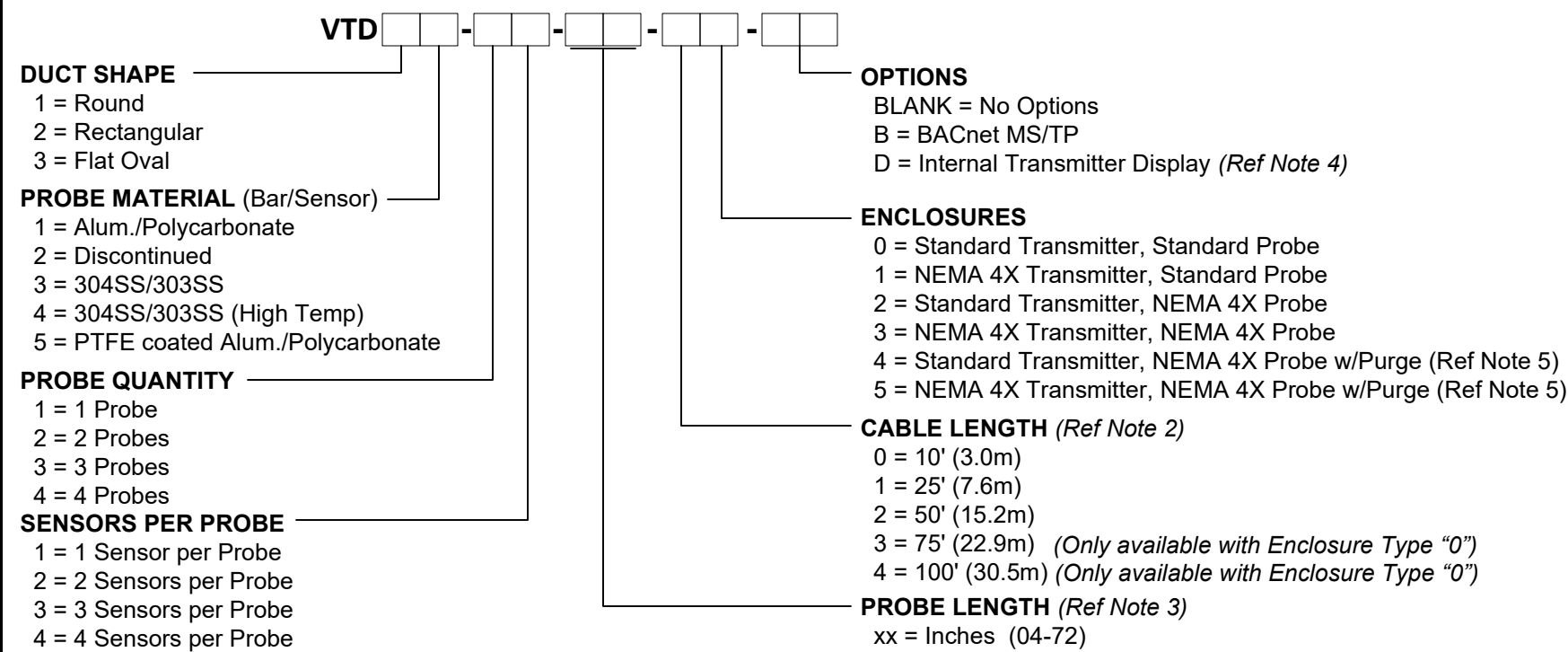


# MODEL CODE

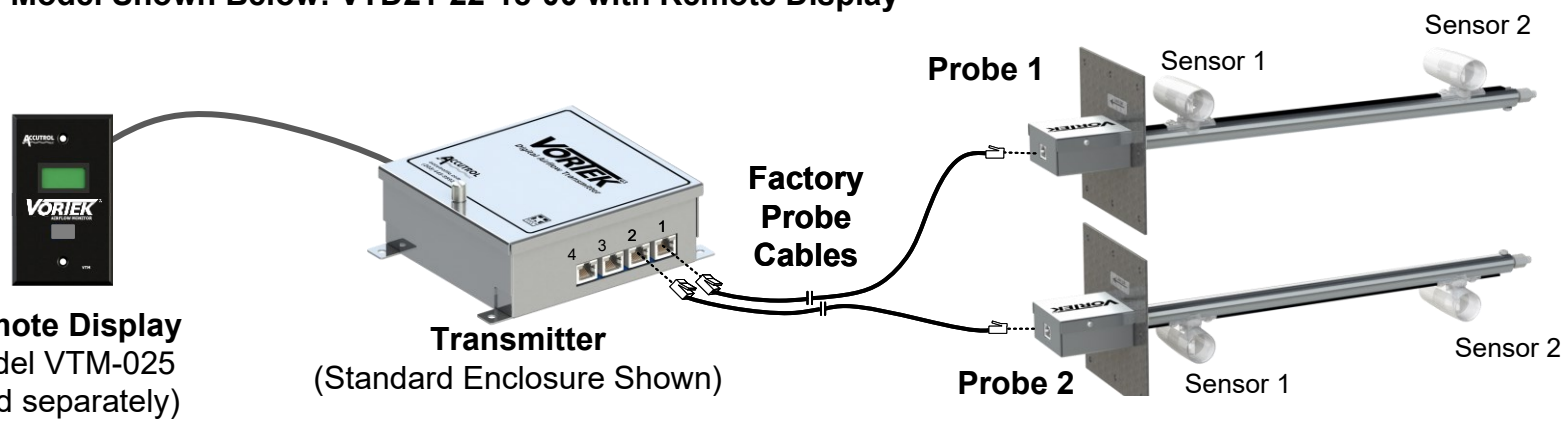


- NOTES:**
- The following information shall be provided with order:
    - Device Tag Number
    - Analog Output Full Scale Range
    - Analog Output Signal Type
    - Duct Size
    - Internal Duct Lining/Insulation Thickness
  - One cable is provided with each probe. Contact factory if plenum-rated cables longer than 100' are required. Cable type is based on the Enclosure Selection. Max length of Outdoor Rated cable is 50'. Outdoor-rated 50' extension cables are sold separately.

Enclosure Selection	Type of Cable Provided	Cable Terminations	Cable Length's Available
0	Plenum Rated	Standard RJ45 / Standard RJ45	0, 1, 2, 3 & 4
1	Outdoor Rated	Weatherproof RJ45 / Standard RJ45	0, 1, 2
2	Outdoor Rated	Weatherproof RJ45 / Standard RJ45	0, 1, 2
3	Outdoor Rated	Weatherproof RJ45 / Weatherproof RJ45	0, 1, 2

- Maximum length High Temp SS Probe Material is 60".
- When Option D (Internal Transmitter Display) is selected, the Remote Display can not be used.
- Purge option requires connection to 20 psi clean and dry instrument air supply.

### Model Shown Below: VTD21-22-18-00 with Remote Display



# SPECIFICATIONS

PERFORMANCE	
<b>Accuracy</b>	Individual Sensors +/-2% of reading (factory verified to NIST traceable standard) System Accuracy +/-3% of reading (installed accuracy expected when installation meets or exceeds minimum placement guidelines)
<b>Repeatability</b>	+/- 0.1% of reading
<b>Sensor Range</b>	FS: Factory Default is 3,000 FPM (15.24 m/s) (software configurable) Minimum: 350 FPM (1.78 m/s)
ENVIRONMENTAL	
<b>Operating Temperature</b>	Probe Types 1,3, & 5 -40° to 165° F (-40° to 74° C) Probe Type 4 -40° to 320° F (-40° to 160° C) Transmitter -20° to 150° F (-29° to 66° C) Display (optional) -4° to 158° F (-20° to 70° C)
<b>Storage Temperature</b>	-22° to 165° F (-30° to 74° C)
<b>Humidity</b>	0 to 95% (non-condensing)
ELECTRICAL	
<b>Input Power</b>	24VAC +/- 20% 50-60Hz, 2.4 VA with no options, 4.8 VA with display & BACnet options 24VDC +/-10%, 1 W with no options, 3 W with display & BACnet options
<b>Inputs</b>	1 to 4 Probes with up to 4 Sensors per Probe (16 Sensors Max)
<b>Output</b>	0-20mA, 4-20mA, 0-10v, 2-10v, 0-5v or 1-5v (software configurable) 12-bit Resolution, Capable of driving 1K ohm load
<b>Configuration Port</b>	USB 2.0, Isolated, USB C Connector
<b>USB Power Switch</b>	Selects alternate power source for configuration when main power is not available Draws 5v power from USB configuration port
<b>Status Indicators</b>	LED Status Indicators for; Power, Output, Configuration Port, Power Source Switch, Sensor Input Channel 3 and 4, Display and BACnet Communications
<b>I/O Terminal Block</b>	3 position vertical pluggable screw terminal block, screw access on top, 12-30 AWG
<b>Cables</b>	Plenum rated cables provided with standard enclosures IP67 Outdoor rated cables with watertight plug provided with NEMA 4X enclosures
<b>Network Com Port</b>	EIA 485 2-wire BACnet MS/TP (Optional) Galvanically Isolated Data Rates 9600, 19200, 38400, 76800 and 115200 1/8 Unit Load Receiver Input Impedance Network bias and EOL Termination not provided within the Transmitter
<b>Display</b>	Remote mount or transmitter mount (Optional) Liquid Crystal Display, 2 lines x 8 characters with white LED backlight Includes USB Configuration Port
MATERIALS OF CONSTRUCTION	
<b>Insertion Probes</b>	Probe Type 1 Alum. bar, Galv. steel mtg. plate, Alum. Hardware, Zinc plated steel sensor mtg. screws, PC sensor UL94 V-0, ether-based polyurethane tubing Probe Type 3 304SS bar, 304SS mtg. plate, 303SS sensor, ether-based polyurethane tubing Probe Type 4 304SS bar, 304SS mtg. plate, 303SS sensor, 304SS tubing Probe Type 5 PTFE coated alum. bar, 304SS mtg. plate, 303SS Hardware, 18-8 SS sensor mtg. screws, PC sensor UL94 V-0, ether-based polyurethane tubing
<b>Enclosures</b>	Standard Transmitter: Aluminum Alloy 5052-H32, 16 Gauge Probe Electronics: Galvanized Steel, 18 Gauge Optional Transmitter: NEMA 4X (IP66) Polycarbonate Plastic UL94 V-0 Probe Electronics: NEMA 4X (IPX6) Polycarbonate Plastic UL94 V-0
EMC AND SAFETY	
<b>Emissions</b>	EN 55011:2009+A1:2010, FCC Part 15:2017, ICES-003 Issue 6, EN61000-3-2:2014, EN61000-3-3:2013
<b>Immunity</b>	EN61326-1:2013, EN61000-4-2:2009, EN61000-4-3:2006+A1:2008+A2:2010, EN61000-4-4:2012, EN61000-4-5:2006, EN61000-4-6:2009, EN61000-4-8:2010, EN61000-4-11:2004
<b>Safety</b>	EN61010-1:2010



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## SUBMITTAL DRAWING

### VorTek Duct Insertion Model VTD

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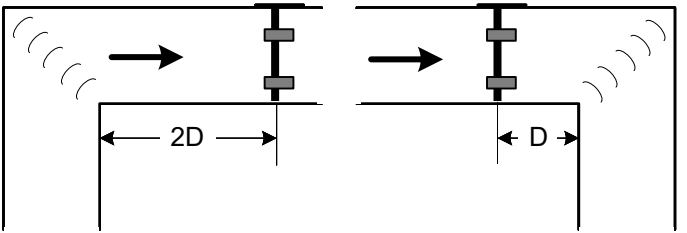
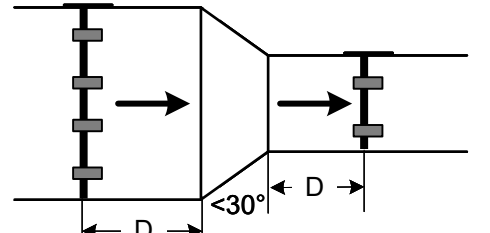
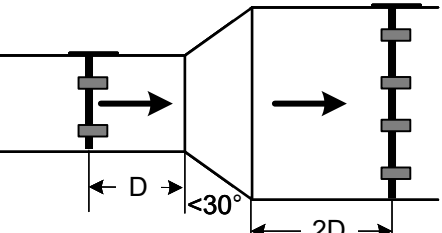
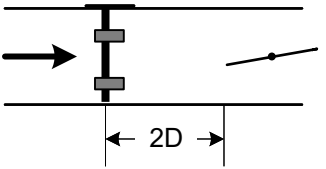
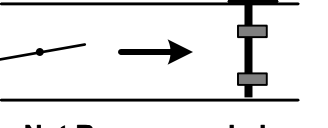
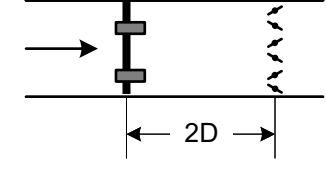
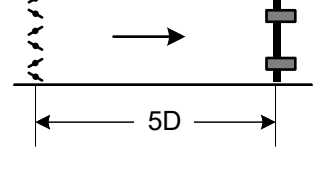
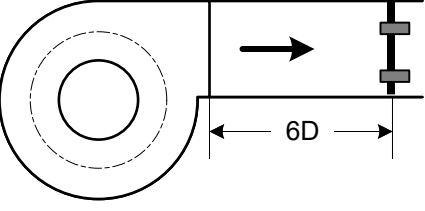
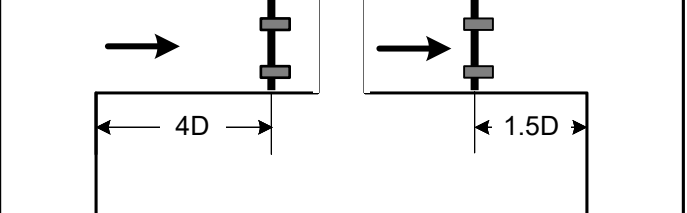
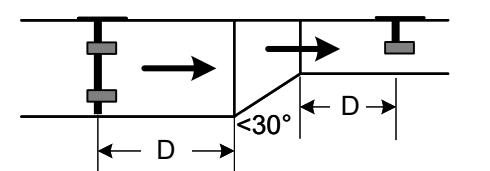
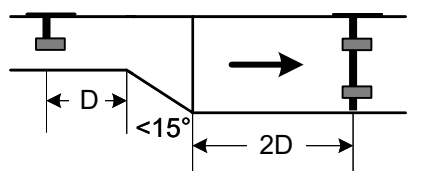
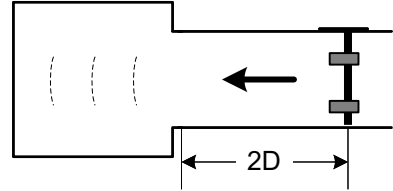
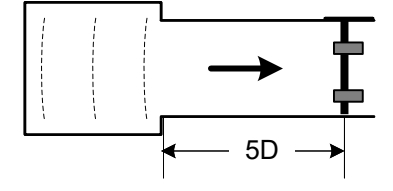
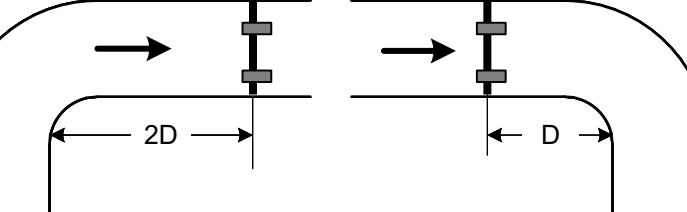
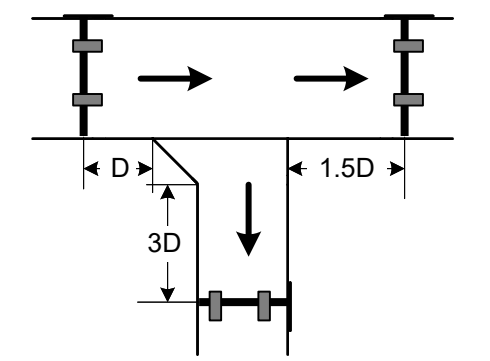
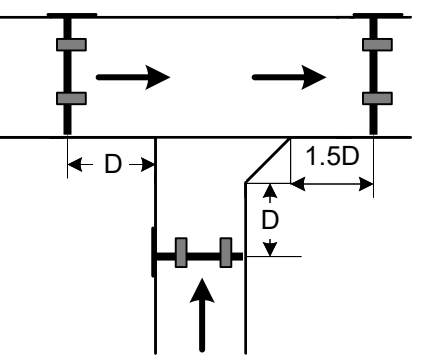
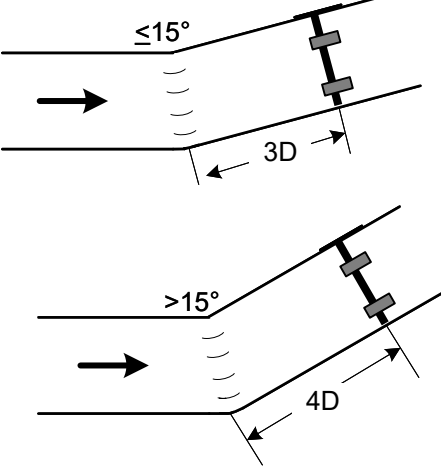
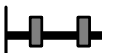

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# PROBE INSTALLATION

To optimize performance, it is always best to locate duct insertion probes with as much distance from upstream obstructions, transitions, elbows etc...as possible. The examples shown below are provided as a minimum guideline only. If the application provides a greater distance of straight duct run than shown below, the probe should be installed to maximize the distance from upstream obstructions.

1. Match the device TAG ID to the HVAC design documents as required to ensure the probe is installed per the design requirements.
2. Select optimum location in the duct for probe installation. Be sure the location selected has enough clearance to insert and extract probe from duct after equipment from all trades has been installed.
3. Install the probes into the duct by following the appropriate set of instructions provided on the following pages.

## Recommended Minimum Probe Placement Guidelines for VorTek Duct Insertion Probes

Duct Elbows	Duct Transitions	Dampers	Ducted Fans
<p>Elbows with Turning Vanes</p> 	<p>Reducing Transition</p>  <p>Expanding Transition</p> 	<p>Probe Upstream of Single Blade Damper</p>  <p>Probe Downstream of Single Blade Damper</p>  <p>Probe Upstream of Opposed Blade Damper</p>  <p>Probe Downstream of Opposed Blade Damper</p> 	<p>Centrifugal Discharge</p> 
<p>Elbows with No Turning Vanes</p> 	<p>Reducing Offset Transition</p>  <p>Expanding Offset Transition</p> 		<p>Centrifugal Inlet</p>  <p>Vane Axial Discharge</p> 
<p>Radius Elbows</p> 	<p>Duct Junctions</p> <p>Supply Junction</p>  <p>Return Junction</p> 	<p>Angle Fittings</p> 	<p>Key</p> <p>Round Duct: "D" = Diameter            Rectangular &amp; Oval Duct: "D" = (W + H) / 2</p> <p>Airflow Probe: </p> <p>Airflow Direction: </p>

# PROBE INSTALLATION - Round Duct Applications

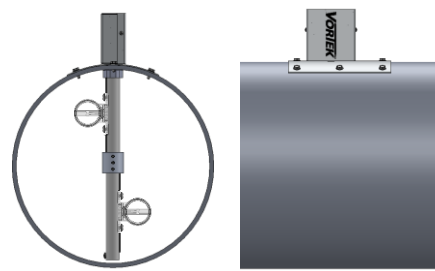
**! WARNING:** Use eye protection, cut-resistant gloves and clothing suitable for working with sheet metal. Failure to do so may result in personal injury.

Each probe will require either one or two holes to be drilled into the duct for installation. Probes 13" and less require only one hole which is referred to as the Insertion Hole. Probes 14" and greater include a threaded stud at the probe end which requires an additional hole referred to as the Receiving Hole. Reference Table 1 to determine the hole drilling requirements for your application. Reference Table 2 for the recommended probe/sensor density based on the duct size. For ducts with internal lining or insulation, the probes provided have been manufactured to accommodate the insulation thickness.

1 X 1



1 X 2



1. Mark the duct where probe is to be inserted.
2. Drill the Insertion Hole per Table 1.
3. Insert Probe into Hole.
4. Position Probe per Airflow Direction Arrow.
5. Secure Probe to Duct by installing #10 Tek-Screws into the mounting plate holes.

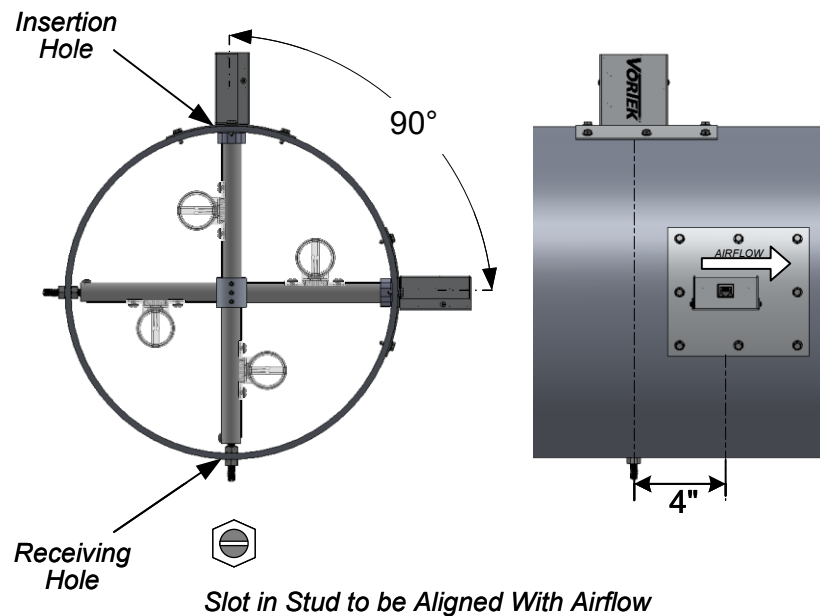
Duct Diameter		Insertion Hole Diameter		Receiving Hole Diameter	
inches	mm	inches	mm	inches	mm
4 to 6	102 to 152	2.5	64	Not Required	
7 to 13	178 to 330	3.5	90	Not Required	
≥ 14	≥ 356	3.5	90	.312	8

**Table 1**

Duct Diameter		Probe Configuration
inches	mm	(probe qty X sensors/probe)
4 to 6	102 to 152	1 X 1
8 to 12	203 to 305	1 X 2
14 to 28	356 to 711	2 X 2
30 to 52	762 to 1321	2 X 4
54 to 72	1372 to 1829	3 X 4

**Table 2**

2 X 2



1. Mark the duct where the center of the Probe 1 Insertion Hole is to be located.

2. Measure the circumference of the duct and mark a straight line extending from the center of the Insertion Hole around the circumference of the duct.

3. Locate and mark the center of the Receiving Hole by measuring 1/2 the Circumference of the duct from the center of the Insertion Hole.

4. For applications with two probes, Probe 2 shall be located 90 degrees from Probe 1 with a 4" offset. Mark the duct where the center of the Probe 2 Insertion Hole is to be located and repeat steps 2 and 3.

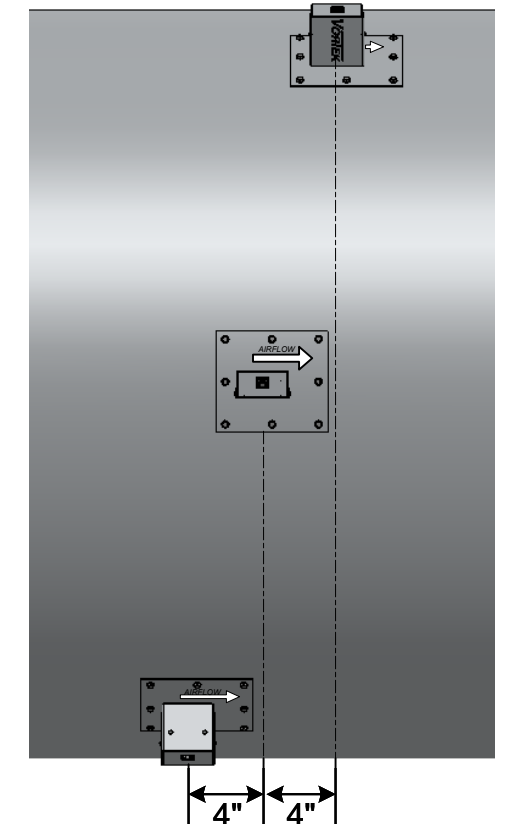
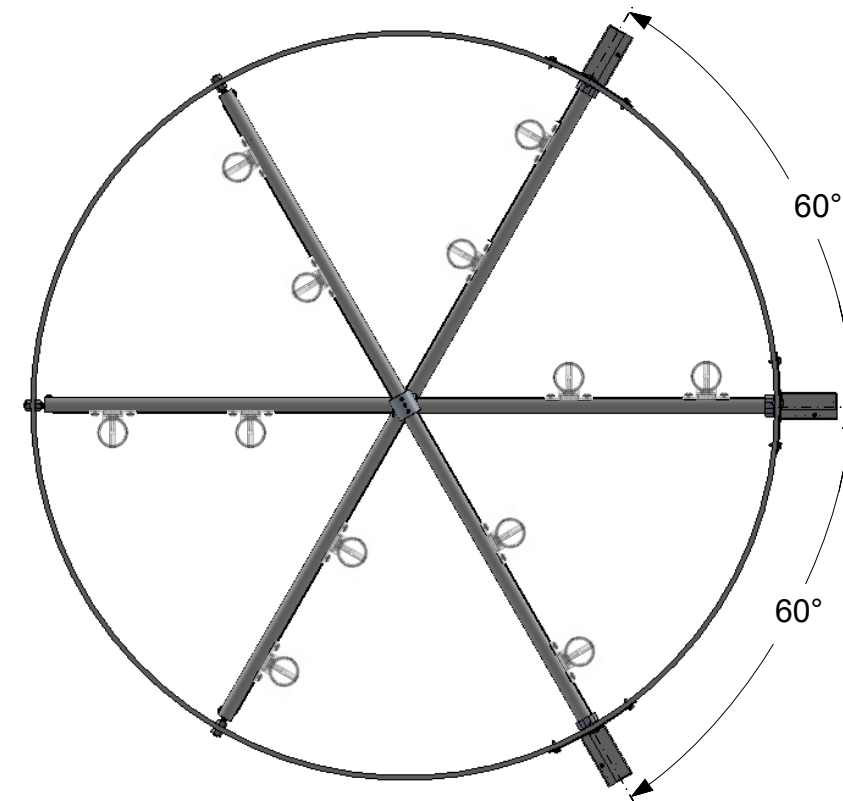
5. For applications with three probes, each probe shall be located 60 degrees from the next with a 4" offset. Mark the duct where the center of the Probe 2 Insertion Hole is to be located and repeat steps 2 and 3. Mark the duct where the center of the Probe 3 Insertion Hole is to be located and repeat steps 2 and 3.

6. Drill the required holes (Reference Table 1) and install each probe with the threaded stud extending through the Receiving Hole.

7. Position each probe so the Airflow Direction Arrow is aligned with the airflow direction in the duct.

8. Secure the mounting plate of each Probe using #10 Tek-Screws. For probes 14" and longer, secure the threaded stud using the locknuts provided.

3 X 4



**NOTES:**

1. Be sure the location selected has enough clearance to insert and extract probe from duct after equipment from all trades has been installed.
2. Tek-Screws provided by others.



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## SUBMITTAL DRAWING

### VorTek Duct Insertion Model VTD

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# PROBE INSTALLATION - Rectangular Duct Applications

**WARNING:** Use eye protection, cut-resistant gloves and clothing suitable for working with sheet metal. Failure to do so may result in personal injury.

Each probe will require either one or two holes to be drilled into the duct for installation. Probes 13" and less require only one hole which is referred to as the Insertion Hole. Probes 14" and greater include a threaded stud at the opposite end which requires an additional hole referred to as the Receiving Hole. Reference Table 1 to determine the hole size requirements for your application.

Before proceeding, confirm the probes provided are correct for the application (Reference Figure 1 & Table 2). The Insertion Side of the duct is where the probes are to be installed and the other side of the duct "L" should be the same as the probe length for probes  $\geq 14$ ". For ducts with internal lining or insulation, the probes provided have been manufactured to accommodate the insulation thickness.

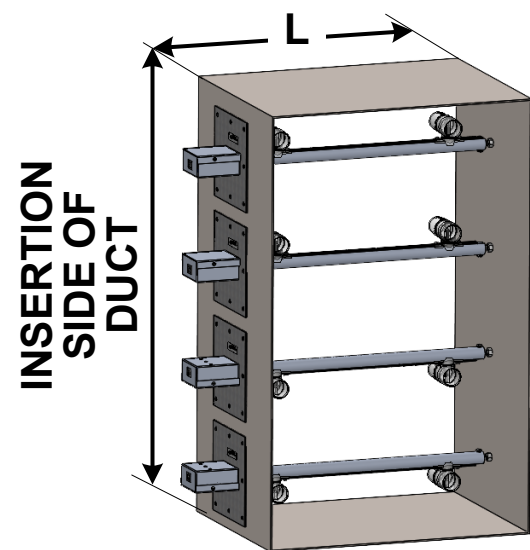


Figure 1

Recommended Rectangular Sensor Distribution							
Insertion Side of Duct	Inches	"L" Dimension					
		4	6	8-10	11-24	25-42	43-72
4		1x1	1x1	1x1			
6-11		1x1	1x1	1x2	1x2	1x3	1x4
12-24			2x1	2x2	2x2	2x3	2x4
25-42			3x1	3x2	3x2	3x3	3x4
43-72			4x1	4x2	4x2	4x3	4x4

Table 2

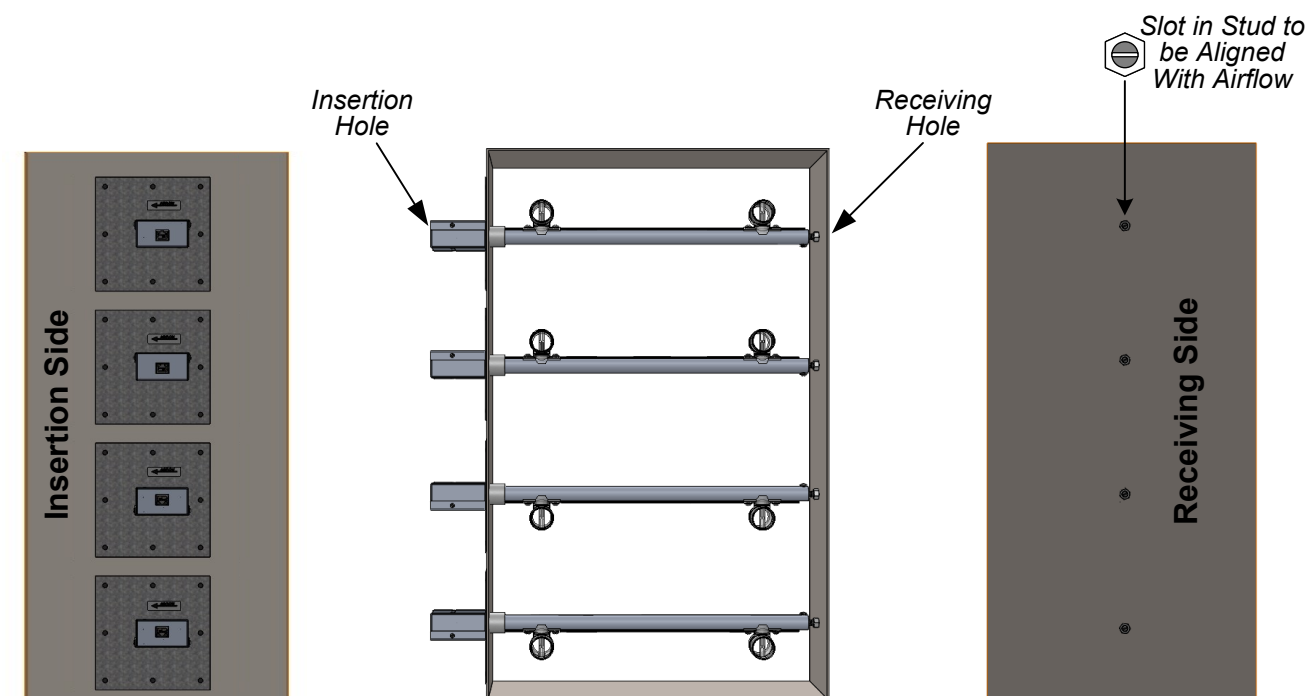


Figure 3

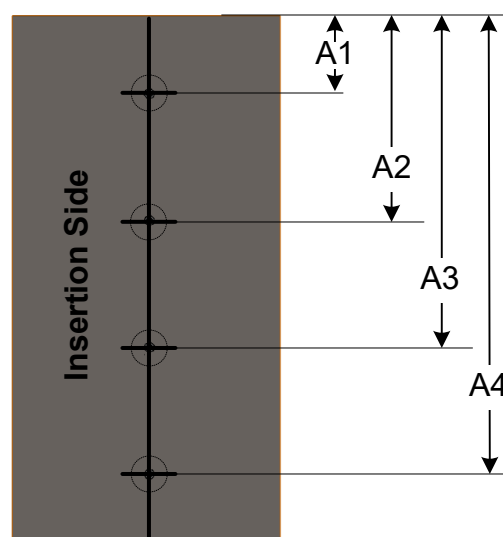


Figure 2

The duct hole locations A1-A4 are based on the quantity of probes and the size of the duct on the insertion side.

To determine A1-A4 for the application, reference the device schedule and probe tag. Single probe applications require A1 only, 2-probe applications require A1 & A2, 3-probe applications require A1, A2 & A3 and 4-probe applications require A1, A2, A3 and A4.

1. Identify the Insertion Side of the duct and draw a straight line perpendicular to the edges of the duct extending edge-to-edge per Figure 2.
2. Mark the center of each Insertion Hole location A1-A4 per Figure 2.
3. Repeat the above steps on the opposite side of the duct to mark the corresponding Receiving Holes.
4. Drill the required holes in the positions marked. Reference Table 1 for the hole sizes.
5. Install each probe through the insertion hole until the threaded stud extends through the Receiving Hole.
6. Position each probe so the Airflow Direction Arrow is aligned with the airflow direction in the duct.
7. Secure the mounting plate of each Probe to the duct using #10 Tek-Screws.

For probes 14" and longer, secure the threaded stud on the Receiving Side using the locknuts provided.

"L" Dimension		Insertion Hole Diameter		Receiving Hole Diameter	
inches	mm	inches	mm	inches	mm
4 to 6	102 to 152	2.5	64	Not Required	
7 to 13	178 to 330	3.5	90	Not Required	
$\geq 14$	$\geq 356$	3.5	90	.312	8

Table 1

**NOTES:**

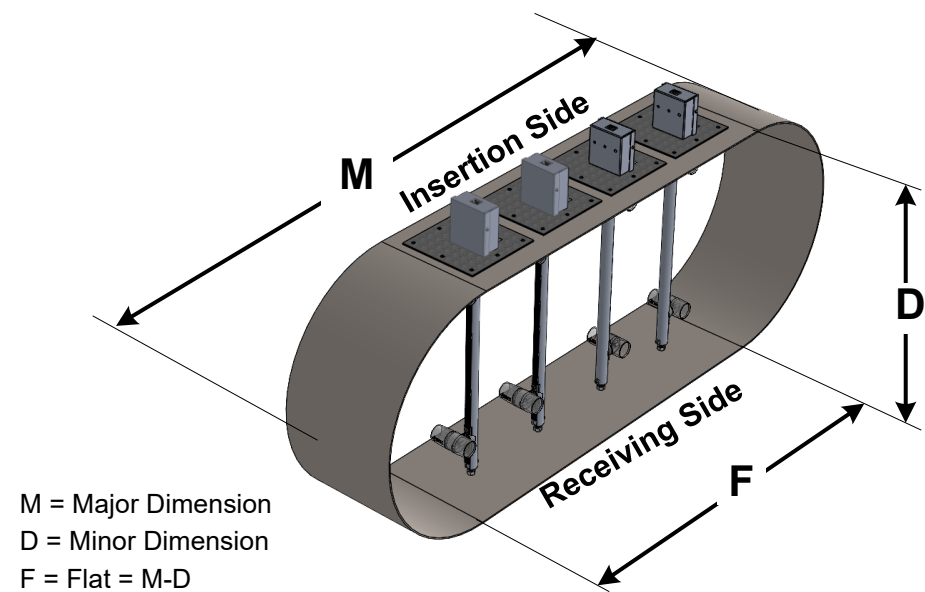
1. Be sure the location selected has enough clearance to insert and extract probe from duct after equipment from all trades has been installed.
2. Tek-Screws provided by others.
3. For 2-Probe applications with duct "H" between 12 and 16", the 2 probes are factory-mounted onto a single plate.

# PROBE INSTALLATION – Flat Oval Duct Applications

**⚠ WARNING:** Use eye protection, cut-resistant gloves and clothing suitable for working with sheet metal. Failure to do so may result in personal injury.

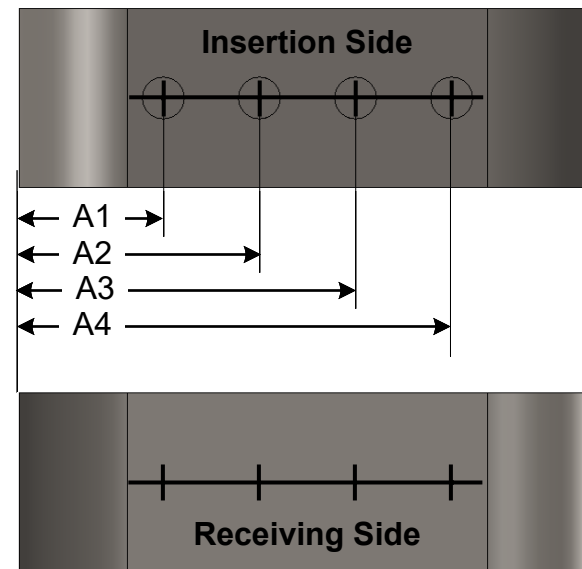
Each probe will require either one or two holes to be drilled into the duct for installation. Probes 13" and less require only one hole which is referred to as the Insertion Hole. Probes 14" and greater include a threaded stud at the opposite end which requires an additional hole referred to as the Receiving Hole. Reference Table 1 to determine the hole size requirements for your application.

Reference Figure 1: Before proceeding, confirm the probes provided are correct for the application. The Insertion Side is where the probes are to be installed over the flat "F" area. The "D" dimension should be the same as the probe length for probes  $\geq 14$ ". For ducts with internal lining or insulation, the probes provided have been manufactured to accommodate the insulation thickness.



M = Major Dimension  
D = Minor Dimension  
F = Flat = M-D

**Figure 1**



**Figure 2**

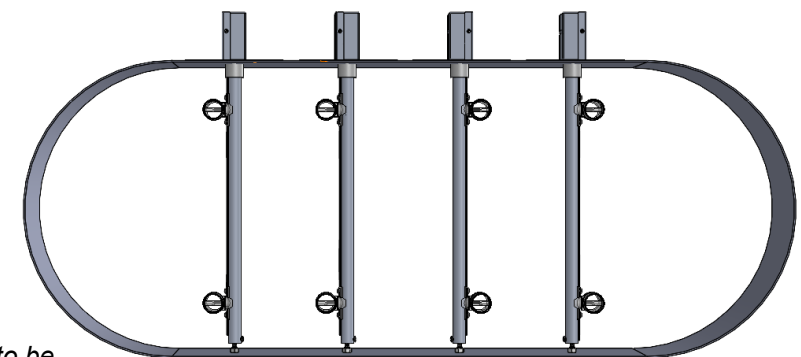
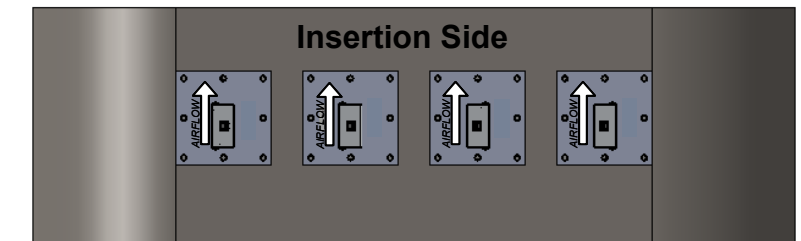
The duct hole locations A1-A4 are based on the quantity of probes and the Major Duct Dimension "M" on the insertion side.

To determine A1-A4 for the application, reference the device schedule and probe tag. Single probe applications require A1 only, 2-probe applications require A1 & A2, 3-probe applications require A1, A2 & A3 and 4-probe applications require A1, A2, A3 and A4.

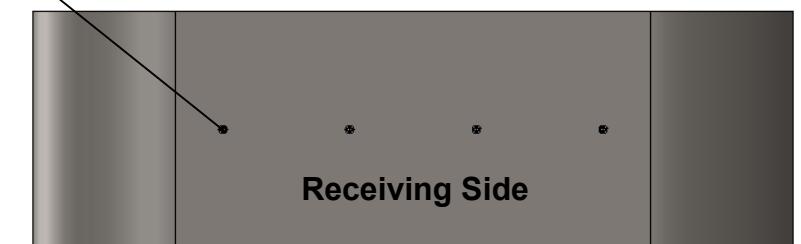
1. Identify the Insertion Side of the duct and draw a straight line perpendicular to the edges of the duct extending edge-to-edge per Figure 2.
2. Mark the center of each Insertion Hole location A1-A4 per Figure 2.
3. Repeat the above steps on the opposite side of the duct to mark the corresponding Receiving Holes.
4. Drill the required holes in the positions marked. Reference Table 1 for the hole sizes.
5. Install each probe through the insertion hole until the threaded stud extends through the Receiving Hole.
6. Position each probe so the Airflow Direction Arrow is aligned with the airflow direction of the duct.
7. Secure the mounting plate of each Probe to the duct using #10 Tek-Screws. For probes 14" and longer, secure the threaded stud using the locknuts provided.

**NOTES:**

1. Be sure the location selected has enough clearance to insert and extract probe from duct after equipment from all trades has been installed.
2. Tek-Screws provided by others.



Slot in Stud to be Aligned With Airflow



**Figure 3**

Duct Minor Dim.		Insertion Hole Diameter		Receiving Hole Diameter	
inches	mm	inches	mm	inches	mm
4 to 6	102 to 152	2.5	64	Not Required	
7 to 13	178 to 330	3.5	90	Not Required	
$\geq 14$	$\geq 356$	3.5	90	.312	8

**Table 1**



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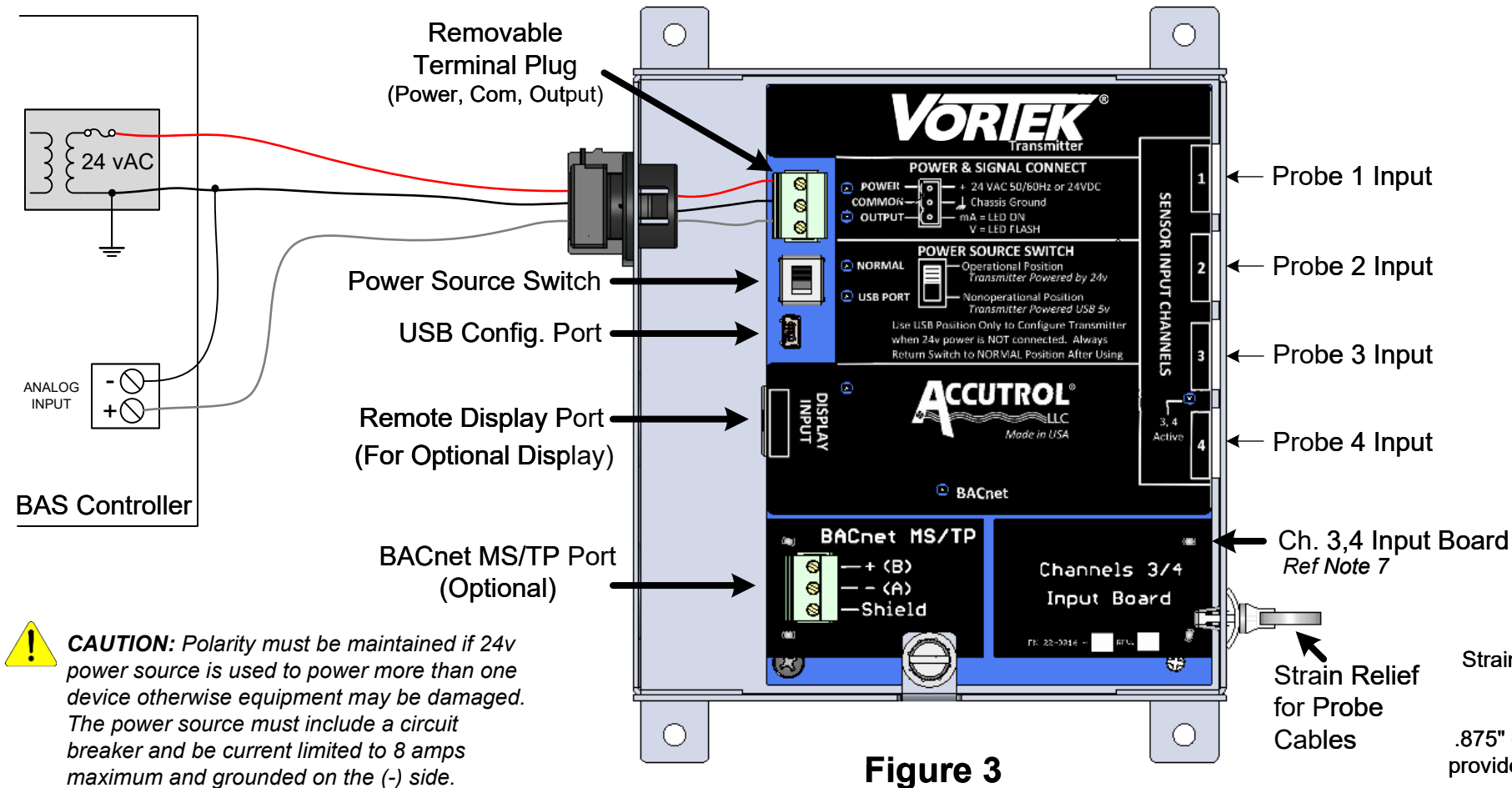
**SUBMITTAL DRAWING**  
**VorTek Duct Insertion Model VTD**

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# TRANSMITTER INSTALLATION

1. Select an easily accessible location to install the transmitter within the range of the Probe Cables that have been provided by the factory. Provide clearance to remove the cover and easily access the connectors and field connections.
2. Using the four 0.20" diameter holes located on the transmitter enclosure, secure the transmitter to mounting surface using (4) #8 or #10 Pan Head Screws. For sheet metal mounting surface, use sheet metal or tek screws, for plywood surface use coarse thread wood screws, for drywall surface, use drywall anchors with the appropriate screws.
3. Connect each probe to the corresponding probe input channel on the transmitter using the cables provided (Reference Figure 1)

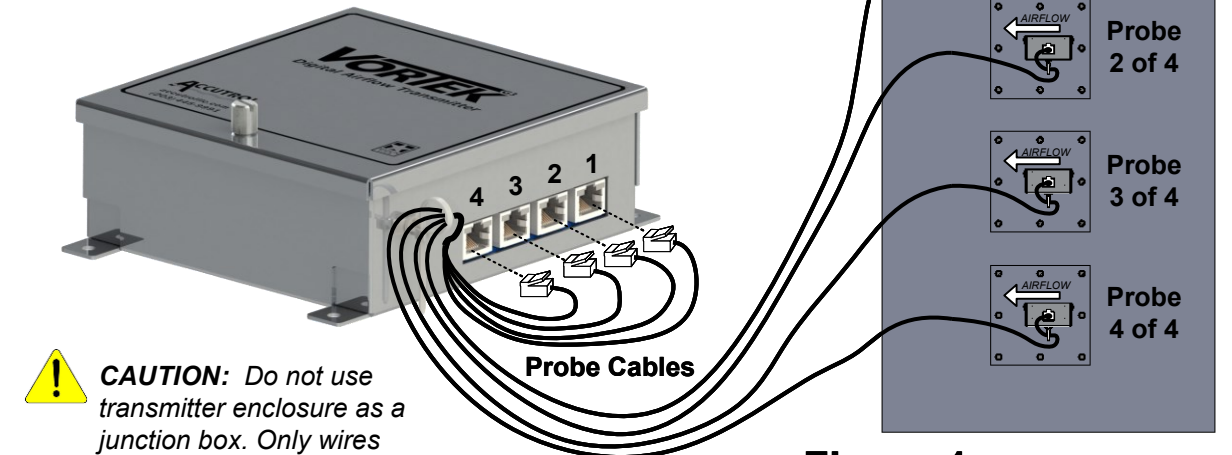


**CAUTION:** Polarity must be maintained if 24v power source is used to power more than one device otherwise equipment may be damaged. The power source must include a circuit breaker and be current limited to 8 amps maximum and grounded on the (-) side.

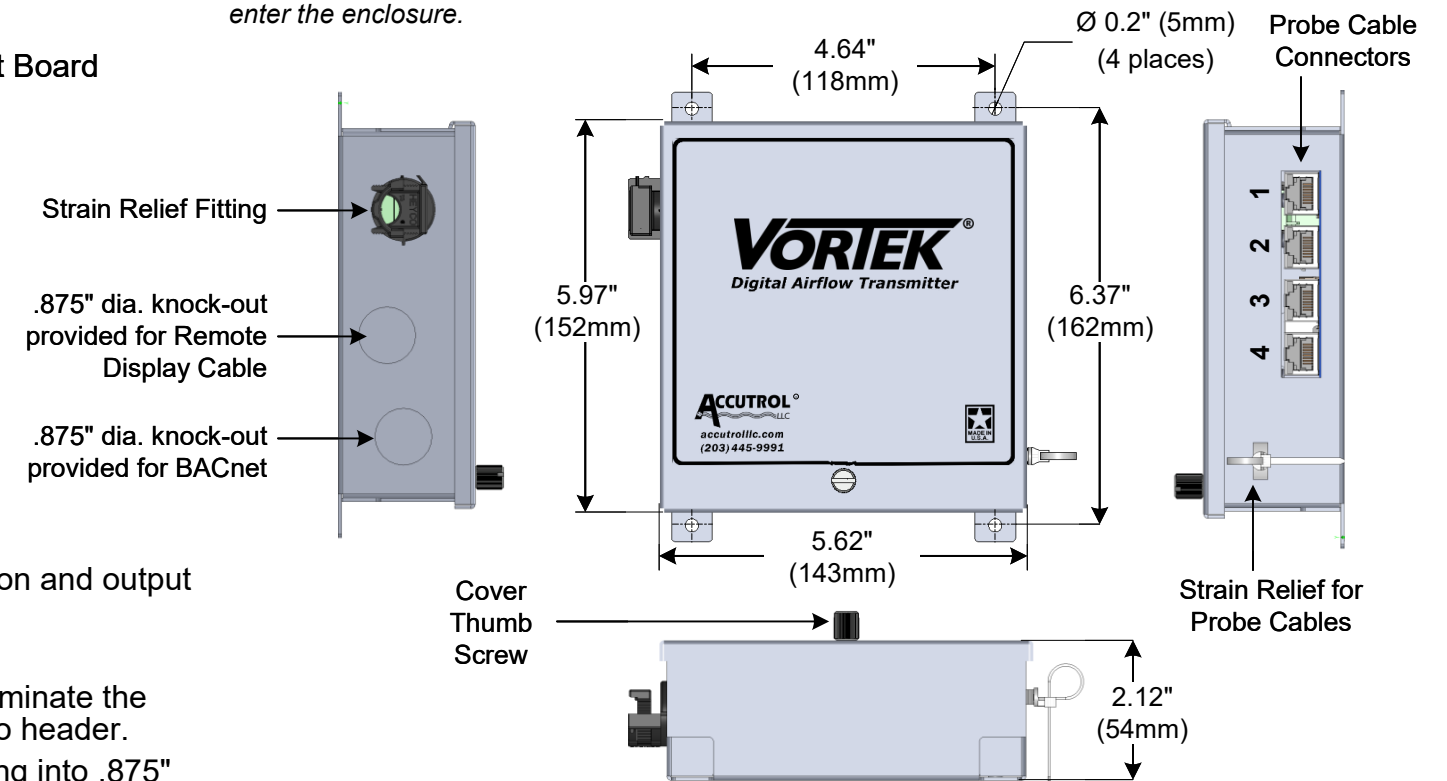
# TRANSMITTER WIRING

1. Loosen the thumb screw located on the transmitter enclosure cover and remove cover.
2. Run 3-conductor cable from the field controller to the transmitter through the strain relief fitting.
3. Remove the terminal block from the power/signal header, loosen the three screws and terminate the power, common and output signal wires in the terminal block per markings.
4. Tighten the terminal block screws, verify wires are secure and reconnect to the header.
5. If BACnet is required; run BACnet MS/TP cable into enclosure, remove terminal block from BACnet header and terminate the BACnet wires in the appropriate terminals. Tighten the terminal block screws, verify wires are secure and reconnect to header.
6. If Remote Display is required; remove knock-out located directly in line with the Display Port, install strain relief fitting into .875" dia. hole, run the factory cable provided with the Remote Display into the enclosure and plug cable into the Display Input Port.
7. The Channel 3-4 input board is required for applications that have 3 and 4 probes. Applications with 1 or 2 probes do not require this board.

**NOTE**  
Captive cable ties provided on the Transmitter and Probe Electronics Enclosures are to be used for probe cable strain relief.



**CAUTION:** Do not use transmitter enclosure as a junction box. Only wires terminating on the transmitter board should enter the enclosure.



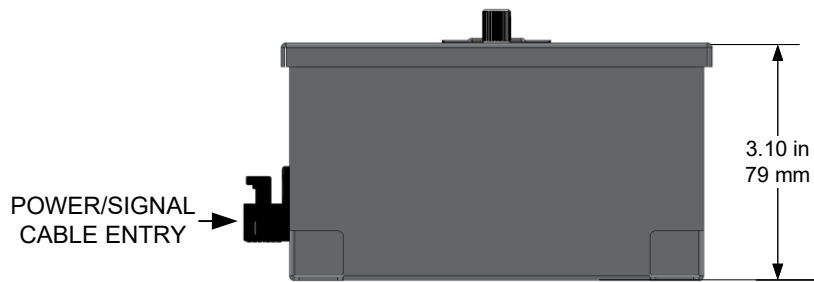
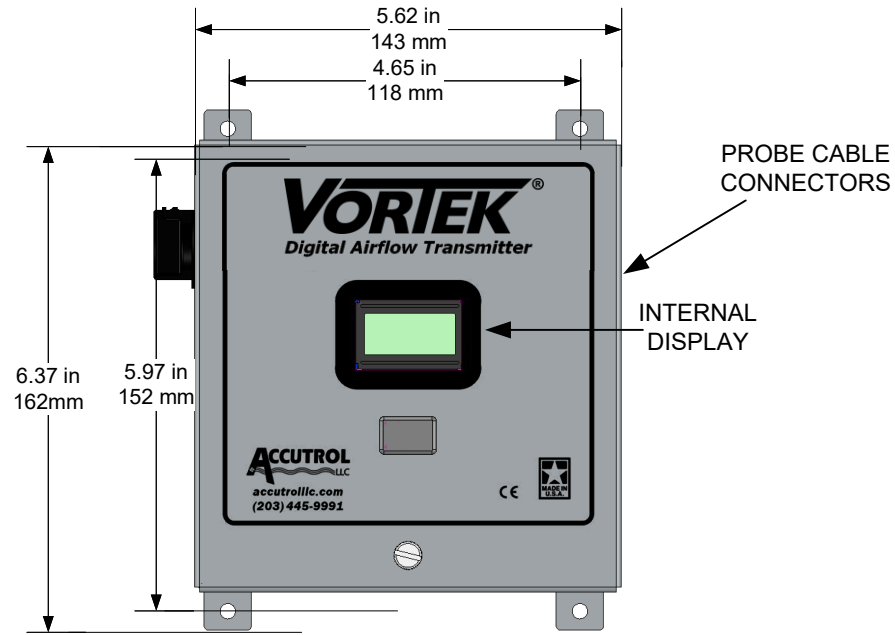
**Figure 2**

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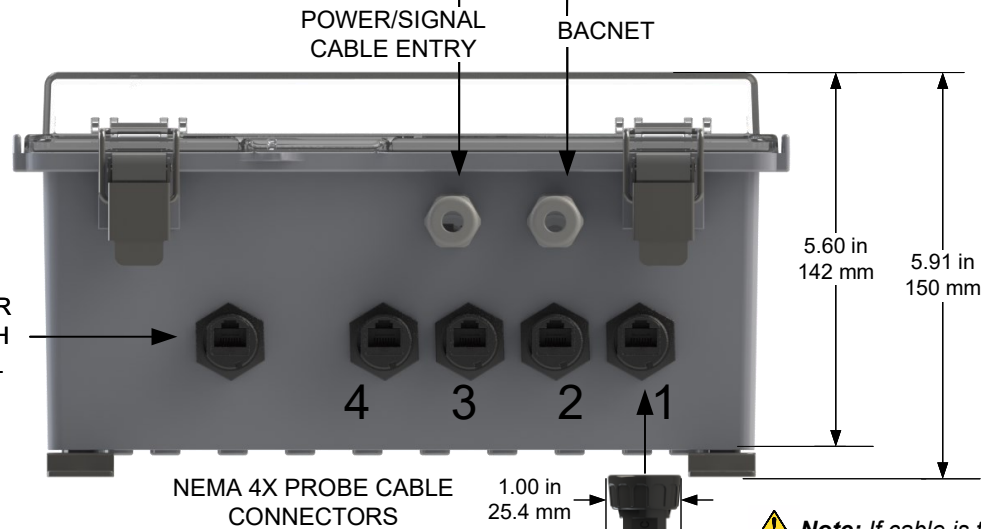
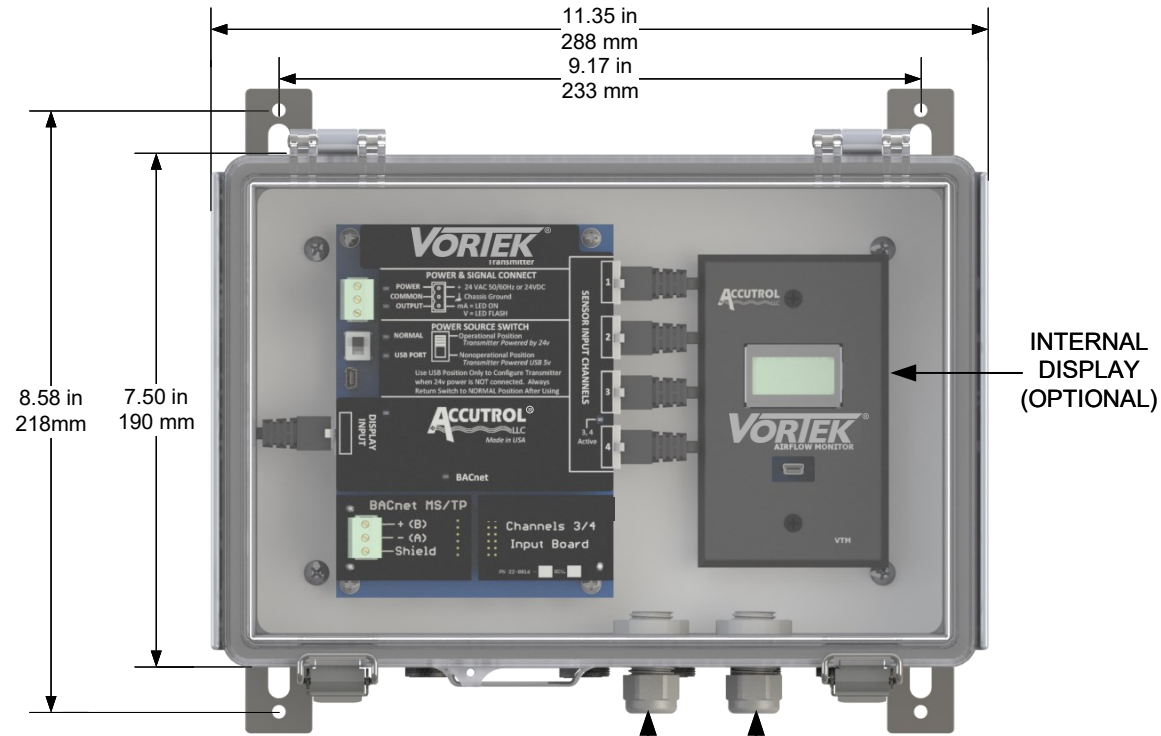


# OPTIONS

## TRANSMITTER WITH OPTIONAL DISPLAY



## NEMA 4X TRANSMITTER WITH OPTIONAL DISPLAY



## NEMA 4X PROBE WITH OPTIONAL PURGE



**Note:** If cable is to be run through conduit, be sure to size the conduit to accommodate the cable connectors.

**Note:** If the factory cable is not long enough, a 52' (16m) long M/F extension cable (p/n 23-0115) can be connected to the factory cable to extend the length. Extension cable is sold separately. See "Weatherproof Extension Cable - VorTek" Submittal drawing for details.

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