Directional Probes
3 – Dimensional

United Sensor 3 Dimensional Directional probes measure yaw and pitch angles of fluid flow, as well as total and static pressures and total temperature.

Each probe has five measuring holes located on its tip. A centrally located pressure hole measures pressure P1, while two lateral pressure holes measure pressures P2 and P3. If the probe is rotated by a Traverse Unit (Fig. 1) until P2 = P3 as indicated on a manometer or other sensitive pressure indicator, the yaw angle of flow is then indicated by the traverse unit scale (see Traverse Unit catalog pages).

When the yaw angle has been determined and additional differential pressure P4 – P5 is measured by pressure holes located above and below the total pressure (P1) hole. Pitch angle is determined by calculating (P4 – P5) / (P1 – P2) and using the calibration curve for the individual probe (e.g. Curve A, Figs. 2 and 3). At any particular pitch angle the velocity pressure coefficient (Pt – Ps) / (P1 – P2) and total pressure coefficient (P1 – Pt) / (Pt – Ps) can be read from curves B and C, while Pt – Ps and Ps can be calculated. In the case of Type DAT probes, a half shielded thermocouple sensor at the probe tip provides total temperature measurements at the same point in the stream as fluid pressure and flow direction measurements.

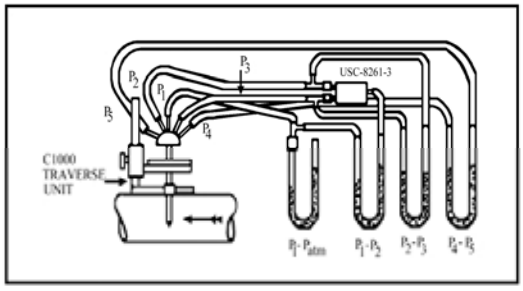

Fig. 1. Typical manometer connections for DA or DC probes.

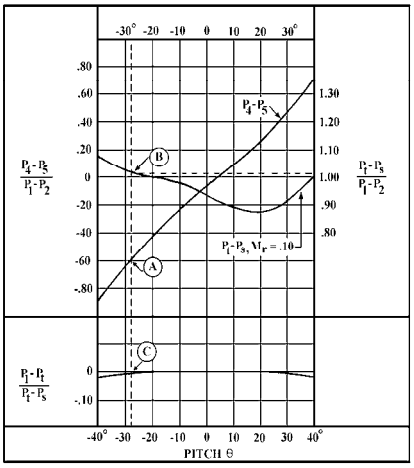

Fig. 2. Typical calibration of DA probes vs. pitch angle.

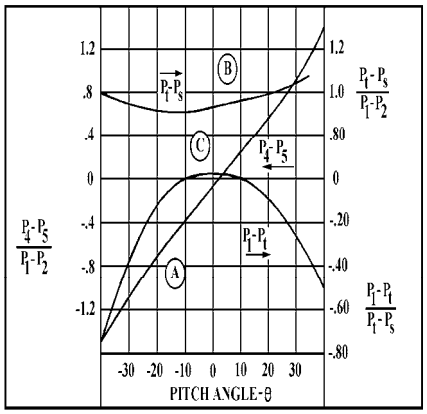

Fig. 3. Typical calibration of DC probes vs. pitch angle.

DA DAT DC

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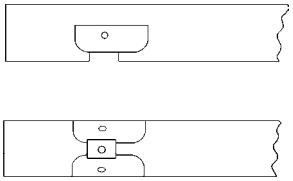
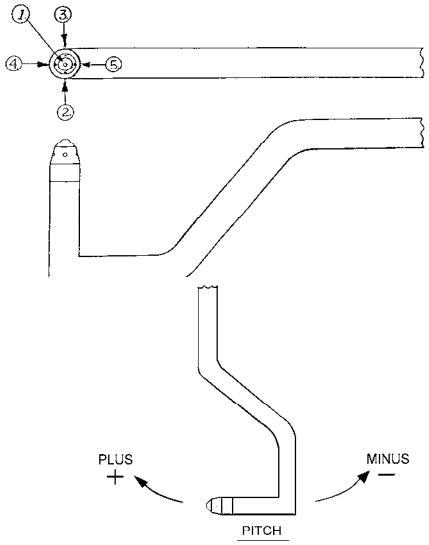
Standard Specifications

DA: Five hole prism shaped measuring section. Measures total and static pressure, yaw angle and pitch angle. Furnished with individual calibration curves up to pitch angles of 40°. Tip extends 2 diameters beyond holes. Typical calibration shown in Fig. 3. Smallest size can be inserted through a 1/8" hole. Usable up to Mach 0.7.
Standard diameters are 1/8", 3/16", 1/4", 3/8",

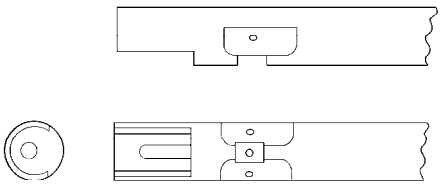


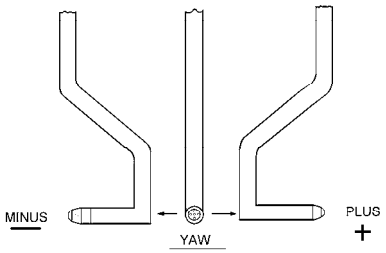
1.00"

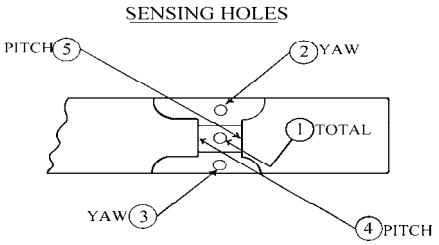
DC: Five hole conical shaped measuring section. Measures total and static pressure, yaw angle, and pitch angle. More suitable for use near boundaries than type DA. Furnished with individual calibration curves up to pitch angles of 40°. Usable up to Mach 0.7. DC-125 head fits through a clearance hole 5/8" diameter. Typical calibration curve illustrated in Fig. 3.
Standard diameters are: 3/32", 1/8", 3/16", 1/4"



DAT: Five holes plus thermocouple. Measures total and static pressure, yaw angle, pitch angle and total temperature. Furnished with individual calibration curves up to pitch angles of 40°. Tip extends 3.5 diameters beyond holes.
Standard diameters are: 3/16", 1/4", 3/8", 1.00"







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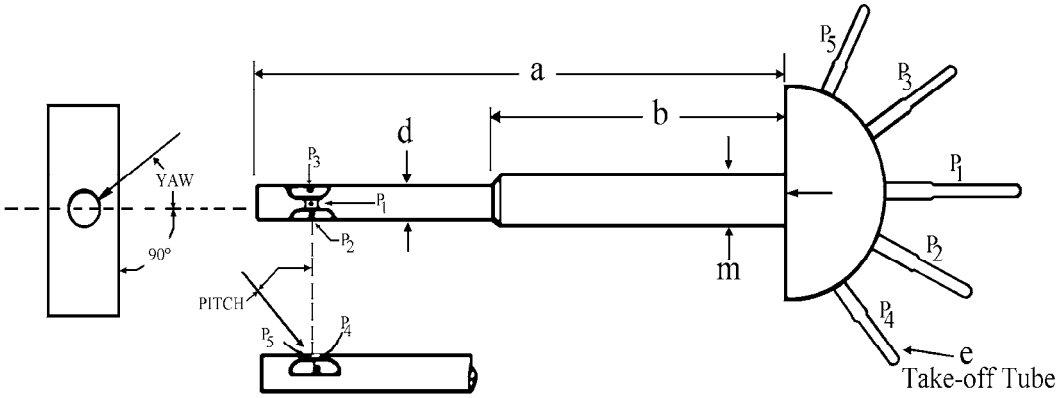
Ordering Information



Typical Example: DAT-187-24-F-22-CD-K-Plug

DAT: Sensing Head Type *
187: d = .187" - Sensing Head Diameter (inches) **
24: a = 24" - Overall Length (inches)
F: m = 1/4" Reinforcement Tubing Diameter ***

D	E	F	H	J	L
1/16"	3/16"	1/4"	5/16"	3/8"	1/2"

22: b = 22" – Reinforcement Tubing Length (inches) ***
CD: e = 5/32" Swaged down to 1/8" - Take-off Tube Diameter

A	C	D	E	F
1/16"	1/8"	5/32"	3/16"	1/4"

Thermocouple Type (DAT probe only)
K: Chromel – Alumel
J: Iron – Constantan
T: Copper – Constantan
E: Chromel – Constantan
Plug: Plug termination is standard. Jacks or Lead-wire are available. – DAT probes only.

* See front page for standard sensing head type
** Give desired dimensions as decimals, e.g. .125" diameter = 125 in part number
*** Omit if reinforcement tubing is not required

VARIATIONS

United Sensor 3 Dimensional Directional Probes are flexible in design, permitting a wide choice of options to fit individual needs; e.g., longer or shorter lengths of probes and reinforcement tubing, lager diameters for reinforcement and pressure take-offs, removable thermocouple, leadwire termination, etc.

Unless otherwise specified, all 3 Dimensional models are made of corrosion resistant non-magnetic stainless steel and silver brazed. If required, inconel can be specified.

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