Propeller Meter

Mc Propeller Flow Meters

Installation, Operation and Maintenance Manual

24517-11 Rev. 4.6
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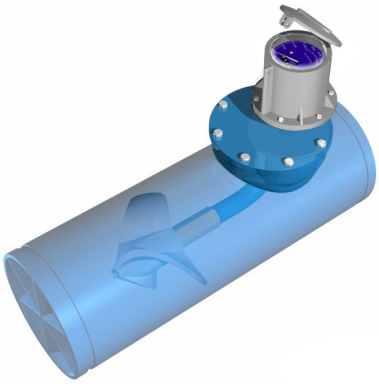
McCROMETER

Contents

1.0 INTRODUCTION

Propeller flow meters are widely accepted as a proven technology for measuring flow with high accuracy and excellent repeatability. McCrometer Inc. produces propeller flow meters used around the world for agricultural, municipal, and industrial applications. Typical Mc Propeller flow meter configurations are shown in Figure 1 below.

1.1 Model Types



Removable Top-Plate - MG900 Shown

Saddle Type - M0308 Shown

Open Flow - M1700 Shown

Fixed Ell - MF100 Shown

Figure 1. Typical Mc Propeller Flow Meter Configurations

1.2 Typical Applications

- Sprinkler irrigation systems
- Center pivot systems
- Farm turnouts from irrigation districts
- Drip irrigation systems
- Golf course and park management
- Remote indication, totalizing, & recording
- Commercial nurseries
- Multi-stage pump actuation and control
- Raw water intake
- Water and wastewater management
- Plant effluent
- Valve actuation and control
- Return activated sludge
- Hot water & petroleum mixtures
- Process batching & chemical feed

2.0 SPECIFICATIONS

The measuring element of a propeller flow meter consists of a rotating device, called a rotor or propeller. Positioned in the center of the flowstream, the propeller rotates at a rate proportional to the velocity of the fluid through the flow meter. This rotation can be transmitted mechanically to a register assembly and the fluid's volumetric flowrate and accumulated volume can then be displayed.

2.1 General Specifications

SIZES AVAILABLE	2" to 96"
FLOWRATES AVAILABLE	40 to 75,000 GPM
TURNDOWN	up to 15:1
ACCURACY	±2%
REPEATABILITY	±0.25%
RATED PRESSURE	150 PSI to 300 PSI
RATED TEMPERATURE	160° F to 180° F

DESCRIPTIONS:

TURNDOWN: Propeller meters are specified to work within a certain range of flowrates. Turndown is the ratio of the maximum flowrate to the minimum flowrate of the meter. A typical turndown of an 8" meter is 15:1. (e.g., max. flow 1500 gpm to min. flow = 100 gpm)

ACCURACY: Accuracy is the relation between the volume shown on the meter's totalizer and the actual volume of fluid which has passed through the meter. McCrometer guarantees that the meter will report within ±2% of the actual flow if it is normally operated between its minimum and maximum rates of flow.

REPEATABILITY: Flow meter repeatability is the ability of a meter to reproduce a measurement under similar conditions. This is not by itself a measure of accuracy, but rather a component of the meter's total accuracy. McCrometer propeller meters have a repeatability of ±0.25%.

PRESSURE: The pressure rating for standard propeller meters is 150 PSI. This pressure rating refers to the constant line pressure in the pipe. Some models can be rated up to 300 PSI. Higher pressures are available on special request.

TEMPERATURE: The temperature rating for standard propeller meters is 160° F constant temperature. This temperature rating refers to fluid temperature. Most standard models can be upgraded to 180° F constant temperature on special request.

2.2 How to Read a Totalizer

The following guidelines should be helpful for reading totalizers on Mc Propeller flow meters:

Most totalizers have "multipliers". Multipliers are always a multiple or fraction of ten which are used to multiply the direct reading of the totalizer.

Reading a 6-Digit Totalizer

Gallons: A meter that totalizes in gallons will have a multiplier of times 10, times 100, or higher. That means that the meter is read not as gallons, but as tens of gallons or hundreds of gallons.

Acre Feet: A meter that totalizes in acre feet will have a multiplier of times .01, times .001, times .0001, or smaller. The digit counters on the right side are colored yellow to indicate where a decimal point should be placed when reading the totalizer.

Max capacity: 99,999,900 gallons	Max capacity: 999.999 AFT
In this example, the correct reading is 9,254,500 gallons.	In this example, the correct reading is 92.545 acre feet.

Figure 2. Totalizer In Gallons x 100

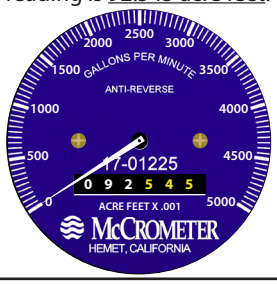


Figure 3. Totalizer in Acre Feet x .001

Reading a 7-Digit Totalizer

The 7-digit totalizer for gallons and acre feet is read the same as described above. See maximum possible values for each multiplier.

When reading a totalizer, be sure to add the correct number of zeroes or to place the decimal point in the right place. If a mistake is made, the meter reading can be off by a factor of 10, 100, or even 1000 units.

Max capacity: 999,999,000 gallons	Max capacity: 9,999.999 AFT
In this example, the correct reading is 9,254,500 gallons.	In this example, the correct reading is 92.545 acre feet.

Figure 4. Totalizer In Gallons x 100

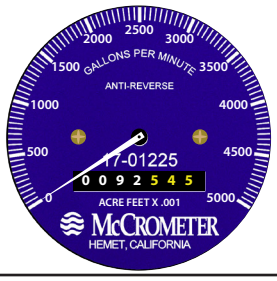


Figure 5. Totalizer In Acre Feet x .001

2.3 Understanding the Register Gear Ratio

Each register has a gear ratio that is matched to the propeller. For instance, consider an 8" McCrometer meter totalizing in gallons. A standard 8" meter will have a gear ratio of 400:1, which means the propeller must rotate 400 times for the first odometer wheel to turn one complete revolution. This first odometer wheel usually symbolizes a certain multiple of the totalizing units, called a multiplier. Since the totalizer on the 8" meter has a multiplier of times 100 (signified by two zeros to the right of the odometer wheels), each number on the first odometer wheel represents one hundred gallons.

Therefore, one complete rotation of the first odometer wheel is ten times one hundred gallons, or 1000 gallons. So remembering the gear ratio for this example is 400 propeller revolutions to one full turn of the odometer wheel, 400 propeller revolutions equals 1000 gallons.

Example: Standard 8" meter: 400 propeller revolutions = 1 rev. of odometer wheel = 1000 gallons

***NOTE* Each line size has its own gear ratio. Registers from different size meters cannot be interchanged freely.** Be sure you know your meter's gear ratio and multiplier for reference.

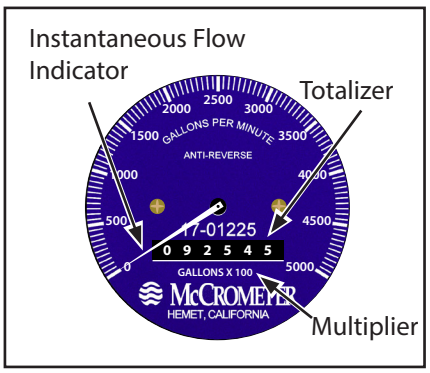
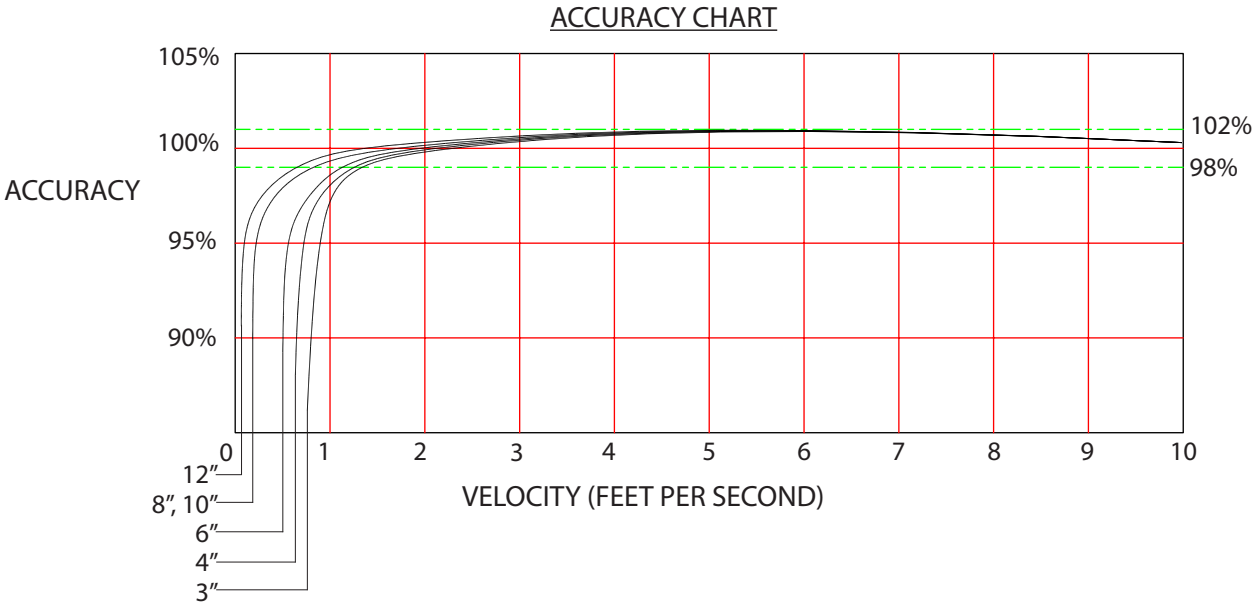


Figure 6. Typical Dial Face

2.4 Accuracy

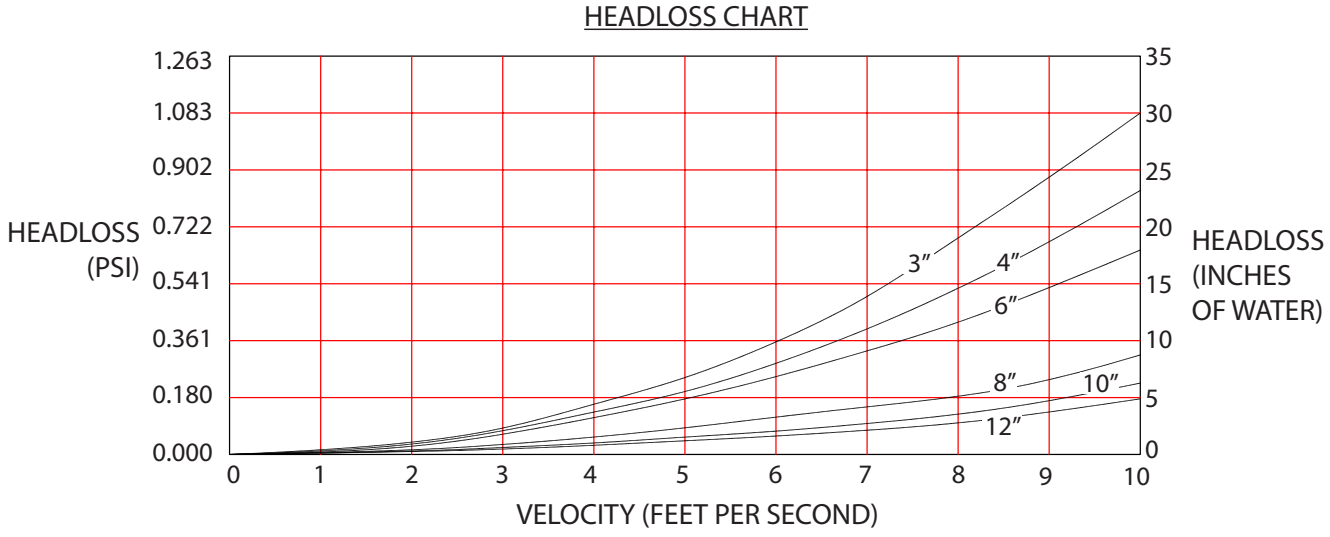


Standard flowrates for McCrometer propeller meters are shown below. Readings are guaranteed accurate within ±2% in these flowrates. Please note that over 80 percent of the meter's flow range, the accuracy is better than ±1%.

Nominal Meter Size	2″	2.5″	3″	4″	6″	8″	10″	12″	14″	16″	18″	20″	24″
Minimum Flow(U.S.GPM)	40	40	40	50	90	100	125	150	250	275	400	475	700
Maximum Flow(U.S.GPM)	250	250	250	600	1200	1500	1800	2500	3000	4000	5000	6000	8500
Dial Face Range	250	250	250	800	1300	2500	3000	4000	6000	8000	10000	10000	15000

2.5 Headloss

Headloss refers to the fluid pressure lost due to the meter. Propeller meters have very low permanent headloss as seen in the chart below.



Nominal Meter Size	3″	4″	6″	8″	10″	12″	14″	16″	18″	20″	24″
Max. Headloss (in. H_20 column)	30	23	17	7	4	3	2	2	2	1	1

3.0 INSTALLATION INSTRUCTIONS

Proper meter installation is the first step to ensure excellent meter performance. Follow these instructions closely. Consult an authorized service representative or the factory for any circumstances encountered which are not covered in this manual.

All McCrometer products are tested and inspected during manufacture and prior to shipping. An inspection should be performed at the time of unpacking to detect any damage that might have occurred during shipment.

3.1 Safety

WARNING

WARNING!
NEVER ATTEMPT TO REMOVE A METER WHILE THE LINE IS UNDER PRESSURE!

- Any person installing, inspecting, or maintaining a McCrometer flow meter should have a working understanding of piping configurations and systems under pressure.
- Before adjusting or removing any meter, be certain the system has depressurized completely.
- Be careful when lifting meters. Meters can cause serious injury if lifted incorrectly or dropped.
- Only necessary and appropriate tools should be used when working on a meter. For tools list see page 12.
- Before starting a system, make sure all connections are properly secured. Keep a safe and prudent distance away from the meter during system start-up.

3.2 Basic Installation Steps

IMPORTANT

NOTE
When cutting a hole in the pipe is required, be sure to use the provided template. It is recommended that four holes be drilled at the corners of the square for guiding the cut. It is also recommended that the cut be made on the inside of the lines that are drawn from the template.

1. Apply MolyKote lubricant or equivalent to the saddle gasket and the ID of the U-bolts.
2. Place saddle with gasket in place over the cut out.
3. Place U-bolts underneath the pipe and through the saddle clips.
4. Place the provided washers and nuts on the U-bolts that have been installed through the saddle clips.
5. Start tightening down the nuts ***evenly in a diagonal or figure 8 pattern***.
   5a. Tighten the nuts to **40 ft. lbs.**
   5b. Tighten the nuts to **60 ft. lbs.**
   5c. Tighten the nuts to **80 fts. lbs.**
6. Go back around and loosen all of the nuts. Do not back the nuts completely off of the U-bolts. The goal is to release force and tension off of the saddle and the gasket.
7. Repeat steps 5a through 5c exactly as described. Any step that is skipped may result in an improper seal.
8. Apply pressure/turn on pump.
9. Verify the saddle is not leaking water. If it is, repeat steps 6 through 8 until the saddle has sealed.

3.3 Straightening Vanes

Special attention should be given to systems using two elbows "out of plane" or devices such as a centrifugal sand separator. (See Figure 7.) These cause swirling flow in the line that affect propeller meters. Well developed swirls can travel up to 100 diameters downstream if unobstructed. Since most installations have less than 100 diameters to work with, straightening vanes become necessary to alleviate the problem. (See Figure 8.) Straightening vanes will break up most swirls and ensure more accurate measurement.

McCrometer's mainline meters like the MW500 series have vanes included as a standard feature. If your model does not have straightening vanes (e.g., M0300 Bolt-On Saddle series), McCrometer actively encourages installing vanes just ahead of the meter. Straightening vanes are available in weld-in, bolt-in, and the FS100 and FS200 Flow Straightener. (See Figure 9) For more information on vane installation, please visit www.mccrometer.com and download the following McCrometer documents:

- 24510-72 Installation Instructions For Bolt-In Vanes
- 24517-03 Flow Straightener Installation Instructions

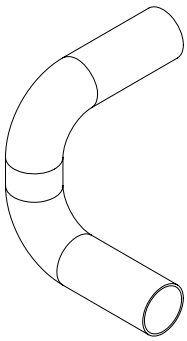


Figure 7. Elbows out of plane

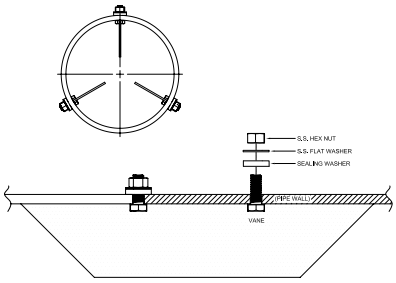


Figure 8. Bolt-in straightening vanes

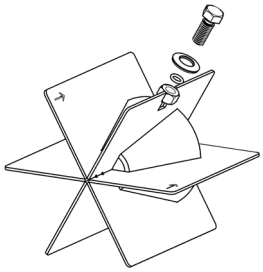


Figure 9. Flow Straightener

3.4 Other Installation Considerations

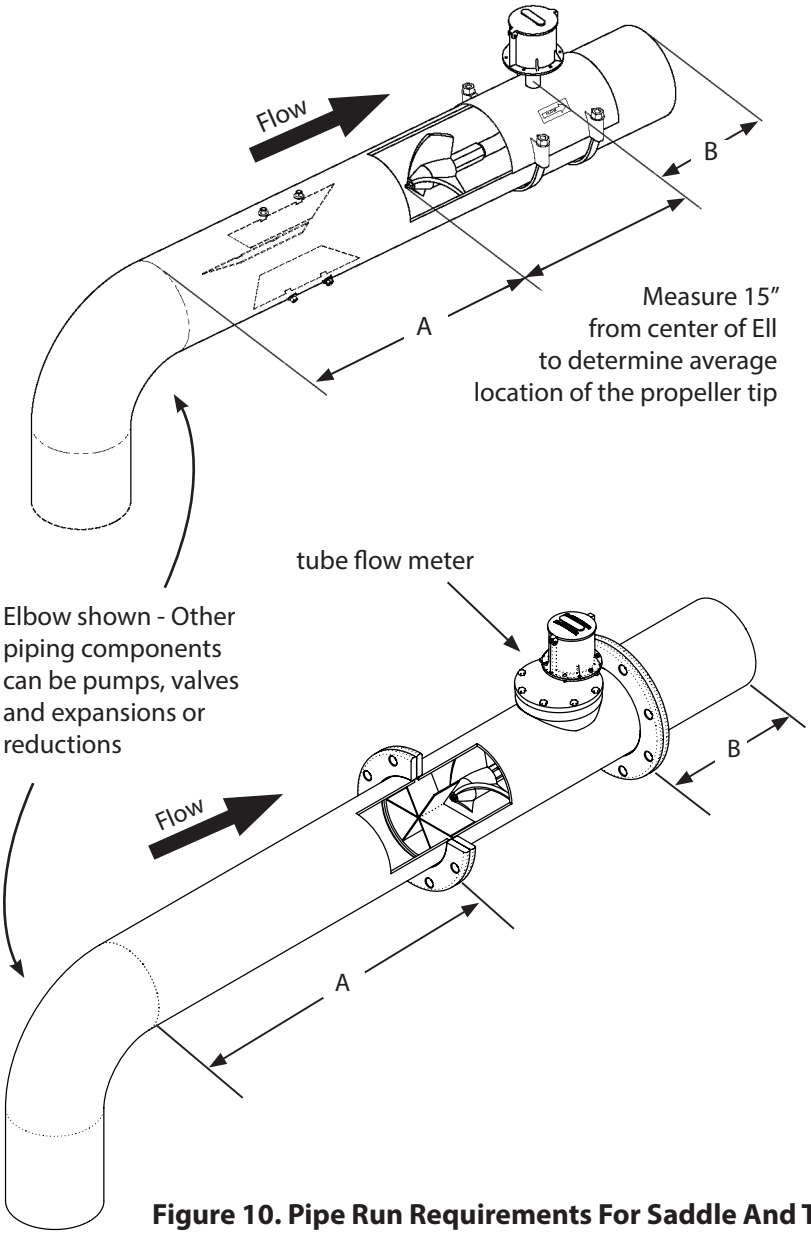
- All propeller flow meters are calibrated for a full pipeline only; if less, the flow meter will over register the flow. Although a minimum line pressure is not necessary for an accurate measurement, a full pipe is necessary.
- Mc Propeller flow meters can be mounted either horizontally or vertically. Mc Propeller flow meters are calibrated for horizontal installation. Vertical mounting can offer some slight advantages due to gravity having a more pronounced flow conditioning effect in vertical lines. If the meter is to be mounted vertically, please notify the factory at time of order as the mechanical indicator needs to be calibrated for vertical installations.
- With the meter installed, check the rate-of-flow indicator. It should be stable to the point that it can be easily read. Some indicator movement is normal due to variations in flow. Erratic movement of the indicator is normally caused by flow variations and the system should be checked. Drastic variations in flow can decrease meter accuracy. If you suspect a problem with the meter, please contact your local McCrometer representative.

3.5 Pipe Run Requirements

Flow meters are velocity sensing devices and are vulnerable to certain upstream disturbances. Because of this, meters need certain lengths of straight pipe runs before and after the meter. These distances usually relate to the diameter (D) of the pipe used. Obstructions can include elbows, valves, pumps, and changes in pipe diameter. The uneven flow created by these obstructions can vary with each system. If your application provides for more than five diameters of upstream run, use the available distance.

- Upstream Requirement: McPropeller meters should be installed a minimum of 5D (with vanes) or 10D (without vanes). When the meter is installed with less than 10D upstream, the meter should be installed with vanes. See the table below. In the case of backflow, chemigation valves, or check valves, which are significant disturbers, we recommend installation of the meter at a greater distance if possible. 5D (with vanes) or 10D (without vanes) is the **minimum** requirement.
- Downstream Requirement: The downstream run should be one to two diameters of straight pipe length after the meter.

For upstream and downstream piping requirements relating to your specific meter, contact your local McCrometer representative. (Please be prepared to provide the serial number of your meter.)



Saddle Meters

Configuration	A	B
Without Straightening vanes	10	1
With Straightening vanes	5	1
With FS100 Flow Straightener	1.5	1

Flanged Meters

Configuration	A	B
Without Flow Straightener	5	1
With FS100 Flow Straightener	1.5	1

Figure 10. Pipe Run Requirements For Saddle And Tube Style Flow Meters

3.6 Flow Direction

All McPropeller meters have a Flow Arrow displayed on the meter in an obvious location to indicate the direction of the fluid flow. This is to insure that a meter is not installed backwards.

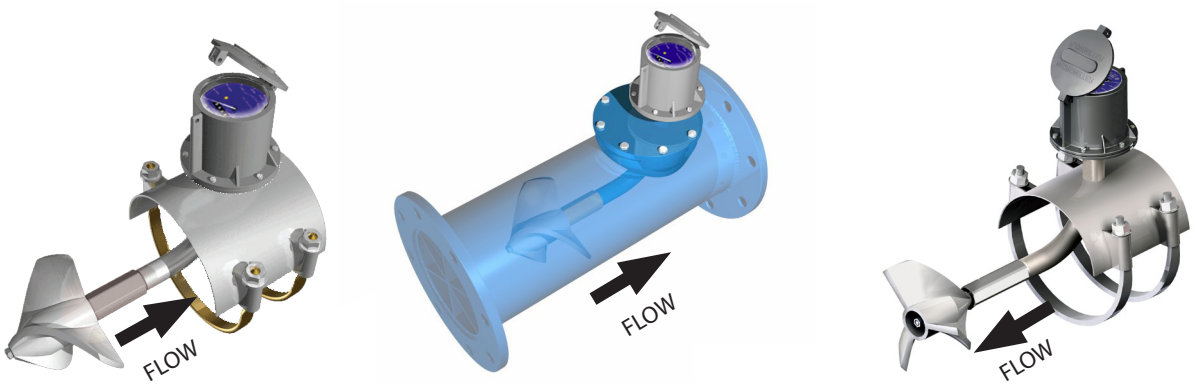


Figure 11. McPropeller Meters with Indication of Flow Direction

Special attention should be given to the installation direction of the surface water (SW) models of Mc Propeller meters, i.e. M0308SW. The M0300SW model meter is designed with the meter body turned 180 degrees from normal, a propeller installed nose-first on the bearing shaft, and a reverse flow style bearing assembly. This configuration allows the ell to curve with the flow, allowing grass or other debris to shed off with ease. Therefore, the proper installation of the M0300SW model meter appears "backwards".

4.0 METER CONSTRUCTION

4.1 Common Parts

Mc Propeller Meters have a simple design with a limited number of moving parts. Figure 12 shows labeled parts that are commonly shared among models. These components are described in detail on the following pages.

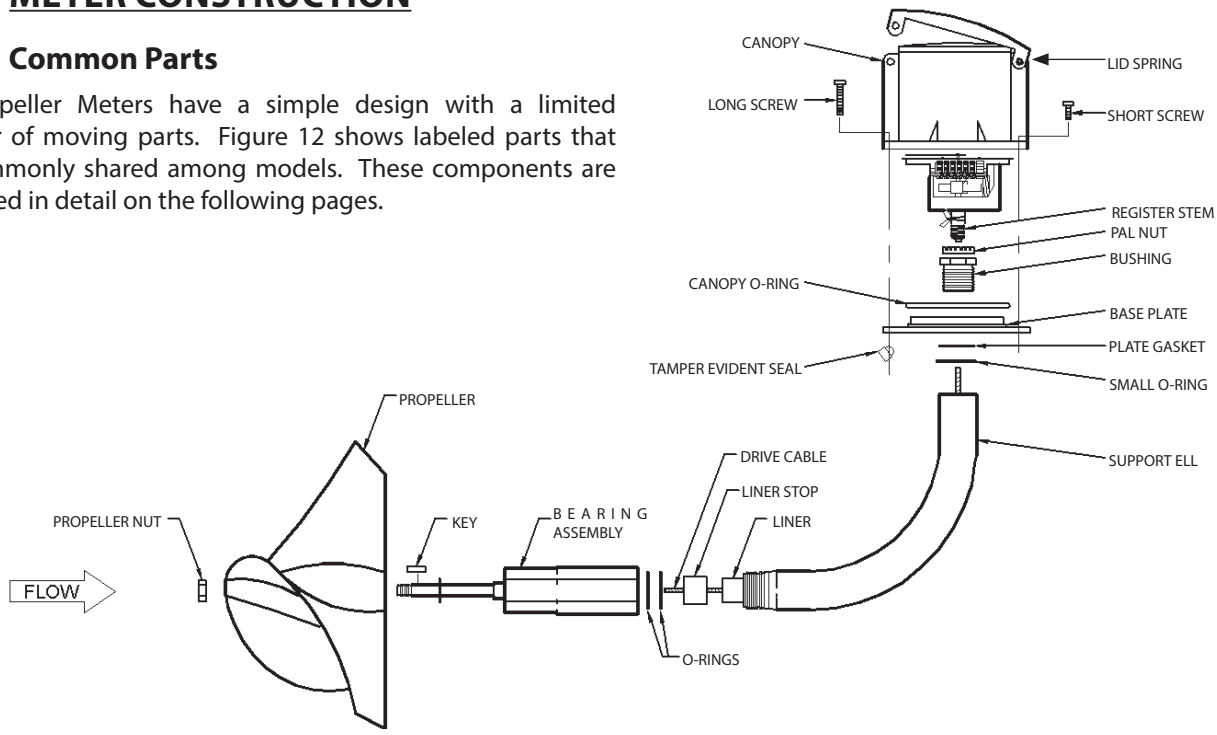


Figure 12. Basic Meter Element Assembly

4.2 Propeller

The propeller is, of course, a very important part of any propeller meter. Mc Propeller flow meter propellers have the following characteristics that ensure accurate readings:

- Each propeller is wet calibrated in a NIST (National Institute of Standards and Technology) traceable laboratory and trimmed so that a standard ratio is achieved. This allows for easy parts replacement in the field without recalibration.
- Propellers have a curved shape called the helical lead. The helical lead governs the rotational speed for a given flow velocity.
- Propellers are as light as possible so that the momentum of the fluid is large in relation to the mass of the propeller. As a result, lower flows can be measured and changes in velocity can be detected more rapidly.
- The propeller is sufficiently rigid to retain its shape during high flow conditions throughout the life of the meter.
- Propellers are large in relationship to the line size. This is necessary to affect the whole flow, which both averages the velocity profile and reduces inaccuracy.
- The propeller covers and protects the bearings to reduce debris and other fluid particles from entering the bearing assembly.

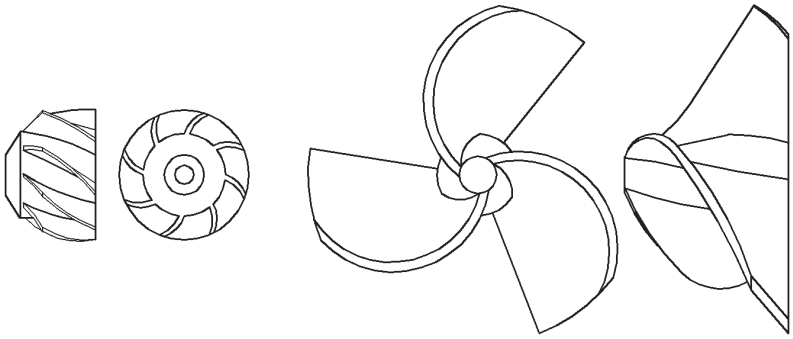
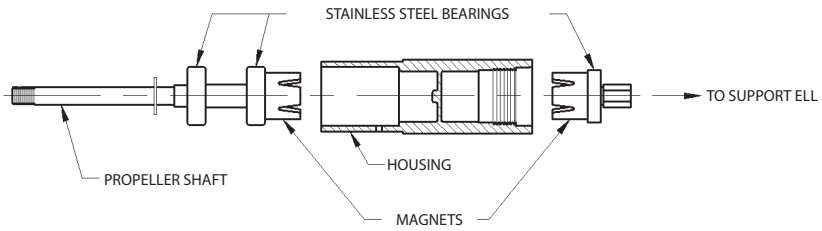


Figure 13. Eight and Three Blade Propellers

4.3 Bearing Assembly

Two shielded stainless steel bearings support the propeller shaft and allow it to rotate freely. The propeller covers the bearings to help prevent loss of lubrication and entry of foreign particles found in the fluid. For higher than normal flows, a third over-run bearing can be added to the propeller shaft to increase the life of the meter.



Note: The bearing assembly should not be disassembled.

Figure 14. Bearing Assembly

The bearing assembly housing prevents the process fluid from entering the drive assembly. The housing is manufactured with an integral diaphragm separating the fore and aft sections. Two permanent magnets on either side of the diaphragm transmit the rotation of the propeller through the diaphragm, while preventing fluid from entering the aft chamber. This magnetic drive makes an excellent and frictionless seal. This connection also allows the magnets to slip if a sudden surge hits the propeller. This slippage protects the meterhead from excess torque. The bearing assembly threads onto the drive assembly support and seals with two O-rings. The bearing is designed with the UltraShield which prevents debris from entering the bearing assembly.

4.4 Drive Assembly

The drive assembly supports the bearing assembly and propeller and transmits propeller revolutions to the meterhead. A heavy walled stainless steel pipe cold formed into an ell (90 degree) shape supports both the bearing assembly and the propeller. This ell holds a steel cable encased in a protective vinyl liner. The cable extends outside the liner to attach to the aft of the bearing assembly and the bottom of the meterhead to transmit the revolutions of the propeller to the register.

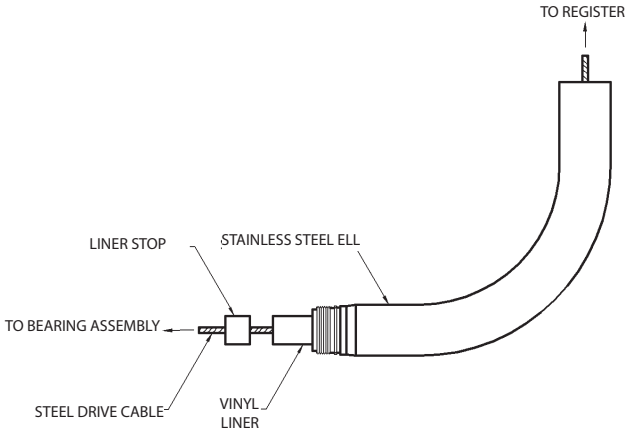


Figure 15. Drive Assembly

4.5 Meterhead

The meterhead consists of a register, canopy, and a base plate. The register transforms the speed of the propeller into both a totalizer and an instantaneous flow indicator. McCrometer's totalizers are six-digit, straight-reading type. Units of totalization include many standard units such as gallons, cubic feet, acre feet, and cubic meters.

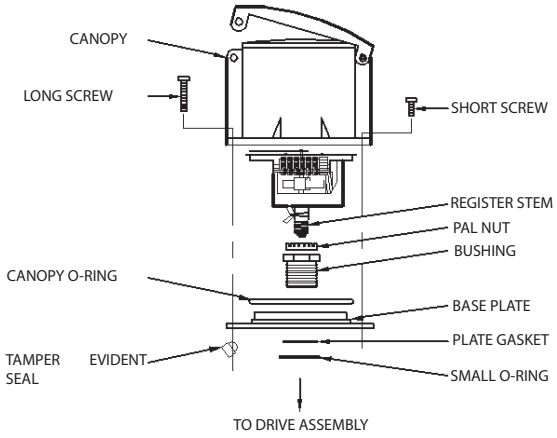


Figure 16. Meterhead

The instantaneous flow indicator is of the mechanical magnetic cup design. Indicator units include gallons per minute, cubic feet per second, and liters per second, as well as many others. McCrometer offers this instantaneous flow indicator standard.

The entire register threads into a bushing which holds a die cast aluminum base plate to the ell where it connects with the drive cable. The base plate seals to the ell with an O-ring and gasket. A die cast aluminum canopy covers the register and attaches to the base plate with six screws. A stamped tamper evident seal attached to one of these screws ensures that the instrumentation of the register remains unaltered.

4.6 Register Extension

The L0780 Register Extension provides a means for relocating a McCrometer Propeller Flow Meter register to a height that improves access and protection of the register.

The L0780 Register Extension extends the register up from the top of the flow meter to a maximum height of 120'. The extension pipe material is 1" Schedule 80, 304 stainless steel. The extension is provided as a kit, including drive cable and sealing hardware. All Mc Propeller flow meters can utilize the extension. The existing meter base plate, register and register canopy are reused.

Meter performance is typically unaffected by the addition of a register extension. Long extensions on small flow meters may require a higher minimum flow rate to operate properly. Maximum flow rates are unaffected. All other aspects of meter performance are unchanged by the extension. The stainless steel construction provides corrosion resistance and requires little maintenance once installed. The meter environmental protection rating of NEMA 4X is retained when the installation is properly installed and maintained.

Applications that would benefit from the installation of the L0780 Register Extension are:

- Flow meter locations subjected to temporary local flooding or washdown.
- Pits and other meter locations considered enclosed spaces.
- Meters installed below walkway level.
- Meters configured for higher than normal fluid temperatures.
- Electronic meters with digital registers or pulse transmitters can also use the extension for meter mounted or remote models.

The L0780 Register Extension is always mounted vertically on horizontally installed flow meters (see Figure 17 below). Meters subjected to pipe vibration should include appropriate anchoring of longer extensions. In areas with limited clearance over the meter, the overall height, including an open canopy lid, should be considered. Orientation of the register for easy viewing is accomplished when installing the register base plate after the extension is secured in place.

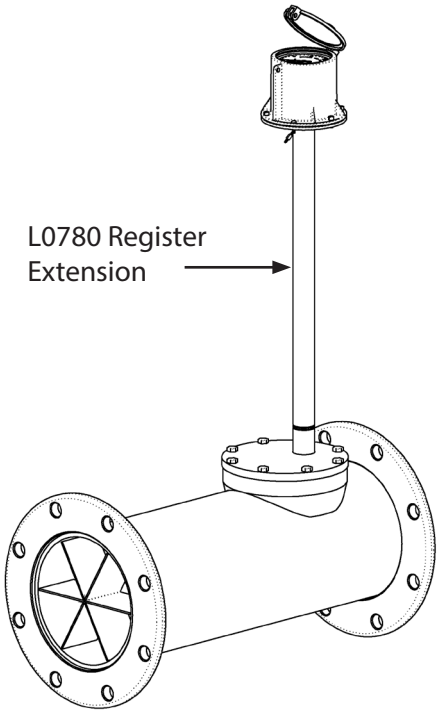


Figure 17. L0780 Register Extension

4.7 FlowCom Option

The FlowCom register displays a flow meter's flowrate and volumetric total. Available are optional outputs: scaled pulse and/or industry standard 4-20mA signal. The FlowCom can be fitted to any new or existing McCrometer propeller flow meter.

The FlowCom register is available for both Mc Propeller and Water Specialties. For more information on the Flowcom register, see the FlowCom Register Installation, Operation, and Maintenance Manual, literature # 24510-29, available for download on the McCrometer web site.

Figure 18. FlowCom Register

5.0 MAINTENANCE AND TROUBLESHOOTING

McCrometer Inc. manufactures propeller meters to be as trouble free as possible. The first criterion in a successful meter application is that the meter is installed correctly. Please refer to the earlier Installation Instructions or call an authorized service representative or the factory to answer any questions.

5.1 Occasional Inspections

Mc Propeller Meters commonly operate for years with little or no routine maintenance. Occasional inspections should be conducted to listen and look for signs of mechanical wear and breakage, such as:

- Mc Propeller flow meters operate very quietly. Any grinding or growling noises that can be detected are the first signs that mechanical failure is near.
- Visual cues are also valuable indicators. A once steady rate-of-flow indicator that has become erratic is usually indicative of something beginning to fail. Fogging visible through the lens would suggest a leak, either from the bearing assembly, or from an external seal.
- If there is doubt whether your rate of flow indicator is properly functioning, perform this simple test. Bring the flow through the meter to a relatively high, steady rate. Time a specific increment of the totalizer wheel. Each meter will require different but simple calculations to determine if your rate of flow indicator agrees with your totalizer. For assistance with this test, contact your local McCrometer representative or the factory.

5.2 Tools List

The following list includes tools needed to service and maintain Mc Propeller meters:

- Open or box end wrenches for top plate bolts (these vary with line size):
  - 1/2" for 2", 2 1/2", and 3" line sizes
  - 9/16" for 4", 6", and 8" line sizes
  - 3/4" for 10" and 12" line sizes
- Open or box end wrenches in the following sizes:
  - 9/16" for propeller nut
  - 1 3/8" for bearing assembly
  - 15/16" for register pal nut
- 1 3/8" Deep Socket
- Standard, flat screwdriver with 6" reach for canopy screws
- Wire cutters for removing tamper evident seal
- Hammer
- Small wire brush for cleaning threads
- Clean cloth
- Loctite (Arontite Stock CE-805-Color Blue is suggested)
- Light machine oil

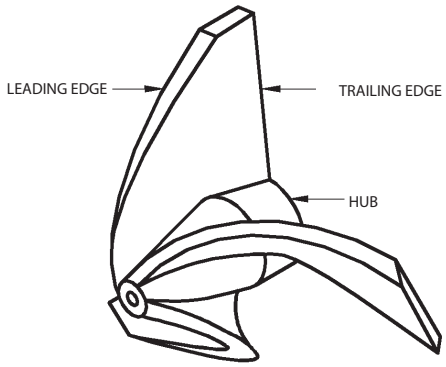
5.3 Disassembly and Inspection Procedure

1. **REMOVE THE METER OR ELEMENT.** Depending on the model, remove the entire meter or the metering element (propeller, bearing and drive assemblies, and meterhead) to access the propeller and bearing assembly.

WARNING

WARNING!
Do not remove the meter or top plate while the line is under pressure!

2. **CHECK THE PROPELLER.** Check the propeller for broken or damaged blades or foreign material hanging from it. Careful examination should be made of the propeller's trailing edge for damage. Some small nicks and abrasions to the leading edge of the blades are common and will not affect the accuracy of the meter. Mc Propeller's propeller blades are thick, resulting in a strong, stiff blade that does not change shape under normal operations.



The leading edge of the propeller can have small nicks and abrasions without sacrificing accuracy. The trailing edge must be clean.

Figure 19. Propeller Elements

3. **CHECK THE BEARINGS.** Check the condition of the bearings by grasping the propeller and trying to move it up and down and sideways. If the propeller has any amount of "play," then the bearing assembly should be replaced.
4. **REMOVE THE PROPELLER.** Remove the propeller by unscrewing the nut on the end of the propeller with a 9/16" wrench. Pull the propeller off the end of the bearing assembly shaft. Watch for the key, it may remain on the shaft, on the propeller, or fall free. If the propeller will not come off by hand, lightly tap the hub of the propeller with a hammer. Tap only the hub, since striking the trailing edge of the propeller blade may change the calibration of the meter. One or more stainless steel washers may be on the shaft. Leave these in place.
5. **REMOVE THE BEARING ASSEMBLY.** Remove the bearing assembly by unscrewing it with a 1 3/8" wrench. The drive cable may come out at this time. Set it aside for now. A deep 1-3/8" socket will be required for meters with fixed ells. After removing the bearing assembly, hold the shaft and spin the bearing housing. It should spin freely and smoothly. If it does not, it should be replaced.
6. **CHECK.** Check for damaged threads and clean the O-ring grooves.
7. **REMOVE THE DRIVE CABLE.** Now pull the drive cable out of the ell and inspect it for moisture, rust, wear, cracks, or breaks. If a cable appears worn, this is usually a symptom of another problem, such as moisture.
8. **REMOVE THE REGISTER CANOPY.** Remove the register canopy by unscrewing the five short screws and the one long screw with the tamper evident seal from around the base. Inspect the canopy and the base plate for signs of leaks.

IMPORTANT
Removing the tamper evident seal from a meter that is still under warranty could void the factory warranty.

9. **REMOVE THE REGISTER HEAD.** Remove the register head by loosening the pal nut on the stem of the register with a 15/16" wrench. Unscrew the whole register unit. Inspect the register for moisture. Look for a white chalky substance on the frame of the register that shows the register was wet. Turn the very bottom of the register stem several times. The register movement should turn freely. The first odometer wheel also should turn. If not, the register should be returned for repair or exchange. The purpose of the silica gel dry pack is to absorb moisture trapped during assembly. Replace the silica pack.
10. **REMOVE THE CABLE LINER.** If moisture exists inside the drive assembly, the liner should be taken out to dry. To remove the liner, use an item such as a large bolt to tap the liner down from the top. Tap enough to push the liner stop out from the bottom to allow the liner to be pulled free.

5.4 Ordering Replacement Parts

When ordering replacement parts, the meter's serial number is needed to ensure correct replacements. The serial number can be found on the register canopy lid. The number sequence should look similar to: 18-01234-06. The first two digits are the year of manufacture, the second set of digits is the number of the meter, and the last set of digits is nominal line size. For meters manufactured before 1994, the last sets of digits are reversed. For specific meter part numbers, see the drawings of each meter type at the back of this Manual.

5.5 Reassembly Procedure

With the problem found and the correct replacement parts collected, the meter must be correctly reassembled to ensure trouble-free service in the future.

1. **CLEAN ALL PARTS.** As with any mechanical device, all of the parts that are going to be reused must be clean and free of dust and dirt. Take some time and make sure these parts are ready to be used.
2. **REPLACE THE CABLE LINER.** If the cable liner was removed, replace it now. Push the cable liner into the ell from the bottom up to the base plate. Replace the liner stop.
3. **CLEAN THE LINER.** Blow out any dirt that may be trapped inside the liner.
4. **REPLACE THE BEARING ASSEMBLY.** With a drop of light machine oil on your finger, lubricate the small o-rings on the end of the threaded ell. (Do not get oil on the threads of ell.) Place two drops of Loctite on the threads of the ell. Thread the bearing assembly on the ell and tighten with a wrench or a special bearing tool. Be careful not to cross thread the assembly and only snug the bearing assembly with the wrench. Extra care should be exercised in assuring that the parts are clean and the o-rings have a good sealing area.
5. **REPLACE THE PROPELLER.** Make sure the washers on the propeller shaft are in place. Slide the propeller over the shaft. Align the shaft and propeller keyways and insert the key. You may need to use a screw driver to push the key to the fully engaged position. Apply a small amount of Loctite to the threads of the nut and tighten to a good snug fit, but not as tight as possible.

> **IMPORTANT**
> **Use only two drops of Loctite. Too much Loctite can cause the aft bearing to seize.**

6. **REPLACE THE DRIVE CABLE.** With a clean cloth, wipe off any dirt or dust from the drive cable. Apply a small amount of light machine oil to the cable and insert it all the way into the ell. To engage the cable, slowly turn the propeller as you gently push on the cable. After you are satisfied that the cable is in the bearing assembly as far as possible, check the height of the cable in relationship to the top of the mounting plate bushing. The cable should be within 1/4 of an inch (plus or minus) from the top of the bushing. If not, it is the wrong cable or the cable is not fully seated into the bearing assembly.
7. **REPLACE THE REGISTER HEAD.** Thread the pal nut, with the open face up, onto the stem on the bottom of the register. The nut should be at least halfway up the threads. Place the register stem on the drive cable and screw it into the mounting plate bushing. The register should be screwed down far enough that the cable is well into the register stem, but not far enough to bind the cable. Face the register the desired direction and tighten the pal nut to lock the register into position.

8. **CHECK.** Spin the propeller to check that the rate of flow indicator and totalizer are engaged. Listen for any clicking or grinding noises. The meter should turn quietly.
9. **REPLACE THE REGISTER CANOPY.** Install the large o-ring onto the base plate. Use a small amount of light oil to lubricate the o-ring and place the register canopy down over it. Push down until the o-ring bottoms out against the base plate. Replace the six screws and lightly snug them.
10. **RE-INSTALL THE FLOW METER.** Re-install the flow meter. Before pressurizing the system, make sure all connections are properly secured. As an obvious general safety consideration, maintain a safe and prudent distance from the meter when the system is to be started. After the system restarts, the indicator should be smooth and the meter quiet.

6.0 TECHNICAL SPECIFICATIONS

PERFORMANCE

ACCURACY/REPEATABILITY: ±2% of reading guaranteed throughout full range; ±1% over reduced range; Repeatability 0.25% or better

MAXIMUM TEMPERATURE: (Standard Construction) 160°F constant

PRESSURE RATING:150 psi or 300 psi

MATERIALS

BEARING ASSEMBLY:
- Impeller shaft is 316 stainless steel.
- Ball bearings are 440C stainless steel

MAGNETS: Permanent type. Alnico.

BEARING HOUSING:
- For models 2" to 16":
  - 304 stainless steel standard
  - 316 stainless steel optional (standard for QW500/QZ500)
- For models 18" and larger: Brass standard, 316 stainless steel optional

SADDLE: 304 stainless steel construction

REGISTER: An instantaneous flowrate indicator and six-digit straight-reading totalizer are standard. The register is hermetically sealed within a die cast aluminum case. This protective housing includes a domed acrylic lens and hinged lens cover with locking hasp.

IMPELLER: Impellers are manufactured of high-impact plastic, retaining their shape and accuracy over the life of the meter. High temperature impeller is optional.

OPTIONS

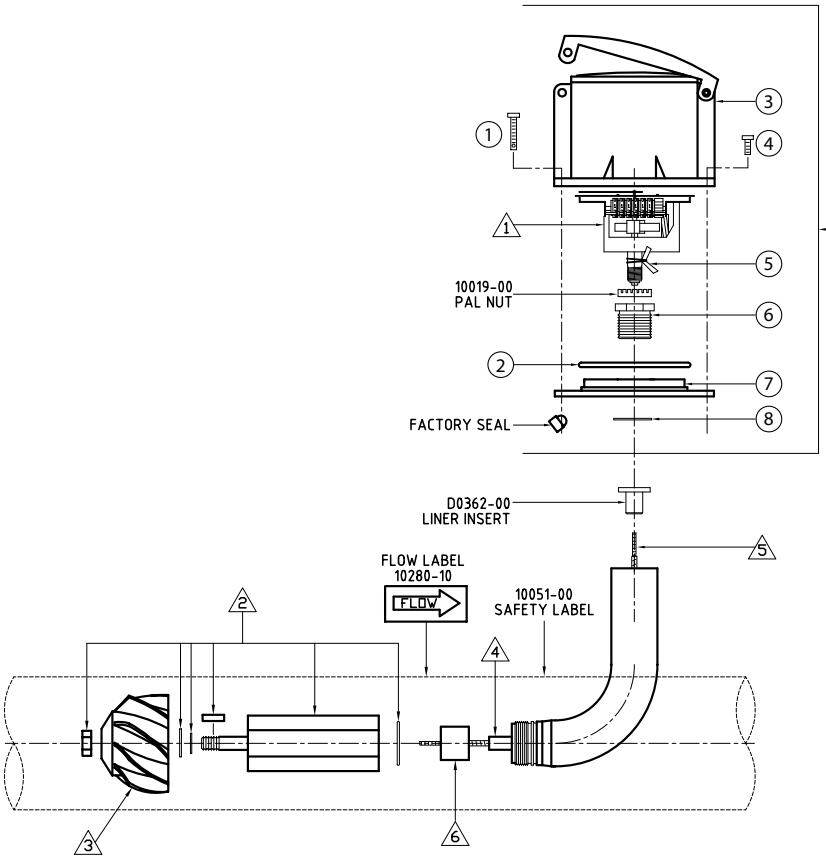
- Saddle can be constructed to fit any outside diameter pipe dimensions, including metric sizes
- Can be used on a variety of pipe materials such as steel, plastic, cast iron, cement or asbestos cement
- Register extension
- 316 stainless steel bearing assembly
- High temperature construction (up to 180° F)
- Marathon bearing assembly for higher than normal flowrates (50%)
- FlowCom Electronic Register
- A complete line of flow recording / control instrumentation including transmitters and flow computers
- Blank repair saddle
- Vanes
- Flow straighteners
- Canopy Boot
- Lid spring
- 3-point / 5-point calibration
- Food grade grease
- 7-wheel register
- Anti-reverse register
- Pool bearing

TECHNICAL SUPPORT

For technical assistance, please contact your authorized service representative or the factory at:

McCrometer Inc.
3255 W. Stetson Avenue
Hemet, CA 92545

PHONE: (951) 652-6811, extension 5061 FAX: (951) 652-3078
techsupport@mccrometer.com
Hours: 8 a.m. - 4 p.m. PT, Mon-Fri



CANOPY KIT
R0143-00, INCLUDES ALL PARTS IN TABLE BELOW, DOES NOT INCLUDE REGISTER R1103-XX OR PAL NUT

REF.	P/N	REGISTER
1	10018-00	SCREW W/HOLE (1)
2	10285	O-RING (LG)
3	R0710-20	ALUM CANOPY
4	10016-00	SCREW (5)
5	10015-00	DRY PACK
6	R0147-00	BUSHING W/ O-RINGS
7	R0141-20	CANOPY PLATE
8	10023-00	PLATE GASKET

NOTES:
1. XX DEPENDS ON SPECIFIC REQUIREMENT
2. DRAWING IS NOT SHOWN TO SCALE.

NOMINAL SIZE	1 REGISTER	2 BEARING	3 PROPELLER	4 LINER	5 CABLE	6 LINER STOP
2", 2½", 3"	R1103-XX	B0710-XX	P0103-XX	6.63"	D0103-00	D0370-10

PLEASE HAVE THE METER SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS

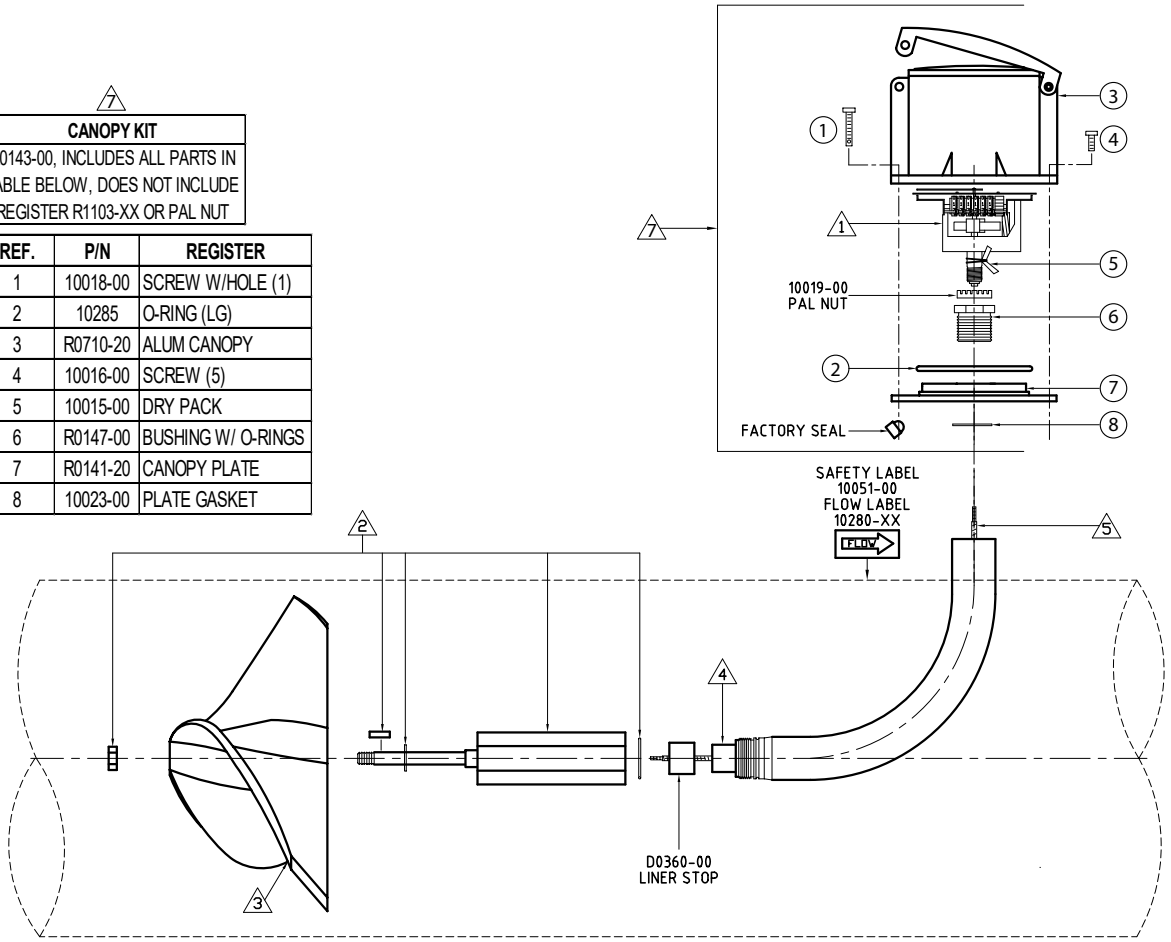
3-PIECE SUPPORT REPLACEMENT COMPONENTS

NOMINAL SIZE	4 LINER	5 CABLE	6 LINER STOP
2", 2½", 3"	6"	D0066-00	D0370-00

△7

CANOPY KIT
R0143-00, INCLUDES ALL PARTS IN TABLE BELOW, DOES NOT INCLUDE REGISTER R1103-XX OR PAL NUT

REF.	P/N	REGISTER
1	10018-00	SCREW W/HOLE (1)
2	10285	O-RING (LG)
3	R0710-20	ALUM CANOPY
4	10016-00	SCREW (5)
5	10015-00	DRY PACK
6	R0147-00	BUSHING W/ O-RINGS
7	R0141-20	CANOPY PLATE
8	10023-00	PLATE GASKET



NOTES:
1. XX DEPENDS ON SPECIFIC REQUIREMENT
2. DRAWING IS NOT SHOWN TO SCALE.

MG100 MS100

SIZE	REGISTER △1	BEARING △2	PROPELLER △3	LINER △4	CABLE △5
4	R1104-XX	B0610-XX	PT105-XX	D0410-00	D0104-00
6	R1106-XX	B0110-XX	P0106-XX	D0410-00	D0104-00
8	R1108-XX	B0110-XX	P0108-XX	D0410-00	D0104-00
10	R1110-XX	B0110-XX	P0110-XX	D0411-00	D0122-00
12	R1112-XX	B0110-XX	P0112-XX	D0412-00	D0105-00
14	R1114-XX	B0110-XX	P0112-XX	D0313-00	D0123-00
16	R1116-XX	B0110-XX	P0112-XX	D0306-00	D0106-00
18	R1118-XX	B1500-XX	P0116-XX	D0307-00	D0107-00
20	R1120-XX	B1500-XX	P0116-XX	D0307-00	D0107-00
24	R1124-XX	B1500-XX	P0116-XX	D0308-00	D0108-00

MT100

MODEL	REGISTER △1	BEARING △2	PROPELLER △3	LINER △4	CABLE △5
MT104	R1104-XX	B0610-XX	PT105-XX	D0410-00	D0104-00
MT106	R1106-XX	B0110-XX	P0106-XX	D0410-00	D0104-00

PLEASE HAVE THE METER SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS

MF100

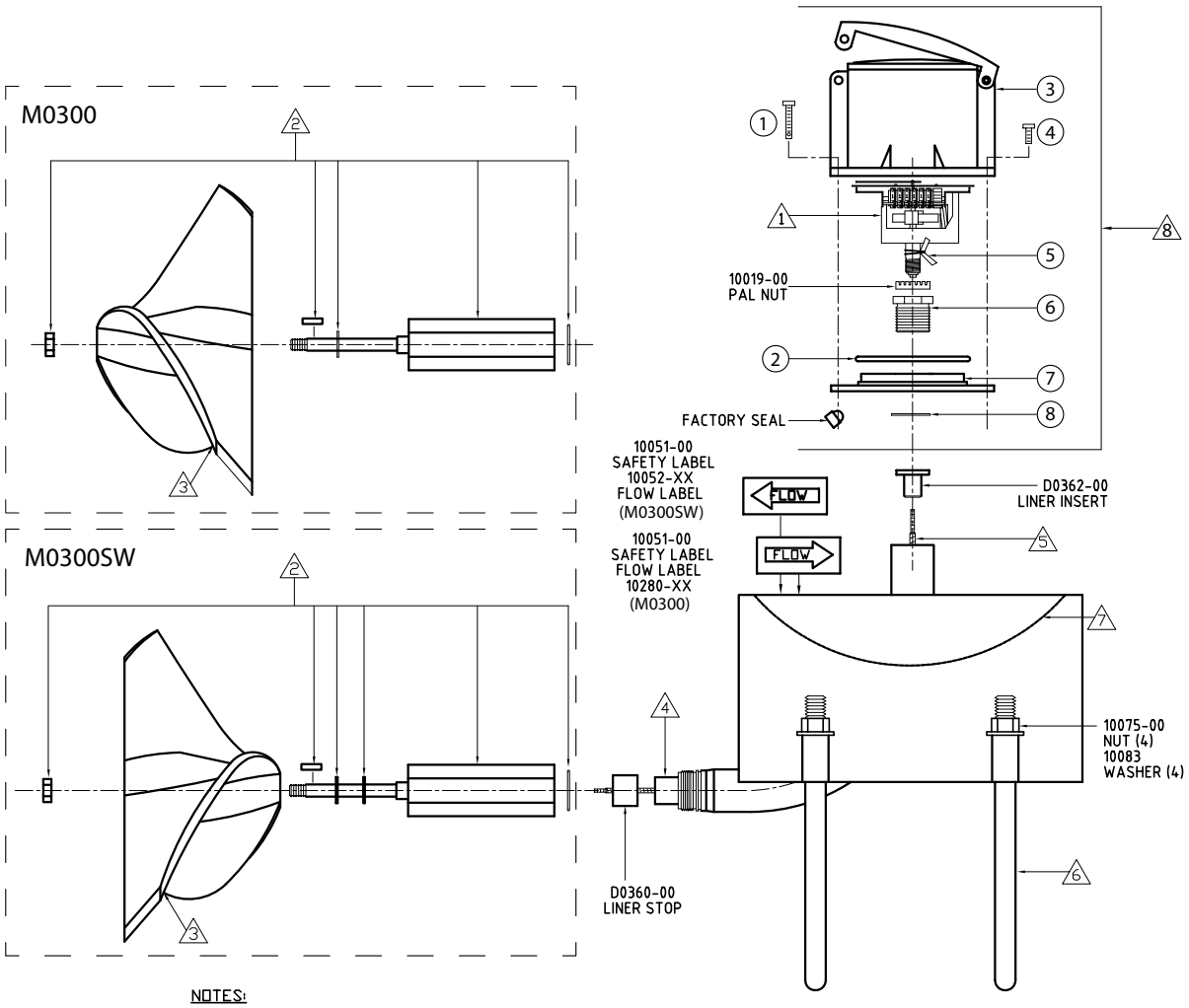
SIZE	REGISTER △1	BEARING △2	PROPELLER △3	LINER △4	CABLE △5
4	R1104-XX	B0610-XX	PT105-XX	D0410-00	D0104-00
6	R1106-XX	B0110-XX	P0106-XX	D0410-00	D0104-00
8	R1108-XX	B0110-XX	P0108-XX	D0410-00	D0104-00
10	R1110-XX	B0110-XX	P0110-XX	D0306-00	D0106-00
12	R1112-XX	B0110-XX	P0112-XX	D0306-00	D0106-00

ML100

SIZE	REGISTER △1	BEARING △2	PROPELLER △3	LINER △4	CABLE △5
6	R1106-XX	B0110-XX	P0106-XX	D0410-00	D0104-00
8	R1108-XX	B0110-XX	P0108-XX	D0410-00	D0104-00
10	R1110-XX	B0110-XX	P0110-XX	D0410-00	D0122-00
12	R1112-XX	B0110-XX	P0112-XX	D0412-00	D0105-00

M03, Standard and Surface Water

4" - 16" Bolt-on Saddle



NOTES:
1. XX DEPENDS ON SPECIFIC REQUIREMENT
2. DRAWING IS NOT SHOWN TO SCALE.

M0300

1 SIZE	2 REGISTER	3 BEARING	4 PROPELLER	5 LINER	6 CABLE	7 U-BOLT	GASKET	TEMPLATE
4	R1104-XX	B0610-XX	PT105-XX	6.75"	D0103-00	T0754-00 (2)	T0384-00	10112-04
6	R1106-XX	B0110-XX	P0106-XX	D0410-00	D0104-00	T0756-00 (2)	T0384-10	10112-06
8	R1108-XX	B0110-XX	P0108-XX	D0410-00	D0104-00	T0758-00 (2)	T0384-10	10112-08
10	R1110-XX	B0110-XX	P0110-XX	D0411-00	D0122-00	T0760-00 (2)	T0384-11	10112-10
12	R1112-XX	B0110-XX	P0112-XX	D0412-00	D0105-00	T0762-00 (2)	T0384-11	10112-12
14	R1114-XX	B0110-XX	P0112-XX	D0313-00	D0123-00	T0745-02 (2)	T0384-11	10112-12
16	R1116-XX	B0110-XX	P0112-XX	D0313-00	D0123-00	T0740-00 (2)	T0384-11	10112-12

M0300SW

1 SIZE	2 REGISTER	3 BEARING	4 PROPELLER	5 LINER	6 CABLE	7 U-BOLT	GASKET	TEMPLATE
4	R1104-XX	B0610-XX	PT105-XX	6.75"	D0103-00	T0754-00 (2)	T0384-00	10112-04
6	R1106-XX	B0110-XX	P0106-XX	D0410-00	D0104-00	T0756-00 (2)	T0384-10	10112-06
8	R1108-XX	B0110-XX	P0108-XX	D0410-00	D0104-00	T0758-00 (2)	T0384-10	10112-08
10	R1110-XX	B0110-XX	P0110-XX	D0411-00	D0122-00	T0760-00 (2)	T0384-11	10112-10
12	R1112-XX	B0110-XX	P0112-XX	D0412-00	D0105-00	T0762-00 (2)	T0384-11	10112-12
14	R1114-XX	B0110-XX	P0112-XX	D0313-00	D0123-00	T0745-02 (2)	T0384-11	10112-12
16	R1116-XX	B0110-XX	P0112-XX	D0313-00	D0123-00	T0740-00 (2)	T0384-11	10112-12

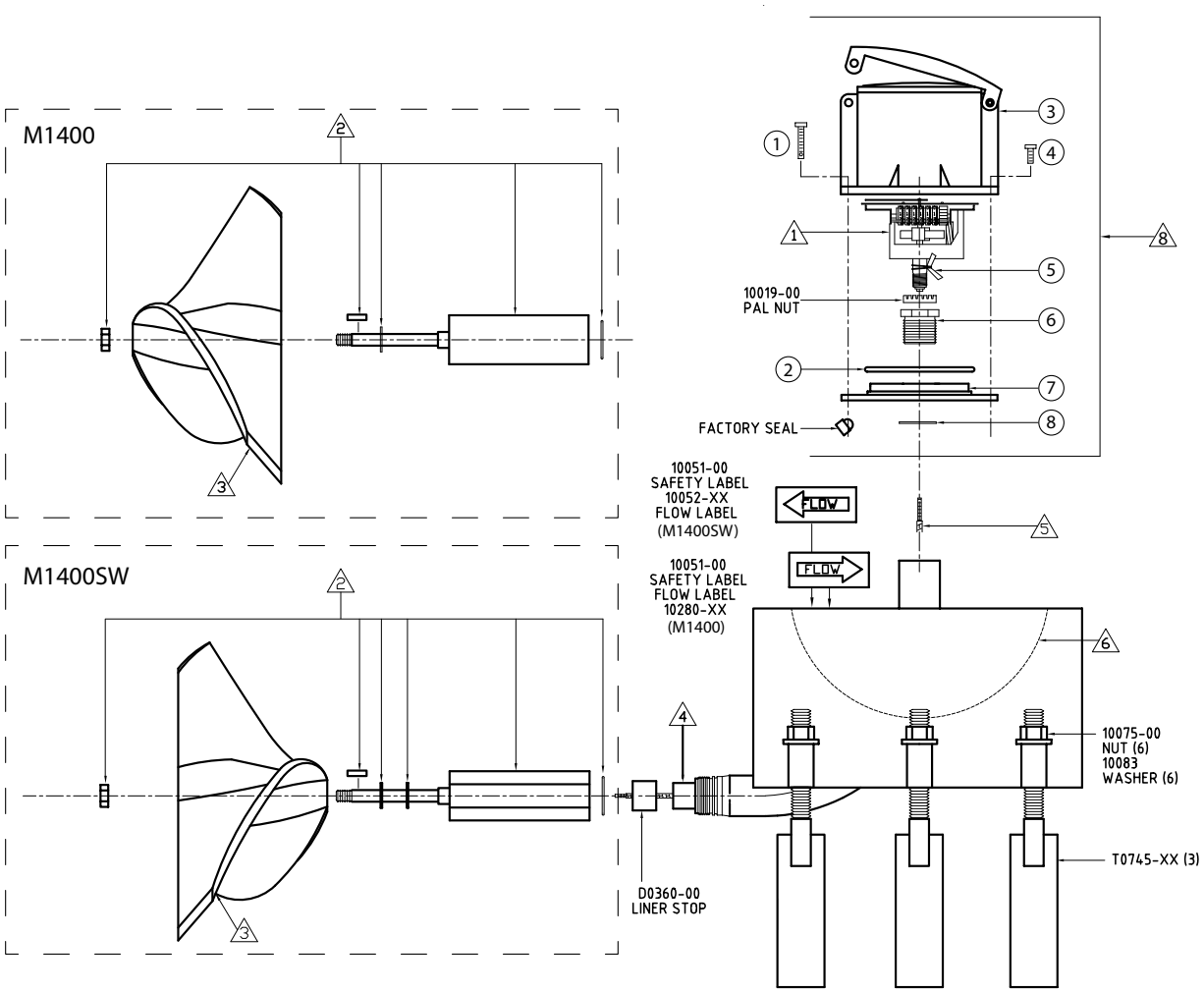
PLEASE HAVE THE METER SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS

8

CANOPY KIT
R0143-00, INCLUDES ALL PARTS IN TABLE BELOW, DOES NOT INCLUDE REGISTER R1103-XX OR PAL NUT

REF.	P/N	REGISTER
1	10018-00	SCREW W/HOLE (1)
2	10285	O-RING (LG)
3	R0710-20	ALUM CANOPY
4	10016-00	SCREW (5)
5	10015-00	DRY PACK
6	R0147-00	BUSHING W/ O-RINGS
7	R0141-20	CANOPY PLATE
8	10023-00	PLATE GASKET

M14, Standard and Surface Water — 18" through 48" Bolt-on Saddle



NOTES:
1. XX DEPENDS ON SPECIFIC REQUIREMENT
2. DRAWING IS NOT SHOWN TO SCALE.
3. CONSULT FACTORY FOR U-STRAP SIZE.

M1400

SIZE	1 REGISTER	2 BEARING	3 PROPELLER	4 LINER	5 CABLE	6 GASKET	7 TEMPLATE
18	R1118-XX	B1500-XX	P0116-XX	D0306-00	D0106-00	T0384-12	T0112-10
20	R1120-XX	B1500-XX	P0116-XX	D0307-00	D0107-00	T0384-12	T0112-10
22	R1122-XX	B1500-XX	P0116-XX	D0307-00	D0107-00	X8001-00	T0112-10
24	R1124-XX	B1500-XX	P0116-XX	D0308-00	D0108-00	X8001-00	T0112-10
30	R1130-XX	B1500-XX	P0145-XX	D0309-00	D0109-00	X8001-00	T0112-10
36	R1136-XX	B1500-XX	P0146-XX	D0311-00	D0111-00	X8001-00	T0112-10
42	R1142-XX	B1900-XX	P0146-XX	D0312-00	D0112-00	X8001-00	T0112-10
48	R1142-XX	B1900-XX	P0146-XX	29"	31.19"	X8001-00	T0112-10

M1400SW

SIZE	REGISTER	BEARING	PROPELLER	LINER	CABLE	GASKET	TEMPLATE
18	R1118-XX	B1500-XX	P0116-XX	D0306-00	D0106-00	T0384-12	T0112-10
20	R1120-XX	B1500-XX	P0116-XX	D0307-00	D0107-00	T0384-12	T0112-10
22	R1122-XX	B1500-XX	P0116-XX	D0307-00	D0107-00	X8001-00	T0112-10
24	R1124-XX	B1500-XX	P0116-XX	D0308-00	D0108-00	X8001-00	T0112-10
30	R1130-XX	B1500-XX	P0145-XX	D0309-00	D0109-00	X8001-00	T0112-10
36	R1136-XX	B1500-XX	P0146-XX	D0311-00	D0111-00	X8001-00	T0112-10
42	R1142-XX	B1900-XX	P0146-XX	D0312-00	D0112-00	X8001-00	T0112-10

8

CANOPY KIT		
R0143-00, INCLUDES ALL PARTS IN TABLE BELOW, DOES NOT INCLUDE REGISTER R1103-XX OR PAL NUT		
REF.	P/N	REGISTER
1	10018-00	SCREW W/HOLE (1)
2	10285	O-RING (LG)
3	R0710-20	ALUM CANOPY
4	10016-00	SCREW (5)
5	10015-00	DRY PACK
6	R0147-00	BUSHING W/ O-RINGS
7	R0141-20	CANOPY PLATE
8	10023-00	PLATE GASKET

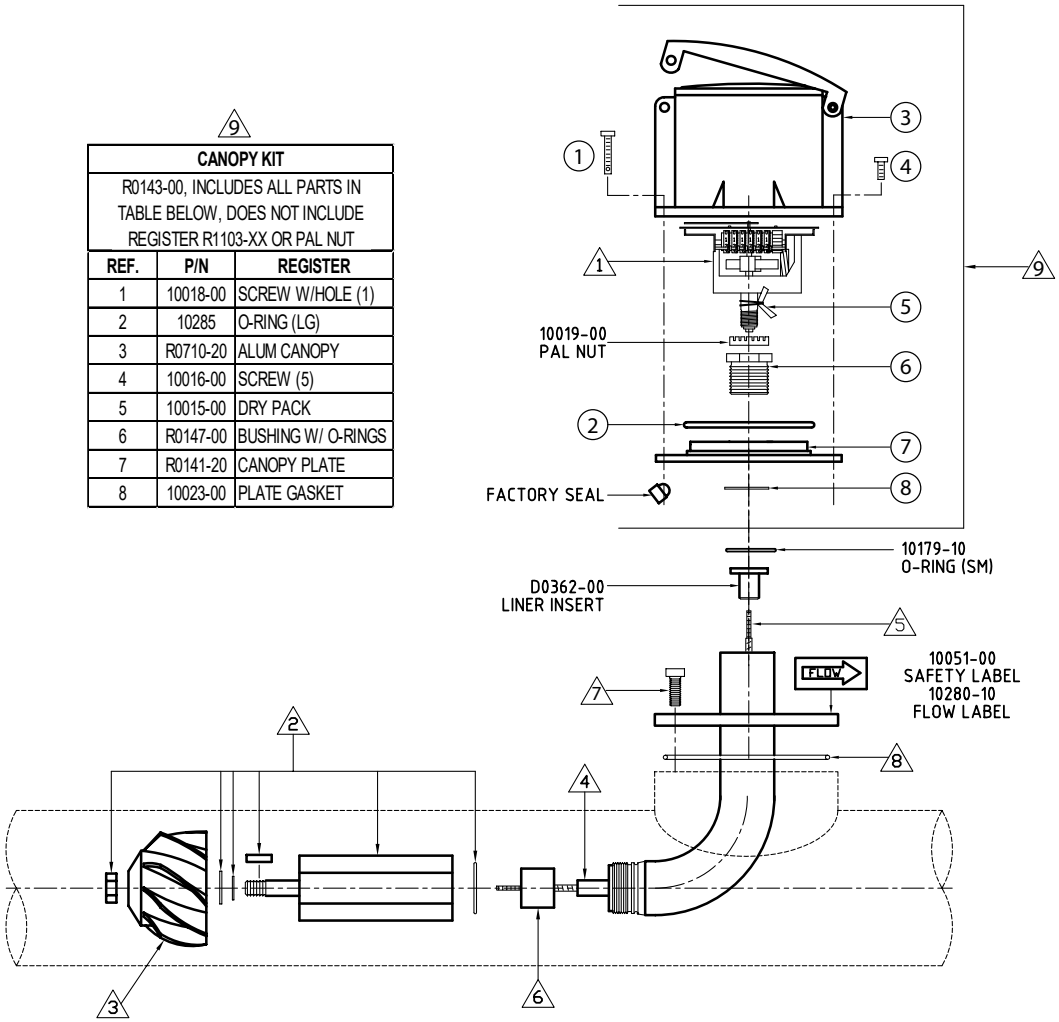
PLEASE HAVE THE METER SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS

Note: X8001-00 is sold in square inches. Contact McCrometer Customer Service.

MW5, MZ5, MW6, MG9, MT9, QW5, QZ5 — 2", 2½, 3" Top Plate

△9

CANOPY KIT		
R0143-00, INCLUDES ALL PARTS IN TABLE BELOW, DOES NOT INCLUDE REGISTER R1103-XX OR PAL NUT		
REF.	P/N	REGISTER
1	10018-00	SCREW W/HOLE (1)
2	10285	O-RING (LG)
3	R0710-20	ALUM CANOPY
4	10016-00	SCREW (5)
5	10015-00	DRY PACK
6	R0147-00	BUSHING W/ O-RINGS
7	R0141-20	CANOPY PLATE
8	10023-00	PLATE GASKET



NOTES:
1. XX DEPENDS ON SPECIFIC REQUIREMENT
2. DRAWING IS NOT SHOWN TO SCALE.

MW500 MG900
MZ500 MT900
MW900

△1 MODEL	△2 REGISTER	△3 BEARING	△4 PROPELLER	△5 LINER	△6 CABLE	△7 LINER STOP	△8 BOLT (6)	O-RING
2", 2½", 3"	R110X-XX	B0710-XX *	P0103-XX	6.63"	D0103-00	D0370-10	10049-10	10240-00

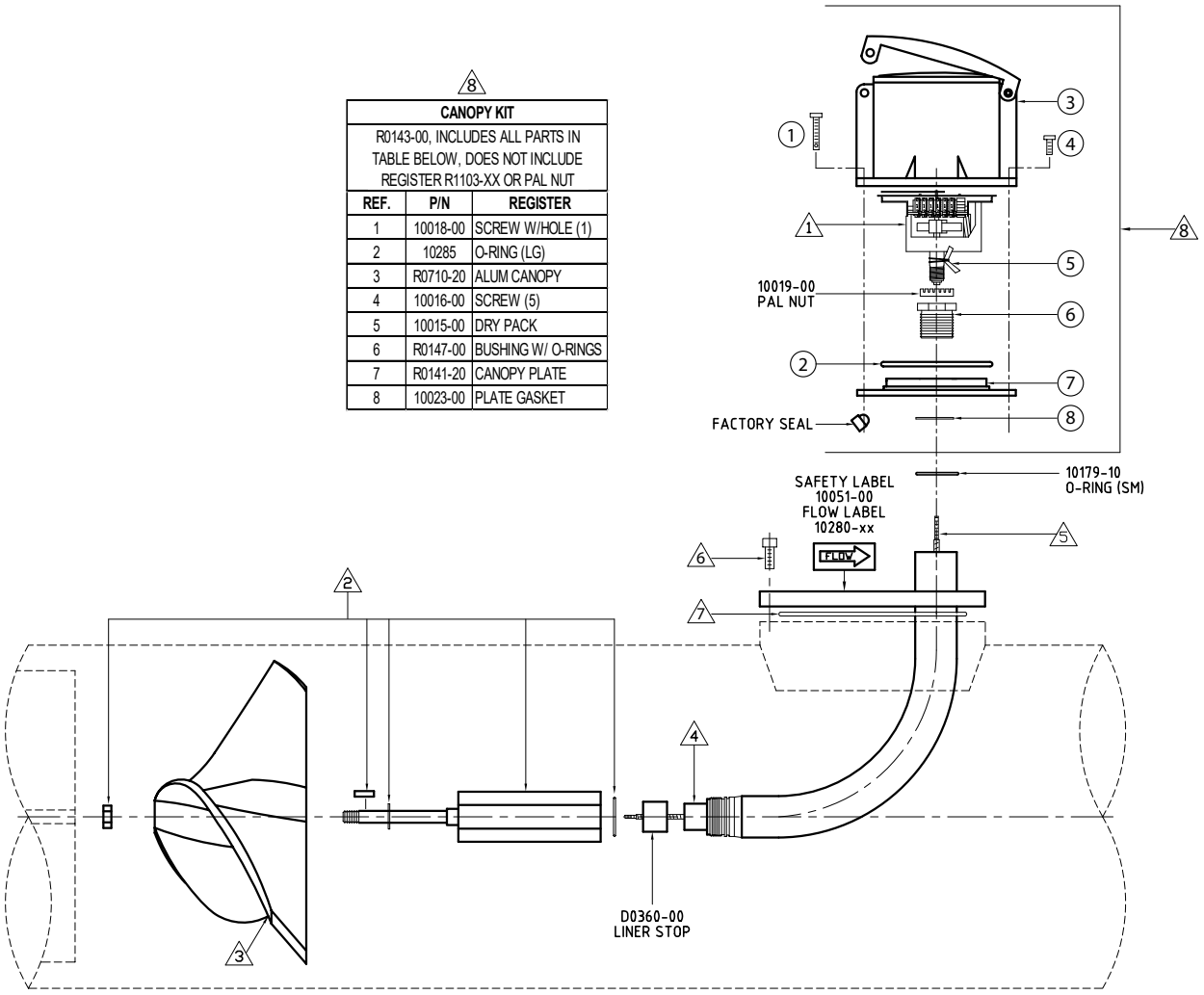
QW500
QZ500

△1 MODEL	△2 REGISTER	△3 BEARING	△4 PROPELLER	△5 LINER	△6 CABLE	△7 LINER STOP	△8 BOLT (6)	O-RING
2", 2½", 3"	R110X-XX	B0710-XX *	P0203-XX	6.63"	D0103-00	D0370-10	10049-10	10240-00

PLEASE HAVE THE METER SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS

* B0710-84 for standard 316 stainless bearing

8 CANOPY KIT		
R0143-00, INCLUDES ALL PARTS IN TABLE BELOW, DOES NOT INCLUDE REGISTER R1103-XX OR PAL NUT		
REF.	P/N	REGISTER
1	10018-00	SCREW W/HOLE (1)
2	10285	O-RING (LG)
3	R0710-20	ALUM CANOPY
4	10016-00	SCREW (5)
5	10015-00	DRY PACK
6	R0147-00	BUSHING W/ O-RINGS
7	R0141-20	CANOPY PLATE
8	10023-00	PLATE GASKET



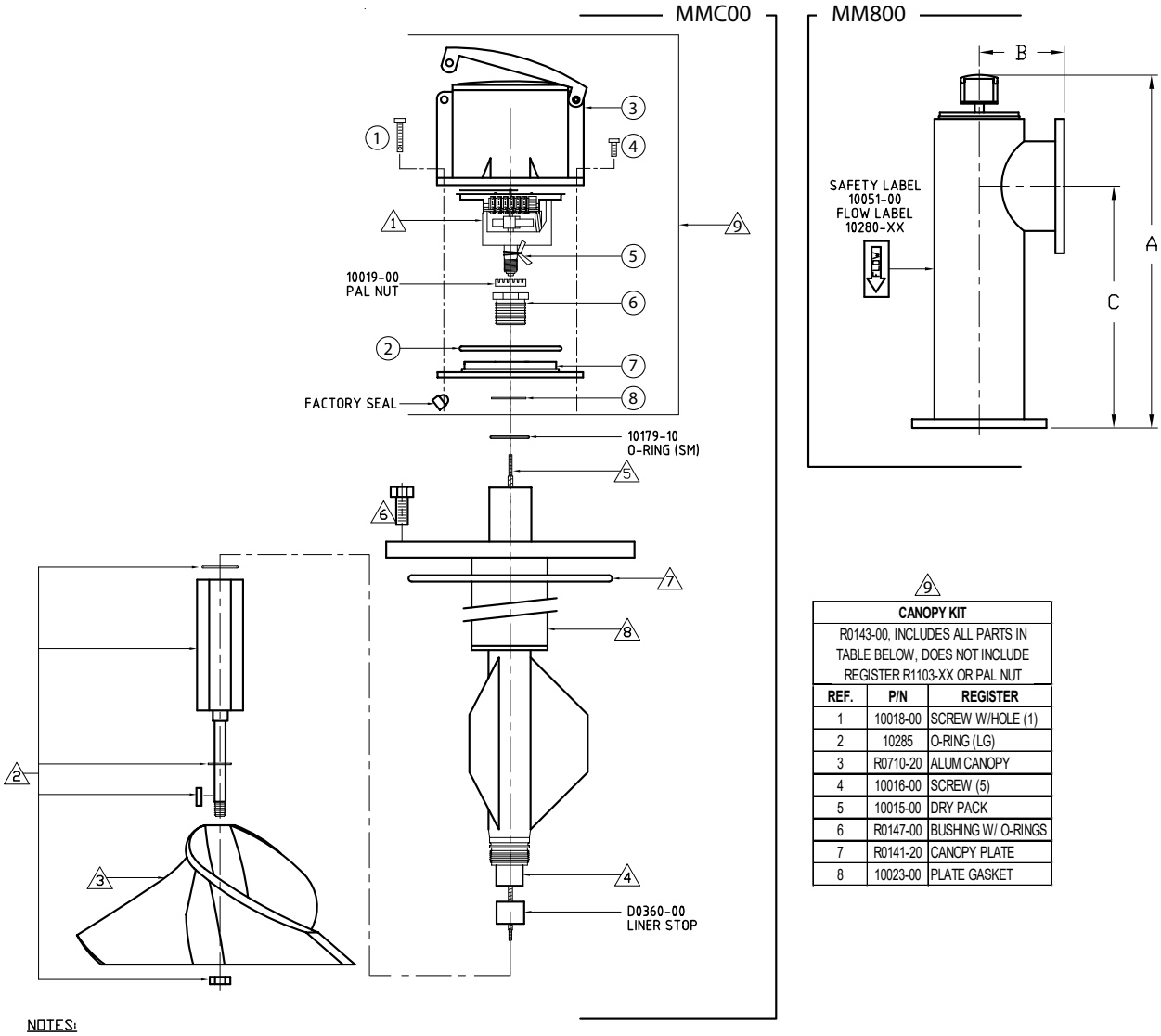
NOTES:
1. XX DEPENDS ON SPECIFIC REQUIREMENT
2. DRAWING IS NOT SHOWN TO SCALE.

	SIZE	1 REGISTER	2 BEARING	3 PROPELLER	4 LINER	5 CABLE	6 BOLT	7 O-RING
QZ500 4" TO 16"	4	R1104-XX	B0610-XX	PT105-XX	D0410-00	D0104-00	10103-00 (6)	T0390-00
	6	R1106-XX	B0110-XX	P0106-XX	D0410-00	D0104-00	10103-00 (8)	T0390-10
	8	R1108-XX	B0110-XX	P0108-XX	D0411-00	D0122-00	10103-00 (8)	T0390-10
	10	R1110-XX	B0110-XX	P0110-XX	D0313-00	D0123-00	10050-00 (12)	T0399-10
	12	R1112-XX	B0110-XX	P0112-XX	D0306-00	D0106-00	10050-00 (12)	T0399-10
	14	R1114-XX	B0110-XX	P0112-XX	D0307-00	D0107-00	10050-00 (12)	T0399-10
	16	R1116-XX	B0110-XX	P0112-XX	D0307-00	D0107-00	10050-00 (12)	T0399-10
MZ500 MG900 4" TO 24"	18	R1118-XX	B1500-XX	P0116-XX	D0307-00	D0107-00	10099-00 (16)	T0399-11
	20	R1120-XX	B1500-XX	P0116-XX	D0308-00	D0108-00	10099-00 (16)	T0399-11
	24	R1124-XX	B1500-XX	P0116-XX	D0309-00	D0109-00	10099-00 (16)	T0399-11
MW500 QW500 4" TO 36"	30	R1130-XX	B1500-XX	P0145-XX	D0309-00	D0109-00	10135-00 (16)	T0399-12
	36	R1136-XX	B1500-XX	P0145-XX	D0311-00	D0111-00	10135-00 (20)	T0399-13
MW600 ALL SIZES	42	R1142-XX	B1900-XX	P0146-XX	D0312-00	D0112-00	10135-00 (20)	T0399-13
	48	R1148-XX	B1900-XX	P0146-XX	29"	31.19"	10135-00 (20)	T0399-13

Note: QZ500 and QW500 meters have different propellor material.

MT900 MW900

SIZE	1 REGISTER	2 BEARING	3 PROPELLER	4 LINER	5 CABLE	6 BOLT	7 O-RING
4	R1104-XX	B0610-XX	PT105-XX	D0410-00	D0104-00	10103-00 (6)	T0390-00
6	R1106-XX	B0110-XX	P0106-XX	D0410-00	D0104-00	10103-00 (8)	T0390-10



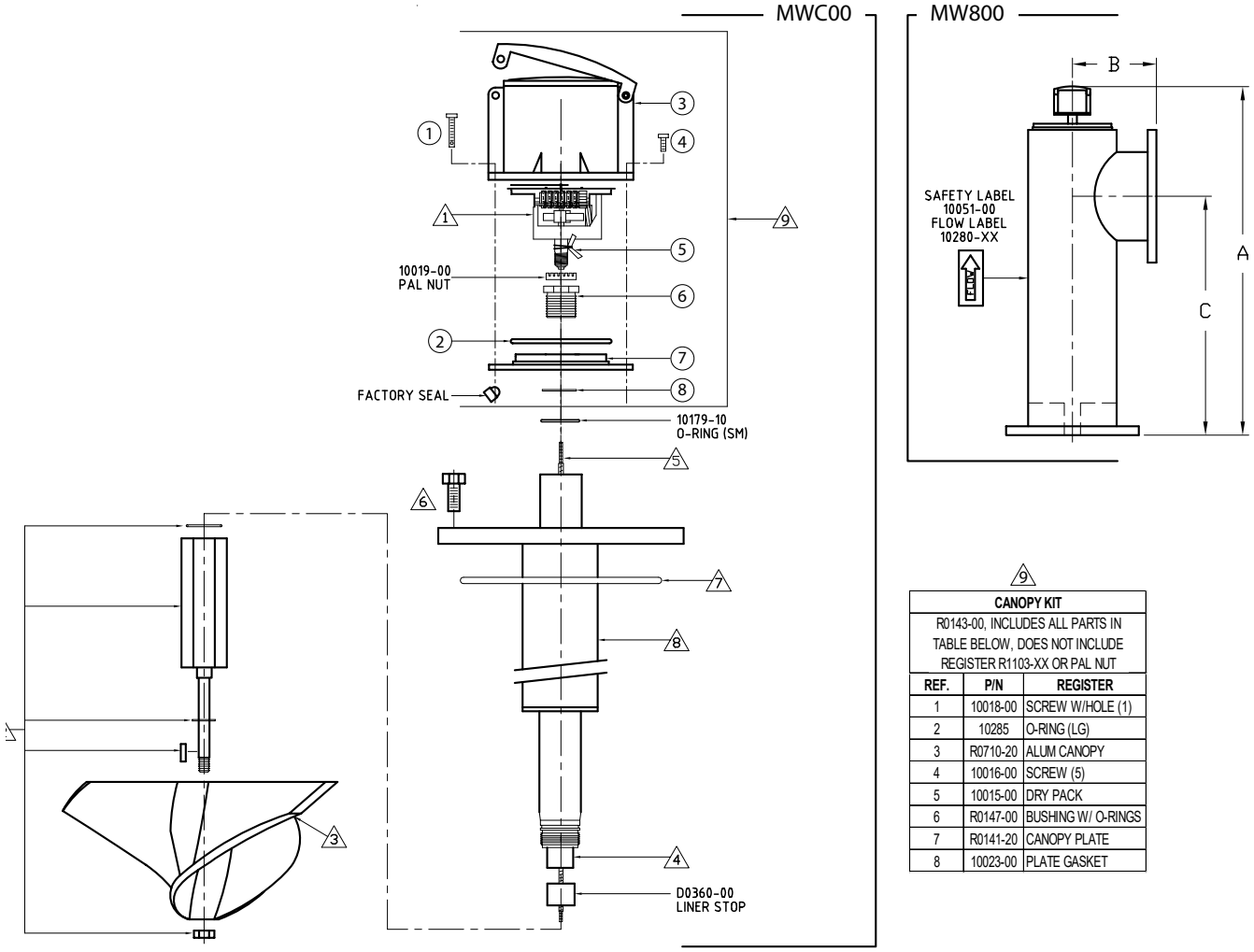
NOTES:
1. XX DEPENDS ON SPECIFIC REQUIREMENT
2. DRAWING IS NOT SHOWN TO SCALE.

△9

CANOPY KIT		
R0143-00, INCLUDES ALL PARTS IN TABLE BELOW, DOES NOT INCLUDE REGISTER R1103-XX OR PAL NUT		
REF.	P/N	REGISTER
1	10018-00	SCREW W/HOLE (1)
2	10285	O-RING (LG)
3	R0710-20	ALUM CANOPY
4	10016-00	SCREW (5)
5	10015-00	DRY PACK
6	R0147-00	BUSHING W/ O-RINGS
7	R0141-20	CANOPY PLATE
8	10023-00	PLATE GASKET

		△1 SIZE	△2 REGISTER	△3 BEARING	△4 PROPELLER	△5 LINER	△6 CABLE	△7 BOLTS	△8 O-RING	TOP PLATE	DIMENSIONS A	B	C
MM800 3" TO 16"	MMC00 4" TO 16"	3	R1103-XX	B0710-XX	P0103-XX	9.63"	11.62"	10049-10 (6)	10240-00	L0145-20	22.50"	5"	12.25"
		4	R1104-XX	B0610-XX	PT105-XX	15.75"	18.13"	10103-00 (6)	T0390-00	L0325-30	27.88"	6.50"	16.63"
		6	R1106-XX	B0110-XX	P0106-XX	16.25"	18.63"	10103-00 (8)	T0390-10	L0326-20	29.88"	8"	18"
		8	R1108-XX	B0110-XX	P0108-XX	22"	24"	10103-00 (8)	T0390-10	L0327-10	36.38"	9"	23"
		10	R1110-XX	B0110-XX	P0110-XX	27"	29.19"	10050-00 (12)	T0399-10	L0328-30	42.38"	11"	28"
		12	R1112-XX	B0110-XX	P0112-XX	32.25"	34.63"	10050-00 (12)	T0399-10	L0328-30	48.38"	12"	33"
		14	R1114-XX	B0110-XX	P0112-XX	37.25"	39.63"	10050-00 (16)	T0399-11	L0330-20	54"	14"	38"
		16	R1116-XX	B0110-XX	P0112-XX	42.25"	44.63"	10050-00 (16)	T0399-11	L0331-11	60"	15"	43"

PLEASE HAVE THE METER SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS



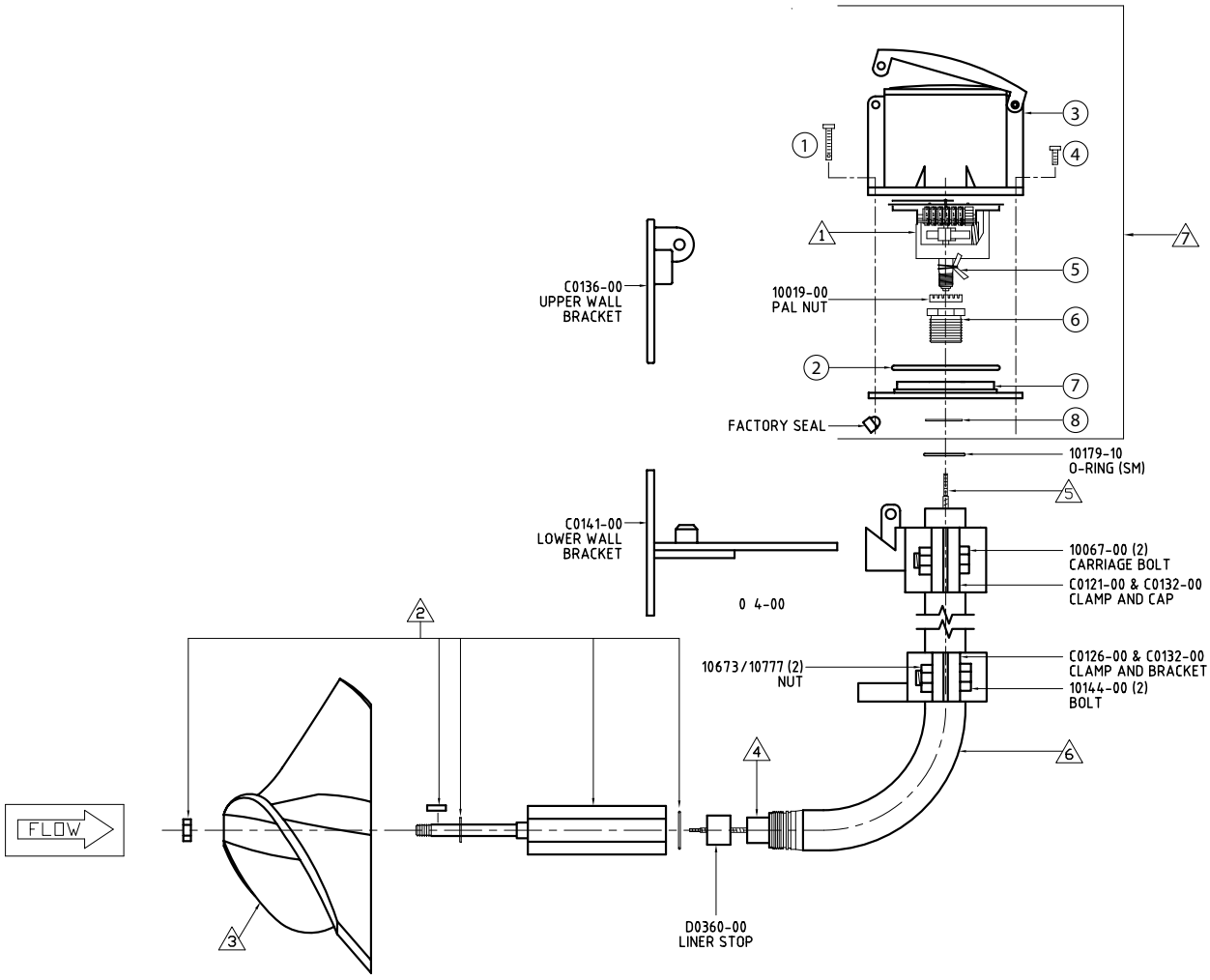
△9

CANOPY KIT		
R0143-00, INCLUDES ALL PARTS IN TABLE BELOW, DOES NOT INCLUDE REGISTER R1103-XX OR PAL NUT		
REF.	**P/N**	**REGISTER**
1	10018-00	SCREW W/HOLE (1)
2	10285	O-RING (LG)
3	R0710-20	ALUM CANOPY
4	10016-00	SCREW (5)
5	10015-00	DRY PACK
6	R0147-00	BUSHING W/ O-RINGS
7	R0141-20	CANOPY PLATE
8	10023-00	PLATE GASKET

NOTES:
1. XX DEPENDS ON SPECIFIC REQUIREMENT
2. DRAWING IS NOT SHOWN TO SCALE.

		△1	△2	△3	△4	△5	△6	△7	△8	DIMENSIONS		
	SIZE	**REGISTER**	**BEARING**	**PROPELLER**	**LINER**	**CABLE**	**BOLTS**	**O-RING**	**TOP PLATE**	**A**	**B**	**C**
MW800 3" TO 16"	3	R1103-XX	B0710-XX	P0103-XX	6.25"	8.63"	10049-10 (6)	10240-00	L0145-10	22.50"	5"	12.25"
MWC00 4" TO 16"	4	R1104-XX	B0610-XX	PT105-XX	7.88"	10.25"	10103-00 (6)	T0390-00	L0147-10	27.88"	6.50"	16.63"
	6	R1106-XX	B0110-XX	P0106-XX	9.25"	11.63"	10103-00 (8)	T0390-10	L0148-10	29.88"	8"	18"
	8	R1108-XX	B0110-XX	P0108-XX	12.75"	15.13"	10103-00 (8)	T0390-10	L0149-10	36.38"	9"	23"
	10	R1110-XX	B0110-XX	P0110-XX	15.75"	18.13"	10050-00 (12)	T0399-10	L0150-10	42.38"	11"	28"
	12	R1112-XX	B0110-XX	P0112-XX	18.75"	21.13"	10050-00 (12)	T0399-10	L0151-10	48.38"	12"	33"
	14	R1114-XX	B0110-XX	P0112-XX	21.38"	23.75"	10050-00 (16)	T0399-11	L0152-10	54"	14"	38"
	16	R1116-XX	B0110-XX	P0112-XX	22.25"	24.63"	10050-00 (16)	T0399-11	L0153-10	60"	15"	43"

PLEASE HAVE THE METER SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS



NOTES:
1. XX DEPENDS ON SPECIFIC REQUIREMENT
2. DRAWING IS NOT SHOWN TO SCALE.

SIZE	REGISTER (1)	BEARING (2)	PROPELLER (3)	LINER (4)	CABLE (5)	DROP PIPE (6)	HEIGHT
10	R1110-XX	B0110-XX	P0110-XX	CONFIGURED PER CUSTOMER REQUEST	CONFIGURED PER CUSTOMER REQUEST	CONFIGURED PER CUSTOMER REQUEST	CONFIGURED PER CUSTOMER REQUEST
12	R1112-XX	B0110-XX	P0112-XX				
14	R1114-XX	B0110-XX	P0112-XX				
16	R1116-XX	B0110-XX	P0112-XX				
18	R1118-XX	B1500-XX	P0116-XX				
20	R1120-XX	B1500-XX	P0116-XX				
24	R1124-XX	B1500-XX	P0116-XX				
30	R1130-XX	B1500-XX	P0145-XX				
36	R1136-XX	B1500-XX	P0146-XX				
42	R1142-XX	B1900-XX	P0146-XX				
48	R1148-XX	B1900-XX	P0146-XX				
54	R1154-XX	B1900-XX	P0146-XX				
60	R1160-XX	B1900-XX	P0146-XX				
72	R1172-XX	B1900-XX	P0146-XX				

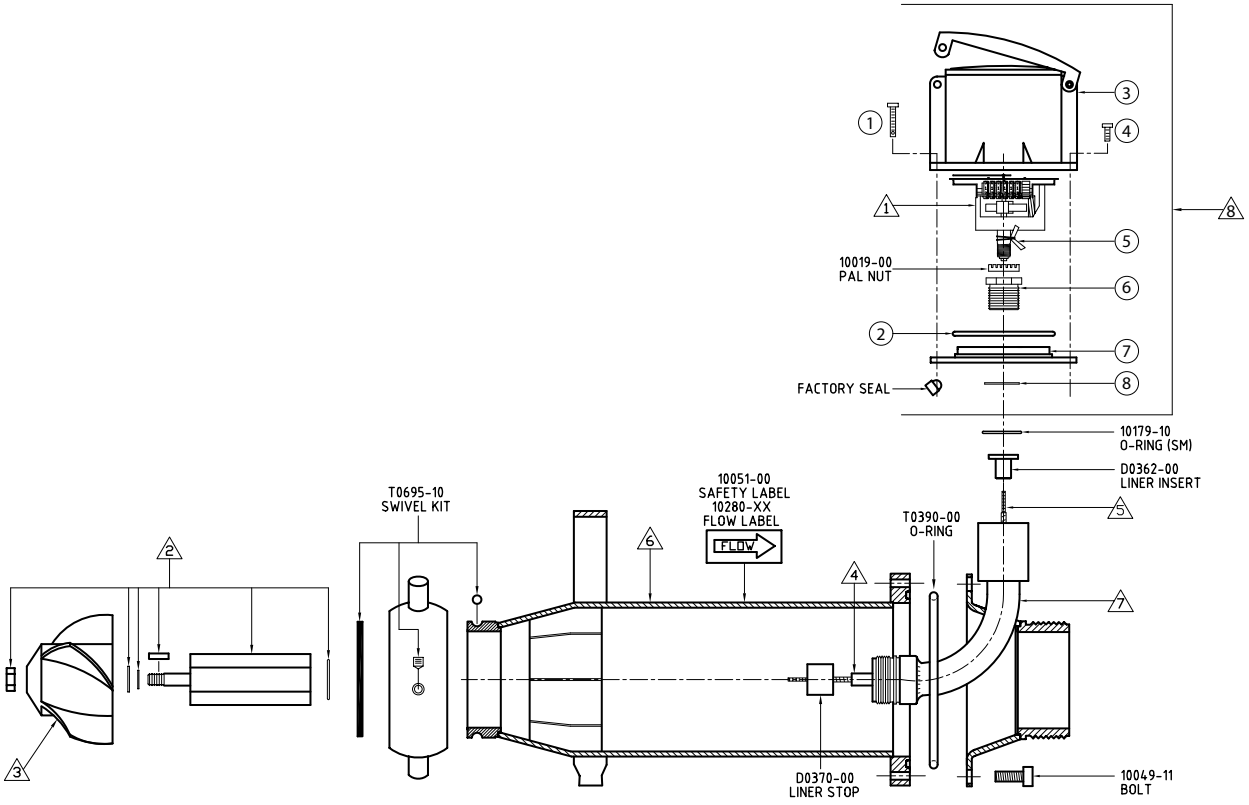
(7)

CANOPY KIT		
R0143-00, INCLUDES ALL PARTS IN TABLE BELOW, DOES NOT INCLUDE REGISTER R1103-XX OR PAL NUT		
REF.	P/N	REGISTER
1	10018-00	SCREW W/HOLE (1)
2	10285	O-RING (LG)
3	R0710-20	ALUM CANOPY
4	10016-00	SCREW (5)
5	10015-00	DRY PACK
6	R0147-00	BUSHING W/ O-RINGS
7	R0141-20	CANOPY PLATE
8	10023-00	PLATE GASKET

PLEASE HAVE THE METER SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS

M1104

4" Fire Hydrant



1 SIZE	2 REGISTER	3 BEARING	4 PROPELLER	5 LINER	6 CABLE	7 TUBE	ELL/END
4	R1104-XX	B0710-XX	P0105-XX	D0318-00	D0066-00	T0068-00	L0155-00

NOTES:
1. XX DEPENDS ON SPECIFIC REQUIREMENT
2. DRAWING IS NOT SHOWN TO SCALE.

PLEASE HAVE THE METER SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS

8 CANOPY KIT		
R0143-00, INCLUDES ALL PARTS IN TABLE BELOW, DOES NOT INCLUDE REGISTER R1103-XX OR PAL NUT		
REF.	P/N	REGISTER
1	10018-00	SCREW W/HOLE (1)
2	10285	O-RING (LG)
3	R0710-20	ALUM CANOPY
4	10016-00	SCREW (5)
5	10015-00	DRY PACK
6	R0147-00	BUSHING W/ O-RINGS
7	R0141-20	CANOPY PLATE
8	10023-00	PLATE GASKET

WARRANTY

McCrometer warrants that this product will be free from defects in material and workmanship for a period 12 months from the date the equipment was first installed, but in no event longer than 18 months from the date the equipment was first shipped by McCrometer. Repairs shall be warranted for 12 months or, if the repair is performed under this warranty, for the remainder of the original warranty period, whichever is less.

Buyer shall report any claimed defect in writing to McCrometer immediately upon discovery and in any event, within the warranty period. McCrometer shall, at its sole option, repair the equipment or furnish replacement equipment or parts thereof, at the original delivery point.

McCrometer shall not be liable for costs of removal, reinstallation, or gaining access. If Buyer or others repair, replace, or adjust equipment or parts without McCrometer prior written approval, McCrometer is relieved of any further obligation to Buyer under this Article with respect to such equipment.

No equipment furnished by McCrometer shall be deemed to be defective by reason of normal wear and tear, failure to resist erosive or corrosive action of any fluid or gas (unless otherwise specified in Quotations/ Purchase Order Specifications), Buyer's direct or indirect failure (or the failure of its agents or contractors) to properly store, install, operate, or maintain the equipment in accordance with good industry practices or specific recommendations of McCrometer, or Buyer's failure to provide complete and accurate information to McCrometer concerning the operational application of the equipment.

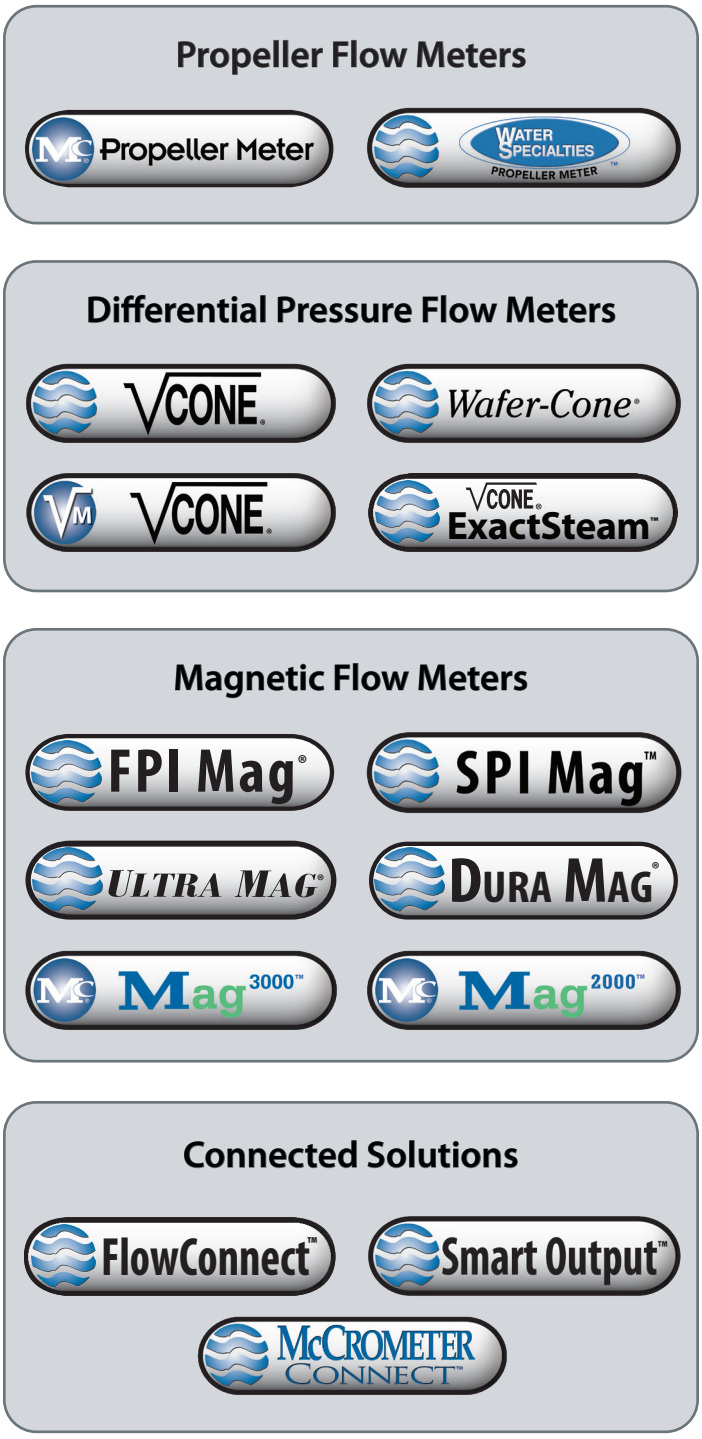
THE FOREGOING LIMITED WARRANTIES WITH RESPECT TO EQUIPMENT AND PRODUCTS ARE EXCLUSIVE AND IN LIEU OF ANY AND ALL OTHER WARRANTIES OF QUALITY OR PERFORMANCE, EXPRESS, IMPLIED OR STATUTORY, INCLUDING, WITHOUT LIMITATION, ANY AND ALL WARRANTIES OF MERCHANTABILITY OR FITNESS OF SAID EQUIPMENT AND PRODUCTS FOR ANY PARTICULAR PURPOSE.

MCCROMETER DISCLAIMS ANY WARRANTY, WHETHER EXPRESS OR IMPLIED, REGARDING THE SUITABILITY OF PRODUCTS AND EQUIPMENT SUPPLIED PURSUANT TO ANY PURCHASE ORDER FOR INSTALLATION IN ANY PARTICULAR SYSTEM OF SYSTEMS. MCCROMETER MAKES NO WARRANTY OF ANY KIND WITH RESPECT TO ANY SERVICES PERFORMED BY MCCROMETER OR ITS AGENTS PURSUANT TO ANY QUOTATION.

Purchaser's sole remedy and manufacturer's sole obligation for alleged product failure, whether under warranty claim or otherwise, shall be the aforestated obligation of manufacturer to repair or replace products returned within the warranty period. The manufacturer shall not be liable for, and the purchaser assumes and agrees to indemnify and save harmless the manufacturer in respect to, any loss or damage that may arise through the use by the purchaser of any of the manufacturer's products.

McCrometer does not authorize any person or entity (including, without limitation, McCrometer agents and employees) to make any representations (verbal or written) contrary to the terms of this limited warranty or its exclusions. Such terms of this limited warranty and its exclusions can only be effectively modified in writing and only by the President of McCrometer.

OTHER McCROMETER PRODUCTS INCLUDE:



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www.mccrometer.com

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