

Angst+Pfister Sensors and Power is a company with a long track record in life science, serving medical device manufacturers across the globe for many decades.

Ventilators serve the task of supporting or controlling a patient's respiration to ensure proper pulmonary gas exchange in both clinical and emergency setting or at home.

"Thanks to Angst+Pfister Sensors and Power, we were able to massively improve our process stability and repeatability"



Example Ventilator (source: Hamilton)

Why is the APSP Massflow sensor PFLOW9015CL beneficial for Ventilators?

- Fast response for real-time volume monitoring
- Asymmetrical calibration for backflow detection
- Individual range calibration for optimization of usable span
- Real gas calibration (e.g. Heliox without GCF to be used)
- Customized peak flow detection >200 lpm
- Fully customizable in terms of flow range, housing, pneumatic/ electrical connection, output signal



For which tasks can the APSP Massflow sensor PFLOW2001 be valuable?

- Low flow range 10 sccm FS
- Fast and accurate detection of both trigger and leakage
- ET tube cuff inflation volume monitoring
- Esophageal catheter balloon volume measurement



What are the advantages of APSP pressure sensors for your application?

- High accuracy miniature pressure sensor AG2/ AG4 for central or gas cylinder O₂ supply (up to 12 bars)
- Backward gage - sensor resistant towards temporary humidity exposure (e.g. condensation when changing to fresh, cold gas bottle)
- Manifold- mountable for easy integration in gas mixer block assembly
- Individual range calibration for optimization of usable span



Where can the APSP low pressure sensors be of value?

- Minimum low pressure range 1 mbar FS
- Real-time Esophageal pressure (P_{es}) monitoring at accuracy $\pm 0.5\%$
- ET tube cuff pressure monitoring
- Volumetric flow measurement with restriction (e.g. venturi, honeycomb or similar)
- Proximal flow monitoring
- No flow-through, therefore no dependence on ambient pressure or Heliox-usage
- Individual range calibration for optimization of usable span



Where's the benefit of APSP electrochemical oxygen sensors for ventilators?

- Extremely stable measurement of FiO₂ up to 100 vol.-% O₂
- Linear analog output signal
- Fast response time
- Very low cross-sensitivity to other gases (e.g. Heliox) or humidity
- Little maintenance because of no wearing parts
- Long life-time, stable signal output
- Suitable for continuous (24/7) measurement
- Lead free, RoHS conform
- Medical norm 93/42/EEC



What are the advantages of APSP ultraminiature GMR sensors for your application?

- Detection of (safety) valve position with high sensitivity and precision
- Higher speed/ lower noise compared to Hall- effect sensors
- Internal temperature compensation
- Factory calibrated
- Programmable offset and gain correction
- I²C interface



Why is the high-performance MEMS humidity sensor MVH-series the right choice for humidifiers?

- Real-time monitoring of humidity in patient circuit at 0...100% RH
- High accuracy (down to $\pm 1.5\%$ RH)
- Additional temperature output ($\pm 0.2^\circ\text{C}$ accuracy)
- Extremely low current consumption
- Outstanding long- term stability and reliability



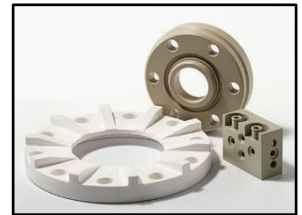
How can you benefit from APSP medical power supplies/ DC-DC converters while maximizing patient safety?

- Compact form factor for reduced space demand
- High efficiency and low no-load energy consumption
- Extremely low leakage current
- High EMC- class
- BF (body floating) and even CF (cardiac floating) insulation
- Specific safety approval
- Design-in engineering and certification support
- Flexible customization even for smaller quantities



What are the advantages of A+P elastomer components for Ventilators?

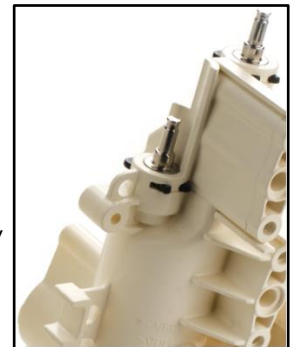
- With our A+P specialists we realize the most suitable and efficient solutions for demanding Life Science applications in terms of sealing, fluid handling and antivibration
- Comprehensive know-how in high-performance elastomers from choice of raw materials to final testing and serial production
- Multiple approvals and conformities



- Specialized in design and production of integrated metal hybrid assemblies
 - 2K/ 3K material with metal components overmolding
 - Clean room facilities available
 - High chemical/ temperature resistance (Sterilizability)
 - Compact, lightweight with flexible flow paths

Examples:

- Expiratory valve membranes with high requirements on planarity
- T-piece for ventilation circuit with integrated sensors
- CPAP mask swivel with integrated leakage silencer/ sensors
- Fluidic manifold with integrated electrodes/ sensors/ valves



Example fluidic manifold

Everything from a single source!

Very fast and flexible engineering prototypes for customized solutions.