

Stealth Mechanical Manual ZTM 1019 Installation & Maintenance



For Oval Gear Meter Models:

- TS10
- TS15
- TS20
- TS30

including:

- Register
- Register & Printer
- Register, Preset & Valve
- Register, Printer, Preset & Valve
- Strainer
- Strainer, Air Eliminator
- Check Valve

Your Meter Model No.: TS _____



TUTHILL
Transfer Systems

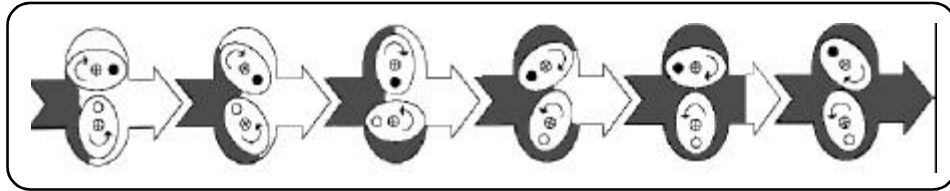
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Rev. 01/04

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FPP Meters and Our Principle of Operation



FPP Meters' Superior Meter Accuracy and Reliability Results from Two Close-Fitting Oval Gears within A Precision Measuring Chamber

About FPP Meters

FPP Meters, formerly Fluid Power Products, is now a tradename of Tuthill Transfer Systems. FPP was established in 1980. Since its inception, the company has been dedicated to manufacturing cost-effective high performance flow metering devices for petroleum, industrial, commercial, and municipal service.

Our facilities include computerized order entry and inventory control so that you are assured accurate and prompt deliveries. Furthermore, our production personnel ensure that each order, regardless of size, receives individual attention.

Constant attention to new product development and production design, our high standards of manufacture and final testing are the reasons why FPP Meters meet your most demanding requirements.

Our meters are used in batching, blending, process control and dispensing of liquid products in all liquid handling industries.

Principle of Operation

Elliptical-shaped rotors are used to accurately measure liquid flow by precisely sweeping a known volume of liquid through a close tolerance measuring chamber. The meshed rotors seal the inlet from the outlet flow, developing a small pressure differential. As the rotors rotate, they trap a precise quantity of liquid in the area between the rotor and the measuring chamber wall. The total quantity of flow for one rotation of the rotor pair is four times the volume trapped between the rotor and the measuring chamber wall. Close tolerance machining of the rotors and the measuring chamber means minimum slippage and high accuracy which is essentially unaffected by changes in viscosity. The rate of flow through the meter is proportional to the rotational speed of the rotors. Therefore, the meter output is directly proportional to the rate of flow. The output for Stealth meters can be either mechanical or

electronic. The output for mini oval gear meters is electronic.

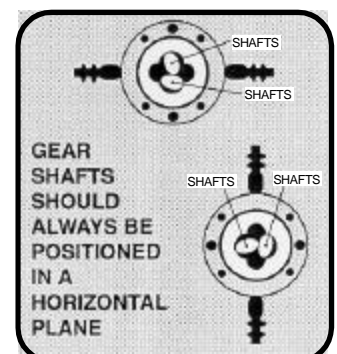
In the mechanical meter, the output shaft drives a gear train that provides a registration in engineering units.

In the electronic version of the meter, magnets mounted in the rotors actuate a switch. Each switch closure represents a precise increment of volume. The switch output can then be used as an input to a variety of electronics including scaling counters, batch controllers, computers, analog converters, etc. The combination of accuracy, low cost and few moving parts makes the FPP Meters' mini oval gear meters a natural for your metering applications.

Fluid Compatibility

If in doubt about compatibility of a specified fluid, contact our manufacturing plant or see Chemical Compatibility Chart to check compatibility of chemicals to the wetted materials.

If You Have Any Questions About Installation or Operation, Please Consult the Factory Prior to Installation (888) 578-3258.



Installation & Operation



SAFETY INSTRUCTIONS

Make sure that all necessary safety precautions have been taken including proper clothing, personal safety equipment and fire safety equipment if required.

Before Start-up of Meter Make Certain:

1. The meter is properly mounted, secured and piped.
2. All connections are tight.
3. All bleed and drain valves are closed.
4. Do NOT smoke near meter or use meter near an open flame when metering flammable fluids. Fire could result.
5. This meter is not intended for use with fluids for human consumption.

Install the Meter and Accessories in Compliance with All Applicable Local, State and Federal Construction, Electrical and Safety Codes.

Installation

Positive displacement meters are designed to operate full of liquid. The meter should be installed in a manner such that it remains full of liquid at all times.

Protective caps installed in each meter at the time of shipment should remain in the openings until you are ready to install in the piping system.

Prior to meter installation, the piping system should be flushed to remove all debris. Apply pipe compound to the male threads, to install the companion flanges.

Install the companion flanges. Tighten to a position that allows the meter to bolt to the companion flanges, free of pipe stress. The meter should always be supported by bolting to a platform. Never use the connecting pipe as the means of support.

When installing the meter consider future maintenance, and install in the best location available to facilitate future meter maintenance. The meter can be disassembled and serviced in place, and provisions for service should be considered during installation.

For the best accuracy, install the meter so that the gear shafts are positioned in a horizontal plane, rotating without the weight of the gear resting on the body or cover of the meter as shown on page 1. In critical installations block valves and by-pass lines are recommended. This allows the meter to be serviced without interruption of flow in critical process application.

Thermal relief valves are recommended and should be installed whenever it is possible to block the meter between two valves. Thermal pressures many times the operating pressure are possible with only a small rise in temperature.

It is recommended that a strainer be installed upstream of each meter to prevent damage from foreign matter, such as weld slag, pipe scale, etc.

Calibration means should be provided during installation. An easy means for diverting flow into a calibration vessel should be considered.

Hydraulic shock like thermal expansion can be harmful to meter components. Consideration should be given to designing pumping piping systems to eliminate hydraulic shock.

Operation

Fill the system slowly to avoid operation on air or vapor. This can be accomplished in the following manner:

1. Throttle the meter inlet valve, and allow to fill slowly by gravity.
2. Crack open the outlet valve, start the pump, then slowly crack open the inlet valve and fill the meter slowly before fully opening the inlet and outlet valves.

The meter is not designed to operate on air, but the design and materials of construction allow for operation on vapor for short periods of time without damage to the elliptical gears or meter internals.

Note: Over-speed and hammer caused by the presence of vapor in the system can cause internal damage to the meter.



SAFETY INSTRUCTIONS

The meter's non-shock Maximum Operating Pressure is indicated on the meter name plate. The meter should never be operated in excess of this pressure. Care should be taken to eliminate thermal and hydraulic shock pressures so that they do not exceed the meter's Maximum Working Pressure design.

Operating the meter in excess of its maximum design flow can cause excessive wear or premature failure. However, the meter can be calibrated to operate below the minimum design flow rate as indicated on the meter name plate if the flow remains constant, or the product is viscous.

Reversing the Meter Registration

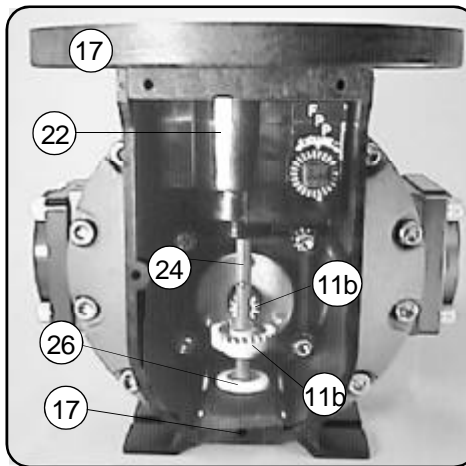
The meter is configured for left to right flow, unless specified differently at the time of order. A label with the word INLET is placed on the inlet flange. Flow direction is determined while facing the front of the meter register.

If the meter is equipped with a strainer, or strainer air eliminator combination, the strainer must be located on the inlet side of the meter. If the meter is equipped with a valve, the valve must be positioned on the outlet side of the meter.

When the meter is first installed, check the register. If the meter and packing gland pinion output shaft is turning, but the register is not turning, or if the register is turning backward, you must reverse the direction of registration by reversing the position of the face gear (11b).

Reversing the direction of rotation of the calibrator drive shaft (11b) is accomplished by the following method:

◆ Reversing the position of the face gear (top 11b) relative to the packing gland pinion gear (11b).



◆ Remove dust cover (see page 5). Observe the position of the face gear (top 11b and the packing gland pinion gear (11b). See servicing the drive components (page 5).

◆ Remove the retaining clip (25) with a screwdriver or pliers.

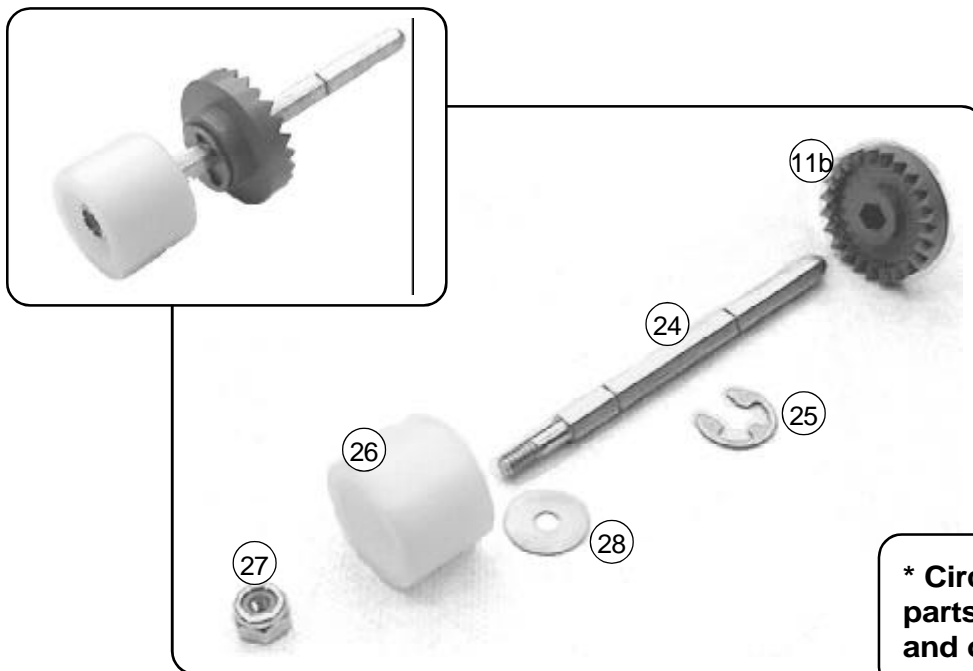
◆ Loosen the set screw (17) (*see Parts' list and Exploded Parts view) securing the calibrator drive shaft bushing (26).

◆ Slide the calibrator drive shaft bushing (26) out of the right angle drive housing (17).

◆ Remove the adjuster drive shaft assembly, from the right angle drive housing (17).

◆ Remove the face gear (11b) and turn it 180° so that the gear teeth are facing in the direction opposite the original installation.

◆ Reassemble the parts in reverse order. Make sure the calibrator drive shaft bushing flange (26) is tight against right angle drive housing (17). Tighten hex nut (27) and re-install retaining clip (25) in the appropriate groove. Inspect to insure there is



*** Circled numbers reference parts in manual, on parts list and on exploded parts view.**

Adjusting the Calibrator

Meters equipped with mechanical registers may have a mechanical calibrator. If so, the calibrator can be used to easily adjust the meter output so that the mechanical registration matches precisely the volume delivered to a meter prover:

- ◆ Remove the dust cover (18), see page 5.
- ◆ Check the meter registration by delivering a known volume of product into an accurate prover. Perform several tests to verify the meter repeatability.
- ◆ Record the meter reading determined in the above step.
- ◆ Note the volume in the prover.

- ◆ When the prover volume is less than the meter register, add the percentage to the original calibrator setting by turning the knob in the direction of the arrow marked “+ volume” on the calibrator. Each click on the calibrator represents a .03% increment.

- ◆ When the prover volume is more than the meter register volume, subtract the percentage from the original calibrator setting by turning the knob in the direction of the arrow marked “- volume” on the calibrator.

- ◆ Make several prover runs to check meter accuracy and repeatability.

Each click of the calibrator represents a .03% increment. There are two clicks per division on the adjustment dial. Run product through the meter to allow the calibrator to adjust to the new setting.

$$\% \text{ CORRECTION} = \frac{(\text{Vol. in the Prover}) - (\text{Vol. on the Meter Register})}{(\text{Vol. in the Prover})} \times 100$$



Servicing the Meter

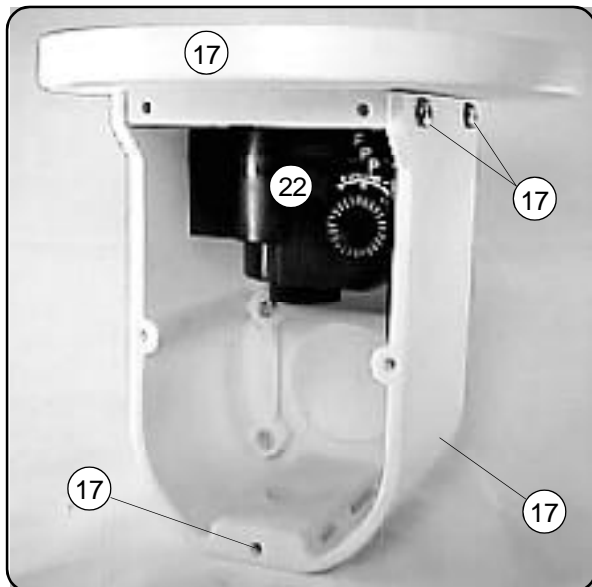
Avoid pipe strain and stress when making meter repairs. The weight of the piping and the meter should be supported independently. This means that the meter can be serviced without affecting the piping alignment.

Avoid prying or exerting heavy pressure on precision parts as this could affect the performance of the meter.

Assure all machined parts are free of burrs and nicks. Stone all machined surfaces if necessary to remove burrs.

Always coat bolt threads with an anti-seize or an appropriate lubricant to prevent thread damage and to assure proper torque values are applied when reassembling.

If meter threads are damaged, repair using inserts.



Note: The calibrator (22) may be removed from the calibrator housing without removing the adapter flange (17) by first removing the adjuster drive shaft assembly.

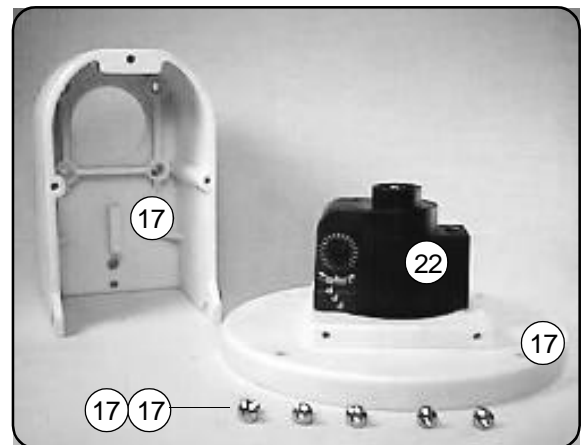
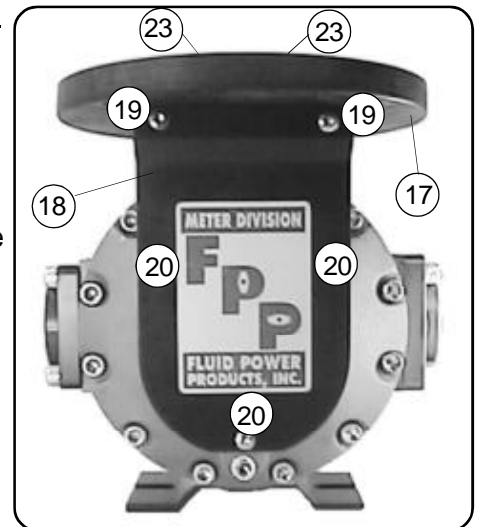
Servicing the Drive Components

◆ Removing the dust cover:

1. Remove hex head screws (19) and (20). These hex head screws require a 5/16 socket.

◆ Replacing the adjuster:

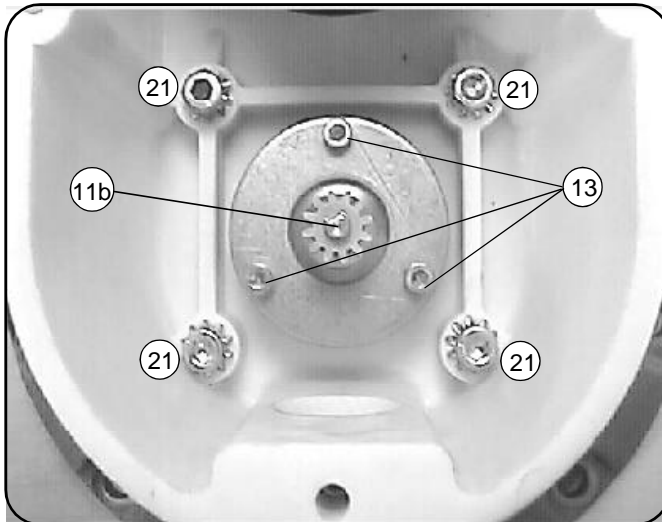
1. Remove the calibrator drive shaft assembly (see page 5.)
2. Remove the counter from the top of the V/R adapter flange (17).
3. Remove the two screws (23) attaching the calibrator to the counter adapter flange using Phillips screwdriver.
4. Reverse the procedure to reinstall the new calibrator.



◆ Removing the adjuster drive shaft assembly: (Refer to the numbered pictures on page 3)

1. Loosen the set screw (17) located in the calibrator housing base, using an Allen wrench (see Torque and Wrench Chart on 12.)
2. Remove the retaining clip (25) using a screwdriver or pliers.
3. Slide the calibrator drive shaft bushing (26) and calibrator drive shaft (24) out of the right angle drive housing (17).
4. Reinstall in the reverse procedure.

Servicing the Meter...Replacing the Packing Gland



3. Remove the packing gland assembly (11) from the meter.

4. Reinstall in the reverse procedure, **making sure the metal pin* is engaged in the slot of the packing gland coupling.**



SAFETY INSTRUCTIONS

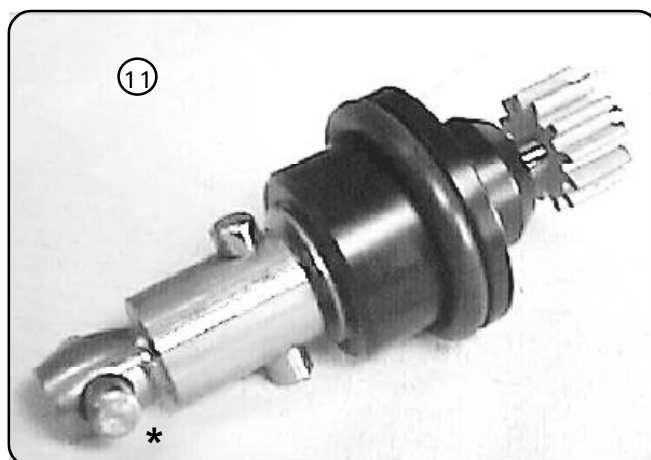
Remove All Pressure and Drain & Rinse Meter Before Servicing.

◆ Replacing the packing gland:

1. Remove the adjuster drive shaft assembly as described on the previous page.

2. Remove the screws (13) using an Allen wrench (see Torque and Wrench Chart on the bottom of page 12.)

The wrenches required for each step, and the torque specification for each screw or bolt is shown in the Torque and Wrench Chart on the bottom of page 12. Anti-seize or an equivalent lubricant should be applied to each bolt or screw before it is installed to assure proper torque application and ease of assembly and disassembly.



SAFETY INSTRUCTIONS

Be Sure to Run a Flushing Fluid Through Meter. Triple Rinse All Meter Components Before Being Taken/Sent in for Repair.

Please Refer to Torque and Wrench Chart, page 12

Disassembling the Meter

Important: Relieve Internal Pressure and Drain Before Servicing.

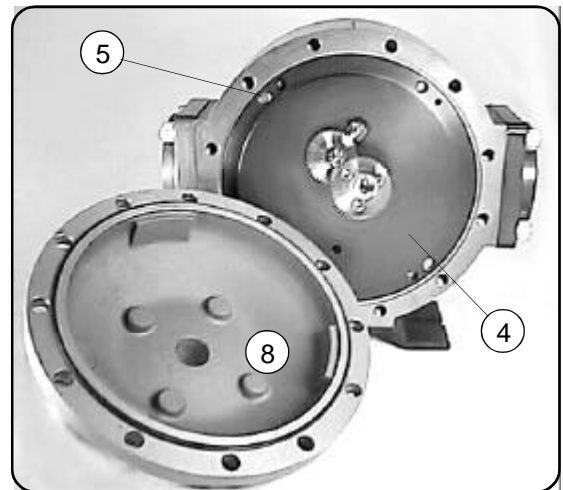
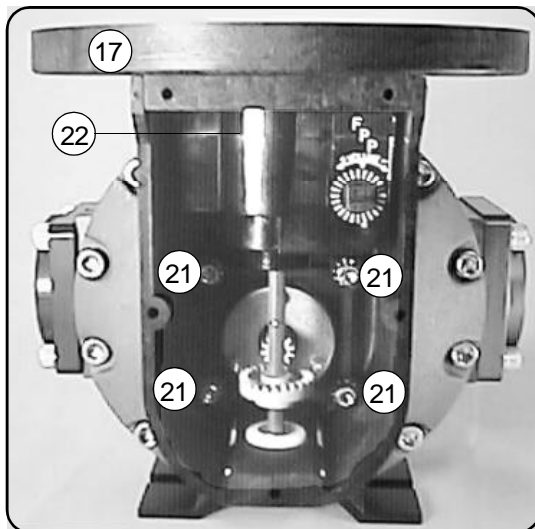
The meter can be serviced through either the front or rear cover. The recommended procedure is to disassemble through the front cover, as this procedure allows for inspection of all components.

◆ Remove the right angle drive assembly by removing the four screws (21) using an Allen wrench.

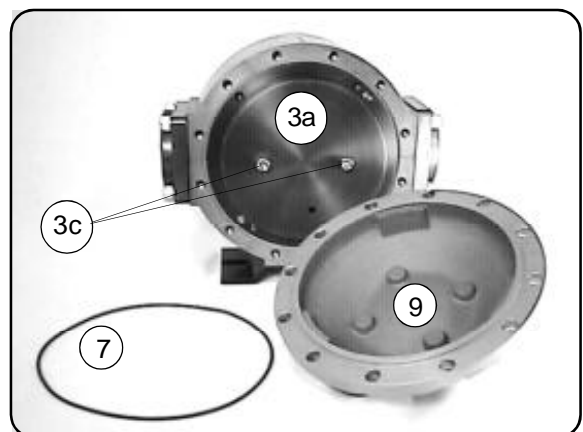
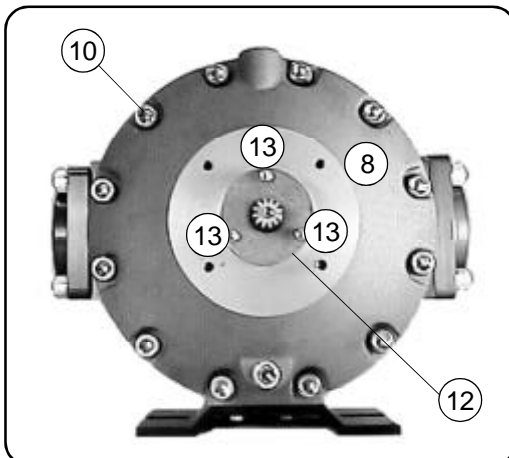
◆ To remove the front cover (8), remove the twelve bolts (10) attaching the front cover to the meter element.

◆ Remove the rear cover (9) by removing the twelve bolts (10) that attach the rear cover to the meter element.

◆ Remove the “O” rings (7) from the front and rear covers. Undamaged Viton™ and Buna seals may be reused. **Always** replace Teflon™ seals.

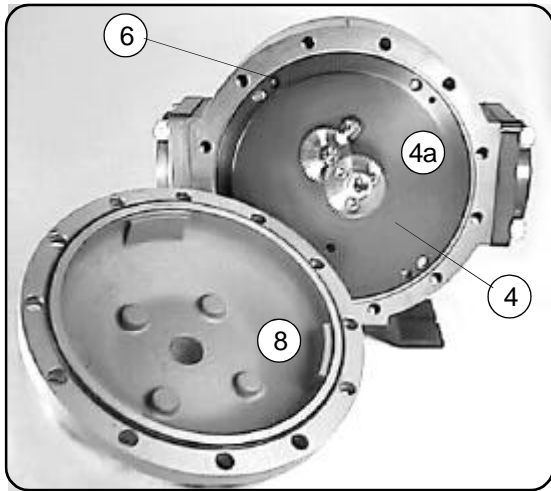


IT IS NECESSARY TO REMOVE THE REAR COVER ONLY IF THE SHAFTS ARE BEING REPLACED

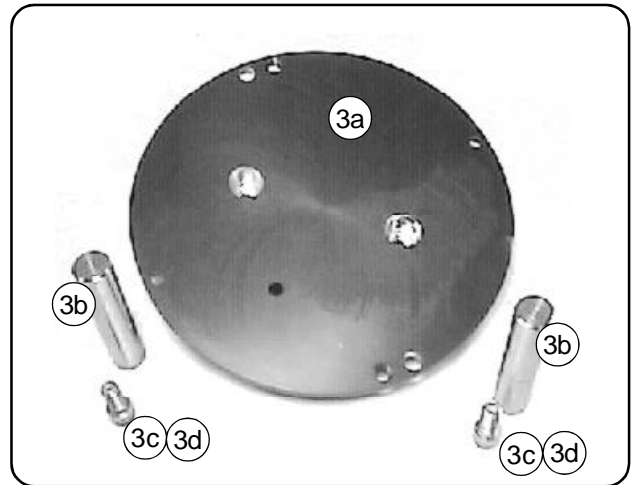


Appearance will differ with Meter Model numbers but procedures are identical.

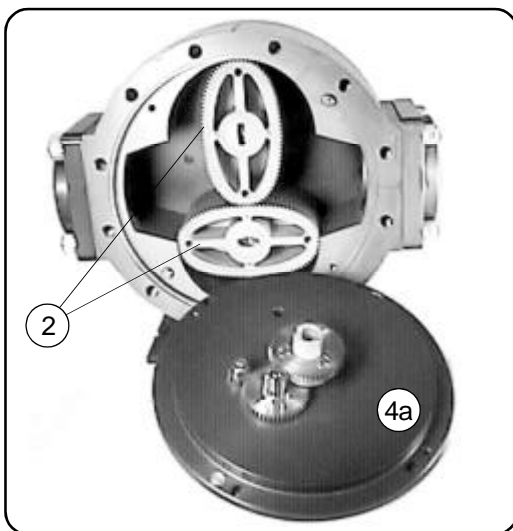
Disassembling the Meter continued...



◆ Remove the screws (6) from the gear plate (4a) by using an Allen wrench.

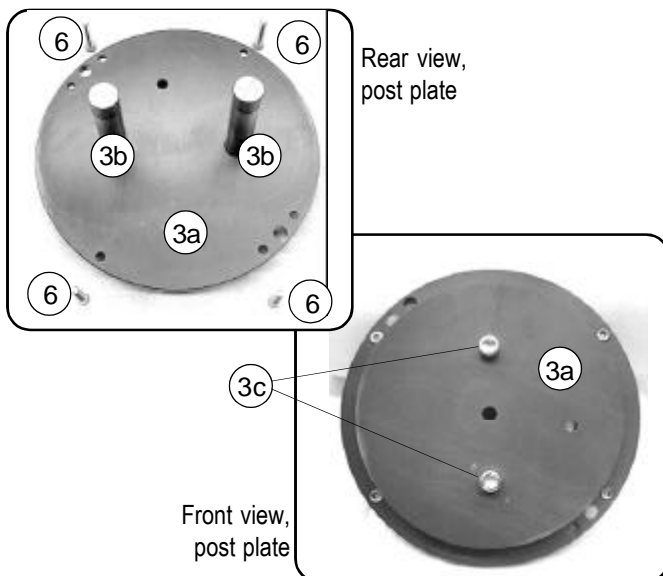


◆ Remove the gear plate (4) assembly from the meter body, using a 5/16 X 18 X 1" jack bolt, if necessary. Once the gear plate is removed, remove the gears (2) and inspect them for wear and damage. If replacement is required, see the next section on servicing the gear and post plates measuring chamber.



◆ Remove the post plate assembly (3) if necessary. Using an Allen wrench, remove the screws attaching the post plate to the meter body. Remove the post plate using jack bolt, if necessary.

◆ To maintain the meters maximum accuracy it is recommended that the post plate with post be replaced as an assembly. It is possible to remove and to replace the old bearing post, which requires a press, and could result in loss of accuracy.



Inspection and Repair

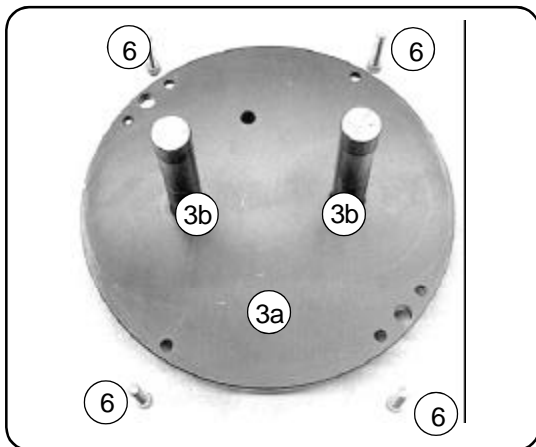
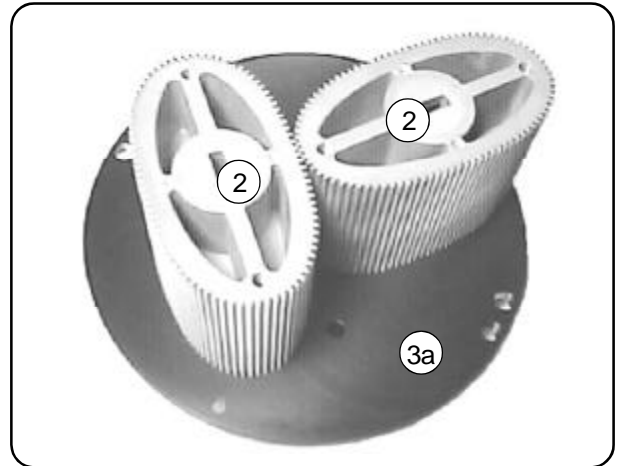
◆ Inspect and repair all critical surfaces like gear teeth, oval gears, gear and post plates and internal housing. Remove any deposits using a fine emery cloth or fine wire brush. Be careful not to score or damage any of the internal parts. Changing the shape, or damaging in any way may interfere with the operation of the meter. Remove all particulate, or grit, as this may also interfere with the proper operation of the meter.

◆ Replace all worn or damaged parts. The proper operation of the meter requires close tolerances to be maintained within the meter chamber. The gears must rotate freely within the measuring chamber without rub or excess clearance.

Reassembling the Meter

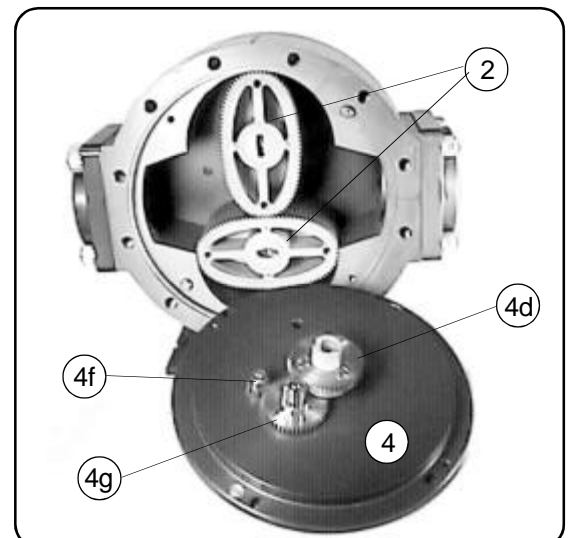
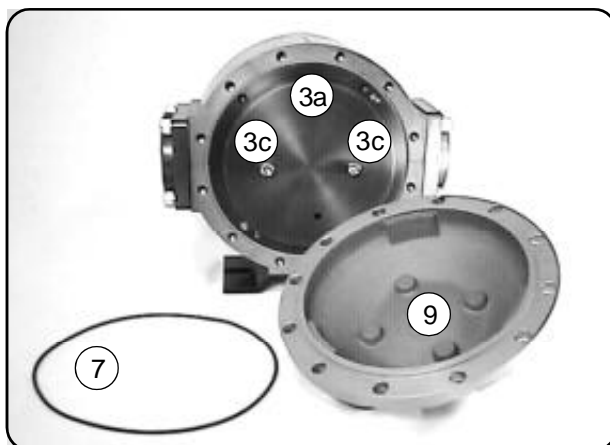
The wrenches required for each step and the torque specification for each screw or bolt is shown in the Torque and Wrench Chart on page 12. Anti-seize or an equivalent lubricant should be applied to each bolt or screw before it is installed to assure proper torque application and ease of assembly.

◆ At this point, place the gears (2) on the gear posts, making sure that they rotate and are properly timed. This is to assure that the oval gears rotate without bind or excessive rub of the post plate. Remove the gears after this is finished.

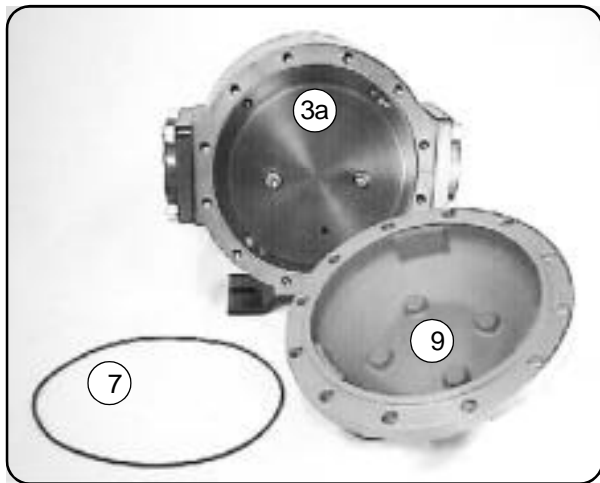


◆ Reinstall the post plate (3a) onto the meter body. The post plate *must* be installed on the proper side of the meter body for proper performance. A dimple on the top of the meter body designates the correct side of the meter body to install the post plate. The gear plate retaining screws (6), attaching the post plate to the meter body, should then be replaced and torqued to the specification shown in the Torque and Wrench Chart on page 12.

◆ Reinstall the oval gears (2). Make sure that the gears are properly timed (gears should be installed at exactly 90° or perpendicular to each other to be properly timed.) Rotate the gears to assure that they are timed properly and that they rotate within the meter housing without interference or excessive clearance.

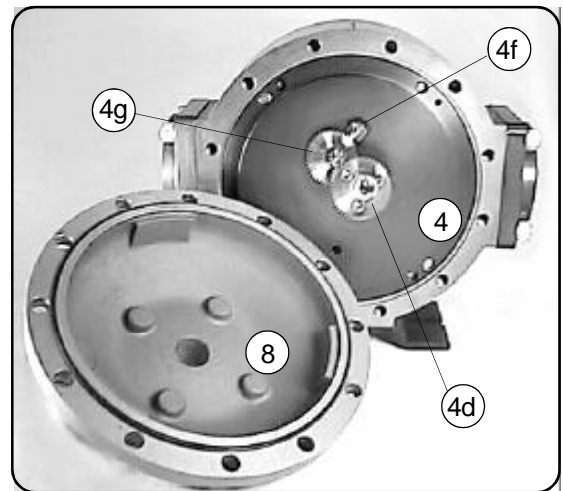


Reassembling the Meter continued...



◆ Reinstall the rear cover (9) and "O" ring (7). Be sure the drain plug (31) is toward the bottom of the meter. The twelve bolts should be torqued to specification shown in the Torque & Wrench Chart on page 12.

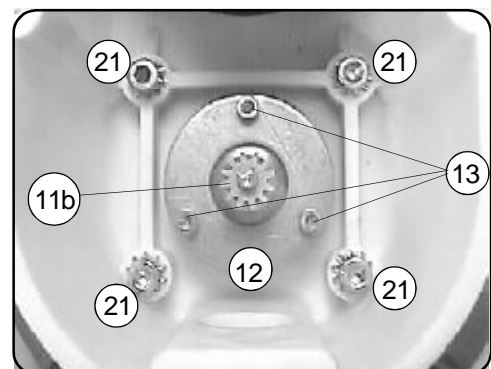
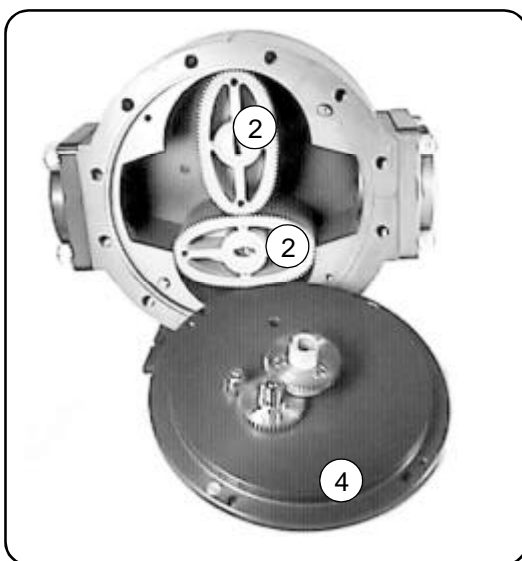
◆ Reinstall the gear plate (4a) onto the meter body. The pressure equalizing hole should be near the outlet flange and the pinion gear (4f) should be located near the top of the meter. Tighten the screws (6), attaching the gear plate to the meter body, torqued to the specification shown in the Torque and Wrench Chart on page 12.



◆ At this point, rotate the drive gear (4d) assuring that all gears turn freely and that the oval gears (2) turn freely in the meter chamber.

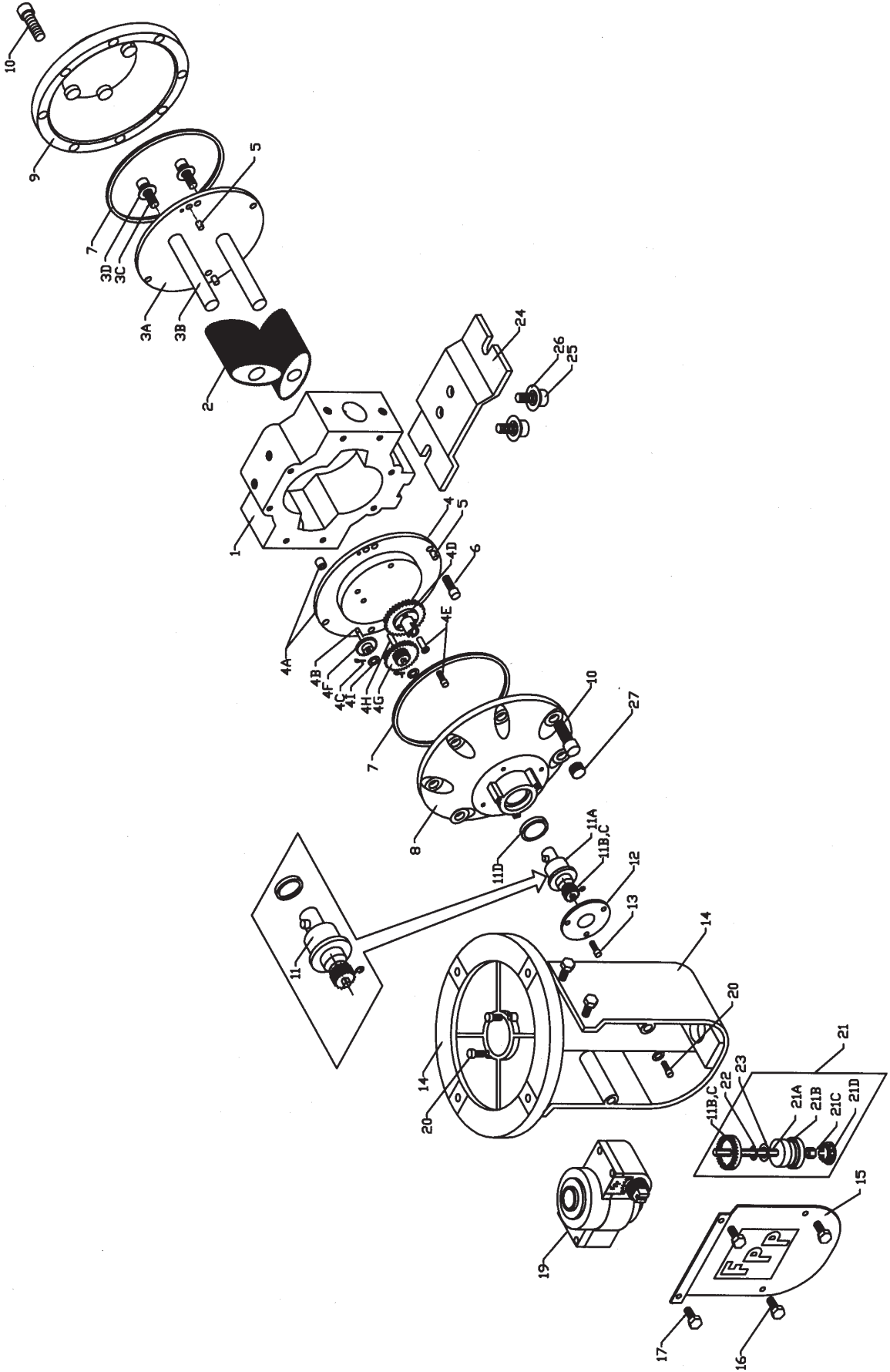
◆ Reinstall the "O" (7) ring on the front cover (8) and then place the front cover back onto the meter. Be sure the drain plug is toward the bottom of the cover. This facilitates draining the meter and positions the cover to accept the calibrator adapter. The twelve bolts should be torqued to the specification shown on the Torque and Wrench Chart on page 12.

◆ Reinstall the right angle drive housing (17). The screws (21) should be torqued to the specification shown in the chart on page 12.



PARTS LISTS

TS10A Mechanical



Parts List for Mechanical Meter Model TS10A

Item	Qty.	Description	Part #	Item	Qty.	Description	Part #
1	1	TS10A Meter Body	MB2560	8	1	Front cover	CP2550
2*	1	Gear Set, Ryton™, no bearings	GS560R	9	1	Rear cover	CP2551
		Gear Set, Ryton™, carbon bearings	GS560RC	10	16	5/16-18 X 1" SS SHCS	FS2900
		Gear Set, Ryton™, high viscosity	GS560RC-HV	11*	1	Packing gland assembly kit, Viton™	RK2001
		Gear Set, Ryton™, medium viscosity	GS560RC-MV	11a	1	Packing gland assembly	PG2001
		Gear Set, Teflon, no bearings	GS560T	11b	1	1:1 ratio gear set	GS2002
		Gear Set, Ryton, Teflon bearings	GS560RT	11c		2:1 ratio gear set	GS2001
		Gear Set, Ryton, Teflon bearings, med. viscosity	GS560RT-MV	11d	1	"O" Ring, Viton™, packing gland	SL1212
		Gear Set, Ryton, Teflon bearings, high viscosity	GS560RT-HV	12	1	Retaining plate	MP9060
3	1	Post plate assembly	CP25521	13	3	8-32 X 3/8" SS SHCS	FS9515
3a**	1	Post plate	CP2552	14	1	Right angle drive housing assembly	RD1591
3b**	2	Gear posts	MP90662	15	1	Aluminum Dust cover	MP2505
3c**	2	1/4-20 X 3/4" SS SHCS	FS9830	16	2	10-14 X 1/2" HH tri plask	FS5912
3d**	2	Lock washers	FS9302	17	3	10-14 X 1/2" HH tri plask w/seal wire hole	FS59121
4	1	Gear plate assembly	CP25532	18	4	1/4-20 X 1" PL SHCS	FS2800
4a***	1	Gear plate w/bushing	CP25531	19	1	Calibrator assembly	CA6000
4b***	1	Pinion drive shaft	MP9043	20	2	Phillips flathead tri plask	FS2501
4c***	2	Cotter pin	FS9210	21	1	Calibrator Drive Shaft Assy	RD15912
4d***	1	Coupling drive assembly	PL8435-1	21a	1	Calibrator drive shaft	MP9099
4e***	1	Drive coupling sleeve w/bolt	MP9833	21b	1	Calibrator drive shaft bushing	MS5520-1
4f***	1	Pinion gear	PL6502	21c	1	10-24 HEX nut	FS3600
4g***	1	Combination gear assembly	PL6500	22	1	Retaining clip-1000-25	MS5003
4h***	1	Idle Post	MP9059	23	2	Thrust washer	MP9053
4i***	2	Flat washer	MP9053	24	1	Meter pedestal	MP2528
5	4	Dowel pin	MS9021	25	2	3/8-16 X 3/4" SS HHCS	FS9923
6	8	10-32 X 3/8" SS SHCS	FS9651	26	2	1/4" SS drain plug	MS4019
7*	2	"O" Ring, Viton™, cover assembly	SL1157	27	2	Split lock washers	FS5004

Torque Specifications

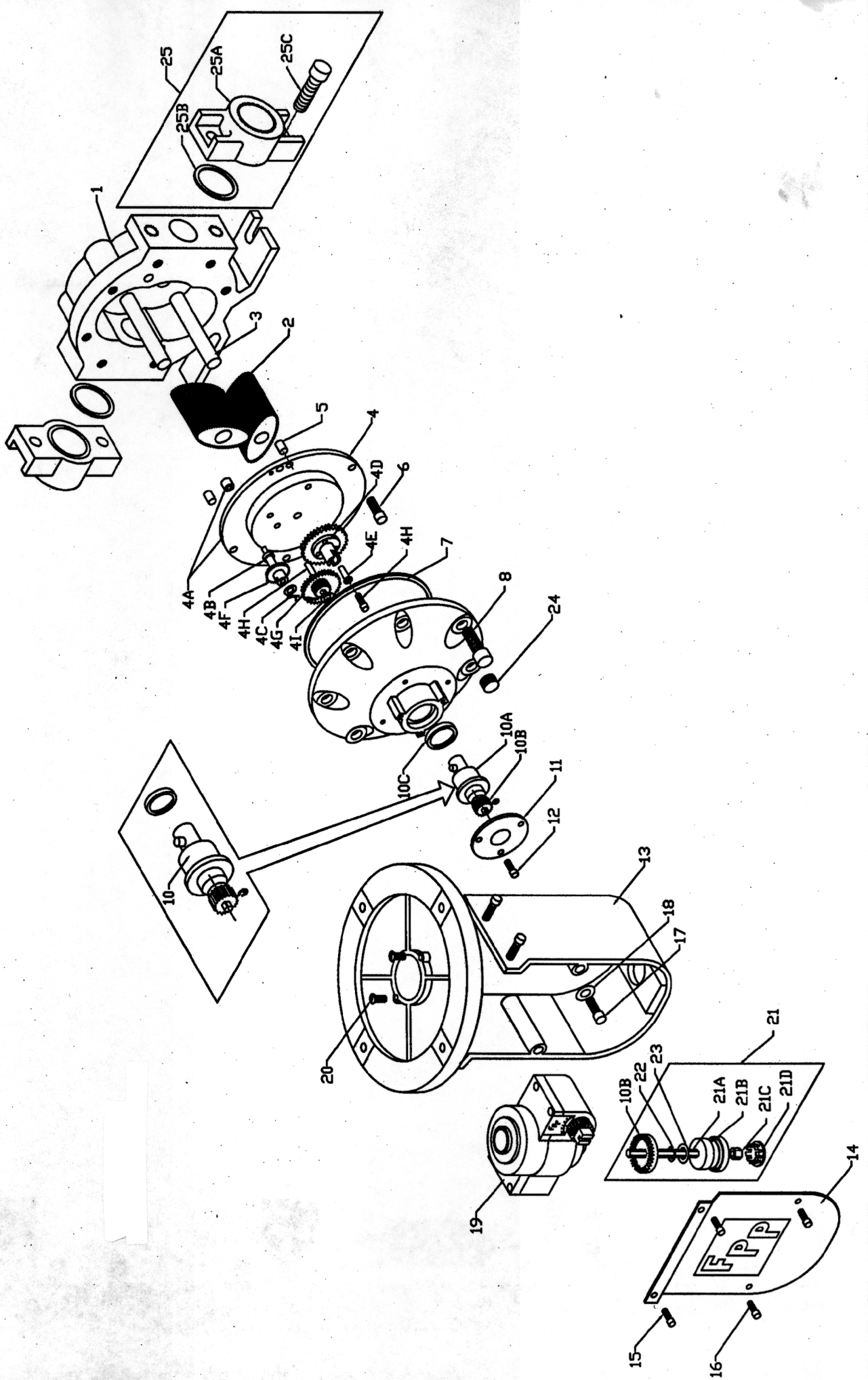
Part #	Description	Torque	Tool	Part #	Description	Torque	Tool
FS9830	1/4-20 X 3/4" SS SHCS	78 in.lbs.	3/16 Allen	FS2800	1/4-20 X 1" AL PLSSCS	Snug tile	3/16 Allen
FS9651	10-32 X 3/8" SS SHCS	24 in.lbs.	5/32 Allen	FS5912	10-14 X 1/2" HH Tri Plask	Snug tile	5/16 Socket
FS9901	5/16-18 X 1" SS SHCS	24 ft.lbs.	1/4 Allen	FS59121	10-14 X 1/2" HH Tri Plask	Snug tile	5/16 Socket
FS9515	8-32 X 3/8" SS SHCS	Snug tile	9/64 Allen	FS9923	3/8-16 X 1" AL HHCS	Snug tile	9/16 Socket
FS2950	3/8-16 X 1" AL SHCS	30 ft.lbs.	9/16 Socket	MS4019	1/4" SS Drain plug	Snug tile	1/4 Allen

* Recommended Spare Parts

** Part of Post Plate assembly, Part No.: CP25521

*** Part of Gear plate assembly, Part No.: CP25532

TS10D Mechanical



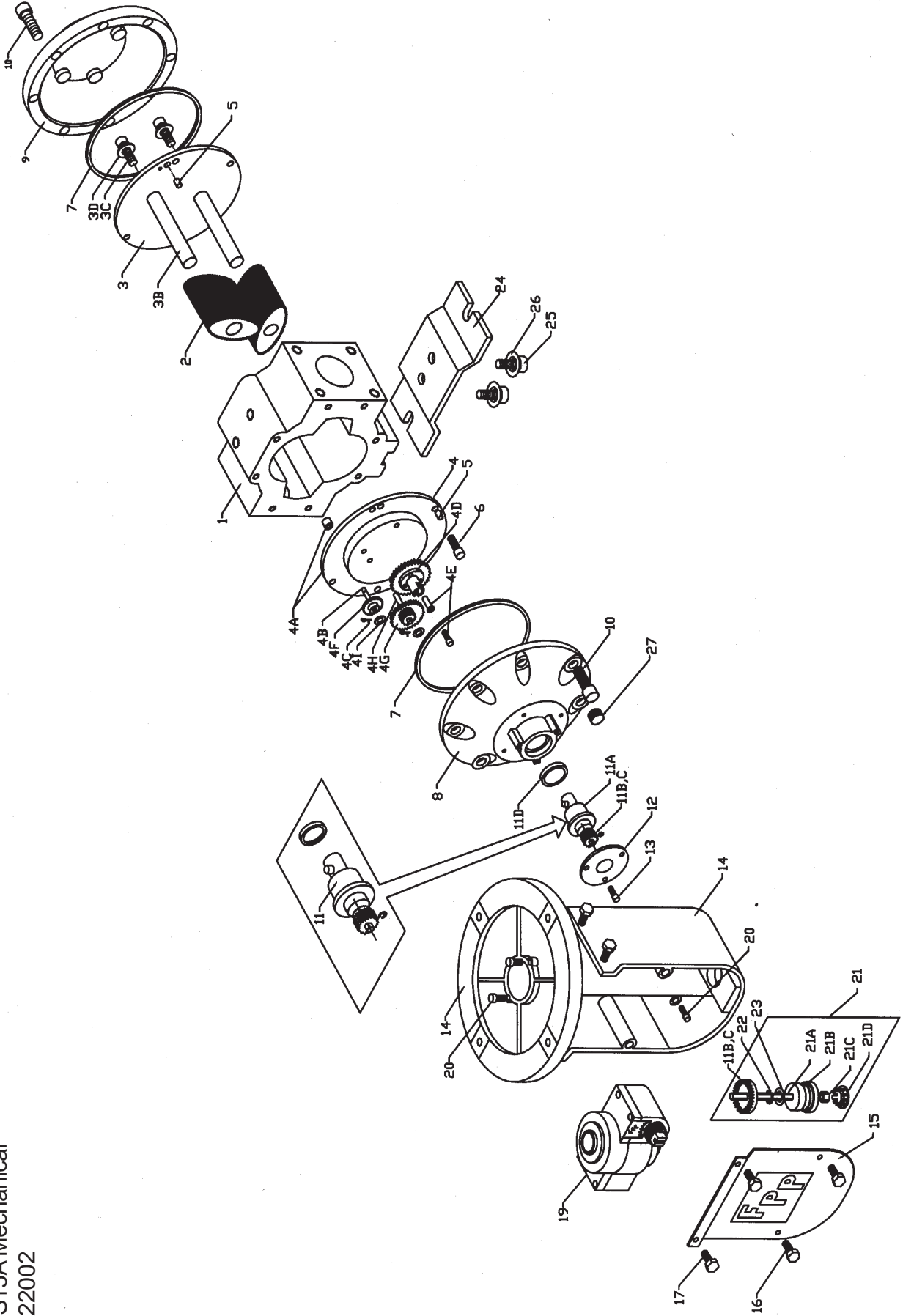
Parts List for Mechanical Meter Model TS10D



Item	Qty	Description	Part #	Item	Qty	Description	Part #
1	1	TS10D Meter Body	MB9320	11	1	Retaining Plate	MP9060
2	1	Gear Set, Ryton/Teflon	GS560RT	12	3	8-32 x 3/8" SS SHCS	FS9515
3	2	Gear Post	MP90662	13	1	Right Angle Drive Housing Assy	RD15911
4	1	Gear Plate Assembly	CP98532	14	1	Aluminum Dust Cover	MP2505
4a***	1	Gear Plate w/ bushing	CP98531	15	2	10-14 x 12" HH Tri Plask	FS5912
4b***	1	Pinion Drive Shaft	MP9043	16	2	Tri Plask w/ seal wire hole	FS59121
4c***	2	Cotter Pin	FS9210	17	4	1/4 -20 X 1" SS SHCS	FS2800
4d***	1	Coupling Drive Assembly	PL8435-1	18	4	1/4" External Lockwasher	FS3602
4e***	1	Drive coupling sleeve	MP9833	19	1	Calibrator Assembly	CA6000
4f***	1	Pinion Gear	PL6502	20	2	Phillips Flathead Tri-Plask	FS2501
4g***	1	Combination Gear Shaft	PL6500	21	1	Calibrator Drive Shaft Assy	RD15192
4h***	1	10-32 x 1" SHCS, 316SS	FS9659	21a	1	Calibrator Drive Shaft Assy	MP9099
5	2	Dowel Pin	MS9021	21b	1	Calibrator Drive Shaft Bushing	MP5520
6	4	10-32 x 3/8" SS SHCS	FS9651	21c	1	10-24 Hex nut	FS3600
7	2	"O" Ring, Teflon, Cover Assy	SL2157	21d	1	Plug, Black Nylon	MS5520
8	1	Front Cover	CP9560	22	1	Retaining clip - 1000-25	MS5003
9	8	5/16 - 18 x 1 SHCS, SS	FS9901	23	2	Thrust Washer	MP9053
10	1	Packing Gland Assembly Kit, Teflon	RK8002	24	2	1/4" SS Drain Plug	MS4019
10a	1	Packing Gland	PG8002	25	1	1" NPG Flange Kit	FK9100A
10b	1	1:1 Gear Set	GS2001	25a	2	1" NPT Companion Flange	MP9321
	1	2:1 Gear Set	GS2002	25b	2	O-Ring Teflon	SL2122
10c	1	"O" Ring, Packing gland, Teflon	SL2212	25c	4	3/8-16 x 7/8, SS SHCS	FS2928

Part #	Description	Torque	Tool	Part #	Description	Torque	Tool
FS9830	1/4-20 X 3/4" SS SHCS	78 in.lbs.	3/16 Allen	FS2800	1/4-20 X 1" AL PLSSCS	Snug tite	3/16 Allen
FS9651	10-32 X 3/8" SS SHCS	24 in.lbs.	5/32 Allen	FS5912	10-14 X 1/2" HH Tri Plask	Snug tite	5/16 Socket
FS9901	5/16-18 X 1" SS SHCS	24 ft.lbs.	1/4 Allen	FS59121	10-14 X 1/2" HH Tri Plask	Snug tite	5/16 Socket
FS9515	8-32 X 3/8" SS SHCS	Snug tite	9/64 Allen	FS9923	3/8-16 X 3/4" SS HHCS	30 ft.lbs.	9/16 Socket
FS2950	3/8-16 X 1" AL SHCS	30 ft.lbs.	9/16 Socket	MS4019	1/4" SS Drain plug	Snug tite	1/4 Allen

TS15A Mechanical
122002





Parts List for Mechanical Meter Model TS15A

Serial No.s > B8360

Item	Qty.	Description	Part #	Item	Qty.	Description	Part #
1	1	TS15A Meter Body	MB2580	9	1	Rear cover	CP2551
		Gear Set, Rylon™, carbon bearings	GS580RC	10	16	5/16 - 18 X 1" AL SHCS	FS2900
		Gear Set, Rylon™, carbon brgs, med viscosity	GS580RC-MV	11*	1	Packing gland assembly kit, Viton™	RK2001
		Gear Set, Rylon™, carbon brgs, high viscosity	GS580RC-HV	11a	1	Packing gland assembly	PG2001
		Gear Set, Rylon™, Teflon™ bearings	GS580RT	11b	1	1:1 ratio gear set	GS2002
		Gear Set, Rylon™, Teflon™, bearings, med viscosity	GS580RT-MV	11c	1	2:1 ratio gear set	GS2001
		Gear Set, Rylon™, Teflon™ bearings, high viscosity	GS580RT-HV	12	1	"O" Ring, Viton™, packing gland	SL1212
3	1	Post plate assembly	CP2556-1	12	1	Retaining plate	MP9060
3a**	1	Post plate	CP2552	13	3	8-32 X 3/8" SS SHCS	FS9515
3b**	2	Gear posts	MP90852	14	1	Right angle drive housing assembly	RD15911
3c**	2	1/4 - 20 X 3/4" SS SHCS	FS9830	15	1	Aluminum Dust cover	MP2505
3d**	2	Lock washers	FS9302	16	2	10-14 X 1/2" HH tri plask	FS5912
4	1	Gear plate assembly	CP25561	17	3	10-14 X 1/2" HH tri plask w/seal wire hole	FS59121
4a***	1	Gear plate w/bushing	CP2553	18	4	1/4-20 X 1" PL SHCS	FS2800
4b***	1	Pinion drive shaft	MP9043	19	1	Calibrator assembly	CA6000
4c***	2	Cotter pin	FS9210	20	2	Phillips flathead tri plask	FS2501
4d***	1	Coupling drive assembly	PL8435-1	21	1	Calibrator drive shaft assembly	RD15912
4e***	1	Drive coupling sleeve w/bolt	MP9833	21a	1	Calibrator drive shaft	MP9099
4f***	1	Pinion gear	PL6502	21b	1	Calibrator drive shaft bushing	MS98820-1
4g***	1	Combination gear assembly	PL6500	21c	1	10-24 HEX nut	FS3600
4h***	1	Idle Post	MP9059	21d	1	Nylon Plug	MS5520
4i***	2	Flat washer	MP9053	22	1	Retaining clip 1000-25	MS5003
5	4	Dowel pin	MS9021	23	1	Thrust washer	MP9053
6	8	10-32 X 3/8" SS SHCS	FS9651	24	1	Meterpedestal	MP2528
7*	2	"O" Ring, Viton™, cover assembly	SL1157	25	2	3/8-16 X 3/4" AL HHCS	FS0920
8	1	Front cover	CP2550	26	2	Split lock washers	FS5004
				27	2	1/4" SS drain plug	

Torque Specifications

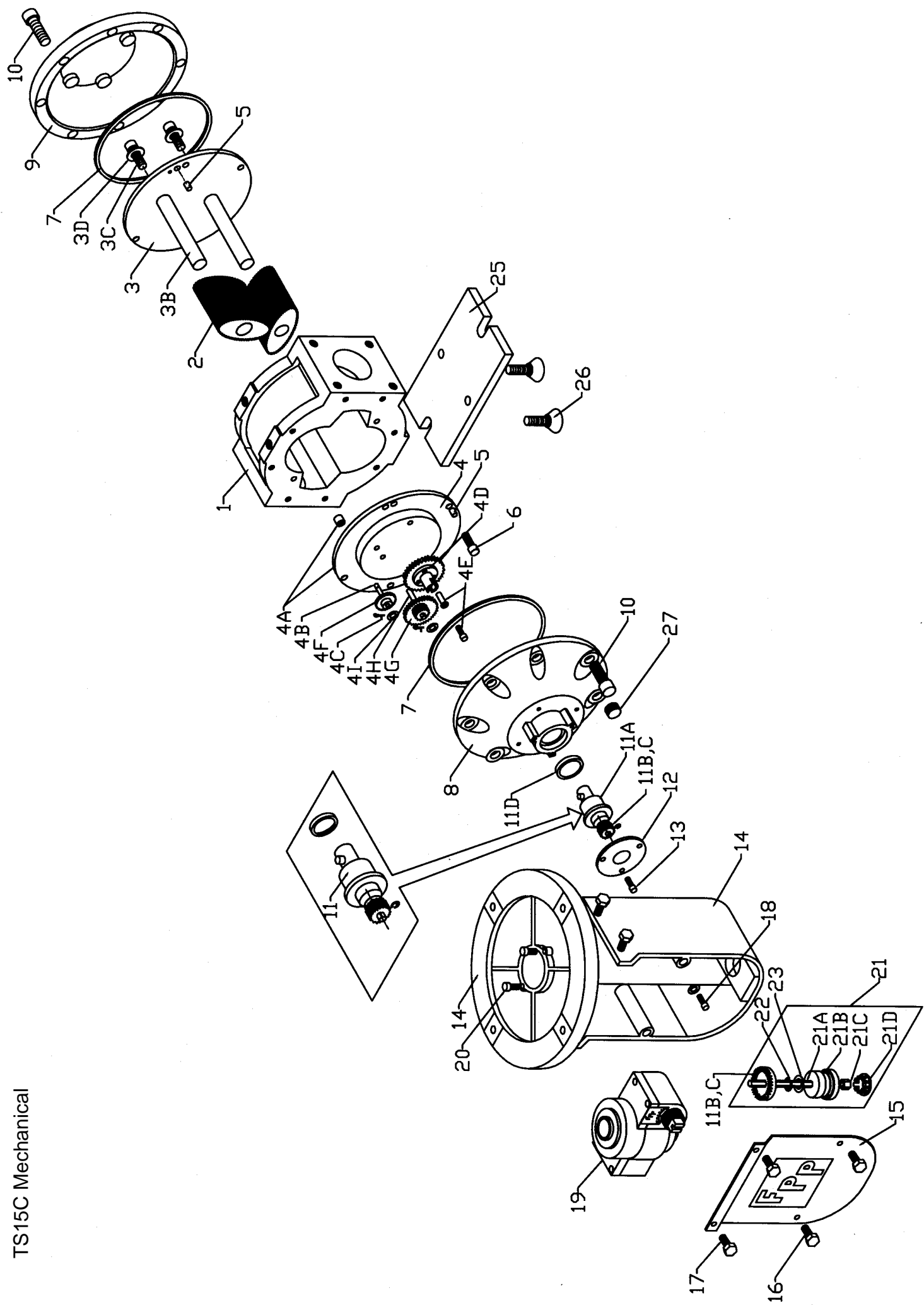
Part #	Description	Torque	Tool	Part #	Description	Torque	Tool
FS9830	1/4-20 X 3/4" SS SHCS	78 in.lbs.	3/16 Allen	FS5912	10-14 X 1/2" HH Tri Plask	Snug tite	5/16 Socket
FS9651	10-32 X 3/8" SS SHCS	24 in.lbs.	5/32 Allen	FS59121	10-14 X 1/2" HH Tri Plask	Snug tite	5/16 Socket
FS2900	5/16-18 X 1" AL SHCS	24 ft.lbs.	1/4 Allen	FS0920	3/8-16 X 3/4" AL HHCS	30 ft.lbs.	9/16 Socket
FS9515	8-32 X 3/8" SS SHCS	Snug tite	9/64 Allen	MS4019	1/4" SS Drain plug	Snug tite	1/4 Allen
FS2800	1/4-20 X 1" AL PLSSCS	Snug tite	3/16 Allen				

* Recommended Spare Parts

** Part of Post Plate assembly, Part No.: CP25521

*** Part of Gear plate assembly, Part No.: CP25561

TS15C Mechanical





Parts List for Mechanical Meter Model TS15C

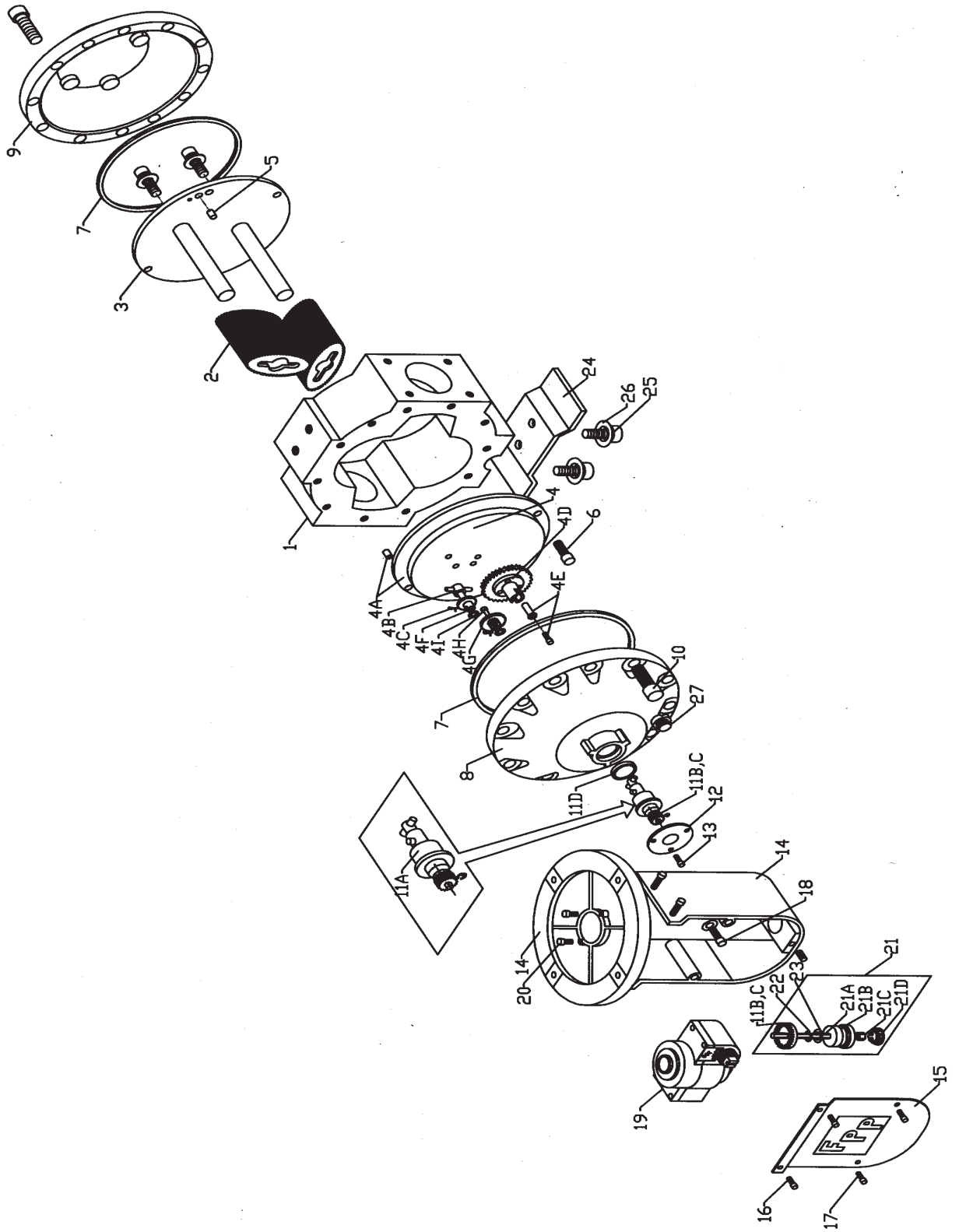
Item	Qty.	Description	Part #	Item	Qty.	Description	Part #
1	1	TS15C Meter Body	MB8580	11b	1	1:1 ratio gear set	GS2002
2*	1	Gear Set, Ryton™, no bearings	GS588R			2:1 ratio gear set	GS2001
	1	Gear Set, Ryton™, carbon bearings	GS580RC	11c	1	"O" Ring, Teflon™, packing gland	SL2212
	1	Gear Set, Ryton™, Teflon™ bearings, high viscosity	GS580RT-HV	12	1	Retaining plate	MP9060
3	1	Post plate assembly	CP98521	13	3	8-32 X 3/8" SS SHCS	FS9515
3a**	1	Post plate	CP9852	14	1	Right angle drive housing assembly	RD15911
3b**	2	Gear posts	MP9086	15	1	Aluminum Dust cover	MP2505
3c**	2	1/4 - 20 X 3/4" SS SHCS	FS9830	16	2	10-14 x 1/2" HH tri plask	FS5912
3d**	2	Lock washers	FS9302	17	3	10-14 X 1/2" HH tri plask w/seal wire hole	FS59121
4	1	Gear plate assembly	CP98532	18	4	1/4-20 X 1" PL SHCS	FS2800
4a***	1	Gear plate w/bushing	CP98531	19	1	Calibrator assembly	CA6000
4b***	1	Pinion drive shaft	MP9043	20	2	Phillips flathead tri plask	FS2501
4c***	2	Cotter pin	FS9210	21	1	Calibrator drive shaft Assembly	RD15912
4d***	1	Coupling drive assembly	PL8435	21A	1	Calibrator drive shaft	MP9099
4e***	1	Drive coupling sleeve w/bolt	MP9833	21B	1	Calibrator drive shaft bushing	MR5520
4f***	1	Pinion gear	PL6502	21C	1	10-24 Hex Nut	FS3600
4g***	1	Combination gear assembly	PL6500	21D	1	Plug, Black Nylon	MS5520
5	4	Dowel pin	MS9021	22	1	Retaining clip-1000-25	MS5003
6	8	10-32 X 3/8" SS SHCS	FS9651	23	1	Thrust washer	MP9053
7*	2	"O" Ring, Teflon™, cover assembly	SL2157	24	1	Meter pedestal	MP2526
8	1	Front cover	CP9560	25	1	3/8 - 16 x 3/4" HHCS	FS9923
9	1	Rear cover	CP9561	26	2	1/4" SS Drain Plug	MS4019
10	16	5/16 - 18 X 1" SS SHCS	FS9901	27	2	Split Lock washers	FS5001
11*	1	Packing gland assembly kit, Teflon™	RK8002				
11a	1	Packing gland assembly	PG8002				

Torque Specifications

Part #	Description	Torque	Tool	Part #	Description	Torque	Tool
FS9830	1/4-20 X 3/4" SS SHCS	78 in. lbs.	3/16 Allen	FS5912	10-14 X 1/2" HH Tri Plask	Snug tite	5/16 Socket
FS9651	10-32 X 3/8" SS SHCS	24 in. lbs.	5/32 Allen	FS59121	10-14 X 1/2" HH Tri Plask	Snug tite	5/16 Socket
FS9901	5/16-18 X 1" SS SHCS	24 ft. lbs.	1/4 Allen	FS9813	3/8-16 X 3/4" FLHD SHCS	30 ft. lbs.	9/16 Socket
FS9515	8-32 X 3/8" SS SHCS	Snug tite	9/64 Allen	MS4019	1/4" SS Drain plug	Snug tite	1/4 Allen
FS2800	1/4-20 X 1" ALPL SHCS	Snug tite	3/16 Allen				

* Recommended Spare Parts
 ** Part of Post Plate assembly, Part No.: CP98521
 *** Part of Gear plate assembly, Part No.: CP98532

Parts List TS20A Mechanical
Serial # ZPL2130



**Parts List TS20A Mechanical (Serial numbers beginning with 591D)
Serial # ZPL2130**



Item #	Qty	Description	Part #	Item #	Qty	Description	Part #
1	1	TS2HA Meter Body	MB2390	11c	1	2:1 ratio gear set	GS2001
2	1	Gear Set, Ryton/Carbon Brgs	GSTS2HRC	11d	1	"O" Ring, Viton, packing gland	SL1212
3	1	Post Plate Assembly	CP23191	12	1	Retaining plate	MP9060
4	1	Gear plate assembly	CP23162	13	3	8-32 x 3/8" SS SHCS	FS9515
4a	1	Gear plate w/bushing	CP23161	14	1	Right angle drive housing assy	RD15911
4b	1	Pinion drive shaft assy	MP9045-2	15	1	Aluminum dust cover	MP2025
4c	2	Cotter pin	FS9210	16	2	10-14 x 1/2" HH tri plask	FS5912
4d	1	Coupling Drive Assembly	PL8435	17	2	10-14 x 1/2" HH tri plask w/wire hole	FS59121
4e	1	Drive coupling sleeve w/bolt	MP9833	18	4	1/4-20 1" PL SHCS	FS2800
4f	1	Pinion Gear	PL6502	19	1	Calibrator assembly	CA6000
4g	1	Combination gear assembly	PL6500	20	2	Phillips flathead tri plask	FS2501
4h	1	Idle post	MP9059	21	1	Calibrator Drive Shaft Assy	RD15912
4i	1	Washer, Flat	MP9053	21a	1	Calibrator Drive Shaft	MP90990
5	4	Dowel Pin	MS9021	21b	1	Calibrator drive shaft bushing	MP5520
6	8	10-32 x 3/8" SS SHCS	FS9651	21c	1	10-24 hex nut	FS3600
7	2	"O" Ring, Viton Cover Assy	SL3167-UL	21d	1	Plug, Black nylon	MS5520
8	1	Front Cover	CP2390	22	1	Retaining clip 1000-25	MS5003
9	1	Rear Cover	CP2391	23	2	thrust washer	MP9053
10	24	3/8 - 16 x 7/8" AL SHCS	FS2928	24	1	Meter pedestal	MP2526
11	1	Packing gland Assy kit, viton	RK20011	25	2	3/8 - 16 x 3/4" HHCS	FS9923
11a	1	Packing gland	PG20011	26	2	Split lock washers	MS4019
11b	1	1:1 ratio gear set	GS2002	27	2	1/4" SS drain plug	FS5001

Torque Specifications

Part #	Description	Torque	Tool	Part #	Description	Torque	Tool
FS9900	5/16 - 18 X 3/4" SS SHCS	Snug tite	1/4 Allen	FS2800	1/4-20 x 1" AL PL SSSCS	Snug tite	3/16 Allen
FS9561	10-32 X 3/8" SS SHCS	Snug tite	5/32 Allen	FS5912	10-14 x 1/2" HH Tri Plask	Snug tite	5/16 Socket
FS2928	3/8 - 16 X 7/8" AL SHCS	34 ft lbs	5/32 Allen	FS59121	10-14 x 1/2" HH Tri Plask	Snug tite	5/16 Socket
FS9515	8-32 X 3/8" SS SHCS	Snug tite	5/32 Allen	FS2927	3/8 - 16 x 5/8" AL HHCS	30 ft lbs	9/16 Socket
FS2950	3/8" - 16 X 1 AL SHCS	Snug tite	3/16 Allen	MS4019	1/4" SS Drain Plug	Snug tite	1/4 Allen

**Parts List TS20A Mechanical (Serial numbers 2H1001 and greater)
Serial # ZPL2130**

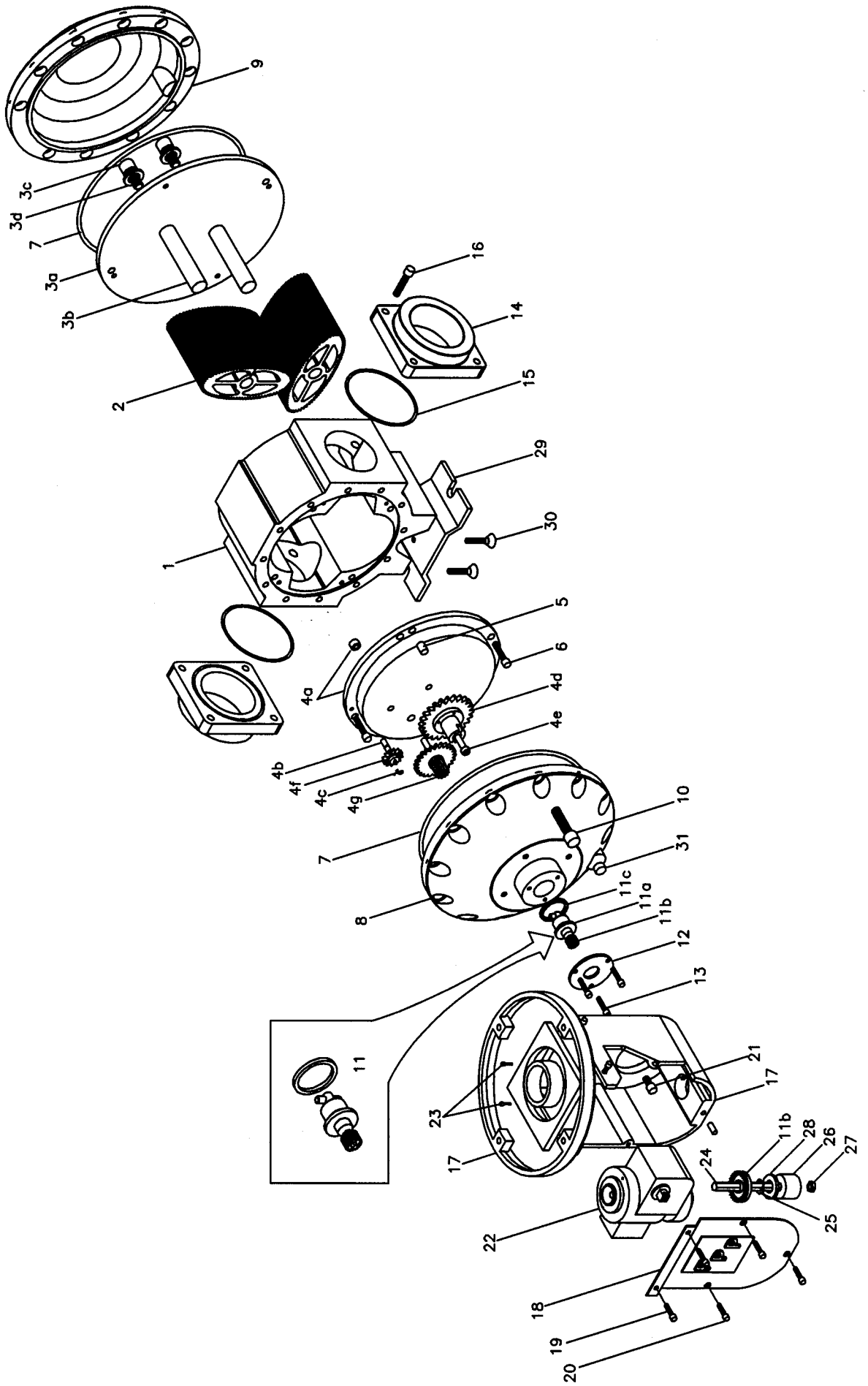


Item #	Qty	Description	Part #	Item #	Qty	Description	Part #
1	1	TS2HA Meter Body	MB2390	11c	1	2:1 ratio gear set	GS2001
2	1	Gear Set, Ryton/Carbon Brgs	GSTS2HRC	11d	1	"O" Ring, Viton, packing gland	SL1212
3	1	Post Plate Assembly	CP23191	12	1	Retaining plate	MP9060
4	1	Gear plate assembly	CP23162	13	3	8-32 x 3/8" SS SHCS	FS9515
4a	1	Gear plate w/bushing	CP23161	14	1	Right angle drive housing assy	RD15911
4b	1	Pinion drive shaft assy	MP9045-2	15	1	Aluminum dust cover	MP2025
4c	2	Cotter pin	FS9210	16	2	10-14 x 1/2" HH tri plask	FS5912
4d	1	Coupling Drive Assembly	PL8435	17	2	10-14 x 1/2" HH tri plask w/wire hole	FS59121
4e	1	Drive coupling sleeve w/bolt	MP9833	18	4	1/4-20 1" PL SHCS	FS2800
4f	1	Pinion Gear	PL6502	19	1	Calibrator assembly	CA6000
4g	1	Combination gear assembly	PL6500	20	2	Phillips flathead tri plask	FS2501
4h	1	Idle post	MP9059	21	1	Calibrator Drive Shaft Assy	RD15912
4i	1	Washer, Flat	MP9053	21a	1	Calibrator Drive Shaft	MP90990
5	4	Dowel Pin	MS9021	21b	1	Calibrator drive shaft bushing	MP5520
6	8	10-32 x 3/8" SS SHCS	FS9651	21c	1	10-24 hex nut	FS3600
7	2	"O" Ring, Viton Cover Assy	SL3167	21d	1	Plug, Black nylon	MS5520
8	1	Front Cover	CP2390	22	1	Retaining clip 1000-25	MS5003
9	1	Rear Cover	CP2391	23	2	thrust washer	MP9053
10	24	3/8 - 16 x 7/8" AL SHCS	FS2928	24	1	Meter pedestal	MP2526
11	1	Packing gland Assy kit, viton	RK2003	25	2	3/8 - 16 x 3/4" HHCS	FS9923
11a	1	Packing gland	PG2003	26	2	Split lock washers	MS4019
11b	1	1:1 ratio gear set	GS2002	27	2	1/4" SS drain plug	FS5001

Torque Specifications

Part #	Description	Torque	Tool	Part #	Description	Torque	Tool
FS9900	5/16 - 18 X 3/4" SS SHCS	Snug tite	1/4 Allen	FS2800	1/4-20 x 1" AL PL SSSCS	Snug tite	3/16 Allen
FS9561	10-32 X 3/8" SS SHCS	Snug tite	5/32 Allen	FS5912	10-14 x 1/2" HH Tri Plask	Snug tite	5/16 Socket
FS2928	3/8 - 16 X 7/8" AL SHCS	34 ft lbs	5/32 Allen	FS59121	10-14 x 1/2" HH Tri Plask	Snug tite	5/16 Socket
FS9515	8-32 X 3/8" SS SHCS	Snug tite	5/32 Allen	FS2927	3/8 - 16 x 5/8" AL HHCS	30 ft lbs	9/16 Socket
FS2950	3/8" - 16 X 1 AL SHCS	Snug tite	3/16 Allen	MS4019	1/4" SS Drain Plug	Snug tite	1/4 Allen

TS20C Mechanical



To be used with Drawing TS20C V

Parts List for Mechanical Meter Model TS20C

Serial no.s > 598A1000



Item	Qty.	Description	Part #	Item	Qty.	Description	Part #
1	1	TS20C Meter Body	MB9310	11b	1	1:1 gear set	GS2002
2*	1	Gear Set, Ryton™	GS598R			2:1 gear set	GS2001
	1	Gear Set, Ryton™ w/Teflon™ bearings	GS590RT	11c	1	"O" Ring, Teflon™, packing gland	SL2212
	1	Gear Set, Med. viscosity	GS590RMV	12	1	Retaining plate	MP9060
	1	Gear Set, high viscosity	GS590RHV	13	3	8-32 X 3/8" SS SHCS	FS9515
3	1	Post Plate assembly	CP93151	14	2	2" Companion flange, NPT	MP9506
3a**	1	Post plate	CP9315			2" Companion flange, BSPP	MP9508
3b**	2	Gear posts	MP90692	15	2	"O" Ring, Teflon™, companion flanges	SL2233
3c**	2	5/16-18 X 3/4" SS SHCS	FS9900	16	8	3/8-16 X 7/8" SS SHCS	FS2928
3d**	2	Lock washers	FS5008	17	1	Right angle drive housing assembly	RD15911
4	1	Gear plate assembly	CP93162	18	1	Aluminum dust cover	MP2505
4a***	1	Gear plate w/bushing	CP93161	19	2	10-14 X 12" HH tri plask	FS5912
4b***	1	Pinion drive shaft	MP9043	20	3	10-14 X 12" HH tri plask w/ seal wire hole	FS59121
4c***	2	Cotter pin	FS9210	21	4	1/4-20 X 1" SS SHCS	FS9800
4d***	1	Coupling drive assembly	PL8435	22	1	Calibrator assembly	CA6000
4e***	1	Drive coupling sleeve w/bolt	MP9833	23	2	Phillips flathead tri plask	FS2501
4f***	1	Pinion gear	PL6502	24	1	Calibrator drive shaft	MP9099
4g***	1	Combination gear assembly	PL6500	25	1	Retaining clip-1000-25	MS5003
4h***	1	Combination gear shaft	MP9059	26	1	Calibrator drive shaft bushing	BR5500
5	1	Dowel Pin	MS9021	27	1	10-24 HEX nut	FS3600
6	8	10-32 X 3/8" SS SHCS	FS9651	28	2	Thrust washer	MP9053
7*	2	"O" ring, Teflon™, cover assembly	SL2167	29	1	Meter pedestal	MP9112
8	1	Front Cover	CP9399	30	4	3/8-16 X 3/4" FLHD SHCS	FS8914
9	1	Rear Cover	CP9398	31	2	1/4" SS drain plug	MS4019
10	24	3/8-16 X 7/8" SS SHCS	FS2928				
11*	1	Packing gland assembly kit, Teflon™	RK80021				
11a	1	Packing gland	PG80021				

Torque Specifications

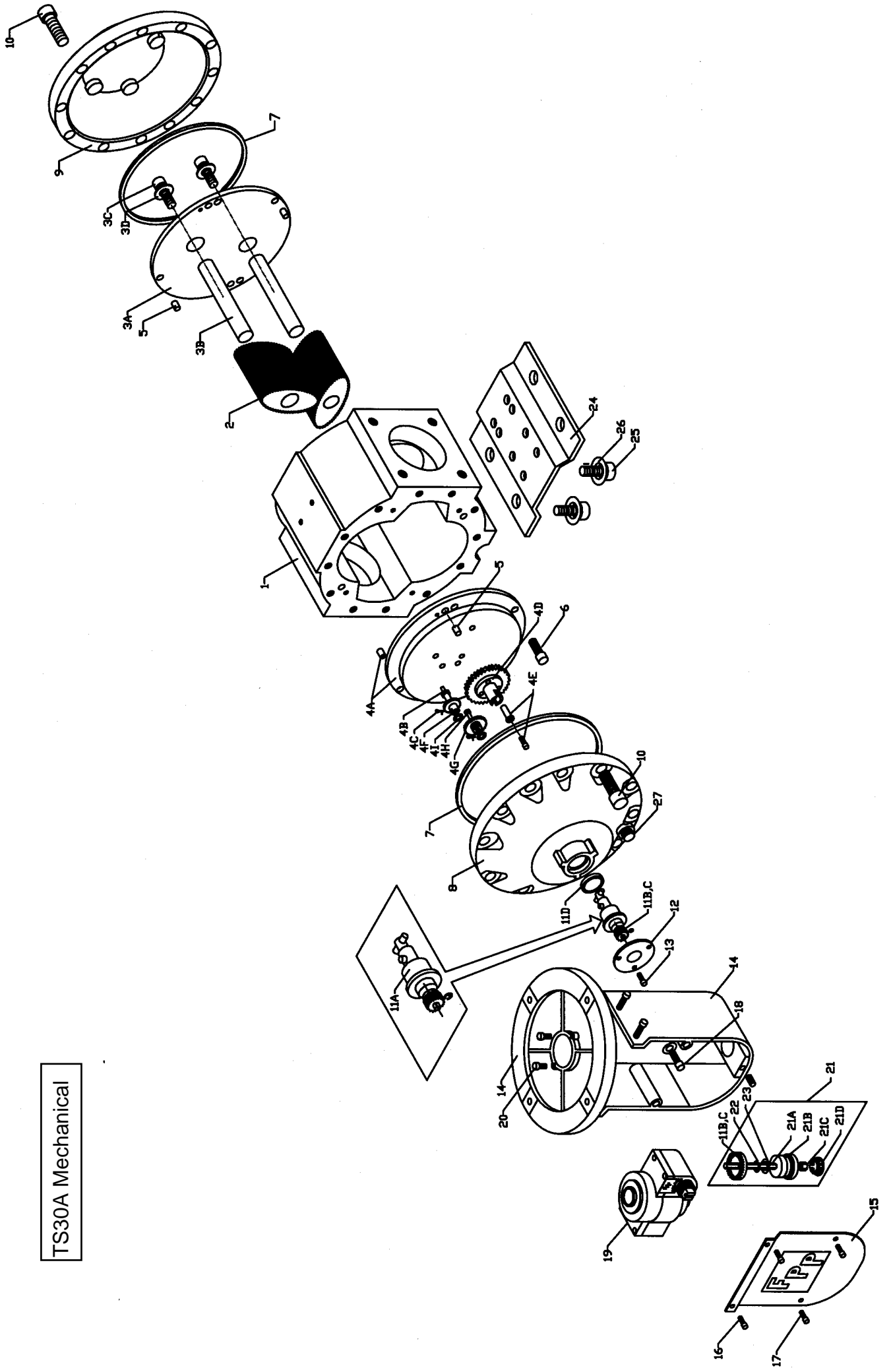
Part #	Description	Torque	Tool	Part #	Description	Torque	Tool
FS9900	5/16-18 X 3/4" SS SHCS	Snug tite	1/4 Allen	FS5912	10-14 X 1/2" HH Tri Plask	Snug tite	5/16 Socket
FS9651	10-32 X 3/8" SS SHCS	24 in. lbs.	5/32 Allen	FS59121	10-14 X 1/2" HH Tri Plask	Snug tite	5/16 Socket
FS2928	3/8-16 X 7/8" AL SHCS	34 ft. lbs.	5/16 Allen	FS9800	1/4-20 X 1" SS SHCS	Snug tite	3/16 Allen
FS9515	8-32 X 3/8" SS SHCS	Snug tite	9/64 Allen	FS8914	3/8-16 X 3/4" FLHD SHCS	Snug tite	1/4 Allen
FS2928	3/8-16 X 7/8" SS SHCS	34 ft. lbs.	5/16 Allen	MS4019	1/4" SS Drain plug	Snug tite	1/4 Allen

* Recommended Spare Parts

** Part of Post Plate assembly, Part No.: CP93151

*** Part of Gear plate assembly, Part No.: CP93162

TS30A Mechanical



Parts List for Mechanical Meter Model TS30A

Serial no.s > TS5201A1000



Item	Qty.	Description	Part #	Item	Qty.	Description	Part #
1	1	TS30A Meter Body	MB5201-1	10	24	3/8-16 X 7/8" AL SHCS	FS2928
2*	1	Gear Set, Ryton™ Bearings	GS5201R	11*	1	Packing gland assembly kit, Viton™	RK2003
		Gear Set, Carbon Bearings	GS5201RC	11a	1	Packing gland	PG2003
		Gear Set, Teflon™ Bearings	GS5201RT	11b	1	1:1 gear set	GS2002
		Gear Set, Carbon Bearings, Med. Viscosity	GS5201RC-MV	11c	1	2:1 gear set	GS2001
		Gear Set, Teflon Bearings, Med. Viscosity	GS5201RT-MV	11d	1	"O" Ring, Viton™, packing gland	SL1212
		Gear Set, Carbon Bearings, High Viscosity	GS5201RC-HV	12	1	Retaining plate	MP9060
		Gear Set, Teflon Bearings, Med. Viscosity	GS5201RT-HV	13	3	8-32 X 3/8" SS SHCS	FS9515
3	1	Post plate assembly	CP23961	14	1	Right angle drive housing assembly	RD15911
3a**	1	Post plate	CP2396	15	1	Aluminum dust cover	MP2505
3b**	2	Gear posts	MP93952	16	2	10-14 X 12" HH tri plask	FS5912
3c**	2	3/8-16 X 3/4" SS HHCS	FS9923	17	3	10-14 X 12" HH tri plask w/ seal wire hole	FS59121
3d**	2	Lock washers	FS9304	18	4	1/4-20 X 1" AL PL SHCS	FS2800
4	1	Gear plate assembly	CP23172	19	1	Calibrator assembly	CA6000
4a***	1	Gear plate w/bushing	CP23171	20	2	Phillips flathead tri plask	FS2501
4b***	1	Pinion drive shaft	MP9043	21	1	Calibrator Drive Shaft Assy	RD15912
4c***	2	Cotter pin	FS9210	21a	1	Calibrator drive shaft	MP9099
4d***	1	Coupling drive assembly	PL8435	21b	1	Calibrator drive shaft bushing	FS3600
4e***	1	Drive coupling sleeve	MP9833	21c	1	10-24 HEX nut	MS5520
4f***	1	Pinion gear	PL6502	21d	1	Plug, Black nylon	MS5003
4g***	1	Combination Gear	PL6500	22	1	Retaining clip-1000-25	MP9053
4h***	1	Post, Idler	MP9059	23	2	Thrust washer	MP2529
4i***	1	Washer, Flat	MP9053	24	1	Meter pedestal	FS9923
5	4	Dowel pin	MS9021	25	4	3/8-16 X 3/4" HHCS	FS93031
6	8	10-32 X 3/8" SS SHCS	FS9651	26	4	Lock washers	MS4019
7*	2	"O" Ring, Viton™, cover assembly	SL1167	27	2	1/4" SS drain plug	
8	1	Front cover	CP2398				
9	1	Rear cover	CP2397				

Torque Specifications

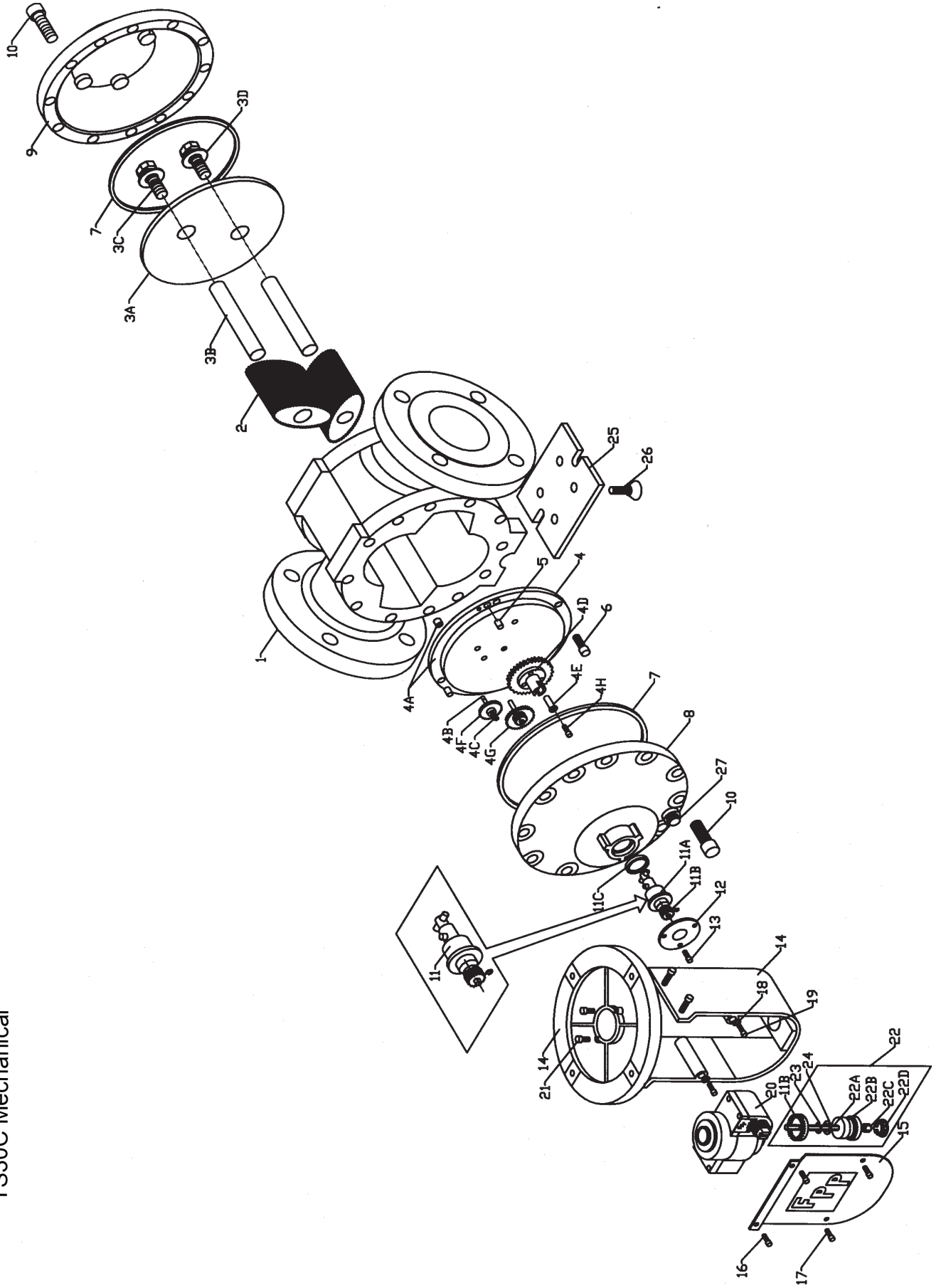
Part #	Description	Torque	Tool	Part #	Description	Torque	Tool
FS9923	3/8-16 X 3/4" SS HHCS	Snug tile	9/16 Socket	FS5912	10-14 X 1/2" HH Tri Plask	Snug tile	5/16 Socket
FS9651	10-32 X 3/8" SS SHCS	24 in.lbs.	5/32 Allen	FS59121	10-14 X 1/2" HH Tri Plask	Snug tile	5/16 Socket
FS2928	3/8-16 X 7/8" AL SHCS	34 ft.lbs.	5/16 Allen	FS2800	1/4-20 X 1" AL PLSSCS	Snug tile	3/16 Allen
FS9515	8-32 X 3/8" SS SHCS	21 in.lbs.	9/64 Allen	FS9923	3/8-16 X 3/4" HHCS	Snug tile	9/16 Socket
FS1951	1/2-13 X 1 1/4" AL SHCS	50 ft.lbs.	3/8 Allen	MS4019	1/4" SS Drain plug, Snug tile	1/4 Allen	

* Recommended Spare Parts

** Part of Post Plate assembly, Part No.: CP23961

*** Part of Gear plate assembly, Part No.: CP23172

TS30C Mechanical



Parts List for Mechanical Meter Model TS30C

2003



Item	Qty.	Description	Part #	Item	Qty.	Description	Part #
1	1	TS30C Meter Body	MB9350	10	24	3/8-16 X 7/8" SS SHCS	FS2928
2*	1	Gear Set, Ryton™ w/ Carbon Bearings	GS5201RC	11*	1	Packing gland assembly kit, Teflon™	RK80031
		Gear Set, Ryton™ w/Carbon Bearings, Med. Viscosity	GS5201RC-MV	11a	1	Packing gland	PG80031
		Gear Set, Ryton™ w/Carbon Bearings, High Viscosity	GS5201RC-HV	11b	1	1:1 gear set	GS2002
3	1	Post plate assembly	CP90521	11c	1	2:1 gear set	GS2001
3a**	1	Post plate	CP9052	11d	1	"O" Ring, Teflon™, packing gland	SL2212
3b**	2	Gear posts	MP9396	12	1	Retaining plate	MP9060
3c**	2	3/8-16 X HHCS	FS9923	13	3	8-32 X 3/8" SS SHCS	FS9515
3d**	2	Lock washers	FS9304	14	1	Right angle drive housing assembly	RD15911
4	1	Gear plate assembly	CP93162	15	1	Aluminum dust cover	MP2505
4a***	1	Gear plate w/bushing	CP93161	16	2	10-14 X 12" HH tri plask	FS5912
4b***	1	Pinion drive shaft	MP9043	17	3	10-14 X 12" HH tri plask w/ seal wire hole	FS59121
4c***	2	Cotter pin	FS9210	18	4	Lockwasher 1/4" shake proof	FS3602
4d***	1	Coupling drive assembly	PL8435	19	4	1/4-20 X 1" SHCS	FS2800
4e***	1	Drive coupling sleeve	MP9833	20	1	Calibrator assembly	CA6000
4f***	1	Pinion gear	PL6502	21	2	Phillips flathead tri plask	FS2501
4g***	1	Combination Gear Shaft	PL6500	22	1	Calibrator Drive Shaft Assy	RD15912
4h***	1	Post, Idler	MP9059	22a	1	Calibrator drive shaft	MP9099
4i***	1	Washer, Flat	MP9053	22b	1	Calibrator drive shaft bushing	MP5520
5	4	Dowel pin	MS9021	22c	1	10-24 HEX nut	FS3600
6	8	10-32 X 3/8" SS SHCS	FS9651	22d	1	Plug, Black nylon	MS5520
7*	2	"O" Ring, Teflon™, cover assembly	SL2167	23	1	Retaining clip-1000-25	MS5003
8	1	Front cover	CP2398	24	2	Thrust washer	MP9053
9	1	Rear cover	CP2397	25	1	Meter pedestal	MP9113

Torque Specifications

Part #	Description	Torque	Tool	Part #	Description	Torque	Tool
FS9923	3/8-16 X 3/4" SS HHCS	Snug tile	9/16 Socket	FS5912	10-14 X 1/2" HH TriPlask	Snug tile	5/16 Socket
FS9651	10-32 X 3/8" SS SHCS	24 in.lbs.	5/32 Allen	FS59121	10-14 X 1/2" HH TriPlask	Snug tile	5/16 Socket
FS2928	3/8-16 X 7/8" AL SHCS	34 ft.lbs.	5/16 Allen	FS2800	1/4-20 X 1" AL PLSSCS	Snug tile	3/16 Allen
FS9515	8-32 X 3/8" SS SHCS	21 in.lbs.	9/64 Allen	FS9923	3/8-16 X 3/4" HHCS	Snug tile	9/16 Socket
FS1951	1/2-13 X 1 1/4" AL SHCS	50 ft.lbs.	3/8 Allen	MSA019	1/4" SS Drain plug, Snug tile	1/4 Allen	

* Recommended Spare Parts

** Part of Post Plate assembly, Part No.: CP23961

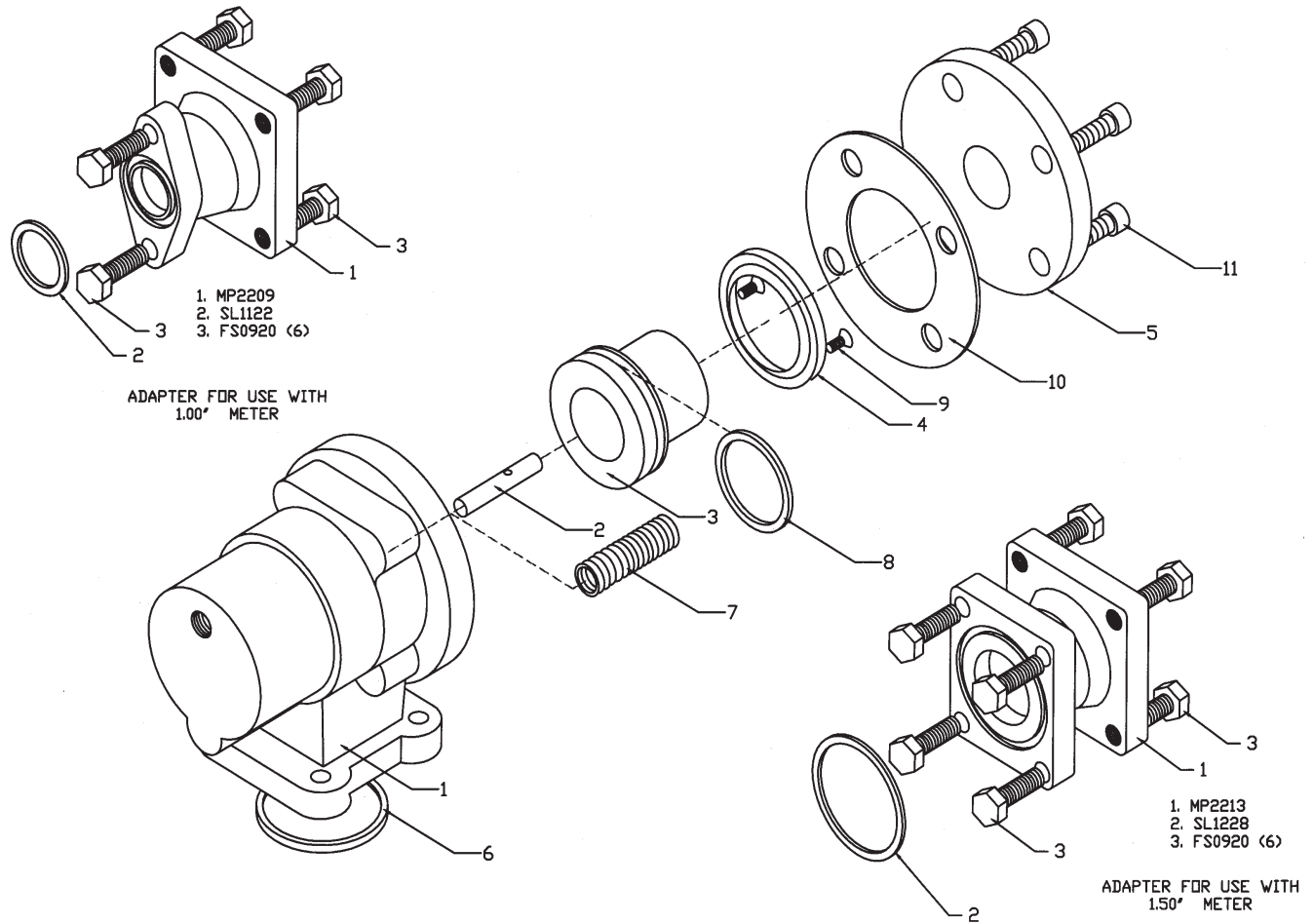
*** Part of Gear plate assembly, Part No.: CP23172

Parts List for Anodized Aluminum Air Check Valve w/ viton seals
 For Meter Models: TS10A, TS15A, TS20A



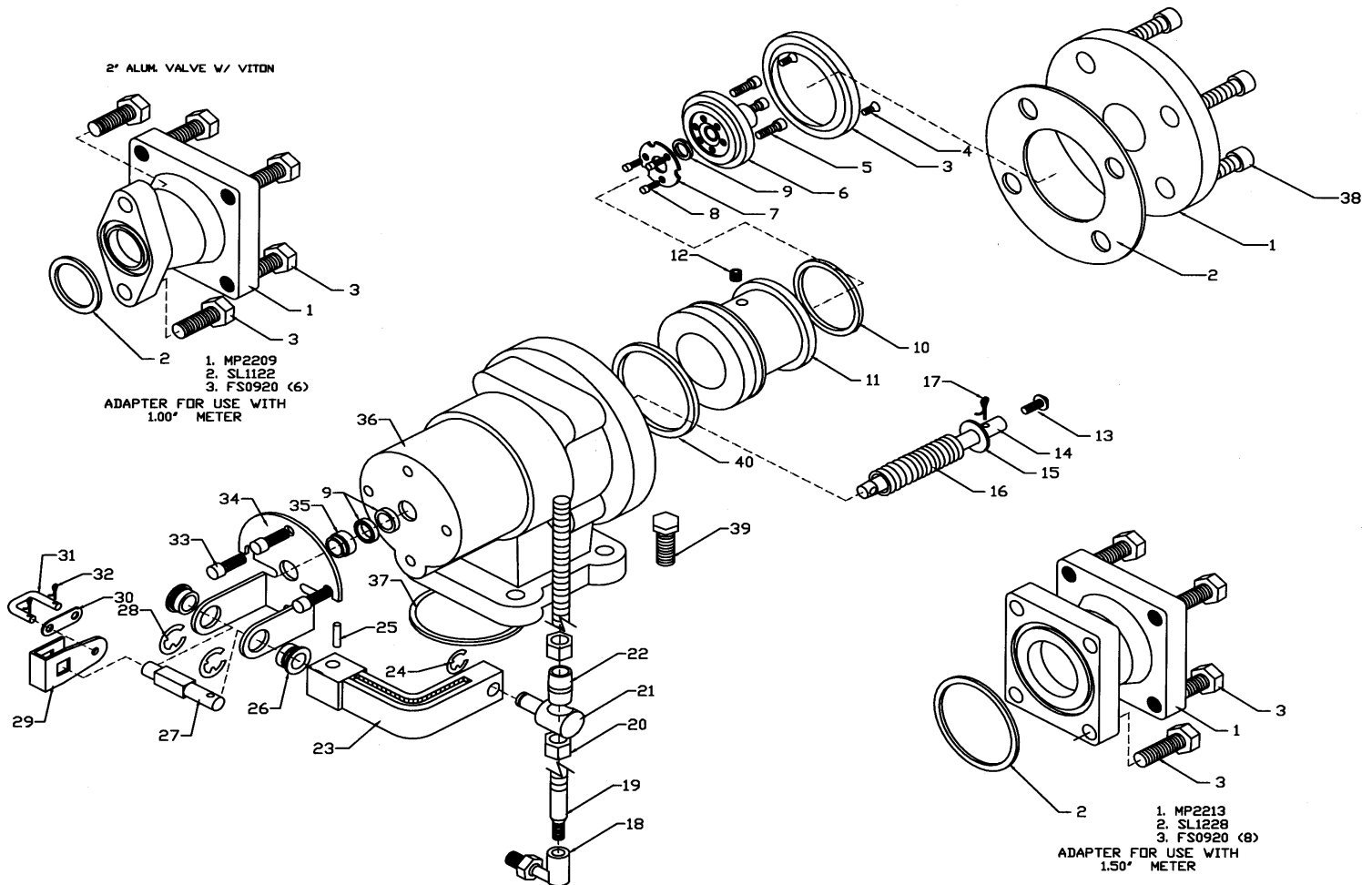
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2"ALUM. AIR CHECK W/ VITON



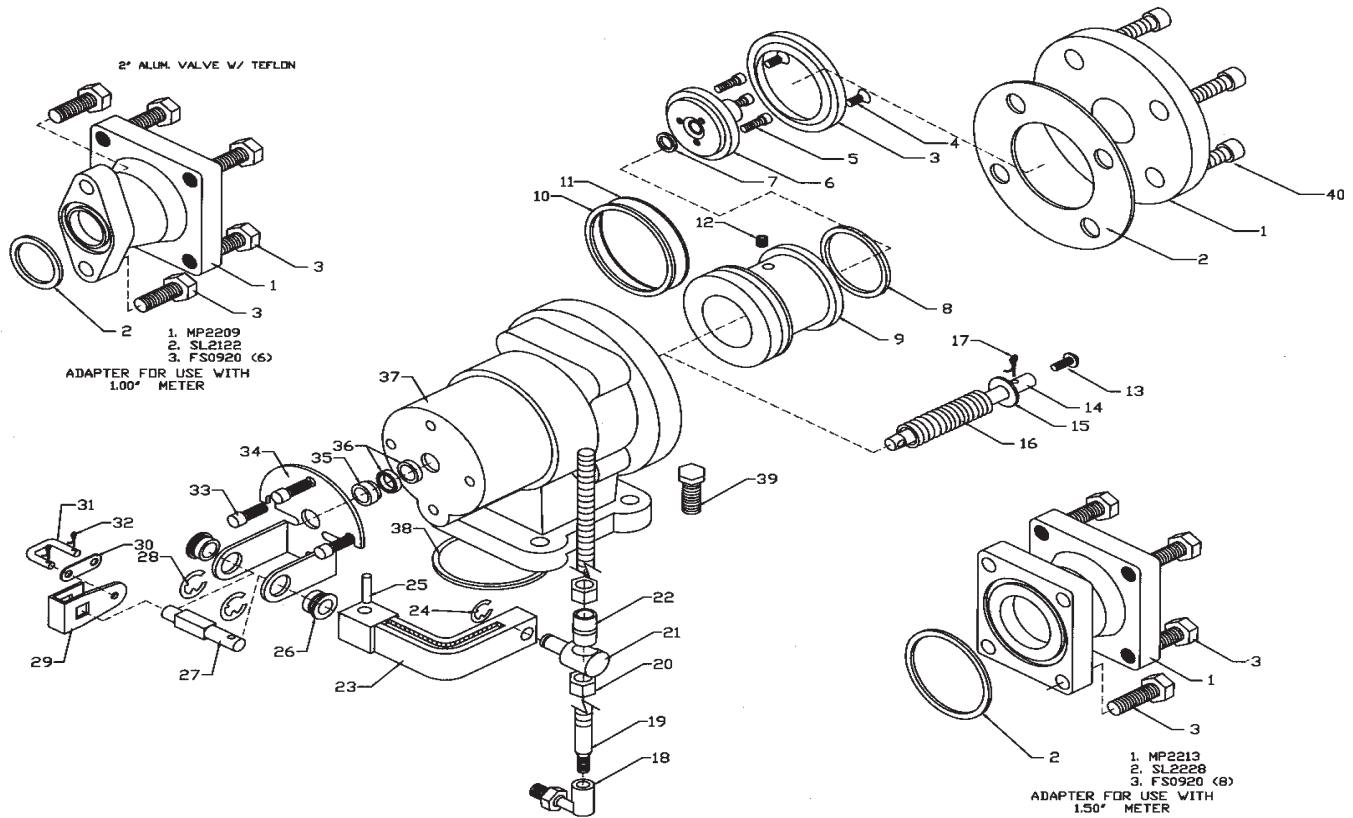
Item	Qty	Description	Part #
1.	1	Body, Air Check, Alum Anod.	MP2450
2.	1	Valve guide shaft	MP8050
3.	1	Piston, Air check Alum Anod	MP2451
4.	1	Valve, Seat, SS	MP8052
5.	1	Valve Cover Flange, NPT, Anod.	MP2225-1
5B.	1	Valve Cover Flange, BSP, Anod.	MP2226-1
6.	1	"O" Ring, Viton	SL1233
7.	1	Spring, Valve	MP9207
8.	1	U-Cup Seal, Viton	SL1332-U
9.	2	Screw, 10-32 x .25 FHCS	FS0658
10.	1	Flat Gasket	SL7500
11.	4	1/2-13 x 1.50" AL SHCS	FS2960

2" Aluminum Valve with Viton Seals
 For Meter Models: TS10, TS15 and TS20
 042003 - ZPL2404 Rev1



Item #	Qty	Description	Part #	Item #	Qty	Description	Part #
1	1	1" NPT, Anod. Alum Valve Flange	MP2215-1	19	1	Preset Link, Shaft	MP3050
		1" BSP, Anod Alum, Valve Flange	MP2216-1	20	2	3/8-16 Ny-Lok	FS3901
		1.5" NPT Anod Alum Valve Flange	MP2220-1	21	1	Linkage Pivot	MP8025
		1.5" BSP Anod Alum Valve Flange	MP2221-1	22	1	Bushing, Linkage	MP8027
		2" NPT Anod Alum Valve Flange	MP2225-1	23	1	Actuating Arm, Linkage, 2" Piston Valve	MP1300
		2" BSP Anod Alum Valve Flange	MP2226-1	24	1	3/8 E-Clip	MS0001
2	1	Seal, Flat Gasket	SL7500	25	1	Roll Pin, 5/32 x 7/8" 420 SS	MS8003
3	1	Main Valve Seat Ring	MP8030	26	2	Lift Bracket Bushing Assy	MP3051
4	2	10-32 x 1/4 FHCS	FS0658	27	1	Lift Bracket Shaft, 2" Valve	MP3054
5	3	10-32x1.0" SHCS	FS9659	28	2	5/8" E-Clip	MS5023
6	1	Valve Seat Retainer	MP2343	29	1	Valve Stem Lifter	MP3012
7	1	Stem Ring Retainer	ST9065	30	1	Retaining Clip	MP3010
8	3	8-32x.375" SS SHCS	FS9515	31	1	Lift Link	MP3015
9	3	Viton, Seal	SL1204	32	2	3/32 x 1/2" Cotter Pin	MS3023
10	1	"O" Ring, Viton, Valve Piston	SL1328	33	4	1/4"-20x1/2" SHCS	FS2802
11	1	Piston, Al. Anod	MP2337	34	1	Lift Bracket	MP3011
12	1	Set Screw, 1/4 20x.25" w/.125 Hole	MS8027	35	1	Seal & Bearing Retainer	MP8031-1
13	1	Valve Stem Seat	MP9920	36	1	Valve Body, 2" Anod	MP2330
14	1	Valve Stem	MP1344	37	1	"O" Ring, Viton	SL1233
15	1	Washer	MS1060	38	4	1/2 - 13 x 1-1/2" ALPL SHCS	FS2960
16	1	Valve Spring	MP9207	39	1	3/8-18X1.0" PLHHCS	FS0920
17	1	Cotter Pin 3/32 x 3/4 18-8 SS	MS9055	40	1	U-Cup O-Ring	SL1332-U
18	1	Ball Joint	MS3021				

Parts List for Aluminum Preset Valve w/Teflon™ Seals
 For Meter Models: TS10A, TS15A, TS20A
 ZPL2406 10/2003

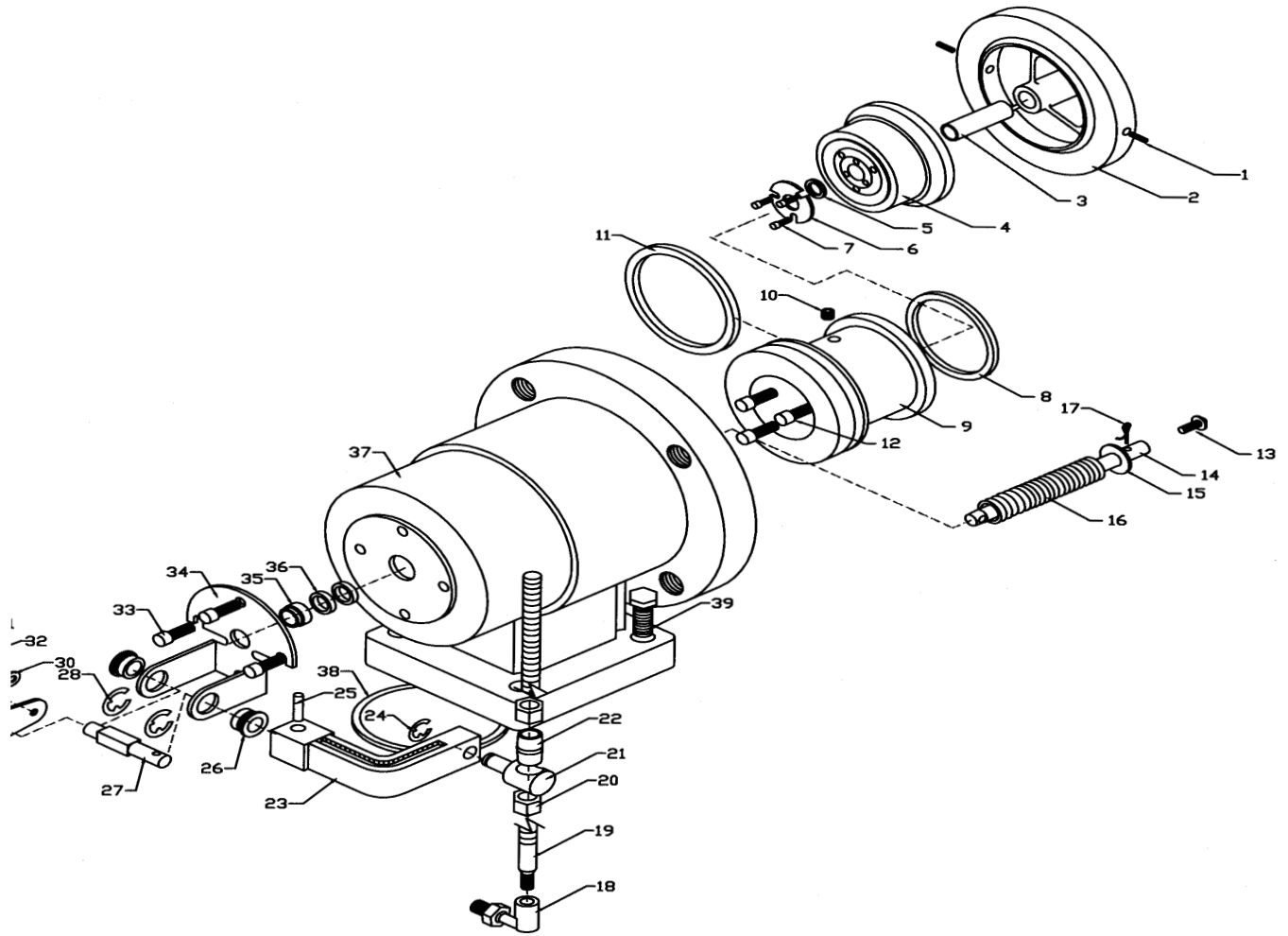


Item	Qty	Description	Part #	Item	Qty	Description	Part #
1	1	1" NPT Andz. Al Valve Flange	MP2215-1	19.	1	Preset Link, Shaft	MP3050
		1" BSPP Andz. Al Valve Flange	MP2216-1	20.	2.	3/8 - 16 Ny-Lok	FS3901
		1½" NPT Andz. Al Valve Flange	MP2220-1	21.	1.	Linkage Pivot	MP8025
		1½" BSPP Andz. Al Valve Flange	MP2221-1	22.	1.	Bushing, Linkage	MP8027
		2" NPT Andz. Al Valve Flange	MP2225-1	23.	1	Actuating Arm, Linkage, 2" Piston Valve	MP1300
		2" BSPP Andz. Al Valve Flange	MP2226-1	24.	1	3/8" E-Clip	MS0001
2	1	Seal, Flat Gasket	SL2500	25.	1	Roll Pin, 5/32 x 5/8" 420 SS	MS8003
3	1	Main Valve Seat Ring	MP8030	26.	2	Lift Bracket Bushing Assy	MP3051
4	2	10-32 X 1/4" FHCS	FS0658	27.	1	Lift Bracket Shaft, 2" Valve	MP3054
5.	3	10-32 x 1" SHCS	FL9659	28.	2	5/8" E-Clip	MS5023
6.	1	Valve Seat Retainer	MP2340	29.	1	Valve Stem Lifter	MP3012
7.	1	Valve Steam Seat, Teflon	MP1341	30.	1	Retaining Clip	MP3010
8.	1	Seal, Teflon, Flat Gasket Type	SL9201	31.	1	Lift Link	MP3015
9.	1	Piston	MP2336	32.	2	3/32 x 1/2" Cotter Pin	MS3023
10.	1	O-Ring, Teflon, U-Cup	SL2230-U	33.	4	1/4" - 20 x 1/2" SHCS	FS2802
11.	1	Retaining Ring	MS9036	34.	1	Lift Bracket	MP3011
12.	1	Set Screw, w/hole	MS8027	35.	1	Seal & Bearing Retaining Assy	MP8037-1
13.	1	Valve Stem Seal Screw	MP9920	36.	2	U-Cup seals, Teflon	SL2204-U
14.	1	Valve Stem	MP1344	37.	1	Valve Body, Anod Alum	MP2330
15.	1	Washer	MS9060	38.	1	O-Ring Teflon	SL2233
16.	1	Spring	MP9207	39.	1	3/8 - 18 x 1" PLHCS	FS0920
17.	1	Cotter Pin	MS9055	40.	4	1/2 x 13 x 1.5" ALPL SHCS	FS2960
18.	1	Ball Joint	MS3021				

Parts List for 3" Alum. Valve w/Viton seals

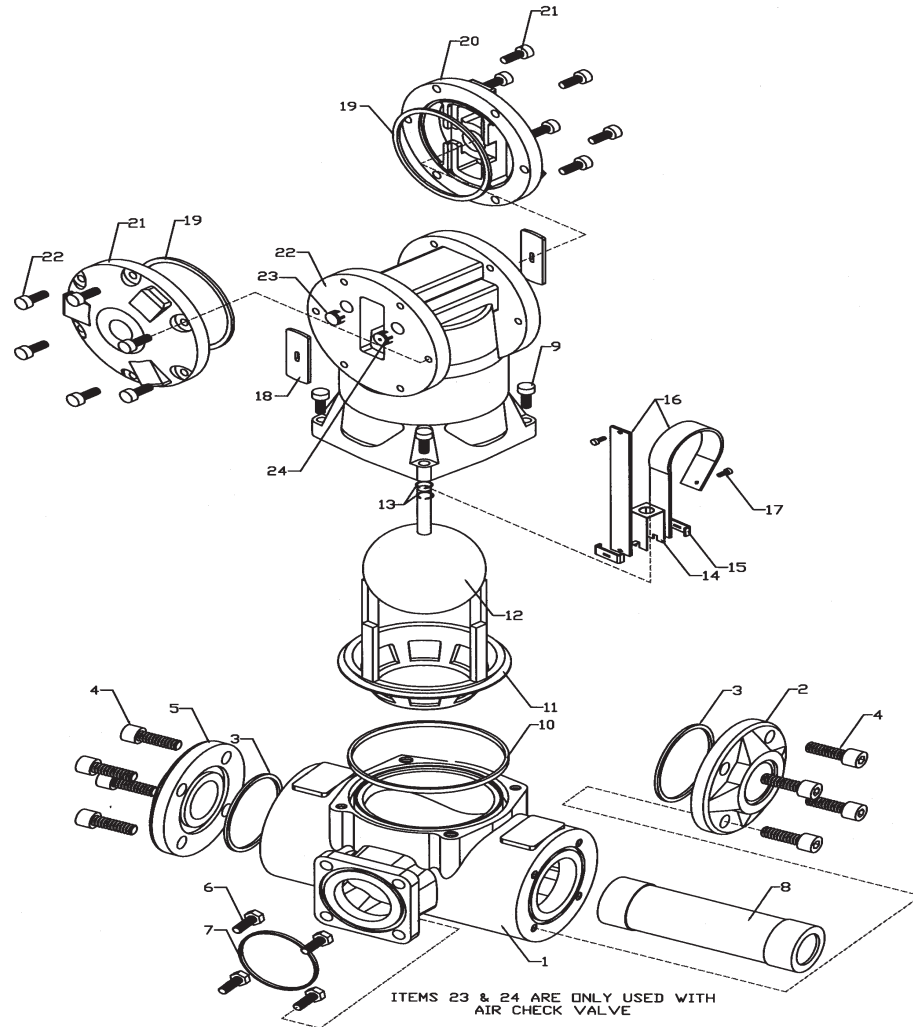
For Meter Models: TS30A

ZPL2410 11/03



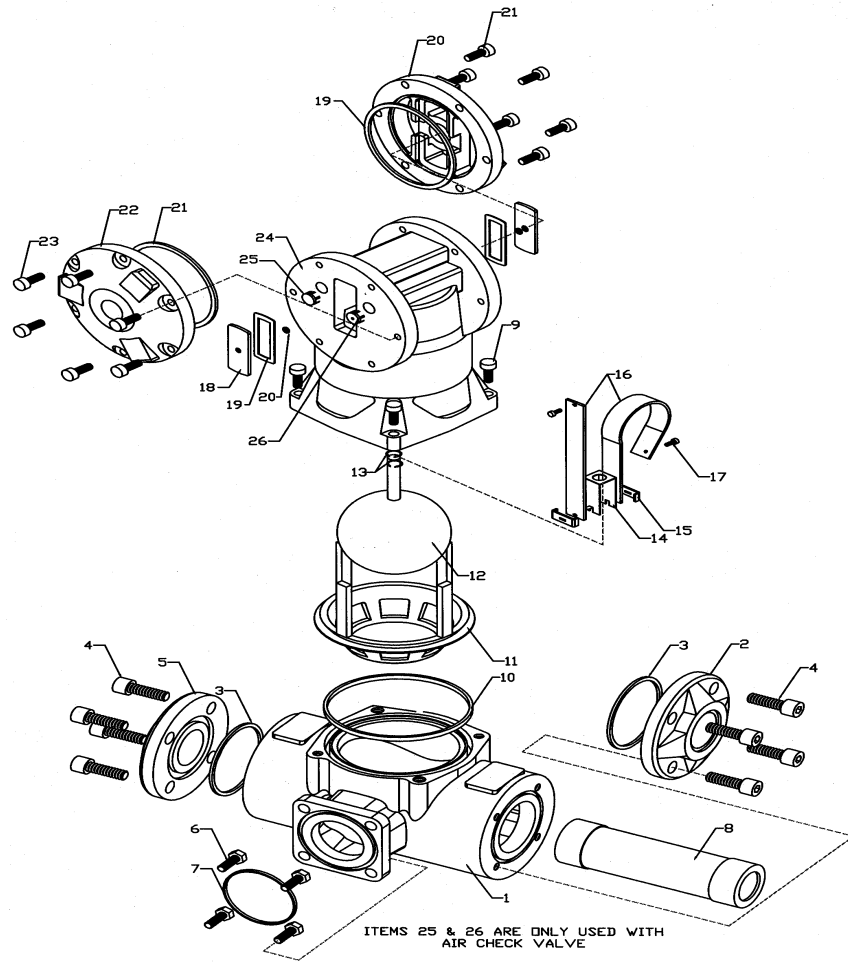
Item	Qty	Description	Part #	Item	Qty	Description	Part #
1	2	6-32 x .50 SS SHSS	FS9434	21.	1	Linkage Pivot	MP8025
2	1	Main Valve Seat Ring	MP2653	22.	1	Linkage Pivot Bushing	MP8027
3	1	Piston Guide	MP8038	23.	1	Actuating Arm	MP1300
4	1	Valve Seat Ring Retainer	MP2652	24.	1	3/8 E-Clip	MS0001
5	1	O-Ring, 3" Valve Stem Seat	SL1310	25.	1	Roll Pin, 5/32 x 7/8	MS8003
6	1	O-Ring Retainer	ST9092	26.	2	Bushing, Lift Bracket	MP3051
7	3	8-32 x .375 X SS SHCS	FS9515	27.	1	Lift Bracket Shaft	MP3054
8	1	O-Ring	SL1336	28.	2	5/8 E-Clip	MS5023
9	1	Piston	MP2651	29.	1	Valve Stem Lifter	MP3012
10	1	Piston Oriface Screw	MS8026	30.	1	Retaining Clip	MP3010
11	1	O-Ring	SL1242	31.	1	Lift Link	MP3015
12	3	1/4-20 x 1.00 SHCS	FS2800	32.	2	3/32 x 1/2 Cotter Pin	MS3023
13	1	Valve Stem Seat	MP9921	33.	4	1/4 - 20 x 1/2 SHCS	FS2802
14	1	Valve Stem	MP9345	34.	1	Lift Bracket	MP3011-1
15	1	Washer	MS1061	35.	1	Seal & Bearing Retainer	MP8035
16	1	Spring	MS9210	36.	2	O-Ring	SL1206
17	1	Cotter Pin	FS9211	37.	1	Body, Valve 3"	MP2331
18	1	Ball Joint	MS3021	38.	1	O-Ring	SL1240
19	1	Preset Link	MP3050	39.	4	1/2 - 13 x 1-1/2" ALPL HHCS	FS1952
20	2	3/8 - 16 Nylok Nut	FS3901	40.	1	Square Cut O Ring	SL1350
				41.	1	3" NPT Flange	MP2537
				41a.	1	3" BSPP Flange	MP2544
				42.	4	5/8 - 11 x 1.75 SHCS	FS2965

Parts List for 2" Anodized Aluminum Strainer
For Meter Models: TS20A



Item	Qty	Description	Part #	Item	Qty	Description	Part #
1	1	Anodized Strainer Housing	MP2210	9	4	3/8-16 x 1-1/2" PL SHCS	FS2925
2	1	1" NPT flange	MP2215	10	1	"O" ring, Viton™	SL1248
2b	1	1" BSP flange	MP2216	11	1	Air Eliminator Float guide	PL9400
2c	1	1 1/2" NPT flange	MP2220	12	1	Air Eliminator Float	SA3006
2d	1	1 1/2" BSP flange	MP2221	13	2	Apiral retaining ring	MS5005
2e	1	2" NPT flange	MP2225	14	1	Reed mounting block	MP9062
2f	1	2" BSP flange	MP2226	15	2	Reed retaining clip	PL9100
3	2	Viton™ Tetraseal	SL1334	16	2	SS Reed	MP9063
4	8	1/2-13 X 1 1/2" PL SHCS	FS2960	17	2	8-32 X 3/8" SS PNHD PHMS	FS9520
5	1	Strainer basket cover	MP2212	18	2	Orifice Reed plate	ST9064-1
6	4	3/8-16 X 1" HHCS	FS0920	19	2	"O" Ring, Viton™	SL1155
7	1	"O" ring, Viton™	SL1233	20	2	Anodized Air Eliminator Cover	MP2207
8	1	SS Strainer basket, 40 mesh	SA3008-040	21	12	5/16-18 x 1" ALPL SHCS	FS2900
8b	1	SS Strainer basket, 80 mesh	SA3008-080	22	1	Anodized Air Eliminator Housing	MP2205
8c	1	SS Strainer basket, 100 mesh	SA3008-100	23	1	Nylon Plug	MS2010
				24	1	Nylon Plug w/hole	MS2010-1
						*Blind Cover for use when Air Eliminator is not in use - MP2214-1	

Parts List for 3" Anodized Aluminum Strainer &
Air Eliminator
For Meter Models: TS30A

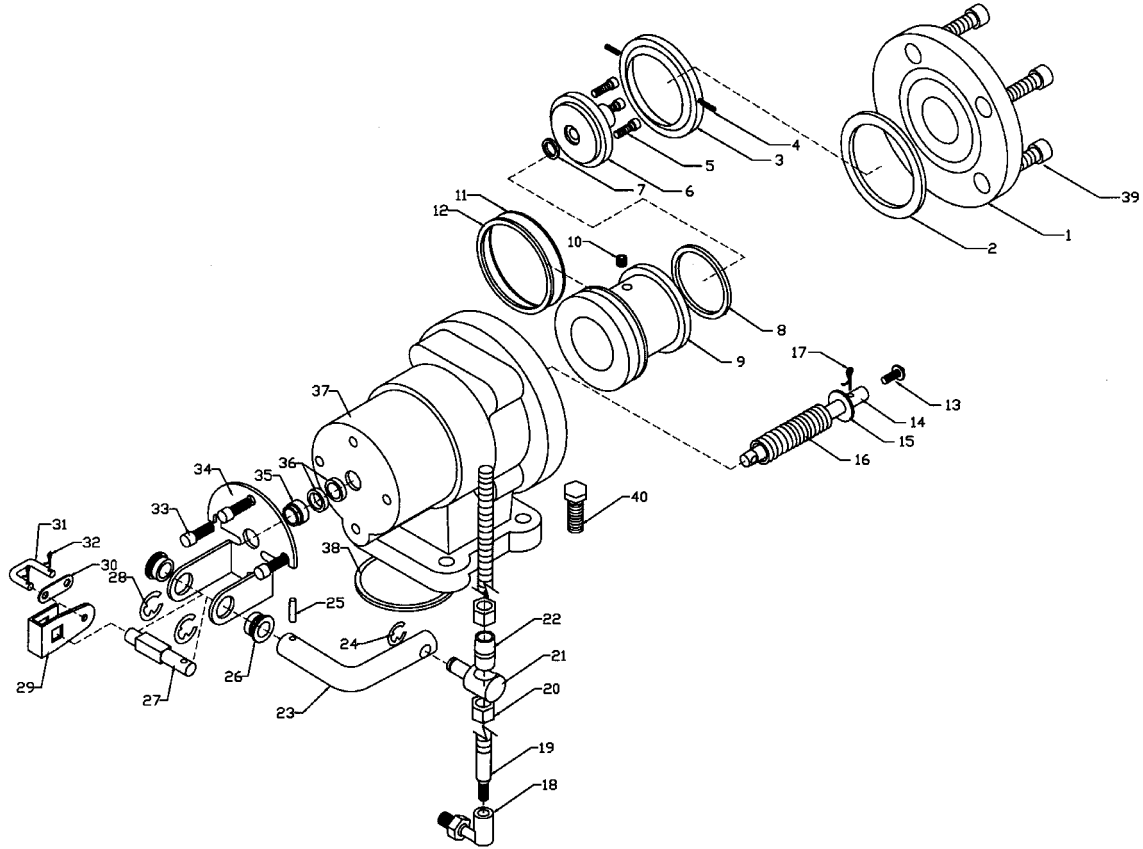


Item	Qty	Description	Part #	Item	Qty	Description	Part #
1	1	3" Anodized Strainer Housing	MP2400	13	2	Spiral retaining ring	MS5005
2b	1	3" NPT flange	MP2537	14	1	Reed mounting block	MP9062
2c	1	3" BSP flange	MP2544	15	2	Reed retaining clip	PL9100
3	2	Viton™ Tetraseal	SL1350	16	2	SS Reed	MP9063
4	8	5/8 -11 X 1 3/4" PL SHCS	FS2965	17	2	8-32 X 3/8" SS PNHD PHMS	FS9520
5	1	Strainer basket cover	MP2538	18	2	Orifice Reed plate	ST9064-1
6	4	3/8-16 X 1 1/4" PL SHCS	FS2926	19	2	"O" ring, Viton™	SL1155
7	1	"O" ring, Viton™	SL1248	20	2	Anodized Air eliminator cover	MP2207
8	1	SS Strainer basket, 40 mesh	SA3010-040	21	12	5/16-18 X 1" PL SHCS	FS2900
8b	1	SS Strainer basket, 80 mesh	SA3010-080	22	1	Anodized Air elim housing	MP2205
8c	1	SS Strainer basket, 20 mesh	SA3010-020	23	1	Plug **	MS2010
9	4	3/8-16 X 1 1/4" PL SHCS	FS2926	24	1	Plug **	MS2010-1
10	1	"O" ring, Viton™	SL1248				
11	1	Air Eliminator Float guide	PL9400				
12	1	Air Eliminator Float	SA3006				

*Blind cover for use when Air Elim is not in use - MP2214

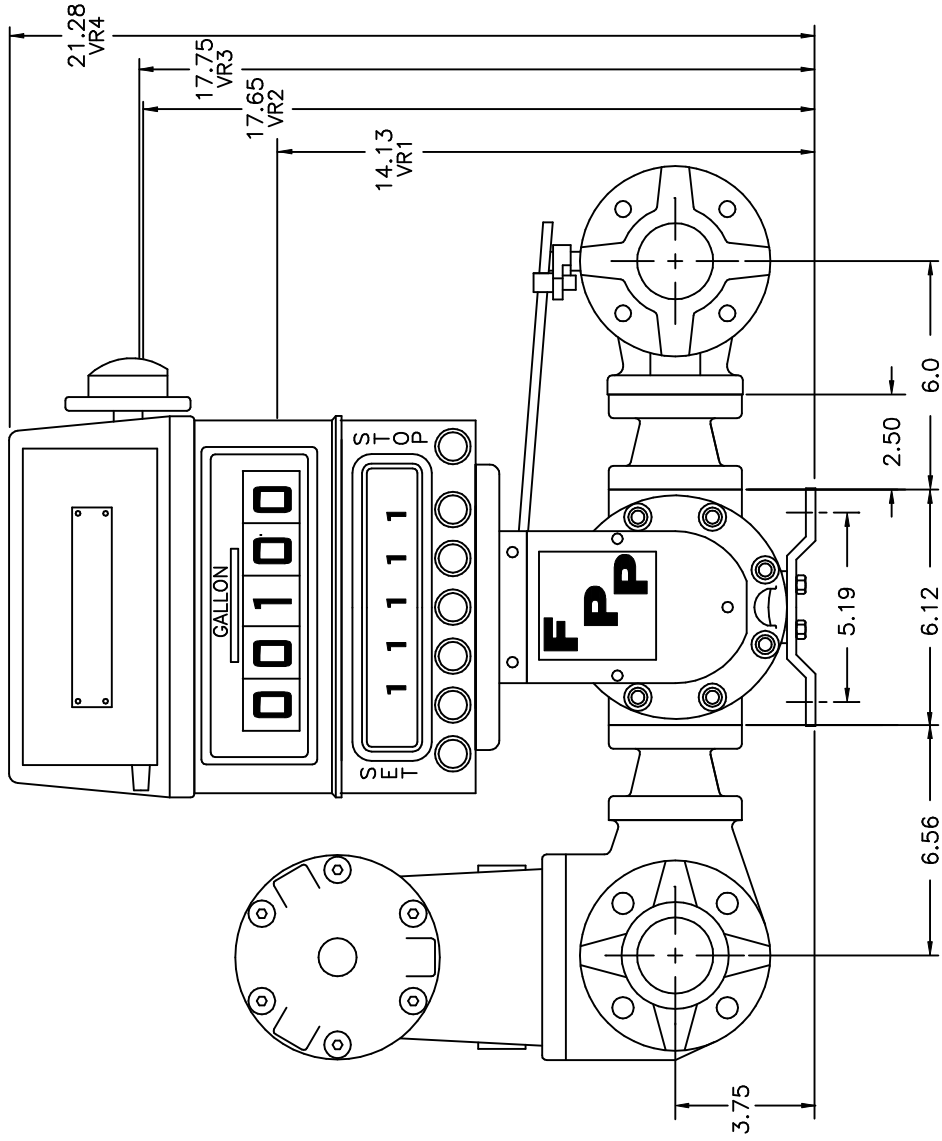
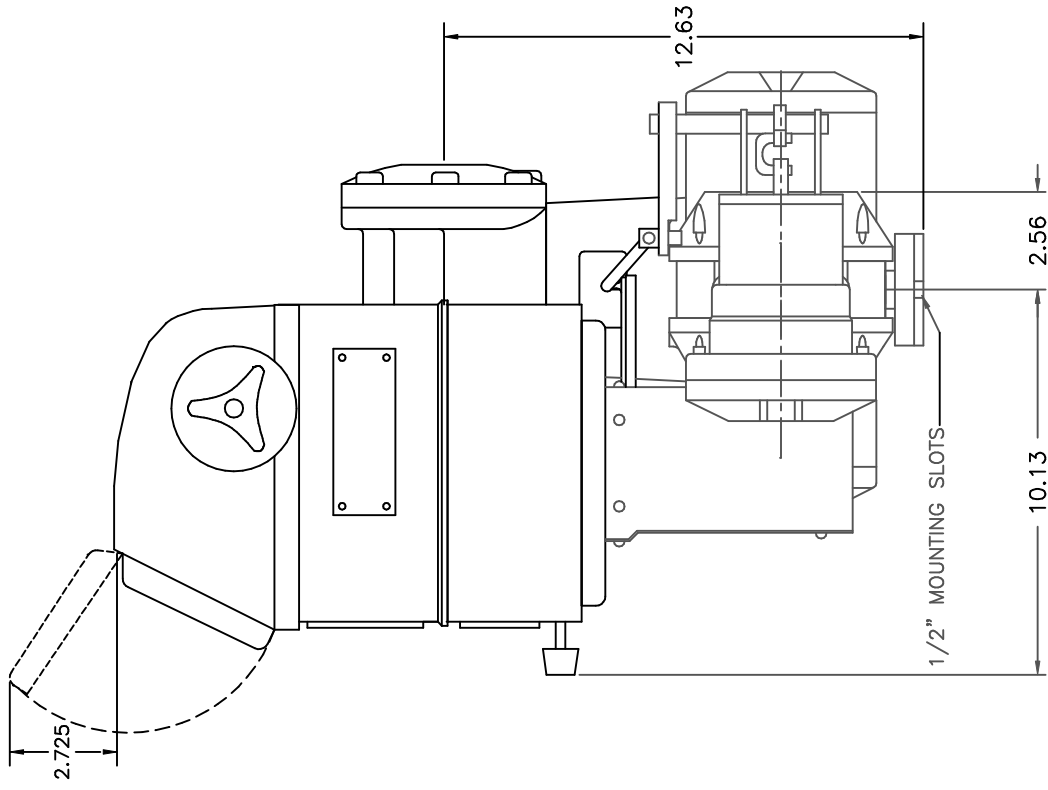
**For use when using air check

Parts for Stainless Steel Preset Valve w/Teflon Seals
 For Meter Models: TS10C, TS15C, TS20



Item	Qty	Description	Part #	Item	Qty	Description	Part #
1	1	1" PT., SS Valve Flange	MP9540	19	1	Present Link, Shaft	MP3050
		1" BSP SS Valve Flange	MP9541	20	2	3/8-16 Ny-Lok	FS3901
		1.5" NPT SS Valve Flange	MP9532	21	1	Linkage Pivot, SS	MP8025
		1.5" BSP SS Valve Flange	MP9533	22	1	Bushing, Linkage, SS	MP8027
		2" NPT SS Valve Flange	MP9530	23	1	Actuating Arm, Linkage, 2"	MP8026
		2" BSP SS Valve Flange	MP9531	24	1	3/8 E-Clip	MS0001
2	1	Square Tetra Seal Teflon	SL2334	25	1	Roll Pin, 5/32 x 5/8" 420 SS	MS8001
3	1	Main Valve Seat Ring	MP8030	26	2	Lift Bracket Bushing Assy	MP3051
4	2	6-32 x .50" SS SHSS	FS9434	27	1	Lift Bracket Shaft,	MP3054
5	3	10-32x1.0" SHCS	FS9659	28	2	5/8" E-Clip	MP5023
6	1	Valve Seat Retainer, SS	MP8340	29	1	Valve Stem Lifter	MP3012
7	1	Valve Stem Seat, Teflon	MP1341	30	1	Retaining Clip	MP3010
8	1	Flat Gasket, Teflon	SL9201	31	1	Lift Link	MP3015
9	1	Piston, SS	MP9450	32	2	3/32 x 1/2" Cotter Pin	MP3023
10	1	Set Screw, 1/4-20 x .25" w/.125 Hole	MS8027	33	4	1/4"-20x1/2" SHCS	FS2802
11	1	Spiral Retaining Ring	MS9036	34	1	Lift Bracket, SS	MP8018
12	1	U-Cup Teflon Seal	SL2230-U	35	1	Seal & Bearing Retainer	MP8031
13	1	Valve Stem Seat	MP9920	36	2	Seal, U-Cup, Teflon	SL2204-U
14	1	Valve Stem	MP1344	37	1	Body, Valve SS	VB9400
15	1	Washer, SS	MS9060	38	1	"O" Ring, Teflon	SL2233
16	1	Valve Spring	MS9207	39	4	1/2 - 13 x 1-1/4 SHCS SS	FS9950
17	1	Cotter Pin 3/32 x 3/4 18-8 SS	MS9055	40	4	3/8 - 18 x 1.0 HHCS SS	FS9922
18	1	Ball Joint	MS3021				

DIMENSIONAL DRAWINGS



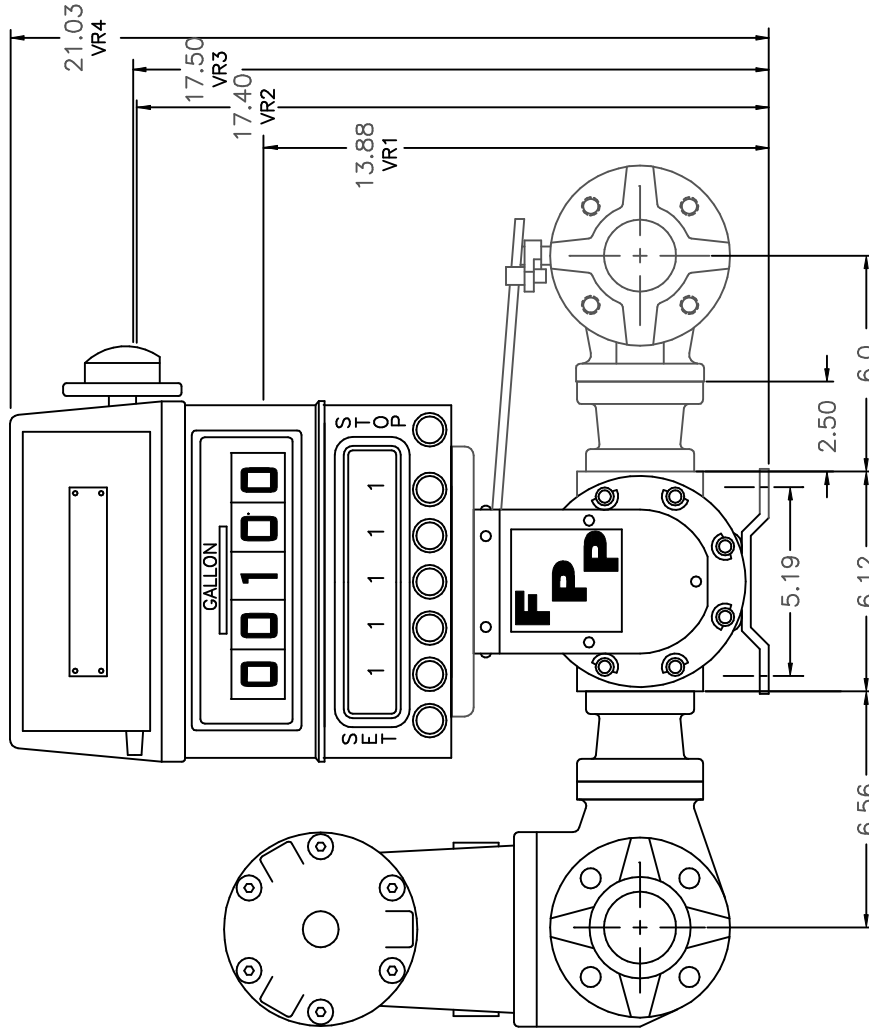
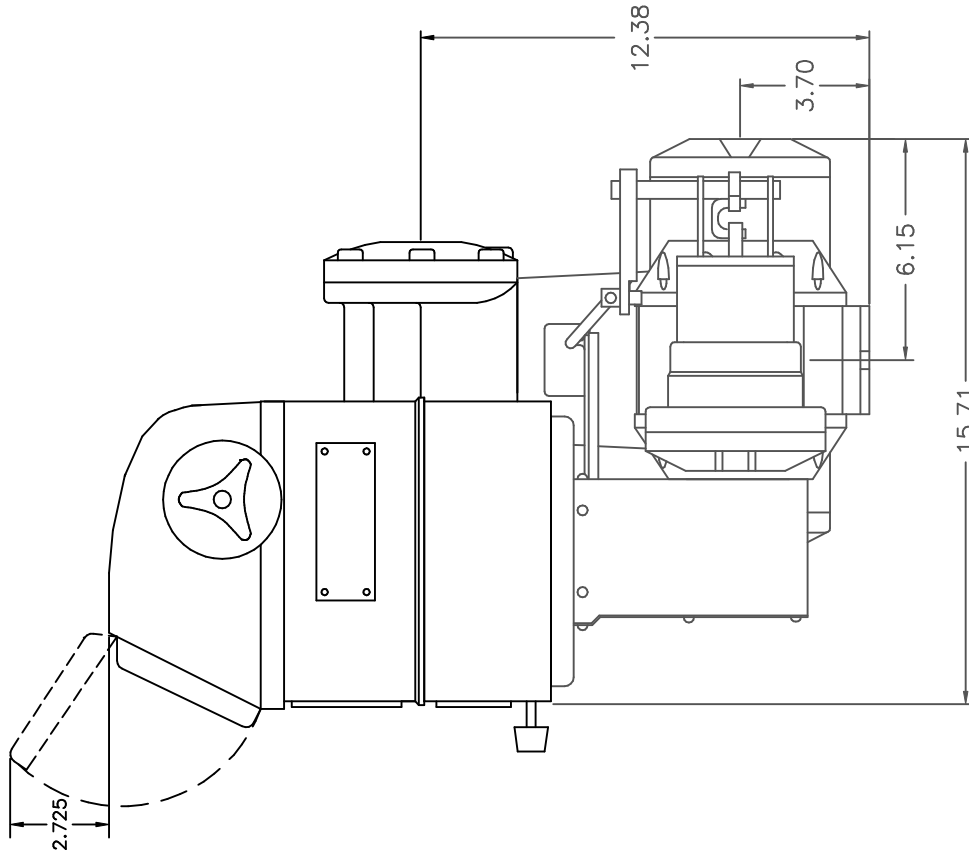
1" ALUM METER W/VR4 & VALVE
W/STRAINER AIR ELIMINATOR

DWN.	RCD	DRAWING NO.
APPD.	KOL	561VR4VSA
PART NO.	TS00AV17	

TUTHILL
Transfer Systems



REVISION	ECN	DATE
A	N/A	10/15/00



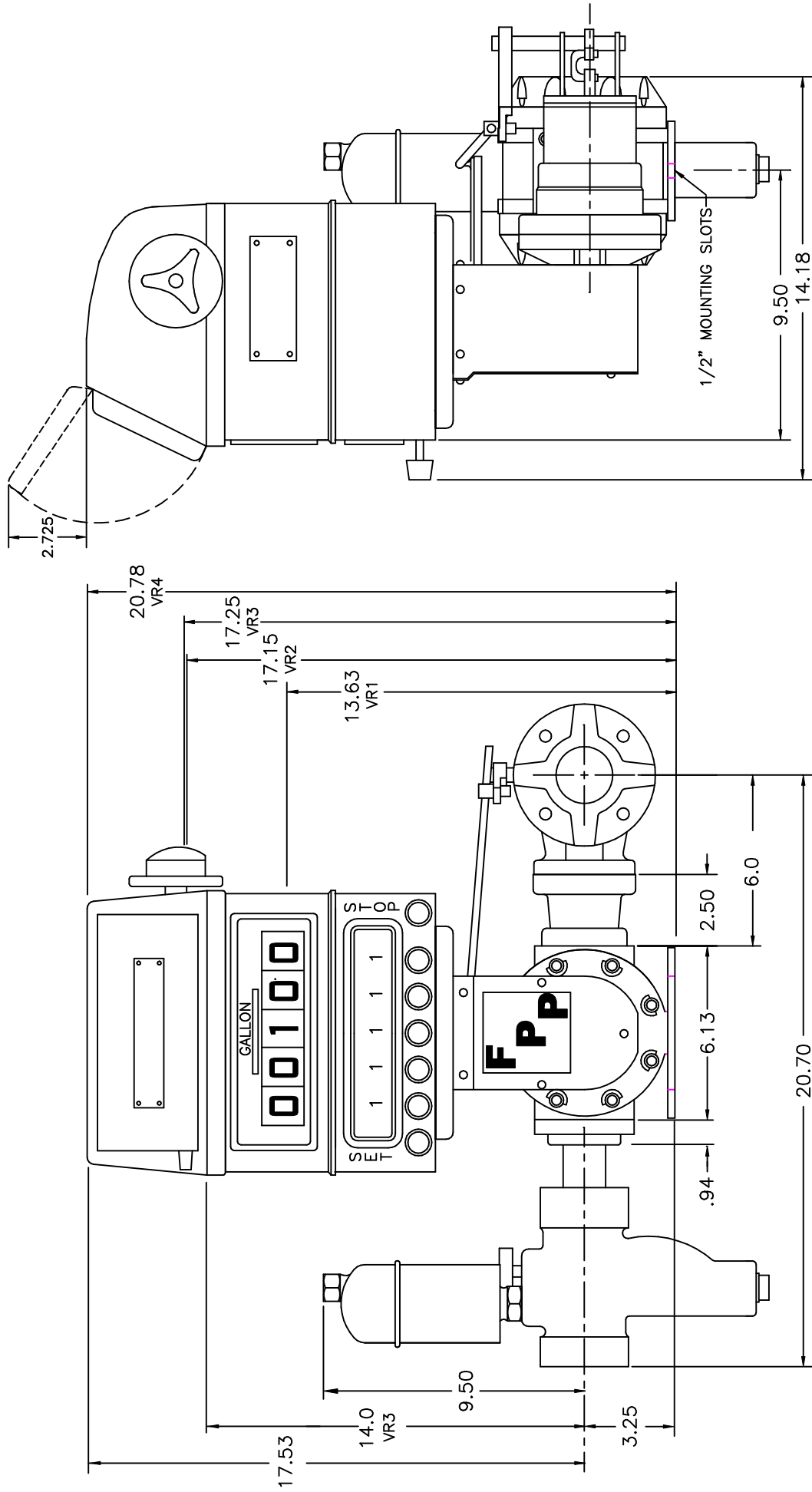
1.5" ALUM METER W/VR4, VALVE
& STRAINER AIR ELIMINATOR

DWN.	RCD	DRAWING NO.
APPD.	KOL	581VR4VSA
PART NO.	TS16AV17	

TUTHILL
Transfer Systems



REVISION	ECN	DATE
A	N/A	10/15/00



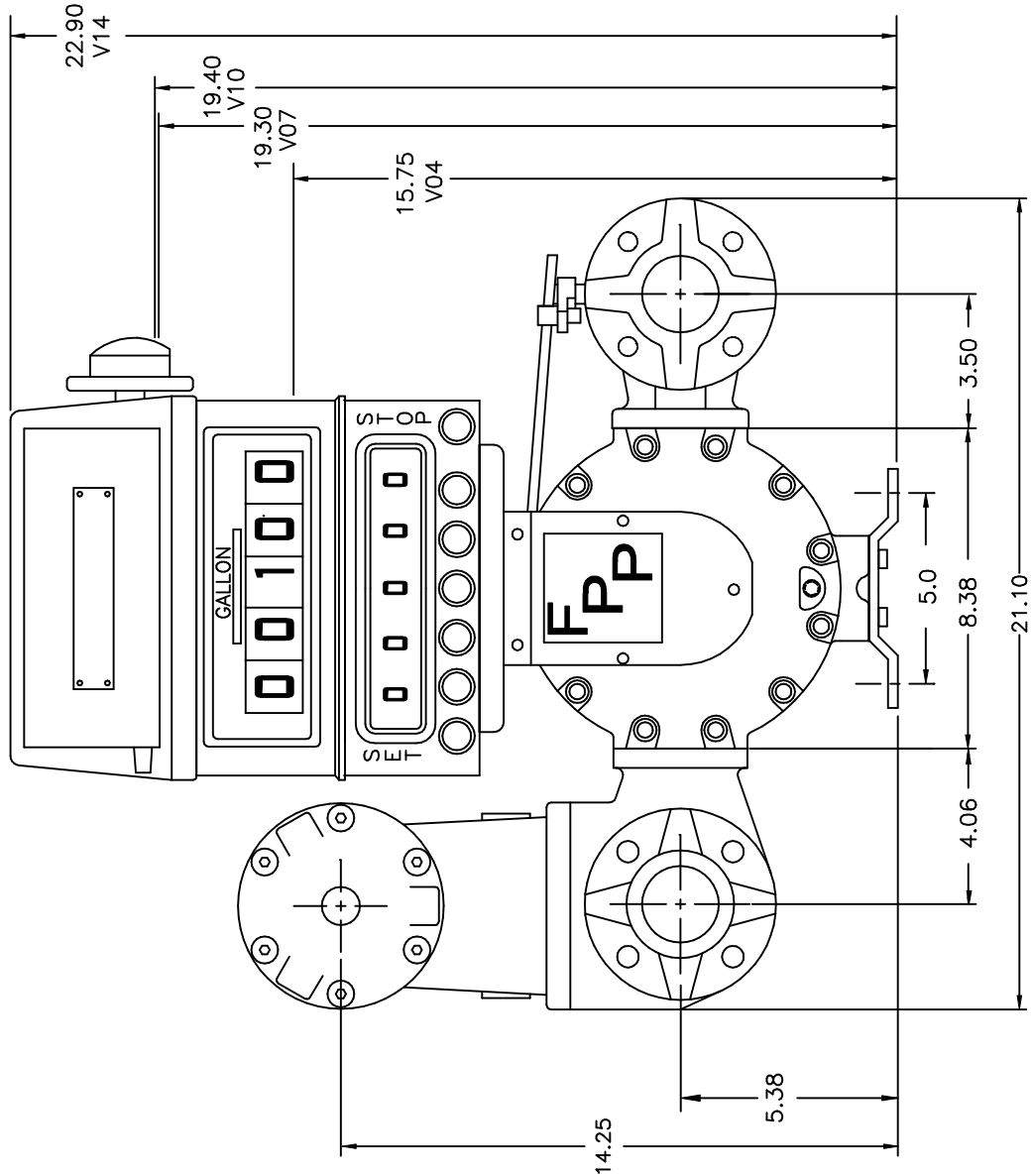
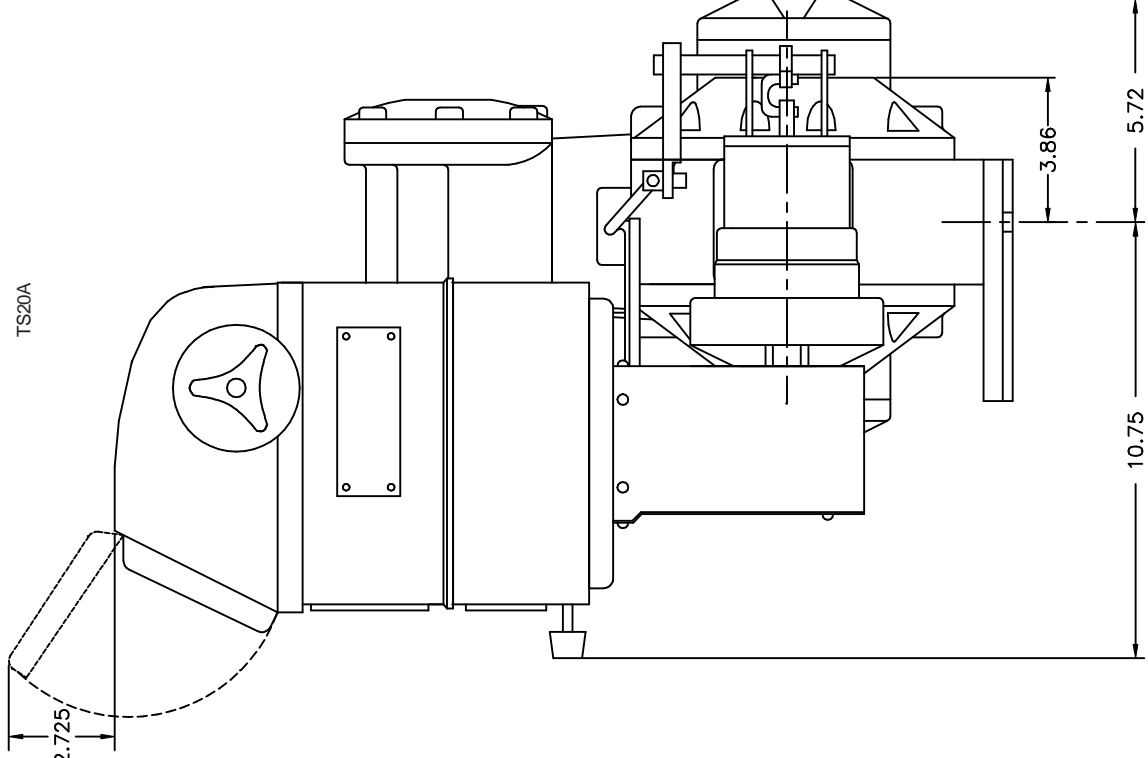
1.5" SS METER W/VR4 & VALVE
 STRAINER, AIR ELIMINATOR

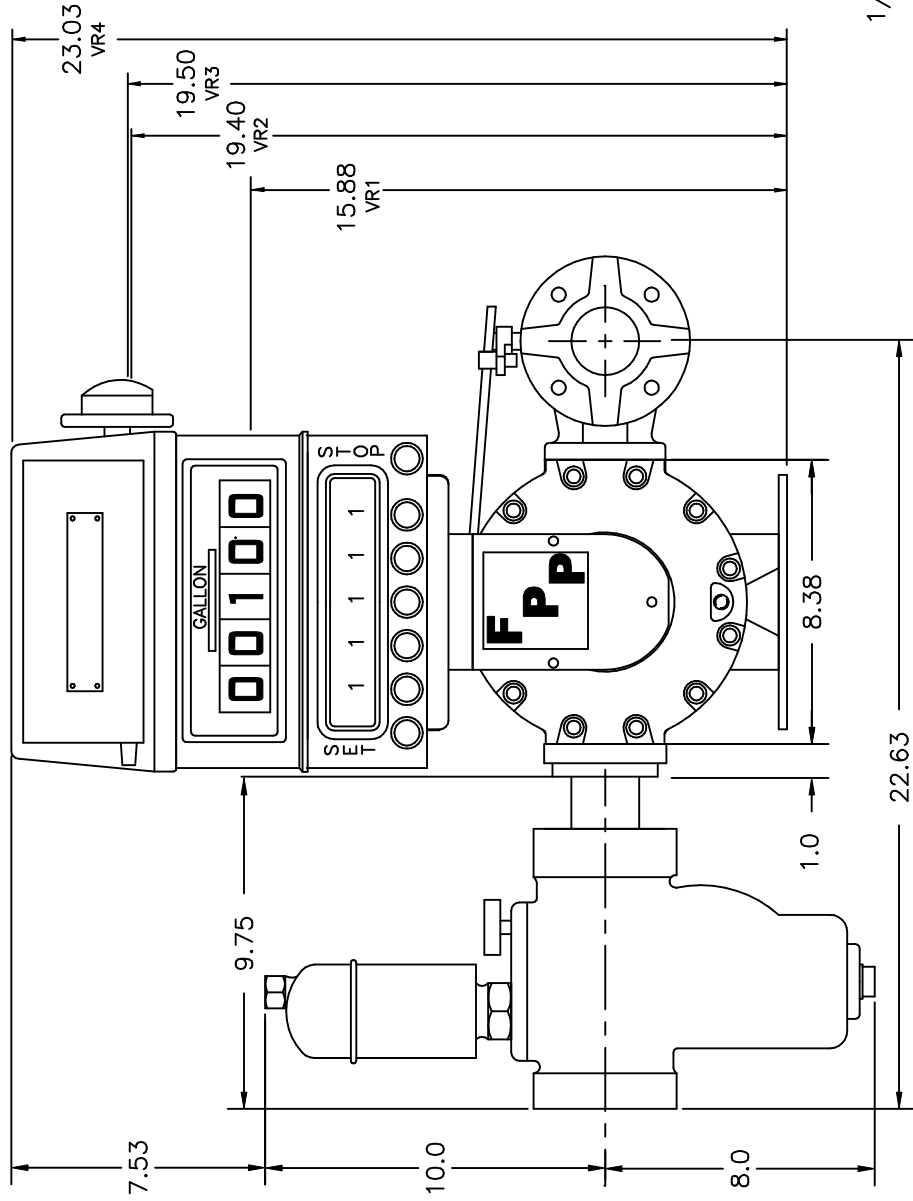
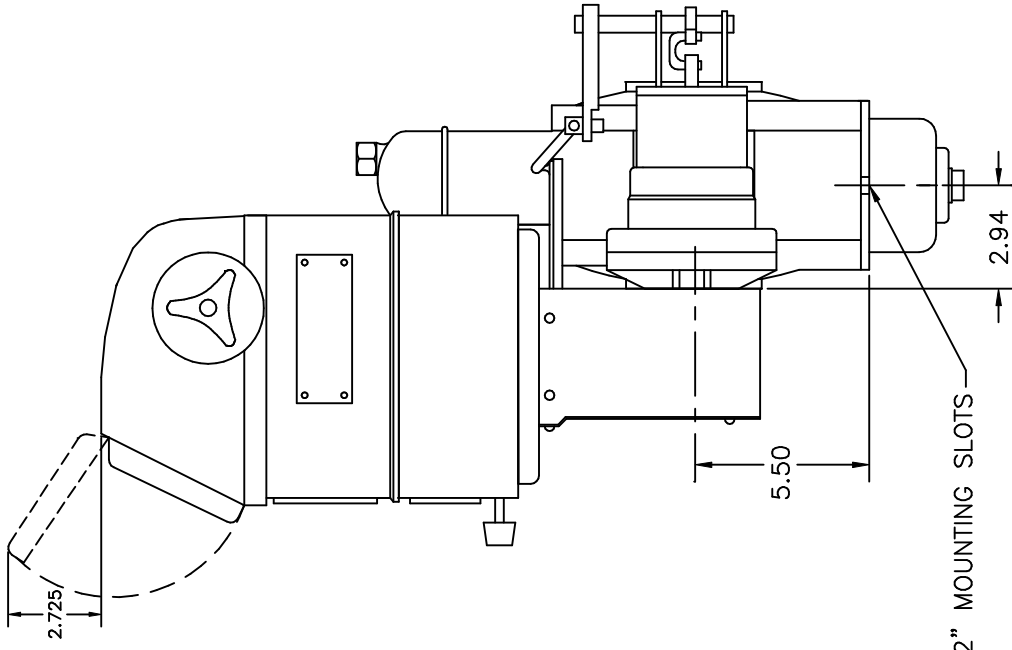
DWN. RCD APPD. KOL
 PART NO. TS15CV17

DRAWING NO.
 588VR4VSA



REVISION	ECN	DATE
A	N/A	10/15/00





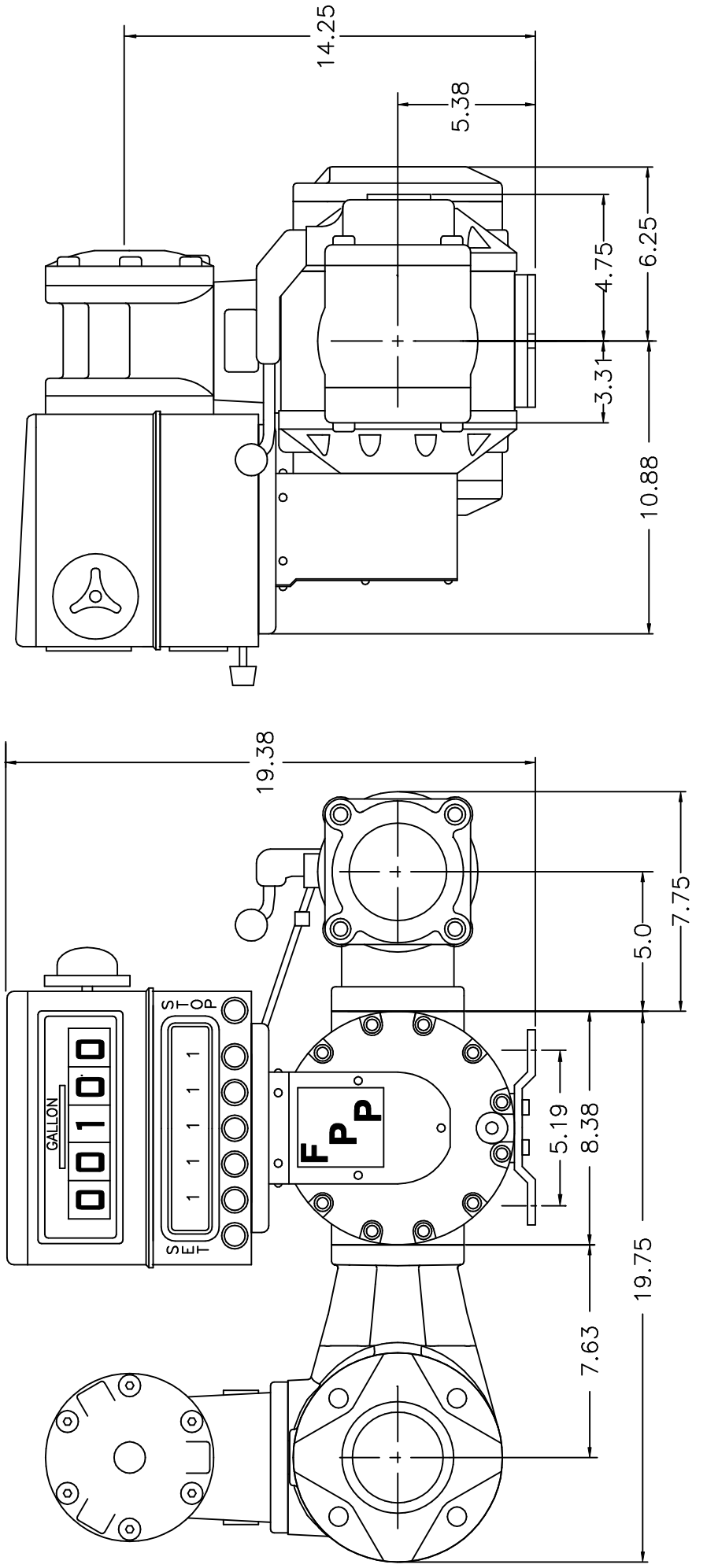
2" SS METER W/VR4, VALVE
& STRAINER AIR ELIMINATOR

DWN.	RCD	DRAWING NO.
APPD.	KOL	598VR4VSA
PART NO.	TS20CV17	

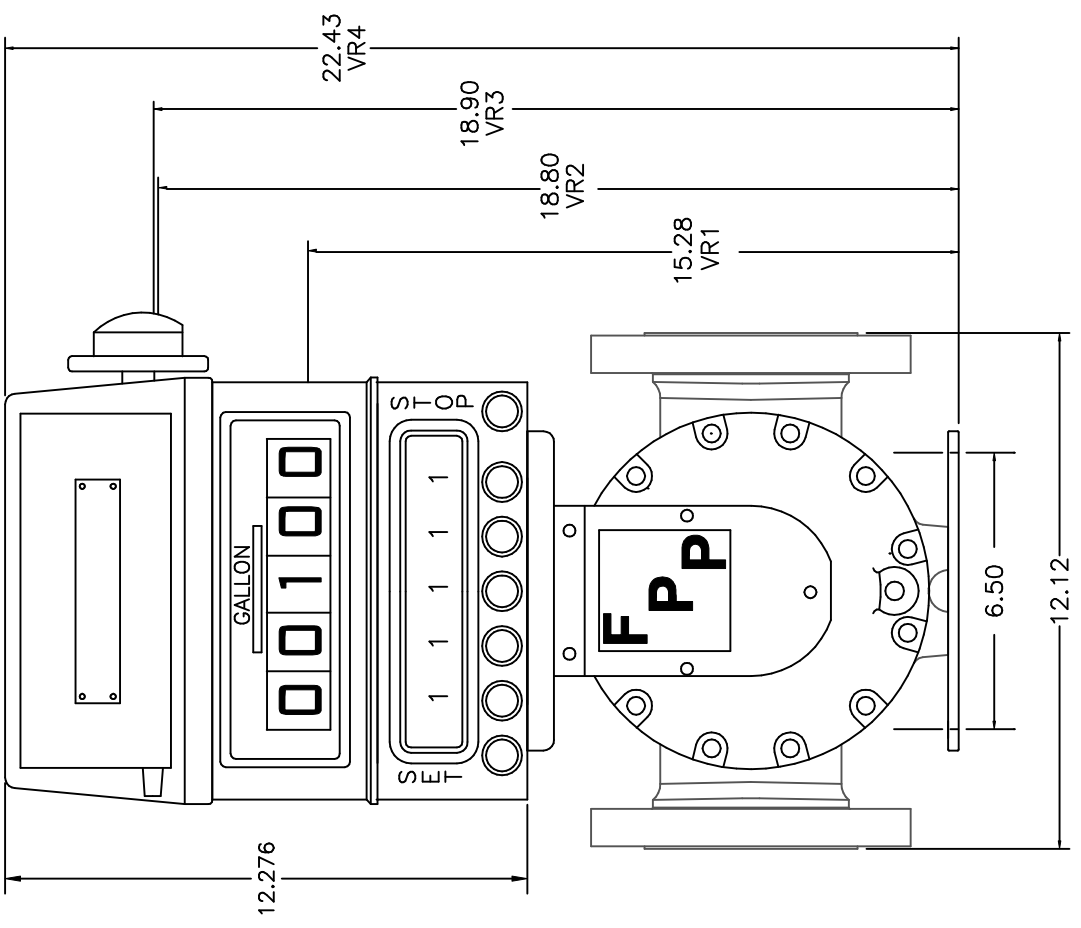
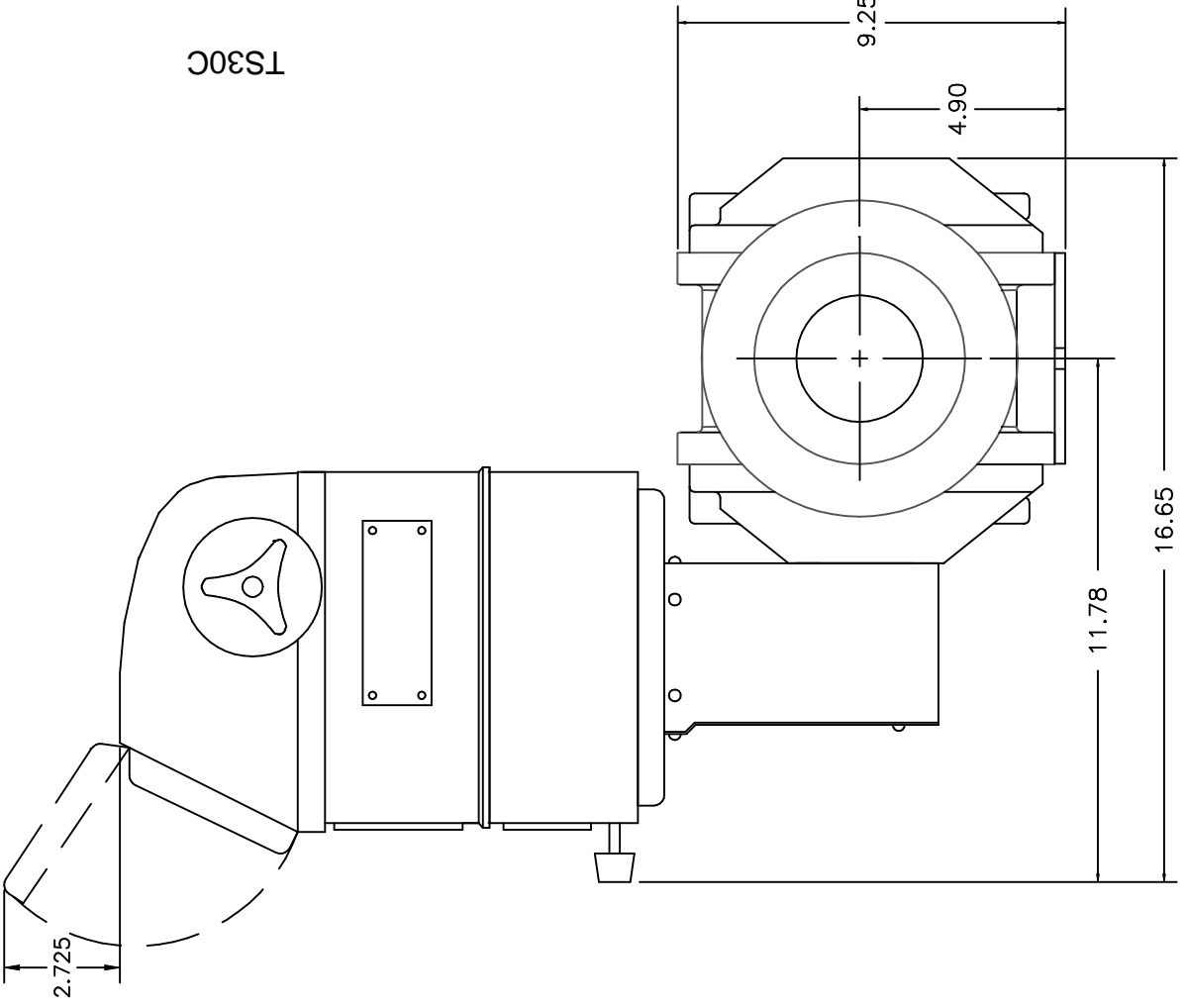
TUTHILL
Transfer Systems



REVISION	ECN	DATE
A	N/A	10/15/00



TS30C



Please have the following information available when you make inquiries, order replacement parts, or schedule service:

Your meter's serial number: _____

Your meter's model number: _____

Your full service Distributor: _____

Your full service Distributor's phone number: _____

Warranty

Tuthill Transfer Systems ("Manufacturer") warrants to each buyer of its FPP Meters products (the "Buyer") for a period of 12 months from date of invoice or sales receipt, but in no event more than 18 months from date of manufacture, that goods of its manufacture ("Goods") will be free from defects of material and workmanship. Manufacturer's sole obligation under the foregoing warranties will be limited to either, at Manufacturers' option, replacing or repairing defective Goods (subject to limitations hereinafter provided) or refunding the purchase price for such Goods theretofore paid by the Buyer, and Buyer's exclusive remedy for breach of any such warranties will be enforcement of such obligations of Manufacturer. If Manufacturer so requests the return of the Goods, the Goods will be redelivered to Manufacturer in accordance with Manufacturer's instructions F.O.B. Factory. The remedies contained herein shall constitute the sole recourse of the Buyer against Manufacturer for breach of warranty. IN NO EVENT SHALL MANUFACTURER'S LIABILITY ON ANY

CLAIM FOR DAMAGES ARISING OUT OF THE MANUFACTURE SALE, DELIVERY OR USE OF THE GOODS EXCEED THE PURCHASE PRICE OF THE GOODS. The foregoing warranties will not extend to Goods subjected to misuse, neglect, accident or improper installation or maintenance, or which have been altered or repaired by anyone other than Manufacturer or its authorized representative. THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF MERCHANTABILITY, FITNESS FOR PURPOSE OF ANY OTHER TYPE, WHETHER EXPRESS OR IMPLIED. No person may vary the foregoing warranties and remedies except in writing signed by a duly authorized officer of Manufacturer. Warranties or remedies that differ from the foregoing shall not otherwise be binding on Manufacturer. The Buyer's acceptance of delivery of the Goods constitutes acceptance of the foregoing warranties and remedies, and all conditions and limitations thereof.



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