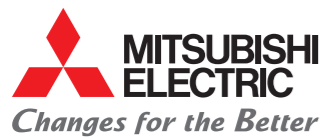
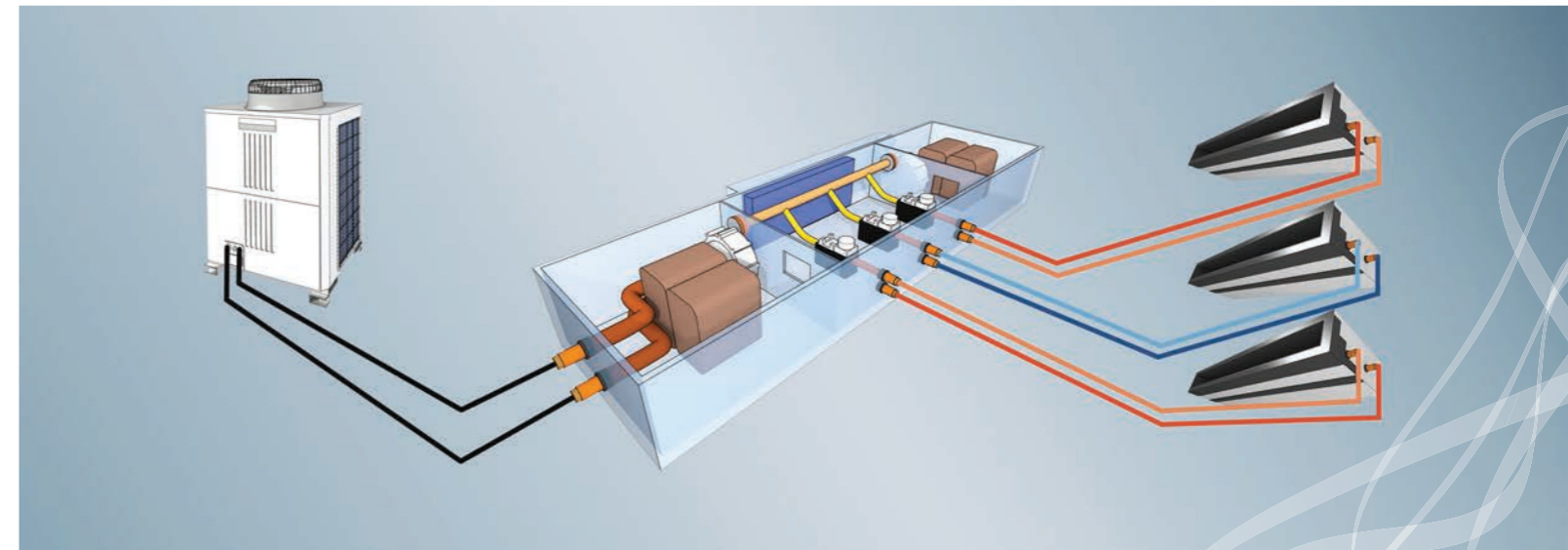


The Renewable Solutions Provider

Making a World of Difference

HVRF City Multi Air Conditioning

The modern alternative to 4-pipe systems



Telephone: 01707 282880

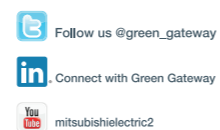
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Current as of 1st March 2013



Air Conditioning | Heating
Ventilation | Controls

Finding a modern alternative

Many of our buildings have been traditionally cooled and heated through a combination of chiller technology and oil or gas boilers, but with increasing legislation on energy efficiency and the rising cost of fuel, we now need a low-carbon, cost-effective alternative.

Everyone is under pressure to reduce their energy bills and lower carbon emissions. This has translated into a raft of challenging legislation that is driving the demand for increased energy efficiency and control in heating, cooling, ventilation and the associated technologies that we use.

Mitsubishi Electric has developed a new approach that answers the need for energy efficiency and internal comfort.

Unsurpassed heating and cooling from Mitsubishi Electric

Mitsubishi Electric's unique HVRF (Hybrid VRF) system is the modern alternative to traditional methods of heating and cooling, offering unmatched performance and simultaneous heating and cooling with heat recovery.

HVRF uses advanced refrigerant technology between the outdoor unit and the Hybrid Branch Controller (HBC). Energy is then transferred around the building using a pair of water pipes per fan coil that can supply hot or cold water. This reduces the resources required for installation and provides a more comfortable environment.

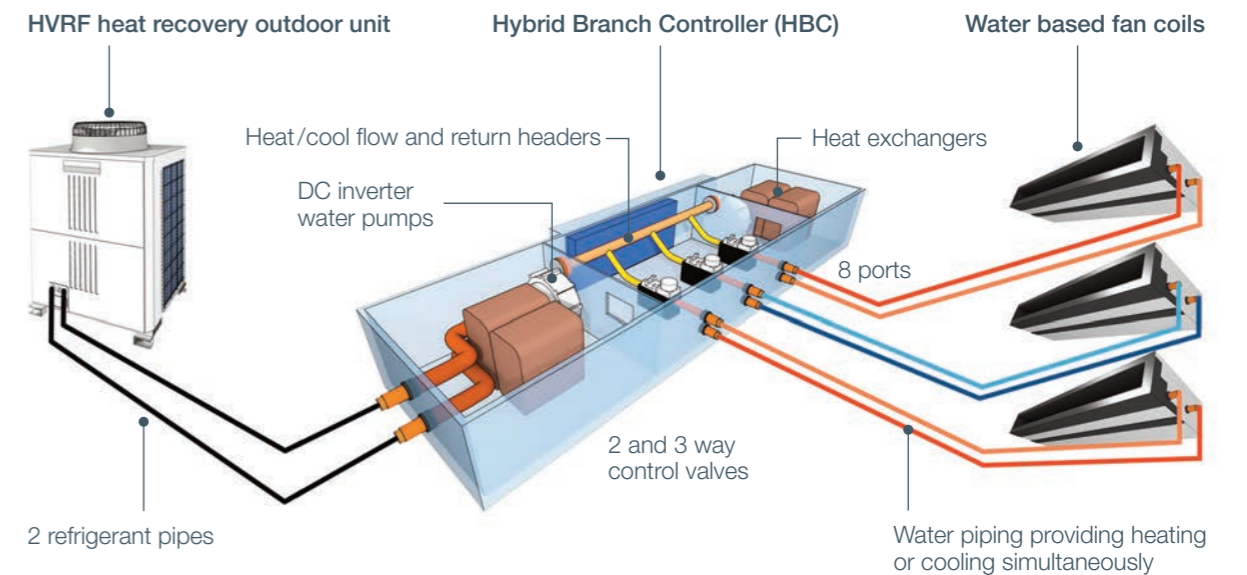
The name Mitsubishi is synonymous with excellence

Founded in 1921, Mitsubishi Electric is now a global, market leading environmental technologies manufacturer. In the UK, the Living Environmental Systems Division provides proven solutions that heat, cool and ventilate our buildings in some of the most energy efficient ways possible.

We have already pioneered the use of advanced heat pump technology and extended the scope and range of applications it can deliver low carbon solutions to. Now with the launch of HVRF, we are able to demonstrate to the traditional 4-pipe chiller/boiler markets, that there is an affordable alternative which will lower both running costs and carbon emissions.

We believe that global climate challenges need local solutions. Our aim is to help individuals and businesses reduce the energy consumption of their buildings and their running costs. At Mitsubishi Electric, we have evolved and today we offer advanced environmental systems that really can make a world of difference.

Set to rival traditional heating and cooling, the new HVRF system delivers optimum comfort and efficiency, using an innovative combination of unique 2-pipe technology and water to provide simultaneous heating and cooling with heat recovery.



- | | | | |
|--|--|--|--|
| | Valves, pumps and heat exchangers all contained within the HBC | | High sensible cooling and stable room temperatures for maximum comfort |
| | No refrigerant in occupied spaces, so no need for leak detection | | Simultaneous heating and cooling with full heat recovery between fan coils and building zones |
| | Simplified 2 pipe design and installation | | Heat recovery defrost method enables typical defrost times of 5 minutes with immediate return to heating |
| | Manageable phased installation through modular system design | | Intuitive load adjusting flow control valves, inverter driven pumps and heat recovery for maximum efficiency |
| | Cat A to Cat B is simple through HBC system design | | Quiet operation through water based fan coils |

The Case for HVRF

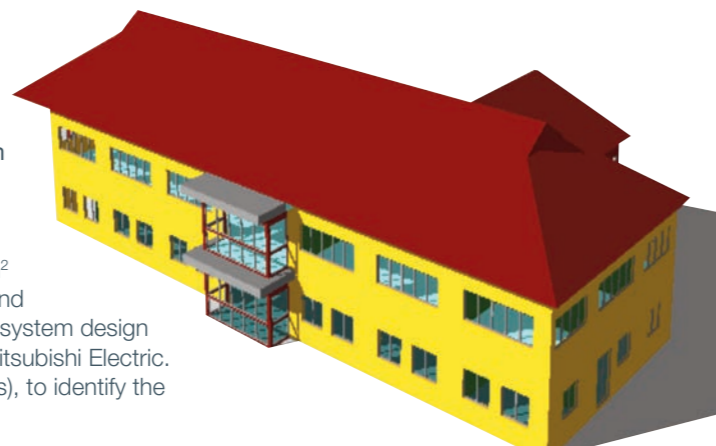
For decades, we have come to rely on traditional methods to heat and cool our buildings, often using a gas or oil boiler to provide heating and hot water, and a chiller to provide chilled water cooling.

Although popular in office applications for the comfort they can provide, these systems are carbon intensive, limited in the control that they offer and can be challenging to design and install. Now there is a viable contender in the form of Mitsubishi Electric's HVRF system. Combining the benefits of a water based system with the efficiency and flexibility of a heat recovery VRF system, HVRF proves the ideal integrated solution for a host of buildings and applications.

Office Application

Understanding the benefits that HVRF can bring to a building is best understood through a true comparative representation against a traditional 4-pipe fan coil system.

Utilising a typical new build office with a 1400m² floor area, both systems have been designed and analysed to clearly identify the differences. The system design has been performed by industry experts and Mitsubishi Electric. EDSL used their Thermal Analysis Software (Tas), to identify the energy use of the systems.



Highlighting energy, run cost and CO₂ emissions, alongside design and installation costs and analysis, it clearly demonstrates that HVRF is the best solution.

Design and Installation

- Design based on 100W/m² (total) cooling, 60W/m² heating
- 104kW peak cooling load, 63kW peak heating load

HVRF System

Designed with 5 x PURY-WP200YJM-A HVRF systems offering heating, cooling with heat recovery delivered via ducted fan coils.

4-Pipe System

Designed with 2 x 70kW chiller (designed at 2/3rd) with published ESEER of 4.15 and 2 x 50kW condensing boiler with full load efficiency of 85% delivered via ducted fan coils.

Operation

- System simulated on Part L 2010 notional building - all equivalent apart from heating / cooling plant
- Swindon CIBSE TRY weather data utilised
- Simulated systems sized using Tas:
 - HVRF - 1 x PURY-WP250YJM-A & 2 x PURY-WP200YJM-A
 - Chiller 70kW peak cooling, Boiler 80kW peak heating with same efficiencies as above
 - 10.5p/kWh electricity, 3.0p/kWh gas (DECC prices of fuels non-domestic 2012 3rd quarter)

HVRF systems are fully integrated with EDSL Tas software. Alongside many other Mitsubishi Electric air conditioning, heating and ventilation products, users can accurately simulate and test a variety of systems and permutations to ascertain effectiveness and efficiency.



The Results

Design and Installation (per annum)

	HVRF System	4-Pipe System
Equipment Cost (£)	£66,529	£42,486
Installation Cost (£)	£54,056	£115,605
Total Cost (£)	£120,585	£158,091

Other benefits of the HVRF system over the 4-pipe system identified were:

- Saving £360/kW on design & install costs (24%)
- Simplified design
- Reduced install time (40% reduction)
- Decentralised plant with reduced footprint and weight
- Phased installation
- Less crange requirements
- Possibility of a flexible reconfiguration
- No need for hot works permits
- No need for on-site connection to the gas mains

Operation (per annum)

	HVRF System	4-Pipe System	% Saving with HVRF
Run Cost (£)	£1,349	£2,733	50%
Emissions (kg CO ₂)	6,508kg	15,126kg	56%
Building Emission Rate (kg CO ₂ /m ²) / EPC rating	17.3 (PASS) / B (32)	23.6 (PASS) / B (43)	

The Part L notional building has limitations to its realism when considering heat recovery. A previous Tas study on a VRF heat recovery system on this same building but applied to a real application, identified the potential for heat recovery occurred for 28% of the year, saving up to 19% in energy - in this example it could annually reduce the run cost by a further £256 and CO₂ emissions by 1.2 tonnes.

Other benefits of the HVRF system over the 4-pipe system identified were:

- Easier on-going maintenance
- Smaller mechanical items that are all located in the one HBC box

Scalable Applications

HVRF not only brings substantial benefits for small to medium sized applications as shown in the case study above, it also shares these benefits with much larger applications.

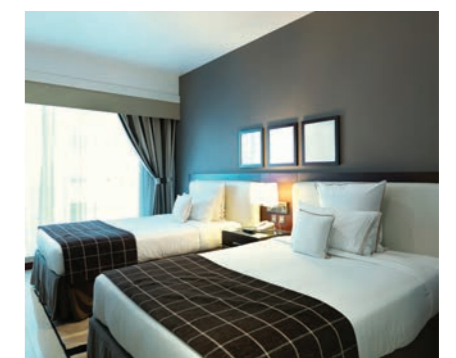
This really shows HVRFs true flexibility and scalability to many different applications. A 540kW peak cooling demand office building, designed to current building standards shows similar positive results for HVRF, giving almost equal install costs, but an 11% saving on installation time and 48% saving on running costs and CO₂ emissions.

	HVRF System	4-Pipe System
Total Kit & Install Cost (£)	£739,000	£736,000
Operation & Run Cost (£)*	£4,126	£8,491

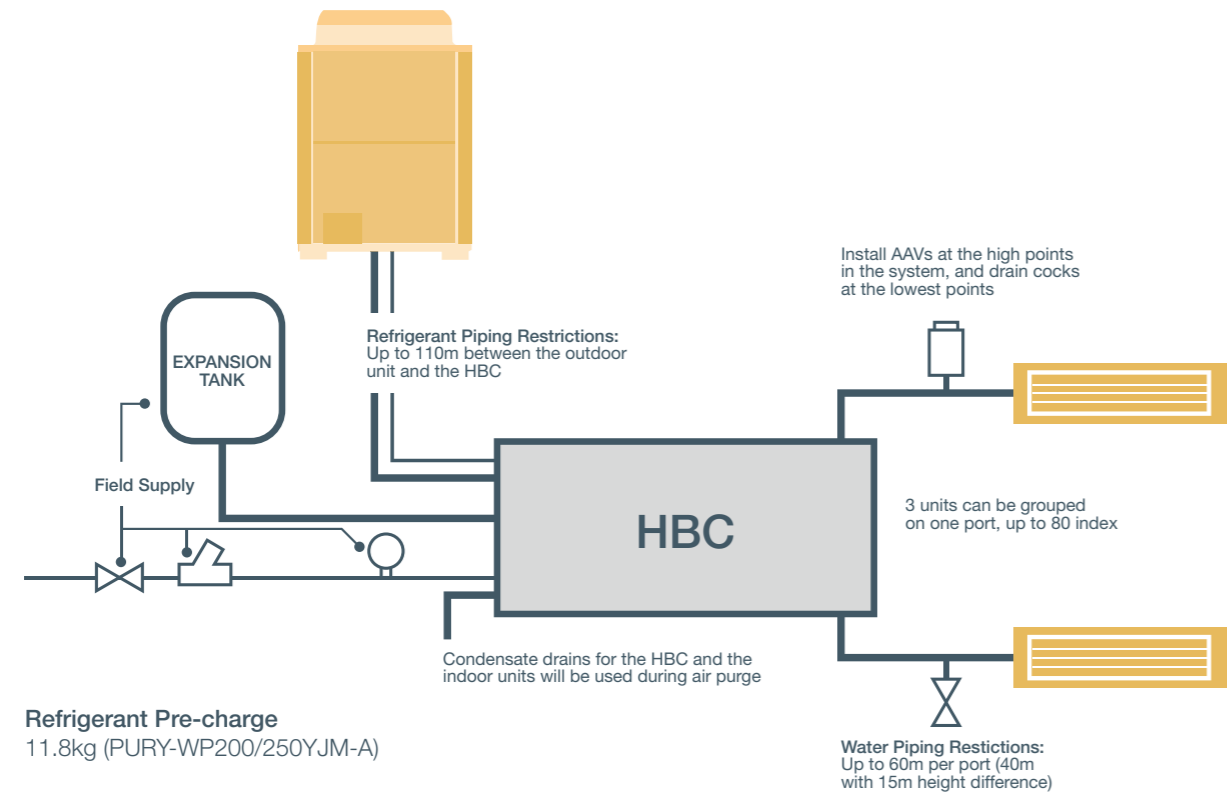
* Estimated from Office Application Study above with heat recovery savings included

Further Applications

HVRF has other significant key benefits which open its use up to many other buildings. Having no refrigerant in occupied spaces whilst delivering simultaneous heating and cooling via quiet fan coils means HVRF is particularly suited to applications such as hotels and high end residential situations.



Technical Overview



Refrigerant Pre-charge
 11.8kg (PURY-WP200/250YJM-A)

Additional Charge
 3kg for the HBC and 0.11kg/m for WP200, 0.16kg/m for WP250 outdoor units

Controls Compatibility

Compatible with a comprehensive range of controls options, HVRF can fully integrate with other Mitsubishi Electric heating, cooling and ventilation products as well as other building services, offering a complete controls solution.



Central Control

- Touch screen option
- Controls up to 50 indoor units
- Week / annual schedule
- Web connectivity



Local Control

- Backlit options
- Set point limit, weekly schedule & night setback



BEMS

- BACnet, Modbus, Trend, Lonworks & KNX
- Simple BEMS Options



Further Options

- PC software - up to 2000 indoors
- Energy monitoring
- Remote control / monitor

Indoor Units

MODEL REFERENCE		PEFY-WP20VMA-E	PEFY-WP25VMA-E	PEFY-WP32VMA-E	PEFY-WP40VMA-E	PEFY-WP50VMA-E
CAPACITY (kW)	Heating (nominal)	2.5	3.2	4	5	6.3
	Cooling (nominal)	2.2	2.8	3.6	4.5	5.6
	High Performance Heating (UK)	2.5	3.2	4	5.1	6.4
	COP Priority Heating (UK)	2.4	3	3.8	4.7	6
	Cooling (UK)	2.1	2.7	3.4	4.3	5.3
SHF (UK)		0.86	0.93	0.91	0.91	0.81
POWER INPUT (kW)	Heating (nominal)	0.05	0.09	0.11	0.14	0.14
	Cooling (nominal)	0.07	0.09	0.11	0.14	0.14
AIRFLOW (m³/min)	Lo-Mi-Hi	7.5 - 9.0 - 10.5	10.0 - 12.0 - 17.0	12.0 - 14.5 - 17.0	14.5 - 18.0 - 21.0	14.5 - 18.0 - 21.0
EXTERNAL STATIC PRESSURE (Pa)		35-50-70-100-150	35-50-70-100-150	35-50-70-100-150	35-50-70-100-150	35-50-70-100-150
SOUND PRESSURE LEVEL (dBA) (50Pa)	Lo-Mi-Hi	23-26-29	23-27-30	25-29-32	26-29-34	26-29-34
WEIGHT (kg)		21	26	26	31	31
DIMENSIONS (mm)	Width	700	900	900	1100	1100
	Depth	732	732	732	732	732
	Height	250	250	250	250	250
ELECTRICAL SUPPLY		220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz
PHASE		Single	Single	Single	Single	Single
RUNNING CURRENT (A)	Heating	0.44	0.53	0.63	1.04	1.15
	Cooling	0.55	0.64	0.74	1.15	1.15
FUSE RATING (BS88) - HRC (A)		6	6	6	6	6
MAINS CABLE No. CORES		3	3	3	3	3

Outdoor Units

MODEL REFERENCE		PURY-WP200YJM-A	PURY-WP250YJM-A
CAPACITY (kW)	Heating (nominal)	25.0	31.5
	Cooling (nominal)	22.4	28.0
	High Performance Heating	25.0	31.5
	COP Priority Heating	23.0	29.0
	Cooling (UK)	21.3	26.6
POWER INPUT (kW)	Heating (nominal)	5.28	6.98
	Cooling (nominal)	4.79	6.99
	High Performance Heating	6.65	8.79
	COP Priority Heating	5.23	6.91
	Cooling (UK)	2.78	4.05
COP / EER (nominal)		4.79 / 4.67	4.51 / 4.00
SCOP / SEER		5.00 / 8.43	4.92 / 7.52
MAX No. OF CONNECTABLE INDOOR UNITS		13	16
AIRFLOW (m³/min)		225	225
SOUND PRESSURE LEVEL (dBA)		60	60
SOUND POWER LEVEL (dBA)		80	80
WEIGHT (kg)		270	270
DIMENSIONS (mm)	Width	1220	1220
	Depth	760	760
	Height (1650 without legs)	1710	1710
ELECTRICAL SUPPLY		380-415v, 50Hz	380-415v, 50Hz
PHASE		3	3
RUNNING CURRENT (A)	Heating	8.1	10.8
	Cooling	7.4	10.7
FUSE RATING (MCB sizes BS EN 60947-2) - (A)		20	20
MAINS CABLE No. CORES		4 + Earth	4 + Earth

SCOP / SEER values for outdoor units only
 COP / EER values for outdoor units only

Hybrid Branch Controller (HBC)

MODEL REFERENCE		CMB-WP108V-G
NUMBER OF PORTS		8
WEIGHT (kg) (Wet)		102
DIMENSIONS (mm)	Width	1600
	Depth	541
	Height	300
ELECTRICAL SUPPLY		220-240v, 50Hz
PHASE		Single
POWER INPUT (kW)		0.47
RUNNING CURRENT (A)		2.79
FUSE RATING (BS88) - HRC (A)		16
MAINS CABLE NO. CORES		3



To extend the range, a new slimline ducted and concealed floor mounted unit will be available by winter 2013. An 8 port sub-HBC will be available in 2014 to enable 16 ports on a single system. Please contact your Mitsubishi Electric representative for further information.

Note: The fuse rating is only a typical value, 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.