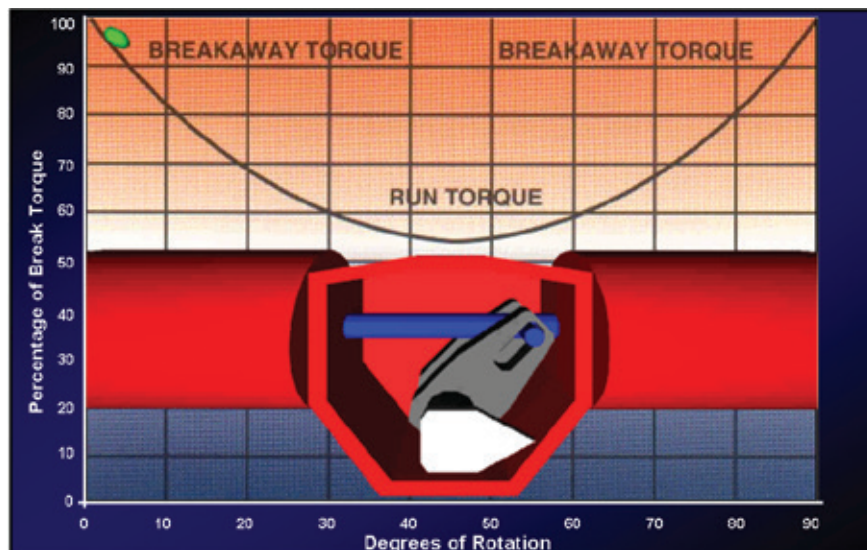


Scotch Yoke Mechanism



The scotch yoke mechanism for Bettis quarter-turn valve operators produces a torque curve that closely matches the valve actuation requirements when converting linear output into rotary motion. The scotch yoke produces greater torque value at the beginning and end of each stroke of the piston, precisely where it is required to operate most types of valves. The torque outputs produced by double-acting actuators are expressed as breakaway and run torque. The breakaway torque is that produced at the beginning and the end of the scotch yoke rotation. The run torque is that produced at the mid-point (45 degrees) of the scotch yoke rotation.



This product is only intended for use in large-scale fixed installations excluded from the scope of Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS 2).

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Safe and Efficient Gas Pipeline Control



Bettis GH-Series Gas/Hydraulic Valve Operators
Controls high pressure natural gas pipelines in remote locations and under severe climatic conditions



Design and Construction

Emerson's Actuation Technologies is recognized worldwide for the reliability of its actuators under the most demanding conditions. The gas/hydraulic products epitomize the quality and performance required for controlling high pressure natural gas pipelines in remote locations and under severe climatic conditions.

Bettis™ gas/hydraulic actuators are used to automate valves located on gas transmission pipelines, often travelling hundreds of miles through inhospitable areas where there are no low pressure instrument air or high pressure hydraulic supply lines available. Bettis actuators are available in either rotary and quarter-turn models.

The gas/hydraulic actuators operate using pressurized gas from the pipeline as its power source, requiring reliability and safety features built into the valve operator system. Since the line gas is a potential hazard, Bettis actuators use a clean, non-explosive hydraulic fluid as an oil barrier rather than direct line gas.

Features and Benefits

- High Pressure - Uses a high pressure gas supply (typically from gas pipeline) as power source.
- Excellent sealing – All models have zero leak pistons and rod seals with materials selected to suit application.
- High torques – Rotary quarter-turn models have torques to 6,000,000 lb. in (678,000 Nm).
- Adaptability – Adaptable for all types of gas compositions including sour (NACE) and wet gas.
- Aluminum alloy actuator body and controls - For exceptional corrosion resistance and low temperature applications.
- Many control system options - including remote control, high/low shutoff and electronic linebreak.
- Hydraulic hand pump for emergency operation.
- Piston with non-metallic wear ring to prevent piston/cylinder scuffing.
- Reliable tanks – Bettis actuators use pressure vessels manufactured and certified (U stamp) to ASME Section VIII as standard and local standard GB-150.
- Standard operating temperature is -50°F to 150°F (-46°C to + 66°C).
- Standard operating pressure up to 2,220 PSIG (ANSI 900 #).



Bettis has been a global leader in valve control for high pressure natural gas operation for more than 55 years.

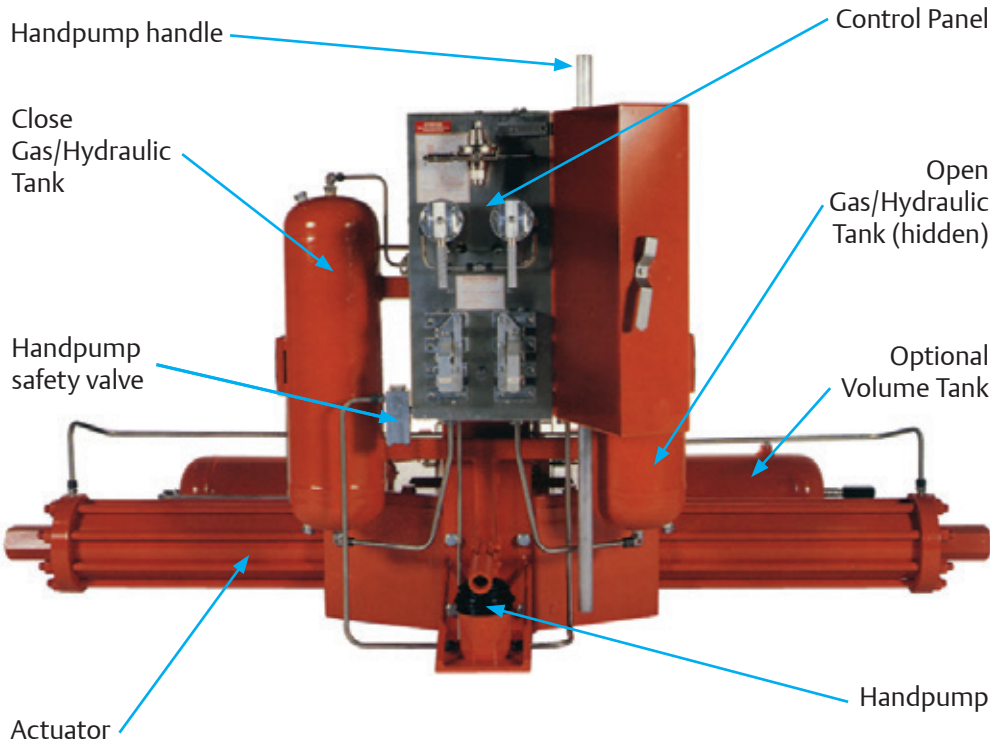
Bettis gas/hydraulic valve operators have proven themselves as a safe means of valve control in any climate or terrain, from remote desert to arctic conditions.

Torques of up to 6,000,000 lb in provide the reliability for operating at the highest pipeline pressure.



Assembly and Features

Bettis GH-Series I

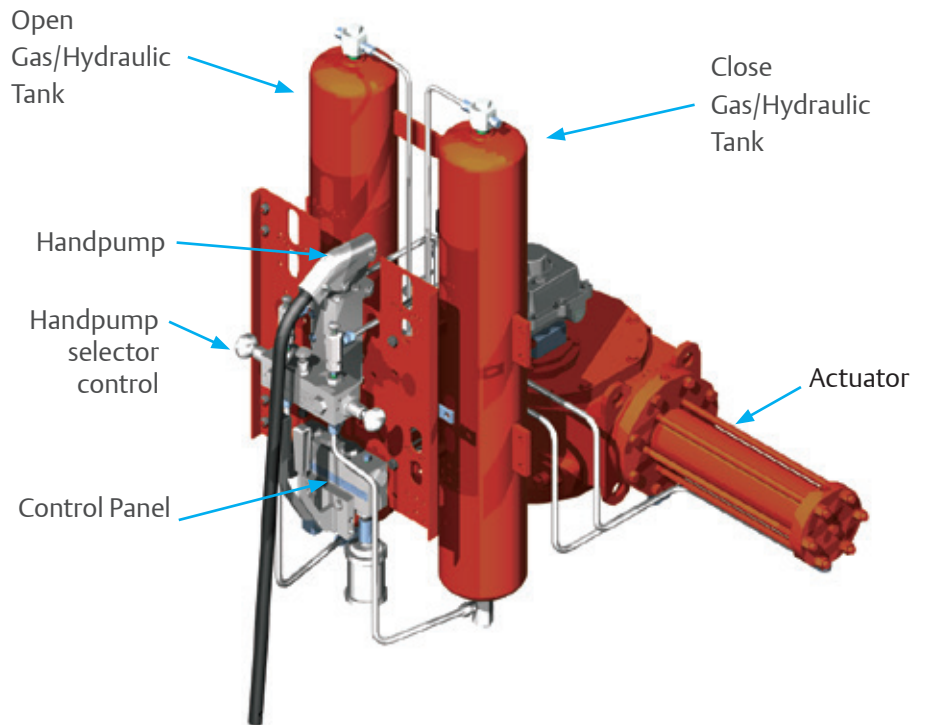


Incorporates a scotch-yoke design for converting linear motion to rotary motion, with breakaway torques from 5,000(565 Nm) to 6,000,000 lb. in (678,000 Nm).

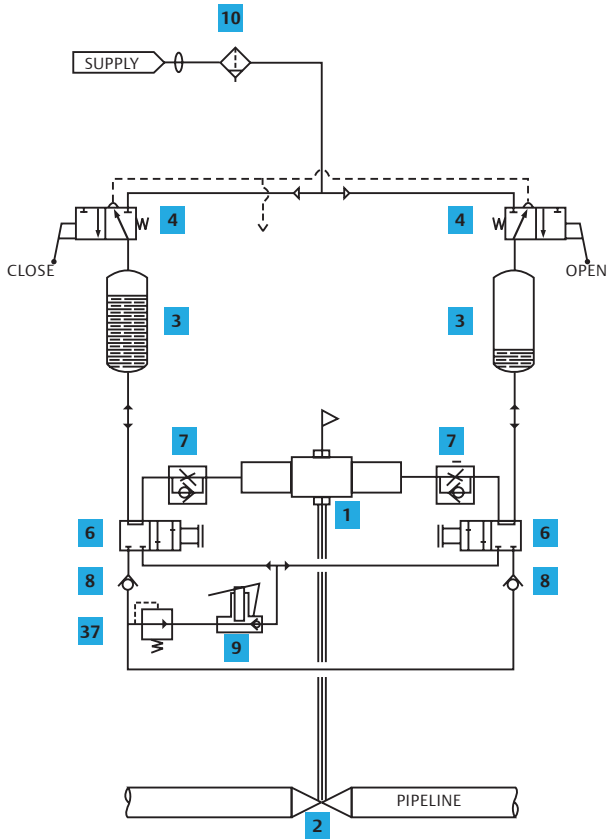
- Readily adaptable for all quarter-turn valves, 90° +/- 10° adjustable rotation standard, limited rotation available.
- Standard light weight cast aluminum drive cases. Optional ductile iron or cast steel cases available.
- Replaceable top and bottom yoke bearings.
- Torque limiting devices available
- Integral drive rod deflection stabilizers to absorb side loads.
- Visual valve position indication
- Readily adaptable for fail safe operation.

Bettis GH-Series II

- Incorporates a scotch-yoke design for converting motion to rotary motion, with breakaway torques from 500 Nm (4,400 lb.in) to 160,000 Nm (1,400,000 lb.in)
- Readily adaptable for all quarter-turn valves, 90° ± 10° adjustable rotation standard, limited rotation available.
- Ductile iron drive case.
- Replaceable top and bottom yoke bearings.
- Visual valve position indication.
- Readily adaptable for fail safe operation.



Control Schematics (Quarter-turn Operator shown)



Typical Control Schematics for Two-Way Manual Operation

Operations:

- Operate 3-way valve (4) to open or close with power gas
- Operate selector valve (6) to enable respective handpump direction

Other control arrangements are available to suit customer applications. For example:

- Line break detection
- Fail close/open by remote signal
- Energize to open, manual close
- Energize to close, manual reset to open

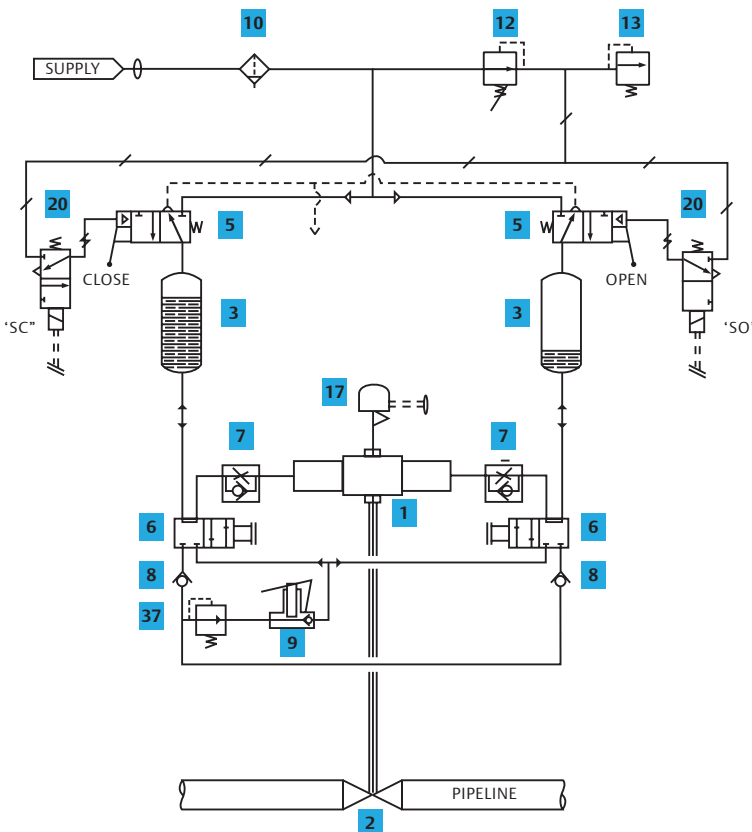
Component List

Manual Operation

- | | |
|------------------------------|---------------------------------|
| 1 Operator | 7 Speed Control Valve |
| 2 Line Valve | 8 Check Valve |
| 3 Gas/Hydraulic Tank | 9 Handpump |
| 4 3-Way Valve, Manual | 10 Filter |
| 6 Selector Valve | 37 Handpump Safety Valve |

Legend

- | | |
|--------------------|--------------|
| → Power Gas | → Return |
| → Hydraulic | ⊠ Closed |
| === Electrical | ⊠ Instrument |
| ⊠ Field Connection | → Vent |
| ⊠ Plugged Port | ⊠ Open |
| ⊠ Signal | |



Typical Control Schematics for Two-Way Electric Operation

Operations:

- Energize solenoid 'SC' to close or "SO" to open
- Solenoids must be de-energized at end of stroke

Component List

Electric Operation

- | | |
|------------------------------------|---------------------------------|
| 1 Operator | 9 Handpump |
| 2 Line Valve | 10 Filter |
| 3 Gas/Hydraulic Tank | 12 Regulator |
| 5 3-Way Valve, Manual/Pilot | 13 Relief Valve |
| 6 Selector Valve | 17 Limit Switch |
| 7 Speed Control Valve | 20 Solenoid Valve, N.C. |
| 8 Check Valve | 37 Handpump Safety Valve |