DATA SHEET

VectoFRAP

PRODUCT NAME

VectoFRAP

TYPE

High-resolution frequency measurement probe

Fig. 1 *Close-up of VectoFRAP probe with straight head design*

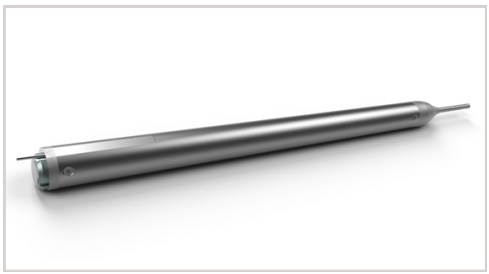

Fig. 2 *VectoFRAP with a straight head*

DESCRIPTION

High-Frequency Flow Measurement up to 5 kHz with VectoFRAP

Vectoflow's VectoFRAP is a robust fast resolution anemometry probe able to detect high-frequency flow phenomena for a range of at least 5 kHz. This makes it the ideal choice for using when time resolved high frequency measurements are required, such as 3D turbulence measurements, shock events, unsteady aerodynamics of rotating systems and CFD validation. The probe heads are made by additive manufacturing, offering the geometrical flexibility and robustness characteristic of all Vectoflow products.

GEOMETRY & DESIGN

Probe Geometry	Straight, L-shape, Cobra
Head geometry	Cone, 4-sided die
Head dimensions	60 mm x Ø 3 mm
Body dimensions (5 hole)	247 mm x Ø 14 mm
Body dimensions (4 hole)	227 mm x Ø 14 mm
Reference surface	Reference surface normal to Z-axis

MEASUREMENT

Angular accuracy	< 1°
Mach no. range	M = 0.03 to M = 0.3
Velocity accuracy	< 1 m/s
Temperature range	-20°C to +70°C
Operating medium	Air and other non-corrosive gases.
Humidity	0% to 95% R.H. non-condensing
Max. angular range	60°
Frequency range	≥ 5000 Hz

PROBE HEAD OPTIONS

The standard VectoFRAP products are offered in straight, L-shaped and Cobra probes for both 4-hole and 5-hole multi-hole probe configuration. The pressure distribution on the probe tip is 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. The shape and length of the probes head will determine the applicable measurement frequency.

SENSORS AND ELECTRONICS

The VectoFRAP 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. VectoFRAP probes output analog voltage, ranging from -10 V to 10 V. The (linear) conversion factor from voltage to pressure is provided by Vectoflow.

PRESSURE ACQUISITION

Pressure acquisition	4 or 5 differential pressure sensors
Sensor pressure range	±2.07 kPa or ±6.85 kPa
Pressure sensor accuracy	Max. ± 0.25 % FSS

INTERFACES

Supply voltage	±12V to ±18 V + GND dual power supply
Probe output	Analog -10V to +10 V
Probe connection	LEMO (0B.309)
Pressure reference port	Metal tube Ø1.0 mm

FREQUENCY RESPONSE

To compensate for the signal distortion caused by the pressure waves travelling through the narrow channels of the probe to the sensor's membrane, each probe is calibrated up to the maximum rated frequency to estimate the amplitude dampening and signal delay (phase shift) per channel with respect to a sensor placed at the tip of the probe. The results are stored in transfer function files, which then can be used to correct the acquired pressure data.

ACQUISITION SYSTEM

Vectoflow offers the FastDAQ system as a solution for powering up and measuring with up to 4 probes simultaneously. Vectoflow's FastDAQ can be connected to a computer directly via USB cable. As it possesses an NI 6210 USB acquisition unit inside, it can be easily controlled via National Instruments libraries.

Fig. 3 Vectoflow's FastDAQ Data Acquisition Unit

FASTDAQ GENERAL CHARACTERISTICS

Supply voltage	5V via a LEMO connector type 0B.307
Trigger input	2 BNC-inputs for probe triggering
Probe connections	Up to 4 probes (LEMO connector type 0B.309)
Cables (included)	1x 1.8 m LEMO FGG.0B.307 to USB Type A 1 to 4x 10 m LEMO FGG.0B.309 extension cable (1 per probe)
Dimensions	235 mm x 130 mm x 50 mm
Acquisition Card	NI USB-6210
Max. acquisition frequency	250 kS/s (aggregate)
Input range	±10 V
Resolution	16 bits