

## **Technical Specifications for Air cooled chiller**

### **A. Scope of work:**

Design and supply of an air cooled Not Less Than 100 TR water chiller on given conditions as per this technical specification. The chiller is required to supply and maintain the deionised (DI)/ demineralized (DM) water flow. The scope includes factory acceptance tests before the dispatch of the water chiller.

**Quantity - 1 Unit**

### **B. Pre-Qualification criteria for the bidders:**

- (i) The bidder/ manufacturer should have a proven record of manufacturing & supply of chiller of similar capacity. The supplier should enclose a list of clients in India where chillers of similar capacity have been supplied in last three years along with their full contact details like address, phone, email addresses and name of the contact person. It is advisable to attach performance certificate issued by the client in support of the above. Startups/MSE's are exempted from bid evaluation criteria with regard to turnover/experience criteria.
- (ii) The manufacturer of the chiller should have ISO-9001 quality management system to enforce standardized practices in design, quality control, manufacturing, testing and servicing of the equipment.
- (iii) The bidder should preferably be the manufacturer of the chiller. In case, the bidder is not the original manufacturer then an authorization letter from the principal authorizing the bidder for sale and service of the chiller should be enclosed with the offer.
- (iv) The manufacturer should have testing facility at their works which should be AHRI certified and electrical power and thermal load availability for testing of the chiller to full capacity should be available. The same should be clearly confirmed in the bid.

### **C. List of documents to be submitted with offer :**

Following documents should be submitted by the supplier along with the offer:

- (i) General arrangement drawing with cross section details of space requirement and relative positions of the components.
- (ii) Specification & make of all important components like Heat exchanger, Pump, Pressure regulator, Controller, Sensors, Flow meter, Level Controller, Flow switch, Pressure Transmitter.
- (iii) The static weight, space & electrical details of the complete unit and condenser units.
- (iv) Compliance statement as per Annexure-A of this specification.

**D. Technical Specification:**

a)	Nominal refrigeration cooling capacity	100 TR or above at 45 °C ambient temperature
b)	Operating Temperature Range	10°C to 30°C
c)	Maximum ambient air temperature	45°C
d)	Compressor	Semi hermetic or fully sealed Screw compressor
e)	Water flow rate	300 lpm or higher
f)	Type of Starter	VFD Drive Starter
g)	Unit Capacity Reduction Steps	Step less/ Capacity control for 100% to 25% load
h)	Refrigerant	R-134a
i)	Operating fluid	Demineralized Water (DM)
j)	Chiller control panel GUI	With touch screen LCD/ HMI
k)	Condenser Type	Air Cooled - operating with low noise fans
l)	Evaporator Type	Shell & Tube Flooded Type
m)	External Oil Separator	Required
n)	Economizer	Required
o)	Power requirements:	415 VAC $\pm$ 10%, 3 Phase, 50 Hz $\pm$ 3%

**E. Codes and Standards:**

Water chiller shall be designed as per the applicable codes like TEMA, ASME, ANSI B31.1, AHRI and ASHRAE. Water chiller unit's performance shall be certified in accordance with AHRI standard 550/590 or equivalent standards.

**F. Specifications of the individual components:****1. Unit cabinet:**

- The water chiller system should be compatible to IP65.
- Frame should be of galvanized steel with heavy gauge thickness.
- Exterior panels should be with a baked enamel powder/ paint finish.
- Cabinet should be capable of withstanding 500-hour salt spray test in accordance with the ASTM standard.

**2. Fans:**

- Condenser fans should be corrosion resistant. They should be direct driven and should be statically and dynamically balanced.

- b. All the fans should be protected by coated steel wire safety guards.
- c. All the fan motors should be totally enclosed with permanently lubricated ball bearings, Class F insulation and internal automatic reset thermal overload protection.
- d. The discharge of the fans should be vertically upwards.

### **3. Compressors:**

- a. The compressor(s) should be semi or fully hermetic, Direct-driven, Screw type compressors. It should be designed as per standard & tested in accordance with AHRI or equivalent standards.
- b. Compressor(s) should be mounted on appropriate vibration isolation pads to prevent the transmission of vibrations to the structure.
- c. The compressor motors should be cooled by the refrigerant gas only.
- d. The compressor motors should have either internal line break thermal and current over load protection or external current over load modules with compressor temperature sensors.
- e. It should have protection devices such as high discharge temperature, electric oil heater, oil temperature, motor winding temperature, self protection module, insulation class F and oil level switch etc.
- f. The supplier has to provide justification for selection of compressor capacity.

### **4. Air cooled Condenser:**

- a. The condenser unit should be air cooled type.
- b. Air cooled condenser shall be made of 99.9% pure copper tubes with aluminium fins.
- c. Assembled condenser coils should be leak tested and pressure tested at 400 psi (g).
- d. Condenser tubes should be cleaned, dehydrated and sealed.

### **5. Evaporator:**

- a. Evaporator shall be manufactured using compact ridged inner finned copper tubes. Tubes shall be mechanically expanded for better fitment.
- b. Unit shall be designed, manufactured and Tested as per ASME or equivalent standard.
- c. PUF or expanded polyurethane Insulation shall be provided along with flange type end Connection with SS hardware (nut/bolts)
- d. Anti-freeze Protection with an electrical heater and controlled by a thermostat shall be provided.

### **6. Refrigeration components**

- a. Refrigerant circuit components should include filter drier, moisture indicating sight glass, electronic expansion device, discharge and liquid service valve and complete operating charge of sides both refrigerant and compressor oil.

## **7. Stainless Steel Water Pump & plumbing**

- a. A dedicated low noise level (<75 dBa at 1 m distance) process Stainless Steel Pump of reputed make should be used for the circulation of water. The required capacity of the pump is 300 liters per minute (minimum) at 4 bar (g).
- b. Only Stainless Steel piping, valves etc (suitably insulated wherever necessary) are permitted to be used for the plumbing in the chiller system, for circulation.
- c. Pressure Gauge and temperature sensor should be provided at suitable locations.

## **8. Controls, diagnostics, and safety requirements**

The unit controls should include the following minimum components.

- i. Microprocessor with non-volatile memory. (Battery backup system will not be accepted).
- ii. Separate terminal block for power and controls.
- iii. Control transformer to serve all controllers, relays and control components.
- iv. ON/OFF control switch.
- v. Replaceable solid state controllers.
- vi. Pressure sensors should be installed to measure suction and discharge pressure for each circuit.
- vii. Suitable temperature sensors shall be installed for measuring the fluid temperature at both entering and leaving cooler.
- viii. Provision for field installation of accessory sensor to measure the return gas temperature to the compressor should be incorporated.
- ix. Any kind of instruments must be easily replaceable and no binding or any programming should be required while replacing instruments

The functions of the unit control should include the following minimum.

- i. Automatic circuit lead/lag for dual circuit.
- ii. Protections of the compressor by an auto-adaptive control to minimize the compressor wear.
- iii. Capacity control based on the leaving chilled water temperature and compensated by rate of change of return water temperature with temperature set point accuracy of 0.5 °C.
- iv. Seven day time schedule of operation.
- v. Chilled water pump start/ stop control and primary and standby sequencing to ensure equal pump run time.
- vi. Timed maintenance scheduling to signal maintenance activities for the pumps, condenser coil cleanings, strainer maintenance and other user-defined maintenance activities.

#### Diagnostics.

- i. The control panel should include a Scrolling Marquee display capable of indicating the safety lockout condition by displaying a code for which an explanation may be scrolled at the display.
- ii. The minimum information included for display should include the following.
  1. Compressor lockout.
  2. Loss of charge.
  3. Low fluid flow.
  4. Cooler set point.
  5. Chilled water reset parameters.
  6. Thermistor and transducer malfunctions.
  7. Entering and leaving water temperature.
  8. Compressor suction temperature.
  9. Evaporator and condenser pressure.
  10. System refrigerant temperature.
  11. Chiller run hours.
  12. Compressor run hours.
  13. Compressor number of starts.
  14. Instant TR Capacity
  15. Instant IKW / TR value
- iii. The display module, in conjunction with the microprocessor, must be capable of displaying the output or results of a service test. The service test should verify the operations of every switch, thermistor, fan and compressor before the chiller is started.
- iv. Diagnostics should also include the ability to review a list of at least 20 most recent alarms with clear language description of the alarm event.
- v. An alarm history buffer should allow the user to store minimum 99 alarm events with clear language descriptions, time and date stamp event entry.
- vi. The chiller controller should include multiple connection ports for communicating with LAN and access to chiller control functions from any point on the chiller.
- vii. The control system should also allow software upgrades without the need for new hardware modules.

Safety requirements. The unit should be equipped with all necessary components in conjunction with the control system to provide the following minimum protections:

- i. Loss of refrigerant charge.
- ii. Reverse rotation.
- iii. Low chilled water temperature.
- iv. Thermal over load.
- v. High pressure.

- vi. Electrical over load.
- vii. Loss of phase.
- viii. External over current protection for motors.

**9. Operating characteristics.**

- a. The unit should be capable of starting with 35°C entering water temperature to the cooler.
- b. The unit should be capable of starting and running in an open air environment at outdoor ambient temperature up to 45°C.

**10. Electrical requirements:**

- a. The Complete unit should operate on a 3-phase power at 415 V, 50 Hz.
- b. The primary electrical power supply should enter the unit at a single electrical box.
- c. The unit should be shipped with factory control and power wiring.

**G. Warranty Period:**

The manufacturer/ supplier shall furnish a warranty against defective workmanship and materials for minimum period of 12 months from the date of commissioning for the full unit. He shall commit himself to speedy servicing, repair or replacement of defective parts of the complete unit during the period of said warranty.

**H. Operation & Maintenance manual:**

Operation and maintenance manual should be submitted in soft as well as hard copies with the chiller.

**I. ACCEPTANCE TESTS**

**a. Factory Acceptance Tests (Pre-dispatch inspection)**

The manufacturer should perform the leak test, vacuuming test and gas charging test of the refrigeration piping before the purchaser's representative. Full functionality of the water chiller shall be demonstrated for acceptance. Purchaser's representative shall verify the conformance of the equipment with the technical specification. A dummy load will be used for testing the performance of the water chiller at its full rated capacity for 24 hours and the power consumption will be verified. Type testing certificate has to be submitted at the time of pre dispatch inspection.

**b. Site Acceptance Tests**

The installation of chiller is in the scope of purchaser. After installation of the chiller, the commissioning of the chiller will be carried out at site by the bidder Full functionality of the water chiller shall be demonstrated.

**J. Packing and transportation**

The manufacturer/ bidder is responsible for safe packing and transportation of the chiller system to purchaser's site. He shall ensure that the equipment is delivered to

purchaser's site without damage and any possible deterioration in performance due to poor transportation/ handling.

**K. Scope of RRCAT**

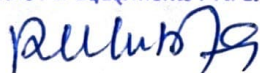
- a. All civil works. The supplier has to inform RRCAT well in advance to facilitate the civil work required for installation of chiller.
- b. Electrical tie-in point for the required rating. The exact power requirement shall be provided by the supplier.

### Annexure- A

The bidder shall **compulsorily fill** this compliance table and submit the signed & stamped copy along with quotation. (Note: Without this the offer will be considered incomplete & rejected)

S.No.	Description details as per tender	Indent value	Offer confirmation by the bidder
<b>Eligibility criteria for Screw Chiller</b>			
1.	OEM of screw chiller or his authorized agency	From 3 years	Manglam Techno Air Equipments
2.	Bidder documentary proof from OEM or authorized representative of OEM	Required	Confirmed
3.	Confirmation for successful completion of similar works during last three years.	Required	Confirmed
4.	Documents related to their similar purchase order lists	Required	Confirmed
5.	Confirmation regarding electrical power and thermal load availability for testing of chiller	Required	Confirmed
<b>Reference standard to be confirmed</b>			
6.	Chiller design shall be as per code ---	Required	ISO-9001-2008
7.	Chiller performance shall be certified in accordance with ---	AHRI or equivalent std	
8.	Electrical cabinet withstanding 500 hrs. salt spray test	ASTM	Confirmed
<b>Technical Specification confirmation</b>			
9.	Compressor semi or fully hermetically sealed screw type	Make & model	Bitzer, 100 TR, Model: 9593-240Y or equivalent
10.	Refrigerant R-134a first charge complete	To be confirmed	Confirmed
11.	Power supply 3 ph, 415 V $\pm$ 10%	To be confirmed	Confirmed
12.	Normal refrigeration cooling capacity	$\geq$ 100TR	Confirmed
13.	Cooling capacity control system	Stepless / 25% to 100%	Stepless
14.	Evaporator type	Shell & Tube	Shell & Tube Type
15.	Condenser type	Air cooled	Air Cooled
16.	Chiller Control panel GUI	Touch screen LCD/HMI	PLC Based Touch Screen
17.	Stainless steel circulation pump	Make & model	Kirloskar/ Crompton, 15 HP

For Manglam Techno Air Equipments Pvt. Ltd.



Authorised Signatory

(Name and Signature of Bidder with Seal)