

# Carrier XPower VRF Technology



# XPOWER

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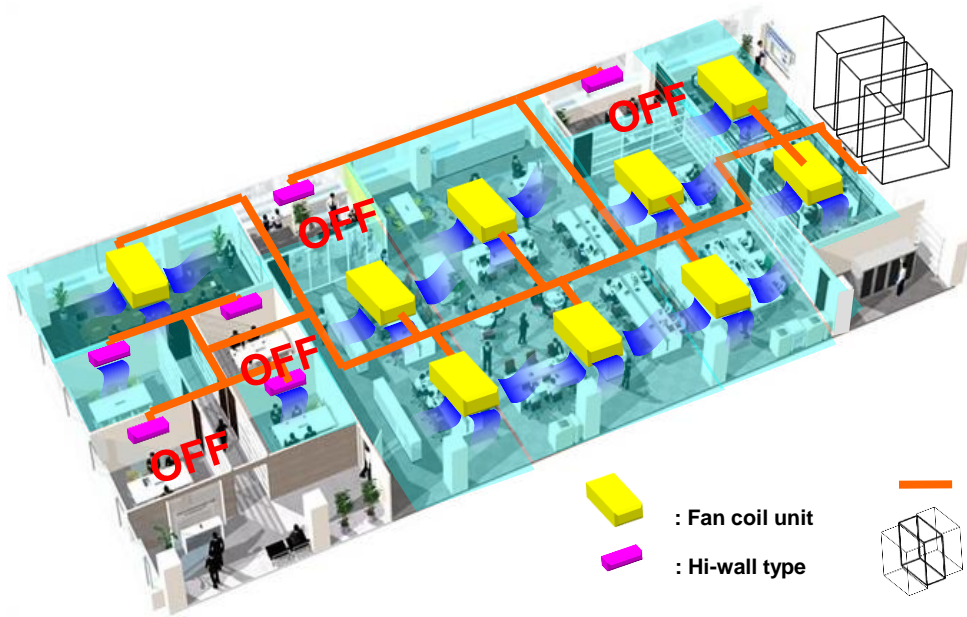
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# VRF System

Zone Operation : VRF Design Considerations

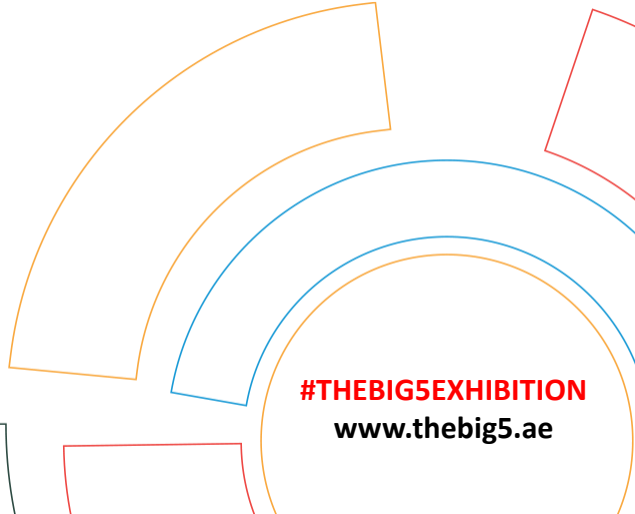


Individual air conditioning control by rooms, zones, areas with suitable type and capacity indoor units

-  : Fan coil unit
-  : Hi-wall type
-  : Piping
-  : Outdoor units

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# VRF System



- VRF utilizes modular outdoor units connected with multiple indoor units, controls and long refrigerant pipes.
- Inverter technology enables VRF systems to run exactly at the capacity required to cool and/or heat your space at a set temperature.
- Compressor doesn't cycle on and off all day like a traditional system.
- VRF offer unique benefits such as:
  - ✓ Lower operating and maintenance costs
  - ✓ Better individual temperature control
  - ✓ Flexibility to accommodate changing tenants
  - ✓ Saving space



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# Carrier XPower : Lineup



Side discharge

VRF Mini



4-6 HP

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Top discharge type

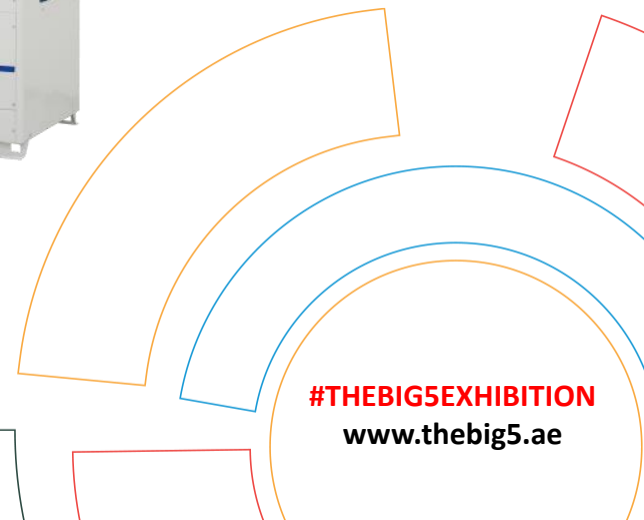
VRF Standard model

VRF High Efficiency model



8-20HP  
Combination up to 56 HP

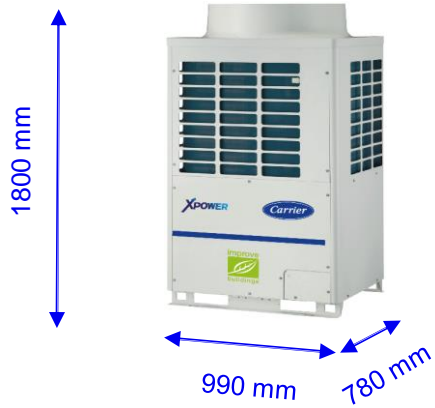
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# Carrier XPower

Smaller Footprint



**8, 10, 12 HP**

**Foot Print : 0.77 m<sup>2</sup>**



**14, 16 HP**

**Foot Print : 0.94 m<sup>2</sup>**



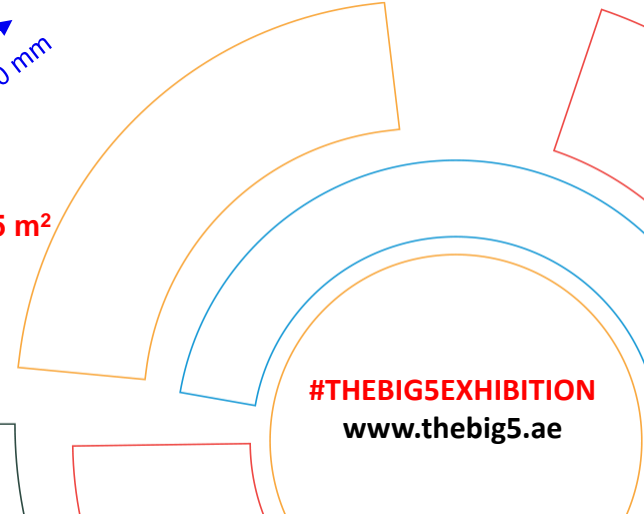
**18, 20 HP**

**Foot Print : 1.25 m<sup>2</sup>**

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# Carrier XPower

## Types of Indoor Units



Wide Range of Indoor Units



Multi-Application



IAQ w/ Air Handling Unit



Energy Efficient



**Hi Wall**  
0.8 – 2.5 HP



**Free Stand**  
1.7 – 6.0 HP

**XPOWER**  
FULL DC INVERTER



**Ducted**  
0.8 – 10.0 HP



**Heat Exchanger**  
1.0 – 2.5 HP



**Ceiling Mounted**  
1.7 – 6.0 HP



**Cassette**  
0.8 – 6.0 HP



**Floor Mounted**  
0.8 – 2.5 HP



**Air Handling Unit**  
*Modular Design*

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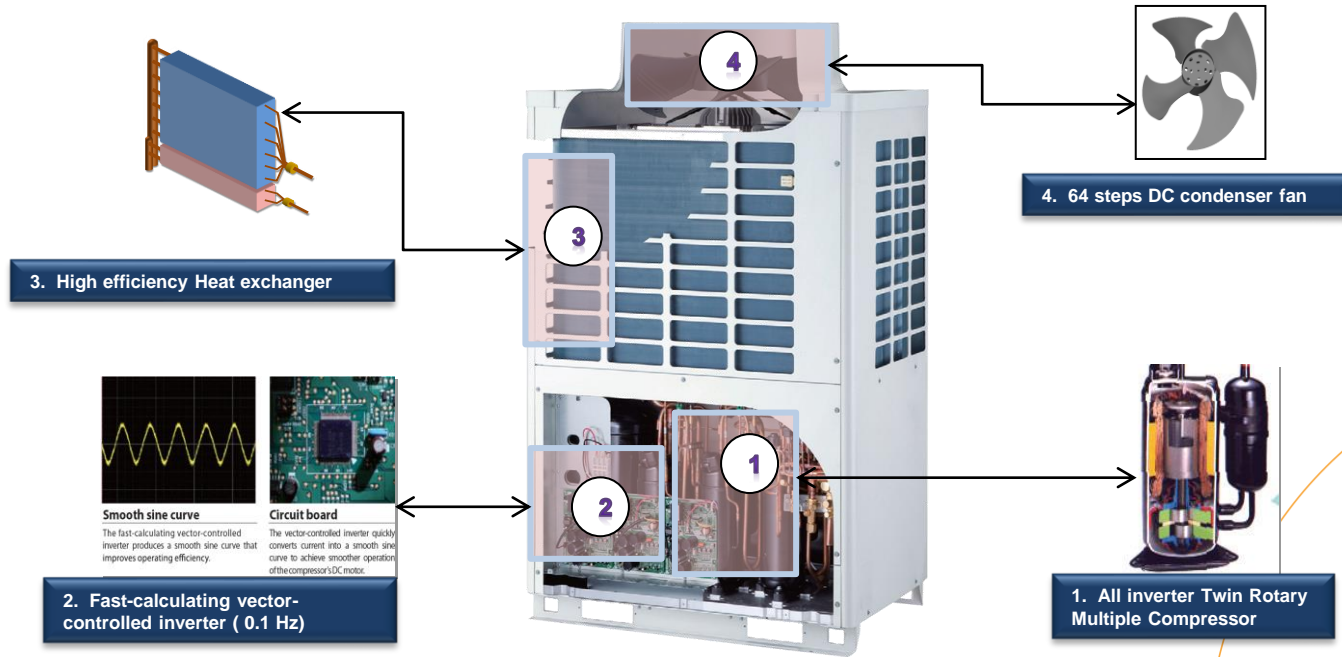
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# Carrier XPower

## Core Technologies



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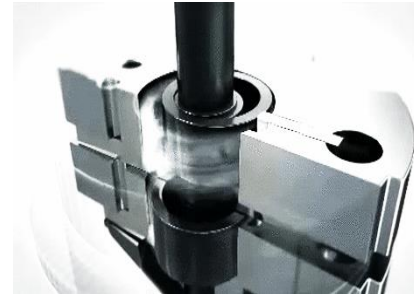
# Carrier XPower

## Compressor Core Technology



**X-Power Rotary compressor** technologies contribute the efficiency and reliability.

- **Twin Rotary compressor**
  - high efficiency and reliability
- **Diamond Like Carbon (DLC) vane**
  - high efficiency and reliability
- **2-stage vane**
  - for high reliability
- **Oil management technology**
  - for high reliability



Appropriate compression position realizes **smooth operation**



Twin Rotary

Conventional

**Less oil consumption**



Twin Rotary

Conventional

Twin Rotary **efficient compression at any frequency.**



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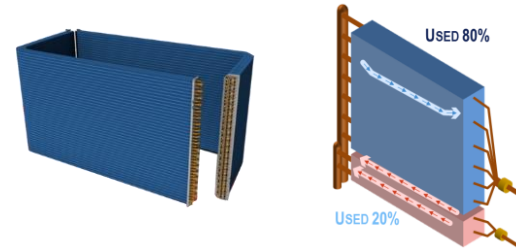
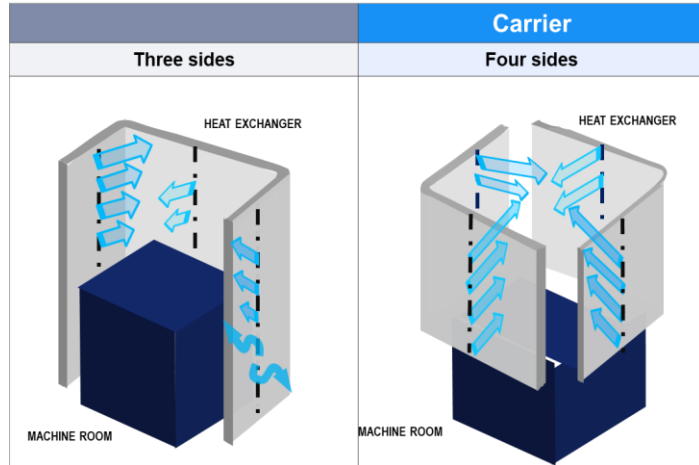


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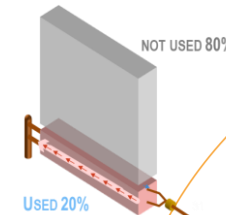
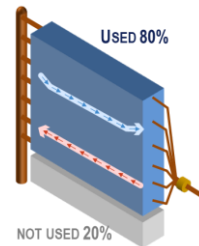


# Carrier XPower

## Heat Exchanger



80-20 principle – Main heat exchanger & Sub heat exchanger



- Heat exchangers are located on all **4 sides** of the CDU, with this structure the air flows smoothly and balanced through all the available surface unlike **3-sided heat exchanger which restricts air flow and overheat the compartment.**
- Resin coated Al fins mechanically bonded to seamless copper tubes
- **1500 Hrs.** Salt spray tested. Best for high ambient condition

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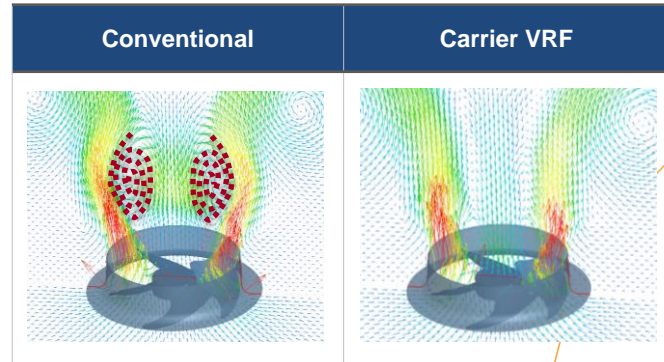
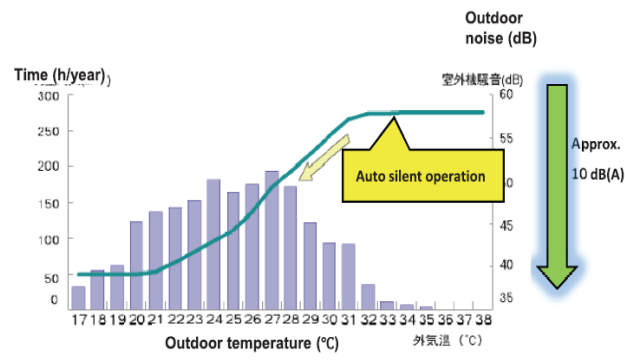
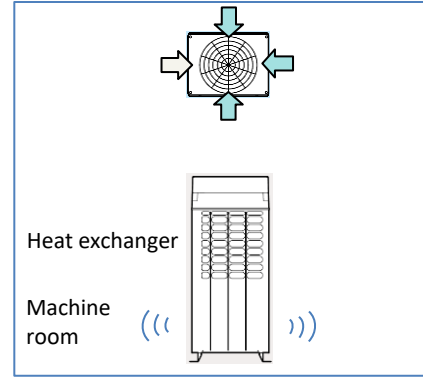
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# Carrier XPower

## Quiet Operation

### BLDC Inverter fan

- Fan inverter control: 64 steps
- Brushless DC electric Fan motor
- Low noise level
- Auto silent operation for balcony application



Note: Flow speed(m/s) 0 15

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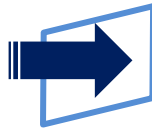
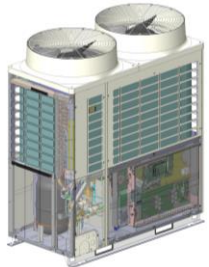
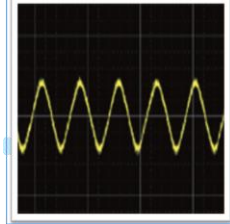
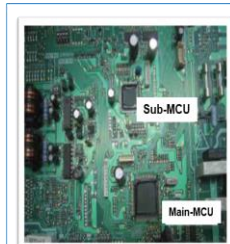
# Carrier XPower

## VRF Control



### Advanced "I/F" (Interface) Technology

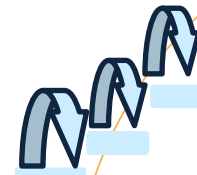
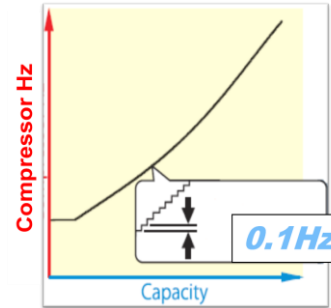
- ✓ Dual MCU system
- ✓ High-speed operation by parallel processing
- ✓ Fast handling of capacity requirements from each indoor unit
- ✓ Produces a smooth sine curve which improves operating efficiency



### Vector Controlled Inverter

#### Ultra-precise 0.1 Hz Infinity Variable Control

- ✓ Adjusts compressor rotation speed in near-seamless 0.1 Hz steps results in **faster cooling**
- ✓ Minimizes energy loss on changing frequencies
- ✓ Comfortable environment to minimal temperature variations.



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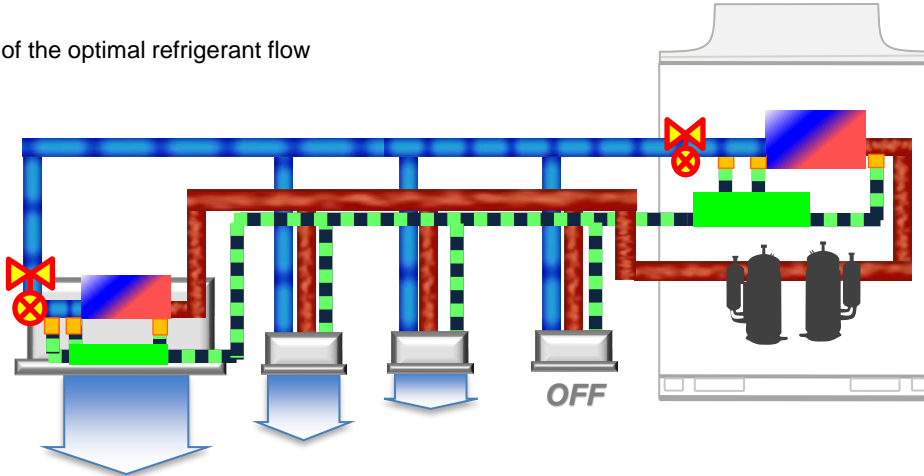


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# Carrier XPower

## Intelligent VRF Control

Calculation of the optimal refrigerant flow



Room temperature	26°C	} 5°C	27°C	} 3°C	23°C	} 1°C
Setting temperature	21°C		24°C		22°C	

For every indoor unit the system detects the difference between the two temperature sensors and regulates the refrigerant flow to reach and maintain the desired level of comfort. This feature is available in cooling mode

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# Carrier XPower

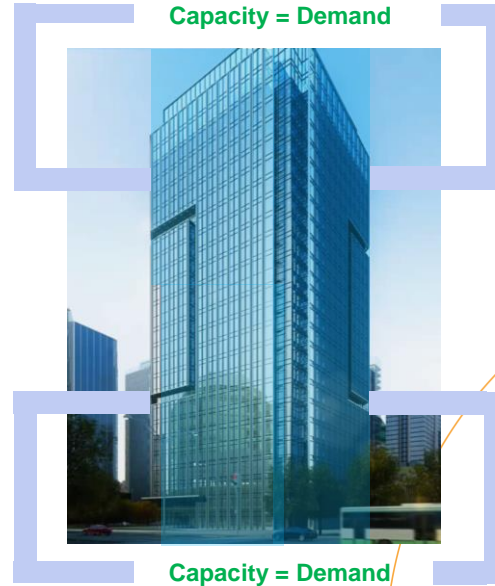
## Intelligent VRF Control



- Without intelligent VRF control, distribution of refrigerant across each indoor unit within a building can become uneven, resulting in over capacity on some units and low capacity on others.



- With intelligent VRF control, the distribution of refrigerant across each indoor unit is uniform, ensuring the capacity output of each unit precisely matches its demand.



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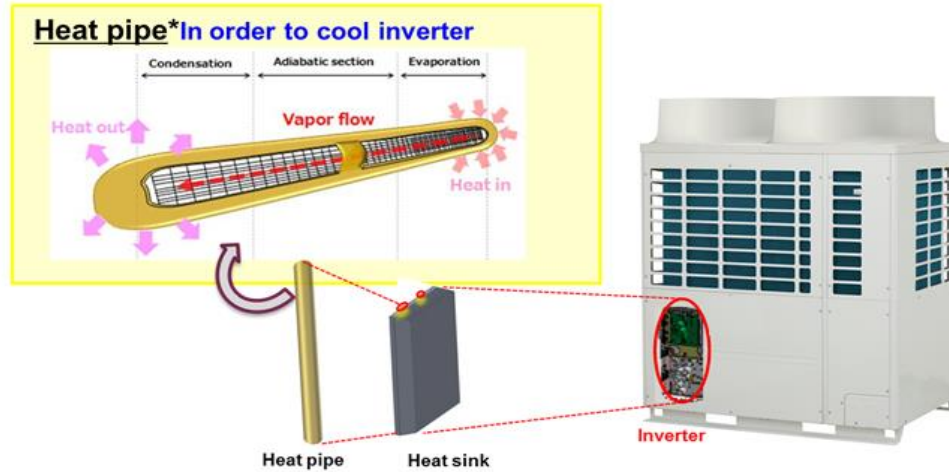
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# Carrier XPower

High Ambient Operation



Thanks to improve performance heat sink with heat pipe for the inverter cooling, cooling temperature range expanded (Middle East Model only)

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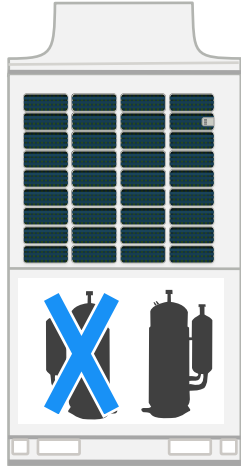
# Carrier XPower

## Back-up Operation

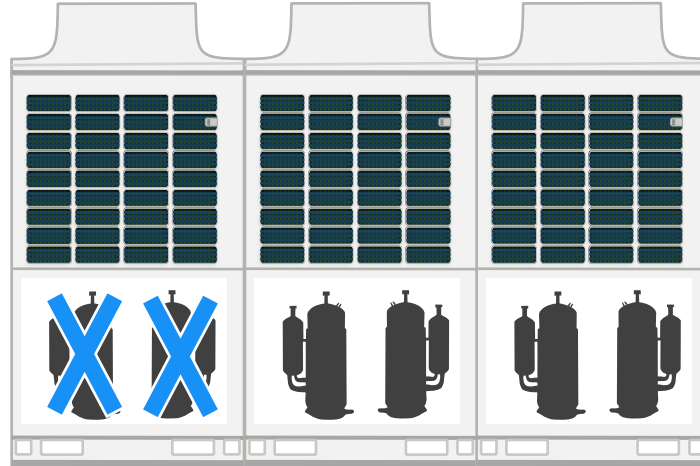


The ALL inverter control can be adjusted to compensate for a failed compressor or header unit

### Single Outdoor Unit Backup



### Module Outdoor Units Backup



In an unlikely event of a compressor failure, backup operation is available in both a single system or as a module

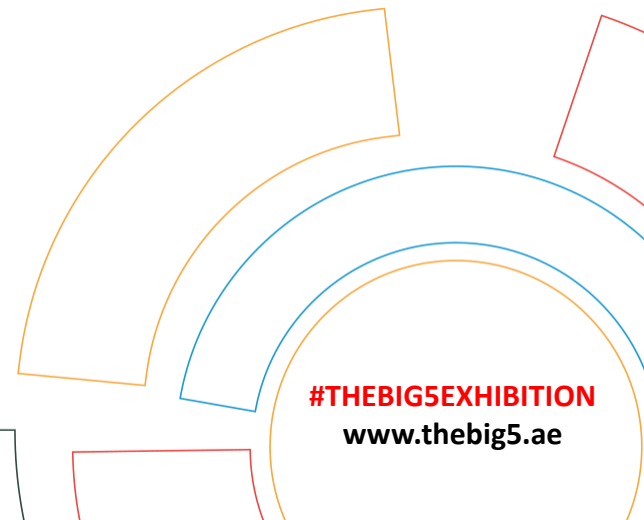
NOTE 1: Compressor Backup is available in single systems

NOTE 2: 50% or more of the compressors must be operational within a single module system

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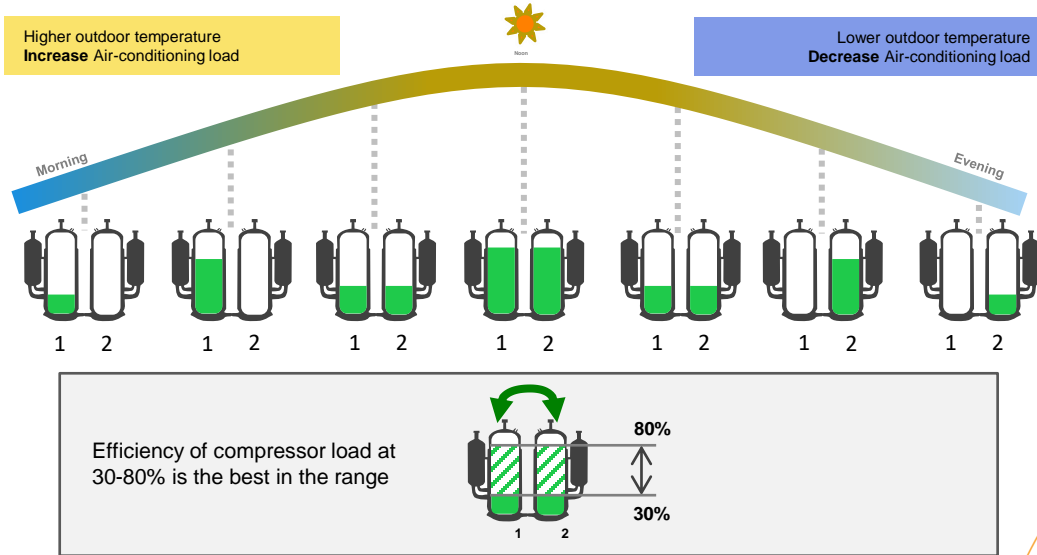
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# Carrier XPower

## Sustainability & Energy Saving



X-Power controls the operation of each compressor, while maintaining the same overall compressor performance.



In order to improve system reliability the compressor control logic has been designed so that not one compressor will operate continually over an extended period of time

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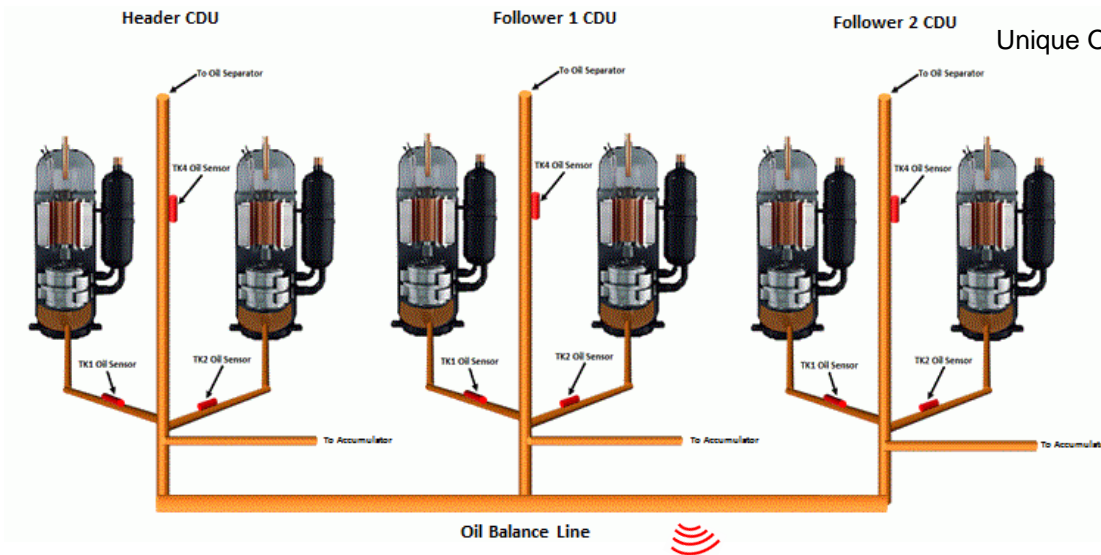


# Carrier XPower

## Oil Management



### Unique Oil Management Control



The Carrier VRF control continually monitors the “real time” oil level inside each of the compressors. Based on these readings the system can maintain the optimum amount of oil inside each of the compressors. This is achieved by system oil retrieval controls and a dedicated oil balance line between CDU's.

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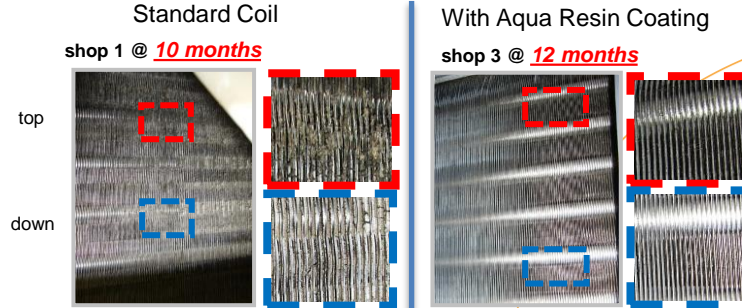
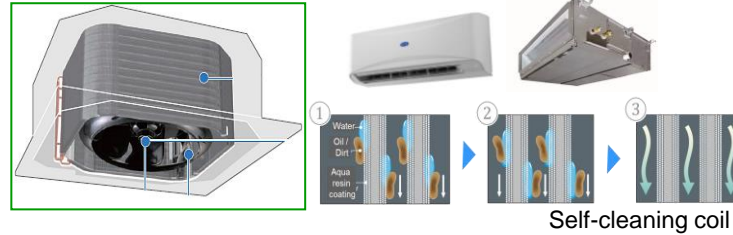
# Carrier XPower

Self Cleaning Magic Coating – VRF IDU



## SPECIAL AQUA RESIN COILS CALLED 'MAGIC COATING'

Carrier offer unique coating on coils called **Magic coating and has a satin finish** which doesn't allow dust/mold to accumulate on the coil at all. Hence much less maintenance, increase the life of the coil and of course consistent performance for years!!



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# Carrier XPower Controller Line-up



## Wireless Remote Control



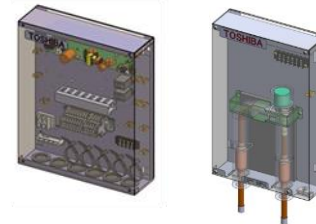
## Wired Remote Control



40VCW311SJEE  
40VCW311SJMM\*  
7-day Timer

40VCW534SJEE  
40VCW535SJMM\*  
Wired Remote

## DX FAHU Kit



DX controller & Valve Kit  
TCB & RBM

## Advanced Central Controls



40VCC420SJEE  
40VCC521SJEE  
Smart Manager  
Up to 128 Indoor Unit



40VCC631SJEE  
Touch Screen Controller  
Up to 512 Indoor Unit

## BMS Interface



TCB-IFLN642TLE  
LonWorks Interface



TCB-IFMB640TLE  
Modbus Interface



BMS-IFBN640TLE  
BACnet Interface

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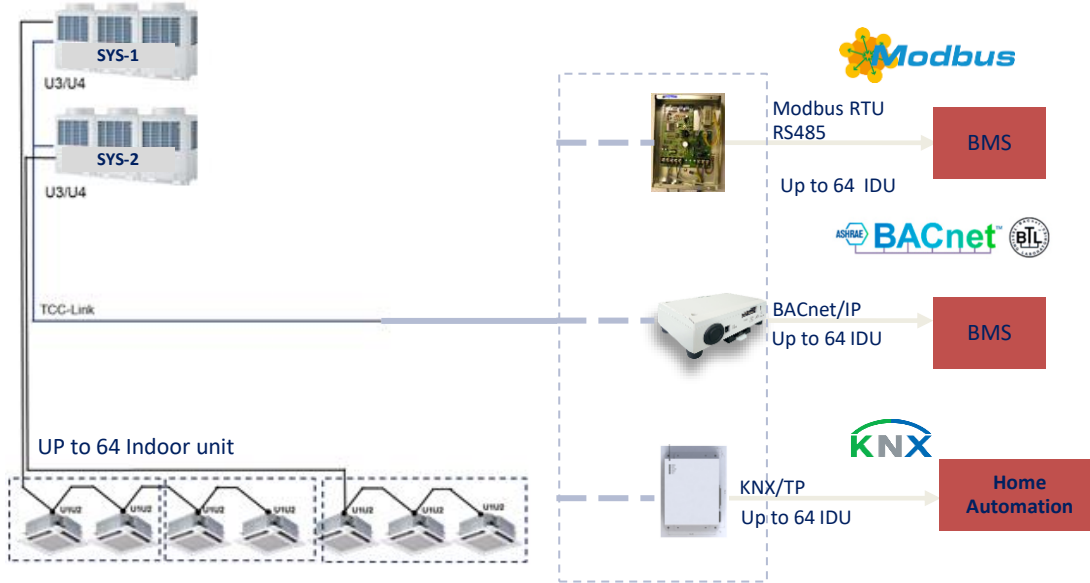
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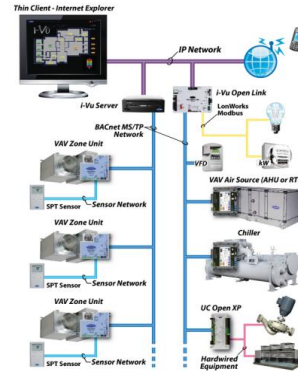
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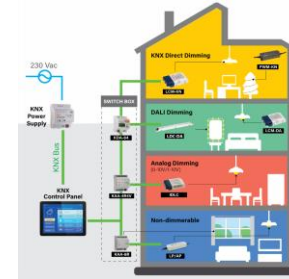
## BMS Integration Solution



### The Carrier i-Vu Open Control System



### BMS Integration



### Home Automation - KNX Integration



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# Carrier XPower

## Fresh Air Configurations



### Air Handling Unit Configuration

**DX-Coil Interface**

VRF CDU      Air Handler

DX Valve Kit

DX Controller

Connectable CDU: Heat Pump VRF	Capacity Range: Up to 112 HP	Valve kit - capacity modulation
Multiple wired controller options	IAQ Offering	Modular system

### 100% Fresh Air Unit

Model	40VD048	40VD072	40VD096
Air Vol. (m³/h)	1080	1680	2100
ESP (Pa)	170-230	140-180	160-205

- Large air-flow rate design
- DC Inverter
- Multiple selectable external static pressure
- Can be incorporated into centralized control

### Air-to-Air Heat Exchanger

Model	40VH050	40VH080	40VH100
Air Vol. (m³/h)	500	800	950
Max. ESP (Pa)	120	120	135

**Cooling Mode**

**Free Cooling Mode**

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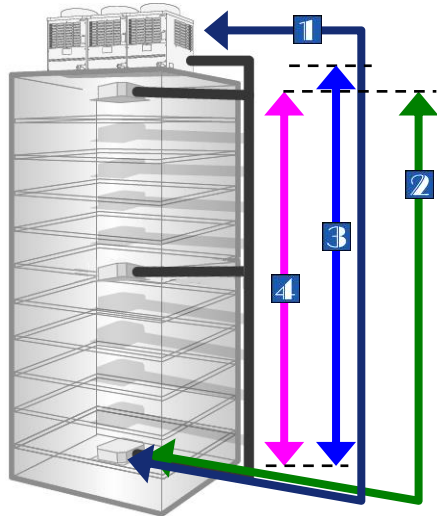
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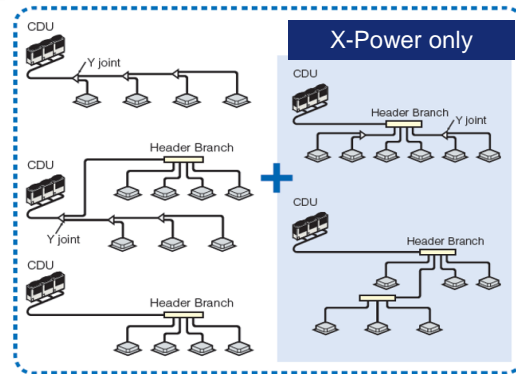
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# Carrier XPower

## Design Flexibility

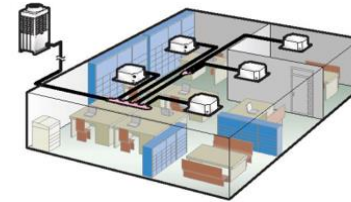


Total length	1000m*
1 Farthest equivalent length	235m
2 Farthest pipe from 1 <sup>st</sup> branch	90m**
3 Height between CDU-FCU (outdoor unit above / below)	90m***/ 40m
4 Height between FCU-FCU	40m



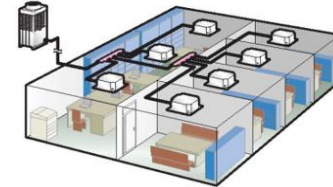
<Example>

Large room layout



Renewal

Small Compartment



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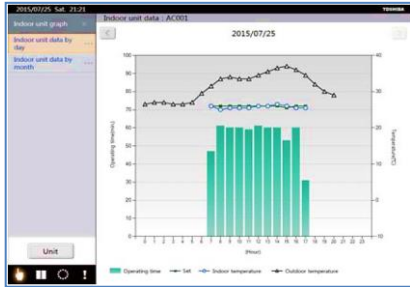
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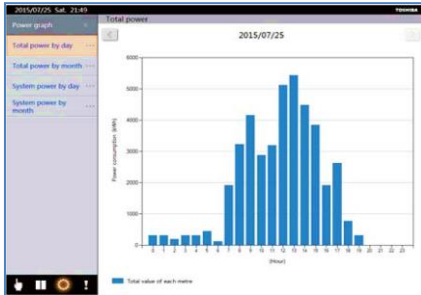
# Carrier XPower

## Operation Data Analyzer Tools

### On Controller Screen



### Indoor Unit Data



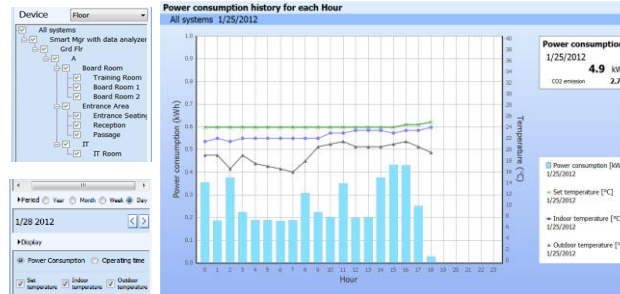
### Power Consumption data

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### On PC Screen



### Power consumption analysis

**Power consumption ranking for each Unit**  
All systems 1/25/2012

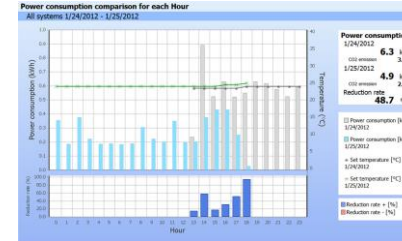
Ranking	System	Floor	Tenant	Area	Unit	Power Consumption	CO2 emission
1	Smart Mgr with data analyzer Grd Fl	A	Board Room	Board Room	Board Room 2	0.5 kWh/HP	0.3 kg
2	Smart Mgr with data analyzer Grd Fl	A	Entrance Area	Reception		0.5 kWh/HP	0.3 kg
3	Smart Mgr with data analyzer Grd Fl	A	Entrance Area	Passage		0.4 kWh/HP	0.2 kg
4	Smart Mgr with data analyzer Grd Fl	A	Entrance Area	Entrance Seating		0.3 kWh/HP	0.2 kg
5	Smart Mgr with data analyzer Grd Fl	A	Board Room	Board Room 1		0.2 kWh/HP	0.1 kg
6	Smart Mgr with data analyzer Grd Fl	A	Board Room	Training Room		0.1 kWh/HP	0.1 kg
6	Smart Mgr with data analyzer Grd Fl	A	IT	IT Room		0.1 kWh/HP	0.1 kg

### Alarm history list

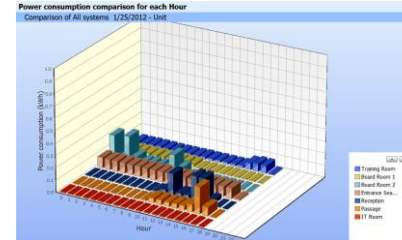
Floor	Tenant	Area	Unit	Date and time	Content	Indoor model	Indoor serial number	Outdoor model	Outdoor serial number
Grd Fl	A	Board Room	Training Room	03/05/2012 16:34	F10:Indoor TA sensor error	40VU018S-4S-TEE1	012G0150	38VTO10168HTMM1	012V0150



Export Data



### Comparison Time Periods



### 3D IDU Comparison

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# Carrier XPower

## Conclusion



## Manufacturer/Supplier of the Year (VRF Systems)

VRF from TCTC



- > [Energy saving](#)
  - > Twin Rotary Inverter Compressor
  - > Minimum 2# Compressors in every model (8HP to 56HP)
  - > Fan with DC motor
  - > 4 sided - Heat Exchanger
  - > Intelligent VRF control – 0.1Hz
- > Wider capacity – 4HP To 56HP
- > 1 ODU can connect maximum 64 IDU
- > 50% to 135% flexible CR%
- > Installation flexibility – Small footprint, Long Piping up to 1000m equivalent length
- > Operating temperature range up to 52 deg C
- > Reliability – Multiple inverter compressors
- > Control solution – BMS Compatible & Central controller up to 512 FCU

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