



# Hydro Instruments Gas Chlorination Systems

## Instruction Manual

*All Hydro Instruments Chlorination systems are carefully designed and tested for years of safe, accurate field service. All Hydro Instruments Chlorination systems are tested, at customer specified conditions, prior to shipment. All Hydro Instruments products are made of the finest materials. To ensure best operation, read these instructions carefully and completely and store them where all maintenance personnel will have access to them.*

The information contained in this manual was current at the time of printing. The most current versions of all Hydro Instruments manuals can be found on our website: [www.hydroinstruments.com](http://www.hydroinstruments.com)

# Hydro Instruments Gas Chlorination Systems Operation & Maintenance Manual

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# SECTION I: SAFETY INFORMATION

## TAKE CARE WITH CHLORINE!

1. Always keep chlorine cylinders in an upright position with the valve cap screwed on tight before moving full or empty cylinders. Cylinders and ton containers must be moved with care.
2. A safety chain must be placed around the cylinder and secured to a wall. Spare full cylinders should also be secured carefully. In earthquake prone areas, ton containers can also be strapped to the floor to secure them in place.
3. For best operation and safety, the **vacuum regulators and cylinder or ton containers should be protected from the elements including direct sunlight.**
4. **Never** place heaters or heat lamps directly on a cylinder. Use fans to increase air flow past chlorine cylinders and ton containers if it is desired to increase the gas withdrawal rate.
5. **Ammonia gas should NOT be stored or fed in the same room with chlorine.** Contact of the gases may result in an explosive mixture.
6. All chlorine gas installations should include chlorine gas leak detector systems for added safety.
7. Refer to Hydro Instruments Chlorine Handling Manual and other technical guides for more detailed guidance.  
Refer to the technical literature section of the Hydro Instruments website to obtain all such literature.

## **IMPORTANT NOTE:**

*Pressurized chlorine gas manifolds should be avoided when possible. These pressurized manifolds increase the risk of a pressurized chlorine gas leak. Hydro Instruments vacuum regulators are designed to mount directly onto the valve of chlorine cylinders and ton containers. **Direct cylinder or ton container mounting is the easiest and safest configuration to operate and maintain.** With this configuration, the chlorine gas flows under vacuum everywhere beyond the one pressure point at the chlorine cylinder valve.*

# SECTION II: DESIGN AND INSTALLATION NOTES

1. The **“all vacuum” system** means that system will shut off at the vacuum regulator, should the vacuum line be broken, if water is stopped for any reason, or if the vacuum regulator is physically damaged.

2. Choosing a **feed capacity:**

Vacuum regulator SIZE SHOULD BE ON MAXIMUM POSSIBLE FLOW.

*Imperial Units:*

$$\begin{array}{rclclcl} \text{GPM} & \times & 0.012 & \times & (\text{PPM}) \text{ Dosage} & = & \text{PPD} \\ \text{Gallons Per Minute} & & & & \text{Parts Per Million} & & \text{Pounds Per Day (Cl}_2\text{)} \end{array}$$

Example: 600 GPM x 0.012 x 3 PPM = 21.6 PPD

In this example a Hydro Instruments 50 PPD vacuum regulator would be adequate.

*Metric Units:*

$$\begin{array}{rclclcl} \text{M}^3/\text{HR} & \times & & \times & (\text{PPM}) \text{ Dosage} & = & \text{GR/HR} \\ \text{Cubic Meters Per Hour} & & & & \text{Parts Per Million} & & \text{Grams Per Hour (Cl}_2\text{)} \end{array}$$

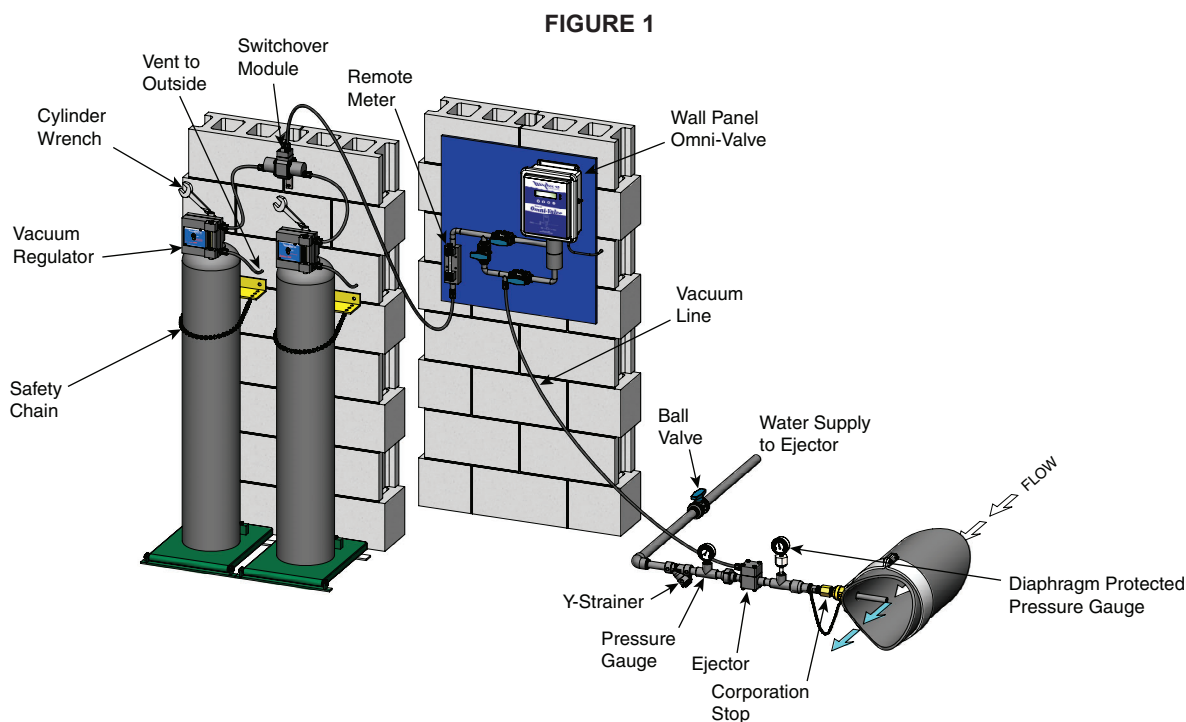
3. **TOTAL BACK PRESSURE** is the pressure in the pipeline to be chlorinated plus the friction losses in the solution line between the ejector and the point of injection at the pipeline. Ejectors capable of operating with back pressures up to 300 Psig (20 bar) are available.

4. It is preferable to locate the ejector at the point of solution injection in order to minimize **solution lines**. Friction losses in the solution line will **increase the ejector back pressure**. To reduce the friction losses, increase the solution line internal diameter and limit the number of flow restrictions and turns. Also be sure that the solution line material is resistant to **the highly concentrated chlorine mixture**. **Avoid or minimize solution lines wherever possible.**
5. The only connection between the ejector and the vacuum regulator is the Hydro Instruments specified black polyethylene tubing which carries the vacuum (originating at the ejector) to the vacuum regulator, allowing the system to operate. Up to 100 feet of polyethylene tubing between vacuum regulator and ejector is standard. For longer distances consult Hydro Instruments and review the Vacuum Tubing and Piping (Gas) guide document.

## Torque Specifications

Item	Min. Inch/lbs.	Max. Inch/lbs.
Yoke bolts	20	25
Body bolts	20	25
Meter block bolts	20	25
Meter inlet plug	10	15
Meter dummy plug	7	10
Vacuum fittings	15	20
Item	Min. Foot/lbs.	Max. Foot/lbs.
Ton ironworks flange bolts	20	25
Ton ironworks closed yoke adapter	72	75
Yoke half-dog bolt	20	25

## SECTION III: SYSTEM INSTALLATION



*A typical Hydro Instruments installation injecting chlorine into a pipe line using city water.*

## (I) INSTALLATION OF HYDRO INSTRUMENTS EJECTOR (Refer to Figure 1)

1. Installation of HYDRO INSTRUMENTS EJECTOR:
  - a. Remove the diffuser from the ejector assembly and place four wraps of Teflon tape on diffuser threads.
  - b. **Do Not** install diffuser into pipe line when assembled with ejector.
  - c. Turn diffuser by hand into NPT threads of pipe line ( $\frac{3}{4}$ " or  $1\frac{1}{4}$ " NPT). Place wrench on diffuser and tighten **one half turn maximum**.
  - d. Reconnect diffuser to ejector making sure OH-BUN-214 O-Rings are on each side of nozzle and diffuser.
2. Testing of ejector. (*Note: The vacuum regulator should still be in the shipping case.*)
  - i. Piping hook up to ejector (Refer to Figure 1 and **Servicing Section in this Manual**).
    - a. Ejector should be installed down stream at a sufficient distance so that chlorinated water is not re-circulated through the booster pump. Pump suction should be 5 feet away from ejector injection point. On larger pipe diameters of 6 inches or greater a distance of 10 times the pipe diameter should be maintained so that chlorinated water is not recirculated through the booster pump.
    - b. On the water inlet side to the ejector nozzle the following should be installed: a water inlet valve, Y-strainer, and a pressure gauge. On the discharge side of the ejector a diaphragm protected pressure gauge appropriate for use with highly chlorinated water should be installed.
  - ii. Testing for sufficient pump pressure to operate ejector. Also checking that booster pump (if applicable) operating in the proper direction.

*Note 1: Ejector must have some back pressure to prevent jetting. (Jetting causes loss of vacuum)*

*Note 2: When chlorinating into a contact chamber a tee should be installed on the solution line with a vacuum breaker to prevent siphoning.*

    - a. If operating with city water pressure (no booster pump), open the water inlet valve to the ejector and feel for suction (with your finger) at the fitting on the top of the ejector.
    - b. Each ejector nozzle/diffuser combination has corresponding performance charts that indicate the required water flow and pressure required to operate at any given back pressure. If sufficient water flow and pressure are being supplied, then there should be a strong suction at the fitting on the top of the ejector. Feel for suction (with your finger) at the fitting on the top of the ejector if no vacuum gauge is available.
    - c. If the ejector has tested satisfactorily continue on to the next step (Mounting the Vacuum Regulator).

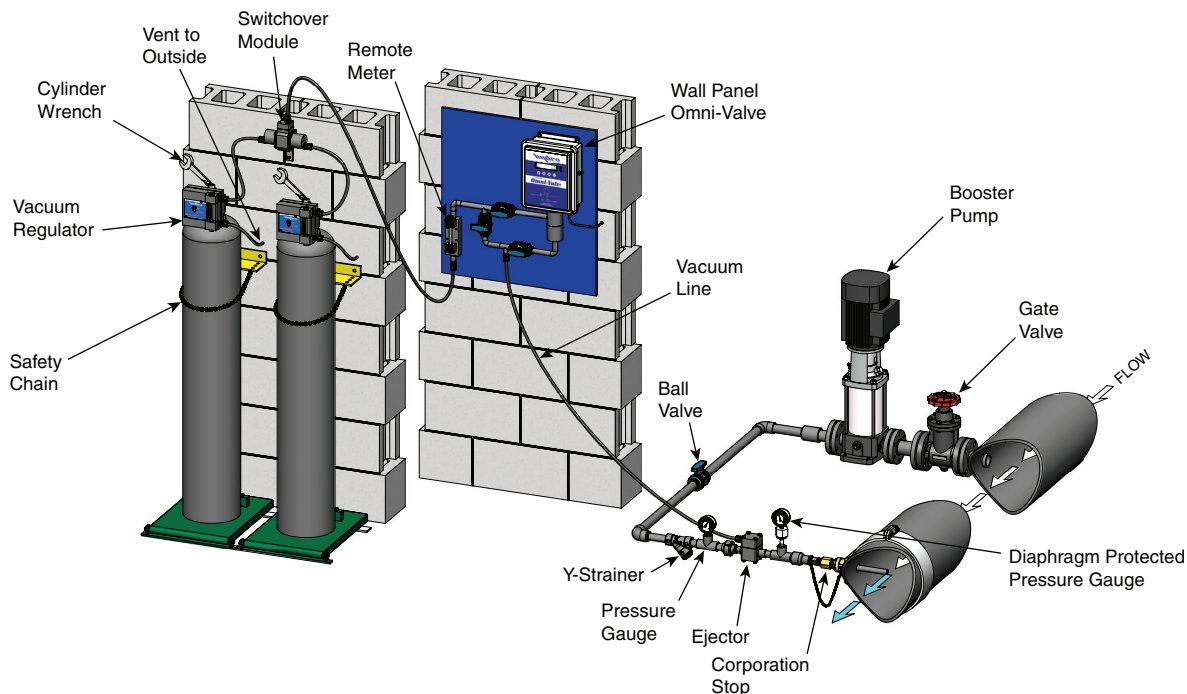
## (II) INSTALLATION OF HYDRO INSTRUMENTS VACUUM REGULATOR

*NOTE: The chlorine cylinder valve is still closed. Do not turn on until instructed to do so.*

1. Make sure that a safety chain is secured around chlorine cylinder or if using ton containers that the ton container is properly supported.
2. Remove the cylinder protection cap from the chlorine cylinder or ton container.

*IMPORTANT: If using ton containers, make sure that the valves on the ton container are vertically aligned and only connect to the top valve for gas withdrawal.*
3. Examine the vacuum regulator for obvious damage.

FIGURE 2



A typical Hydro Instruments installation injecting chlorine into a pipe line using a centrifugal pump. Note the location of gate and ball valves for easy Y-strainer cleaning and practical pump maintenance.

NOTE: Pump suction should be 5 feet away from ejector injection point. On larger pipe diameters of 6 inches or greater a distance of 10 times the pipe diameter should be maintained so that chlorinated water is not recirculated through the booster pump.

NOTE: Pump suction and ejector must be from the side of pipeline, not from top of the main.

4. Remove all materials used for shipping purposes.

**IMPORTANT:** If it is a direct ton mounted ton container, make sure to evenly tighten the four  $\frac{3}{8}$ -16 x  $1\frac{5}{16}$ " bolts according to the label with red letters that is on the vacuum regulator. Ton Mounted Vacuum Regulators shipped prior to the year 2016 would have only 2 of these  $\frac{3}{8}$ -16 x  $1\frac{5}{16}$ " bolts.

5. Place a new lead gasket over vacuum regulator inlet assembly.
6. While placing lead gasket on vacuum regulator make sure that the filter material has not fallen out of inlet assembly. (This filter is necessary to remove particles that may precipitate out of chlorine.) Filters must be changed as necessary. Inspect the filters periodically and keep in mind that if vacuum level starts to increase or feed rate is restricted, then the filter might be clogged and in need of replacement.

7. Mount vacuum regulator on cylinder valve being sure the yoke screw is backed out far enough for sufficient clearance. While tightening the yoke screw be certain that the lead gasket stays in place. Excessive tightening can damage gasket and/or yoke screw. **DO NOT USE EXCESSIVE FORCE.**

**IMPORTANT:** Ton mounted vacuum regulators mount on the top valve only. They include a drip leg and heater. The heater must be plugged in and powered on at least 15 minutes prior to opening the ton container valve. The heater must always be powered on while in service.

### (III) CONNECTING VACUUM LINES BETWEEN VACUUM REGULATOR AND EJECTOR AND VACUUM REGULATOR VENT TO OUTSIDE (Refer to Figures 1 and 2)

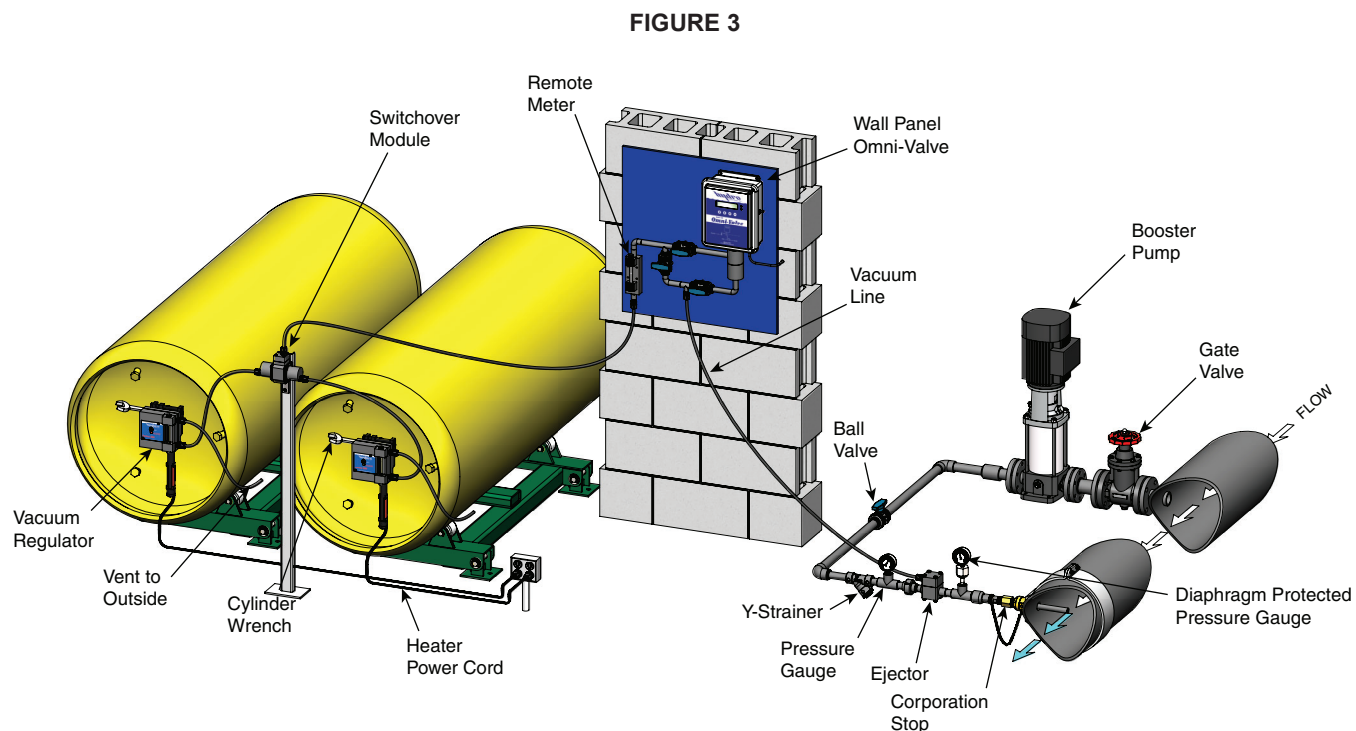
1. The upper connector on right top of vacuum regulator is for vacuum line tubing to ejector.

2. Connect vent tubing to second connector on the vacuum regulator and vent to safe area outside of building. (Place bug screen outside on end of vent tubing.)

*NOTE: Vent lines should be lower than the vacuum regulator. Do not connect vent lines from multiple vacuum regulators into a common vent – vent lines must remain separate. If desired, vent lines can be terminated at a scrubber intake duct or a vent arrestor device.*

#### (IV) REMOTE METERS/WALL PANEL OMNI-VALVES & SWITCHOVER MODULES (Refer to Figures 2 & 3)

1. **Switchover modules:** (Gas flow is from bottom/side to top from one side only at a time)  
Make vacuum tubing connections as shown in Figures 1, 2 and 3.
2. **Remote Meters:** (Gas flow is from bottom to top through the tube)  
Make vacuum tubing connections as shown in Figures 1, 2 and 3.



*A typical Hydro Instruments Switchover System injecting chlorine into a pipeline using a centrifugal pump.*

*NOTE: Pump suction and ejector must be from the side of the pipeline, not from the top of the line.*

## SECTION IV: CHLORINATION SYSTEM VACUUM TEST

1. **Do Not** open chlorine cylinder valve until vacuum test is satisfactorily completed.
  - a. **Vacuum Test**  
With the chlorine cylinder still closed, start the ejector booster pump and the meter tube ball should drop to the bottom within 30 seconds. At this time the feed rate adjustment valve should be open. If the ball continues to bounce there is a vacuum leak in the system. Check the lead gasket seal at the cylinder valve and all tubing connections. (The tube fittings should be hand tight. It is not necessary to use pliers or a wrench on these fittings.)
  - b. If the ejector is operating properly (pulling sufficient vacuum) the red indicator on the front of the vacuum regulator should be showing.
  - c. Turn off water supply to ejector.

- d. Wait 5 to 10 minutes with water supply off. The reset knob should turn freely all the way around and the indicator should continue to show red. (If red continues to show, the system is vacuum tight.)
- e. If the system is vacuum tight proceed to the next step.
- f. Disconnect vacuum tubing at top of vacuum regulator to allow air to enter the system. Reconnect tubing.
  - (1) Turn the reset on the front of the vacuum regulator and it should not show red.

## SECTION V: START UP OF CHLORINATION

*Material necessary: A small plastic squeeze bottle, 1/3 full of ammonia, for detecting chlorine leaks. When ammonia fumes contact chlorine gas a visible white smoke is produced.*

*IMPORTANT: If using direct ton container mounted vacuum regulators ensure that the 3/8-16 x 1 5/16" bolts were checked and tightened and that the heater was plugged in and allowed to heat up for at least 15 minutes prior to starting this procedure.*

1. Open chlorine cylinder valve 1/4 turn and **close immediately**.
2. Squeeze ammonia bottle at gasket and yoke assembly area and around rate valve bonnet: if no smoke appears the seals are tight and it is OK to proceed to the next step. (Do not intentionally squirt liquid ammonia onto the lead gasket connection or elsewhere. If liquid ammonia does get onto the equipment, wipe it up using a dry towel.)
3. Open chlorine cylinder valve 1/4 turn, leave open, and **recheck for chlorine leaks**. (1/4 turn open of the cylinder valve is all that's required. The reason we specify 1/4 turn is that when you turn it off you know it should close with 1/4 turn. In an emergency you can shut it off quickly and safely. The wrench stays on the cylinder valve while cylinder is open.)
4. Turn on water supply or booster pump to ejector and set rate valve to desired flow rate. Read flow rate at center of ball on meter tube scale and at the top edge for machined floats.
5. Be aware that the rate valve is not a shut off valve: it is a flow rate control only. **To shut off chlorine feed close the chlorine cylinder valve/ton container valve.**

## SECTION VI: SHUT DOWN PROCEDURE

*IMPORTANT!: This procedure of shut down must be followed before a vacuum regulator is removed from a cylinder or ton container.*

1. Close all chlorine cylinder valves or ton container valves while the ejector is still operating.
2. Wait for the ball to rest at the bottom of the meter tube and the indicator flag on the vacuum regulator to show red.
3. Shut off the water supply to the ejector.

## SECTION VII: RATE VALVE OPERATION

Turn the rate valve counter-clockwise to open it completely. Further turns will completely remove the rate valve from the assembly, which will cause a loss of Cl<sub>2</sub> feed. **(See Appendix for servicing instructions.)**

The O-ring seal for the rate valve is locked in place under the valve bonnet and does not come out when the rate valve is pulled out of the bonnet.



*PREVENTATIVE MAINTENANCE NOTE: Rate valves which are not exercised frequently may experience a build up of a white powdery substance which precipitates out of the chlorine gas. In order to avoid this build up, which can cause the rate valve to become stuck in place, it is recommended that the rate valve be periodically exercised. See Appendix for rate valve maintenance instructions.*

## SECTION VIII: TROUBLESHOOTING

### (I) PRESSURIZED LEAKS

1. Pressurized chlorine leaks are a safety hazard to life and equipment and should be corrected immediately. When searching for this type of leak there are basic safety rules to follow.
  - a. Air breathing pack should be readily available and personnel should know how to use it properly.
  - b. Exhaust fan switch should be located near outside entrance with an additional alternate outside switch appropriately located.
  - c. Chlorine cylinder wrench should remain on the cylinder whenever cylinder is open.
  - d. Plastic squeeze bottle  $\frac{1}{3}$  full of household ammonia.
  - e. Buddy system used (two people capable of operating system).
2. If a leak is detected the following should be checked first:
  - a. The **lead gasket** between the chlorine cylinder valve and the vacuum regulator inlet assembly.
    - i. Tighten the half dog screw on the vacuum regulator yoke assembly which is used to secure the inlet assembly to the chlorine cylinder valve. (Do not use excessive force.)
    - ii. Always use a new lead gasket. It is recommended to obtain gaskets through Hydro Instruments to be certain of size and quality.
  - b. **Chlorine cylinder or ton container valve packing.**
    - i. Tighten the cylinder valve with care, not excessively! Close the valve if problem persists and notify your chlorine supplier.
    - ii. If valve is the problem try to move cylinder with a high degree of safety to an outside location. (**Never** attempt to place cylinder in water as this will only increase the leak and the cylinder may float to the surface.) If Emergency Repair Kit A or B is available and personnel are trained to use it, then this can also be used to temporarily stop the leak.
  - c. Chlorine leaking out the vent due to the **inlet safety shut off valve** having dirt on the valve seat.
    - i. Close the **chlorine cylinder or ton container valve**.
    - ii. Wait until the metering ball drops to zero on the flow tube.
    - iii. Turn off water supply to ejector.
    - iv. Now remove the vacuum regulator from the cylinder or ton container valve provided that the red indicator is showing no chlorine pressure. (Red should be showing.)
    - v. See Appendix for inlet safety shut off valve servicing instructions.
    - vi. After servicing and remounting vacuum regulator with a new lead gasket, perform a vacuum test **before** you open the cylinder or ton container valve valve. **See “Chlorination System Vacuum Test”.**

### (II) NO CHLORINE FEED

Possible causes:

1. No vacuum being produced by ejector.
  - a. Remove poly tubing from ejector fitting and place your finger on it; you should feel a suction.

- b. If you feel no suction (vacuum) check in this order:
  - i. **Nozzle (See Appendix):** Turn off water supply and remove nozzle from ejector.
    - (1) It may be clogged with a stone or other foreign matter. Flush out or run pipe cleaner through only.
    - (2) If there is a build-up of rust, iron, or manganese, place the nozzle in a Muriatic acid for five minutes and rinse with water. If you see a black syrup substance you may find it necessary to clean the nozzle on a preventative maintenance schedule.
  - ii. **Inlet Water Supply.**
  - iii. Reduced city water pressure.
  - iv. Y strainer needs cleaning.
  - v. Booster pump cavitating (lost its prime).
  - vi. Booster pump insufficient boost due to wear or single phasing due to loss of one leg of power.
  - vii. Booster pump may have flooded suction.
2. Chlorine flow blocked at vacuum regulator inlet assembly.
  - a. The **Inlet filter could be clogged.**
3. **Out of Chlorine.**
  - a. The scale would read 150 lbs. lighter than when the cylinder was new or 2,000 lbs. lighter for ton containers.
  - b. Flow ball would be at zero and RED indicated on front of vacuum regulator.

## APPENDIX A – SERVICING THE HYDRO INSTRUMENTS SYSTEM

### SECTION A-1: VACUUM REGULATOR

#### (I) CLEANING THE RATE VALVE

1. Unscrew the rate valve knob and stem (by hand) completely out of the top meter block.
2. Replace o-ring under the rate valve bonnet.
3. Lubricate the new o-ring lightly with Flourolube grease before replacing the rate valve and knob into the top meter block.

#### (II) CLEANING THE METER TUBE

1. While holding the glass meter tube (to prevent it from falling) unscrew the inlet plug at the base of the bottom meter block, until the meter tube can be removed.
2. Remember to be careful not to lose the stops or ball in the following steps.
3. Remove the white stops at either end of the tube (you could use a paper clip).
4. Soak the tube in warm water with a cleaner like lime away or Muriatic Acid. Also, brush the inside of the tube with a pipe cleaner.

*NOTE: Always follow safety precautions with Muriatic Acid and other chemicals.*

5. Dry the meter tube and reinstall the ball and stops.
6. It is recommended that new meter tube gaskets be used when reinstalling the meter tube.
7. Remove the inlet plug completely and inspect the o-rings. If it has been more than 12 months since they were changed or if there is any noticeable damage, the o-rings should be replaced.
8. Reinstall the inlet plug, meter gaskets and meter tube, making sure to center the tube on the top and bottom meter gaskets.
9. Tighten the inlet plug with reasonable force to make a seal. Do not use excessive force.

*NOTE: All other vacuum regulator repairs should be done by the factory or authorized repair personnel.*

**WARNING:** *If the vacuum regulator leaks gas out the vent or any other place on the body the problem is most likely caused inside the vacuum regulator inlet capsule assembly SPA-SAWS-US or SPA-SAWS-UN. It is not recommended that the vacuum regulator inlet capsule assembly be disassembled by any untrained personnel because if it is not done properly then dangerous leakage of pressurized chlorine gas could result.*

## **SECTION A-2: EJECTOR/CHECK VALVE ASSEMBLY**

**(I) LOSS OF VACUUM AT THE EJECTOR:** If vacuum is lost at the ejector and water supply is sufficient, then the nozzle is most likely clogged, broken or loose. Before working on the ejector it must first be isolated so that water will not leak when the ejector is removed.

1. First detach the intake side (nozzle) of the ejector from the pipe line.
2. For 100 PPD or lower ejectors rotate the complete ejector body counter clockwise. This loosens the threaded portion of the nozzle from the diffuser. It also eliminates the need for pliers on the nozzle which could damage the plastic.
3. Inspect the nozzle for:  
Pipe scale, stones, dirt, etc...  
Build-up of iron, manganese, calcium, etc...
4. The nozzle should be soaked and brushed with warm water mixed with a cleaner like Muriatic Acid.  
*NOTE: TAKE CARE NOT TO SCRATCH OR ATTEMPT TO MODIFY THE ORIFICE IN ANY WAY.*
5. Using two new OH-VIT-214 O-Rings the ejector can now be reassembled.

When reassembling the ejector the nozzle and diffuser should be screwed together hand tight leaving the ejector body 90 degrees to the left of its final position. Once the nozzle and diffuser are hand tight, the ejector can then be turned the final 90 degrees.

**WARNING:** *Do not use excessive force in tightening the nozzle, diffuser and ejector assembly. The ejector is constructed of PVC and excessive force can break the parts.*

**(II) SERVICING THE EJECTOR CHECK VALVE ASSEMBLY:** If water leaks back into the system, this means that the ejector check valve has failed. This could be caused by incorrect assembly, o-ring or diaphragm, or foreign material lodged in the check valve.

1. Remove the four bolts holding the ejector body together.
2. Inside you will find a diaphragm assembly and a spring.

3. The diaphragm assembly can usually be unscrewed by hand. If it is too tight, carefully try large jaw pliers or a vice. Note that a plastic support diaphragm is on the top side of the rubber diaphragm. The purpose is to protect the softer rubber diaphragm in installations with high pressure.
4. Inspect the rubber diaphragm for holes or weak points.
  - a. For O-Ring check valves, inspect the OH-VIT-203 o-ring. Replace if damaged.
5. Reassemble the diaphragm assembly, preferably with a new rubber diaphragm.
6. Install the assembly in the recess between the ejector body halves being careful to install the spring properly below the assembly.

## SECTION A-3: SWITCHOVER MODULE

### (I) OPERATION OF THE MODULE

**GENERAL:** This device requires no outside setting or adjustment. The switchover module allows gas to flow from one of the two intake ports at a time, keeping the other sealed. It will continue to feed from first side until the vacuum level rises sufficiently (in the event of an empty cylinder or closing of the cylinder valve), at which time an internal spring loaded mechanism automatically switches to open the second intake port and to close the first intake port.

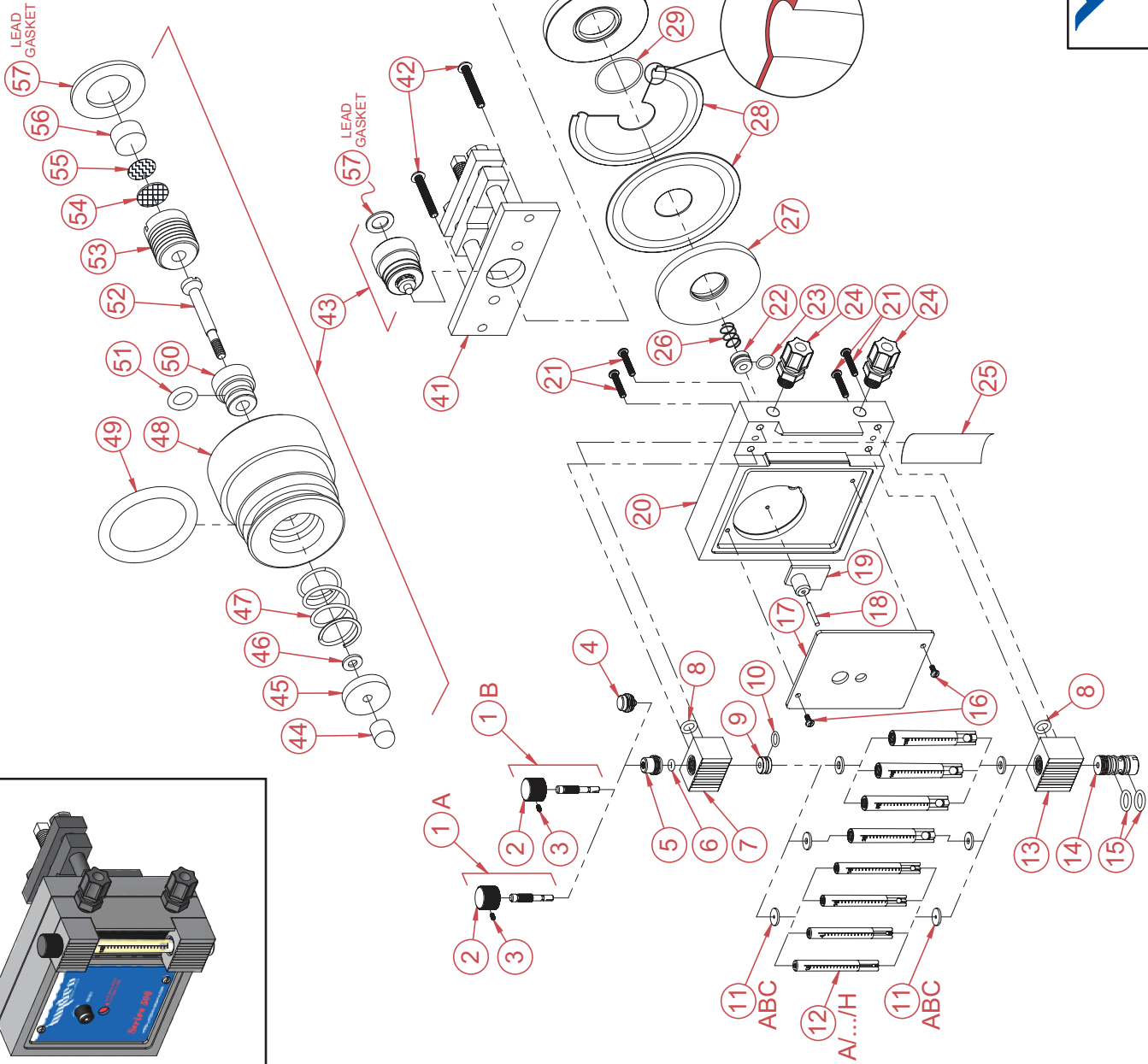
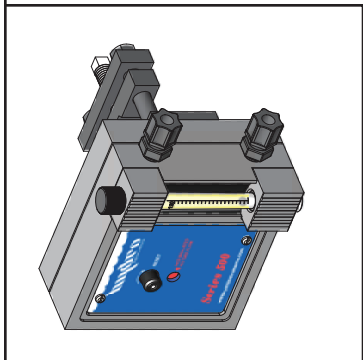
**NOTE:** *In low capacity systems where the feed rate is less than 10 PPD or the time between switching is more than two weeks, it is recommended that the module be "exercised" weekly. If the module is left in one position for long periods of time, it may have a tendency to stick in one position. To exercise the module it can be disconnected from both vacuum regulators with the ejector still connected and operating. Use a finger or thumb to close the open intake port of the module until it switches to feed from the other port. Repeat this process 5 to 10 times.*

### (II) SERVICING THE MODULE

**GENERAL:** If the module does not operate correctly first try exercising it as described in the last paragraph. If this does not work the unit must be disassembled.

1. Remove the four screws that secure the top cap onto the main body.
2. Remove the four screws that secure each of the side caps onto the main body.
3. Remove the diaphragm assemblies and the toggle mechanism noting their orientations for reassembly.
4. Inspect the guide pin to ensure that it is free of dirt or burrs. If not clean and polish it with alcohol until it is able to slide freely.
5. Inspect the o-ring seats on the diaphragm assemblies. Ensure that they are free of any residue and should be cleaned with alcohol being careful not to scratch them.
6. Replace the o-rings unless they are less than 12 months old and unless they are in perfect condition.
7. Inspect the diaphragms to ensure that they are free of tears or holes. If they are not in good condition, they should be replaced.
8. Reassemble the module in reverse order.





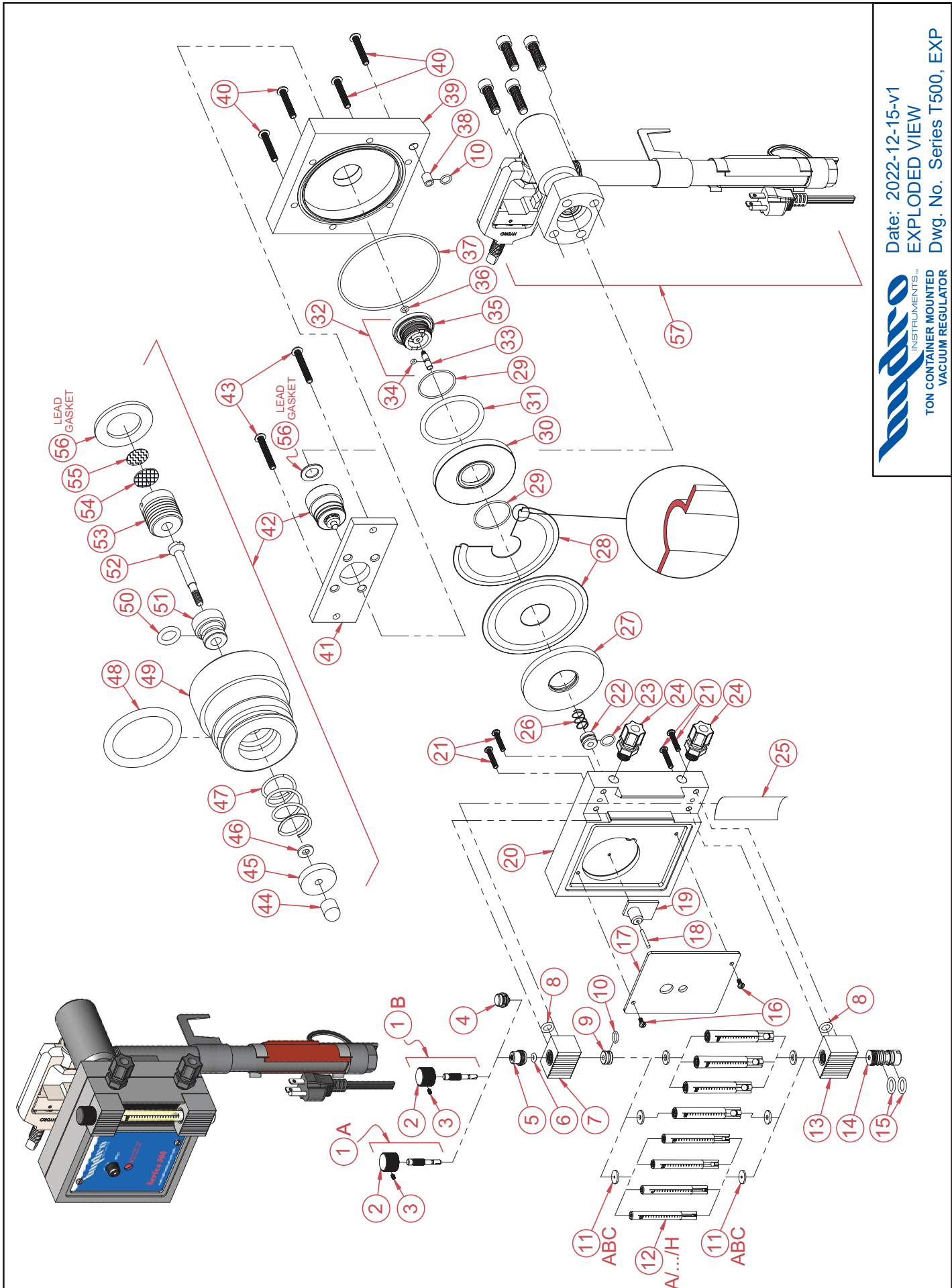
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 EXPLODED VIEW  
 Dwg. No. Model 500, EXP



Item No.	Description	Quantity	Part No.	Item No.	Description	Quantity	Part No.
1A	Rate Valve Stem & Knob (10 PPD)	1	VP-103C-010	26	Vent Spring	1	DM-100
1B	Rate Valve Stem & Knob (100 PPD)	1	VP-103C-100	27	Front Diaphragm Plate	1	DP-100A
2	Rate Valve Knob	1	RV-100A	28	PM Set of Two Diaphragms	1	DP-103
3	Rate Valve Knob Set Screw	1	#5-40 x 1/4"	29	PM O-Rings	2	OH-VIT-029
4	Dummy Plug	1	FM-104	30	Rear Diaphragm Plate	1	DP-101A
5	Valve Bonnet	1	VB-100C	31	O-Ring	1	OH-VIT-332
6	PM O-Ring	1	OH-VIT-106	32	Guide Pin & Diaphragm Bolt Assembly (DM-101A and DP-102A, factory installed)	1	DM/DP-A
7	Top Meter Block	1	FM-100B	33	Guide Pin	1	DM-101A
8	PM O-Rings	2	OH-VIT-110	34	PM O-Ring	1	OH-VIT-006
9	Rate Valve Seat	1	VT-104	35	Diaphragm Vent Bolt	1	DP-102A
10	PM O-Ring	2	OH-VIT-012	36	PM O-Ring	1	OH-VIT-009
11A	PM Meter Gaskets (4 & 10 PPD)	2	MG-001-010	37	PM O-Ring	1	OH-VIT-156
11B	PM Meter Gaskets (25 PPD)	2	MG-001-025	38	PM Tube Connector	1	FB-106
11C	PM Meter Gaskets (50 & 100 PPD)	2	MG-001-100	39	Back Body	1	BB-100A
12A	Meter Tube (1.5 PPD)	1	MTB-11-0015	40	Body Screws (Monel)	4	1/4-20 x 1 1/2"
12B	Meter Tube (4 PPD)	1	MTB-11-004	41	Yoke	1	YA-111B
12C	Meter Tube (10 PPD)	1	MTB-11-010	42	Yoke Screws (Monel)	2	1/4-20 x 1 3/4"
12D	Meter Tube (15 PPD)	1	MTB-11-015	43	Seal Plug Assembly	1	SPA-SAWS-US
12E	Meter Tube (25 PPD)	1	MTB-11-025	44	Vent Plug	1	YM-102A
12F	Meter Tube (50 PPD)	1	MTB-11-050	45	PM Spring Retainer	1	YP-100
12G	Meter Tube (100 PPD)	1	MTB-11-100	46	Bearing Washer	1	YM-101A
12H	Meter Tube (120 PPD)	1	MTB-11-120	47	Inlet Spring	1	YM-103
13	Bottom Meter Block	1	FM-103	48	Seal Adapter	1	SAWS-US3
14	Inlet Plug	1	FM-101A	49	PM O-Ring	1	OH-VIT-214
15	PM O-Rings	2	OH-VIT-112	50	PM Inlet Valve Seat	1	YP-101A
16	Cover Plate Screws (Nylon)	2	#6-32 x 5/16"	51	PM O-Ring	1	OH-VIT-010
17	Cover Plate	1	FB-105-500	52	Inlet Valve	1	YM-100A
18	Flag Pin	1	FB-103A	53	Filter Holder	1	KFH-300
19	Flag & Knob	1	FB-101/102	54	PM Inlet Filter Screen	1	S-210
20	Front Body	1	FB-100A	55	PM Filter Pad	1	FBG-500
21	Meter Block Screws (Monel)	4	#10-24 x 1"	56	PM Teflon Filter	1	T-210
22	Pin Guide	1	FB-104	57	Lead Gasket	1	LG-100
23	PM O-Ring	1	OH-VIT-014	PM	Part and Maintenance Kit (100 PPD, Cylinder Mounted)	1	KT5-100-VRC
24	PM Tubing Connector (3/8")	2	BKF-64				
25	Meter Shield	1	MS-500				



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EXPLODED VIEW  
Dwg. No. Model 500, BOM



Date: 2022-12-15-v1  
 EXPLODED VIEW  
 Dwg. No. Series T500, EXP

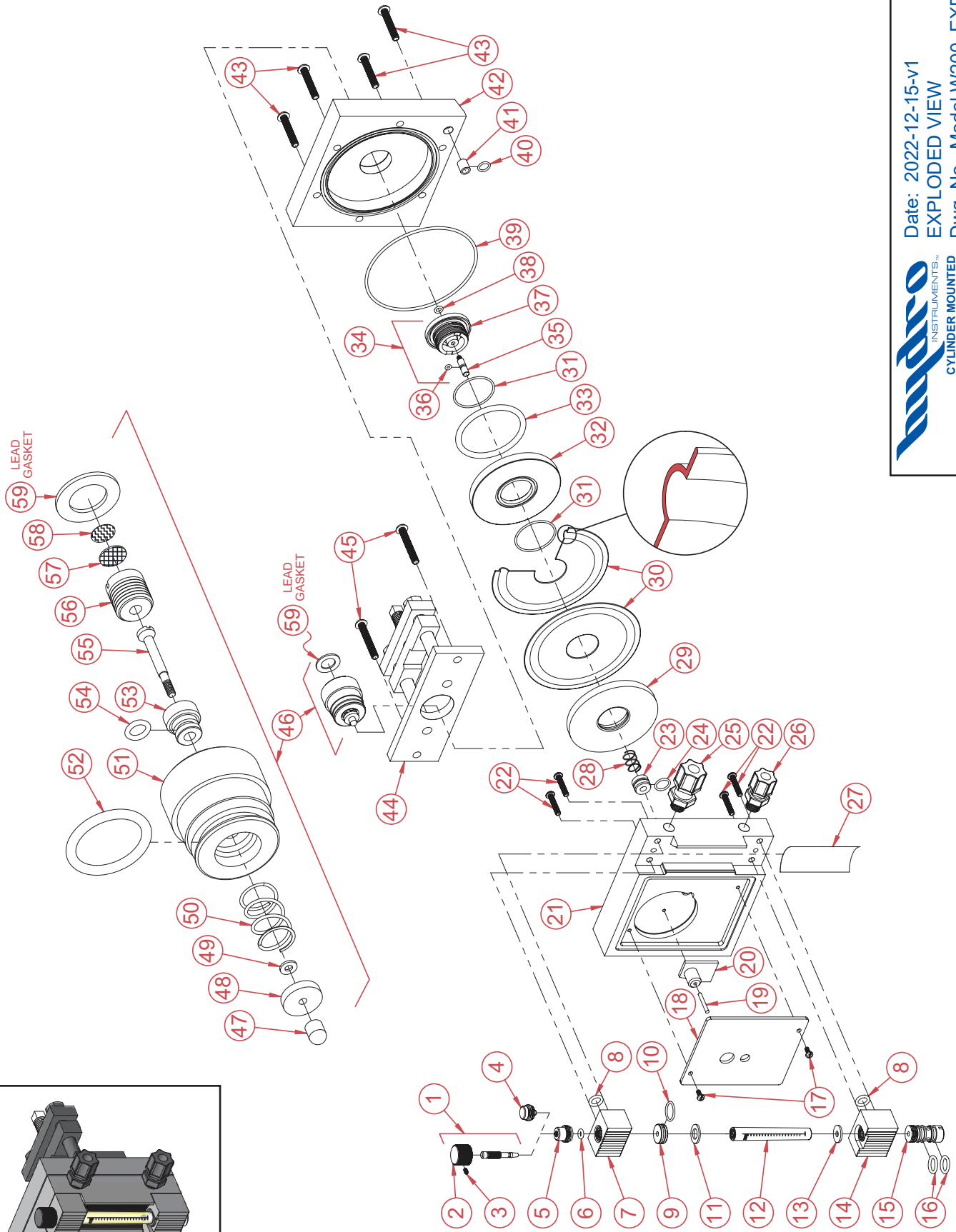
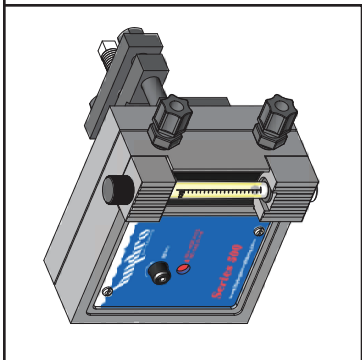
**mpetro**  
 INSTRUMENTS™  
 TON CONTAINER MOUNTED  
 VACUUM REGULATOR



Item No.	Description	Quantity	Part No.	Item No.	Description	Quantity	Part No.	
1A	Rate Valve Stem & Knob (10 PPD)	1	VP-103C-010	27	Front Diaphragm Plate	1	DP-100A	
1B	Rate Valve Stem & Knob (100 PPD)	1	VP-103C-100	28	PM Set of Two Diaphragms	1	DP-103	
2	Rate Valve Knob	1	RV-100A	29	PM O-Ring	2	OH-VIT-029	
3	Rate Valve Knob Set Screw	1	#5-40 x 1/4"	30	Rear Diaphragm Plate	1	DP-101A	
4	Dummy Plug	1	FM-104	31	O-Ring	1	OH-VIT-332	
5	Valve Bonnet	1	VB-100C	32	Guide Pin & Diaphragm Bolt Assembly (DM-101A and DP-102A, factory installed)	1	DM/DP-A	
6	PM O-Ring	1	OH-VIT-106	33	Guide Pin	1	DM-101A	
7	Top Meter Block	1	FM-100B	34	PM O-Ring	1	OH-VIT-006	
8	PM O-Ring	2	OH-VIT-110	35	Diaphragm Vent Bolt	1	DP-102A	
9	Rate Valve Seat	1	VT-104	36	PM O-Ring	1	OH-VIT-009	
10	PM O-Ring	2	OH-VIT-012	37	PM O-Ring	1	OH-VIT-156	
11A	PM Meter Gaskets (4 & 10 PPD)	2	MG-001-010	38	PM Tube Connector	1	FB-106	
11B	PM Meter Gaskets (25 PPD)	2	MG-001-025	39	Back Body	1	BB-100A	
11C	PM Meter Gaskets (50 & 100 PPD)	2	MG-001-100	40	Body Screws (Monel)	4	1/4-20 x 1 1/2"	
12A	Meter Tube (1.5 PPD)	1	MTB-11-0015	41	Back Plate	1	TI-105-4	
12B	Meter Tube (4 PPD)	1	MTB-11-004	42	Seal Plug Assembly	1	SPA-SAWS-US-1	
12C	Meter Tube (10 PPD)	1	MTB-11-010	43	Yoke Screws (Monel)	2	1/4-20 x 1 3/4"	
12D	Meter Tube (15 PPD)	1	MTB-11-015	44	Vent Plug	1	YM-102A	
12E	Meter Tube (25 PPD)	1	MTB-11-025	45	PM Spring Retainer	1	YP-100	
12F	Meter Tube (50 PPD)	1	MTB-11-050	46	Bearing Washer	1	YM-101A	
12G	Meter Tube (100 PPD)	1	MTB-11-100	47	Inlet Spring	1	YM-103	
12H	Meter Tube (120 PPD)	1	MTB-11-120	48	PM O-Ring	1	OH-VIT-214	
13	Bottom Meter Block	1	FM-103	49	Seal Adapter	1	SAWS-US3	
14	Inlet Plug	1	FM-101A	50	PM O-Ring	1	OH-VIT-010	
15	PM O-Ring	2	OH-VIT-112	51	PM Inlet Valve Seat	1	YP-101A	
16	Cover Plate Screws (Nylon)	2	#6-32 x 5/16"	52	Inlet Valve	1	YM-100A	
17	Cover Plate	1	FB-105-500	53	Filter Holder	1	KFH-300	
18	Flag Pin	1	FB-103A	54	PM Inlet Filter Screen	1	S-210	
19	Flag & Knob	1	FB-101/102	55	PM Filter Pad	1	FBG-500	
20	Front Body	1	FB-100A	56	PM Lead Gasket	1	LG-332	
21	Meter Block Screws (Monel)	4	#10-24 x 1"	57	Iron Works Assembly	1	IW-1	
22	Pin Guide	1	FB-104	PM Part and Maintenance Kit (100 PPD, Ton Container Mounted)			1	KT5-100-VRT
23	PM O-Ring	1	OH-VIT-014					
24	PM Tubing Connector (3/8")	2	BKF-64					
25	Meter Shield	1	MS-500					
26	Vent Spring	1	DM-100					



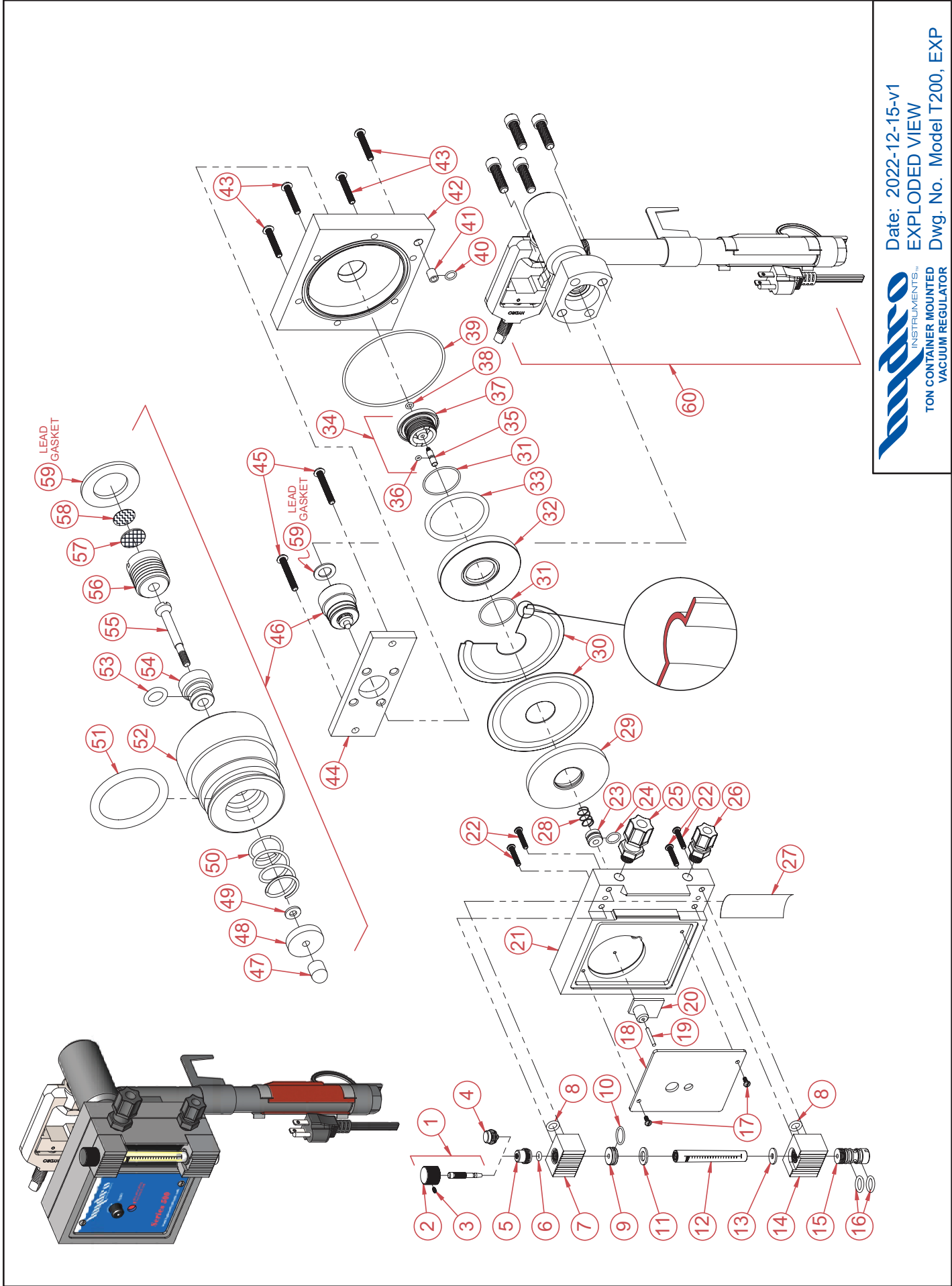
Date: 2022-12-15-v1  
 BILL OF MATERIALS  
 Dwg. No. Series T500, BOM



Item No.	Description	Quantity	Part No.	Item No.	Description	Quantity	Part No.
1	Rate Valve Stem & Knob (250 PPD)	1	VP-203C	32	Rear Diaphragm Plate	1	DP-101A
2	Rate Valve Knob	1	RV-100A	33	O-Ring	1	OH-VIT-332
3	Rate Valve Knob Set Screw	1	#5-40 x 1/4"	34	Guide Pin & Diaphragm Bolt Assembly (DM-101A and DP-102A, factory installed)	1	DM/DP-A
4	Dummy Plug	1	FM-104	35	Guide Pin	1	DM-101A
5	Valve Bonnet	1	VB-100C				
6	<sup>PM</sup> O-Ring	1	OH-VIT-106	36	<sup>PM</sup> O-Ring	1	OH-VIT-006
7	Top Meter Block	1	FM-200B	37	Diaphragm Vent Bolt	1	DP-102A
8	<sup>PM</sup> O-Ring	2	OH-VIT-110	38	<sup>PM</sup> O-Ring	1	OH-VIT-009
9	Rate Valve Seat	1	VT-204	39	<sup>PM</sup> O-Ring	1	OH-VIT-156
10	<sup>PM</sup> O-Ring	1	OH-VIT-016	40	<sup>PM</sup> O-Ring	1	OH-VIT-012
11	<sup>PM</sup> Top Meter Gasket	1	MG-200T	41	<sup>PM</sup> Tube Connector	1	FB-106
12	Meter Tube (250 PPD)	1	MTB-11-250	42	Back Body	1	BB-100A
13	<sup>PM</sup> Bottom Meter Gasket	1	MG-001-100	43	Body Screws (Monel)	4	1/4-20 x 1 1/2"
14	Bottom Meter Block	1	FM-203	44	Yoke	1	YA-111B
15	Inlet Plug	1	FM-101A	45	Yoke Screws (Monel)	2	1/4-20 x 1 3/4"
16	<sup>PM</sup> O-Ring	2	OH-VIT-112	46	Seal Plug Assembly	1	SPA-SAWS-US-1
17	Cover Plate Screws (Nylon)	2	#6-32 x 5/16"	47	Vent Plug	1	YM-102A
18	Cover Plate	1	FB-105-200	48	<sup>PM</sup> Spring Retainer	1	YP-100
19	Flag Pin	1	FB-103A	49	Bearing Washer	1	YM-101A
20	Flag & Knob	1	FB-101/102	50	Inlet Spring	1	YM-103
21	Front Body	1	FB-100A	51	Seal Adapter	1	SAWS-US3
22	Meter Block Screws (Monel)	4	#10-24 x 1"	52	<sup>PM</sup> O-Ring	1	OH-VIT-214
23	Pin Guide	1	FB-104	53	<sup>PM</sup> Inlet Valve Seat	1	YP-101A
24	<sup>PM</sup> O-Ring	1	OH-VIT-014	54	<sup>PM</sup> O-Ring	1	OH-VIT-010
25	<sup>PM</sup> 1/4" NPT 1/2" Tube Tubing Connector (Vacuum)	1	BKF-84	55	Inlet Valve	1	YM-100A
26	<sup>PM</sup> 1/4" NPT 3/8" Tube Tubing Connector (Vent)	1	BKF-64	56	Filter Holder	1	KFH-300
27	Meter Shield	1	MS-500	57	<sup>PM</sup> Inlet Filter Screen	1	S-210
28	Vent Spring	1	DM-100	58	<sup>PM</sup> Filter Pad	1	FBG-500
29	Front Diaphragm Plate	1	DP-100A	59	Lead Gasket	1	LG-100
30	<sup>PM</sup> Set of Two Diaphragms	1	DP-103		<sup>PM</sup> Part and Maintenance Kit (250 PPD, Cylinder Mounted)	1	KT2-250-VRC
31	<sup>PM</sup> O-Ring	2	OH-VIT-029				



Date: 2022-12-15-v1  
 BILL OF MATERIALS  
 Dwg. No. Model W200, BOM

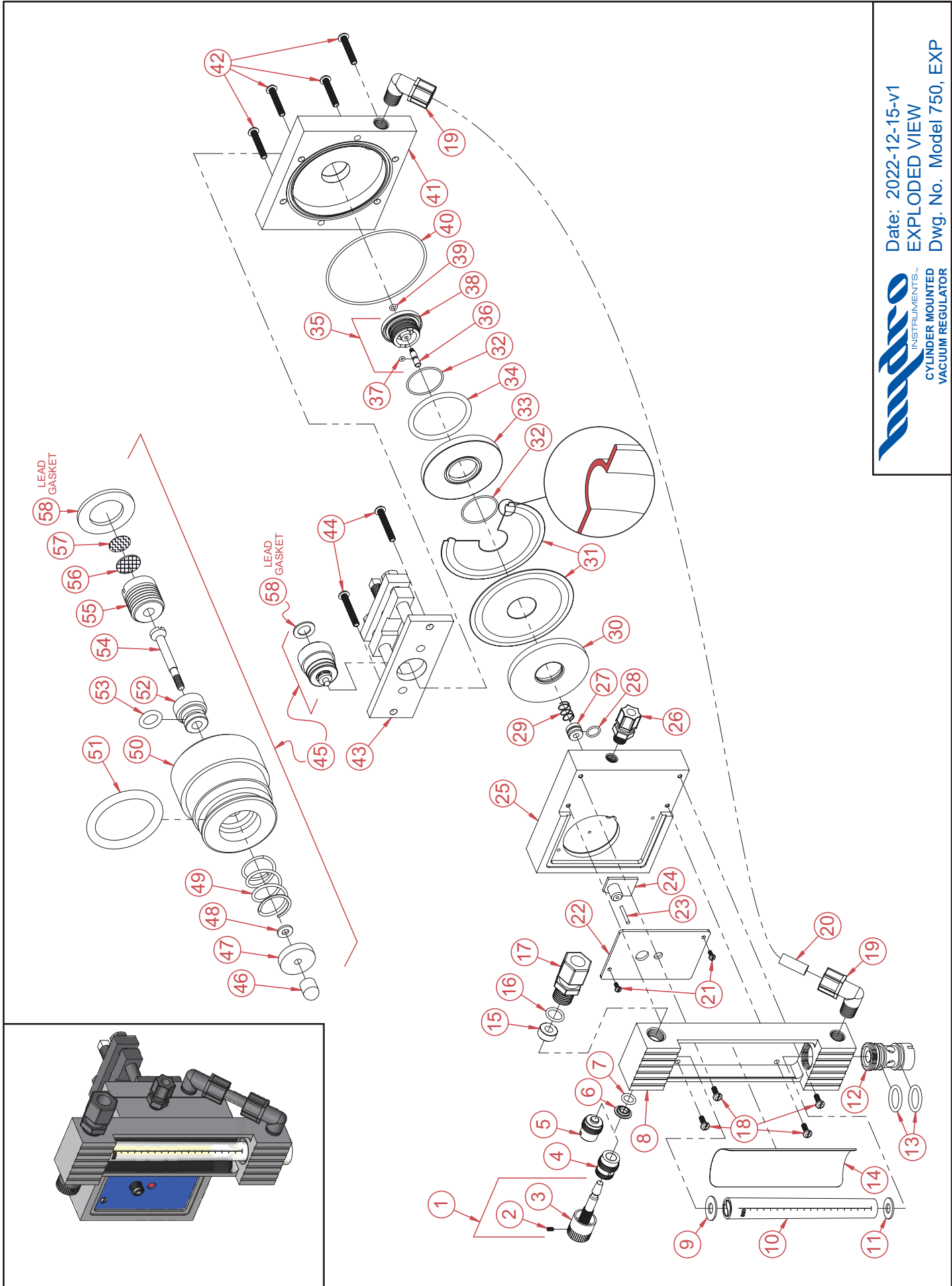



 Date: 2022-12-15-v1  
 EXPLODED VIEW  
 DWG. No. Model T200, EXP  
 TON CONTAINER MOUNTED  
 VACUUM REGULATOR

Item No.	Description	Quantity	Part No.	Item No.	Description	Quantity	Part No.
1	Rate Valve Stem & Knob (250 PPD)	1	VP-203C	33	O-Ring	1	OH-VIT-332
2	Rate Valve Knob	1	RV-100A	34	Guide Pin & Diaphragm Bolt Assembly (DM-101A and DP-102A, factory installed)	1	DM/DP-A
3	Rate Valve Knob Set Screw	1	#5-40 x 1/4"	35	Guide Pin	1	DM-101A
4	Dummy Plug	1	FM-104	36	PM O-Ring	1	OH-VIT-006
5	Valve Bonnet	1	VB-100C	37	Diaphragm Vent Bolt	1	DP-102A
6	PM O-Ring	1	OH-VIT-106	38	PM O-Ring	1	OH-VIT-009
7	Top Meter Block	1	FM-200B	39	PM O-Ring	1	OH-VIT-156
8	PM O-Ring	2	OH-VIT-110	40	PM O-Ring	1	OH-VIT-012
9	Rate Valve Seat	1	VT-204	41	PM Tube Connector	1	FB-106
10	PM O-Ring	1	OH-VIT-016	42	Back Body	1	BB-100A
11	PM Top Meter Gasket	1	MG-200T	43	Body Screws (Monel)	4	1/4-20 x 1 1/2"
12	Meter Tube (250 PPD)	1	MTB-11-250	44	Back Plate	1	TI-105-4
13	PM Bottom Meter Gasket	1	MG-001-100	45	Yoke Screws (Monel)	2	1/4-20 x 1 3/4"
14	Bottom Meter Block	1	FM-203	46	Seal Plug Assembly	1	SPA-SAWS-US-1
15	Inlet Plug	1	FM-101A	47	Vent Plug	1	YM-102A
16	PM O-Ring	2	OH-VIT-112	48	PM Spring Retainer	1	YP-100
17	Cover Plate Screws (Nylon)	2	#6-32 x 5/16"	49	Bearing Washer	1	YM-101A
18	Cover Plate	1	FB-105-200	50	Inlet Spring	1	YM-103
19	Flag Pin	1	FB-103A	51	PM O-Ring	1	OH-VIT-214
20	Flag & Knob	1	FB-101/102	52	Seal Adapter	1	SAWS-US3
21	Front Body	1	FB-100A	53	PM O-Ring	1	OH-VIT-010
22	Meter Block Screws (Monel)	4	#10-24 x 1"	54	PM Inlet Valve Seat	1	YP-101A
23	Pin Guide	1	FB-104	55	Inlet Valve	1	YM-100A
24	PM O-Ring	1	OH-VIT-014	56	Filter Holder	1	KFH-300
25	PM 1/4" NPT 1/2" Tube Tubing Connector (Vacuum)	1	BKF-84	57	PM Inlet Filter Screen	1	S-210
26	PM 1/4" NPT 3/8" Tube Tubing Connector (Vent)	1	BKF-64	58	PM Filter Pad	1	FBG-500
27	Meter Shield	1	MS-500	59	PM Lead Gasket	1	LG-332
28	Vent Spring	1	DM-100	60	Ironworks Assembly	1	IW-1
29	Front Diaphragm Plate	1	DP-100A	PM Part and Maintenance Kit (250 PPD, Ton Container Mounted)	1	KT2-250-VRT	
30	PM Set of Two Diaphragms	1	DP-103				
31	PM O-Ring	2	OH-VIT-029				
32	Rear Diaphragm Plate	1	DP-101A				



Date: 2022-12-15-v1  
 BILL OF MATERIALS  
 Dwg. No. Model T200, BOM



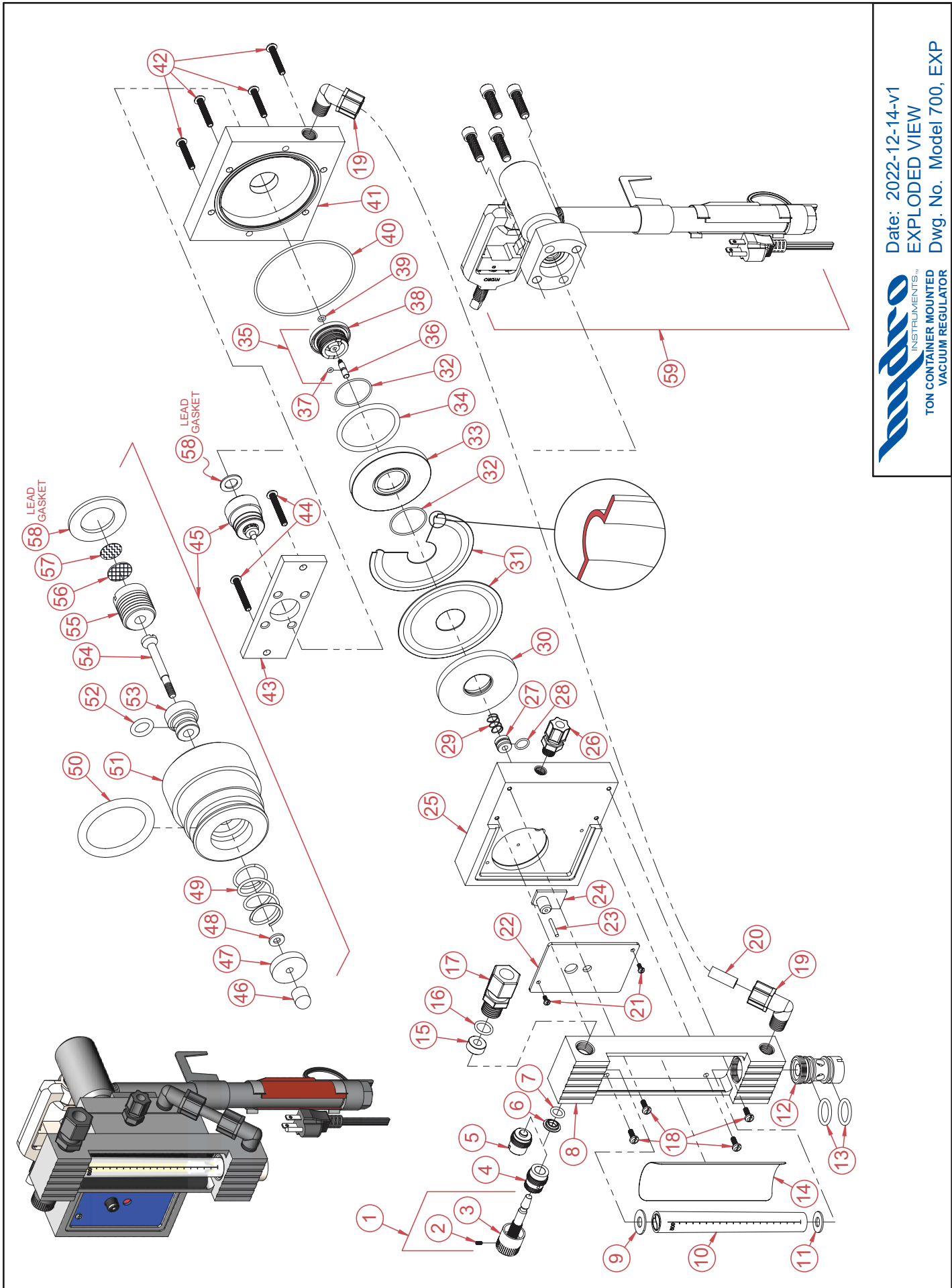
Date: 2022-12-15-v1  
 EXPLODED VIEW  
 Dwg. No. Model 750, EXP

**mpdpro**  
 INSTRUMENTS™  
 CYLINDER MOUNTED  
 VACUUM REGULATOR

Item No.	Description	Quantity	Part No.	Item No.	Description	Quantity	Part No.
1	Rate Valve Stem & Knob (300-600 PPD)	1	SA-495	33	Rear Diaphragm Plate	1	DP-101A
2	Rate Valve Knob Set Screw (stainless)	1	#6-32 x 1/4"	34	O-Ring	1	OH-VIT-332
3	Rate Valve Knob	1	S-496	35	Guide Pin & Diaphragm Bolt Assembly (DM-101A and DP-102A, factory installed)	1	DM/DP-A
4	Rate Valve Bonnet	1	S-493	36	Guide Pin	1	DM-101A
5	Dummy Plug	1	DB-765				
6	<sup>PM</sup> Shaft Seal (Teflon)	1	SA-498	37	<sup>PM</sup> O-Ring	1	OH-VIT-006
7	<sup>PM</sup> O-Ring	1	OH-VIT-111	38	Diaphragm Vent Bolt	1	DP-102A
8	Flow Meter Body (3/8" NPT Inlet)	1	TFM-500-VR	39	<sup>PM</sup> O-Ring	1	OH-VIT-009
9	<sup>PM</sup> Top Meter Gasket, 200-600 PPD	1	G-161	40	<sup>PM</sup> O-Ring	1	OH-VIT-156
10	Meter Tube, 500 PPD (10 kg/hr)	1	MT-678-500	41	Back Body	1	BB-5A
11	<sup>PM</sup> Bottom Meter Gasket, 200-600 PPD	1	G-162	42	Body Screws (Monel)	4	1/4-20 x 1 1/2"
12	Meter Inlet (200-600 PPD)	1	IP-498	43	Yoke	1	YA-111B
13	<sup>PM</sup> O-Ring	2	OH-VIT-212	44	Yoke Screws (Monel)	2	1/4-20 x 1 3/4"
14	Meter Shield (Series 700)	1	MS-700	45	Seal Plug Assembly	1	SPA-SAWS-US-1
15	Rate Valve Seat	1	S-497	46	Vent Plug	1	YM-102A
16	<sup>PM</sup> O-Ring	1	OH-VIT-114	47	<sup>PM</sup> Spring Retainer	1	YP-100
17	<sup>PM</sup> 1/2" NPT 5/8" Tube Tubing Connector	1	BKF-108	48	Bearing Washer	1	YM-101A
18	Panel Screws (316 SS)	4	#10-24 x 1/2"	49	Inlet Spring	1	YM-103
19	3/8" NPT 1/2" Tube 90° Elbow	2	BPE-86	50	Seal Adapter	1	SAWS-US3
20	500 PPD Tube Connector	1	FB-106-500	51	<sup>PM</sup> O-Ring	1	OH-VIT-214
21	Cover Plate Screws (Nylon)	2	#6-32 x 5/16"	52	<sup>PM</sup> Inlet Valve Seat	1	YP-101A
22	Cover Plate (Series 750)	1	FB-105-750	53	<sup>PM</sup> O-Ring	1	OH-VIT-010
23	Flag Pin	1	FB-103A	54	Inlet Valve	1	YM-100A
24	Flag & Knob	1	FB-101/102	55	Filter Holder	1	KFH-300
25	Front Body	1	FB-5A	56	<sup>PM</sup> Inlet Filter Screen	1	S-210
26	<sup>PM</sup> 1/4" NPT 3/8" Tube Tubing Connector (Vent)	1	BKF-64	57	<sup>PM</sup> Filter Pad	1	FBG-500
27	Pin Guide	1	FB-104	58	Lead Gasket	1	LG-100
28	<sup>PM</sup> O-Ring	1	OH-VIT-014		<sup>PM</sup> Part and Maintenance Kit (500 PPD, Cylinder Mounted)		KT7-500-VRC
29	Vent Spring	1	DM-100				
30	Front Diaphragm Plate	1	DP-100A				
31	<sup>PM</sup> Set of Two Diaphragms	1	DP-103				
32	<sup>PM</sup> O-Rings	2	OH-VIT-029				



Date: 2022-12-15-v1  
EXPLODED VIEW  
Dwg. No. Model 750, BOM



Date: 2022-12-14-v1  
**EXPLODED VIEW**  
 Dwg. No. Model 700, EXP



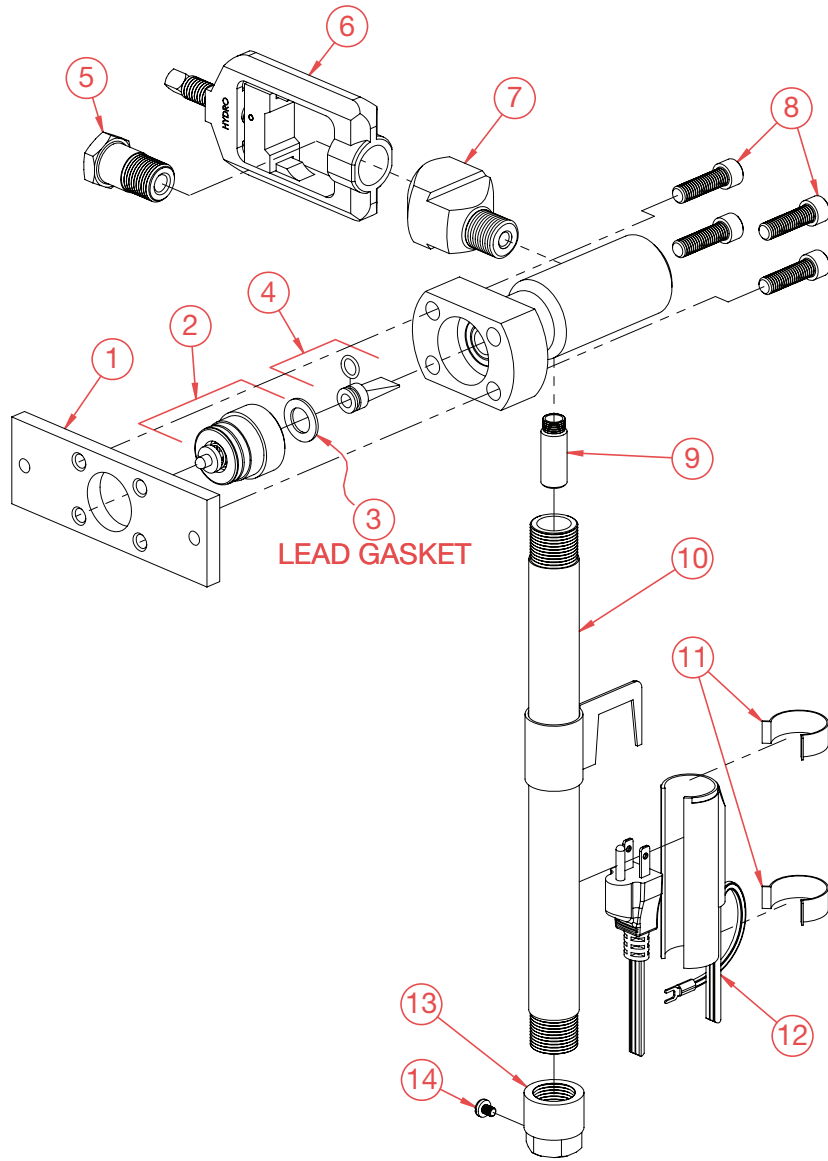
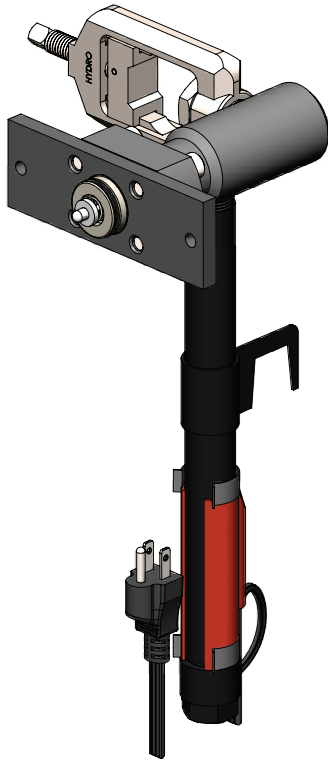


Item No.	Description	Quantity	Part No.	Item No.	Description	Quantity	Part No.
1	Rate Valve Stem & Knob (300-600 PPD)	1	SA-495	33	Rear Diaphragm Plate	1	DP-101A
2	Rate Valve Knob Set Screw (stainless)	1	#6-32 x 1/4"	34	O-Ring	1	OH-VIT-332
3	Rate Valve Knob	1	S-496	35	Guide Pin & Diaphragm Bolt Assembly (DM-101A and DP-102A, factory installed)	1	DM/DP-A
4	Rate Valve Bonnet	1	S-493	36	Guide Pin	1	DM-101A
5	Dummy Plug	1	DB-765				
6	<sup>PM</sup> Shaft Seal (Teflon)	1	SA-498	37	<sup>PM</sup> O-Ring	1	OH-VIT-006
7	<sup>PM</sup> O-Ring	1	OH-VIT-111	38	Diaphragm Vent Bolt	1	DP-102A
8	Flow Meter Body (3/8" NPT Inlet)	1	TFM-500-VR	39	<sup>PM</sup> O-Ring	1	OH-VIT-009
9	<sup>PM</sup> Top Meter Gasket, 200-600 PPD	1	G-161	40	<sup>PM</sup> O-Ring	1	OH-VIT-156
10	Meter Tube, 500 PPD (10 kg/hr)	1	MT-678-500	41	Back Body	1	BB-5A
11	<sup>PM</sup> Bottom Meter Gasket, 200-600 PPD	1	G-162	42	Body Screws (Monel)	4	1/4-20 x 1 1/2"
12	Meter Inlet (200-600 PPD)	1	IP-498	43	Back Plate	1	TI-105-4
13	<sup>PM</sup> O-Ring	2	OH-VIT-212	44	Yoke Screws (Monel)	2	1/4-20 x 1 3/4"
14	Meter Shield (Series 700)	1	MS-700	45	Seal Plug Assembly	1	SPA-SAWS-US-1
15	Rate Valve Seat	1	S-497	46	Vent Plug	1	YM-102A
16	<sup>PM</sup> O-Ring	1	OH-VIT-114	47	<sup>PM</sup> Spring Retainer	1	YP-100
17	<sup>PM</sup> 1/2" NPT 5/8" Tube Tubing Connector	1	BKF-108	48	Bearing Washer	1	YM-101A
18	Panel Screws (316 SS)	4	#10-24 x 1/2"	49	Inlet Spring	1	YM-103
19	3/8" NPT 1/2" Tube 90° Elbow	2	BPE-86	50	<sup>PM</sup> O-Ring	1	OH-VIT-214
20	500 PPD Tube Connector	1	FB-106-500	51	Seal Adapter	1	SAWS-US3
21	Cover Plate Screws (Nylon)	2	#6-32 x 5/16"	52	<sup>PM</sup> O-Ring	1	OH-VIT-010
22	Cover Plate (Series 700)	1	FB-105-700	53	<sup>PM</sup> Inlet Valve Seat	1	YP-101A
23	Flag Pin	1	FB-103A	54	Inlet Valve	1	YM-100A
24	Flag & Knob	1	FB-101/102	55	Filter Holder	1	KFH-300
25	Front Body	1	FB-5A	56	<sup>PM</sup> Inlet Filter Screen	1	S-210
26	<sup>PM</sup> 1/4" NPT 3/8" Tube Tubing Connector (Vent)	1	BKF-64	57	<sup>PM</sup> Filter Pad	1	FBG-500
27	Pin Guide	1	FB-104	58	<sup>PM</sup> Lead Gasket	1	LG-332
28	<sup>PM</sup> O-Ring	1	OH-VIT-014	59	Ironworks Assembly	1	IW-1
29	Vent Spring	1	DM-100		<sup>PM</sup> Part and Maintenance Kit (500 PPD, Ton Container Mounted)		KT7-500-VRT
30	Front Diaphragm Plate	1	DP-100A				
31	<sup>PM</sup> Set of Two Diaphragms	1	DP-103				
32	<sup>PM</sup> O-Rings	2	OH-VIT-029				

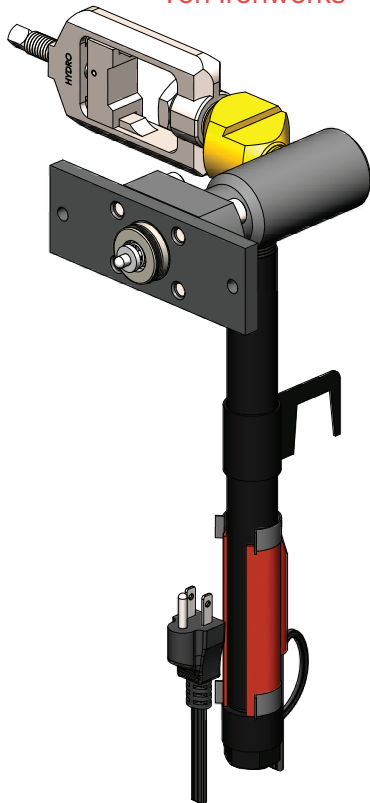


Date: 2022-12-14-v1  
EXPLODED VIEW  
Dwg. No. Model 700, BOM

**Ton Ironworks**




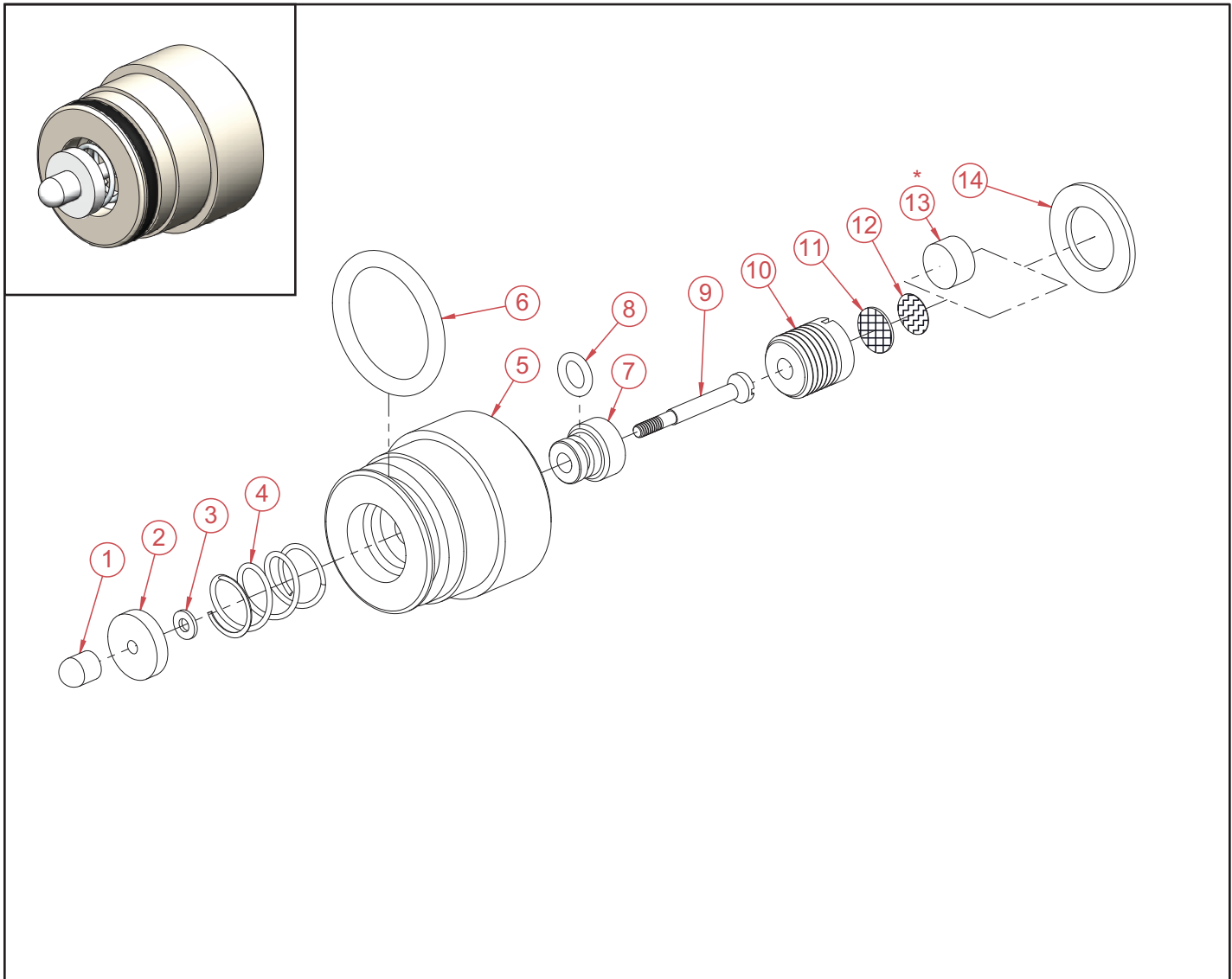
**Actuator Mounting  
Ton Ironworks**



Part Number	With Seal Plug Assembly	Actuator Mounting
IW-1	No	No
IW-1SP	Yes (Includes item 2)	No
IW-1-AW	No	Yes (Includes item 7)
IW-1SP-AW	Yes (Includes item 2)	Yes (Includes item 7)

**hydro** INSTRUMENTS™  
TON IRONWORKS ASSEMBLY  
Date: 2023-05-17-v2  
EXPLODED VIEW  
Dwg. No. IW-1, EXP

Item No.	Description	Quantity	Part No.
1	Back Plate	1	TI-105-4
2	Seal Plug Assembly	1	SPA-SAWS-US-1
3	<sup>PM</sup> Ton Ironwork Inner Lead Gasket	1	LG-332
4	<sup>PM</sup> Filter Assembly (includes holder, screen, and o-ring)	1	S581/560
5	Closed Yoke Adapter (Monel)	1	YAH-1300
6	Assembled Closed Yoke Assembly (includes yoke frame, half dog, slide bar, and pin)	1	YAH-705
7	* Eccentric Extender ½" MNPT x ½" FNPT (Bronze) (only included for actuator mounting configurations)	1	YAH-319
8	⅜-16 x 1⅝" Socket Head Cap Screw	4	BTH-STA-140
9	✓ Drip Tube	1	DT-112
10	✓ Monel Drip Leg	1	DL-134
11	Heater Clamps	2	CLH-100-500
12 A	Drip Leg Heater (25W, 115VAC)	1	HTH-111-115
12 B	Drip Leg Heater (25W, 230VAC)	1	HTH-111-230
12 C	Drip Leg Heater, New Zealand (25W, 230VAC)	1	HTH-111-230-NZ
12 D	Drip Leg Heater (25W, 24VDC)	1	HTH-111-024
13	✓ Drip Leg Cap	1	DCM-15
14	Ground Screw (stainless)	1	#10-32 x ¼"
✓	Not sold separately.		
*	Eccentric Extender is only used in actuator mounting configurations.		
<sup>PM</sup>	Part & Maintenance kits for ton mounting vacuum regulators using the IW-1XX-XXX: Series 500 (100 PPD) – KT5-100-VRT Series 200 (250 PPD) – KT2-250-VRT Series 700 (500 PPD) – KT7-500-VRT		
	<b>Part Number</b>	<b>With Seal Plug Assembly</b>	<b>Actuator Mounting</b>
	IW-1	No	No
	IW-1SP	Yes (Includes item 2)	No
	IW-1-AW	No	Yes (Includes item 7)
	IW-1SP-AW	Yes (Includes item 2)	Yes (Includes item 7)
			Date: 2023-05-17-v2 <b>BILL OF MATERIALS</b> Dwg. No. IW-1, BOM



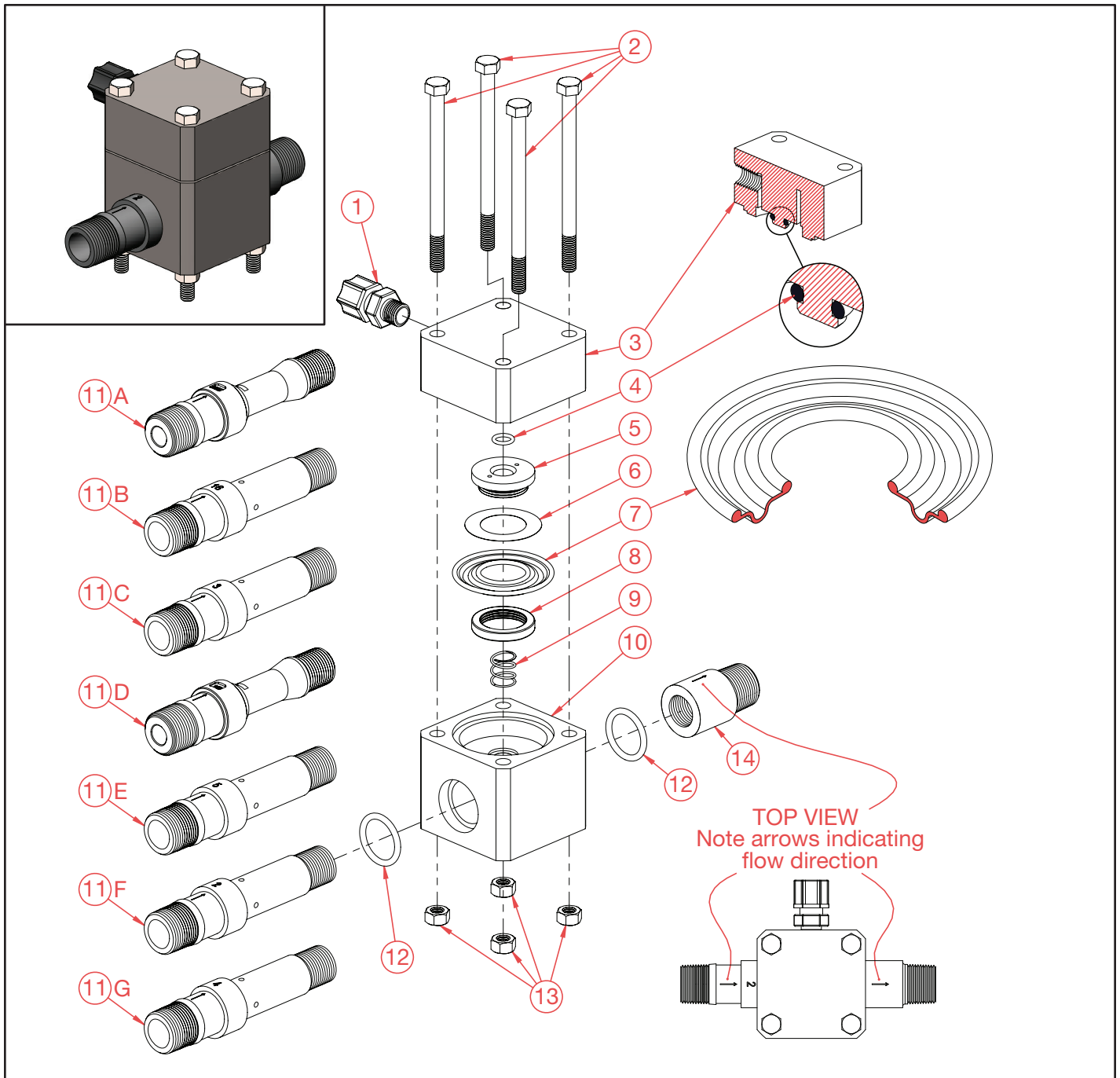
Item No.	Description	Quantity	Part No.
1	Vent Plug	1	YM-102A
2	Spring Retainer	1	YP-100
3	Bearing Washer	1	YM-101A
4	Inlet Spring	1	YM-103
5	Seal Adapter	1	SAWS-US3
6	O-Ring	1	OH-VIT-214
7	Inlet Valve Seat	1	YP-101A
8	O-Ring	1	OH-VIT-010
9	Inlet Valve	1	YM-100A
10	Filter Holder	1	KFH-300
11	Inlet Filter Screen	1	S-210
12	Fiberglass Filter Pad	1	FBG-500
13	* Teflon Filter	1	T-210


14	** Lead Gasket	1	LG-100
14	*** Lead Gasket	1	LG-332

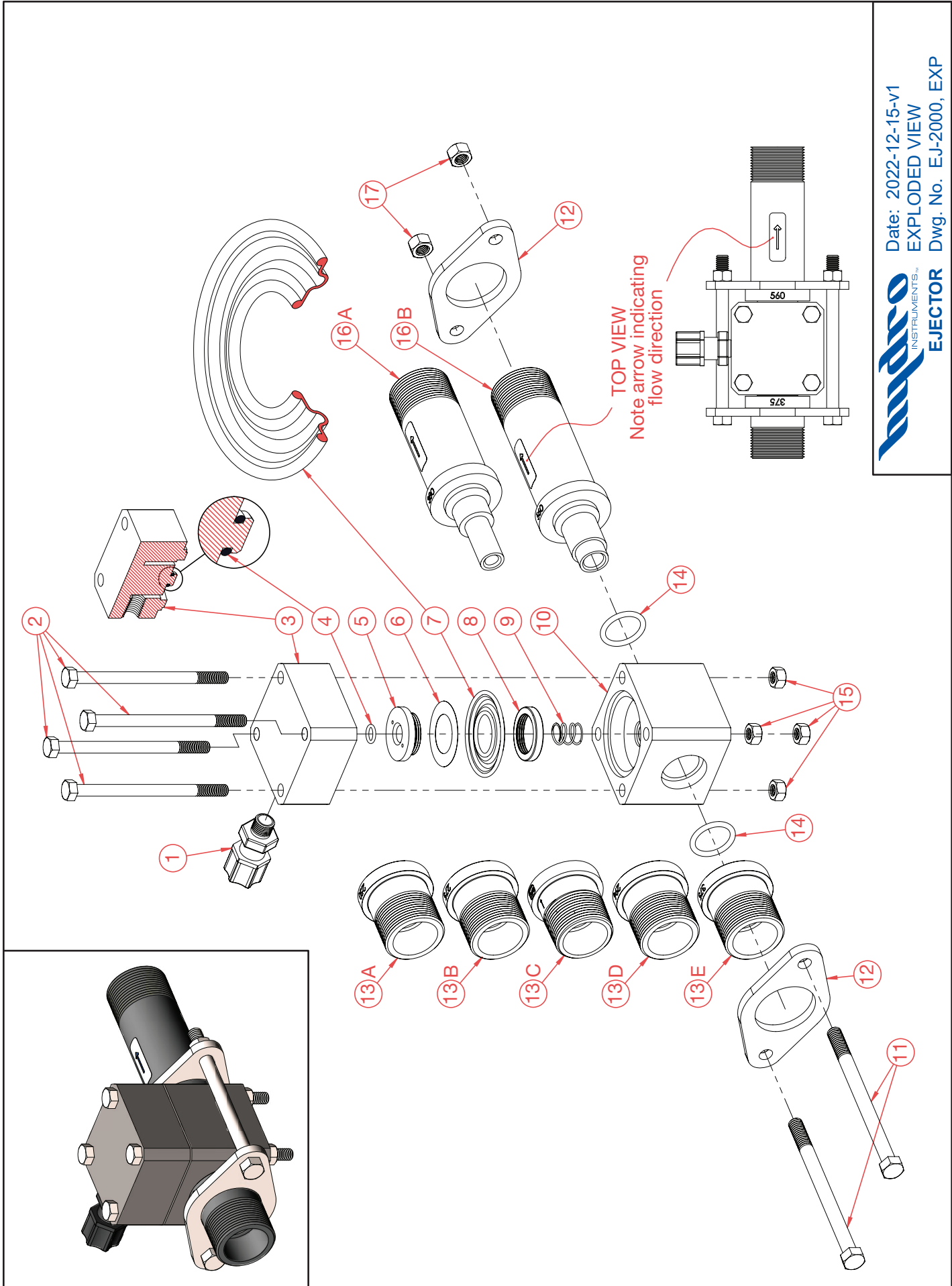
\* Used only with SPA-SAWS-US: 100 PPD Cl<sub>2</sub> and smaller Non-ton mounting vacuum regulators.

\*\* Used with upright cylinder mounting vacuum regulators.

\*\*\* Used with ton & wall mounting vacuum regulators.



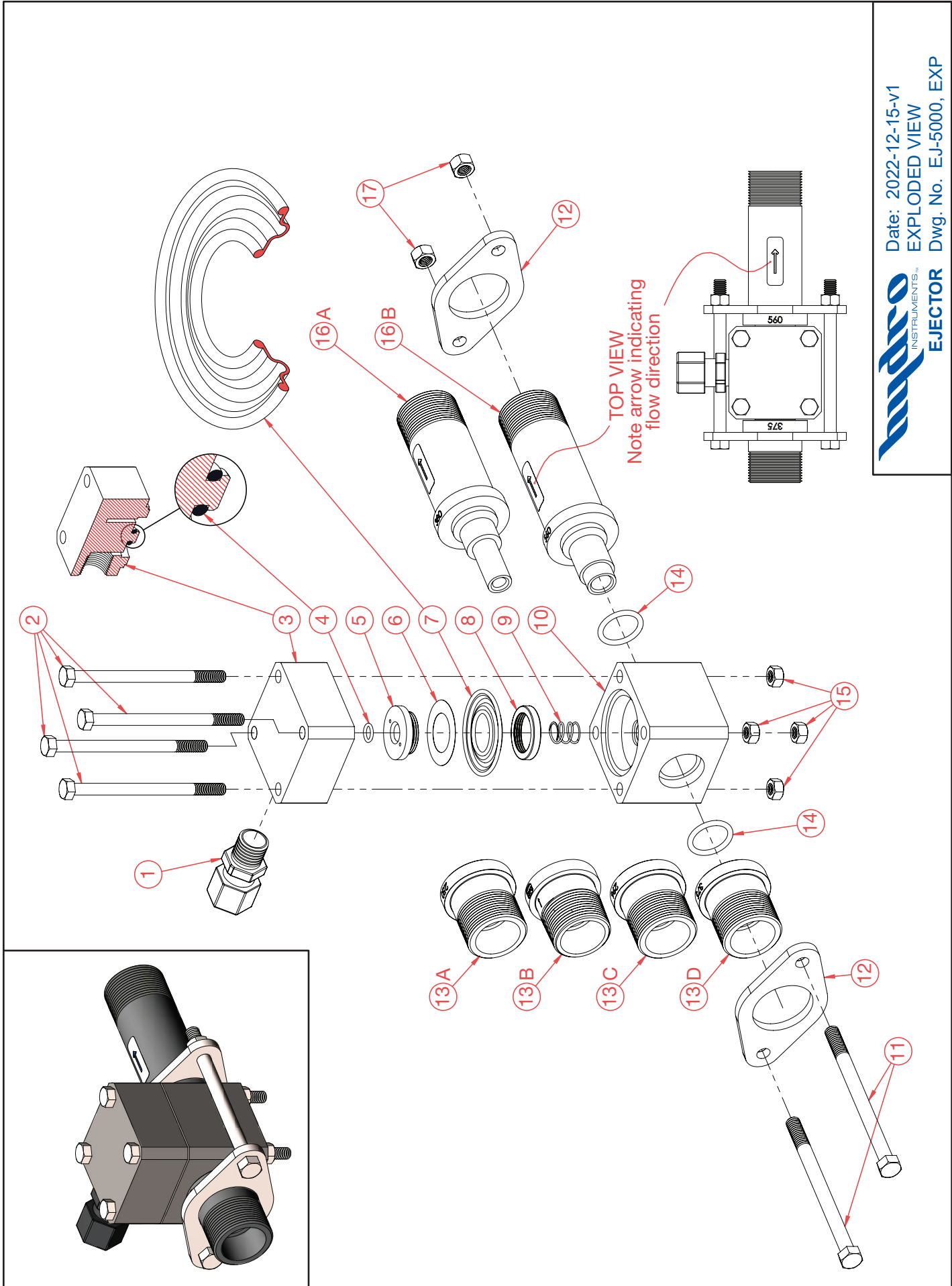
Item No.	Description	Quantity	Part No.	Item No.	Description	Quantity	Part No.
1	PM 1/4" NPT 3/8" Tube Tubing Connector	1	BKF-64	11 C	* Nozzle (50 PPD max)	1	UN-101-3
2	Bolt 5/16-18 x 4 1/2"	4	B-57	11 D	* Nozzle (100 PPD max)	1	UN-102-140
3	Top Body (250 PPD)	1	E-550-250	11 E	* Nozzle (100 PPD max)	1	UN-101-5
4	PM O-Ring	1	OH-VIT-203	11 F	* Nozzle (100 PPD max)	1	UN-101-2
5	PM Check Assembly Bolt	1	E-553	11 G	* Nozzle	1	UN-101-4
6	PM Set of Two Support Diaphragms	1	KY-1	12	PM O-Ring	2	OH-VIT-214
7	PM Rolling Diaphragm	1	SM-112	13	Nut 5/16-18	4	N-56
8	PM Check Assembly Nut	1	E-552	14	Diffuser (Threaded)	1	E-1063
9	Spring	1	S-145	PM	Part and Maintenance Kit	1	KT1-100-EJS
10	Bottom Body	1	E-551	*	Refer to nozzle sizing charts for correct sizing.		
11 A	* Nozzle (50 PPD max)	1	UN-102-099D	 Date: 2022-12-15-v1 <b>EXPLODED VIEW AND BOM</b> Dwg. No. EJ-1000			
11 B	* Nozzle	1	UN-101-16				



Item No.	Description	Quantity	Part No.
1	PM 1/4" NPT 1/2" Tube Tubing Connector	1	BKF-84
2	Bolt 5/16-18 x 4 1/2" (stainless)	4	B-57
3	Top Body (250 PPD)	1	E-550-250
4	PM O-Ring	1	OH-VIT-203
5	PM Check Assembly Bolt	1	E-553
6	PM Set of Two Support Diaphragms	1	KY-1
7	PM Rolling Diaphragm	1	SM-112
8	PM Check Assembly Nut	1	E-552
9	Spring	1	S-145
10	Bottom Body	1	E-551
11	Bolt 3/16-16 x 5" (stainless)	2	B-59
12	Nozzle/Diffuser Brackets	2	EJB-425
13A	* Nozzle – .250 (1/4" NPT)	1	EN-250
13B	* Nozzle – .275 (1/4" NPT)	1	EN-275
13C	* Nozzle – .290 (1/4" NPT)	1	ENX-290
13D	* Nozzle – .300 (1/4" NPT)	1	EN-296
13E	* Nozzle – .375 (1/4" NPT)	1	EN-375
14	PM O-Ring	2	OH-VIT-214
15	Nut 5/16-18 (stainless)	4	N-56
16A	* Throat – .380 (1 1/4" NPT)	1	EDT-380
16B	* Throat – .560 (1 1/4" NPT)	1	EDT-560
17	Nut 3/16-16 (stainless)	2	N-58
PM	Part & Maintenance Kit (250 PPD)	1	KT2-250-EJS
*	Refer to nozzle sizing charts for correct sizing.		



Date: 2022-12-15-v1  
 BILL OF MATERIALS  
 Dwg. No. EJ-2000, BOM



Date: 2022-12-15-v1  
 EXPLODED VIEW  
 Dwg. No. EJ-5000, EXP

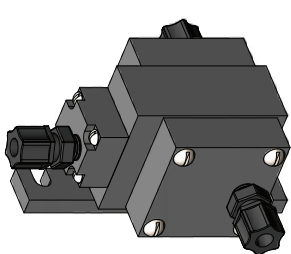




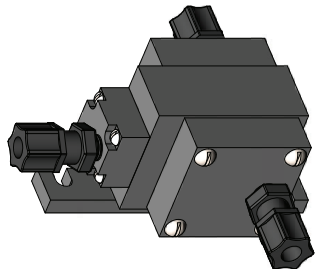
Item No.	Description	Quantity	Part No.
1	PM 1/2" NPT 5/8" Tube Tubing Connector	1	BKF-108
2	Bolt 5/16-18 x 4 1/2" (stainless)	4	B-57
3	Top Body (500 PPD)	1	E-550-500
4	PM O-Ring	1	OH-VIT-203
5	PM Check Assembly Bolt	1	E-553
6	PM Set of Two Support Diaphragms	1	KY-1
7	PM Rolling Diaphragm	1	SM-112
8	PM Check Assembly Nut	1	E-552
9	Spring	1	S-145
10	Bottom Body	1	E-551
11	Bolt 3/8-16 x 5" (stainless)	2	B-59
12	Nozzle/Diffuser Brackets	2	EJB-425
13A	* Nozzle - .250 (1/4" NPT)	1	EN-250
13B	* Nozzle - .290 (1/4" NPT)	1	ENX-290
13C	* Nozzle - .300 (1/4" NPT)	1	EN-296
13D	* Nozzle - .375 (1/4" NPT)	1	EN-375
14	PM O-Ring	2	OH-VIT-214
15	Nut 5/16-18 (stainless)	4	N-56
16A	* Throat - .380 (1/4" NPT)	1	EDT-380
16B	* Throat - .560 (1/4" NPT)	1	EDT-560
17	Nut 3/8-16 (stainless)	2	N-58
PM	Part & Maintenance Kit (500 PPD)	1	KT7-500-EJS
*	Refer to nozzle sizing charts for correct sizing.		



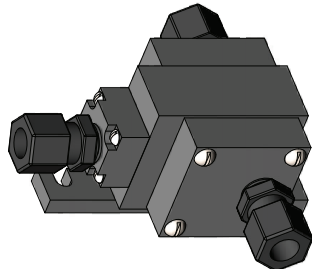
Date: 2022-12-15-v1  
 BILL OF MATERIALS  
 Dwg. No. EJ-5000, BOM



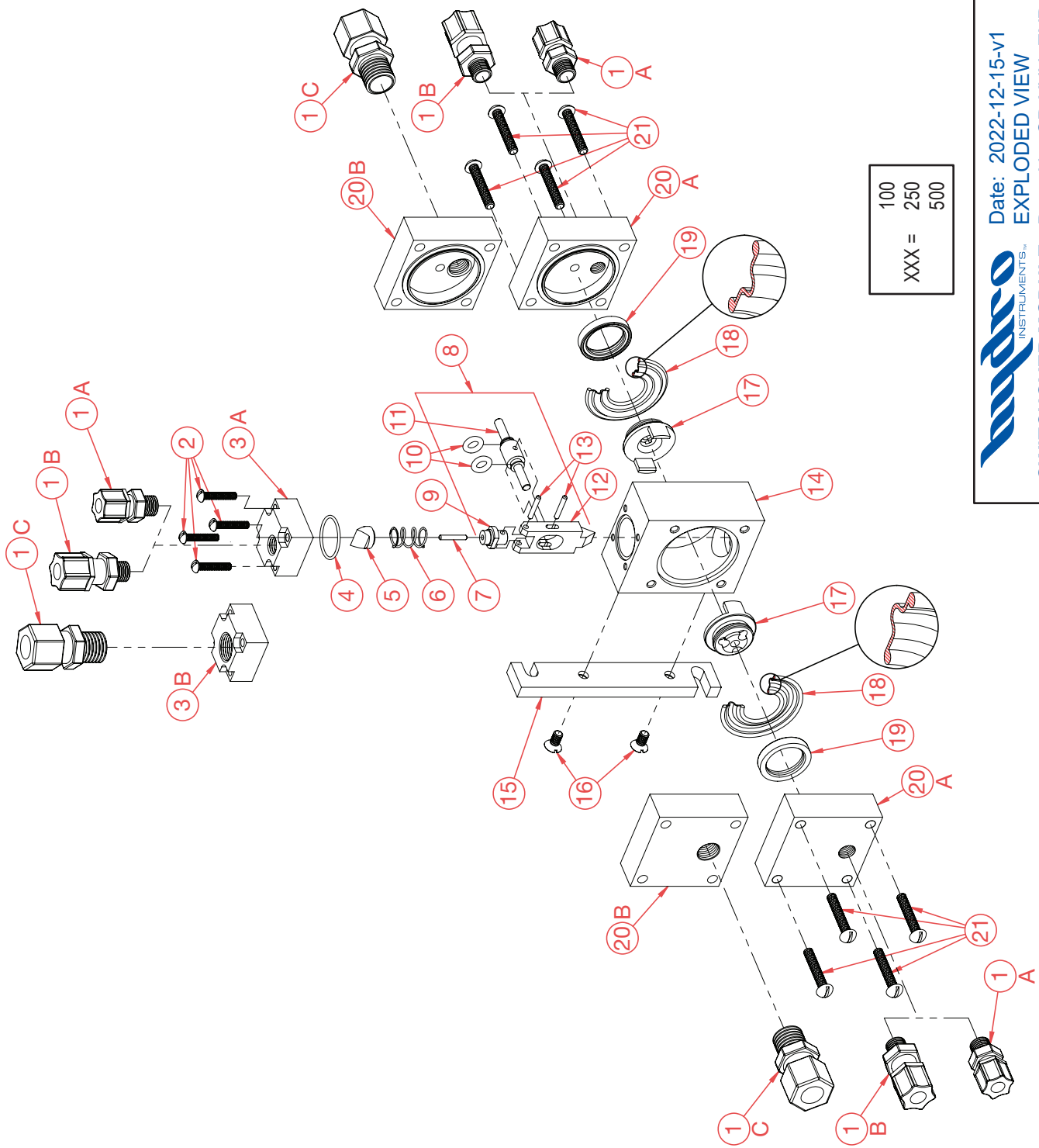
SP-100



SP-200



SP-500



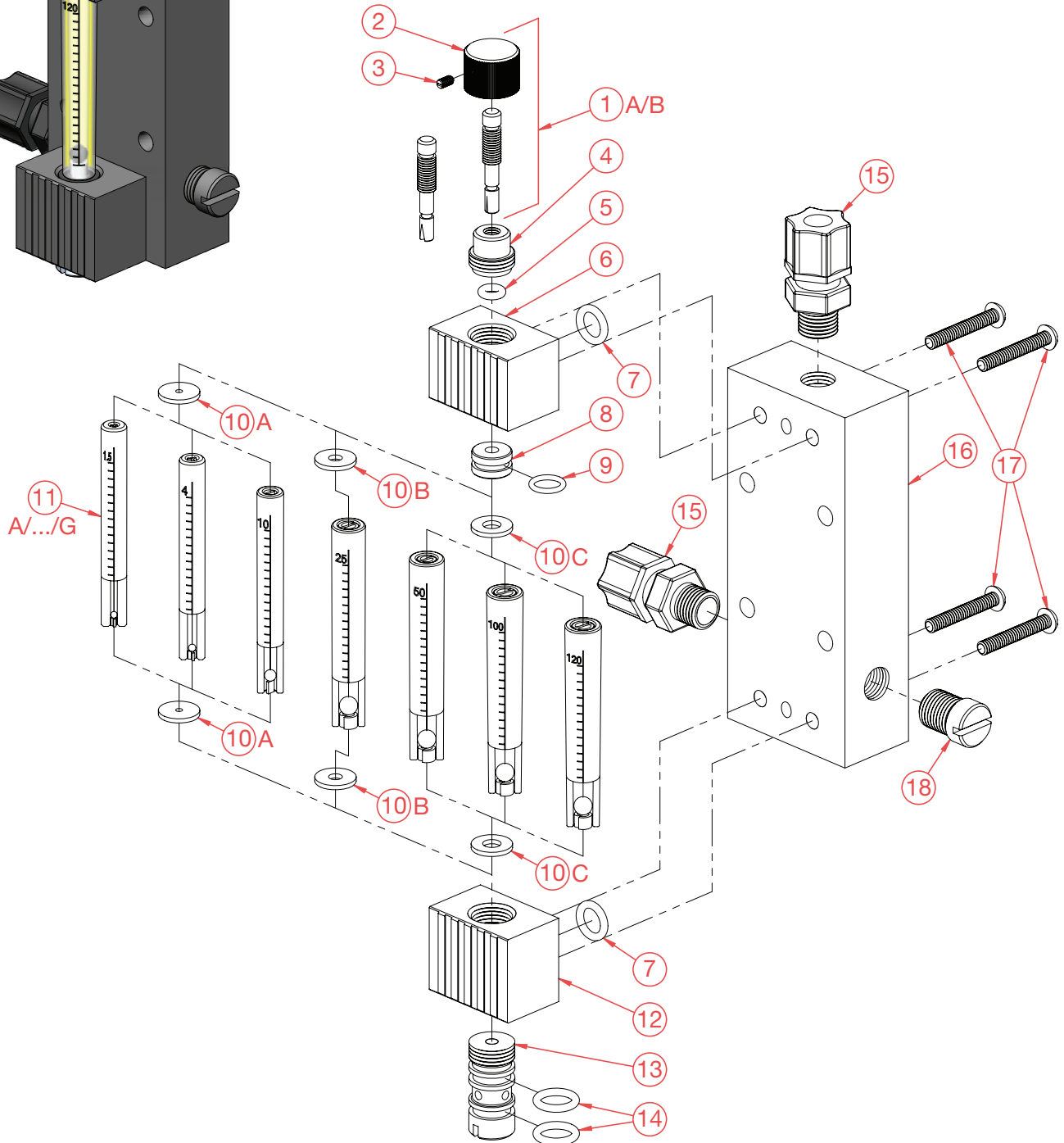
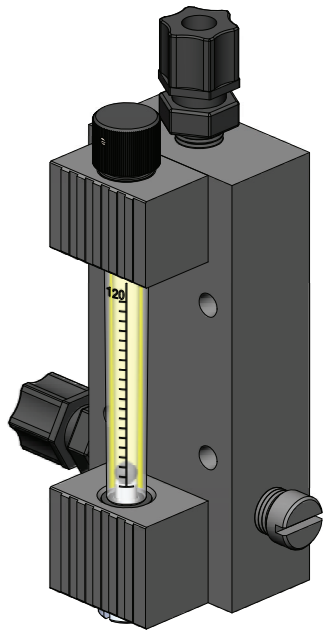
100
XXX = 250
500

Item No.	Description	Quantity	Part No.	Item No.	Description	Quantity	Part No.
1A	PM 3/8" Tube 1/4" NPT Tubing Connector	3	BKF-64	PM	Part & Maintenance Kit (100 PPD)	1	KT1-100-SOM
1B	PM 1/2" Tube 1/4" NPT Tubing Connector	3	BKF-84	PM	Part & Maintenance Kit (250 PPD)	1	KT2-250-SOM
1C	PM 5/8" Tube 1/2" NPT Tubing Connector	3	BKF-108	PM	Part & Maintenance Kit (500 PPD)	1	KT7-500-SOM
2	#10-24 x 1" Top Cap screw (Monel)	4	#10-24 x 1"				
3A	Top Cap (for SP-100 and SP-200)	1	SM-106-250				
3B	Top Cap (for SP-500)	1	SM-106-500				
4	PM O-Ring	1	OH-VIT-023				
5	Spring Pin Guide	1	SM-104				
6	Spring (Hastelloy)	1	YM-103-HC				
7	Spring Guide Pin	1	SM-105				
8	Toggle Assembly	1	SM-Assembly				
9	* Spring Pivot	1	SM-103				
10	PM * O-Ring	2	OH-VIT-203				
11	* Valve Plug	1	SM-100				
12	* Pivot Arm	1	SM-102				
13	* Hinge Pin	2	SM-101				
14	Center Body	1	SM-108				
15	Mounting Bracket	1	SM-109				
16	Mounting Bolt (Zinc-plated)	2	1/4-20 x 1/2"				
17	Diaphragm Bolt	2	SM-110				
18	PM Rolling Diaphragm	2	SM-112				
19	Diaphragm Nut	2	SM-111				
20A	End Cap (for SP-100, SP-200)	2	SM-107-250				
20B	End Cap (for SP-500)	2	SM-107-500				
21	1/4-20 x 1 1/2" End Cap screw (Monel)	8	1/4-20 x 1 1/2"				
*	Items 9, 10, 11, 12, and 13 are sold pre-assembled as the Toggle Assembly (Item 8), "SM-Assembly"						

100
XXX = 250
500



Date: 2022-12-15-v1  
 BILL OF MATERIALS  
 SWITCHOVER MODULE Dwg. No. SP-XXX, BOM

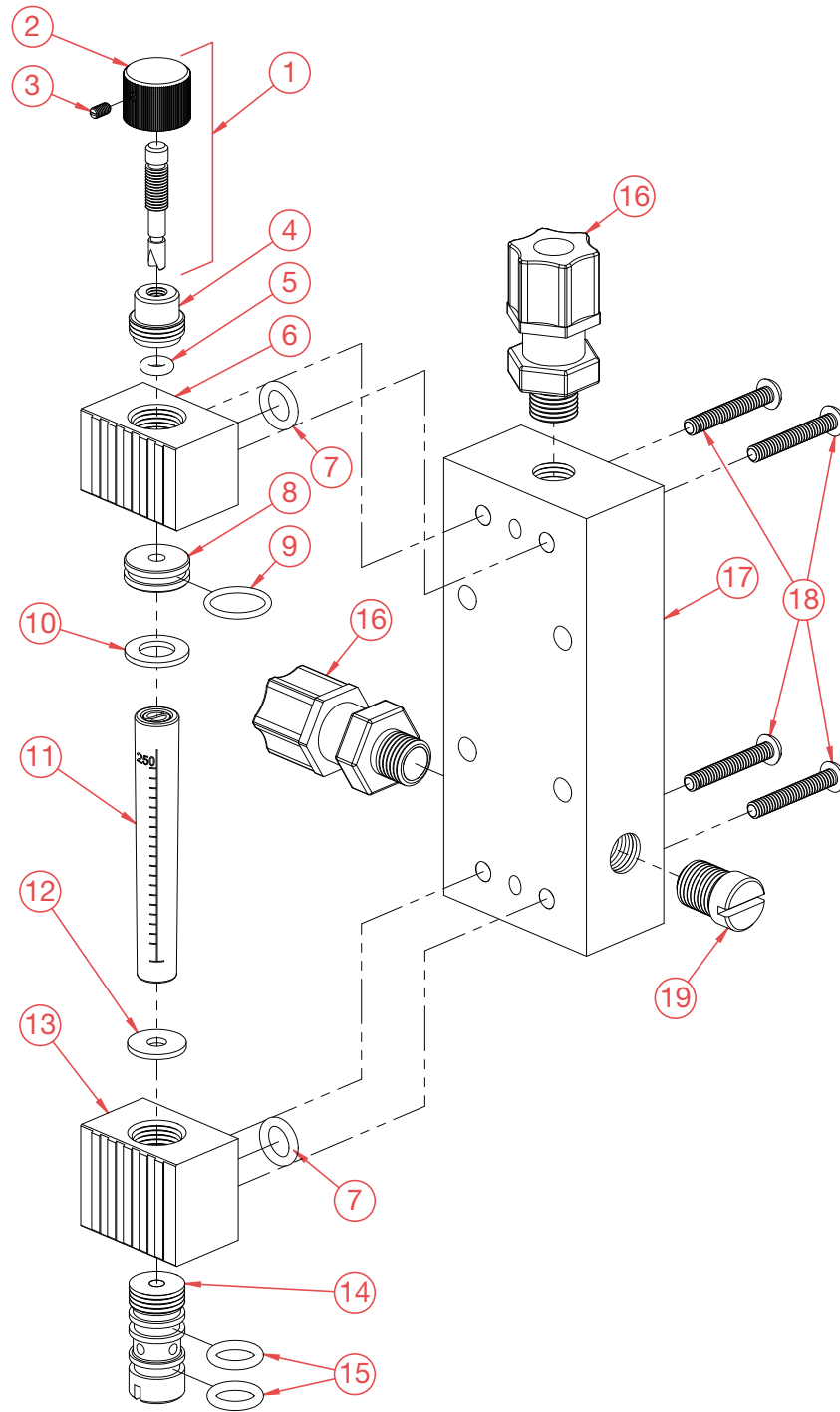
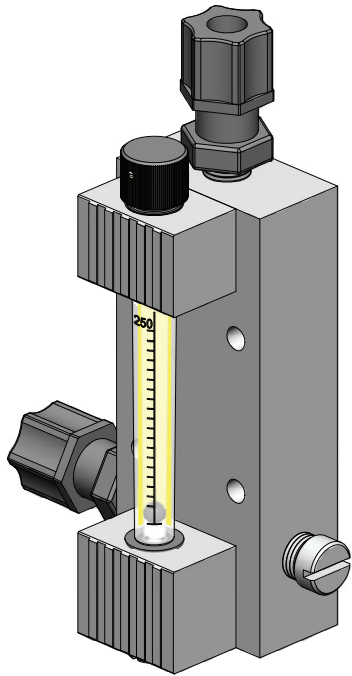



 Date: 2022-12-15-v1  
 EXPLODED VIEW  
 100 PPD REMOTE METER Dwg. No. RM-401, EXP

Item No.	Description	Quantity	Part No.
1A	Rate Valve Stem & Knob (10 PPD)	1	VP-103C-010
1B	Rate Valve Stem & Knob (100 PPD)	1	VP-103C-100
2	Rate Valve Knob	1	RV-100A
3	Rate Valve Knob Set Screw	1	#5-40 x 1/4"
4	Valve Bonnet	1	VB-100C
5	<sup>PM</sup> O-Ring	1	OH-VIT-106
6	Top Meter Block	1	FM-100B
7	<sup>PM</sup> O-Ring	2	OH-VIT-110
8	Rate Valve Seat	1	VT-104
9	<sup>PM</sup> O-Ring	1	OH-VIT-012
10A	<sup>PM</sup> Meter Gasket (1.5-10 PPD)	2	MG-001-010
10B	<sup>PM</sup> Meter Gasket (25 PPD)	2	MG-001-025
10C	<sup>PM</sup> Meter Gasket (50-120 PPD)	2	MG-001-100
11A	Meter Tube, 1.5 PPD	1	MTB-11-0015
11B	Meter Tube, 4 PPD (75 gr/hr)	1	MTB-11-004
11C	Meter Tube, 10 PPD (200 gr/hr)	1	MTB-11-010
11D	Meter Tube, 25 PPD (500 gr/hr)	1	MTB-11-025
11E	Meter Tube, 50 PPD (1000 gr/hr)	1	MTB-11-050
11F	Meter Tube, 100 PPD (2000 gr/hr)	1	MTB-11-100
11G	Meter Tube, 120 PPD (2500 gr/hr)	1	MTB-11-120
12	Bottom Meter Block	1	FM-103
13	Inlet Plug	1	FM-101A
14	<sup>PM</sup> O-Ring	2	OH-VIT-112
15	<sup>PM</sup> 1/4" NPT 3/8" Tube Tubing Connector	2	BKF-64
16	Back Body	1	RM-1-250
17	Remote Meter Block Screws (Monel)	4	#10-24 x 1 1/4"
18	1/4" NPT Plug (PVC)	1	PLH-108-250
<sup>PM</sup>	Part & Maintenance Kit (100 PPD)	1	KT4-100-RMP



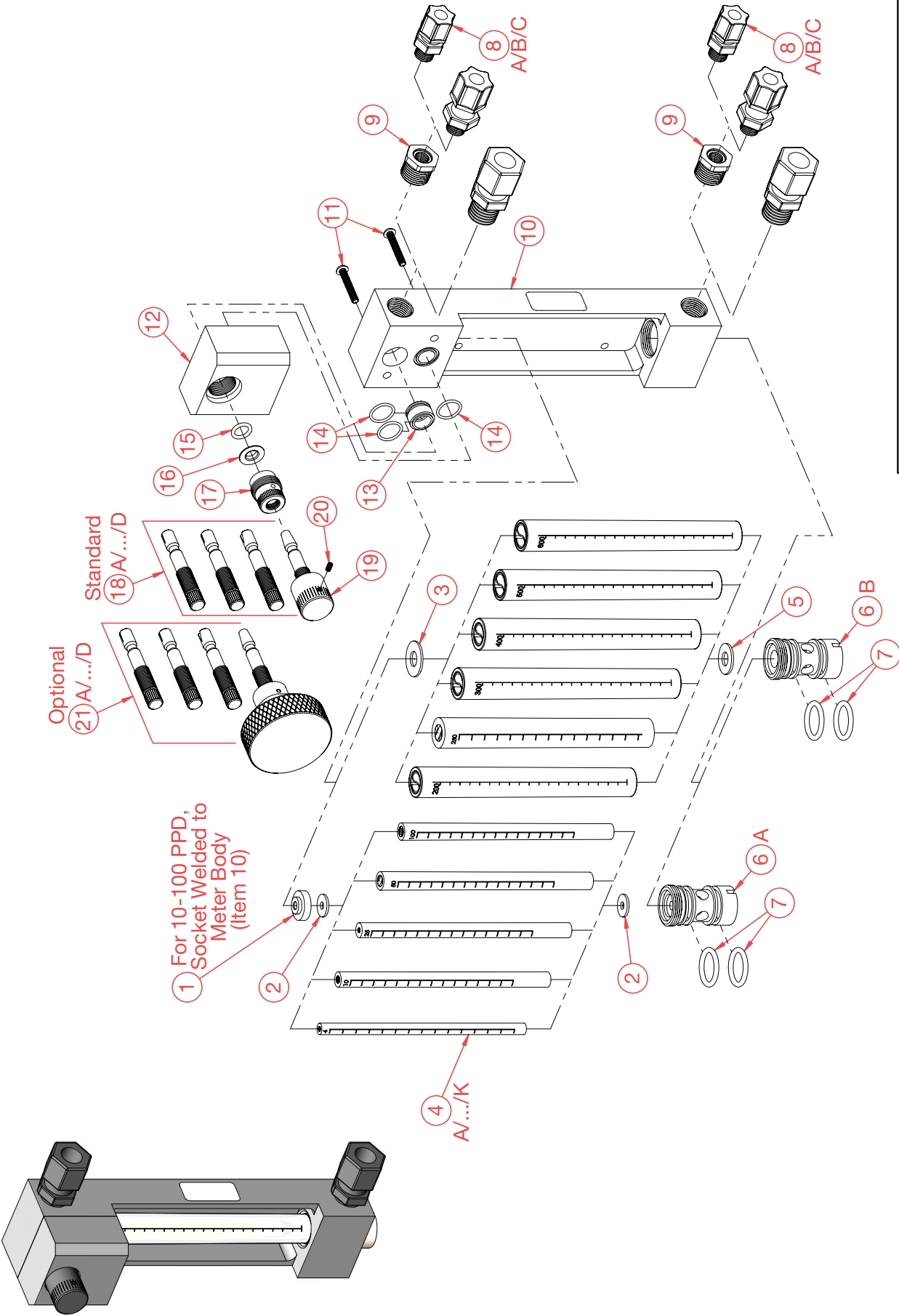
Date: 2022-12-15-v1  
 BILL OF MATERIALS  
 Dwg. No. RM-401, BOM



Date: 2022-12-15-v1  
EXPLODED VIEW  
Dwg. No. RM-200, EXP

250 PPD REMOTE METER

Item No.	Description	Quantity	Part No.
1	Rate Valve Stem & Knob (250 PPD)	1	VP-203C
2	Rate Valve Knob	1	RV-100A
3	Rate Valve Knob Set Screw	1	#5-40 x ¼"
4	Valve Bonnet	1	VB-100C
5	<sup>PM</sup> O-Ring	1	OH-VIT-106
6	Top Meter Block	1	FM-200B
7	<sup>PM</sup> O-Ring	2	OH-VIT-110
8	Rate Valve Seat	1	VT-204
9	<sup>PM</sup> O-Ring	1	OH-VIT-016
10	<sup>PM</sup> Top Meter Gasket	1	MG-200T
11	Meter Tube, 250 PPD (5 kg/hr)	1	MTB-11-250
12	<sup>PM</sup> Bottom Meter Gasket	1	MG-001-100
13	Bottom Meter Block	1	FM-103
14	Inlet Plug	1	FM-101A
15	<sup>PM</sup> O-Ring	2	OH-VIT-112
16	<sup>PM</sup> ¼" NPT ½" Tube Tubing Connector	2	BKF-84
17	Back Body	1	RM-2-250
18	Remote Meter Block Screws (Monel)	4	#10-24 x 1¼"
19	¼" NPT Plug (PVC)	1	PLH-108-250
<sup>PM</sup>	Part & Maintenance Kit (250 PPD)	1	KT2-250-RMP

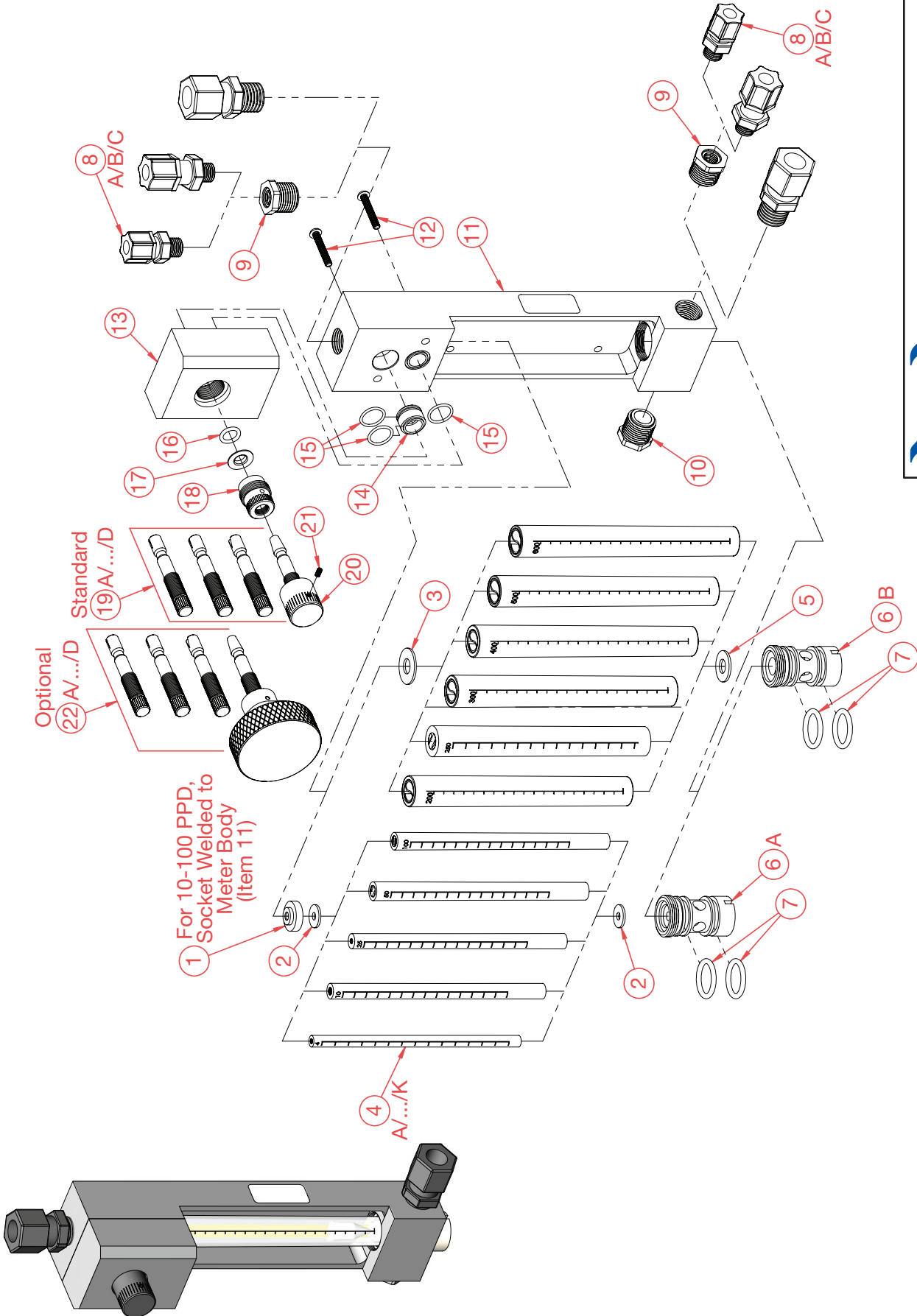




Item No.	Description	Quantity	Part No.	Item No.	Description	Quantity	Part No.
1	Meter Tube Adapter, 10-100 PPD (Socket Welded to Meter Body, Item 10)	1	MPH-830-101	11	Remote Meter Block Screws (Monel)	2	#10-24 x 1 1/4"
2	PM Meter Gasket, Top and Bottom	2	MG-200B	12	Top Meter Block	1	TMB-501
3	PM Top Meter Gasket, 200-600 PPD	1	G-161	13	Rate Valve Seat	1	VT-504
4A	Meter Tube, 4 PPD (75 gr/hr)	1	MT-678-004	14	PM O-Ring	3	OH-VIT-016
4B	Meter Tube, 10 PPD (200 gr/hr)	1	MTH-129-010	15	PM O-Ring	1	OH-VIT-111
4C	Meter Tube, 25 PPD (500 gr/hr)	1	MTH-129-025	16	PM Shaft Seal (Teflon)	1	SA-498
4D	Meter Tube, 50 PPD (1000 gr/hr)	1	MTH-129-050	17	Rate Valve Bonnet	1	S-493
4E	Meter Tube, 100 PPD (2000 gr/hr)	1	MTH-129-100	18A	Rate Valve Stem & Knob (4-10 PPD)	1	SA-495-010
4F	Meter Tube, 200 PPD (4 kg/hr)	1	MT-678-200	18B	Rate Valve Stem & Knob (25-100 PPD)	1	SA-495-100
4G	Meter Tube, 250 PPD (5 kg/hr)	1	MT-678-250	18C	Rate Valve Stem & Knob (200-250 PPD)	1	SA-495-250
4H	Meter Tube, 300 PPD (6 kg/hr)	1	MT-678-300	18D	Rate Valve Stem & Knob (300-600 PPD)	1	SA-495
4I	Meter Tube, 400 PPD (8 kg/hr)	1	MT-678-400	19	Rate Valve Knob	1	S-496
4J	Meter Tube, 500 PPD (10 kg/hr)	1	MT-678-500	20	Rate Valve Knob Set Screw (stainless)	1	#6-32 x 1/4"
4K	Meter Tube, 600 PPD (12 kg/hr)	1	MT-678-600	21A	Rate Valve Stem & Large Knob (4-10 PPD)	1	S-495-CAB-010
5	PM Bottom Meter Gasket, 200-600 PPD	1	G-162	21B	Rate Valve Stem & Large Knob (25-100 PPD)	1	S-495-CAB-100
6A	Meter Inlet (4-100 PPD)	1	MIH-232-101	21C	Rate Valve Stem & Large Knob (200-250 PPD)	1	S-495-CAB-250
6B	Meter Inlet (200-600 PPD)	1	MIH-232-500	21D	Rate Valve Stem & Large Knob (300-600 PPD)	1	S-495-CAB-500
7	PM O-Ring	2	OH-VIT-212	PM	Part & Maintenance Kit (4 PPD)		KT1-702-RMP4
8A	PM 1/4" NPT 3/8" Tube Tubing Connector	2	BKF-64	PM	Part & Maintenance Kit (100 PPD)		KT1-702-RMP
8B	PM 1/4" NPT 1/2" Tube Tubing Connector	2	BKF-84	PM	Part & Maintenance Kit (250 PPD)		KT2-702-RMP
8C	PM 1/2" NPT 5/8" Tube Tubing Connector	2	BKF-108	PM	Part & Maintenance Kit (600 PPD)		KT5-702-RMP
9	1/2" x 1/4" PVC Reducing Bushing (Required if using 1/4" NPT tubing connectors)	2	839-072				
10A	Meter Body, 10-100 PPD (Socket Welded to Meter Tube Adapter, Item 1)	1	TFM-501				
10B	Meter Body	1	TFM-501				



Date: 2022-12-15-v1  
 BILL OF MATERIALS  
 Dwg. No. RM-702, BOM



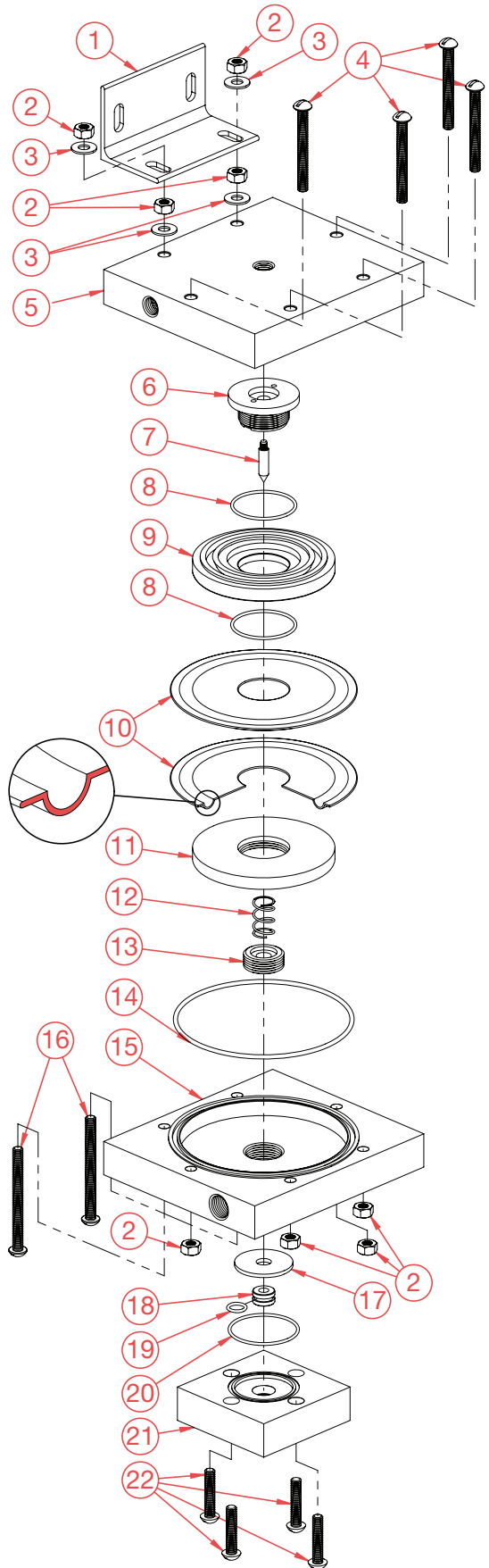
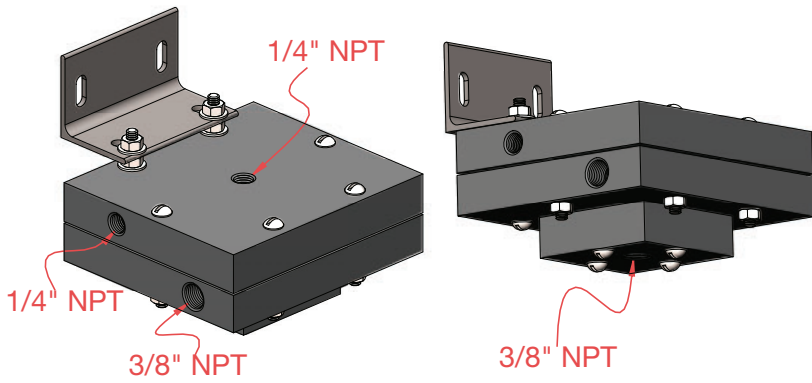
**midpro**  
INSTRUMENTS™  
UP TO 600 PPD / 12 kg/hr  
REMOTE METER

Date: 2022-12-15-v1  
EXPLODED VIEW  
Dwg. No. RM-703, EXP

Item No.	Description	Quantity	Part No.	Item No.	Description	Quantity	Part No.
1	Meter Tube Adapter, 10-100 PPD (Socket Welded to Meter Body, Item 11)	1	MPH-830-101	11B	Meter Body	1	TFM-501-T
2	<sup>PM</sup> Meter Gasket, Top and Bottom	2	MG-200B	12	Remote Meter Block Screws (Monel)	2	#10-24 x 1 1/4"
3	<sup>PM</sup> Top Meter Gasket, 200-600 PPD	1	G-161	13	Top Meter Block	1	TMB-501-T
4A	Meter Tube, 4 PPD (75 gr/hr)	1	MT-678-004	14	Rate Valve Seat	1	VT-504
4B	Meter Tube, 10 PPD (200 gr/hr)	1	MTH-129-010	15	<sup>PM</sup> O-Ring	3	OH-VIT-016
4C	Meter Tube, 25 PPD (500 gr/hr)	1	MTH-129-025	16	<sup>PM</sup> O-Ring	1	OH-VIT-111
4D	Meter Tube, 50 PPD (1000 gr/hr)	1	MTH-129-050	17	<sup>PM</sup> Shaft Seal (Teflon)	1	SA-498
4E	Meter Tube, 100 PPD (2000 gr/hr)	1	MTH-129-100	18	Rate Valve Bonnet	1	S-493
4F	Meter Tube, 200 PPD (4 kg/hr)	1	MT-678-200	19A	Rate Valve Stem & Knob (4-10 PPD)	1	SA-495-010
4G	Meter Tube, 250 PPD (5 kg/hr)	1	MT-678-250	19B	Rate Valve Stem & Knob (25-100 PPD)	1	SA-495-100
4H	Meter Tube, 300 PPD (6 kg/hr)	1	MT-678-300	19C	Rate Valve Stem & Knob (200-250 PPD)	1	SA-495-250
4I	Meter Tube, 400 PPD (8 kg/hr)	1	MT-678-400	19D	Rate Valve Stem & Knob (300-600 PPD)	1	SA-495
4J	Meter Tube, 500 PPD (10 kg/hr)	1	MT-678-500	20	Rate Valve Knob	1	S-496
4K	Meter Tube, 600 PPD (12 kg/hr)	1	MT-678-600	21	Rate Valve Knob Set Screw (stainless)	1	#6-32 x 1/4"
5	<sup>PM</sup> Bottom Meter Gasket, 200-600 PPD	1	G-162	22A	Rate Valve Stem & Large Knob (4-10 PPD)	1	S-495-CAB-010
6A	Meter Inlet (4-100 PPD)	1	MIH-232-101	22B	Rate Valve Stem & Large Knob (25-100 PPD)	1	S-495-CAB-100
6B	Meter Inlet (200-600 PPD)	1	MIH-232-500	22C	Rate Valve Stem & Large Knob (200-250 PPD)	1	S-495-CAB-250
7	<sup>PM</sup> O-Ring	2	OH-VIT-212	22D	Rate Valve Stem & Large Knob (300-600 PPD)	1	S-495-CAB-500
8A	<sup>PM</sup> 1/4" NPT 3/8" Tube Tubing Connector	2	BKF-64	PM	Part & Maintenance Kit (4 PPD)		KT1-702-RMP4
8B	<sup>PM</sup> 1/4" NPT 1/2" Tube Tubing Connector	2	BKF-84	PM	Part & Maintenance Kit (100 PPD)		KT1-702-RMP
8C	<sup>PM</sup> 1/2" NPT 5/8" Tube Tubing Connector	2	BKF-108	PM	Part & Maintenance Kit (250 PPD)		KT2-702-RMP
9	1/2" x 1/4" PVC Reducing Bushing (Required if using 1/4" NPT tubing connectors)	2	839-072	PM	Part & Maintenance Kit (600 PPD)		KT5-702-RMP
10	1/2" PVC Plug	1	850-005				
11A	Meter Body, 10-100 PPD (Socket Welded to Meter Tube Adapter, Item 1)	1	TFM-501-T				



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 BILL OF MATERIALS  
 Dwg. No. RM-703, BOM

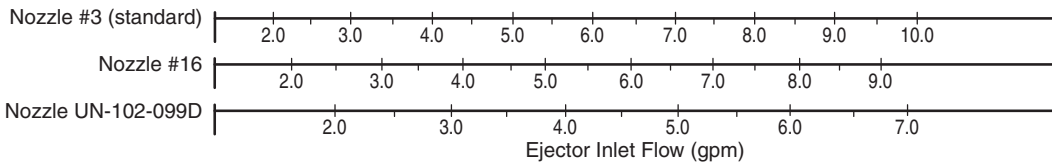
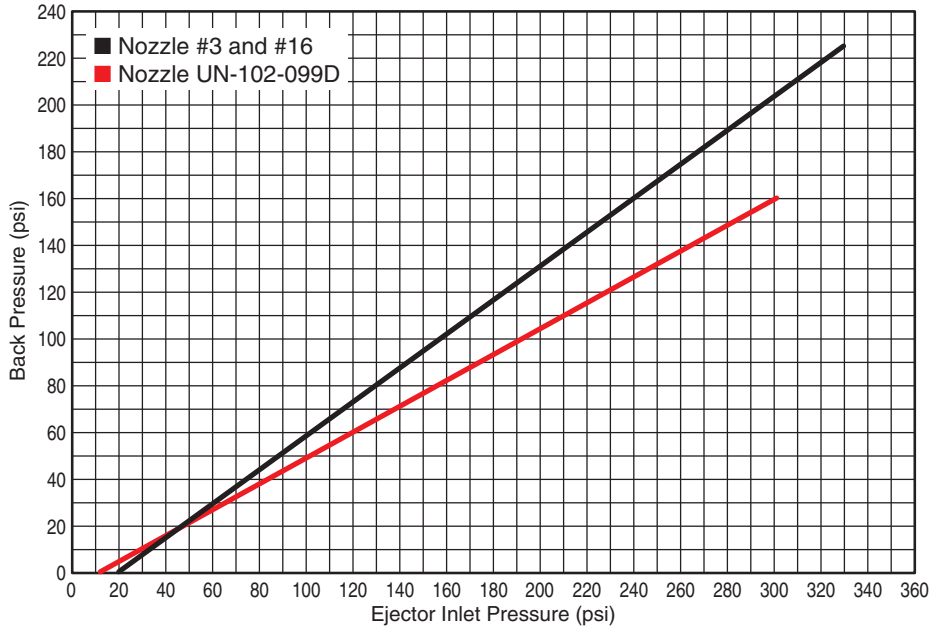


Item No.	Description	Quantity	Part No.
1	Mounting Bracket	1	DPMB-1
2	Hex Nut	8	1/4-20 HNUT
3	Flat Washer	4	1/4" Flat Washer
4	Monel Screws	4	1/4-20 x 2 1/4"
5	Front Body (1/4" NPT Port)	1	DP-FB1
6	Diaphragm Vent Plug	1	DPR-B-1
7	Rate Valve (PVDF)	1	DP-SRV
8	<sup>PM</sup> O-Ring	2	OH-VIT-029
9	Back Diaphragm Plate	1	DP-101A
10	<sup>PM</sup> Set of Two Diaphragms	1	DP-103
11	Front Diaphragm Plate	1	DP-100A
12	Spring (Hastelloy C-276)	1	YM-103-HC
13	Adjustment Screw	1	DP-AS1
14	<sup>PM</sup> O-Ring	1	OH-VIT-156
15	Back Body (3/8" NPT Port)	1	DP-BB1-500
16	Monel Screws	2	1/4-20 x 2 3/4"
17	Seal Disc	1	DP-SD-1
18	Rate Valve Seat	1	DPVS-1
19	<sup>PM</sup> O-Ring	1	OH-VIT-012
20	<sup>PM</sup> O-Ring	1	OH-VIT-030
21	Back Body Cap (3/8" NPT Port)	1	DP-BBC-500
22	Monel Screws	4	1/4-20 x 1 1/4"
<sup>PM</sup>	Part and Maintenance Kit (500 PPD)		KT5-500-DPR

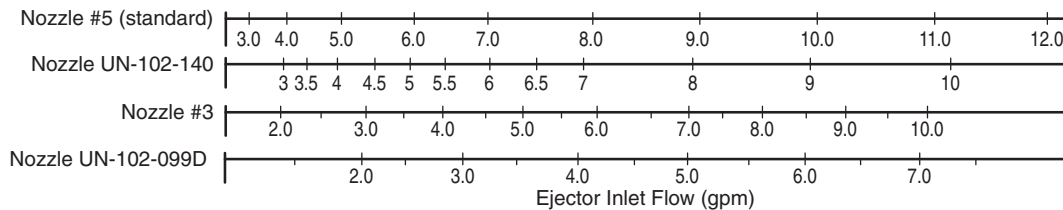
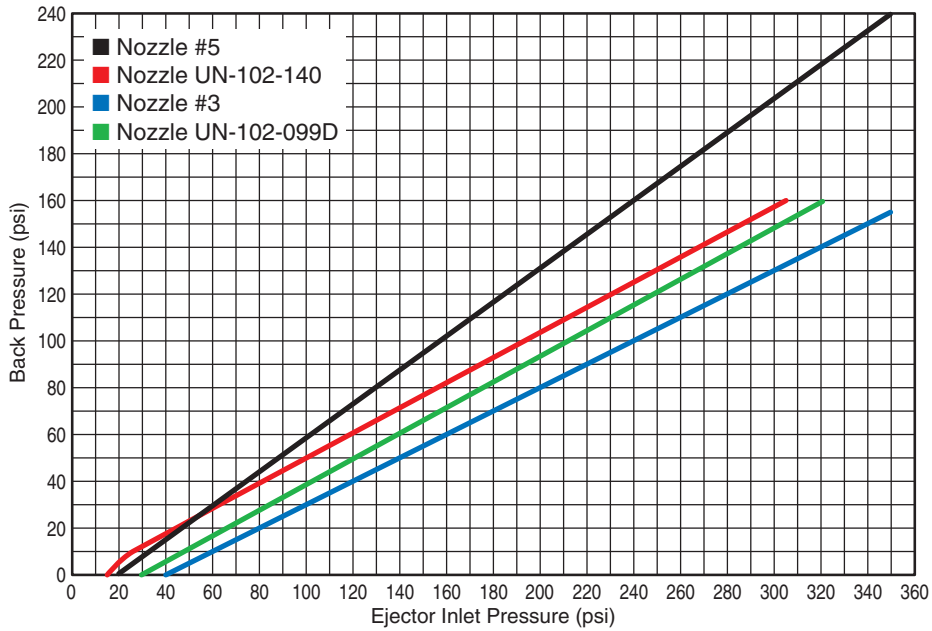


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 EXPLODED VIEW AND BOM  
 Dwg. No. DP-500

## NOZZLE SIZING CHART (10 PPD / 200 gr/hr)

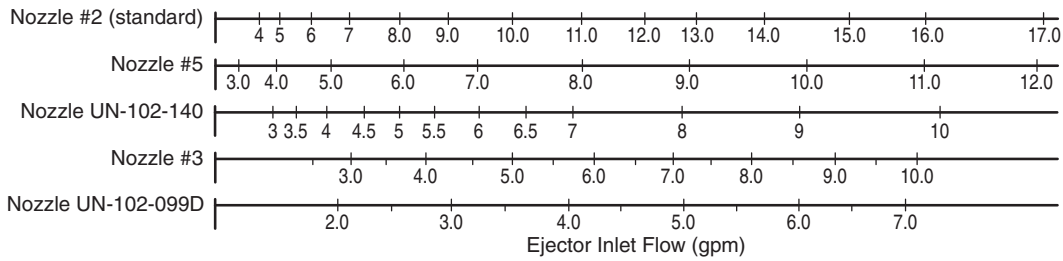
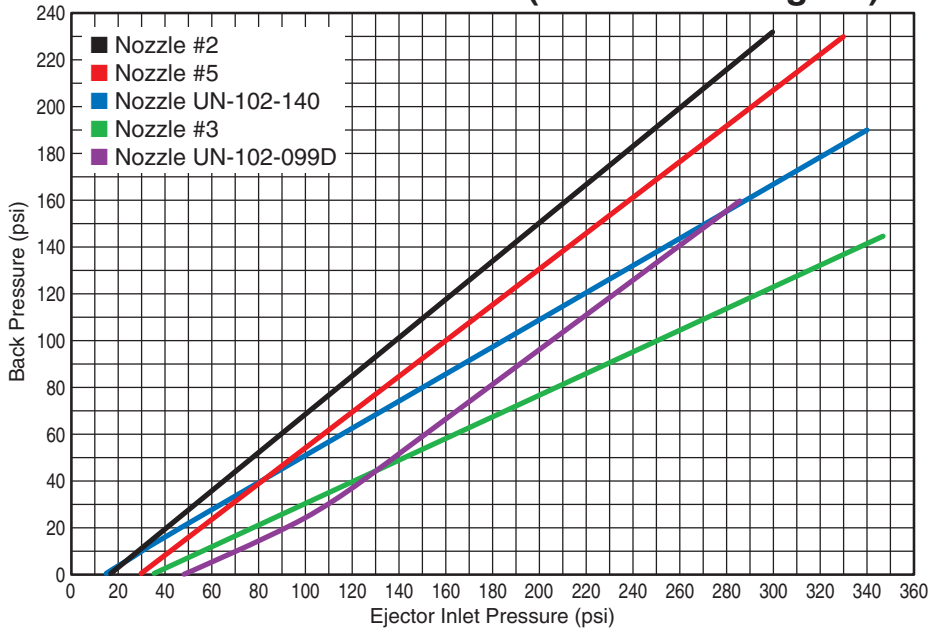


## NOZZLE SIZING CHART (25 PPD / 500 gr/hr)

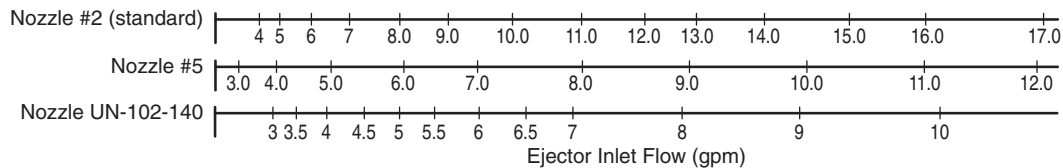
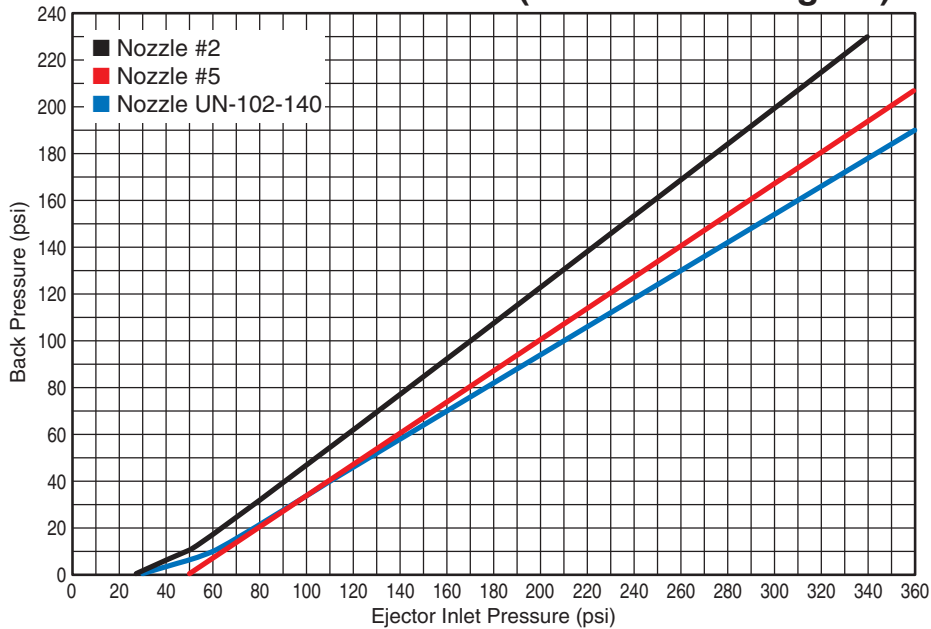


**Note:** Pressure combinations that plot below the line for any given nozzle are acceptable for operating that nozzle at the stated chemical feed rate for that chart. Pressure combinations that fall above the line for any given nozzle are not acceptable.

## NOZZLE SIZING CHART (50 PPD / 1000 gr/hr)

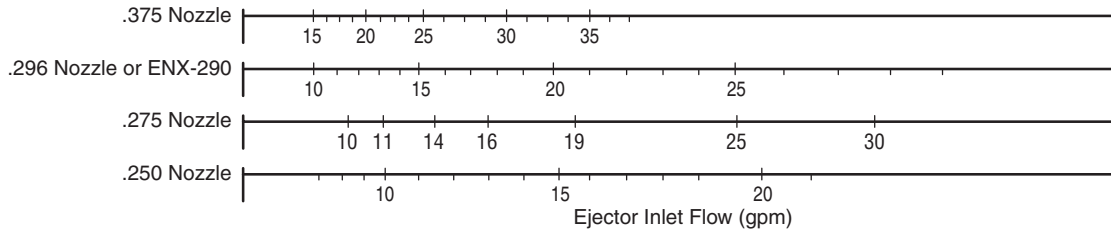
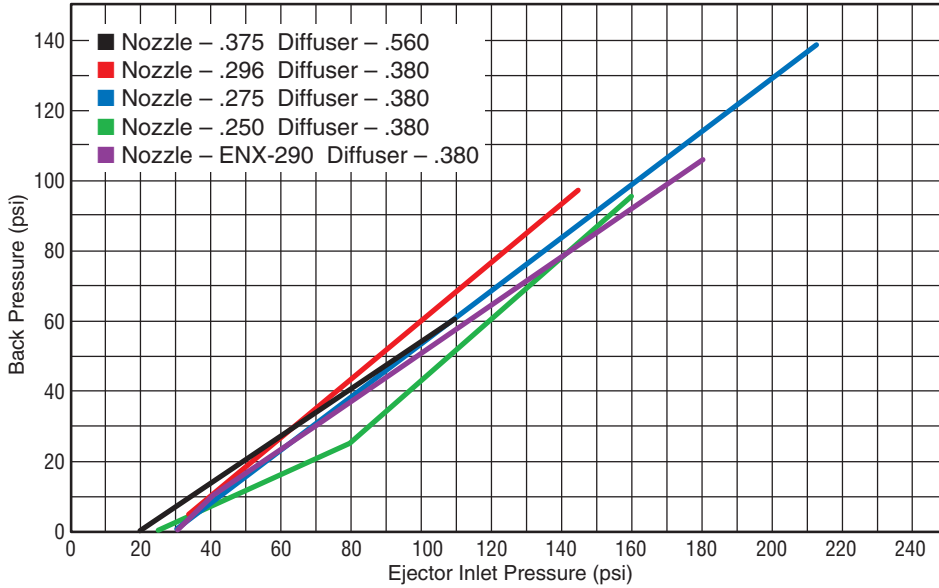


## NOZZLE SIZING CHART (100 PPD / 2000 gr/hr)

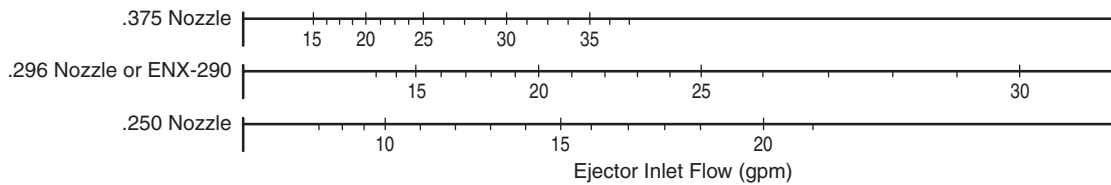
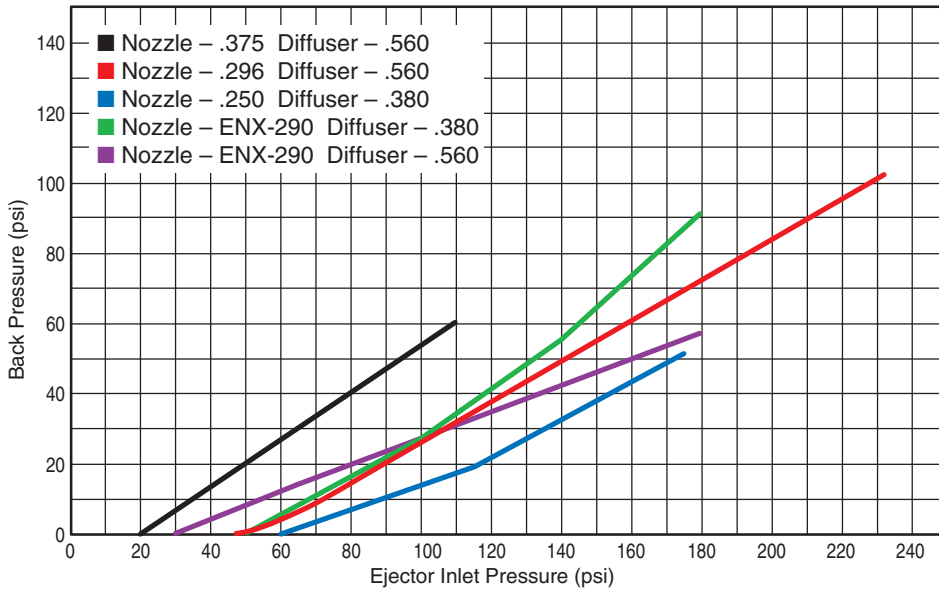


**Note:** Pressure combinations that plot below the line for any given nozzle are acceptable for operating that nozzle at the stated chemical feed rate for that chart. Pressure combinations that fall above the line for any given nozzle are not acceptable.

## NOZZLE SIZING CHART (250 PPD / 5 kg/hr)



## NOZZLE SIZING CHART (500 PPD / 10 kg/hr)



**Note:** Pressure combinations that plot below the line for any given nozzle are acceptable for operating that nozzle at the stated chemical feed rate for that chart. Pressure combinations that fall above the line for any given nozzle are not acceptable.

# Nozzle Tables

## 10 PPD (200 gr/hr)

Nozzle >	3		16		UN-102-099D	
Ejector Backpressure	PSI @ GPM		PSI @ GPM		PSI @ GPM	
0	20	1.9	18	1.5	12	1.2
10	32	2.2	33	2.0	29	1.5
20	48	2.7	48	2.4	47	1.9
30	60	3.0	60	2.7	65	2.3
40	75	3.5	75	3.1	83	2.6
50	89	3.9	90	3.6	101	3.0
60	102	4.3	103	3.9	120	3.4
70	116	4.7	116	4.3	138	3.8
80	130	5.1	130	4.7	156	4.1
90	143	5.5	145	5.1	174	4.5
100	157	5.9	156	5.4	192	4.9
110	170	6.3	171	5.8	210	5.2
120	185	6.7	185	6.2	228	5.6
130	198	7.0	198	6.6	246	6.0
140	213	7.5	213	7.0	264	6.3
150	227	7.9	227	7.4	282	6.7
160	240	8.3	240	7.7	301	7.1

## 25 PPD (500 gr/hr)

Nozzle >	5		UN-102-140		3		UN-102-099D	
Ejector Backpressure	PSI @ GPM		PSI @ GPM		PSI @ GPM		PSI @ GPM	
0	20	3.7	15	2.5	40	2.5	30	1.5
10	33	4.3	26	3.0	60	3.0	47	1.9
20	47	4.9	45	3.8	80	3.6	65	2.3
30	61	5.3	63	4.5	100	4.2	84	2.6
40	74	5.8	82	5.2	120	4.8	102	3.0
50	88	6.2	101	5.7	140	5.4	120	3.4
60	102	6.7	119	6.3	160	5.9	139	3.8
70	115	7.1	138	6.6	180	6.5	157	4.1
80	130	7.4	156	7.0	200	7.1	175	4.5
90	143	7.7	175	7.4	220	7.7	193	4.9
100	157	8.0	194	7.9	240	8.3	212	5.3
110	170	8.3	212	8.3	260	8.8	230	5.6
120	185	8.7	231	8.7	280	9.4	248	6.0
130	198	8.9	249	9.0	300	10.0	267	6.4
140	212	9.2	268	9.4	-	-	285	6.8
150	226	9.5	287	9.6	-	-	303	7.1
160	240	9.8	305	9.9	-	-	321	7.5



# Nozzle Tables

## 50 PPD (1 Kg/hr)

Nozzle >	2		5		UN-102-140		3		UN-102-099D	
Ejector Backpressure	PSI @ GPM		PSI @ GPM		PSI @ GPM		PSI @ GPM		PSI @ GPM	
0	16	4.0	30	4.3	15	2.8	35	2.3	48	1.9
10	25	5.0	43	4.8	28	3.5	55	2.9	70	2.4
20	40	5.8	55	5.1	48	4.1	75	3.5	92	2.8
30	50	6.3	69	5.4	64	4.5	95	4.1	110	3.2
40	65	7.1	81	6.0	82	5.3	120	4.8	124	3.5
50	80	8.0	95	6.6	100	5.7	141	5.4	137	3.7
60	90	8.6	109	6.8	120	6.3	162	6.0	151	4.0
70	105	9.1	120	7.2	132	6.5	183	6.6	164	4.3
80	115	9.6	134	7.6	150	6.9	205	7.3	178	4.6
90	127	10.0	147	7.8	170	7.4	226	7.9	191	4.8
100	139	10.4	160	8.1	185	7.8	247	8.5	205	5.1
110	152	10.8	173	8.4	202	8.2	268	9.1	218	5.4
120	165	11.3	188	8.7	221	8.5	290	9.8	232	5.7
130	176	11.8	200	9.0	239	8.8	-	-	245	5.9
140	189	12.2	213	9.2	255	9.1	-	-	259	6.2
150	200	12.7	226	9.5	273	9.4	-	-	272	6.5
160	216	13.3	240	9.8	290	9.7	-	-	286	6.8

## 100 PPD (2 Kg/hr)

Nozzle >	2		5		UN-102-140	
Ejector Backpressure	PSI @ GPM		PSI @ GPM		PSI @ GPM	
0	25	5.0	50	5.1	30	3.3
10	50	6.7	65	5.4	59	4.3
20	65	7.3	80	6.1	79	5.0
30	75	8.0	95	6.5	95	5.6
40	89	8.6	110	7.0	110	6.0
50	104	9.0	125	7.2	126	6.4
60	118	9.3	139	7.4	145	6.9
70	131	9.9	155	7.9	160	7.2
80	142	10.5	170	8.3	180	7.5
90	155	11.0	185	8.7	195	7.9
100	170	11.5	200	9.0	210	8.2
110	180	11.9	213	9.3	229	8.5
120	194	12.7	228	9.5	243	8.9
130	208	13.2	244	9.9	260	9.2
140	222	13.7	260	10.2	279	9.5
150	235	14.2	275	10.4	295	9.8
160	250	14.5	291	10.8	310	10.0

# Nozzle Tables

## 250 PPD (5 Kg/hr)

Nozzle >	0.375		0.296		ENX-290		0.275		0.250	
Throat >	0.560		0.380		0.380		0.380		0.380	
Ejector Backpressure	PSI @ GPM		PSI @ GPM		PSI @ GPM		PSI @ GPM		PSI @ GPM	
0	20	15.0	-	-	30	11.5	30	10.0	25	7.5
10	35	20.0	40	13.2	39	13.0	42	12.0	48	10.8
20	50	25.0	52	15.0	55	15.7	55	14.0	69	12.5
30	65	28.0	65	16.7	69	17.5	70	16.0	85	14.5
40	80	32.0	77	18.2	84	19.4	82	18.0	98	15.8
50	95	34.0	87	19.7	97	20.9	95	19.0	108	17.0
60	110	38.0	100	21.0	113	22.3	110	21.5	120	18.0
70	-	-	113	22.3	127	23.5	122	23.5	130	19.0
80	-	-	125	23.3	142	25.5	135	24.0	143	19.6
90	-	-	137	24.5	157	26.2	150	26.0	155	20.3
100	-	-	148	25.4	172	27.3	162	27.5	-	-
110	-	-	160	26.3	-	-	175	29.0	-	-
120	-	-	172	27.0	-	-	189	31.0	-	-
130	-	-	183	27.8	-	-	201	33.0	-	-
140	-	-	196	28.7	-	-	213	35.0	-	-
150	-	-	208	29.4	-	-	-	-	-	-
160	-	-	217	30.0	-	-	-	-	-	-

## 500 PPD (10 Kg/hr)

Nozzle >	0.375		0.296		ENX-290		ENX-290		0.250	
Throat >	0.560		0.560		0.560		0.380		0.380	
Ejector Backpressure	PSI @ GPM		PSI @ GPM		PSI @ GPM		PSI @ GPM		PSI @ GPM	
0	20	15.0	48	14.5	30	11.0	50	15.0	60	12.0
10	35	20.0	72	18.3	52	15.5	67	17.5	90	15.0
20	50	24.9	90	20.6	80	19.3	85	20.0	117	17.5
30	64	27.2	105	22.2	107	22.4	104	22.1	135	19.3
40	80	31.0	123	24.2	132	25.3	118	23.6	154	20.5
50	96	34.0	140	25.5	160	26.5	132	25.1	172	22.0
60	110	37.0	160	26.7	-	-	145	25.8	-	-
70	-	-	175	27.4	-	-	157	26.5	-	-
80	-	-	192	28.5	-	-	168	27.0	-	-
90	-	-	210	29.2	-	-	179	27.7	-	-
100	-	-	229	30.5	-	-	-	-	-	-