



QS200 Insertion Ultrasonic Flowmeter

U.S. Design Patent No. D845,804 - Ultrasonic Insert
U.S. Design Patent No. D845,805 - Tee Housing for Ultrasonic Insert

STANDARD METERS:

QS200-10, QS200-15, QS200-20, QS200-30, QS200-40

NSF CERTIFIED METERS:

QS200-10PW, QS200-15PW, QS200-20PW, QS200-30PW, QS200-40PW

STANDARD RETROFIT INSERT:

QS200



Please save these instructions for future reference. Read carefully before attempting to assemble, install, operate or maintain the product described.

Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage.

Please refer to back cover for information regarding this product's warranty and other important information.

SAVE FOR YOUR RECORDS

Model #: _____

Serial#: _____

Purch. Date: _____

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BEFORE YOU BEGIN

Usage Requirements

- This meter is for use with water only.
- This meter is not legal for trade applications.
- This meter has a permanent factory setting for measuring water only.
- Flow must go uphill through the meter, never downhill through the meter to avoid air bubbles or air pockets captured in the Tee.



Power Source Requirements

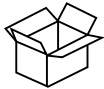
- This meter requires DC power from a customer-provided controller in order to provide flow information back to the controller.



Tools and Materials Needed

- Wire strippers, wire cutters, tape measure
- PVC pipe fittings (as needed), PVC pipe primer, PVC pipe cement
- Direct burial wire splices, valve box
- #18 AWG wire cable (Direct Burial). (Controller manufacturer may recommend thicker gauge wire for longer distances)

UNPACKING



Contents: QS200-10, -15, -20, -30, -40 or QS200-10PW, -15PW, -20PW, -30PW, -40PW Meters

NOTE: The "PW" suffix denotes an NSF certified meter

(1) QS200 Ultrasonic insert assembly	(2) K-factor Decals
(1) PVC Pipe Tee (for 1 in., 1-1/2 in., 2 in., 3 in., or 4 in. diameter pipe)	(1) Owner's Manual
(1) Quick Release Pin	

Contents: QS200 Retrofit Insert (Not available as NSF certified)

(1) QS200 Ultrasonic insert assembly	(1) Quick Release Pin
(1) Set of two O-rings (round profile)	(1) Owner's Manual
(2) K-factor Decals	



Inspect

- After unpacking the unit, inspect carefully for any damage that may have occurred during transit. Check for loose, missing or damaged parts. Shipping damage claims must be filed with carrier.
- See General Safety Instructions, and all Cautions, Warnings, and Dangers as shown.



GENERAL SAFETY INSTRUCTIONS

IMPORTANT: It is your responsibility to:

- Ensure that all equipment operators have access to adequate instructions concerning safe operating and maintenance procedures.

⚠ CAUTION

This product is not approved for use with petroleum products (diesel fuel, unleaded gasoline, jet fuel, kerosene, etc.), aromatic hydrocarbons or other incompatible chemicals.

⚠ CAUTION

This product is not approved for use in hazardous locations.

⚠ WARNING

When applying power, adhere to specifications listed in appropriate electronics manual.

⚠ CAUTION

Disconnect external power before attaching or detaching input or output wires.

NOTE: Be sure O-rings and seals are kept in good repair.

⚠ WARNING

Compatibility of this product's material and the process fluid and/or environment should be considered prior to putting into service.

⚠ WARNING

Product should never be operated outside its published specifications for temperature or pressure. See specifications for your model.

⚠ WARNING

Make sure flow and pressure have been eliminated from process pipe prior to installing or removing product.

⚠ CAUTION

Installation near high electromagnetic fields and high current fields is not recommended and may result in inaccurate readings.

⚠ CAUTION

Do not allow water to freeze in meter. Ice expansion may burst the plastic housing.

⚠ CAUTION

Do not allow this meter to be used with steam.

NSF CERTIFICATION INFORMATION

NOTE: QS200 meter are available as a standard meter, or as an NSF certified meter. Only QS200 meters ordered as a complete unit (ultrasonic insert installed in FLOMEC tee) qualify to be NSF certified.

Standard meter: The identification plate on the top of the ultrasonic insert is marked "QS200".

NSF certified meter: The identification plate on the top of the ultrasonic insert is marked "QS200PW", and the tee body is marked with an NSF certification decal for additional identification.

NOTE: NSF certified meters use the same part number structure as non- NSF models, except for the addition of the "PW" suffix on the end. The "PW" suffix indicates an NSF certified meter. e.g., QS200-15PW.



NSF certification is valid only when product is marked per the above information.

SPECIFICATIONS

	QS200-10	QS200-15	QS200-20	QS200-30	QS200-40
	QS200-10PW	QS200-15PW	QS200-20PW	QS200-30PW	QS200-40PW
Tee Housing Material	SCH 80 PVC (Polyvinyl chloride)				
Insert Housing Material	PPS (Polyphenylene sulfide) / ULTEM® (Polyetherimide)				
Type	Ultrasonic Flowmeter				
Powered by	DC power provided by customer controller 7.5V (dc) min to 36V (dc) max OFF State Current: 200µA (typical)				
Unit of Measure	Controller Dependent				
Flow Rate	0.22-33 GPM 0.83-124.92 L/min 0.1-15 ft/sec	0.55-82 GPM 2.08-310.41 L/min 0.1-15 ft/sec	0.92-138 GPM 3.48-522.39 L/min 0.1-15 ft/sec	2.06-309 GPM 7.80-1169.70 L/min 0.1-15 ft/sec	3.58-537 GPM 13.55-2032.78 L/min 0.1-15 ft/sec
Accuracy	+/- 2% of Reading				
Uncertainty	0.04 GPM 0.018 ft/sec	0.10 GPM 0.018 ft/sec	0.17 GPM 0.018 ft/sec	0.37 GPM 0.018 ft/sec	0.65 GPM 0.018 ft/sec
Max. Working Pressure	203 PSI @ 70°F (10.3 bar @ 21°C)				
Operating Temperature	+32°F to +140°F (0°C to +60°C)				
Storage Temperature	+32°F to +140°F (0°C to +60°C)				
Field Calibration	No				
Inlet / Outlet Connections	1 in. Female Socket	1 1/2 in. Female Socket	2 in. Female Socket	3 in. Female Socket	4 in. Female Socket
Weight	0.95 lbs. (0.43kg)	1.12 lbs. (0.51kg)	1.39 lbs. (0.63kg)	2.52 lbs. (1.14kg)	3.21 lbs. (1.46kg)
INSERTS – ALL METER SIZES					
Transducer Excitation	OFF State Current	200µA (typical)			
	OFF State V-High	Supply Voltage - (OFF State Current x Supply impedance)			
	ON State Current	(Supply Voltage / (Supply impedance + 50Ω))			
	ON State V-Low	ON State Current x 50Ω			
Output Frequency	0 to 100 Hz				
Output Pulse Width	4mSec (Approx.)				

SPECIFICATIONS (Continued)

Dimensions

	QS200-10	QS200-15	QS200-20	QS200-30	QS200-40
	QS200-10PW	QS200-15PW	QS200-20PW	QS200-30PW	QS200-40PW
	1 INCH	1-1/2 INCH	2 INCH	3 INCH	4 INCH
A. Length	4.25 in. (108mm)	4.90 in. (124mm)	5.56 in. (141mm)	6.63 in. (168mm)	7.38 in. (187mm)
B. Height	5.38 in. (137mm)	5.63 in. (143mm)	6.12 in. (156mm)	7.20 in. (183mm)	8.41 in. (213mm)
C. Width (at widest point)	2.50 in. (64mm)	2.50 in. (64mm)	2.88 in. (73mm)	4.18 in. (106mm)	5.23 in. (133mm)
D. Depth	4.47 in. (114mm)	4.47 in. (114mm)	4.94 in. (125mm)	4.91 in. (124mm)	6.17 in. (156mm)
E. Pipe end stop gap	1.97 in. (50mm)	2.12 in. (54mm)	2.53 in. (64mm)	2.88 in. (73mm)	2.88 in. (73mm)

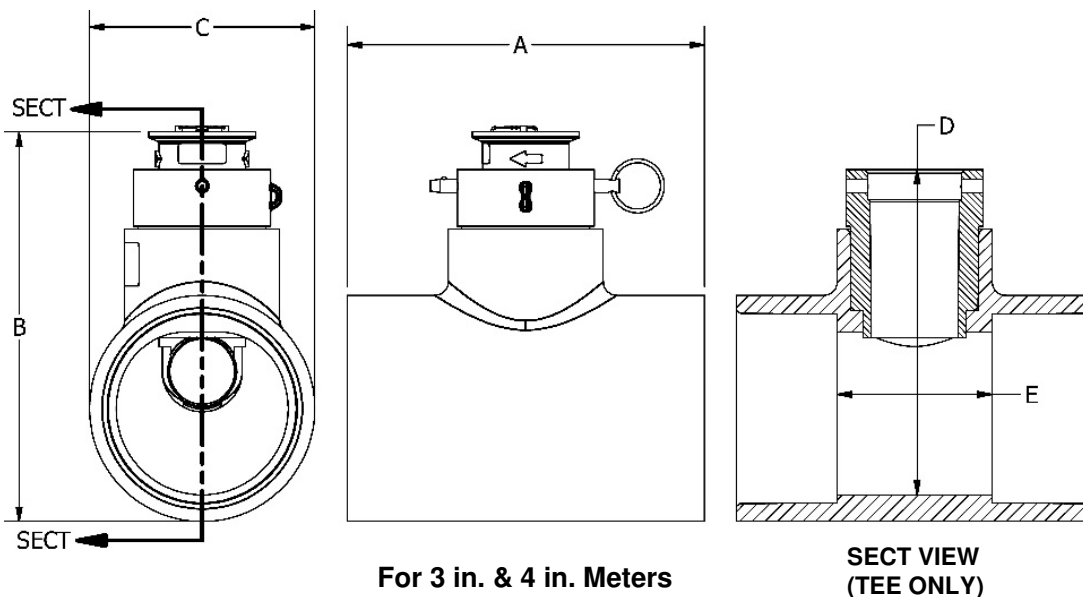
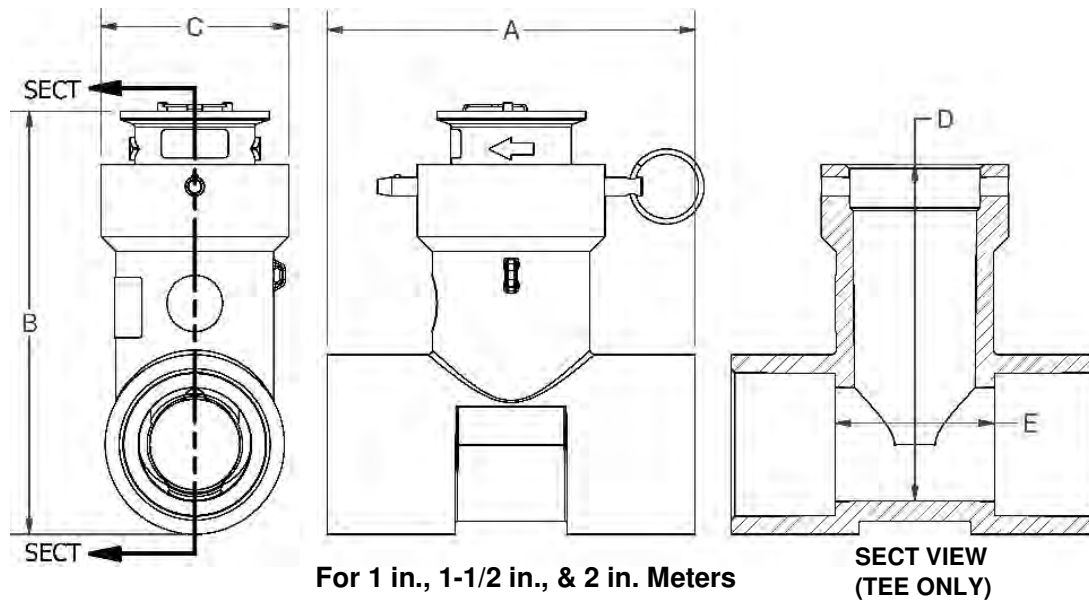


Figure 1

SPECIFICATIONS (Continued)

K-Factor Chart

Meter Model	Size	Adjoining Pipe	Typical ¹ K-Factor	Hydrawise® ² K-Factor (litre/pulse)	Rain Master® K-Factor	Offset	Reference	
							Pulses/Gal	Pulses/Litre
QS200-10	1 in.	Class 200	0.5828	0.0368	159	0	102.96	27.20
		Sch 40	0.5575	0.0352	152	0	107.62	28.43
		Sch 80	0.5354	0.0338	146	0	112.06	29.60
QS200-15	1-1/2 in.	Class 200	0.8028	0.0506	219	0	74.74	19.74
		Sch 40	0.7923	0.0500	216	0	75.73	20.00
		Sch 80	0.7860	0.0496	214	0	76.34	20.17
QS200-20	2 in.	Class 200	1.5067	0.0951	411	0	39.82	10.52
		Sch 40	1.4610	0.0922	398	0	41.07	10.85
		Sch 80	1.4568	0.0919	397	0	41.19	10.88
QS200-30	3 in.	Class 200	4.5283	0.2857	1235	0	13.25	3.50
		Sch 40	4.2630	0.2690	1163	0	14.07	3.72
		Sch 80	4.0850	0.2577	1114	0	14.69	3.88
QS200-40	4 in.	Class 200	8.1967	0.5171	2235	0	7.32	1.93
		Sch 40	8.0881	0.5103	2206	0	7.42	1.96
		Sch 80	7.9062	0.4988	2156	0	7.59	2.00

1

2

K-Factor Information

NOTE: The meter size is molded on the vertical stem of the Tee.

FLOMEC ultrasonic meters use K-Factor plus offset numbers for greater accuracy during calibration. These values are derived by calibrating the meters using NIST traceable instrumentation. Using both sets of values to calibrate the meters provides greater accuracy than using only a K-factor value. The K-factor and offset values for each meter are listed above.

IMPORTANT: The K-factors provided are for reference. Accuracy can be affected by plumbing configuration, fluid condition, adjoining pipe schedule, type of meter tee (non-FLOMEC brand), and entrapped air. Customers should always validate accuracy and adjust K-factor as needed.

If using non-FLOMEC tees, K-Factor will be different from those shown. Inconsistencies with these tees affect any stated value. Customers must verify accuracy if concerned.

INSTALLATION

Below is a typical QS200 meter with labeled components.
Familiarize yourself with the meter before installation.

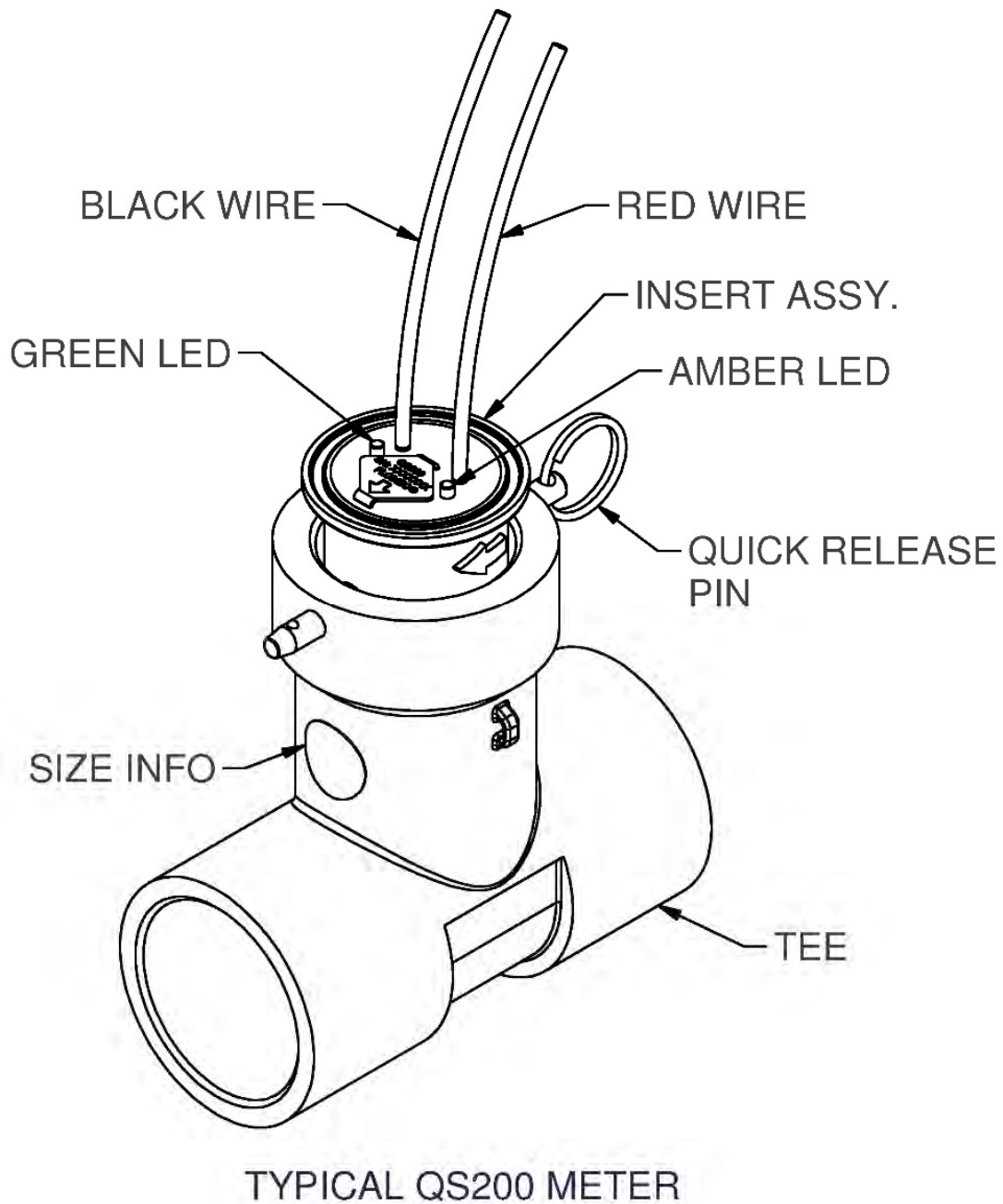


Figure 2

INSTALLATION (Continued)

QS200 ultrasonic sensors should be installed in a ground box with straight runs of pipe equal to 10 pipe diameters upstream, and 5 times the pipe diameter downstream to prevent turbulence that can decrease the sensor's accuracy. Without these straight runs, QS200 sensors will still detect higher and lower than expected flows and unscheduled flows. The arrow embossed on the insert body denotes the flow direction.

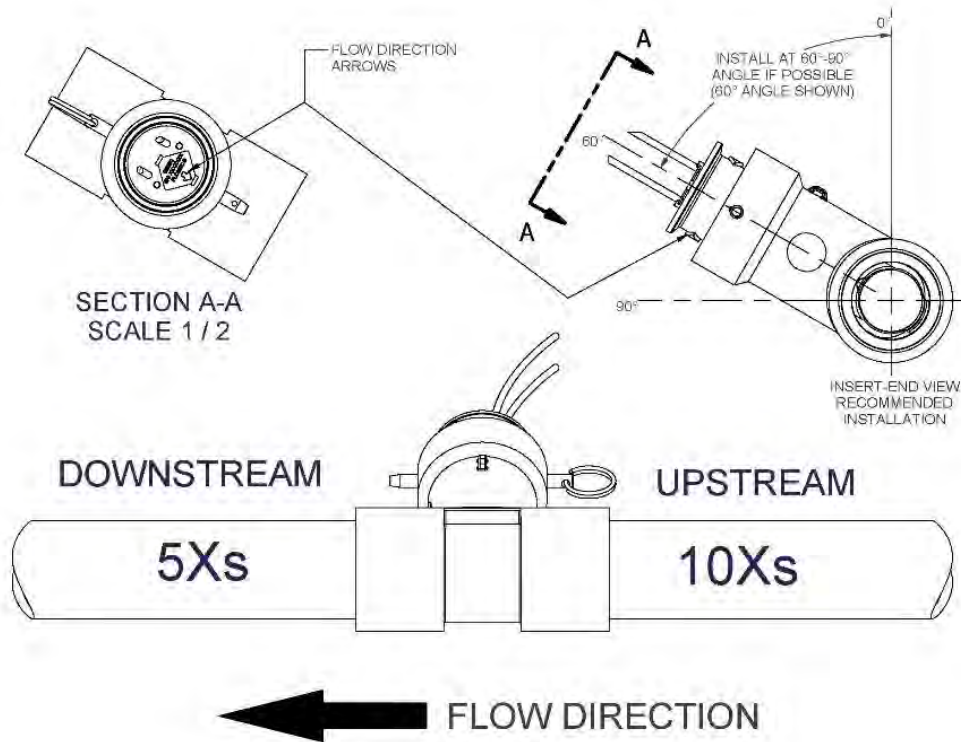


Figure 3

Install Meter onto Pipe

NOTE: There is no need to remove the insert to install the meter. The meter must be installed with the arrow on the insert pointing in the flow direction.

If the meter is accidentally installed backwards, simply remove the insert, rotate 180 degrees so the arrow points in the flow direction, and reinstall the insert.

The Tee is bi-directional; the insert is not. The insert operates correctly as long as the insert arrow is pointed in the direction of flow. The insert can be rotated 180 degrees, so its arrow can always be pointed in the direction of flow regardless of Tee installation.

If space allows, install Tee/insert at a 60° to 90° angle from vertical (see Figure 3).

NOTE: For 1-inch pipe installations, this 60° to 90° angle is especially important for the most accurate meter operation.

Note: Flow must go uphill through the meter, never downhill through the meter to avoid air bubbles or air pockets captured in the Tee.

INSTALLATION (Continued)

1. Remove all burrs from the pipe ends I.D. and O.D. edges and the Tee sockets I.D. edges (see Figure 4).
2. Clean and apply primer to the pipe ends and Tee sockets (see Figure 5)
3. Apply PVC cement to pipe ends and Tee sockets and quickly assemble the parts while the cement is fluid. Follow the cement manufacturer's instructions (see Figure 6).
4. Hold the cemented parts together for at least 30 seconds.

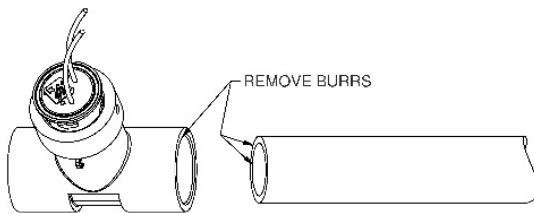


Figure 4

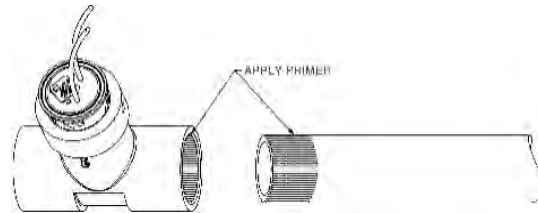


Figure 5

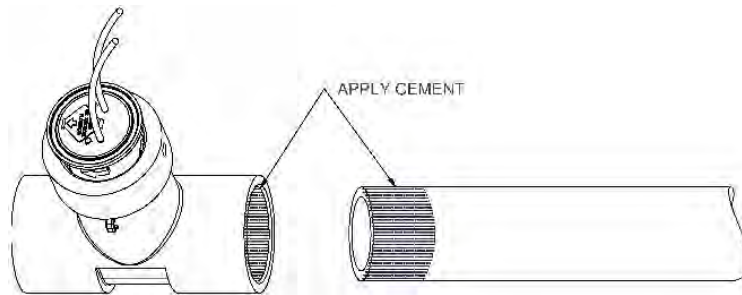


Figure 6

For Below Ground Installation

Install a valve box around the insert. Valve box extensions may be needed, depending on depth (see Figure 7).

NOTE: A minimum of 10 in. thick layer of gravel should be installed immediately below the meter and valve box.

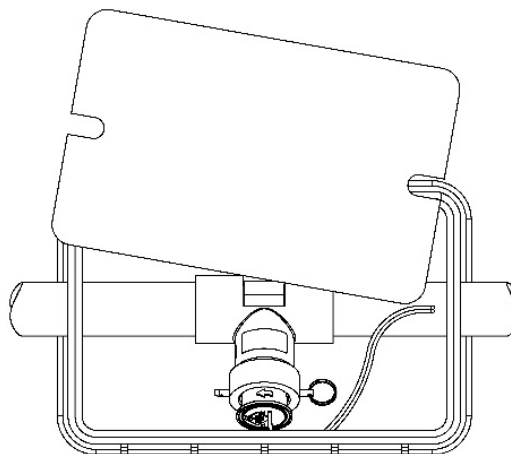


Figure 7

INSTALLATION (Continued)

Wiring Connections

NOTE: Wiring diagram is shown in next section.

1. When using 18 AWG cable, cut off the unused wires so that they are even with the sheath of the cable.

NOTE: For 18 AWG connections, remember the color of the wires you use so that you can make an identical connection with the same wires later.

2. 3M DBR/Y-6 Splice Kit Instructions:



Figure 8a

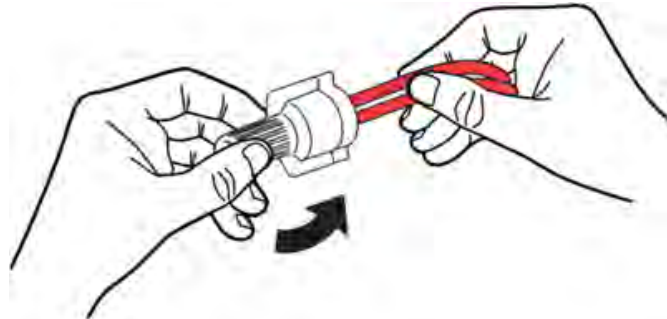


Figure 8b



Figure 8c

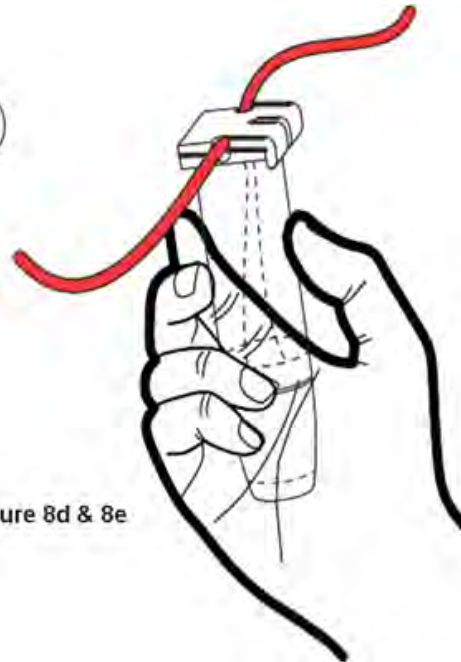


Figure 8d & 8e

INSTALLATION (Continued)

- Strip insulation 3/4 in. (19 mm).
- With wire ends even, insert wires into the connector and tighten until secure.
- Insert the connector all the way into the tube until the connector rests on the bottom of the tube.

NOTE: If having difficulty getting the twist-on connector down into the tube when using small gauge wires, use a thin, non-conductive object to push the connector to the bottom of the tube. Upon removal of the object, ensure that no voids or water paths remain in the grease.

- Fold the wires into the channels.
- Close the cap

Wiring Connections

This diagram shows connection to a RAIN BIRD® Flow Smart Module. Connections to other flow controllers may vary.

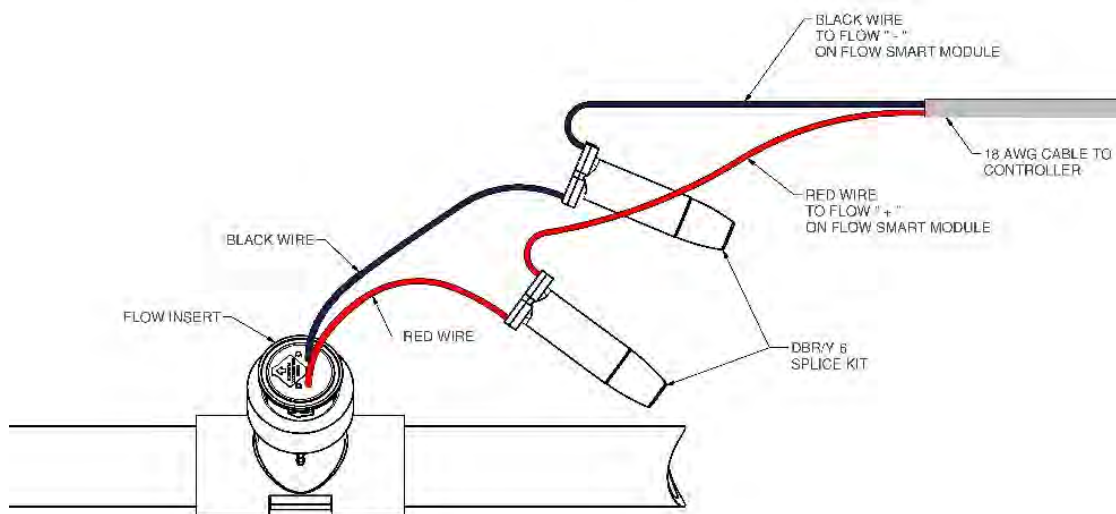


Figure 9

OPERATION

Each QS200 meter is shipped with two K-factor decals (placed loose inside the owner's manual packet). One is to affix on or near the installed meter for on-site use if desired. The other decal is to affix to a convenient spot on or near the controller for immediate reference if desired.

LEDs Functionality

There are two LEDs on the QS200 product. The GREEN LED is used to indicate basic power and functionality of the meter. The AMBER LED is used to indicate that there is a flow of water through the QS200 meter insert. The LEDs will behave in the following manner to indicate different modes of operation:

MODE	LED BEHAVIOR
Power Disconnected or Meter Failure:	Both GREEN and AMBER LEDs are OFF.
No Flow Low Power Mode:	GREEN LED flashes ON/OFF at a rate of approximately 2 blinks per second.
No Flow or Reverse Flow Active Mode:	GREEN LED flashes ON/OFF at a rate of approximately 8 blinks per second.
Low Flow Active Mode:	GREEN LED flashes ON/OFF at a rate of approximately 8 blinks per second and the AMBER LED flashes ON/OFF at a rate that is proportional to the rate of water flow thru the meter.
**High Flow Active Mode:	GREEN LED flashes ON/OFF at a rate of approximately 8 blinks per second and the AMBER LED will appear to be constantly ON, but will be dim.

****NOTE:** To save power it is normal for the LEDs to be dim when flashing at higher flow rates. At very high flow rates, the AMBER LED will appear to be constantly ON but dim.

TROUBLE SHOOTING

1. The LEDs are the primary indicators of meter performance. Refer to the Operations Section for LED indicating functionality.
2. Entrained air is air bubbles suspended in the water flow. Entrained air creates errors in accuracy of ultrasonic technology meters. Recommend a maximum of 10% entrained air in the water flow.
3. Flow must go uphill through the meter, never downhill through the meter to avoid air bubbles or air pockets captured in the Tee.
4. The faces of the transducers need to be clean and free of oily substances for accurate operation. Do not touch transducers with fingers, oily rags, etc.

DO NOT use wire brushes or abrasives to clean the faces of the transducers (see Figure 10).

5. Ensure the flow direction arrow is pointing in the direction of flow for correct LED functionality.
6. Ensure the quick release pin is installed in the tee to maintain pressure and alignment of the insert in the tee.

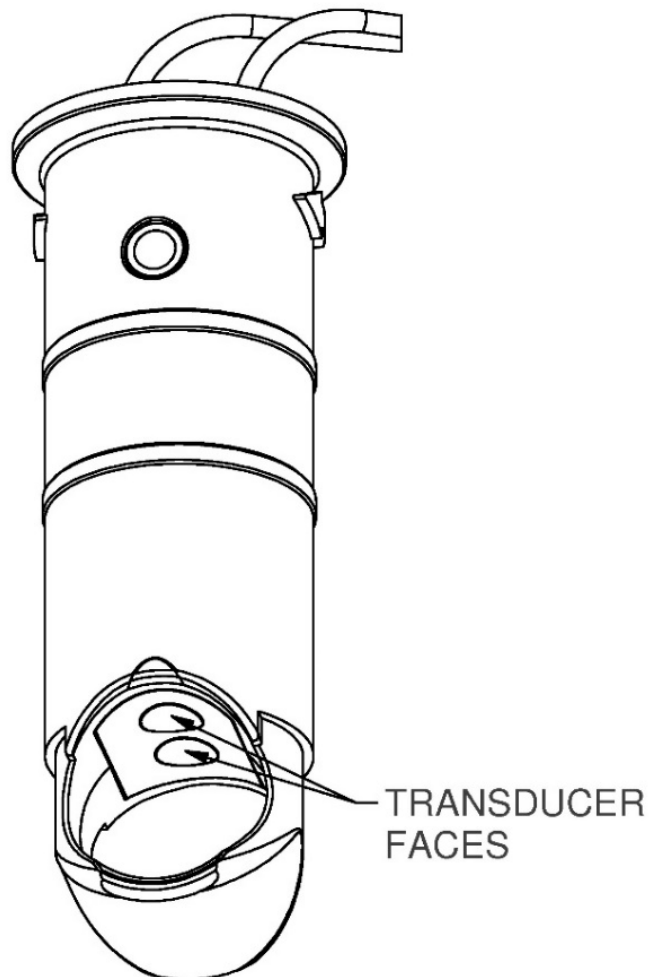


Figure 10

REPAIR

QS200 Insert Replacement and

QS200 Retrofit Insert Installation Instructions

NOTE: These instructions are intended to assist in replacing the insert in an existing FLOMEC[®] QS200 ultrasonic Meter.

These instructions also apply when a FLOMEC QS200 insert is used as a replacement insert in other brands of Tee type meters that have an obsolete or unreliable insert.

The FLOMEC QS200 is a direct replacement for a paddle wheel type insert in most meters that have a Tee type housing.

⚠ CAUTION Keep the new insert free of dirt and debris during installation.

Check Meter Size

If your flow controller requires a meter K-factor, use the K-factor for your size meter (see SPECIFICATIONS section). If the meter size is unknown, it is easily determined using one of the following methods (for FLOMEC and other brands):

1. Dipstick Method (For 2 in., 3 in. and 4 in. meters only): The interior depth of the meter body indicates its size. To check, remove the old insert from the meter body and insert the end of a stiff tape measure down into the insert bore until it touches the bottom of the meter body bore. Read the depth shown on the tape measure at the top of the Tee housing (see Figure 11) and compare with dimension "D" in the specifications section (see Figure 1).
2. Line Pipe Size Method: Normally, the line pipe size is the same as the meter size. Figure 12 shows line pipe sizes.

NOTE: FLOMEC Tees are marked with hallmark of size, part number, SCH80 and pressure.

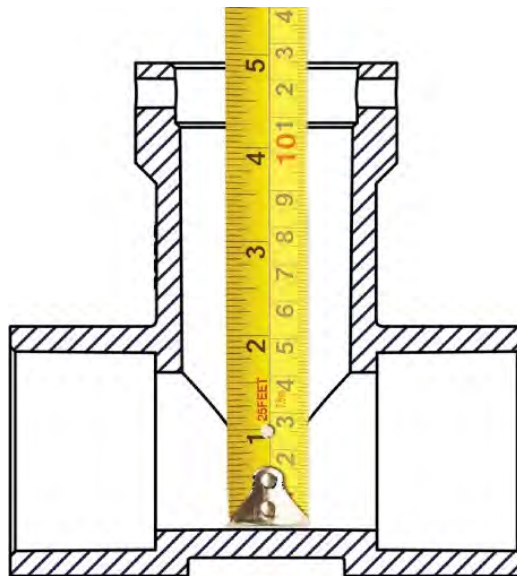


Figure 11

REPAIR (Continued)

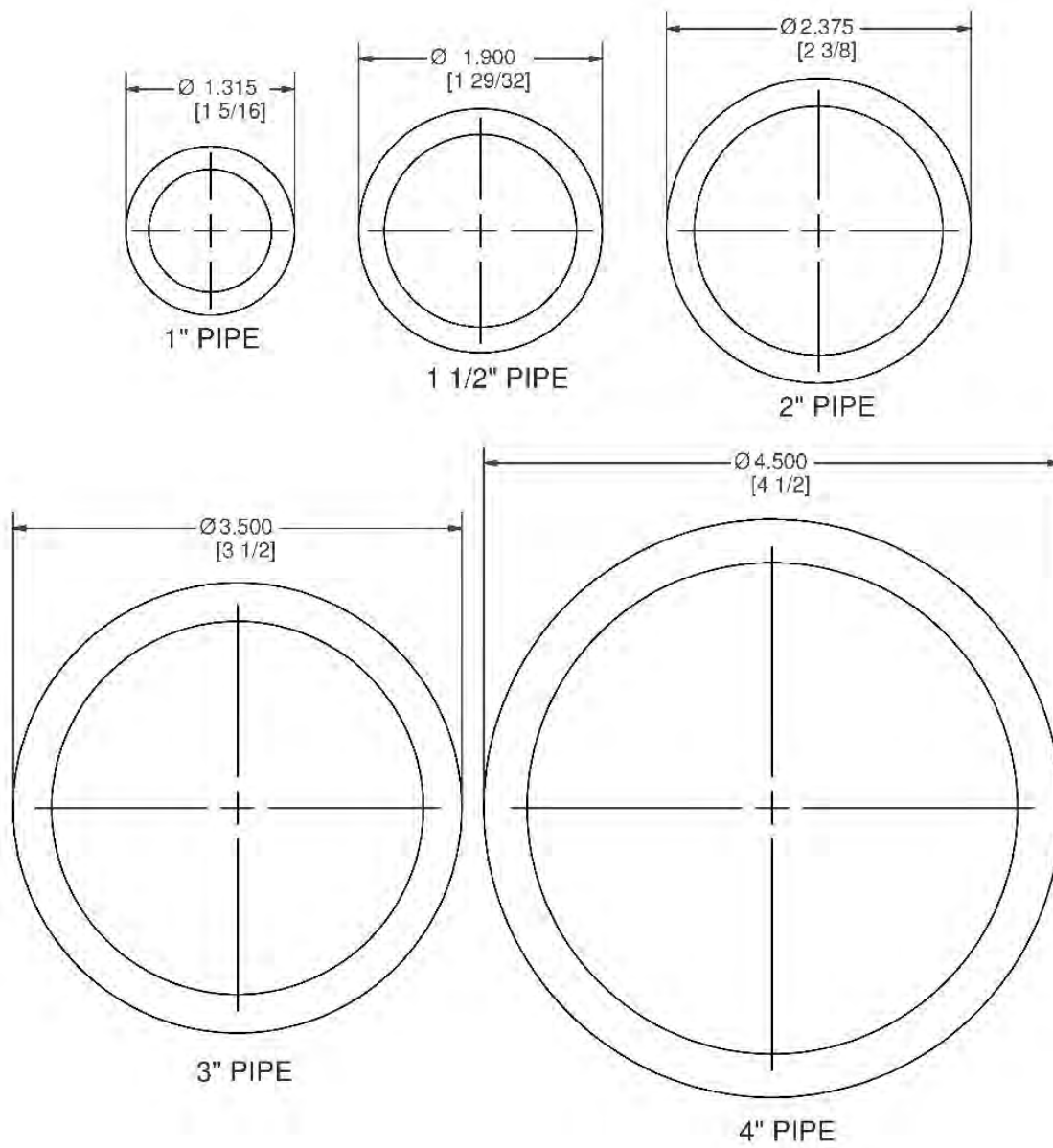


Figure 12

REPAIR (Continued)

Remove Old Insert From Tee

1. Clean all dirt and debris away from the immediate area of the old insert and the top of the meter then pull out the quick release pin from the meter (see Figure 13).
2. Remove the old insert. Grasp the insert flange with your hand and pull straight up and out of the Tee, making sure no dirt or other particles fall into the insert bore of the meter (see Figure 14).

NOTE: The FLOMEC Multi-Tool (P/N 146055-501) can be used to make removal of old insert easier (see Figure 17).

NOTE: When replacing another manufacturer's insert with the QS200 Retrofit Insert, the old insert could have a sediment or mineral buildup and need to be leveraged out of the tee.

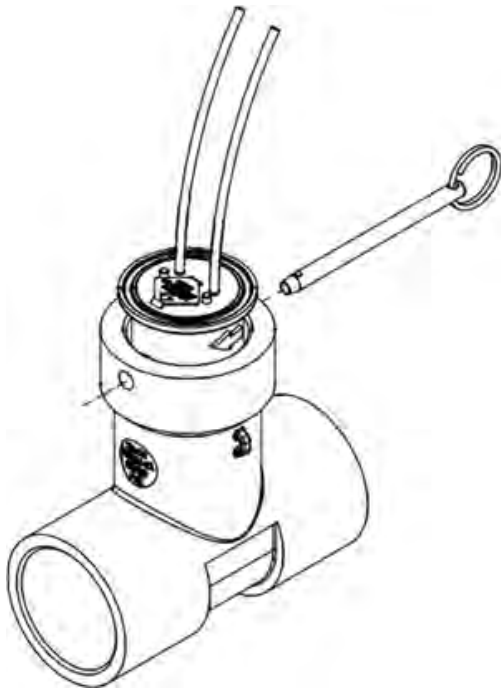


Figure 13

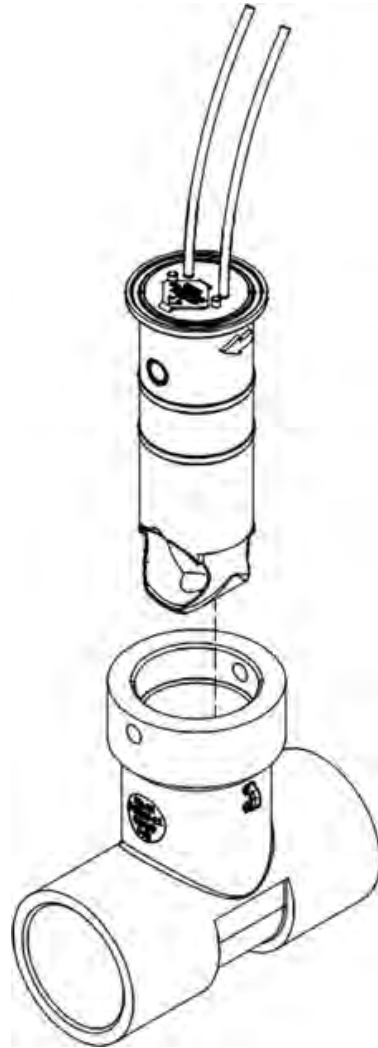


Figure 14

REPAIR (Continued)

Install New or Replacement Insert Into Tee

1. The Tee insert bore must be clean before installing the insert and the (2) black O-rings on the insert should be fully lubricated.
2. Orient the insert over the insert bore so that the arrow on the insert is pointing in the direction of flow.
3. Insert the insert straight down into the Tee.
4. Push down on the insert flange and twist slightly to install, and to align the retaining pin holes in the insert with the holes in the Tee (see Figure 15).

NOTE: The FLOMEC Multi-Tool (P/N 146055-501) can be used to make installing new insert easier (see Figure 18).

NOTE: The O-rings on the outside of the QS200 Retrofit Insert are square profile O-rings. When installing in another brand of Tee, if the insert fits too tight into the Tee, replace the square profile O-rings with the round profile O-rings included with the QS200 Retrofit Insert. Their installation could make installation easier in tight fitting Tees. The O-rings must be fully lubricated before insert installation.

5. Next, replace the quick release pin (see Figure 16).
6. Using the splicing and wiring information (see WIRING CONNECTIONS and WIRING DIAGRAM in the INSTALLATION section), connect the wiring from the new insert to the wiring cable of the controller.
7. Energize the insert and verify that it is operating properly (see Troubleshooting section if required).

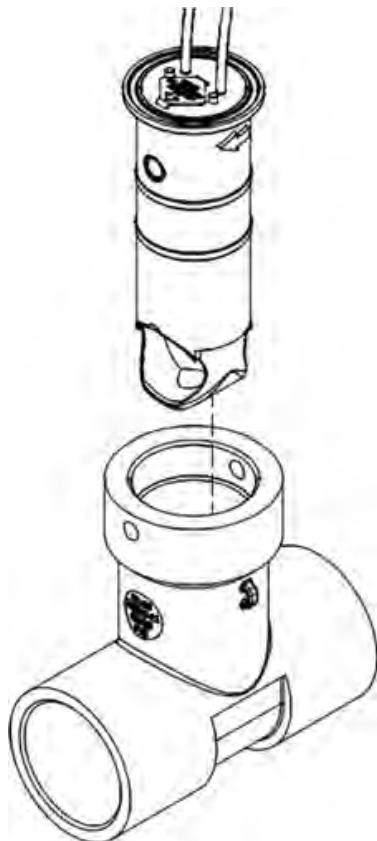


Figure 15

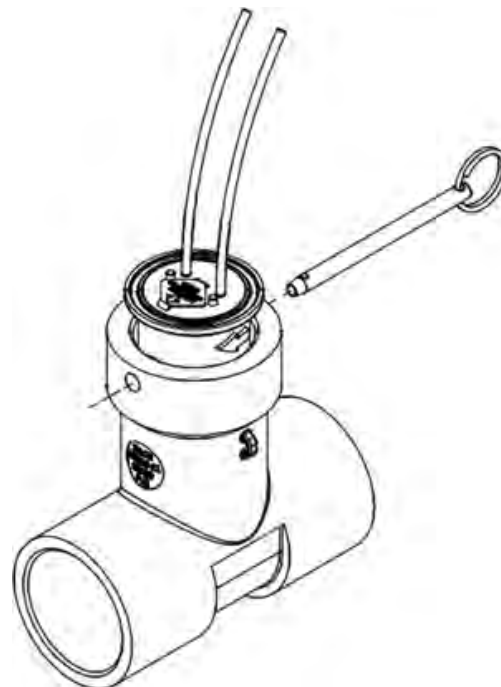


Figure 16

REPAIR (Continued)

Using the FLOMEC Multi-Tool

The multi-tool was designed exclusively for tee type meters that use an insertion type insert. It facilitates easier removal of the insert, whether from a QS200 meter or other brands of tee type insertion meters.

It is especially useful when attempting to remove an old, inoperative, or inaccurate insert from another brand of tee type insertion meter for replacement with a QS200 insert.

The multi-tool is versatile, compact and fits easily into the valve box for close quarters use.

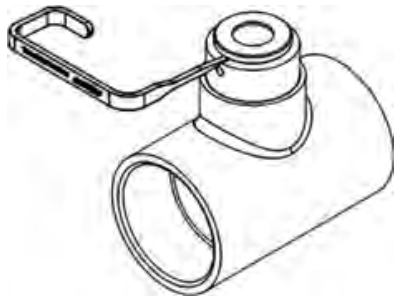
The pointed end is designed for use as:

1. A versatile pry bar and driving wedge. On other brands of tee type insertion meters, when the insert lip may be too close to the top of the tee to use the U-formed end of the multi-tool, use the pointed end (as pry bar or driving wedge) between the insert lip and top of the tee to break the insert loose and gain room between the insert lip and tee to use the U-formed end to lever the insert up and out.
2. An alignment tool to align the pin holes of the new insert with the pin holes in the tee.
3. A cleaning tool for clearing debris from the valve box lid groove or other crevices.

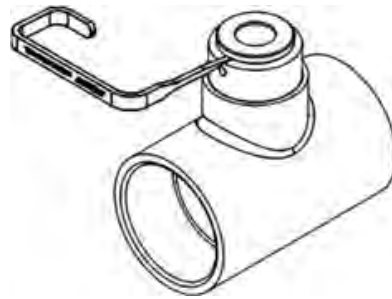
The U-formed end is designed for use as:

4. A handle for leverage when using the pointed end.
5. A levering tool by slipping the U-formed end around the insert between the insert lip and the top of the tee. This positions the tool for use as a lever for levering inserts up and out of the tee for replacement. It can be levered up or down, and can be rotated to any quadrant around the insert in order to give the best position for leverage.

The multi-tool (P/N 146055-501) is a separate item available to the customer, and is listed in the repair parts list near the back of the manual.

REPAIR (Continued)**Remove Old Insert From Tee using FLOMEC Multi-Tool**

PRY UP
To break a stuck insert loose



DRIVING WEDGE
To lift insert more

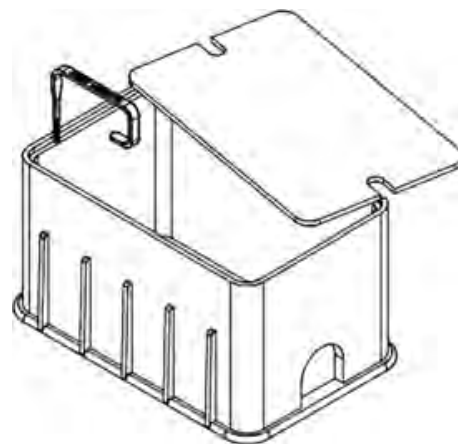


LEVERAGE
To lift insert up and out

Figure 17

Install New QS200 Insert using FLOMEC Multi-Tool

PIN HOLE ALIGNMENT
For easy pin install

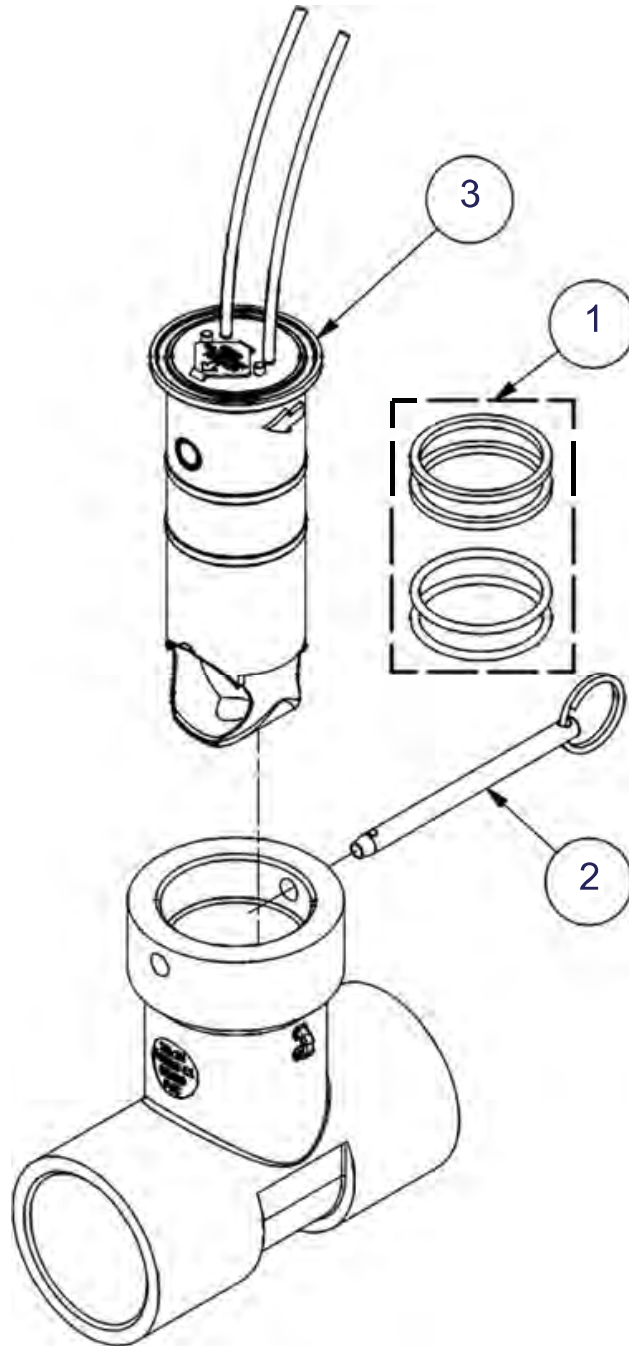


CLEAN LID GROOVE
Remove dirt, roots, debris

Figure 18

REPAIR PARTS ILLUSTRATION FOR QS200**⚠ CAUTION**

Do not return this product without prior approval from the GPI Customer Service Department. Due to strict government regulations, GPI cannot accept parts unless they have been drained and cleaned.



REPAIR PARTS LIST FOR QS200

Ref. No.	Description	Part Number
1	O-Ring Seal Kit Includes (2) square profile O-rings & (2) round profile O-rings	146500-01
2	Hardware Kit Includes (1) quick release pin	146500-02
3	Ultrasonic Insert Includes (1) insert assembly w/square profile O-rings, (2) round profile O-rings, (1) quick release pin, (2) K-factor decals & (1) owner's manual	QS200
-	Housing, 1 inch tee, PVC, Spare	146010-511
-	Housing, 1-1/2 inch tee, PVC, Spare	146015-511
-	Housing, 2 inch tee, PVC, Spare	146020-511
-	Housing Assembly, 3 inch tee, PVC, Spare	146030-512
-	Housing Assembly, 4 inch tee, PVC, Spare	146040-512
-	Multi-Tool, Spare	146055-501

PARTS & SERVICE

For warranty consideration, parts, or other service information, please contact your local distributor.

To obtain prompt, efficient service, always be prepared with the following information:

- The model number of your meter.
- The serial number or manufacturing date code of your meter.
- Part descriptions and numbers.

For warranty work, always be prepared with your original sales slip or other evidence of purchase date.

IMPORTANT: Please contact GPI before returning any parts. It may be possible to diagnose the trouble and identify needed parts in a telephone call.



FLOMEC® TWO-YEAR LIMITED WARRANTY

Great Plains Industries, Inc. hereby provides a limited warranty against defects in material and workmanship on all products manufactured by Great Plains Industries, Inc. This product includes a 2-year warranty. Manufacturer's sole obligation under the foregoing warranties will be limited to either, at Manufacturer's option, replacing or repairing defective Goods (subject to limitations hereinafter provided) or refunding the purchase price for such Goods theretofore paid by the Buyer, and Buyer's exclusive remedy for breach of any such warranties will be enforcement of such obligations of Manufacturer. The warranty shall extend to the purchaser of this product and to any person to whom such product is transferred during the warranty period.

The warranty period shall begin on the date of manufacture or on the date of purchase with an original sales receipt. This warranty shall not apply if:

- A. the product has been altered or modified outside the warrantor's duly appointed representative;
- B. the product has been subjected to neglect, misuse, abuse or damage or has been installed or operated other than in accordance with the manufacturer's operating instructions.

To make a claim against this warranty, or for technical assistance or repair, contact your FLOMEC distributor



The company will step you through a product troubleshooting process to determine appropriate corrective actions.

GREAT PLAINS INDUSTRIES, INC., EXCLUDES LIABILITY UNDER THIS WARRANTY FOR DIRECT, INDIRECT, INCIDENTAL AND CONSEQUENTIAL DAMAGES INCURRED IN THE USE OR LOSS OF USE OF THE PRODUCT WARRANTED HEREUNDER.

The company herewith expressly disclaims any warranty of merchantability or fitness for any particular purpose other than for which it was designed.

This warranty gives you specific rights and you may also have other rights which vary from U.S. state to U.S. state.

NOTE: In compliance with MAGNUSON MOSS CONSUMER WARRANTY ACT – Part 702 (governs the resale availability of the warranty terms).

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