

When sizing air compressor systems for altitude it is important to note that all manufacturers' standard specifications are given at sea level conditions. There are two main affects of altitude on compressor performance that should be taken into consideration: maximum allowable pressure and flow capacity.

**Maximum Allowable Pressure:** The maximum allowable pressure of the compressor is reduced at increased elevations in order to keep the compression ratio constant. This is generally not of concern for Level 1 medical air since only 55 psig is required. However, if you are sizing for a lab that requires 90-100 psig at the point of use, this may be very important. If you do not de-rate the pressure, the compressor can overheat and you risk premature failure. You should consult the manufacturer of a particular pump for acceptable pressure ratings at various altitudes, but a safe "rule of thumb" is to multiply the maximum pressure rating of the pump at sea level by the percent of atmospheric pressure (in atm) at the specific altitude. For example, a pump rated for 100 psig at sea level would be rated for 83 psig in Denver, CO (100 psig x .83 atm). Below is a simplified chart of acceptable pressure ratings at various altitudes for the Powerex oil-less compressors.

| Pump Type                             | Maximum Allowable Pressure (psig) |                |                 |
|---------------------------------------|-----------------------------------|----------------|-----------------|
|                                       | 0-3,280 ft                        | 3,281-8,200 ft | 8,201-13,100 ft |
| Scroll, Standard Pressure 3-5 HP      | 116                               | 100            | 87              |
| Scroll, High Pressure 3-5 HP          | 145                               | 130            | 116             |
| Reciprocating 1-15 HP                 | 145                               | 130            | 116             |
| Rotary Tooth, Standard Pressure 50 HP | 109                               | 93             | 80              |
| Rotary Tooth, High Pressure 50 HP     | 125                               | 110            | 97              |

**Flow Capacity:** The performance of a compressor must also be de-rated at altitude due to the atmospheric variations in air pressure, temperature and density. Similar to the pressure calculation, performance can be derived as a percentage of the atmospheric pressure. For example, a compressor rated at 15 CFM at sea level would yield 12.45 CFM in Denver, CO (15 CFM x .83 atm). A good "Rule of Thumb" is to reduce the capacity rating by approximately 3% per 1,000 feet of elevation. Below is a table of atmospheric pressures (in atm) for various altitudes.

| Altitude (ft) | Atmospheres |
|---------------|-------------|
| 0             | 1           |
| 3,000         | 0.90        |
| 5,000         | 0.83        |
| 8,000         | 0.74        |
| 10,000        | 0.69        |
| 13,000        | 0.61        |