



नव मंगलूर पत्तन प्राधिकरण
NEW MANGALORE PORT AUTHORITY
यांत्रिक अभियंता विभाग
Mechanical Engineering Department
इलेक्ट्रिकल इंजिनियरिंग डिविजन, पणंबूर, मंगलूर
Electrical Engineering Division
Panambur, Mangalore – 575010

E-mail: praveenkumark.k@nmpt.gov.in

Phone: 0824 2887736/756

GSTIN: 29AAALN0057A2ZG

No. 8/9/ESD-I/AC/Data Centre/2024

Date: 22-03-2024

REQUEST FOR BUDGETARY OFFERS

Sir,

Sub: “Supply, Installation, Testing and Commissioning of Bottom Discharge 5.5 TR – Direct Expansion Precision Air Conditioner Units in place old Units at Data Centre, NMPA”.

Budgetary Offer in sealed covers superscribed as “**Supply, Installation, Testing and Commissioning of Bottom Discharge 5.5 TR – Direct Expansion Precision Air Conditioner Units in place old Units at Data Centre, NMPA**” may please be submitted addressed to “**The Executive Engineer (Elec.), Electrical Division, Administration Building, New Mangalore Port Authority, Panambur, Mangalore- 575010**” not later than **3.00 PM on or before 28.03.2024.**

Sl No.	Item Description	Qty	Unit	Rate	Amount(Rs)
	PART-I				
1	Supply of Bottom Discharge 5.5 TR - DX (Direct Expansion) Precision Air Conditioner units with following items a) Digital scroll compressor- with variable capacity results in better power saving. b) Backward curved Fan with EC Motor- which varies the speed based on temperature condition. c) Thermal Expansion valve. d) Evaporator Cooling coil- having better heat exchange and achieves delta temperature delta	03	No's.		

	<p>of 10-12 degree C, suitable for data centre application.</p> <p>e) HCR Air cooled condenser coil - with FSC which varies the fan speed based on data centre load and ambient conditions.</p> <p>f) Microprocessor (ICOM) (Direct Panel mount Large Liquid Crystal Display as a factory installed.)</p> <p>g) Heater</p> <p>h) Infrared Humidifier</p> <p>i) Power Panel and Starter for all drives</p> <p>j) BMS Configuration card (Unity Platform card with all configuration)</p> <p>k) G4 grade Clogged Filters 95% down to 5 micron filter.</p> <p>Each unit footprint should not exceed 890mm (W) 890mm (D) 1970 (H)</p> <p>Model: Px021 or Equivalent.</p> <p>Refrigerant: R410A Eco friendly.</p> <p>Warranty: 12 months from date of commissioning.</p>				
	Total				
	Applicable GST @ 28%				
	Grand Total				
	PART-II				
1	Unloading, lifting, shifting and positioning of Bottom Discharge 5.5 TR - DX (Direct Expansion) Precision Air Conditioner units.	03	No's.		
2	Supply, installation of indoor MS stands suitable for Bottom Discharge 5.5 TR - DX (Direct Expansion) Precision Air Conditioner units with civil work.	03	No's.		
3	Supply, installation of outdoor MS stands suitable for Bottom Discharge 5.5 TR - DX (Direct Expansion) Precision Air Conditioner units with civil work.	03	No's.		
4	Supply and fixing of Copper pipe 18G, 1 1/8 with 9mm thick sleeve insulation.	40	Mtrs.		
5	Supply and fixing of Copper pipe 18G, 7/8 with 9mm thick sleeve insulation.	40	Mtrs.		
6	Supply and laying of 3 Core 2.5 Sqmm I/O communication cable for PAC units.	50	Mtrs.		

	(Interconnecting cabling between indoor and outdoor unit)				
7	Supply and laying of 40mm UPVC Drain pipe with insulation and end termination.	20	Mtrs.		
8	Supply and laying of 32mm UPVC fresh water pipe with insulation and end termination.	20	Mtrs.		
9	Supply and laying of 32mm UPVC ball valve for fresh water line.	03	No's.		
10	Supply of eco-friendly R 410A Refrigerant .	35	Kgs.		
11	Supply and installation of CAT6 E sequencing cable for PAC units	40	Mtrs.		
12	Supply and installation of 8 Port 10/100mbps D-LINK Switch for PAC units	01	No.		
13	Supply and installation of Nitrile Rubber Floor Insulation sheet, Class '0', 13mm thickness.	30	Sqft.		
14	Supply and installation of Damper with Actuator with power supply cable suitable for Bottom Discharge 5.5 TR - DX (Direct Expansion) Precision Air Conditioner units	03	No's.		
15	Supply and installation of Mild Steel Powder coated, broken white, RAL 9010 60-80 microns), 70% opening Air grills suitable for 25mm thick False Floor Tile. a) Size: 600mm x 600 mm, b) Height: 25mm c) Material: Frame 16G CRCA Sheet, Blades: 20G CRCA Roll formed slotted U channels or fabricated 18G CRCA slotted U Channels d) Point Load: 500Kgs e) Uniformly distributed load: 1500Kgs/Sqmtr. f) Face velocity: 2.75m/Sec g) Air quantity range: 1250 CFM	03	No's.		
16	Installation, Testing and Commissioning of 03 No's Bottom Discharge 5.5 TR – Direct Expansion Precision Air Conditioner Units by using refrigerant including all necessary items with Civil work etc. as a complete job.	01	Job		
17	Buy Back for old Bottom Discharge 5.5 TR – Direct Expansion Precision Air Conditioner Units including	03	No's.		

	Indoor/Outdoor units with all accessories.				
	Total				
	Applicable GST @ 18%				
	Grand Total				
	PART-III				
1	Non Comprehensive Maintenance Contract for Newly installed Bottom Discharge 5.5 TR - DX (Direct Expansion) Precision Air Conditioner units after expiring Warranty period- First year. (By month Site visit)	12	Months		
2	Non Comprehensive Maintenance Contract for Newly installed Bottom Discharge 5.5 TR - DX (Direct Expansion) Precision Air Conditioner units after expiring Warranty period- Second year. (By month Site visit)	12	Months		
3	Non Comprehensive Maintenance Contract for Newly installed Bottom Discharge 5.5 TR - DX (Direct Expansion) Precision Air Conditioner units after expiring Warranty period- Third year. (By month Site visit)	12	Months		
	Total				
	Applicable GST @18%				
	Grand Total				
	Total=PART-I+PART-II+PART-III (excluding GST)				
	Total=PART-I+PART-II+PART-III (including GST)				

Sd/-
Executive Engineer (E)
Electrical Division, NMPA

TERMS & CONDITIONS:

1. The rate quoted for the items shall be firm and F.O.R destination basis. Please note that NMPA is not issuing any concessional C or D forms.
2. Applicable GST will be paid as extra as per actual.
3. Offer shall be submitted in NMPA format only along with Terms & Conditions of Enquiry with seal & signature.
4. The Tenderer may visit the work site and get acquainted himself with the site conditions, nature of work involved before tendering. Any assistance, in this regard will be provided by the department under prior appointment and the undersigned may be contacted for the purpose.
5. The Tenderers should quote their rates in figures as well as in words the amount tendered by them. The amount per each item should be worked out and requisite total should be given. All rates shall be quoted in proper form in the tender schedule enclosed. The rates quoted should be valid for **90 days**.
6. No tools, plant, Labour, equipment, transport, etc., required for the work will be supplied departmentally and contractor has to make his own arrangements.

Sd/-

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Electrical Division, NMPA

Seal and sign of Tenderer

TECHNICAL SPECIFICATION

Unit inlet air temperature	23.0	°C	Sea level	0	m
Unit inlet air relative humidity	40.0	%	Refrigerant	R410A	
Unit airflow	8039	m3/h	Unit power supply	400v/3ph/50 Hz	
ESP	20	Pa	Compressor type	Digital Scroll	
Air flow configuration	Down flow Up		Expansion Valve	EEV	
			Compressor modulation	100	%
Unit	PX021DA + 1 x HCR33		Unit power input	6.82	KW
Gross total cooling capacity	19.0	KW	Unit Net Sens EER	2.45	
Gross sensible cooling capacity	19.0	KW	System power input	7.37	KW
SHR	1.00		Internal filter class (EN779 std)	F5	
Net total cooling capacity	16.8	KW	Internal filter air pressure drop	169	Pa
Net Sensible cooling capacity	16.7	KW	Coil air pressure drop	136	Pa
Off coil air temperature	15.9	°C	Unit air pressure drop	622	Pa
Off coil air relative humidity	62.2	%	Condensing temperature	49.0	C
Room SPL (@ 2m, f.f)	62.7	dB(A)	Width	844	mm
Supply air temperature	16.8	C	Depth	890	mm
Supply air relative humidity	58.7	%	Height	1970	mm
			Weight	300	kg
Quantity	1	n	Operating Ampere	1 x 3.52	A
Fan modules	Premium		Full load Ampere	1 x 5.60	A
Power Supply	400v/3ph/50 Hz		Locked rotor Amp	1 x 0.10	A
Power input	1 x 2.29	KW	Room fan modulation (%)	97	%
Type	Digital Scroll		Compressors COP	4.24	
Power Supply	400 v/ 3 ph/ 50 Hz		Operating Ampere	1 x 7.90	A
Power Point	1 x 4.5	KW	Full load Ampere	1 x 11.80	A
			Locked rotor Amp.	1 x 64.00	A

Condenser model	HCR33		Max outdoor SPL (@5m, f.f)	50.0	dB(A)
Version	Standard		Actual outdoor SPL (@5m,f.f)	50.0	dB(A)
Air discharge	Vertical		Power input	0.55	KW
Power Supply	230 v/1 ph/50 Hz		Full load Ampere	2.50	A
Variex	Yes		Locked rotor Amp.	4.80	A
Heat Load	23.5	KW	Width	1340	mm
Outdoor air temperature	38	C	Depth	1112	mm
Condenser airflow (@ max speed)	7400	m3/h	Height	910	mm
Condenser actual airflow	7400	m3/h	Weight	75	kg

Sd/-
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Electrical Division, NMPA

COMPONENT SPECIFICATION

PRECISION AIR CONDITIONING UNITS

The Precision Environmental Control Systems shall be with up flow/ down flow air delivery. The Precision Air Conditioner shall be High sensible cooling capacity and high sensible Heat Ratio (i. e. the sensible to total cooling capacity ratio).

PRODUCT

The frame shall be constructed of 2.5, 2.0 and 1.2 mm folded galvanized steel. The external panels shall be constructed of 1.2mm zinc coated sheet steel, Front, rear and end panels shall be fitted with 25 mm glass fiber insulation, fire rated to Australian Standard 1530 (indices 0,0,0,3). The cabinet shall powder coated with charcoal grey color and have a texture finish. The hinged front panels shall be removable and include captive ¼ turn fasteners. The cabinet shall be assembled with pop rivets providing ease of disassembly.

FILTRATION

The filter chamber shall be an integral part of the system and withdraw able from the front of the unit. Filtration shall be provided by dry media disposable filters capable of filtering air to 95% down to 5 micron efficiency and shall be replaceable from the top of the unit. Filtration shall be provided by deep V form G4 performance dry disposable media to ASI324.

EC FANS

Units should be offered with backward curve direct drive Fan, High efficiency, external rotor electronically commutated (EC) motor with integrated electronics, True soft start characteristics (inrush current lower than operating current), Backward curve, corrosion resistant aluminum fan wheel, Maintenance free design and construction. The fan section shall be designed for higher air flow. The unit shall be fitted with one (two, three) direct-driven, high efficiency, single inlet, backward curved; the fan motors shall be Electronically Commutated (EC), IP54, with internal protection and speed regulation via controller signal. They shall statically and dynamically balanced.

COMPRESSOR

One refrigeration circuit, incorporating a high efficiency, fully hermetic Variable Capacity Digital Scroll Compressor with crankcase heater. The compressor shall be charged with R410A. The compressor solenoid valve shall unload the compressor & allow the variable capacity operation, i.e. the Digital Scroll compressor shall modulate its capacity from 20% to 100% without frequency variation. Each compressor is equipped with pre-set high and low

pressure switches for protection against high condensing and low evaporating temperatures. Each compressor shall have internal motor protection and be mounted on vibration isolators.

REFRIGERATION CIRCUIT

The refrigeration system shall be of the direct expansion type and incorporate one or more hermetic scroll compressors, complete with crankcase heaters. Cooling steps shall be 33%, 66% & 100% for three compressor models. A hot gas bypass solenoid valve shall be used on single compressor models. A system shall include a manual reset high pressure control, auto reset low pressure switch, externally equalized thermal expansion valve, high sensitivity refrigerant sight glass, large capacity filter drier and charging/access ports in each circuit. Each refrigeration circuit shall include rigidly mounted isolation valves in the discharge and liquid lines to aid servicing and installation (air cooled units only).

EVAPORATOR COIL

The evaporator coil shall be A-coil (for down flow) and V-coil (for up flow) incorporating draw-through air design for uniform air distribution. The coil shall be constructed of rifled bore copper tubes and louvered aluminium fins, with the frame and drip tray fabricated from heavy gauge aluminium. All metal parts in contact with condensate shall be the same material to prevent electrolytic corrosion. The drip trays shall ensure the collection of condensate and be accessible for cleaning. The cooling shall be maximum of condensate and minimum 11 fins per inch and the face velocity shall not be more than 2.5 m/s.

DEHUMIDIFICATION

SINGLE COMPRESSOR MODELS.

A specific dehumidification cycle (split-suction) shall operate by reducing the operating surface temperature in a section of the refrigeration coil by means of a solenoid valve on the suction header. Full airflow of the unit will be maintained at all times to ensure consistent air distribution to the conditioned space.

MULTIPLE COMPRESSOR MODELS.

A specific dehumidification cycle (split-liquid) shall operate by reducing the operating surface temperature in a section of one of the refrigeration coils by means of a solenoid valve in the liquid line. Full air flow of the unit will be maintained at all times to ensure consistent air distribution to the conditioned space.

REMOTE AIR COOLED CONDENSER

The Air-cooled condenser shall be the low profile, weatherproof type incorporating high efficiency, direct drive, external rotor motors with axial

blade fans. The condenser shall balance the heat rejection of the compressor at 39C ambient. The condenser shall be constructed from heavy duty aluminium and corrosion resistant through special anticorrosive epoxy coatings for any specific polluted areas. Heavy duty mounting legs and all assembly hardware shall be included. Condensers shall be suitable for 24 assembly hardware shall be capable of providing vertical or horizontal discharge. The condenser shall be fully factory wired and required a 230 volt, single phase, 50 Hz electrical service.

The high performance heat exchanger shall include mechanically expanded cross-hatched copper tubes and louvered aluminium fins for maximum heat transfer.

HUMIDIFIER

Humidification shall be provided by boiling water in a high temperature polypropylene steam generator. The steam shall be distributed evenly in to the bypass air stream of the environmental control system to ensure full integration of the water vapour in to the supply air without condensation. The humidifier shall be capable of providing 10 KG of steam per hour. The humidifier shall have an efficiency of not less than 1.3 kg/kw and be fitted with an auto flush cycle activated on demand from the microprocessor control system. The humidifier shall be fully serviceable with replaceable electrodes. Waste water shall be flushed from the humidifier by the initiation of the water supply solenoid valve via a U-pipe overflow system. Drain solenoid valves will not be used. The humidifier shall be type test certified for direct connection to portable water supplies in accordance with Australian Standard MP52.

ELECTRICAL HEATING

The electric heating elements with a capacity of 9 kW and shall operate at a heat density level not exceeding 60 kW/m². The low watt density elements shall be of finned tubular steel construction finished in high temperature paint. The heating circuit shall include dual safety protection through loss of air and manual reset high temperature controls.

BMS CONFIGURATION UNITY CARD

Unity Platform card family delivers enhanced communication and control of AC Power, Power Distribution and Thermal Management products. The platform communicates with software tools and services. The card employs an Ethernet network to monitor and manage a wide range of operating parameters, alarms and notification about the power, distribution and cooling equipment. The card also communicates with building Maintenance Systems and Network Management Systems. The card supports the Company Protocol, Remote Service Delivery Protocol and HTTP Web by Default.

UNIT SIZE

The maximum foot print area of the unit shall not exceed:

0.72 m ²	up to 35 kW
1.45 m ²	above 35 and up to 70 kW
2.17 m ²	above 70 and up to 100 kW

The unit shall require front access only for routine service and installation work.

MICROPROCESSOR CONTROLLER:

The unit control shall be factory-set for intelligent Control which uses “fuzzy logic” and “expert systems” methods. Proportional and Tunable PID shall also be user selectable options. Internal unit component control shall include the following.

SYSTEM AUTO RESTART:

The auto restart feature will automatically restart the system after a power failure. Time delay is programmable

SEQUENTIAL LOAD ACTIVATION:

On initial startup or restart after power failure, each operational load is sequenced with a minimum of one second delay to minimize total inrush current.

PREDICTIVE HUMIDITY CONTROL:

Calculates the moisture content in the room and prevents unnecessary humidification cycles by responding to changes in dew point temperature. The control shall be compatible with all remote monitoring and control devices. Options are Available for BMS interface via MODbus, BACNet and SNMP. The control processor shall be microprocessor based with a 128x64 dot matrix graphic front monitor display and control keys for user inputs mounted in an ergonomic, aesthetically pleasing housing. The controls shall be menu driven. The display & housing shall be viewable while the unit panels are open or closed. The display shall be organized into three main sections: User Menus, Service Menus and Advanced Menus. The system shall display user menus for: active alarms, event log, graphic data, unit view/status overview (including the monitoring of room conditions, operational status in % of each function, date and time), total run hours, various sensors, and display setup and service contacts. A password shall be required to make system changes within the service menus. Service menus shall include: setpoints, standby settings (lead/lag), timers/sleep mode, alarm setup, sensor calibration, maintenance/wellness settings, option setup, system/network setup, auxiliary boards and diagnostics/service mode. A password shall be required to access the advanced menus.

USER MENUS SHALL BE DEFINED AS FOLLOWS:

ACTIVE ALARMS:

Unit memory shall hold the 200 most recent alarms with time and date stamp for each alarm.

EVENT LOG:

Unit memory shall hold the 400 most recent events with id number, time and date stamp for each event

GRAPHIC DATA VIEW:

Two graphic records shall be available: return air temperature and return air humidity.

UNIT VIEW – STATUS OVERVIEW

Simple or Graphical. Unit view summary displays shall include temperature and humidity values, active functions (and percent operation) and any alarms of the host unit.

TOTAL RUN HOURS

Menu shall display accumulative component operating hours for major components including compressors, fan motor, humidifier and reheat.

MICROPROCESSORS SHOULD BE INTELLIGENT ENOUGH TO DO THE FOLLOWING TASK:

- Save Energy using Predictive Humidity Control
- Built-in Lead/Lag Functions for enhanced system reliability
- Wellness Calculation alerts service personnel before problems occur
- Unit to Unit (U2U) Communications allows Lead/Lag and optional teamwork settings for maximum flexibility and control.
- Optional Intelli Slot cards offer external monitoring through Modbus RTU and HTTP/SNMP protocols.

SERVICE MENUS BE DEFINED AS FOLLOWS: SET POINTS:

Menu shall allow set points within the following ranges:

- Temperature Set point 18-29°C (65-85°F)*
- Temperature Sensitivity 0.6-5.6°C(1-10°F)
- Humidity Set point 20-80% RH*
- Humidity Sensitivity 1-30% RH
- High Temperature Alarm 2-32°C (35-90°F)
- Low Temperature Alarm 2-32°C(35-90°F)
- High Humidity Alarm 15-85% RH
- Low Humidity Alarm 15-85% RH

*The microprocessor may be set within these ranges, however the unit may not be able to control to extreme combinations of temperature and humidity.

STANDBY SETTINGS/ LEAD-LAG

Menu shall allow planned rotation or emergency rotation of operating and standby units.

TIMERS/SLEEP MODE

Menu shall allow various customer settings for turning on/off unit.

TEAMWORK MODES OF OPERATION

Saves energy by preventing operation of units in opposite modes multiple units.

AUXILIARY BOARDS

Menu shall allow setup of optional expansion boards.

DIAGNOSTICS/SERVICE MODE

Control input and output values and status shall be displayed to aid in unit diagnostics and trouble shooting.

Control inputs shall be indicated as on or off at the front display. Control outputs shall be able to be turned on or off from the front display without using jumpers or a service terminal. Each control output shall be indicated by an LED on a Circuit board.

The unit shall also incorporate the following protections:

- Single phasing preventers.
- Reverse phasing
- Phase unbalancing
- Phase failure
- Overload tripping (MPCB) of all components

Sd/-

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