



DATA SHEET

Engineering Flow-Measurement Solutions

Features

- An omniprobe has 12 ports on a spherical tip
- Tip diameters as small as 6.35mm
- Average Angular Accuracy of $\pm 1.5^\circ$
- Average Velocity Accuracy of 3% or ± 1 m/s
- Temperature Ratings to 500C
- Probe Calibrations from 5 m/s to Mach 1.0
- Capable of measuring flow vectors up to $\pm 150^\circ$ incidence angle from the probe's axis

Applications

- Wind engineering.
- General aerodynamics.
- Combustor swirl flows.
- Automotive wakes, engine compartments
- Ideal for applications where the predominant direction of the flow is not known in advance.
- Invaluable in applications where the probe may see a complete reversal of the flow during testing.

PRODUCT SPECIFICATIONS

Measurement Accuracy

Velocity Magnitude ^{1,2}	3%
Flow Angle of Receptivity	Cone Angle: 150°
Flow Angles	± 1.5
Calibration Flow Speeds	5 m/s to Mach 1
Frequency Reponse	<50 Hz, Frequency Calibration Available Upon Request
Media	Non-Reactive Gases (Stainless); Other Media Possible – Contact Aeroprobe

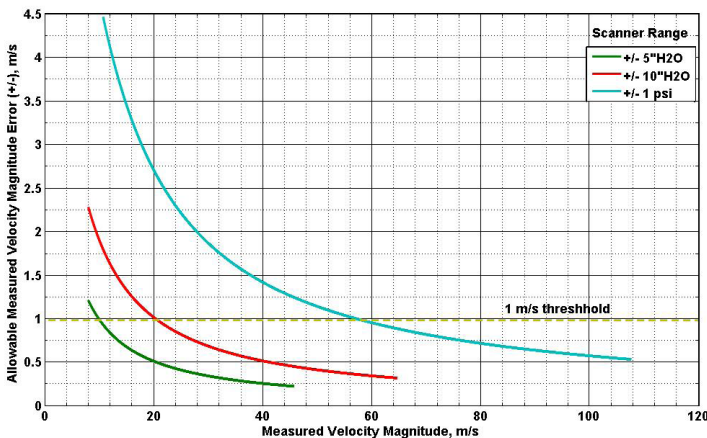
¹Based on Average of Test Point Data

²Utilizing 0.1% Accurate Pressure Sensors Properly Rated for Flow Speed

Geometry and Construction

Probe Geometry	Straight, L-Shaped
Number of Holes	12
Tip Geometry	Spherical
Tip Diameter	Standard: 9.53 mm Optional: 6.35 mm
Material	303, 304 Stainless Construction, Including Shafts and Internal Tubing
Pneumatic Connection	Exit Tubing of 1.02 mm (0.040") OD with Tubulation
Mounting	Hex Prism (9.53 mm Standard Flat-to-Flat) Optional: Rectangular Prism, Cylindrical with Flat
Probe Angle Reference	Straight: Flat on Hex Mount
Temperature Rating	Standard: 0 – 500°C

Velocity Magnitude Elaborated



The stated velocity accuracy for Aeroprobe's omniprobe is 1 m/s or 3% of the measured velocity, whichever is larger, assuming a properly ranged scanner. The graph below illustrates the effect of scanner range on velocity accuracy. The graph shows the allowable velocity error as a function of velocity for three different pressure scanner ranges, all with 0.5% full-scale span error. The calculated error assumes that the pressure measured by the scanner is the dynamic pressure and no system or reduction error is accounted for.

When designing an omniprobe test it is important to consider the effect of pressure measurement error at the desired flow velocity. For example, the user should not expect accuracies of less than 1/m/s using the +/- 1 psi scanner with 0.5% FSS error for a measurements below approximately 60 m/s.

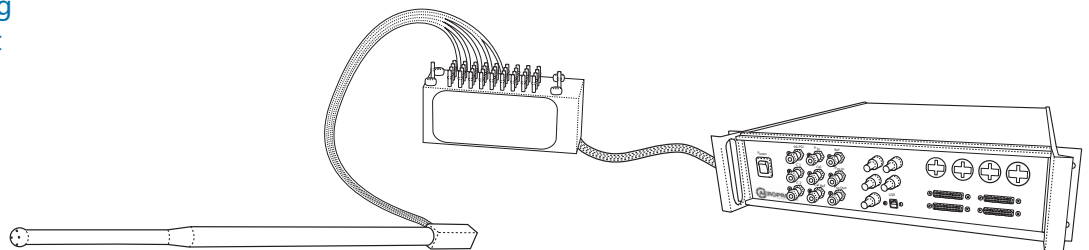
SYSTEM SCHEMATIC

Where your probe fits in our system

Aeroprobe provides complete system solutions to challenging and unique flow measurement problems.

Aeroprobe systems include:

- Measurement instruments
- Supporting hardware
- Data acquisition
- Software



PRODUCT SPECIFICATIONS

Minimum Bend Radii¹ (*r*) (Centerline)

Component Diameter	Minimum Bend Radius
6.35 mm	14.3 mm

¹Refer to technical drawing below for notations

Standard Calibration Speed Ranges for Typical Omniprobe Tip Diameters

Omniprobe Tip Diameter ¹ (<i>d</i>)	Calibration Velocity Range
6.35 mm	5 to 320 m/s
9.53 mm	5 to 70 m/s

¹Refer to technical drawing below for notations

Conventional 5- and 7-hole probes are limited to flow incidence angles of 70° or below. For measurement applications involving higher angularity, unknown angularity, or reversed flows, AeroProbe has developed the Omniprobe.

AeroProbe offers two standard omniprobe geometries: Straight and L-Shaped. Standard omniprobes are of stainless steel and are available with a 9.53 mm or 6.35 mm tip diameter and a 152.4 mm overall length.

Geometry Limitations for Omniprobes

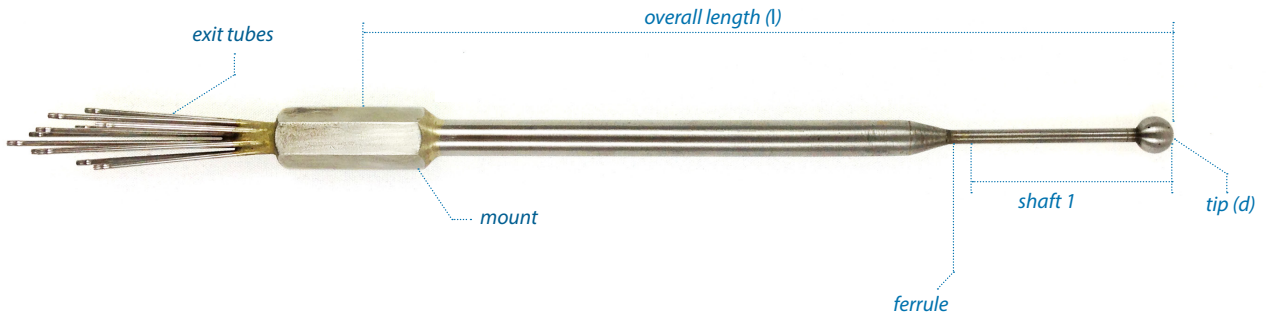
Dimension	Minimum	Maximum
Tip Diameter (<i>d</i>) ¹	6.35 mm	9.53 mm
Overall Length (<i>l</i>) ¹	102 mm	255 mm
Tip Length (<i>t</i>) ¹	70 mm	102 mm

¹Refer to technical drawing below for notations

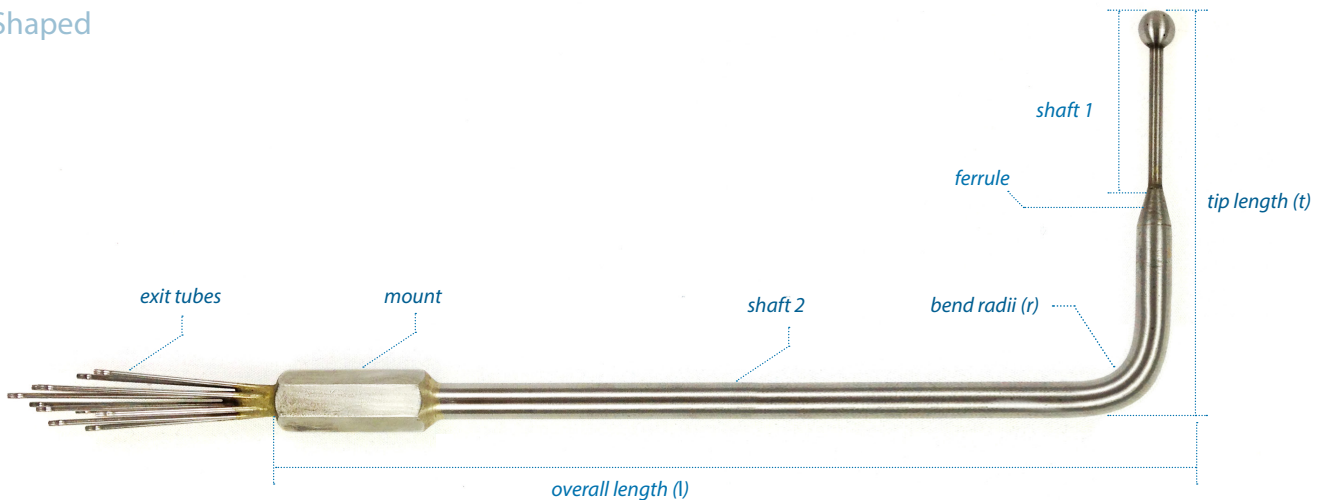
Standard Tolerances

Dimension or Component	Tolerance
Tip Diameter and Exit Tubes	± 0.05 mm
Other Diameters (Housing Tubes)	± 0.10 mm
Locations (Centerlines, Ports)	± 0.05 mm
Primary Lengths (Overall Length, Exit Tubes, Hex Mount, Ferrules)	± 2.54 mm
Other Lengths (Bent Leg, Housing Stages)	± 5.1 mm
Included Tip Angle (Conical)	± 0.5°
On-Axis Bend Angle	± 1°
Off-Axis Bend Angle	± 5°

Straight



L-Shaped



PROBE MODEL NUMBER STRUCTURE:

P-C12C06S-SX-S-152- _ _ _



Multi-Hole Probe Model Number Definition

1	P: Standard Probe
2	C: Conventional
3	Number of Probe Ports (12)
4	Tip Style (S = Spherical)
5	Tip Diameter (06 = 6.35 mm, 09 = 9.35mm)
6	Shaft Style (S = Straight, L = L-Shaped)
7	Temperature Rating (S = 500°C, H = 900°C)
8	Thermal Capability Enhancement (X = None)
9	Customization (S = Standard, N = Near Standard, C = Custom)
l	Overall Length of Probe (mm)
t	Length of Probe Tip (mm)

Example Probe Model Numbers:

Model Number: P-C12C09L-SX-S-152-070

Standard 9.53mm L-Shaped Omniprobe for Full-Scale Automotive Wake Measurements. Overall Length 152mm, Tip Length 70mm

Model Number: P-C12C06S-SX-N-320

Near Standard 6.35mm Straight Omniprobe for Flow Measurements in Tornado Simulator. Overall Length 320mm.

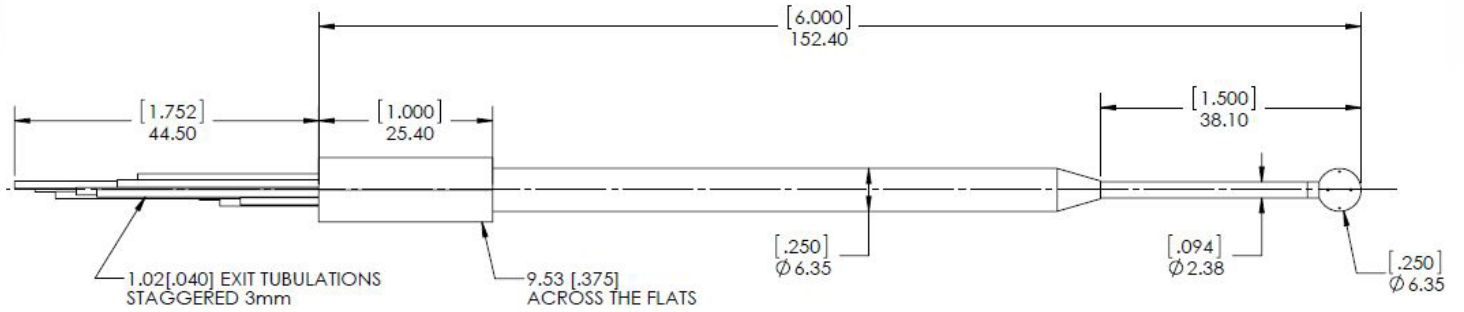
Please Note:

- Standard omniprobos are manufactured with 6.35 mm and 9.53 mm tip diameters, and are 152 mm in length.
- Near-standard probes have standard geometry EXCEPT for the length of the shafts.
- Custom probes have variations from the standard that include non-standard tip sizes, non-standard probe or mount geometry, or non-standard materials.
- **Important:** Near-standard and custom probes require confirmation of probe drawing by customer, prior to manufacturing.

STANDARD TECHNICAL DRAWINGS

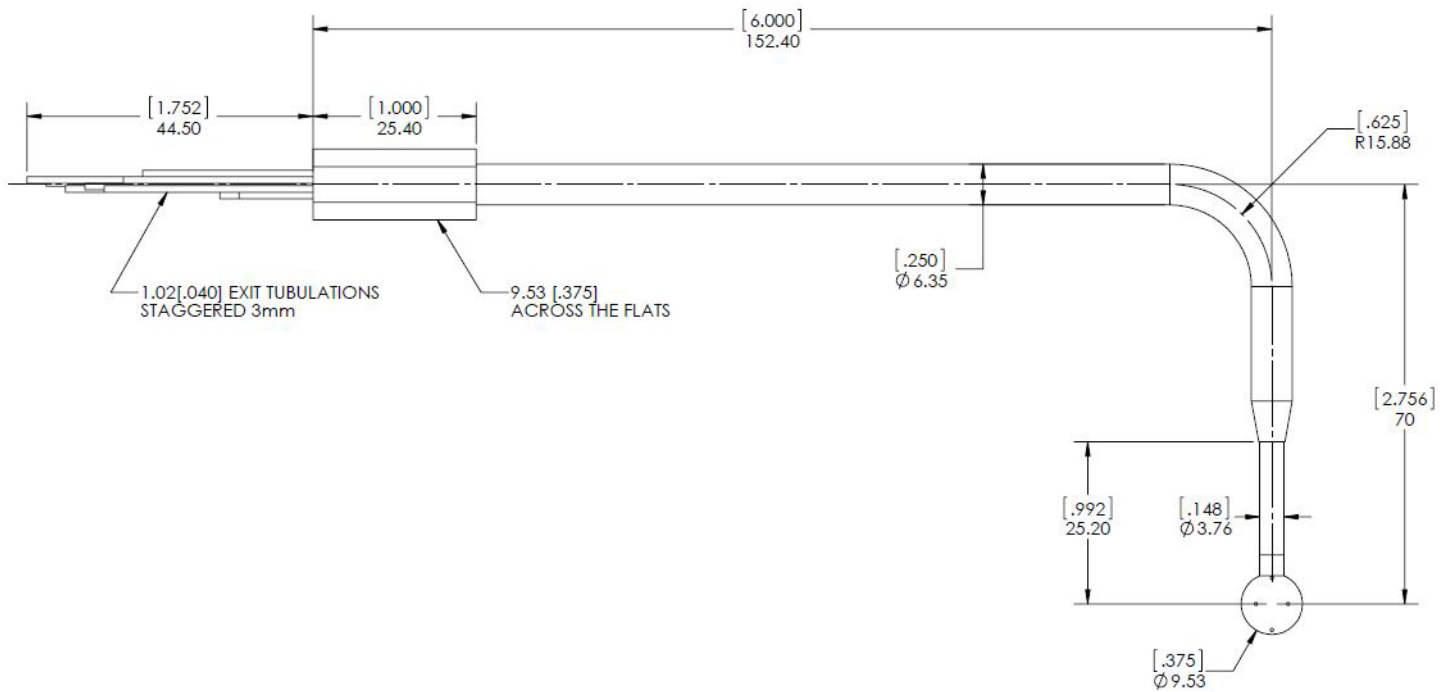
Straight

Model Number: P-C12H06S-SX-S-152



L-Shaped

Model Number: P-C12H09L-SX-S-152

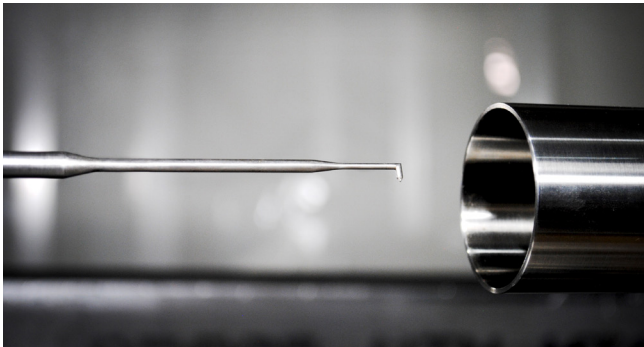
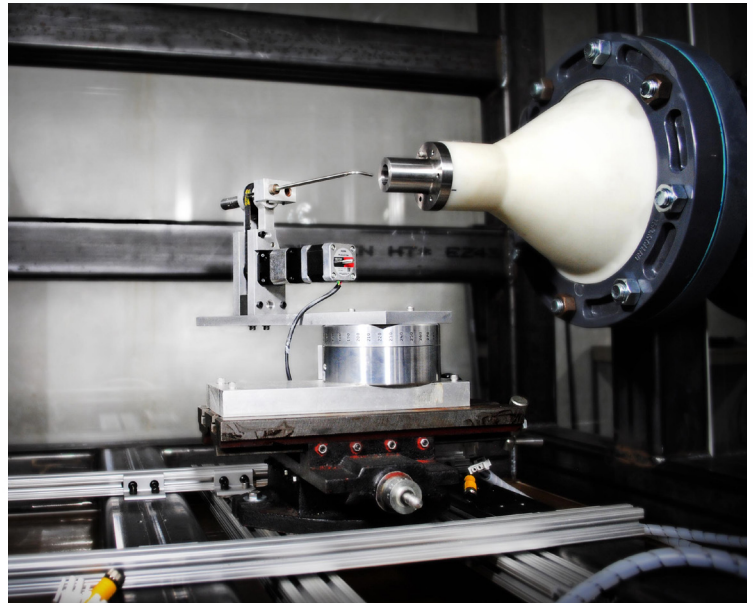


CALIBRATION & SERVICES

ONE SOURCE FOR A FULL SOLUTION

The probe calibration is essential to the proper operation of the probe. It defines the relationship between the measured probe port pressures and the actual velocity vector sensed by the probe and pressure transducers. The probe is placed in a known flowfield and rotated to between 2000 and 6000 discrete points (depending on probe type). A calibration map is then generated for use with pressure to velocity reduction software, such as AeroFlow, Aeroprobe's data acquisition and data reduction software.

Aeroprobe's calibration wind tunnels are thoroughly-characterized free jets, configured to allow continuous flow at 5 m/s to Mach 2.0. This configuration allows Aeroprobe to record extreme number of calibration points for each calibration. Aeroprobe can calibrate probes for other fluid flows via Reynolds number matching, and can recommend a calibration schedule for any probe and application.



CAPABILITIES

- | | |
|--|------------------------------------|
| Probe Calibrations from 5 m/s to Mach 1.0 | NIST-Traceable Calibrations |
| Average Angular Accuracy of $\pm 1.5^\circ$ | Specialized Calibrations Available |
| Average Velocity Accuracy of 3% or ± 1 m/s | >5000 Calibration Points |

** Reported probe calibration accuracies are based on the measured error values for a comprehensive set of test points collected in Aeroprobe's laboratory wind tunnel facilities. Flow environments exist where expected errors could be larger. Contact Aeroprobe for more information.

COMPANY SUMMARY

Unique challenges. Quality solutions.

Aeroprobe provides air data measurement systems to aerospace, automotive, turbomachinery, wind turbine, and wind tunnel testing industries around the world. Aeroprobe's air data systems for unmanned aircraft provide real time air speed, angle of attack and angle of sideslip for improved flight performance. Turnkey systems include instrumentation for measurement, hardware for data collection, and software for data reduction, analysis and visualization. High temperature probes operate in flows up to 900°C. Omniprobes, featuring a 300° flow angle range, are capable of measuring reversed flow. Fast response probes provide a frequency response exceeding 4 KHz. Rake configurations allow for simultaneous multi-point, unsteady measurements. The company conducts international business through a network of over 20 distributors.

Engineering Flow-Measurement Solutions



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