



NZP1000 Series Nozzle Pitot Air/Gas Flow Sensor

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Thermo Electron's patented NZP1000 Series Nozzle Pitot Flow Sensor combines integral flow straighteners, a nozzle and a pitot averaging array to form a flowmeter requiring "No Upstream Straight Run With $\pm 0.5\%$ Reading Accuracy". The nozzle eliminates distortions in the velocity profile caused by upstream obstructions and also doubles the velocity before it is measured by the pitot averaging array.

- **No Upstream Straight Run Required.**
- **High Accuracy of $\pm 0.5\%$ of Reading.**
- **Excellent Repeatability: $\pm 0.1\%$.**
- **34:1 Flow Turndown.**
- **Superior Performance Under Adverse Conditions.**



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Designed for circular ducts, the excellent flow conditioning of Brandt's patented Nozzle Pitot allows it to be used where conventional primaries (orifices, venturis, pitot averaging, etc.) are adversely affected by irregular flow profiles and turbulence and where particularly high accuracy and repeatability are required.

Model Number Description

SERIES: NZP1000 NOZZLE PITOT FLOW SENSOR

NZP10 - Circular Carbon Steel, Standard Flange and Duct Section, Neoprene Gaskets

NZP11 - Circular Carbon Steel 150# Flange and Standard Schedule Pipe, Spiral Wound Graphite Gaskets

NZP13 - Circular 125 # Ductile Iron Backup Flanges, Stainless Steel Slip On Angle Rings, Sch.10s S. Steel Pipe, Spiral Wound Graphite Gaskets

NZP14 - Circular 304 Stainless Steel, Standard Flange and Duct Section, Neoprene Gaskets

NZP15 - Circular 304 Stainless Steel 150# Flange and Standard Schedule Pipe, Spiral Wound Graphite Gaskets

NZP1X - Special (consult factory)

NOZZLE/PITOT ASSEMBLY

3 - Aluminum nozzle with 316 Stainless Steel probe array

4 - 304 Stainless Steel nozzle with 316 Stainless Steel probe array

5 - 316 Stainless Steel Nozzle with 316 Stainless Steel probe array

X - Special (consult factory)

FLOW STRAIGHTENERS

0 - None

1 - Aluminum

2 - 304 SS, welded Construction

3 - 304 SS, 6 mil thick, welded every node (for velocities greater than 5000 FPM)

5 - 316 SS, welded construction.

X - Special (consult factory)

- SIZE

Nominal diameters of 4", 6", 8", 10", 12", 14", 16", 18", 20", 22", 24", 26", 28", 30" and 40". 40" not available in High Pressure configuration. Consult factory for availability of other sizes.

- FLANGE PREFERENCE

0 - None

1 - Brandt Standard Flanges with Industry Standard Bolt Hole Pattern

2 - Brandt Standard without Bolt Holes

X - Special (consult factory).

- OPTIONS (See Back Page For Option Description)

ZV - Mounted Zeroing Manifold Valve

CF - Companion Flange

IB - Intake Bell

TH - Intake Bell Rain Cover

SGM - Special Gasket Material. Specify

RTD - Resistance Temperature Sensor

ARTD - Averaging RTD

TC - Temperature Connection, 1/2" NPTF

PC - Pressure Connection, 1/4" NPTF

FC - Flow Calibration, Traceable to NIST

QS - Seismic Qualified for Nuclear Applications.

Specify seismic zone and response spectrum.

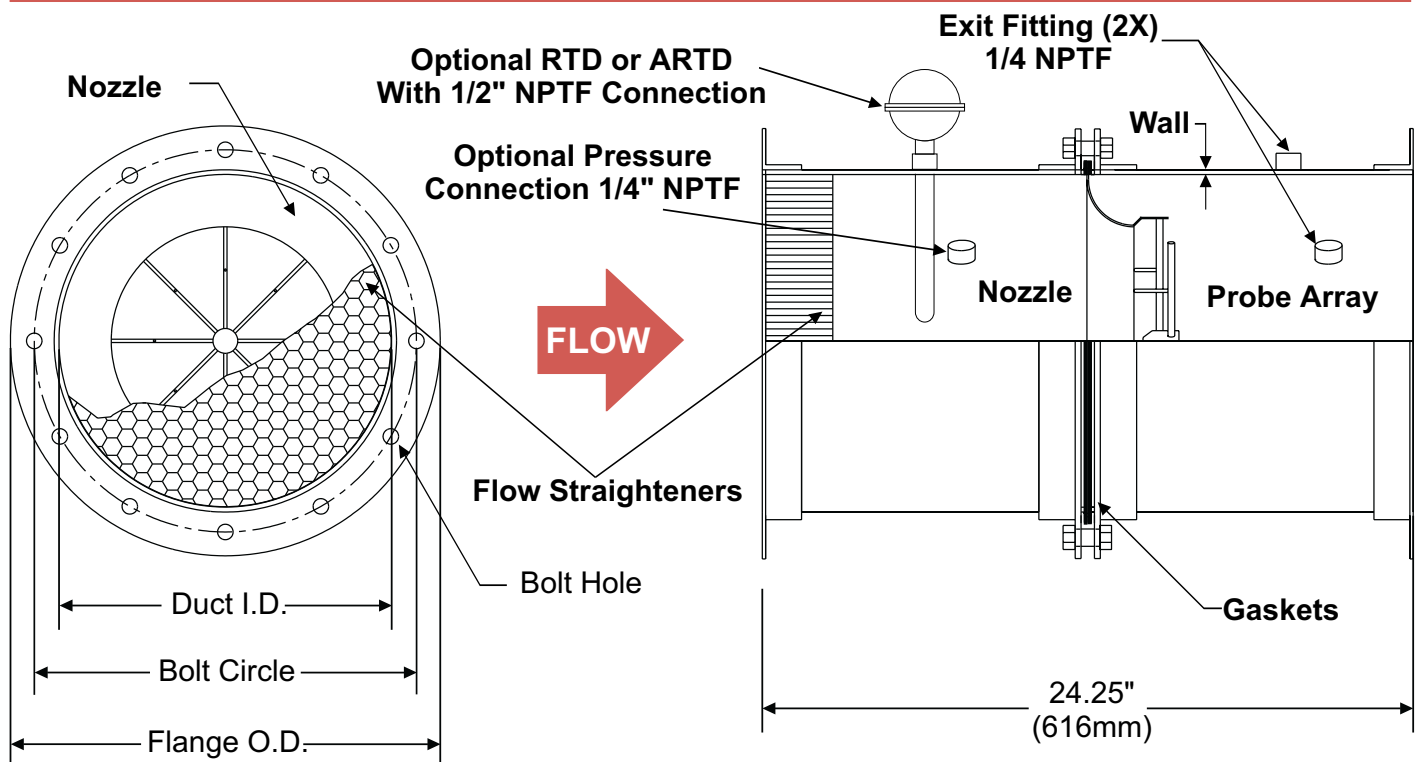
NOTES:

1. Flow calculations will be based on conditions supplied at time of order. Temperature Range, Pressure Range, Flow or Velocity Range, Molecular Weight, Gas Composition and Relative Humidity are necessary to insure unit design meets application requirements.

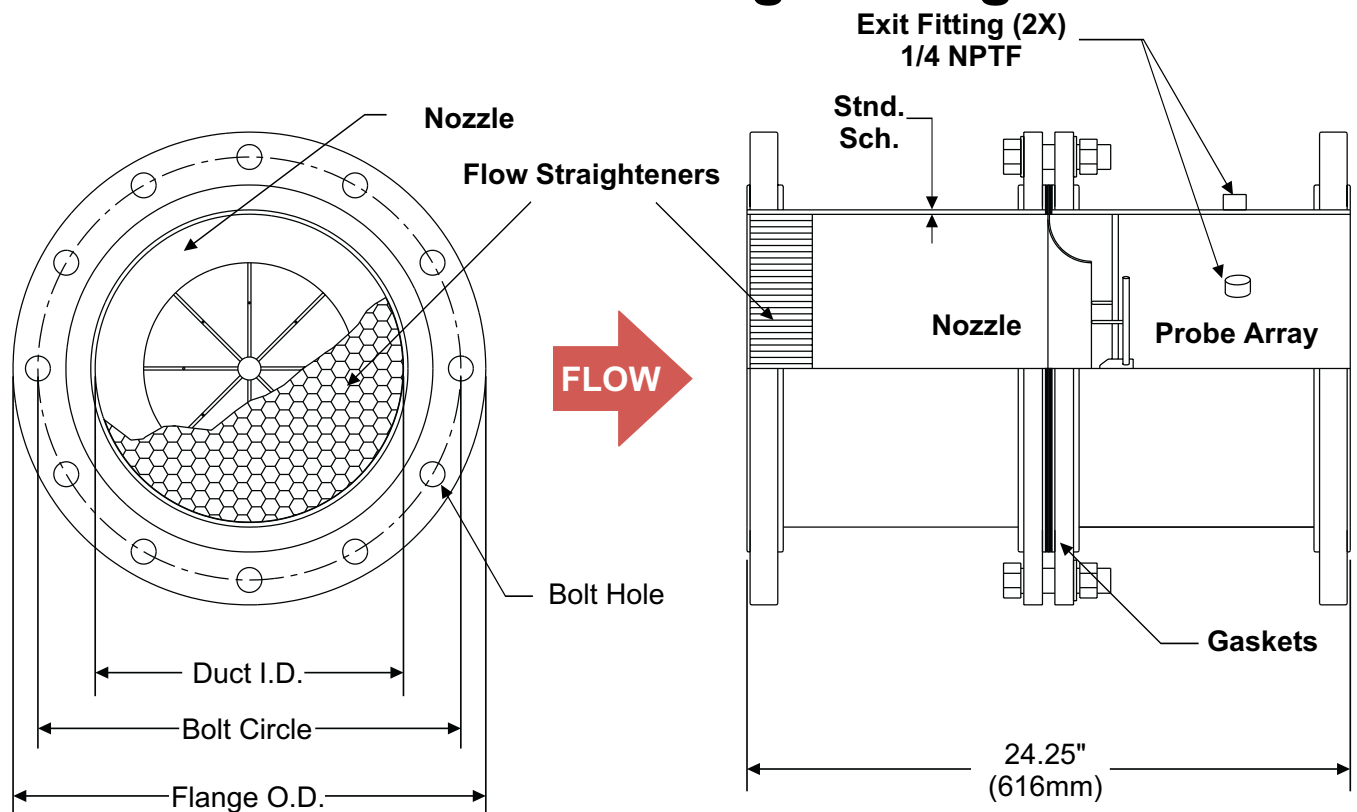
2. Specify tagging if applicable.

NZP14 4 2 - 12" - 1 - CF

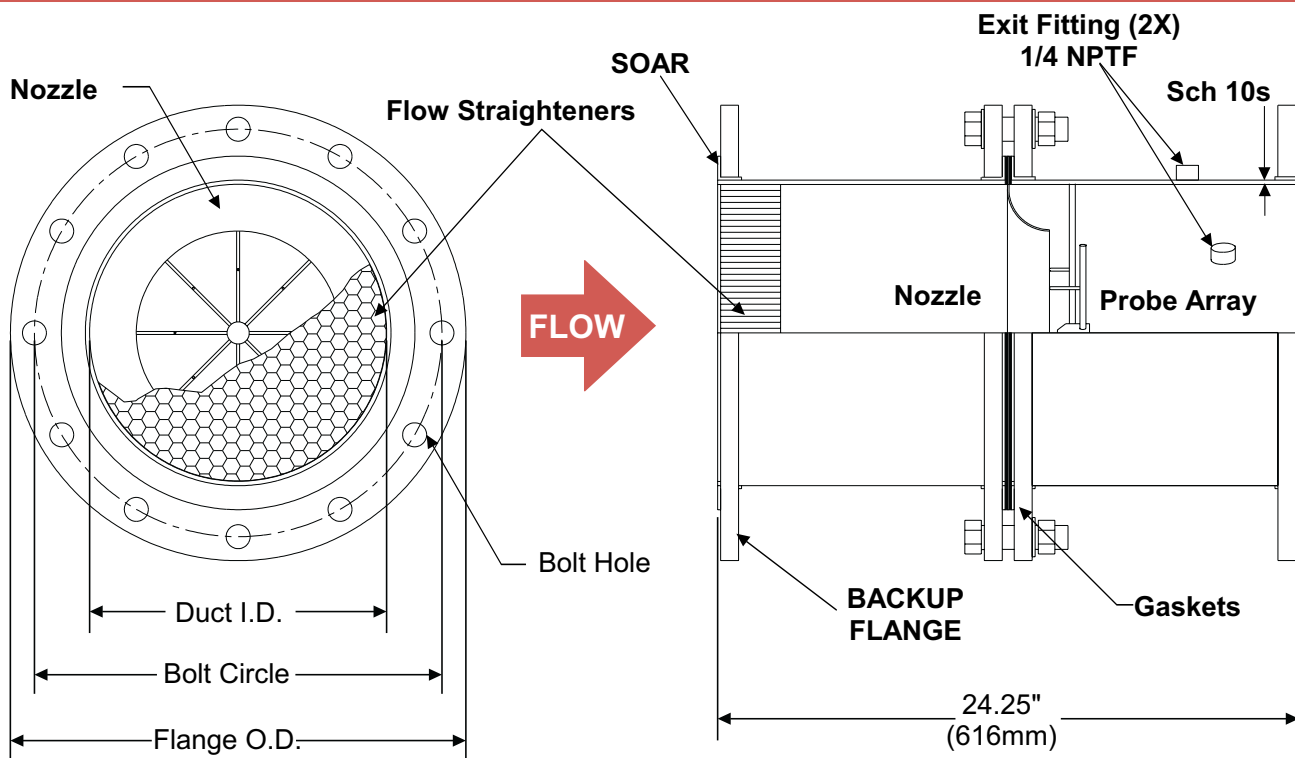
Typical Model No.



NZP1000: Standard Angle Flange & Duct



NZP1000: High Pressure Flange & Standard Pipe



NZP1300: 125 lb. Ductile Iron Backup Flange, SOAR and Schedule 10s Pipe

Standard Flange & Duct Casing

Nominal Duct Size Dia..	Duct Wall	Duct I.D. +/-1/16	Flange O.D.	Bolt Circle	Bolt Holes Qty. @
4 inch	16 ga.	4	6 ¹ / ₁₆	5 ⁵ / ₁₆	6 @ ⁹ / ₃₂
6 inch	16 ga.	6	8 ³ / ₃₂	7 ⁵ / ₁₆	6 @ ⁹ / ₃₂
8 inch	16 ga.	8	10 ³ / ₈	9 ⁹ / ₁₆	6 @ ⁷ / ₁₆
10 inch	16 ga.	10	12 ⁷ / ₈	11 ¹³ / ₁₆	6 @ ⁷ / ₁₆
12 inch	16 ga.	12	15 ¹ / ₈	14	6 @ ⁷ / ₁₆
14 inch	16 ga.	14	17 ¹ / ₈	16	8 @ ⁷ / ₁₆
16 inch	16 ga.	16	19 ¹ / ₈	18	8 @ ⁷ / ₁₆
18 inch	16 ga.	18	21 ¹ / ₈	20	8 @ ⁷ / ₁₆
20 inch	16 ga.	20	23 ¹ / ₈	21 ³ / ₄	12 @ ⁷ / ₁₆
22 inch	16 ga.	22	25 ¹ / ₈	23 ³ / ₄	12 @ ⁷ / ₁₆
24 inch	16 ga.	24	27 ¹ / ₈	25 ⁷ / ₈	12 @ ⁷ / ₁₆
26 inch	16 ga.	26	30 ¹ / ₈	28 ³ / ₈	16 @ ⁷ / ₁₆
28 inch	16 ga.	28	32 ¹ / ₈	30 ³ / ₈	16 @ ⁷ / ₁₆
30 inch	14 ga.	30	34 ¹ / ₈	32 ³ / ₈	16 @ ⁷ / ₁₆
40 inch	14 ga.	40	44 ¹ / ₈	42 ³ / ₈	24 @ ⁷ / ₁₆

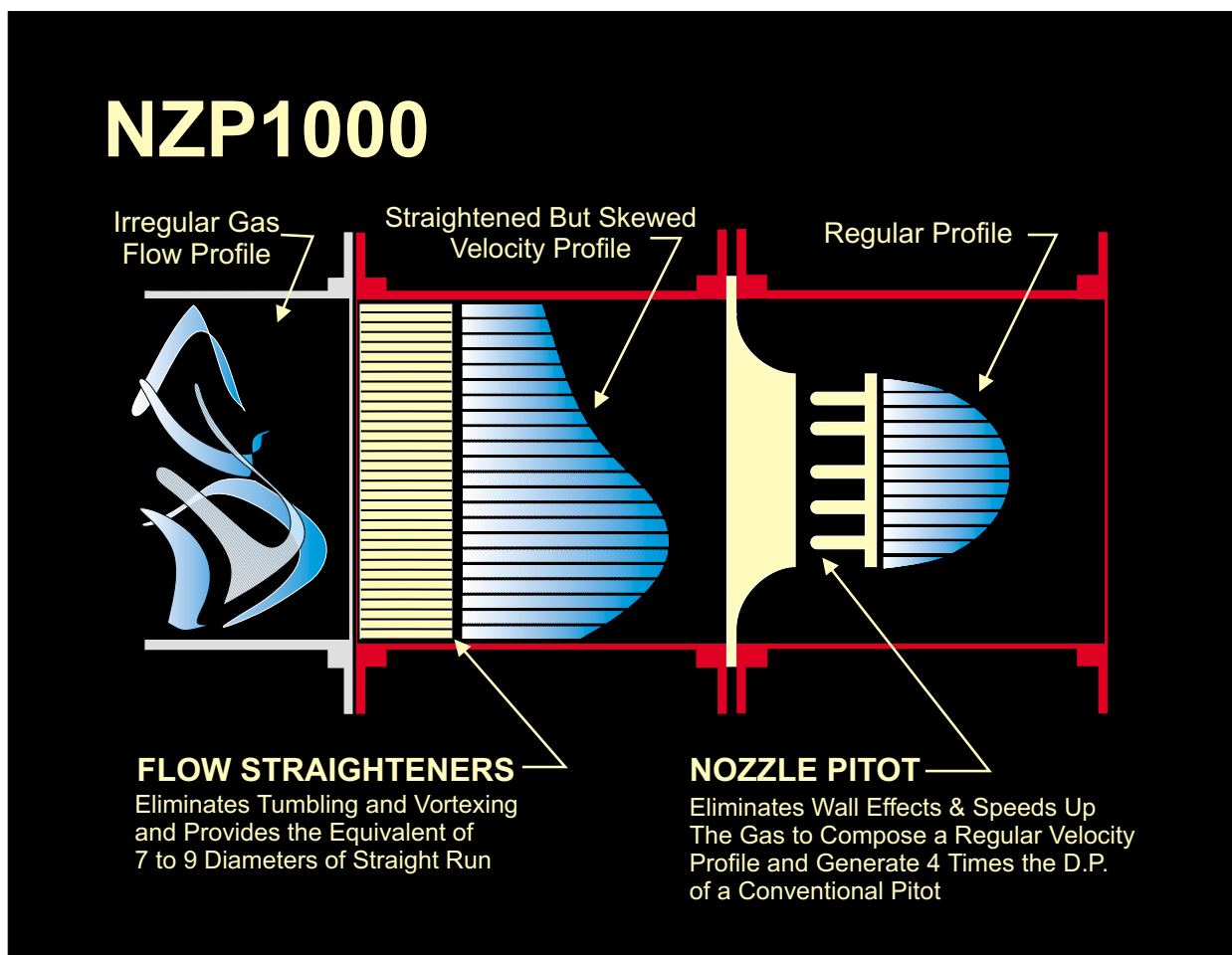
125 & 150 Lb. Flange & Standard Wall Pipe

Nominal Duct Size Dia..	Duct Wall	Duct I.D. +/-1/16	Flange O.D.	Bolt Circle	Bolt Holes Qty. @
4 inch	0.237	4.026	9	7 ¹ / ₂	8 @ .75
6 inch	0.280	6.065	11	9 ¹ / ₂	8 @ .88
8 inch	0.322	7.981	13 ¹ / ₂	11 ³ / ₄	8 @ .88
10 inch	0.365	10.02	16	14 ¹ / ₄	12 @ 1.0
12 inch	0.375	12	19	17	12 @ 1.0
14 inch	0.375	13.25	21	18 ³ / ₄	12 @ 1.12
16 inch	0.375	15.25	23 ¹ / ₂	21 ¹ / ₄	16 @ 1.12
18 inch	0.375	17.25	25	22 ³ / ₄	16 @ 1.25
20 inch	0.375	19.25	27 ¹ / ₂	25	20 @ 1.25
22 inch	0.375	21.25	29 ¹ / ₂	27 ¹ / ₄	20 @ 1.38
24 inch	0.375	23.25	32	29 ¹ / ₂	20 @ 1.38
26 inch	0.375	25.25	34 ¹ / ₄	31 ³ / ₄	24 @ 1.38

NZP1000 Series Nozzle Pitot Air/Gas Flow Sensor

The NZP1000 Series Air/Gas Flow Sensor exhibits superior performance under adverse conditions. It is virtually unaffected by upstream or downstream elbows, bends, transitions or tees. In fact, experience indicates that only a valve or damper less than 5 pipe diameters upstream of the flowmeter can degrade performance outside of the specification.

The Straightening vanes and flow nozzle combine to minimize the effects of turbulence, vortexing, swirl and profile shift. As shown below, the flow straighteners help align the flow and the nozzle conforms the flow to a known profile shape. An averaging pitot array installed at the throat of the nozzle accurately and repeatably measures the conditioned velocity profile.



NZP1000 Series Proven Applications

- Anti Surge Control - Centrifugal Compressors
- Aeration Basin Flow
- Compressed Air Flow
- Combustion Air Flow
- Drying / Coating Process Flow
- Flue Gas Recirculation Flow
- Primary Air Flow To Coal Mills
- Quench Air Flow
- Test/Calibration Air Flow

NZP1000 Series Nozzle Pitot Air/Gas Flow Sensor

PERFORMANCE SPECIFICATIONS

Accuracy:	Typically $\pm 0.5\%$ of Flow
Repeatability:	$\pm 0.1\%$ of Flow
Recommended Velocity Range:	175 - 6000 FPM (0.89 to 30.5 m/s) pipe velocity @ S.T.P. Corresponding D.P. = 0.00764 to 9.0 inch w.c. (0.194 to 229 mmwg). <i>The throat velocity is approximately double the pipe velocity.</i>
Unrecovered Pressure Loss:	Approximately 44% of measured DP <i>Example: At a Velocity of 4000 FPM @ S.T.P., the measured D.P. is 1.0" w.c. The permanent pressure loss is 44% of 1.0" w.c. or 0.44" w.c.</i>
Velocity Turn-down:	34:1 (Ratio of Maximum to Minimum Velocity)

FUNCTIONAL SPECIFICATIONS

Temperature Rating:	Carbon Steel: -200° to 750°F (-128° to 400°C) Stainless Steel: -200° to 750°F (-128° to 400°C) With Aluminum Flow Straighteners or Nozzle: -67° to 300°F (-55° to 149°C)
Maximum Static Pressure	
Low Pressure:	Carbon Steel Casing: 10 psig (0.4 Bar). Stainless Steel Casing: 12 psig (0.8 Bar).
High Pressure:	Dependent on process temperature, media and installation. Flanges/Casing are ANSI standard and fabrication is continuous weld. Special Flanges, Pipe and fabrication requirements or procedures are possible. Consult factory.

PHYSICAL SPECIFICATIONS

Pitot Array:	316 Stainless Steel with Argon welded joints
Connections:	316 Stainless Steel, 1/4" NPTF Standard
Flow Straighteners:	3/8" Hexagonal Cells either Aluminum (3.5" deep), 304 SS or 316SS (2.5" deep). SS is of welded construction. For higher velocities, reinforced Flow Straighteners (6 mil. thick, welded each node) are available. <i>Other materials available. Consult factory.</i>
Casing/Flanges:	304 Stainless Steel or Carbon Steel (Epoxy coated with rust inhibiting primer). All joints are continuously seam welded. Flanges with bolt holes are standard. For other materials, special coatings, custom flanges, etc. consult factory. <i>Note : End Flange Bolts Not Supplied</i>
Nozzle:	Aluminum, 304 or 316 Stainless Steel
Gaskets:	Low Pressure Configuration: Neoprene High Pressure Configuration: Spiral Wound Graphite <i>Other gasket materials such as Silicon, Gortex, etc. are available. Consult Factory</i>
Available Sizes:	Nominal diameters of 4", 6", 8", 10", 12", 14", 16", 18", 20", 22", 24", 26", 28", 30" and 40". Consult factory for other sizes.

OPTIONS

ZV	Mounted Zeroing Valve for D.P. Transmitter. See Brandt MVA1000 Specification Sheet for Model Number of Valve.
CF	Companion Flanges: Mounting flanges for adapting the NZP1000 to existing duct work. Please supply Duct O.D.
IB	Intake Bell. Mounts on Inlet of NZP for outside air intake measurement. Minimizes permanent pressure loss and shapes profile.
TH	Intake Bell Rain Cover.
SGM	Special Gasket Material: Gaskets used between the two flanged section assemblies. Specify Material.
TC	Temperature Connection: 1/2" NPTF, 316SS connection for insertion of Temperature Sensor
PC	Pressure Connection: 1/4" NPTF, 316SS connection for static pressure measurement in Mass Flow Applications.
RTD	Resistance Temperature Detector, 3 wire device for temperature measurement. Includes TC Option.
ARTD	Averaging RTD Sensor, 3 wire device for temperature measurement. Averages Temperature across Pipe. Includes TC Option.
QS	Seismic Qualified for Nuclear applications. Specify seismic zone & response spectrum.

INSTALLATION GUIDELINES

The Patented NZP1000 Series Nozzle Pitot requires No Upstream Straight run and only 1-2 Downstream Diameters to maintain an accuracy of $\pm 0.5\%$ except when a Damper is installed. Consult Factory for special installation conditions.

SPECIFYING THE BRANDT NZP1000

Flow measuring station shall be a Nozzle/Pitot Averaging Type with integral flow straightening vanes. Nozzle shall compose a uniform velocity profile and reduce the area at the point of measurement by 1/2. Flow straighteners shall have 3/8 inch diameter hexagon shaped cells with a minimum depth of 2.5 inches. All components shall be housed in a flanged spool piece with a flange to flange dimension of 24.25 Inches. Flow station shall measure actual flow within $\pm 0.5\%$ of reading over a range of 175 to 6000 FPM with repeatability of $\pm 0.1\%$ of reading. Permanent pressure loss shall not exceed 44% of the measured velocity pressure.

Thermo Electron Corporation

Thermo Electron has been the recognized leader in the measurement of air/gas flow and very low differential pressure in industrial applications. Thermo offers a complete line of pitot/static probes and arrays, D.P. Transmitters, the unique Nozzle Pitot flow sensor and a complete family of Current to Pressure (I/P) and Pressure to Current (P/I) Transducers.



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