





VectoDAQ Air Data Computer

-  Miniature pressure scanner and data reduction all-in-one device for ground, vehicle and flight applications
-  For 1, 3, 5, 7 and 14 hole light weight probes + static ring with optional heating
-  Robust design also for in flight applications
-  Data acquisition over CAN or USB Port

VectoDAQ Hardware Configuration	
General	
Weight	130g (4.6 oz.)
Dimensions	60 x 30 x 80 mm (2.4 x 1.2 x 3.1 inches)
Power Supply	
Voltage/Current input	Via CAN connector, 7-24V, 50mA
Environmental Conditions	
Operating temperature	-20 ... 70 °C (-4 ... 158 °F)
Operating medium	Air and other non-corrosive gases
Humidity	0 ... 95 %, non-condensing
Temperature Acquisition	
Temperature	Thermocouple Type K or PT100

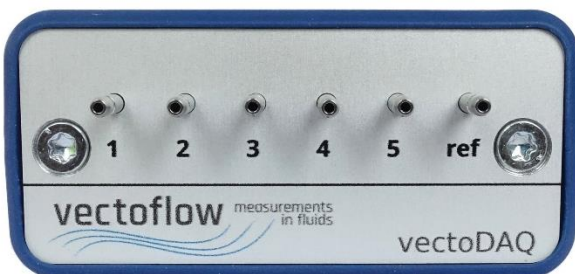


Figure 1: Front panel (Example for 5-hole probes)

Pressure Acquisition	
Pressure acquisition	1 to 14 differential pressure sensors with variable pressure ranges Optional: Multiple pressure sensor ranges in one device with automatic switching between the sensors for optimal measurement accuracy at all air speeds
Pressure sensor accuracy	Max. +/-0,25% full scale (typical +/-0,1%)
Absolute pressure acquisition	Barometric or absolute pressure sensor
Sensor options	
Differential Pressure Range (psi/kPa)	Max. Mach Number
0,004/0,025	0,02
0,007/0,05	0,03
0,014/0,1	0,04
0,036/0,25	0,06
0,181/1,25	0,13
0,363/2,5	0,19
0,725/5	0,26
1,088/7,5	0,32
1,45/10	0,37
3,626/25	0,57
7,252/50	0,78
Measurement errors	
Pressures (raw)	0.1% FS (typical)
Flow angles	< 0.5°
P_d (dynamic pressure)	< 0.5%
P_s (static pressure)	< 0.5%
Velocities	<0.5m/s (1.6 ft/s) or
Temperatures	<1°K
Alt (Altitude)	<1m (3 ft 3 in)
Frequency Response	Dependent on probe's geometry and tubing system. Calculated upon request.

Interfaces	
USB	Communication with host PC (for setup)
Power/CAN	Communication with host PC via CAN bus (during operation) and power supply

Options	
Magnetic valves	To host sensors with different measurement ranges and switch in between them to maximize accuracy
Heater	Heater for the probe for de-icing and probe drying (increases power requirement to 7-24V and 4A)

General

The VectoDAQ Air Data Computer is designed for simultaneous measurements of multiple pressure and temperature signals and data reduction of the data to obtain flow values like angle of attack, true air speed and flight height.

The device is equipped with 1 to 14 differential pressure channels, and one absolute or barometric pressure port, which is the reference for the differential sensors at the same time. Each pressure channel range can be individually customized according to customer specifications. The temperature-compensated



Figure 2: Back panel

pressure transducers feature high accuracy and a minimal offset drift. Due to the extremely high proof pressure it is possible to overload the sensors without damage.

The data can be transmitted via USB or CAN interface. The transmission rate can be set in the range between 1 and 50Hz. The CAN-bus protocol is implemented according to the CAN 2.0A or CAN 2.0B specification. Baud-rates up to 1Mbps are supported. For easy integration in measurement environments a DBC-file (Vector-format) is supplied.

A tare function can be triggered by a software command.

Power is supplied over the USB or CAN bus connector (M8 connector). When using CAN, only one single supply unit is necessary for all devices in the bus. The voltage can vary in the range between 7 and 24V.

The CAN version is equipped with a USB interface, allowing easy configuration. When connected via USB the pressure scanner identifies itself to the host PC as virtual COM port. Thus, any software supporting serial protocols can be used for communication.

The device can be customized on request, e.g. multiple pressure sensor ranges and automatic switching in between them can be installed to optimize the pressure measurement accuracy and hence the accuracy of the flow values.

CAN/Power connector cables can be supplied including a resistance for CAN termination

Power supply

Power is supplied over the CAN bus connector (M8 connector). Thus, only one single supply unit (7-24V, 50mA) is necessary for all devices in the bus.

The grounding of the device is generally recommended.

PC communication

After connecting the VectoDAQ device's USB port to the host PC and installing the driver it is identified as a virtual COM-port. Thus, any software which supports the standard RS-232 protocol can be used.

If unknown, the appropriate COM-port can be identified, using the Windows® Device Manager.

The VectoVis Pro software allows the configuration and reading including logging of the device data.

Outputs

The following output values are available from the device:

Outputs (CAN and USB)	
Name	Unit
$P_1 \dots P_5$ [P_{14}] differential	[Pa] or [psia]
P_{abs} absolute	[Pa] or [psia]
Theta (cone angle)	[°]
Phi (roll angle)	[°]
Alpha (angle of attack)	[°]
Beta (yaw angle)	[°]
P_d (dynamic pressure)	[Pa] or [psia]
P_s (static pressure)	[Pa] or [psia]
V_{mag} (true air speed/TAS)	[m/s] or [ft/s]
u (x component of velocity)	[m/s] or [ft/s]
v (y component of velocity)	[m/s] or [ft/s]
w (z component of velocity)	[m/s] or [ft/s]
ρ (air density)	[kg/m ³] or [lb/gal]
T_{tot} (total temperature)	[°K] or [°F]
T_s (static temperature)	[°K] or [°F]
M (Mach number)	[-]
Alt (Altitude)	[m] or [ft]
Error	[-]

Available probes

The VectoDAQ Air Data System can be connected to a 1-, 3-, 5-, 7- and 14-hole probe which can optionally be equipped with an integrated thermocouple or PT100 and a static ring. Additionally, the probe can be equipped with a heater.



Figure 3: 5-hole probe

The measurement error of a multi-hole probe depends on the pressure scanner used for the data acquisition. For the VectoDAQ, the following error tolerances have been determined:

Probe Configuration	
Geometry	Straight, L-shaped, Cobra, Drilled elbow
Number of holes	1, 3, 5, 7, 14 plus static ring
Max. length	Up to 280 mm (one part) (>280)
Min. tip diameter	1 mm (Standard 3 mm)
Tip geometry	Conical, spherical or custom
Material	Stainless steel, Titanium, Inconel,
Fastening	Square, hexagonal, one-sided
Connections	Standard 1 mm pressure tubes
Reference	Reference surface normal to Z axis
Temperature range	950°C

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