



***C-RS Ultrasonic
Flow Transducer***

Installation Guide



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916-077A

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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.

Introduction

The *C-RS ultrasonic flow transducer* is used exclusively with the GE Panametrics line of ultrasonic flowmeters. These transducers measure the flow rate of sonically-conductive liquids through pipes having diameters between 2 in. (5 cm) and over 300 in. (7.6 m). Such measurements are typically independent of the pipe material.

This document provides the following instructions on installing and maintaining C-RS transducers:

- Transducer Construction - see below
- Couplants - page 2
- Preparing for Installation - 3
- Installing the Universal Clamping Fixture and Transducers - page 7
- Installing the General Clamping Fixture and Transducers - page 21
- Installing the Magnetic Clamping Fixture and Transducers - page 32
- Maintaining Transducers - page 44
- Specifications - page 45

Transducer Construction

The C-RS operates in process temperatures from -40 to 302°F (-40 to 150°C)*. Each C-RS transducer assembly consists of the following components (see Figure 1 below):

- a stainless steel adapter with 3/4" NPT male thread for attaching a junction box
- a transducer that consists of a peizoelectric element mounted on a wedge and wired to the BNC connector
- a BNC style connector for use in connecting the transducer to the flowmeter.

*This temperature is for ATEX certified designs. Consult factory for higher temperatures.

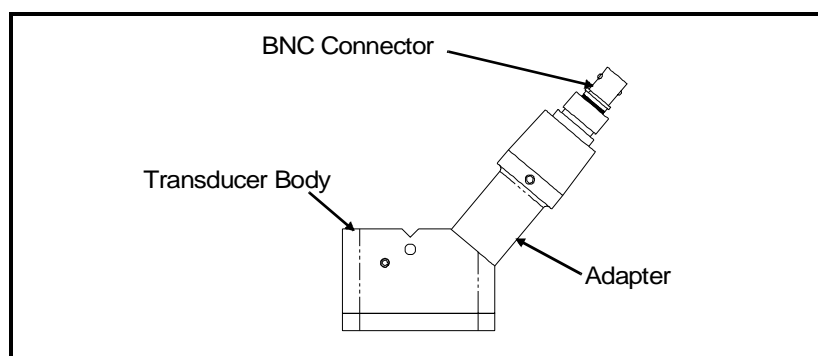


Figure 1: General C-RS Transducer Assembly

Couplants

GE Panametrics supplies an ultrasonic couplant for your C-RS installation. The purpose of the couplant is to provide reliable transmission of ultrasound between two adjacent solid surfaces. Generally speaking, couplants perform this task by excluding air from between the adjacent surfaces. Accordingly, the C-RS transducers should be pressed tightly against the pipe, using hand pressure on the set screw to squeeze the couplant to as thin a film as practical for the given pipe surface.

The most commonly used couplants in ultrasonic testing are ordinarily satisfactory for any short-term clamp-on flowmeter application. These couplants include, in general order of preference: gels, grease, propylene glycol, oil, glycerine, and water. Long-term couplants include grease, epoxy adhesive, and solid rubber-like sheet couplant.

GE Panametrics provides couplants for both permanent and temporary use as well as for high- and low-temperature applications. For long-term installations, make sure the couplant does not dry or run out.

Standard couplants supplied from GE Panametrics are listed in Table 1 below.

Table 1: Couplants

PART NO.	TYPE	TEMP. RANGE	USE
CPL-1	Standard	-40 to 149°F (-40 to +65°C)	Semi-Permanent
CPL-2	High/Low Temperature	-256 to 500°F (-160 to +260°C)	Semi-Permanent
CPL-3	For Portable	-4 to 140°F (-20 to +60°C)	Temporary
CPL-4	Special	As Required	*Difficult Applications
CPL-7	Epoxy	14 to 122°F (-10 to +50°C)	Permanent
CPL-8	Solid Sheet	-40 to 446°F (-40 to +230°C)	Permanent
* Installations involving hotter or colder temperatures than listed above, may require special couplants. Consult GE Panametrics for these applications.			

Preparing for Installation

Before the clamping fixture and transducers can be properly installed, you must do the following:

- Choose an Installation Location
- Prepare the Pipe
- Obtain the Transducer Spacing
- Determine the Number of Traverses

Caution!

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

Choosing an Installation Location

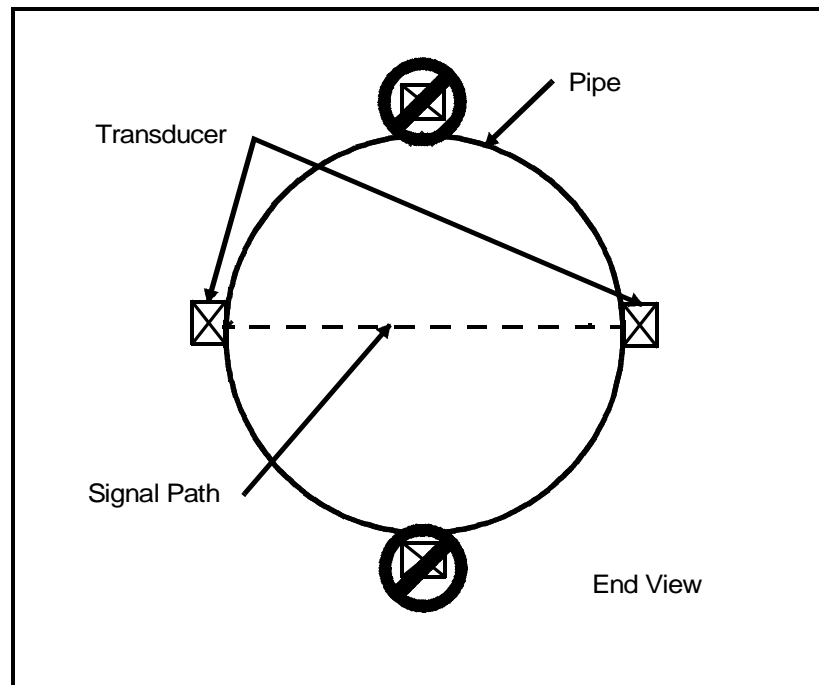
1. Locate the transducer measurement point at least 3 ft (1 m) or more from any butt welds or flanges, ideally in the center of a 20 ft (6 m) length of straight run of pipe. Keep appropriate clearance on either side of the pipe for easy transducer installation:
 - 6 in. (15 cm) if you are not using a junction box, or
 - 9 in. (22.5 cm) if you are using a junction box.

Note: *To guarantee the specified accuracy of the flowmeter there is no substitute for a straight run pipe and fully-developed flow profile. However, if straight run is not available, the transducer location should be in a position such that the acoustic signal travels through the full distribution of the under-developed flow profile for best repeatability.*

Choosing an Installation Location (cont.)

2. Place the transducers as close as possible to the horizontal plane. (see figure below). Locate the transducers on opposite sides of the pipe 180° apart, ideally at the 3 and 9 o'clock positions. **Do not place transducers on the top or bottom of the pipe.**

Note: For best profile identification in limited straight run, place transducers at 1 and 7 o'clock.



Preparing the Pipe

1. Prepare the pipe for the transducers by clearing rust and paint from an area 2 in. (5 cm) wide by 4 in. (10 cm) long on one side of the pipe.
2. Polish the cleared area, taking care to preserve the original curvature of the pipe.
3. With an ultrasonic thickness gage, measure the pipe thickness at a minimum of six spots on the cleared area. Take at least three measurements at each spot to ensure accuracy. The thickness should not vary by more than 5% at each spot. If you encounter more than a 5% variation at each spot, move to another section of the pipe. Verify that the wall thickness at both transducer locations has less than the 5% variation.
4. Measure the outside diameter (OD) of the pipe using a tape measure or the supplied pipe wrap.

Obtaining the Transducer Spacing

Before installing the clamping fixture, you must obtain the transducer spacing from the flowmeter. You will need to know the transducer spacing later in this procedure.

To obtain the spacing, you must enter the measured OD and the pipe wall thickness into the flowmeter's user program (Pipe Parameters) to determine the transducer spacing. Refer to your *User's Manual* or *Startup Guide* for more details.

Determining the Number of Traverses

The next step in installation is determine the number of traverses. The transducers can be mounted using one of two methods (see Figure 2 on the next page):

- Double-traverse method ("V" method) - transducers are mounted on the same side of the pipe and the ultrasonic signal is bounced from one transducer to the other, off the opposite pipe wall.
- Single-traverse method ("Z" method) - transducers are mounted diagonally across from each other. The ultrasonic signal is transmitted directly from one transducer to the other, across the pipe.

If the pipe diameter is 4 to 20 in., you should always try the double-traverse method first since it easier to install and yields greater accuracy. Otherwise, the single-traverse method is best for pipes with the following:

- diameters 20 in. or greater
- poor inside surface conditions
- highly attenuating fluid

Note: *You may want to try both configurations to see which yields more accurate results.*

Proceed to one of the following sections to properly install your fixture and transducers.

- Installing the Universal clamping fixture and transducers - page 7.
- Installing the General clamping fixture (permanent installation) and transducers - page 21.
- Installing the Magnetic clamping fixture and transducers - page 32.

Determining the Number of Traverses (cont.)

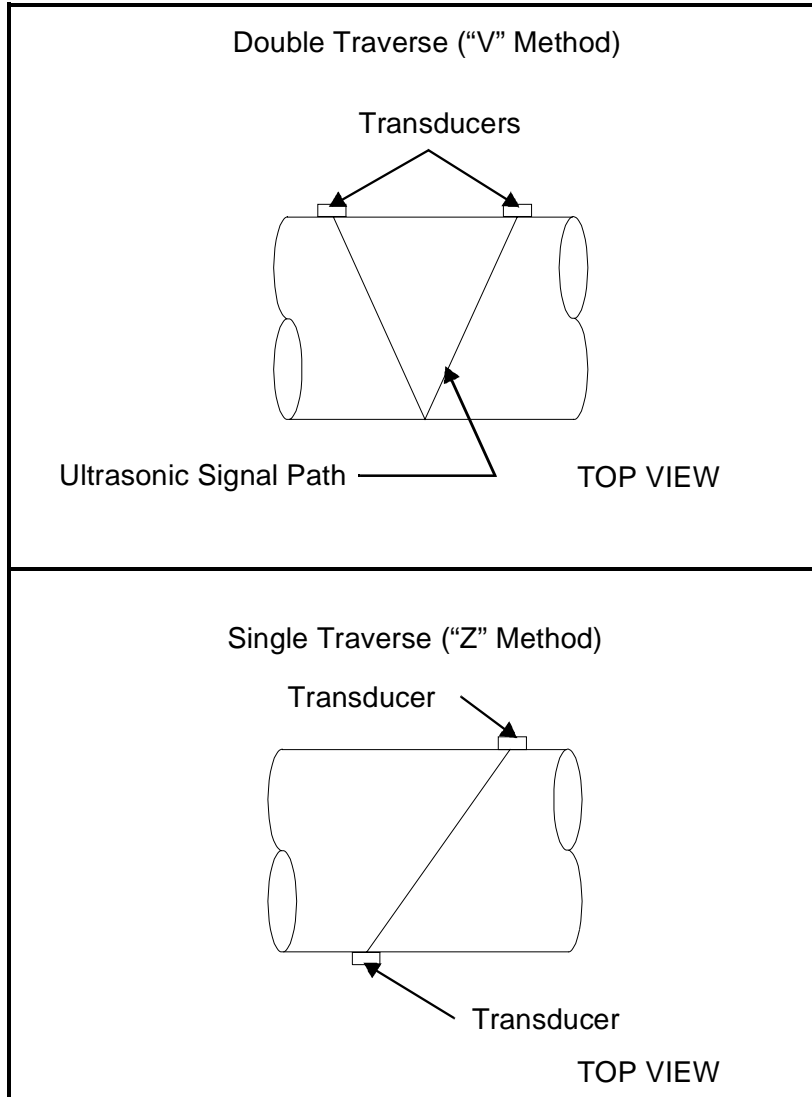


Figure 2: Double- and Single-Traverse Installations

Installing the Universal Clamping Fixture and Transducers - UCF

The Universal Clamping Fixture (UCF) acts as a spacing device and a transducer holder. The UCF is available in two lengths and consists of a number of components. Before you begin installation, you should verify your fixture is the correct length and familiarize yourself with the fixture components.

IMPORTANT: *To maintain ATEX certification the transducer face must be protected against impact. This is provided by properly installing the transducer into the clamping fixture. All care must be taken during installation to ensure all protection is afforded.*

Verify Fixture Length

Make sure you note the following restrictions for your clamping fixture. The UCF is available in two lengths, 12- and 24-in. (~30.5- and ~61-cm). Each size fixture can be installed for a single- or double-traverse method. However, depending on the method used, there are pipe size restrictions that are outlined in Table 2 below.

Table 2: UCF Pipe Sizes

Clamping Fixture Length	Single-Traverse Pipe Diameter	Double-Traverse Pipe Diameter
12-in. (30.5 cm)	2 to 24 in. (5 to 61 cm)	2 to 12 in. (5 to 30.5 cm)
24-in. (61 cm)	2 to 48 in. (5 to 122 cm)	2 to 24 in. (5 to 61 cm)

Note: *The mounting chain/strap provided is best suited for your application.*

Identifying the UCF Components

The UCF has two adjustable short blocks that are used for the double-traverse method. Two slide tracks connect the blocks. A ruler attached to one of the tracks helps set the transducer spacing. For single-traverse methods, a long block is also used.

The blocks are used to hold the transducers in position for accurate measurement. The UCF is chained or strapped around the pipe. The blocks are positioned using the spacing dimension calculated by the flowmeter. Then the transducers are mounted into the blocks. Figure 3 on the next page shows the short and long blocks.

The transducer installation consists of mounting the UCF to the pipe and then mounting the transducers into the fixture. Refer to the appropriate section that follows for instructions:

- Double-traverse Method - page 9
- Single-traverse Method - page 12

Identifying the UCF
Components (cont.)

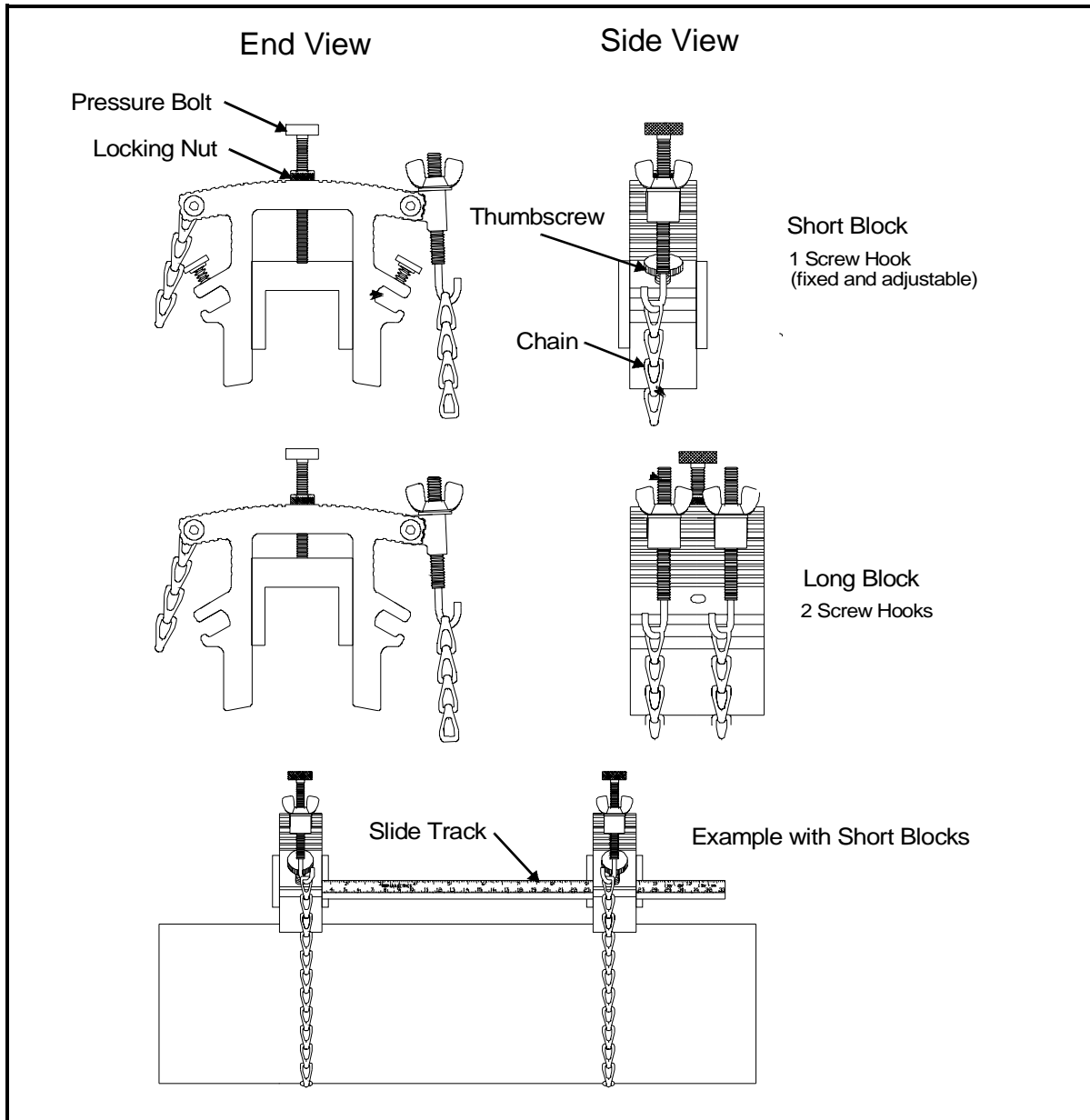


Figure 3: Components of the UCF

The Double-Traverse Method -UCF

Note: *The instructions in this section can also be used for a multiple-traverse method. However, you must use an EVEN number of traverses. The distance the signal travels from one side of the pipe wall to the opposite side of the pipe wall is considered one traverse. For more than two traverses, consult the GE Panametrics factory.*

There are three advantages to using the double-traverse method:

- Accuracy is improved because the signal is in the fluid longer than with a single-traverse.
- This configuration can reduce some effect of an underdeveloped flow profile.
- If there is enough pipe length available, the double-traverse fixture is easier to install.

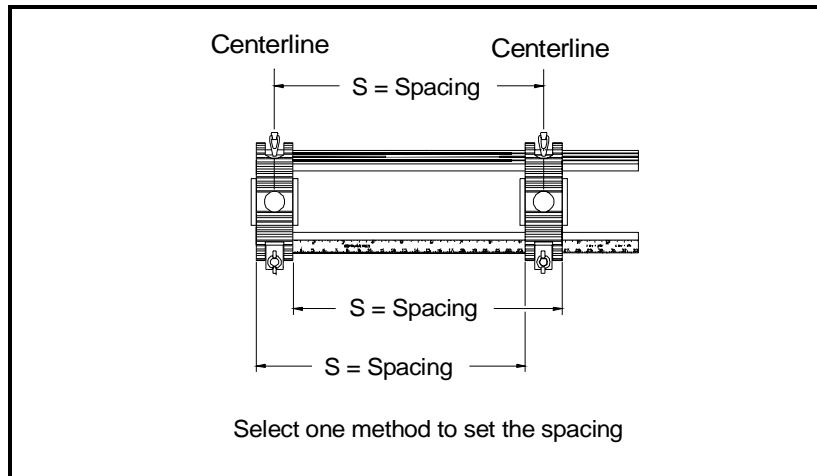
Procedure for the Double-Traverse Method

The procedure for mounting the UCF involves setting the transducer spacing and fastening the fixture on the pipe. Please note you will only need the short block assembly for a double-traverse installation; the long block is not used.

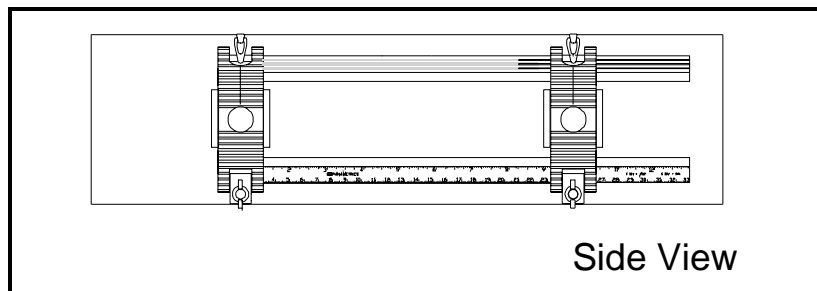
1. Obtain the transducer spacing dimension S , as described in the programming section of the *Startup Guide*.
2. Be sure the location you have chosen for the installation has at least 10 pipe diameters of straight, undisturbed flow upstream and 5 pipe diameters downstream of the measurement point.
3. Prepare the pipe where you intend to place the clamping fixture by making sure it is clean and free of loose material. Sanding, though usually not required, may be necessary to take off any high spots. When sanding, be careful to preserve the original curvature of the pipe.

The Double-Traversal Method -UCF (cont.)

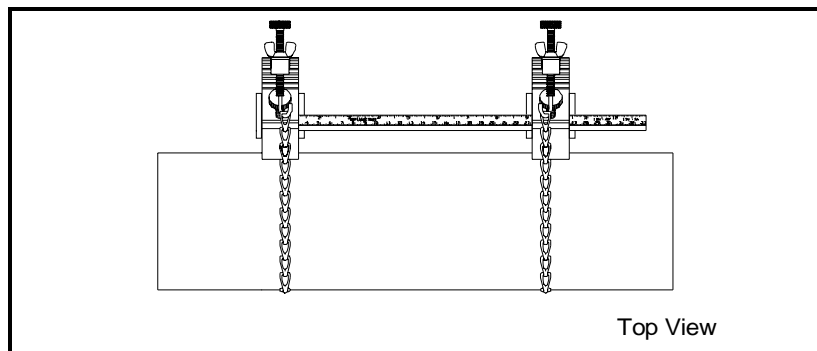
- Using the attached ruler, move the blocks so they are a distance S from each other. Use the pressure bolt or the ends of the blocks as reference points.



- Position the clamping fixture along the **horizontal plane of the pipe, but not on the top or bottom**. Make sure the chains on both blocks are on the same side of the fixture and are opposite the ruler.



- Wrap the chain around the pipe and fasten the chain on the J screw hook on the opposite side of the block. Do this for both blocks.



The Double-Traverse Method -UCF (cont.)

7. Using the screw hook on the blocks, tighten the chains until the fixture is secured snugly to the side of the pipe.

Note: *Make sure the chains are perpendicular to the clamping fixture and are not twisted. If the chains are slanted, the slack may cause the fixture to move around. The slack may also change the transducer spacing after the transducers are mounted.*

Figure 4 below shows a completed double-traverse installation without transducers. Proceed to *Mounting Transducers into the UCF* on page 17.

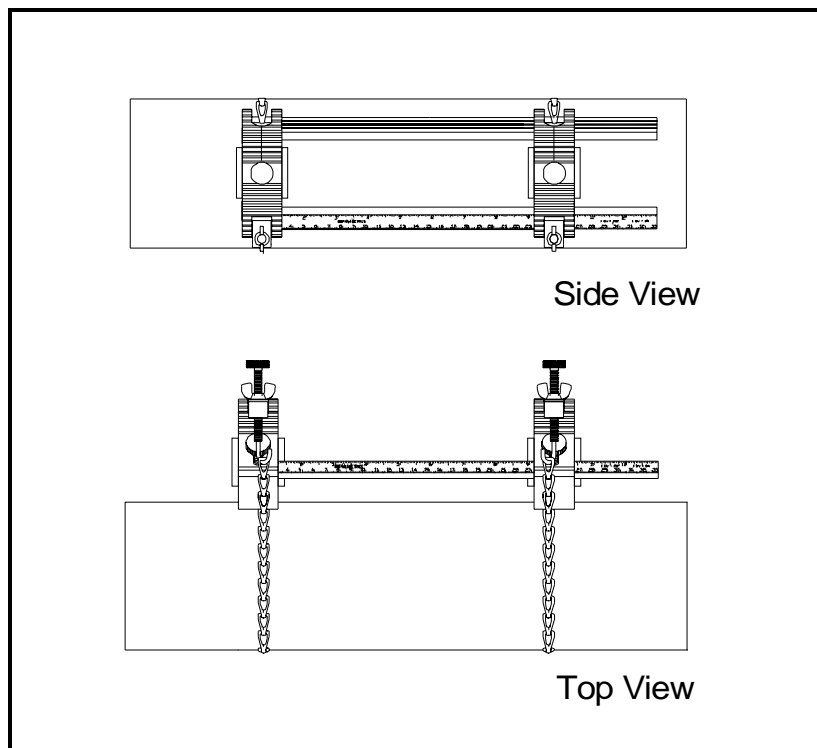


Figure 4: A Double-Traverse Clamping Fixture Installation without Transducers

The Single-Traversal Method - UCF

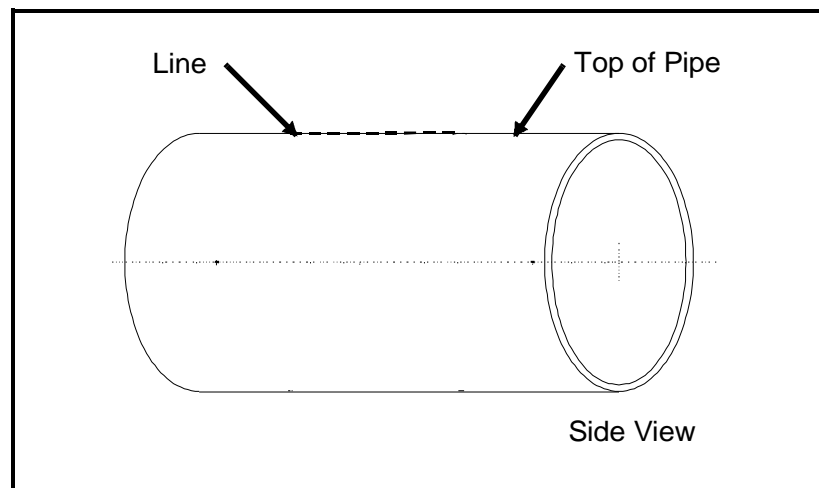
Note: *The instructions in this section can also be used for a multiple-traverse method. However, you must use an ODD number of traverses. The distance the signal travels from one side of the pipe wall to the opposite side of the pipe wall is considered one traverse.*

The procedure for mounting the UCF for the single-traverse method requires a long block and two short blocks. The long block is fastened to the pipe first and then the short block assembly is properly aligned and fastened at 180° from the long block.

Procedure for the Single-Traversal Method

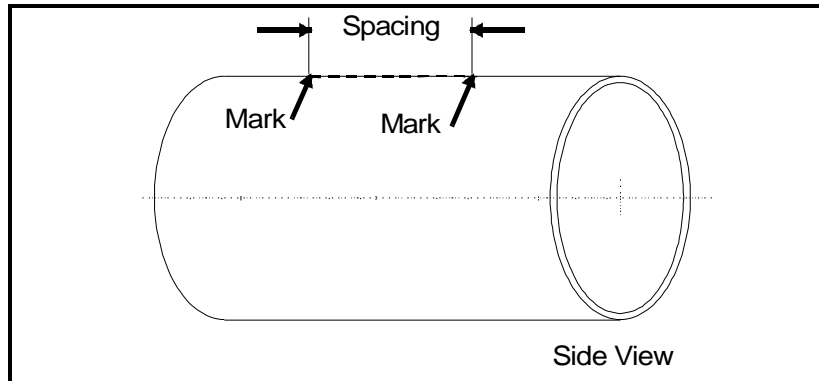
You will need a marker or scribe to locate and mark the transducer locations on the pipe. Do the following:

1. Obtain the transducer spacing dimension S , as described in the programming section of the *Startup Guide*.
2. Be sure the location you have chosen for the installation has at least 10 pipe diameters of straight, undisturbed flow upstream and 5 pipe diameters downstream of the measurement point.
3. Prepare the pipe where you intend to place the UCF by making sure it is clean and free of loose material. Sanding, though usually not required, may be necessary to take off any high spots. However, be careful to preserve the original curvature of the pipe and not to eradicate the marks on the pipe.
4. Find the top of the pipe and use a level to draw a line parallel to the pipe's axis.

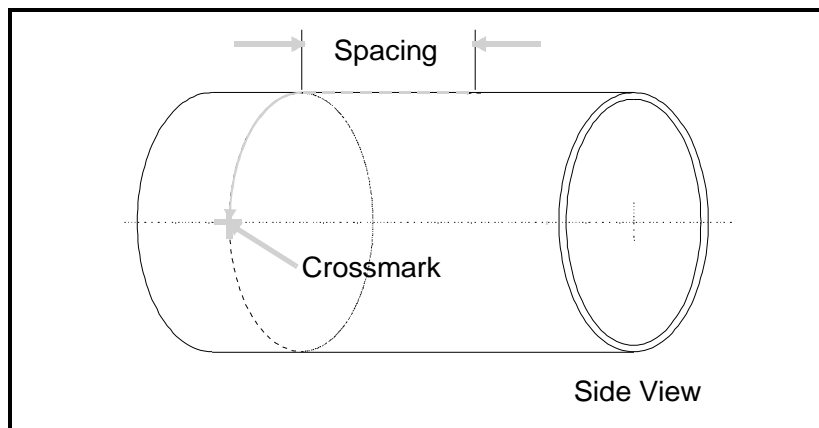


The Single-Traversal Method -UCF (cont.)

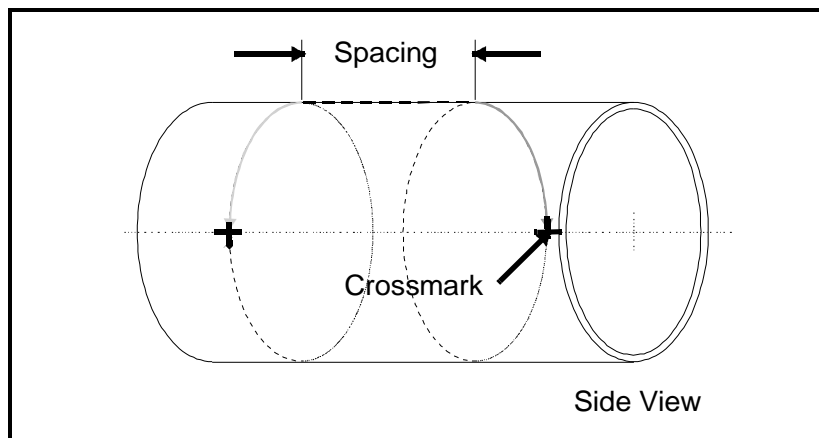
5. Make two marks on the line equal to the transducer spacing distance S , as calculated by the meter.



6. From one of the marks, measure around the circumference of the pipe a distance equal to one quarter the pipe's circumference and make a crossmark with the marker or scribe.

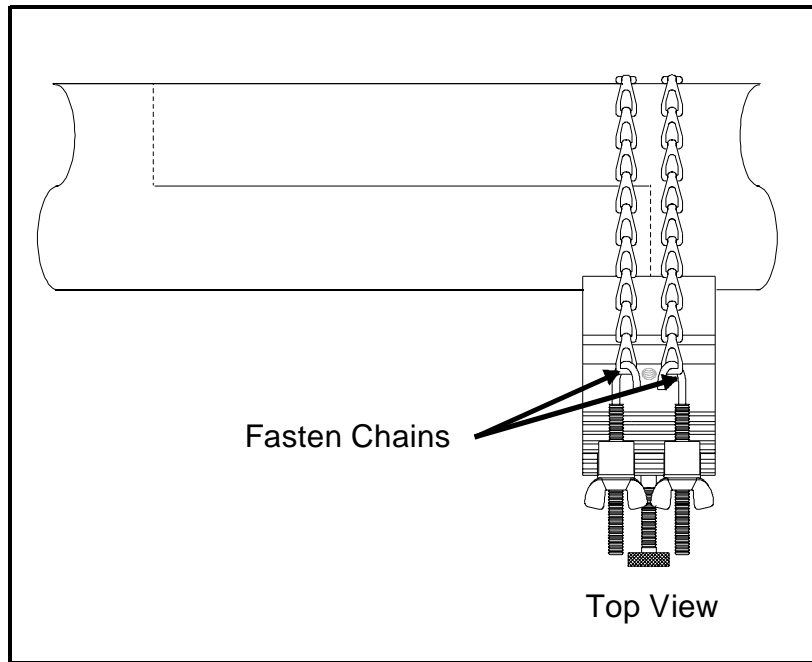


7. From the other mark, go in the other direction around the pipe for one quarter the circumference and make another crossmark.



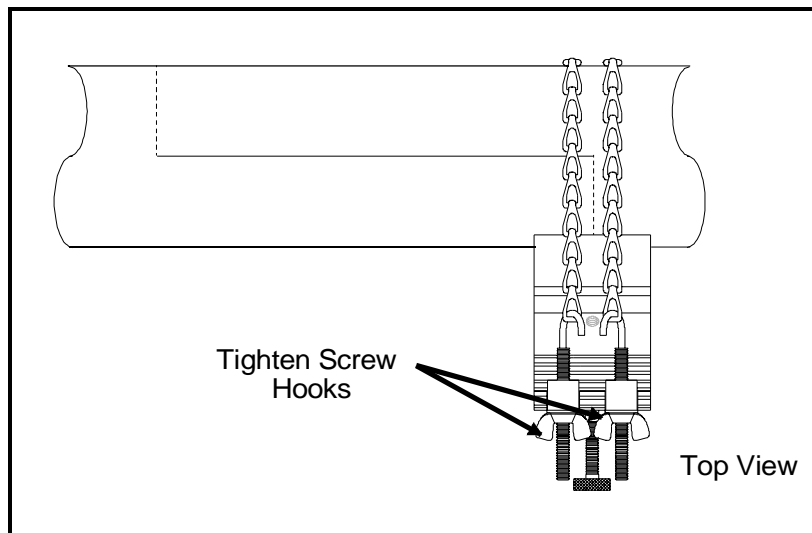
The Single-Traversal Method -UCF (cont.)

8. Center the long block over one of the crossmarks on the pipe. Align the long block so that the pressure bolt is over the center of the crossmark. Fasten the block by wrapping both chains around the pipe and fastening the chains to the screw hooks on the opposite side of the block.



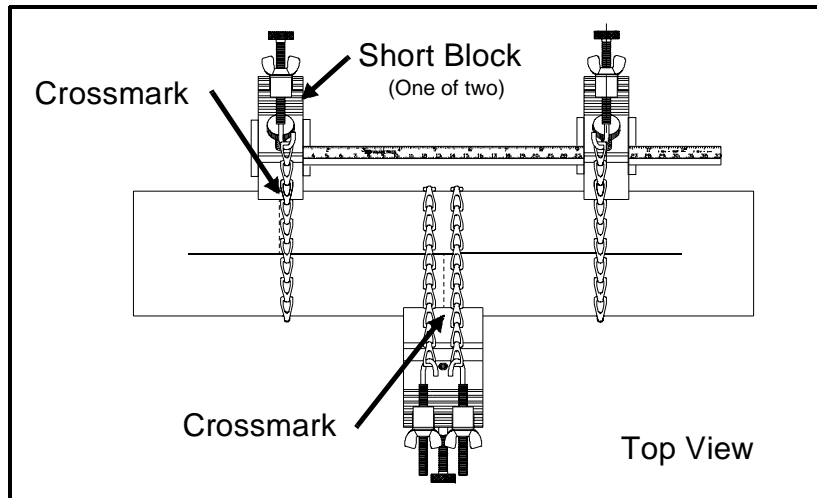
9. Use the wing nuts to tighten the chains on the long block until it is secured snugly to the pipe.

Note: Make sure both chains are perpendicular to the bottom of the block and are not twisted. If the chains are slanted, the slack will cause the block to slide.



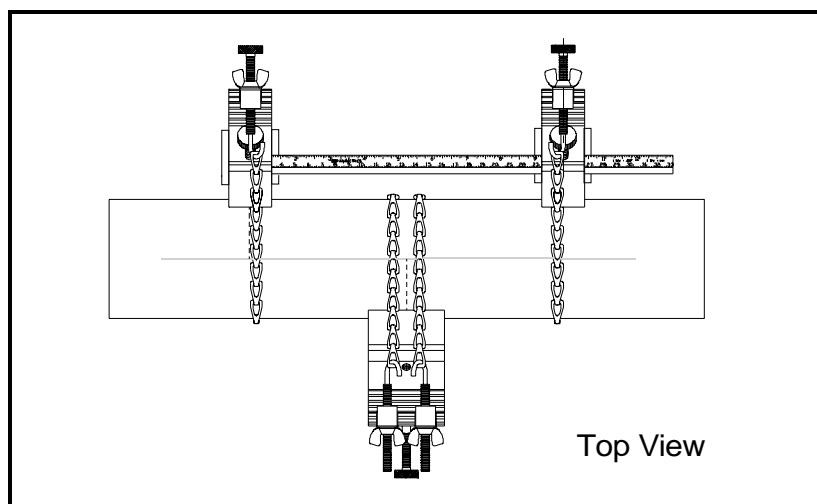
The Single-Traversal Method -UCF (cont.)

10. Position the clamping fixture rails so that one of the short blocks is placed over the remaining crossmark on the opposite side of the pipe and the pressure bolt is over the center of the crossmark. Make sure the block does not lie on top of the chains of the long block.



11. Wrap the chain around the pipe and fasten the chain to the screw hook on the opposite side of the block. Do this for both short blocks.

Note: Make sure the chains on both blocks are on the same side of the fixture and are opposite the ruler.



12. Tighten the pressure bolt all the way down on the short block that is **NOT** positioned over the crossmark. This will act as a reminder to not install the transducer in that block.

The Single-Traversal Method - UCF (cont.)

13. Use the screw hooks to tighten the chains on the fixed and adjustable blocks until the blocks are secured snugly to the pipe.

Note: *Make sure both chains are perpendicular to the clamping fixture and are not twisted. If the chains are slanted, the slack will cause the blocks to slide. The slack may also change the transducer spacing after the transducers are mounted.*

Figure 5 below shows a completed single-traverse installation without transducers. Proceed to *Mounting Transducers into the UCF* on the next page.

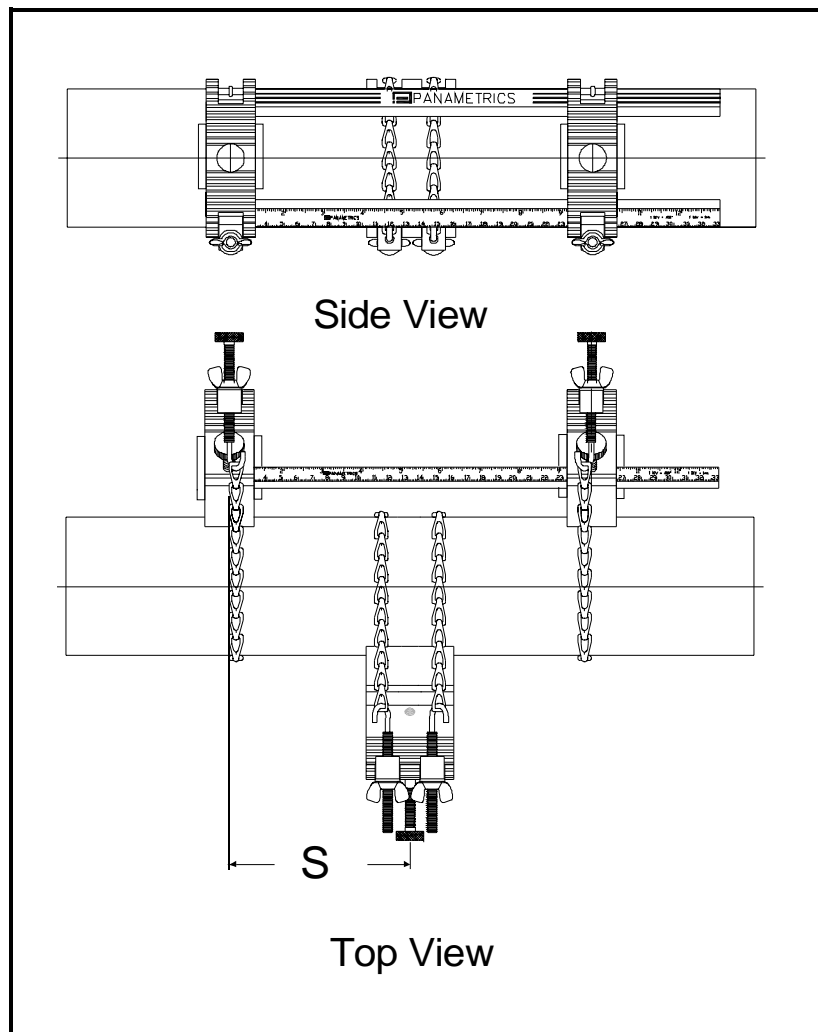


Figure 5: A Single-Traversal Clamping Fixture Installation without Transducers

Mounting Transducers into the UCF

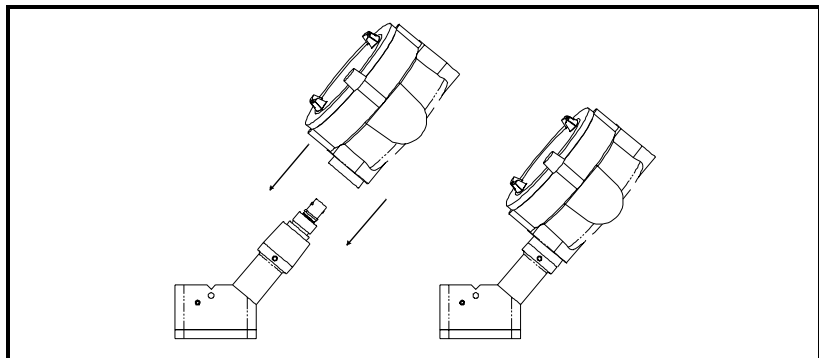
The last step of installation is mounting the transducers into the clamping fixture. C-RS transducers are manufactured with a V-notch on top of the transducer body.

IMPORTANT: *To maintain ATEX certification the transducer face must be protected against impact. This is provided by properly installing the transducer into the clamping fixture. All care must be taken during installation to ensure all protection is afforded.*

Procedure for Mounting Transducers

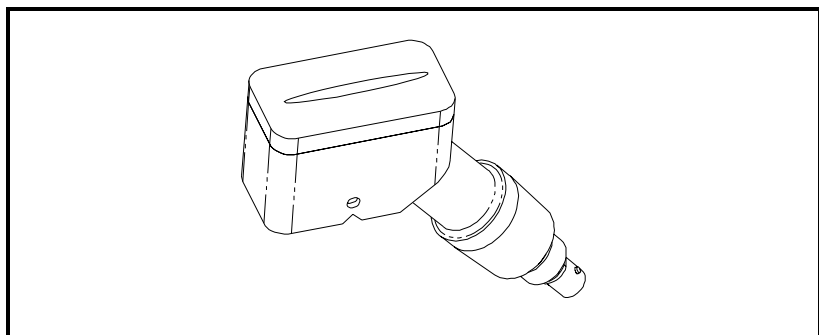
To mount the transducers into the UCF, use the following steps:

1. Apply a thread sealant to the transducer threads. A sealant is not required within the US, however, a sealant must be used in European Communities.
2. Before mounting the transducers, thread the junction box onto the end of the transducer with the BNC connector. Ensure that at least five full threads are engaged. Make sure to orient the cover of the junction box so it is accessible to make cable connections once the box is installed.



3. Take one of the transducers and apply a thin bead of couplant down the center of its face approximately the size of a toothpaste bead.

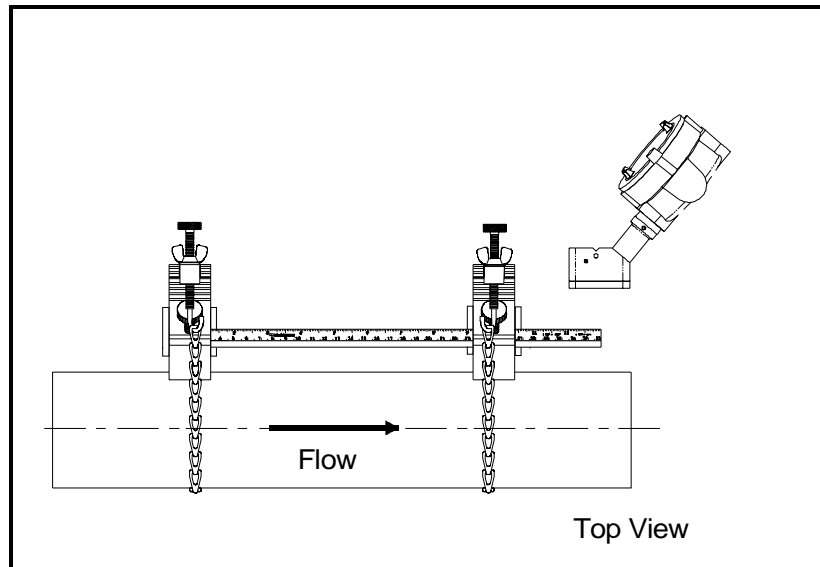
Note: *To prevent the loss of couplant, do not slide the transducer with couplant along the surface of the pipe when mounting.*



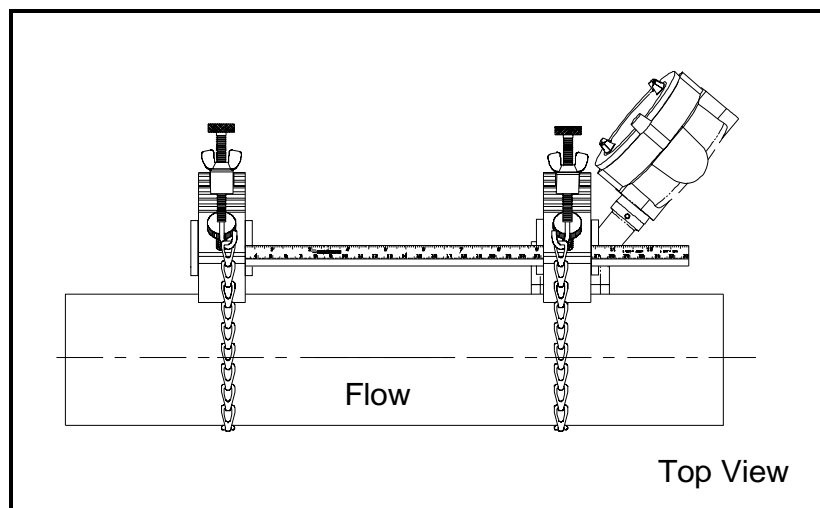
Mounting Transducers into the UCF (cont.)

4. Place the transducers into the blocks. Make sure the junction box faces away from the block as shown below.

Note: *If the transducer cables are already connected, you must determine the upstream and downstream directions of the pipe and place the transducers into the appropriate blocks.*



5. Use the pressure bolt to secure the transducer in place. The pressure bolt should fit into the dimple. Hand-tighten enough to hold the transducer in place. Do not overtighten so that the fixture lifts off the pipe.



Mounting Transducers into the UCF (cont.)

6. Tighten the locking nut on the pressure bolt (see Figure 3 on page 8).

IMPORTANT: *When using the UCF in a pipe location with possible mechanical vibration, the locking nut must be used to secure the position of the pressure bolt on the transducer after the bolt has been hand-tightened into the transducer dimple. For additional resistance to vibration a thread lock compound or a stainless steel washer and lock washer may also be used. These items can be ordered from GE Panametrics by requesting a "special" clamping fixture and specifying either the thread lock or the washers.*

7. Repeat Steps 1 to 6 to mount the other transducer in the remaining block.
8. Tighten the thumbscrews on the short blocks to make sure the block is secure on the rail. See Figure 6 on the next page for completed UCF installations.

!WARNING!

Before performing the next step make sure power to the flowmeter electronics has been disconnected.

9. Make transducer cable connections as described in the *Installation* chapter of the *Startup Guide*.

Mounting Transducers into the UCF (cont.)

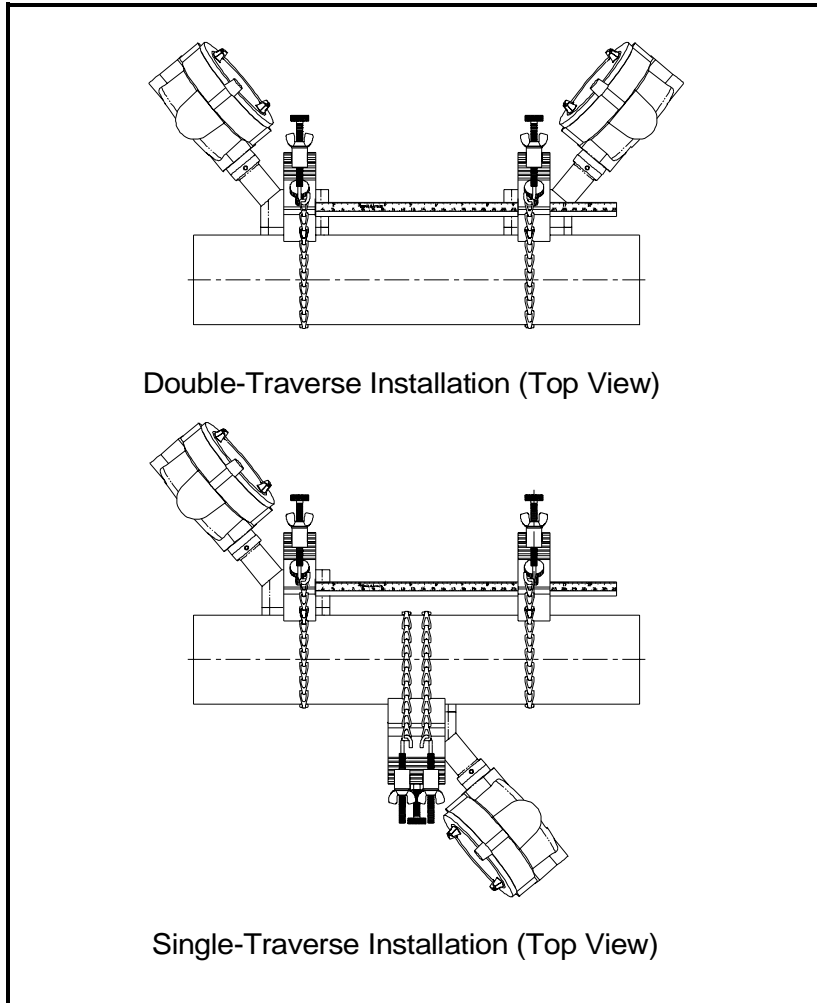


Figure 6: Completed UCF Installations with Transducers

Note: *If you have mounted the transducers into the UCF properly, the two transducer cable connectors will face away from each other as shown in the above figure.*

Installing the General Clamping Fixture and Transducers - GCF

The General Clamping Fixture (GCF) acts as a permanent transducer holder. The fixture has two blocks that are used for double- and single-traverse methods. Steel straps secure the blocks to the pipe for a permanent installation.

The blocks are positioned properly using the spacing dimension calculated by the flowmeter. Then the transducers are mounted into the blocks. Figure 7 below shows a long block.

The transducer installation consists of mounting the GCF to the pipe and then mounting the transducers into the blocks. Refer to the appropriate section that follows for instructions:

- Double-traverse Method - see below
- Single-traverse Method - see page 25

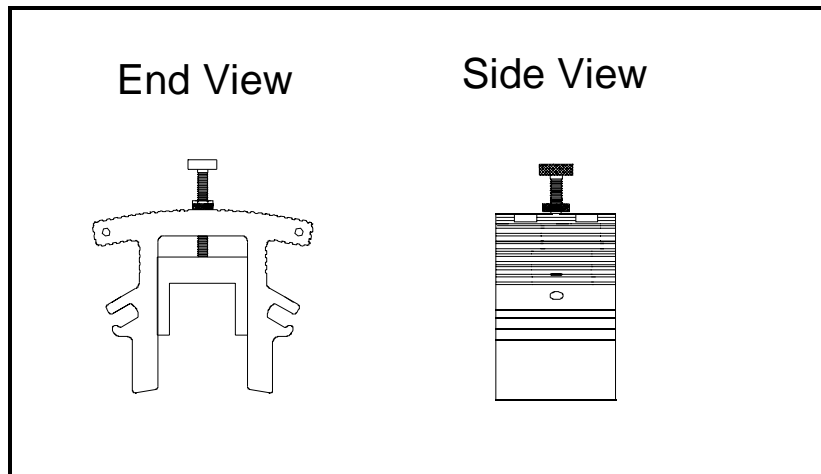


Figure 7: General Clamping Fixture Block

The Double-Traverse Method - GCF

Note: *The instructions in this section can also be used for a multiple-traverse method. However, you must use an **EVEN** number of traverses. The distance the signal travels from one side of the pipe wall to the opposite side of the pipe wall is considered one traverse. For more than two traverses, consult the GE Panametrics factory.*

There are three advantages in using the double-traverse method:

- Accuracy is improved because the signal is in the fluid longer than with a single-traverse.
- This configuration can reduce some effects of an underdeveloped flow profile.
- If there is enough pipe length available, the double-traverse fixture is easier to install.

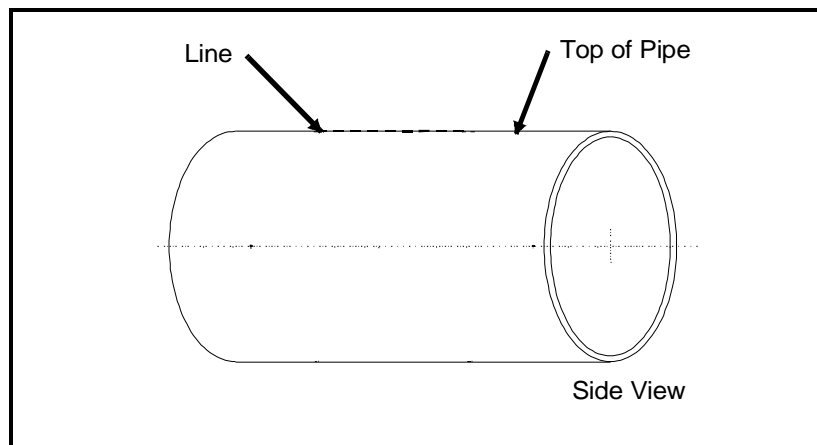
The Double-Traversal Method - GCF (cont.)

The procedure for mounting the GCF involves marking the pipe for the desired spacing, fastening the clamping fixture on the pipe and then mounting the transducers into the fixture.

Procedure for the Double-Traversal Method

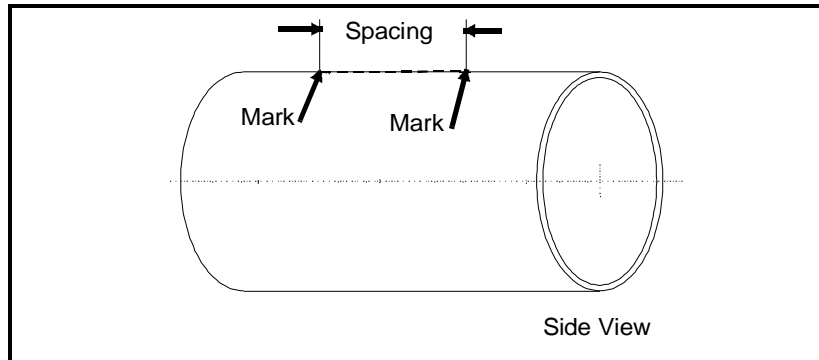
You will need a level and a marker or scribe to locate and mark the transducer locations on the pipe.

1. Obtain the transducer spacing dimension S , as described in the programming section of the *Startup Guide*.
2. Be sure the location you have chosen for the installation has at least 10 pipe diameters of straight, undisturbed flow upstream and 5 pipe diameters downstream of the measurement point.
3. Prepare the pipe where you intend to place the clamping fixture by making sure it is clean and free of loose material. Sanding, though usually not required, may be necessary to take off any high spots. Be careful to preserve the original curvature of the pipe.
4. Find the top of the pipe and use a level to draw a line parallel to the pipe's axis.

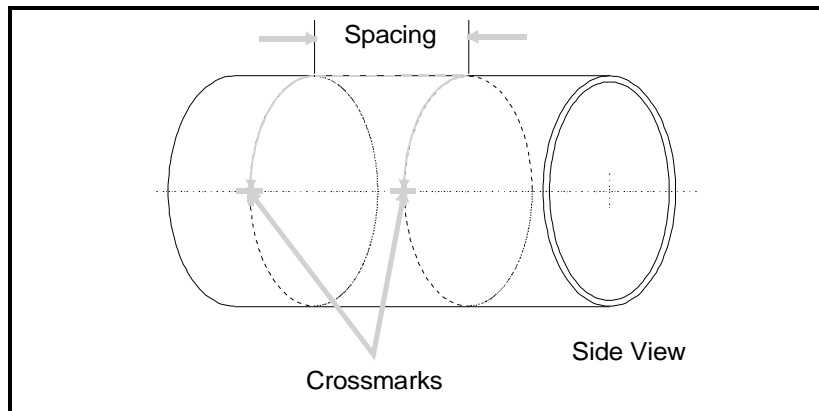


The Double-Traversal Method - GCF (cont.)

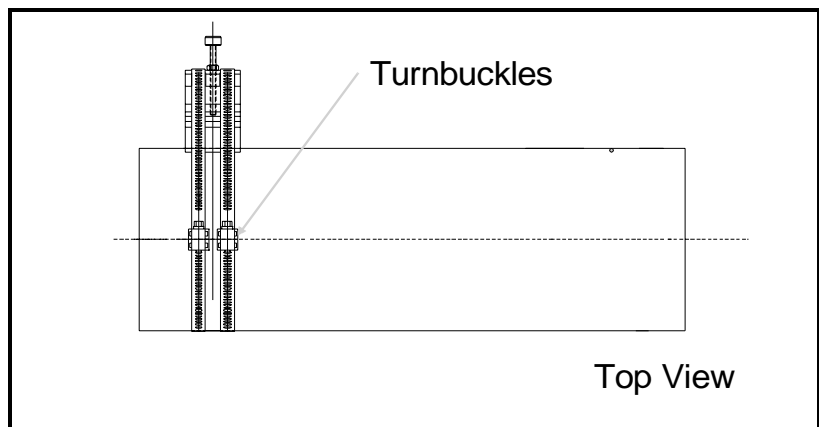
5. Make two marks on the line equal to the transducer spacing distance S , as calculated by the meter.



6. From each of the marks, measure around the circumference of the pipe in the same direction a distance equal to one quarter the pipe's circumference. Make a crossmark with a marker or scribe.



7. Center one of the blocks over one of the crossmarks on the pipe. Align the block so that the pressure bolt is over the center of the mark. Secure the block by wrapping the two straps around the block and pipe and tightening them. Make sure the turnbuckles are at least $1/2$ pipe diameter away from the block.



The Double-Traversal Method - GCF (cont.)

- Repeat Step 7 to install the other block over the other crossmark.

Note: Make sure both straps are perpendicular to the bottom of the block. If the straps are slanted, the slack will cause the block to slide. The slack may also change the transducer spacing after the transducers are mounted.

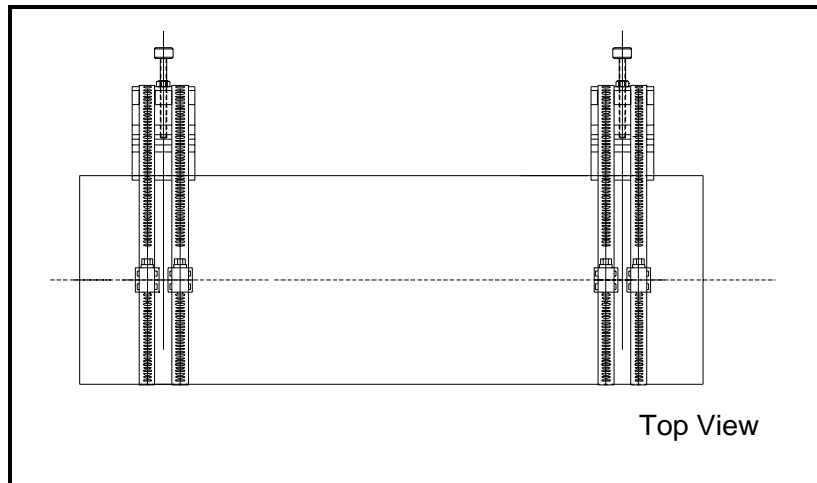


Figure 8 below shows a double-traverse installation without transducers. Proceed to *Mounting Transducers into the GCF* on page 29.

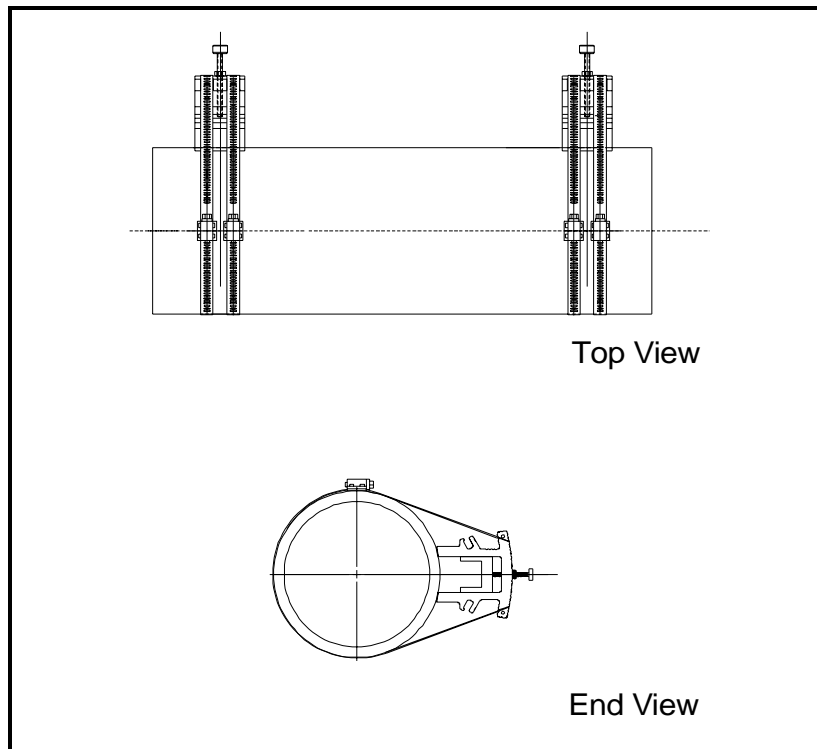


Figure 8: A Double-Traversal GCF Installation without Transducers

The Single-Traverse Method - GCF

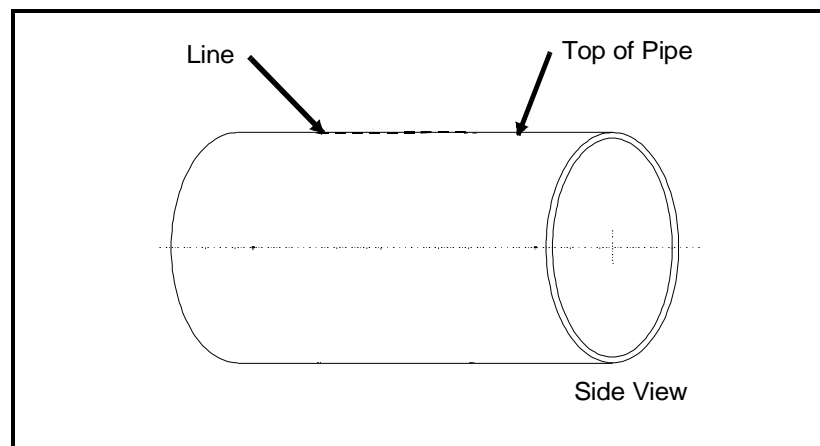
Note: *The instructions in this section can also be used for a multiple-traverse method. However, you must use an ODD number of traverses. The distance the signal travels from one side of the pipe wall to the opposite side of the pipe wall is considered one traverse.*

The procedure for mounting the GCF involves marking the pipe for the desired spacing, fastening the fixture to the pipe and then mounting the transducers into the fixture.

Procedure for the Single-Traverse Method

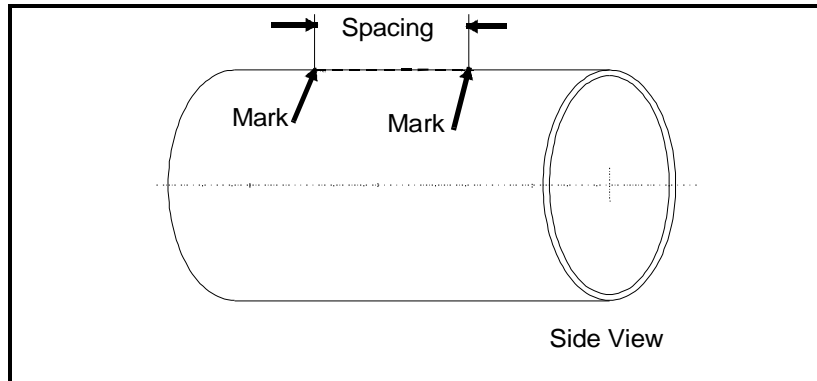
You will need a level and marker or scribe to locate the transducers on the pipe.

1. Obtain the transducer spacing dimension S , as described in the programming section of the *Startup Guide*.
2. Be sure the location you have chosen for the installation has at least 10 pipe diameters of straight, undisturbed flow upstream and 5 pipe diameters downstream of the measurement point.
3. Prepare the pipe where you intend to place the GCF by making sure it is clean and free of loose material. Sanding, though usually not required, may be necessary to take off any high spots. Be careful to preserve the original curvature of the pipe and not to eradicate the marks on the pipe.
4. Find the top of the pipe and use a level to draw a line parallel to the pipe's axis.

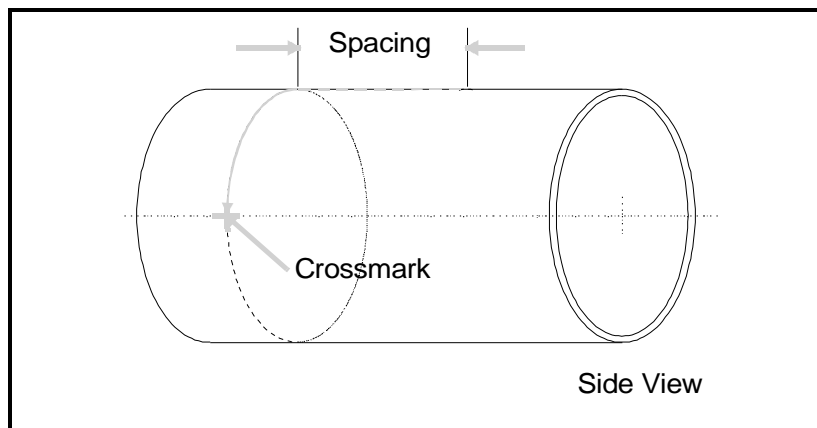


The Single-Traverse Method - GCF (cont.)

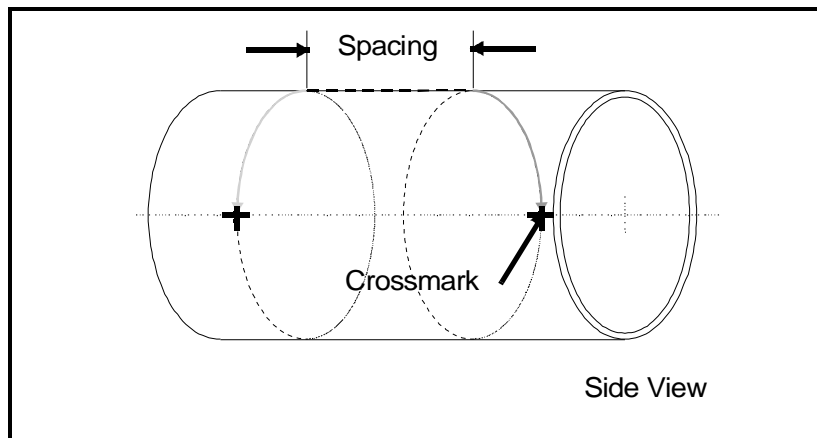
5. Make two marks on the line equal to the transducer spacing distance S , as calculated by the meter.



6. From one of the marks, measure around the circumference of the pipe a distance equal to one quarter the pipe's circumference. Make a crossmark with a marker or scribe.

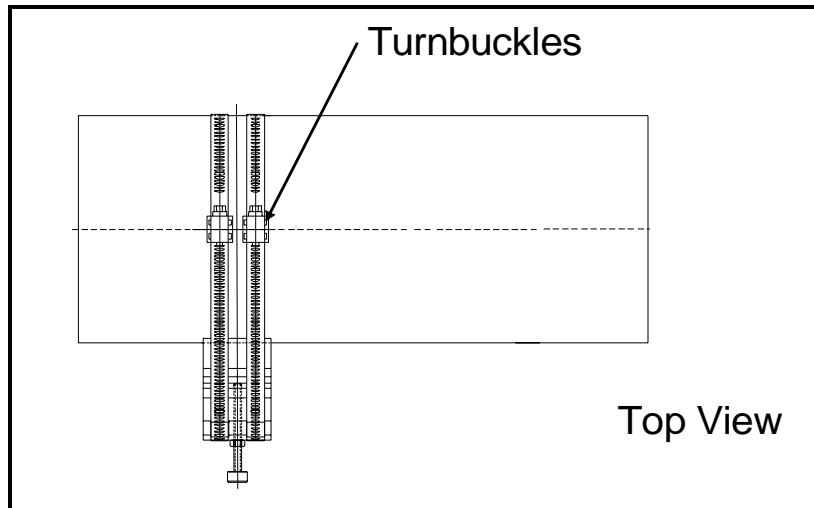


7. From the other mark, go in the opposite direction around the pipe for one quarter the circumference and make another crossmark.



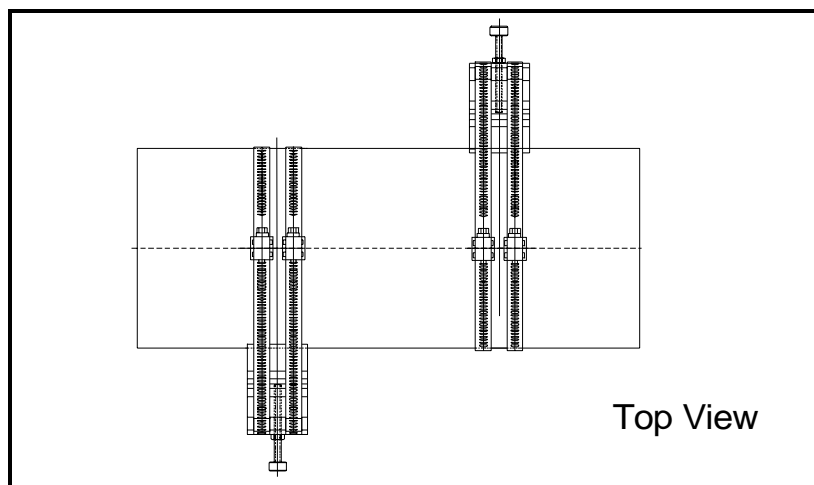
The Single-Traversal Method -GCF (cont.)

- Center one of the blocks over one of the crossmarks on the pipe. Align the block so that the pressure bolt is over the center of the crossmark. Secure the block by wrapping two straps around the block and pipe and tightening them. Make sure the turnbuckles are at least $1/2$ pipe diameter away from the block.



- Repeat Step 8 to install the other block over the other punch mark.

Note: Make sure both straps are perpendicular to the bottom of the block. If the straps are slanted, the slack will cause the block to slide. The slack may also change the transducer spacing after the transducers are mounted.



The Single-Traversal
Method -GCF (cont.)

Figure 9 below shows a single-traverse installation without transducers. Proceed to *Mounting Transducers into the GCF* on the next page.

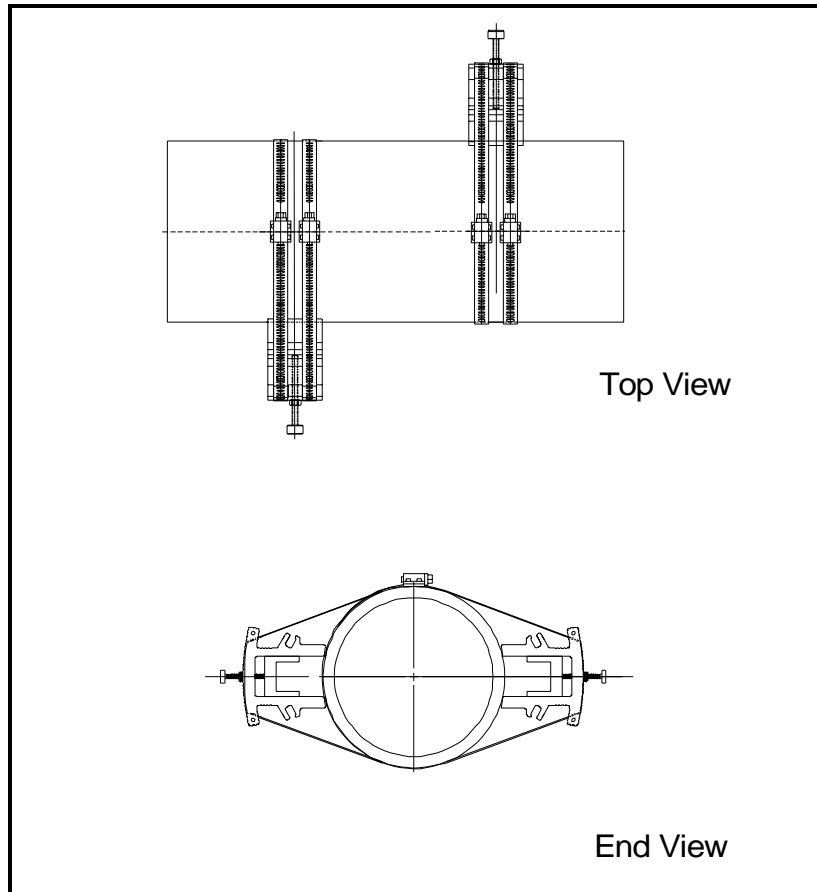


Figure 9: A Single-Traversal GCF Installation without Transducers

Mounting Transducers into the GCF

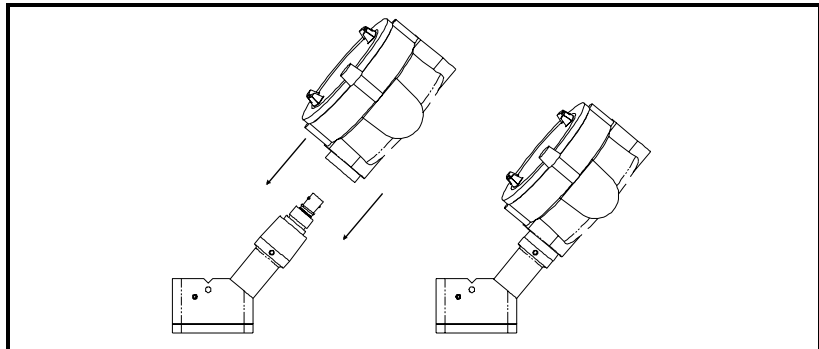
The last step of installation is mounting the transducers into the clamping fixture. C-RS transducers are manufactured with a dimple on top of the transducer body. In addition, there are scribe marks on each side.

IMPORTANT: *To maintain ATEX certification the transducer face must be protected against impact. This is provided by properly installing the transducer into the clamping fixture. All care must be taken during installation to ensure all protection is afforded.*

Procedure for Mounting Transducers

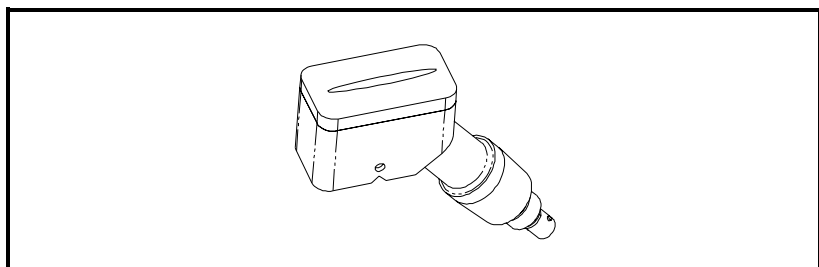
To mount the transducers into the GCF, use the following steps:

1. Apply a thread sealant to the transducer threads. A sealant is not required within the US, however, a sealant must be used in European Communities.
2. Before mounting the transducers, thread the junction box onto the end of the transducer with the BNC connector. Ensure that at least five full threads are engaged. Make sure to orient the cover of the junction box so it is accessible to make cable connections once the box is installed.



3. Take one of the transducers and apply a thin bead of couplant down the center of its face approximately the size of a toothpaste bead.

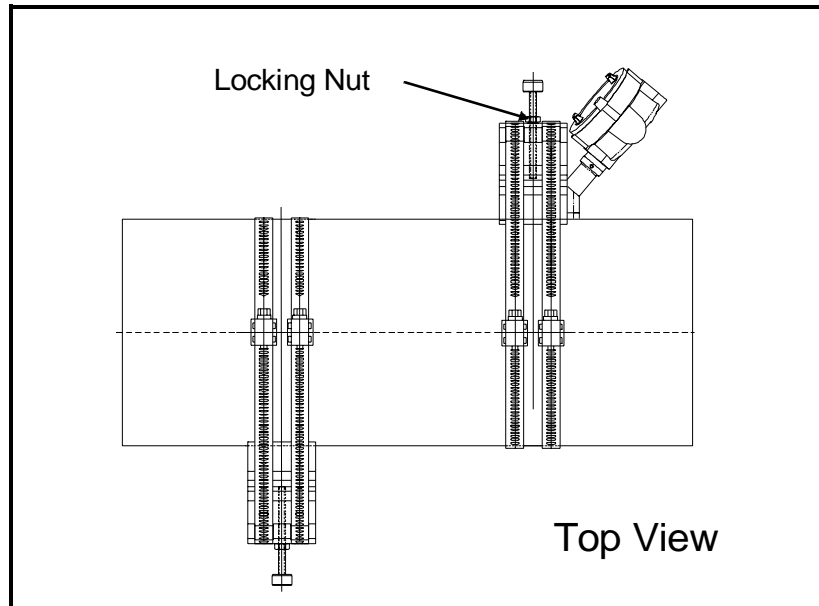
IMPORTANT: *To prevent the loss of couplant, do not slide the transducer with couplant along the surface of the pipe when mounting.*



Mounting Transducers into the GCF (cont.)

4. Place the transducers in the appropriate blocks. Make sure the transducers are oriented as shown below.

Note: *If the transducer cables are already connected, you must determine the upstream and downstream directions of the pipe and place the transducers into the appropriate blocks.*



5. Use the pressure bolt to secure the transducer in place. The pressure bolt should fit into the dimple. Hand-tighten enough to hold the transducer in place. Do not overtighten so that the fixture lifts off the pipe.
6. Tighten the locking nut on the pressure bolt (see above).

IMPORTANT: *When using the GCF in a pipe location with possible mechanical vibration, the locking nut must be used to secure the position of the pressure bolt on the transducer after the bolt has been hand-tightened into the transducer dimple. For additional resistance to vibration a thread lock compound or a stainless steel washer and lock washer may also be used. These items can be ordered from GE Panametrics by requesting a "special" clamping fixture and specifying either the thread lock or the washers.*

7. Repeat Steps 1 to 6 to mount the other transducer in the remaining block. See Figure 10 on the next page for completed installations.

Mounting Transducers
into the GCF (cont.)

!WARNING!

**Before performing the next step make
sure power to the flowmeter electronics
has been disconnected.**

8. Make transducer cable connections as described in the *Installation* chapter of the *Startup Guide*.

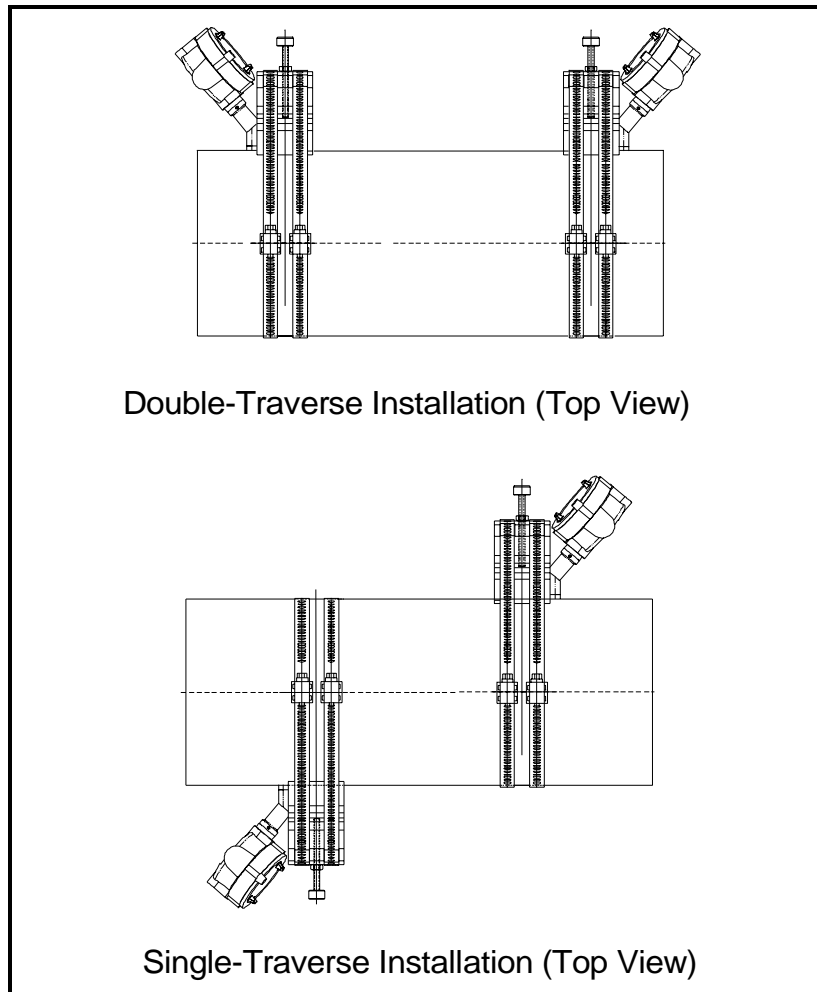


Figure 10: Completed GCF Installations with Transducers

Note: *If you have mounted the transducers into GCF properly, the two transducer cable connectors will face away from each other as shown in the above figure.*

Installing the Magnetic Clamping Fixture and Transducers - MCF

The Magnetic Clamping Fixture (MCF) is used to fasten transducers to the pipe at the proper spacing **without** chains or straps. The MCF is used on ferrous pipe materials only.

Different fixtures are used for a single- and double-traverse installation. Each type of MCF has magnets at either end of the fixtures. When the magnets are turned ON, the fixture magnetically “clamps” to the pipe wall.

To properly mount the MCF, you should become familiar with the components of each type of fixture.

Identifying the MCF Components

Refer to Figure 11 below to identify these components, then refer to one of the following sections to install the clamping fixture:

- Double-traverse Method - on the next page
- Single-traverse Method - page 36

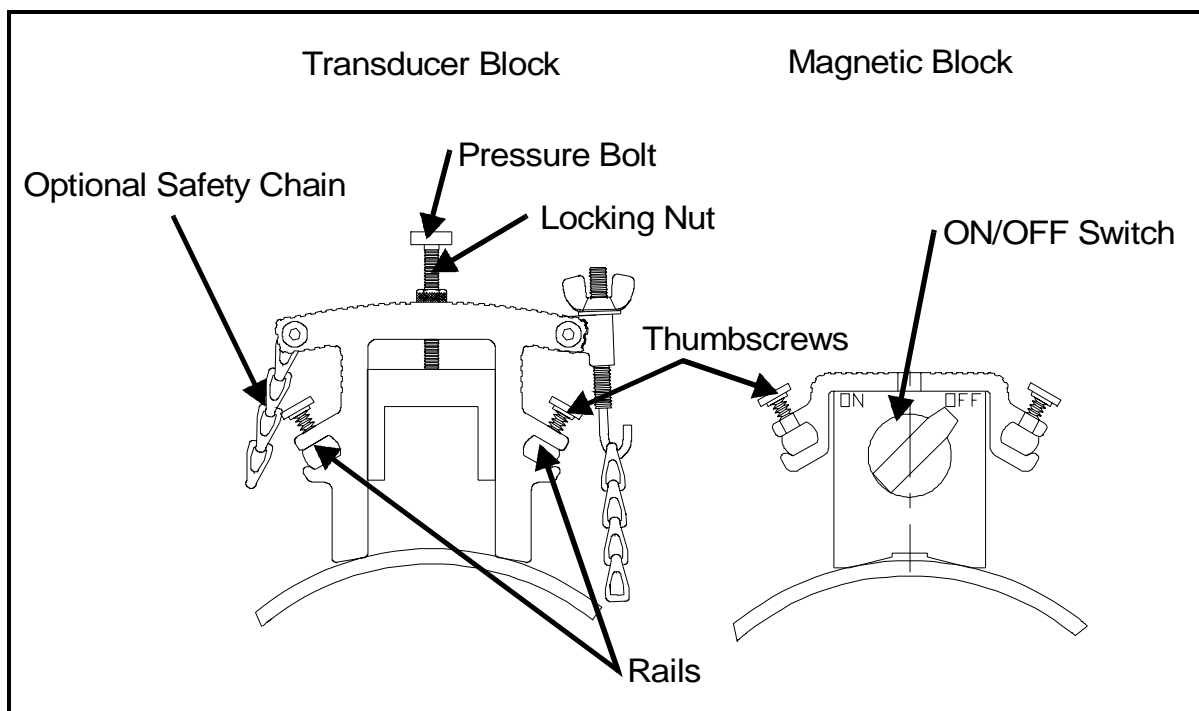


Figure 11: Transducer Block and Magnetic Block

The Double-Traversal Method - MCF

The Double-Traversal MCF consists of two blocks connected by two rods (one of the two rods acts as a scale or ruler to help you properly space transducers). Both blocks are adjustable. This type of fixture has two transducer blocks and like the magnetic blocks, both are adjustable.

The procedure for mounting the MCF involves setting the transducer spacing and then securing the fixture to the pipe.

Procedure for the Double-Traversal Method

!WARNING!

Do not use the MCF at temperatures that exceed 120°F (49°C), or the fixture will fall off the pipe.

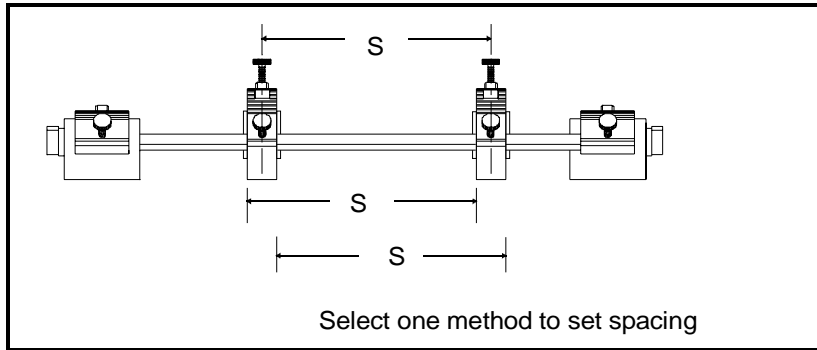
To install the MCF in a double-traversal configuration:

Note: *The instructions that follow can be used for a multiple-traversal method. However, you must use an EVEN number of traverses. The distance the signal travels from one side of the pipe wall to the opposite side of the pipe wall is considered one traversal.*

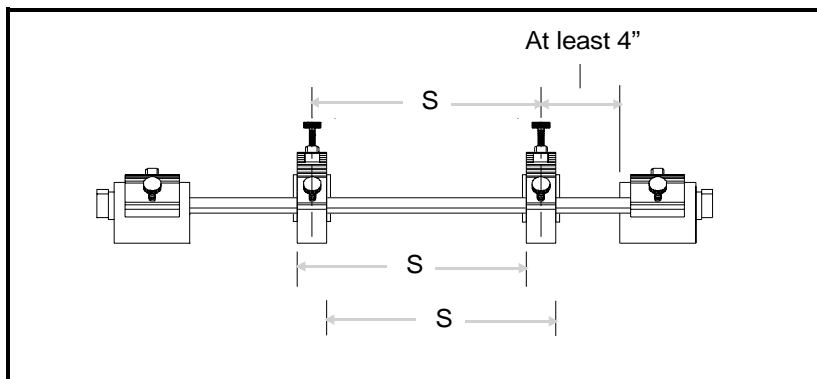
1. Obtain the transducer spacing dimension S , as described in the programming section of the *Startup Guide*.
2. Be sure the location you have chosen for the installation has at least 10 pipe diameters of straight, undisturbed flow upstream and 5 pipe diameters downstream of the measurement point.
3. Prepare the pipe where you intend to place the clamping fixture by making sure it is clean and free of loose material. Sanding, though usually not required, may be necessary to take off any high spots. Be careful to preserve the original curvature of the pipe.

The Double-Traversal Method - MCF (cont.)

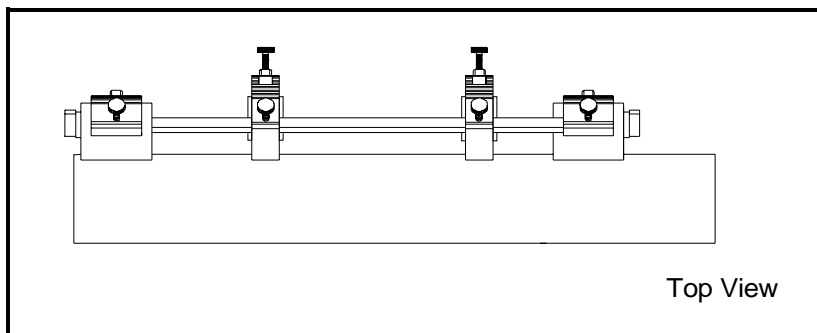
- Using the scale on the rod, move the blocks so they are located a distance equal to the spacing dimension from each other. To move the block, loosen the red thumb screws, slide the block to the desired location and tighten the thumb screws. Use the pressure bolt or the edge of the block as the measuring point for the block.



- Locate the magnetic blocks at least 4 in. away from the transducer blocks. This will ensure that there is enough clearance to mount the transducers in the blocks. Move the adjustable magnetic block in the same manner as the transducer block.

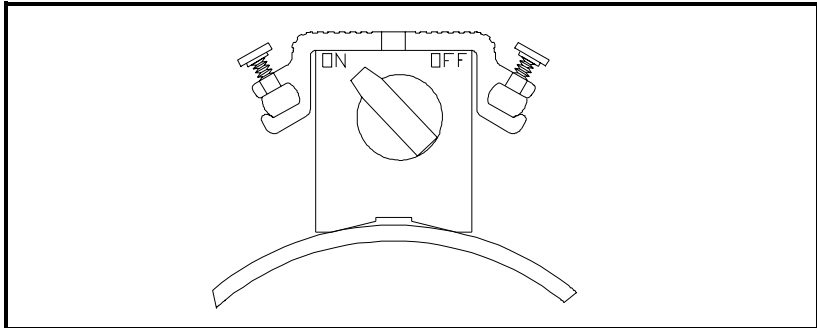


- Position the clamping fixture along the horizontal plane of the pipe. If the pipe is horizontal, do not place the fixture on the top or bottom of the pipe.



The Double-Traversal
Method - MCF (cont.)

7. Turn the switches on each magnet to the ON position.



8. If provided, secure the safety chain. The safety chain prevents the fixture from falling off the pipe in the event the magnet releases.
9. Proceed to *Mounting Transducers into the MCF* on page 40.

The Single-Traversal Method - MCF

The Single-Traversal MCF consists of two parts. Each part is made up of two magnetic blocks which are connected by two rods. In addition, a sliding transducer block, which is used to hold the transducer in proper alignment, is positioned on the two rods. Each part is positioned on the pipe to face 180° opposite each other.

Note: *In some cases, a magnetic clamping fixture with two transducer blocks is used.*

The procedure for mounting the MCF involves marking the pipe and then securing the fixtures to the pipe.

Procedure for the Double-Traversal Method

!WARNING!
**Do not use magnetic fixtures
at temperatures that exceed 120°F (49°C),
or the fixture will fall off the pipe.**

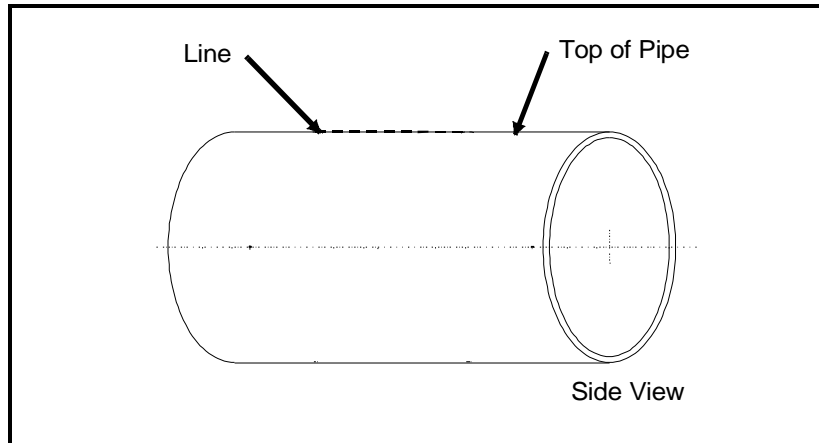
To install the MCF in a single-traversal configuration:

Note: *The instructions in this section can also be used for a multiple-traversal method. However, you must use an ODD number of traverses. The distance the signal travels from one side of the pipe wall to the opposite side of the pipe wall is considered one traversal.*

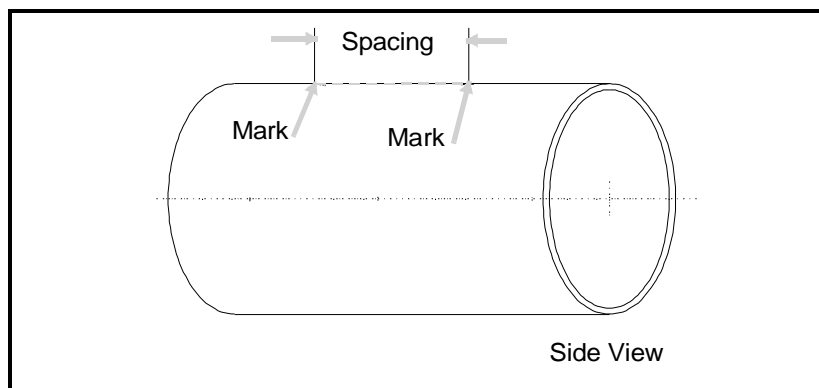
1. Obtain the transducer spacing dimension S, as described in the programming section of the *Startup Guide*.
2. Be sure the location you have chosen for the installation has at least 10 pipe diameters of straight, undisturbed flow upstream and 5 pipe diameters downstream of the measurement point.
3. Prepare the pipe where you intend to place the MCF by making sure it is clean and free of loose material. Sanding, though usually not required, may be necessary to take off any high spots. Be careful to preserve the original curvature of the pipe and not to eradicate the marks on the pipe.

The Single-Traversal Method - MCF (cont.)

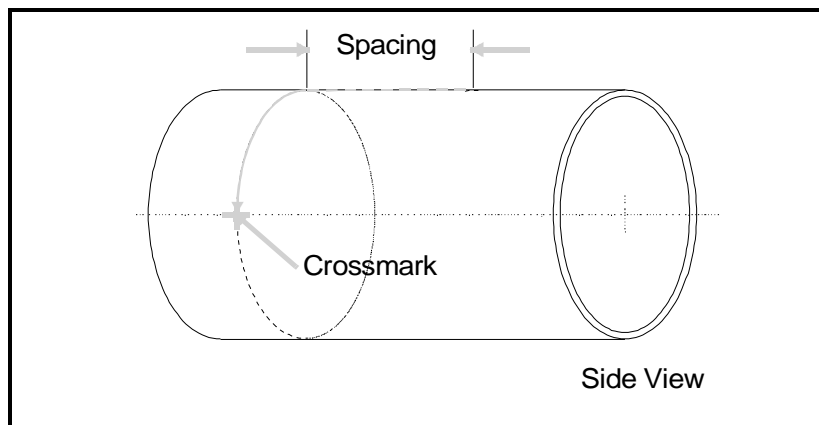
- Find the top of the pipe and use a level to draw a line parallel to the pipe's axis.



- Make two marks on the line separated by the transducer spacing distance S , as calculated by the meter.

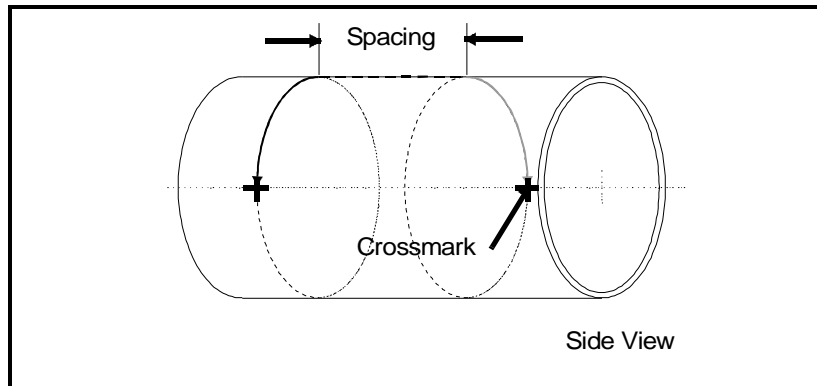


- From one of the marks, measure around the circumference of the pipe a distance equal to one quarter the pipe's circumference. Use a marker or scribe to make a crossmark.



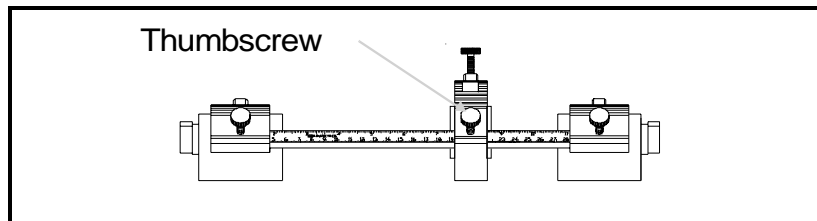
The Single-Traversal Method - MCF (cont.)

7. From the other mark, go in the opposite direction around the pipe for one quarter the circumference and make another crossmark.

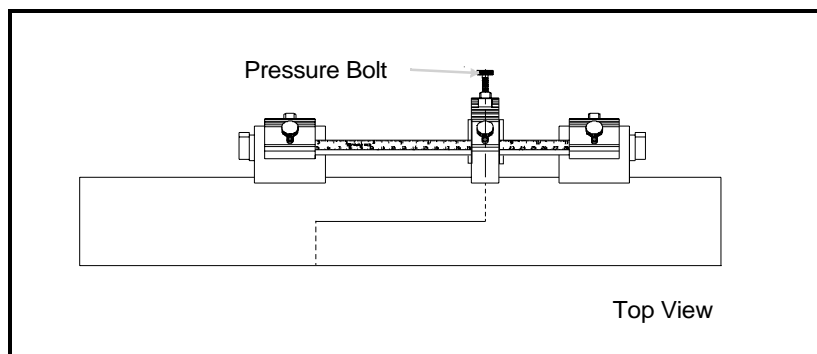


8. On one of the fixtures, position the transducer block anywhere along the rods, being sure to leave enough room on either side to easily insert the transducer. To move the block, loosen the red thumbscrews, slide the block to the desired location and tighten the thumbscrews. Use the pressure bolt as the measuring point for the block. Repeat for the other fixture.

Note: *If you are using a fixture with two transducer blocks, adjust one block as described above and push the unused block all the way to one side of the rail. Tighten the pressure bolt all the way down on the unused block. This will act as a reminder to not install the transducer in that block.*

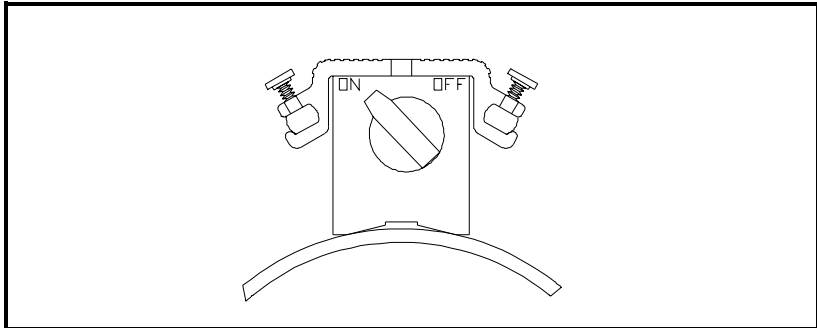


9. Center the block over one of the marks on the pipe. Align it such that the pressure bolt on the transducer block is right over the center of the crossmark.

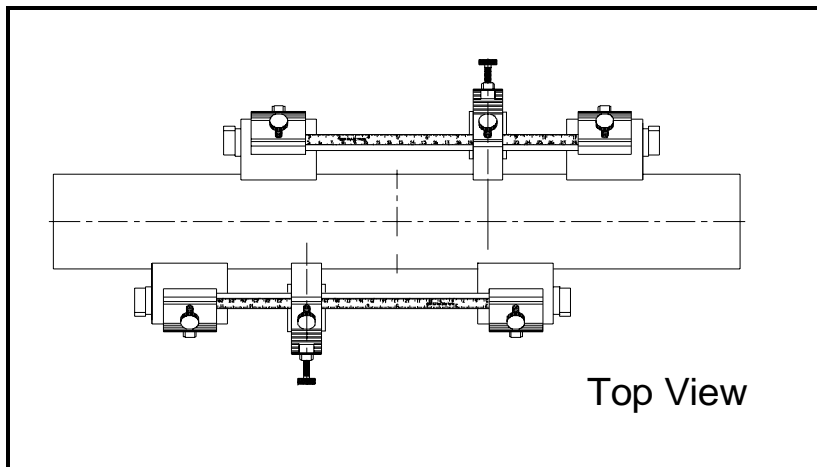


The Single-Traversal
Method - MCF (cont.)

10. Turn the switches on each magnet to the ON position.



11. Repeat Steps 9 and 10 for the other fixture on the opposite pipe marking.



12. If provided, secure the safety chain. The safety chain prevents the fixture from falling off the pipe in the event the magnet releases.

Proceed to *Mounting Transducers into the MCF* on the next page.

Mounting Transducers into the MCF

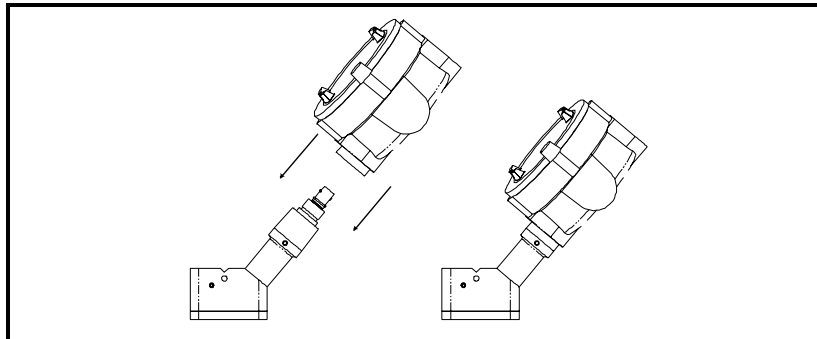
The last step of installation is mounting the transducers into the clamping fixture. C-RS transducers are manufactured with a dimple on top of the transducer body. In addition, it also has scribe marks on each side.

IMPORTANT: *To maintain ATEX certification the transducer face must be protected against impact. This is provided by properly installing the transducer into the clamping fixture. All care must be taken during installation to ensure all protection is afforded.*

Procedure for Mounting Transducers

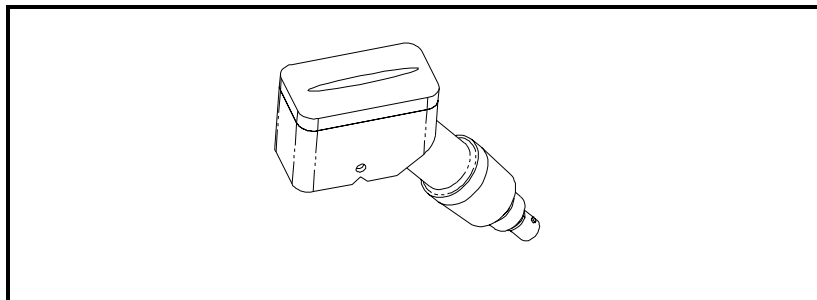
To mount the transducers into the MCF, use the following steps:

1. Apply a thread sealant to the transducer threads. A sealant is not required within the US, however, a sealant must be used in European Communities.
2. Before mounting the transducers, thread the junction box onto the end of the transducer with the BNC connector. Ensure that at least five full threads are engaged. Make sure to orient the cover of the junction box so it is accessible to make cable connections once the box is installed.



3. Take one of the transducers and apply a thin bead of couplant down the center of its face approximately the size of a toothpaste bead.

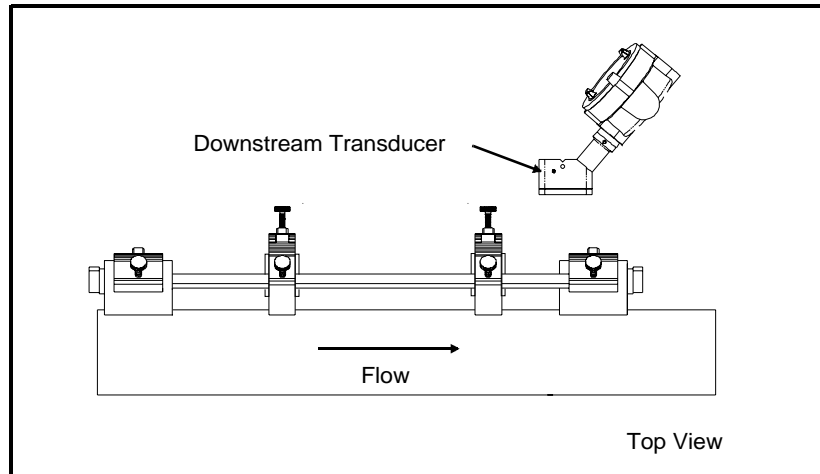
IMPORTANT: *To prevent the loss of couplant, do not slide the transducer with couplant along the surface of the pipe when mounting.*



Mounting Transducers into the MCF (cont.)

- Place the transducers in the appropriate blocks. Make sure the transducers are oriented as shown below.

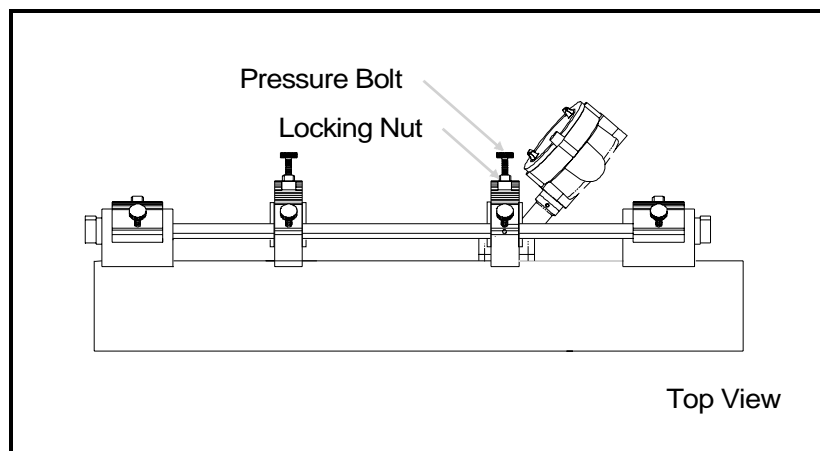
Note: *If the transducer cables are already connected, you must determine the upstream and downstream directions of the pipe and place the transducers into the appropriate blocks.*



- Use the pressure bolt to secure the transducer in place. The pressure bolt should fit into the dimple. Hand-tighten enough to hold the transducer in place. Do not overtighten so that the fixture lifts off the pipe.

!WARNING!

Do not tighten the pressure bolt so that the magnet separates from the pipe.



Mounting Transducers
into the MCF (cont.)

6. Tighten the locking nut on the pressure bolt (see drawing in step 5 on previous page).

IMPORTANT: *When using the MCF in a pipe location with possible mechanical vibration, the locking nut must be used to secure the position of the pressure bolt on the transducer after the bolt has been hand-tightened into the transducer dimple. For additional resistance to vibration a thread lock compound or a stainless steel washer and lock washer may also be used. These items can be ordered from GE Panametrics by requesting a "special" clamping fixture and specifying either the thread lock or the washers.*

7. Repeat Steps 1 to 6 to mount the other transducer in the remaining block. See Figure 12 on the next page for completed installations.

!WARNING!
**Before performing the next step make
sure power to the flowmeter electronics
has been disconnected.**

8. Make transducer cable connections as described in the *Installation* chapter of the *Startup Guide*.

!WARNING!
**If your fixture is installed at an elevated location, GE
Panametrics recommends securing the fixture with
the optional safety chain or a tether/leash to
prevent injury if the fixture falls off the pipe.**

Mounting Transducers
into the MCF (cont.)

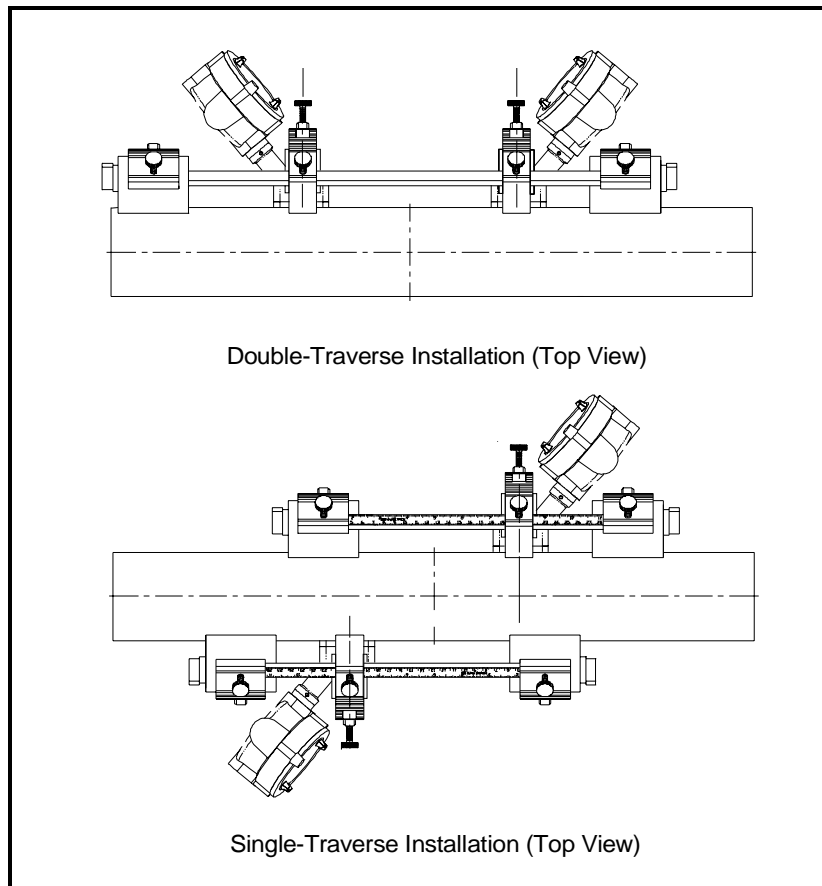


Figure 12: Completed MCF Installations with Transducers

Note: *If you have mounted the transducers into the MCF properly, the two transducer cable connectors will face away from each other as shown in the above figure.*

Maintaining the C-RS Transducers





Transducers, couplant, the clamping fixture and dampening material are provided by GE Panametrics. Once you have completed installation little maintenance is required. Refer to Table 3 below for maintenance information.

Table 3: Maintenance Checks

Component	Interval	Maintenance Check	Comments
Transducer	N/A	No additional adjustments or maintenance needed. If you suspect something is wrong with a transducer or need to replace a transducer, simply loosen the pressure bolt that secures the transducer in place and remove it. If necessary, loosen the locking nut with a wrench. Refer to <i>Installing the Transducers</i> to insert a new transducers.	No cleaning required.
Couplant	Verify every 6 months in dry areas (e.g. the desert). Verify every 12 months in other areas.	Measure the signal strength using diagnostics and compare to the value taken at the time of installation. Good and bad limits are listed in the <i>Service Manual</i> or <i>User's Manual</i> .	No cleaning required.
Dampening Material	N/A	Life of 25 years. Consult factory for additional information if needed.	No cleaning required.
Clamping Fixture	Determined by user.	Periodic inspection and tightening of clamping fixture nuts is required to ensure clamping fixture does not become loose and fall, possibly causing injury.	No cleaning required.

Specifications

Table 4: C-RS Transducer Specifications

Transducer #	401	402	403
Designation	Large pipes; ductile iron pipes, lined pipes; high levels of two-phase liquid; high performance	Mid-size pipes, high performance	Small pipes; high performance
Installation Type	Clamp-on for liquid applications		
Material	316 Stainless Steel or plastic		
Pipes Sizes	2" to 300" (5 cm to 7.6 m) diameter	2" to 300" (5 cm to 7.6 m) diameter	2" to 6" (5 to 15 cm) diameter
Operating Frequency	0.5 MHz	1.0 MHz	2.0 MHz
Electrical Rating	200 V peak-to-peak, 5 mA		
Ambient Temperature Range	-40 to +167°F (-40 to +75°C)		
Process Temperature Range	-40 to +302°F (-40 to +150°C)		
North American Certification - Explosion proof (Pending)	 Class I, Division 1, Group B, C & D C US		
European Certification - Flameproof	 II 2 GD, EEx md IIC T6 80°C Tam -40 to 75°C (-40 to 167°F) KEMA 02ATEX2337 X		
North American Certification - Weatherproof	 IP66, TYPE 4X C US 200Vpp, 5mA		
European Certification - Weatherproof	IP 66 		
IMPORTANT: <i>The transducer is protected by a suitable fuse located in the flowmeter electronics. The fuse has a breaking capacity in accordance with the short circuit current of the supply.</i>			



GE Panametrics

**DECLARATION
OF
CONFORMITY**

We,

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

declare under our sole responsibility that the

**CRL Ultrasonic Flow Transducer
CRS Ultrasonic Flow Transducer
CRV Ultrasonic Flow Transducer
CRW Ultrasonic Flow Transducer**

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

- EN 50014:1997+A1+A2:1999
- EN 50018:2000
- EN 50028:1987
- EN 50281-1-1:1998
- II 2 GD EEx md IIC T6
CRL, CRS, CRV: KEMA02ATEX2337 X
CRW: KEMA03ARTEX1540 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

**CRL Ultrasonic Flow Transducer
CRS Ultrasonic Flow Transducer
CRV Ultrasonic Flow Transducer
CRW Ultrasonic Flow Transducer**

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

- EN 50014:1997+A1+A2:1999
- EN 50018:2000
- EN 50028:1987
- EN 50281-1-1:1998
- II 2 GD EEx md IIC T6
CRL, CRS, CRV: KEMA02ATEX2337 X
CRW: KEMA03ARTEX1540 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

**CRL Ultrasonic Flow Transducer
CRS Ultrasonic Flow Transducer
CRV Ultrasonic Flow Transducer
CRW Ultrasonic Flow Transducer**

folgende Normen erfüllen:

- EN 50014:1997+A1+A2:1999
- EN 50018:2000
- EN 50028:1987
- EN 50281-1-1:1998
- II 2 GD EEx md IIC T6
CRL, CRS, CRV: KEMA02ATEX2337 X
CRW: KEMA03ARTEX1540 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





GE Panametrics

ATEX COMPLIANCE

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 CRS 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:

CE 1180  **II 2 GD EEx md IIC T6
KEMA02ATEX2337X T80°C, -40°C to +75°C**

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

- Having been designed in accordance with EN 50014, EN 50018, EN 50281 and EN 50028, the product meets the fault tolerance requirements of electrical apparatus for categories “d” and “m”.
- 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 must be protected by a suitable fuse. The breaking capacity of the fuse must be in accordance with the prospective short circuit current of the supply.
- The product must be installed in such a way that its front face is protected against impact.
- **Installation Instructions:** The product is provided with a male 3/4” NPT thread. For electrical connection, the product must be mounted to a certified metal enclosure in type of explosion protection flameproof enclosure “d”, the assembly complying with the requirements of EN50018 and providing a degree of protection of IP6X. Measures must be taken to ensure a good bonding connection and to prevent the connection from self-loosening.





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