REGULATORS FOR COMPRESSED GASES

Safety
The primary purpose of a regulator is to reduce high-pressure gas found in a cylinder or process line, to a lower, useable pressure as the gas passes from the supply to the process.

Regulators regulate pressure - not flow.

Regulators must have a max working pressure rating equal to or exceeding the maximum pressure in the gas cylinder or system to which it is connected - if it doesn't then don't use it!

Selection and use of the wrong regulator can lead to serious or fatal accidents.
Regulators come with connections that are compatible only with particular cylinder valves. These standardized connections help prevent the wrong regulator from being attached to a cylinder. The Compressed Gas Association (CGA) has established the U.S. standard for cylinder connections. Changing these connections could lead to serious injury or death.

Note: UHP DISS connections are also available. These have been developed by the CGA with the help of industry for ultra high purity gas applications (semiconductor industry).
**Summary of Selection Criteria**

**Base selection of a regulator upon:**

1. The application;
2. The maximum possible inlet pressure;
3. Desired delivery pressure;
4. Whether or not the regulator will be used for a high purity system (see note at bottom of slide);
5. If a constant delivery pressure is needed (if so use a two stage regulator);
6. Desired accuracy; and
7. Flow requirements.

These are industrial regulators not intended for specialty gas applications due to purity. T-bar regulators are intended for welding applications.
The most common type of regulator failure occurs when the regulator outlet pressure is left dialed in when the inlet is charged with a high pressure supply.

Other types of regulator failures can be caused by improper use and over pressurization.

Some failures can allow the upstream pressure to travel through the regulator into downstream piping, valves, equipment etc.

Use overpressure protection, such as pressure relief valves, to protect downstream piping, valves, equipment, etc. from being over pressurized.
Inspecting regulators prior to use can help identify those that should not be used because they may leak and/or fail.

Make sure regulators being used for oxidizing gases (such as oxygen) are free from contamination prior to being installed. The presence of oils or other contamination could result in a fire.

A gradual rise in pressure from the high to low pressure side of a two stage regulator is known as creep and can be an indicator of damage.
Parts that are not original regulator components, like this changed CGA connection. If you encounter something like this you should ask yourself:
1. If the threads have been damaged but aren’t visible now;
2. If this component is compatible with the original regulator;
3. If the Teflon tape was used to tighten an otherwise loose connection; and
4. If the part was tightened enough or over tightened.

Damage to the CGA connection like this can lead to leakage or component failure.

Teflon tape on a CGA connection may cause the connection to leak & not seal. Don’t tape the seal.

This regulator needs to be serviced prior to being used.
Gas from a high-pressure system can travel back through a regulator if a check valve is not used. Flow should never be reversed through a regulator. This could damage the regulator resulting in premature regulator failure. Use a check valve if the regulator is connected to a high pressure system.

Note: Airgas analytical regulators now come with a standard CGA check valve.
Don't build or service your own regulators! Doing so endangers you and others. Reasons why individuals should not service or build their own regulator(s):

1. A new regulator has fittings and components that are tightened to meet specifications and satisfy testing requirements. Self serviced and pieced together regulator components may be over or under tightened.
2. The service history of old regulators is unknown.
3. They often contain parts that exceed the 5-year service requirement (CGA E-15-2011).
4. Components that are used may not be compatible with one another or the service application.
5. Components may have become obsolete, and may present a hazard if used.
Use Warning

The adjustment knob of a regulator needs to be in the full counter clockwise position (see below) before opening a cylinder valve. Doing so will help extend the life of the regulator and help avoid a possible accident due to premature regulator failure.

Some regulator failures allow the full upstream pressure (e.g. that in a gas cylinder) to travel through the regulator to downstream piping and equipment which may not be able to handle the pressure.

Regulators need to be serviced every 5 years. (CGA E15-2011)
**Additional Safety Measures**

1. Keep regulators clean.
2. Always pressurize a regulator slowly, while standing with the cylinder valve between you and the regulator if possible – a gauge could blow.
3. Never lubricate a regulator or use pipe dopes. This includes inlet fittings which are intended to be installed dry. Lubricants and pipe dopes could react with the gas or provide a source of contamination.
4. Always depressurize a regulator before closing the adjusting knob and removing the regulator from the cylinder.
5. Always remove regulators before moving a compressed gas cylinder.

NEVER USE CONNECTION ADAPTORS TO MOUNT THE WRONG REGULATOR!!!
The number of gages on a regulator does not indicate if it is a single or a two stage regulator. Some single stage regulators have two gauges. Never guess that a regulator is single or two stage based upon the number of gauges present.