



IVRFW. The AC that's not just an AC.





Blue Star has been a leader in the Indian commercial airconditioning industry for 70 years now. Driven by a continuous urge to innovate, it aims to bring home the best of AC&R technology from across the world.

Over the decades, Blue Star has pioneered many firsts in India. Be it the introduction of the energy-efficient scroll compressor-driven packaged ACs; the design of the HiPer and HiSen Packaged ACs to serve the high sensible heat needs of the burgeoning IT sector; the list goes on.

Blue Star's latest introduction – the DC Inverter VRF AC with Hot Water Generator (IVRFW) – adds hot water generation to the already popular features of cooling and heating in its highly successful IVRF Airconditioning system. It therefore serves both the vital requirements of establishments like hospitals and hotels with one single energy-efficient system.

## Why choose the Blue Star IVRFW?

The IVRFW system caters to the two basic and essential needs of any commercial establishment while being energy efficient. It keeps occupants comfortable with airconditioning and also serves their need for hot water. This system not only consumes less energy and saves on power bills but since it multi-tasks, it saves on initial investment cost and space too.

### Features:



A multi-tasking airconditioning system – it can heat, cool, and generate hot water



Integrated business management solution and simplified computer controlled operation



Wide range of designer cooling units to choose from



Precise temperature control with pulse width modulated flow control technology



R410A based eco-friendly system



Need-based cooling with high flexibility in "select and use" to suit your comfort requirements



When working in cooling mode, the hot water generation does not consume any extra energy and is practically a free by-product



Highly energy-saving in both full and part load conditions





## Blue Star IVRFW – Serving both airconditioning and hot water needs

In many commercial establishments, especially in hospitality and healthcare, airconditioning and hot water are both essential requirements. Given the amount of hot water consumed in many industries (see table), enormous amounts of energy are wasted each day in hot water generation alone.

Typical consumption of hot water per person

Type of building	Consumption per occupant	Peak demand per occupant	Storage per occupant	
	litre/day	litre/hr	litre	gal
Factories	22 - 45	9	5	1
Hospitals	160	30	27	6
Hostels	90	45	30	7
Hotels	90 - 160	45	30	7
Residences	90 - 160	45	30	7
Offices	22	9	5	1
Boarding Schools	115	20	25	5

Conventionally, industries use separate airconditioning and water heating systems to cater to these two requirements, thus requiring twice of everything – power, space, hardware and maintenance.

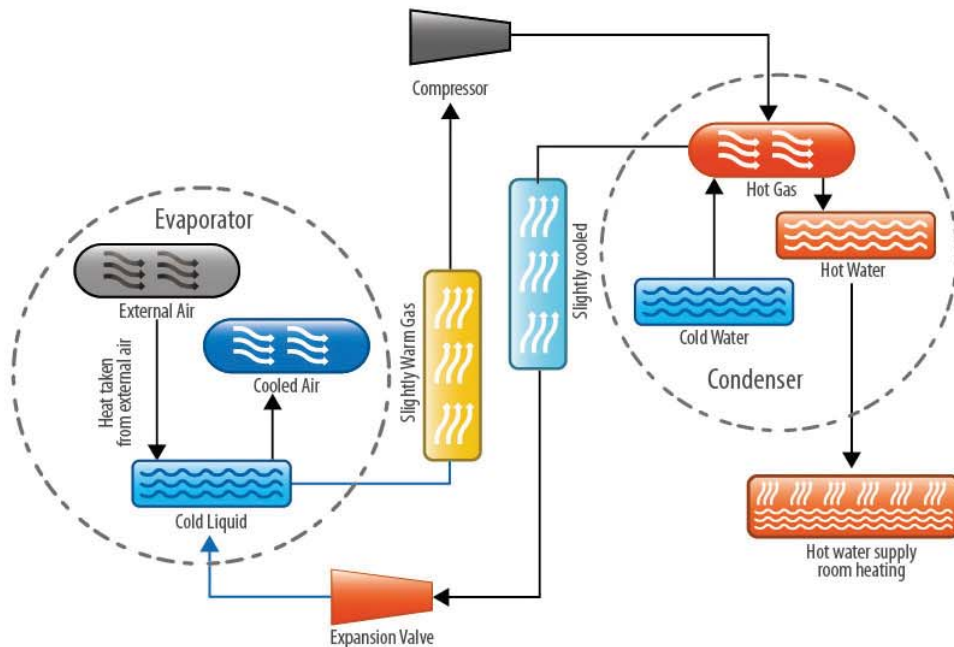
What the IVRFW does is it taps the heat recovered from cooling the interiors and uses the same to heat water, which it supplies through an independent delivery mechanism.

This ingenious heat recovery mechanism saves enormous amounts of power that would otherwise have gone into heating water independently using inefficient electrical heaters or burning precious fossil fuels. Not only does this save on power bills but it serves the larger cause of reducing CO<sub>2</sub> emission.



## Re-designing the IVRF to bring you the IVRFW

The standard Blue Star Inverter VRF system has the outdoor unit directly connected to various indoor units to serve cooling applications. And the heat pump inverter VRF system can either cool or heat the interiors depending on ambient conditions outside.



The Blue Star IVRFW on the other hand additionally offers hot water generation, not just as a by-product but as a controlled feature. Further, the system offers the flexibility of a combination of these functionalities.

The IVRFW therefore has some key design changes as compared to a conventional IVRF. It comes with a specially designed outdoor unit that has an additional four-way valve with an advanced control mechanism, as well as a unique 'hydro box' and a hot water storage tank, to enable hot water generation along with heating or cooling.

In the hot water generation mode, the discharge gas from the compressor in the ODU is diverted to the hydro box where the primary circulating water recovers the heat from the refrigerant gas. The heated primary water is circulated inside the water tank through a coil.

The source water entering the tank is then heated and delivered between 50°C and 58°C.



## Versatile operation

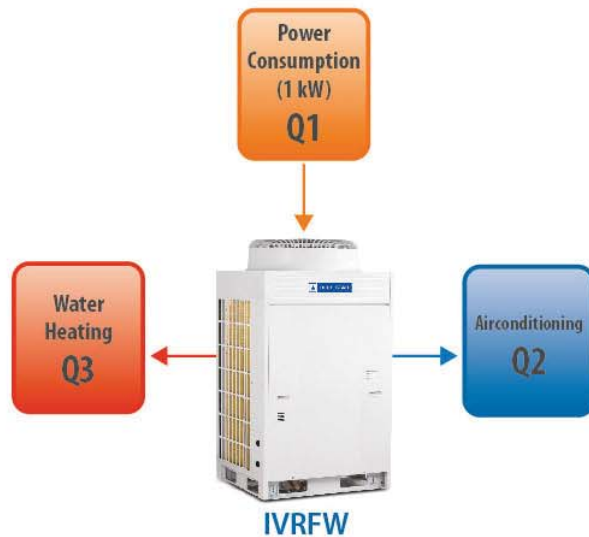
Blue Star's technical expertise has ensured that the new system goes beyond just supplying hot water when in the cooling mode. The IVRFW can function in any of the following modes:



Even when the IVRFW operates in the full water-heating mode, the running cost is still just one-third of conventional heating systems! In the cooling and in the hot water generator only mode, it is at the lowest level of energy consumption.

## Enhanced COP (ECOP)

ECOP is defined as the maximum energy efficiency rate which is achieved when the system is working in cooling + hot water generation mode.



With 1 kW (Q1) of input power to the system we get

(i) 2.8 kW (Q2) of cooling output

(ii) 3.8 kW (Q3) of heat recovered (which includes compressor heat rejection)

Hence the ECOP of system will be  $(Q2 + Q3) / Q1 = (2.8 + 3.8) / 1 = 6.6$

## IVRFW Advantages over Conventional AC & water-heating systems

- Much lower cost of hot water generation
- In cooling-only mode, even AC running cost is lower
- Easy and quick to install
- Pollution-free
- Lower space requirement
- No statutory clearances for installing the system
- Continuous heat recovery mode ensures hot water readily available throughout the day
- Can be used in all weather conditions
- Can be used for hot water generation alone





## The Outdoor Unit

Since the IVRFW offers both heating and cooling functions, as well as hot water generation, the outdoor units are specially designed to suit these requirements.



### Compressor

Twin rotary compressors drive the smaller systems up to the 6 HP module, while scroll inverters power the 8 to 10 HP modules.



### Eco-friendly refrigerant

The entire IVRFW range is R410A-based thus making the system eco-friendly.



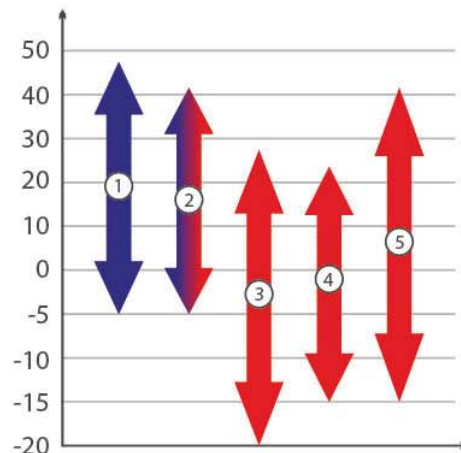
### Special valve and controller

To enable easy switching between its various functions of hot water generation along with either heating or cooling modes, the ODU of the IVRFW comes equipped with an advanced four-way valve and controller which help to capture the exhausted heat from the airconditioned space to generate hot water.

## Wider range of ambient temperature

With advanced DC inverter technology, IVRFW performs heat-recovery operation (cooling + water heating) even at 43° C in summer and at -15° C in winter to provide heating and sanitary hot water.

1. Cooling Airconditioning Only:  
-5° CDB ~ 48° CDB
2. Cooling Airconditioning + Water Heating:  
-5° CDB ~ 43° CDB
3. Heating Airconditioning Only:  
-20° CDB ~ 27° CDB
4. Heating Airconditioning + Water Heating:  
-15° CDB ~ 24° CDB
5. Water Heating Only:  
-15° CDB ~ 43° CDB







## Hot water tank

The hot water tank in the IVRFW is a stainless steel PUF insulated tank which has a heat exchange coil. The tank also has an auxiliary electric heater of 3 kW capacity. The unique construction isolates the water entering the tank from the hydro box. The primary water from the hydro box is circulated through coils inside the tank.

This ensures consistent performance of the system as the quality of the water supplied may affect the performance of the hydro box in the long run.

## Cold water injection pipe

The cold water is injected at the bottom of the tank through a water inlet pipe. This is specially designed with equi-spaced injection holes, which help reduce water hammer.



## Slowing up clap board

Cold water entering the tank is made to rise slowly in such a way that cold water temperature can be sensed by the controller before it mixes. This also helps to calculate hot water requirement accurately.

## Smart dual temperature control

The tank has two temperature sensors, one at the bottom and another at the top. Based on the inputs from these sensors, the controller regulates the heat recovery in the system. This helps in:

- Responding to hot water requirements swiftly
- Improving the hot water yield

## 24x7 hot water

Irrespective of the time of the day or the climatic conditions, the powerful automatic control ensures a continuous supply of hot water throughout the day without any interruption.



Store water at night



Use water during the day

## Hydro box (Heat recovery unit)

The hydro box consists of tube-in-tube heat exchanger, water circulating pump, expansion tank, electric heater (optional) and water flow switch. The advanced wired controller senses the hot water requirement and regulates the flow of discharge gas from outdoor unit to hydro box. The heat from the discharge gas is rejected to the primary water in the tube-in-tube heat exchanger, which is then circulated to the coil in the storage tank.



### Water circulating pump

The hydro box is fitted with a highly efficient Wilo pump which is well known for reliability and stability. This circulates the primary water between hydro box and water tank.

### Flow switch

A water flow switch ensures the reliability of the system.

### Anti-freeze protection

Hydro boxes of the Blue Star IVRFW system which are rated up to 8 kW come with electric heaters for defrosting purposes while hydro boxes rated 20 and 30 kW use hot gas technology for defrosting. This feature offers effective and energy-efficient anti-freeze protection to the system.

## A wide range of Indoor Units

Blue Star's Inverter VRFW system offers the widest range of indoor units in the industry. These units are designed keeping in mind the modern day interiors and decors. They are also flexible in their locational requirement, allowing you to position the IDUs as required by the architect. The IDUs are compact and easily service-able. They can be operated using cordless remotes, wired remotes, central controllers or even through a personal computer.

## Hi-Wall units (EXV separated and EXV integrated)

- Ternary air filter
- Quiet operation
- Wide air supply angle
- Remote controller with LCD display
- Easily removable front panel
- Vertical auto-swing
- Auto-clean function
- Low noise

EXV separated Split

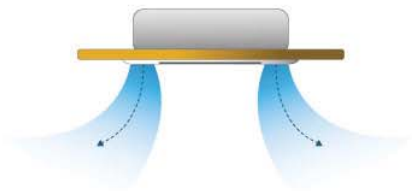


EXV integrated Split



## Four-way Cassettes

- Compact design
- Powerful and uniform air supply
- Intelligent drainage
- Low noise 3D spiral fan blades
- Long-life washable filter
- LED display
- Fresh air function
- Available in standard and compact range. Standard range available in size 96 cm x 96 cm, from 0.8 TR to 4 TR. Compact range is available in size 65 cm x 65 cm, from 0.6 TR to 1.3 TR



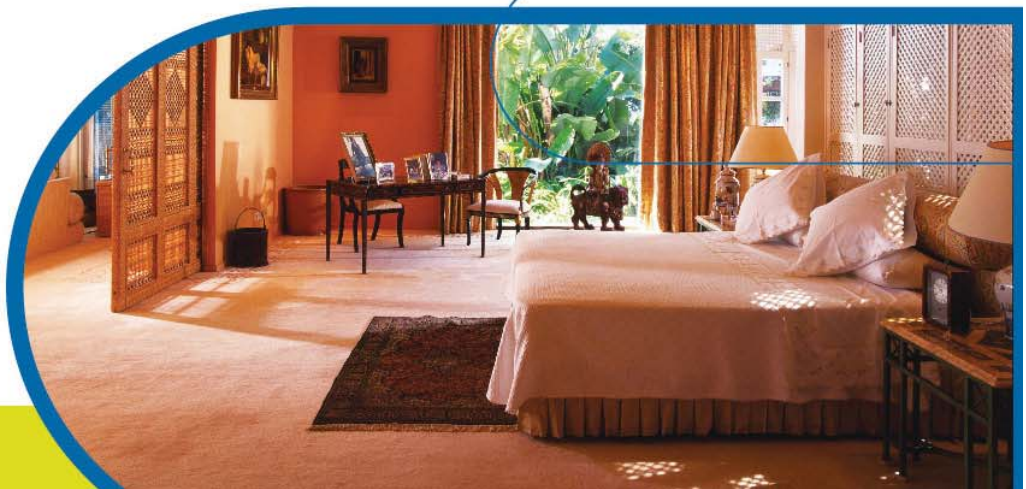
Wider air distribution

## One-way Cassettes

- Space-saving, compact design
- Easy installation
- Intelligent drainage
- Detachable and washable grilles
- Long-life filter
- Ultra-quiet operation
- Uniform temperature distribution

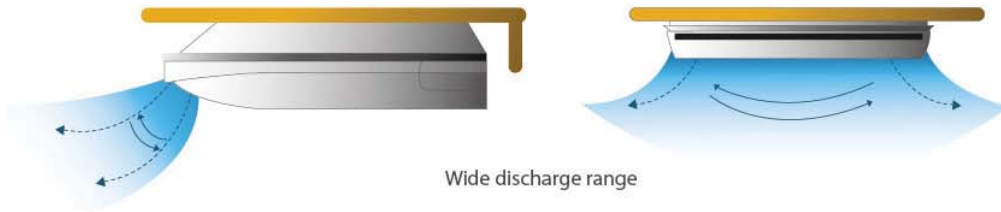


Detachable and washable grilles



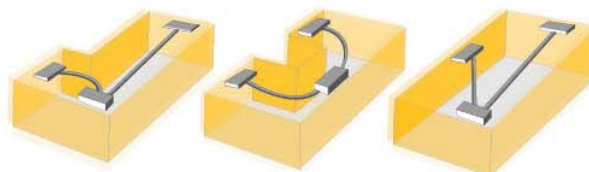
## Floor/Ceiling Mounted units

- High-efficiency filter
- Great looks
- Space-saving design
- Easy maintenance
- Quiet operation
- Flexible installation – floor-mounted or ceiling-suspended
- No suspended ceiling required



## Ducted units

- High external static pressure
- 4-step fan motor
- Uniform air supply
- Highly flexible installation

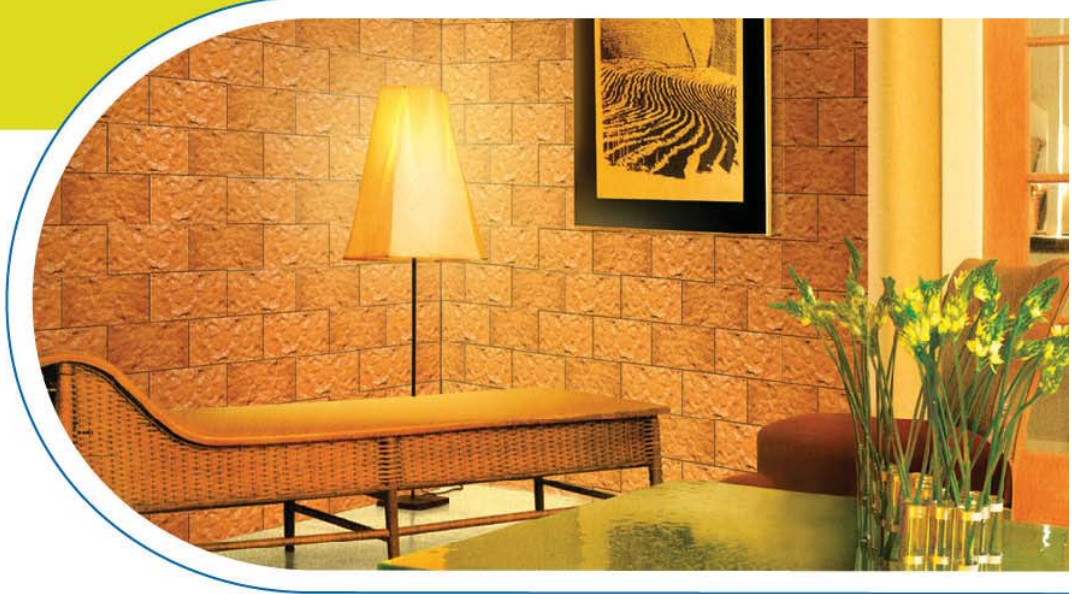


Highly flexible installation

## Concealed units

- Low height of 200 mm
- Compact size
- Intelligent drainage
- Flexible installation
- 4-step fan motor
- Uniform air distribution
- Low noise level





## Schematic of the IVRFW



Outdoor Unit

+



Hydro Box

+



Water Tank

Hi-Wall Units



Ducted Units



Concealed Units





Cassettes










Floor/Ceiling mounted Units

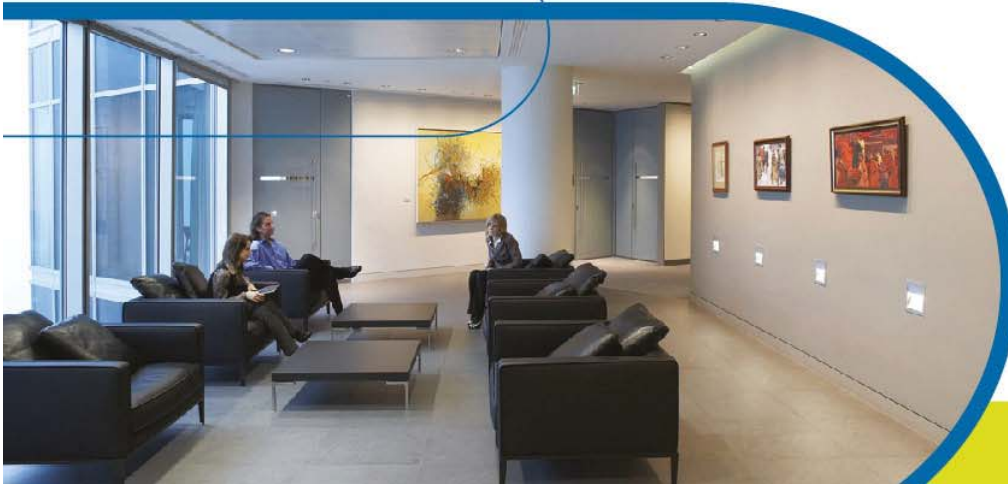


## Product line-up: Outdoor Units

Appearance	HP	Max. no. of IDUs
	3.5	6
	4	7
	5	8
	6	9
	8	14
	10	16

## Product line-up: Indoor Units

Appearance	Type	0.6TR	0.8TR	1TR	1.3TR	1.5TR	1.7TR	1.8TR	2TR	2.3TR	2.6TR	2.8TR	3.2TR	3.6TR	4TR
	Hi-Wall units (EXV separated)	●	●	●	●	●	●		●						
	Hi-Wall units (EXV Integrated)	●	●	●	●	●	●	●	●						
	Concealed units	●	●	●	●		●		●						
	Compact Cassettes	●	●	●	●										
	Standard Cassettes		●	●	●	●	●	●	●	●	●	●	●	●	●
	One-way Cassettes	●	●	●											
	Floor/Ceiling mounted units		●	●	●				●		●		●	●	●
	Ducted units	●	●	●	●		●		●		●		●		●





## Advanced Controllers

### Hot Water Controller

- On/off timer
- Mode setting
- Self-diagnosis function (Error code display)
- Night mode operation
- Energy-saving mode
- Instant heating mode
- Rapid water heating mode
- Pre-set mode for water heating
- Water temperature setting (35-58°C)
- Error codes
- Auxillary heating



### Wired Remote Controller

- Temperature setting
- Fan speed setting
- Energy-saving function
- Room temperature & set temperature display
- Sleep function
- Operating mode setting
- On/off Timer
- Vertical swing
- Self-diagnosis function (Error code display)
- Memory function
- Child lock function
- Infrared remote control function



### Wireless Remote Controller

- Operation mode setting
- Vertical swing
- Sleep function
- Room temperature & set temperature display
- Temperature setting
- Fan speed setting
- Child lock function
- On/off Timer



### Centralised Controller

- Error alarm and error code display
- Single/Group/Centre control (including weekly timer setting, shield setting, etc.)
- 64 communication modules can be connected to control 1024 indoor units
- Control the On/Off, operation mode, set temperature, fan speed, swing state, etc. of indoor unit
- Automatically detect and display the status (including operation mode, set temperature, fan speed, swing, weekly timer, shield, etc.)
- Up to 1km communication wires without repeaters
- Clock setting







### Smart Zone Controller

- Up to three ODUs can be controlled
- Direct control over 16 indoor units in the network without extra communication module
- Single unit control and centralised control available
- Operation status of any one operating indoor unit in its control group can be checked and displayed
- Remote shield function
- Timer function



### Communication Module

- Used for transforming and transmitting signals between the computer and the airconditioning system
- Modbus protocol and RS485 interface are adopted so that the unit can be connected to the user's BMS system and other networks
- Numerous monitoring nodes allow almost 255 units to be included in the same network
- Control of setting parameter is available
- Monitoring of operation state is available
- Monitoring of malfunction state is available



# Technical Specifications

## Outdoor units



Model			IVRFW-035F	IVRFW-04F	IVRFW-05F	IVRFW-06F	IVRFW-08T	IVRFW-10T
Capacity	Cooling	kW	10	12	14	16	22.4	28
	Heating	kW	11	13.2	15.4	17.6	25	31.5
	Water heating	kW	5	5	8	8	12 ~20	12 ~30
Power input	Cooling	kW	4.5	5	5.5	5.9	6.82	7.52
	Heating	kW	3.8	4.2	4.9	5.3	6.97	7.7
	Water heating	kW	2	2	2.86	2.86	8	10.7
Hot Water flow		Lph	107	107	172	172	258~500	258~650
Supply water temperature		°C	Default 50°C, adjustable between 35°C to 58°C					
IPLV	Cooling	kW/kW	4.2	4.2	4.2	4.2	3.6	3.6
ECOP	Cooling+water heating	kW/kW	6	6	6.6	6.6	6	6.4
Power supply		V/Ph/Hz	240/1/50				415/3/50	
Rated current	Cooling	A	20.2	23	25	26.8	11.7	13.44
	Heating	A	18.1	19.1	22.3	24.1	11.4	13.76
	Water heating	A	9	9	12.8	12.8	13.1	19.1
R410A-Refrigerant Charge		kg	5	5	7	7	15	16
Compressor	Type	—	Inverter Rotary				Inverter + fixed Speed Scroll	
	Quantity	—	1	1	1	1	2	2
Recommended Cable	Area x core	sq mm	6x2	6x2	10x2	10x2	6x4	6x4
Sound pressure level		dB(A)	56	56	58	60	58	58
Dimensions	Width	mm	950	950	950	950	930	930
	Depth	mm	340	340	340	340	770	770
	Height	mm	1250	1250	1250	1250	1670	1670
Net weight		kg	105	105	115	115	265	265
Refrigerant Connections	Suction	In	3/4	3/4	3/4	3/4	7/8	7/8
		mm	19.1	19.1	19.1	19.1	22.2	22.2
	Liquid	In	3/8	3/8	3/8	3/8	3/8	3/8
		mm	9.5	9.5	9.5	9.5	9.5	9.5
	To Hydro box	In	5/8	5/8	5/8	5/8	3/4	3/4
		mm	15.9	15.9	15.9	15.9	19.1	19.1
	From Hydro box	In	1/2	1/2	1/2	1/2	5/8	5/8
		mm	12.7	12.7	12.7	12.7	15.9	15.9
	Type		Flare	Flare	Flare	Flare	Flare	Flare
Maximum No. of IDUs		Nos	6	6	7	7	11	12

### Note

1. Cooling Capacity is based on inside temperature 27°C DB, 19°C WB and Outdoor air temperature of 35°C DB
2. Heating capacity based on inside temperature 20°C DB, and outdoor air temperature 7°C DB, 6°C WB
3. Hot water capacity is based on outdoor air at 20°C DB, 15°C WB; water temperature heating from 15°C to 55°C

## Water tank



Model			IWTDH - 2001	IWTDH - 3001	IWTDH - 3501	IWTDH - 4001
Tank volume		L	200	300	350	400
Max. working pressure		Psig	100	100	100	100
Auxiliary electrical heater	Rate power input	kW	3.0	3.0	3.0	3.0
Dimension	Outer Diameter	mm	540	620	620	620
	Overall Height	mm	1595	1620	1895	2125
Power supply		V/Ph/Hz	230/1/50	230/1/50	230/1/50	230/1/50
Cooling Coil Pipe	OD	In	3/4	3/4	3/4	3/4
Water Connection	In	inch	1/2	1/2	1/2	1/2
	Out	inch	1/2	1/2	1/2	1/2
Net weight		kg	68	84	92	99

Note: Use soft water for circulation

## Hydro Box (without electric heater)



Model			IHB - 51	IHB - 81	IHB- 201	IHB- 301
Heating capacity		kW	5.00	8.00	20.00	30.00
Hot Water Yield		lph	107.00	172.00	258~500	258~650
Dimensions	W	mm	650	650	1050	1050
	D	mm	300	300	470	470
	H	mm	250	250	760	910
Type of heat exchanger			Tube in Tube			
Power supply		V/Ph/Hz	230/1/50	230/1/50	230/1/50	230/1/50
Water pump	Type		IN LINE PUMP			
	Power input	Watts	80	80	370	370
	Water flow	lph	1000	1000	2500	2500
	Delivery lift	m	6	6	15	15
Refrigerant Connections	Discharge gas in	In	5/8	5/8	3/4	3/4
		mm	15.9	15.9	19.1	19.1
	Liquid out	In	1/2	1/2	5/8	5/8
		mm	12.7	12.7	15.9	15.9
	Type		Flare	Flare	Flare	Flare
Water Connections (in/out)		In	3/4	3/4	3/4	3/4
	Type		Screw	Screw	Screw	Screw
Net weight		kg	25.0	25.0	75	100

Note: Hot water yield is based on water heating from 15°C to 55°C

## Hydro Box (with electric heater)



Model			IHBD-51	IHBD-81	IHBD-203	IHBD- 303
Heating capacity		kW	5.0	8.0	20.00	30.00
Auxiliary Electric Heater		kW	1.5	1.5	5.0	5.0
Hot Water Yield		lph	107	172	258~500	258~650
Outline dimension	W	mm	650	650	1050	1050
	D	mm	435	435	470	470
	H	mm	270	270	760	910
Type of heat exchanger			TUBE INTUBE			
Power supply		V/Ph/Hz	230/1/50	230/1/50	415/3/50	415/3/50
Water pump	Type		IN LINE PUMP			
	Power input	Watts	80	80	370	370
	Water flow	lph	1000	1000	2500	2500
	Delivery lift	m	6	6	15	15
Refrigerant Connections	Discharge gas in	In	5/8	5/8	3/4	3/4
		mm	15.9	15.9	19.1	19.1
	Liquid out	In	1/2	1/2	5/8	5/8
		mm	12.7	12.7	15.9	15.9
	Type		Flare	Flare	Flare	Flare
Water connections (in/out)		In	3/4	3/4	3/4	3/4
	Type		Screw	Screw	Screw	Screw
Net weight		kg	31	31	110	120

Note: Hot water yield is based on water heating from 15°C to 55°C

The above models are to be selected when water entering temperature is below 15°C

All specifications are subject to change without notice.



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