

Chapter 24

Valve Maintenance

A globe valve is a linear-motion valve used to start, stop, and regulate the flow of fluids. As shown in the cross-sectional diagram in [Fig. 1](#), the main components are the body, bonnet, stem, and plug (often called the disc in steam plant terminology). The handwheel turns the stem, causing the disc to move toward or away from the valve seat. This design allows precise flow control and reliable shutoff, making globe valves common in steam, condensate, and process systems.

The bonnet contains the stem threads and packing assembly. The packing seals around the stem to prevent leakage while still allowing the stem to move during valve operation.

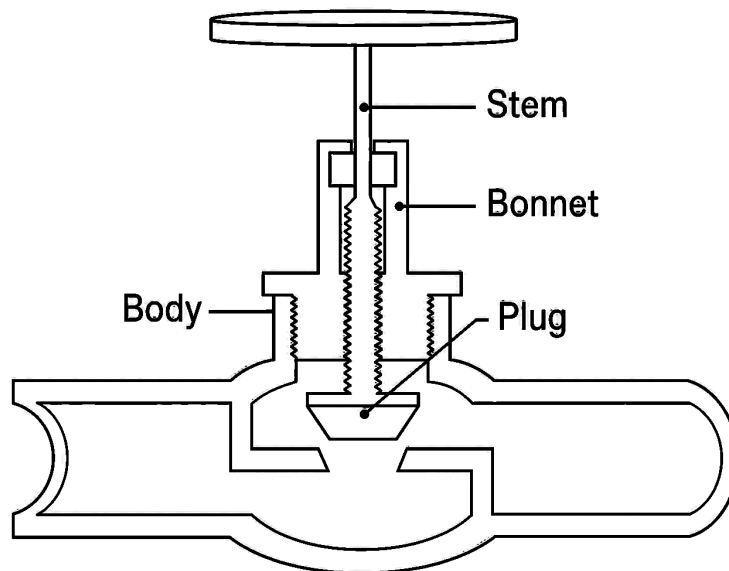


Fig. 1 Globe Valve

24.1 Disc (Plug) Materials

The disc is the primary sealing component of the valve and is selected according to the pressure, temperature, and service conditions of the system. In low- and medium-pressure steam systems operating at pressures below approximately 300 psi, replaceable discs with **PTFE (Teflon) seating surfaces** are used almost exclusively because they provide excellent shutoff performance and can be replaced easily during routine maintenance.

Common disc materials include:

- **PTFE (Teflon) Disc**

- The most common choice for steam-rated globe valves below 300 psi.
- Provides excellent shutoff performance in low- and medium-pressure steam service.
- Simple and inexpensive to replace when worn.
- Resistant to corrosion and many process fluids.

- **Bronze Disc**

- Typically used in water service and older low-pressure valve designs.
- Offers good corrosion resistance but does not seal as effectively as PTFE-seated discs.

- **Stainless Steel Disc**

- Used where temperatures exceed the limits of PTFE.
- Common in high-temperature steam and process applications.
- Provides durability but generally requires metal-to-metal seating.

- **Hardened Stainless Steel Disc**

- Used in valves that experience frequent operation or abrasive service.
- Provides improved wear resistance compared to standard stainless steel.

- **Stellite-Faced Disc**

- Used in high-pressure and high-temperature steam service.
- The hard-facing alloy resists erosion, wire drawing, and seat damage.
- Commonly found in power plant and severe-service applications.

A disc should be replaced when it becomes worn, scored, cracked, distorted, or when the valve leaks through the seat while fully closed.

24.2 Stem Packing Materials

Packing forms a pressure-tight seal between the stem and bonnet while allowing stem movement.

Common packing materials include:

24.2.1 Graphite Packing

- Most common for steam service.
- Excellent high-temperature performance.
- Low friction and long service life.

24.2.2 PTFE (Teflon) Packing

- Excellent chemical resistance.
- Common in water and chemical service.
- Limited for high-temperature steam applications.

24.2.3 Graphite/PTFE Combination Packing

- Combines chemical resistance with improved temperature capability.

Packing material must always be selected to match the operating temperature, pressure, and fluid being controlled.

24.3 Adjusting the Packing

If steam, water, or condensate is leaking from around the stem, the packing may not require replacement. In many cases, normal packing wear can be compensated for by tightening the gland nut slightly.

1. Tighten the gland nut a small amount.
2. Operate the valve several times.
3. Check whether leakage has stopped.
4. If leakage persists, repeat the adjustment as necessary.

If the gland nut can no longer be tightened sufficiently to stop the leak, or if leakage continues after adjustment, inspect and replace the packing.

24.4 Repacking the Bonnet-Stem Interface

The bonnet-stem interface consists of the stuffing box, packing, gland follower, and gland nut(s). The stuffing box is the annular space between the valve stem and the bonnet that is filled with packing material. The gland follower compresses the packing, while the gland nut or gland nuts provide the force required to maintain a tight seal around the stem.

Depending on the valve design, the packing may be installed as preformed rings or as continuous packing cord.

Step 1: Isolate the Valve

1. Close and isolate the valve from the system.
2. Apply lockout/tagout procedures.
3. Depressurize and drain the valve.
4. Verify that pressure has been removed before beginning work.

Step 2: Loosen the Gland Assembly

1. Loosen the gland nut evenly.
2. Lift off or withdraw the gland follower.
3. Expose the stuffing box.

Step 3: Remove Old Packing

1. Use a packing puller to remove all old packing material.
2. Remove packing completely from the stuffing box.
3. Clean the stuffing box thoroughly.

Step 4: Inspect Components

Inspect:

- Stem for scoring or wear
- Stuffing box for corrosion or damage
- Gland follower for distortion

Replace damaged components before installing new packing.

Step 5: Prepare New Packing

1. Select the correct packing material for the service.
2. Determine whether the packing is supplied as:
 - Preformed rings, or

- Continuous packing cord (rope packing).

For Preformed Rings

1. Verify that the rings are the correct size for the valve stem and stuffing box.
2. Inspect rings for damage before installation.

For Rope Packing

1. Clean the stem thoroughly.
2. Wind the packing around the stem in the stuffing-box area.
3. Apply enough turns that the packing will fill the stuffing box when compressed by the gland follower.
4. Ensure the packing is wrapped evenly and without twists.

Step 6: Install the Packing

Using Preformed Rings

1. Install one ring at a time.
2. Seat each ring firmly in the stuffing box.
3. Stagger ring joints approximately 90° to 120° apart.
4. Continue until the stuffing box is filled to the original packing height.

Using Rope Packing

1. Position the wound packing around the stem.
2. Install the gland follower.
3. Tighten the gland nut evenly.
4. As the gland follower moves downward, it compresses the packing into the stuffing box.
5. Continue tightening until the packing is firmly seated but the stem still moves freely.

Step 7: Adjust the Packing

1. Verify the gland follower is seated correctly.
2. Tighten gland nut evenly.
3. Apply only enough compression to seat the packing.
4. Ensure the stem still operates smoothly.

Step 8: Return the Valve to Service

1. Slowly restore system pressure.
2. Cycle the valve several times.

3. Check for stem leakage.
4. Tighten the gland slightly if leakage occurs.
5. Avoid overtightening, as excessive packing pressure can increase operating torque and accelerate stem wear.

24.5 Key Point

Leakage around the stem does not necessarily indicate failed packing. First attempt to stop the leak by tightening the gland nut slightly. If adjustment is ineffective, inspect and replace the packing. If the valve leaks through the seat while fully closed, the disc (plug) and seat should be inspected for wear or damage.

24.6 Valve Seat Reconditioning

Occasionally, a globe valve may continue to leak after the disc has been replaced. In this case, the valve seat should be inspected for scoring, pitting, or erosion.

Minor seat damage can often be repaired by reconditioning the seating surface.

Step 1: Disassemble the Valve

1. Isolate and depressurize the valve.
2. Remove the bonnet and disc assembly.
3. Inspect the seat for wear, scoring, or pitting.

Step 2: Dress the Seat

1. Mount a suitable seat-grinding stone in a power drill.
2. Position the stone so that it remains square with the valve seat throughout the grinding operation.
3. Grind lightly using moderate speed and pressure.
4. Remove only enough material to restore a smooth, continuous seating surface.
5. Periodically inspect the seat to avoid excessive material removal.

Step 3: Clean and Inspect

1. Remove all grinding residue.
2. Inspect the seating surface.
3. Verify that all scoring and surface defects have been removed.

Step 4: Reassemble and Test

1. Reinstall the disc and bonnet assembly.
2. Return the valve to service.
3. Check for leakage when the valve is fully closed.

If a satisfactory seat surface cannot be restored, the seat or valve should be replaced.