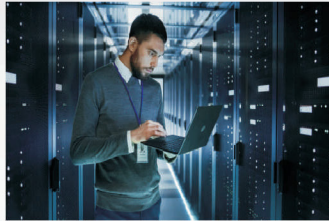




## DB-Aire In Row Series 50/60Hz

Precision Environmental Control Unit  
Cooling Capacity : 3 to 17 TR (12 to 60 kW)



R410A

**DUNHAM-BUSH®**

Products that perform...By people who care

# DB-AIRE IN ROW

## Precision Environmental Control Systems For Row-Based Cooling Solution

DB-AIRE IN ROW is another milestone in Dunham Bush DB-Aire product series. Provides a comprehensive cooling solution for a new generation of data centers, a wide range of capacities in a highly aesthetic and slim cabinet design with advanced features equipped on it.

Adopting a close-to-machine design concepts, DB-Aire IN ROW provides a cooling close to the server heat source for effective and efficient thermal management. A highly efficient and precise temperature-humidity control, DB-AIRE IN ROW is suitable for data center that demand for a high Tier class rating.

## GENERAL INFORMATION

### AIR COOLED DIRECT EXPANSION (DX) & CHILLED WATER SYSTEM

DB-Aire In Row available in 2 systems, Air Cooled DX and Chilled Water system. The nominal capacity range is 3 to 17 TR (12 to 60 kW) of cooling accordance to AHRI 1360 standard condition.

### VFD COMPRESSOR

DB-Aire In Row offers a Variable Frequency Drive (VFD) DC Scroll Compressor technology to satisfy the needs of high efficiency and reliable product controls.

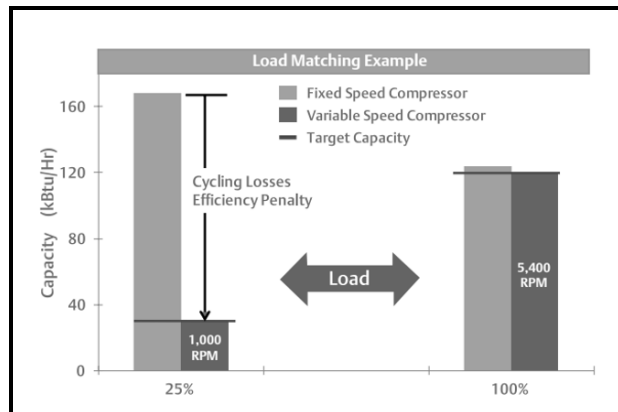


The capability to modulate compressor speed can precisely match the on-demand capacity while maintaining the optimum power usage.

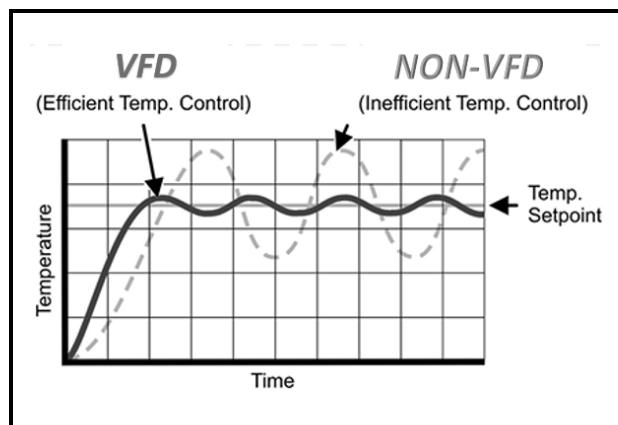
More energy saving can be expected especially during part load condition. Low start-up frequency will

significantly minimize the initial current peak that usually happen in normal fix speed compressor.

VFD Advantage 1 – Matching actual capacity needed thus optimize energy usage.



VFD Advantage 2 – Better temperature control compare to conventional fix speed control.



# GENERAL INFORMATION

## EC FAN

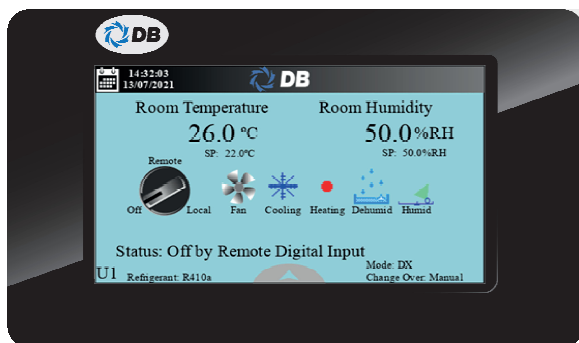
The indoor unit are equipped with electronically commutated (EC) compact axial fans to make sure the system is driven with lesser energy compare to the conventional AC motor type.



Capability to give higher part load efficiency due to the ability to precisely regulate the airflow according to the load demand makes EC fan is the right choice.

The EC fan's impellers were made of glass-fiber reinforced PA plastic and its housing was made of die-cast aluminium.

## TOUCH SCREEN CONTROLLER



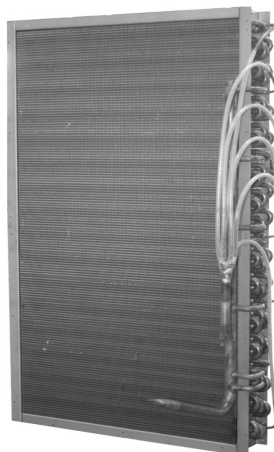
DB-Aire In Row is equipped with a colored touch screen controller for interactive controls and display. The 65k color display provides a high quality images and advanced features for user to conveniently navigate between various screens.

## COOLING COIL

Computer selected coil design, using interwoven coil surface increases unit efficiency at low loads.

Air is drawn through the coil at low velocity providing effective surface exposure with minimum turbulence.

This provides greater efficiency in the overall cooling and dehumidification process.



## FILTERS

The system shall be provided with disposable 2 inches (50 mm) deep with MERV8 rating filters for DBIR03/07V and DBIR08/10W. Then, disposable 4 inches (100 mm) deep with MERV8 rating filters for DBIR10/13V and DBIR 11/17W.



## ELECTRICAL HEATER

The one stage stainless steel finned tubular reheat coils provide ample capacity to maintain room dry bulb conditions during a system call for dehumidification. It gives an accurate controlled response to the requirements of the computer room. The heating elements are protected by thermal safety switches. The one stage of reheat create a noticeable lowering of energy use.



## ELECTRONIC EXPANSION VALVE (EEV)

The system shall be provided with Electronic Expansion Valve (EEV) for precise refrigerant control and highly responsive mechanism in adapting variable capacity operation, while maintain a constant superheat for efficient and reliable operation.



# NOMENCLATURE

## INDOOR UNIT

String	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
	D	B	I	R	O	3	V	A	U	B	D	N	N	N	N	N	N	E	N	N	N	N
1 & 2 DB-AIRE																						
3 & 4 SERIES IR = In Row																						
5 & 6 MODEL TR TR Std Airflow CFM (m³/h) Air Cooled DX 03 2,010 (3,415) 07 3,350 (5,692) 10 4,800 (8,155) 13 5,600 (9,514) Chilled Water 08 3,100 (5,267) 10 3,600 (6,116) 11 4,600 (7,815) 17 6,200 (10,534)																						
7 REFRIGERANTS V = R410A VFD Compressor W = Chilled Water																						
8 & 9 VOLTAGE AU = 380~415V/3ph/50Hz EF = 380-400V/3ph/60Hz																						
10 PIPE CONNECTION B = Standard Bottom Pipe Connection																						
11 DRAIN PAN D = Standard GI Painted T = Stainless Steel																						
12 HUMIDIFIER H = Humidifier Selected N = Not Selected																						
13 AIR DISCHARGE B = Horizontal Air Flow with Baffle N = Horizontal Air Flow without Baffle																						
14 EVAPORATOR CONTROL N = Standard EEV L = Standard EEV + Liquid Line Solenoid Valve (LLSV)																						

# PERFORMANCE AND TECHNICAL DATA

## AIR COOLED DX SYSTEM

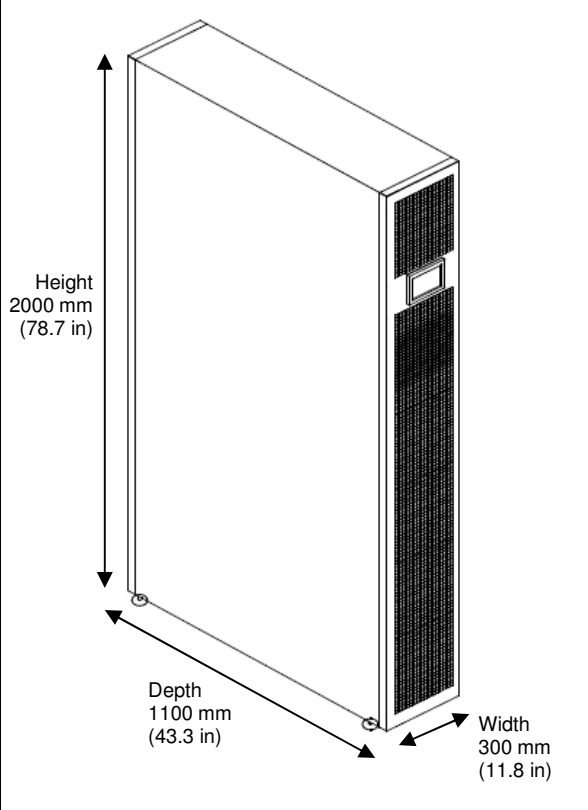
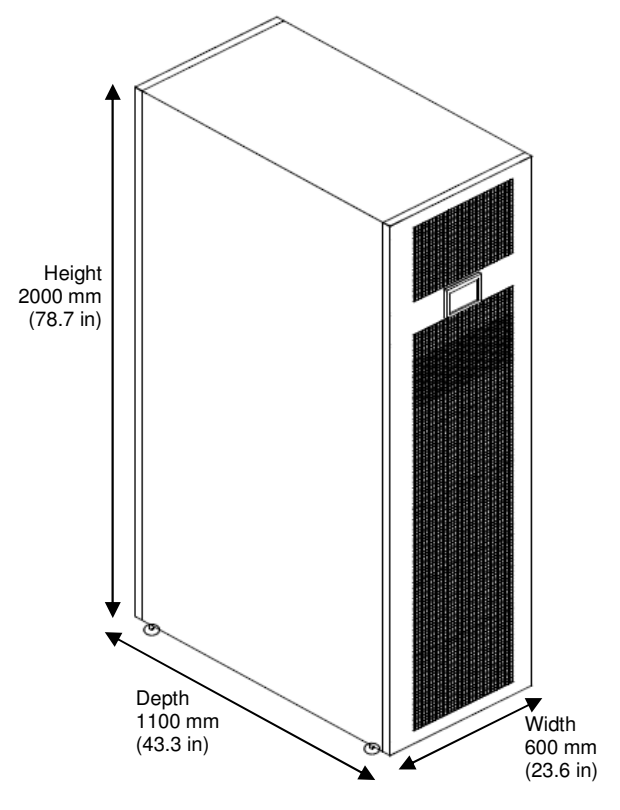
MODEL			DBIR03V	DBIR07V	DBIR10V	DBIR13V	
Rating 1 ID=DB95.0F/ WB67.7F/ 24%RH OD=DB95.0F  AHRI 1360 rating condition	Total Cooling Capacity	MBH (kW)	43.6 (12.8)	92.0 (27.0)	123.2 (36.1)	157.4 (46.1)	
	Sensible Cooling Capacity	MBH (kW)	43.6 (12.8)	92.0 (27.0)	123.2 (36.1)	157.4 (46.1)	
	Sensible Heat Ratio (SHR)		1	1	1	1	
Rating 2 ID=DB98.6F/ WB70.0F/ 24%RH 113.0F Cond. Temp.	Total Cooling Capacity	MBH (kW)	47.5 (13.9)	96.9 (28.4)	129.4 (37.9)	164.5 (48.2)	
	Sensible Cooling Capacity	MBH (kW)	47.5 (13.9)	96.9 (28.4)	129.4 (37.9)	164.5 (48.2)	
	Sensible Heat Ratio (SHR)		1	1	1	1	
Compressor (VFD)	Number of Compressor		1	1	1	1	
	Rating 1    Power Input	kW	3.4	5.2	9.1	11.9	
	Rating 2    Power Input	kW	3.1	5.0	8.6	10.9	
	Hot Gas; Liquid Lines, 50/60Hz	In	1/2 ; 3/8	7/8 ; 5/8	7/8 ; 5/8	7/8 ; 5/8	
EC Fan	Fan Qty		3	5	7	9	
	Air Volume (ESP 0 inwg)	CFM (m³/h)	2,010 (3,415)	3,350 (5,692)	4,800 (8,155)	5,600 (9,514)	
	Fan Size	mm	200	200	200	200	
Evap Coil DX	Face Area	ft² (m²)	6.6 (0.6)	11.3 (1.1)	14.2 (1.3)	18.3 (1.7)	
	Face Velocity	FPM (m/s)	290 (1.5)	282 (1.4)	347 (1.8)	405 (2.1)	
	Condensate Drain O.D	In	7/8	7/8	7/8	7/8	
Air Filter	Efficiency Rating		MERV 8	MERV 8	MERV 8	MERV 8	
	Thickness	In	2	2	4	4	
	Type		Disposable	Disposable	Disposable	Disposable	
Reheat (Electric)	Capacity	MBH (kW)	6.8 (2.0)	10.2 (3.0)	20.5 (6.0)	20.5 (6.0)	
Steam Humidifier (Optional)	Capacity (max.)	lbs/hr (kg/hr)	3.3 (1.5)	3.3 (1.5)	3.3 (1.5)	3.3 (1.5)	
	Power Input (max.)	kW	1.1	1.1	1.1	1.1	
Sound Pressure Level (at 1m distance)			dBA	81	83	85	86
Electrical Data (415V/3Ph/50Hz)			RLA	16.3	25.3	35.9	48.4
			MCA	18.8	29.5	41.5	56.8
*Rating 1 Condition			MFS	30	50	65	95
Electrical Data (400V/3Ph/60Hz)			RLA	16.0	25.0	35.4	47.8
			MCA	18.6	29.2	40.9	56.3
*Rating 1 Condition			MFS	30	50	65	90

# PERFORMANCE AND TECHNICAL DATA

## CHILLED WATER SYSTEM

Model			DBIR08W	DBIR10W	DBIR11W	DBIR17W	
RATING 1 ID=DB95.0F/ WB67.7F/ 24%RH EWT/LWT= 50.0F/62.0F AHRI 1360 rating condition	Total Cooling Capacity	MBH (kW)	103.3 (30.3)	116.3 (34.1)	137.3 (40.2)	205.3 (60.2)	
	Sensible Cooling Capacity	MBH (kW)	103.3 (30.3)	116.3 (34.1)	137.3 (40.2)	205.3 (60.2)	
	Sensible Heat Ratio (SHR)		1	1	1	1	
	Water Flow Rate	GPM (m³/hr)	17.2 (3.9)	19.4 (4.4)	22.9 (5.2)	34.2 (7.8)	
	Water Pressure Drop	PSI (kPa)	1.1 (21.8)	1.3 (26.9)	1.2 (24.5)	1.8 (36.8)	
EC Fan	Fan Qty		5	6	7	10	
	Air Volume (ESP 0 inwg)	CFM (m³/h)	3,100 (5,267)	3,600 (6,116)	4,600 (7,815)	6,200 (10,534)	
	Fan Size OD	mm	200	200	200	200	
Coil (Chilled Water)	Face Area	ft² (m²)	7.0 (0.7)	7.0 (0.7)	10.3 (1.0)	11.2 (1.0)	
	Face Velocity	FPM (m/s)	421 (2.1)	489 (2.5)	426 (2.2)	526 (2.7)	
	Condensate Drain O.D	Inch	7/8	7/8	7/8	7/8	
Chilled Water Control	3-Way Modulating Valve, Size	DN, mm	25	25	25	40	
		Kv, m³/h	10	10	10	16	
Air Filter	Efficiency Rating		MERV 8	MERV 8	MERV 8	MERV 8	
	Thickness	In	2	2	4	4	
	Type		Disposable	Disposable	Disposable	Disposable	
Reheat (Electric)	Capacity	MBH (kW)	20.5 (6.0)	20.5 (6.0)	20.5 (6.0)	27.3 (8.0)	
Steam Humidifier (Optional)	Capacity (max.)	lbs/hr (kg/hr)	3.3 (1.5)	3.3 (1.5)	3.3 (1.5)	3.3 (1.5)	
	Power Input (max.)	kW	1.1	1.1	1.1	1.1	
Sound Pressure Level (at 1m distance)			dBA	83	84	85	86
Electrical Data (415V/3Ph/50Hz)  *Rating 1 Condition		RLA	13.0	13.4	13.8	18.2	
		MCA	13.5	14.1	14.6	19.2	
		MFS	20	20	20	25	
Electrical Data (400V/3Ph/60Hz)  *Rating 1 Condition		RLA	12.4	12.9	13.3	17.5	
		MCA	13.0	13.5	14.1	18.6	
		MFS	20	20	20	25	

## DIMENSIONAL AND WEIGHT DATA

			
Model	Weight (kg)	Model	Weight (kg)
DBIR03V	225	DBIR10V	360
DBIR07V	265	DBIR13V	375
DBIR08W	245	DBIR11W	340
DBIR10W	250	DBIR17W	355

## CONDENSER SELECTION

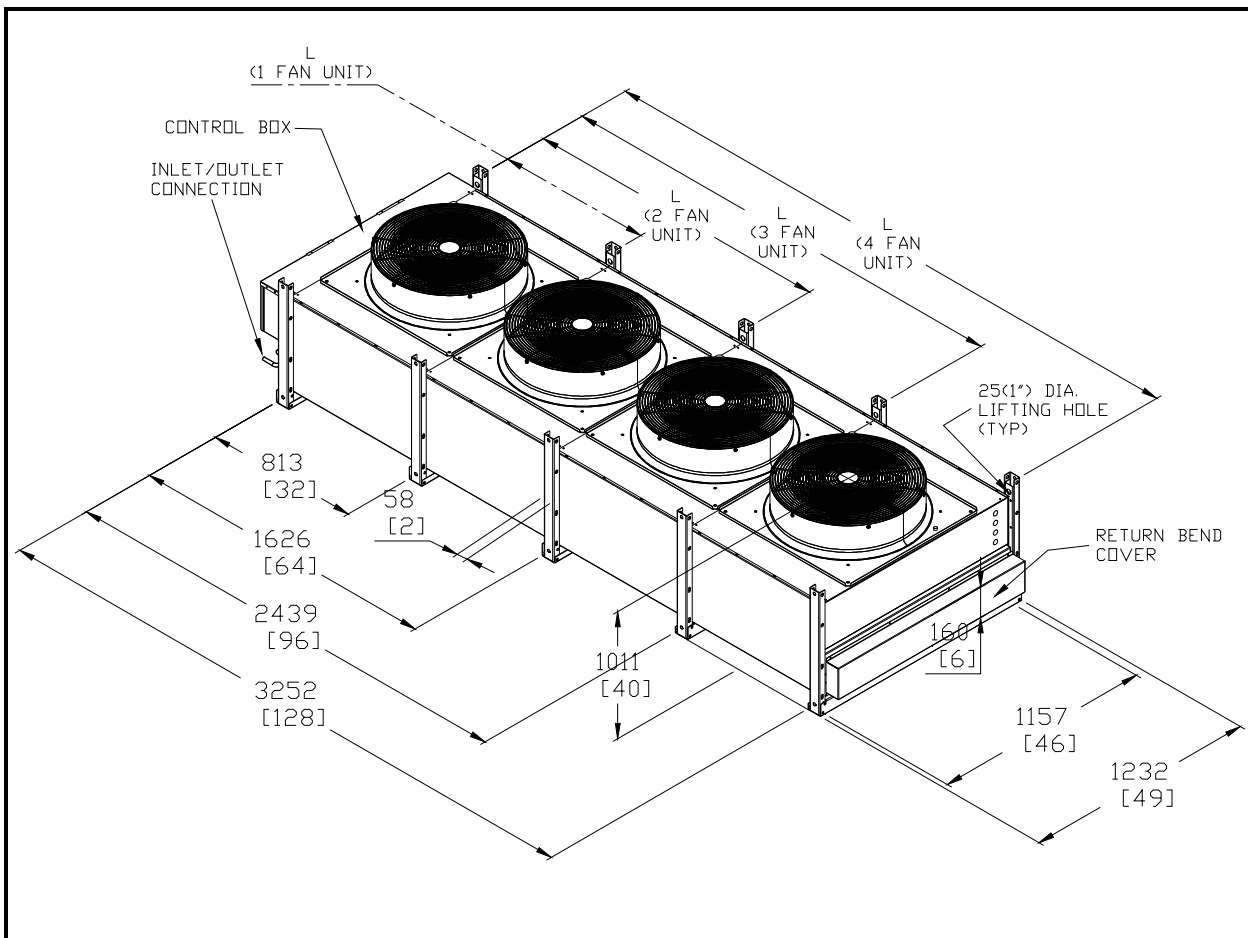
Selections are to be based on standard airflow rate and return air temperature of 35°C / 19.8°C (95°F / 67.7°F) or lesser at sea level.

Model	Dx-System	DBIR03V	DBIR07V	DBIR10V	DBIR13V
<b>Total Heat Rejection (Nominal)</b>	MBH (kW)	56.7 (16.6)	118.1 (34.6)	155.0 (45.4)	196.3 (57.5)
35°C (95°F) Ambient	-	DBRC04	DBRC13	DBRC17	DBRC20
37.8°C (100°F) Ambient	-	DBRC06	DBRC13	DBRC17	DBRC20
40.6°C (105°F) Ambient	-	DBRC06	DBRC13	DBRC17	DBRC26
43°C (110°F) Ambient	See Note 1	DBRC08	DBRC17	DBRC20	DBRC30
46°C (115°F) Ambient	See Note 1	DBRC17	DBRC26	DBRC34	DBRC44
49°C (120°F) Ambient	See Note 2	DBRC17	DBRC26	DBRC34	DBRC44
52°C (125°F) Ambient	See Note 3	DBRC20	DBRC30	DBRC40	DBRC44

Notes: 1.) Multiply Total Compressor Power Input by 1.05  
2.) Multiply Cooling Capacity by 0.9. Multiply Total Compressor Power Input by 1.1  
3.) Multiply Cooling Capacity by 0.9. Multiply Total Compressor Power Input by 1.2

# REMOTE AIR-COOLED CONDENSERS

## TECHNICAL DATA



Model	Physical Data					Electrical Data							
	Length 'L' mm (inches)	Fans		Approx. Weight kg (lbs)	Motor Qty	RPM		415V/3Ph/50Hz			400V/3Ph/60Hz		
		Qty	Total L/S (CFM)			50Hz	60Hz	MCA	MFS	FLA	MCA	MFS	FLA
DBRC 04	870 (34¼)	1	3210 (6800)	100 (220)	1	925	1110	2.1	6.0	1.7	2.0	6.0	1.6
DBRC 06	870 (34¼)	1	3210 (6800)	111 (244)	1	925	1110	2.1	6.0	1.7	2.0	6.0	1.6
DBRC 08	870 (34¼)	1	3210 (6800)	122 (268)	1	925	1110	2.1	6.0	1.7	2.0	6.0	1.6
DBRC 10	870 (34¼)	1	3210 (6800)	134 (295)	1	925	1110	2.1	6.0	1.7	2.0	6.0	1.6
DBRC 11	870 (34¼)	1	3210 (6800)	180 (400)	1	925	1110	2.1	6.0	1.7	2.0	6.0	1.6
DBRC 13	1683 (66¼)	2	6420 (13600)	190 (420)	2	925	1110	3.8	10.0	3.4	3.6	10.0	3.2
DBRC 17	1683 (66¼)	2	6420 (13600)	204 (450)	2	925	1110	3.8	10.0	3.4	3.6	10.0	3.2
DBRC 20	1683 (66¼)	2	6420 (13600)	265 (583)	2	925	1110	3.8	10.0	3.4	3.6	10.0	3.2
DBRC 26	2500 (98¼)	3	9630 (20400)	288 (634)	3	925	1110	5.5	10.0	5.1	5.2	10.0	4.8
DBRC 30	2500 (98¼)	3	9630 (20400)	320 (700)	3	925	1110	5.5	10.0	5.1	5.2	10.0	4.8
DBRC 34	2500 (98¼)	3	9630 (20400)	355 (780)	3	925	1110	5.5	10.0	5.1	5.2	10.0	4.8
DBRC 40	3308 (130¼)	4	12838 (27200)	380 (835)	4	925	1110	7.2	10.0	6.8	6.8	15.0	6.4
DBRC 44	3308 (130¼)	4	12838 (27200)	410 (900)	4	925	1110	7.2	10.0	6.8	6.8	15.0	6.4

Note: All dimensions are in mm (inches).



# SPECIFICATION GUIDE

This specification describes requirements for precision air conditioning system. The system shall be designed to maintain precised temperature and humidity conditions for applications such as computer server rooms, telecommunication facilities, clean rooms, laboratories, etc. The precision environmental control system shall be factory assembled by Dunham-Bush Industries, Malaysia.

## DESIGN REQUIREMENTS

### (A) Direct Expansion (DX) System

- The system shall have a total cooling capacity of \_\_\_\_ MBH / \_\_\_\_ kW and a sensible cooling capacity of \_\_\_\_ MBH / \_\_\_\_ kW based on an entering air temperature of \_\_\_\_ °F / \_\_\_\_ °C DB and \_\_\_\_ °F / \_\_\_\_ °C WB.
- The system shall be designed based on \_\_\_\_ °F / \_\_\_\_ °C DB ambient temperature. For low ambient application, the system shall also be designed to operate at \_\_\_\_ °F / \_\_\_\_ °C DB ambient temperature.
- The unit shall be supplied with \_\_\_\_ / \_\_\_\_ / \_\_\_\_ (Volt/Phase/Hz) electrical service.

### (B) Chilled Water (CW) System

- The system shall have a total cooling capacity of \_\_\_\_ MBH / \_\_\_\_ kW and a sensible cooling capacity of \_\_\_\_ MBH / \_\_\_\_ kW based on an entering air temperature of \_\_\_\_ °F / \_\_\_\_ °C DB and \_\_\_\_ °F / \_\_\_\_ °C WB.
- The system shall be supplied with chilled water with an entering water temperature of \_\_\_\_ °F / \_\_\_\_ °C and leaving water temperature \_\_\_\_ °F / \_\_\_\_ °C.
- The unit shall be supplied with \_\_\_\_ / \_\_\_\_ / \_\_\_\_ (Volt/Phase/Hz) electrical service.

## 1 STANDARD FEATURES (ALL SYSTEMS, INDOOR UNIT)

### 1.1 Filters

The system shall be provided with 2 inches (50mm) deep (for model DBIR 03V/07V, 08W/10W) or 4 inches (100mm) deep (for model DBIR 10V/13V, 11W/17W) extended surface pleated disposable type filters rated for MERV8 efficiency to ASHRAE 52.2 standard (equivalent to G4). Filters shall be withdrawable from the rear of the unit.

### 1.2 Fan Motor

The system shall be provided with high efficiency EC motor axial fan set.

### 1.3 Evaporator Air Discharge

The system shall be configured for front free-flow discharge air pattern with rear return air inlet. The system shall be supplied with grilles on the cabinet doors for front discharge & rear return air configuration. It also has option of manual configuration air baffle at front discharge outlet to direct the air movement.

### 1.4 Electric Reheat

The electric reheat shall be factory installed with low watt density finned-tubular nickel-plated element heater with overheat safety controls.

### 1.5 Electrical Circuits

The system shall be provided with a factory installed electrical enclosure as per local code requirements. The fan motor(s), compressor(s), electric heaters, humidifier (if applicable) shall have their own circuit breaker and contactor. The electrical circuit shall have provision for user to cut off control power during fire / emergency shutdown

### 1.6 Control System

#### 1.6.1 Controller and display

The unit shall be provided with control system with the following features,

- The control algorithm and parameters shall be stored in flash memory and E<sup>2</sup>PROM of the controller and shall retain even in the event of power failures, without requiring a backup battery
- 4.3" graphical touch terminal with 65k color display
- Built in memory for data logging

# SPECIFICATION GUIDE

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- Temperature and humidity controlled
- Configurable by user
- Alarm status/display
- Analog input/output display
- Digital input/output status
- Remote start/stop input
- Digital input for customer input alarm
- General alarm output (dry contact)
- Self-diagnostics
- Security password access with multiple access level for advanced settings
- Unit status display with following information:
  - Current room temperature and temperature setpoint
  - Current room relative humidity and relative humidity setpoint
  - System ON/OFF
  - Operating mode (cooling/ heating/ humidifying/ dehumidifying)

## 1.6.2 Alarm Monitoring

When the system is in alarm condition, the system shall activate an audible buzzer and visual alarm message on the terminal display. A digital output (dry contact) shall be closed to indicate the alarm condition. The following alarm conditions shall be monitored by the controller:

- High room temperature
- Low room temperature
- High supply air temperature
- High room humidity
- Low room humidity
- No air flow/loss of air flow
- Sensor failure
- Evaporator fan overload alarm
- Customer interlock alarm
- Unit/ Compressor running hours threshold exceeded
- LAN network disconnected alarm
- High/Low refrigerant pressure alarm (DX models)
- Chilled water flow switch alarm (chilled water models)
- Humidity Alarms
- Under floor water detector alarm (optional)
- Smoke detector alarm (optional)

## 1.6.3 Master-Slave Sequencing Control

When more than one unit is present in the system, master-slave or duty-standby control of this group of units shall be done by just connecting controller of each unit in serial and require no additional controller.

## 2 DIRECT EXPANSION (DX) SPLIT SYSTEMS WITH REMOTE OUTDOOR AIR-COOLED CONDENSER (DBRC MODELS)

### 2.1 Compressor

Compressor shall be mounted on the base via vibration isolators. Compressor shall be charged with polyolester oil and designed for use with R410A refrigerant.

### 2.2 Refrigeration Circuits

The refrigeration system shall be of the direct expansion type with one hermetic scroll compressors. All refrigeration circuit shall be pre-piped with copper tubing and include expansion valve with external equalizer, filter dryer, sight glass, refrigerant service valves, pressure fittings of pressure sensor and charging/access ports in each circuit.

### 2.3 Evaporator Coil

The evaporator coil shall be of draw through air design for uniform air distribution. The evaporator coil shall be quality construction of seamless copper tube, mechanically bonded to hydrophilic aluminium fins with galvanized coil plates. The coil shall be factory leak and pressure tested to 650psig (45 bar) for R410A system and the refrigeration system shall be sealed prior to shipment. A galvanized and painted drain pan shall be provided to cover the entire coil area. The drain pan shall be designed to incorporate sloped gutter for complete condensate removal.

# SPECIFICATION GUIDE

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## 2.4 Remote Outdoor Air-Cooled Condenser (DBRC Models)

The remote condenser shall be constructed from sturdy heavy gauge steel sheets with epoxy powder coated oven baked, factory standard beige color to provide a durable finish.

The remote condenser shall include direct driven propeller fans, condenser coil, fan guard, thermally protected rated IP55 motors, integral factory wired and tested control panel. The condenser coil shall be quality construction of seamless copper tube, mechanically bonded to aluminium fins with galvanized coil plates. The coil shall be factory leak and pressure tested to 650psig (45 bar) for R410A system and the refrigeration system shall be sealed prior to shipment.

The evaporator and condenser sections shall ship with a dry-nitrogen holding charge ready for field refrigerant charging.

## 3 CHILLED WATER (CW) SYSTEMS

### 3.1 Chilled Water Coil

The evaporator coil shall be of draw through air design for uniform air distribution. The chilled water coil shall be quality construction of seamless copper tube, mechanically bonded to hydrophilic aluminium fins with galvanized coil plates. The coil shall be factory leak and pressure tested to 450psig (31 bar) and sealed prior to shipment. Copper pipe for brazed connection shall be provided as standard. A galvanized and painted drain pan shall be provided to cover the entire coil area. The drain pan shall be designed to incorporate sloped gutter for complete condensate removal.

### 3.2 Chilled Water Control

The water circuit shall include 3-way forged brass valve and modulating actuators. The microprocessor positions the valve in response to room condition. Cooling capacity shall be controlled by bypassing chilled water around the coil.

## 4 OPTIONS

### 4.1 Stainless Steel Drain Pan

A stainless-steel condensate drain pan shall be provided for the evaporator/chilled water coil in lieu of standard galvanized and painted drain pan.

### 4.2 Steam Generating Humidifier

Humidifier shall be factory installed inside the unit. The humidification system shall be an electrode cylinder type, complete with fill valve, drain valve, adjustable humidity output and automatic flush cycle activated on demand from the microprocessor control system.

### 4.3 Liquid Line Solenoid Valve (DX Systems only)

A factory fitted liquid line solenoid valve shall be provided for each refrigeration circuit as an option.

### 4.4 Hydrophilic or Copper Fin for Condenser Coil (DBRC)

Condenser coils shall be provided with hydrophilic or copper fins in lieu of aluminium.

### 4.5 Black Color Epoxy Powder Coating for Remote Condenser (DBRC)

The remote condenser DBRC shall be epoxy powder coated oven baked black color paint in lieu of standard beige color.

### 4.6 Under Floor Water Detector

A remote water leak detector shall be factory provided for field installation. When water leak is detected, cooling mode of the unit is off.

### 4.7 Smoke Detector

A smoke detector shall be supplied loose for remote mounting. The unit shall shut down when smoke alarm is triggered.

### 4.8 Low Ambient Kit

Outdoor fan cycling for better performance during low ambient.

### 4.9 Remote Temperature Sensor

The sensor is used to monitor the temperature of other devices in the equipment room, and the temperature can be used as the control temperature of the unit.

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