

# Hypoxic Safety

## Anesthetic Pearls: Hypoxic Safety Mechanisms of the Anesthesia Machine

Hypoxic safety begins with ensuring delivery of the right gases to the right places on the anesthesia machine. Central supply gases are delivered through color-coded hoses that connect to the anesthesia machine using a non-interchangeable **Diameter Index Safety System** (DISS) to prevent incorrect hose attachment. The E-cylinders of compressed oxygen, nitrous oxide, and air attach to the anesthesia machine using the non-interchangeable **Pin Index Safety System** (PISS); which can fail if pins are damaged or if cylinders are filled with the wrong gas.

**Central Alarm Systems** monitor gas supply sources and pipeline systems while indicator lights and auditory alarms signal change-over to secondary gas sources or abnormal pressures (high or low).

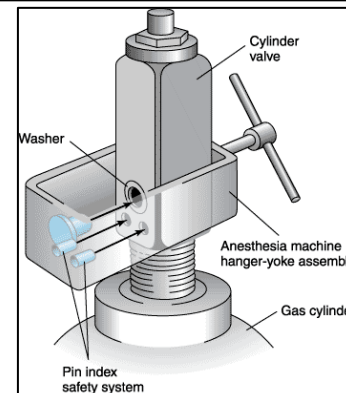
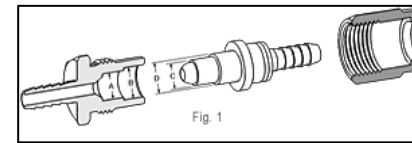
The **Fail-Safe Valve** automatically closes the nitrous and other gas lines if the oxygen pressure in the supply line fails below a set level to help prevent delivery of a hypoxic mixture (auditory alarms sounds at the same time). This system is pressure driven, and only prevents delivery of hypoxic mixture due to failure of adequate pressure in the oxygen supply.

**Proportioning Systems** are additional safety measures to prevent hypoxic mixtures by pneumatically or mechanically linking oxygen and nitrous so that the minimum oxygen concentration as the common outlet is 25%. Leaks downstream from this system or the addition of a third inert gas may still result in a hypoxic gas mixture therefore obligating the use of an oxygen analyzer.

Touch and color coded control knobs for gas flows help prevent errors in gas mixtures. The oxygen flowmeter is positioned closest to the fresh gas outlet to reduce the chance of hypoxic gas mixture due to leak within or downstream from the flowmeter.

Oxygen driven bellows are used to reduce the risk of a hypoxic mixture. In the event of a leak within the bellows, **Oxygen Analyzers** are used to determine oxygen levels in the anesthesia circuit and have a set low level alarm to signal hypoxic gas mixtures. The **Disconnect Alarm** detects a drop in peak circuit pressure when the ventilator is used.

Hypoxic safety is ultimately dependant on the anesthesiologist's vigilance, which starts with a **thorough machine checkout** to ensure the operational condition of its safety mechanisms.



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