

Angst+Pfister is a company with a long track record in HVAC applications, serving manufacturers with both sensor and elastomer solutions across the globe for many decades.

Heat Pumps utilize cycles of liquefying and vaporizing a refrigerant through compression and expansion. The resulting heat is transferred to air or water via a heat exchanger with the goal of maximizing energy efficiency.

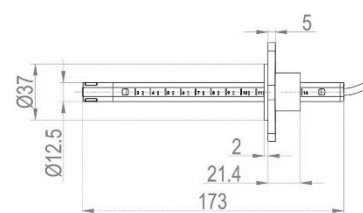
"Thanks to Angst+Pfister Sensors and Power, we were able to massively improve our process stability and repeatability"



Example Heat Pumps (source: NIBE)

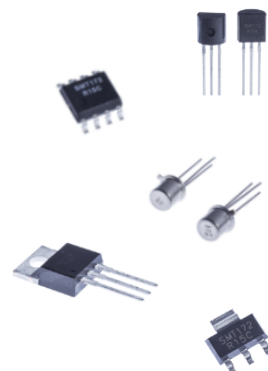
Why is the APSP insertion flow sensor PFLOW1000V beneficial for Heat Pumps?

- Flow speed range 0...3...30 m/sec
- Fast response time of 10 msec for real-time volume monitoring
- Total accuracy $\pm 2,5\%$ FS
- Variable insertion depth to accommodate for different duct diameters, customized sensor length
- Intrinsically insensitive to altitude change-induced errors
- Analog/ digital interface
- Optional temperature and humidity output (digital)
- According to IEC 61326-1; -2; -3



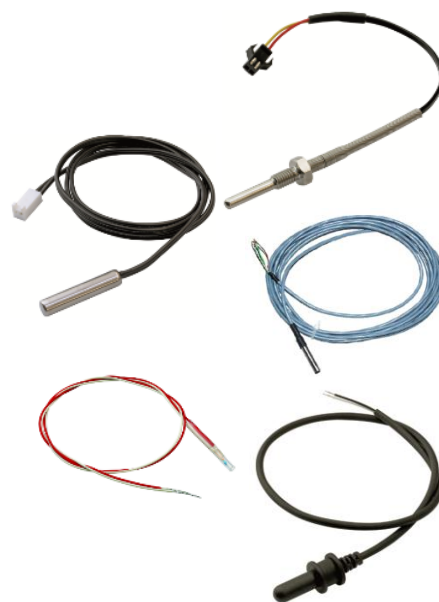
What advantages do APSP temperature sensors SMT172 offer to enhance the efficiency and sustainability of Heat Pumps?

- PWM (duty cycle-based output signal) for loss-free transmission over long distances
- Factory-calibrated with extremely high accuracy of $\pm 0.04^{\circ}\text{C}$
- Very high Signal-to-noise ratio
- Fast response time of $t_{63\%}=0.6\text{s}$
- High repeatability of 0.01°C to increase process stability
- Direct interface with Microcontroller (MCU)
- Excellent long-term stability
- Versatile packages for higher design-in flexibility



What's the value of APSP temperature probes in your application?

- Customized, economical probe solutions
- Sensors according to DIN EN 60751:
SMT172, NTCs with any R25 and beta values, PTC, PT100/ PT1000, Ni-120 as well as K-Type
- Freely select the housing as well as the cable outlet and connector (only pay for what you need)
- Various enclosure materials to choose from
- Almost any housing shape can be realized for easier integration
- Design-in engineering support



How can you benefit from APSP ultraminiature GMR sensors?

- Detection of 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

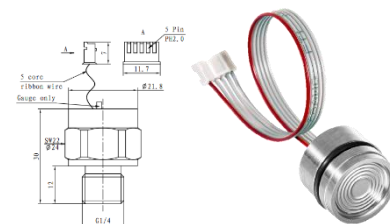


What are the advantages of APSP pressure sensors for Heat Pumps?

- Ceramic cell for a wide temperature range -40 to +135°C
- P_{abs, gage} 0,5...≥50 bar FS, customizable
- Unamplified or analog output (0,5...4,5V)
- Suitable for both gas and aggressive liquids



- Stainless steel cell or threaded version
- P_{abs, gage} 0,07... ≥50 bar FS, customizable
- Accuracy ±0.25%FS typ.
- Long Term Stability ±0.2% FS/year
- I²C or SPI output



- Pressure transmitter
- P_{abs, gage, vacuum} 0,35bar...≥50 bar FS, customizable
- Multiple configurations
- For corrosive liquids and gases
- Special coating for refrigerants optional

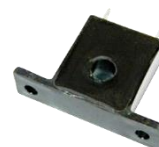


- Miniature pressure sensor PBM230 for both gas and liquids
- P_{abs} 0.3...20 bar
- Additional temperature output
- Manifold mountable for non-intrusive integration in pneumatic/ hydraulic block



Where can APSP current sensors be of value in Heat Pumps?

- Simple, inexpensive and robust solution for the measurement of heating power (e.g. for additional heating element)
- Potential-isolating AC current sensor
- Project-related engineering support



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

- With our A+P specialists we realize the most suitable and efficient solutions for demanding 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
- Ensuring silent operation of compressor with the appropriate shock absorbers
- Multiple approvals and conformities



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

Examples:

- Valves with high requirements on leakage tightness
- Custom molded parts with integrated 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.