INTRODUCTION

This manual contains a wealth of information about gas regulators. It will enable you to handle gases in the safest possible manner and help you to obtain maximum value from your new regulator.

All Matheson Regulators are precision instruments. When properly used and maintained they give excellent service for many years.

BEFORE USING YOUR NEW REGULATOR, BE SURE TO READ OVER THE STANDARD STEPS FOR INSTALLATION, OPERATION AND SHUTDOWN - ON PAGES 8, 9, 10 and 11.

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NOTE: See next two pages for information on the performance of regulators.
Three criteria are used by Matheson to measure the performance 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
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 closer control of the delivery pressure over a wider range of inlet pressures.
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. In the case of Oxygen, open the cylinder valve slightly, to blow any dirt out of the outlet. A dirty Oxygen Regulator inlet can be rinsed clean in trichloroethylene and blown dry with oil free Nitrogen.

2. 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. Some regulator 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 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.

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

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

5. Attach tubing or piping to the regulator valve outlet. Except for high pressure regulators a hose end is provided with the regulator. Regulators supplied with tube fittings accept standard 3/8" O.D. copper or stainless steel tubing.

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.
OPERATION — in 3 steps

1. Slowly open the cylinder valve until full cylinder pressure is registered on the tank gauge. (In the 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 0.

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


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 counterclockwise, the high pressure gage 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 gage 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. Close 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 permissible and there is no safety hazard.