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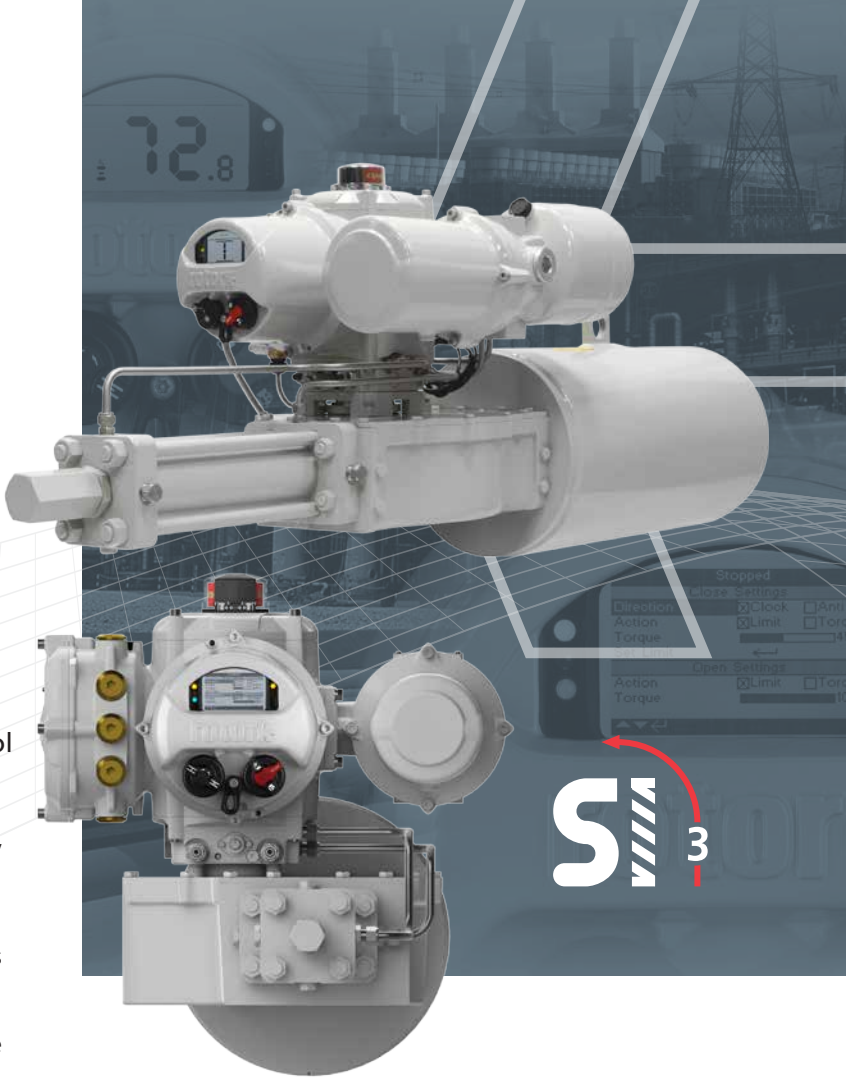

Introducing the 3rd generation of Skilmatic SI self-contained electric fail-safe actuators.

The SI range of self-contained electro-hydraulic actuators combining the simplicity of electrical operation with the precision of hydraulic control and the reliability of mechanical spring-return.

Building on the success of the Skilmatic SI range of actuators, Rotork has enhanced the specification by introducing the new SI 3rd generation which includes an extended range of spring-return actuators with a torque ranges of 2,000 Nm to 20,000 Nm. The new range of electrically operated actuators offers a wide range of operating speeds, additional ESD options with single or dual inputs, enhanced partial stroke testing and communication capabilities to meet a wide range of applications.

$SI_3$4 customised range of actuators with torques up to 600,000 Nm will be introduced in 2015.

Skilmatic $SI_3$3

Electric Fail-Safe Actuators

Key benefits of the 3rd generation SI actuators

- Fail-safe, closed, open or in last position
- Flameproof Ex d IIB/IIC T4 & watertight to a minimum IP67
- Additional ESD options including dual inputs
- Functional Safety to SIL 2 (1oo1) & SIL3 (1oo2) IEC 61508-2-2010
- Partial Stroke Tests (PST) can be performed either via the Rotork *Bluetooth*® Setting Tool locally or remotely from the DCS or through network cards
- PST measures the time to move to a set position while monitoring the pressure
- All final elements are tested as part of the PST
- PST results are recorded in the data logger, shown on the display with an option for remote pass/fail indication
- Advanced dual stacked display presents valve and process data for asset management and data analysis
- Large backlit HMI display. Low power version available for solar applications
- Non-intrusive setting – no cover removal required using secure *Bluetooth*® wireless connection
- Configurable data logger functionality including service alarms
- Increased functionality over network cards including *Pakscan*™, Profibus®, Foundation Fieldbus®, Modbus® and HART®
- Operating temperature availble from -50 to +70 °C

Redefining Flow Control

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Technological Advances

Display

The dual stacked display shows large segment characters down to -50 °C while the matrix display provides detailed setting, status and diagnostic multilingual screens. Overall the display is 30% bigger, is backlit to provide excellent contrast even in the brightest ambient light conditions and is protected by a toughened glass window. An optional protective clip-in cover is available where high UV levels or abrasive environments are present.

Control

The actuator can be controlled remotely by either digital inputs, analogue signals or network interface cards, like those used with fieldbus systems, are connected using an internal bus system based on CAN, reducing wiring and connections and increasing reliability.

Pressure monitoring

A pressure sensor is installed to measure the internal hydraulic pressure being generated within the actuator. The pressure sensor will detect obstructions in mid-travel (between the two limits) and to torque seat a valve at one or both ends of travel (past the limits). When torque seating is required, an option is included for the system to maintain the internal hydraulic pressure by re-starting the motor / pump if the pressure drops below the required pressure.

Hysteresis adjustment for over- and under- pressure can be enabled to compensate for hydraulic expansion or contraction due to ambient temperature changes.

Position

A non-contacting hall-effect sensor constantly monitors the position of the actuator. Position feedback can be provided as a 4 to 20 mA output signal as an option.

Auxiliary supply

When mains power is not available an auxiliary supply can be used to power the processor, internal clock, indication relays, sensors, display and optional network cards from an external 24 VDC supply. This will also operate the data logger so that the movement to the fail-safe position on loss of mains supply can be monitored and recorded.

Indication power

All configurations and data logger files are stored in non-volatile EEPROM memory, all settings are safe when the power is removed. A super capacitor is included as standard, which allows the internal clock for the data logger to be maintained for up to 2 weeks without power.

Skilmatic SI$_3$3

Electric Fail-Safe Actuators

Optimised for preventative maintenance

All SI actuators incorporate a sophisticated data logger, which can provide comprehensive data capture and analysis for planned maintenance and troubleshooting issues with valves and processes. They capture:

- Pressure profiles
- Operational starts profiles
- Operational, vibration and temperature trend logs
- Event logs

In addition, asset management data regarding the actuator and the valve is stored within the actuator and available for download. Specific asset management information includes:

- Running time
- Average pressure
- Starts
- Life statistics

As part of the ongoing commitment to improving asset management and providing reliable data for optimised preventative maintenance, the 3rd generation SI now includes configurable service / maintenance alarms.

The alarm parameters can be set in the assets section of the setup menus and include:

- Pressure at Open limit
- Pressure at Closed limit
- Starts/Hr
- Total starts
- Service intervals

With 3rd generation SI actuators this data can be viewed in real-time using the large dual stacked display. In addition, the data can be downloaded wirelessly with the Rotork *Bluetooth*® Setting Tool Pro or to a PC and analysed using the Rotork Insight2 software.

Safe manual operation

In case of an emergency, power outage or failure of the control network, SI actuators can be fitted with a hand pump as an option for manual operation. To put the actuator into manual mode will require a lockable lever to be rotated. This lever will also allow the actuator to detect which mode it is in, which will prevent electrical operation when it is in manual mode.

Network system connectivity

With the addition of the appropriate option card, the SI actuator can be incorporated in to a number of different fieldbus control systems. The SI actuator can be utilised within the Rotork *Pakscan* control system, either wired or wirelessly, and the major open fieldbus protocols including Profibus, Foundation Fieldbus, Modbus and HART.

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Advanced Engineering

1 Environmental Sealing

The Rotork double-sealed terminal compartment provides a sealed actuator compartment to protect the actuator from the environment.

2 Display

The advanced dual stacked display is significantly larger, clearer and has a wide viewing angle making it easily legible from a distance.

3 Local Controls

Local Open/Close and lockable Local/Stop Remote selectors are coupled magnetically to the designated switches and therefore do not penetrate the control cover.

4 Position Indication Beacon

The actuator can be supplied with a beacon in various materials to suit the environment. Alternatively the actuator can be supplied with no indicator beacon.

5 Position Limit Switches

Up to four mechanical limit or proximity switches can be fitted for positional feedback.

6 Manifold Block

The manifold includes all the hydraulic components required to operate the actuator including solenoid valves, flow control valves, check valves and pressure relief valves.

7 Hydraulic Piping

All actuators are classed as being self-contained with stainless steel piping.

8 Electric Motor

The motor operates a gear pump which generates the hydraulic pressure required to overcome the spring, which is housed in a sealed enclosure.

9 Gear Pump

A selection of different size gear pumps can be fitted depending on the operating speed required.

10 Oil Reservoir

Different size oil reservoirs will be fitted depending on the actuator size.

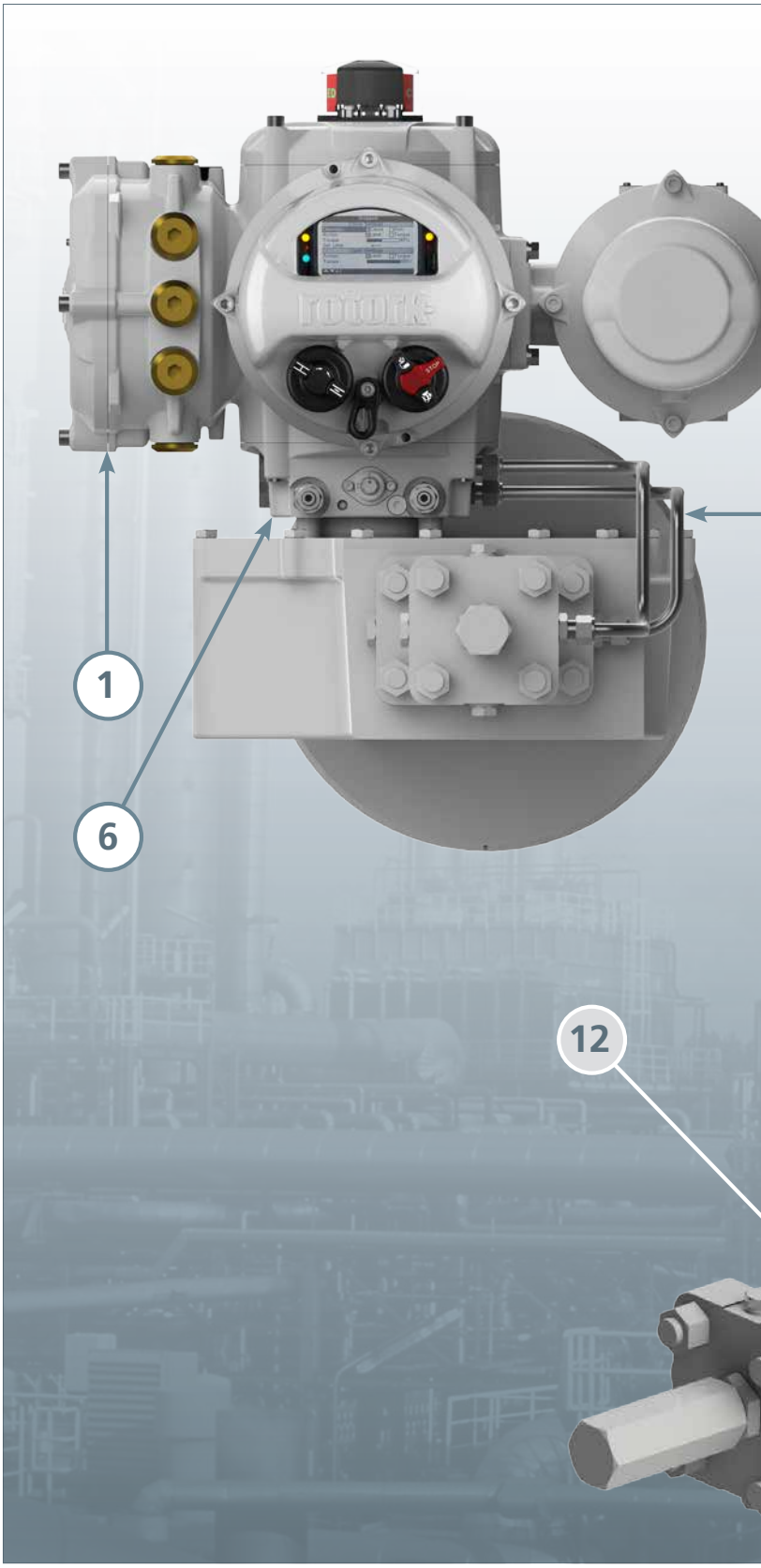
11 Hydraulic Filter

The filter is replaceable.

12 Hydraulic Cylinder

13 Scotch Yoke Mechanism

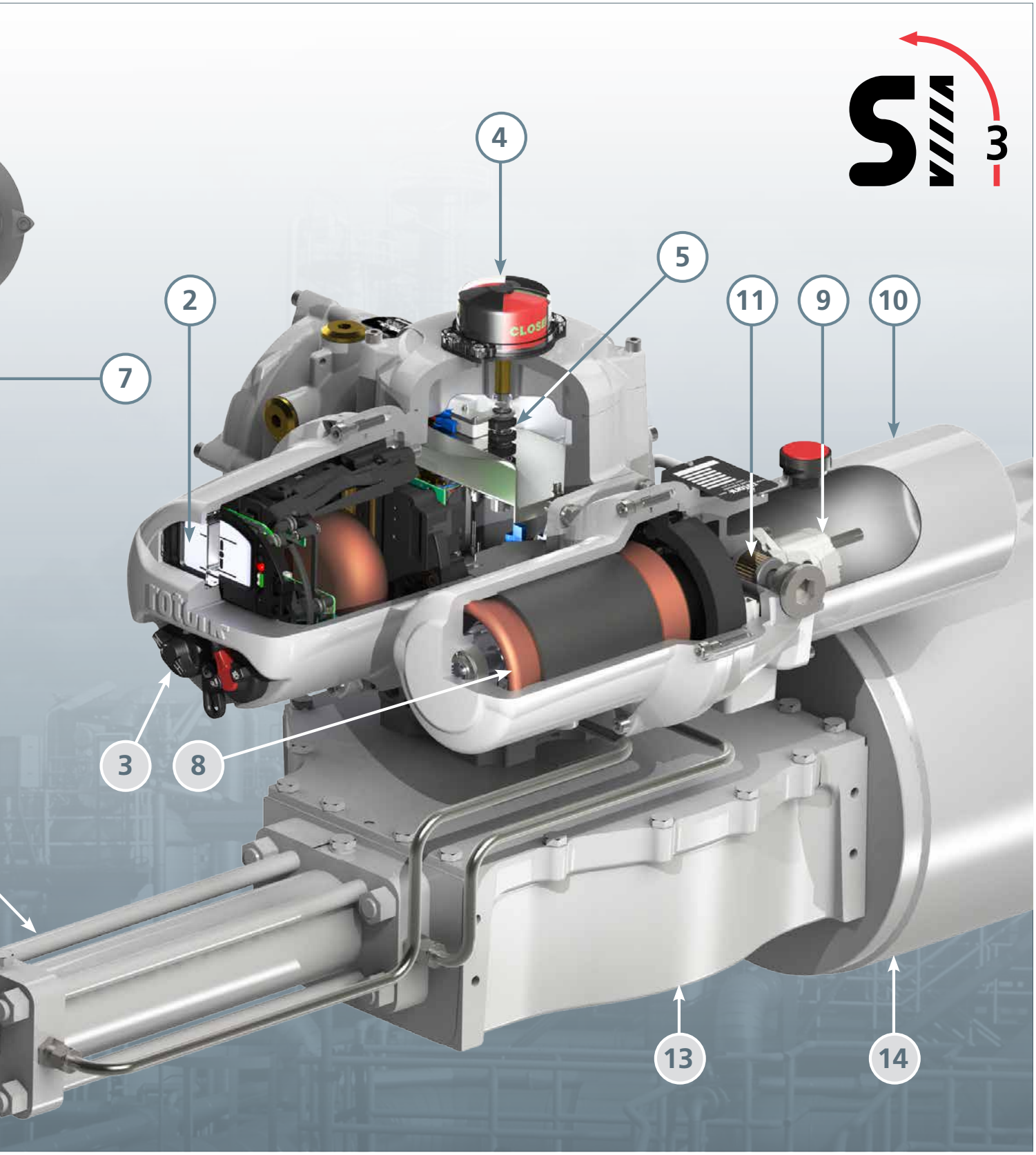
14 Spring Can



Redefining Flow Control

Skilmatic SI$_3$3

Electric Fail-Safe Actuators



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Human Machine Interface (HMI)

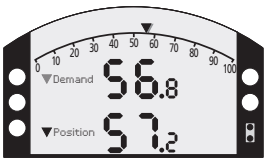
Local diagnostics and setup

The large dual stacked, hi-resolution display, with positional characters that are 25 mm high, is unrivalled in visibility for all lighting and orientation conditions. Consisting of a static, high-contrast positional display and a fully configurable dot-matrix LCD behind, the SI offers the easiest, user-friendly configuration and data analysis ever seen in the actuation world.

Configurable Home-screens

With a mixture of the static and dot-matrix displays, there are now four configurable home-screens available to the user. The four screens reflect the parameters most commonly required to analyse operation at-a-glance:

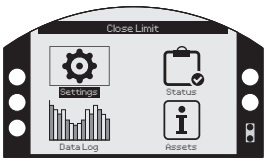
- Positional information with input demand (digital and analogue)



Using the Rotork *Bluetooth*® Setting Tool Pro, each of these screens can be easily accessed with a press of a button. Alternatively you can select one of the four screens to be continually displayed in the setup menu.

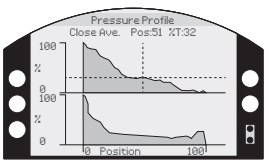
User friendly setup menus

A single press of a button on the Rotork *Bluetooth*® Setting Tool Pro takes you into the user-friendly setup menu. This menu has been designed and structured to reduce reliance on having a written manual to hand. With large, clear characters available in many languages, setup and configuration has never been so easy.



Graphical data logger

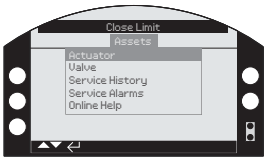
Greater amounts of data and analytical screens are now available in the data logger and viewable locally. The data logger screens are displayed on a 168 x 132 pixel dot-matrix display and can display anything from a torque vs position graph to statistical operational data.



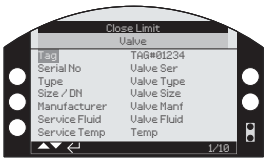
Asset management

Not only can you store information relating to the actuator, but also the valve and gearbox. This includes data about build (class, size, ratio and tag numbers) along with service information (commission date, service date etc).

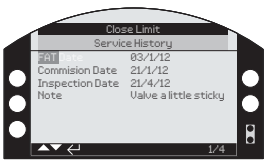
- Actuator data



- Valve data



- Service history



Emergency Shut Down (ESD) Input

The SI can be configured through hardware to operate in several different modes as detailed below:

Fail-safe on loss of mains supply

This option offers a low power draw on the ESD input. In this mode the solenoid valve(s) that perform the safety function are to be powered by the mains power supply to the actuator with the following functionality:

- Fail-safe on loss of ESD signal
- Fail-safe on loss of mains power supply

Fail in Position on loss of mains supply

In this mode the solenoid valve(s) that perform the safety function are to be powered by the ESD signal to the actuator.

- Fail-safe on loss of ESD signal
- Fail in position on loss of mains power supply

Additional ESD input

There is also the option of being able to add a second ESD circuit with the following functionality:

- Two independent ESD signals operating the same solenoid valve(s). If either ESD signal is removed then the actuator will perform the safety function by using the same final elements.
- Two independent ESD signals operating independent solenoid valve(s). If either ESD signal is removed then the actuator will perform the safety function by using different final elements.

Skilmatic SI_3

Electric Fail-Safe Actuators

Partial Stroke Testing (PST)

Partial stroke testing (PST) is a function used in safety critical applications where the safety valve is infrequently operated. PST allows the operator to test a percentage of possible failure modes of the actuated shutdown valve. The test can be performed without the need to physically close the valve and thereby maintain production. This procedure, allows the user to identify any faults which could potentially prevent the actuated valve from performing its safety function.

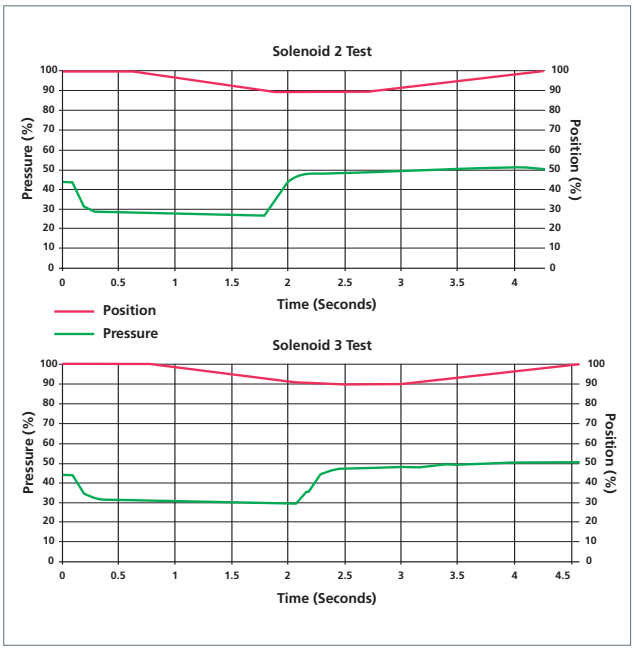
All final elements such as solenoid valves are tested during the Partial Stroke Testing.

The SI offers an electrically operated fail-safe actuator for use in safety applications where PST is required to test the availability of the valve. The SI spring-return actuators provide partial stroking as standard on all configurations. When the command is given to initiate the test, the actuator will move the valve to a preset position (adjustable).

The advanced PST system operates by de-energising each solenoid valve in turn to allow the valve to move to the required position and then return the valve to the open state. The degree of movement required is configured by the user during the commissioning process and is adjustable from 0 to 99%.

Diagnostics

The operator can also gain information relating to the performance of the valve and actuator assembly. The PST system records the time to move the actuator to a pre-set position while also monitoring the pressure. This data is then compared to the original PST curve recorded during the commissioning stage. PST results are recorded in the data logger and shown on the display with an option for remote indication.



This provides the user with a high level of diagnostic data on all critical components within the actuator including the solenoid valves.

The PST can be initiated using any of the following three methods:

- Locally using the Rotork *Bluetooth*® Setting Tool Pro
- Hardwired switched digital input 20-40 VDC or 20-120 VAC
- Routed via Fieldbus network cards

Actuator Size	Torque (Nm)						Operating Speed (S)				
	Hydraulic Direction			Spring Direction			Hydraulic Direction			Spring Direction	
	BTO	RTO	ETO	BTC	RTC	ETC	Speed 1	Speed 2	Speed 3	From	To
$SI_3$3-100	3261	1395	1581	3820	1826	2381	48	21	15	0.5	83.7
$SI_3$3-110	4419	1968	2349	5036	2448	3259	65	29	20	0.7	113.7
$SI_3$3-120	5640	2608	3264	6415	3197	4388	85	38	26	1.0	148.4
$SI_3$3-130	9255	4420	5760	9496	4713	6439	131	58	41	1.5	227.4
$SI_3$3-140	10976	5146	6554	12628	6371	8879	165	73	51	1.9	287.4
$SI_3$3-150	13849	5882	6608	16955	8187	10815	205	90	63	2.3	355.3
$SI_3$3- 160	18189	9506	13812	16307	8506	12332	251	110	78	2.9	435.8
$SI_3$3-170	21880	11820	17846	18998	10194	15274	304	134	94	3.5	527.4
$SI_3$3-180	28345	15344	23224	24385	13094	19635	393	173	122	4.5	682.1

$SI_3$4 Customised electro-hydraulic actuators available, consult your nearest Rotork office.

Spring-return: up to 210,000 Nm
Double-acting: up to 600,000 Nm double-acting

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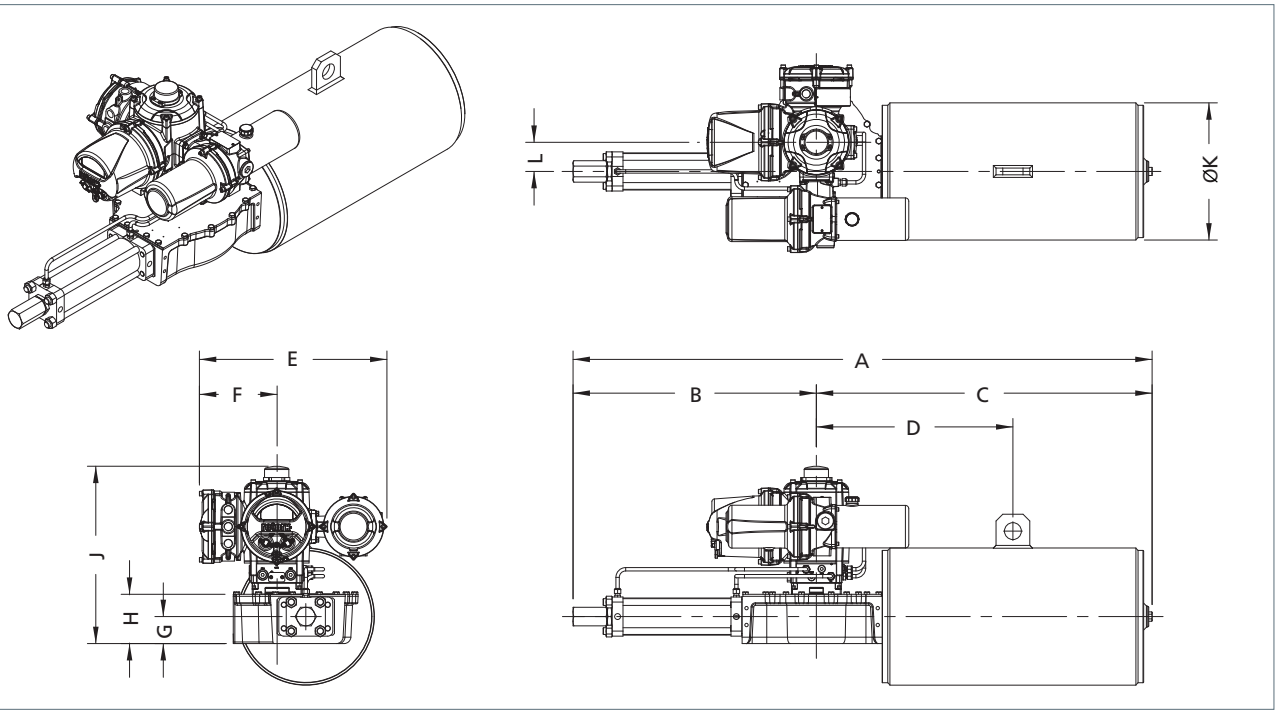
Skilmatic SI_3

Electric Fail-Safe Actuators

SI_3 Dimensions



Actuator Size	Actuator Dimensions (mm)											
	A	B	C	D	E	F	G	H	J	K	L	Weight (kg)
$SI_3$3-100	1599	717	882	519	556	229	80	146	522	324	85	286
$SI_3$3-110	1604	722	882	496	556	229	80	146	522	324	85	314
$SI_3$3-120	1703	717	986	576	556	229	80	146	522	406	85	370
$SI_3$3-130	2255	980	1275	689	556	229	113	200	576	457	130	593
$SI_3$3-140	2262	981	1281	760	556	229	113	200	576	508	130	823
$SI_3$3-150	2262	981	1281	760	556	229	113	200	576	508	130	875
$SI_3$3- 160	3207	1173	2034	1181	556	229	150	232	608	610	160	1266
$SI_3$3-170	3003	1139	1864	1097	556	229	150	232	608	610	160	1218
$SI_3$3-180	3023	1159	1864	1097	556	229	150	232	608	610	160	1383

A full listing of our worldwide sales and service network is available on our website.

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