# VectoDAQ Flight Pro

Mini Air Data Computer with pressure scanner and data reduction capabilities for flight applications.

- 5 pressure ports + reference pressure sensor + heater power supply
- Robust design with aluminium housing and Lemo connector
- Data output over CAN, or USB

| General | |
|---|---|
| **Weight** | 130 g |
| **Dimensions** | 84 x 55 x 28 mm |
| **Probe options** | 5-hole probe heads |
| **Environmental Conditions** | |
| **Operating temperature** | -20 ... 70 °C (-4 … 158 °F) |
| **Operating medium** | Air and other non-corrosive gases |
| **Humidity** | 0 ... 95%, non-condensing |

## General

The VectoDAQ Flight Pro is an Air Data Computer designed to measure multiple pressure signals, as well as temperature, GPS and IMU data, simultaneously. With its capabilities, this device not only enables data reduction but also allows you to conveniently monitor and record engineering data in real time. Whether you are working in the field or in a laboratory environment, this versatile setup seamlessly integrates with any laptop.

Setting it apart from its predecessor, the Air model, the VectoDAQ Flight Pro is specifically designed to meet the rigorous demands of flight applications. This advanced version offers the added functionality of powering a heated probe (anti-icing). It also incorporates sensors dedicated to capturing GPS and IMU data. This invaluable feature expands its usability in challenging environmental conditions, making it an ideal choice for diverse scenarios.

Moreover, the VectoDAQ Flight Pro goes beyond merely measuring flow parameters. It incorporates sophisticated features that facilitate the calculation of vital data relevant to piloted flight applications. From pressure altitudes and query codes (QNH, etc.) to ICAO standard velocities, this device provides comprehensive information essential for optimizing flight performance. Additionally, with integrated GPS and IMU data, it offers precise location and orientation data, enhancing the accuracy and efficiency of flight-related measurements.

*Figure 1: VectoDAQ Flight Pro*

*Figure 2: Front panel (Example for 5-hole probes)*

*Figure 3: Example for 5-hole Air Data Boom*

| Pressure Acquisition | |
|---|---|
| **Pressure acquisition** | Up to 5 differential pressure sensors with a customizable pressure range |
| **Accuracy** | Max +/- 0.25 % FS (typical +/- 0.1 %) |
| **Acquisition of absolute pressure** | Barometric pressure sensor |
| **Accuracy** | 1.25 hPa |

| Temperature Acquisition | |
|---|---|
| **Temperature measurement** | Thermocouple Type K or PT100 |

| Sensor Options | |
|---|---|
| **Differential pressure range (kPa)** | **Max. Mach number** |
| **0.25** | 0.06 |
| **0.50** | 0.09 |
| **1.25** | 0.13 |
| **2.50** | 0.19 |
| **5.00** | 0.26 |
| **7.50** | 0.32 |

| Measurement Errors | |
|---|---|
| **Angle** | < 1° |
| **Velocity** | < 1.0 m/s or < 1.0 % whichever is greater |
| **Temperature** | < 2.5 K for thermocouple type K and < 1 K for PT100 |

| Interface | |
|---|---|
| **USB or CAN** | Communication with Host PC for configuration (USB) and data acquisition USB and CAN) |
| **Power** | 5 V via USB or 7 – 36 V (via CAN) |
| **Pressure connection** | Metal tube ⌀ 1,06 mm or ⌀ 1,6 mm or connector (female) |
| **Cable (included)** | 1,8 m Lemo (FGG.0B.307 to USB) |
| **Cable (optional)** | Lemo (FGG.0B.307 D-SUB 9 (CAN)) |

## Sensors and Electronics

The VectoDAQ Flight Pro is equipped with up to 5 differential pressure sensors as well as one absolute pressure sensor. All differential pressure sensors can be selected by pressure range. The temperature-compensated pressure transducers feature high accuracy and a minimal offset drift. The high-proof pressure provides sufficient protection against accidental overloads.

In addition to its pressure measurement capabilities, the VectoDAQ Flight Pro supports the measurement of GPS coordinates using an antenna, enabling precise location tracking. Additionally, the device is equipped to capture gyro and accelerometer data, further enhancing its versatility in gathering essential flight-related information.

## PC Communication

The VectoDAQ Flight Pro offers convenient options for data transmission, allowing you to choose between USB or CAN protocol. With a transmission rate that can be set up to 25Hz, the device accommodates your specific requirements while reducing the rate, if needed, based on the number of outputs requested.

When connected via USB, the pressure scanner seamlessly interfaces with the host PC as a virtual COM port. This means that any software supporting serial protocols can be utilized for smooth communication. Furthermore, the device simplifies the power supply process by drawing a 5V power directly from the USB connection.

In terms of CAN-bus protocol, the VectoDAQ Flight follows the CAN 2.0A or CAN 2.0B specification, supporting baud rates of up to 1 Megabaud. To facilitate integration into measurement environments, a supplied DBC file in vector format streamlines the process. Additionally, CAN/Power connector cables, including a CAN termination resistor, can be provided as necessary. Power is conveniently supplied through the CAN bus connector (Lemo connector), ensuring efficient operation. For optimal performance, it is generally recommended to ground the device.

Data acquisition becomes a seamless process with VectoVis. This user-friendly software offers a real-time view of all data, enabling active monitoring and analysis. Furthermore, it provides the valuable

functionality of data recording, allowing you to save data in easily readable file formats such as .csv, ensuring accessibility and compatibility.

### Outputs

The following output values are available:

| Output ** | |
|---|---|
| **Name** | **Unit** |
| **P1…P5 (differential pressure)** | [Pa] |
| **Pabs (absolute pressure)** | [Pa] |
| **Ttc (temperature of RTD or TC)** | [°C] |
| **Theta (cone angle)** | [°] |
| **Phi (roll angle)** | [°] |
| **Alpha (angle of attack)** | [°] |
| **Beta (yaw angle)** | [°] |
| **$V_{mag}$ (velocity magnitude)** | [m/s] |
| **u (x-component of velocity)** | [m/s] |
| **v (y-component of velocity)** | [m/s] |
| **w (z-component of velocity)** | [m/s] |
| **$P_d$ (dynamic pressure)** | [Pa] |
| **$P_s$ (static pressure)** | [Pa] |
| **ρ (air density)** | [kg/m$^3$] |
| **$T_{tot}$ (total temperature)** | [°C] |
| **$T_s$ (static temperature)** | [°C] |
| **M (Mach number)** | [-] |
| **Alt (baro altitude)** | [m] |
| **AltAbs (absolute altitude)** | [m] |
| **Num (counter)** | [-] |
| **Error** | [-] |

| Flight Parameters ** | |
|---|---|
| **Name** | **Unit** |
| **Indicated Air Speed-IAS** | [m/s] |
| **Calibrated Air Speed-CAS** | [m/s] |
| **Equivalent Air Speed- EAS** | [m/s] |
| **True Air Speed - TAS** | [m/s] |
| **Dynamic Pressure derived from True Airspeed** | [Pa] |
| **Mach Number derived from True Airspeed** | [-] |
| **Local speed of sound** | [m/s] |
| **Flight Level Query Nautical Elevation** | [m] |
| **Height Query Field Elevation** | [m] |
| **Altitude Query Nautical Height** | [m] |
| **Pressure Altitude** | [m] |
| **Density Altitude** | [m] |

| Flight Pro Parameters ** | |
|---|---|
| **Name** | **Unit** |
| **Latitude** | [deg] |
| **Longitude** | [deg] |
| **Altitude** | [m] |
| **Timestamp** | [] |
| **Velocity NED** | [m/s] |
| **IMU Velocity Uncertainty** | [m/s] |
| **Yaw, Pitch, Roll** | [deg] |
| **Gyroscope X, Y, Z** | [rad/s] |
| **Accelerometer X, Y, Z** | [m/s$^2$] |

** Details see Manual

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