



# Breathing Air Compressor Bid Specification

The system shall be designed as a complete breathing air package, made up of an air compressor module, air storage and breathing apparatus cylinder charge station. This document describes the minimum requirements for a complete breathing air compressor system. The system shall be modular and capable of being supplied as specified herein. The ability to separate the compressor module from the bottle charge station is for operator safety.

## EXCEPTIONS

Any exceptions to the specification shall be submitted with the **BID PROPOSAL FORM**.

## WARRANTY

The equipment supplied shall be guaranteed to be new, of current design, and free of all defects in material and workmanship for a period of five years or 1000 hours, whichever is sooner, based on prescribed service and maintenance.

## AFTER SALES SERVICE

Support and service shall be available from a factory authorized local service center. The service center shall be capable of performing all maintenance and repairs at the site of the compressor installation. Service technicians shall be factory trained and authorized by the equipment's manufacturer. Under normal circumstances, qualified service technicians shall be capable of responding to requests for service within 48 Hours.

## 10 HP AIR COMPRESSOR

1. Charge rate (12 scfm / 340 lpm)
2. 1080RPM
3. Electric ODP motor shall be 10 HP, three phase 208, 230, or 460 volts at 60hz; or 380, or 450 volts at 50hz

## AIR COMPRESSOR CONSTRUCTION

1. Compressor shall be a 5 stage, air-cooled reciprocating compressor which is belt driven by an induction motor
2. Minimum pressure continuous duty shall be 7500 psi / 517.1 bar
3. Delivery of high pressure air shall be temperature only slightly above the ambient air temperature (Approximately 15°F (9.4°C) above ambient)



4. Reduction of moisture content and impurity levels in the air stream issuing from the last stage separator to CGA Grade “E” criteria by absorption, chemical reaction, and filtration in the purification subsystem.
5. Oil mist lubrication for all cylinders, main, big, and small end rod bearings
6. Programmable auto condensate drain system (ACD) shall have the capability to monitor the function of each stage drain valve and alert the operator of any malfunctioning stage drain.
7. Multi-valve dump block design for ease of service consisting of four piston-type valves
8. Oil change only required every 200 hours
9. Auto condensate drain system service only required at 500 hours
10. 12-blade high-velocity fan for cooling efficiency
11. Serviceable and rebuild able multi-ported reed valves & flat plates
12. Compressor shall have sound dampening doors and interior sound dampening material
13. Cylinders shall have finned aluminum heads for superior heat dissipation
14. Flywheel shall be precision-balanced and fan-bladed for excellent cooling capacity
15. Enclosed all metal fan-blade guard
16. Modular construction to fit through a 36” door opening
17. Compressor shall utilize a pressurized oil lubrication system
18. Compressor shall have pressure transducers for digital display of inter-stage, final pressures and oil pressure
19. Compressor shall have incorporate intercoolers and relief valves for all stages, and condensate traps after 2nd, 3rd, 4th, & 5th stage of compression.
20. Compressor and electric motor shall be mounted in a horizontal format with an adjusting belt system.
21. Radial layout for reduced vibration
22. Stainless steel valves assemblies on all stages for long wear, excellent heat resistance and dissipation
23. Pressurized oil crankshaft
24. Ductile iron connecting rods for high strength.
25. Needle bearings on connecting rods for added durability and reliability
26. Condensate container sensor alarms at  $\frac{3}{4}$  full and automatically shuts down compressor when full



## **PURIFICATION SYSTEM**

1. The purification system shall consist of a mechanical oil/moisture separator and either 2, 3, or 4 chemical purification chambers. The chambers shall be designed to conform to the CRN & ASME code for Unified Pressure Vessels.
2. Purification chambers shall be constructed in aluminum alloy 6061 T6 as its anti-corrosive properties exceed all other chamber materials.
3. Under ideal conditions the purification system shall process a maximum of 60,000 scf of air per cartridge set (2 pieces) for 10 HP compressor.
4. Purified air shall be measured by the actual weight of Molecular Sieve. Electronic Dew Point (DP) detection shall not be used as a means to claim extended chemical cartridge life.
5. CO and dew point sensors shall not be installed in the purification chamber.
6. Sensors shall be installed downstream of all chambers so the sampled air is representative of that delivered to the B.A. cylinders.
7. The purification system shall have the following minimum ratings:
8. 7000 PSI working pressure.
9. 4 to 1 safety factor.
10. 10 SCFM minimum flow capacity per purification chamber.

## **COMPUTERIZED CONTROL AND MONITORING SYSTEM**

All significant functions of the system shall be monitored and controlled by a microprocessor controller. The operational status will be presented on an enunciator panel. In the event of an out-of-tolerance condition, the “controller” will “alarm” and stop the compressor. The “status” and/or “cause” will be indicated on the enunciator panel. All accumulated times on all significant time sensitive functions will be recorded and displayed on command. The system will be touch screen enabled and user access controlled via RFID, numeric passcode or some other method. The system shall have the following capabilities at a minimum:

1. Touch screen control
2. User access control via RFID, touchscreen key pad, and/or biometrics
3. Cloud integration
4. Tracking and recording of compressor operation and operating parameters
5. Digital pressure gauges
6. Read/write BA cylinder RFID capability



7. The control & monitoring system can be mounted in the charge station when a charge station is purchased with the compressor. If the compressor is ordered without a charge station the control & monitoring system shall be a separate wall mount system.

## **CONTROLLER FUNCTIONS / PARAMETERS MONITORED AND CONTROLLED**

### **1. COMPRESSOR ASSEMBLY**

- Compressor start/stop (advise normal/alarm abnormal condition, auto shutdown if parameters exceeded)
- Discharge air pressure (advise normal/alarm abnormal condition, auto shutdown if parameters exceeded)
- Programmable Auto Condensate Drain control cycle drain function (advise normal/alarm abnormal condition, auto shutdown if parameters exceeded)
- Auto Drain/Cool Down Cycle \*\* (on each shutdown, pressure switch deactivation or Stop button)
- Oil temperature and pressure (advise normal/alarm abnormal condition, auto shutdown if parameters exceeded)
- Display automatic service alerts for auto condensate drain, oil, air sample, CO calibration and purifier elements.
- Multi-level user access control for security and safety.
- Downloadable history for diagnostic and performance evaluation.

### **2. PURIFICATION SYSTEM**

- Dew Point monitoring/control (continuous monitoring) (advise normal/alarm abnormal condition, auto shutdown if parameters exceeded)
- Carbon monoxide monitoring/control (continuous monitoring) (advise normal/alarm abnormal condition, auto shutdown if parameters exceeded)
- Auto condensate drain control (advise normal/alarm abnormal condition, auto shutdown if parameters exceeded)
- “Purge” control, dumps the air exiting the purifier in order to clear up temporary alarm conditions (advise status normal, halts any cylinder filling until alarm has been remedied)

### **3. MISCELLANEOUS**

- Total time on compressor assembly from manufacture date (advise time on command)
- Time remaining until compressor service (re-settable, advise time on command)
- Time remaining until next purification cartridge change (re-settable, advise time on command)
- Time on DP monitor cell (re-settable, advise time on command)
- Time on CO monitor cell (re-settable, advise time on command)
- Automatic calibration notification of CO monitors (advise procedure on command)
- Current compressor run time each session



#### **4. ALARMS (AUDIO/VISUAL)**

- High discharge air temperature - with automatic compressor “STOP”, “OVERRIDEABLE” with a ”MAXIMUM” upper limit, not “OVERRIDEABLE”. The upper limit is factory set.
- High discharge air carbon monoxide - with automatic compressor “STOP”, “OVERRIDEABLE” with a “MAXIMUM” upper limit of 30 PPM not “OVERRIDEABLE”. OVERRIDE only used in an extreme emergency to SAVE A LIFE.
- High discharge air moisture (dew point) - with a “WARN” to advise a pending filter (purification cartridge) change; an “ALARM” with automatic compressor “STOP”, “OVERRIDEABLE” with a “MAX” upper limit factory set at a safe condition. “OVERRIDE” only used in an extreme emergency to SAVE A LIFE.
- Low oil level and/or pressure - with automatic compressor “STOP” - “OVERRIDEABLE.”

#### **5. SPECIAL FEATURES AND CONTROLS**

- Prolonged run time control. Will stop the compressor assembly when pre-determined continuous run time has been exceeded. An audio/visual alarm is presented on the abnormal condition. “RESET” is required.
- Time delay for false alarm recognition. Preprogrammed to prevent false alarms from stopping the compressor or initial system setup and on purifier cartridge change.
- Demand Control \*(In Automatic mode)
- “Emergency Stop” control mounted on the main control panel.

#### **6. DISPLAY**

- Final Output Pressure (0-10,000 psi)
- Discharge Air Temperature
- Oil Level/Pressure
- Dew Point Level up to +30 °F, down to -100 °F
- Carbon Monoxide Level 0 to 200 PPM
- Timing Functions Hours and Minutes, calendar date
- Cylinder fill data - cylinder serial number, date of last fill, hydro date, last filled by user, pressure, duration
- Compressor inter-stage pressures
- Compressor 5th stage pressure

#### **7. MISCELANOUS**

##### **Door Switch**

The controller shall be wired for two door switches. When these switches are activated by the door being open when the system is running, the controller shall display an error message and the compressor shall go into a cool-down cycle and then shut down.



## **Demand Control**

The compressor will automatically respond to air “demand”, keeping the air receivers at optimum pressure.

## **Cool Down System**

The system shall have the capability of dumping all mechanical moisture traps at least every fifteen (15) minutes during compressor operation. Prior to shutdown, manually or automatically, it shall open and unload all moisture drain valves. It shall run for two to five minutes in order to cool and dry completely purging the system of all accumulated water and oil vapor.

## **CONTAINMENT FRAGMENTATION SHIELD**

1. The charge system shall be a separate module. It shall be designed to safely and efficiently recharge breathing apparatus cylinders (BACs) in a protective containment “chamber” that will contain all fragments in the event of BAC failure. The resulting air blast shall be vented in a harmless direction such that any resultant air or particle flow will not cause injury or collateral damage to persons or property. The containment chamber must have been tested to contain a 75 minute (111 cu ft) BAC for maximum safety per NFPA 1901.
  2. The design of the system shall be such that:
    - one or two BACs are charged within the “chamber” while one or two BACs are attached and made “ready” on the outside of the “chamber”. When the first set of BACs are charged, they shall be rotated out of the “chamber” as the next set of BAC’s are ready then are rotated into the “chamber”. Once the locks are engaged, the BACs automatically begin filling.
- **OR** -
- four BACS can be charged can be charged within the “chamber” at the same time. Once the locks are engaged, the BACs automatically begin filling.
  3. The charge adapters shall be the “rigid-fast-attach type”. The charge adapters shall be mounted 38 inches plus or minus four inches above ground/floor level, to provide an efficient ergonomic operation.
  4. The device shall contain safety interlocks such that if the “chamber” is not closed and locked, air will not flow into the BACs. The “chamber” shall automatically lock and unlock by the operation of a single actuation lever. BAC charging shall be accomplished by presetting the air flow-control valve and pressure regulator to the required flow and air pressure and engaging the locks.
  5. The control panel shall contain “safety” pressure gauges for air from the compressor, the air storage system, and the BACs being charged. Manual bleed valves shall be integrated into the charging circuit to provide a rapid and safe BAC disconnect.



6. An adjustable pressure regulator shall be provided to select the “charge” pressure for automatic BAC recharging.
7. Safety relief valve shall be incorporated to prevent over charging high pressure BACs. The system shall come with a 6000psi in 6000 psi maximum out fill pressure regulator.
8. A “Full System Pressure” outlet port shall be provided at the rear of the control panel for additional devices to be added at any time.

## **PERFORMANCE**

This performance is based on charging a 30 minute, 4500 PSI, breathing air cylinder (BAC), from 0 to 4500 PSI at a rate not to exceed a pressure rise of 1500 PSI per minute (recommended by all BAC manufacturers). This rate will require three minutes to fill the BACs. Result must be 100 cylinders completely charged in 2 hours and 34 minutes. This performance analysis shall include the necessary manipulations that are normal for that charge station. Mathematical computation of the compressor charge rate alone is not acceptable.

## **SMART FILL TECHNOLOGY/AUTO CASCADE SYSTEM**

System shall have a fully automatic changing, auto cascade, auto flow system. The system shall automatically cascade and control the flow rate of filling the SCBA. With systems that have RFID technology the system will automatically set pressure.

## **CALIBRATION KIT FOR CARBON MONOXIDE MONITOR**

Calibration Kit shall include:

- A calibration regulator and connection hose assembly,
- 1 20PPM calibration gas cylinder and 1 Zero PPM calibration gas cylinder with Material Safety Data Sheets for both.  
Note: The calibration gas cylinder’s volume shall be enough for a minimum of twelve calibrations when used according to the instructions provided.
- Complete instructions for proper calibration and a protective hard plastic carrying case that houses all kit components.

## **ASME STORAGE CYLINDERS**

A total of 4 – 612.5 Cu Ft ASME storage cylinders shall be mounted in a vertical or horizontal rack, each cylinder shall be rated for 7500PSI

The system shall have ASME relief valves, isolation valves, drain valves and pressure gauges as required by current by federal and state OSHA codes.

## **DELIVERY, INSTALLATION AND TRAINING**

The system shall be assembled and tested as a complete system at the factory prior to shipment. A factory test certificate shall be shipped with the system.



Two copies of the operation manual shall be shipped with the system.

The system shall be delivered FCA seller's premise.

The system shall be set up, installed, and checked out at the user's destination by the distributor.

The user shall receive training by the distributor on the operation and maintenance of the system as required.

## **INTER-LOCAL JOINT PURCHASING AGREEMENT**

It is the intent of this bid document to make available to other local government entities of the state of Washington, and neighboring states, as authorized by Inter-Local purchasing agreements as provided for by RCW 39.34, the right to purchase the same equipment/product at the prices quoted for the period of the contract. Therefore, upon award and execution of the contract, the bid unit price and any option prices herein shall remain valid until December 31, 2018. Units may be ordered per inter local agreement after that date, however any price increases may be added to the unit price.