Established Leaders in Valve Actuation

Electro-Hydraulic Self-Contained Failsafe Actuators

Skilmatic Range

Fluid Power Actuators and Control Systems

Publication F700E Issue 10/10
Since the company was founded in 1957, Rotork has become the standard for excellence in the field of valve and damper automation for the oil, gas, power, water and waste treatment industries around the world.

As established leaders in actuation technology, we owe our success to a commitment to quality at every stage, and at every level, of Rotork’s operations.

At the heart of the company is an exceptional workforce – the highly trained, forward thinking engineers, technicians, and sales support staff who each play a crucial role in maintaining Rotork’s unrivalled reputation for innovation, reliability and first class after sale support. With several fluid power factories and additional Centres of Excellence located around the globe, we are able to offer creative solutions and design systems for virtually any application – from subsea hydraulics to the most sophisticated yet simple fluid power control system.

Contact Rotork for your operational or safety application requirements. We will work with you from conception, to design, to manufacture, to installation, and finally to maintenance and service support.

Skilmatic Range

Reliability by design

The Rotork Fluid Systems Skilmatic range of self-contained, electro-hydraulic actuators are the result of Rotork’s ongoing commitment to product development utilising leading edge technology. The Skilmatic range includes SI, SB and EH actuators.

The SI & SB actuators combine the simplicity of electrical operation with the precision of hydraulic control and the reliability of spring-powered failsafe action. The actuators use an internal spring-return mechanism to provide the most reliable means of positioning a valve to a safe condition. They can be failsafe to close, open, or lock-in-last position on power, ESD or system failure.

EH actuators offer the flexibility of customisation to suit the application. They feature an integrated control module; a hydraulic manifold; and a power unit consisting of a motor, hydraulic pump and reservoir. They are available in double-acting or spring-return configurations for both quarter-turn and linear applications.

Features

• Self-contained electrically operated.
• Failsafe spring or accumulator powered.
• Two-position control & ESD.
• Partial stroking capability.
• Modulating control 4-20 mA input / output with resolution better than 0.25%.
• LCD display for position, pressure and fault diagnostics.
• Integral controls with infrared non-intrusive setting.
• Double-sealed terminal compartment.
• Optional fieldbus communications.
• Watertight up to and including IP68.
• Flameproof / Explosionproof models.

Benefits

• Reduced installation and maintenance costs.
• Most reliable means of positioning a valve in a safe position on loss of power or signal.
• Designed for safety critical applications.
• Confirms valve availability and minimises plant shutdown.
• Improved process control and product quality.
• Provides local operator information.
• Complete sealing allows calibration and interrogation of the actuator in all environments.
• Environmental protection maintained for internal components during installation and commissioning.
• Interfaces with a variety of communication networks.
• Suitable for harsh environments including immersion up to 7 m.
• Suitable for Zone 1 / Division 1 hazardous areas.
Skilmatic Range – Electro-Hydraulic self-contained actuators

SI Quarter-turn Actuators
Failsafe spring-return.
Torque output to 4,400 Nm (39,000 lbf-in).

EH Quarter-turn Actuators
Double-acting and spring-return.
Torque output to 600,000 Nm (5.3 Million lbf-in).

SI Linear Actuators
Failsafe spring-return.
Thrust output to 61 kN (13,700 lbf).

EH Linear Actuators
Double-acting and spring-return.
Thrust output to 5,500 kN (1.2 Million lbf).
SI Quarter-turn Actuators

Intelligent Design
The SI-Q are compact and robust electrically operated failsafe spring-return quarter-turn actuators. Designed for two-position, ESD or modulating control for all types of ball, butterfly, plug valves and dampers.

Consisting of a self-contained electro-hydraulic control module and scotch yoke drive, the actuators are available as spring-return (clockwise or anticlockwise) or lock-in-last position. Single-phase, three-phase, or 24 VDC power supply options are available. Although available on all SI and EH actuators, the following features are specifically relevant to quarter-turn applications.

ESD
SI-Q actuators are specifically designed for emergency shutdown (ESD) applications with a discrete input signal. The ESD signal can be configured to control the shutdown through the internal processor or a hardwired circuit by-passing the processor. Various closing speeds are available to meet application requirements.

Partial Stroking
Partial stroking is available as standard and allows for testing of the valve with minimal affect on the process. All key components within the actuator including valve torque and movement are tested to confirm availability for shutdown on demand.

For safety critical applications the actuator is designed to meet up to SIL 3 standards with hardwired ESD. Alarms are indicated through both the local LCD display and alarm relay outputs. Mean Time Between Failures (MTBF) and Probability to Fail on Demand (PFD) calculations can be provided to suit the specific application.

<table>
<thead>
<tr>
<th>Actuator Size</th>
<th>Torque (Nm)</th>
<th>Stroke Speed (Seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hydraulic Stroke</td>
<td>Spring Stroke</td>
</tr>
<tr>
<td></td>
<td>Start</td>
<td>Mid</td>
</tr>
<tr>
<td>SI-1-Q31</td>
<td>95</td>
<td>42</td>
</tr>
<tr>
<td>SI-1-Q41</td>
<td>190</td>
<td>95</td>
</tr>
<tr>
<td>SI-1-Q51</td>
<td>290</td>
<td>1400</td>
</tr>
<tr>
<td>SI-1-Q60</td>
<td>720</td>
<td>360</td>
</tr>
<tr>
<td>SI-1-Q61</td>
<td>620</td>
<td>300</td>
</tr>
<tr>
<td>SI-2-Q60</td>
<td>720</td>
<td>360</td>
</tr>
<tr>
<td>SI-2-Q61</td>
<td>620</td>
<td>300</td>
</tr>
<tr>
<td>SI-2-Q70</td>
<td>1,650</td>
<td>718</td>
</tr>
<tr>
<td>SI-2-Q80</td>
<td>3,350</td>
<td>1,450</td>
</tr>
<tr>
<td>SI-2-Q110</td>
<td>4,422</td>
<td>4,422</td>
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<tr>
<td>SI-2-Q111</td>
<td>6,428</td>
<td>3,290</td>
</tr>
<tr>
<td>SI-2-Q112</td>
<td>5,264</td>
<td>2,447</td>
</tr>
</tbody>
</table>

Note - Torque in lbf-in is 8.85x Nm figure.
Table reflects standard sizes. Alternative sizes and stroke speeds are available. See product specification sheets for full details.
Established Leaders in Valve Actuation Technology

### Intelligent Design

EH-Q actuators offer the flexibility of customisation to suit specific applications. The actuators are self-contained, as with all Skilmatic products, eliminating the installation and maintenance cost associated with conventional hydraulic systems having a central hydraulic power unit with supply and return lines.

The range includes an integrated control module with hydraulic manifold; a power unit consisting of a motor, hydraulic pump and reservoir; and a spring-return or double-acting scotch yoke actuator from our extensive range. Optional accumulators and various hydraulic pump sizes are available to suit the required operating speed and application.

They can be configured to mount in any position and can also be supplied with remote mounting of the hydraulic power unit when space is an issue. The EH-Q can also operate with an existing hydraulic power unit; the HPU must operate with compatible hydraulic fluid and pressures.

EH-Q actuators are specifically designed for two-position and emergency shutdown (ESD) applications with the option of partial stroke testing for all types of ball, butterfly, plug valves and dampers. The actuators can also be configured for modulating control from a 4-20 mA input signal with a resolution <0.5% with the option of slow mode control.

They are available in various voltages for single-phase, three-phase, or 24 VDC power supplies and are watertight to a minimum of IP54 with the option of up to IP67. Explosionproof models are certified to FM, CSA, ATEX, IEC Ex or Gost.

EH actuators offer the same features as the SI range: non-intrusive setting, LCD display, double-sealed terminal compartment, lockable local controls and field communications.

Consult Rotork Fluid Systems with your specific requirements.

#### EH-Q Range Performance Table

<table>
<thead>
<tr>
<th>Actuator Type</th>
<th>Valve Seat Torque (Nm)</th>
<th>Stroke Speed (Seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Hydraulic Direction</td>
</tr>
<tr>
<td>EH-Q-SR (Spring-Return)</td>
<td>2,000 to 210,000</td>
<td>5 to 425</td>
</tr>
<tr>
<td>EH-Q-DA (Double-Acting)</td>
<td>1,000 to 600,000</td>
<td>5 to 325</td>
</tr>
</tbody>
</table>

*Note - Torque in lbf-in is 8.85x Nm figure.*

Table reflects standard sizes. Alternative sizes and stroke speeds are available. See product specification sheets for full details.
**Intelligent Design**

The SI-L are compact and robust electrically operated linear actuators designed for modulating control and are equally suited for two-position or ESD applications. The control module provides a pulsed hydraulic output to accurately position the spring-opposed linear cylinder, and is suitable for all styles of control valves with a linear drive shaft. They are available as spring-extend, spring-retract or lock-in-last position on loss of power or signal with standard strokes up to 105 mm (4”). Various single-phase, three-phase, or 24 VDC power supply options are available. Although available on all SI and EH actuators, the following feature is specifically relevant to linear control applications.

**Modulating Control**

SI-L actuators are designed for modulating control application and can be calibrated with our infrared setting tool to accept various forms of analogue or digital input. A wide range of functions such as zero, span, deadband and hysteresis can be configured without removing any covers. They accept 4-20 mA or 0-10 VDC input to accurately position a control valve with a resolution better than 0.2%. They will also provide a 4-20 mA output of valve position and can be either internally or externally powered.

### SI-L Range Performance Table

**Spring to extend actuator drive shaft:**

<table>
<thead>
<tr>
<th>Actuator Size</th>
<th>Stroke (mm)</th>
<th>Thrust (kN)</th>
<th>Stroke Speed (mm/sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Hydraulic Stroke (Open)</td>
<td>Spring Stroke (Close)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Start</td>
<td>End</td>
</tr>
<tr>
<td>SI-1-L80/40</td>
<td>40</td>
<td>2.08</td>
<td>1.26</td>
</tr>
<tr>
<td>SI-1-L100/40</td>
<td>40</td>
<td>3.7</td>
<td>2.04</td>
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<tr>
<td>SI-1-L125/65</td>
<td>65</td>
<td>6.13</td>
<td>3.57</td>
</tr>
<tr>
<td>SI-1-L160/65</td>
<td>65</td>
<td>9.73</td>
<td>5.39</td>
</tr>
<tr>
<td>SI-1-L200/65</td>
<td>65</td>
<td>15.42</td>
<td>8.51</td>
</tr>
<tr>
<td>SI-2-L200/105</td>
<td>105</td>
<td>15.42</td>
<td>8.52</td>
</tr>
<tr>
<td>SI-2-L250/105</td>
<td>105</td>
<td>23.88</td>
<td>13.14</td>
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<tr>
<td>SI-2-L280/105</td>
<td>105</td>
<td>30.17</td>
<td>16.62</td>
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<td>SI-2-L320/105</td>
<td>105</td>
<td>39.47</td>
<td>21.57</td>
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<td>SI-2-L350/105</td>
<td>105</td>
<td>47.9</td>
<td>26.68</td>
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<tr>
<td>SI-2-L400/105</td>
<td>105</td>
<td>62.22</td>
<td>34.09</td>
</tr>
<tr>
<td>SI-2-L450/105</td>
<td>105</td>
<td>78.75</td>
<td>42.95</td>
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</tbody>
</table>

**Spring to retract actuator drive shaft:**

<table>
<thead>
<tr>
<th>Actuator Size</th>
<th>Stroke (mm)</th>
<th>Thrust (kN)</th>
<th>Stroke Speed (mm/sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Hydraulic Stroke (Close)</td>
<td>Spring Stroke (Open)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Start</td>
<td>End</td>
</tr>
<tr>
<td>SI-1LA80/40</td>
<td>40</td>
<td>2.79</td>
<td>1.78</td>
</tr>
<tr>
<td>SI-1LA100/40</td>
<td>40</td>
<td>4.42</td>
<td>2.88</td>
</tr>
<tr>
<td>SI-1LA125/65</td>
<td>65</td>
<td>6.84</td>
<td>4.41</td>
</tr>
<tr>
<td>SI-1LA160/65</td>
<td>65</td>
<td>11.39</td>
<td>7.49</td>
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<td>SI-1LA200/65</td>
<td>65</td>
<td>17.93</td>
<td>11.9</td>
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<tr>
<td>SI-2-LA200/105</td>
<td>105</td>
<td>17.93</td>
<td>11.9</td>
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<tr>
<td>SI-2-LA250/105</td>
<td>105</td>
<td>27.94</td>
<td>18.49</td>
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<td>SI-2-LA280/105</td>
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<td>35.14</td>
<td>23.32</td>
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<td>SI-2-LA320/105</td>
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<td>46.14</td>
<td>30.81</td>
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<tr>
<td>SI-2-LA350/105</td>
<td>105</td>
<td>54.97</td>
<td>36.52</td>
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<tr>
<td>SI-2-LA400/105</td>
<td>105</td>
<td>72.26</td>
<td>48.4</td>
</tr>
<tr>
<td>SI-2-LA450/105</td>
<td>105</td>
<td>91.69</td>
<td>61.61</td>
</tr>
</tbody>
</table>

*Note - Thrust lbf-in is 224.8x kN figure.*

*Table reflects to standard sizes. Alternative sizes and stroke speeds are available. See product specification sheets for full details.*
Established Leaders in Valve Actuation Technology

Intelligent Design
EH-L actuators offer the flexibility of customisation to suit specific applications. The actuators are self-contained, as with all Skilmatic products, eliminating the installation and maintenance cost associated with conventional hydraulic systems having a central hydraulic power unit with supply and return lines.

The range includes an integrated control module with hydraulic manifold; a power unit consisting of a motor, hydraulic pump and reservoir; and a spring-return or double-acting scotch yoke actuator from our extensive range. Optional accumulators and various hydraulic pump sizes are available to suit the required operating speed and application. The range is available with strokes up to 343 mm (13.5”).

They can be configured to mount in any position and can also be supplied with remote mounting of the hydraulic power unit when space is an issue. The EH-L can also operate with an existing hydraulic power unit; the HPU must operate with compatible hydraulic fluid and pressures.

EH-L actuators are specifically designed for two-position and emergency shutdown (ESD) applications with the option of partial stroke testing for globe, gate valves and dampers. The actuators can also be configured for modulating control from a 4-20 mA input signal with a resolution <0.5% with the option of slow mode control.

They are available in various voltages for single-phase, three-phase, or 24 VDC power supplies and are watertight to a minimum of IP54 with the option of up to IP67. Explosionproof models are certified to FM, CSA, ATEX, IEC Ex or Gost.

EH actuators offer the same features as the SI range: non-intrusive setting, LCD display, double-sealed terminal compartment, lockable local controls and field communications.

Consult Rotork Fluid Systems with your specific requirements.

EH-L Range Performance Table

<table>
<thead>
<tr>
<th>Actuator Type</th>
<th>Valve Seat Thrust (kN)</th>
<th>Spring Speeds (mm/sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Hydraulic Direction</td>
</tr>
<tr>
<td>EH-L-SR (Spring-Return)</td>
<td>25 to 150</td>
<td>300 to 0.5</td>
</tr>
<tr>
<td>EH-L-DA (Double-Acting)</td>
<td>10 to 5,500</td>
<td>300 to 0.5</td>
</tr>
</tbody>
</table>

Note - Thrust lbf-in is 224.8x kN figure.
Table reflects standard sizes. Alternative sizes and stroke speeds are available. See product specification sheets for full details.
Principles of Operation

SI-1 Actuators

The actuators operate on a pump and bleed principle and utilise the Skilmatic dual oscillating pumps to provide instantaneous hydraulic pulses in one direction and spring-return in the opposite (bleed) direction, providing inherently accurate control.

Actuator commanded to Open from the Closed limit. The bleed solenoid valve(s), and pumps are energised. The system pressure acts against a spring opposed piston to drive the actuator in the open direction.

Actuator commanded to Stop, or reaches the Open limit. The pumps are de-energised and the bleed solenoid valve(s) remain energised, the system pressure is maintained to hold the actuator position.

Actuator commanded to Close, reach the Closed limit or loss of ESD. The bleed solenoid valve(s), and dual oscillating pumps are de-energised. Pressure is released; the hydraulic fluid returns to the reservoir and the springs return the drive shaft to the closed or safe position.

SI-2 Actuators

The actuators operate on a pump and bleed principle utilising a motorised vane pump to provide hydraulic pressure in one direction and spring-return in the opposite (bleed) direction.

Actuator commanded to Open from the Closed limit. The bleed solenoid valve(s) are energised. The motorised vane pump is started under no-load condition as a result of the delay in energising the by-pass solenoid valve. With the by-pass solenoid energised, the system pressure acts against a spring opposed piston to drive the actuator in the open direction.

Actuator commanded to Stop or reaches the Open limit. The by-pass solenoid valve is de-energised, followed by the motorised vane pump after 5 seconds unless a new command to Open is given. The bleed solenoid valve(s) remain energised and the system pressure is maintained to hold the actuator position.

Actuator commanded to Close, reach the Closed limit or loss of ESD. The by-pass solenoid valve(s), and dual oscillating pumps are de-energised. Pressure is released; the hydraulic fluid returns to the reservoir and the springs return the drive shaft to the closed or safe position.

*Diagram shows Linear configuration

*Diagram shows Quarter-turn configuration
Established Leaders in Valve Actuation Technology

**EH Actuators**

### Spring-return

During the opening cycle, the motor turns on and drives the hydraulic pump. The bypass solenoid valve allows the pump to get up-to-speed under no load. When the motor is at full speed, the bypass valve shuts and hydraulic fluid is forced into the actuator cylinder moving the actuator to the open position. In an on/off application, to move the actuator to the close position, the close solenoid is opened allowing oil to flow to the reservoir at a high flow rate. For positioning applications, the close solenoid is opened until the actuator nears the position set point. At a configurable distance away from the set point, the close solenoid is shut and the slow solenoid is opened to provide an adjustable slow-speed mode for fine positioning. When moving in the close direction while in positioning mode, the bypass valve is opened allowing the motor to run continuously during frequent positioning. This reduces motor starts, increasing motor and contactor life. An accumulator will be fitted if hydraulic stroke speed adjustment is required by the application.

### Double-acting

Double-acting EH actuators include a 4-way, 2-position solenoid valve to control the direction of travel. A stop solenoid is used to keep the actuator in position. A slow-speed solenoid is included for fine positioning near the set point. When energized, the hydraulic fluid is forced through the fixed orifice. An optional accumulator is used to provide stored energy for failsafe operation. Also for failsafe operation, the stop solenoid is changed to a normally open type. An accumulator will also be fitted if hydraulic stroke speed adjustment is required. The dual pilot operated check valves hold the actuator in position upon loss of pressure.

N.B. These schematics show the basic operation of EH spring-return and double-acting actuators. For simplicity, some items are not shown (i.e., relief valves, filtration, drain valves, and pressure sensing devices). EH actuators operate at high pressure, typically 100 to 170 bar (1,500 to 2,500 psi).
SB General Purpose Actuators

SB301/302 – Two-Position

SB actuators offer the simplest solution to spring-return failsafe electric actuation for valve automation. Operating from a standard 230/110 VAC supply, they are designed for general purpose applications with ball and butterfly valves and fire damper. The actuators utilise a fully sealed electro-hydraulic power system with internal spring-return action for clockwise or anti-clockwise rotation.

Skilmatic model SB301/302 general purpose, two-position, quarter-turn actuators are designed for weatherproof applications to IP66/NEMA 4. The actuators provide a torque range of 24 to 480 Nm (212 to 4,248 lbf-in).

See publication F754 for further details.

SB405/406 – Modulating

SB405/406 quarter-turn actuators are specifically designed for modulating control but are equally suited for 2-position applications. They accept a standard 4-20 mA or pulsed signal to position a valve or damper with a resolution better than 0.2° and offer a 100% duty rating.

The actuators are housed in a compact and robust weatherproof enclosure to IP65/NEMA 4 to suit all industries and remote valve locations with torque range from 24 to 510 Nm (212 to 4,513 lbf-in).

See publication F755 for further details.

SB-1 and SB-2 – Flameproof

SB-1Q and SB-2Q flameproof quarter-turn actuators are designed for two-position and emergency shutdown applications where failsafe spring-return action is required.

Suitable for hazardous areas certified ATEX II 2 G Ex dm IIB T4 (Tamb -35 to +60 °C, Tamb -31 to +140 ºF).

The actuators are housed in a compact and robust watertight enclosure to IP67, suitable for a torque range from 65 to 4,400 Nm (575 to 39,000 lbf-in).

See publications F756 (SB-1) and F757 (SB-2) for further details.
Bus Control Systems

Rotork Pakscan – the total control solution
Whether you need remote control of just a small number of motorised valves or full automation of a plant with thousands of instruments and control elements, Pakscan can help you to achieve significant savings in terms of both time and money.

That’s because Pakscan is capable of controlling and monitoring up to 240 field devices using a simple shielded, twisted pair cable loop instead of a multi-conductor cable for each field device. The system can also gather important digital and analogue plant data when its master station(s) is linked to the double-sealed field unit which is fully integral to each Rotork actuator.

Together with Pakscan’s ability to communicate directly with a PLC or DCS system via an RS485 or RS232 link, its overall simplicity keeps customers’ design work to a minimum.

See publication 5000 for further details.

Fieldbus Compatibility
In addition to offering full compatibility with Pakscan, SI and EH actuators can be specified to interface seamlessly to many other fieldbus digital control systems. Open fieldbus protocols such as Profibus, Foundation Fieldbus, DeviceNet and Modbus are all available within the SI and EH actuator control options.

This is achieved simply and cost effectively through fitting an appropriate Rotork Fluid Systems manufactured circuit board module inside the actuator’s electrical housing – normally at the time of production. Module commissioning and setup is carried out using a combination of the Rotork Setting Tool and the network commissioning tools used for the chosen protocol.

An internally mounted Pakscan field unit is used for remote control and status indication over a fault tolerant two-wire serial link. The system has loop distances of up to 20 km without repeaters and host communications using Modbus protocol. System variables are programmable over the infra-red data link.

Rotork Fluid Systems SI and EH Range actuators are fully compatible with the following fieldbus communication systems:

- **Foundation Fieldbus**
- **DeviceNet**
- **Modbus**

Rotork Fluid Systems SI and EH Range actuators are fully compatible with the following fieldbus communication systems:
Applications for Skilmatic actuators cover a wide range of industries including oil & gas, power, water, chemical, mining, HVAC and various processing plants. They are ideally suited for remote locations, severe applications where compressed air is not a practical solution, safety critical loops and continuously modulating control. Below is a representative list of typical Skilmatic application.

- Wellhead ESD and choke valve control.
- Pipeline metering pressure control and remote ESD.
- Remote solar power applications.
- Inlet and outlet flow control for fuel storage.
- ESD for fuel storage terminals (ROSOV).
- Modulating control for gas distribution networks and booster stations.
- Tanker loading to optimise and control flow rates.
- Petroleum and hazardous substances road tanker loading ESD.
- Aviation fuel control, fuel line pressure control and ESD.
- Oil and gas refinery fire valves.
- Fire water system pressure control and failsafe distribution valves.
- Hydrocarbon vapour recovery systems.
- Methanol injection control.
- Flare stack ESD and pressure control.
- Modulating control for dosing and blending systems.
- Pump suction and discharge metering facilities.
- Ballast control for floating production vessels.
- Activated sludge aeration tank control WWTP.
- Methane recovery flow and temperature control.
- Filter overflow protection for potable water WTP.
- Water reservoir level control.
- Storm tank overflow protection.
- Feed water control for hydro-electric turbines.
- Tunnel and metro system fire dampers ESD (400 °C).
- Power plant steam and feed water control, damper control, shut-off systems.
- Gas turbine ESD valves.
- Glass manufacturing temperature control.
- Mining and quarry hydrosizer control.
Severe Temperatures

Standard SI actuators are suitable to operate in a temperature range of -15 to +60 °C (+5 to +140 °F) and EH between -20 to +40 °C (-4 to +104 °F). The product range can be supplied with various options of hydraulic fluid and seals to suit application with ambient temperatures to -50 °C (-58 °F).

High temperature, fire and explosive atmospheres are a major concern to refinery, gas processing, petro-chemical and offshore installations. Danger and damage from fire can be minimised by the efficient and effective protection of the actuators which control the process. Rotork can provide flexible, semi-rigid and rigid enclosure solutions up to 1,200 °C (2,192 °F) for up to 2 hours.

*See publication S310 for further details.*

Manual Overrides

Skilmatic actuators are available with optional manual overrides to allow operation of the valve or damper when power to the actuator is not available.

Quarter-turn actuators up to SI-2Q80 are available with manual override gearboxes that mount between the actuator and valve. The handwheel operated gearbox is housed in a cast-iron enclosure which can be supplied with an ISO drive shaft arrangement. Hydraulic manual hand pumps are available for all linear and large quarter-turn actuators.

Rotork Site Services

Rotork Site Services provides a comprehensive range of service products, each specifically tailored to meet customer requirements. *Emergency and Planned Service* encompasses installation, commissioning, upgrading, troubleshooting and repair of damaged or deteriorating assets. *Actuator Overhauls* are performed in Rotork workshops to bring long in service units back to guaranteed “as new” condition. *Health Checks* enable customers to prioritise maintenance and replacement planning and *Preventative Maintenance* enhances the integrity of actuators to maximise plant utilisation.

Rotork Site Services has a wealth of experience in retrofitting new actuators to valves, penstocks and dampers installed in an existing plant, as well as the factory assembly of new valves and actuators for plant upgrades and extensions. Capabilities for extended scope projects include surveys, design, procurement, manufacturing and commissioning to cover the broad scope of activities surrounding actuation projects.
SI and EH Actuators - General Specification

**Materials**

All SI / EH Actuators
- SI / EH power unit: Aluminium.
- Piping: Stainless steel (Hard piped).
- External fasteners: Stainless steel.
- Paint finish: Standard 2-pack epoxy silver grey or red (150 microns thick).

SI-1-Q31 to SI-1-Q80
- Actuator body: Aluminium.
- Drive shaft: Plated steel.
- Switchbox: Aluminium.

SI-2-Q100 to SI-2-Q130 & EH-Q
- Actuator body: Carbon steel or ductile iron.
- Drive shaft: Carbon steel.
- Switchbox: Aluminium.

SI-1-L, SI-2-L & EH-L
- Actuator body: Steel.
- Piston rod: Stainless steel.

**Standard Operating Temperature**

SI actuators: -15 to +60 °C (+5 to +140 °F).
EH actuators: -20 to +60 °C (-4 to +140 °F).

**Low Operating Temperature**

SI-1: -35 to +60 °C (-31 to +140 °F).
SI-2: -40 to +60 °C (-40 to +140 °F).
EH: -50 to +60 °C (-58 to +140 °F).

**Watertight Rating**

SI: IP67 – IP68.
EH: IP54 – IP68.

**Torque / Thrust**

See product specification sheets.

**Linear Strokes**

Standard up to 105 mm (4”). For optional strokes up to 3,000 mm, consult Rotork Fluid Systems.

**Weight**

See product specification sheets.

**Failure Mode**

SI: Failsafe in direction of the spring or fail in last position.
EH: Failsafe in direction of the spring / accumulator or fail in last position.

**Failsafe Action**

Quarter-turn: Spring / accumulator to act clockwise or anti-clockwise.
Linear: Spring / accumulator to extend or retract drive shaft.

**Manual Override**

SI-1-Q, SI-2-Q70/80: Hydraulic hand pump or gearbox.

**Pressure Measurement**

An internal pressure transducer monitors the internal hydraulic system for valve seating and provide an alarm of potential stall conditions. Displayed as a % of maximum generated system pressure, or actual psi / bar.

**Mounting**

Vertical or horizontal, see product specification sheets.

**Electrical**

**Mains Power Supply**

Single-phase: 110, 120, 230 VAC ±10%, 50/60 Hz
Three-phase (SI): 380 to 480 VAC ±10%, 50/60 Hz
Three-phase (EH): 190 to 690 VAC ±10%, 50/60 Hz
DC: 24 VDC

**Power Consumption**

See product specification sheets.

**Digital Control (two-position)**

Open, Close, Stop / Maintain, Partial stroke and ESD 20-60 VDC or 20-120 VAC, 5 mA minimum duration 300 ms.

**Analogue Control (modulating)**

4-20 mA or 0-10 VDC (adjustable deadband and hysteresis).

**Optional Fieldbus Control**

Compatible with Pakscan, Modbus, Profield, Foundation Fieldbus and DeviceNet. See page 11.

**Position Feedback**

4-20 mA, internally or externally powered.

**Resolution**

SI: <0.25% of full scale.
EH: <0.5% of full scale.

**Repeatability**

SI: <0.2% of full scale.
EH: <0.5% of full scale.

**Duty Rating**

SI: 90%.
EH: Consult Rotork Fluid Systems.

**Alarm and Monitoring**

Relay rating: Volt free NC or NO contacts rated 5 mA to 5 A 120/230 VAC, 30 VDC.
Monitor relay: Hardware, local controls, position sensor fault, and EEPROM error.
Alarm relay: Over/under pressure, stalled, incorrect direction, loss signal, and unsuccessful partial stroke.

**Cable Entries**

SI: Four M25/ M20 x 1.5P, adaptors can be fitted for other options.
EH: Three ½” NPT, adaptors can be fitted for other options.

**Position Measurement**

Quarter-turn: Potentiometer.
Linear: Potentiometer or transducer.

**Limit Switches**

Two optional four electro mechanical SPDT volt-free switches. Rating 5 A maximum at 230 VAC.

**Local Controls**

Lockable Local / Stop / Remote selector switch and Open / Close switch. Totally sealed with internal reed switches.

**Non-Intrusive Setting**

Infrared setting via the Rotork Setting Tool.

**Display**

Liquid crystal display (LCD) for position, pressure and diagnostics, LEDs for limits and intermediate position.
**Hazardous Area Certifications**

### SI-1 Actuators

ATEX - II 2G EEx dme* IIB T4 (Tamb -35 to +60 ºC)
ATEX - II 2G EEx dme IIC T4 (Tamb -30 to +60 ºC)

INMETRO – BR – Exdme IIB T4 (Tamb -35 to +60 ºC)
INMETRO – BR – Exdme IIC T4 (Tamb -20 to +60 ºC)

IECEx - Ex dme* IIB T4 (Tamb -35 to +60 ºC)
IECEx - Ex dme* IIC T4 (Tamb -20 to +60 ºC)

FM - Class I, Zone 1 AEx dme* IIB T4 (Tamb -35 to +60 ºC)
FM - Class I, Zone 1 AEx dme* IIC T4 (Tamb -30 to +60 ºC)

CSA - Class I, Zone 1 Ex dme* IIB T4 (Tamb -35 to +60 ºC)
CSA - Class I, Zone 1 Ex dme* IIC T4 (Tamb -30 to +60 ºC)

GOST - Ex dme* IIB T4 (Tamb -35 to +60 ºC)

### SI-2 Actuators

ATEX - II 2G EEx de* IIB T4 (Tamb -40 to +60 ºC)
ATEX - II 2G EEx de* IIC T4 (Tamb -30 to +60 ºC)

INMETRO – BR – Exde IIB T4 (Tamb -40 to +60 ºC)
INMETRO – BR – Exde IIC T4 (Tamb -20 to +60 ºC)

### Setting Tool for SI and EH Actuators

ATEX - EEx ia IIC T4 (Tamb -30 to +50 ºC).

FM - Intrinsically Safe for use in Class I, Division 1, Groups A, B, C & D T4 (Tamb -30 to +50 ºC).

CSA - Ex ia, Class I, Division 1, Groups A, B, C, D (Tamb -30 to +50 ºC).

### SB-1 Actuators

ATEX - II 2G EEx dme IIB T4 (Tamb -35 to +60 ºC)

INMETRO – BR – Exdme IIB T4 (Tamb -35 to +60 ºC)

### SB-2 Actuators

ATEX - II 2 G EEx de IIB T4 (Tamb -40 to +60 ºC)

INMETRO – BR – Exde IIB T4 (Tamb -40 to +60 ºC)

* ‘e’ increased safety available on single-phase & DC supply voltage only.

Certification temperatures are not operating temperatures. See specific operating temperature in product specification sheets.

See operating temperatures in general specifications, PUB021-001 / F700.

The certifications listed were accurate at the time of publication. The latest certifications are available on www.rotork.com
A full listing of our worldwide sales and service network is available on our website.

Fluid Systems
Fluid Power Actuators and Control Systems

Controls
Electric Actuators and Control Systems

Gears
Gearboxes and Gear Operators

Site Services
Projects, Services and Retrofit

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