Quick Installation Guide
00825-0200-4809, Rev DB
December 2009

Flange-Lok 485 Annubar

Rosemount 485 Annubar® Flange-Lok Assembly

Step 1: Location and Orientation
Step 2: Drill Holes into Pipe
Step 3: Weld Mounting Hardware
Step 4: Insert the Annubar
Step 5: Mount the Transmitter

Product Certifications
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--- IMPORTANT NOTICE ---

This installation guide provides basic guidelines for Rosemount 485 Annubar. It does not provide instructions for configuration, diagnostics, maintenance, service, troubleshooting, Explosion-proof, Flameproof, or Intrinsically Safe (I.S.) installations. Refer to the 485 Annubar reference manual (document number 00809-0100-4810) for more instruction. This manual is also available electronically on www.rosemount.com.

If the 485 Annubar was ordered assembled to a Rosemount 3051S transmitter, see the following Quick Installation Guide for information on configuration and hazardous locations certifications: Rosemount 3051S Series Pressure Transmitter (document number 00825-0100-4801).

If the 485 Annubar was ordered assembled to a Rosemount 3095 transmitter, see the following Quick Installation Guide for information on configuration and hazardous locations certifications: Rosemount 3095 (document number 00825-0100-4716).

--- WARNING ---

Process leaks may cause harm or result in death. To avoid process leaks, only use gaskets designed to seal with the corresponding flange and o-rings to seal process connections. Flowing medium may cause the 485 Annubar assembly to become hot and could result in burns.
485 Annubar Flange-Lok Assembly Exploded View

Transmitter and housing are shown for clarity purposes – only supplied if ordered.

NOTE
Use an appropriate pipe sealing compound rated for the service temperature on all threaded connections.
**STEP 1: LOCATION AND ORIENTATION**

Correct orientation and straight run requirements must be met for accurate and repeatable flow measurements. Refer to Table 1 for minimum pipe diameter distances from upstream disturbances.

### Table 1. Straight Run Requirements

<table>
<thead>
<tr>
<th></th>
<th>Upstream Dimensions</th>
<th>Downstream Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Without Straightening Vanes</td>
<td>With Straightening Vanes</td>
</tr>
<tr>
<td></td>
<td>In Plane A</td>
<td>Out of Plane A</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>
**STEP 1 CONTINUED...**

### Upstream Dimensions

<table>
<thead>
<tr>
<th>Without Vanes</th>
<th>With Vanes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>In Plane A</strong></td>
<td><strong>Out of Plane A</strong></td>
</tr>
<tr>
<td>A'</td>
<td>C</td>
</tr>
<tr>
<td>5</td>
<td>18</td>
</tr>
</tbody>
</table>

### Downstream Dimensions

<table>
<thead>
<tr>
<th><strong>A'</strong></th>
<th><strong>C</strong></th>
<th><strong>C'</strong></th>
<th><strong>B</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>18</td>
<td>8</td>
<td>4</td>
</tr>
</tbody>
</table>

### NOTE

- Consult the factory for instructions regarding use in square or rectangular ducts.
- "In Plane A" means the sensor is in the same plane as the elbow. "Out of Plane A" means the sensor is perpendicular to the plane of the elbow.
- If proper lengths of straight run are not available, position the mounting such that 80% of the run is upstream and 20% is downstream.
- Use straightening vanes to reduce the required straight run length.
- Row 6 in Table 1 applies to gate, globe, plug, and other throttling valves that are partially opened, as well as control valves.

### Misalignment

485 Annubar installation allows for a maximum misalignment of 3°.

Figure 1. Misalignment
**STEP 1 CONTINUED...**

**Horizontal Orientation**

For proper venting and draining, the sensor should be located in the upper half of the pipe for air and gas applications. For liquid and steam applications, the sensor should be located in the bottom half of the pipe. The maximum temperature for a direct mounted transmitter is 500 °F (260 °C).

**NOTE:**

For steam applications with DP readings between 0.75 and 2 inH₂O in horizontal pipes, it is recommended to install the primary element / flowmeter mounting above the pipe.
STEP 1 CONTINUED...

Vertical Orientation
The sensor can be installed in any position around the circumference of the pipe, provided the vents are positioned properly for bleeding or venting. Optimal results for liquid or steam are obtained when flow is up. The preferred orientation for air or gas is flow down, but upwards flow is acceptable. For steam applications, a 90° spacer will be added to provide water legs to ensure the transmitter stays within temperature limits. The maximum temperature for a direct mounted transmitter is 500 °F (260 °C).

Figure 5. Steam
Figure 6. Liquid
Figure 7. Gas
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**STEP 2: DRILL HOLES INTO PIPE**

1. Determine the sensor size based on the probe width (see Table 2).
2. Depressurize and drain the pipe.
3. Select the location to drill the hole.
4. Determine the diameter of the hole to be drilled according to the specifications in Table 2. Drill the mounting hole into the pipe with a hole saw or drill. DO NOT TORCH CUT THE HOLE.

**Table 2. Sensor Size / Hole Diameter Chart**

<table>
<thead>
<tr>
<th>Sensor Size</th>
<th>Sensor Width</th>
<th>Hole Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.590-in. (14.99 mm)</td>
<td>3/4-in. (19 mm) + 1/32-in (0.8 mm)</td>
</tr>
<tr>
<td>2</td>
<td>1.060-in. (26.92 mm)</td>
<td>15/16-in. (34 mm) + 1/16-in. (1.6 mm)</td>
</tr>
<tr>
<td>3</td>
<td>1.935-in. (49.15 mm)</td>
<td>2 1/2-in. (64 mm) + 1/16-in. (1.6 mm)</td>
</tr>
</tbody>
</table>

Note: Drill the hole 180° from the first hole for opposite-side support models.

5. If opposite-side support model is supplied, a second identically sized hole must be drilled opposite the first hole so that the sensor can pass completely through the pipe. (To determine if you have an opposite-side support model, measure the distance from the tip to the first slot or hole. If the distance is greater than 1-in. (25.4 mm), it is the opposite-side support model.) To drill the second hole, follow these steps:
   a. Measure the pipe circumference with a pipe tape, soft wire, or string. (For the most accurate measurement the pipe tape needs to be perpendicular to the axis of flow.)
   b. Divide the measured circumference by two to determine the location of the second hole.
   c. Re-wrap the pipe tape, soft wire, or string from the center of the first hole. Then, using the number calculated in the preceding step, mark the center of what will become the second hole.
   d. Using the diameter determined in step 3, drill the hole into the pipe with a hole saw or drill. DO NOT TORCH CUT THE HOLE.
6. Deburr the drilled holes on the inside of the pipe.
STEP 3: WELD MOUNTING HARDWARE

1. Center the flanged assembly over the mounting hole, gap ¹/₁₆-in. (1.6 mm), and measure the distance from the outer diameter of the pipe to the face of the flange. Compare this to Table 3 and adjust the gap as necessary.

Table 3. Flange Sizes and ODF Per Sensor Size

<table>
<thead>
<tr>
<th>Sensor Size</th>
<th>Flange Size</th>
<th>ODF (in. (mm))</th>
<th>Size</th>
<th>ODF (in. (mm))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>¹/₂-in. 150#</td>
<td>3.88 (98.5)</td>
<td>DN40 PN16</td>
<td>3.09 (78.6)</td>
</tr>
<tr>
<td>1</td>
<td>¹/₂-in. 300#</td>
<td>4.13 (104.9)</td>
<td>DN40 PN40</td>
<td>3.21 (81.6)</td>
</tr>
<tr>
<td>1</td>
<td>¹/₂-in. 600#</td>
<td>4.44 (112.7)</td>
<td>DN40 PN100</td>
<td>3.88 (98.6)</td>
</tr>
<tr>
<td>1</td>
<td>¹/₂-in. 900#</td>
<td>4.94 (125.4)</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>1</td>
<td>¹/₂-in. 1500#</td>
<td>4.94 (125.4)</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>1</td>
<td>1/₂-in. 2500#</td>
<td>6.76 (171.6)</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>2</td>
<td>2.0-in. 150#</td>
<td>4.13 (104.8)</td>
<td>DN50 PN16</td>
<td>3.40 (86.3)</td>
</tr>
<tr>
<td>2</td>
<td>2.0-in. 300#</td>
<td>4.38 (111.2)</td>
<td>DN50 PN40</td>
<td>3.51 (89.3)</td>
</tr>
<tr>
<td>2</td>
<td>2.0-in. 600#</td>
<td>4.76 (120.8)</td>
<td>DN50 PN100</td>
<td>4.30 (109.3)</td>
</tr>
<tr>
<td>2</td>
<td>2.0-in. 900#</td>
<td>5.88 (149.2)</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>2</td>
<td>2.0-in. 1500#</td>
<td>5.88 (149.2)</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>2</td>
<td>3.0-in. 2500#</td>
<td>9.87 (250.7)</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>2</td>
<td>3.0-in. 150#</td>
<td>4.63 (117.5)</td>
<td>DN80 PN16</td>
<td>3.84 (97.6)</td>
</tr>
<tr>
<td>2</td>
<td>3.0-in. 300#</td>
<td>5.00 (126.9)</td>
<td>DN80 PN40</td>
<td>4.16 (105.6)</td>
</tr>
<tr>
<td>2</td>
<td>3.0-in. 600#</td>
<td>5.38 (136.6)</td>
<td>DN80 PN100</td>
<td>4.95 (125.6)</td>
</tr>
<tr>
<td>2</td>
<td>4.0-in. 900#</td>
<td>8.19 (208.0)</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>2</td>
<td>4.0-in. 1500#</td>
<td>8.56 (217.5)</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>2</td>
<td>4.0-in. 2500#</td>
<td>11.19 (284.2)</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>

2. Place four ¹/₄-in. (6 mm) tack welds at 90° increments. Check alignment of the mounting both parallel and perpendicular to the axis of flow (see Figure 8). If alignment of the mounting is within tolerances, finish weld per local codes. If alignment is outside of specified tolerance, make adjustments prior to making the finish weld.

Figure 8. Alignment

3. If opposite-side support is being used, center the fitting for the opposite side support over the opposite side hole, gap ¹/₁₆-in. (1.6 mm), and place four ¹/₄-in. (6 mm) tack welds at 90° increments. Insert the sensor into the mounting hardware. Verify that the tip of the sensor is centered in the opposite side fitting and the plug will fit around sensor. Finish weld per local codes. If alignment of the bar does not allow enough clearance to insert the opposite side plug, adjustments prior to making the finish weld.

4. To avoid serious burns, allow the mounting hardware to cool before continuing.
**Step 4: Insert the Annubar**

1. Align the flow arrow on the head with the direction of flow. Assembly the bar to the mounting flange using a gasket, bolts, and nuts.
2. Tighten the nuts in a cross pattern to allow even compression of the gasket.
3. Thread the studs into Flange-Lok body.
4. To ensure that the flowmeter contacts the opposite side wall, mark the tip of the sensor with a marker. (Do not mark if ordered with option code P2 or PA.)
5. Insert the flowmeter into the Flange-Lok body until the sensor tip contacts the pipe wall (or support plug), rotating the flowmeter back and forth.
6. Remove the flowmeter.
7. Verify that the sensor tip made contact with the pipe wall by ensuring that some of the marker has been rubbed off. For special-cleaned bars, look for wear marks on the tip. If the tip did not touch the wall, verify pipe dimensions and the height of the mounting body from the outer diameter of the pipe and re-insert.
8. Re-insert the flowmeter into the Flange-Lok body and install the first packing ring on the sensor between the retaining ring and the packing follower. Take care not to damage the split packing rings.
9. Push the packing ring into the Flange-Lok body and against the weld retaining ring. Repeat this process for the two remaining rings, alternating the location of the packing ring split by 180°.
10. Tighten the nuts onto the studs:
   a. Place the included split-ring lock washer between each of the nuts and the compression plate. Give each nut one half turn in succession until the split-ring lock washer is flat between the nut and the compression plate. Torque is as follows.

<table>
<thead>
<tr>
<th>Sensor Size</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40-in. / lb</td>
</tr>
<tr>
<td>2</td>
<td>100-in. / lb</td>
</tr>
<tr>
<td>3</td>
<td>250-in. / lb</td>
</tr>
</tbody>
</table>

   b. Inspect the unit for leakage. If any exists, tighten the nuts in one-quarter turn increments until there is no leakage.

**Note**

On sensor size 1, failure to use the split-ring Lock washers, improper washer orientation, or over-tightening the nuts may result in flowmeter damage.
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**Figure 10. Split-Ring Lock Washer Orientation**

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**NOTE**

Flange-Lok sealing mechanisms generate significant force at the point where the sensor contacts the opposite pipe wall. Caution needs to be exercised on thin-walled piping (ANSI Sch 10 and lower) to avoid damage to the pipe.

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**STEP 5: MOUNT THE TRANSMITTER**

**Transmitter Mounting, Direct Mount Head with Valves**

It is not necessary to retract the Annubar when direct mounting a transmitter with valves.

1. Place PTFE O-rings into grooves on the Annubar head.
2. Align the high side of the transmitter to the high side of the sensor ("Hi" is stamped on the side of the head) and install.
3. Tighten the nuts in a cross pattern to 400 in•lb (45 N•m).

**Transmitter Mounting with Remote Mount Head**

Temperatures in excess of 250 °F (121 °C) at the sensor module diaphragms will damage the transmitter. Remote mounted transmitters are connected to the sensor by means of impulse piping, which allows process temperatures to decrease to a point where the transmitter is no longer vulnerable.

Different impulse piping arrangements are used depending on the process fluid and must be rated for continuous operation at the pipeline design pressure and temperature. A minimum of \( \frac{1}{2} \)-in. (12 mm) outer diameter stainless steel tubing with a wall thickness of at least 0.035-in. (0.9 mm) is recommended including and under 600# ANSI (DN50 PN100). Above 600# ANSI (DN50 PN100), stainless steel tubing with \( \frac{1}{16} \)-in. wall thickness. Threaded pipe fittings are not recommended because they create voids where air can become entrapped and create leakage points.
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STEP 5 CONTINUED...
The following restrictions and recommendations apply to impulse piping location:

1. Impulse piping that runs horizontally must slope at least one inch per foot (83 mm/m).
   • Slope downward (toward the transmitter) for liquid and steam applications
   • Slope upward (toward the transmitter) for gas applications.

2. Outdoor installations for liquid, saturated gas, or steam may require insulation and heat tracing to prevent freezing.

3. An instrument manifold is recommended for all installations. Manifolds allow an operator to equalize the pressures prior to zeroing and isolates the process fluid from the transmitter.

Figure 11. Valve Identification for 5-valve and 3-Valve Manifolds
STEP 5 CONTINUED...

Table 4. Description of Impulse Valves and Components

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Components</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Transmitters</td>
<td>Reads Differential Pressure</td>
</tr>
<tr>
<td>2</td>
<td>Manifold</td>
<td>Isolates and equalizes electronics</td>
</tr>
<tr>
<td>PH</td>
<td>Primary Sensor(1)</td>
<td>High and low side pressure process connections.</td>
</tr>
<tr>
<td>PL</td>
<td>Primary Sensor(2)</td>
<td></td>
</tr>
<tr>
<td>DVH</td>
<td>Drain/Vent Valve(1)</td>
<td>Drains (for gas service) or vents (for liquid or steam service) the DP sensor diaphragms</td>
</tr>
<tr>
<td>DVL</td>
<td>Drain/Vent Valve(2)</td>
<td></td>
</tr>
<tr>
<td>MH</td>
<td>Manifold(1)</td>
<td>Isolates high side or low side pressure from the process</td>
</tr>
<tr>
<td>ML</td>
<td>Manifold(2)</td>
<td></td>
</tr>
<tr>
<td>MEH</td>
<td>Manifold Equalizer(1)</td>
<td>Allows high and low pressure side access to the vent valve, or for isolating the process fluid</td>
</tr>
<tr>
<td>MEL</td>
<td>Manifold Equalizer(2)</td>
<td></td>
</tr>
<tr>
<td>ME</td>
<td>Manifold Equalizer</td>
<td>Allows high and low side pressure to equalize</td>
</tr>
<tr>
<td>MV</td>
<td>Manifold Vent Valve</td>
<td>Vents process fluid</td>
</tr>
</tbody>
</table>

(1) High Pressure
(2) Low Pressure

Recommended Installations

Gas Service

Secure the transmitter above the sensor to prevent condensable liquids from collecting in the impulse piping and the DP cell.

Figure 12. Horizontal Gas

Figure 13. Vertical Gas
**STEP 5 CONTINUED...**

*Steam or Liquid Service (below 600 °F (315 °C))*

Mount the transmitter below the process piping, adjust 10 to 15 degree above direct vertical down. Route the impulse piping down to the transmitter and fill the system with cool water through the two cross fittings.

**NOTE**

Ensure the drain legs are long enough to capture the dirt particles and sediment.

**Top Mounting for Steam Service**

This orientation can be used for any steam temperature. For remote mount installations the impulse piping should slope up slightly from the instrument connections on the Annubar to the cross fittings allowing condensate to drain back into the pipe. From the cross fittings, the impulse piping should be routed downward to the transmitter and the drain legs. The transmitter should be located below the instrument connections of the Annubar. Depending on the environmental conditions, it may be necessary to insulate the mounting hardware.

Figure 16. Horizontal Top Mounting for Steam
PRODUCT CERTIFICATIONS

Approved Manufacturing Locations
Rosemount Inc. — Chanhassen, Minnesota USA

European Directive Information
The EC declaration of conformity for all applicable European directives for this product can be found on the Rosemount website at www.rosemount.com. A hard copy may be obtained by contacting our local sales office.

European Pressure Equipment Directive (PED) (97/23/EC)
Rosemount 485 Annubar — Refer to EC declaration of conformity for conformity assessment
Pressure Transmitter — See appropriate Pressure Transmitter QIG

Hazardous Locations Certifications
For information regarding the transmitter product certification, see the appropriate transmitter QIG:
• Rosemount 3051SF (document number 00825-0100-4801)
• Rosemount 3095MF (document number 00825-0100-4716)