VRF HWS & ATW

HYBRID SYSTEM - Heating/Cooling/Domestic hot water

CITY MULTI

WATER HEATING | DOMESTIC HOT WATER | ENERGY RECOVERY

AIR COOLING | AIR HEATING

The scalability, flexibility and modularity of the Ecodan® – VRF HWS & ATW system represents the state of the art in Mitsubishi Electric technology. This solution makes it possible to use a single producer – the VRF outdoor unit – to deliver heating water, cooling water and domestic hot water simultaneously.

Hydronic modules for VRF CITY MULTI systems.

Ecodan® heat pump technology has been used in conjunction with hydronic modules to create systems for the production of domestic hot water (HWS) and heating water for radiator panels (ATW) which are perfectly compatible with the inclusion of both thermal and photovoltaic solar panels in the installation. Systems with electric heat pumps may be used all year round, as their use is not restricted by legislation.
The added comfort of being able to use the air conditioning system in spring and autumn is yet another advantage of these VRF systems. The indoor units of the VRF CITY MULTI system gently cool and dehumidify the interior space in spring, cool and dehumidify in summer, transferring the extracted heat to both the HWS and ATW hydronic modules, and heat the interior gently at cooler times of day in autumns.
HWS hydronic modules are ideal for the production of domestic hot water all year round. They make use of the energy drawn from indoor spaces by the VRF indoor units, as well as supplementary energy provided by solar panels in summer and spring.
ATW hydronic modules provide hot water for radiant panel heating in winter and deliver warm water to heat a pool in summer, contributing to maintaining comfortable temperature conditions and making use of the energy drawn from the indoor space by the VRF indoor units supplemented by heat supplied by thermal solar panels.
In systems with this capability, ATW hydronic modules may also be used to deliver refrigerated water to radiant panels in summer.

TYPICAL APPLICATIONS: HOTEL (ROOMS)

TYPICAL APPLICATIONS: CENTRALIZED RESIDENTIAL SYSTEMS

SOLUTION FOR CLIMATIZATION, HEATING AND DOMESTIC HOT WATER PRODUCTION

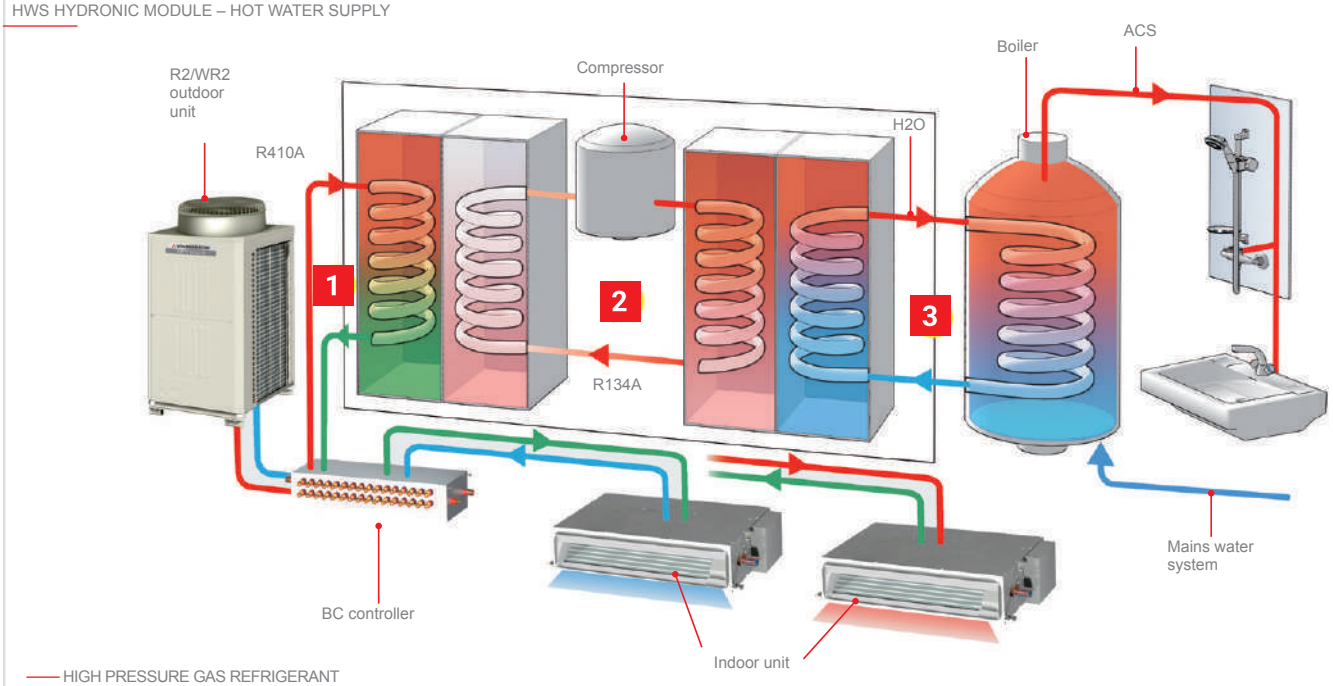
1 R2 Outdoor Units
2 Photovoltaic solar panels
3 BC controller
4 HWS Hydronic Module
5 ATW Hydronic Module
6 Domestic hot water accumulator tank fed from HWS
7 Hot water inertial accumulator tank fed by ATW

GREEN REFRIGERANT CIRCUIT
RED DOMESTIC HOT WATER CIRCUIT
ORANGE HEATING HOT WATER CIRCUIT
BLACK POWER CIRCUIT

HWS hydronic module – Hot water supply

Mitsubishi Electric was the first to introduce VRF systems for the production of high temperature hot water (up to 70°C), usable for domestic hot water production. The HWS hydronic module represents a significant, innovative technological breakthrough that uses the most advanced refrigeration technology, and has been conceived to be easily integrable with R2/WR2 series VRF CITY MULTI simultaneous cooling / heating systems.
Heat recovery plays a crucial role in these systems, as the HWS hydronic module may be used to extract heat from rooms where cooling is required, which would otherwise be vented into the outdoor atmosphere, and then use this heat to contribute to hot water production, adding only the supplementary heat necessary to reach the desired temperature.
The HWS hydronic module can produce hot water at temperatures up to 70°C in the return line, with a heating capacity of up to 12.5 kW per module which, however, is scalable in relation to internal demand.

HWS HYDRONIC MODULE – HOT WATER SUPPLY



HIGH PRESSURE GAS REFRIGERANT
HIGH PRESSURE FLUID REFRIGERANT TWO-PHASE
HIGH PRESSURE LIQUID REFRIGERANT
LOW PRESSURE GAS REFRIGERANT

Operating principle of two-stage technology

The HWS hydronic module employs a variant of the two-stage compression principle – a principle that has been known and used for many years, but which, until now, has only been applied in refrigeration systems to reach very low temperatures (as low as -60°C). Mitsubishi Electric has redesigned the two-stage circuit to achieve the opposite effect, for units intended to produce heating power at medium to high temperatures, from 30°C to 70°C. This solution combines superior energy efficiency with high hot water temperatures that are not attainable with the conventional heat pumps currently on the market. As illustrated previously, the HWS hydronic module uses the "free" heat extracted from the air conditioned interior by the heat recovery circuit of the CITY MULTI R2 outdoor units and raises the temperature to the desired value to deliver usable hot water. This double process recovers energy from the system, increasing its overall efficiency, and raises the temperature of the water with minimal energy expenditure.

Advantages of two-stage technology

The two-stage technology employed in the HWS hydronic module offers a number of significant advantages:

- R134a refrigerant in high temperature stage. R134a is a pure HFC refrigerant which is harmless for the stratospheric ozone layer and contributes only marginally to the greenhouse effect. This refrigerant is particularly suitable for high temperature applications.
- R410A refrigerant in low temperature stage. This is also an HFC refrigerant that is harmless to stratospheric ozone, which offers extraordinary efficiency in air conditioning applications.
- Minimal external energy demand, even when the system is operating in air conditioning mode. The heat drawn from the air is used to heat water.
- When the system functions predominantly in air conditioning mode – in summer, for example – hot water is produced with extremely low energy consumption. This makes it possible for the system to attain very high COP values.
- Continuously variable heating power in relation to demand, made possible by the inverter motor scroll compressor, which reduces energy consumption proportionally.
- Compact dimensions and very light weight. These modules may be mounted on walls, even in intermediate positions. Practically zero floor space usage.
- Individual thermal energy consumption billing with field devices.

TWO-STAGE TECHNOLOGY

Hybrid systems

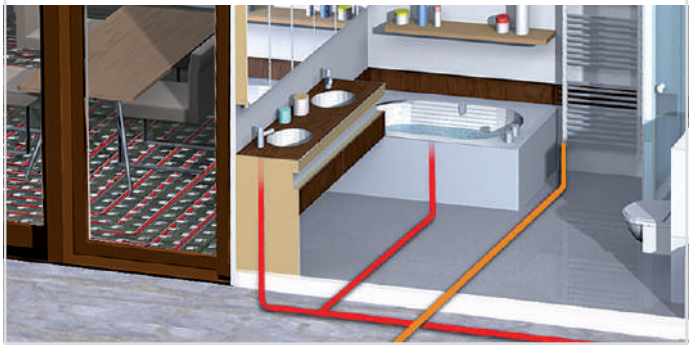
The HWS hydronic module may be used to create hybrid systems, with both hydronic modules and VRF direct expansion units. For instance, this makes it possible for the system to produce domestic hot water and heat or cool the air in the indoor space using the most suitable indoor units of the Mitsubishi Electric range (cassette units, ceiling-suspended units, ducted units etc.).
As well as superior energy efficiency, a hybrid system also offers the extraordinary flexibility needed to cater for very diverse situations, which a conventional air conditioner system simply does not.

Control and adjustment system

The HWS hydronic module can be configured for the following operating modes and hot water temperatures:

OPERATING MODE	TEMPERATURE RANGE
Hot water	30 - 70°C
Heating	30 - 50°C
ECO heating	30 - 45°C
Antifreeze	10 - 45°C

HWS HYDRONIC MODULE



Technical specifications HWS HYDRONIC MODULE

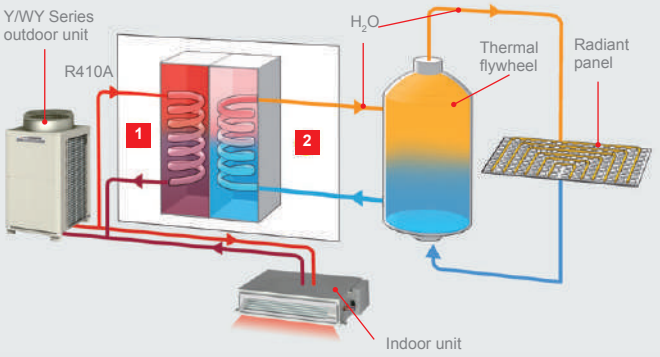
MODEL			PWFY-P100VM-E-BU
Power			Single-phase, 220-230-240V, 50 Hz/60Hz
Heating power output (nominal)		kW *1	12,5
		kcal/h *1	10,800
		Btu/h *1	42,700
	Power absorption	kW	2,48
	Current consumption	A	11,63 - 11,12 - 10,66
Temp. range in heating mode	PURY Series	Outdoor temp. DB	-20~32°C
	PQRY Series	Water temp. in circuit	10~45°C
	PQRY Series	Temp. in water/glycol circuit (for geothermal applications)	-5~45°C
	PWFY-P VM-E1-BU	Return line water temp.	10~70°C
Connectable outdoor units	Total capacity		50-100% of external unit capacity
	Series		R2 (E)P, WR2
Sound pressure in anechoic chamber	dB <A>		44
Refrigerant circuit piping diameter	Liquid	mm (inches)	ø 9,52 (ø 3/8") brazed
	Gas	mm (inches)	ø 15,88 (ø 5/8") brazed
Water piping diameter	Inlet	mm (inches)	ø 19,05 (R 3/4") screw-on connection
	Delivery	mm (inches)	ø 19,05 (R 3/4") screw-on connection
Drain pipe diameter		mm (inches)	ø 32 (1-1/4")
External finish			Galvanised sheet steel
External dimensions HxLxW		mm	800 (785 without feet) x 450 x 300
Dry weight		kg	60
Compressor	Type		Hermetic scroll compressor with inverter
	Manufacturer		MITSUBISHI ELECTRIC CORPORATION
	Starter method		Inverter
	Power	kW	1
	Lubricant		NEO22
Water in circuit	Nominal	m^3/h	0,6 ~ 2,15
	(entire operating volume)		
Internal circuit protection (R134a)	Overpressure protection		Overpressure sensor, pressure switch calibrated to 3.60 Mpa (601 psi)
	Inverter circuit (COMP)		Overcurrent protection, overheat protection
	Compressor		Outlet temperature protection, overheat protection
Refrigerant	Type / original charge		R134a x1.1kg (0,50lb)
	Controller		LEV
Rated pressure	R410a	MPa	4,15
	R134A	MPa	3,60
	Water	MPa	1
Standard equipment	Manuals		Installation manual, Instruction manuals
	Accessory		Water filter, insulating material

Note:
* Nominal conditions *1 are subject to EN14511-2:2004(E)
* Install the module in an environment with a wet bulb temperature not exceeding 32°C
* Due to continuous improvements made to these products, the specifications given above are subject to modification without prior notification.
* The module is not designed to be installed outdoors.
*1 Nominal heating conditions Outdoor temp.: 7°C DB/6°C WB
Nominal heating conditions Outdoor temp.: 7°C DB/6°C WB (45°F DB/43°F WB)
Pipe Length 7.5 m (24-9/16 feet) – Vertical difference: 0 m (0 feet)

ATW hydronic module – Air to water

Mitsubishi Electric has developed the ATW reversible air-water heat pump hydronic module specifically for hydronic heating and air conditioning systems. The refrigeration side of the module may be connected to VRF CITY MULTI SMALL Y and Y Series outdoor heat pump units, or to R2 heat recovery units. The hydronic side of the module may feed heated underfloor systems or other similar utilities, to provide heating in winter in heat pump mode, or cooling in summer in conditioning mode.
Connecting these modules to R2 Series VRF CITY MULTI heat recovery outdoor units offers extraordinarily levels of efficiency, especially in spring and autumn, with extremely high COP values. The HWS hydronic module can produce hot water at temperatures up to 40°C in the return line (45°C in delivery line), with a heating capacity of up to 12.5 kW per module which, however, is scalable in relation to internal demand.

ATW HYDRONIC MODULE – AIR TO WATER



Hybrid systems

Like the HWS module, the ATW hydronic module may be used to create hybrid systems, with both hydronic modules and VRF direct expansion units. For instance, this makes it possible to create a system that can heat certain rooms with radiant panels (a heating solution that is now very popular, as it offers uniform temperatures and quietness) and heat other rooms using appropriate Mitsubishi Electric indoor units (cassette units, wall-mounted units, ducted units etc.). Similarly, conditioning in summer may be performed with a heated underfloor system in rooms where this is installed, and with cooled air in other rooms, via standard VRF indoor units.
This makes it possible to use the most effective treatment solution possible for each interior space, catering for both the requisites of the specific application and the preferences of the user. As well as superior energy efficiency, a hybrid system also offers the extraordinary flexibility needed to cater for very diverse situations, which a conventional conditioning system simply does not.

TYPICAL APPLICATIONS: HOTEL (COMMON AREAS)

TYPICAL APPLICATIONS: CENTRALIZED RESIDENTIAL SYSTEMS (RADIANT PANEL HEATING)

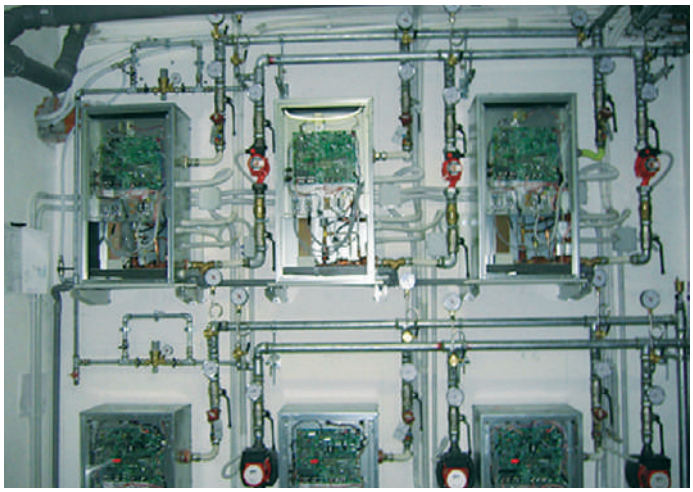
Main features

The functional characteristics of the ATW hydronic module cater for the needs of a very wide variety of different installations:

- nominal heating capacity: 12.5 kW;
- nominal cooling capacity: 11.2 kW;
- outdoor operating temperature range, heating mode: -20°C to +32°C (R2 heat recovery series); -20 to +15.5°C (Y heat pump series);
- outdoor operating temperature range, conditioning mode: -5°C to +46°C (R2 and Y series);
- return hot water temperature range: 10°C to 40°C;
- mains power: single-phase, 230V AC;
- individual thermal energy consumption billing with field devices.

Operating principle

The ATW reversible heat pump hydronic module consists essentially of a brazed plate stainless steel refrigerant-water heat exchanger connected to the VRF CITY MULTI outdoor unit on the refrigeration side, and to the hydronic circuit of the system (radiant panels, radiator units etc.) on the water side. The module is equipped with an electronic expansion valve which modulates the flow of refrigerant in the heat exchanger in response to heating or cooling demand and the demand required by the electronic management and control circuit. The entire system is encased in a housing with compact dimensions and very limited weight comparable to a wall-mounted boiler. The high COP value attained by the ATW hydronic module means that it delivers superior comfort with minimal operating costs, contributing to reducing the CO2 emissions produced for energy production at the power plant. This offers a two-sided advantage as emissions are not only reduced, but also delocalised away from populated areas.



Control and adjustment system

Like the HWS module, the ATW hydronic module is equipped with a sophisticated control system offering a wide choice of functions, selectable in relation to the needs of the installation and the preferences of the user.
The ATW module may be associated with its own independent remote controller (PAR-W21MAA), allowing the user to configure all operating settings, including water temperature, which may be displayed either for the delivery circuit or for the return circuit.
The water temperature reading displayed depends on the type of installation and on the auxiliary controller devices used. The return circuit reading configuration is the most widely used of the two, and allows precise control over the water temperature in the inertial accumulator tank (which is recommended) as a means to balance flows. Once the set temperature is reached, the ATW continues to operate to maintain a constant value.
Note that with this configuration, the delivery temperature is normally higher (max. 45°C) than the set temperature until the set temperature itself is reached.
In installations operating in summer, the ATW produces cold water at a temperature regulated with the same method, based on the primary delivery circuit reading or the return circuit reading.
As the cooling action of the radiant panels only reduces the sensible heat of the interior space, suitable dehumidification systems may also be included in the installation.
The ATW hydronic module can be configured for the following operating modes and hot water temperatures:

MODE	TEMPERATURE RANGE
Heating	30 - 45°C
ECO heating	30 - 45°C
Antifreeze	10 - 45°C
Cooling	10 - 30°C

Technical specifications HWS HYDRONIC MODULE

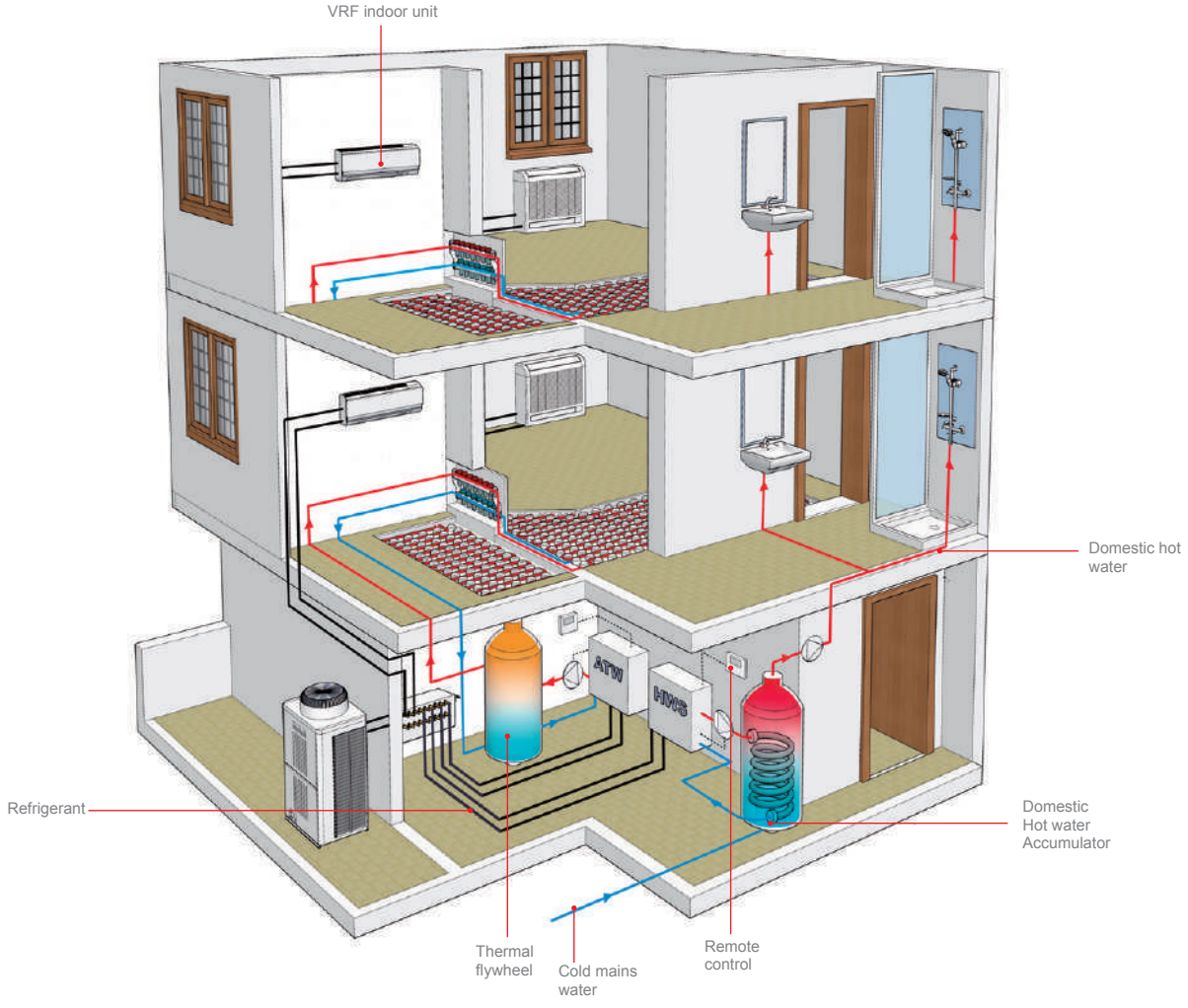
MODEL			PWFY-EP100VM-E2-AU
Power			Single-phase, 220-230-240V 50/60Hz
Heating power output (nominal)		kW *1	12,5
		kcal/h *1	10,800
		Btu/h *1	42,700
	Power absorption	kW	0,025
	Current consumption	A	0,138
Temp. range in heating mode	Serie PUMY	Outdoor temp. DB	-
	Serie PUHY	Outdoor temp. DB	-20~15,5°C
	Serie PURY	Outdoor temp. DB	-20~32°C
	Serie PQHY - PQRY	Water temp. in circuit	10~45°C
	Serie PQHY - PQRY	Temp. in water/glycol circuit	-5~45°C
		(for geothermal applications)	
		Return line water temp	10~40°C
Cooling output (nominal)		kW *2	11,2
		kcal/h *2	9,600
		Btu/h *2	38,200
	Power absorption	kW	0,025
	Current consumption	A	0,138
Temp. range in cooling mode	PUMY Series	Outdoor temp. B.S.	-
	PUHY Series	Outdoor temp. B.S.	-5~46°C
	PURY Series	Outdoor temp. B.S.	-5~46°C
	PQHY - PQRY Series	Water temp. in circuit	10~45°C
	PQHY - PQRY Series	Temp. in water/glycol circuit	-5~45°C
		(for geothermal applications)	
		Return line water temp	10~35°C
Connectable outdoor units	Total capacity		50-100% of capacity of OU
	Series		Y (Ecostandard (P), Standard Efficiencyl (P),High Efficiency (EP)), Zubadan Y, WY, R2 (Standard Efficency (P), High Efficiency (EP)), WR2
			29
			ø 9,52 (ø 3/8") brazed
Sound pressure in anechoic chamber	dB <A>		ø 15,88 (ø 5/8") brazed
Refrigerant circuit piping diameter	Liquid	mm (inches)	ø 19,05 (R 3/4") screw-on connection
	Gas	mm (inches)	ø 19,05 (R 3/4") screw-on connection
Water piping diameter	Inlet	mm (inches)	ø 32 (1-1/4")
	Delivery	mm (inches)	Galvanised sheet steel
Drain pipe diameter		mm (inches)	800 (785 without feet) x 450 x 300
External finish			36
External dimensions HxLxW		mm	1,8-4,30
Dry weight		kg	
Water in circuit	Nominal	m³/h	4,15
	(entire operating volume)		1
Rated pressure	R410A	MPa	Installation manual, Instruction manuals
	Water	MPa	
Standard equipment	Manuals		Water filter, insulating material, 2x external signal connectors, plumbing fittings for filter, flow regulator
	Accessory		

Note:
* Nominal conditions *1 and 2* are subject to EN14511-2:2004(E)
* Install the module in an environment with a wet bulb temperature not exceeding 32°C
* Due to continuous improvements made to these products, the specifications given above are subject to modification without prior notification.
* The module is not designed to be installed outdoors.

*1 Nominal heating conditions
Outdoor temp.: 7°C DB/6°C WB (45°F DB/43°F WB)
Pipe length: 7.5 m (24-9/16 feet)
Vertical difference: 0 m (0 feet)
Intake water temp.: 30°C
Water flow rate: 2.15 m³/h (P100)
4.30 m³/h (P200)

*2 Nominal cooling conditions:
External temp: 35°C DB/(95°F DB)
Pipe length 7.5 m (24-9/16 feet)
Vertical difference: 0 m (0 feet)
Intake water temp.: 23°C
Water flow rate: 1.93 m³/h (P100)
3.86 m³/h (P200)

SCHEMATIC: ECODAN® VRF HWS & ATW (SIMULTANEOUS HEATING, COOLING AND DOMESTIC HOT WATER PRODUCTION)



200% EXTENDED CONNECTIVITY FUNCTION

Y SERIES HEAT PUMP UNITS

With Y Series outdoor units, this function is only applicable in mixed installations and allows the connection of indoor units (air heating or cooling) and an Ecodan® ATW hydronic module (water heating) with a total capacity index up to 200% of the capacity of the outdoor unit.*

R2 SERIES HEAT RECOVERY UNITS

With R2 Series outdoor units operating in different modes, the function is only applicable in mixed installations configured either with the BC Controller or with the WCB refrigerant-water connection box, and permits the connection of indoor units (air heating and cooling) and Ecodan® HWS&ATW hydronic modules (DHW production and water heating) with a total capacity index up to 200% of the capacity of the outdoor unit.*

*For detailed informations, please contact your representative


EXIT