

Micro Motion™ Retractable Fork Meter



Safety messages

Safety messages are provided throughout this manual to protect personnel and equipment. Read each safety message carefully before proceeding to the next step.

Safety and approval information

This Micro Motion product complies with all applicable European directives when properly installed in accordance with the instructions in this manual. Refer to the EU Declaration of Conformity for directives that apply to this product. The following are available: the EU Declaration of Conformity, with all applicable European directives, and the complete ATEX installation drawings and instructions. In addition, the IECEx installation instructions for installations outside of the European Union and the CSA installation instructions for installations in North America are available at Emerson.com or through your local Micro Motion support center.

Information affixed to equipment that complies with the Pressure Equipment Directive, can be found at Emerson.com. For hazardous installations in Europe, refer to standard EN 60079-14 if national standards do not apply.

Other information

Troubleshooting information can be found in the appropriate Configuration and Use Manual. Product data sheets and manuals are available from the Micro Motion website at Emerson.com.

Return policy

Follow Micro Motion procedures when returning equipment. These procedures ensure legal compliance with government transportation agencies and help provide a safe working environment for Micro Motion employees. If you fail to follow Micro Motion procedures, then Micro Motion will not accept your returned equipment.

Return procedures and forms are available on our web support site at Emerson.com, or by calling the Micro Motion Customer Service department.

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1 About this document

The Micro Motion Retractable Fork Meter Installation Manual provides basic guidelines for the mechanical functionality and installation of a retractable fork meter. This manual covers the components supplied by Emerson. It is possible for users to supply some of these components themselves. User-supplied components may change the dimensions called out in this manual.

Retractable Fork Meter components

The Retractable Fork Meter assembly can include the following components:

- Retractable fork meter, retractor mechanism, and calibration reports
- Mounting hardware which includes the isolation valve and weld-o-let both with flanged connections
- Bolts, nuts, and gaskets
- Optional test certificates and other documentation

Retractable Fork Meter user-supplied components

The Retractable Fork Meter requires these additional pieces of equipment that must be supplied by the user:

- Retractable mechanism support
- Hot-tapping drilling device

2 Installation of a retractable fork meter

2.1 Step 1: Location and orientation of the retractable fork

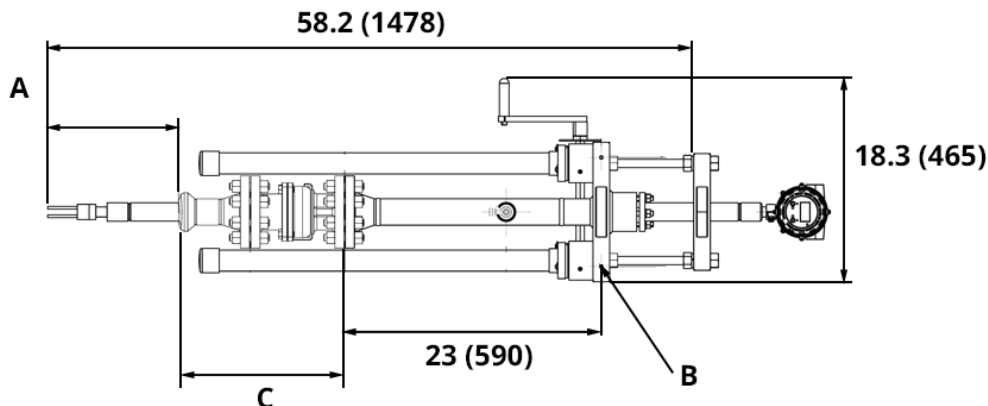
For best performance and proper support, it is recommended to install the retractable fork assembly horizontally. Verify that you meet the clearance requirements for the retractor handle and body before welding the mounting hardware into place. See [Figure 2-1](#).

Note

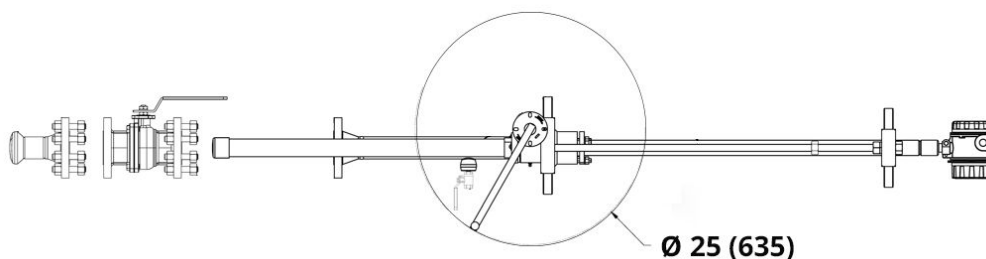
- If you must install the retractable fork assembly vertically, please contact Micro Motion for more information on the installation requirements.
 - Mounting hardware can be supplied by Micro Motion and will meet the dimensions listed. In the event that the mounting hardware is supplied by the end-user, the dimensional requirements must be followed.
-

Figure 2-1: Clearance requirements

Top down view



Side view



Dimensions are in inches (mm).

- A. Maximum insertion is 7.2 in. (183 mm).
- B. Assembly to be supported at points shown using customer-supplied standoffs and $\frac{3}{8}$ -16 UNC bolts.
- C. The distance from the front of the weld-o-let to the back of the ball valve must be a minimum of 13.3 in. (338 mm) and a maximum of 18.4 in. (468 mm).

Note

- Maximum insertion is dependent on the length of the combined weld-o-let and valve, shown as dimension C.
- For customer-supplied mounting hardware, the total length of this dimension C must be between 13.3 in. (338 mm) and 18.4 in. (468 mm). Equipment supplied by Micro Motion meet these dimensions.
- Maximum insertion example: CL600 weld-o-let 6.8 in. (173 mm), typical valve 11.5 in. (292 mm) total = 18.319 in.

2.2 Step 2: Install the flanged mounting hardware

The flanged mounting assembly includes hardware that is critical in properly aligning and orienting the retractable fork assembly horizontally to the pipeline and ensures correct drilling of the mounting hole. The mounting hardware is an assembly kit which consists of: the isolation valve, the weld-o-let, and associated gaskets.

Note

If mounting hardware is supplied by Micro Motion, all necessary fasteners will be included.

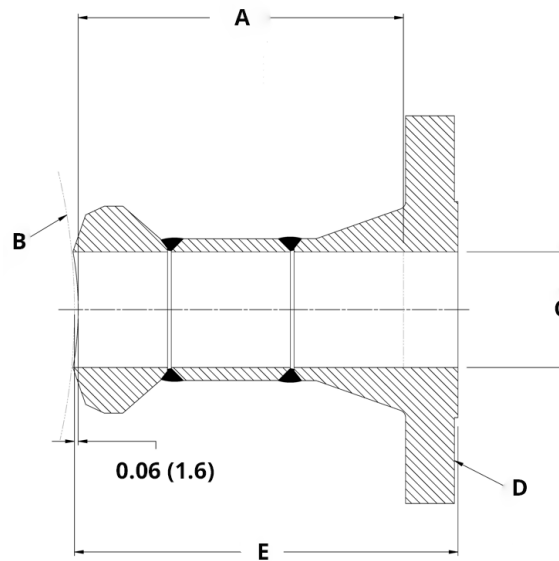
Procedure

1. At the predetermined location on the side of the pipeline, place the flanged assembly on the pipe. Be sure to align the weld-o-let contour to fit the pipe radius, with a gap of 1/16 in. (1.6 mm), and measure the distance from the outer diameter of the pipe to the face of the weld-o-let flange. Compare this length to [Table 2-1](#) for reference.

Table 2-1: Emerson supplied Weld-o-let dimensions

Flange rating	Dimension
150 #	6.19 in. (157 mm)
300 #	6.44 in. (164 mm)
600 #	6.82 in. (173 mm)

Figure 2-2: Weld-o-let dimensions

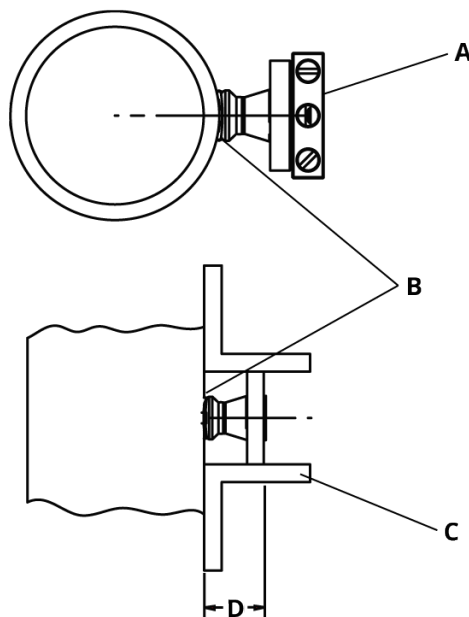


Dimensions in inches (mm).

- A. Bore to be smooth in this area, minimum 5.7 in. (145 mm)
- B. Note the pipe OD
- C. Nominal 2-in. Schedule 80—Ø 1.94 in. (49.2 mm)
- D. Nominal 2-in. ASME B16.5 Flange
- E. Weld-o-let dimension, see [Table 2-1](#).

2. Place four 4-in. (6 mm) tack welds at 90° increments. Check both the parallel and perpendicular alignment of the flanged mounting to the axis of flow (see [Figure 2-3](#)).

Figure 2-3: Weld-o-let installation



- A. Level used to check parallel alignment
- B. Tack welds
- C. Square(s) used to check perpendicular alignment
- D. Length of the weld-o-let. Refer to [Table 2-1](#) and [Figure 2-2](#).

3. Weld the hardware into place according to the local codes.



CAUTION

To avoid serious burns, allow the mounting hardware to cool before continuing the installation.

2.3 Step 3: Install the isolation valve

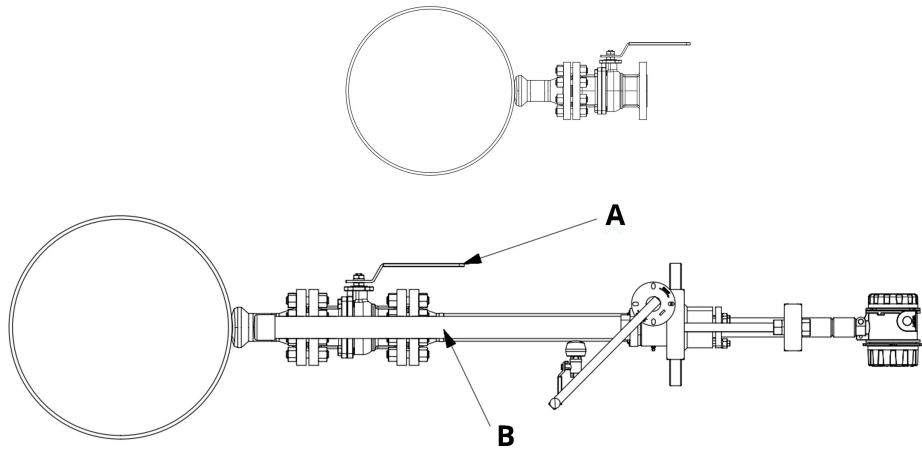
Procedure

1. Position the isolation valve onto the mounting flange. Ensure the valve stem is positioned so that when the retractable fork assembly is installed, the valve handle will be centered between the drive rods (see [Figure 2-4](#) and [Figure 2-5](#)).
2. Fasten the isolation valve to the mounting using gasket, bolts, and nuts (if supplied). Ensure that the valve handle is oriented so that the handle will be facing upward.

Note

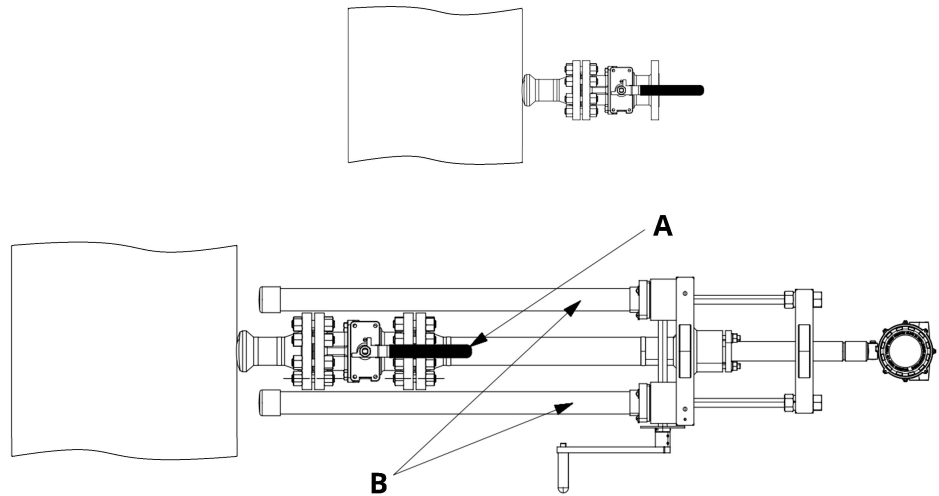
Interference will occur if the valve is located inline with the rods.

Figure 2-4: Isolation valve stem orientation (side view)



- A. Valve handle
- B. Drive rod(s) (side view)

Figure 2-5: Isolation valve stem orientation (top view)



- A. Valve handle
- B. Drive rods (top view)

2.4 Step 4: Mount the drilling machine

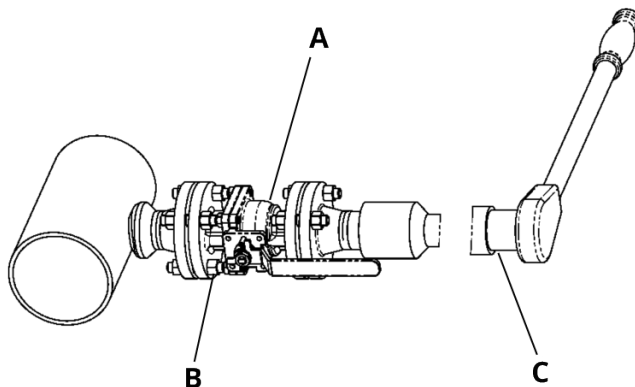
Important

The drilling machine is not provided with the retractable fork assembly.

Procedure

1. Mount the drilling machine to the isolation valve (see [Figure 2-6](#)).
2. Open the valve fully.
3. Drill the hole into the pipe wall in accordance with the instructions provided by the drilling machine manufacturer. The hole size should be as large as possible, but within the flanged mounting dimensions [recommended hole size: 1 7/8 in., maximum hole size: 1 15/16 in.].
4. Retract the drilling machine fully beyond the valve.

Figure 2-6: Drilling assembly



- A. Isolation valve is fully open when inserting the drill
- B. Isolation valve is fully closed after withdrawing the drill
- C. Pressure drilling machine

2.5 Step 5: Remove the drilling machine

Procedure

1. Verify that the drilling machine has been retracted past the valve.
2. Close the isolation valve to isolate the process.
3. Relieve the drilling machine pressure and remove.
4. Check isolation valve and mounting for leakage.

2.6 Step 6: Mount the retractable fork

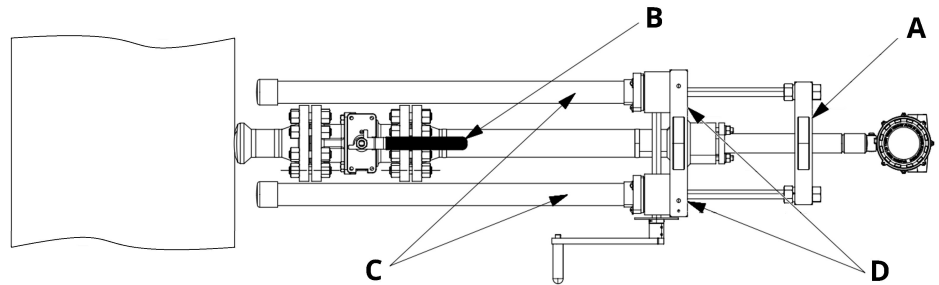
Important

Because the retractable fork assembly carries a large amount of weight, the assembly requires additional customer-supplied supports. The support plate has threaded holes (3/16-16 UNC) to attach these additional support standoffs.

Procedure

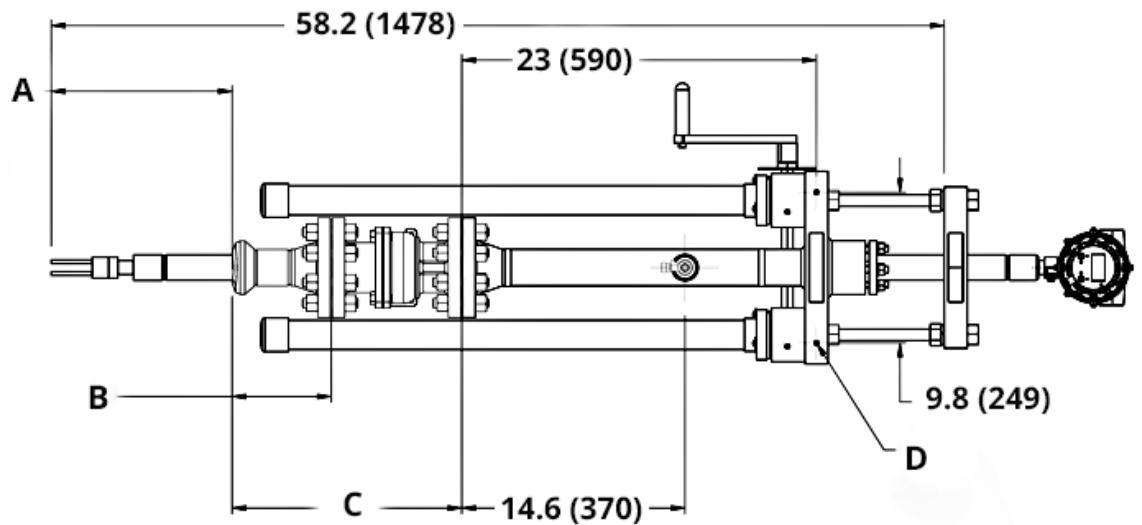
1. Fully retract the assembly before mounting.
2. Align retractable fork with the head plate (below electronics) horizontally, with the drive rods straddling the valve handle (see [Figure 2-7](#)).

Figure 2-7: Retractable fork assembly alignment (top view)



- A. Head plate
- B. Valve handle
- C. Drive rods (with PVC protector rod assembly installed)
- D. Support plate with two $\frac{3}{8}$ UNC threaded holes

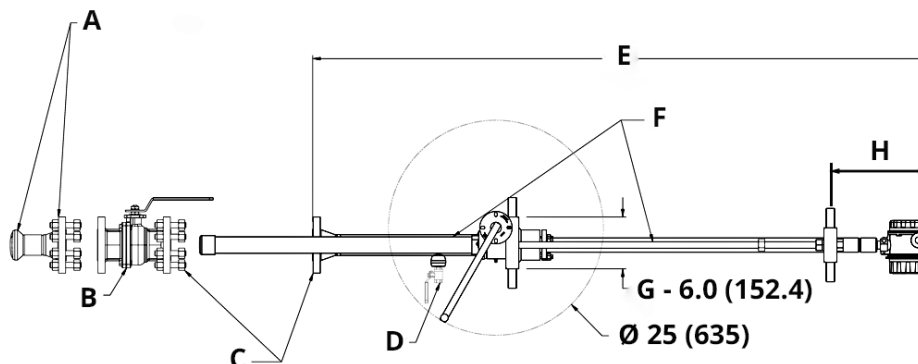
Figure 2-8: Retractable fork assembly alignment (top view)



Dimensions are in inches (mm).

- A. Maximum insertion is 7.2 in. (183 mm), ANSI 600# Class.
- B. Weld-o-let length, see [Table 2-1](#).
- C. Length of combined weld-o-let and valve, 13.3 in. (338 mm) minimum; 18.4 in. (468 mm) maximum
- D. Assembly to be supported at points shown using customer-supplied standoffs and two $\frac{3}{8}$ -16 UNC bolts.

Figure 2-9: Retractable fork assembly alignment (side view)



Dimensions are in inches (mm).

- A. 2-in. RFWN mounting flange and ftg. (CS) studs, nuts (CS) and gasket (304 SS/MICA)
- B. 2-in. ball valve (CS)
- C. 2-in. RF cage nipple flange (SS) studs, nuts (CS) and gasket (304/MICA)
- D. ¼ NPT ball valve (SS)
- E. Fully retracted maximum clearance is 69.1 in. (1755 mm).
- F. Insert or retract mechanism with 41.63 in. long guide rods handle (CS).
- G. Assembly to be supported at points shown using customer-supplied standoffs and ¾-16 UNC bolts.
- H. Length of transmitter from head plate is 9.4 in. (239 mm).

3. Use the supplied gaskets and flange bolts to fasten the retractable fork assembly to the isolation valve.
4. Tighten the nuts in a cross-pattern to compress the gasket evenly.
5. Install the supplied ¼-in. drain valve in the ¼-in. NPT port (see Figure 2-9, D for location of the port). Ensure that the drain valve is closed before proceeding.
6. Quickly open and close the isolation valve to pressurize the assembly.

! CAUTION

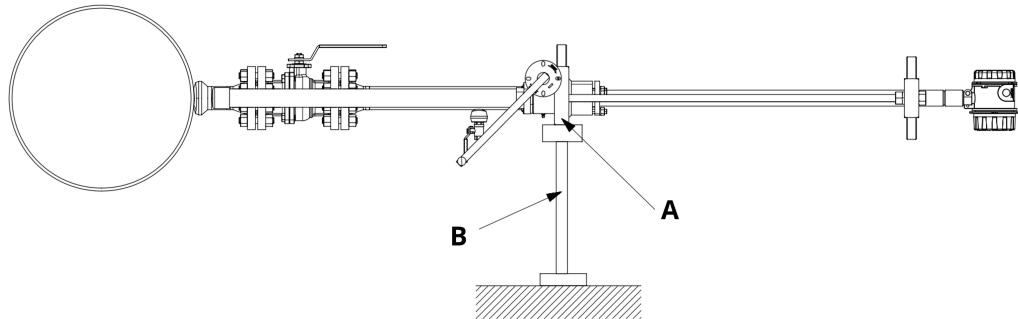
During installation, there is a potential for leakage at the packing. Use extreme caution if the flowing medium is steam or is a caustic material.

7. Check the entire installation for leakage. Tighten as required to stop any connection from leaking. Repeat tightening until there is no leakage.
8. Place the PVC protector rod assembly over the drive rods and attach to gear drive with supplied hardware (see Figure 2-7).

2.7 Step 7: Support the retractable fork

The retractable fork assembly must be supported to prevent bending of the assembly and possible misalignment. Failure to properly support the assembly can lead to damage to the device.

Figure 2-10: Retractable fork assembly support (side view)



- A. Support plate with two $\frac{3}{8}$ UNC threaded holes
- B. Customer-supplied support

2.8 Step 8: Insert the retractable fork

The retractable fork tine location depends on the process fluid characteristics. Position the retractable fork tines according to the flow rates and viscosity limits shown below.

- The retractable fork is shipped with a 2-in. schedule 80 calibration as standard. The supplied flanged mounting (weld-o-let) is designed to accommodate this calibration.

! CAUTION

Verify that the ball valve is open before inserting the retractable fork. Damage to the assembly will occur if the tines collide with the ball valve.

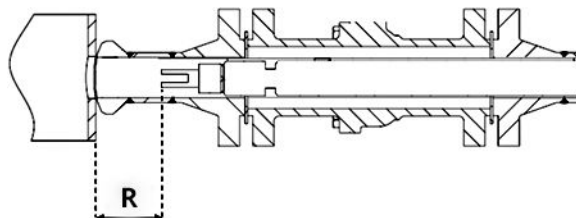
Procedure

1. Determine the right tine location according to [Table 2-2](#) and [Figure 2-11](#).

Table 2-2: Tine recess location according to flow velocity and viscosity limits

Fluid velocity and viscosity in the mainline	Appropriate tine location
1.5 to 10 ft/s (0.5 to 3 m/s) Up to 200 cP	End of the tines should be retracted 1 in. (25.4 mm) into the nozzle from pipe wall.
10 to 13 ft/s (3 to 4 m/s) Up to 200 cP	End of the tines should be retracted 1½ in. (38.1 mm) into the nozzle from the pipe wall.
13 to 16 ft/s (4 to 5 m/s) Up to 200 cP	End of the tines should be retracted 2 in. (50.8 mm) into the nozzle from the pipe wall.

Figure 2-11: Tine location (top view)



- The tines may also be placed inside the main line for free stream applications. These applications require a calculated calibration offset. The maximum tine insertion (into the main line) is 7.2 in. (183 mm).

Note

Please contact Micro Motion Flow for further support on viscosities above 200 cP.

CAUTION

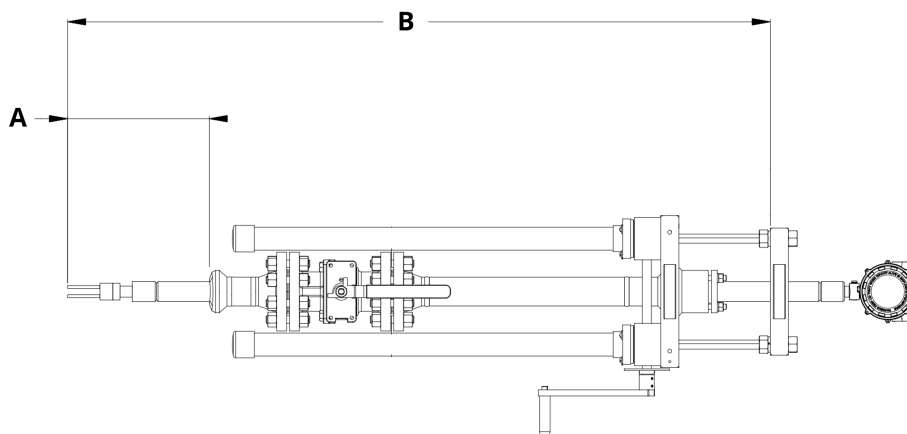
Damage to the assembly will occur if the tines collide with the pipe wall.

Note

With the assembly fully retracted, the end of the fork tines are even with the top flange opening.

2. The total length from the tip of the tines to the inside face of the head plate is 58.2 in. (1478 mm).

Figure 2-12: Total Length (top view)



- A. Maximum insertion is 7.2 in. (183 mm) for ANSI 600# Class.

Note

Maximum insertion is based on components supplied by Micro Motion. Customer supplied weld-o-let or valve may change this dimension.

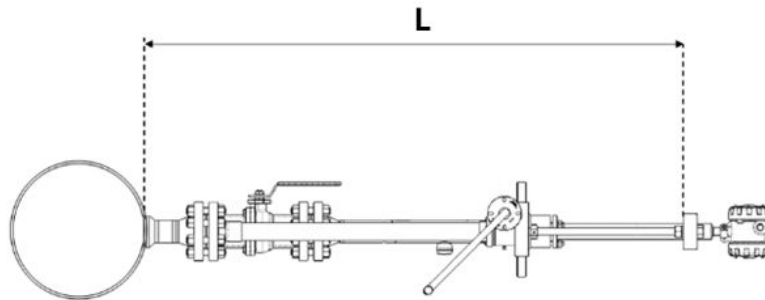
- B. Measured from plate to tip is 58.2 in. (1478 mm).

Depending on the determined tine recess location (previous step), the distance between the pipe wall and the inside face of the head plate can then be used to properly locate the tines into the correct position by using [Table 2-3](#) and [Figure 2-13](#).

Table 2-3: Proper distance between the pipe wall and the head plate based on required tine location

Required tine recess location	1 in. (25.4 mm)	1.5 in. (38.1 mm)	2 in. (50.8 mm)
Pipe wall to inside face of the head plate distance (L)	59.2 in. (1503 mm)	59.7 in. (1516 mm)	60.2 in. (1529 mm)

Figure 2-13: Pipe wall to inside face of the head plate distance



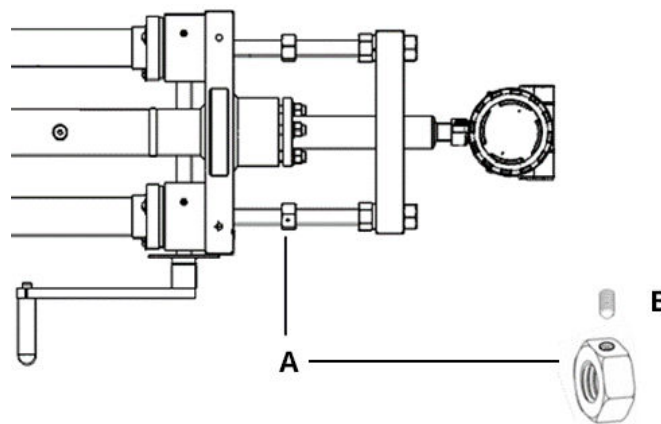
3. Rotate the crank clockwise until the head plate is positioned in the determined location.

Note

If a power drill with an adapter is used, do not exceed 200 rpm.

4. Adjust the drive rod nut to the overall dimension. Lock the nuts into place with the set screw.

Figure 2-14: Drive rod nut



- A. Drive rod nut
- B. Set screw

 **CAUTION**

If during the process of positioning the fork, the crank mechanism should feel hard to operate and the required L distance hasn't been reached, make sure the isolation valve is fully open, otherwise, irreversible damage will occur to the sensor.

2.9 Step 9: Retract the retractable fork (when needed)

Procedure

1. Remove the drive lock pin.
2. Rotate the crank counter-clockwise. Retract until the rod end nuts are against the gear box mechanism.

Note

If a power drill with an adapter is used, do not exceed 200 rpm.

3. Close the isolation valve completely.
4. Depressurize the assembly using the drain valve.

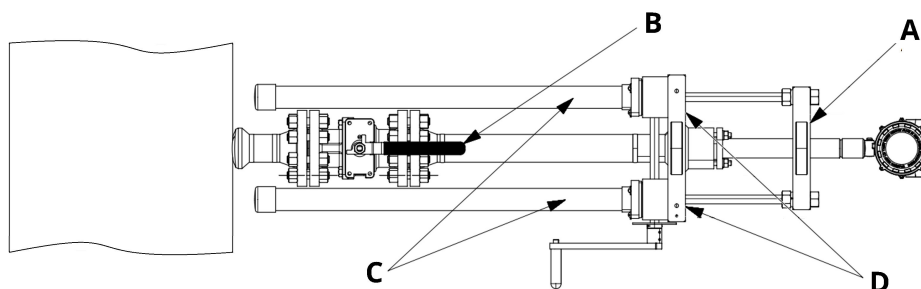
A Alignment of the retractable fork assembly

Twisting or movement may cause the fork tines to become misaligned with the weld-o-let and the retractor flange. If this occurs, the tines can be realigned using the following process.

Procedure

1. Align the retractable fork with the head plate horizontally, with the drive rods parallel to the valve handle (see [Figure A-1](#)).

Figure A-1: Retractable fork assembly alignment



- A. Head plate
- B. Valve handle
- C. Drive rods (with PVC protector installed)
- D. Drive plate

2. To align the tines and retractable assembly, ensure the head plate (A) and drive plate (D) are parallel with each other. Adjust the assembly as needed to make the head plate and drive plate parallel both top-to-bottom and side-to-side.

B Full insertion and retraction dimension

Figure B-1: Fully retracted dimensions

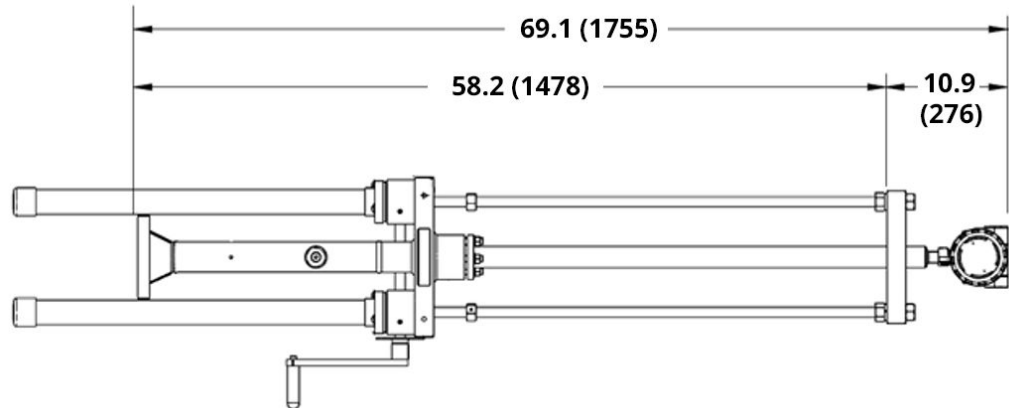
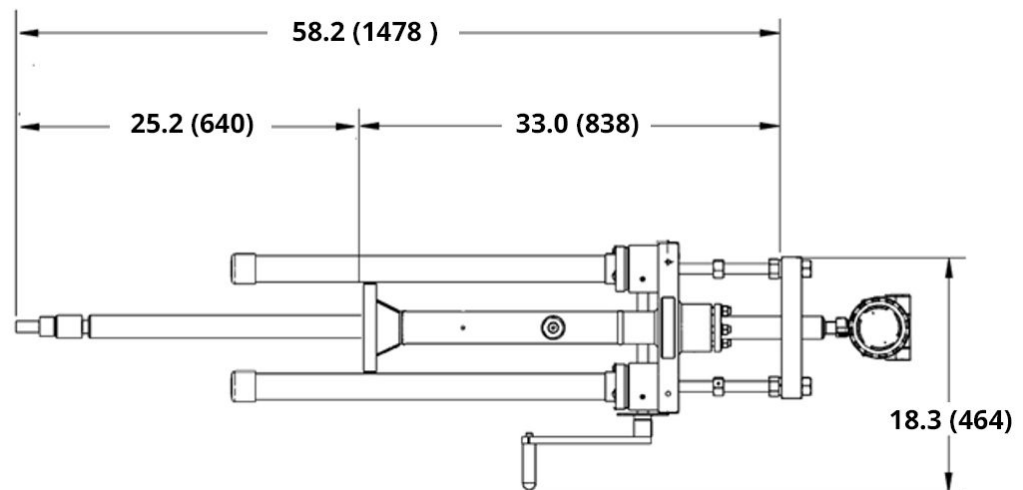


Figure B-2: Fully inserted dimensions



Dimensions are in inches (mm).



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