Installation guide
Radar gauge Antennas

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Preface

This installation guide is intended for technicians involved in mechanical and electrical installation of the Enraf Series 970, 971, 973 SmartRadar and SmartRadar FlexLine. It describes the antenna installation, which is identical for both types of SmartRadar.

EC declaration of conformity

Refer to the installation guide of the instrument (970, 971, 973 SmartRadar and SmartRadar FlexLine).

Safety aspects, legal aspects

Refer to the installation guide of the instrument.
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**Adapter plate**

Prepare adapter plate to install tank separator for atmospheric and medium pressure antennas:
- free space: F08, T06 and W06 antennas;
- stilling well: S06 - S12 antennas.

Use any adapter plate of 10 to 30 mm (\(\frac{3}{8}\) to \(\frac{1}{3}\)”) thickness or, alternatively, prepare counter flange.

Adapter plate must have hole pattern of roof nozzle flange. Refer to Appendix A for mechanical details.

For safety, the adapter plate must be finished to 20 µm over a diameter of 100 mm (4”) at the underside of the adapter plate around tank separator hole. However, for adequate sealing in pressurized applications, the surface finish requirement is 1.6 µm.

**Tank separator**

The tank separator for planar antennas is already fixed to the antenna. Install tank separator and antenna as follows (figure 1):

1) Check if O-ring (1) on tank separator is in place.

2) Insert tank separator (2) from underneath adapter plate. Mind locking pin!

3) Place M55 inside star washer (3) over tank separator.

4) Tighten tank separator nut (4).
Installation F06 antenna

Free space 6" planar antenna

The 6" planar antenna (F06) can be installed on a 6" (or larger) roof nozzle or on a manhole. Refer to section: adapter plate / tank separator.

Antenna position

The antenna can be positioned anywhere on the tank roof, but a minimum distance of 0.12 x tank height from tank shell (with AdvancedDSP software enabled) or 0.25 x tank height from tank shell (without AdvancedDSP software) is recommended.

If possible, the radar beam should avoid large reflecting obstacles. It is recommended to select stem length so that antenna position is below roof nozzle.

Field orientation 6" planar antenna

Install antenna with magnetic field (H-field) directed towards tank shell (figure 2).

Direction of magnetic field is in line with locking pin hole from tank separator.

Manhole cover preparation

For easy installation, make 6" nozzle on manhole cover.

Limit nozzle height to minimize antenna stem length. Nozzle can be constructed from an 6", 150 lbs welding neck flange. Refer to figure 3.
Install antenna with adapter plate on nozzle

Refer to figure 4.

1) Place 8" planar antenna / adapter plate assembly on roof nozzle.

2) Position adapter plate so that locking pin hole (2) on top of tank separator is directed towards tank shell.

3) Secure adapter plate. 
Line (3) in figure 4 indicates antenna position.

**Warning**

*For proper grounding of adapter plate, install a copper strip under one of the flange bolts.*

*Place sharks ring between flange and strip (figure 5).*
Free space 8” planar antenna

The 8” planar antenna (F08) can be installed on a 8” (or larger) roof nozzle or on a manhole. Refer to section: adapter plate / tank separator.

Antenna position

The antenna can be positioned anywhere on the tank roof, but a minimum distance of 0.1 x tank height from tank shell (with AdvancedDSP software enabled) or 0.15 x tank height from tank shell (without AdvancedDSP software) is recommended. If possible, the radar beam should avoid large reflecting obstacles.

Field orientation 8” planar antenna

Install antenna with magnetic field (H-field) directed towards tank shell (figure 6).

Manhole cover preparation

For easy installation, make 8” nozzle on manhole cover.

Limit nozzle height to minimize antenna stem length. Nozzle can be constructed from an 8”, 150 lbs welding neck flange. Refer to figure 7.
Install antenna with adapter plate on nozzle

Refer to figure 8.

1) Place 8” planar antenna / adapter plate assembly on roof nozzle.

2) Position adapter plate so that:
   a) tank separator (1) is located as far as possible from tank shell;
   b) locking pin hole (2) on top of tank separator is directed towards tank shell.

3) Secure adapter plate. Line (3) in figure 8 indicates antenna position.

Warning
For proper grounding of adapter plate, install a copper strip under one of the flange bolts.

Place sharks ring between flange and strip (figure 9).
Free space 6" (hinged) WALP antenna

Refer to section: adapter plate / tank separator.

The T06 (hinged WALP) antenna will fit through 6" and larger nozzles. The W06 (WALP) antenna can be installed on 10" (or larger) roof nozzles with restrictions on nozzle length (refer to figure 10 and table below), or on a manhole.

<table>
<thead>
<tr>
<th>Nozzle size (D)</th>
<th>Max. nozzle length (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10&quot;</td>
<td>200 mm (8&quot;)</td>
</tr>
<tr>
<td>12&quot;</td>
<td>350 mm (1' 2&quot;)</td>
</tr>
<tr>
<td>14&quot; or larger</td>
<td>800 mm (2' 7½&quot;)</td>
</tr>
</tbody>
</table>

Antenna position
The antenna can be positioned anywhere on the tank roof, but a minimum distance of 0.06 x tank height from tank shell (with AdvancedDSP software enabled) or 0.1 x tank height from tank shell (without AdvancedDSP software) is recommended.

If possible, the radar beam should avoid large reflecting obstacles. Alternatively, the antenna can be installed very close to the tank shell. Distance antenna side to tank shell shall not exceed 5 cm (2"). Refer to figure 11.

Note:
Obstacles at inner side of tank shell, such as piping or welding seams, influence the radar measurement when (hinged) WALP antenna is positioned towards tank shell.
Field orientation 6" (hinged) WALP Antenna

Install antenna with the electric field (E-field) directed towards tank shell (figure 12).

Manhole cover preparation

For easy installation, make 10" nozzle on manhole cover (maximum nozzle height: 200 mm (8")). Nozzle can be constructed from a welding neck flange. Refer to figure 7.

Installing WALP antenna (W06) and adapter plate on nozzle

Refer to figure 13.

1) Place WALP antenna / adapter plate assembly on roof nozzle.

2) Position adapter plate so that:
   a) tank separator (1) is located as far as possible from tank shell;
   b) locking pin hole (2) on top of tank separator is directed towards tank shell.

Note:
If the WALP antenna is installed as close as possible to tank shell, the tank separator shall be located close to tank shell, with the locking hole on top of tank separator towards tank centre.
3) Secure adapter plate.
   Line (3) in figure 13 indicates antenna position, when installed towards the tank centre.

   **Warning**
   *For proper grounding of adapter plate, install a copper strip under one of the flange bolts.
   Place shark rings between flange and strip (figure 9).*

**Installing hinged WALP antenna (T06) and adapter plate on nozzle**

1) Rotate antenna surface 90°

2) Lower antenna into roof nozzle (figure 14).

3) Briefly rotate adapter plate to turn back the antenna into its original position.

4) Before fixing adapter plate, check antenna surface position.

5) Proceed as described in previous section.

![Figure 14: Inserting hinged WALP antenna](image-url)
Free space RoD antenna

The RoD antenna can be installed on a manhole (preferred method), or on a 8" (200 mm) or larger roof nozzle. Installation with RoD antenna can be:

<table>
<thead>
<tr>
<th>Application</th>
<th>Figure 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>8&quot; or larger roof nozzle with $L \leq 200$ mm</td>
<td>A</td>
</tr>
<tr>
<td>8&quot; roof nozzle with $L$ between 350 mm and 500 mm</td>
<td>B</td>
</tr>
<tr>
<td>20&quot; or larger manhole</td>
<td>C</td>
</tr>
<tr>
<td>8&quot; or larger roof nozzle with $200 \leq L \leq 350$ mm: via insert pipe</td>
<td>D</td>
</tr>
</tbody>
</table>

![Figure 15 RoD antenna installation examples](image)

Antenna position

The antenna can be positioned anywhere on the tank roof, but a minimum distance of $0.15 \times$ tank height from the tank shell (with AdvancedDSP software enabled) is recommended. If possible, the radar beam should avoid large reflecting obstacles.
Installing RoD antenna on manhole

Manhole cover preparation

A socket with 1½” NPT screw thread must be welded into centre of manhole cover (figure 16).

Refer to appendix B for an example of socket.

Screw RoD antenna in socket

1) Put some PTFE tape or pipe sealant around screw thread of RoD antenna.

2) Refer to figure 17. Insert and screw antenna into socket (1).

3) Lock antenna with locking nut (2).
Install manhole cover

1) Position manhole cover so that locking pin hole (1) of RoD antenna is towards tank shell (figure 18).

2) Secure manhole cover.

Grounding

**Warning**

For proper grounding of manhole cover, install a copper strip under one of the flange bolts.

Place shark rings (1) between flange and strip (figure 19).
Installing RoD antenna on roof nozzle

Flange preparation

A threaded hole of 1½” NPT is required in centre of flange. Refer to Appendix B. Make sure that flange obliquity is within 2°. Flange thickness should be sufficient to meet antenna safety requirements.

Screw RoD antenna in flange

1) Put some PTFE tape or pipe sealant around screw thread of RoD antenna.

2) Refer to figure 20. Insert and screw antenna into flange through top hole (1).

3) Lock antenna with locking nut (2).
Install RoD antenna with flange on nozzle

Refer to figure 21.

1) Place RoD antenna / flange assembly on roof nozzle.

2) Position flange so that locking pin hole (1) is towards tank shell.

3) Secure flange.

Grounding

**Warning**

For proper grounding of flange, install a copper strip under one of the flange bolts.

Place shark rings (1) between flange and strip (figure 22).
Stilling well 6" to 12" planar antennas

Refer to section: adapter plate / tank separator.

Stilling well should have at least one row of equalisation holes with 500 mm (20”) pitch.

Hole diameter:  
- 15 mm (½”) for a 6" stilling well  
- 20 mm (¾") for 8" and 10” stilling well  
- 25 mm (1”) for a 12” stilling well

Inner side stilling well should be free from burrs at equalisation hole positions. Stilling well should be straight and consistent in diameter without welding seams at inside; obliquity should be within 0.5 degrees.

Usually, the stilling well antenna can be installed directly under the adapter plate. For fixed-roof tanks containing heated products, the stilling well antenna can be lowered into the heated tank area to prevent condensation. Refer to figure 23.

![Figure 23](image-url)  
Installation example of stilling well antenna on floating roof and fixed-roof tank with heated product
Installing antenna with adapter plate on stilling well

Refer to figure 24.

1) Place antenna / adapter plate assembly on stilling well's counter flange.

2) Position of locking pin hole on tank separator (1) determines position of Antenna Unit / SmartRadar LT.

3) Secure adapter plate.

Warning
For proper grounding of adapter plate, install a copper strip under one of the flange bolts. Place sharks ring (1) between flange and strip (see figure 22).
High pressure 4" horn antenna

The stilling well should have at least one row of equalisation holes with a diameter of 5 - 10 mm ($\frac{5}{16}$ - $\frac{3}{8}$") at 500 mm (20") pitch. Local regulations may require a different pitch and/or size of equalisation holes. In this case consult Enraf or the local representative. Stilling well’s inner side should be smooth and free from burrs.

The equalisation hole position in the pipe should be clearly marked on the stilling well flange. When using verification pins, they should also be in line with the mark on the flange. Refer to figure 25.

![Diagram showing equalisation holes and verification pins in line with mark on flange](image)

Figure 25  Holes and verification pins in line with mark on flange

There are three configurations:

- on a 4" ball valve, type H04/B4
- in a 4" SCH40 stilling well, type H04/N4
- in a 4" SCH10s insert pipe, type H04/N1
Install horn antenna to adapter flange (4" or 6")

This procedure is common for all three configurations.

Refer to figure 26.

1) Place four Allen head screws M6 x 60 (2) with springs (3) and nuts (4) in Horn Antenna (1).

2) Insert bushing (5) from underneath adapter flange (6).

3) Place antenna (1) against bushing and turn Allen head screws (2) into adapter flange. Secure Allen head screws with nuts (4) against adapter flange. Leave sufficient space for springs (3) to be pressed at least 8 mm (5/16").

Figure 26 Installing antenna to adapter flange
Installation on 4” ball valve (type H04/B4)

Refer to figure 27.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4” SCH40 stilling well with welding neck flange (300 lbs)</td>
</tr>
<tr>
<td>2</td>
<td>4” full bore ball valve (300 lbs)</td>
</tr>
<tr>
<td>3</td>
<td>spool piece</td>
</tr>
<tr>
<td>4</td>
<td>tank separator</td>
</tr>
</tbody>
</table>

Note:
The 4” full bore ball valve should be well aligned on welding neck flange. Bad alignment of internal diameters will cause false reflections, resulting in level inaccuracies. Also, spool piece should be well aligned, as cone will lower into ball valve housing.

Note:
The spool piece should provide a plug for a vent facility (by means of a small valve) and/or pressure gauge.

Start installation with ball valve and spool piece; mind alignment as described in note above.

Figure 27 Assembly of H04 antenna on top of 4” ball valve
Place horn antenna with 4" adapter flange in spool piece

1) Place 4" gasket on spool piece flange.

2) Carefully lower the antenna/adapter flange assembly inside spool piece. Do not yet fix adapter flange to spool piece.

Place tank separator and position adapter flange

Refer to figure 28.

1) Place 1" gasket (1) between the four stud bolts on 4" adapter flange.

2) Place tank separator (2) over the four stud bolts. Tighten with four nuts.

Note:
Tighten nuts carefully on opposite sides. Check that bushing is pressed downwards.

3) Turn 4" adapter flange in position. The correct position is as indicated in figure 28. Hole for locking pin (3), which is 90° away from vent plug (4), is in line with marker on stilling well flange (5).

4) Secure 4" adapter flange to spool piece flange with standard bolts and nuts.
**Warning**
For proper grounding of all flanges, install a copper strip under one of the flange bolts.

Place shark rings (1) between flange and strip (figure 29).

---

**Figure 29** Example of flange ground connection
Installation in 4" SCH40 stilling well (type H04/N4)

Refer to figure 30.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4&quot; SCH40 stilling well with 300 lbs flange</td>
</tr>
<tr>
<td>2</td>
<td>4&quot; 300 lbs adapter flange</td>
</tr>
<tr>
<td>3</td>
<td>1&quot; full bore ball valve</td>
</tr>
<tr>
<td>4</td>
<td>tank separator</td>
</tr>
</tbody>
</table>

Refer to section: install horn antenna to adapter flange.

Figure 30    Assembly of H04 antenna in 4" SCH40 stilling well
Place horn antenna with 4" adapter flange in stilling well

1) Place 4" gasket on stilling well flange.

2) Carefully lower antenna/adapter flange assembly inside stilling well. Do not yet fix adapter flange to stilling well flange.

Place ball valve and position adapter flange

Refer to figure 31.

1) Place 1" gasket (1) between the four stud bolts on the 4" adapter flange.

2) Place 1" ball valve (2) over the four stud bolts. Tighten with four nuts.

Note:
Tighten nuts carefully on opposite sides. Check that bushing is pressed downwards.

3) Turn 4" adapter flange in position. The correct position is found when handle of ball valve (3) is in line with the marker on stilling well flange (4).

4) Secure 4" adapter flange to stilling well flange with standard bolts and nuts.

Figure 31  Position of adapter flange with respect to equalisation holes or verification pins
Install tank separator

Refer to figure 32.

1) Place 1" gasket (1) on 1" ball valve flange (2).

2) Place tank separator (3).
   Mind the position!
   The correct position is as indicated in figure 32. Hole for locking pin (4), which is 90° away from vent plug (5), is in line with marker on the stilling well flange (6).

3) Secure the tank separator with 4 standard bolts and nuts.
**Warning**
For proper grounding of all flanges, install a copper strip under one of the flange bolts.

Place shark rings (1) between flange and strip (figure 33).
Installation in 4" SCH10s insert pipe (type H04/N1)

Refer to figure 34.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6&quot; SCH40 stilling well (or nozzle)</td>
</tr>
<tr>
<td>2</td>
<td>4&quot; SCH10s insert pipe</td>
</tr>
<tr>
<td>3</td>
<td>6&quot; 300 lbs intermediate flange</td>
</tr>
<tr>
<td>4</td>
<td>6&quot; 300 lbs adapter flange</td>
</tr>
<tr>
<td>5</td>
<td>1&quot; full bore ball valve</td>
</tr>
<tr>
<td>6</td>
<td>tank separator</td>
</tr>
</tbody>
</table>

Refer to section: Install horn antenna to adapter flange.

Figure 34  Assembly of H04 antenna in 4" SCH10s insert pipe
Place horn antenna with 6" adapter flange in insert pipe

1) Place 6" gasket on intermediate flange.

2) Carefully lower antenna/adapter flange assembly inside insert pipe. Do not yet fix adapter flange.

Place ball valve and position adapter flange

Refer to figure 35.

1) Place 1" gasket (1) between the four stud bolts on 6" adapter flange.

2) Place 1" ball valve (2) over the four stud bolts and tighten it with four nuts.

Note:
Tighten nuts carefully on opposite sides. Check that bushing is pressed downwards.

The correct position is found when handle of ball valve (3) is in line with marker on intermediate flange (4).

4) Secure 6" adapter flange to stilling well flange with standard bolts and nuts.

Figure 35  Position of adapter flange with respect to equalisation holes or verification pins
Install tank separator

Refer to figure 36.

1) Place 1” gasket (1) on 1” ball valve flange (2).

2) Place tank separator (3).  
   Mind the position!  
   The correct position is as indicated in figure 36. Hole for locking pin (4), which is 90° away from vent plug (5), is in line with marker on intermediate flange (6).

3) Secure tank separator with 4 standard bolts and nuts.
**Warning**
For proper grounding of all flanges, install a copper strip under one of the flange bolts.

Place shark rings (1) between flange and strip (figure 37).
High pressure 2" planar antenna

The stilling well should have at least one row of equalisation holes with a diameter of 3 - 5 mm ($1/8$ - $3/16$") at 500 mm (20") pitch. Local regulations may require a different pitch and/or size of equalisation holes. The position of equalisation holes should be clearly marked on flange. The inner side of stilling well should be free from burrs.

There are four configurations:
- on 2" ball valve and 2" SCH40 pipe (type H02V4)
- on 2" ball valve and 1.5" SCH5 pipe (type H02V5)
- on a 2" SCH40 stilling well (type H02P4)
- on a 1.5" SCH5 insert pipe (type H02P5)

Installation on 2" ball valve and 2" SCH40 pipe (type H02V4)

Refer to figure 38.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2&quot; SCH40 stilling well with welding neck flange (300 lbs)</td>
</tr>
<tr>
<td>2</td>
<td>2&quot; full bore ball valve (300 lbs)</td>
</tr>
<tr>
<td>3</td>
<td>adapter ring to match inner diameter of the ball valve with antenna aperture</td>
</tr>
<tr>
<td>4</td>
<td>2&quot;, 300 lbs counter flange</td>
</tr>
<tr>
<td>5</td>
<td>tank separator with integrated 2&quot; planar antenna</td>
</tr>
</tbody>
</table>

Figure 38  Antenna type H02V4

**Note:**
The 2" full bore ball valve should be well aligned on welding neck flange. Bad alignment of internal diameters will cause false reflections, resulting in level inaccuracies. Also, the antenna should be well aligned, as the adapter ring will lower into ball valve housing.
Installation procedure:

Refer to figure 38.

1) Check if adapter ring (3) is correctly screwed into H02 antenna housing (5).

2) Place 2" gasket on ball valve.

3) Place adapter ring with tank separator (5) carefully in ball valve housing and mind alignment as described in the notes. Mind correct position of gasket. Watch position of bleed valve in respect to flange bolts. Valve should be at 90° angle to marker on flange (figure 39).

4) Lower 2" counter flange over tank separator, and let it rest on antenna housing.

5) Fix counter flange on the 2" ball valve flange (for proper grounding, see page 39).

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>marker, which indicates position of holes in pipe</td>
</tr>
<tr>
<td>2</td>
<td>use this locking pin hole for the Antenna Unit or SmartRadar LT</td>
</tr>
<tr>
<td>3</td>
<td>bleed valve</td>
</tr>
<tr>
<td>4</td>
<td>tank separator</td>
</tr>
<tr>
<td>5</td>
<td>2&quot;, 300 lbs counter flange</td>
</tr>
</tbody>
</table>

Magnetical field (H-field) directed towards equalisation holes in stilling well.
Installation on 2” ball valve and 1.5” SCH5 pipe (type H02V5)

Refer to figure 40.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.5” SCH5 stilling well</td>
</tr>
<tr>
<td>2</td>
<td>intermediate plate</td>
</tr>
<tr>
<td>3</td>
<td>2”, 300 lbs roof nozzle flange</td>
</tr>
<tr>
<td>4</td>
<td>adapter ring between 1.5” pipe and 2” full bore ball valve</td>
</tr>
<tr>
<td>5</td>
<td>2” full bore ball valve (300 lbs)</td>
</tr>
<tr>
<td>6</td>
<td>adapter ring to match inner diameter of the ball valve with antenna aperture</td>
</tr>
<tr>
<td>7</td>
<td>2”, 300 lbs counter flange</td>
</tr>
<tr>
<td>8</td>
<td>tank separator with integrated 2” planar antenna</td>
</tr>
</tbody>
</table>

Figure 40  Antenna type H02V5

**Note:**

The 2” full bore ball valve should be well aligned on the 1.5” insert pipe. Bad alignment of internal diameters will cause false reflections, resulting in level inaccuracies. Also, the antenna should be well aligned, as adapter ring will lower into ball valve housing.
Installation procedure:

Refer to figure 40

1) Place adapter ring (3) over end of 1.5" insert pipe (1)

2) Place gasket on top of intermediate plate connected to 1.5" stilling well (1).

3) Place 2" full bore ball valve (4)

4) Check if adapter ring (5) is correctly screwed into H02 antenna housing (7).

5) Place 2" gasket on ball valve

6) Place adapter ring with tank separator (5) carefully in ball valve housing and mind alignment as described in the notes. Mind correct position of gasket. Watch position of bleed valve in respect to flange bolts. Valve should be at 90° angle to marker on flange (figure 39).

7) Lower 2" counter flange over tank separator, and let it rest on antenna housing.

8) Fix 2" counter flange on 2" ball valve flange (for proper grounding, see page 39).
Installation on a 2” SCH40 stilling well (type H02P4)

Refer to figure 41.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2” SCH40 stilling well with welding neck flange (300 lbs)</td>
</tr>
<tr>
<td>2</td>
<td>adapter ring to match inner diameter of the stilling well with antenna aperture</td>
</tr>
<tr>
<td>3</td>
<td>2”, 300 lbs counter flange</td>
</tr>
<tr>
<td>4</td>
<td>tank separator with integrated 2” planar antenna</td>
</tr>
</tbody>
</table>

Figure 41  Antenna type H02P4

Installation procedure:

Refer to figure 41.

1) Check if adapter ring (2) is screwed correctly into H02 antenna housing (4).

2) Place 2” gasket on the 2” stilling well flange.

3) Place adapter ring with tank separator (4) carefully in stilling well. Use adapter ring for alignment and mind correct position of gasket. Watch position of bleed valve in respect to flange bolts. Valve should be at 90° angle to marker on flange (figure 39).

4) Lower 2” counter flange over tank separator, and let it rest on antenna housing.

5) Fix 2” counter flange on 2” stilling well flange (for proper grounding, see page 39).
Installation on a 1.5” SCH5 insert pipe (type H02P5)

Refer to figure 42.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2” stilling well (or nozzle)</td>
</tr>
<tr>
<td>2</td>
<td>1.5” SCH5 insert pipe</td>
</tr>
<tr>
<td>3</td>
<td>intermediate plate</td>
</tr>
<tr>
<td>4</td>
<td>adapter ring to match inner diameter of the insert pipe with antenna aperture</td>
</tr>
<tr>
<td>5</td>
<td>tank separator with integrated 2” planar antenna</td>
</tr>
<tr>
<td>6</td>
<td>2”, 300 lbs counter flange</td>
</tr>
</tbody>
</table>

**Note:**

*When using a 2” full bore ball valve in combination with a 1.5” SCH5 insert pipe, a second adapter ring is required between the two. This unit should be placed over the end of the 1.5” stilling well first, before the ball valve is installed on top of the intermediate installation plate.*
Installation procedure:

Refer to figure 42.

1) Check if adapter ring (2) is screwed correctly into H02 antenna housing (4).

2) Place 2" gasket on 2" stilling well flange.

3) Place adapter ring with tank separator (4) carefully in stilling well. Use adapter ring for alignment and mind correct position of gasket. Watch position of bleed valve in respect to flange bolts. Valve should be at 90° angle to marker on flange (refer to figure 39).

4) Lower 2" counter flange over tank separator, and let it rest on antenna housing.

5) Fix 2" counter flange on 2" stilling well flange.

Grounding

**Warning**

For proper grounding of all flanges, install a copper strip under one of the flange bolts.

Place shark rings between flange and strip (figure 43).
Appendix A  Adapter plates

Thickness: 10 T 30

<table>
<thead>
<tr>
<th>Flange</th>
<th>D</th>
<th>K</th>
<th>d</th>
<th>n (number of holes)</th>
<th>a</th>
<th>Antenna type</th>
<th>Part no. (cs version)</th>
<th>Part no. (ss version)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6&quot;, 150 lbs</td>
<td>279.4</td>
<td>241.3</td>
<td>22.2</td>
<td>8</td>
<td>20</td>
<td>T06</td>
<td>0186.422</td>
<td>0186.424</td>
</tr>
<tr>
<td>8&quot;, 150 lbs</td>
<td>342.9</td>
<td>298.4</td>
<td>22.2</td>
<td>8</td>
<td>45</td>
<td>F08, T06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10&quot;, 150 lbs</td>
<td>406.4</td>
<td>361.9</td>
<td>25.4</td>
<td>12</td>
<td>70</td>
<td>F08, T06, W06 *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12&quot;, 150 lbs</td>
<td>482.6</td>
<td>431.8</td>
<td>25.4</td>
<td>12</td>
<td>95</td>
<td>F08, T06, W06 **</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NW150 ND6</td>
<td>265</td>
<td>225</td>
<td>18</td>
<td>8</td>
<td>20</td>
<td>T06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NW200 ND6</td>
<td>320</td>
<td>280</td>
<td>18</td>
<td>8</td>
<td>45</td>
<td>F08, T06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NW200 ND10</td>
<td>340</td>
<td>295</td>
<td>23</td>
<td>8</td>
<td>45</td>
<td>F08, T06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NW250 ND6</td>
<td>375</td>
<td>335</td>
<td>18</td>
<td>12</td>
<td>70</td>
<td>F08, T06, W06 *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NW250 ND10</td>
<td>395</td>
<td>350</td>
<td>23</td>
<td>12</td>
<td>70</td>
<td>F08, T06, W06 *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NW300 ND6</td>
<td>440</td>
<td>395</td>
<td>23</td>
<td>12</td>
<td>95</td>
<td>F08, T06, W06 **</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NW300 ND10</td>
<td>445</td>
<td>400</td>
<td>23</td>
<td>12</td>
<td>95</td>
<td>F08, T06, W06 **</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:  *) Maximum nozzle length 200 mm  
**) Maximum nozzle length 350 mm  
***) General finish 20 m, gas finish 1.6 m
### Table: Antenna Specifications

<table>
<thead>
<tr>
<th>Flange</th>
<th>D</th>
<th>K</th>
<th>d</th>
<th>n (number of holes)</th>
<th>Antenna type</th>
<th>Part no. (cs version)</th>
<th>Part no. (ss version)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6&quot;, 150 lbs</td>
<td>279.4</td>
<td>241.3</td>
<td>22.2</td>
<td>8</td>
<td>S06, F06</td>
<td>0186.430</td>
<td>0186.431</td>
</tr>
<tr>
<td>8&quot;, 150 lbs</td>
<td>342.9</td>
<td>298.4</td>
<td>22.2</td>
<td>8</td>
<td>S08</td>
<td>0186.423</td>
<td>0186.425</td>
</tr>
<tr>
<td>10&quot;, 150 lbs</td>
<td>406.4</td>
<td>361.9</td>
<td>25.4</td>
<td>12</td>
<td>S10</td>
<td>0186.426</td>
<td>0186.427</td>
</tr>
<tr>
<td>12&quot;, 150 lbs</td>
<td>482.6</td>
<td>431.8</td>
<td>25.4</td>
<td>12</td>
<td>S12</td>
<td>0186.428</td>
<td>0186.429</td>
</tr>
<tr>
<td>NW150 ND6</td>
<td>265</td>
<td>225</td>
<td>18</td>
<td>8</td>
<td>S06, F06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NW200 ND6</td>
<td>320</td>
<td>280</td>
<td>18</td>
<td>8</td>
<td>S08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NW200 ND10</td>
<td>340</td>
<td>295</td>
<td>23</td>
<td>8</td>
<td>S08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NW250 ND6</td>
<td>375</td>
<td>335</td>
<td>18</td>
<td>12</td>
<td>S10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NW250 ND10</td>
<td>395</td>
<td>350</td>
<td>23</td>
<td>12</td>
<td>S10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NW300 ND6</td>
<td>440</td>
<td>395</td>
<td>23</td>
<td>12</td>
<td>S12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NW300 ND10</td>
<td>445</td>
<td>400</td>
<td>23</td>
<td>12</td>
<td>S12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: *

*General finish 20 m
Gas finish 1.6 m
Appendix B  Flange and socket for RoD antenna

Flange for SmartRadar RoD antenna with screw connection

Socket for SmartRadar RoD antenna with screw connection
Appendix C  Dimensional drawings antennas

F06 antenna

Material: AISI 316L, mat. no.: 1.4404

<table>
<thead>
<tr>
<th>Stem length</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 mm</td>
<td>0.62 kg (1.4 lbs)</td>
</tr>
<tr>
<td>300 mm</td>
<td>0.97 kg (2.1 lbs)</td>
</tr>
<tr>
<td>500 mm</td>
<td>1.60 kg (3.5 lbs)</td>
</tr>
<tr>
<td>800 mm</td>
<td>2.65 kg (5.8 lbs)</td>
</tr>
</tbody>
</table>

Note:
F06 and S06 antennas have identical housings. F06 antenna can be identified by the character “F” on the sticker with the antenna serial number; e.g. 0103006 F, or F 0103006.
F08 Antenna

<table>
<thead>
<tr>
<th>Stem length</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 mm</td>
<td>1.23 kg (2.7 lbs)</td>
</tr>
<tr>
<td>300 mm</td>
<td>1.58 kg (3.5 lbs)</td>
</tr>
<tr>
<td>500 mm</td>
<td>1.86 kg (4.1 lbs)</td>
</tr>
<tr>
<td>800 mm</td>
<td>2.25 kg (4.9 lbs)</td>
</tr>
</tbody>
</table>

Material: AISI 316L, mat. no.: 1.4404
W06 Antenna

<table>
<thead>
<tr>
<th>Stem length</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 mm</td>
<td>2.97 kg (6.5 lbs)</td>
</tr>
<tr>
<td>300 mm</td>
<td>3.22 kg (7.1 lbs)</td>
</tr>
<tr>
<td>500 mm</td>
<td>3.50 kg (7.4 lbs)</td>
</tr>
<tr>
<td>800 mm</td>
<td>3.89 kg (8.8 lbs)</td>
</tr>
</tbody>
</table>

Material: antenna stem : AISI 316L, mat. no.: 1.4404
antenna cover : ASTM A351 CF8M, mat no.: 14408
T06 Antenna

<table>
<thead>
<tr>
<th>Stem length</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>300 mm</td>
<td>4.7 kg (10.5 lbs)</td>
</tr>
<tr>
<td>500 mm</td>
<td>5.0 kg (11 lbs)</td>
</tr>
<tr>
<td>800 mm</td>
<td>5.4 kg (12 lbs)</td>
</tr>
</tbody>
</table>

Material: antenna stem: AISI 316L, mat. no.: 1.4404
        antenna cover: ASTM A351 CF8M, mat no.: 14408
D02 Antenna with screw connection

Material: RoD housing : AISI 316L, mat. no.: 1.4404
RoD antenna : TMF

wrench size a: 65 (2 9/16")
wrench size b: 55 (2 3/16")
S06 - S12 Antennas

<table>
<thead>
<tr>
<th>Stem length</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 mm</td>
<td>0.62 kg (1.4 lbs)</td>
</tr>
<tr>
<td>300 mm</td>
<td>0.97 kg (2.1 lbs)</td>
</tr>
<tr>
<td>500 mm</td>
<td>1.60 kg (3.5 lbs)</td>
</tr>
<tr>
<td>800 mm</td>
<td>2.65 kg (5.8 lbs)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stem length</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 mm</td>
<td>1.23 kg (2.7 lbs)</td>
</tr>
<tr>
<td>300 mm</td>
<td>1.58 kg (3.5 lbs)</td>
</tr>
<tr>
<td>500 mm</td>
<td>1.86 kg (4.1 lbs)</td>
</tr>
<tr>
<td>800 mm</td>
<td>2.25 kg (4.9 lbs)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stem length</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 mm</td>
<td>1.66 kg (3.7 lbs)</td>
</tr>
<tr>
<td>300 mm</td>
<td>2.01 kg (4.4 lbs)</td>
</tr>
<tr>
<td>500 mm</td>
<td>2.29 kg (5 lbs)</td>
</tr>
<tr>
<td>800 mm</td>
<td>2.71 kg (6 lbs)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stem length</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 mm</td>
<td>2.18 kg (4.8 lbs)</td>
</tr>
<tr>
<td>300 mm</td>
<td>2.53 kg (5.6 lbs)</td>
</tr>
<tr>
<td>500 mm</td>
<td>2.81 kg (6.2 lbs)</td>
</tr>
<tr>
<td>800 mm</td>
<td>3.23 kg (7.1 lbs)</td>
</tr>
</tbody>
</table>

Material: AISI 316L, mat. no.: 1.4404

**Note:**

*S06 and F06 antennas have identical housings. S06 antenna can be identified by the character “S” on the sticker with the antenna serial number; e.g. 0103006 S, or S 0103006.*
**H04 Antenna**

<table>
<thead>
<tr>
<th></th>
<th>mm</th>
<th>inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>Ø25</td>
<td>1&quot;</td>
</tr>
<tr>
<td>b</td>
<td>Ø85</td>
<td>3 3/8&quot;</td>
</tr>
<tr>
<td>c</td>
<td>65</td>
<td>2 3/16&quot;</td>
</tr>
<tr>
<td>d</td>
<td>Ø32</td>
<td>1 3/16&quot;</td>
</tr>
<tr>
<td>e</td>
<td>5</td>
<td>3/32&quot;</td>
</tr>
<tr>
<td>f</td>
<td>10</td>
<td>3/32&quot;</td>
</tr>
</tbody>
</table>

Connection for pressure relief and/or pressure gauge 1/4" BSP (RP 1/4)

Material: AISI 316, mat. no.: 1.4401
Weight: 3.1 kg (6.8 lbs)
Flange: 1", 300 lbs, rf acc. to ANSI B16.5

<table>
<thead>
<tr>
<th></th>
<th>mm</th>
<th>inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>g</td>
<td>Ø25</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>h</td>
<td>Ø32</td>
<td>3/16&quot;</td>
</tr>
<tr>
<td>k</td>
<td>5</td>
<td>3/32&quot;</td>
</tr>
</tbody>
</table>

Material: ASTM A351 CF8M, 316, mat. no.: 1.4408
Weight: 2.9 kg (6.4 lbs)
Flange: 1", 300 lbs, rf acc. to ANSI B16.5
Flange finish: turning, Ra: 3.2-6.3 μm
Appendix D  Related publications

SmartRadar Safety instructions for installation, commissioning, operation and maintenance

Installation guide 970 SmartRadar ATi
Installation guide 971 SmartRadar LTi
Installation guide 973 SmartRadar LT
Installation guide SmartRadar FlexLine

Instruction manual 970 SmartRadar ATi
Instruction manual 971 SmartRadar LTi
Instruction manual 973 SmartRadar LT
Instruction manual Smartradar FlexLine
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