VECTOFLOW

# DATA SHEET

# iProbe Wing

PRODUCT NAME

iProbe Wing

TYPE

Integrated Air Data Probe

*Fig. 1* *Close-up of the iProbe Wing Probe Head*

*Fig. 2* *iProbe Wing Integrated Air Data Probe*

## DESCRIPTION

### All-in-one air data probe with air data computer designed to meet the demands of UAV flight applications

The *iProbe Wing* is Vectoflow's all-in-one solution for precise air data acquisition, delivering critical flight parameters such as airspeed, altitude, temperature, pressure, and humidity from a single compact device. The key features are:

- Robust Probe Head Design
  - 3D printed from metal for superior heat conduction and corrosion resistance.
  - Aluminium variants available for applications with strict weight constraints.
  - Includes integrated drainage for the total pressure port and a built-in heating element to prevent icing or moisture obstruction.
  - Contains a humidity and temperature sensor.

- Embedded Air Data Computer (ADC): Housed within the main body, the embedded ADC processes raw sensor data and applies aerodynamic corrections. The calculated air data is then transferred through the electronic interface.
- Sensor Suite: Equipped with high-precision pressure, temperature, and humidity sensors for accurate environmental monitoring.
- Dual pressure sensor range: To maximize measurement precision across a wide operating envelope, the probe can be equipped with two pressure sensor ranges. This dual-range configuration ensures high accuracy in both low-speed and high-speed flight conditions.
- Aerodynamic Calibration: Aerodynamic corrections are applied in real-time, based on calibration data obtained under controlled conditions, ensuring optimal accuracy across a wide range of flight profiles.

## APPLICATIONS

- Ideal for UAVs and other aerospace platforms requiring a lightweight, compact, and reliable air data solution.

## GENERAL PROPERTIES

| | |
|---|---|
| **Dimensions** | 185 mm x 60 mm x 35 mm |
| **Weight** | <80 g (316L)<br><55 g (Al) |
| **Material** | Head: Metal (316L or Al)<br>Mount: Plastic |

## ENVIRONMENTAL CONDITIONS

| | |
|---|---|
| **Operating temperature** | -40 … 80°C |
| **Operating medium** | Air |
| **Humidity** | 0 … 95%, non-condensing |
| **Velocity** | 1 to 123 m/s |
| **Maximum Altitude** | ~ 5km |

## ELECTRIC PROPERTIES

| | |
|---|---|
| **Power Consumption** | 48 W (with a heater at full power)<br>~1 W normal consumption without heater |
| **Voltage** | 16 – 28 V |
| **Data rate** | 100 Hz |
| **Comm. protocol** | Serial (CAN or I2C) |

## CUSTOMIZATION

The probe is customizable for your application, especially in terms of:

- Functional capabilities
- Sensor measurement range
- Single or dual range sensors
- Probe head shape
- Probe head material
- Probe main body shape
- Digital interface
- Mounting configuration
- Mechanical interfaces
- Heater configuration

## OPERATION

The *iProbe Wing* combines an air data probe and onboard processing unit in a single compact device. It is affixed to the aircraft via 4 screws, while its electrical interface is a single electrical connector.

The device interfaces electrically with a DC power supply and supports data communication via CAN or I2C protocols, ensuring seamless integration with onboard flight control systems.
A protective cap is provided with the probe to prevent contamination or blockage of the sensing ports during ground handling.

## POWER AND HEATER

The *iProbe Wing* probe head is equipped with a heater system featuring precise temperature control to prevent the accumulation of ice. This ensures accurate and reliable performance in low-temperature environments and high-altitude applications.
The heater is governed by an automatic closed-loop control system. Heating is activated when the internal temperature drops below a defined lower threshold and deactivated once the temperature exceeds a defined upper limit, maintaining a stable thermal environment without user intervention. The demand temperature can be set by the user through communication channel.

## HEATER

| | |
|---|---|
| **Probe head heater** | Up to 48 W |
| **Heater Activation Temperature Threshold** | < 7° C (default) |
| **Heater Deactivation Temperature Threshold** | > 7° C (default) |

## SENSORS

The *iProbe Wing* is equipped with one or two highly accurate, temperature-compensated differential and absolute pressure sensors. The temperature-compensated pressure transducers feature high accuracy and a minimal offset drift.
The high proof pressure provides sufficient protection against accidental overloads.
Due to its dual pressure range, the *iProbe Wing* can dynamically optimize measurement accuracy based on the flight speed, allowing for maximum performance across the entire flight envelope. High-accuracy sensors are available in ranges of ±1.2 kPa, ±2.5 kPa and ±7.5 kPa. The values listed on this datasheet are some common pressure ranges. However, additional ranges such as ±10 kPa are available on request with reduced accuracy. Please contact Vectoflow so we can help you select the right sensor ranges for your application. The *iProbe Wing* allows for temperature measurement through a thermocouple. This allows precise calculation of all Air Data quantities.

## PRESSURE ACQUISITION

| | |
|---|---|
| **Dynamic pressure** | Up to 2 differential pressure sensors |
| **Accuracy** | Typical ±0.2% FS (max ±0.25% FS) |
| **Absolute pressure** | 1 barometric pressure sensor (typically 100 or 200 kPa) |
| **Accuracy of absolute pressure** | Typical ± 0.1% FS (max ± 0.25% FS) |

## DIFFERENTIAL SENSOR OPTIONS[1]

| Differential pressure range (kPa) | Max. Mach number [2] |
|---|---|
| **1.2** | 0.13 |
| **2.5** | 0.19 |
| **7.5** | 0.33 |

[1] *More options available upon request.*
[2] *Mach numbers based on dynamic pressures computed at International Standard Atmosphere (ISA) conditions, which assumes atmospheric conditions at mean sea level.*

## TEMPERATURE ACQUISITION

| | |
|---|---|
| **Temperature measurement** | Thermocouple Type K |
| **Accuracy** | < 3 K |

## COMMUNICATION

The *iProbe Wing* provides data transmission over the following protocols: CAN 2.0 and I2C. The data output rate is up to 100 Hz.
The CAN-bus protocol is implemented according to the CAN 2.0A or CAN 2.0B specification with Baud rates up to 1 Megabaud. A DBC file (vector-format) is supplied for easy integration. The full list of outputs can be found in the Outputs table.

## INTERFACES

The *iProbe Wing* features a simple mounting system and an electric connector for power supply and communication.

## CONNECTIONS

| | |
|---|---|
| **Electrical connector** | S04B-PASK-2D |

## OUTPUTS

The complete list of *iProbe Wing* output values is given below. Full definitions of each along with coordinate systems can be found in the product manual.

| Name | Unit |
|---|---|
| Differential pressure | [Pa] |
| Static pressure | [Pa] |
| Corrected differential pressure | [Pa] |
| Corrected static pressure | [Pa] |
| ρ (air density) | [kg/m$^3$] |
| Alt (barometric altitude) | [m] |
| True air speed – TAS | [m/s] |
| Health status word | [-] |
| Differential pressure digital count | [Counts] |
| Temperature from pressure sensor | [°C] |
| Static pressure digital count | [Counts] |
| Heater temperature setpoint | [°C] |
| Ambient temperature | [°C] |
| Ambient Rel. Humidity | [%] |
| Heater current | [A] |

## COMMANDS

The *iProbe Wing* provides the feature to set some of the parameters listed below through the communication channel. Command structure can be found in the product manual.

| Name | Comm. Channel |
|---|---|
| Set dynamic pressure correction factor | CAN/I2C |
| Set static pressure correction factor | CAN/I2C |
| Set heater demand temperature | CAN/I2C |