

PSA Plant Oxygen Purity Guidance

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This document was developed by [Build Health International](https://www.bhioxygen.org) to support global medical oxygen infrastructure planning, site preparation, operation, maintenance, and sustainability. Additional technical resources are available at www.bhioxygen.org.

Objective: This memo aims to address the range of oxygen purities advertised by manufacturers as well as requested by end users.

93% oxygen purity meets WHO medical oxygen standards

The WHO's International Pharmacopoeia (Eleventh Edition, 2022) states that the standard medicinal oxygen at Oxygen 93% "is produced from ambient air by pressure swing adsorption (PSA)". The oxygen purity range for Oxygen 93 is between 90-96%; this purity range is often stated by manufacturers and users as $93 \pm 3\%$.

While some PSA plant manufacturers have equipment that produces $95 \pm 1\%$ oxygen purity, it should be noted that a PSA plant with a $93 \pm 3\%$ oxygen purity has much the same tolerance for oxygen purity. A $95 \pm 1\%$ purity plant would produce oxygen in the range of 94-96% oxygen, while a $93 \pm 3\%$ purity plant would produce 90-96% oxygen. Regardless of the specification, the maximum oxygen purity does not exceed 96%, due to the limits of pressure swing adsorption technology. While the $93 \pm 3\%$ purity plant does have a lower tolerance range (down to 90%), this is still acceptable with no impact on patient care per the WHO's standards for medicinal oxygen.

95% or higher oxygen purity plants require larger investments

As more oxygen product is demanded from the PSA plant, the purity will decrease. For example, a 20 Nm³/h PSA plant set to produce oxygen at a purity of $93 \pm 3\%$ could produce 20 Nm³/h of oxygen output flow, while the same equipment set to produce $95 \pm 1\%$ oxygen purity would produce 18 Nm³/h. This means that with the same budget, a larger PSA plant can be procured if the oxygen requirement is specified to be $93 \pm 3\%$. If one were to look at a $95 \pm 1\%$ purity and $93 \pm 3\%$ purity plant with the same output flow (for example, 20 Nm³/h), the $95 \pm 1\%$ purity plant would need to have larger equipment in order to achieve the same flow rate. The larger equipment will require a larger initial capital investment for equipment, site preparation and will also have increased operating expenses due to the increased power consumption of the larger equipment when compared to a $93 \pm 3\%$ purity plant.