

FRAP Air

High-resolution frequency measurement system




-  Slim design compatible with 4- and 5-hole probe heads
-  Robust design with stainless steel housing and Lemo connector
-  Measurement frequencies up to 2 kHz



Figure 1: FRAP Air

Probe head options

The FRAP Air is configurable in different multi-hole probe options. This includes 4- and 5-hole probes. The pressure distribution on the probe tip will be correlated to individual wind tunnel calibrations to determine static pressure, total pressure, and the velocity components/flow angles.

The probe can be equipped with freely customized probe shapes, due to the design freedom in additive manufacturing. Hence, shape and size can be adapted to any installation or access to flow path situation. Shape and length of the probes head will determine the applicable measurement frequency.



Figure 2: Shape examples (top to bottom: cobra probe, straight probe, L-shaped probe)

General	
Weight probe shaft	~200 g
Dimension probe	Head: 60 mm x Ø 3 mm 5-hole probe: 230 mm x Ø 20 mm 4-hole probe: 210 mm x Ø 20 mm
Probe options	4- and 5-hole probe heads
Geometry	Straight, L-shaped, Cobra
Tip diameter	Typ. 3 mm ... 5 mm

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 FRAP Air from Vectoflow make it possible to detect high-frequency flow phenomena in the kHz range This makes it the ideal choice for measurements of:

- 3D turbulence spectra
- Time resolved high frequency measurements
- Shock events
- Unsteady aerodynamics of rotating systems
- CFD Validation

Pressure Acquisition

Pressure acquisition	4 or 5 differential pressure sensors
Pressure sensor accuracy	Max. +/- 0.25 % FSS (typical +/- 0.1 % FSS)

Sensor Options

Differential pressure range (kPa)	Max. Mach number
2.00	0.17
6.90	0.30

Measurement Errors

Flow angles	< 1°
Velocities	< 1.0 m/s or < 1.0 %, whichever is greater

Interfaces (DAQ System)

Supply voltage	5 V USB Type A or 5 – 13 V
Trigger Input	2 BNC-Inputs for probe triggering
Probe connection	Up to 4 probes (Lemo EGG.0B.309)
Cable (included)	Lemo (FGG.0B.309) to USB
Acquisition hardware	NI-USB 6210

Interfaces

Supply voltage	± 12 – 18 V + GND
Pressure reference port	Metal tube for reference pressure ø 1.6 mm
Cable (included)	Lemo Type (FGG.0B.309)
Acquisition hardware	Compatible with any ±10 V ADC

Frequency Calibration

Calibration system	Acoustic calibration
Frequency range	Up to 2 kHz (depending on probe geometry)
Transfer function frequency step size	Custom

Sensors and Electronics

The FRAP AIR is equipped with 4 or 5 differential pressure sensors close to the probe tip. 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.

Frequency calibration

The frequency response depends on the acoustical behavior of the pressure line and the dynamic behavior of the sensor. This will be determined in an acoustic chamber, which will compare the dynamic behavior of the probe to a known reference. The resulting transfer-functions are used to correct the pressure signals.

System solution

Vectoflow provides a complete system solution for velocity measurements.

The Fast Response measuring system includes:

- Fast Response Probe
- Cabling and Connection
- AD-Converter
- Post-Processing Software
- Calibration Data
- Consulting for Data Evaluation

Contact

Vectoflow GmbH, Germany
 T: +49 89 124149570
 M: info@vectoflow.com
 w: www.vectoflow.com