



BWT™ System Installation Guide



Process Control Instruments

BWT™ System

Installation Guide

916-058B



GE Panametrics

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Warranty

Each instrument manufactured by GE Panametrics is warranted to be free from defects in material and workmanship. Liability under this warranty is limited to restoring the instrument to normal operation or replacing the instrument, at the sole discretion of GE Panametrics. Fuses and batteries are specifically excluded from any liability. This warranty is effective from the date of delivery to the original purchaser. If GE Panametrics determines that the equipment was defective, the warranty period is:

- one year for general electronic failures of the instrument
- one year for mechanical failures of the sensor

If GE Panametrics determines that the equipment was damaged by misuse, improper installation, the use of unauthorized replacement parts, or operating conditions outside the guidelines specified by GE Panametrics, the repairs are not covered under this warranty.

The warranties set forth herein are exclusive and are in lieu of all other warranties whether statutory, express or implied (including warranties or merchantability and fitness for a particular purpose, and warranties arising from course of dealing or usage or trade).

Return Policy

If a GE Panametrics instrument malfunctions within the warranty period, the following procedure must be completed:

1. Notify GE Panametrics, giving full details of the problem, and provide the model number and serial number of the instrument. If the nature of the problem indicates the need for factory service, GE Panametrics will issue a RETURN AUTHORIZATION NUMBER (RAN), and shipping instructions for the return of the instrument to a service center will be provided.
2. If GE Panametrics instructs you to send your instrument to a service center, it must be shipped prepaid to the authorized repair station indicated in the shipping instructions.
3. Upon receipt, GE Panametrics will evaluate the instrument to determine the cause of the malfunction.

Then, one of the following courses of action will then be taken:

- If the damage is covered under the terms of the warranty, the instrument will be repaired at no cost to the owner and returned.
- If GE Panametrics determines that the damage is not covered under the terms of the warranty, or if the warranty has expired, an estimate for the cost of the repairs at standard rates will be provided. Upon receipt of the owner's approval to proceed, the instrument will be repaired and returned.

Chapter 1

General Information

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Introduction

Installing the BWT™ System consists of creating a meter body, installing the transducer buffer, and then mounting transducers into the buffer. GE Panametrics offers a variety of buffers and meter bodies for liquid and gas applications. This section consists of general information for the following:

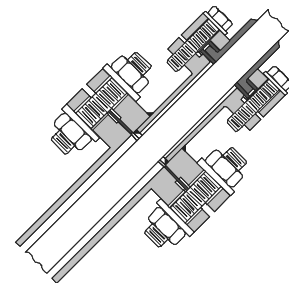
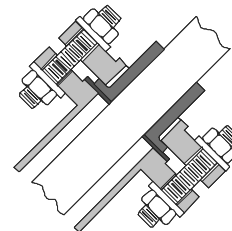
- Types of BWT Buffers
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Refer to the appropriate section of this manual to install the BWT buffers and transducers that you ordered.

Types of BWT Buffers

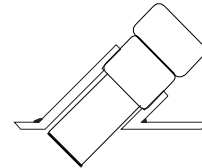
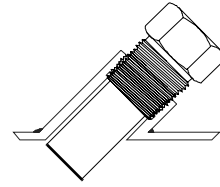
Buffers are used to protect the BWT transducers from temperature extremes. Since they mount directly into the pipe coupling or nozzle, they also act as barriers against the process, making it possible for the transducers to be removed without interrupting the process or emptying the pipe. There are three BWT buffer types available for transducers for liquid and gas applications:

- Standard BWT Buffer (part number FTPA) - is used for liquid and gas applications. The buffer has a flanged process connection and is available in two lengths: 2 in. (temperatures up to 600°F/315°C) and 6 in. (temperatures up to 1,100°F/600°C).
- Acoustic Isolation BWT Buffer (part number FIPA) - is used for gas applications at lower pressures. The buffer has a flanged isolation section that reduces acoustic short circuit. The outer buffer has a flanged process connection and is available in two lengths: 2 in. (temperatures up to 600°F/315°C) and 6 in. (temperatures up to 1,100°F/600°C).



Types of BWT Buffers (cont.)

- Non-Flanged BWT Buffer (part number FSPA) - is used in liquid applications and has a 1 in. NPT thread.
- Socket-Weld BWT Buffer (part number FWPA) - is used in liquid applications and has a 1 in. coupling that is welded into the pipe coupling.



General Guidelines for Transducer Position and Location

Whichever transducer type is selected for your installation, flowmeter accuracy depends on proper transducer location, spacing, alignment, and electronics programming. However, even though every transducer installation has specific location considerations, the following location guidelines apply to all transducers, regardless of type:

Caution!

A flowmeter's accuracy and performance depends on the location, spacing, and alignment of the transducers. The specific spacing of your transducers are unique to your installation.

1. To help assure a uniform flow profile, locate the buffers so that there are at least 10 pipe diameters of straight, undisturbed flow upstream and 5 pipe diameters of straight, undisturbed flow downstream from the point of measurement. The more straight run available the better. "Undisturbed flow" means avoiding sources of turbulence such as valves, flanges, and elbows. You should also avoid swirl, cross flow and cavitation (in liquids).
2. It is important to locate the transducers on a horizontal plane. This specifically applies to mounting transducers on a horizontal pipe. One transducer cannot be on top of the pipe and one on the bottom, because the top of the pipe tends to accumulate gas (in liquids) and the bottom tends to accumulate sediment (in gas and liquids). These contaminants can attenuate or block the ultrasonic signal. There is no similar restriction with vertical pipes. However, in liquid applications you should avoid vertical downward flow to ensure a full pipe.

BWT Meter Body

BWT installations typically use a tilted-diameter meter body. A tilted-diameter meter body is so named because the transducers send their pulses at an angle across the diameter of the pipe. This type of meter body can be configured as a single-traverse or double-traverse installation.

Note: *The mounting angle for the transducer is typically 45°, but other angles (20°, 30°, or 60°) can be used as required. Tilted diameter can also refer to paths that are off-diameter such as the mid-radius path.*

A meter body is created by mounting the nozzles on the existing pipeline, or on a **meter body**. A meter body is a precision-manufactured section of matching pipe that contains the ports where the transducer buffers will be mounted. This setup allows more accurate transducer alignment before mounting the meter body into the pipeline. If requested, a meter body can be calibrated prior to shipment. All meter bodies are factory-supplied.

Single-Traverse Meter Body

A single-traverse configuration consists of two transducers mounted on opposite sides of the pipe so that the signal they transmit passes through the fluid just once, at a typical 45° angle (Figure 1-1 below). A single-traverse configuration may include more than one path (Figure 1-2 on the next page).

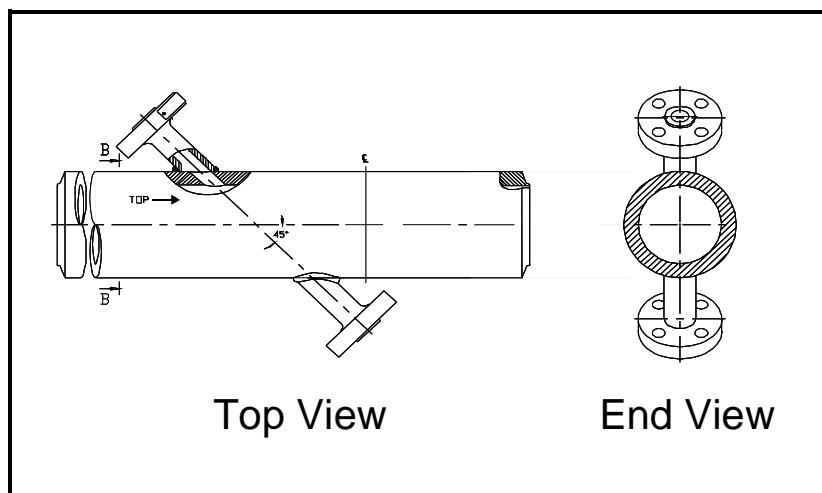


Figure 1-1: Single-Traverse, 2-Path, Diagonal 45 Meter Body

Single-Traverse Meter Body (cont.)

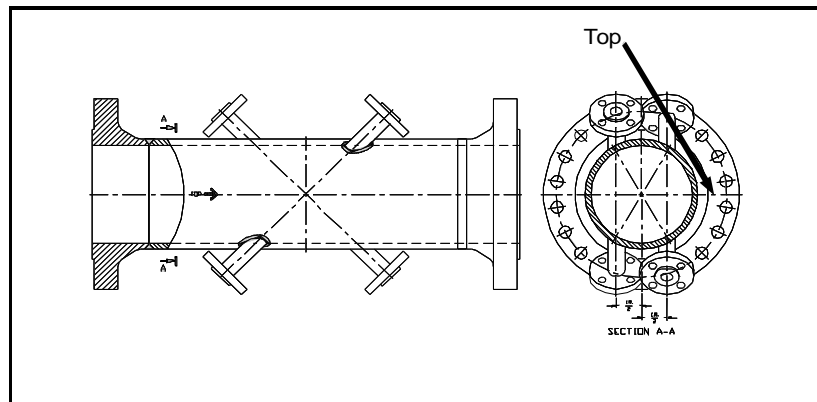


Figure 1-2: Single-Traverse, 2-Path, Mid-Radius Meter Body

Double-Traverse Meter Body

A double-traverse configuration consists of two transducers mounted on the pipe so that the signal traverses the fluid two times before reaching the other transducer. See Figure 1-3 below.

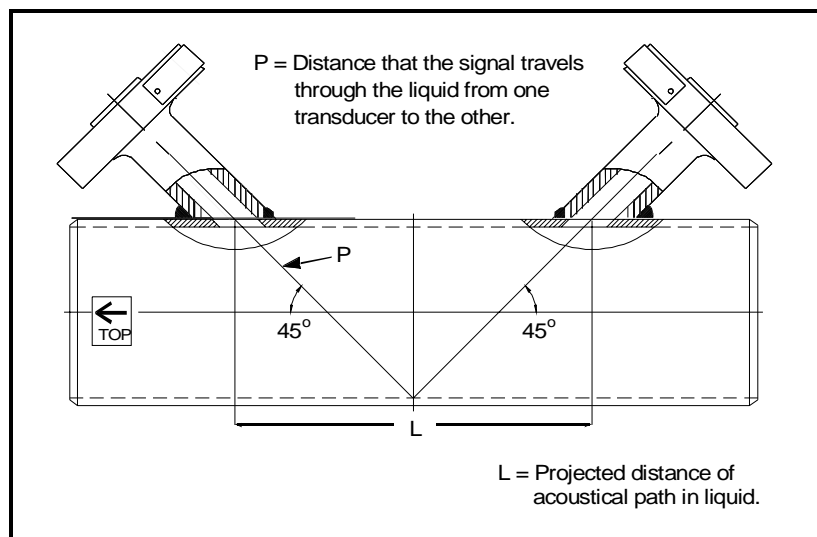


Figure 1-3: Double-Traverse Meter Body

Handling and Installing a Meter Body

To ensure proper nozzle alignment, GE Panametrics uses the highest quality welding and machining techniques when manufacturing meter bodies. Since proper alignment of the nozzles is important to making accurate flow measurement, great care must be taken when unpacking and installing the meter body.

Unpacking a Meter Body

Upon receipt, you should take great care in unpacking the meter body. Although meter bodies are constructed of steel, improper unpacking or handling can result in damage or affect nozzle alignment. Use the guidelines below for unpacking the meter body:

- Since the nozzles protrude from the pipe, take care when removing packing material and the meter body from its shipping container, so as not to disturb the nozzles.
- After the meter body is removed from its shipping container, never allow the full weight of the meter body to rest on the nozzle or buffer. You should prop up the meter body to prevent it from rolling over, which again, may cause damage or misalignment of nozzles.
- Do not let the meter body hit against other objects or surfaces. Nozzle alignment can be affected if the meter body is dropped onto sand or the ground.
- If the meter body is shipped with the buffers already installed in the nozzles, take care as to not disturb the buffers when unpacking.

Installing a Meter Body

Meter bodies can be either flanged or welded into the existing pipeline. Use the following steps to position the meter body into the pipeline (refer to Figure 1-4 on the next page):

!WARNING!

Before installing the meter body make sure pipe flushing is completed. For additional information when flushing is necessary, refer to *Meter Body Requirements When Flushing* on page 1-7.

1. Find the tag plate with the words TOP and FLOW DIRECTION marked on it. If the meter body is flanged, two bolt holes should straddle the vertical centerline.

IMPORTANT: *In general (including cases where the meter body axis is not horizontal), be sure that the installation does not allow gas or sediment to deposit in the transducer ports. Otherwise the sound waves could be attenuated or blocked entirely.*

Installing a Meter Body (cont.)

2. Place the meter body in the pipeline so that the FLOW DIRECTION arrow mark is in the direction of flow and the top is appropriately located. (Be sure the transducer ports are in a horizontal plane.)

IMPORTANT: *If you cannot place the meter body in the required orientation, consult the factory; otherwise operational problems may occur.*

3. Do one of the following:
 - Bolt the meter body into place and proceed to the appropriate section that follows to mount the BWT buffers and transducers.
 - Weld the meter body into place in accordance with the requirements described in *Welding Requirements* below. Once welding is completed, proceed to the appropriate section that follows to mount the BWT buffers and transducers.

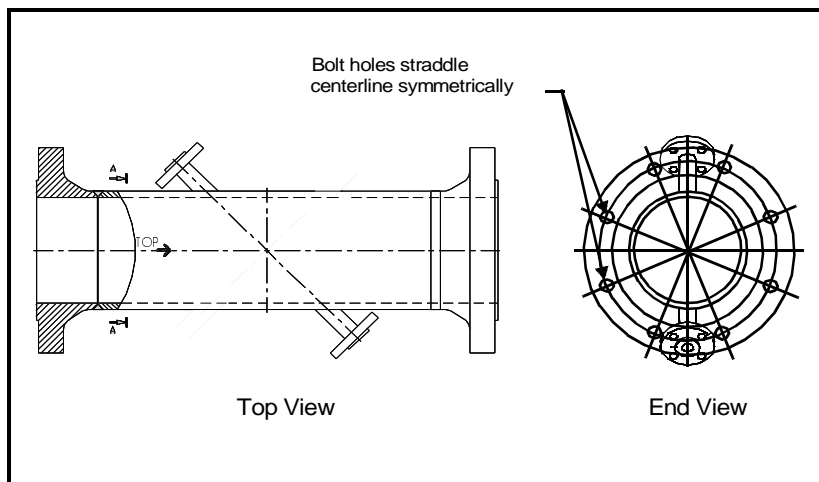


Figure 1-4: Top View of a Flanged Meter Body

Welding Requirements

Prior to welding, do the following:

- Remove power from the flowmeter console and disconnect the cables from the transducers.
- Make sure the inside diameter of the meter body and process pipe are properly aligned. Misalignment can affect measurement accuracy.

**Meter Body
Requirements When
Flushing**

GE Panametrics strongly recommends using a dummy meter body during flushing operations; otherwise, damage may occur for the following reasons:

- Fast moving solid objects in the flowing medium could damage the buffer faces.
- Flushing residue/sediment could clog nozzles.

In the event that a dummy meter body is not available for flushing operations, remove the buffers and plug the holes properly for the temperature and pressure used. Blind flanges are typically used.

Reinstall the buffers and transducers after flushing using the information in this guide.

Caution!

Be sure to use new gaskets when reinstalling buffers.
Never reuse gaskets for safety reasons and acoustic
performance of the flowmeter.

Chapter 2

Installing Standard FTPA BWT Buffers and Transducers

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Introduction

The FTPA Buffer is used for liquid and gas applications. The buffer has a flanged process connection and is typically available in two lengths:

- 2 in. × 6 in. for low temperature ranges from -150 to 315°C (-270 to 600°F)
- 6 in. × 6 in. for high temperature ranges from -150 to 600°C (-270 to 1,100°F).

Use the sections that follow to properly install the buffers and transducers.

Identifying and Checking Components

Caution!

It is critical that you follow the instructions outlined in this document. If you do not, GE Panametrics cannot ensure the proper operation of your equipment.

Before you install the FTPA Buffer you should make sure you have all the needed equipment. Use the lists below to identify the needed components. GE Panametrics will supply you with the following (use Figures 2-1 and 2-2 on the next page to help you identify each component):

Note: *The list below is for a one-path installation.*

- 2 FTPA Buffers
- 2 BWT1 transducers
- 2 Kamprofile gaskets

IMPORTANT: *Kamprofile gaskets must be used for two reasons: they ensure a leak tight seal and they provide necessary acoustic isolation.*

- 2 Mating lap-joint flanges
- 2 Junction boxes
- Preamplifier(s) - for gas application only
- 3M epoxy or equivalent (for permanent bond) (*not shown in photo*)
- Required studs, nuts and washers (*not shown in photo*)
- 10 ft (3 m) Coaxial cable with BNC connectors (*not shown in photo*)
- Additional cable to connect preamplifier to electronics - for gas only (*not shown in photo*)

Identifying and Checking Components (cont.)

You will need to supply the following:

- Copperslip (SS316), Molykote grease P47 (CS) or equivalent anti-seizing compound
- Adjustable torque wrench with 15 - 148 ft-lb range (20 - 200 N-m) with socket drive
- standard and deep sockets
- adjustable wrench (12 in. handle or equivalent)
- Steel wool
- Calipers

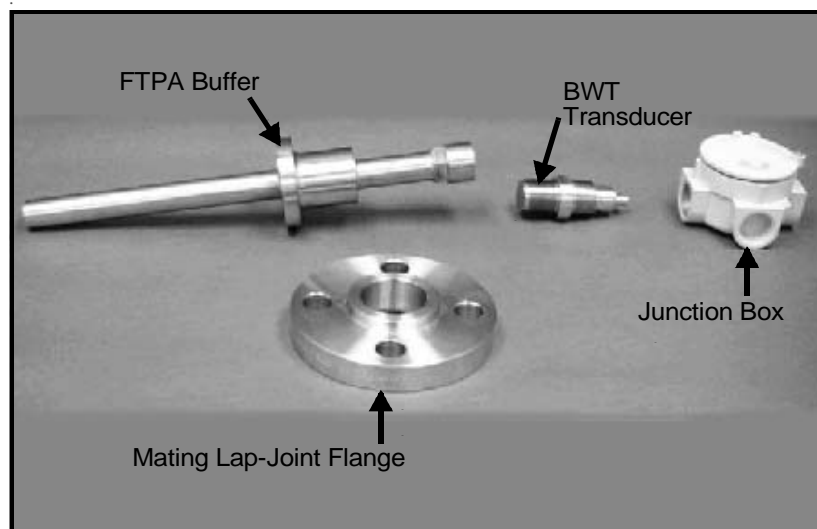


Figure 2-1: Components for FTPA Buffer

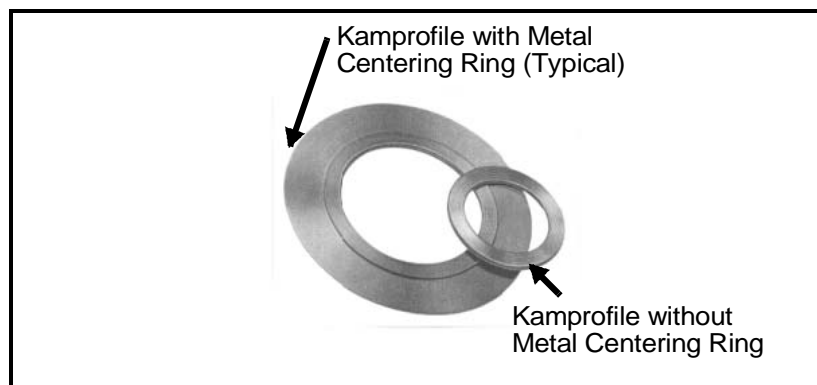
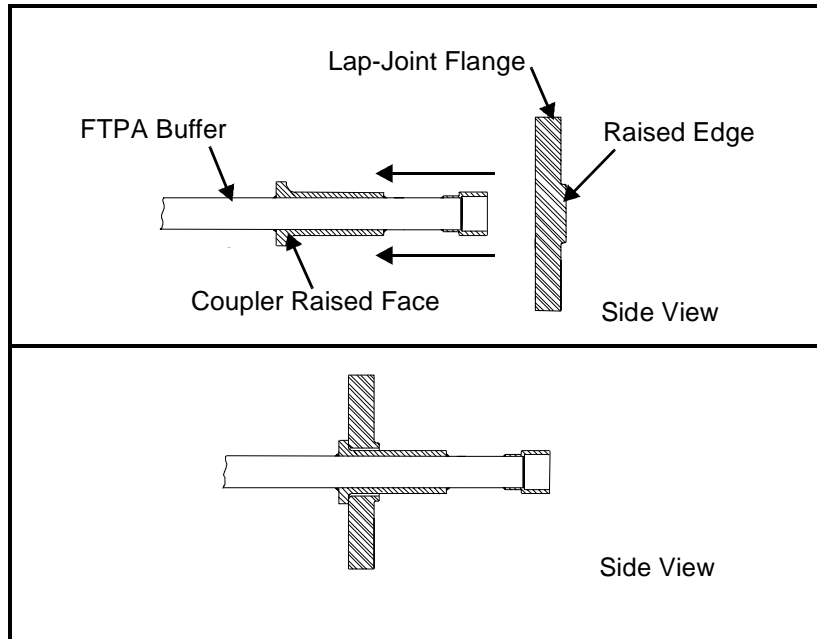


Figure 2-2: Gaskets

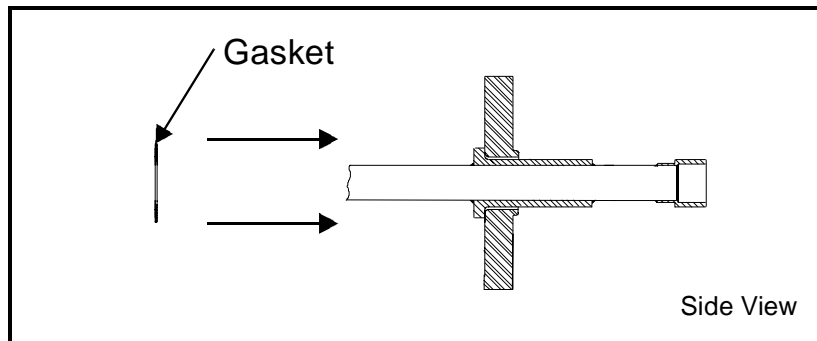
Assembling the Standard FTPA Buffer

Note: *If the BWT system is shipped with the buffers already installed in the nozzles, proceed to Installing the BWT Transducer on page 2-9.*

1. Slide the lap-joint flange over the threaded end of the FTPA Buffer. Make sure you orient the flange as shown below.

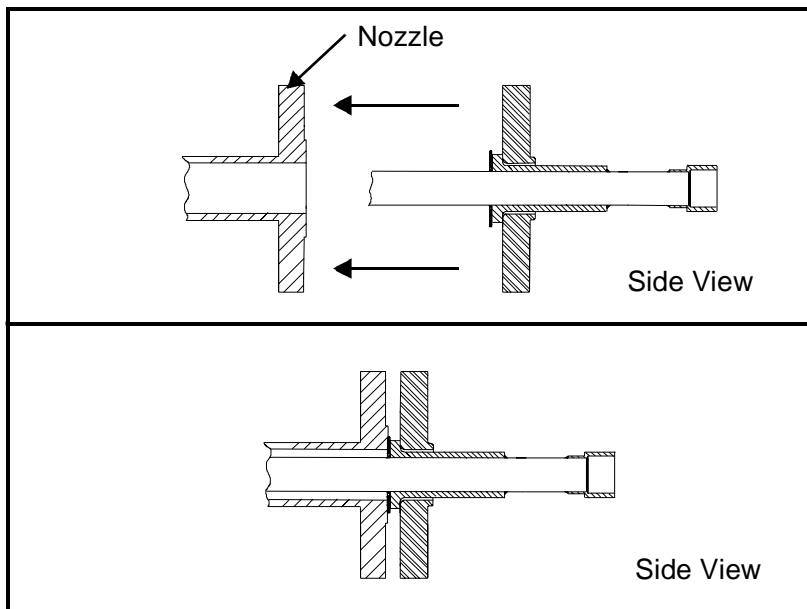


2. Check the raised face of the spool nozzle flange to make sure it is free from paint, rust, dirt, corrosion, and damage. If necessary, clean the raised faces with steel wool. In addition, clean the buffer flange if you are reusing the buffer.
3. Inspect the GE Panametrics-supplied gaskets. They must not be used, warped, pitted or scratched.
4. Place one gasket on the end of the buffer assembly.

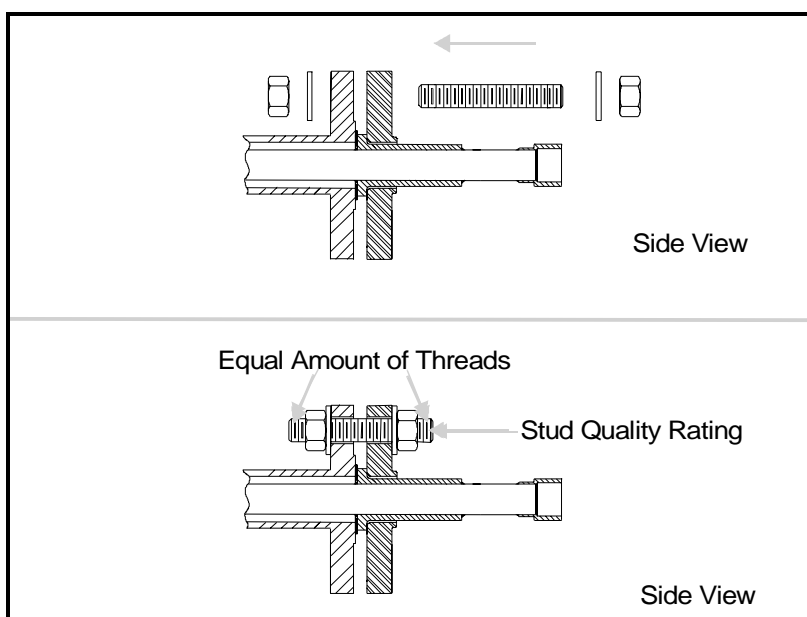


Inserting the Standard FTPA Buffer

1. Inspect the pipe nozzle. Make sure it is free from dirt/rust. Use the steel wool to clean the pipe nozzle face and inside if necessary.
2. Insert the buffer assembly into the nozzle.

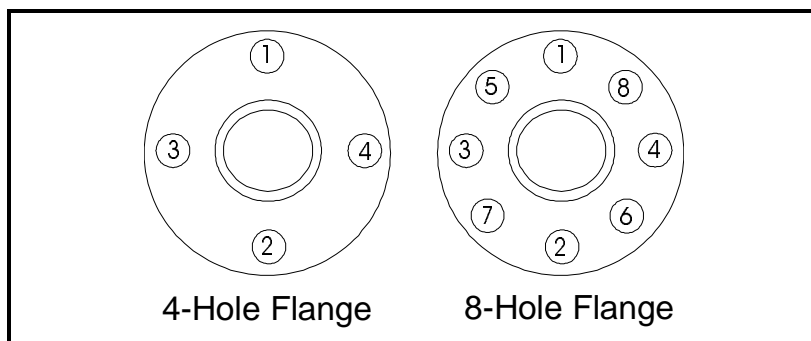


3. Apply Copperslip, Molykote or equivalent anti-seize compound on the first several threads at both ends each stud.
4. Insert one stud through the flanges. Make sure the stud quality rating (e.g., B7) is facing away from the meter body. Hand-tighten a washer and nut on to each end of the stud. Make sure you leave an equal number of threads exposed on each end of the stud.



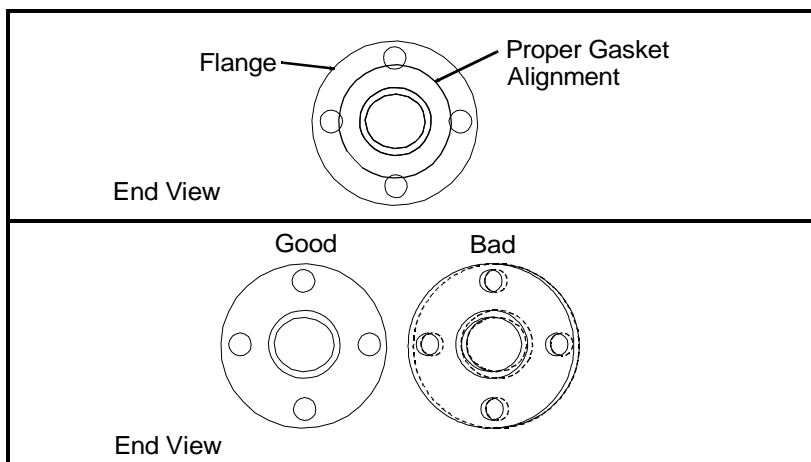
Inserting the Standard FTPA Buffer (cont.)

5. Install the remaining studs in the order shown below, but **do not** tighten the nuts yet.



6. Center the buffer in the middle of the lap joint flange. Feel 360 degrees around the flanges to ensure equal spacing, by placing your hands around the diameter of the buffer flange and the nozzle flange.
7. Align the flanges as shown below.

IMPORTANT: *Make sure the gasket is in the center of the flanges.*



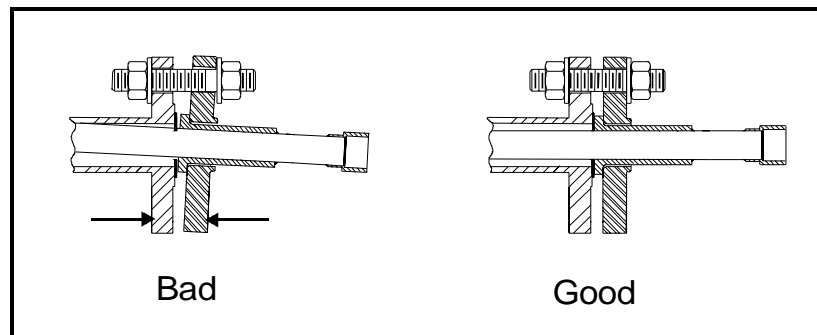
8. Tighten the nuts and studs further by hand to maintain the centering. Visually inspect that the buffer is centered in the lap joint flange; if necessary, adjust the buffer by hand until it is centered.

Torquing the Studs

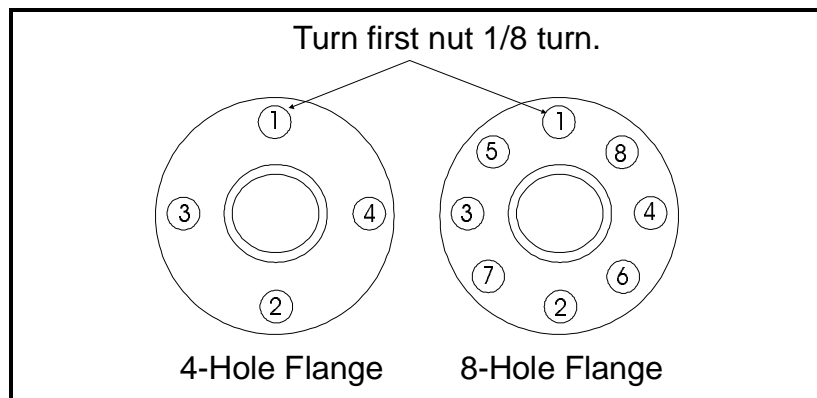
It is important to torque the studs properly for a good seal. However, you should not over-torque them so as to cause an acoustic short or change the transducer alignment.

The studs must be tightened and torqued in stages as described below.

1. Check the flange and buffer alignment again. Make sure the flanges are consistently parallel to each other.

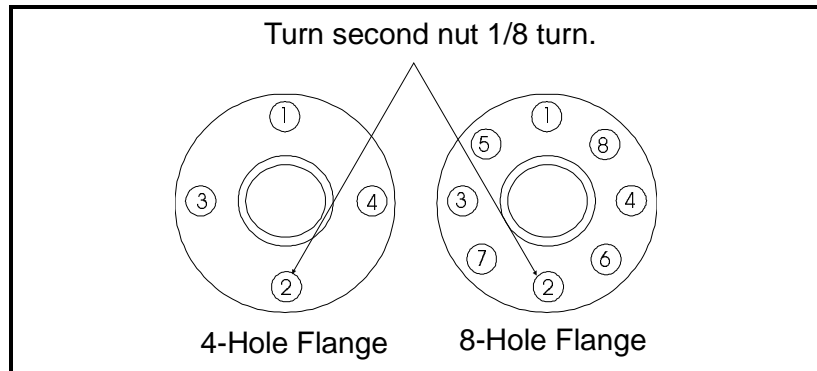


2. Using an adjustable wrench, turn the first nut 1/8 turn.



Torquing the Studs (cont.)

3. Turn the second nut 1/8 turn. The second stud should be diametrically opposite the first stud. Proceed to tighten the remaining studs in the order shown below, or in a similar manner.



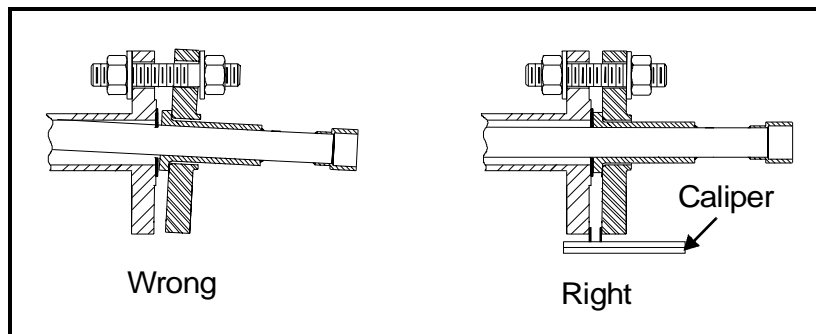
4. Turn each nut an additional 1/8 turn. **TURN NUTS IN SEQUENCE.**
5. Use Table 2-1 below to determine the appropriate torque.

Table 2-1:
Recommended Torque (using Kamprofile Gaskets)

Flange Rating	Stud Rating 4 Studs/ Flange	Stud Diameter (in.) x Length (in.)	Torque ft-lb (N-m)
316 Stainless Steel			
1 1/2" ANSI 150#	B8M,C,1	1/2" x 3 1/4"	56 (76)
1 1/2" ANSI 300#	B8M,C,1	3/4" x 4 3/4"	82 (111)
1 1/2" ANSI 600#	B8M,C,1	3/4" x 4 3/4"	82 (111)
1 1/2" ANSI 900#	B8M,C,1	1" x 6 "	107 (145)
1 1/2" ANSI 1500#	B8M,C,1	1" x 6"	107 (145)
Carbon Steel			
1 1/2" ANSI 150#	B7	1/2" x 3 1/4"	56 (76)
1 1/2" ANSI 300#	B7	3/4" x 4 3/4"	82 (111)
1 1/2" ANSI 600#	B7	3/4" x 4 3/4"	82 (111)
1 1/2" ANSI 900#	B7	1" x 6 "	107 (145)
1 1/2" ANSI 1500#	B7	1" x 6"	107 (145)

Torquing the Studs (cont.)

6. You must torque the flange studs in small increments. Divide the appropriate torque by 10 to determine the number of steps. For example, if the appropriate torque is 90 ft-lb, the steps would be 20, 30, 40, 50, 60, 70, 80 and 90 ft-lb.
7. Set the torque wrench for the first setting and torque the studs in sequence. Turn each stud a maximum of a 1/8 turn at a time.
8. Repeat Step 7 for each torque setting.
9. Check the flange alignment again to ensure that the flanges are parallel to each other. Measure the spacing between the flanges with the caliper on at least four equally distant points; the maximum tolerance is 0.2 mm difference between the four points. If you cannot achieve a tolerance of 0.2 mm or less, replace the gasket with a new gasket, and repeat the entire procedure.



10. Repeat the above steps for the remaining flanges.

Installing the BWT Transducer

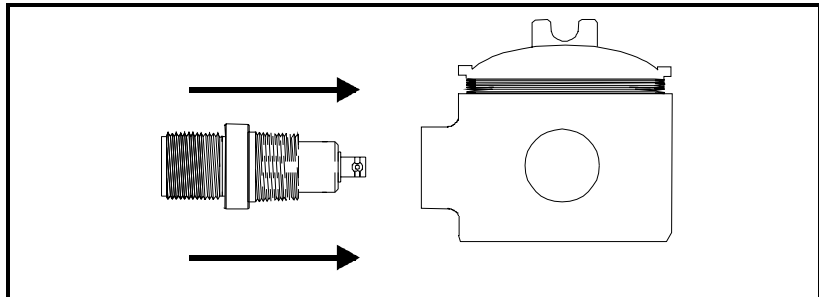
Installing the BWT transducers into the FTPA Buffer requires three steps:

- Installing and Orienting the Junction Box
- Inserting the BWT transducers
- Verifying Installation

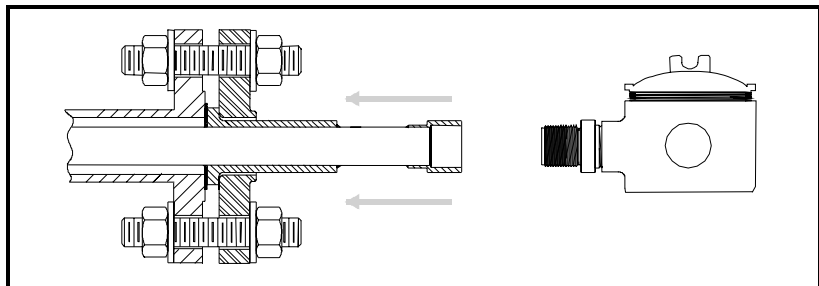
Installing and Orienting the Junction Box

Before placing the BWT transducer into the FTPA Buffer permanently, you must make sure the junction box will be properly oriented once installed.

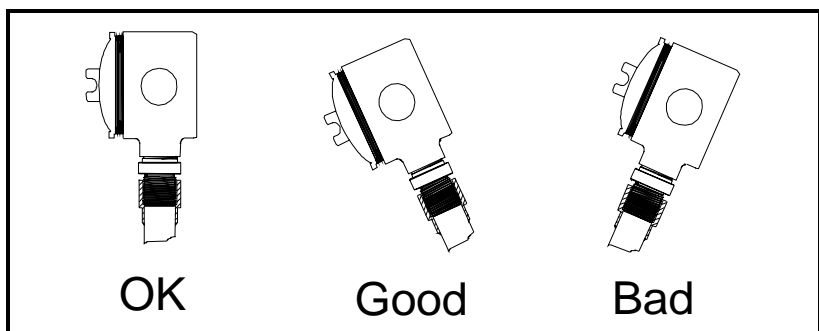
1. Screw the transducer into the junction box as shown below.



2. Screw the transducer/junction box assembly into the FTPA Buffer.



3. Check the junction box orientation. The junction box lid should be at a downward angle so water can drain. If it is not, adjust the junction box until it does.



4. Remove the transducer/junction box assembly.
5. Repeat the above steps for the other transducer.

Inserting the BWT Transducer

Please read the following steps before installing the BWT transducer.

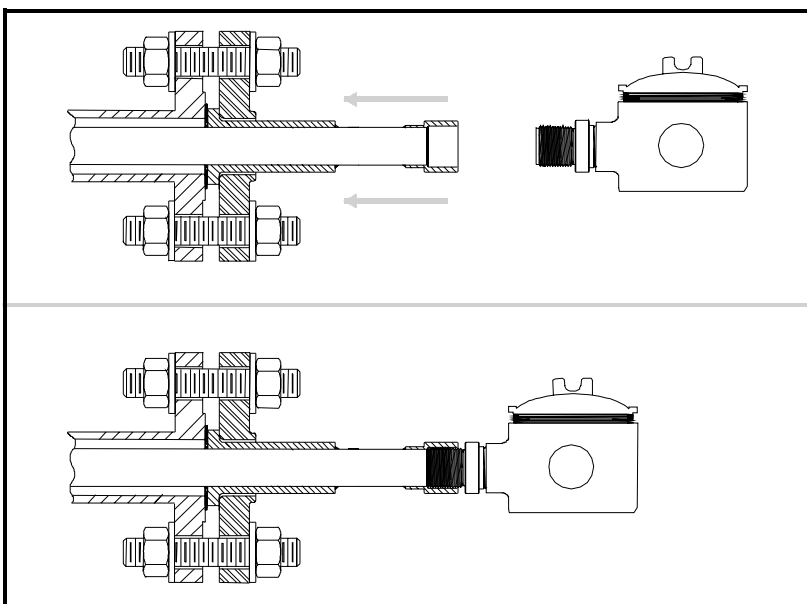
IMPORTANT: *After you install the BWT transducers, you must allow the epoxy to cure for eight hours.*

Note: *In gas applications, the typical minimum pressure should be 5 barg (75 psig) to see a signal at all. A higher pressure should give a better signal-to-noise ratio.*

1. Place a small droplet (2 mm in diameter) of 3M Epoxy or equivalent on the center of the end of the transducer (*picture below does not show the junction box*).



2. Screw the transducer/junction box into the receptacle fitting at the end of the FTPA Buffer. When the transducer begins to feel tight, stop turning it. Wait for 5 seconds to give the couplant a chance to spread out.



Inserting the BWT Transducer (cont.)

3. Torque the transducer to 15 to 18 ft-lb (20 to 25 N-m). DO NOT OVERTIGHTEN.
4. Verify the junction box is properly oriented as discussed in the previous section.
5. Connect the transducer to the electronics and/or preamplifier as described in the flowmeter's *Startup* or *User's Manual*.

Caution!

Do not place insulation on or around the transducer or junction box. The transducer and junction box act as a heat sink that protects the transducer from high and low temperatures.

6. After you install the FTPA Buffers and transducers, you must allow the epoxy to cure for 8 hours. However, while the epoxy cures, you should verify the transducer and buffer are working properly as described below.

Caution!

While the epoxy cures, do not remove, re-torque or adjust the transducer or you will crack the epoxy.

7. Repeat the above steps for the other transducer.

Verifying Installation

1. Power up the electronics.
2. Refer to *Displaying Diagnostics* in the flowmeter's *Service* or *User's Manual* to display the up and down signal strength.
3. Record this data in the *Service Record* in the back of the flowmeter's *Service* or *User's Manual*.
4. Verify that the signal strength diagnostics are the same or better after 8 hours.

This completes the installation of the FTPA buffers and transducers. Refer to the flowmeter's *Startup* or *User's Manual* for instructions on obtaining flow rate measurements.

Chapter 3

Installing Acoustic Isolation FIPA BWT Buffers and Transducers

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Introduction

The FIPA Buffer is used for gas applications at lower pressures. The buffer has a flanged isolation section that reduces acoustic short circuit. The buffer has a flanged process connection and is typically available in two lengths:

- 2 in. × 6 in. for low temperature ranges from -150 to 315°C (-270 to 600°F)
- 6 in. × 6 in. for high temperature ranges from -150 to 600°C (-270 to 1,100°F).

Use the sections that follow to properly install the buffers and transducers.

Identifying and Checking Components

Caution!

It is critical that you follow the instructions outlined in this document. If you do not, GE Panametrics cannot ensure the proper operation of your equipment.

Before you install the BWT transducers you should make sure you have all the needed equipment. Use the list below to identify the needed components. GE Panametrics will supply you with the following (see Figures 3-1 and 3-2 on the next page to help you identify each component):

Note: *The list below is for a one-path installation.*

- 2 Acoustic Isolation FIPA Buffers - *fully assembled*
- 2 BWT1 transducers
- 2 Kamprofile gaskets

IMPORTANT: *Kamprofile gaskets must be used for two reasons: they ensure a leak tight seal and they provide sufficient acoustic isolation.*

- 2 Junction boxes
- Preamplifier(s) - for gas application only
- 3M epoxy or equivalent (for permanent bond) (*not shown in photo*)
- Required studs, nuts and washers (*not shown in photo*)
- 10 ft (3 m) Coaxial cable with BNC connectors (*not shown in photo*)
- Additional cable to connect preamplifier to electronics - for gas only (*not shown in photo*)

Identifying and Checking Components (cont.)

You will need to supply the following:

- Copperslip (SS316), Molykote grease P47 (CS) or equivalent anti-seizing compound
- Adjustable torque wrench with 15 - 148 ft-lb range (20 - 200 N-m) with socket drive
- standard and deep sockets
- adjustable wrench (12 in. handle or equivalent)
- Steel wool
- Calipers
- Tape Measure

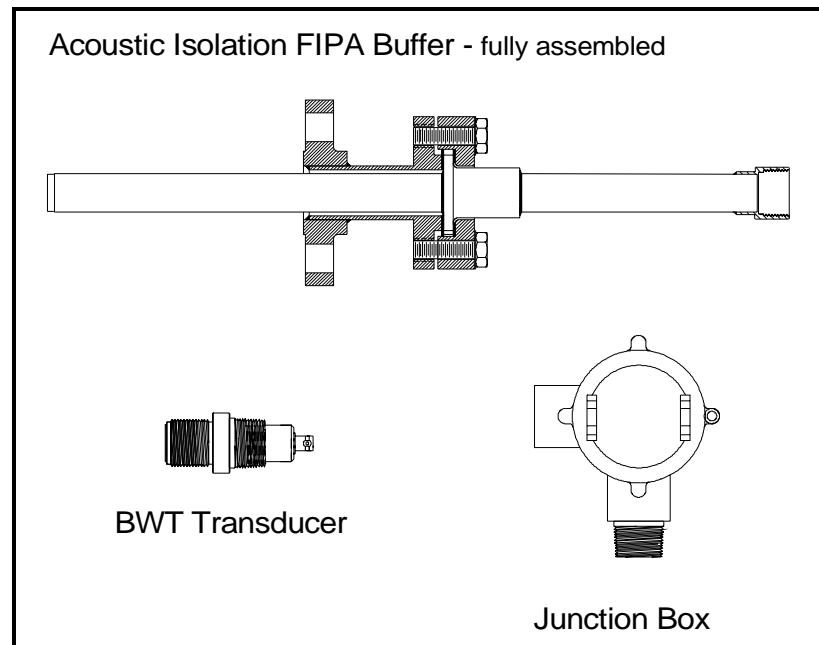


Figure 3-1: Components for Acoustic Isolation FIPA Buffer

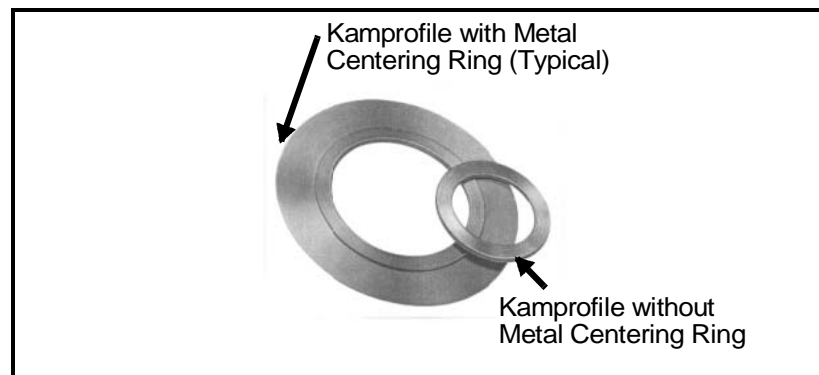


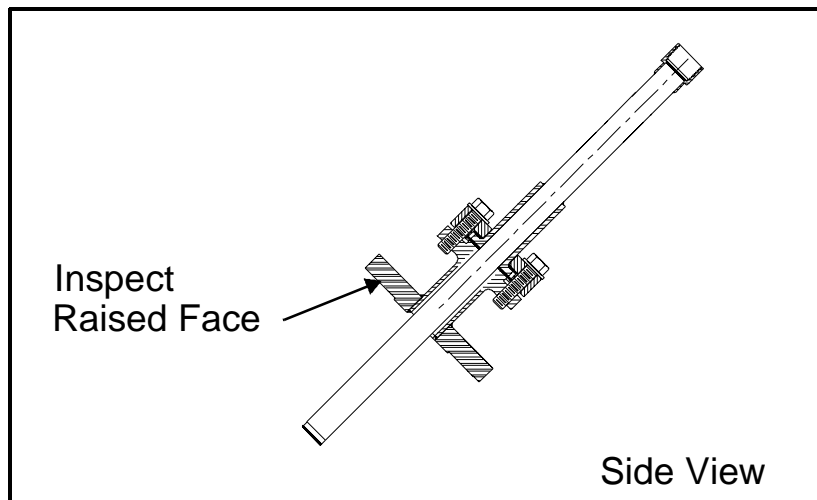
Figure 3-2: Gaskets

Inserting the Acoustic Isolation FIPA Buffer

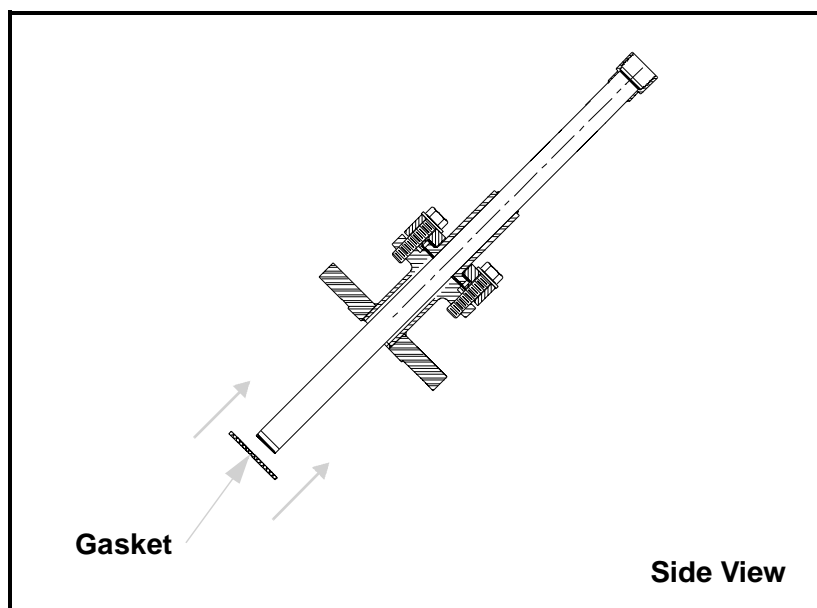
When you receive the Acoustic Isolation FIPA Buffer it will be fully assembled. Use the steps below to properly install the buffer.

Note: *If the BWT system is shipped with the buffers already installed in the nozzles, proceed to Installing the BWT Transducer on page 3-11.*

1. Check the raised face of the spool nozzle flange to make sure it is free from paint, rust, dirt, corrosion, and damage. If necessary, clean the raised faces with steel wool. In addition, clean the buffer flange if you are reusing the buffer.

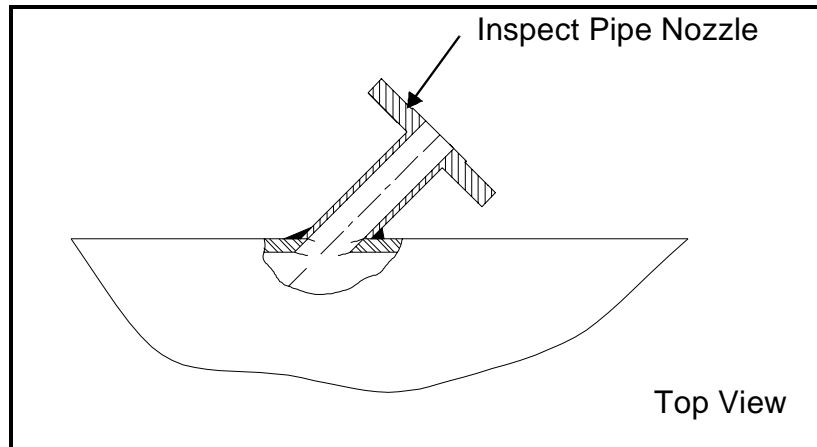


2. Inspect the GE Panametrics-supplied gaskets. They must not be used, warped, pitted or scratched.
3. Place one gasket on the end of the buffer.

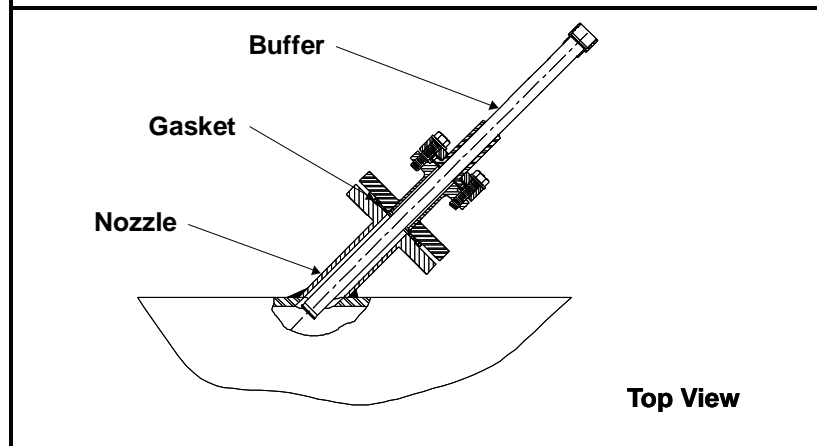
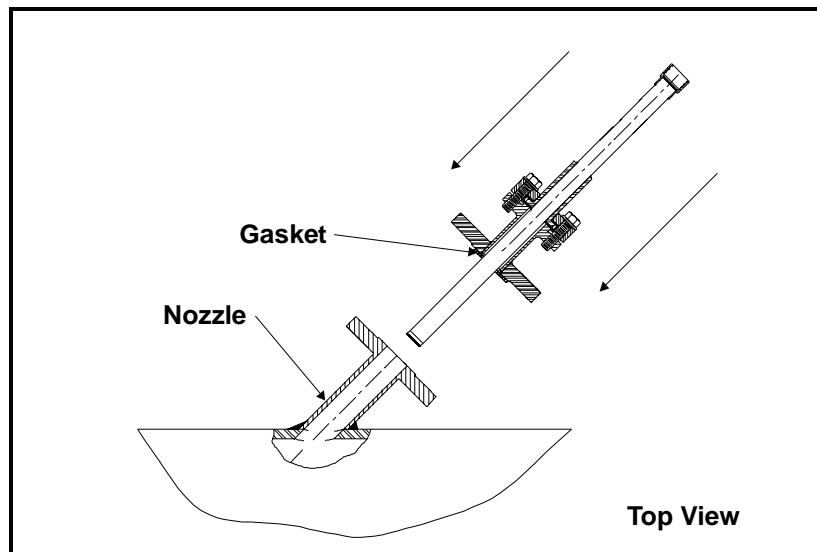


Inserting the Acoustic Isolation FIPA Buffer (cont.)

4. Inspect the pipe nozzle. Make sure it is free from dirt/rust. Use the steel wool to clean the pipe nozzle face and inside if necessary.



5. Insert the buffer/gasket assembly into the nozzle.

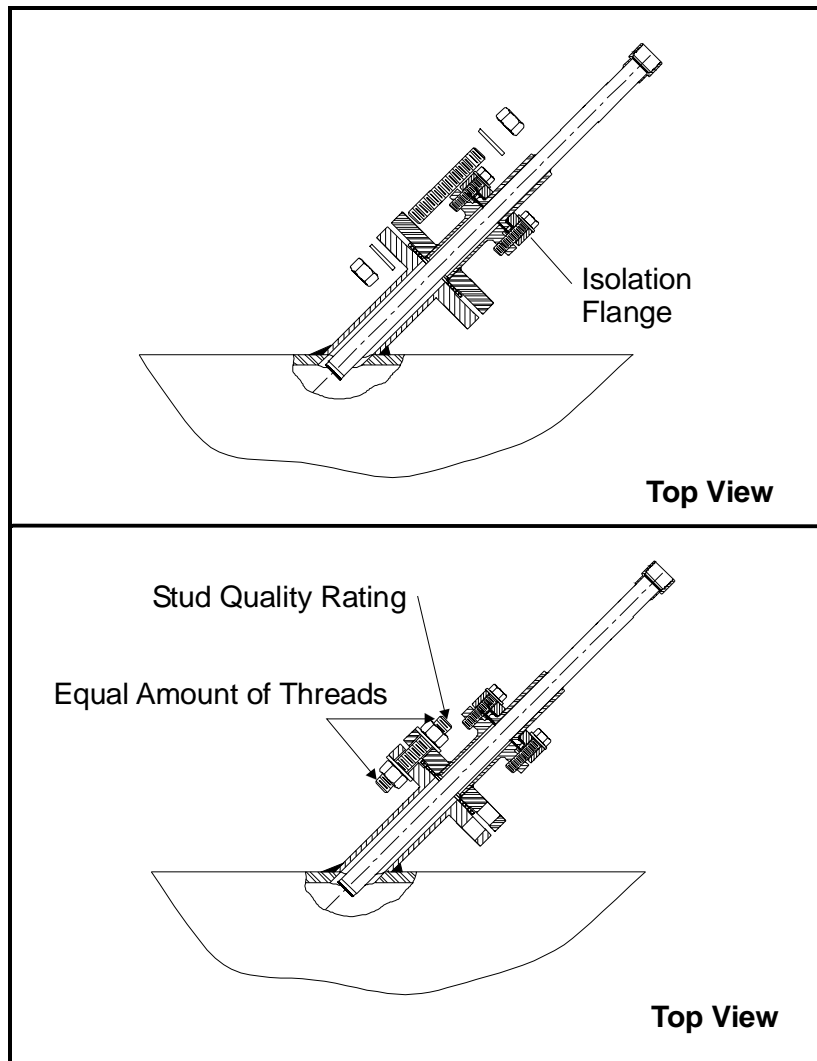


Inserting the Acoustic Isolation FIPA Buffer (cont.)

6. Apply Copperslip, Molykote or equivalent anti-seize compound on the first several threads at both ends each stud.
7. Insert one stud through the flanges. Make sure the stud quality rating (e.g., B7) is facing away from the meter body. Hand-tighten a washer and nut on to each end of the stud. Make sure you leave an equal number of threads exposed on each end of the stud.

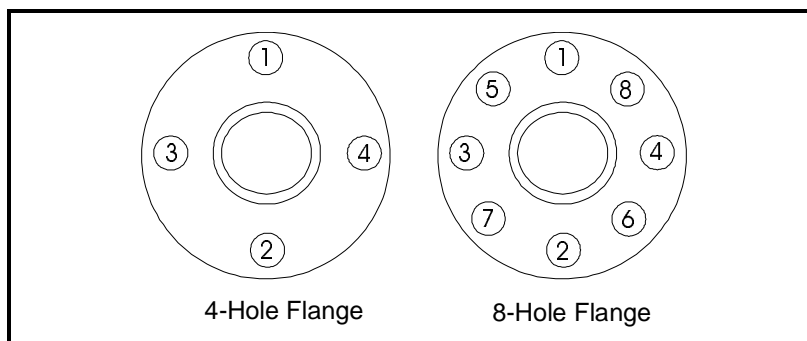
Caution!

Do not adjust the studs on the FIPA isolation flange.
The isolation flange is already set to specification determined at the factory.



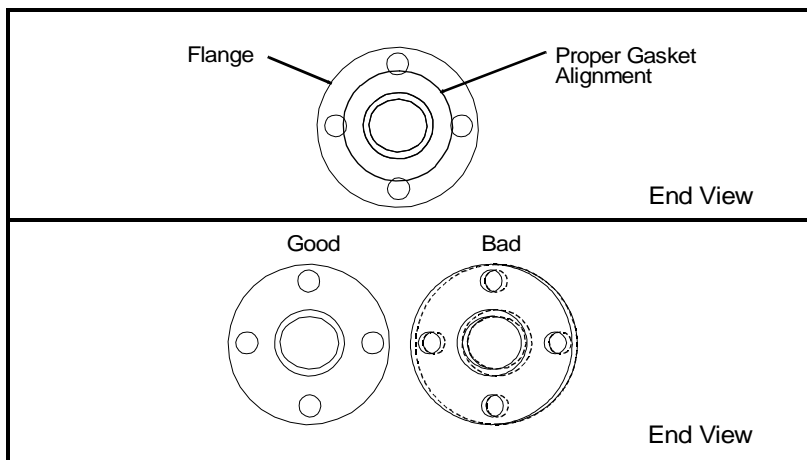
Inserting the Acoustic Isolation FIPA Buffer (cont.)

8. Install the remaining stud in the order shown below, but **do not** tighten the nuts yet.



9. Run your hands around the diameter of the buffer flange and nozzle flange to ensure equal spacing.
10. Then align the flanges as shown below.

IMPORTANT: *Make sure the gasket is in the center of the flanges.*



11. Once you have centered the buffer, tighten the studs further by hand to maintain the centering. Visually inspect that the buffer is centered in the lap joint flange; if necessary, adjust the buffer by hand until it is centered.

Torquing the Studs

You must torque the studs to give a good seal. However, you should not over torque them so as to cause an acoustic short or change the transducer alignment.

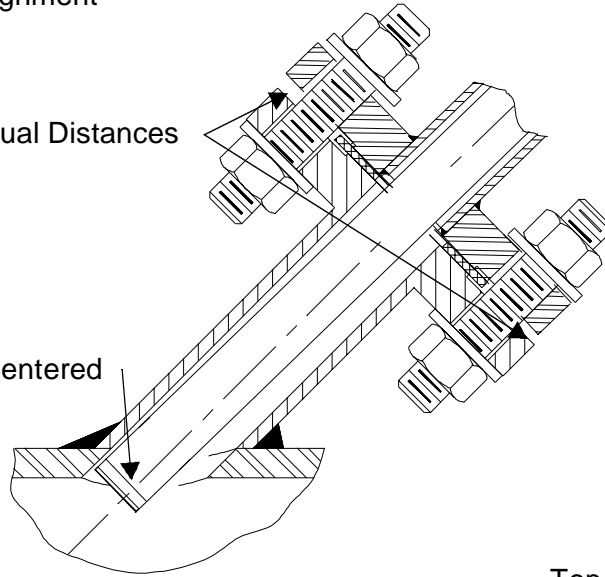
The nuts must be tightened and torqued in stages as described below.

1. Check the flange and buffer alignment again. Make sure the flanges are consistently parallel to each other.

Bad Alignment

Unequal Distances

Not Centered

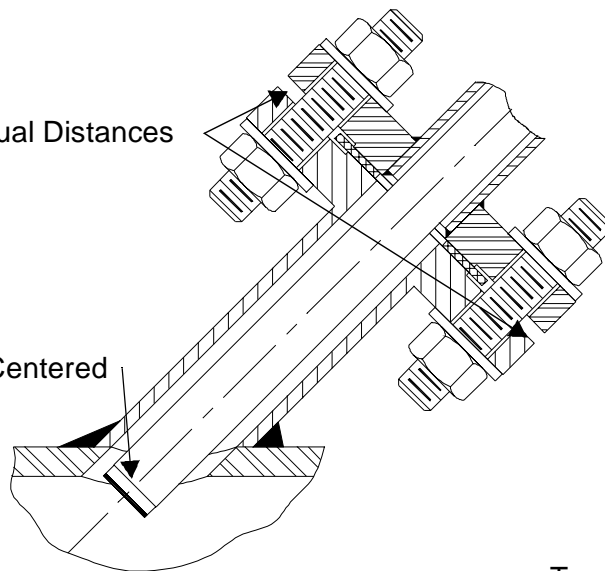


Top View

Proper Alignment

Equal Distances

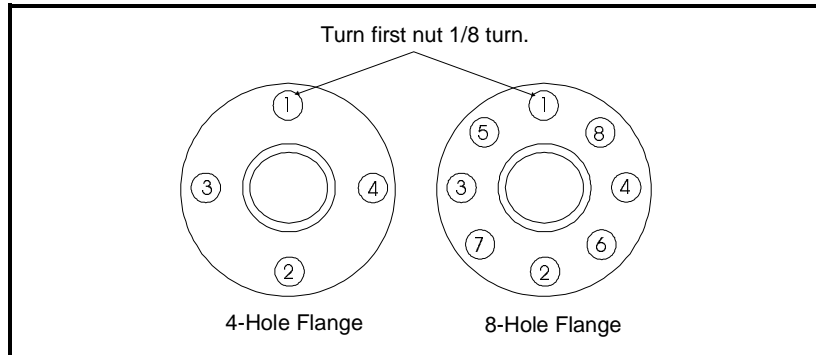
Centered



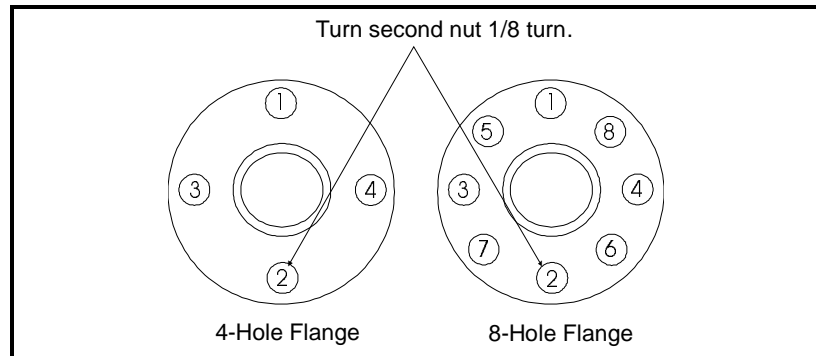
Top View

Torquing the Studs (cont.)

2. Using an adjustable wrench, turn the first nut $1/8$ turn.



3. Turn the second nut $1/8$ turn. The second stud should be diametrically opposite the first stud. Proceed to turn the remaining studs in the order shown below, or in a similar manner.



4. Turn each nut an additional $1/8$ turn. **TURN NUTS IN SEQUENCE.**

Torquing the Studs (cont.)

5. Use Table 3-1 below to determine the appropriate torque.

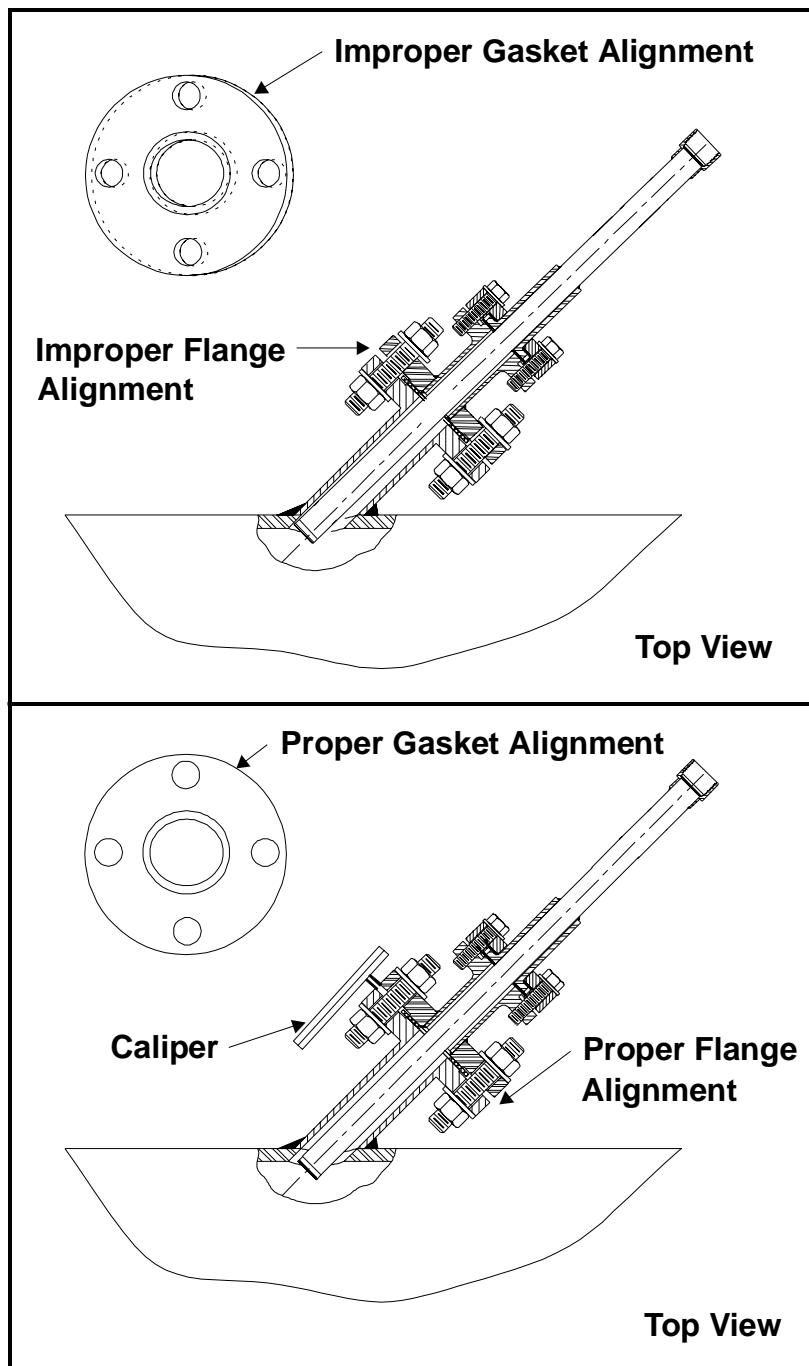
**Table 3-1:
Recommended Torque (using Kamprofile Gaskets)**

Flange Rating	Stud Rating 4 Studs/ Flange	Stud Diameter (in.) x Length (in.)	Torque ft-lb (N-m)
316 Stainless Steel			
1 1/2" ANSI 150#	B8M,C,1	1/2" x 3 1/4"	56 (76)
1 1/2" ANSI 300#	B8M,C,1	3/4" x 4 3/4"	82 (111)
1 1/2" ANSI 600#	B8M,C,1	3/4" x 4 3/4"	82 (111)
1 1/2" ANSI 900#	B8M,C,1	1" x 6 "	107 (145)
1 1/2" ANSI 1500#	B8M,C,1	1" x 6"	107 (145)
Carbon Steel			
1 1/2" ANSI 150#	B7	1/2" x 3 1/4"	56 (176)
1 1/2" ANSI 300#	B7	3/4" x 4 3/4"	82 (111)
1 1/2" ANSI 600#	B7	3/4" x 4 3/4"	82 (111)
1 1/2" ANSI 900#	B7	1" x 6 "	107 (145)
1 1/2" ANSI 1500#	B7	1" x 6"	107 (145)

6. You must torque the flange studs in small increments. Divide the appropriate torque by 10 to determine the number of steps. For example, if the appropriate torque is 90 ft-lb, the steps would be 20, 30, 40, 50, 60, 70, 80 and 90 ft-lb.
7. Set the torque wrench for the first setting and torque the studs in sequence. Turn each stud a maximum of 1/8 of a turn at a time.
8. Repeat Step 7 with the remaining torque settings.

Torquing the Studs (cont.)

9. Check the flange alignment again to ensure that the flanges are parallel to each other. Measure the spacing between the flanges with the caliper on at least four equally distant points; the maximum tolerance is 0.2 mm difference between the four points. If you cannot achieve tolerance of 0.2 mm or less, replace the gasket with a new gasket, and repeat the entire procedure.



10. Repeat the above steps for the remaining flanges.

Installing the BWT Transducer

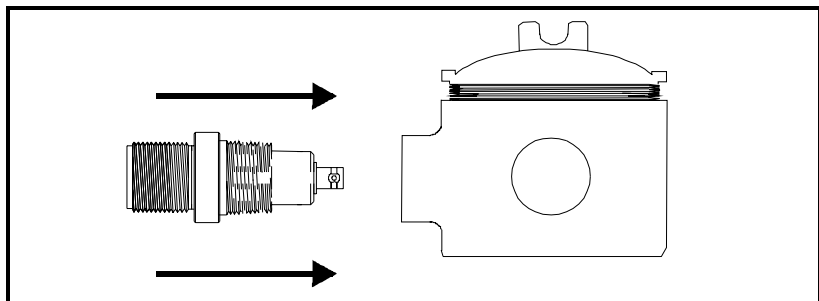
Installing the BWT transducers into the FIPA Buffer requires three steps:

- Installing and Orienting the Junction Box
- Inserting the BWT transducers
- Verifying Installation

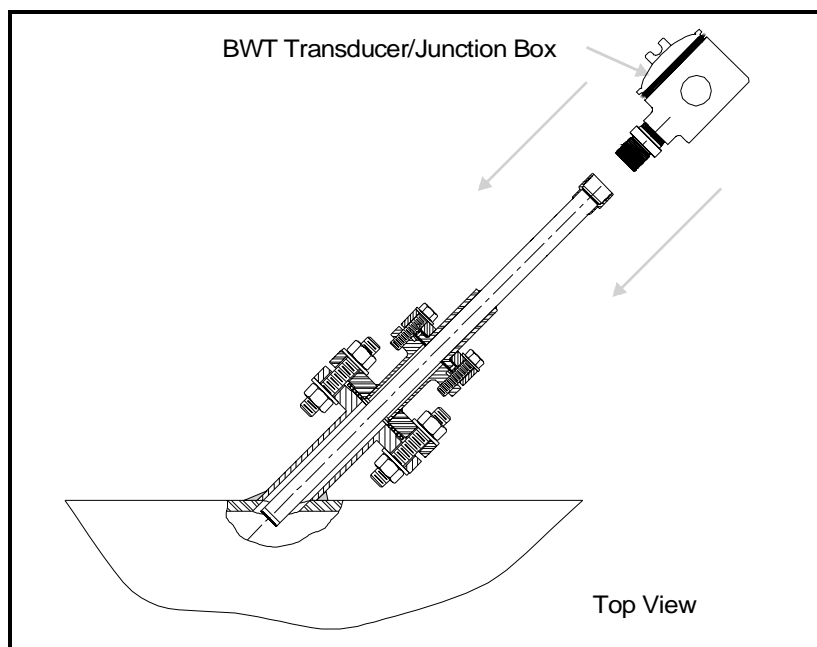
Installing the Orienting the Junction Box

Before placing the BWT transducer into the FIPA Buffer permanently, you must make sure the junction box will be properly oriented once installed.

1. Screw the transducer into the junction box as shown below.

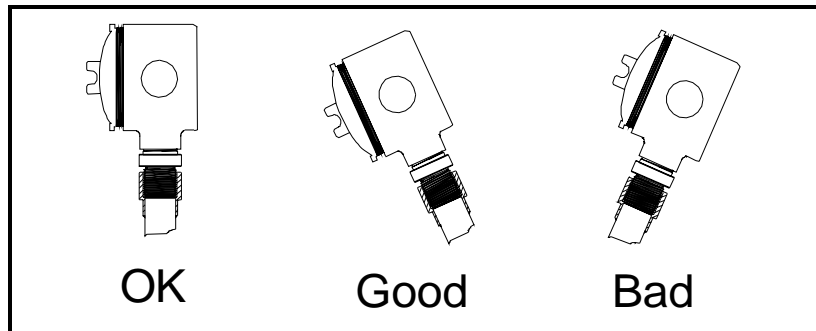


2. Screw the transducer/junction box assembly into the FIPA Buffer.



Installing the Orienting the Junction Box (cont.)

3. Check the junction box orientation. The junction box lid should be at a downward angle so water can drain. If it is not, adjust the junction box until it does.



4. Remove the transducer/junction box assembly.
5. Repeat the above steps for the other transducer.

Inserting the BWT Transducer

Please read the following steps before installing the BWT transducer.

IMPORTANT: *After you install the BWT Buffer and transducers, you must allow the epoxy to cure for eight hours.*

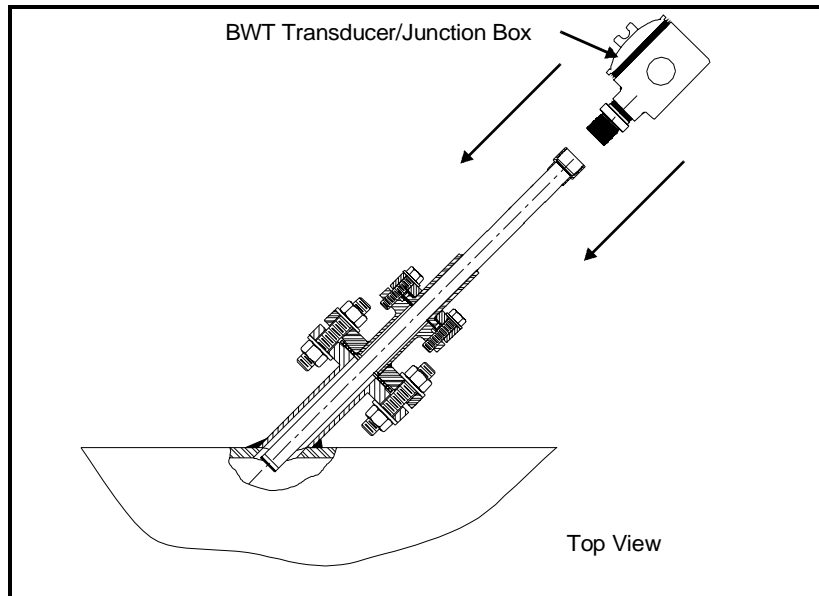
Note: *In gas applications, the typical minimum pressure should be 5 barg (75 psig) to see a signal at all. A higher pressure will give a better signal-to-noise ratio.*

1. Place a small droplet (2 mm in diameter) of 3M Epoxy or equivalent on the center of the end of the transducer (picture below does not show the junction box).



Inserting the BWT Transducer (cont.)

2. Screw the transducer/junction box into the receptacle fitting at the end of the buffer. When the transducer begins to feel tight, stop turning it. Wait for 5 seconds to give the couplant a chance to spread out.



3. Torque the transducer to 15 to 18 ft-lb (20 to 25 N-m). DO NOT OVERTIGHTEN.
4. Verify the junction box is properly oriented as discussed in the previous section.
5. Connect the transducer to the electronics and/or preamplifier as described in the flowmeter's *Startup* or *User's Manual*.

Caution!

Do not place insulation on or around the transducer or junction box. The transducer and junction box act as a heat sink that protects the transducer from high and low temperatures.

6. After you install the FTPA Buffers and transducers, you must allow the epoxy to cure for 8 hours. However, while the epoxy cures, you should verify the transducer and buffer are working properly as described below.

Caution!

While the epoxy cures, do not remove, re-torque or adjust the transducer or you will crack the epoxy.

7. Repeat the above steps for the other transducer.

Verifying Installation

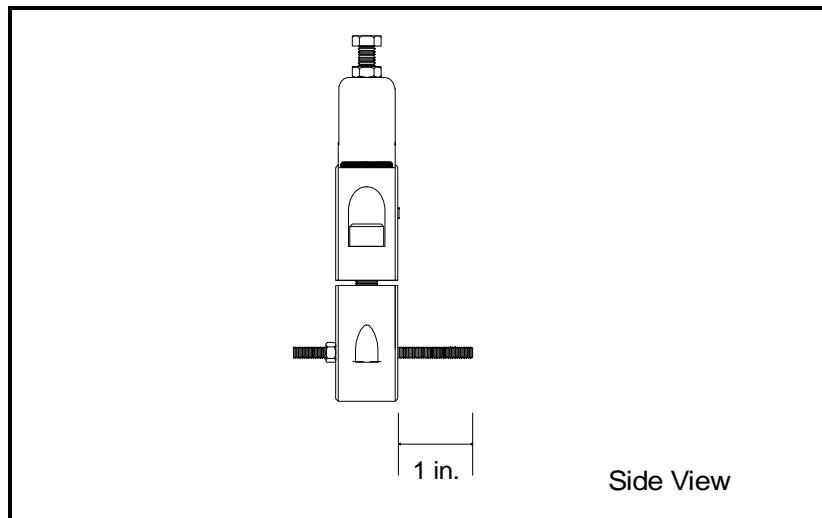
1. Power up the electronics.
2. Refer to *Displaying Diagnostics* in the flowmeter's *Service* or *User's Manual* to display the up and down signal strength.
3. Record this data in the *Service Record* in the back of the flowmeter's *Service* or *User's Manual*.
4. Verify that the signal strength diagnostics are the same or better after 8 hours.

This completes the installation of the FIPA buffers and transducers. Refer to the flowmeter's *Startup* or *User's Manual* for instructions on obtaining flow rate measurements.

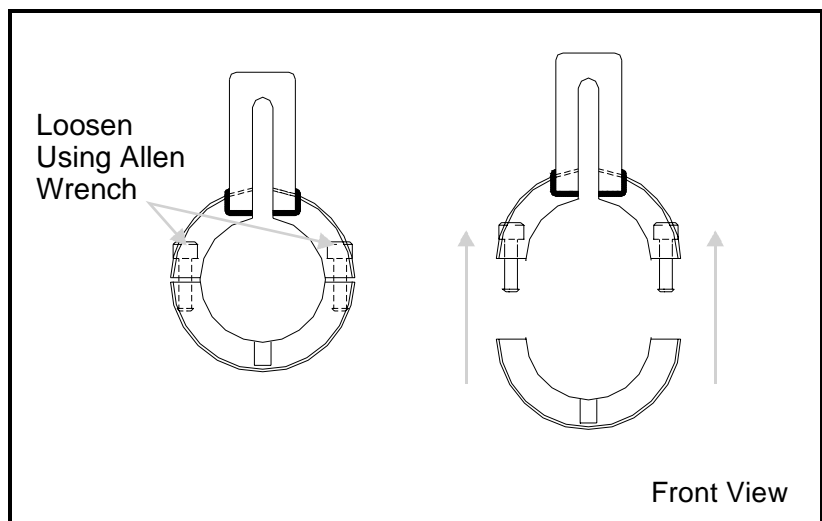
Installing Additional Acoustic Isolation

If your application requires additional acoustic isolation, you will need the following to perform this procedure:

- 1 to 3 ring collets (for 4 in. pipes or larger)
 - Allen wrench
1. If you are using more than one collet, adjust the spacing rods on each pipe riser fixture to 1 in. (25 mm). Use the drawing below to properly set the rods. When adjusting the rods, make sure you pay attention to how the collets will be positioned on the buffer (i.e. how the collets will face each other).

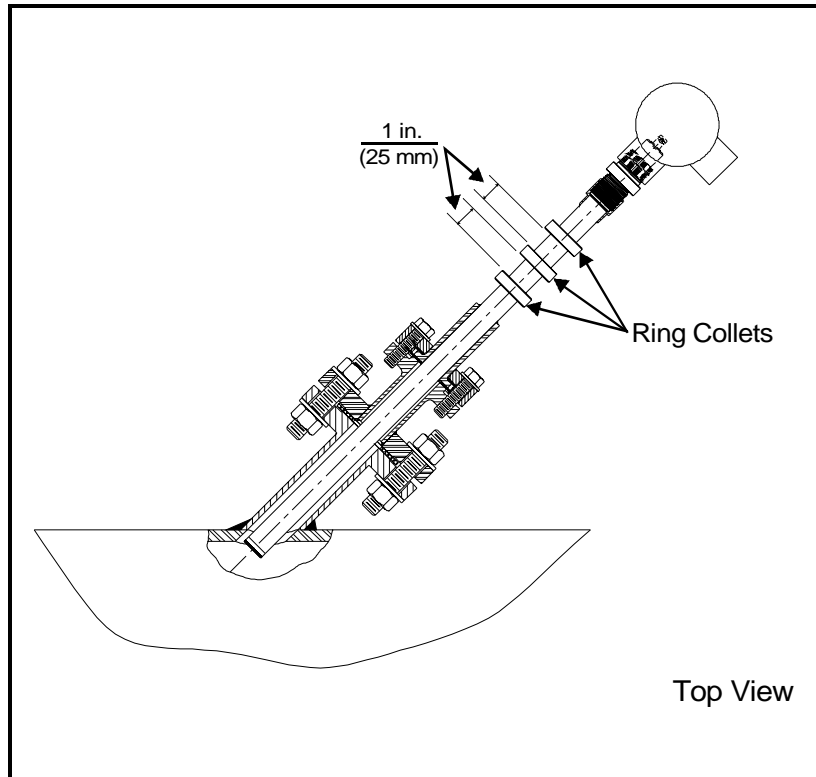


2. Use an Allen wrench to separate the two pieces of the collet so that it can be placed on the buffer. Repeat for the other collet(s). Be sure not to mix pieces from different fixtures.



Installing Additional Acoustic Isolation (cont.)

3. Place the collet(s) on the buffer as shown below.



4. Repeat the above steps for the other transducer.

You have completed the installation. Refer to the flowmeter's *Startup* or *User's Manual* for instructions on operation.

Chapter 4

Installing Non-Flanged FSPA/FWPA BWT Buffers and Transducers

Installing Non-Flanged FSPA/FWPA BWT Buffers and Transducers
4-1

Installing Non-Flanged FSPA/FWPA BWT Buffers and Transducers

The Non-Flanged FSPA/FWPA Buffer is a pipe plug and coupling assembly made of stainless steel or titanium (see Figure 4-1 below).

The FSPA is a threaded buffer that is screwed into the pipe coupling or nozzle. The FWPA is a socket-weld buffer that is welded into the pipe coupling. Both types of buffers enable you to install and remove transducers easily without interrupting the process or emptying the pipe.

Installing the BWT transducers into the FSPA/FWPA Buffer requires three steps:

- Installing the FSPA/FWPA
- Installing and Orienting the Junction Box
- Inserting the BWT transducers
- Verifying Installation

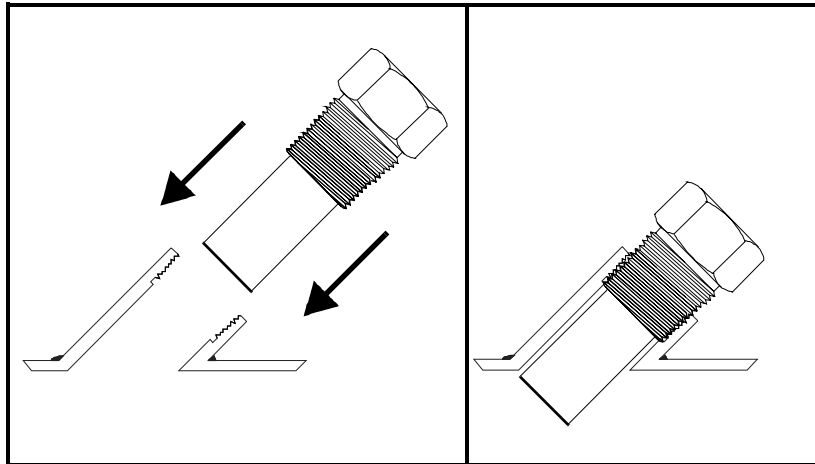


Figure 4-1: Threaded FSPA/FWPA Buffer

Installing the FSPA/ FWPA Buffer

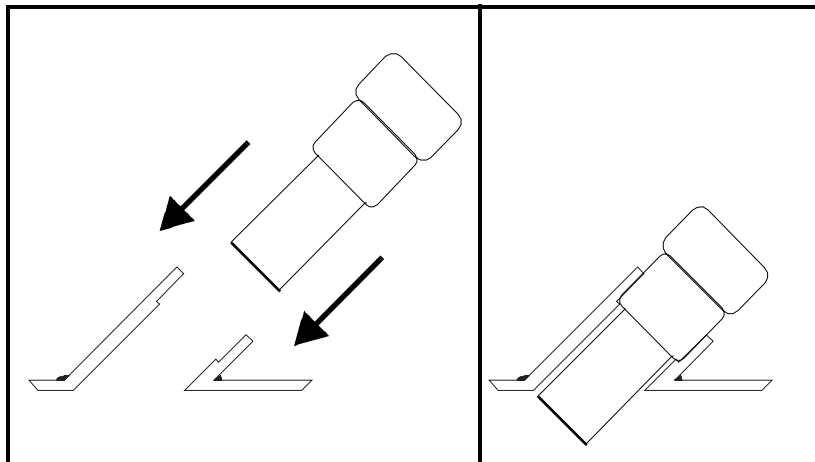
Both types of buffers are easily installed into the pipe coupling or flange as follows:

- **FSPA threaded mount** - Use Teflon[®] tape or thread sealant on the buffer threads and screw the buffer into the transducer port. Hand-tighten, once inserted the NPT threads will seal the connection; no torquing is required.



- **FWPA socket-weld mount** - Insert the buffer into the meter body transducer port and weld in accordance with all applicable safety codes and procedures.

!WARNING!
Welding should be performed by qualified
personnel only. Safety personnel
should be consulted.

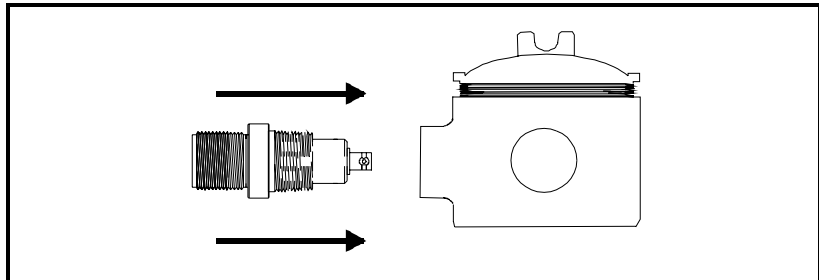


Installing and Orienting the Junction Box

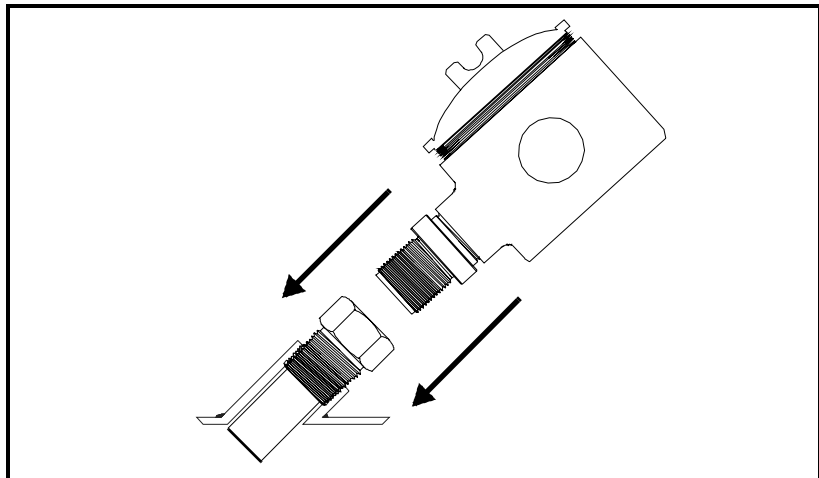
Before placing the BWT transducer into the FSPA/FWPA Buffer permanently, you must make sure the preamplifier junction box will be properly oriented once installed.

Note: *The following drawings show the FSPA Buffer only.*

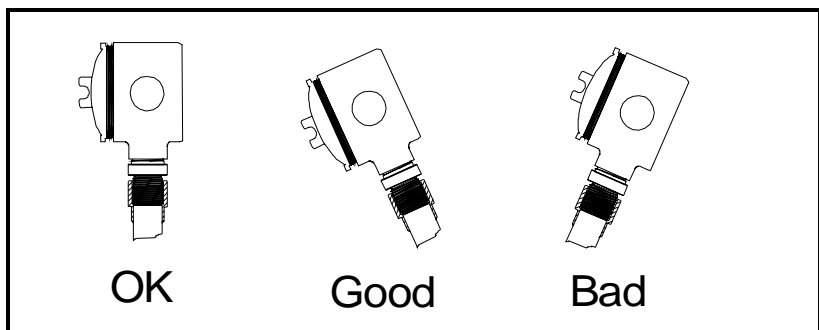
1. Screw the transducer into the junction box as shown below.



2. Screw the transducer/junction box assembly into the FSPA/FWPA Buffer.



3. Check the junction box orientation. The junction box lid should be at a downward angle so water can drain. If it is not, adjust the junction box until it does.



4. Remove the transducer/junction box assembly.
5. Repeat the above steps for the other transducer.

Inserting the BWT Transducers

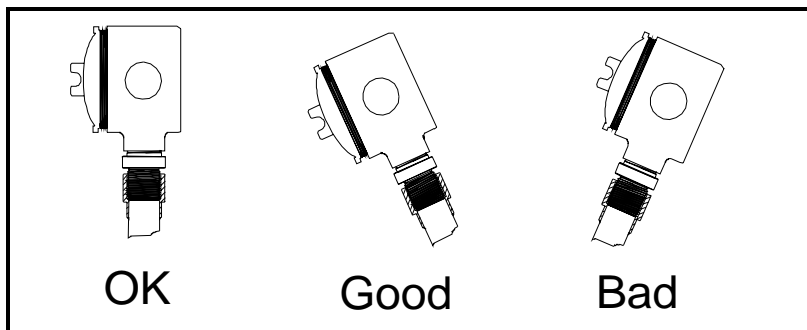
!WARNING!

Follow all applicable safety codes and safety procedures when installing or removing the plugs.

1. Apply the epoxy couplant (2 mm in diameter) to the flat face of the BWT transducer and screw it into the buffer (*picture below does not show the junction box*).



2. Hand-tighten transducers, then torque it to a maximum of 15 ft-lb (20 N-m).
3. Check the junction box orientation. The junction box lid should be at a downward angle so water can drain. If it is not, adjust the junction box until it does.



4. Connect the transducer to the preamplifier and electronics as described in the flowmeter's *Startup* or *User's Manual*.

Verifying Installation

1. Power up the electronics.
2. Refer to *Displaying Diagnostics* in the flowmeter's *Service* or *User's Manual* to display the up and down signal strength.
3. Record this data in the *Service Record* in the back of the flowmeter's *Service* or *User's Manual*.
4. Verify that the signal strength diagnostics are the same or better after 8 hours.





This completes the installation of the FSPA/FWPA buffers and transducers. Refer to the flowmeter's *Startup* or *User's Manual* for instructions on obtaining flow rate measurements.

Chapter 5

Specifications

Specifications

Table 5-1: BWT Transducer Specifications

Transducer	BWT for Liquids	BWT for Gases
Designation	Hazardous area applications; high temperature and high pressure applications; petrochemical industry.	High temperature and high pressure applications; superheated steam.
Installation Type	Wetted (removable under pressure)	
Material	<i>Standard:</i> 316LSS <i>Optional:</i> Titanium	
Field Mounting	Meter Body, cold tap	
Process Connection	1.5" flanged (standard) 1" NPT 1" socket weld	1.5" flanged (standard)
Holder Type	FTP, FIPA, FSPA, FWPA	
Holder Ratings	150#, 300#, 600#, 900#, 1500# and 2500# Lapjoint	
Operating Frequency	0.5 MHz	<i>Standard:</i> 200 kHz <i>Optional:</i> 500 kHz
Pressure Range	100 to 3480 psig (2500# flange)	100 to 3480 psig (2500# flange). Contact factory for minimum pressure.
Electrical Rating	200 V peak-to-peak, 5 mA	
Ambient Temperature Range	<i>North America:</i> -20 to +60°C (-4 to +140°F) <i>Europe:</i> -40 to +70°C (-40 to +158°F)	
Process Temperature Range	Standard: -190 to +300°C (-310 to +572°F) Optional: -190 to +600°C (-310 to +1112°F) Note: Mechanical buffer assembly (not transducer) is exposed to process temperatures.	
North American Certification - Explosion proof	 Class I, Division 1, Group C, D C US	
European Certification - Flameproof	 II 2 G, EEx d IIC T6 80°C Tam -40 to 75°C (-40 to 167°F) KEMA 01ATEX2051X	
North American Certification - Weatherproof	 IP66, TYPE 4X 200Vpp, 5mA C US	
European Certification - Weatherproof	IP 66 	



GE Panametrics

**DECLARATION
OF
CONFORMITY**

We,

**GE Panametrics
Shannon Industrial Estate
Shannon, Co. Clare
Ireland**

declare under our sole responsibility that the

**T5 Ultrasonic Flow Transducer
T8 Ultrasonic Flow Transducer
T11 Ultrasonic Flow Transducer
BWT Ultrasonic Flow Transducer**

to which this declaration relates, are in conformity with the following standards:

- EN 50014:1997+A1+A2:1999
- EN 50018:2000
- II 2 G EEx d IIC T6
T5: KEMA01ATEX2045 X; **T8:** KEMA02ATEX2283 X;
T11: KEMA02ATEX2252; **BWT:** KEMA01ATEX2051 X
KEMA, Utrechtseweg, 310 Arnhem, The Netherlands
- EN 61326:1998, Class A, Annex A, Continuous Unmonitored Operation

following the provisions of the 89/336/EEC EMC Directive and the 94/9/EC ATEX Directive.

The *units listed above and any ancillary sample handling systems supplied with them* do not bear CE marking for the Pressure Equipment Directive, as they are supplied in accordance with Article 3, Section 3 (sound engineering practices and codes of good workmanship) of the Pressure Equipment Directive 97/23/EC for DN<25.

Shannon - July 1, 2003

Mr. James Gibson
GENERAL MANAGER





GE Panametrics

**DECLARATION
DE
CONFORMITE**

Nous,

**GE Panametrics
Shannon Industrial Estate
Shannon, Co. Clare
Ireland**

déclarons sous notre propre responsabilité que les

**T5 Ultrasonic Flow Transducer
T8 Ultrasonic Flow Transducer
T11 Ultrasonic Flow Transducer
BWT Ultrasonic Flow Transducer**

relatif à cette déclaration, sont en conformité avec les documents suivants:

- EN 50014:1997+A1+A2:1999
- EN 50018:2000
- II 2 G EEx d IIC T6
T5: KEMA01ATEX2045 X; **T8:** KEMA02ATEX2283 X;
T11: KEMA02ATEX2252; **BWT:** KEMA01ATEX2051 X
KEMA, Utrechtseweg, 310 Arnhem, The Netherlands
- EN 61326:1998, Class A, Annex A, Continuous Unmonitored Operation

suivant les règles de la Directive de Compatibilité Electromagnétique 89/336/EEC et d'ATEX 94/9/EC.

Les matériels listés ci-dessus ainsi que les systèmes d'échantillonnages pouvant être livrés avec, ne portent pas le marquage CE de la directive des équipements sous pression, car ils sont fournis en accord avec la directive 97/23/EC des équipements sous pression pour les DN<25, Article 3, section 3 qui concerne les pratiques et les codes de bonne fabrication pour l'ingénierie du son.

Shannon - July 1, 2003

Mr. James Gibson
DIRECTEUR GÉNÉRAL





GE Panametrics

**KONFORMITÄTS-
ERKLÄRUNG**

Wir,

**GE Panametrics
Shannon Industrial Estate
Shannon, Co. Clare
Ireland**

erklären, in alleiniger Verantwortung, daß die Produkte

**T5 Ultrasonic Flow Transducer
T8 Ultrasonic Flow Transducer
T11 Ultrasonic Flow Transducer
BWT Ultrasonic Flow Transducer**

folgende Normen erfüllen:

- EN 50014:1997+A1+A2:1999
- EN 50018:2000
- II 2 G EEx d IIC T6
T5: KEMA01ATEX2045 X; **T8:** KEMA02ATEX2283 X;
T11: KEMA02ATEX2252; **BWT:** KEMA01ATEX2051 X
KEMA, Utrechtseweg, 310 Arnhem, The Netherlands
- EN 61326:1998, Class A, Annex A, Continuous Unmonitored Operation

gemäß den Europäischen Richtlinien, Niederspannungsrichtlinie EMV-Richtlinie Nr.: 89/336/EG und ATEX Richtlinie Nr. 94/9/EG.

Die *oben aufgeführten Geräte und zugehörige, mitgelieferte Handhabungssysteme* tragen keine CE-Kennzeichnung gemäß der Druckgeräte-Richtlinie, da sie in Übereinstimmung mit Artikel 3, Absatz 3 (gute Ingenieurpraxis) der Druckgeräte-Richtlinie 97/23/EG für DN<25 geliefert werden.

Shannon - July 1, 2003

Mr. James Gibson
GENERALDIREKTOR





We,

**GE Panametrics
221 Crescent Street, Suite 1
Waltham, MA 02453
U.S.A.**

as the manufacturer, declare under our sole responsibility that the product

Type BWT Ultrasonic Flow Transducer

to which this document relates, in accordance with the provisions of ATEX Directive 94/9/EC Annex II, meets the following specifications:

 **1180**  **II 2 G EEx d IIC T6
KEMA01ATEX2051X -40°C to +70°C, 200 V_{pp}, 5 mA**

Furthermore, the following additional requirements and specifications apply to the product:

- Having been designed in accordance with EN 50014 and EN 50018, the product meets the fault tolerance requirements of electrical apparatus for category “d”.
- The product is an electrical apparatus and must be installed in the hazardous area in accordance with the requirements of the EC Type Examination Certificate. The installation must be carried out in accordance with all appropriate international, national and local standard codes and practices and site regulations for flameproof apparatus and in accordance with the instructions contained in the manual. Access to the circuitry must not be made during operation.
- Only trained, competent personnel may install, operate and maintain the equipment.
- The product has been designed so that the protection afforded will not be reduced due to the effects of corrosion of materials, electrical conductivity, impact strength, aging resistance or the effects of temperature variations.
- The product cannot be repaired by the user; it must be replaced by an equivalent certified product. Repairs should only be carried out by the manufacturer or by an approved repairer.
- The product must not be subjected to mechanical or thermal stresses in excess of those permitted in the certification documentation and the instruction manual.
- The product contains no exposed parts which produce surface temperature infrared, electromagnetic ionizing, or non-electrical dangers.
- The product is provided with a 1” NPT male thread. For electrical connection, the product must be mounted in a certified metal enclosure of flameproof protection type “d”, the assembly complying with the requirements of EN50018. Measures must be taken to ensure a good bonding connection and to prevent the connection from self-loosening.



USA

GE Panametrics
221 Crescent Street, Suite 1
Waltham, MA 02453-3497
Telephone: (781) 899-2719
Toll-free: (800) 833-9438
Fax: (781) 894-8582
E-Mail: panametrics@ps.ge.com
Web: www.gepower.com/panametrics

Ireland

GE Panametrics
Shannon Industrial Estate
Shannon, County Clare
Ireland
Telephone: 353-61-470200
Fax: 353-61-471359
E-Mail: info@panametrics.ie

