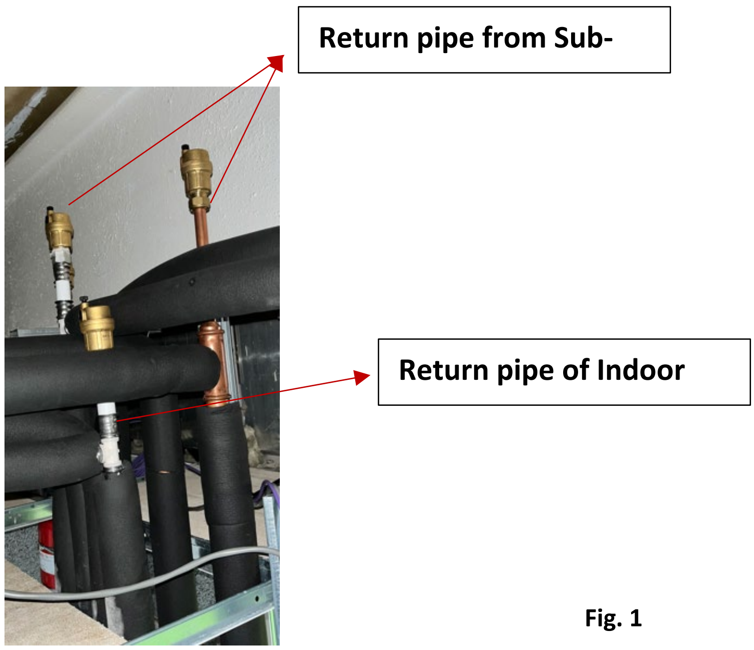


Fig. 1

1.3 Filling Indoor units

1. Open the isolation valve of the filling loop on the Main-HBC.

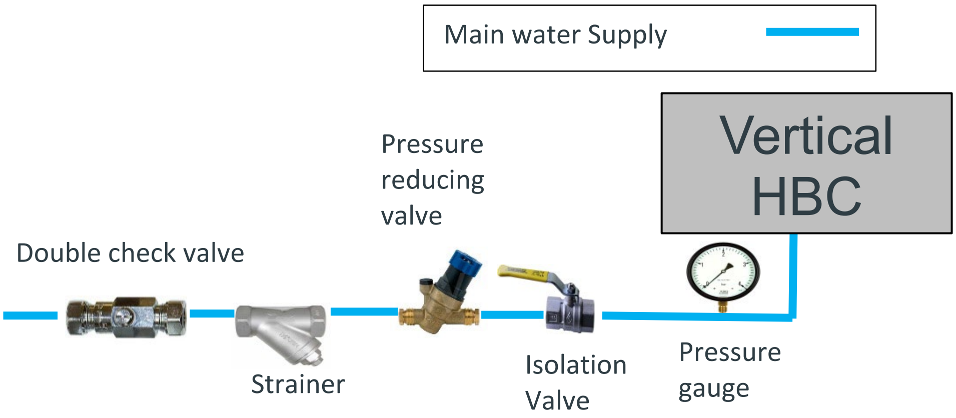


Fig. 2

2. Open the isolation valve of each indoor unit and then manually purge each indoor unit via the external drain cock which is located on the lowest pipe as shown in Figure 3.
   Repeat this process for the 4-pipe connection between the Sub-HBC and Vertical HBC. (If present)

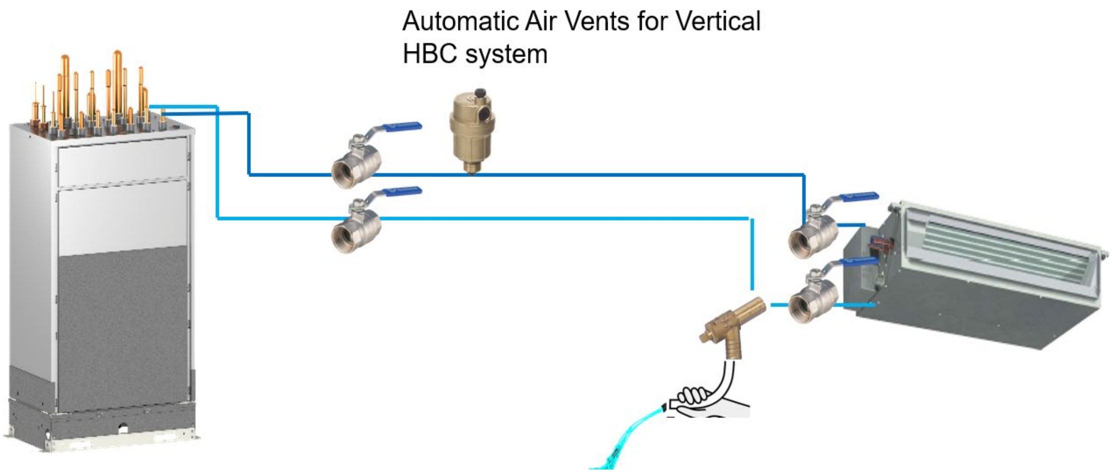


Fig. 3

3. Make sure the indoor unit and the Sub-HBC (4 pipe connection) is purged properly (*i.e. all the air is out and there is a clear flow of water from the drain cock*). Also open the automatic air Vent while carrying out this process.

4. Close the drain cock & automatic air vent and then repeat this procedure for all indoor units in the layout.

Note:
It is recommended that a drain cock is installed at each HBC for each return port used; this is useful in flushing each circuit individually prior to commissioning. In addition, this will also ensure the orientation of the pipe is correct i.e. no crossed flow and return pipes leading to the flow/return pipes of a FCU.

Please install a drain cock at the lowest point on the system.
The drain cock installed at the FCU is optional if it is not at the lowest point. This is for future maintenance purposes.

1.4 System Index and Height Check

1. As standard, the water filling pressure is limited to 1.6 bars and the index on the Vertical HBC and Sub-HBC is limited to P170 and P250 respectively. The example below shows, how to calculate the index on these HBCs.

OU : PURY-M450-YNW

System Diversity : 100% , Index 450

IU	QTY	Index
WP40-VMA	5	200
WP50-VMA	5	250
TOTAL	**10**	**450**

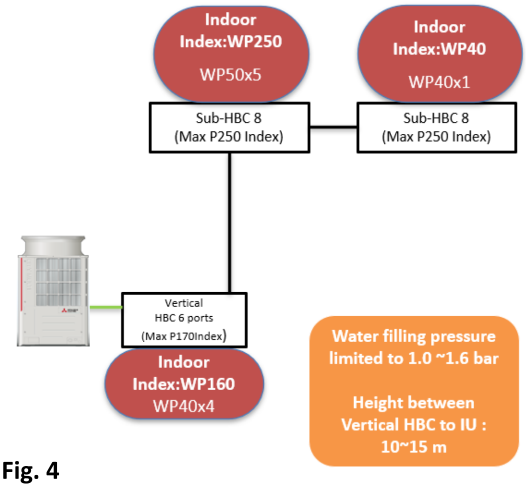


Fig. 4

2. The index on the Vertical & Sub-HBC can be increased to P200 and P350 respectively via Dip-SW.
   However, the water filling pressure is limited to 1.2 bars and the height between the Vertical HBC and the indoor unit is limited to 11m.
   The software on these HBC boxes should be Ver 11.03 or above.

(A) Main-HBC
Total indoor units capacity: W/WP/WL170 or less (DipSW001-8 = OFF)
W/WP/WL200 or less (DipSW001-8 = ON) *
(B), (C), (D) Sub-HBC
Total indoor units capacity: W/WP/WL250 or less (DipSW001-8 = OFF)
W/WP/WL350 or less (DipSW001-8 = ON) *

OU : PURY-M450-YNW

System Diversity : 100% , Index 450

IU	QTY	Index
WP40-VMA	5	200
WP50-VMA	5	250
TOTAL	**10**	**450**

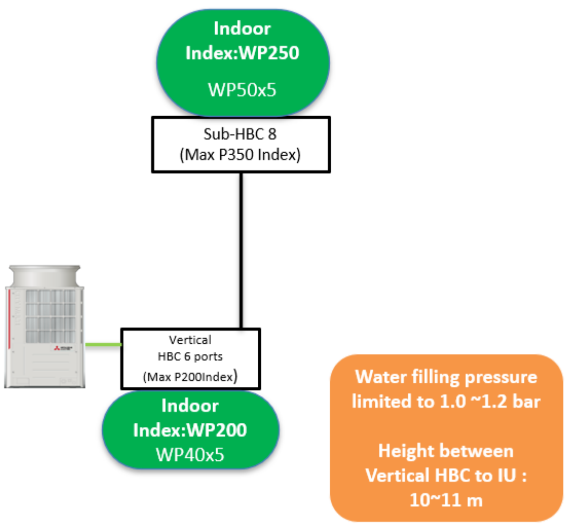


Fig. 5

1.5 <u>Debris Operation</u>

1. Switch on the Indoor units, HBC and the Outdoor unit.

   Note: If Sub-HBC is present, switch this on also.

2. Open the front panel of the Vertical HBC.
   The service monitor/LED screen on the HBC initially will display the system information (software version, refrigerant type, unit address etc.). Wait till the last two segments has two line i.e. LD7 and LD8 as shown on figure 5;

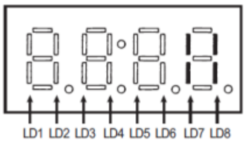


Fig. 5

Note: If Sub-HBC is present, the LED 8 will only have the line.
Note: For example; if the LED shows 2502 18: it means there is a drain pump error on the indoor unit addressed No.18.
Switch off the remote controller of the indoor unit No.18 and after this the LED will show the two lines on LD7 and LD8 as shown in Figure 5.

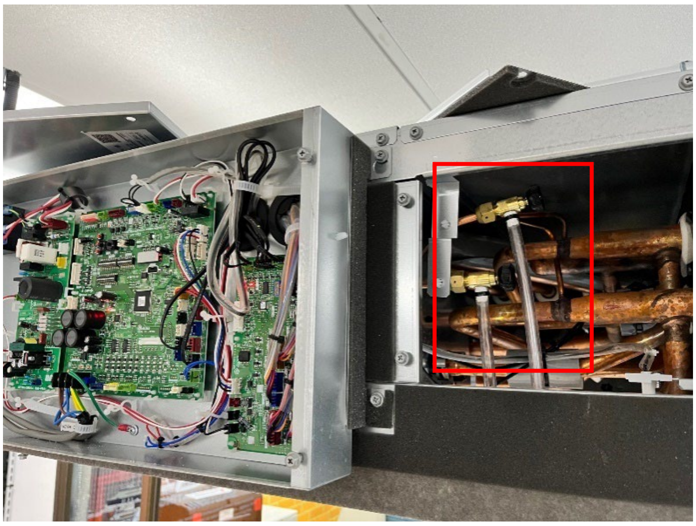
3. Set DIP SW 001-1 and DIP SW 001-2 from OFF to ON.

   Note: *This opens all the valves in the supply and return header of the HBC. It also ignores the drain flow error (2502) from the float sensor on the HBC for 9 hours.*

4. Set the Isolation valve on the water supply pipe (to the HBC) to the flow position.

5. As shown on figure 6; open the side panel of the Sub-HBC (if connected).

Vertical HBC



Sub-HBC

Fig. 6

6. As highlighted on figure 6, open the manual purge valves of the Sub-HBC and make sure water is coming from the manual purge valve of the Sub-HBC, before going to Step 7.
   If there’s no Sub-HBC in this layout, open the external drain cocks of two indoor units and direct the flow of water to a drain.

   Note:
   If there is too much water coming into the drain pan/tray then only partially-open the air purge valve.

7. Set SW 002-1 from OFF to ON and LED screen will shows “AIR 1”.

   Note:
   *The Debris removal operation will now start and will take approximately **40 minutes** to finish. During this time the LED screen will change to “AIR 1” and then to “AIR 2” and “AIR E” finally.*

   “AIR1” means; that the water pumps in the HBC box will start and stop to adjust the flow rate indoor to gather the existing air in the system so that it can discharge this to automatic air vents or air purge valve.

   “AIR 2” means; the pump will operate in a fixed flow rate to collect all the debris in the system. This debris will then accumulate on each strainers of the HBC.

   If ‘ERR’ appears; turn off the power supply to HBC, set SW 4-1 from ON to OFF, and also turn off the power supply to the Outdoor Unit. Wait for 1 minute and then turn the power ON to the HBC & Outdoor unit and restart from step 6.

8. Once the “AIR E” is on the display of the LED screen, close the 2 x Manual Purge valves of the Sub-HBC box that were opened at Step 6.
   If there’s no Sub-HBC in this layout, close the external drain cocks of the two indoor units.

9. Close the isolation valve of the water supply pipe leading to the HBC.

10. Set the SW 002-1 from ON to OFF.

11. Set the SW 002-6 from OFF to ON and switch OFF

12. Close all the isolation valve on the Vertical HBC of each branch (Indoor unit).

13. Close all the isolation valves on the Vertical HBC for the pipes that are connected to the Sub-HBC (if present).

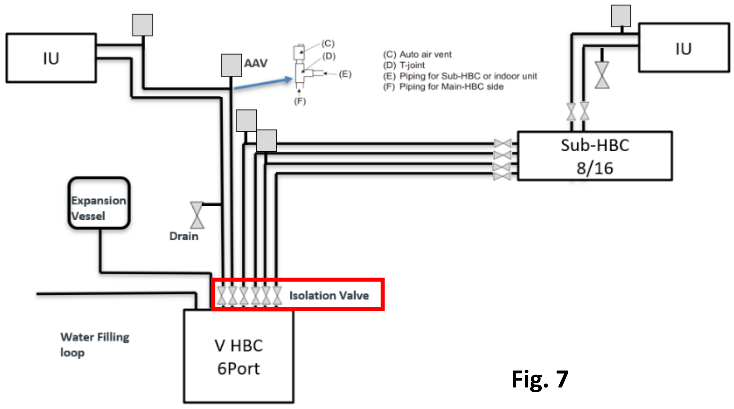


Fig. 7

14. As highlighted on figure 8, slowly turn the water vent screw of the two water pumps that is situated at the lower part of the pump casing.
(Maximum of two turns or water may burst out)

Revert the vent screw of the pumps back to it’s original position and make sure there are no leaks.

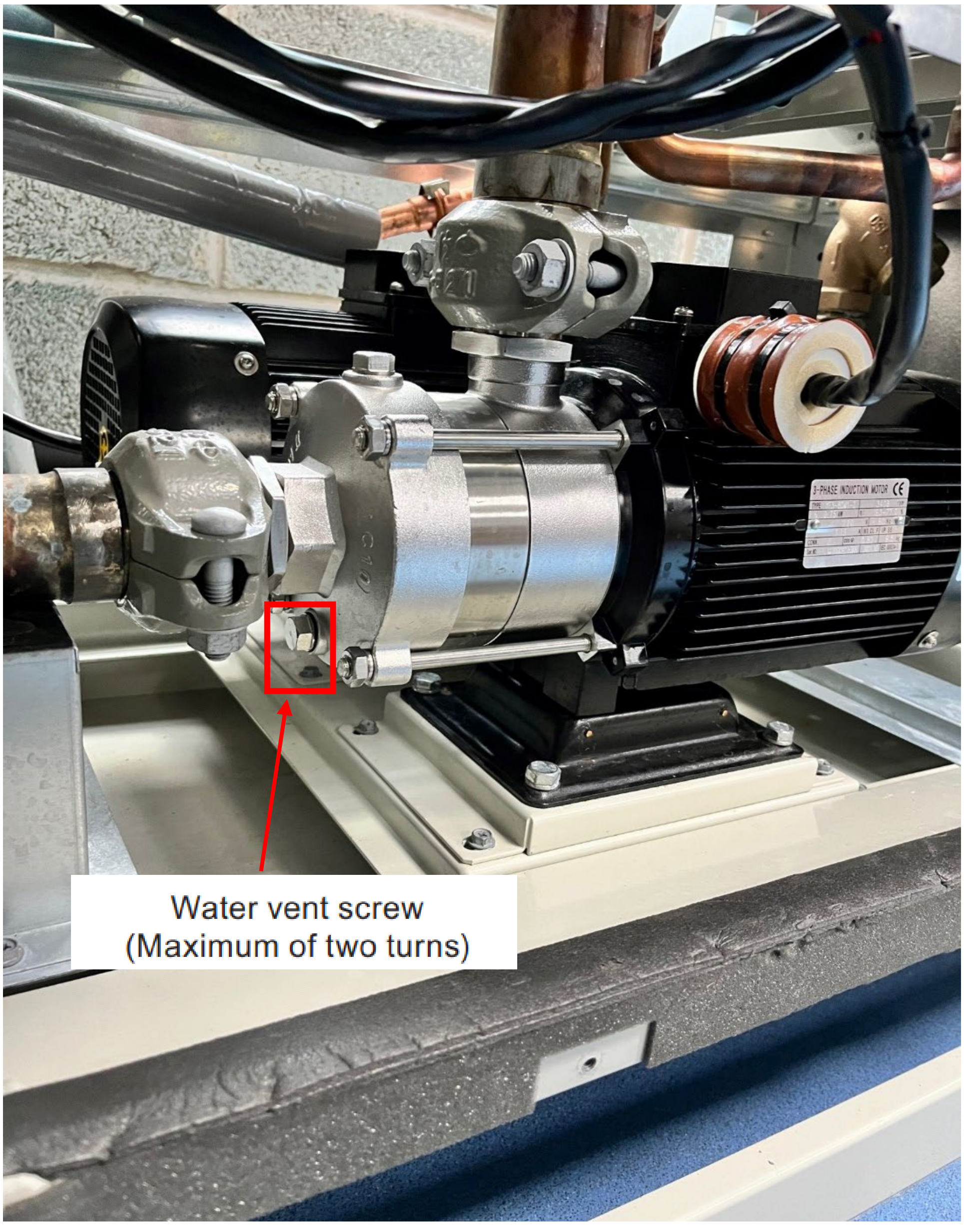


Fig. 8

15. Figure 9 shows the position of the two strainers.
Firstly, remove the front strainer, clean it, and refit it back. Repeat this process for the second strainer. If they are opened fast, water may burst out.

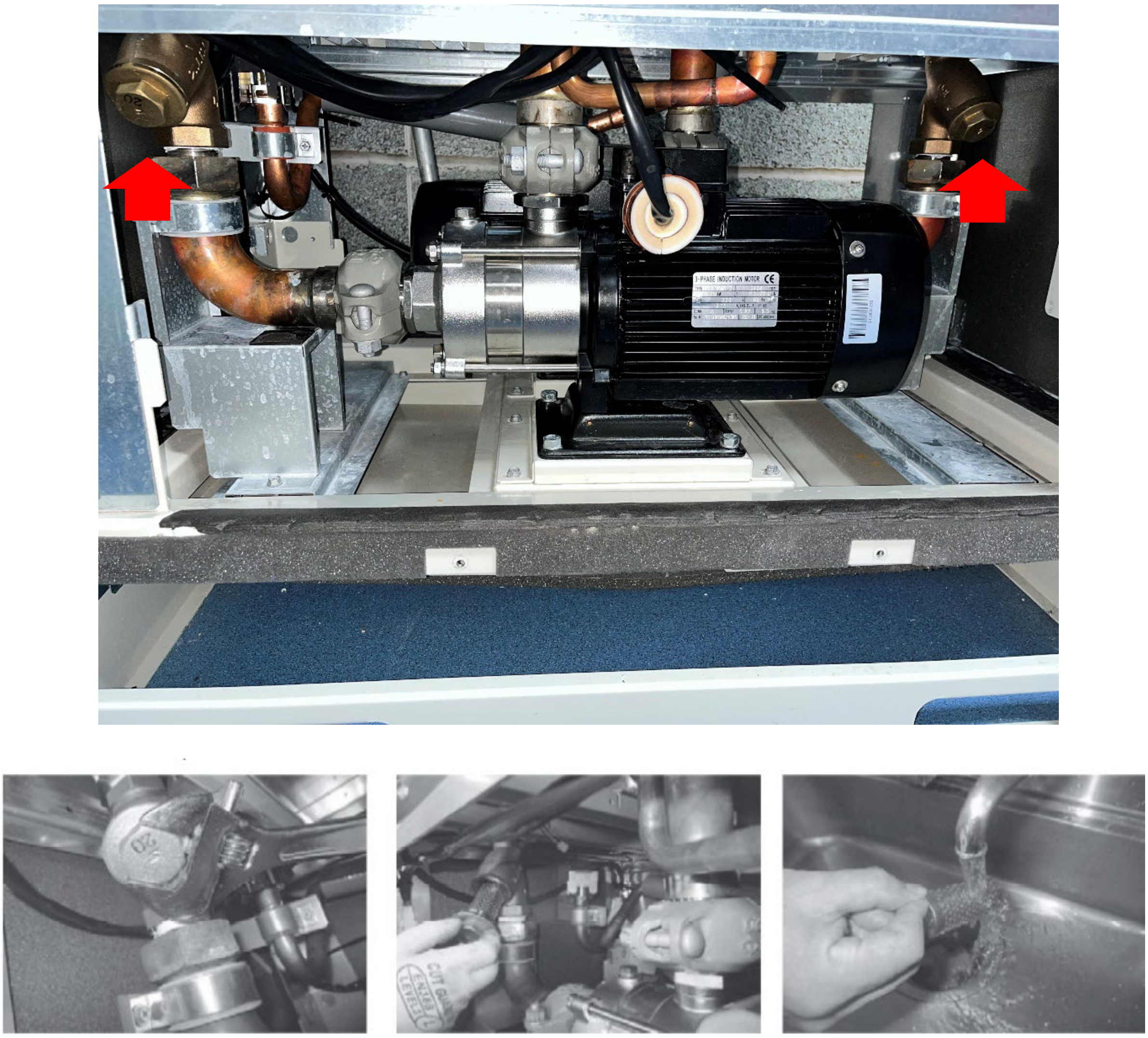


Fig. 9

16. Make sure that both strainers are re-installed and there no leaks

17. Set the SW 002-6 from ON to OFF.

18. Open all the isolation valves on the Vertical HBC for the pipes that are connected to the Sub-HBC (if present).
These were closed on Step (13) prior to cleaning the strainers.

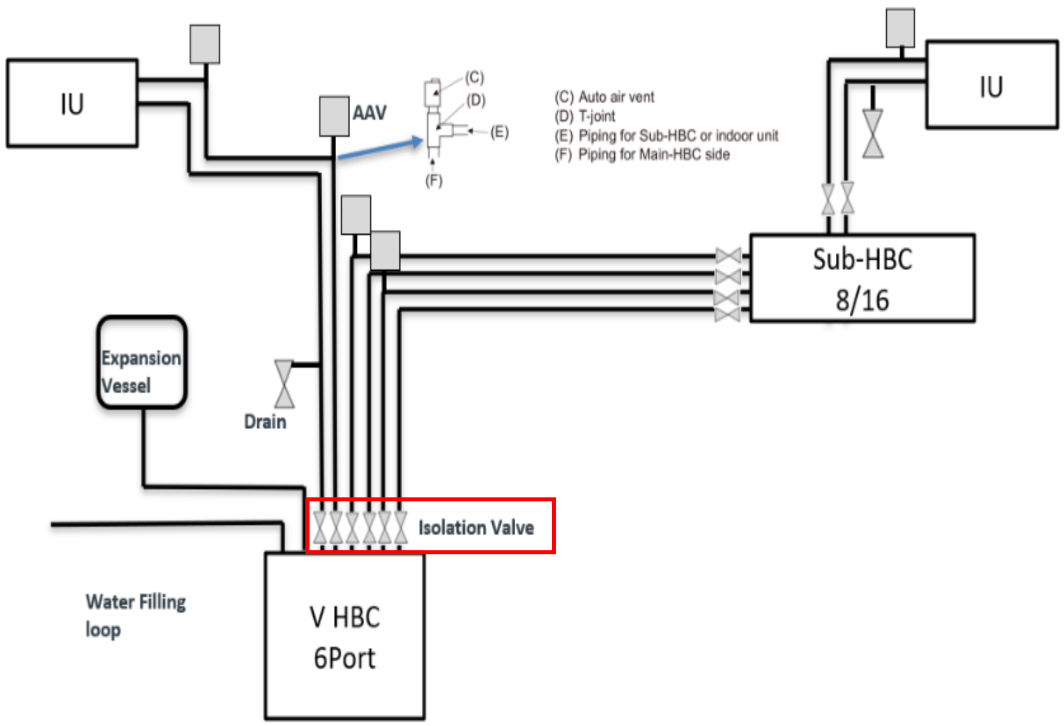


Fig. 10

19. The debris operation is completed.

Note: *If the debris operation is carried out in the future for maintenance reasons, please carry out the air vent operation after this procedure.*
This is because once the strainers are removed (for cleaning), air then re-enters the system. Hence the Air vent operation should be carried.

1.6 <u>Air Vent Operation</u>

1. Open the isolation valve of the water supply pipe leading to the HBC.

2. Switch ON the power supply to the HBC.

3. Make sure DIP SW 001-1 and DIP SW 001-2 is set from OFF to ON.

4. Wait for the filling pressure to increase to the set the level. This will be between 1 to 1.6 bar.

5. Open the 2 x manual purge valves of the Sub-HBC and make sure water is coming from the manual purge valve of the HBC as shown in Figure 6. If there's no Sub-HBC in this layout, open the external drain cocks of two indoor units and direct the flow of water to a drain

6. Set the SW 002-3 from OFF to ON.
   Note: *If the air vent operation is carried out in the future for maintenance reasons, please start the air vent operation from section 1.3; (Step 2 to 6) first.*

7. The LED screen will now indicate "AIR 1", "AIR 2", "AIR 3", "AIR 4" and "AIR E" in over 140 - 380 minutes (this time mainly depends on the indoor units connected to the HBC).
   Note:
   "AIR1" means; that the water pumps in the HBC box will start and stop to adjust the flow rate indoor to gather the existing air in the system so that it can discharge this to automatic air vents or air purge valve.

   "AIR2" means; that the water pumps in the HBC box will operate in a fixed flow rate to remove any residual air by sending water to all indoor units.

   "AIR3" means; that the water pumps in the HBC box will operate in fixed flow rate to remove any residual air by sending water to each indoor unit. This will take 10 minutes per one branch.

   "AIR4" means; the saturated air in the circulating water will be removed by performing heating operation for all indoor units thereby raising the temperature of the water.

   If 'ERR' appears; turn off the power supply to HBC, set SW 4-3 from ON to OFF, and also turn off the power supply to the Outdoor Unit. Wait for 1 minute and then turn the power ON to the HBC & Outdoor unit and restart from step 1.

8. The chart below shows the approximate time for this operation depending on the number of indoor units.

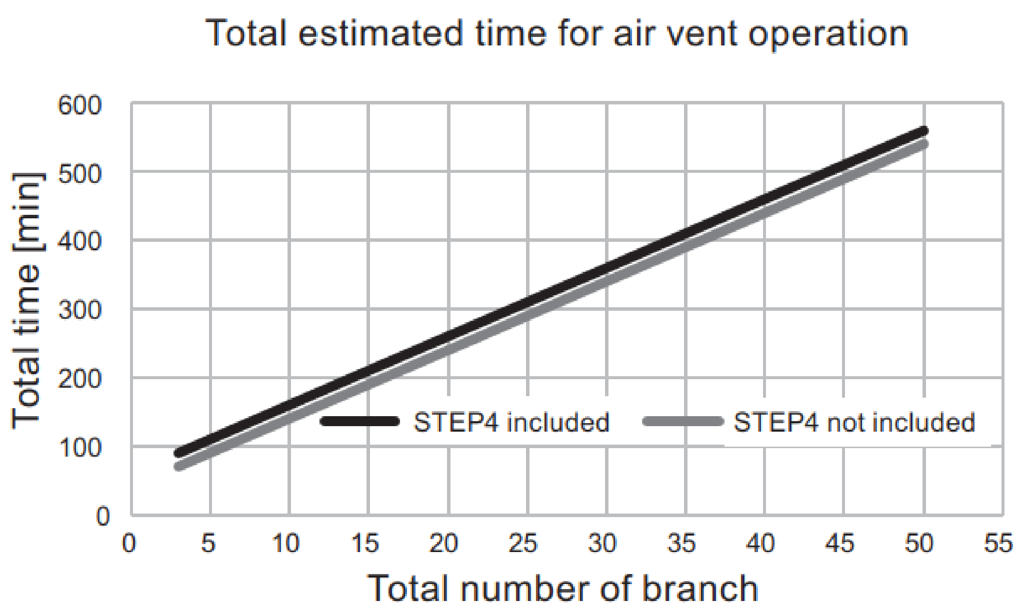


Fig. 11

9. Once "AIR E" appears on the LED screen, set SW 002-3 from ON to OFF.

10. Close the 2 x air purge valve of the Sub-HBC (if present). If there's no Sub-HBC in this layout, close the external drain cocks of the two indoor units.

11. Close the isolation valve of the water supply pipe leading to the HBC.

12. Check the pressure gauge on the Expansion Vessel is reading 1.6 bars as shown in figure 12.
As explanied on section 1.4, for increased index, please limit the water filling pressure to 1.2 bars.

Fig. 12

Pressure gauge should read 1.6 bars
or 1.2 bars if the Vertical HBC and Sub-HBC index is

13. Please set SW 002-5 from OFF to ON. This will operate the water pumps.

14. If the pump is noisy, it means there is still air in the system. Set SW 002-5 from ON to OFF and restart from step 1 of section 1.4.

15. If the pump is not noisy, set SW 002-5 from ON to OFF and then set SW 002-1 and SW 002-2 from ON to OFF.

16. Make sure all automatic air Vents have been sealed-off.
    If not, the system will reduce pressure over time.

17. The air vent operation is completed.

1.7 Commissioning without the Outdoor unit

2. As shown in figure 13, the Vertical HBC system can be partially commissioned without the outdoor unit.

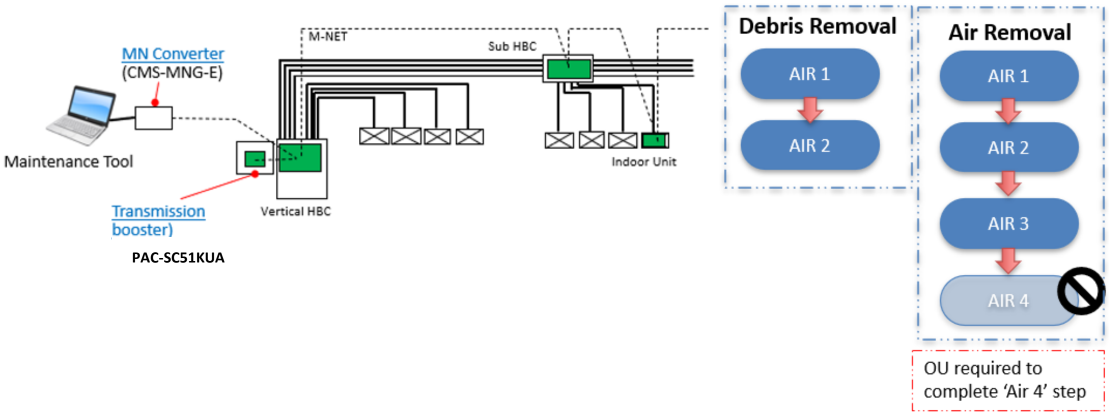


Fig. 13

3. Complete section 1.1, 1.2, 1.3 and 1.4 before starting this procedure

4. PAC-SC51KUA power supply kit and Maintenance tool version 5.43 or later is required to drive this operation.

5. While the debris removal operation is being performed, no other functions of the Maintenance Tool are available for use

6. Once the PAC-SC51KUA & Maintenance tool is connected, switch on the Indoor units, HBC and the Outdoor unit.

7. The service monitor/LED screen on the HBC initially will display the system information (software version, refrigerant type, unit address etc.). Wait till the last two segments has two line i.e. LD7 and LD8 as shown on figure 14;

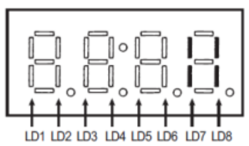


Fig. 14

Note: If Sub-HBC is present, the LED 8 will only have the line.
Note: For example; if the LED shows 2502 18: it means there is a drain pump error on the indoor unit addressed No.18.

Switch off the remote controller of the indoor unit No.18 and after this the LED will show the two lines on LD7 and LD8 as shown in Figure 14

8. As shown on Figure 15; on the maintenance tool software, Click [Option] > [Commissioning support] > [HVRF-R2 commissioning]

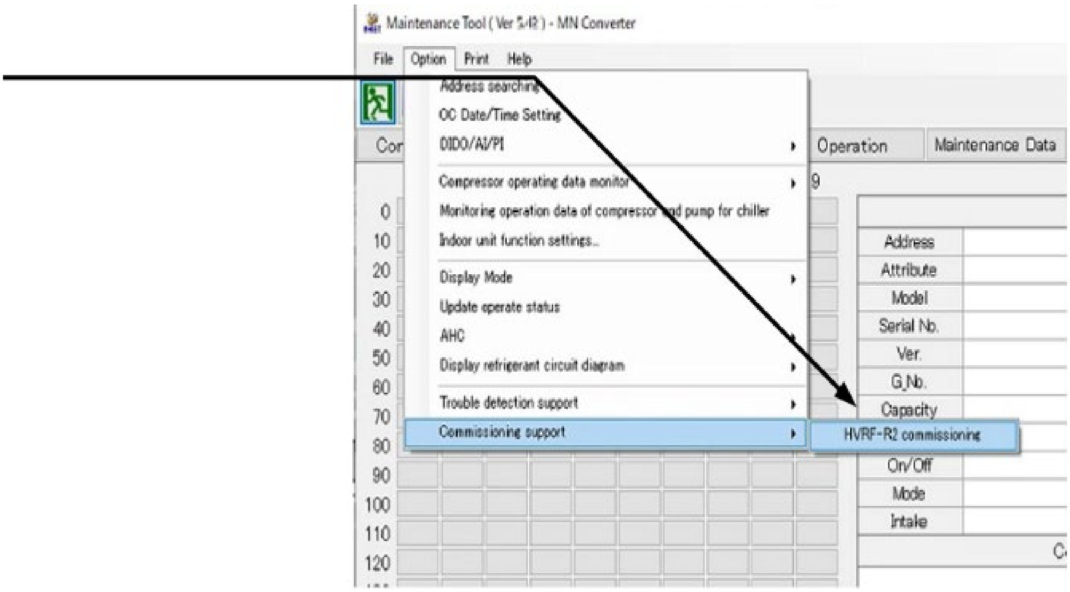


Fig. 15

9. A confirmation window will appear. Check the details and click [Next].

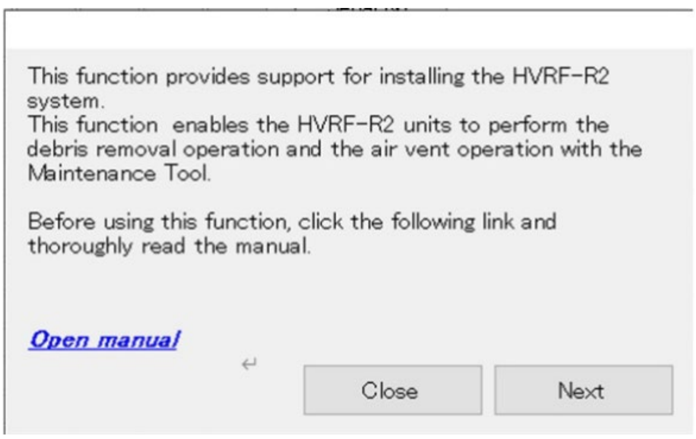


Fig. 16

10. A progress bar will appear. An error message will appear if there is a problem with the system configuration.

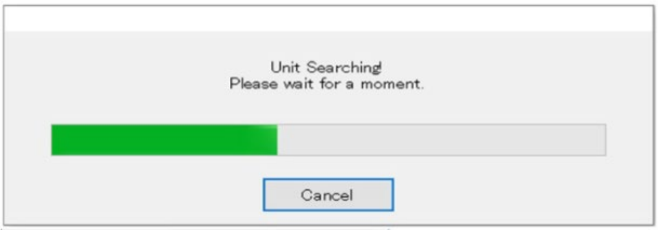


Fig. 17

11. If the error message appears, take corrective actions according to the table below, and restart from step (7).

Error message	Action
HBC controller with the M-NET address ** does not support the HVRF-R2 installation support function.	This function works only for the Vertical HBC. For other Horizontal Main-HBC controllers, install the outdoor unit to perform the debris removal operation and the air vent operation.
HBC controller does not exist.	Check that the HBC controller is connected to the M-NET transmission line
Two or more main HBC controllers exist	With the HVRF-R2 installation support function, the debris removal operation and the air vent operation cannot be performed in systems containing multiple Main-HBC controllers. Only a maximum of three Sub-HBCs can be connected to a Vertical HBC.
Four or more Sub-HBC controllers exist.	
M-NET address ** is set to the device other than the HBC controller. To use the HVRF-R2 installation support function, disconnect the devices other than HBC controllers and ICs from the M-NET transmission line.	Separate the devices other than the HVRF system (such as the VRF system and chiller) from the M-NET transmission line.

12. The start-up window of the virtual outdoor unit appears.
The virtual outdoor unit communicates with the HBC controllers and indoor units to perform a start-up processing. Wait until the start-up processing is completed.

13. The start-up processing will be completed in about three minutes.

Fig. 18

Note:
The service LED of the virtual outdoor unit appears on the Maintenance Tool window. The horsepower, software version, M-NET address, and refrigerant information of the virtual outdoor unit
are displayed alternately. If an error occurs, an error code will be displayed. If the error code is displayed, see the Service Handbook, and take corrective action.

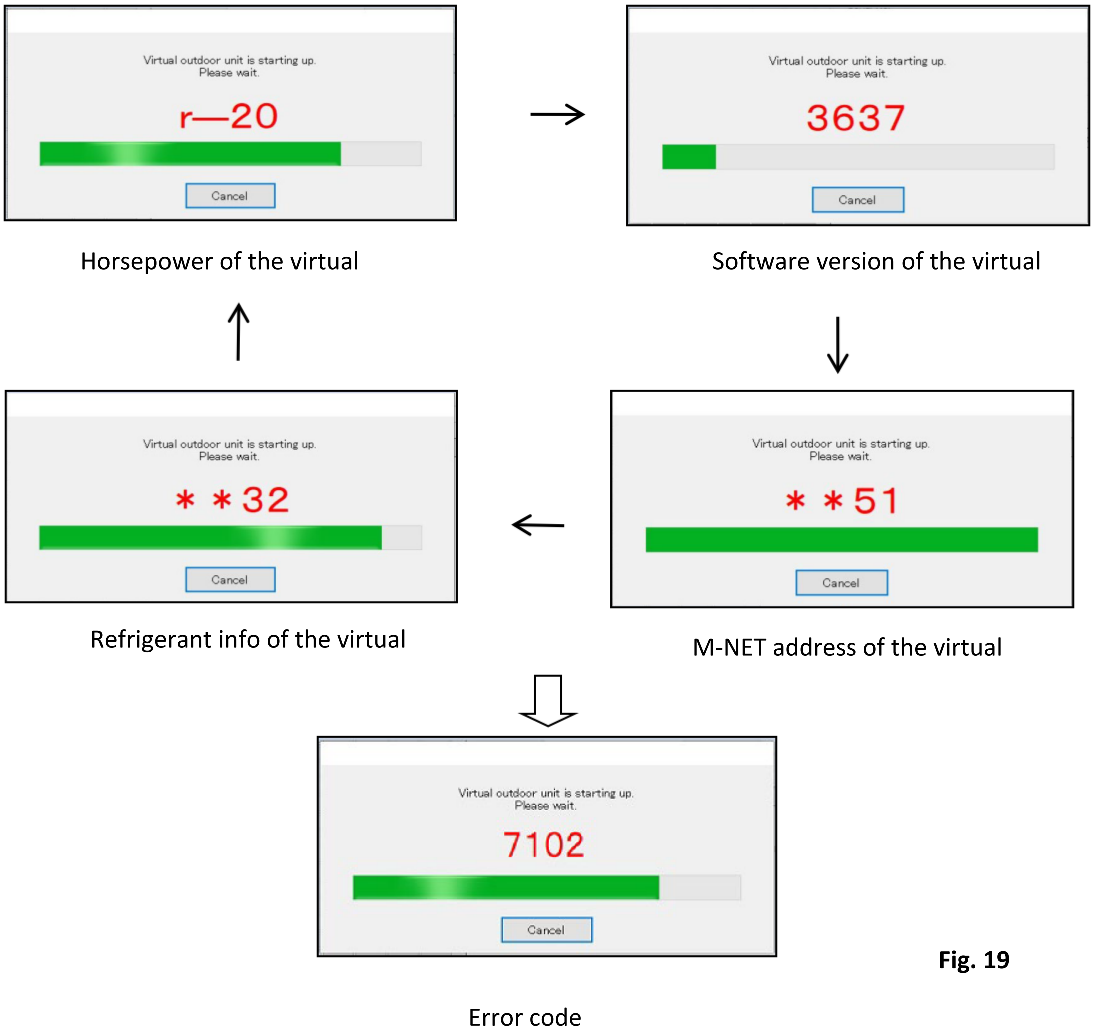


Fig. 19

14. When the start-up of the virtual outdoor unit has been completed, a preparation window will appear.

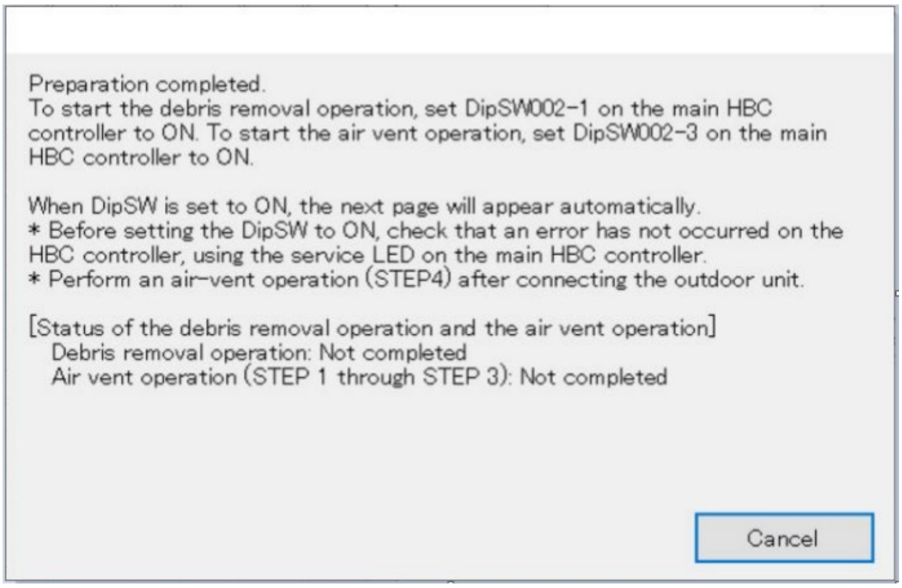


Fig. 20

15. Refer to section 1.5 for the 'Debris Removal procedure' and follow the steps from (4) to (20).

16. During the 'Debris Removal procedure', the Maintenance Tool window changes to the next page, and the debris removal operation starts. Wait until the debris removal operation is completed. The progress of the debris removal operation is not displayed in the Maintenance Tool window. To check the progress, see the service LED on the main HBC controller.

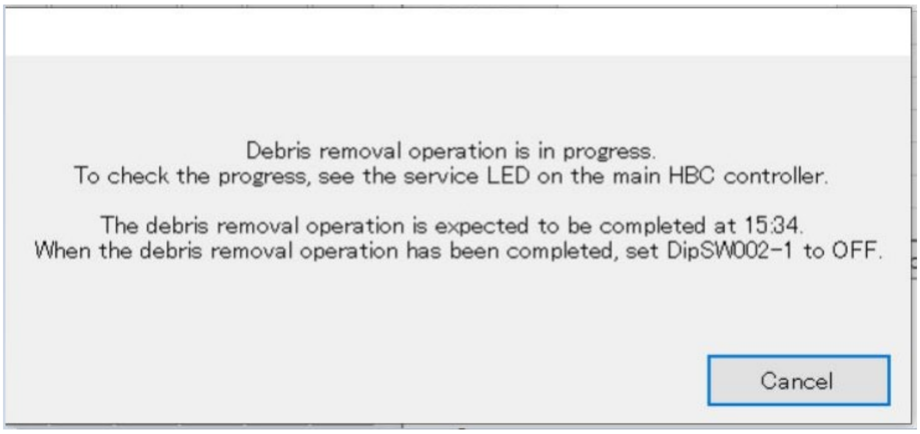


Fig. 21

17. When the debris removal operation has been completed. The Maintenance Tool window will change to the next page. Check that "Debris removal operation: Completed" is displayed.

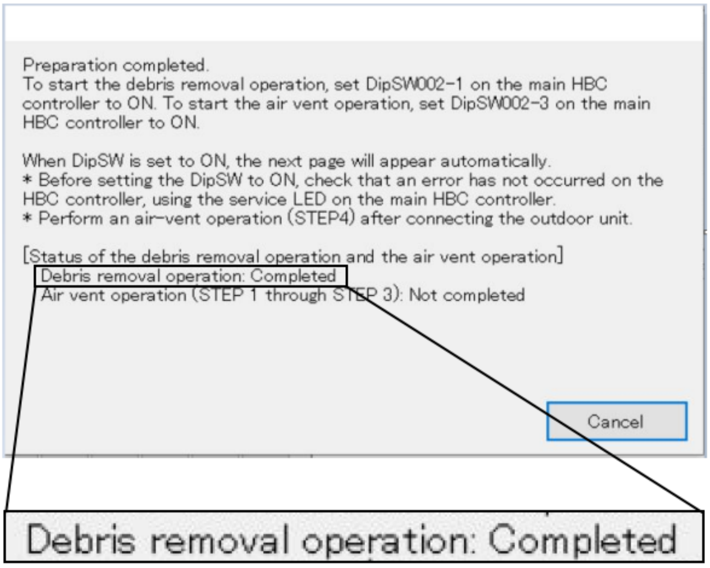


Fig. 22

18. Once the 'Debris Removal procedure' is completed, refer to section 1.6 'Air Vent Operation'. The Maintenance tool window will change as shown in Figure 23.

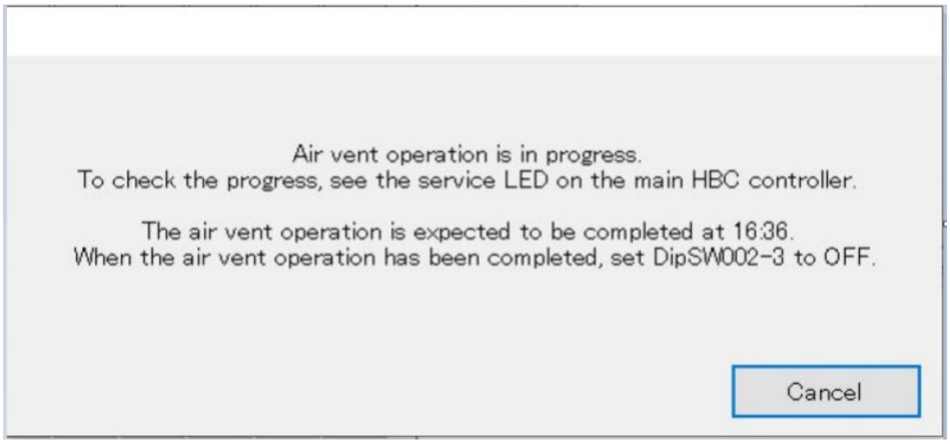
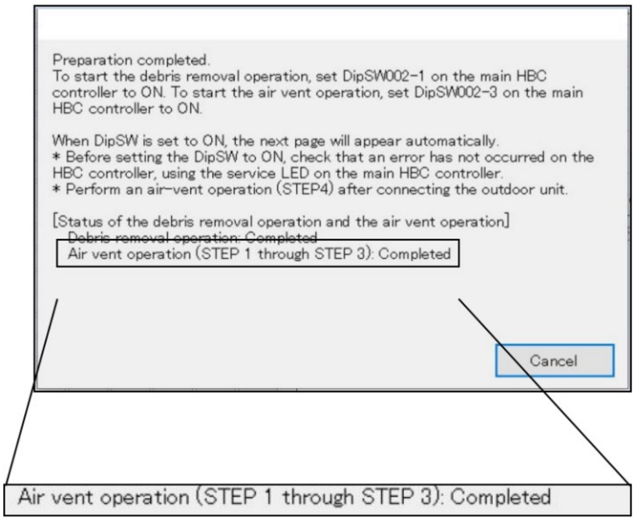


Fig. 23

19. Wait until the air vent operation (Air1 through Air3) is completed. Check the progress, using the service LED on the main HBC controller.
    At the end of the procedure, the Maintenance Tool window will change to the next page and check that 'Air vent operation: Completed' is displayed.

20. The Maintenance Tool will not be used in the further steps. Click [Cancel] to exit the Maintenance Tool



21. Once the outdoor unit is connected and the system is charged with refrigerant, remember to complete the final 'Air 4' set of the 'Air vent operation'.
    This can be done by setting the DIP SW 001-10.
    With 'Air 4', the saturated air in the circulating water will be removed by performing heating operation for all indoor units thereby raising the temperature of the water.

4.5. Commissioning With Monitor Tool

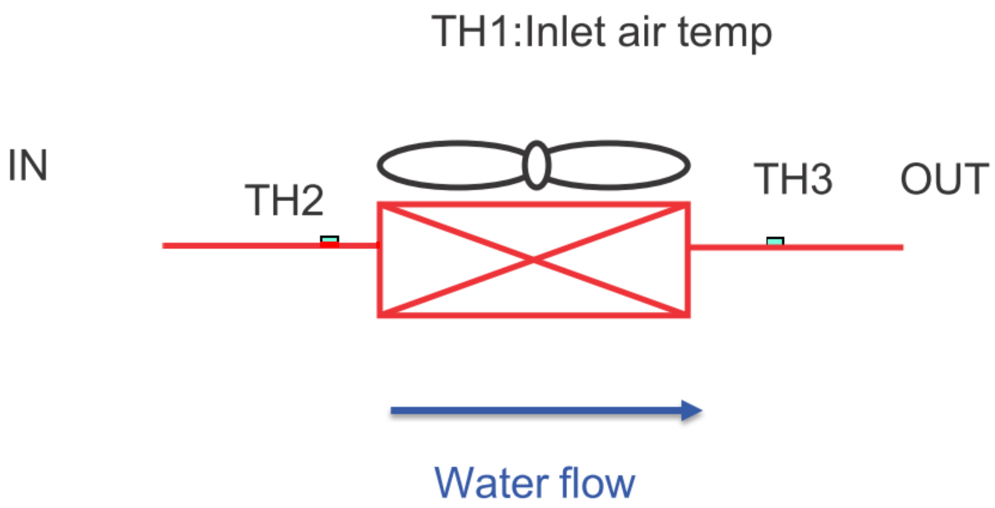
Checking correct orientation of pipework to FCU

Attach the monitor tool to the system and operate all the indoor units in test cooling

	QJ	G_No	B_No	TH1	TH2	TH3	TH4	SH/SC	Li	TO	Save	O/F	Mode	State	IC S	Fan
010	8	10	2	20.5	9.1	11.9				21.0	100	Test	Cooling	ON	Cool ON	Hi
011	6	11	4	22.6	9.5	12.3				21.5	100	Test	Cooling	ON	Cool ON	Hi
012	6	12	7	22.4	9.1	12.7				24.5	100	Test	Cooling	ON	Cool ON	Hi
013	6	12	6	22.3	10.3	13.1				24.5	100	Test	Cooling	ON	Cool ON	Hi
014	10	14	3	20.9	13.5	10.3				22.5	100	Test	Cooling	ON	Cool ON	Hi
015	10	14	5	22.8	9.9	13.1				22.5	100	Test	Cooling	ON	Cool ON	Hi
016	6	16	8	21.1	9.5	12.7				28.0	100	Test	Cooling	ON	Cool ON	Hi

Once the operation has settled (approximately 40 minutes) inspect the TH2 (TH22) values and ensure they are lower than the TH3 (TH23), if as shown on unit 14 the TH3 is lower, then the field piping of the inlet and outlet may have been crossed.

Please see below the water flow orientation through a fan coil unit.



	QJ	G_No	B_No	TH1	TH2	TH3	TH4	SH/SC	Li	TO	Save	O/F	Mode	State	IC S	Fan
010	8	10	2	20.7	41.8	36.6				18.5	100	Test	Heating	ON	Heat ON	Hi
011	6	11	4	24.2	42.2	36.6				19.0	100	Test	Heating	ON	Heat ON	Hi
012	6	12	7	22.4	42.7	39.4				22.0	100	Test	Heating	ON	Heat ON	Lo
013	6	12	6	22.4	43.2	39.4				22.0	100	Test	Heating	ON	Heat ON	Lo
014	10	14	3	20.8	37.5	41.3				20.0	100	Test	Heating	ON	Heat ON	Hi
015	10	14	5	22.0	42.2	38.0				20.0	100	Test	Heating	ON	Heat ON	Hi
016	6	16	8	20.8	43.2	38.9				23.0	100	Test	Heating	Heater	Heat ON	Hi

Operate all the indoor units in test heating and ensure that all the TH2 values are higher than the TH3, If TH2 is lower than the field piping may be crossed.

Checking correct setting of branch ports

To ensure that each indoor unit has the correct branch port setting, approximately half the indoor units attached to each master HBC should be set to test cooling and half to test heating.

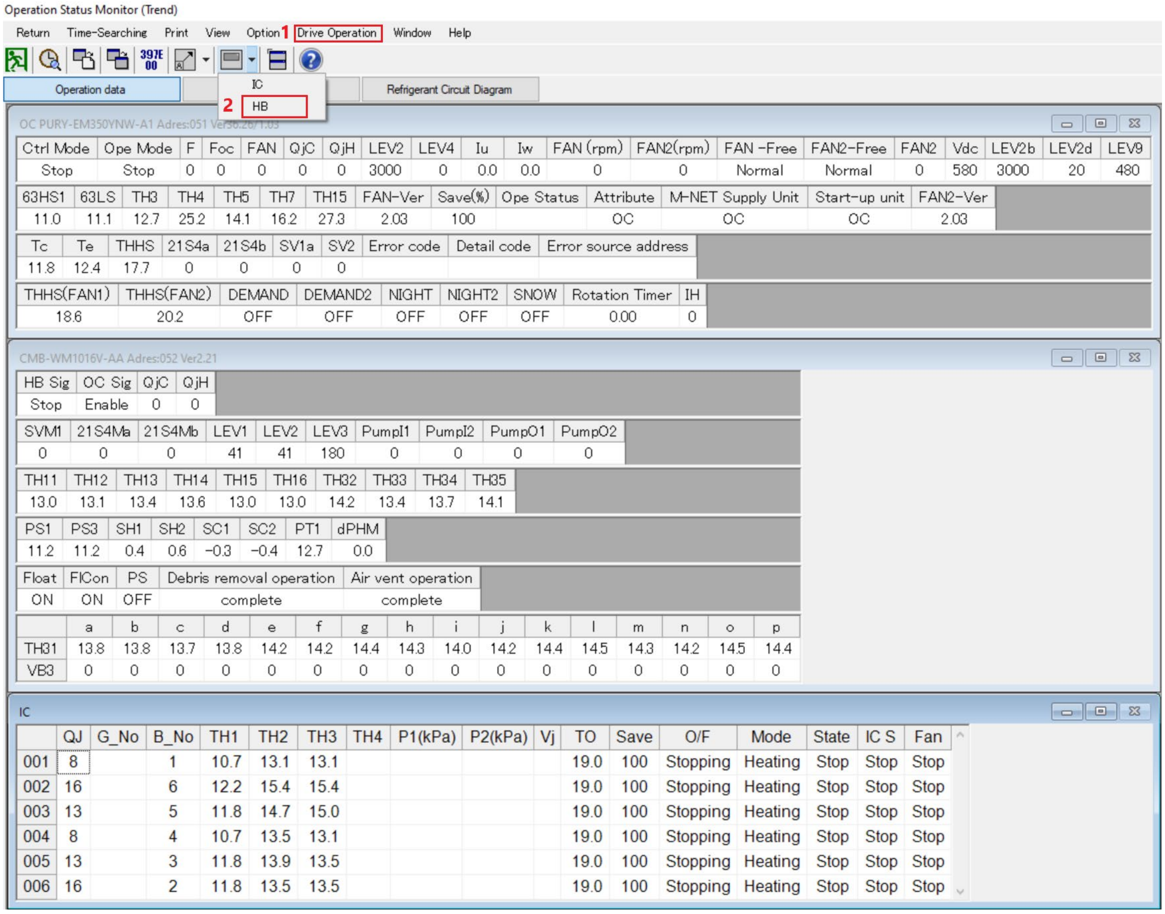
	QJ	G_No	B_No	TH1	TH2	TH3	TH4	SH/SC	Li	TO	Save	O/F	Mode	State	IC S	Fan
010	8	10	2	18.6	46.3	42.2				18.5	100	Test	Heating	ON	Heat ON	Hi
011	6	11	4	21.3	46.9	41.3				19.0	100	Test	Heating	ON	Heat ON	Hi
012	6	12	7	22.1	46.3	42.7				22.0	100	Test	Heating	ON	Heat ON	Lo
013	6	12	6	22.1	45.8	42.7				22.0	100	Test	Heating	ON	Heat ON	Lo
014	10	14	3	20.5	15.4	13.1				22.5	100	Test	Cooling	ON	Cool ON	Hi
015	10	14	5	22.8	13.1	15.4				22.5	100	Test	Cooling	ON	Cool ON	Hi
016	6	16	8	20.5	13.5	15.4				28.0	100	Test	Cooling	ON	Cool ON	Hi

Once the operation has settled, select a unit, in this example we are starting with indoor unit address 10 branch port 2.

IC

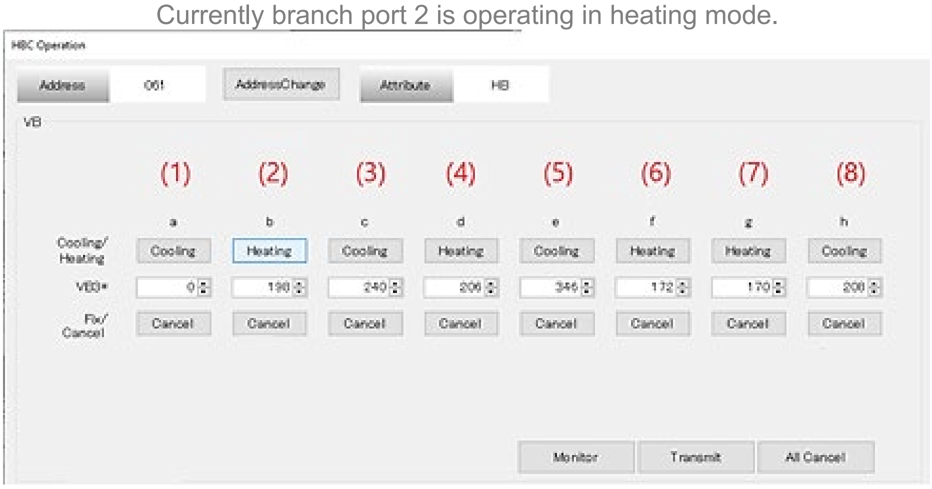
	QJ	G_No	B_No	TH1	TH2	TH3	TH4	SH/SC	Li	TO	Save	O/F	Mode	State	IC S	Fan
010	8	10	2	19.6	46.3	40.8				18.5	100	Test	Heating	ON	Heat ON	Hi
011	6	11	4	22.5	46.9	41.8				19.0	100	Test	Heating	ON	Heat ON	Hi
012	6	12	7	22.1	46.3	42.7				22.0	100	Test	Heating	ON	Heat ON	Lo
013	6	12	6	22.1	46.3	43.2				22.0	100	Test	Heating	ON	Heat ON	Lo
014	10	14	3	20.1	15.0	13.1				22.5	100	Test	Cooling	ON	Cool ON	Hi
015	10	14	5	22.8	12.3	14.7				22.5	100	Test	Cooling	ON	Cool ON	Hi
016	6	16	8	20.2	13.1	15.4				28.0	100	Test	Cooling	ON	Cool ON	Hi

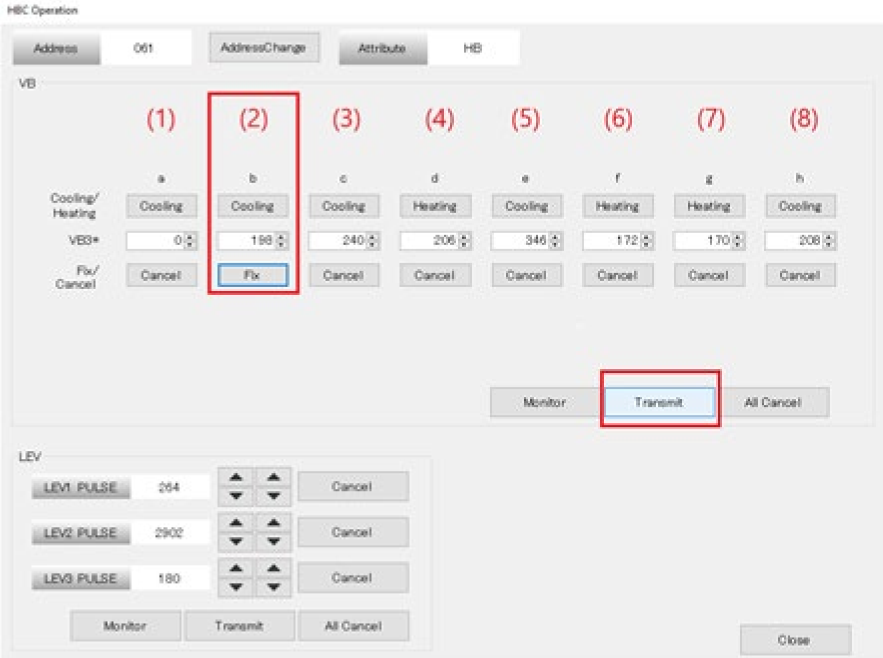
Open the (1) Drive Operation within the Monitor Tool and select the (2) HBC



The HB window will open displaying the VB3 postion (heating or cooling)

Currently branch port 2 is operating in heating mode.



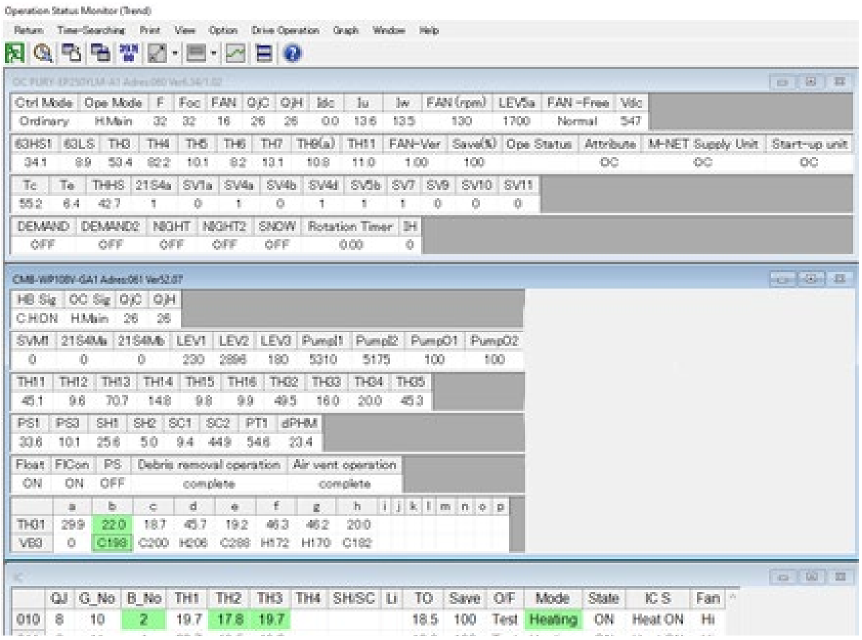


Switch the operation from heating to cooling and fix the mode below this.
Click transmit to send the command and close the window.

Pay attention to the fan coil unit's thermistors, TH2&3 to fall as highlighted below.

Continue this procedure until all the units in heating mode have been tested. Then carry out the port checking procedure on the fan coils operating in cooling.

The TH2&3 thermistors will rise in this case.



4.6 Commissioning Without Monitor Tool

DIP SWITCH SW4 (SW6-9 Off, SW6-10 Off)											Display							
1	2	3	4	5	6	7	8	9	0	Description	LD 1	LD 2	LD 3	LD 4	LD 5	LD 6	LD 7	LD 8
	■		■			■	■	■		IC1 Water Inlet Temperature	-99.9 to 999.9							
■	■		■			■	■	■		IC2 Water Inlet Temperature	-99.9 to 999.9							
		■	■			■	■	■		IC3 Water Inlet Temperature	-99.9 to 999.9							
■		■	■			■	■	■		IC4 Water Inlet Temperature	-99.9 to 999.9							
	■	■	■			■	■	■		IC5 Water Inlet Temperature	-99.9 to 999.9							
■	■	■	■			■	■	■		IC6 Water Inlet Temperature	-99.9 to 999.9							
				■		■	■	■		IC7 Water Inlet Temperature	-99.9 to 999.9							
■				■		■	■	■		IC8 Water Inlet Temperature	-99.9 to 999.9							
	■			■		■	■	■		IC9 Water Inlet Temperature	-99.9 to 999.9							
■	■			■		■	■	■		IC10 Water Inlet Temperature	-99.9 to 999.9							
		■		■		■	■	■		IC11 Water Inlet Temperature	-99.9 to 999.9							
■		■		■		■	■	■		IC12 Water Inlet Temperature	-99.9 to 999.9							
	■	■		■		■	■	■		IC13 Water Inlet Temperature	-99.9 to 999.9							
■	■	■		■		■	■	■		IC14 Water Inlet Temperature	-99.9 to 999.9							
			■	■		■	■	■		IC15 Water Inlet Temperature	-99.9 to 999.9							
■			■	■		■	■	■		IC16 Water Inlet Temperature	-99.9 to 999.9							
	■		■	■		■	■	■		IC17 Water Inlet Temperature	-99.9 to 999.9							
■	■		■	■		■	■	■		IC18 Water Inlet Temperature	-99.9 to 999.9							
		■	■	■		■	■	■		IC19 Water Inlet Temperature	-99.9 to 999.9							
■		■	■	■		■	■	■		IC20 Water Inlet Temperature	-99.9 to 999.9							
	■	■	■	■		■	■	■		IC21 Water Inlet Temperature	-99.9 to 999.9							
■	■	■	■	■		■	■	■		IC22 Water Inlet Temperature	-99.9 to 999.9							
					■	■	■	■		IC23 Water Inlet Temperature	-99.9 to 999.9							
■					■	■	■	■		IC24 Water Inlet Temperature	-99.9 to 999.9							
	■				■	■	■	■		IC25 Water Inlet Temperature	-99.9 to 999.9							
■	■				■	■	■	■		IC26 Water Inlet Temperature	-99.9 to 999.9							
		■			■	■	■	■		IC27 Water Inlet Temperature	-99.9 to 999.9							
■		■			■	■	■	■		IC28 Water Inlet Temperature	-99.9 to 999.9							
	■	■			■	■	■	■		IC29 Water Inlet Temperature	-99.9 to 999.9							
■	■	■			■	■	■	■		IC30 Water Inlet Temperature	-99.9 to 999.9							
			■		■	■	■	■		IC31 Water Inlet Temperature	-99.9 to 999.9							
■			■		■	■	■	■		IC32 Water Inlet Temperature	-99.9 to 999.9							
	■		■		■	■	■	■		IC33 Water Inlet Temperature	-99.9 to 999.9							
■	■		■		■	■	■	■		IC34 Water Inlet Temperature	-99.9 to 999.9							
		■	■		■	■	■	■		IC35 Water Inlet Temperature	-99.9 to 999.9							
■		■	■		■	■	■	■		IC36 Water Inlet Temperature	-99.9 to 999.9							
	■	■	■		■	■	■	■		IC37 Water Inlet Temperature	-99.9 to 999.9							
■	■	■	■		■	■	■	■		IC38 Water Inlet Temperature	-99.9 to 999.9							
				■	■	■	■	■		IC39 Water Inlet Temperature	-99.9 to 999.9							
■				■	■	■	■	■		IC40 Water Inlet Temperature	-99.9 to 999.9							
	■			■	■	■	■	■		IC41 Water Inlet Temperature	-99.9 to 999.9							
■	■			■	■	■	■	■		IC42 Water Inlet Temperature	-99.9 to 999.9							
		■		■	■	■	■	■		IC43 Water Inlet Temperature	-99.9 to 999.9							
■		■		■	■	■	■	■		IC44 Water Inlet Temperature	-99.9 to 999.9							
	■	■		■	■	■	■	■		IC45 Water Inlet Temperature	-99.9 to 999.9							
■	■	■		■	■	■	■	■		IC46 Water Inlet Temperature	-99.9 to 999.9							
			■	■	■	■	■	■		IC47 Water Inlet Temperature	-99.9 to 999.9							
■			■	■	■	■	■	■		IC48 Water Inlet Temperature	-99.9 to 999.9							
	■		■	■	■	■	■	■		IC49 Water Inlet Temperature	-99.9 to 999.9							
■	■		■	■	■	■	■	■		IC50 Water Inlet Temperature	-99.9 to 999.9							

DIP SWITCH SW4 (SW6-9 Off, SW6-10 Off)											Display
1	2	3	4	5	6	7	8	9	0	Description	LD 1 / LD 2 / LD 3 / LD 4 / LD 5 / LD 6 / LD 7 / LD 8
■	■		■						■	IC1 Water Outlet Temperature	-99.9 to 999.9
		■	■						■	IC2 Water Outlet Temperature	-99.9 to 999.9
■		■	■						■	IC3 Water Outlet Temperature	-99.9 to 999.9
	■	■	■						■	IC4 Water Outlet Temperature	-99.9 to 999.9
■	■	■	■						■	IC5 Water Outlet Temperature	-99.9 to 999.9
				■					■	IC6 Water Outlet Temperature	-99.9 to 999.9
■				■					■	IC7 Water Outlet Temperature	-99.9 to 999.9
	■			■					■	IC8 Water Outlet Temperature	-99.9 to 999.9
■	■			■					■	IC9 Water Outlet Temperature	-99.9 to 999.9
		■		■					■	IC10 Water Outlet Temperature	-99.9 to 999.9
■		■		■					■	IC11 Water Outlet Temperature	-99.9 to 999.9
	■	■		■					■	IC12 Water Outlet Temperature	-99.9 to 999.9
■	■	■		■					■	IC13 Water Outlet Temperature	-99.9 to 999.9
			■	■					■	IC14 Water Outlet Temperature	-99.9 to 999.9
■			■	■					■	IC15 Water Outlet Temperature	-99.9 to 999.9
	■		■	■					■	IC16 Water Outlet Temperature	-99.9 to 999.9
■	■		■	■					■	IC17 Water Outlet Temperature	-99.9 to 999.9
		■	■	■					■	IC18 Water Outlet Temperature	-99.9 to 999.9
■		■	■	■					■	IC19 Water Outlet Temperature	-99.9 to 999.9
	■	■	■	■					■	IC20 Water Outlet Temperature	-99.9 to 999.9
■	■	■	■	■					■	IC21 Water Outlet Temperature	-99.9 to 999.9
	■	■	■		■				■	IC22 Water Outlet Temperature	-99.9 to 999.9
■					■				■	IC23 Water Outlet Temperature	-99.9 to 999.9
	■				■				■	IC24 Water Outlet Temperature	-99.9 to 999.9
■	■				■				■	IC25 Water Outlet Temperature	-99.9 to 999.9
		■			■				■	IC26 Water Outlet Temperature	-99.9 to 999.9
■		■			■				■	IC27 Water Outlet Temperature	-99.9 to 999.9
	■	■			■				■	IC28 Water Outlet Temperature	-99.9 to 999.9
■	■	■			■				■	IC29 Water Outlet Temperature	-99.9 to 999.9
			■		■				■	IC30 Water Outlet Temperature	-99.9 to 999.9
■			■		■				■	IC31 Water Outlet Temperature	-99.9 to 999.9
	■		■		■				■	IC32 Water Outlet Temperature	-99.9 to 999.9
■	■		■		■				■	IC33 Water Outlet Temperature	-99.9 to 999.9
		■	■		■				■	IC34 Water Outlet Temperature	-99.9 to 999.9
■		■	■		■				■	IC35 Water Outlet Temperature	-99.9 to 999.9
	■	■	■		■				■	IC36 Water Outlet Temperature	-99.9 to 999.9
■	■	■	■		■				■	IC37 Water Outlet Temperature	-99.9 to 999.9
				■	■				■	IC38 Water Outlet Temperature	-99.9 to 999.9
■				■	■				■	IC39 Water Outlet Temperature	-99.9 to 999.9
	■			■	■				■	IC40 Water Outlet Temperature	-99.9 to 999.9
■	■			■	■				■	IC41 Water Outlet Temperature	-99.9 to 999.9
		■		■	■				■	IC42 Water Outlet Temperature	-99.9 to 999.9
■		■		■	■				■	IC43 Water Outlet Temperature	-99.9 to 999.9
	■	■		■	■				■	IC44 Water Outlet Temperature	-99.9 to 999.9
■	■	■		■	■				■	IC45 Water Outlet Temperature	-99.9 to 999.9
			■	■	■				■	IC46 Water Outlet Temperature	-99.9 to 999.9
■			■	■	■				■	IC47 Water Outlet Temperature	-99.9 to 999.9
	■		■	■	■				■	IC48 Water Outlet Temperature	-99.9 to 999.9
■	■		■	■	■				■	IC49 Water Outlet Temperature	-99.9 to 999.9
		■	■	■	■				■	IC50 Water Outlet Temperature	-99.9 to 999.9

Table 2

Operate all the indoor units in test heating and ensure that all the TH2 values are higher than the TH3, If TH2 is lower than the field piping may be crossed.

Checking correct setting of branch ports

To ensure that each indoor unit has the correct branch port setting, approximately half the indoor units attached to each master HBC should be set to test cooling and the other half to test heating.

Then change one unit's mode in the opposite mode previously, use tables 1&2 to determine if the indoor unit drops or rises. If, however, another units temperature does change and its mode hasn't then it is likely that the branch port setting is incorrect. Please inspect further at this point.

It is recommended to test all branch ports before making any changes to the SW14 branch port setting in the indoor unit.

Logbooks

Once the commissioning process has been completed please complete the HVRF logbook (available from https://les.mitsubishielectric.co.uk/installers/tools-and-software-downloads)
Once complete please send to Commissioning.logbook@meuk.mee.com to register the system for warranty.

4.7 Maintenance sheet

MELSMART TECHNICAL SERVICES

Maintenance Sheet

Complete one form per indoor unit

The Renewable Solutions Provider
Making a World of Difference

Contractor Name:		Site Name:
Engineers Name:	Site No:	Date of Visit:

Outdoor Unit Details		
Model No:	Serial No:	Area Served

Indoor Unit 1		
Tasks	Frequency	Tick box or record reading
Clean air handling unit filters	Every Visit	
Check evaporator coil for dirt and clean as necessary	Every Visit	
Check drip tray for dirt and debris and test condensate pump for correct operation (if fitted)	Every Visit	
Check fan motor and blade visual inspection	Every Visit	
Check air on coil temperature in cooling	Every Visit	
Check air off coil temperature in cooling	Every Visit	
Check air on coil temperature in heating	Every Visit	
Check air off coil temperature in heating	Every Visit	
Check controls operation	Every Visit	
Check the water quality adheres to the BSRIA Guidance (by competent person)	Every Visit OR at a period decided by a competent person	

Additional Notes And Tasks Carried Out

MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS
Air Conditioning | Heating
Ventilation | Controls

Frequency of Visits:
Every visit - Minimum of 2 visits per year
Mitsubishi Electric recommends that the frequency of maintenance visits be no less than two per annum.
Frequency of maintenance may increase dependent upon the equipment's environment.
Failure to maintain the system to the above minimum recommendations could result in the warranty becoming null and void.
Monitor system, save and record all data.
An appropriate frequency of monitoring water samples will be required, to ensure the corrosion inhibitor is maintained at optimum levels

MELSMART TECHNICAL SERVICES

Maintenance Sheet

Complete one form per WBC Controller

The Renewable Solutions Provider
Making a World of Difference

Contractor Name:		Site Name:
Engineers Name:	Site No:	Date of Visit:

WBC Controller Details		
Model No:	Serial No:	:Area Served:

WBC Controller 1		
Tasks	Frequency	Tick box or record reading
Check all electrical connections including mains isolator and tighten as necessary	Every Visit	
Check for visible signs of refrigerant leaks	Every Visit	
Check integrity of pipework and lagging	Every Visit	
Check for visible signs of water leaks	Every Visit	
Check all water related components	Every Visit	
Check the water quality adheres to the BSRIA Guidance (by competent person)	Every visit OR at a period decided by a competent person	

Additional Notes And Tasks Carried Out

MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS
Air Conditioning | Heating
Ventilation | Controls

Frequency of Visits:
Every visit - Minimum of 2 visits per year
Mitsubishi Electric recommends that the frequency of maintenance visits be no less than two per annum.
Frequency of maintenance may increase dependent upon the equipment's environment.
Failure to maintain the system to the above minimum recommendations could result in the warranty becoming null and void.
Monitor system, save and record all data.
An appropriate frequency of monitoring water samples will be required, to ensure the corrosion inhibitor is maintained at optimum levels

MELSMART TECHNICAL SERVICES

Maintenance Sheet

Complete **one** form per outdoor unit

The Renewable Solutions Provider
Making a World of Difference

Contractor Name:		Site Name:
Engineers Name:	Site No:	Date of Visit:

Outdoor Unit Details					
Model No:	Serial No:	Compressor Run Hours:			Area Served:
		No. 1:	No. 2:	No. 3:	

Outdoor Unit					
Tasks	Frequency	Tick box or record reading			
Inspect and clean heat exchanger	Every Visit				
Check for visible signs refrigerant leaks	Every Visit				
Check integrity of pipework and lagging	Every Visit				
Check all electrical connections including mains isolator and tighten as necessary	Every Visit				
Check unit operation voltage and record	Every Visit	L1 to N:	L2 to N:	L3 to N:	N to Earth:
Check unit operation current and record	Every Visit				
Check compressor run hours and record* (All compressors)	Every Visit				
Check discharge temperature and record* (All compressors)	Every Visit				
Check suction temperature and record*	Every Visit				
Check discharge pressure and record* (All compressors)	Every Visit				
Check suction pressure and record *	Every Visit				
Check operation of crankcase heater (All compressors)	Every Visit				
WR2 / WY Additional Tasks	**Frequency**	**Tick box or record reading**			
Check integrity of pipework and lagging (refrigerant and water systems)	Every Visit				
Check water flow temperature and record	Every Visit				
Check water return temperature and record	Every Visit				
Check and clean water system strainers	Every Visit				
Check flow switch operation and record	Every Visit				

*Obtained by the use of Dipswitch SW1

Additional Notes And Tasks Carried Out

MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS

Air Conditioning | Heating
Ventilation | Controls

Frequency of Visits:
Every visit - Minimum of 2 visits per year
Mitsubishi Electric recommends that the frequency of maintenance visits be no less than two per annum.
Frequency of maintenance may increase dependent upon the equipment's environment.
Failure to maintain the system to the above minimum recommendations could result in the warranty becoming null and void.
Monitor system, save and record all data.

Changes for the Better

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Note: The fuse rating is for guidance only. Please refer to the relevant databook for detailed specification. It is the responsibility of a qualified electrician/electrical engineer to select the correct cable size and fuse rating based on current regulation and site specific conditions. Mitsubishi Electric's air conditioning equipment and heat pump systems contain a fluorinated greenhouse gas, R410A (GWP:2088), R32 (GWP:675), R407C (GWP:1774), R134a (GWP:1430), R513A (GWP:631), R454B (GWP:466), R1234ze (GWP:7) or R1234yf (GWP:4). *These GWP values are based on Regulation (EU) No 517/2014 from IPCC 4th edition. In case of Regulation (EU) No.626/2011 from IPCC 3rd edition, these are as follows. R410A (GWP:1975), R32 (GWP:550), R407C (GWP:1650) or R134a (GWP:1300).

Green Gateway
www.greengateway.mitsubishielectric.co.uk
Mitsubishi Electric UK's commitment to the environment