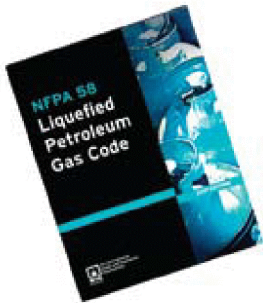


## LP-Gas Internal Valves

### Safety Warning



#### Purpose

In its continuing quest for safety, Engineered Controls International, Inc. publishes a series of bulletins explaining the hazards associated with the use, misuse, and aging of LP-Gas valves and regulators. It is hoped that these factual bulletins will make clear to LP-Gas dealer managers and service personnel, that the utmost care and attention must be used in the installation, inspection, and maintenance of these products, or problems could occur which would result in injuries and property damage.

The National Fire Protection Association Pamphlet #58, "Storage and Handling of Liquefied Petroleum Gases" states in section 1-6 that "In the interest of safety, all persons employed in handling LP-Gases shall be trained in proper handling and operating procedures". These "ECII® Safety Warnings" may be useful in training new employees and reminding older employees of hazards that can occur.

It is recommended that all employees be furnished with a copy of NPGA Safety Pamphlet 306-88 "LP-Gas Regulator and Valve Inspection and Maintenance, 111-81 Limitations of Excess Flow Check Valves for LP-Gas, and 113-78 Safety Considerations in Bobtail Deliveries."

### Nature of Warnings

It is recognized that warnings should be as brief as possible, but the factors involved in internal valve and excess flow valve failures to perform are not simple. They need to be fully understood. If there is a simple warning, it would be:

**Make sure that the internal valve's excess flow feature really closes when the flow exceeds rated closing flow, and that the valve will shut-off.**

This bulletin is not intended to be an exhaustive treatment of internal valves, and certainly does not cover all safety practices that should be followed in installation, operation and maintenance of LP-Gas systems, which include internal valves.

**Internal valves must be closed on Cargo Vehicles when traveling on public roads and highways. The valve should only be open when pumping. Per MC 330 or 331, internal valves must also be equipped with remote closure system, when used on transports or bobtails.**

There are two types of internal valves being used on storage tanks, transports and bobtails — spring loaded internal valves and differential pressure internal valves. They both provide positive shut-off when product is not being withdrawn and may include excess flow protection for the system during transfer operations.

#### Spring Loaded Internal Valves

Spring loaded internal valves are manually opened by levers, by means of fuse linked cable mechanisms or pneumatic or hydraulic actuators. They incorporate an excess flow feature that will close the valve when the flow through the valve exceeds its rate of flow. **These valves should never be locked open by means of wires, chains, pegs or other devices.**

#### Testing

**Testing should be completed on a periodic basis.**

1. To check operation of a spring loaded valve, activate the remote control to close the valve while unit is pumping. If the meter indicator flow continues, the valve should be repaired immediately.
2. Testing excess flow feature.  
The National Propane Gas Association Safety Bulletin #113-78 states: "In order to test an excess flow valve in a piping system, the flow through the valve must be made to exceed the valve's closing rating."



**This testing should only be attempted by trained personnel familiar with the process. If no one at the facility has experience in proper testing, outside expert help should be obtained.**

The exact procedure used may vary with the installation, advisability of gas discharge and availability of equipment.

In general, most testing makes use of the fact that the excess flow valves are "surge sensitive" and will close quicker under a sudden flow surge than under steady flow. A sufficient surge can often be created by using a quick open/close valve to control sudden, momentary flow into a tank or piping section containing very low pressure. An audible click from the excess flow valve (and

corresponding stoppage of flow) indicates its closure.

A test involving venting gas to the atmosphere is hazardous and may be impractical, or illegal.

Any test of any excess flow valve will not prove that the valve will close in an emergency situation, due to reasons cited before. This test will only check the valves condition, and the flow rate sizing for those test conditions.

3. **Tight Shut-Off** — A test should be made to insure the internal valve will give a gas tight seal when the valve is in the closed position. This will require removal of all product downstream from the internal valve, to insure the valve will give 100% seal when in the closed position. If the internal valve does not give 100% seal the valve should be repaired immediately.

## Pressure Differential Internal Valves (Flomatics)

Pressure differential valves (Flomatics) open by pump pressure and close when the pump stops.

These valves must never be locked open by means of wires, chains, pegs or other devices.

### Testing

Testing should be completed on a periodic basis.

1. To check operation of a differential pressure internal valve activate the remote control shut-off valve while the unit is pumping. If the meter indicates that flow continues the valve should be repaired immediately.
2. Since the differential pressure internal valve requires at least 18 psi to open and 8 psi over container pressure to keep open, a test may be performed to check for closure. With the PTO disengaged, connect delivery hose to a container with very low pressure. Then with hose end valve open, engage PTO. The internal valve should remain closed, no flow should be detected through the meter. If flow continues through the meter the valve should be repaired immediately.
3. **Tight Shut-Off** — A test should be made to insure the internal valve will give a gas tight seal when the valve is in the closed position. First insure the pump prime valve is closed by turning clockwise until it seats. Then with the valve closed (PTO disengaged) the product downstream from the internal valve will have to be safely removed. If the internal valve does not give 100% seal, the valve should be repaired immediately.

### General Warning

All ECII® Products are mechanical devices that will eventually become inoperative due to wear, contaminants, corrosion and aging of components made of materials such as metal and rubber.



The environment and conditions of use will determine the safe service life of these products. Periodic testing at least once a year when tank pressures are low and maintenance, as required, are essential.

Because ECII® products have a long and proven record of quality and service, LP-Gas dealers may forget the hazards that can occur because an excess flow valve is used beyond its safe service life. Life of an excess flow valve is determined by the environment in which it "lives". The LP-Gas dealer knows better than anyone what this environment is.

**NOTE:** There is a developing trend in state legislation and in proposed national legislation to make the owners of products responsible for replacing products before they reach the end of their safe useful life. LP-Gas dealers should be aware of legislation which could effect them.

## Manual Internal Valves

### A3200 Series

#### General Information

Manual Internal Valves are designed for a variety of uses in LP-Gas and anhydrous ammonia service. In addition, accessories allow most of them to be actuated manually, by cable or with air.

Installation, usage and maintenance of this product must be in compliance with all Engineered Controls International, Inc. instructions, as well as requirements and provisions of NFPA # 58, DOT, ANSI, and all applicable federal, state, provincial, and local standards, codes, regulations and laws.

These valves must remain in the closed position except during product transfer. A line break downstream of the pump may fail to actuate the excess flow valve as the pump may limit flow. If break occurs in the system, or the excess flow closes, immediately shut down the system.

Inspection and maintenance on a periodic basis is essential. Installation and maintenance must be performed only by qualified personnel.

Be sure all instructions are read and understood before installation and operation of these valves.

#### How The Valves Work

Refer to the drawings. View "A" shows the valve held closed without leakage by tank pressure and the valve's closing spring. Actuation of the operating handle alone does not open the valve, it only allows pressure to equalize between the inlet and outlet of the valve by rapid bleeding of the product downstream. This equalized pressure then allows the valve to open via the internal spring.

The valve opens by moving the handle to mid-point, see view "B". This position allows the actuator to put the equalizing portion of the valve stem in the pilot opening, allowing more product to bleed downstream than if the handle was fully open.

In a few seconds, the tank and downstream pressure will be nearly equal. The excess flow spring will push the main poppet to the open position, see view "C", the handle should then be moved to the fully open position.

If at first, the handle is quickly moved to the fully opened position, the pilot valve allows a small amount of bleed downstream, but much less than during rapid bleed (view "B"). This results in a longer pressure equalizing time before the main valve can open.

#### NOTE:

The main poppet will not open until outlet pressure approximates tank pressure!

Once the main poppet is open, flow greater than the excess flow rating, or a sufficient surge in flow, forces the main poppet closed against the excess flow spring, as seen in view "D". The pilot valve in this position is open and allows a small amount of bleed downstream, but much less than during rapid bleed (view "B").

When the operating handle is moved to the closed position, the valve closes and a leak-tight seal is re-established as seen in view "A".

#### NOTE:

To provide excess flow protection, the flow rating of the pump, piping, valves, fittings, and hose on the inlet and outlet sides of the valve must be greater than the flow rating of the valve. Any restrictions that reduce the flow to less than the excess flow valve rating will result in the excess flow valve not operating when required.

#### Valve Operation and Precautions

1. Valve must be opened before starting pump, and before opening valve on pump outlet.
2. Leave pumping system "wet" to avoid drying of seals and to reduce time involved in opening valve. Drain piping only when required by codes or safe operating practices.
3. When piping is dry or at lower pressure than the tank, open valve half-way for a few seconds to allow line pressure to equalize before fully opening the valve handle. The main poppet may not open immediately if the handle is placed in the open position too quickly.
4. Flow surges may close the built-in excess flow valve and should be avoided. If the valve slams shut, immediately stop the pump, close the nearest downstream valve, and move handle to midpoint position to equalize pressure until valve reopens with a click, then restart pump and open downstream valve slowly.

5. Always keep valve closed except during product transfer.
6. Completely open all valves during pumping. Partially closed or throttle type valves may prevent excess flow valve from closing when required, even in a properly designed piping system.
7. All personnel must be aware of remote closure locations and their operation in case of emergency. They must also be aware of the equalizing opening through which bleeding can occur after the excess flow valve closes. If this bleed is not stopped by closing a downstream valve, a hazard may occur.
8. Never, under any circumstances, permanently wire open the operating handle of the internal valve.

#### Cable Control System

The cable control system employed must meet the requirements and be in accordance with the provisions of NFPA #58, DOT, ANSI, and all applicable federal, state, provincial and local codes.

#### Troubleshooting

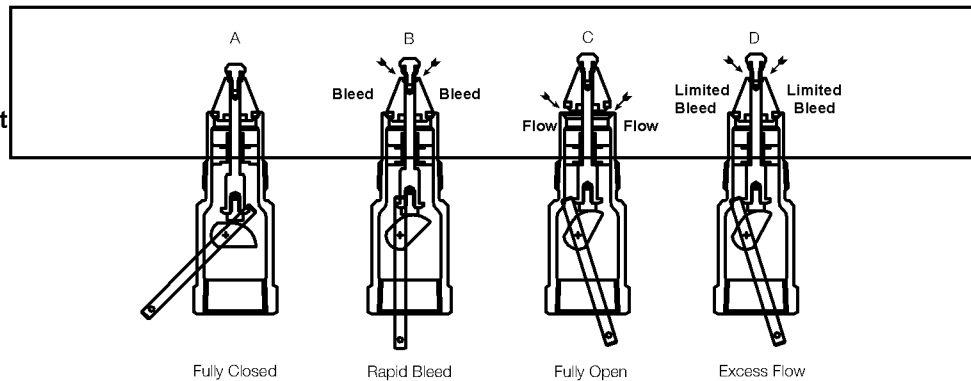
1. Internal Valve Will Not Open.  
Causes may be excess leakage downstream, pump engaged too quickly, excessive wear of valve, or ice freezing of poppet.  
When there is excessive volume downstream, a greater amount of time is required to equalize tank and downstream pressure.  
To determine if the pilot seat is opening, install a pressure gauge downstream of valve outlet, open any hand valves between valve and pressure gauge, and open valve. Pilot seat is not opening if pressure does not build up to tank pressure. Perform this test with pump off. A broken internal part may cause pilot seat not to open.  
If operating handle rotates past the full open position, there is internal malfunctioning, and the valve must be disassembled and repaired.
2. Premature Valve Closure.  
First, check to see that operating lever is properly connected and fully opens valve. Premature closure may also be a result of engaging pump too quickly, sudden line surges, an underrated excess flow spring or an obstructed inlet port.
3. Valve Will Not Close.  
Usually a result of faulty or sticking actuator. First, check the actuator to see that it works freely by disconnecting it from valve handle and cycling it several times. Also, operate valve handle manually. If it sticks in the open position, replace the packing and bushings. This should free the operating mechanism providing the valve has no internal damage.
4. Low Flow Capacity  
Downstream piping may be too small and/or long, screen or strainer may be plugged, possible restriction downstream, or a bypass valve stuck in the open position are causes of low flow. Also, the bypass valve may be set too low and prematurely opening. Check for high differential pressure across the bypass valve. If bypass valve is open, the differential across the valve should not exceed 5 to 6 psig.

## Maintenance

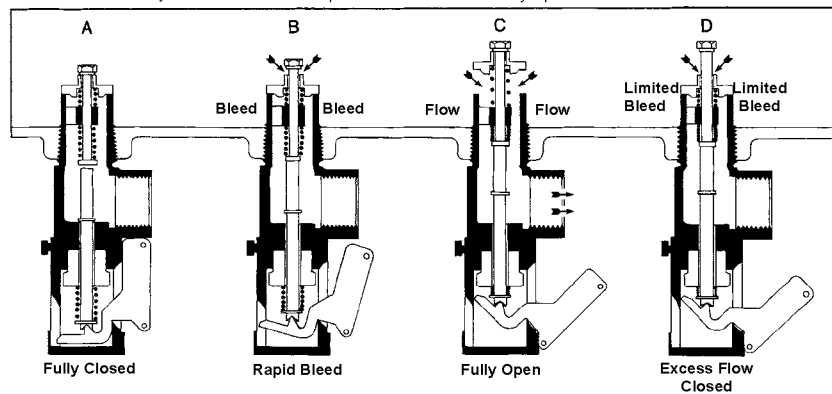
Potential problems may be eliminated with preventive internal valve maintenance. Perform the following steps once a month:

1. Check to see that the operating lever moves freely and smoothly. There should be no leakage around the lower stem or seal housing. Leakage requires replacement of the seal housing packing. A sticking lever indicates trapped foreign material or mechanism wear.
2. Check both seat discs for tight closure. Close valve and exhaust downstream pressure. Be sure piping is warmed to an ambient temperature. Close the first downstream valve and note pressure buildup between the closed valves with a pressure gauge. If leakage occurs, replace both seat discs.
3. Inspect, clean and oil all operating controls. Check controls to see that they open fully, but do not overtravel the valve operating lever. See that they work freely to close the valve. Worn parts should be replaced.
4. Remove valve if the tank is to be steam cleaned. Heat may damage the valve's seals.
5. Valve is not designed for water service. After tank is hydrostatically tested, immediately remove all water and allow tank to thoroughly dry out before installing valve.

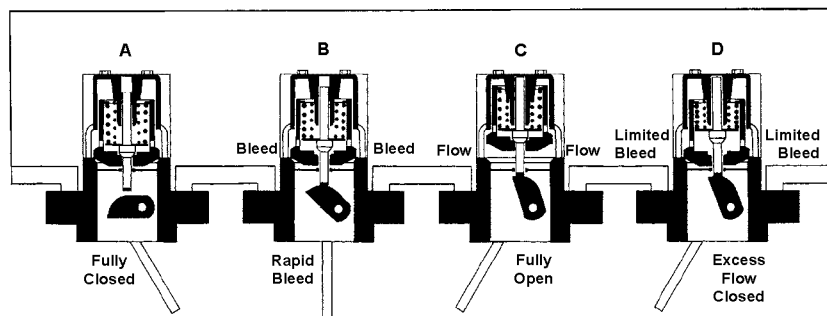
A3209R Series, 1 1/4" Straight  
A3212R & RT Series, 2"  
A3213A & T Series, 3"



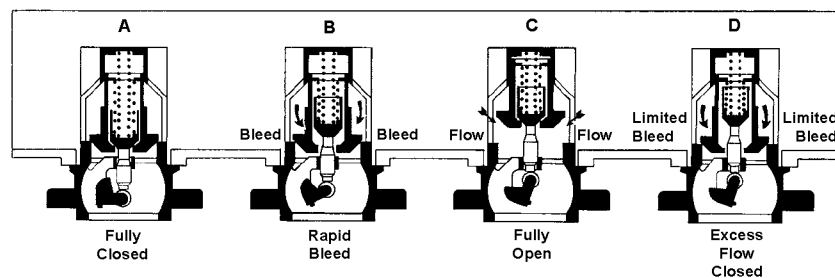
A3210A Series, 1 1/4" Angle



A3217F Series, 3" Flanged  
A3217DF Series,  
3" Double Flanged

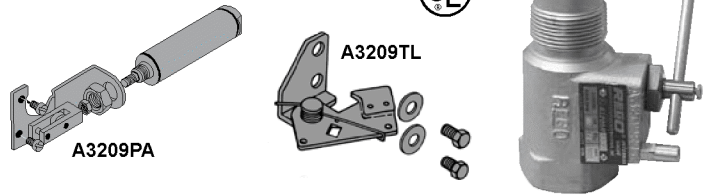


A3219F Series, 4" Flanged



## 1 1/4" Threaded Internal Valve for Small Capacity Pumping Systems and Bobtail Vapor Equalization

Designed primarily for use with LP-Gas and anhydrous ammonia as a main valve on small capacity pumping systems, NH<sub>3</sub> nurse tanks and in-line installations. It may also be installed in the vapor equalizing opening on bobtail delivery trucks. Installation is quick and easy, and it fits in both full and half couplings, as well as, in-line applications. The valve may be actuated manually by hand or cable.

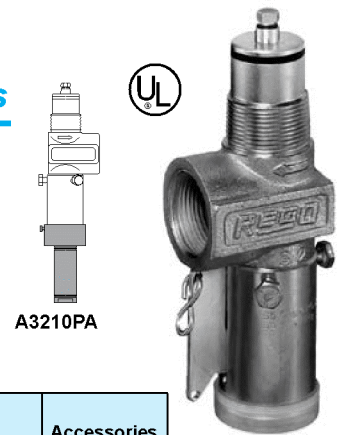


Part Number	Inlet Connection M. NPT	Outlet Connection F. NPT	Closing Flow		LP-Gas Vapor Capacity** (SCFH/Propane)		Accessories	
			LP-Gas	NH <sub>3</sub>	25 PSIG	100 PSIG	Thermal Latch	Pneumatic Actuator
A3209R050	1 1/4"	1 1/4"	50	45	13,300	22,900	A3209TL	A3209PA
A3209R080	1 1/4"	1 1/4"	80	72	15,700	26,700	A3209TL	A3209PA

\*Installs in full or half coupling.  
\*\*Data for flow in half coupling.

## 1 1/4" Threaded Angle Internal Valve for Motor Fuel Dispensers and Small Capacity Pumping Systems

Designed primarily for use with LP-Gas and anhydrous ammonia as a main valve on pump systems with small capacity, such as motor fuel dispensers. It may also be installed in bottom liquid withdrawal openings in NH<sub>3</sub> nurse tanks or the vapor equalizing opening of bobtail delivery trucks. Installation is quick and easy, and must be installed in a modified half coupling or the equivalent. The valve may be actuated manually by cable or pneumatically.



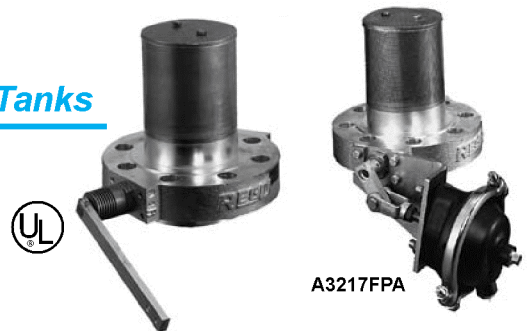
Part Number	Inlet Connection	Outlet Connection	Closing Flow (GPM)		LP-Gas Vapor Capacity (SCFH/Propane)				Accessories
			LP-Gas	NH <sub>3</sub>	25 PSIG Inlet	50 PSIG Inlet	75 PSIG Inlet	100 PSIG Inlet	Pneumatic Actuator
A3210A065	1 1/4"	1 1/4"	65	58.5	17,000	22,250	26,500	30,000	A3210PA-R1

\* For use in half coupling only, 1/2" diameter minimum bore. If welded-in dip pipe is required, use of 1/2" schedule 40 pipe is recommended –flow will be reduced by approximately 10%.

## 3" Flanged Internal Valve for Bobtail Delivery Trucks, Transports, and Large Stationary Storage Tanks

Designed primarily for LP-Gas and anhydrous ammonia filling and/or withdrawal on MC331 bobtail delivery trucks, transports and stationary storage tanks with flanged pumps or piping. Installation is quick and easy, and the valve may be operated manually by cable or pneumatically.

Lever available on right or left side to allow for installation without the use of an extra pulley.



Part Number		Operating Lever Position	Inlet Connection	Outlet Connection	Closing Flow GPM		Accessories
Single Flange Body	Double Flange Body				LP-Gas	NH <sub>3</sub>	Pneumatic Actuator
A3217FR160	A3217DFR160	Right Side	3" 300# ANSI RF Modified Flange**	3" 300# ANSI RF Flange	160	145	A3217FPA
A3217FL160	A3217DFL160	Left Side					A3217FLPA
A3217FR210	A3217DFR210	Right Side			210	190	A3217FPA
A3217FL210	A3217DFL210	Left Side					A3217FLPA
A3217FR260	A3217DFR260	Right Side			260	236	A3217FPA
A3217FL260	A3217DFL260	Left Side					A3217FLPA
A3217FR410	A3217DFR410	Right Side			410	372	A3217FPA
A3217FL410	A3217DFL410	Left Side					A3217FLPA

\* Valve supplied with 16 nuts and 8 studs for mounting.

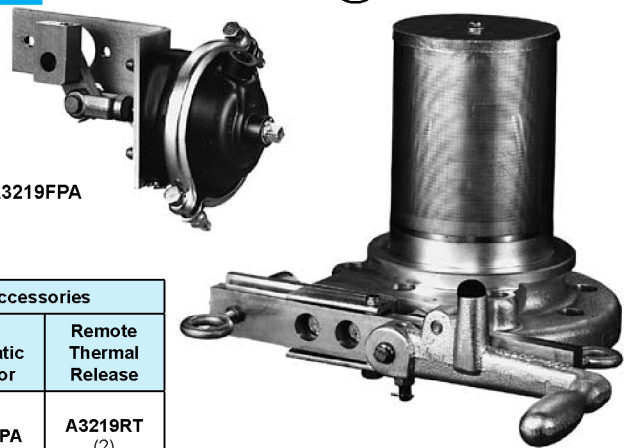
\*\* Modified bore = 4 3/8" diameter with 5 1/8" diameter raised face.

## 4" Flanged Internal Valve for Transports and Large Stationary Storage Tanks

Designed primarily for LP-Gas and anhydrous ammonia service on MC331 transport pressure vessels and large stationary storage tanks. Installation is quick and easy, and it fits in most existing tank flanges. The valve may be actuated manually or pneumatically.

Use of the A3219RT Remote Thermal Release with this valve is suggested to provide a remote means of mechanical closure along with thermal protection, as required by DOT MC331.

A3219FPA



Part Number*	Inlet Connection	Outlet Connection	Closing Flow GPM		Accessories	
			LP-Gas	NH <sub>3</sub>	Pneumatic Actuator	Remote Thermal Release
A3219FA600L	4" 300# ANSI RF Modified Flange**	4" 300# ANSI RF Flange	600	544	A3219FPA	A3219RT (2)
A3219FA400L			400	360		

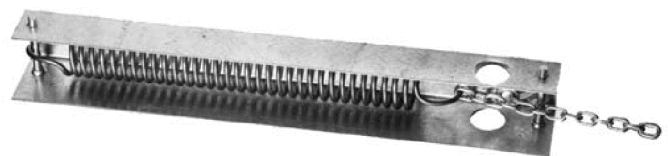
\* Valve supplied with 16 nuts and 8 studs for mounting.

\*\* Modified bore = 5/8" diameter with 7" diameter raised face.

## Remote Thermal Release for DOT MC331 Pressure Vessel

Designed especially for use with Internal Valves installed in DOT MC331 pressure vessels. The A3219RT provides a remote means of mechanical closure along with thermal protection, as required by DOT MC331.

The A3219RT is connected by cable to the internal valve(s) on the vessel. In the event of extreme heat (over 212° F.), the fuse link will melt, causing the spring to contract and pull the cable. When properly installed the cable will trip the internal valve release lever(s) allowing the connected handle(s) to move to the closed position.



Part Number	For Use With	Release Temperature	Spring Load		Minimum Number Required By MC331
			Fully Extended	After 4" Travel	
A3219RT	Internal Valves	212° F.	≈100 lbs.	≈50 lbs.	2

## Remote Cable Controls for Internal Valves

The 3200C Remote Cable Kit is designed especially for use with the 3200L Remote Operating Lever to operate internal valves from a remote location.

The internal valve is opened by pulling back the remote operation lever and closed by returning the lever to its original position. A remote release is provided to close the internal valve from a different remote location.



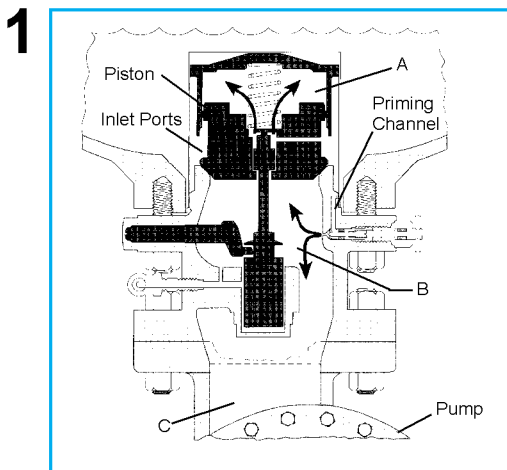
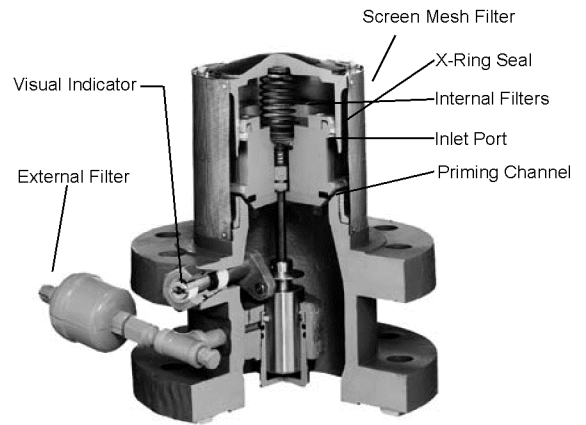
Part Number	Description	Contents
3200C	Remote Cable Kit	100 Foot Cable, 6 Cable Clamps, Quick Link, Sign, Fuse Link, Steel Nut and Bolt
3200L	Operating Lever	Lever Assembly

## Flomatic® Internal Valve Operation

### General Information

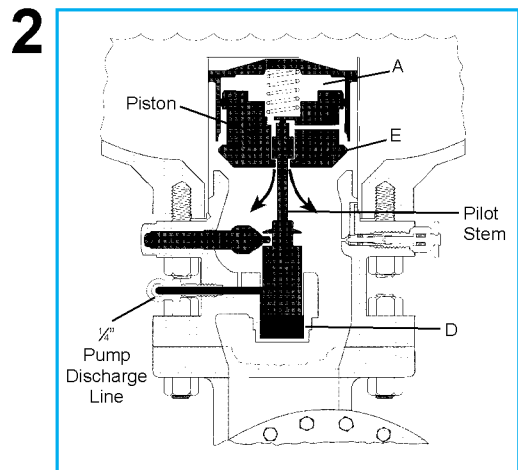
RegO® piston type Flomatic® Internal Valves are normally closed and use pressure differential to provide completely automatic service. Mounted directly between the tank body and pump, the Flomatic® uses the pressure differential developed by the pump to open the valve and it closes automatically when the differential no longer exists.

This means the RegO® Flomatic® opens when the pump is on and closes when the pump is shut off – fully automatic.



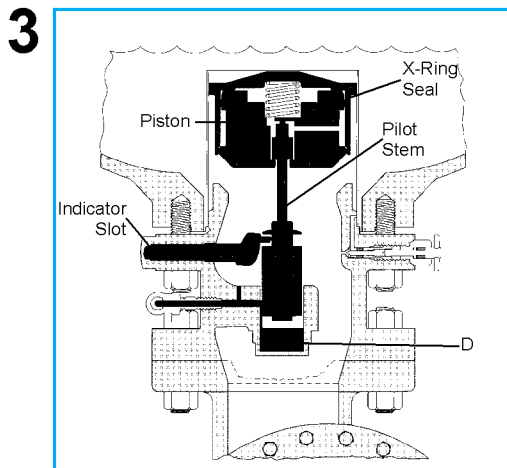
#### 1. Normally Closed

When the valve is closed, liquid flows into the INLET PORTS, through a channel in the PISTON, and into area A. It also flows down through the PRIMING CHANNEL in the valve body, into area B beneath the valve seat, and into area C to prime the PUMP.



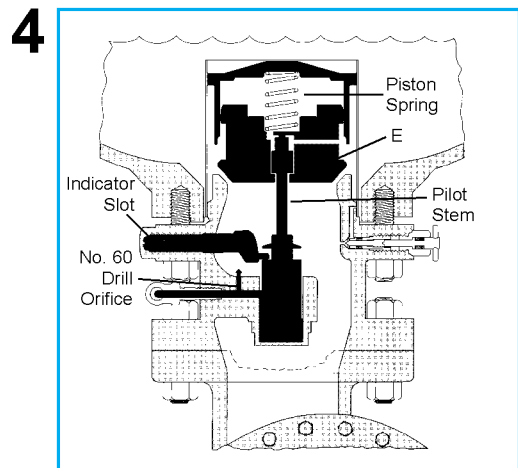
#### 2. Pump On – Valve Opening

When the pump is started, differential pressure transmits through the 1/2" piping into chamber D, lifting the PILOT STEM. This opens the seat between the stem and piston at E. Pump suction then evacuates the tank pressure in area A, which becomes equal to the pump suction pressure.



#### 3. Pump On – Valve Open

The force below the pilot stem forces the piston up to open the valve; rotating the INDICATOR SLOT to its vertical (valve open) position. Pump differential pressure in area D holds the PILOT STEM and PISTON open. Approximately 20 psig pump differential pressure is required to open the valve; approximately 8 psig differential pressure will hold the valve open.



#### 4. Pump Off – Valve Closes

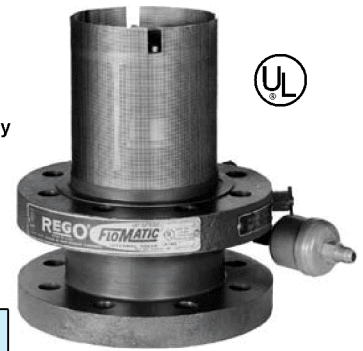
With the pump shut off, the pressure in area D which holds the valve open, bleeds out through the #60 DRILL ORIFICE. This loss of pressure permits the SPRING to push the PILOT STEM down to reseat at point E. Since pressures are equal above and below the PISTON, with no sustaining pressure in area D, the SPRING forces the valve closed. The INDICATOR SLOT rotates to the horizontal (valve closed) position.

## Flomatic® Internal Valves for Bobtail Delivery Trucks, Transports and Large Stationary Storage Tanks

Designed primarily for LP-Gas and anhydrous ammonia liquid withdrawal on MC331 bobtail delivery trucks, transports and large stationary storage containers with flanged connections. The valve is fully automatic, opening and closing as the pump is turned on or off.



A7853A 1/4" Three-Way Quick-Acting Valve



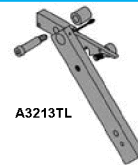
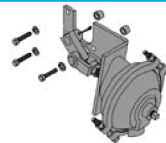
Part Number	Inlet Connection ANSI Flange	Outlet Connection ANSI Flange	Strainer Width	Base Width	Overall Height (Approx.)	Height from Indicator to Base	Accessories (included with Flomatic®)	
							Filter	3-Way Valve
A7883FK	3"-300#**	3"-300#	4 3/4"	8 1/4"	10 7/8"	4 13/16"		
A7884FK	4"-300#***	4"-300#	5 3/4"	10"	11 1/4"	4 13/16"	A7884-201	A7853A

\*Supplied with A7853A 3-way valve, A7884-201 filter, studs, nuts and gaskets.  
 \*\*With 4 1/8" diameter bore.  
 \*\*\*With 5 1/8" diameter bore.

## Threaded Internal Valves For Bobtail Delivery Trucks, Transports and Stationary Storage Tanks

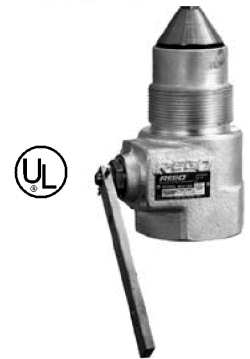
### Application

Designed primarily for use with LP-Gas and anhydrous ammonia for liquid withdrawal; vapor transfer or vapor equalization of bobtail delivery trucks, transports, stationary storage tanks, and in-line installations. The valve may be operated manually by cable or pneumatically.



A3213PA

A3213TL

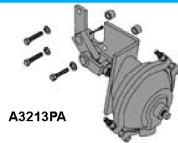


Part Number	Inlet Connection M. NPT	Outlet Connection F. NPT	Closing Flow (GPM) Half Coupling		Closing Flow (GPM) Full Coupling		A	B	C	Accessories	
			LP-Gas	NH3	LP-Gas	NH3				Thermal Latch	Pneumatic Actuator
			A3212R105	2"	2"	105					
A3212R175	175	158	100			90					
A3212R250	250	225	130			117					
A3213A150	3"	3"	150	135	125	113	1 9/16"	5 15/16"	4 1/8"	A3213TL	A3213PA
A3213A200			200	180	160	144					
A3213A300			300	270	250	225					
A3213A400			400	360	325	293					

## Threaded Internal Valves For Bobtail Delivery Trucks, Transports and Stationary Storage Tanks

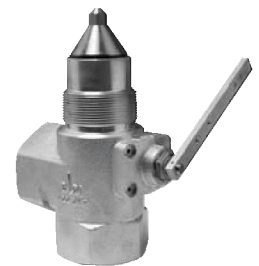
### Application

Designed primarily for use with LP-Gas and anhydrous ammonia for liquid withdrawal; vapor transfer or vapor equalization of bobtail delivery trucks, transports, stationary storage tanks, and in-line installations. The valve may be operated manually by cable or pneumatically.



A3213PA

A3213TL



Part Number	Inlet Connection M. NPT	Outlet Connection F. NPT	Closing Flow (GPM) Half Coupling		Closing Flow (GPM) Full Coupling		A	B	C	Accessories	
			LP-Gas	NH3	LP-Gas	NH3				Thermal Latch	Pneumatic Actuator
			A3212RT105	2"	2"	105					
A3212RT175	175	158	100			90					
A3212RT250	250	225	130			117					
A3213T150	3"	3"	150	135	125	113	1 9/16"	5 15/16"	4 1/8"	A3213TL	A3213PA
A3213T200			200	180	160	144					
A3213T300			300	270	250	225					
A3213T400			400	360	325	293					