

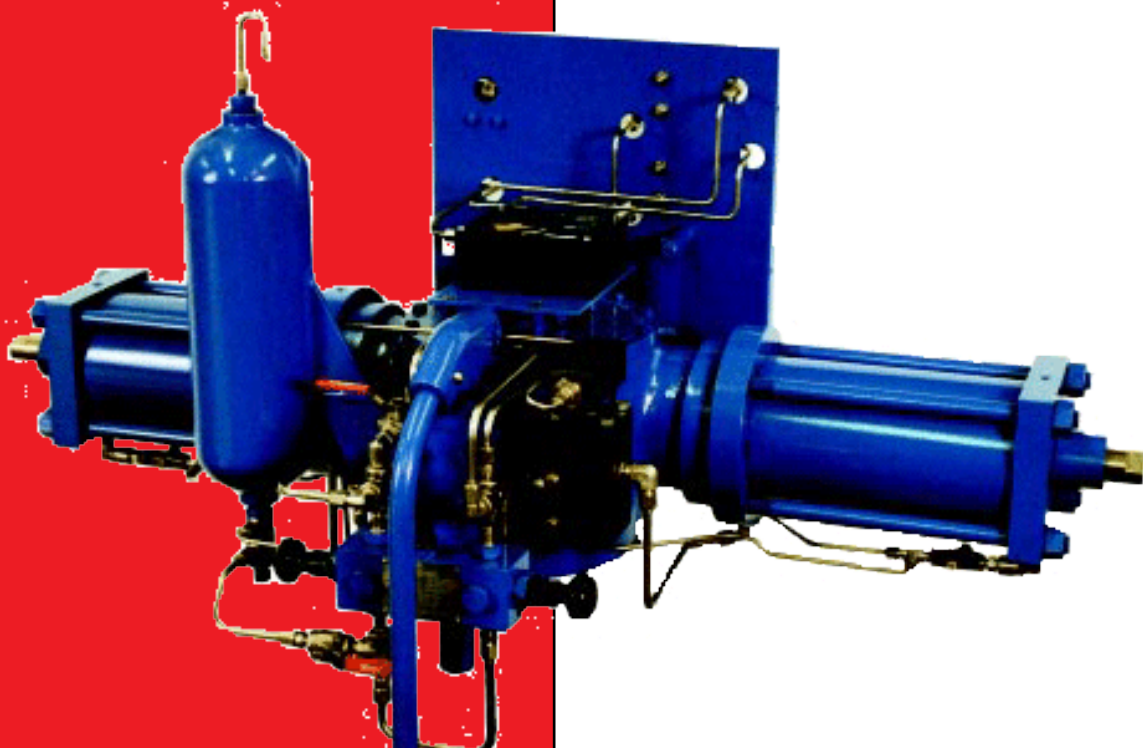
Shafer[™]

Valve Positioning System

Applications

The Shafer **Valve Positioning System** provides automatic control of valve position in response to a continuous feedback signal from the customer's process. This product brochure will focus on natural gas pipeline valve applications including:

- **Pressure regulation**
- **Valve modulating or throttling**
- **Flow control**
- **Valve monitoring or positioning**
- **Pressure relief control**



No over-travel or positioner hunting

Valve stem may be either vertical or horizontal

- **Integral Hydraulic Circuit**
Assures smooth motion and accurate control of the valve. The presence of the hydraulic circuit also provides a means to incorporate an optional hand pump for manual operation.
- **Hydraulic Locking Mechanism**
Provides immediate response and allows for faster stroking speeds without overtravel or positioner hunting.
- **Resistance To Fluid Dynamic Forces**
Once valve position is satisfied, an immediate hydraulic lock-in occurs followed by a pneumatic pressure lock-in on both of the actuator pistons. The hydraulic lock-in feature provides the highest degree of stiffness to resist any rotational forces caused by high valve differential pressures and the fluid dynamic forces in the pipeline. Any tendency for the actuator to resonate is eliminated.
- **High Pressure Control Circuit**
The flow and pressure output of the positioner is used only as a pilot signal for the high pressure control circuit. Therefore, the flow capacity of the positioner does not have any impact on the stroking speed of the actuator.
- **Mounting Flexibility**
The actuator may be mounted to the valve with its stem in either the vertical or horizontal position.
- **Power Supply Pressure From The Pipeline**
The actuator is powered by high pressure natural gas from the pipeline. This greatly reduces the actuator size and increases its response time capability.
- **Low Temperature Capability**
Most systems are rated for -20°F ambient temperatures. The limiting factor on temperature rating is the positioner selection. Many of the positioners offered have -20°F ratings; however, some of the electronic models are rated at +5°F. Please consult our sales engineers for details.
- **High Repeatability With Least Possible Hysteresis**
The G-Series actuator is designed to swallow the valve stem and bolt directly to the valve flange. In this manner, backlash is greatly reduced because crank arms, couplings, and associated linkage are not required. Eliminating the sources of backlash reduces the potential for any significant hysteresis.

SYSTEM COMPONENTS

The Shafer **Valve Positioning System** consists of three integral components: a pneumatic or electric positioner, a valve actuator and a quarter-turn valve.

■ **Positioner**

Several commercially available brands of positioners can be utilized in the system. Extensive laboratory testing and field proven experience are associated with each of the positioner brands and types listed below. Our Sales Engineers can help you choose the positioner best suited for your application and budget. Shafer will also use other brands of positioners if specified by the customer.

"PMV" Series P-1500, Pneumatic or Series P-2000, Electro-Pneumatic Positioners

"Moore" Model 750P Pneumatic, Model 750E I/P Electronic Positioners or Series 760 Valve Controller.

■ **Valve Actuator**

The G-Series, Scotch Yoke Type Valve Actuator provides excellent performance on natural gas pipeline applications. The G-Series double acting piston actuator can utilize high pressure gas, from the pipeline, as its power source thus minimizing size, weight, and cost of the actuator. Also, with the high pressure actuator design, there is no need for a power gas regulator or separate low pressure power supply.

If you do not have specific product literature on the G-Series type valve actuators, or if your application is not for natural gas pipelines, please contact the sales department and we will forward additional information to you promptly.

■ **Valve**

The Shafer **Valve Positioning System** can be adapted to most types of quarter-turn valves; ball, plug or butterfly. The manufacturer and specific valve model are usually specified by the customer.

The most economical approach for the customer is to purchase the valve as a separate item directly from the valve manufacturer. The actuator and control system can be mounted to the valve or valve extension at the construction site, even after the valve has been installed in the pipeline.

If you prefer that Shafer supply the valve, we do have the full capability to supply the complete system, including the valve, purchased to your specifications.



PRINCIPLE OF OPERATION

DYNAMIC STATE ACTUATOR ROTATING



Customer input signal (3-15 psi, 4-10 mA etc.) is fed to the positioner. In this illustration, the positioner responds by bleeding off pilot pressure from the 2-way pilot valve (1). The two pilot valves are the components which ultimately set the actuator in motion. Removing pilot pressure from one pilot valve or the other will cause rotation (open or close).

The poppet type control block (3) regulates pressure in the actuator cylinders. In this sequence, the left poppet (5) is unseated by the piston reacting to the incoming pressure signal. The unseated poppet opens the port for high pressure gas to exhaust from the in-board cylinder (8).

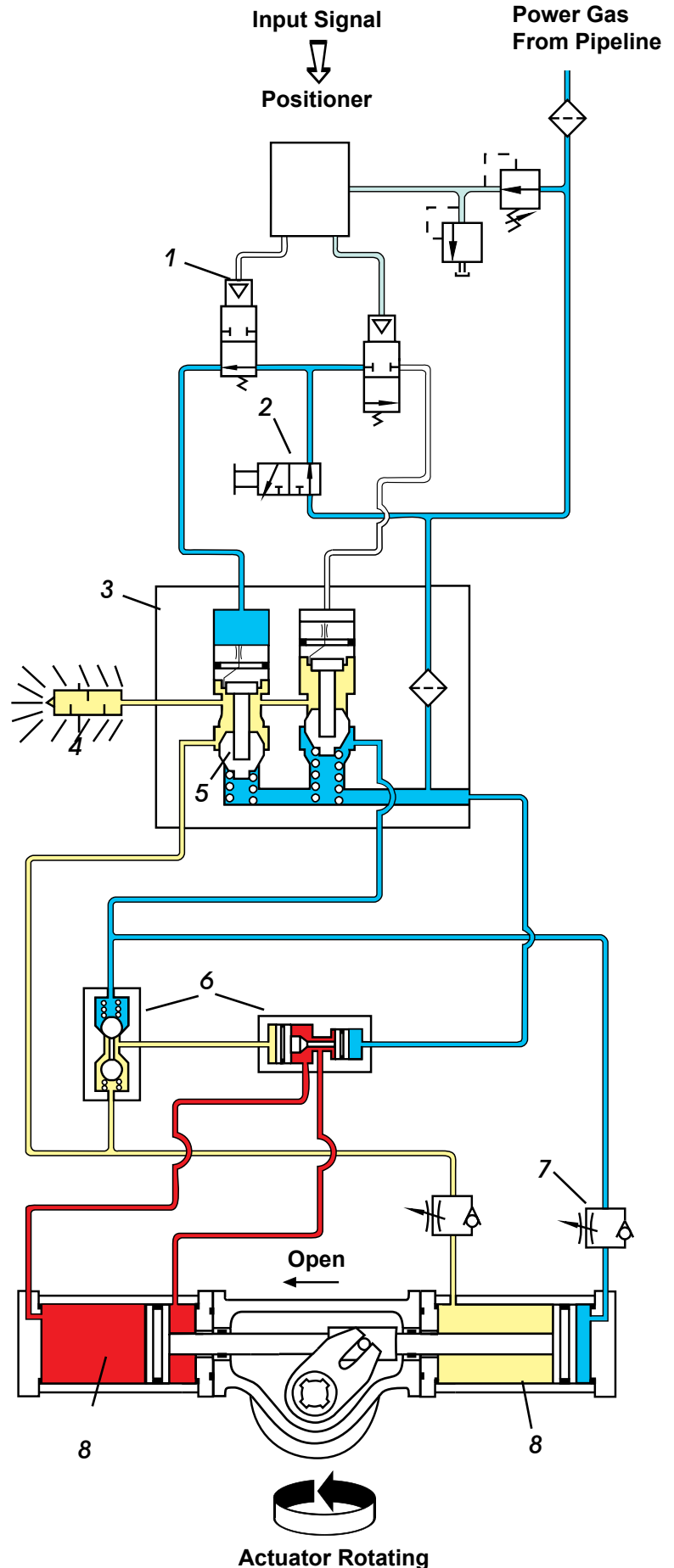
As high pressure gas exhausts from the gas cylinder (8), the actuator rotates the pipeline valve in the counter-clockwise direction. The actuator will continue to move until the positioner is satisfied.

Whenever the positioner is calling for motion, the hydraulic lock mechanism (6) senses the exhaust gas and reacts by unlocking or opening the hydraulic circuit thus allowing rotation of the actuator.

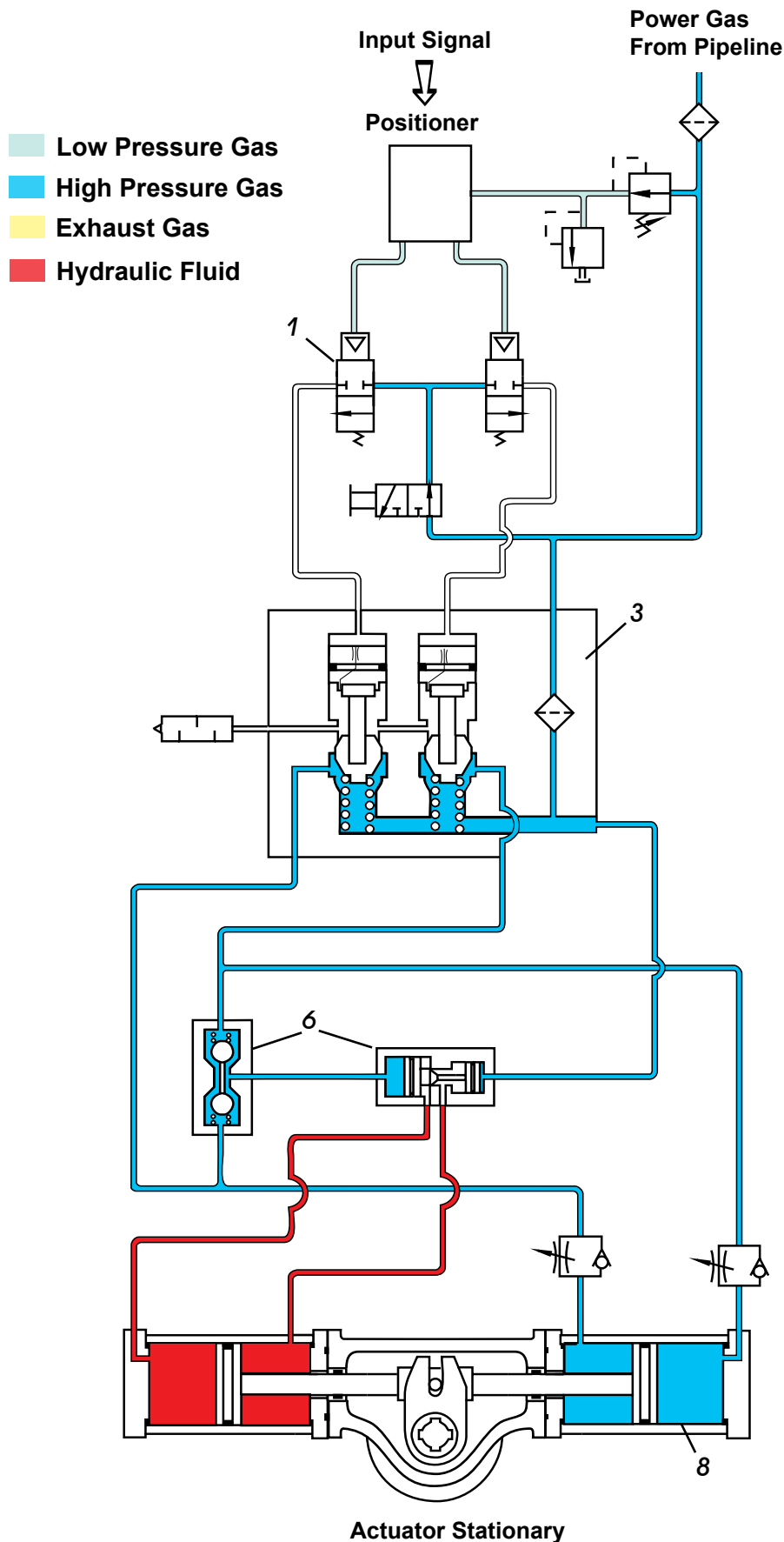
A high performance muffler (4) minimizes any sound from the high pressure exhaust gas.

A 2-position hand valve (2) permits manual override of any remote commands from the positioner and is used for local or emergency manual operation of the pipeline valve.

Two speed control valves (7) provide a means of adjusting the stroking speed.



PRINCIPLE OF OPERATION



STATIC POSITION ACTUATOR STATIONARY

Once the valve positioner is satisfied through its internal feedback mechanism, a pilot pressure signal is transmitted to the 2-way pilot valve (1) causing the pilot valve to close in this sequence.

Without an incoming pressure signal, the poppet type control block (3) will seal off the exhaust port, allowing high pressure gas to pressurize the gas cylinder (8) of the actuator. The actuator is now in a static position with equal pressure on both sides of the piston.

The hydraulic locking mechanism (6) will close immediately once the positioner is satisfied. The locked hydraulic circuit will stop the actuator from drifting or overtraveling in order to prevent positioner hunting.

With the gas cylinder ports equally pressurized, and the hydraulic circuit locked closed, the actuator remains in a stable position awaiting the next command for motion.

ACCESSORIES

No bleed feature

- A manual hydraulic hand pump may be provided for emergency operation in the event the power gas supply from the pipeline is lost.
- A no-bleed feature can be added to the system which will eliminate continuous bleeding of the positioner in either the full open or full closed valve position. The no-bleed accessory should be added on applications where the valve is likely to be in either the full open or full closed position for long periods of time.
- Limit switches or valve position monitors may be specified to provide discrete or analog feedback signals.



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