PURPOSE OF A REGULATOR

Your new gas pressure regulator is a precision instrument designed to reduce high source pressures (cylinders or compression systems) to a safe value, one consistent with a system's design. Each regulator will control a chosen delivery pressure within the bounds of the regulator's delivery pressure range.

This constant delivery pressure prevents the "overpressurization" of any apparatus downstream of the regulator and permits stable flow rates to be established according to requirements.

To protect the system against a regulator failure, it is recommended that suitable relief devices be installed in the system.

BEFORE INSTALLING REGULATOR PLEASE REFER TO GAS HANDLING DATA SHEET AVAILABLE FREE FROM ANY MATHESON LOCATION FOR SAFE HANDLING OF THE GAS OR GAS MIXTURE YOU ARE USING.

NOTE: See next two pages for information on the performance of regulators.

Three criteria are used by Matheson to measure the perfor. .e of a regulator:

(1) The regulator's ability to maintain a constant delivery pressure, regardless of the rate of gas discharge. All regulators will show a drop in delivery pressure with increased flow. The smaller the drop, the better the regulator performance. Curves 1A and 1B show the pressure-flow relationships of Matheson No. 8 and 1L regulators.

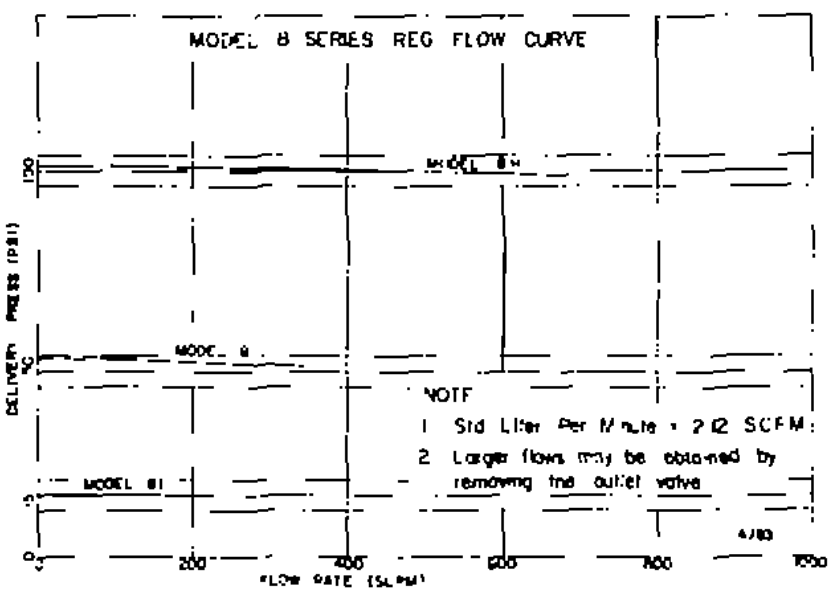
(2) The regulator's ability to maintain a constant delivery pressure as source pressure varies. This is very important. Curves 2A and 2B show the performance of Matheson No. 8 and 1L regulators with falling source pressures.

(3) The "lock-up" of the regulator. This is defined as the final pressure attained by a system when all flow is stopped. It is usually slightly above the delivery pressure when set at flowing conditions. All Matheson regulators are chosen to give the best possible "lock-up" performance with only a slight rise from delivery pressure.

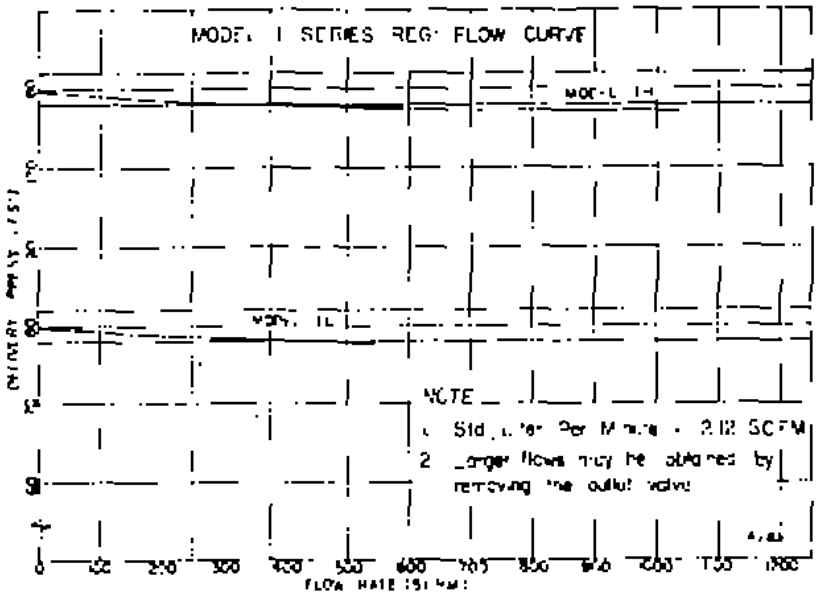
PERFORMANCE CHARTS

FLOW VS. DELIVERY PRESSURE

Model 8

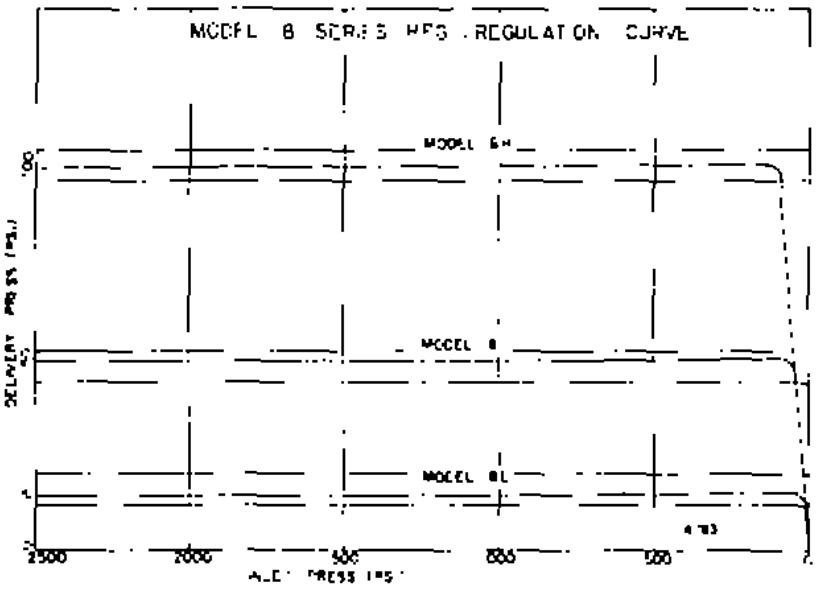


Model I

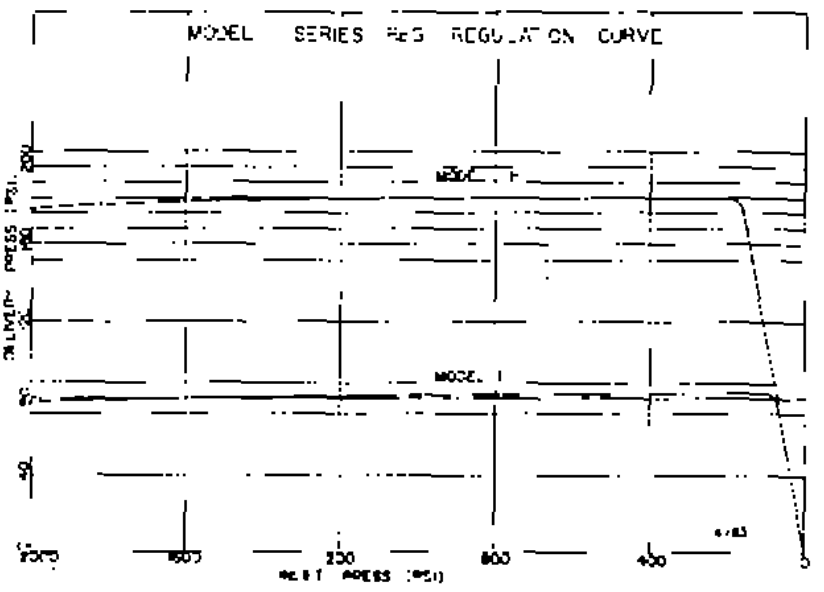


PERFORMANCE WITH DECREASING SOURCE PRESSURES

Model 8



Model I



HOW YOUR REGULATOR WORKS

Figure 1 on the opposite page will help you understand how a regulator works. A regulator reduces gas pressure by the counteraction of gas pressure on a diaphragm against the compression of a spring which can be adjusted externally with an adjusting screw.

In operation the pressure adjusting screw is turned to exert force on the spring and diaphragm. This force is transmitted to the valve assembly, pushing the valve away from the seat. The high pressure gas will flow past the valve into the low pressure chamber. When the force of gas pressure on the diaphragm equals the force of the spring, the valve and seat assembly close, preventing the flow of additional gas into the low pressure chamber.

Removal of gas from the low pressure chamber will reduce the pressure, thereby permitting downward deflection of the diaphragm, opening the valve assembly, and permitting gas to flow into the low pressure chamber to replace the gas that was withdrawn. This constant throttling action permits a pressure balance in the regulator's low pressure chamber, thus yielding a steady delivery pressure relatively independent of normal flow fluctuations and decreasing cylinder pressure.

PRESSURE REDUCTION "STAGES"

Controlled pressure reduction, as explained on the preceding page, constitutes a "stage" of pressure reduction. Two stages of reduction constitute the same action in series, with the delivery pressure from one stage becoming the source pressure for the second stage.

Most gas regulators employed for use on high pressure cylinders are of the single or two stage variety.

Generally, the reduction of pressure in two stages permits a closer control of the delivery pressure over a wider range of inlet pressures.

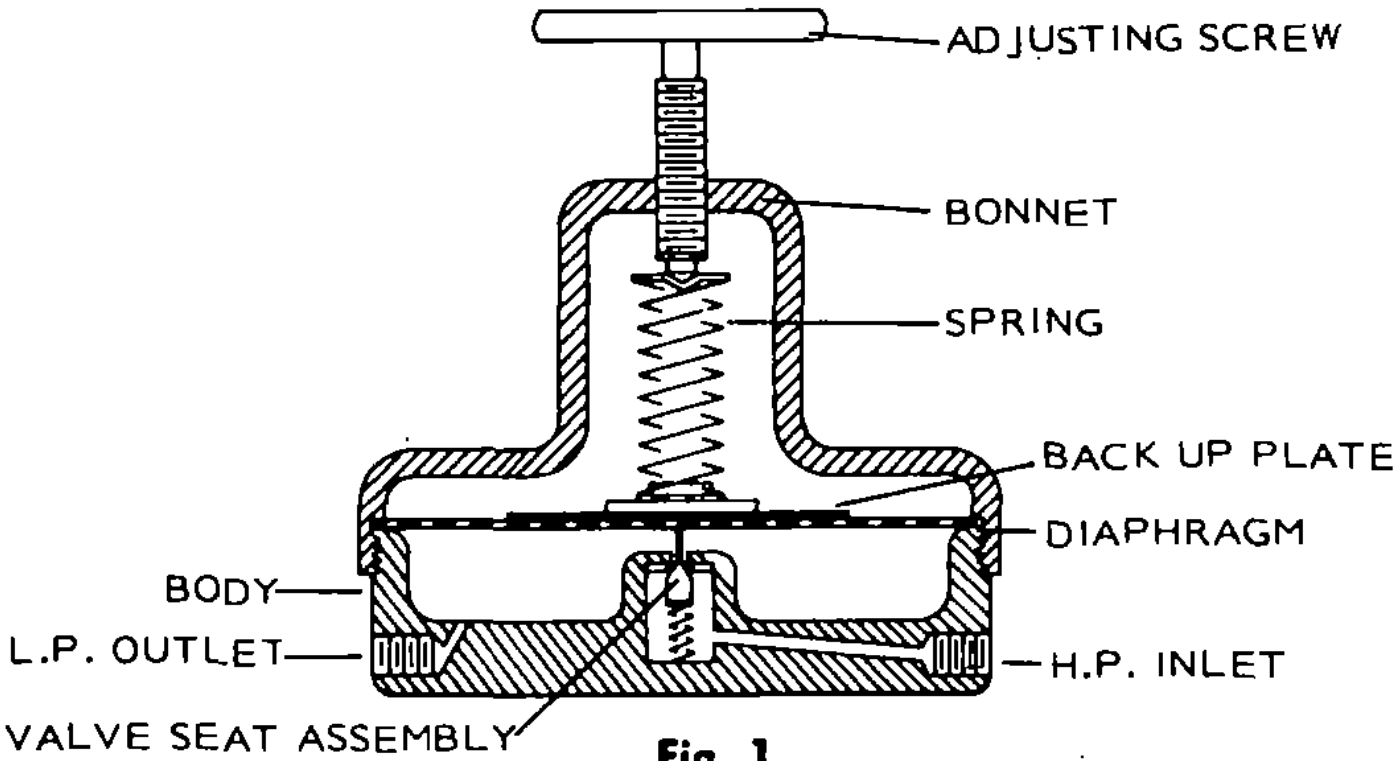


Fig. 1

SCHEMATIC
SINGLE STAGE
TYPICAL CONSTRUCTION

INSTALLATION — in 5 steps

(Refer to Fig. 2 for identification of Regulator parts)

1. Before connecting the regulator to the cylinder valve outlet, be sure the regulator has the proper CGA connection to fit the cylinder valve. If there is some doubt about the connection being correct, check the Matheson Gas Catalog for valve outlet designation and description. Inspect the regulator inlet and cylinder valve outlet for foreign matter. Remove foreign matter with a clean cloth except in the case of oxygen or other oxidizers. In the case of an oxidizer, do not use the regulator if dirt or foreign matter is visible in the outlet.

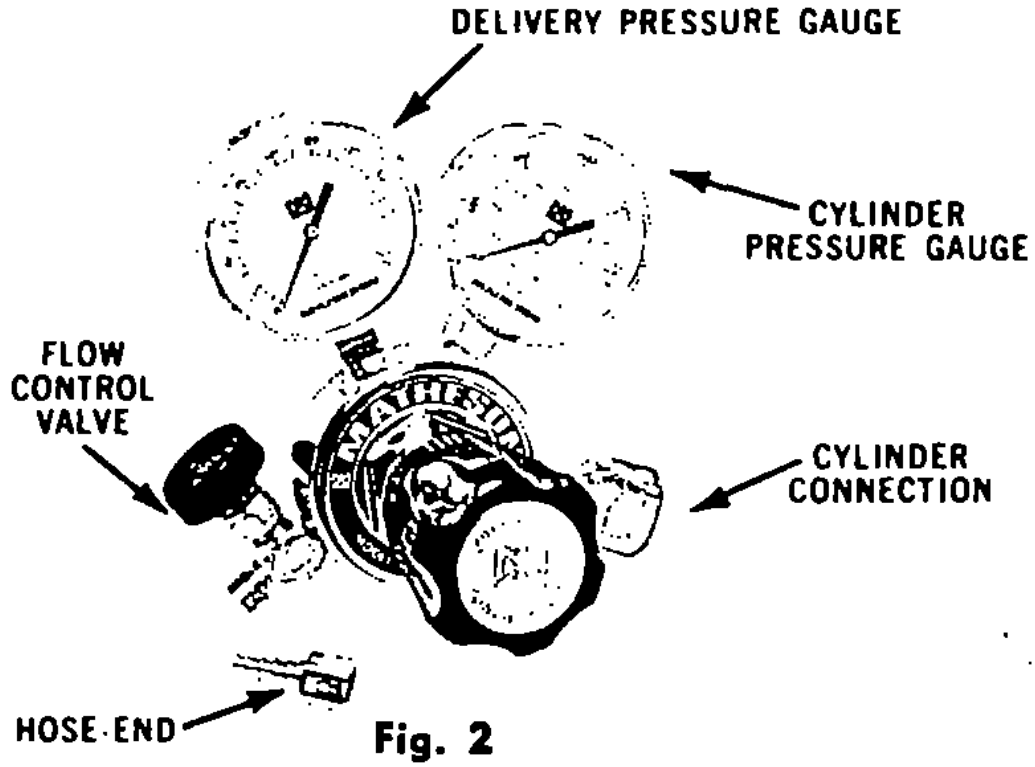


Fig. 2

Caution: Regulators and valves used with oxygen must not come into contact with oil and grease. In case of such contamination do not connect the regulator – this problem must be referred to personnel trained in handling this situation.

With a flat faced wrench, tighten the regulator inlet connection nut to the cylinder valve outlet. (Depending on gas service, the regulator inlet may be a right hand thread or a left hand thread. Make sure that proper identification of the mating connections has been made). Do not force the threads. Regulators with flat faced CGA connections require the use of a flat gasket to provide a leak tight seal between the regulator and valve outlet. In this instance, gaskets are supplied with the regulator and should be replaced with gaskets of compatible material when they become worn. When utilizing Teflon gaskets, do not exert excessive force in tightening the connection or the gasket may force its way into the valve opening and impede the discharge of gas.

NOTE: If you are not sure that cylinder connection requires a gasket, consult your Matheson catalog or contact supplier.

NOTE: Check connection periodically and retighten as required to compensate for gasket cold flow if gasket is used.

3. Close the regulator by turning the pressure adjusting screw counterclockwise until screw turns freely without tension.

4. Check to see that needle valve on regulator outlet is closed.

WARNING: DO NOT HOLD REGULATOR WHILE OPENING CYLINDER VALVE.

5. Attach tubing or piping to the regulator valve outlet. Except high pressure regulators a hose end is provided with the regulator. Regulators supplied with tube fittings accept standard ¼" O.D. copper or stainless steel tubing.

6. It is the user's responsibility to protect the gas handling system from excessive downstream pressure due to possible regulator failure. This is most easily accomplished by installing properly vented relief device in the system.

OPERATION — in 3 steps

1. Slowly open the cylinder valve until full cylinder pressure is registered on the tank gauge. (In case of Liquefied gases a tank gauge is not usually provided). It is recommended that the cylinder valve be fully opened to prevent limiting of flow to the regulator which would result in the failure of the regulator to maintain required delivery pressure.

2. Adjust the delivery pressure to the desired pressure setting by turning the pressure adjusting screw clockwise and noting the delivery pressure as registered on the delivery pressure gauge.

3. The flow may now be regulated by proper adjustment of the outlet needle valve.

SHUTDOWN — in 4 steps

1. Close cylinder valve.

2. Relieve all the pressure from the regulator through needle valve, until both gauges register O.

3. Turn the adjusting screw counterclockwise until screw turns freely without tension.

4. Close regulator outlet needle valve.

DISMANTLING

1. If the regulator will not be used for a while, store in a clean, dry location, free of corrosive fumes.
2. Regulators used with corrosive or flammable gases should be flushed with dry Nitrogen. This can be done by screwing in the pressure adjusting screw (clockwise), opening the outlet valve, and directing a stream of dry Nitrogen into the regulator inlet by means of a flexible tube or rubber hose. After flushing turn out adjusting screw and close the outlet valve.
3. Capping or sealing the regulator inlet or simply storing in the original plastic bag will prevent dirt from clogging the regulator inlet and extend the life of the regulator.

PROPER FUNCTIONING

Check your regulator periodically to see that it is functioning properly. This procedure is covered in the "Trouble Shooting" Section on pages 12 and 13.

TROUBLE SHOOTING

Regulators should be checked periodically to insure proper and safe operation. This periodic check will vary depending on gas service and usage.

Regulators in non-corrosive gas service such as Nitrogen, Hydrogen and Helium require relatively little maintenance, and a quick check on a monthly basis is usually adequate. Regulators in "corrosive" gas service such as Hydrogen Chloride, Chlorine and Hydrogen Sulfide require considerably more checking – once a week is recommended.

The procedure for checking out any regulator is as follows:

1. Gauges should read zero when all pressure is drained from system.
2. With cylinder valve open and adjusting screw turned counter-clockwise, the high pressure gauge should read the cylinder pressure.
3. With the regulator outlet needle valve closed and waiting 5 to 10 minutes in check point no. 2, the delivery pressure gauge should not indicate a pressure increase. The pressure increase would indicate leakage across the internal valve system.
4. Next, turn the adjusting screw clockwise until a nominal delivery pressure is indicated. Inability to attain a proper delivery pressure setting indicates improper operation which may be attributed to blockage of the gas passage or inability to open valve. Continued wear on a regulator valve and seat assembly will cause a rise above a set delivery pressure, termed as "crawl". A regulator exhibiting "crawl" should not be used.

5. ,ose cylinder valve and observe pressure both on inlet and delivery side of the regulator after 5 or 10 minutes. A drop in the pressure reading after this period of time may indicate a leak in the system possibly at the inlet or through the needle valve, safety devices or diaphragm.
6. An excessive fall in delivery pressure under operating conditions and normal flows, indicates an internal blockage.

Any deviation from the normal in the above check out will require servicing by reputable repairmen. See "Repairs" on next page.

WARNING — A regulator, valve, or other equipment that has been used with another gas should never be used with Oxygen. A regulator or control should never be used on more than one gas, unless the user is fully familiar with the properties of the gases involved, or has obtained assurance from the gas supplier that the interchange is permissable and there is no safety hazard.

REPAIR OF REGULATORS

Matheson maintains a well equipped repair department capable of providing excellent and rapid servicing of worn regulators.

When a regulator shows signs of wear it should only be serviced by reputable repairmen. Detailed drawings on all regulators and recommended parts lists are available for those equipped to do their own repairs. We strongly recommend that Matheson regulators be returned to us for reconditioning and/or repair. All Matheson regulators sent to us for repair are returned to you in first class condition meeting all original factory specifications. Any new revisions in design are automatically incorporated in all Matheson regulators repaired in our own shop.

A fixed fee overhaul service is provided to eliminate the cost and time involved in quotations. Regulators will be restored and returned with an "as new" warranty. Cost varies with the regulator. Contact your nearest Matheson branch for information and service.

A complete overhaul for regulators in non-corrosive gas service is recommended once a year, and for regulators in corrosive gas service every 3–6 months.

Regulators in corrosive gas service (Hydrogen Chloride, Chlorine, etc.) which are used only intermittently should be adequately flushed with dry Nitrogen and stored in a dry area at room temperature to prevent excessive corrosion of the metal parts.

CHOOSING A REGULATOR

Matheson has the world's most complete line of gas regulators, covering two stage and single stage regulators, high and low pressure regulators, regulators for corrosive service, special purpose regulators diffusion resistant metal diaphragm regulators, and regulator-flowmeter combinations.

Complete details of these regulators and other equipment for the safe handling of gases are contained in the Matheson Compressed Gas Catalog – free for the asking. Opposite each gas listing you will find the recommended regulators and valves.

Typical of Matheson's superiority in gas regulators are the many models designed for the various corrosive gases. One style is constructed of materials to withstand the corrosive effects of gasses that normally attack copper bearing alloys. Another type is made to resist attack from strongly acid forming gases such as the halogens.

All of Matheson's regulators are designed with strength in reserve for recommended pressure ratings. They are also individually tested before shipment.

You will find that the Matheson Compressed Gas Catalog is a "must" when it comes to the intelligent selection of the proper gas regulators and other gas handling equipment. A comprehensive regulator selection guide is also available. You may request your free copies of both these publications from your nearest Matheson facility.

For prompt service on gas needs contact these offices:

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