DATA SHEET

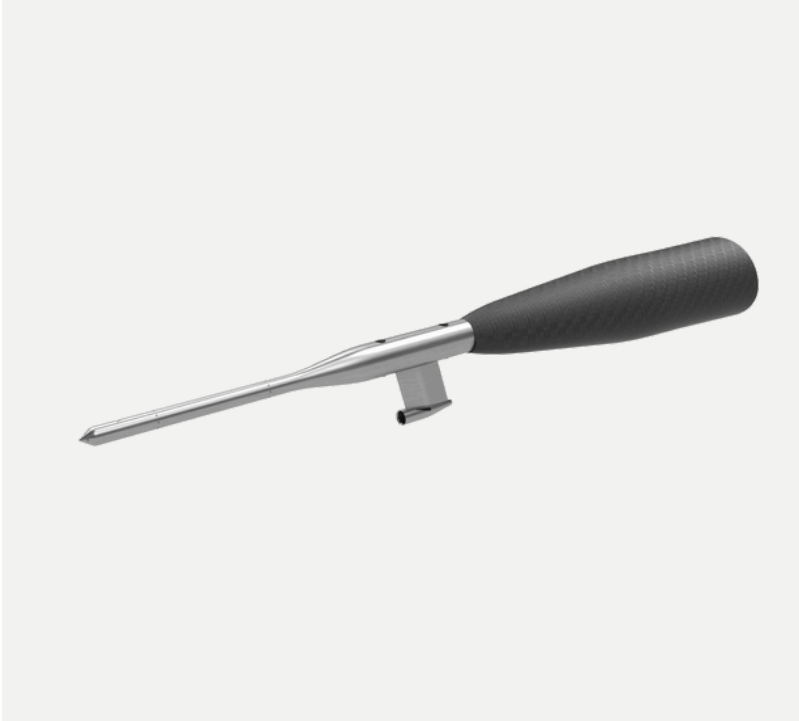
# VectoADP Beak

PRODUCT NAME

VectoADP Beak

TYPE

Air Data Probe



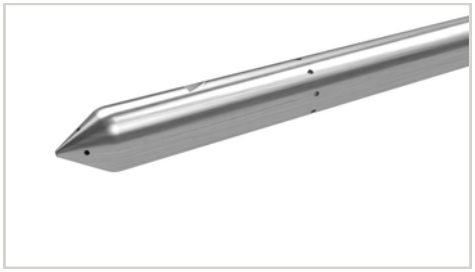


*Fig. 1 Close-up of the VectoADP Beak Probe Head*

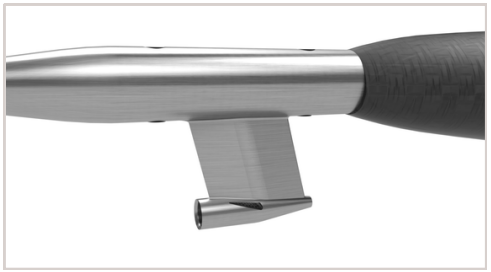


*Fig. 2 VectoADP Beak with TAT sensor*

## DESCRIPTION

### Measuring air data & flow parameters in subsonic, transonic & supersonic flows with one integrated system

The VectoADP Beak is a multi-functional air data probe designed to allow for precise measurement of flow parameters, such as velocity, angle of attack and angle of sideslip throughout subsonic, transonic and supersonic flight conditions. It offers flexible head geometry with an integrated and controllable heater. Its robust design allows for operation even under harsh conditions. In combination with an air data computer, such as Vectoflow's Eagle ADC, this system is a plug and play solution for airborne applications. It is designed for manned and unmanned aerospace platforms.

## GEOMETRY & DESIGN

| | |
|---|---|
| **Probe head shape** | Straight |
| **Number of pressure ports** | 5-hole head+multiple static rings+back pressure ports |
| **Tip diameter** | ≥ 9 mm (> 12 mm with heater) |
| **Tip geometry** | Conical/Hemispherical |

## MATERIALS & CONSTRUCTION

| | |
|---|---|
| **Material** | Stainless steel, Titanium, Inconel |
| **Mounting** | Streamlined nosecone integration |
| **Heater** | Cartridge or spiral heater for anti-icing |

Like all probes from Vectoflow, every VectoADP Beak is made by additive manufacturing, providing high geometric flexibility and very high robustness at the same time. The probes are generally built out of one piece, with no internal tubing or welding, thus avoiding internal leakage and assuring a long lifetime.

The probe further comprises an option to include a total air temperature (TAT) sensor with a Pt100 or a thermocouple as well as an optional heater for anti-icing.

## MEASUREMENT

| | |
|---|---|
| **Angular range** | Up to ±60° (> ±20° for supersonic regimes) |
| **Angular accuracy** | < ±1° |
| **Velocity range** | 0.1<Mach<2 (depending on design requirements) |
| **Velocity accuracy** | < 0.015 or < 1.0 %, whichever is greater |
| **Temperature range** | Max. 700°C |

The VectoADP Beak is a multi-hole probe with a special pressure tapping improving the sensitivity of the measurement of the flow speed in transonic regimes. It can measure the flow velocity, angle of attack and angle of sideslip in a range of up to ±60° for subsonic flow, and at least ±20° for supersonic flows.

## MEASUREMENT ERROR

The measurement error of any air data probe highly, but not exclusively depends on the used differential pressure transducers inside the air data computer. Maximum full sensor scale errors of 0.25% provide good accuracy. Absolute pressure measurement onboard the Eagle ADC is performed with a separate sensor, which provides a maximum error of 125 Pa.

Additional sources of error arise from the mathematical model used to calculate velocity and flow angle from port pressures. From internal experience at Vectoflow, the estimated accumulation of additional errors is 0.87% at maximum. This corresponds to a standard uncertainty of 0.5% at 68% confidence interval.

## CALIBRATION PROCESS

Vectoflow has its own calibration wind tunnels, delivering flow speeds from 1 m/s up to Mach 1 (higher Mach numbers upon request). Vectoflow has a very rigid quality assurance, which ultimately leads to the highest possible measurement accuracy of flow probes.

**Wind Tunnel Calibration:**

- Angular range: ±155° (yaw axis), ±180° (roll axis)
- Max. Power: 90 kW
- Velocity range: From 1 m/s to Mach 1
- Control parameters: Mach number, Velocity (m/s)
- Long-term velocity stability: ±0.25% (at Ma = 0.1)

For transonic and supersonic calibrations, Vectoflow has multiple external partners which offer calibration services depending on the design specifications and operational boundary conditions. More detailed information regarding the partner facilities is available upon request.