Scotch-Yoke LEDEEN Actuators

Gas-over-oil and direct-gas actuators
Scotch-Yoke Gas-Over-Oil LEDEEN Actuators

**Typical application**
For on-off control of any natural gas transmission ball or plug valve using the high-pressure natural gas from the pipeline with a gas-over-oil configuration.

**Modular assembly**
Scotch-yoke gas-over-oil LEDEEN* actuators provide increased flexibility through consistent engineering design and efficient modularity. Double-acting, single-cylinder, and dual-cylinder options are available to meet specific pipeline application requirements.

Quarter-turn gas-over-oil actuator.

- Hydraulic cylinder
- Frame
- Symmetric yoke
- Canted yoke
- Gas-over-oil tanks, gas control, and hand pump (mounts to frame)
Scotch-Yoke Direct-Gas LEDEEN Actuators

**Typical application**
For on-off control of any natural gas transmission ball or plug valve utilizing the high-pressure natural gas from the pipeline with a direct-gas configuration.

**Modular assembly**
Consistent engineering design and efficient modular assembly enable increased flexibility. Double-acting, dual-cylinder, and spring-return options are available to meet specific pipeline application requirements.
Quarter-Turn Gas-Over-Oil Standard Features

- Single- or dual-cylinder models
- Torque outputs to 5,700,000 lbf.in [644,000 N.m]
- Open and close travel stops that provide ±3° minimum
- Scotch yoke mechanism that generates powerful opening and closing torque outputs
- Steel-fabricated frame that provides rugged foundation of modular assemblies
- Chrome-plated side-load bar with guide block for effective elimination of piston rod deflection and stem side loading
- Bronze bushing interfaces that provide low-friction support of sliding and rotating components
- Aluminum bronze sliding blocks for a low-friction, low-stress pin connection
- Steel cylinder assembly that provides robust pressure containment for all conditions
- Plated cylinder ID to ensure excellent sealing surface with enhanced corrosion resistance
- Nitrile rubber piston seal configurations designed specifically for gas-over-oil applications
- Composite guide band on piston to provide low-friction guidance and support
- ASME and PED gas-over-oil pressure vessels with dipstick, hydraulic filter, and adjustable speed controls
- High-pressure-rated gas controls for local, remote, and automatic operations
- Hydraulically manual override with four-position selector valve, purging port, and breakdown-style pump lever

<table>
<thead>
<tr>
<th>Standard Product Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuator Type</td>
</tr>
<tr>
<td>Gas over oil</td>
</tr>
</tbody>
</table>

† Lower-temperature material available upon request
Quarter-Turn Direct-Gas Standard Features

- Dual cylinders for all double-acting models
- Gas cylinder dedicated to generating torque and hydraulic cylinder dedicated to smooth speed control and manual override with hand pump
- Torque outputs to 5,700,000 lbf.in [644,000 N.m]
- Open and close travel stops that provide ±3° minimum
- Scotch yoke mechanism that generates powerful opening and closing torque outputs
- Steel-fabricated frame that provides rugged foundation of modular assemblies
- Chrome-plated side-load bar with guide block for effective elimination of piston rod deflection and stem side loading
- Bronze bushing interfaces that provide low-friction support of sliding and rotating components
- Aluminum bronze sliding blocks for a low-friction, low-stress pin connection
- Steel cylinder assembly that provides robust pressure containment for all conditions
- Plated cylinder ID to ensure excellent sealing surface with excellent corrosion resistance
- Nitrile rubber piston seal configurations designed specifically for direct-gas applications
- Composite guide band on piston to provide low-friction guidance and support
- Seal-welded, steel-spring cartridge that provides maximum personnel safety and resistance to environmental conditions
- Epoxy-coated, prestressed springs that provide consistent performance with corrosion protection
- High-pressure-rated gas controls for local, remote, and automatic operations
- Hydraulic manual override with three-position selector valve, dual-speed controls, purging port, and breakdown-style pump lever

<table>
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<tr>
<th>Standard Product Characteristics</th>
<th></th>
</tr>
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<tbody>
<tr>
<td><strong>Actuator Type</strong></td>
<td><strong>Temperature Range, degF [degC]</strong></td>
</tr>
<tr>
<td>Direct gas</td>
<td>−20 to 176 [−29 to 80]</td>
</tr>
</tbody>
</table>
Gas-Over-Oil Standard Construction

Single-cylinder assembly.

Item | Description | Material
--- | --- | ---
1 | Travel stop | Alloy steel
2 | Guide bar | Alloy steel
3 | Pin | Alloy steel
4 | Guide block | Carbon steel
5 | Sliding block | Aluminum bronze
6 | Cylinder | Carbon steel
7 | Tie rod | Alloy steel
8 | Flange | Carbon steel
9 | Guide band | PTFE and graphite
10 | Seal | Nitrile rubber quad ring
11 | Piston | Carbon steel
12 | Piston rod | Alloy steel
13 | Scotch yoke | Alloy steel
14 | Bushing | Bronze
15 | Frame | Carbon steel

Dual-cylinder assembly.
Direct-Gas Standard Construction

**Double-acting assembly.**

**Spring-return assembly.**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Travel stop</td>
<td>Alloy steel</td>
</tr>
<tr>
<td>2</td>
<td>Guide bar</td>
<td>Alloy steel</td>
</tr>
<tr>
<td>3</td>
<td>Pin</td>
<td>Alloy steel</td>
</tr>
<tr>
<td>4</td>
<td>Guide block</td>
<td>Carbon steel</td>
</tr>
<tr>
<td>5</td>
<td>Sliding block</td>
<td>Aluminum bronze</td>
</tr>
<tr>
<td>6</td>
<td>Cylinder</td>
<td>Carbon steel</td>
</tr>
<tr>
<td>7</td>
<td>Tie rod</td>
<td>Alloy steel</td>
</tr>
<tr>
<td>8</td>
<td>Flange</td>
<td>Carbon steel</td>
</tr>
<tr>
<td>9</td>
<td>Guide band</td>
<td>PTFE and graphite</td>
</tr>
<tr>
<td>10</td>
<td>Seal</td>
<td>Nitrile rubber quad ring</td>
</tr>
<tr>
<td>11</td>
<td>Piston</td>
<td>Carbon steel</td>
</tr>
<tr>
<td>12</td>
<td>Piston rod</td>
<td>Alloy steel</td>
</tr>
<tr>
<td>13</td>
<td>Scotch yoke</td>
<td>Alloy steel</td>
</tr>
<tr>
<td>14</td>
<td>Bushing</td>
<td>Bronze</td>
</tr>
<tr>
<td>15</td>
<td>Frame</td>
<td>Carbon steel</td>
</tr>
<tr>
<td>16</td>
<td>Spring cartridge</td>
<td>Carbon steel</td>
</tr>
<tr>
<td>17</td>
<td>Spring</td>
<td>Alloy steel</td>
</tr>
</tbody>
</table>
Standard Accessories

High-pressure gas control assembly
- Compact design with weather-resistant enclosure
- Controls of hard anodized marine-grade aluminum material
- Stainless steel filter with molecular sieve to condition supply gas
- All control configurations rated for high pressure
- Compact, easy-to-operate thumb levers for local operation
- Conversion from local to remote with integrated explosion-proof solenoids
- Extensive combination of automatic features available for meeting specific requirements of emergency shutdown

Hand pump assembly
- Easy generation of a high-pressure hydraulic output to the actuator
- Multiposition selector valve for open, close, and remote functions (bypass position included on gas-over-oil model)
- Integrated pilot feature that assures selector valve position does not inhibit power operation of actuator during remote or automatic functions
- Lockable, breakdown-style pump lever that secures selector valve in remote position
- Purging feature that allows hydraulic circuit to expel trapped air
Standard Options

- ASME and Pressure Equipment Directive (PED) emergency storage vessels
- Materials of construction for service conditions down to −50 degF [−45 degC]
- Special seals for low-temperature applications to −76 degF [−60 degC] and for high-temperature applications to 392 degF [200 degC]
- Spring-return direct-gas configurations with hydraulic dampening

Certifications
Our scotch-yoke LEDEEN actuators comply with many industry standards.
- ISO 9001:2000
- PED 97/23/EC
- SI 825
- IEC 61508:2000 (TÜV SIL 3)
- Technical Regulations Customs Union (TR CU)
Model Number Designation

Cameron offers customizable assemblies for scotch-yoke gas-over-oil and direct-gas LEDEEN actuators. An example model number for each actuator configuration is shown. By sequentially proceeding through each variable, the specific subassemblies of either actuator type can be clearly identified.

Gas over oil

**Example**

<table>
<thead>
<tr>
<th>Frame Type</th>
<th>Frame Size</th>
<th>Power Cylinder Size</th>
<th>Power Cylinder Quantity</th>
<th>Product Type</th>
<th>Yoke Type</th>
<th>Manual Override Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>SY</td>
<td>6 to 32</td>
<td>Hydraulic</td>
<td>x2 Two cylinders</td>
<td>G Gas over</td>
<td>A Canted</td>
<td>Hand pump override is provided with each gas-over-oil assembly. No selection is required.</td>
</tr>
</tbody>
</table>

Technical data

For additional technical data such as torque charts or dimensional drawings, refer to the scotch-yoke gas-over-oil LEDEEN actuators technical data package or contact Schlumberger.
Direct gas

SY1613D-A-HMO
(Double-acting example)
SY1613D-A-SRC2-HMO
(Spring-return example)

Example

```
SY  16  13  D - A - SR  C  2 - HMO
```

- **Frame type**
- **Frame size**
- **Power cylinder size**
- **Product type**
- **Yoke type**
- **Actuator type**
- **Fail position**
- **Spring cartridge size**
- **Manual override option**

<table>
<thead>
<tr>
<th>Frame Type</th>
<th>Frame Size</th>
<th>Power Cylinder Size</th>
<th>Product Type</th>
<th>Yoke Type</th>
<th>Actuator Type</th>
<th>Fail Position</th>
<th>Spring Cartridge Size</th>
<th>Manual Override Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>SY</td>
<td>6 to 32</td>
<td></td>
<td>D - Direct-gas</td>
<td>A - Canted</td>
<td>SR - Spring-return</td>
<td>Open</td>
<td>Close</td>
<td>1 to 5</td>
</tr>
</tbody>
</table>

Technical data

For additional technical data such as torque charts or dimensional drawings, refer to the scotch-yoke direct-gas LEDEEN actuators technical data package or contact Schlumberger.
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