Compressor specification

2-Stage, Water-Cooled
Oil-Free Air bearing Centrifugal

1. Scope

1.1. This specification is for a high-speed PM motor directly driven, oil-free, 2-stage water cooled centrifugal air compressor. The compressor shall be a 380kW ZCJSD model LBC600.

1.2. The compressor shall deliver 10,560 Nm³/h at 125 kPa(g) in accordance with ISO 1217, the outlet temperature increasing is estimated 70°C.

1.3. Based on the standard configuration, the overall size of the package is 2560mm*1560mm*2200mm (L*W*H), and the gross weight shall be 2,430kg.

2. General

2.1. The centrifugal air compressor shall be capable of delivering 100% oil-free of the required air demand as specified at standard operating conditions.

2.2. The compressor shall be designed and supplied as a complete package with all necessary equipment, including but not limited to the following components: inlet filter, air compression core, circuit breaker, silencer, vent valve, PM motor, Inverter, cooling system for coolant & air, microprocessor regulation and control system. All components shall be mounted on a common solid base frame and fully enclosed with a sound attenuating enclosure.

2.3. The compressor shall be a 2-stage compression, with one body rotor-impeller connection to minimize the loss of energy. Multi-stage compressors have an inter-cooler placed between stages and an after-cooler installed in the package.

2.4. The compressor package shall be rated to operate in ambient conditions from -20°C to 55°C.

2.5. The units shall be manufactured by a qualified manufacturer who has been manufacturing air compressors for at least ten (10) years.

2.6. The compressor manufacturer shall be certified under ISO 9001 / 9002 quality standards and ISO 14001 environmental standards.

3. Enclosure

3.1. The compressor shall be enclosed in a steel sound attenuating canopy with removable panels.

3.2. The sound attenuating material shall be flame retardant polyurethane foam.

4. Noise Levels

4.1. The compressor package shall not exceed 70 dB(A) when measured in the free field conditions at one meter.

5. Compressor Core

5.1. The material of volute shall be Aluminum alloy ZAl108.

5.2. The material of impeller shall be Aviation aluminum alloy Al7075.

5.3. The optimized design of impeller under advanced 3D fluid simulation analysis, with 84% aerodynamic isentropic efficiency.

5.4. A wide turndown range shall be from 45% to 100%.

6. PM Motor

6.1. Main parameters of the motor are as follows:
- Power supply: AC 380V/400V, 50Hz
- Rated output: 370kW
- Rated current: 680A
- Motor efficiency: 97.6%

6.2. The motor shall be ultra-premium high efficiency (IE5), water-cooled, permanent magnet motor with class H insulation, rated at 20,800 rpm. For increased reliability, the insulation temperature rise shall be limited to 125°C, IP 66 protection rating allows no dust or water ingress.

6.3. Rotor and shaft shall be of one-piece titanium alloy construction. Rotors must be balanced in accordance to ISO 1940 to guarantee the dynamic and static tolerances.

6.4. The high-speed rotor shall be supported by air bearing, means oil-free and no periodic maintenance is needed. The start/stop cycles shall be more than 500,000 times.

6.5. The complete motor shall be 100% maintenance-free.

7. Inverter

7.1. Variable Frequency Drives (VFD).

7.2. The adoption of water-cooling configuration has enhanced efficiency up to 97%.

8. Cooling System

8.1. High performance coolers for both coolant circuit and compression air shall be provided and mounted via couplings for stress free connections. Zero air loss drains with high level alarm shall be included.

8.2. The coolers shall be designed for 10 barg operation and shall be capable of providing approach temperatures of less than -20°C at design conditions

8.3. Tubular heat exchanger is adopted between inner coolant circuit and external cooling water tower.

8.4. Water-to-air plate intercooler, the plates must be brazed together with copper.

8.5. The aftercooler is optional for the outlet air temperature requirement less than 45°C.

9. Silencer

9.1. Use both absorptive and reactive design elements, combining airflow path management and acoustical materials to reduce noise, the resulting combination provides excellent broad-band, low and high frequency noise attenuation.

10. Vent valve

10.1. The vent valve shall be a low-pressure pneumatic type, driven by solenoid valve.

10.2. The required driving air pressure for the vent valve shall be lower than 0.3kgf/cm².

11. Inlet Air Filter

11.1. The filter shall be a 2-stage filtration and be factory installed inside the compressor enclosure.

11.2. The filter shall have the following SAE fine efficiency ratings:

1 micron:	98.0%
2 microns:	99.5%
3 microns:	99.9%

11.3. The filter shall be equipped with a differential pressure indicator for monitoring by the control system.

11.4. The service interval of the filter must be at least 4,000 hours.

12. Circuit breaker

12.1. The circuit breaker shall be equipped for protection, in case of overload, short-circuit and ground fault.

13. Control System

13.1. The compressor shall be equipped with an onboard microprocessor controller which will control, monitor and protect the operation and condition of the air compressor.

13.2. The controller shall have a 7” color display.

13.3. The control algorithm shall include a function to proactively stop the compressor during periods of low demand without having to wait for the stop timer to time out.

13.4. The controller must be capable of graphing any of the measured temperature or pressure inputs on the display.

13.5. The compressor shall be able to be controlled locally, remotely or via a local area network.

13.6. The controller must be equipped with auxiliary contacts for external indication of automatic or manual load control, general warning and general shutdown conditions.

13.7. The controller must be capable of providing remote monitoring by a PC through the local Ethernet system via an Ethernet port on the controller.

13.8. The controller shall monitor the hours of operation and output a message on the display to notify the operator to provide preventative maintenance in accordance with the factory approved service plan.

13.9. The control system shall have the capability to monitor the following functions:

- Discharge air pressure
- Element outlet temperature
- Ambient temperature
- Compressor status
- Motor overload status
- Running hours
- Loaded hours

14. Shipment and Delivery Preparation

14.1. The compressor must be packaged on a wooden skid and fully enclosed with a wooden enclosure.

15. General Installation Requirements

15.1. Upon placement on a level surface and connection to essential utilities, the unit shall be provided available for immediate operation.

15.2. The compressor must not require bolting to the floor.