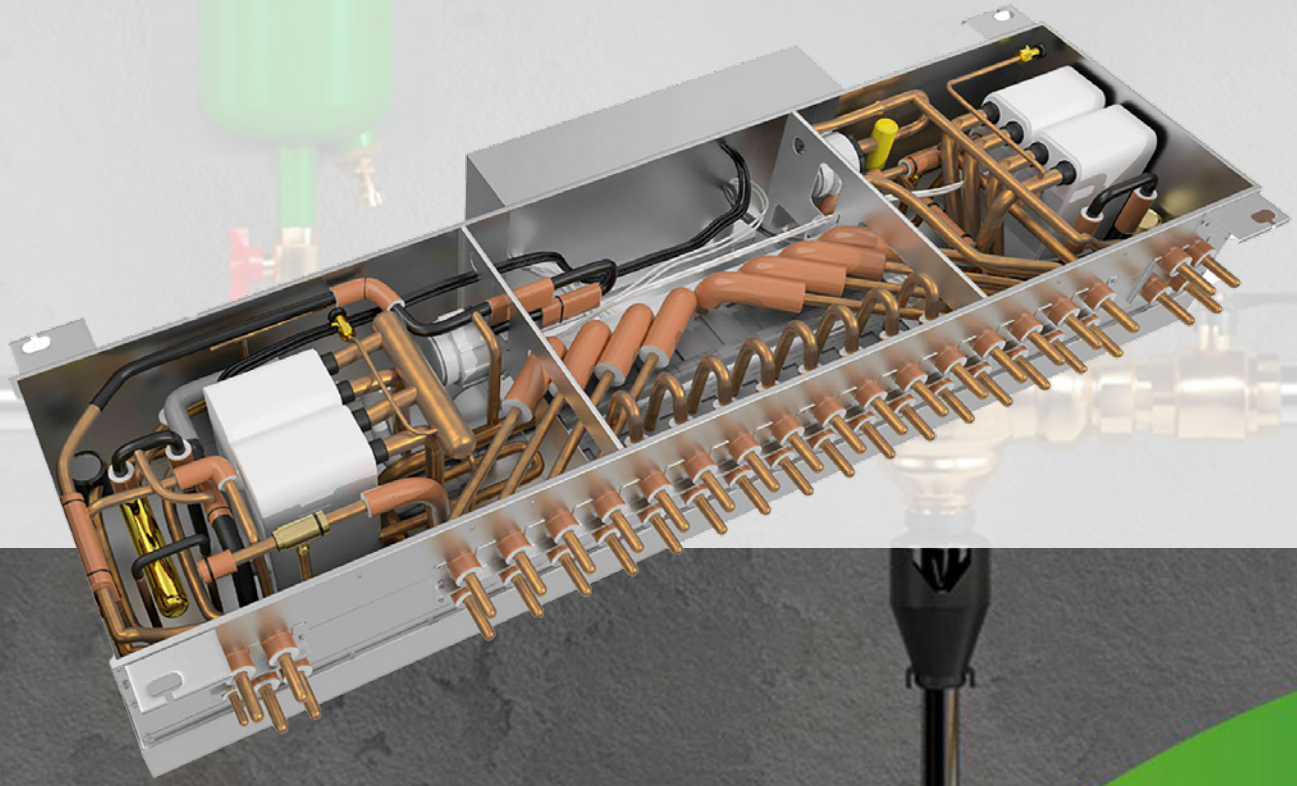
uponor

CALEFFI

PIPESPEC PRO

MITSUBISHI HYBRID VRF PIPE CONNECTION SYSTEM



WATERWARE

waterware.co.nz

SYSTEM OVERVIEW

The following pages provides installers with all the key technical specifications, components, and diagrams required to properly set up the pipework for Mitsubishi Electric's Hybrid VRF systems.

This valuable reference guide outlines the preferred pipe sizing, fitting requirements, installation best practices, and pre-commissioning procedures. With the right configuration of PipeSpec Kits ordered upfront, HVAC professionals can expertly install these innovative water-based energy transfer systems for optimal efficiency and performance.

INNOVATIVE WATER-BASED ENERGY TRANSFER

The Mitsubishi Electric Hybrid-VRF is a 2-Pipe Heat Recovery System using water as the energy transfer medium (heating/cooling) between the HBC (Hybrid Branch Circuit) Controller and the Indoor Units (Fan Coil Unit).

This design feature requires no refrigerant charge (replaced by water) in occupied spaces, minimising the need for leak detection. Hybrid VRF is a truly integrated modern heating and cooling solution for office buildings, hotels, hospitals, medical centres, schools, high-rise buildings, shopping centres and other commercial premises, where occupant comfort is paramount.

The system offers a wide range of terminal FCUs that have specific requirements for pipe sizing to be run to these units. The H-VRF has three different connection types.

These connection types refer to the internal diameter (I/D) as detailed in the drawings and specifications:

I/D Sizing	Indoor Unit FCU Model	Required sized pipes and fittings
20mm	up to 5.6kW cooling - up to WP50 Slave units and Water Make-up	25mm O/D Multilayer **CRIMP**
32mm	up to 9kW cooling - WP63 - WP80	40mm O/D Multilayer **CRIMP**
32mm	over 9kW cooling - WP100 - WP125	40mm O/D Multilayer **CRIMP** – Twin Port

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WATERWARE DISTRIBUTED UPONOR COMPOSITE PIPES

To meet these pipe size requirements, the German manufactured **UPONOR** pipe system supplied by **Waterware Group** is recommended as an ideal solution. The **UPONOR** MULTILAYER COMPOSITE (MLC) pipe that consists of internal and external layers of PE-RT (Polyethylene Raised Temperature) with an internal layer of aluminium. This composition ensures durability and longevity, with a designed lifespan of over 50 years.

The **UPONOR** MLC pipe system is suitable for a wide range of applications, temperatures, and pressures in heating and cooling systems. Absolutely **100%** oxygen-diffusion-tight 5-layer composite pipe for distribution and heating applications.

PIPESPEC PRO

HYBRID VRF TECHNICAL OVERVIEW

HYBRID VRF SYSTEM EXAMPLE

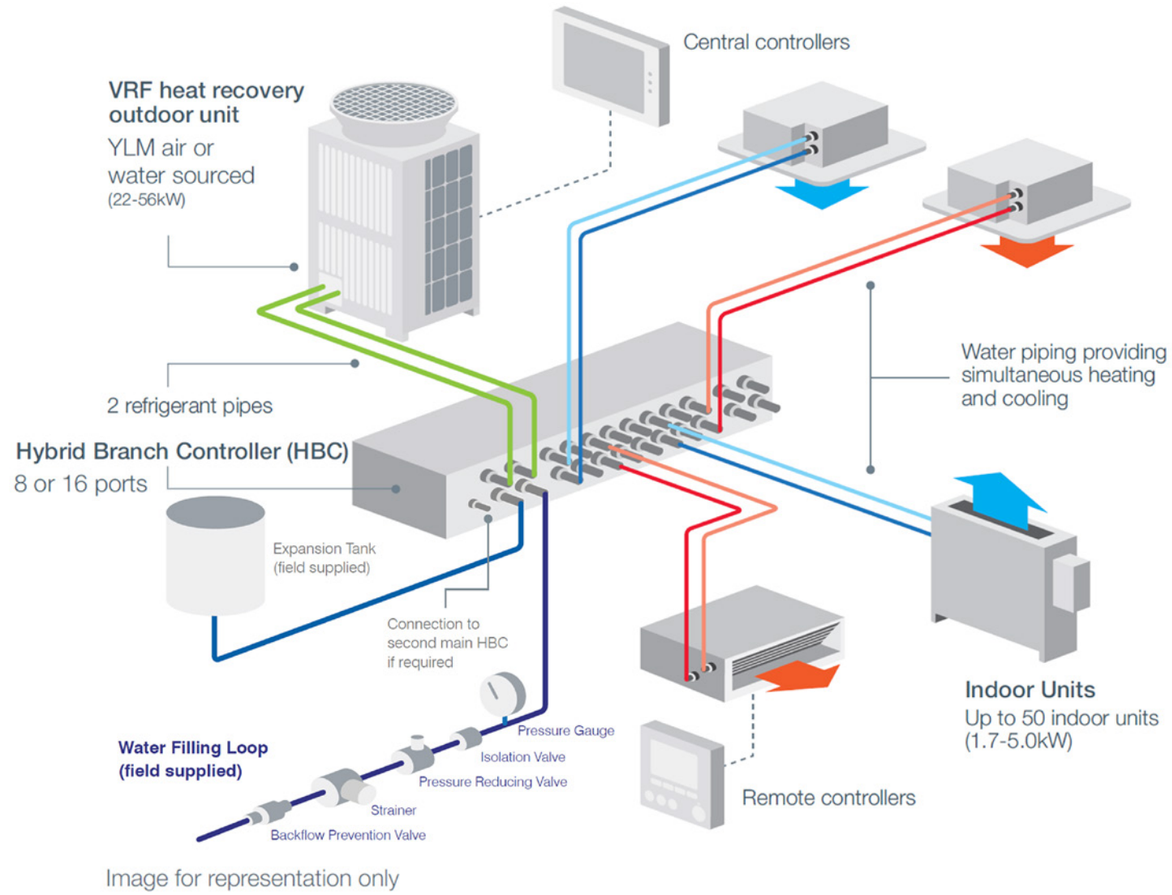

Image for representation only

BDT have acknowledged that Waterware Services Limited pipework and fittings are suitable for use with the Mitsubishi Electric Hybrid HVRF system.

CALEFFI

PRODUCT SPECIFICATIONS

Code	Description	Max. Working Temperature	Max. Working Pressure
AS551805	DISCALSLIM® Air Separator - 3/4" F	0-90 °C	4 bar
AV502640	Automatic Air Vent 1/2"	0-115 °C	10 bar
MA538400	Drain Tap 1/2"	5-110 °C	10 bar
HS553640	Auto filling Valve Set 15mm (0.2 – 4 bar)	5-65 °C	16 bar
EV255008	Wall Hanger 3/4"	5-110 °C	N/A
EV5560	Expansion Vessel 3/4", 1.5bar p/c	-10-120 °C	6 bar

H-VRF CITY MULTI - PIPEWORK SPECIFICATION

Refrigerant Connections

Mitsubishi Electric Heat Recovery Outdoor Units will be installed and connected to main Hybrid Branch Circuit box (HBC). Proprietary refrigeration insulated copper pipework (not distributed by **Waterware**) will be installed between the outdoor unit & Main HBC('s), coupling them together.

Water Connections

Main & Slave HBC units are fitted with 22mm Ø copper tails/stubs to EN 1057 water pipe sizing for the flow and return circuit lines, expansion, and filling ports. All water connections to the Main & Slave HBC boxes shall be made with compression and/or press connections that match the EN 1057 copper tails/stubs on Main & Slave HBC Boxes.

The 32mm I/D pipe flow and return circuits size up from the 22mm Ø copper tails/stubs to 40mm Ø **Uponor** MLC pipe with matched fittings to couple these components together between.:

- Main HBC and Slave HBC 20mm ID
- HBC to the FCU 20mm or 32mm (FCU specific)

PRODUCER WARRANTY SUMMARY

Supplier/Manufacturer	Category	Detail
Caleffi and other products supplied by Waterware within the **PipeSpec** PRO System.	Valves, Isolation, Air Management, Expansion Control	**5 years** - parts and labour
Uponor	Pipework and Fittings	**25 years** - destruction, damage to or loss of property (property damage)

uponor

MULTILAYER COMPOSITE PIPES (MLC)

Uponor Uni Pipe PLUS is the unique composite pipe with no weld seam, which increases fixing distances and reduces the bending radii by up to 40 % compared to conventional composite pipes – that means fewer pipe fixing points are required during installation and many changes in direction can be achieved with pipe bends. That reduces the number of fittings and pipe clamps required and saves assembly time.

UPONOR UNI PIPE PLUS

- Seamless for maximum safety
- High form stability and minimal expansion
- Improved bending properties
- 100 % oxygen-tight
- Low weight, dimensional range 14 – 110 mm
- Large mounting distances without clips

Detail	Unit	25	40
Pipe dimension (O/D)	mm	25x2.5	40x4
Inner dimension (I/D) mm	mm	20	32
Material		PE-RT/AL/PE-RT	
Operation Temperature – Heating	°C	Up to 80	
Operation Pressure (max. permanent)	Bar	10	
Fire classification		Normally inflammable B2 according to DIN 4102 / Euroclass E	
Length per bar/coil (standard)	m	50	5
Water volume l/m		0.314	0.800
Weight of pipe with water kg/m		547/560	-/1310
Thermal conductivity	W/mK	0.4	
Coefficient of expansion a	m/mK	25 x 10-6	
Min. bending radius **by Hand**	mm	125 (5x ø r)	-
Min. bending radius by **Bending Spring**	mm	75 (3x ø r)	-
Fixing distances	Horizontal mm	1600	1700
	Vertical mm	2100	2200

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AS 4176.2-2010

MULTILAYER COMPOSITE PIPES (MLC)

ALL CIRCULATING PIPEWORK MUST BE INSULATED TO THE MANUFACTURERS REQUIREMENT OR PROJECT SPECIFIED R-VALUE.

1. Food-safe polythylene inner layer
2. Bonding agent
3. Seamless aluminium pipe
4. Bonding agent
5. Robust polyethylene outer layer

PIPE FITTINGS

WATERWARE AND UPONOR HAVE 2 TYPES OF FITTINGS…

High-quality materials

Fittings made of dezincing resistant brass according to the UBA positive list and alternatively made of the high-performance plastic PPSU allow unrestricted use in tap water and heating installations.

Unique pressing control and test safety

The stainless-steel press sleeves are sheathed with a colour-coded foil depending on the dimensions, which can be easily removed after pressing and thus offers a double pressing control in addition to the "unpressed-untight" function.

Flow-optimised design

The streamlined design ensures low zeta values and enables pressure loss optimised planning.

Fast and simple installation

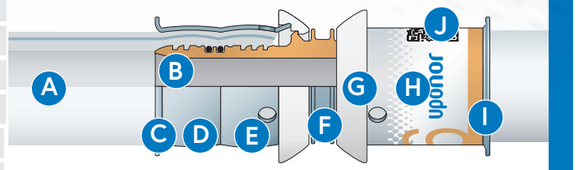
Just three steps to the finished connection without deburring or calibrating: Cut, stick, press. The slim design of the finished connection also makes subsequent insulation easier.

WaterMark
Certificate No.: 23233
AS 4176.2-2010

MULTILAYER COMPOSITE PIPES (MLC)

UPONOR S-PRESS PPSU FITTING 40 – 75 MM

Item	Description
A	Uponor MLC or Uni Pipe PLUS composite pipe 16 – 32 mm
B	Flow-optimised design
C	Sleeve collar for press jaw centring
D	Stainless steel press sleeve
E	Inspection window for insertion depth
F	Fitting body made of PPSU
G	Press jaw stop
H	Press indicator film
I	Colour-coded dimensional marking
J	QR code for additional information



Flow-optimised design

The streamlined design ensures low zeta values and enables pressure loss optimised planning.

Fast and simple installation

Just three steps to the finished connection without deburring or calibrating: **Cut, Stick, Press**. The slim design of the finished connection also makes subsequent insulation easier.

1 Insert the Uponor composite pipe into the fitting.

The pipe must be cut square at a 90° angle, insert the pipe into the fitting. The pipe end does not have to be deburred or calibrated beforehand.

2 Apply the press jaw.

Ensure the pipe is visible through the inspection window the apply the press jaw with the same colour coding as the fitting to the press jaw guide in the stainless steel press sleeve.

3 The film can be easily removed after successful pressing.

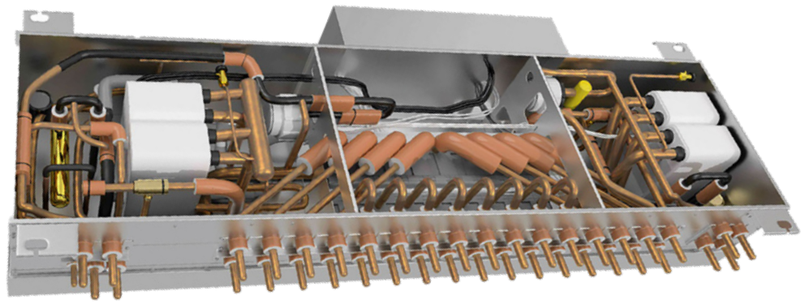
After pressing, a clear deformation of the stainless steel press sleeve is visible. In addition, the film can be easily removed after successful pressing (visual inspection).

4 Unpressed connections are reliably detected.

Unpressed connections are reliably detected as leaky during the leak test due to the unpressed-untight function. An unpressed fitting also stands out clearly due to the indicator foil still being present on the stainless steel press sleeve.

PIPE AND ADDITIONAL FITTINGS

The following equipment offer is to allow connection to HBC Branch Controller Unit:



Code	Description	Unit	Image
UP1094883	UPONOR UNI Pipe+ White p/m (50m coil), 25x2.5mm, Insulated S13 Blue	50m	
UP1059574	Uponor UNI Pipe+ p/m (5m length), White S, 25x2.5mm	5m	
UP1084911	Uponor UNI Pipe+ p/m (50m coil), White S, 25x2.5mm	50m	
UP1013446	UPONOR UNI Pipe+ p/m (5m length), White S, 40x4mm UP UNI PIPE+ 40x4mm (5m length)	5m	

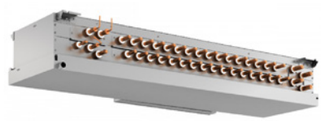
Kit Code Key							
C	Compression	**F**	Flexible	**AF**	Autofill	———	Pipe Connection
I	Isolation	**AS**	Air Separator	**EV**	Expansion Vessel	- - -	Direct Connection
U	Union	**AV**	Air Vent	**T**	Threaded		

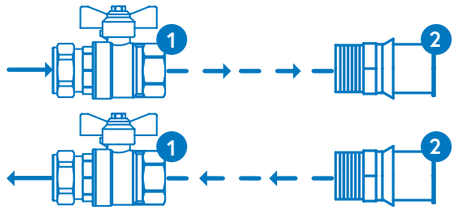
CONNECTION KITS FOR HBC

HBC-CI25 — **25mm Connection Kit to HBC with Isolation Valve**

Component		Description	Image	Required
1	**BV2022C**	Ball valve 3/4"F x 22 compression		2
2	**UP1070507**	Uponor S-PRESS PLUS, Male Adapter, 25mm x 3/4" R		2

Compression olive connection to HBC copper stub, with threaded BSP adapter connection to 25mm pipework.





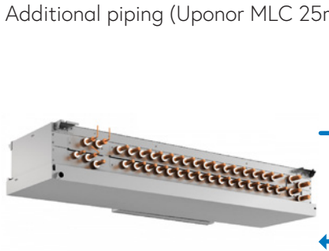
HBC-CIAS25 — **25mm Connection to HBC - With Isolation Valve and Air Separator**

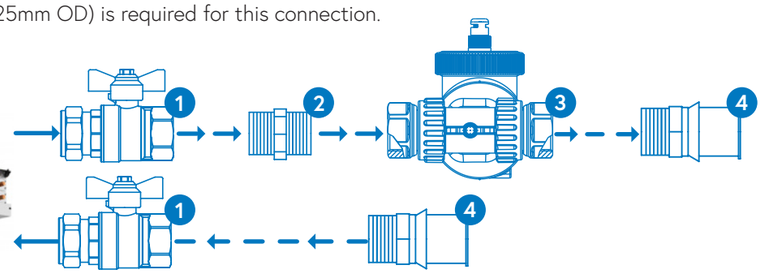
Component		Description	Image	Required
1	**BV2022C**	Ball valve 3/4"F x 22 compression		2
2	**BNH20**	Hex Nipple 3/4"		1
3	**AV551805**	DISCALSLIM® - 3/4" F, adjustable for horizontal and vertical pipes, includes Insulation kit		1
3*	**AV551805I**	DISCALSLIM® - insulation kit		1
4	**UP1070507**	Uponor S-PRESS PLUS, Male Adapter, 25mm x 3/4" R		2

The DISCALSLIM® Deaerator devices can autonomously and continuously discharge the air from climate control circuits, down to the microbubble level.

Typically fitted to either the first or last flow circuit (e.g. port 1 or 8 or 16) on the HBC in relation to available space. Includes insuation kit.

Additional piping (Uponor MLC 25mm OD) is required for this connection.





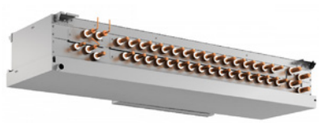
CONNECTION KITS FOR HBC

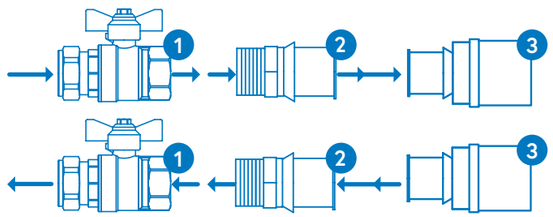
HBC-CI40 — **40mm Connection Kit at HBC - with Isolation Valve**

Component		Description	Image	Required
1	BV2022C	Ball valve 3/4"F x 22 compression		2
2	UP1070507	Uponor S-PRESS PLUS, Male Adapter, 25mm x 3/4" R		2
3	UP1039941	Uponor S-Press, PPSU Straight Reducer, 40x25mm		2

Compression olive connection to HBC copper stub, with threaded BSP adapter to 25mm pipework into 25/40 reducer fitting.

Additional Piping (Uponor MLC 25mm OD) is required for this connection.





* same configuration as Kit FCU-CI40, on page 19

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CONNECTION KITS FOR HBC

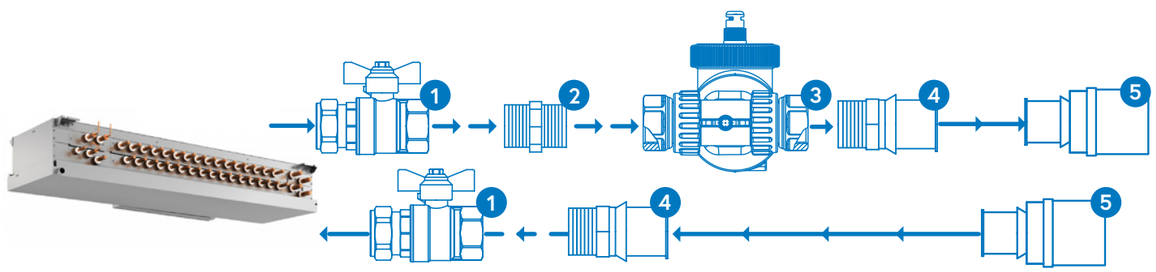
HBC-CIAS40 — **40mm Connection to HBC - with Isolation Valve and Air Separator**

Component		Description	Image	Required
1	BV2022C	Ball valve 3/4"F x 22 compression		2
2	BNH20	Hex Nipple 3/4"		1
3	AV551805	DISCALSLIM® - 3/4" F, adjustable for horizontal and vertical pipes, includes Insulation kit		1
3*	AV551805I	DISCALSLIM® - insulation kit		1
4	UP1070507	Uponor S-PRESS PLUS, Male Adapter, 25mm x 3/4" R		2
5	UP1039941	Uponor S-Press, PPSU Straight Reducer, 40x25mm		2

The DISCALSLIM® Deaerator devices can autonomously and continuously discharge the air from climate control circuits, down to the microbubble level.

Typically fitted to either the first or last flow circuit (e.g. port 1 or 8 or 16) on the HBC in relation to available space. Includes insulation kit.

Additional Piping (Uponor MLC 25mm OD) is required for this connection.



CONNECTION KITS FOR HBC

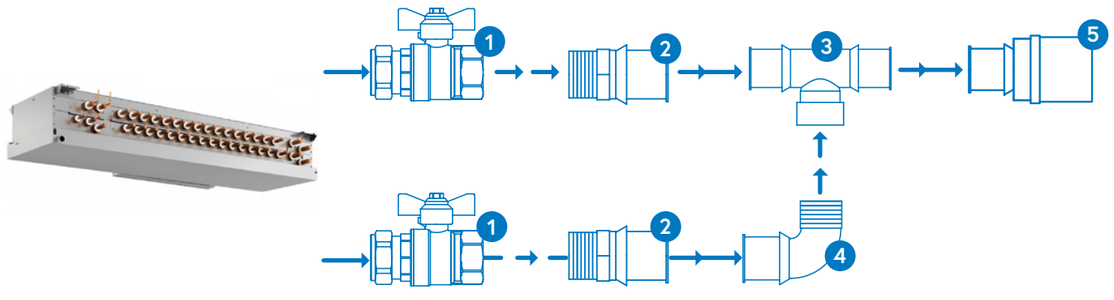
HBC-CI40TP — **40mm Connection Kit at HBC Twin Port - with Isolation Valve**

Component		Description	Image	Required
1	BV2022C	Ball valve 3/4"F x 22 compression		4
2	UP1070507	Uponor S-PRESS PLUS, Male Adapter, 25mm x 3/4" R		4
3	UP1070599	Uponor S-Press+, Female Tee, 25mmx3/4" RPx25mm		2
4	UP1070535	Uponor S-Press+, Male Elbow Adapter, 25x3/4" R		2
5	UP1039941	Uponor S-Press, PPSU Straight Reducer, 40x25mm		2

Compression olive connection to HBC copper stub, with threaded BSP adapter to 25mm pipework of equal length to allow the tee connection twin port, then 25/40 reducer fitting.

Additional Piping (Uponor MLC 25mm OD) is required for this connection.

This section is to allow in-line pipework kits in circuit connection between the Branch Controller and Indoor Units:



*2 of the above set included in the kit

CONNECTION KITS TO HWU

HVRF-AV25 — **25mm Inline Automatic Air Vent**

Component		Description	Image	Required
1	AV502640	Air vent 1/2" top bleed 6bar, brass		1
Optional	AV562200	Anti-vacuum cap for automatic air vents 5026 and 5027 series		Optional
2	UP1070598	Uponor S-Press+, Female Tee, 25mm x 1/2" RP x 25mm		1

In-Line AAV can be installed at either the HBC or FCU end of the circuit, determined by the highest point where air will gather in the water circuit.

This location should be easily accessible for servicing typically near the unit or hatch way.

HVRF-DP25 — **25mm Inline Drain Tap**

Component		Description	Image	Required
1	UP1070598	Uponor S-Press+, Female Tee, 25mm x 1/2" RP x 25mm		1
2	MA538400	15mm Boiler drain tap + tail and cap		1

Optional: able to be installed as part of repair and maintenance to individual circuits post install, this can avoid the need to fully re-commission HBC Controller.

This location should be easily accessible for servicing typically near the unit or hatch way at the lowest point in the pipeline.

CONNECTION KITS TO HWU

HVRF-AV40		40mm Inline Automatic Air Vent		
Component		Description	Image	Required
1	AV502640	Air vent 1/2" top bleed 6bar, brass		1
Optional AV562200		Anti-vacuum cap for automatic air vents 5026 and 5027 series		Optional
2	UP1046922	Uponor S-Press+, Female Tee, 40mmx1/2" RPx40mm		1

In-Line AAV can be installed at either the HBC or FCU end of the circuit, determined by the highest point where air will gather in the water circuit.

This location should be easily accessible for servicing typically near the unit or hatch way.

HVRF-DP40		40mm Inline Drain Tap		
Component		Description	Image	Required
1	UP1046922	Uponor S-Press+, Female Tee, 40mmx1/2" RPx40mm		1
2	MA538400	15mm Boiler drain tap + tail and cap		1

This location should be easily accessible for servicing typically near the unit or hatch way.

Optional: able to be installed as part of repair and maintenance to individual circuits post install, this can avoid the need to fully re-commission HBC Controller.

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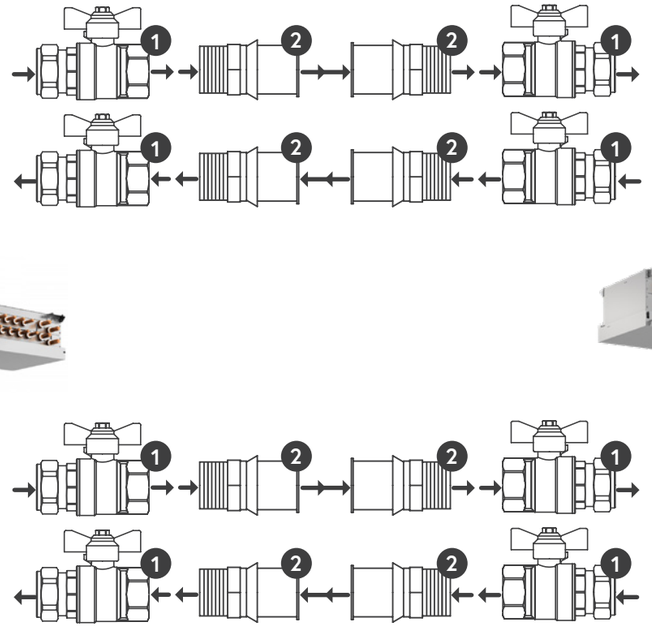
CONNECTION KITS TO HWU

Slave Kit		25mm Hot and Cold Water feeds to Sub HBC - With Isolation Valve		
Component		Description	Image	Required
1	BV2022C	Ball valve 3/4"F x 22 compression		8
2	UP1070507	Uponor S-PRESS PLUS, Male Adapter, 25mm x 3/4" R		8

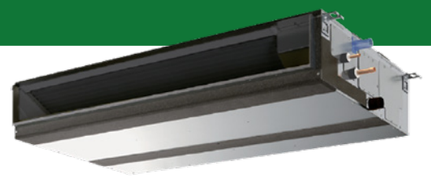
This kit provides isolation valves and connection between the Main HBC Box and sub-HBC controller.

2 x HBC-CI25 and additional piping (Uponor MLC 25mm OD) is required for this connection.

The connection between Main and Slave HBC requires flow and return on both heating and cooling circuit to balance the system and deliver independent circuit temperature, thus 4-pipe connection.



The following component Kits allow connection to FCU Indoor Unit:

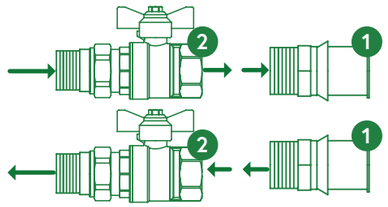


TIP: Where possible, it is easier to assemble and secure valves and fittings while the Fan Coil Unit (IDU) is positioned on the ground, ensuring that the pipework can be connected effortlessly once the unit is suspended. This approach enhances precision and simplicity compared to working at elevated heights.

FCU-TI25 — **25mm Connection Kits to FCU – with Isolation Valve**

Component		Description	Image	Required
1	UP1070507	Uponor S-PRESS PLUS, Male Adapter, 25mm x 3/4" R		2
2	BVUM20F	Airaga Union Ball Valve, 25mm (male union) x 25mm (female)		2

This kit offers isolation and break away union connection for maintenance purposes.



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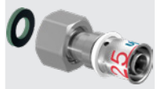
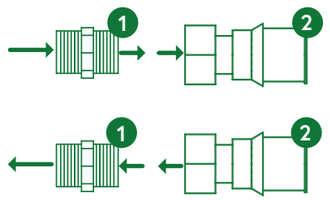
INDOOR UNIT (FAN COIL) FCU

FCU-TU25 — **25mm Connection Kits to FCU**

Component		Description	Image	Required
1	BNS20	Hex Nipple 3/4"		2
2	UP1070606	Uponor S-Press+, Female Swivel Adapter, 25mm x 3/4" G		2

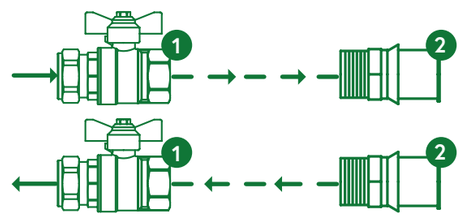
This kit offers break away union connection only for maintenance purposes.



FCU-CI25 — **25mm Connection Kit to FCU with Isolation Valve**

Component		Description	Image	Required
1	BV2022C	Ball valve 3/4"F x 22 compression		2
2	UP1070507	Uponor S-PRESS PLUS, Male Adapter, 25mm x 3/4" R		2

This kit offers isolation and break away union connection for maintenance purposes.



INDOOR UNIT (FAN COIL) FCU

FCU-FI25 — **25mm Connection Kits to FCU – High Wall with Isolation Valve**

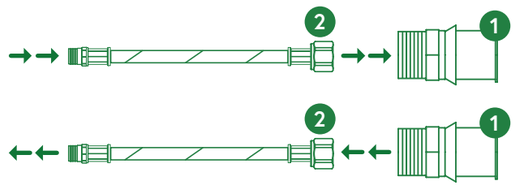
Component		Description	Image	Required
1	UP1070507	Uponor S-PRESS PLUS, Male Adapter, 25mm x 3/4" R		2
2	BV20	Ball valve, 20mm m/f		2
3	FH18500SS	Flexible hose, stainless steel, 3/4", 500x18mm ID m/f		2

This kit offers isolation and break away union connection for maintenance purposes and flexiable hose for access down walls or into ceiling spaces.

FCU-FU25 — **25mm Connection Kits to FCU - High Wall**

Component		Description	Image	Required
1	UP1070507	Uponor S-PRESS PLUS, Male Adapter, 25mm x 3/4" R		2
3	FH18500SS	Flexible hose, stainless steel, 3/4", 500x18mm ID m/f		2

This kit offers break away union connection only, for maintenance purposes and flexiable hose for access down walls or into ceiling spaces.



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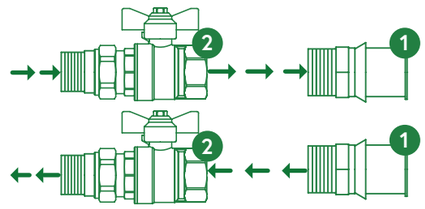
INDOOR UNIT (FAN COIL) FCU

FCU-TI40 — **40mm Connection Kits to FCU – with Isolation Valve Union**

Component		Description	Image	Required
1	UP1046901	Uponor S-Press, Male Adapter, 40mm x 1 1/4" R		2
2	BVUM32F	Union ball valve 32mm, 32m x 1 1/4" f		2

This kit offers isolation and break away union connection for maintenance purposes.

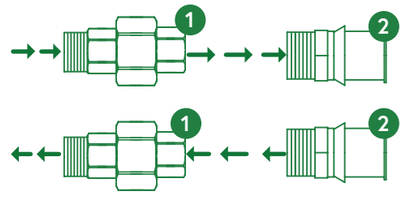


*FCU-CI40 see page 10 HBC-CI40, same configuration

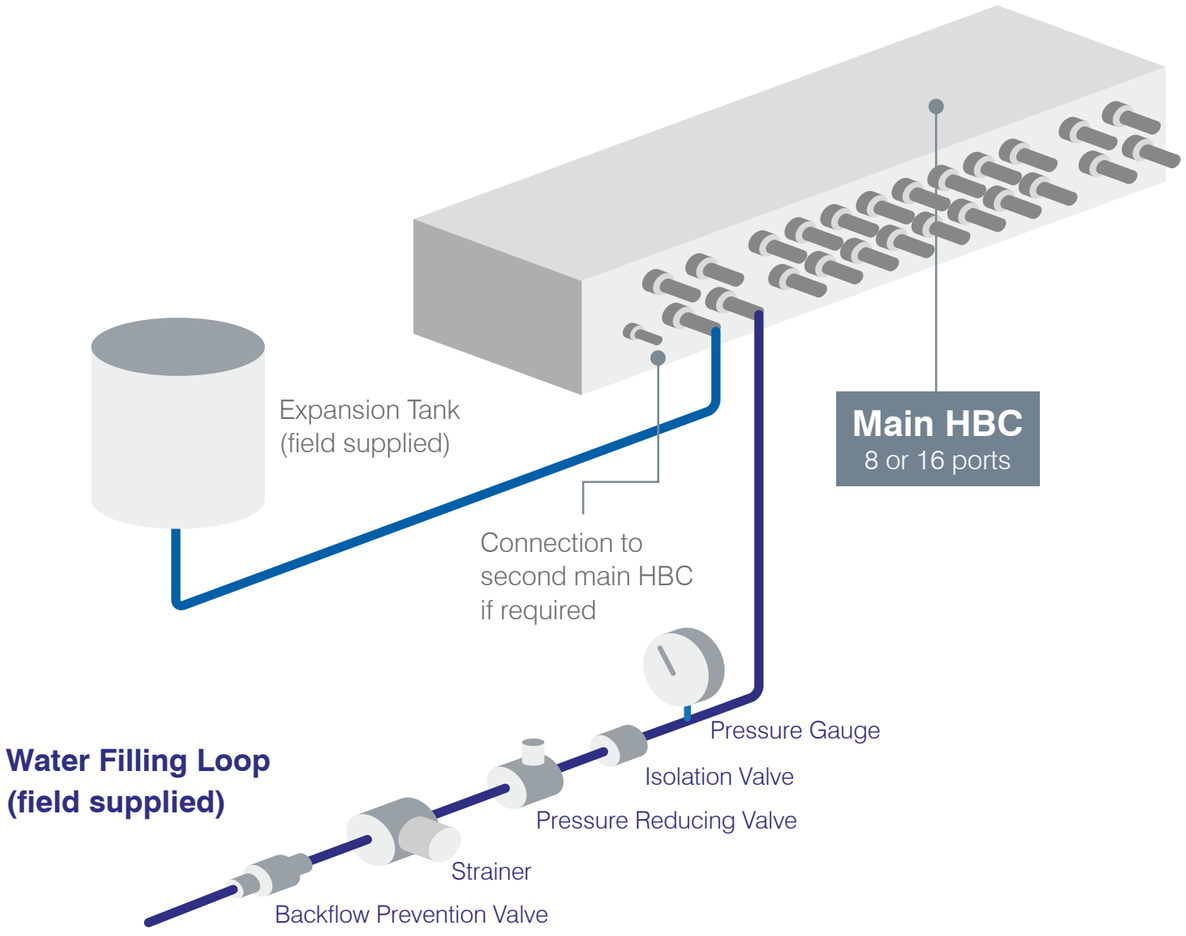
FCU-TU40 — **40mm Connection Kit at FCU**

Component		Description	Image	Required
1	BUMF32	32mm Brass Union M/F		2
2	UP1046901	Uponor S-PRESS PLUS, Male Adapter, 40mm x 1 1/4" R		2

This kit offers break away union connection only, for maintenance purposes.



WATER MAKEUP – FILLING AND EXPANSION KITS



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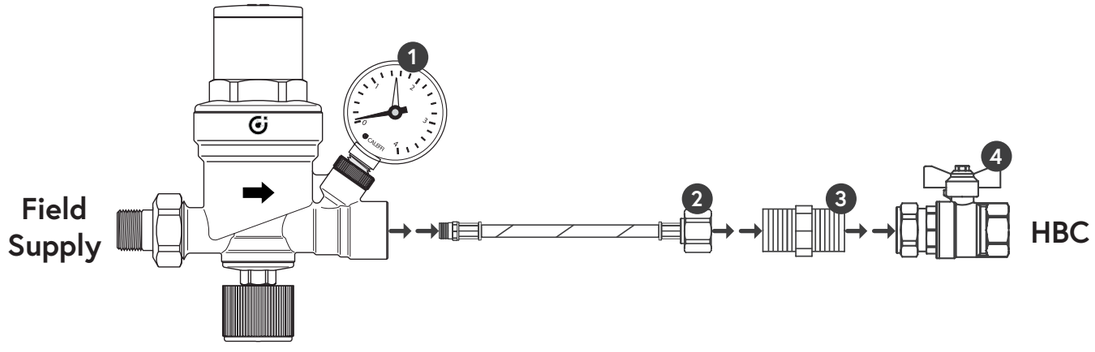
WATER MAKEUP – FILLING AND EXPANSION KITS

HVRF-AFV — **20mm Fill Set with Isolation, Strainer, Shut-off Cock, Check & Gauge**

Component		Description	Image	Required
1	HS553540	Auto filling 15mm – PRV, Strainer, shut-off Cock, Check valve & Gauge		1
2	FH15300SS	Flexible hose, stainless steel, 1/2", 300x15mm ID m/f		1
3	BRN2015	3/4" to 1/2" Reducing Hex Nipple		1
4	BV2022C	Ball valve 3/4"F x 22 compression		1

The automatic filling unit is a device consisting of a pressure reducing valve with compensated seat, an inlet strainer, a shut-off valve and a check valve.

It is installed on the water inlet pipe in sealed heating systems and its main function is to maintain the pressure of the system stable at a set value, automatically topping up with water as required.



EXPANSION VESSEL KIT

HVRF-EV##		Expansion Vessel Kit with Isolation Valve (vessel sized to system demand)		
Component		Description	Image	Required
1	BV2022C	Avonflow Ball Valve 22mm x 3/4"F		1
2	UP1070507	Uponor S-Press+, Male Adapter, 25mmx3/4" R		1
3	UP1070542	Uponor S-Press+ Adapter Elbow Female 25-RP x 3/4"		1
4	EV255008	"L" Bracket & EV Shut-off Valve 3/4"		1
5	EV556012 EV556018 EV556025	12 litre Expansion Vessel, 1.5bar p/c 18 litre Expansion Vessel, 1.5bar p/c 25 litre Expansion Vessel, 1.5bar p/c		1

Alt Options		Expansion Vessel Kit with Isolation Valve (vessel sized to system demand)		
Component		Description	Image	Required
4*	HS558500	Caleffi auto isolator for Expansion Vessel, 3/4" (for 35 & 50L EVs)		1
5*	EV556035 EV556050	35 litre Expansion Vessel, 1.5bar p/c 50 litre Expansion Vessel, 1.5bar p/c		1

* = Alternate part options for larger expansion vessels.

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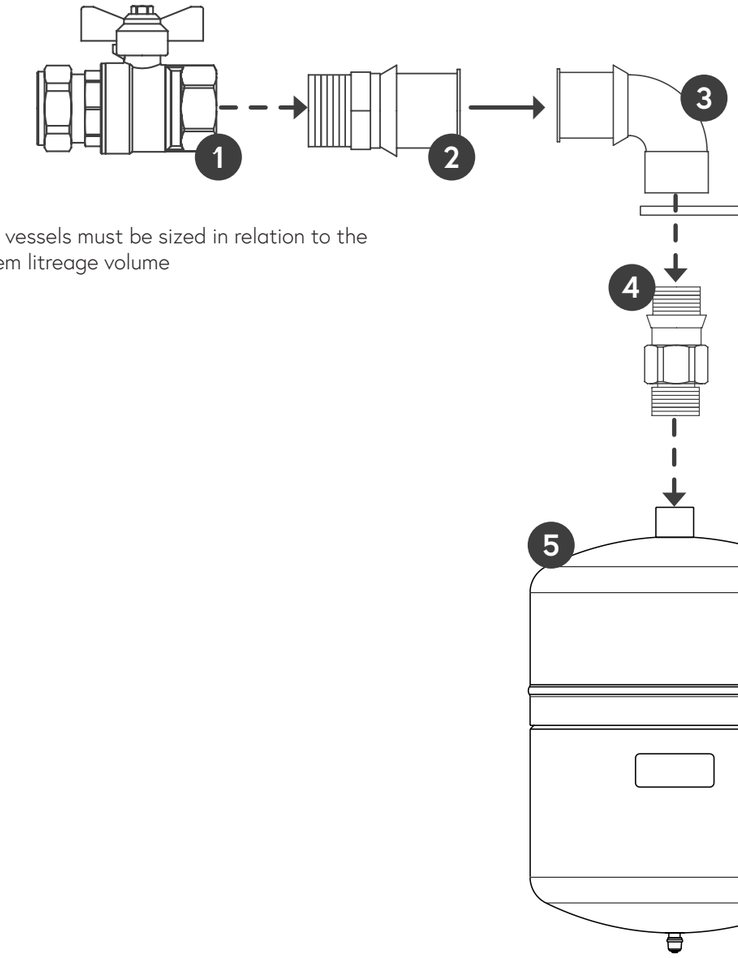
The Expansion Vessel Kit offers isolation at the HBC and and automatic shut-off valve between the hanger and vessel for maintenance purposes.

Additional Piping (Uponor MLC 25mm OD) is required for this connection.



Expansion vessels must be sized in relation to the total system litreage volume

TOOLING

Component	Description	Image
NOVOACO153	Novopress ACO153 Mini Battery Press Tool (Batteries, Charger, Bluetooth) to suit 16mm to 40mm "U" Jaws	
NOVOMINI-U25	U-Profile Press Jaw - 25mm to suit Novopress ACO153 Mini	
NOVOMINI-U40	U-Profile Press Jaw - 40mm to suit Novopress ACO153 Mini	
UP1015756	Uponor MLC bevelling tool 25mm	
UP1006638	Uponor MLC bevelling tool 40mm	
UP1060167	Uponor MLC deburring tool universal	
UP1015739	Uponor MLC calibrating tool 16/20/25	
UP1089677	Uponor Multi pipe cutting tool 12-40	

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PIPE AND ADDITIONAL FITTINGS

25MM OD (20MM ID) MULTILAYER AND FITTING

Code	Description	Unit	Image
UP1094883	UPONOR UNI Pipe+ White p/m (50m coil), 25x2.5mm, Insulated S13 Blue	50m	
UP1084911	Uponor UNI Pipe+ p/m (50m coil), White S, 25x2.5mm	50m	
UP1059574	Uponor UNI Pipe+ p/m (5m length), White S, 25x2.5mm	5m	
UP1039935	UP S-Press+, Straight Coupling, 25x25mm	ea.	
UP1039931	Uponor S-PRESS+ ELBOW 25-25	ea.	
UP1070545	Uponor S-PRESS+ PPSU Elbow 45° 25-25	ea.	
UP1070535	Uponor S-Press+, Male Elbow Adapter, 25x3/4" R	1	

40MM OD (32MM ID) MULTILAYER AND FITTINGS

Code	Description	Unit	Image
UP1013446	UPONOR UNI Pipe+ p/m (5m length), White S, 40x4mm UP UNI PIPE+ 40x4mm (5m length)	5m	
UP1046401	UP S-Press+, Straight Coupling, 40x40mm	ea.	
UP1046386	Uponor S-Press, PPSU Elbow, 40x40mm, 90°	ea.	
UP1046388	Uponor S-Press, PPSU Elbow, 40x40mm, 45°	ea.	
UP1046909	UPONOR S-Press+, Male Adapter Elbow, 40x1 1/4" R	ea.	

PIPE AND ADDITIONAL FITTINGS

INSULATION AND FIXING CLIPS

Code	Description	Image
HVRF-I25H1	H1/VM3 Insulation, 25mm Pipe - 25mm ID x 38mm wall	
HVRF-I40H1	H1/VM3 Insulation, 40mm Pipe - 42mm ID x 38mm wall	
HVRF-I25.25	Pipe insulation, 25mm ID x 25mm wall	
HVRF-I40.25	Pipe insulation, 40mm ID x 25mm wall	
HVRF-I40E	European Insulation, 40mm Pipe - 42mm ID x 19mm wall	

Code	Description	Unit	Image
HVRF-PC25	UNI Pipe clip, to fix 51ø insulated pipe, 48-56mm	ea.	
HVRF-PC25H1	UNI Pipe clip, to fix 101ø insulated pipe, 100-105mm	ea.	
HVRF-PC40	UNI Pipe clip, to fix 78ø insulated pipe, 74-80mm	ea.	
HVRF-PC40H1	UNI Pipe clip, to fix 116ø insulated pipe, 115-125mm	ea.	

THERMAL RESISTANCE CALCULATIONS

The following table provides the material R-values for Pre-insulated pipe coil and Armaflex® pipe insulation; the values are calculated in accordance with AS/NZS 4859.1. R-values are referred to specified in the NZ Building Code in relation to the H1 Energy Efficiency Verification Method H1/VM3, section 7.2.1.2.

R-Value is a measure of thermal resistance for the thickness of material concerned.
Wall thickness / conductivity W/mK = R-Value.
e.g. 13mm pre-insulated 0.013/0.4 conductivity = 0.325.

$$R = \frac{l}{\lambda}$$

l (Thickness in metres)

λ (Thermal Conductivity)

Brand	Nominal Pipe Size (mm)	13mm Wall	19mm Wall	25mm Wall	38mm Wall
Uponor MLC pre-insulated (Thermal conductivity 0.4 W/mK)	25	0.33			
Armaflex FRV - Therma conductivity tested acc. to ASTM C518, ASTM C335 / EN ISO 8497	25		0.83	1.2	1.9
	40		0.74	1.0	1.7

NOTES

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PIPE AND ADDITIONAL FITTINGS

H-VRF SYSTEM DESIGN SUMMARY

Connection	Design/Components Best Practise	
Hybrid Branch Circuit (HBC) Controller	**Isolation Valve** on each terminated circuit port, flow and return at the HBC.	HBC controller is to be installed in a place where noise will not be an issue; for use in quiet environments with low background noise, position the HBC CONTROLLER at least 5m away from any indoor units.
In-Line Components	Recommended to install an **Air Separator Kit** unit per HCB, to remove and continually manage air venting within the close loop system.	It is recommended that a AAV is installed within each group of serial ports in an individual pump group. e.g. the HBC Controller comes in 8 and 16 port configurations therefore a system should consist of a minimum of 1 air separator and 1 in-line AAV.
	Automatic Air Vent (AAV) should be installed on the "flow" line unless fitted with an "anti-vacuum cap or function". This prevents air being sucked through the air vent when fitted to the return/suction line. Mitsubishi notes: Air Vents should be installed at highest point where air will gather in the water circuit. Generally, near the HBC, FCU or hatch for ease of access.	Automatic Air Vent (without the anti-suction) should only be installed on the "flow" line, to prevent unwanted air from entering the system if fitted to the return/suck line. This ensures a more efficient draining process and provides a refill point without requiring the full re-commissioning of the HBC, that can save time and resources
	Drain option available – when the circuit line requires draining; necessary for maintenance or to address issues within the system.	
Fail Coil Unit (FCU) Indoor Unit	The FCU are typically a ¾" or 1 ¼" female "Rc" BSP thread connection, determined IDU model. The other alternative is by a 22mm ø copper stub.	Installing an isolation valve at the FCU is advised to facilitate maintenance procedures, especially in cases where exclusive and individual operational use of the zone is necessary e.g. independent units, hotels, motels and health facilities.

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BEST PRACTISE CONNECTION METHOD

H-VRF SYSTEM DESIGN SUMMARY

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CONSULTING ENGINEERS VALUE

Our In-House Design and Estimation Service can quickly calculate a concept estimate for your project.

Simply send us the project schematics or unit schedule with estimate average pipe lengths to prepare estimated material cost save hours of QS and design concept functioning.

We understand the critical importance of precise design in pipe installations, and our team is dedicated to providing you with accurate and efficient solutions. From initial concept to final execution, PipeSpec Pro ensures that your project is backed by a robust design and estimation process.

KIT COMPONENT CONNECTIONS

PipeSpec Pro simplifies your installation process with kit component connections. Each kit is designed to seamlessly connect components, streamlining the assembly process. This not only enhances the efficiency of your installation but also guarantees a high level of accuracy and reliability in your piping system.

PROJECT DELIVERABLE PROVISIONING

Experience a new level of organization with PipeSpec Pro as components are packaged according to your specific design layout. Each component is clearly marked with its designated HBC (Hybrid Branch Controller) and IDU (Indoor Unit), eliminating guesswork during the installation process. This organization ensures that your project progresses smoothly, saving both time and resources.

Savings Time On-Site

With components packaged according to the installation design, sorting fittings to FCU and IDUs becomes a hassle-free task. This not only accelerates the installation process but also minimizes the likelihood of errors.

Deliveries Scheduled to Project Stages

Efficiency is key, and PipeSpec Pro integrates seamlessly with SmartCart to assist with scheduled deliveries. Our system is designed to align with your project timelines, ensuring that components arrive precisely when needed. This strategic coordination enhances your project management capabilities and minimizes disruptions, keeping your project on track and within schedule.

ON-SITE INSTALLATION SCHEMATIC GUIDE

Navigate your installation with confidence using PipeSpec Pro's "Installation Schematic Guide". This comprehensive guide provides detailed schematics indicating the locations of fittings and components within the pipework. Delve into the specifics of allowed pipe lengths per circuit, what connects where and how, empowering you with the information needed for a flawless installation.

With PipeSpec Pro, experience a new era of efficiency, accuracy, and reliability in your pipe installations. Our integrated services, attention to detail ensure that your project progresses seamlessly from design to implementation. Upgrade your pipe installation experience with PipeSpec Pro – where precision meets performance.

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DESIGN AND ESTIMATION

KIT COMPONENTS

PROJECT ORGANISATION

INSTALLATION CONFIDENCE

PIPESPEC PRO

PRE-COMMISSIONING FILL GUIDE

Following the completed installation of the H-VRF pipework connection between the Main HBC and Indoor Units the system is required to be filled prior to the commissioning process.

To assist with commissioning time, as much air as possible needs to be vented from the watertight units and pipework.

This process can be improved through a controlled filling of the system, to push as much air out while filling the system with clean water as part of the leak and pressure test procedure. Please follow these steps to fill and test your install…

1. **DO NOT Power Up any of the Units prior to the fill procedure:**
   Powering the units can signal to the valve block within the HBC to close internal circuits. This will prevent the filling of the system to complete this Pre-Commissioning process.

2. **Close off all circuit isolation valves:**
   Close off all circuit isolation valves at the HBC for both the flow and return lines.

3. **Isolate Expansion Control:**
   Disconnect or close isolation valves on the Expansion Control line.

4. **Check Water Quality:**
   Ensure the fill water quality is clean water, to manufacturers requirements. Connect the water filling loop to supply mains or temporary water supply.

5. **Open Automatic Air Vents:**
   Open any air vents, either within the HBC or inline vents (if fitted), to allow the air in the pipework to vent as the water fills the system, pipework, and indoor units. Manual air vents will continue to leak water when open.

6. **Set PRV (Pressure Reducing Valve):**
   Set the Auto filling valve (PRV) between 1 to 2bar.

7. **Turn on Fill Water Supply:**
   Turn on the water supply to begin filling the system. Mains water pressure is typically based on 500 kPa, this should be sufficient for the leak and pressure test. If not a manual pressure testing pump for water lines could be used.

8. **Open First Circuit Valve:**
   Working left to right of the HBC water circuits close all flow and return isolation valves. Then open the first circuit (port) flow isolation valve to allow the individual zone to fill with water, pushing the air toward the air vents. Open the return valve to allow the air to vent and the water to fill the system.

9. **Repeat for Each Circuit:**
   Repeat step 8 for each individual circuit, opening one circuit at a time and allowing it to fill. Leave each filled circuit open until the HBC is filled.

10. **Close Manual Air Vents:**
    After each circuit has been filled, close any manual air vents, ensuring that the IDU bleed vents are closed.

11. **Set Automatic Air Vent to Open:**
    Set the automatic air vent to open position to continue venting any remaining air from the system.

12. **Fill the Expansion Leg:**
    Re-connect and open the Expansion Vessel isolation valve to fill the expansion leg of the system.

13. **Close Main Water Supply:**
    Once the expansion leg has been filled, close the main water supply and/or disconnect it from the HBC.

Following these steps will help ensure that your H-VRF system is properly filled, and that air is efficiently vented, which is crucial for the commissioning process.

Always refer to the manufacturer's instructions and guidelines for the specific system requirements and ensure correct procedures are followed at all times.

HVRF LEAK TEST REPORT

Date: _____ Project / Site / Stage: _____

Company Name: _____ Company Contact Name: _____

All vessels, devices, and fittings, e.g. safety valves and expansion vessels, which are not suitable for the test pressure must be disconnected or isolated from the system throughout the leak and pressure test procedure. The system is to be filled with clean water and fully vented of all air in the system.

A visual inspection of all pipe connections was carried out during leak and test procedure. The temperature compensation between ambient temperature and filling water temperature shall be considered by a corresponding waiting time after the test pressure has been established. If necessary, restore the test pressure after the waiting period.

LEAK TEST

The leak test requires a minimum of 15 minutes duration and should only be completed after equalization between ambient (room) temperature and pipe test medium (filling water).

Use the Fill Set to fill and leak test the system – start by setting the PRV between 1 and 2bar when filling the system from clean mains pressure water. In some cases, it may be necessary to disconnect sections of piping to achieve these testing conditions effectively.

The leak test pressure should be held for a minimum of 15 minutes after the system has equalised. A minimum wait period of 30 minutes is recommended after filling the system.

The allowable test differential pressure for the leak test is 0.0 bar.

	YES	NO
Check and confirm there are no leak or permanent deformation of components, fittings, and pipe-runs.	☐	☐
Filling water is clean & the pipeline is fully vented of air:	☐	☐
Visual inspection of Pipe and connections:	☐	☐

Leak Test completed by: _____ Date of leak test: _____

HVRF PRESSURE TEST REPORT

PRESSURE TEST

Following the above Leak Test, re-adjust the PRV pressure setting to a minimum of 1.3 times the system operating pressure and not to exceed the 4bar reading on the pressure gauge. The Hybrid Branch Circuit Controller pressure safety valve activates above 5bar (84 psi). The pressure measurement device should preferably be at the lowest position in the system, when not using the gauge within the Fill Set.

The temperature equalisation between ambient and filling water temperature must be considered after the testing pressure is generated. The testing pressure should be restored after the waiting time, if necessary.

Start: _____ hours Date: _____ Test Pressure: _____ bar

End: _____ hours Date: _____ Pressure: Drop _____ bar

Max 0.2 bar

	YES	NO
Check and confirm there are no leak or permanent deformation of components, fittings, & pipework.	☐	☐
Antifreeze was added to the water prior to pressure testing:	☐	☐
Antifreeze was removed from the system after a pressure test:	☐	☐
The system remains completely full and there is no risk of freezing	☐	☐

CONFIRMATION OF SYSTEM WATER TIGHTNESS

Contractor: _____ Signature: _____ Date: _____

Time: from _____ to _____

Client: _____ Signature: _____ Date _____

Waterware are taking a proactive approach in helping protect your business and customers. With many suppliers cutting back on shipments during this tough period it is inevitable that there will be stockouts and now is the time to think ahead!

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- Secure supply before market recovery.

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- Benefit from exclusive offers and pricing.

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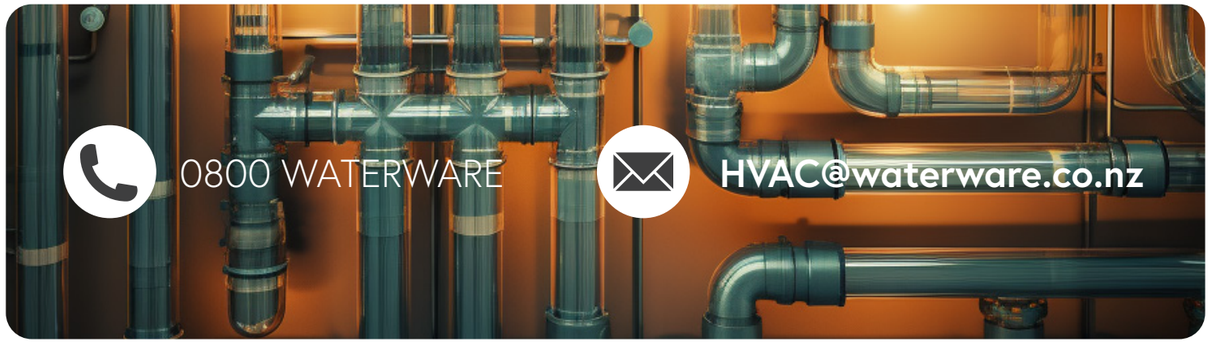
GET IN TOUCH



At Waterware, we understand the importance of a reliable and efficient heating, ventilation, and air conditioning (HVAC) system to ensure optimal comfort year-round.

Our robust HVAC solution is designed to meet the unique needs of every project. From energy-efficient models to advanced climate control technology, we have the perfect solution for you. Our commitment to quality ensures that you'll enjoy a comfortable and inviting environment while minimizing energy consumption.

WHY CHOOSE WATERWARE?

- **Tailored Solutions:** We recognize that every project is different. Our team works closely with you to understand your specific requirements and recommends a customized HVAC solution that fits your needs.
- **Cutting-Edge Technology:** Stay ahead with our state-of-the-art design systems, offering the latest in energy efficiency and smart technology. Experience the future of climate control at your fingertips.

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