Smith Meter® Rotary Vane PD Meters

2-Bladed Double Case PD Meters

Service Manual

Bulletin MN01005 Issue/Rev 0.6 (12/18)

Models

Straight Through	Angle Type
C2 - S1, S3, S5, S7	–
E3 - S1, S3, S5, S7	A1, A3
E4 - S1	A1
F4 - S1, S2*, S3, S5, S7	A1, A3
G6 - S1, S3, S5, S7	A1, A3
H8 - S1, S3, S5, S7	–
JA10 - S1, S3, S5, S7	–

* European version

G6-S1 - Straight Through Type

F4-A1 - Angle Type

Important

All information and technical specifications in this documentation have been carefully checked and compiled by the author. However, we cannot completely exclude the possibility of errors and are always grateful to be informed of these errors.

Smith Meter® is a registered trademark of TechnipFMC.

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1 – Overview

This manual provides detailed inspection and service information for the models of Smith Meter® Double Case, 2-bladed Rotary Meters listed. See the Related Publications section for Specification, Part Lists, and Installation/Operation information pertaining to your specific model of meter.

Double case meter construction features ease of maintenance and service. For example, the measuring unit can be removed vertically from the outer housing with little spillage and without disturbing pipe connections. Also, within a given size, complete metering units and parts are interchangeable. As a result, the simple removal and disassembly steps encourage periodic preventive maintenance inspections.

It is suggested that a detailed record be maintained for each meter in the installation. Nameplate data (Figure 1), clearances, progressive totalizer readings, meter factor, parts used, and other similar information provide background material for scheduling a preventive maintenance program. An increase in meter factor drift against throughput can be used as the basis for making an inspection.

The time of the first inspection must be based on the operating conditions imposed by the installation.

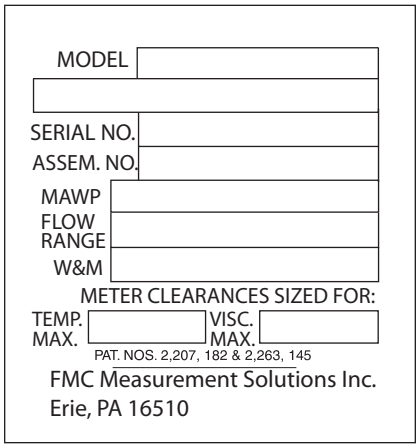


Figure 1

Flow rate, lubrication properties of the fluid, and the possibility of abrasive contaminants are points to consider. Then, at the time of inspection, the condition of the meter should indicate whether the inspection interval can be lengthened or shortened.

When ordering parts or inquiring about a unit, be sure to include complete model and serial number information from the plate, Figure 1.

Note: Meters constructed to special specifications (designated by 6-digit serial number) may have clearances in variance to those shown in this manual. Consult your representative or the factory for the correct information pertaining to your meter.

1.1. Description

Smith Meter® double case rotary meters are of the positive displacement type, Figure 2. The metering mechanism is an inner unit bolted into the outer housing. The double case design eliminates distortion of the measuring chamber due to pressure differential and piping strains. Pipe connections are confined to the outer housing, which means the meter can be removed by taking off the cover assembly and lifting it out. Inspection, maintenance, and service are greatly simplified through the double case design.

The measuring function is accomplished in a chamber of precise volume created by the moving blades, rotor, body, and cover. There is a smooth flow of product through the meter. The blades rotate around a fixed cam, which causes them to move out to, but not touch, the body of the meter. Four chambers per revolution are formed as the rotor and blades are turned by product flow.

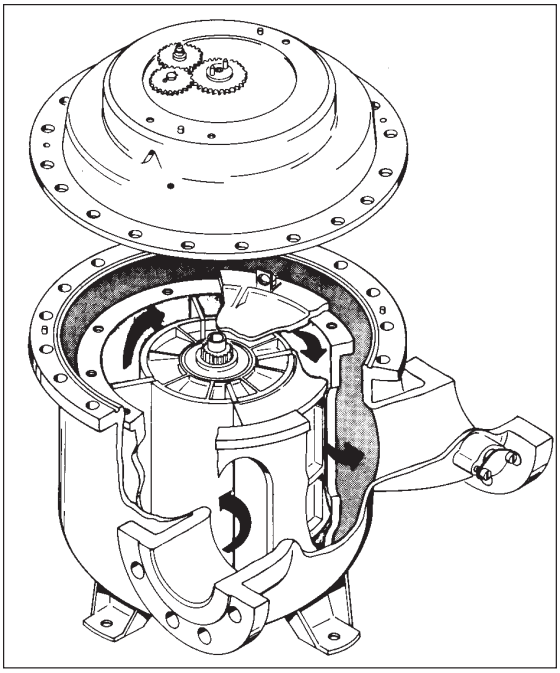


Figure 2 – *Horizontal Double Case Meter*

TechnipFMC Measurement Solutions, Inc. provides a meter variation with tungsten carbide trim to resist the accelerated wear that can be caused by impurities, such as sand and iron sulfide, and also by the low lubricity of condensates. This variation includes solid tungsten carbide journal rotor and thrust bearings. In addition, blade bearing size and weight have been reduced to minimize the rotational inertia and wear resistance of the bearings and cam has been substantially increased. Also, the rotor and jackshaft gear assemblies are hardened stainless steel.

2 – Disassembly

2.1. General

To assure adequate inspection and maintenance, the step-by-step procedures in this manual should be carefully followed. To gain a better understanding of high capacity rotary meter design and construction, it is suggested that the service person review this manual before starting disassembly.

All parts, as they are removed, should be thoroughly washed and cleaned in solvent. Parts that are worn enough to affect operation or calibration should be replaced. All parts that are nicked, gouged, or have rough places on them, should be dressed with a fine file or crocus cloth, as conditions warrant.

2.2. Suggested Tools and Fixtures

In addition to ordinary hand tools, the following tools and equipment will facilitate work on the meter.

- Suitable lifting equipment for larger meters.
- Crocus cloth.
- Feeler gauges[1], leaf type 9 as illustrated during disassembly) – (Table 1).
- Wood box (Figure 3A) for supporting inner unit.
- Eye bolts: one 1"-*, two ½"-13, two 3/8"-16.
- Circular wood block (Figure 3B) to support rotor.
- Micrometer+, depth type – 1".
- Idler pin puller (Models C2- H-8 Low Pressure, S1) facilitates removal of idler pinion gear shaft from cover.
- Rotor shaft nut with loop[1] and spiders[1].
- Spiders[1] (Figure 3C).

Parts No.[2]	Thickness	Part No.[2]	Thickness
515252-1	.0015"	515252-11	.011"
515252-2	.002"	515252-12	.012"
515252-3	.003"	515252-13	.013"
515252-4	.004"	515252-14	.014"
515252-5	.005"	515252-15	.015"
515252-6	.006"	515252-16	.016"
515252-7	.007"	515252-17	.017"
515252-8	.008"	515252-18	.018"
515252-9	.009"	515252-19	.019"
515252-10	.010"	515252-20	.020"

***Table 1** – Feeler Gauge Sizes*

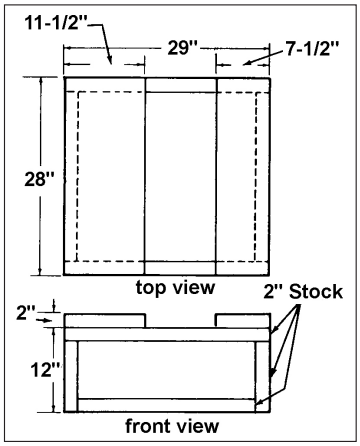


***Figure 3A –** Wood box*

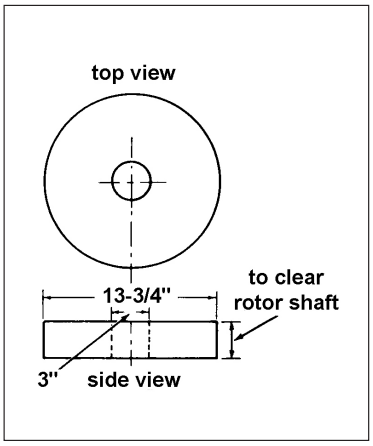


***Figure 3B –** Circular wood block*

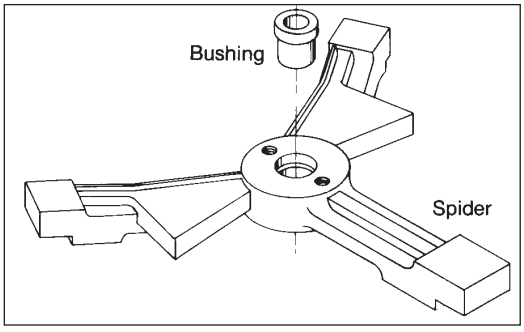


***Figure 3C –** Spider and Bushing*

1 Available Smith Meter® Parts. Reference Form No. PO0A001.
2 Consists of feeler gauge soldered to 15" rod. An extension rod (22") and coupling is available as Part No. 5152500.

2.3. Standard Pressure-Outer Cover (Models C2 Through JA10-S1 and A1)

1. If desired, the cover can be removed and set aside with the packing gland and gears in place. On 10" meters, the gear train is attached to the cover of the inner mechanism. See Figure 4.
2. Any evidence of leaking through this packing gland will be visible at this time. To replace packing gland, it is necessary to remove the jackshaft washer and gear as shown in Figure 5.
3. Packing gland may then be replaced as shown in Figure 6. See Table 12 on page 28 for torque values.
4. Jackshaft should be inspected for corrosion or scoring.

   If necessary to polish or replace, cover must be removed by removing bolts and nuts securing cover to body.
5. Remove the upper jackshaft, thrust bearing, and link assembly, Figure 7. If reusable, clean, polish and coat with grease.
6. Check the jackshaft bushing, Figure 7, for wear. Bushing may be replaced if worn.
7. Inspect the retainer and ball assembly, Figure 7, for wear. If worn, replace. Be sure flat side of races are next to bearings.
8. Reassemble the jackshaft components and gear parts to cover.

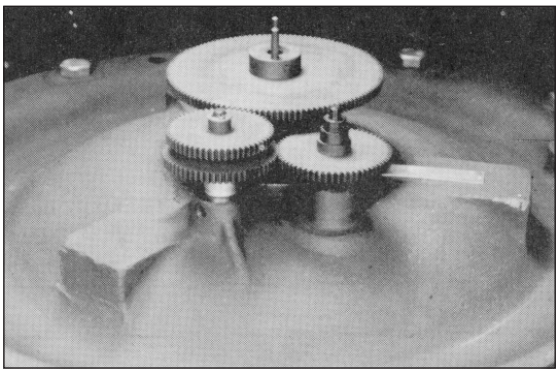


Figure 4 – *Series JA10 10" Meter*

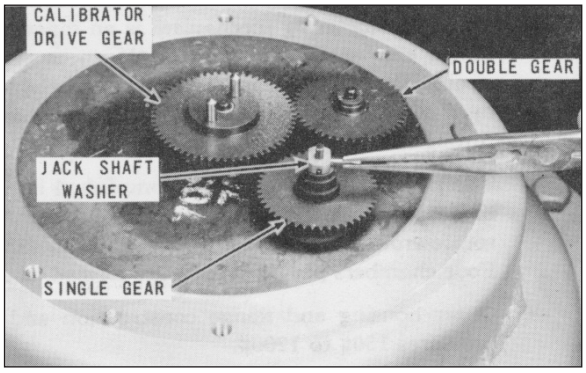


Figure 5 – *Removing Pin from Washer*

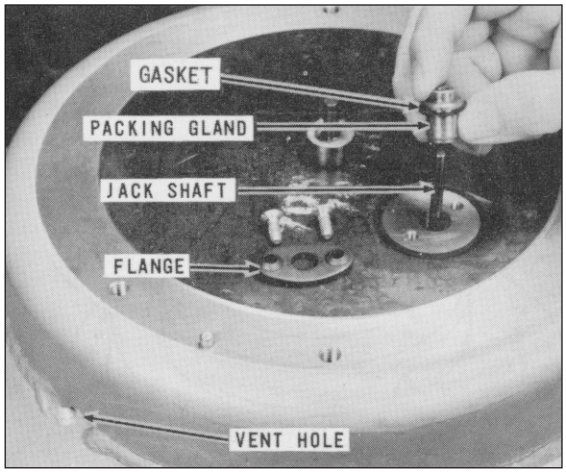


Figure 6 – *Removing Packing Gland*

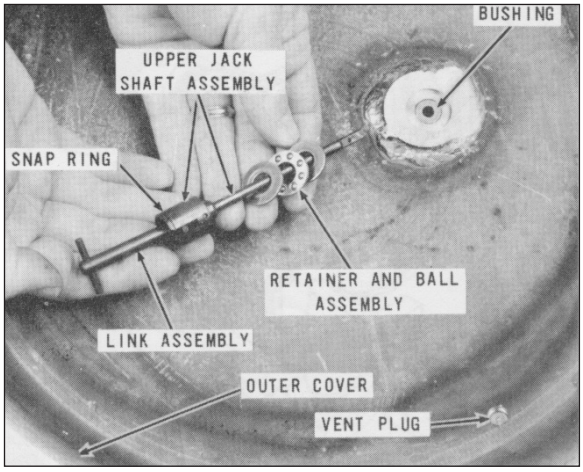


Figure 7 – *Jackshaft Assembly*

2.4. High Pressure Packing Gland Maintenance (Models C2 Through JA10-S1, S3, S5, S7, and A3)

Glycerine solution is used as a sealant and lubricant in this type of packing gland. The gland should be serviced on an interval determined by experience, however, the period between injections should not exceed 60 days. See Figure 8.

Ambient Temperature	Lubricant
-4°F to 300°F (-20°C to 150°C)	Glycerine solution

Table 2

If the meter has been idle for a period of time, prior to startup, inject the packing gland with 1 oz of Glycerine solution.

The lubricant injection volume of the packing gland is recommended to be 1 fluid oz. injected through the lubrication (Zerck) fitting. The packing gland design and reservoir overflow into the meter which ensures that the packing gland cannot be overfilled.

Note: Lubricating grease should never be used in the packing gland.

Reference Literature:

- PO01042 Packing Gland Parts List
- PO0A002 Lubricants and Sealants Parts List
- PO0A001 Tools Parts List

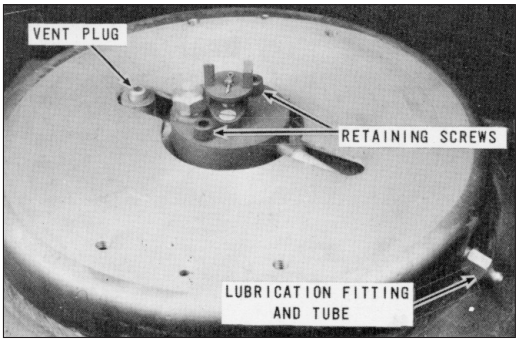


Figure 8 – *Packing Gland on Cover*

2.5. High Pressure Packing Gland Service (Models C2 Through JA10-S1, S3, S5, S7, and A3)

WARNING: Prior to any service or disassembly of the packing gland, it is strongly recommended to depressurize and drain the meter, maintaining zero pressure on the packing gland.

1. To remove the gland assembly, Figure 9:

   Remove the lubrication fitting and tube. Remove the two socket head cap screws. Lift out the gland assembly and seal ring.

2. The gland may be disassembled and parts replaced as necessary. Refer to general meter parts list for assembly number and specific parts list for individual parts. See Table 12 on page 28 for torque values.

3. If the shaft is worn or corroded, it should be replaced. If reusable, clean and polish the shaft with fine crocus cloth.

   When reinstalling, lightly coat the shaft with grease.

4. Inspect the thrust bearing plates for wear. If worn, replace. Be sure flat side of races are next to bearings.

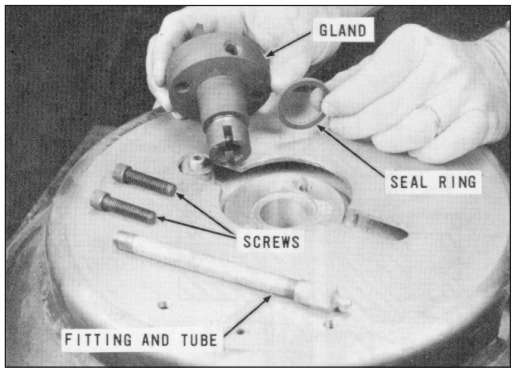


Figure 9 – *Gland Removed*

2.6. Gear Train

To remove the gear train from the cover: Turn the cover over, loosen the set screw, and remove the calibrator drive gear, shaft, and washer, Figure 10. Remove the screws, Figure 10, that hold the gear housing to the cover and lift off, Figure 11. The locating pin and hole aid in reassembly.

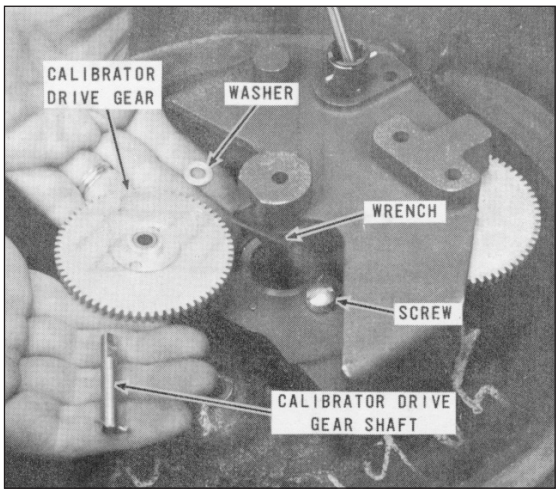


Figure 10 – *Removing Drive Gear and Shaft*

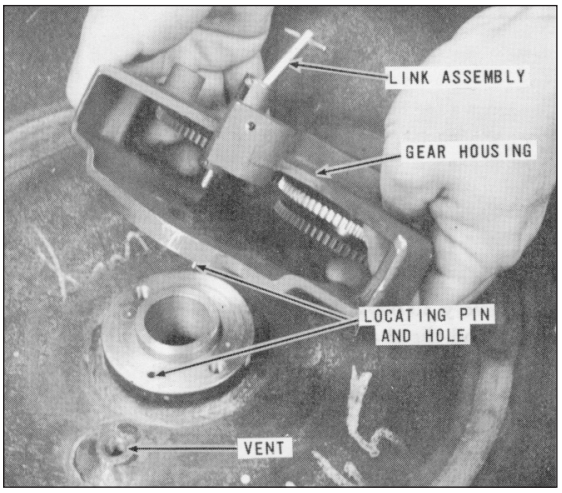


Figure 11 – *Removing Gear Housing*

2.7. Inner Mechanism

If rotor assembly does not turn freely, total end clearance can be checked and adjusted at this time. This is accomplished by dividing top and bottom clearance with adjusting screw.

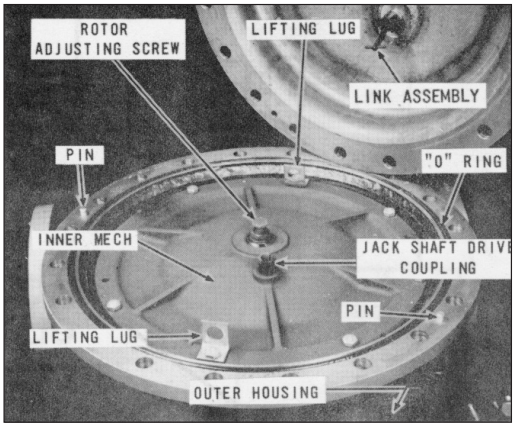


Figure 12 – *Cover Removed*

2.8. Models C2 - G6 Meter Adjustment

1. Loosen the adjusting screw nut, Figure 12.
2. Apply torque to jackshaft coupling and turn the adjusting screw until a position is found where the rotor turns freely.
3. When a free turning position has been found, with the rotor revolving, the adjusting screw should be turned CCW slowly until rotor rubs top cover.
4. Mark the position of the adjusting screw in relation to the top cover. With the rotor revolving, turn the adjusting screw CW until rotor rubs bottom. Mark this position of the screw in relation to the cover.
5. Turn the adjusting screw to adjust rotor approximately 1/3 down between the two above positions.

5. If, at this time, the rotor turns freely, the meter may now be reassembled and tested to see if the calibration problem has been corrected.
6. If the rotor cannot be adjusted properly, the mechanism will have to be disassembled and the necessary corrective steps taken. A properly cleaned and adjusted meter can be turned by hand with a slow, even torque applied to the jackshaft coupling. Do not use pliers to turn coupling.

2.9. Models H8 and JA10 Meter Adjustment

These two meters differ from the smaller sizes in that the rotor assemblies are suspended rather than supported by the spring. Thus, the procedure for adjusting rotor end clearance is reverse (CCW to bottom, CW to raise) of the smaller sizes.

Clearances should be checked through the inlet and outlet ports using feeler gauges to position the rotor 1/3 down from the cover.

In the H8, the adjusting mechanism consists of a long cap screw, which extends down through the center of the rotor shaft, and threaded into the adjusting bar which moves the adjusting collar. To prevent movement after the rotor is adjusted, a locking plate is used over the head of the adjusting cap screw.

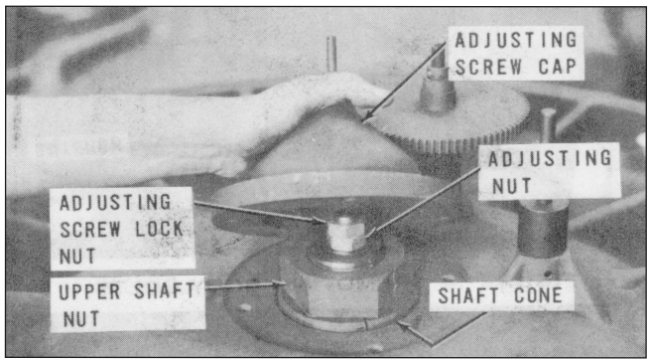


Figure 13 – *JA10*

In the JA10, both the top and bottom of the adjusting rod are threaded. The bottom portion is screwed into the adjusting bar and pinned in place to prevent movement and a nut and lock nut are used on the opposite end to accomplish the adjustment and locking.

2.10. Disassembly of Inner Mechanism

The inner mechanism removal and disassembly procedure is essentially the same for all meters, unless otherwise noted:

1. Take out the bolts that fasten the body to the housing, Figure 14.
   - 2", 3", and 4" (pipe size) meters use two bolts.
   - 6", 8", and 10" meters use four bolts, two on either side of nozzle port.
2. Using the lifting lugs, remove the inner mechanism from the housing, Figure 15.

   Due to sealant, it may be necessary to break apart the body and housing if they cling together.

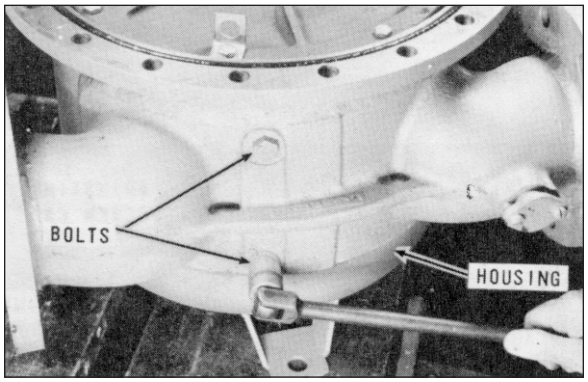


Figure 14 – *Removing Body Bolts*

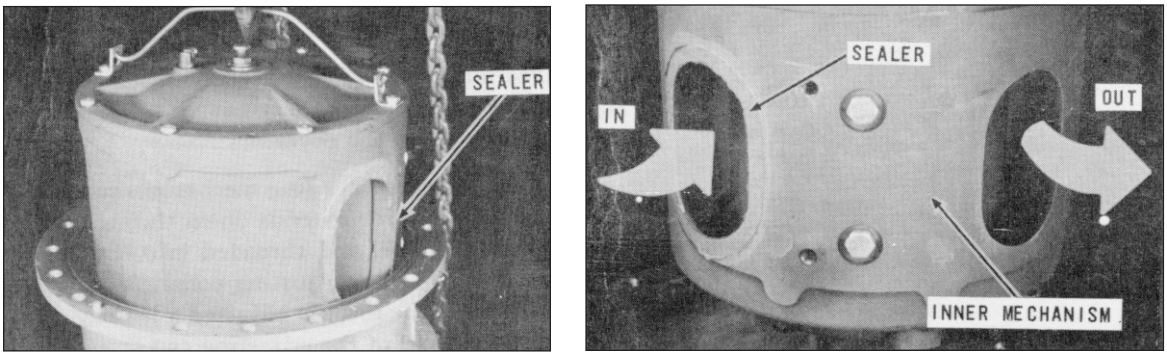


Figure 15 – *Removing Inner Mechanism*

JA10 Meters Only: Do not attempt to remove the inner mechanism cover before taking off the adjusting screw cap and rotor shaft nut and shaft collar. Figure 16. Failure to remove the upper shaft nut will result in breakage of the meter cover or base.

To remove inner mechanism cover, take out all of the cover screws. Place cover screws into the (2 or 3) tapped holes as shown. Using the screws as jacks, remove the cover, Figure 17.

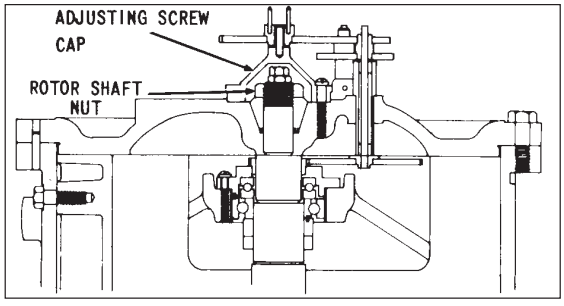


Figure 16

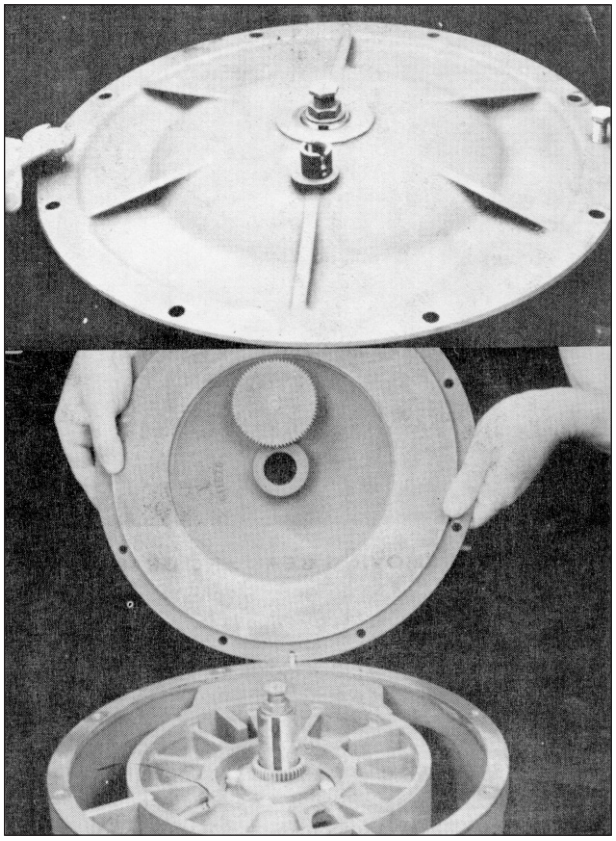


Figure 17

During disassembly of the inner mechanism, clearance may be checked (see Clearance Check section) to determine the condition for various parts. To be done accurately, a spider should be used. This fixture maintains inner housing concentricity when the cover is removed. Contact your TechnipFMC authorized distributor for availability.

Take out the machine screw and plate (on JA10 meters, shaft nut) located on underside of housing.

Remove the rotor from the housing, Figure 18. Lift out carefully to prevent damaging blades.

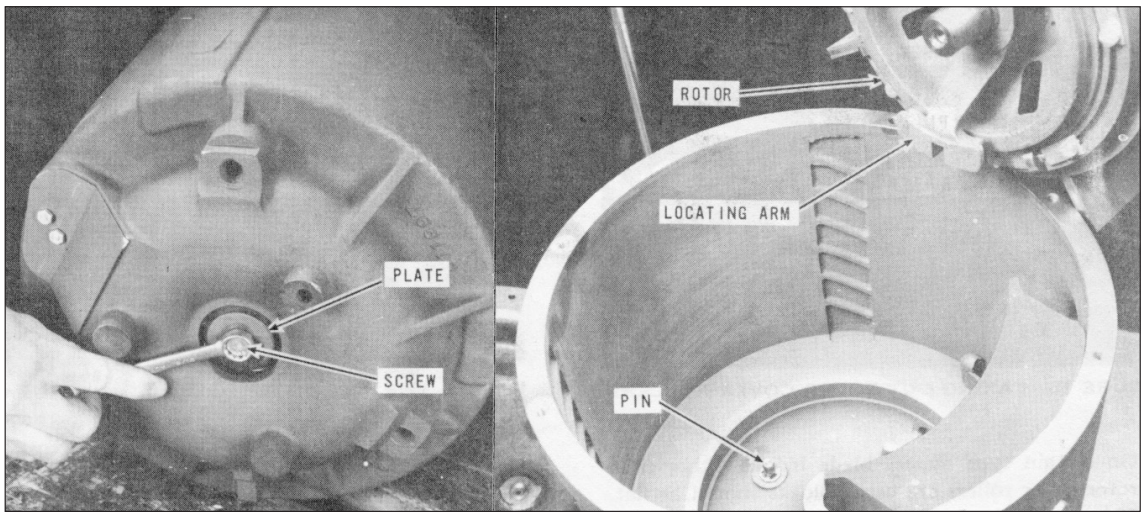


Figure 18

To disassemble the rotor, place the assembly upside down on a suitable surface, Figure 19.

Loosen the socket head cap screw and lift off locating arm.

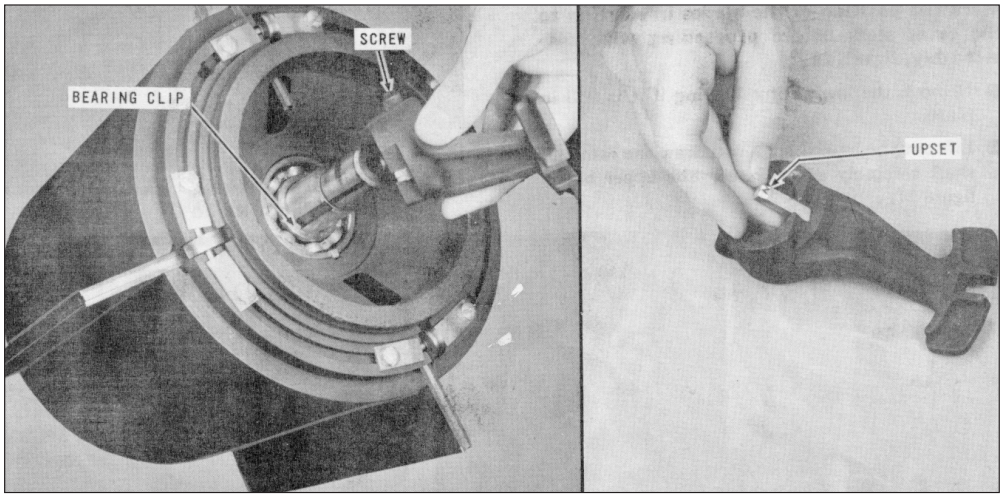


Figure 19 – *Removing Arm from Rotor*

2.11. Rotor Cover Rollers Removal (Figure 20)

1. Remove the screws and clamps that secure the rollers to the rotor.
2. Lift out the rollers and pins. Check for wear and smoothness of operation.

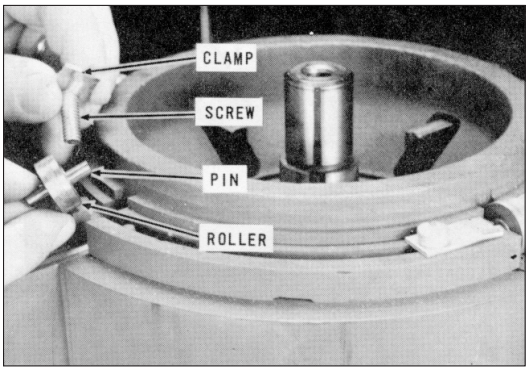


Figure 20 – *Taking Out Rotor Cover Rollers*

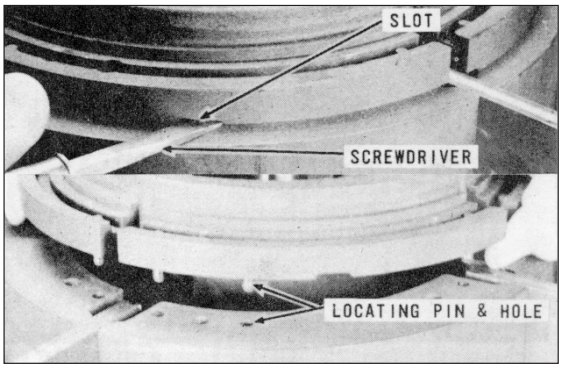


Figure 21 – *Removing Cover from Rotor*

On certain type meters, blade blocks rather than rotor cover rollers are used. Blocks should be Flat. If grooved, they may be turned over and reused. The rotor cover and rotor are mated parts. If taken apart, they should not be exchanged with another meter or replaced individually.

3. To separate the cover and rotor, pry up (to prevent damaging edge of rotor) at the openings provided, Figure 21.
4. Lift off the cover. Note position of locating pin and hole to assure proper positioning during reassembly.

   Mark the position of the blades in relation to the rotor slots before proceeding with disassembly (Figure 22). Note the different blade and rotor bearings for standard and tungsten carbide meter versions (See Figure 22A).
5. Remove the lower rotor bearing if it is still in place.

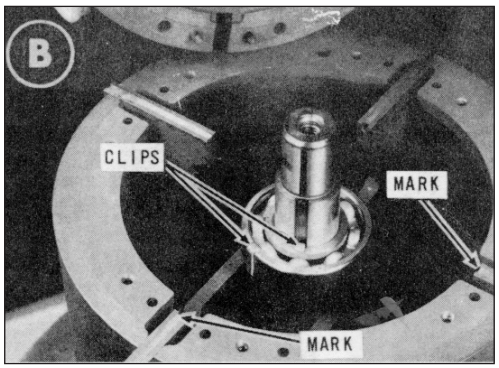


Figure 22 – *Removing Cover from Rotor*

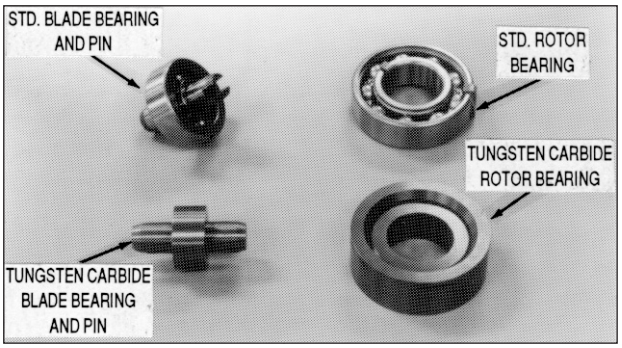


Figure 22A – *Blade and Rotor Bearing Comparison*

6. Lift out the lower blade, withdraw the cam and shaft assembly, and take out the upper blade, Figure 23.

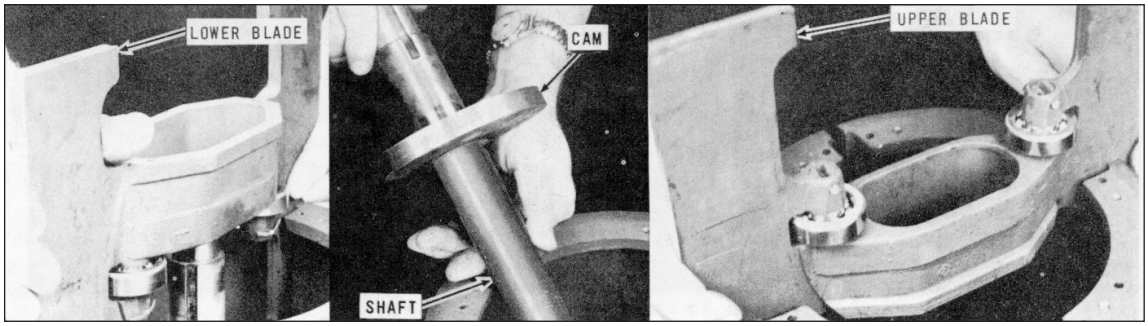
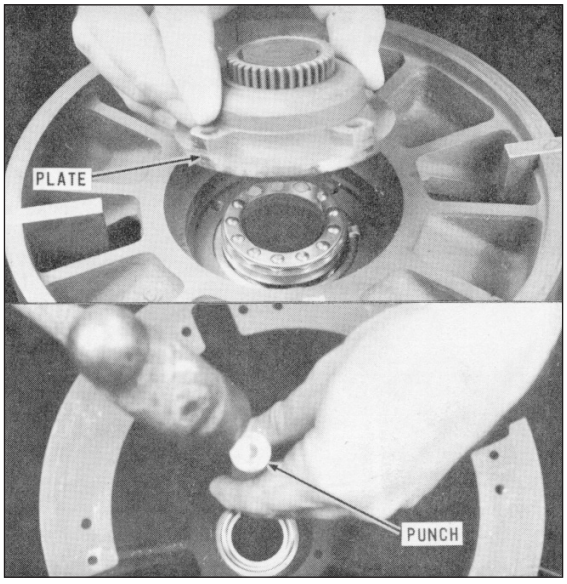


Figure 23 – *Removing Blade and Shaft*

Turn the rotor over and remove the rotor gear plate, Figure 24. Note the different thrust bearing types used on standard and tungsten carbide meter versions (see Figure 24A). Take out the screws that hold the plate to the rotor and lift off. Remove the upper rotor bearing, spacer, and thrust bearing. If necessary, drive with punch made of soft material.



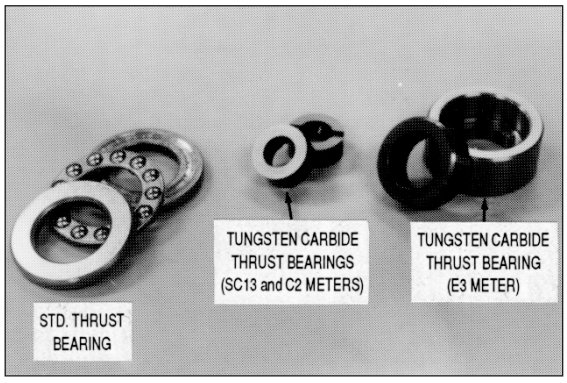


Figure 24A – *Thrust Bearing Comparison*

Figure 24 To disassemble shaft and cam, place shaft in press or vise to compress spring so that pin can

be removed from collar.

The cam may be removed from the shaft by pressing it off. A woodruff key is used to prevent the cam from turning on the shaft.

The adjusting screw extension pin is removed from the shaft by taking out the adjusting screw, nut, and washer, Figure 25.

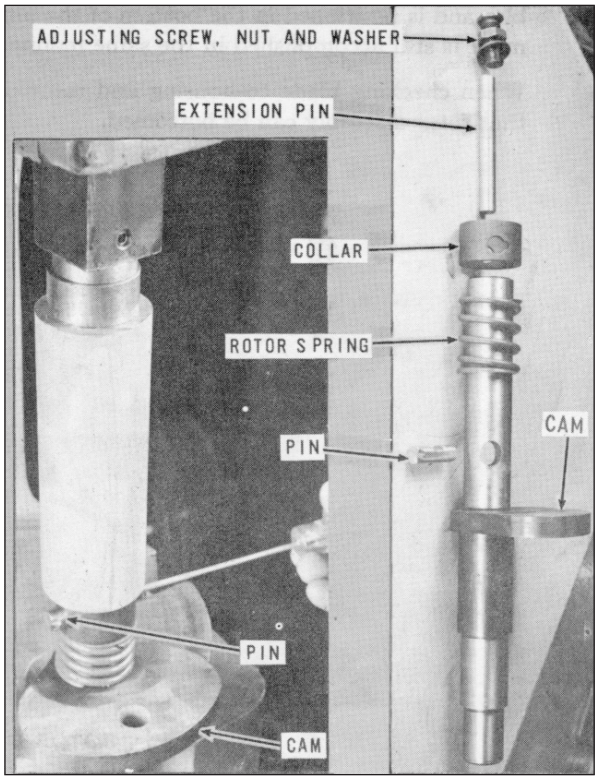


Figure 25 *– Removing Collar*

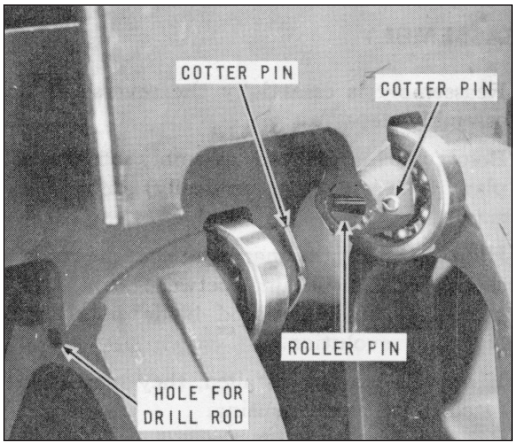


Figure 26

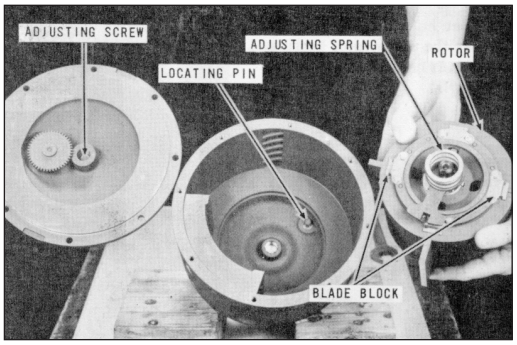


Figure 27 – *Rotor Removal, Series C2 Meter*

If blade bearings need replacement, removal is accomplished as follows, Figure 26:

1. Remove cotter pin and press out blade roller pin with a drill rod.
2. Reassemble with new bearing in press. Use care to align slot pin with cotter pin hole.
3. Bend ends of cotter pin as shown.

If replacement of tungsten carbide outer radial bearings is necessary, it is recommended that complete next-level assemblies (rotor gear plate or rotor sub-assembly) be procured with bearings already installed, or capabilities must permit epoxying bearings in precise alignment.

Note on H8 and JA10 Blade Roller Pins:
On later meters, a change has been made in blade roller pins.
The exposed end of the pin has been shortened, drilled, and tapped so that it can be extracted by using a cap screw and a bushing arrangement to jack the pin from the blade rather that having to drive it out with a drill rod as in the old style. In assembly, pins should be coated with "Anti-Sieze Lube," then pressed into position.

2.12. C2 Series Meter

The main difference in this series is that the rotor spring is not a part of the cam and shaft assembly, and is positioned in the bottom of the inner housing below the rotor assembly. Rotor adjustment is still accomplished in the same manner, Figure 27. When checking blade to housing and rotor to block clearances, the spring must be removed so that rotor assembly can be bottomed.

3 – Clearance Checks

3.1. Clearance Guide

This clearance guide lists the recommended minimum and maximum fitting clearance for repaired meters. (All units of measurement are inches).

Meters often exhibit acceptable accuracy even if the clearances exceed the ranges shown.

Meter Model	(B) Rotor to Block Clearance	(F) Rotor Adjustment Total End Clearance	(C) Blade Slot Clearance	(D) Blade Ends Below Rotor Clearance	(E) Blade Roller Over Cam Radius Clearance	(A) Blade Tip to Housing Clearance
C2	.002"-.004"	.005"-.009"	.001"-.004"	.000"-.003"	.001"-.005"	.003"-.005"
E3, E4	.002"-.004"	.005"-.011"	.001"-.005"	.000"-.004"	.001"-.005"	.003"-.005"
F4	.003"-.006"	.005"-.011"	.002"-.005"	.000"-.004"	.001"-.005"	.004"-.006"
G6	.003"-.006"	.007"-.013"	.002"-.005"	.000"-.004"	.001"-.005"	.006"-.008"
H8	.004"-.007"	.010"-.016"	.002"-.006"	.000"-.004"	.001"-.006"	.007"-.011"
JA10	.004"-.008"	.010"-.016"	.002"-.006"	.000"-.004"	.001"-.006"	.008"-.013"
NOTE: For Special Clearances, Consult Factory or Authorized Service Representative.						

Table 3

The above clearances apply to meters operating at standard operating temperatures and viscosity range as listed below. For meters built to operate at higher temperature and viscosity (designated by a 6-digit serial number). Consult factory. Specify serial number and record special clearances in space provided.

Standard Temperature Ranges
C2 Through G6: -20°F (-29°C) to 150°F (65°C)
H8: -20°F (-29°C) to 137°F (58°C)
JA10: -20°F (-29°C) to 125°F (52°C)

Standard Viscosity Limit
C2 Through H8: Less than 2,000 SSU (400 mPa•s)
JA10: Less than 1,000 SSU (200 mPa•s)

3.2. Clearance Checks

Clearances should be checked with a leaf type feeler gauge and compared with the Clearance Guide Table.

Any average of clearances that are outside of the tolerance listed should be noted. Certain parts may be at or over the maximum shown but consideration should be given to the condition of the part and the accuracy obtained during meter calibration. Certain major parts such as the rotor, cam, and blades need not be replaced if the meter proving records show no appreciable change in accuracy between provings.

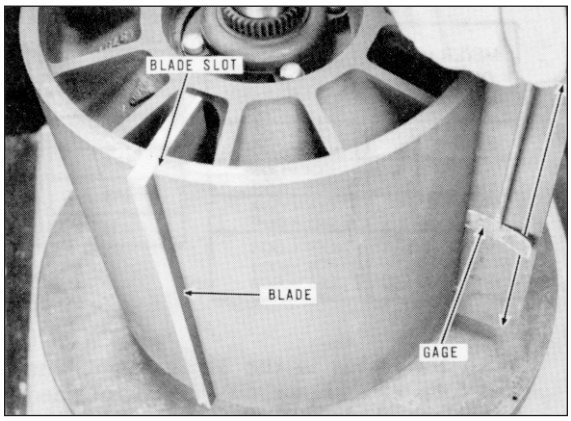
3.3. Blade Slot Clearance (C)

Special Tools Required:

1. Feeler Gauges

2. Flat metal surface with opening to receive shaft.

Blades should move freely in rotor slots and the average clearance in each slot should not exceed the listed clearances, nor shall any single point be more than 25% above the maximum listed.

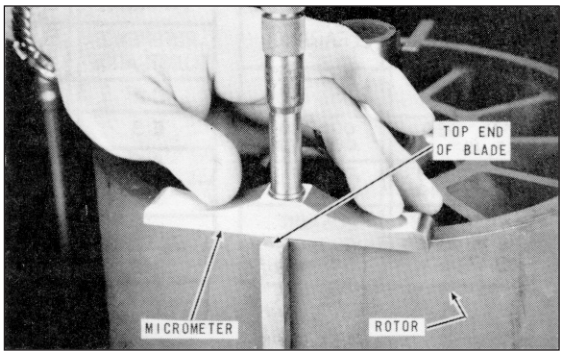


3.4. Blade Top End Below Rotor Clearance (D)

Special Tool Required:

1. Depth Micrometer or Feeler Gauge

Place a depth micrometer on the rotor over the blade end as shown. If a depth micrometer is not available, a feeler gauge may be used. Lower edge of blade should not project below bottom surface of rotor.



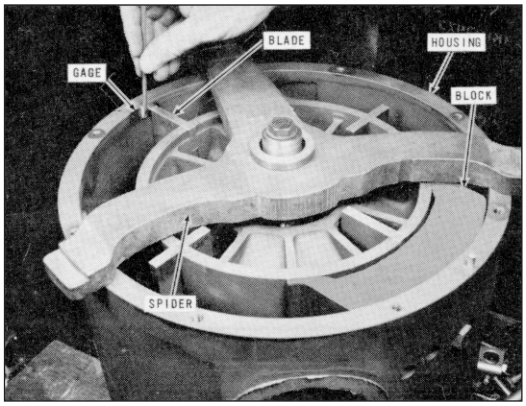
3.5. Blade Tip to Housing Clearance (A)

Special Tool Required:

1. Spider

2. Feeler Gauge

With the blade held toward the housing, these clearances should be maintained between the measuring chamber and the full length of the edge of the blade.



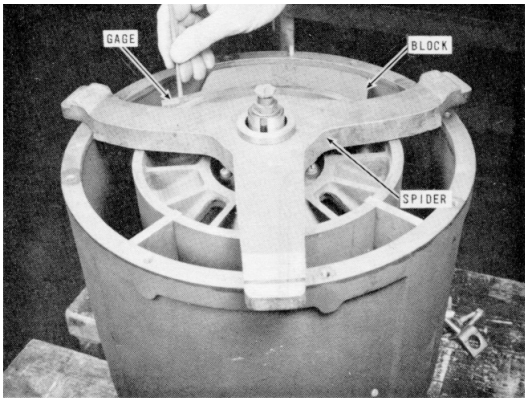
3.6. Rotor to Block Clearance (B)

Special Tool Required:

1. Spider

2. Feeler Gauge

These clearances between rotor and block should be maintained the full length of the rotor.



3.7. Blade Roller to Cam Radius Clearance (E)

Special Tool Required:

1. Feeler Gauge

With the blade in the measuring chamber, this total clearance should be maintained between the radius of the cam and one roller only.

To measure blade roller clearance over radius portion of cam, insert feeler gauge and check through radius. Compare measurement with clearance guide.

Check only one blade roller on each blade.

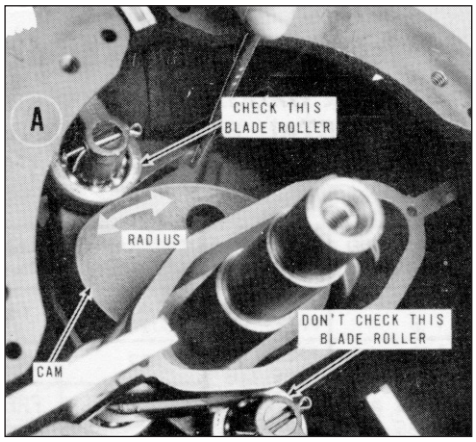


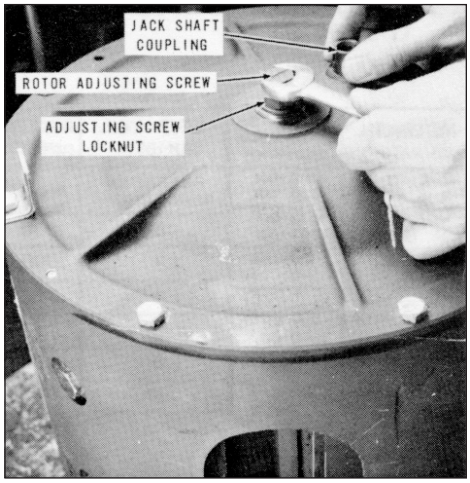
Illustration shown with bottom cover removed for better visibility. Bottom cover and lower bearing should be in place on shaft for accurate check.

3.7.1. Alternate Method (for Smaller Meters)

Rotate the element until the blade is fully extended. With the blade held toward the housing, check the clearance between the blade and housing. Then hold the blade away from the housing and recheck the clearance between the blade and housing. The difference between these clearances is the “Blade Roller to Cam Radius Difference.”

3.8. Rotor Adjustment-Total End Clearance (F)

Apply torque to jackshaft coupling and turn adjusting screw clockwise to bottom, counter-clockwise to raise against cover. Mark both positions and adjust rotor approximately 1/3 down.



Meter Clearance Record

Item	Date	As Found	As Assembled	Date	As Found	As Assembled	Date	As Found	As Assembled
Rotor to Block									
Rotor Adj. Total End Clearance									
Blade Slot Total Clearance									
Blade Ends Top End Clearance Below Rotor									
Blade Roller Over Radius Portion of Cam									
Blade Tip Toward Housing									

Item	Date	As Found	As Assembled	Date	As Found	As Assembled	Date	As Found	As Assembled
Rotor to Block									
Rotor Adj. Total End Clearance									
Blade Slot Total Clearance									
Blade Ends Top End Clearance Below Rotor									
Blade Roller Over Radius Portion of Cam									
Blade Tip Toward Housing									

4 – Reassembly

Reassembly is essentially the reverse of the disassembly procedure. Be sure to observe the reassembly precautions noted during teardown of the unit.

1. Should it become necessary to install a new rotor assembly into a meter, check rotor to block clearances, refer to Clearance Check Section.
    - If clearances are too small, block should be removed and the necessary clearances provided by filing metal from the front faces of the block.
    - If clearances are too great, the block should be shimmed to provide the proper clearances.
    - Dress all rotor slot edges lightly with a mill file to remove any burrs, etc.
2. New blades installed into a rotor must be fitted to the meter case.
    - After installation of blades to their furthest extended position.
        a. Position any two adjacent blades to their furthest extended position.
        b. Raise the assembly to a position over the inner unit.
        c. Line up rotor so that the extended blades are just inside of the indentations in the case (opposite the block) at either end of the measuring chamber.
        d. Slowly, lower rotor assembly into position in the inner housing.
        e. By means of the adjusting screw, lower rotor until it bottoms. If spider is used, there should be some clearance between rotor and base.
    - With the rotor in this position, determine blade end clearances for full length of blade. Check Clearance Check Section for proper clearances.
    - In most instances with new blades, these clearances will be found to be too close. When this is the case, the complete rotor assembly must be removed and the blade ends dressed down.
    - Support the rotor assembly in vice or vertically on wood blocks of sufficient height so that the blade ends can be dressed down the full length, Figure 28.
        a. Using a Vixen (Babbit Metal) file for aluminum blades and a course metal file for cast iron blades, dress each blade to size.

            ***Caution**: Care should be taken not to remove too much metal from the blade. Also, blades should have sharp, clean-cut edges.*

    - After all the blade ends have been dressed down, reinstall rotor assembly back into the inner housing. Recheck clearances.
    - If not enough metal is removed the first time, the process must be repeated until the desired clearances are obtained.
    - Record these measurements as “as assembled” clearances.
    - After the properly fitted rotor assembly has been lowered into the inner housing, it may be necessary to turn the entire rotor assembly, shaft and all, clockwise or counter-clockwise a slight amount to line up keyway slots in lower end of shaft and the bottom of the housing. This can be accomplished by using a short length of 1" x 4" board, inserted in the blade slot between the rear of an extended blade and the rotor housing. This prevents the rotor and blades from turning on the cam and forces the shaft to turn in the housing.

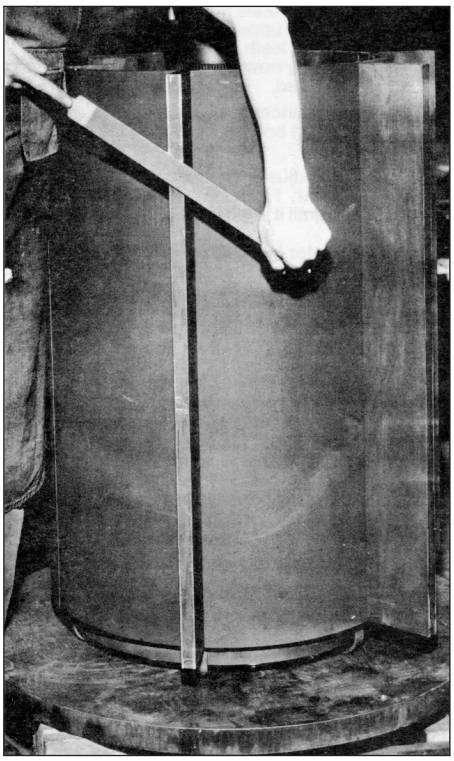


Figure 28

3. Care must be taken when installing the inner unit cover to assure that the rotor gear and the lower jackshaft gear are properly meshed.
   - The fit of the inner unit cover is normally close enough to necessitate tapping the cover with a soft hammer to drive it into place on the inner unit. At the same time, rotate the rotor adjusting screw.

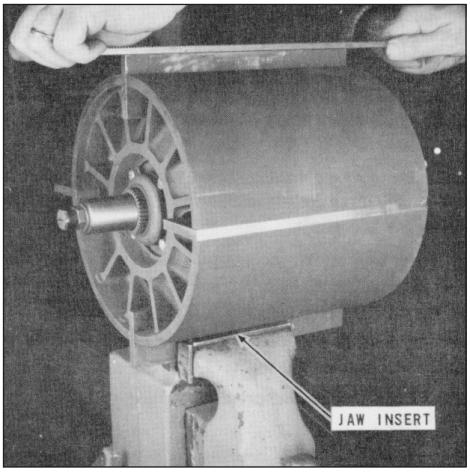


Figure 29 *– Filing Edge of Blade Using Vice with Jaw Inserts to Protect Blades*

4. Total end clearances (see Clearance Guide Table) is divided, top and bottom, by setting the rotor adjusting screw.
   - Loosen the adjusting screw locknut and while turning the rotor, Figure 30, slowly raise the rotor assembly until it just begins to bind against the top cover.
   - With the rotor in this position, check the bottom rotor clearances at both the inlet and outlet ports, compare with Clearance Guide.
   - By means of the adjusting screw, lower the rotor until 1/3 of this clearance is at the tip and 2/3 is at the bottom.
   - Add .002" - .004" to the top clearances to allow for the tightening of the lock nut.
   - Tighten adjusting shaft lock nut and check top and bottom rotor clearances to see that they are 1/3 off the top and 2/3 off the bottom.
   - If these clearances do not check, loosen lock nut and repeat the complete adjusting procedure.
   - After this adjustment has been satisfactorily completed, and lock nut tightened, record these measurements as “as assembled” clearances.

Figure 30

5. Determine rotor to block and blade slot clearances.
   - Record these measurements as “as assembled” clearances.
6. Assemble inner unit into outer housing.
   - Clean the machined surfaces of the outlet port of the inner unit and outer housing with alcohol or solvent. Do not use a scraper or screwdriver on these surfaces. See Figure 31.
   - Coat both surfaces with Loctite 518. (See Figure 31).

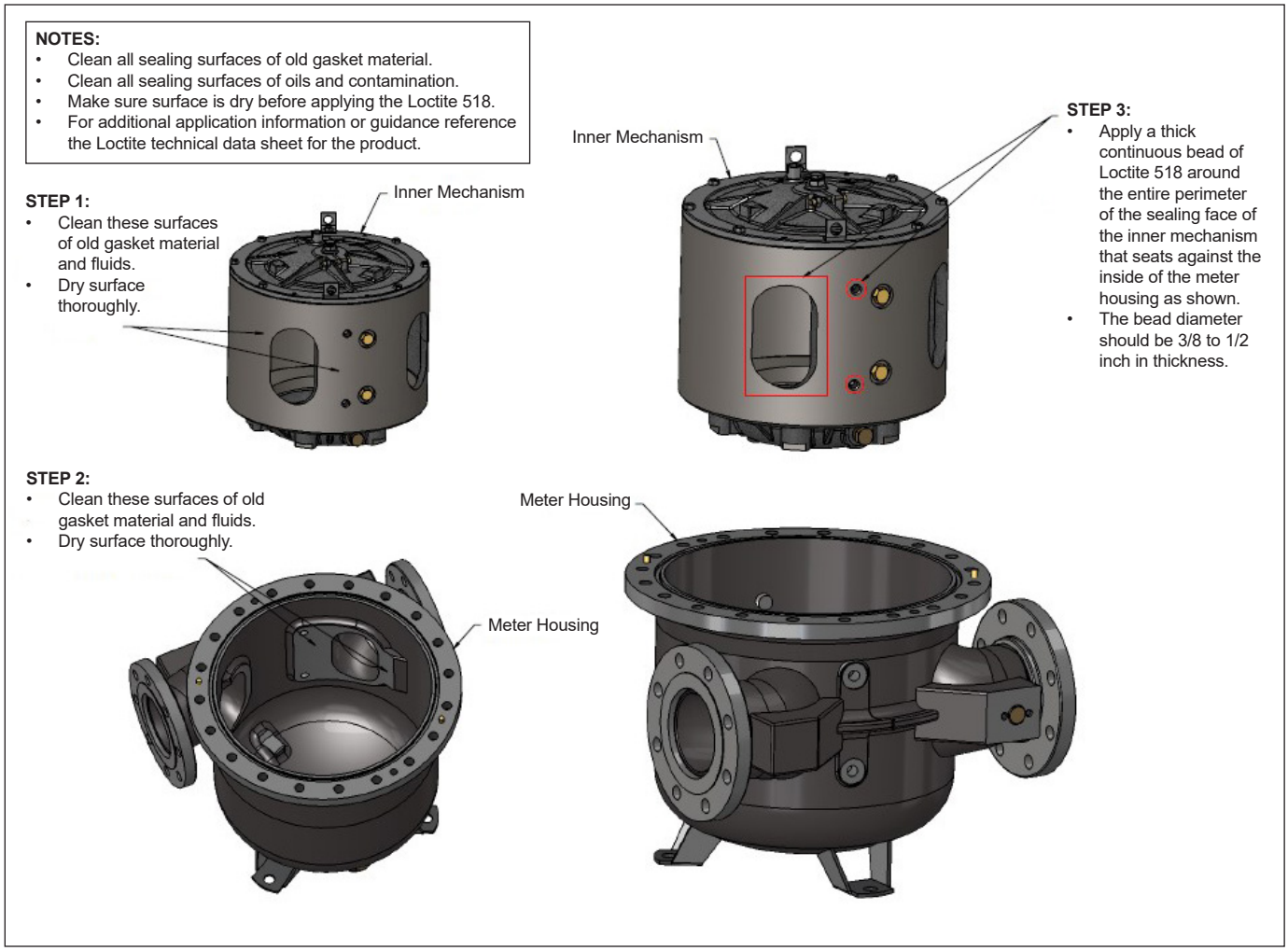


Figure 31 *– Inner Mechanism Sealing*

- Lower inner unit into outer housing. Apply Molykote O-ring grease to the O-rings on the cap screws and installing washers, draw inner unit up to seal outlet port (if cinch bolts have O-rings). See Table 5 for torque values.
- For cinch bolts that don't have an O-ring, refer to Figure 32 for sealing. See Table 5 for torque values.

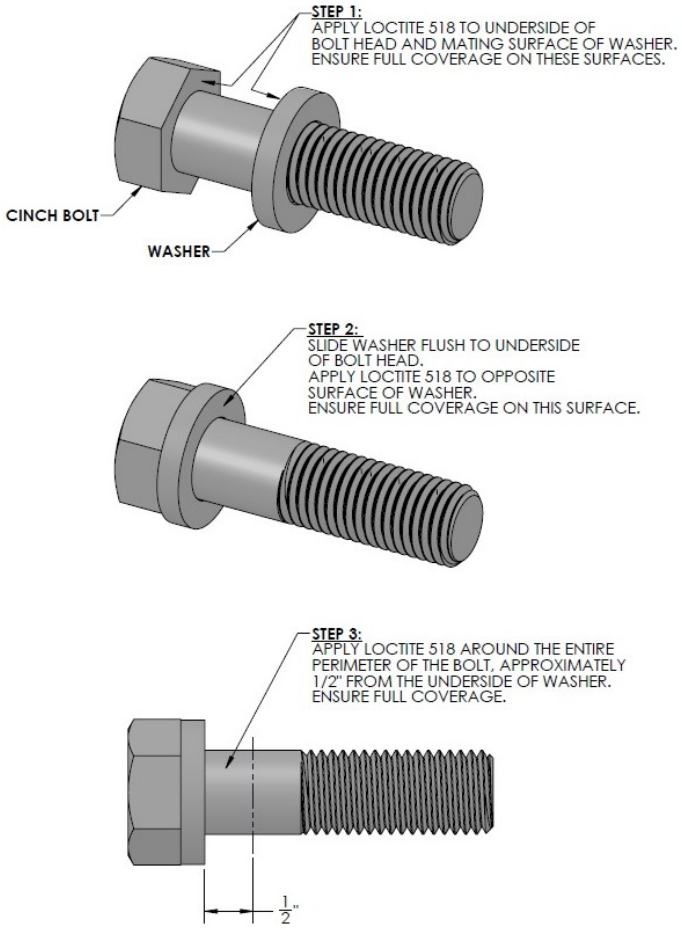


Figure 32 *– Cinch Bolt Sealant*

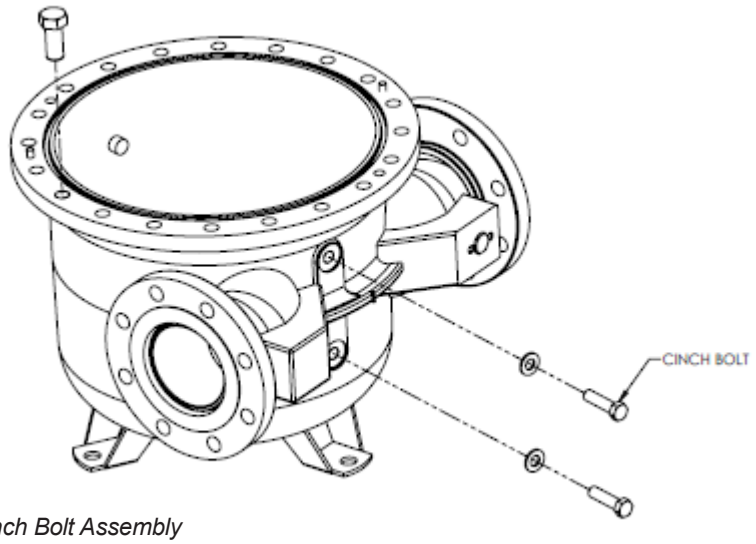


Figure 33 *– Cinch Bolt Assembly*

PD Meter	Pressure Rating	Stud Size (Inch)	Tightening Torque – Dry or Wet (FT*LB)
C2	S1-S7	3/8	10-12
E3	S1-S7	1/2	23-28
F4	S1-S7	1/2	23-28
G6	S1-S8	1/2	23-28
H8	S1-S7	3/4	82-97
JA10	S1 to S7	5/8	110-125

Table 5 *– Cinch Bolt Torque Table*

7. Complete reassembly.
    - Coat O-ring with Molykote O-ring Grease and install O-ring in groove in top of outer housing.
    - Install cover. Be sure to line up locating pin in cover with hole in housing flange.
    - Install cover screws (see Figure 34). Torque screws per Tables 6, 7, 8, 9, 10, and 11.

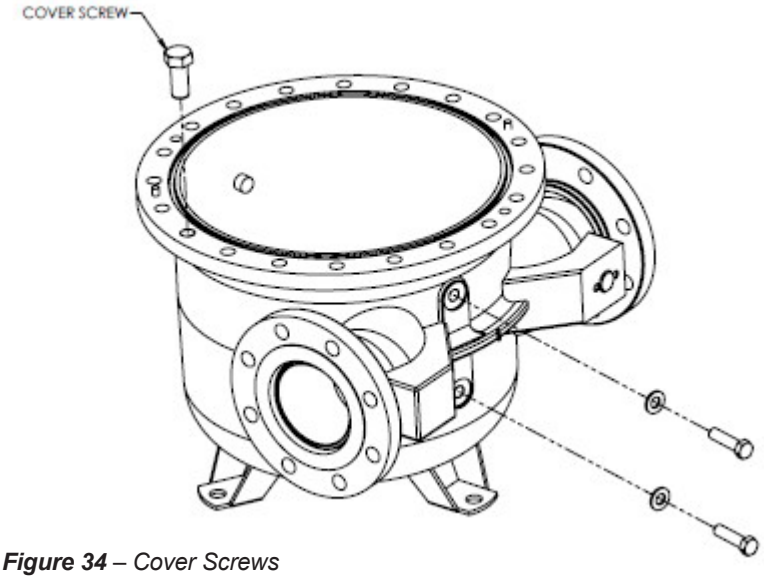


Figure 34 *– Cover Screws*

PD Meter	Pressure Rating	Stud Size (Inch)	Tightening Torque – Dry (FT*LB)
C2	S1, S3, and S5	7/16	48-55
	S6	5/8	142-160
	S7	3/4	28-275

***Table 6** – C2 Cover Torque Table*

PD Meter	Pressure Rating	Stud Size (Inch)	Tightening Torque – Dry (FT*LB)	Stud Size (Inch)	Tightening Torque – Dry (FT*LB)	Stud Size (Inch)	Tightening Torque – Dry (FT*LB)	Stud Size (Inch)	Tightening Torque – Dry (FT*LB)
Implementation		Pre 1994		1994-2005		2005-present		All	
E3	S1	9/16	85-100	9/16	85-100	3/4	171-186		
	S3 and S5	9/16	85-100	3/4	171-186	3/4	171-186		
	S6							3/4	248-275
	S7							1	610-675

***Table 7** – E3 Cover Torque Table*

PD Meter	Pressure Rating	Stud Size (Inch)	Tightening Torque – Dry (FT*LB)	Stud Size (Inch)	Tightening Torque – Dry (FT*LB)	Stud Size (Inch)	Tightening Torque – Dry (FT*LB)
Implementation		Pre 2008		2008-Present		All	
F4	S1	9/16	85-100	3/4	159-174		
	S3 and S5					3/4	159-174
	S6					3/4	248-275
	S7					1	610-675

***Table 8** – F4 Cover Torque Table*

PD Meter	Pressure Rating	Stud Size (Inch)	Tightening Torque – Dry (FT*LB)
G6	S1	5/8	142-160
	S3 and S5	5/8	142-160
	S6	3/4	248-275
	S7	1-1/8	760-840
	S8	1-3/4	2760-3050

***Table 9** – G6 Cover Torque Table*

PD Meter	Pressure Rating	Stud Size (Inch)	Tightening Torque – Dry (FT*LB)
H8	S1, S3, and S5	3/4	248-275
	S6	1	610-675
	S7	1-1/4	960-1,070

***Table 10** – H8 Cover Torque Table*

PD Meter	Pressure Rating	Stud Size (Inch)	Tightening Torque – Dry (FT*LB)	Stud Size (Inch)	Tightening Torque – Dry (FT*LB)	Stud Size (Inch)	Tightening Torque – Dry (FT*LB)
Implementation		Pre 2008		1998-2003		2003-present	
JA10	S1	3/4	248-275				
	S3 and S5	1	610-675	1-1/8	780-840	1-1/8	780-840
	S6					1	610-675
	S7					1-3/8	1,295-1,430

***Table 11** – JA10 Cover Torque Table*

- Install all remaining parts and accessories, including the packing gland (See Figure 35). Torque packing gland screws per Table 12.

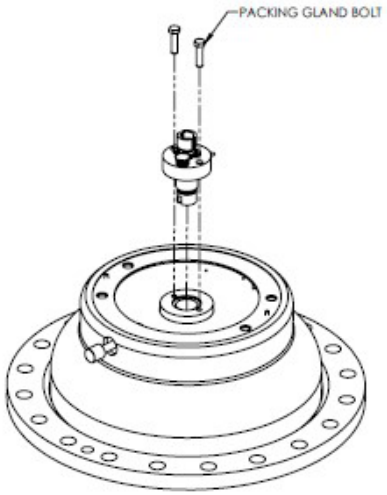


Figure 35 *– Packing Gland Bolts*

Packing Gland Type	Bolt Size	Tightening Torque – Dry	Typical CT Meter / Pressure Rating
PG-15 HP-9	10-32	24-28 (IN*LB)	C2-S1 E3-S1 to S3 F4-S1 G6-S1 H8-S1
PG-30 HP-4 HP-12 Low Friction	5/16	12-16 (FT*LB)	C2-S3 to S5 E3-S1 to S5 F4-S1 to S5 G6-S3 to S5 H8-S3 to S5 JA10-S1 to S5
PG-144 PG-222 HP-2	7/16	35-47 (FT*LB)	C2-S6 to S7 E3-S6 to S7 F4-S6 to S7 G6-S6 to S8 H8-S6 to S7 JA10-S6 to S7

Table 12 *– Packing Gland Torque Table*

The following literature can be obtained from Measurement Solutions' Literature Fulfillment at measurement.fulfillment@TechnipFMC.com or online at http://info.smithmeter.com/literature/online_index.html.

When requesting literature from Literature Fulfillment, please reference the appropriate bulletin number and title.

Model	Specifications	Parts Lists	Manuals
C2	SS01010	P0544	MN01011 Installation / Operation / Maintenance Manual
E3	SS01016	PO01001 (E3-A1, S1, and E3-S1 prior to 2005) PO01002 (E3-S1 and E4-S1 2005 to present) PO01003 (E3-S3, S5 and E4-S3 2005 to present) PO01004 (E3-A3, S3, S5 and E4-S3 prior to 2005) PO01005 (E3-S6, S7)	
E4	SS01011	PO01001 (E3-A1, S1, and E3-S1 prior to 2005) PO01002 (E3-S1 and E4-S1 2005 to present) PO01003 (E3-S3, S5 and E4-S3 2005 to present) PO01004 (E3-A3, S3, S5 and E4-S3 prior to 2005)	
F4 (Except F4-S2[4])	SS01012	PO01006 (F4-A1, S1) PO01012 (F4-S6, S7) PO01013 (F4-V1, VA1) PO01016 (F4-A3, S3, S5)	
G6	SS01014	PO01009 (G6-A1, S1, A3, S3, S5, S6, S7) P0548.51[3] (G6-S8) P0549.05[3] (G6-V1)	
H8	SS01017	PO01010 (H8-S1, S3, S5, S6, S7) P0550.50[3] (H8-S3 Flat Plate Cover)	
JA10	SS01018	PO01021 (JA10-S1, S3, S5) PO01022 (JA10-S6, S7	
All or Multiple		PO0A001 Tools PO0A002 Lubricant, Sealants	

3 The latest edition is indicated by a two-digit post script (e.g., .01, .02 etc.).
4 European version.

Technical Support

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24/7 Technical Support/Schedule a Technician: 1-844-798-3819
System Installation Supervision, Start-Up, Commissioning Services, and Training Available

Revisions included in MN01005 Issue/Rev. 0.6 (12/18):
Added to document: Required torque values for studs and bolts at the cover, inner-mech (cinch bolts) and packing gland based on size, material, and application. Total revision of page numbers and layout of the document.
The specifications contained herein are subject to change without notice and any user of said specifications should verify from the manufacturer that the specifications are currently in effect. Otherwise, the manufacturer assumes no responsibility for the use of specifications which may have been changed and are no longer in effect.

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