

FAST-RESPONSE SEVEN-HOLE “COBRA” PROBE

This fully-integrated, self-contained probe system with on-board sensors and A/D offers a robust wide-bandwidth flow measurement solution. Ideal for use in wind tunnel, automotive and research applications, this probe is dynamically calibrated and provides measures of velocity components and turbulence intensity on-screen in real time.

The modular structure enables probe stings to be removed for maintenance or purge, and offers maximum flexibility in operation.

- Flow speed ranges possible from under 1 m/s to 100 m/s at standard conditions
- Three components of velocity provided, with 1,681-point directional calibration grid
- Time-accurate measurement between 0.8 kHz and 1.5 kHz through dynamic calibration
- Local fluid temperature, humidity and absolute static pressure also measured and streamed
- 6-axis inertial measurement unit for automatic alignment and vibration warning
- Low-profile, in-line sensor package measuring under 20 mm in diameter



Specification

Standard sensor specifications			
Product code	FD7HP-160P	FD7HP-1K0	FD7HP-6K9
Standard pressure ranges	160 Pa FS	1 kPa FS	6.9 kPa FS
Maximum overpressure	33.5 kPa	37.5 kPa	69 kPa
Sensor accuracy ¹	± 0.1 % FS		
Total error band after auto-zero ²	± 0.5 % FS	± 0.25 % FS	± 0.25 % FS
Operational mode	Differential with external reference		
Compensated temperature range	0° to +50° C (wider ranges may be available)		
Operating temperature range	-40° to +65° C		
Storage temperature range	-40° to +65° C		
Vibration	Sensors rated to 15 g, 10 Hz to 2 Hz		
Maximum relative humidity	95 %, non-condensing		
Relative ambient humidity sensor specification	0 % to 100 % RH, +/- 3%		

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Ambient temperature sensor specification ³	0°C - 65°C ± 0.5°C
Ambient absolute pressure sensor specification	30-110 kPa FS, +/- 0.1kPa

Standard probe specifications (custom configurations available on request)			
Product code	FD7HP-XXX		
Reference pressure	Connection to steady reference static pressure required for operation		
Sting and enclosure material	316 stainless		
Sting diameter	3.7 mm		
Standard tip geometry	Hemispherical (other geometries available by request)		
Angular measurement range ⁴	± 45° or ± 60°		
Fluid temperature probe	-40°C - 150°C ± 0.5°C		
Voltage	6-12 VDC or via USB		
Power	min. 290 mW		
Communications interface	USB2.0 & UART RS232 or UDP Ethernet available ⁵		
Data acquisition rate	Typ. 0.8 kHz	Max. 0.9 kHz	Ext. 1.6 kHz ⁶
Digital resolution	24-bit pressure, 16-bit environmental and IMU		
System requirements	Windows 7 or later, minimum 3GHz & 4Gb RAM		
IMU specification	3 axis gyro, 125 °/s FS, ± 3.9 x10 ⁻³ °/s 3 axis accelerometer, 2g FS, ± 0.061 mg		

Measurement performance			
Typical mean velocity uncertainty ⁷	0.8% at 5 m/s	0.4% at 13 m/s	0.4% at 34 m/s
Typical mean angular uncertainty ⁷	±0.5°	±0.3°	±0.3°
Nyquist limit	0.5 kHz		

¹ Includes errors due to pressure non-linearity, pressure hysteresis, non-repeatability and calibration uncertainty.

² Total residual error after auto-zero, excluding residual temperature sensitivity.

³ Temperature is recorded at the location of the PCB. Waste heat from electronic components may distort temperature readings.

⁴ Calibrated range. Uncertainty will vary over this range.

⁵ Additional adaptor system required, sold separately.

⁶ Extended range. Requires disabling of temperature compensation. May result in nonuniform sampling.

⁷ Based on MC analysis. Steady-state, averaged over ±60° with zeroth order minimum finding with spline resampling.

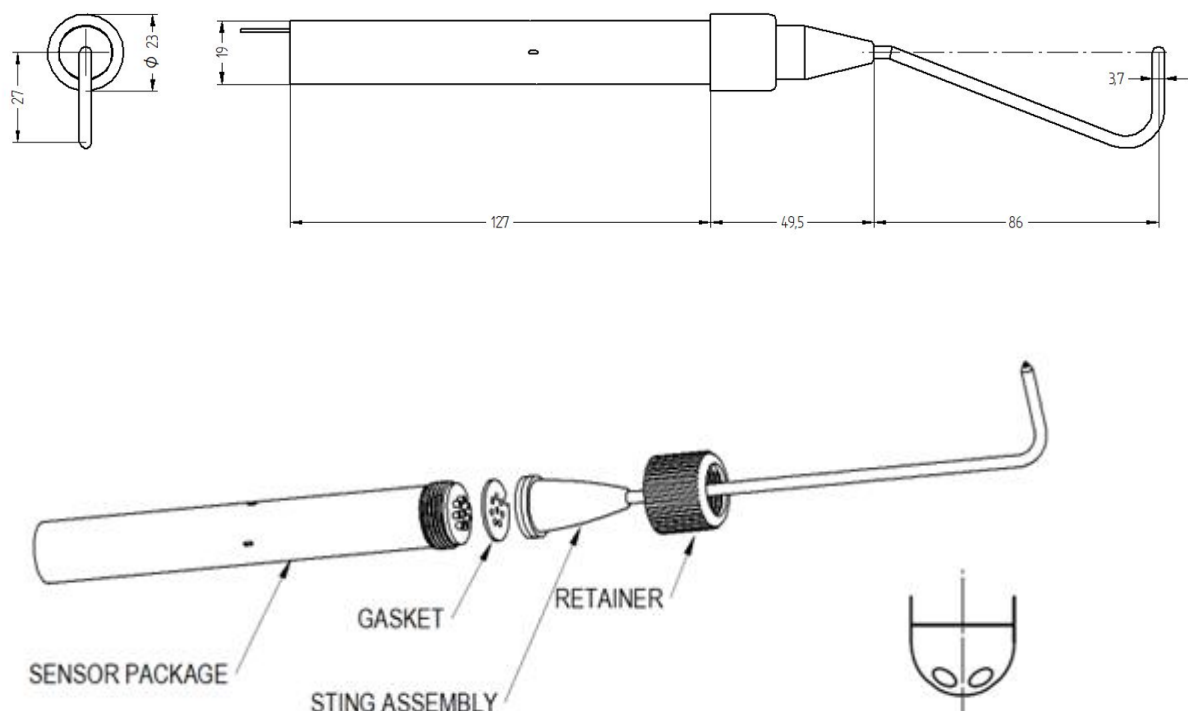
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Additional custom modifications available:

- Conical tips available
- Custom sting bends available
- Custom direction calibration range/resolution
- Custom dynamic calibration range/resolution
- Low-mass nylon enclosures available
- Custom enclosure design service
- Custom software and driver development service
- Extended product support and warranty

Dimensions

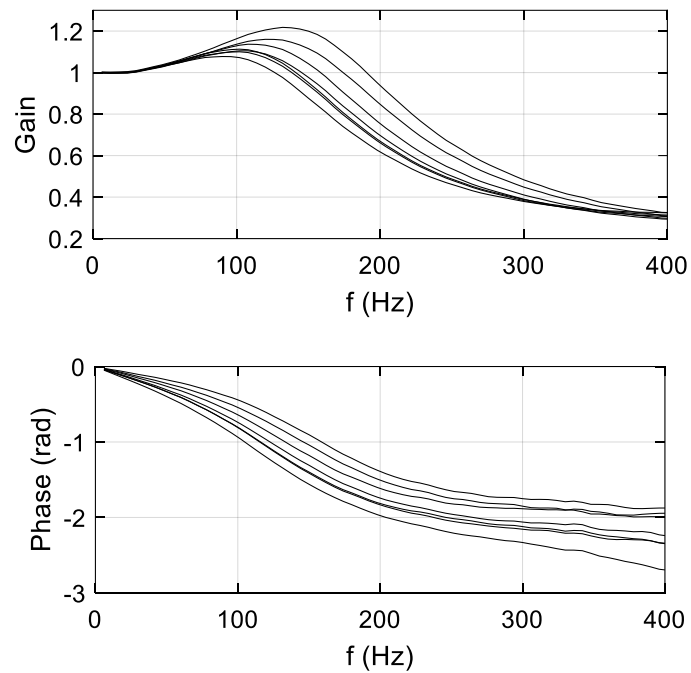
FD7HP (Custom geometries possible; enclosure supplied in stainless steel as standard)



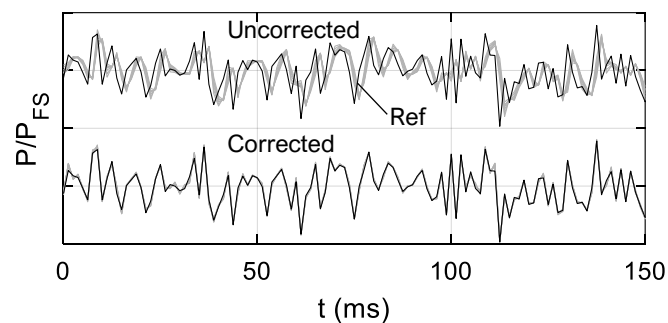
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Dynamic response

Typical dynamic response for standard sting configuration, 0 - 800 Hz.



Uncorrected and corrected measurements, 800 Hz, white noise input at $\pm P_{FS}$



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