



Keeping the World Flowing
for Future Generations



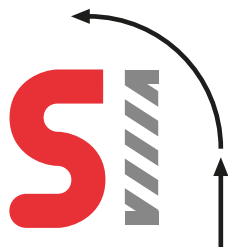
Skilmatic SI-2.1L

Spring-Return Electric Linear Actuator
(11 to 61 kN)

Skilmatic SI intelligent actuators offer a unique combination of the renowned features of Rotork actuation, such as the double-sealing system and non-intrusive commissioning capability, with the benefits of control and safety from Skilmatic range.

The **SI-2.1L** are compact and robust electrically operated failsafe spring-return linear actuators. The actuators are designed for modulating, two-position or ESD applications and are suitable for all styles of control valves with a linear drive shaft.

The **SI-2.1L** is watertight and dusttight to IP67 / NEMA 6 with the option of IP68 and includes the Rotork double-seal system with separated termination and cable gland compartment. The actuators are also available certified explosionproof for hazardous area gas group **IIB** and **IIC** applications.



Features

- Self-contained electrically operated actuator with internal low pressure electro-hydraulic control module
- Spring-return, failsafe or lock in position
- Spring-return speed options – single or dual valve combinations
- Single-phase, three-phase and DC power supply
- Watertight and explosionproof for gas group IIB & IIC
- Double-sealed control module – with separate terminal compartment
- Non-intrusive commissioning and configuration setting tool
- Local LCD dual screen display – for position indication, internal pressure and fault diagnostics
- Local controls – lockable Local/Stop/Remote selector switch with local Open/Closed switch
- Modulating control – 4-20 mA input and output with a resolution < 0.25 %
- Digital control – two position and emergency shutdown options for functional safety instrumented systems
- Output relays for monitoring, fault alarms and Open/Closed limits
- Optional Fieldbus communications
- Built in datalogger – recording events, trends and alarms

Skilmatic SI-2.1L

Consisting of a self-contained electro-hydraulic control module and linear spring-return cylinder. The actuators combine the simplicity of electrical operation, with the precision of hydraulic control, and reliability of spring-powered failsafe action. The spring-return mechanism provides the most reliable means of positioning a valve to the safe condition and can be provided as failsafe close, open or lock in last position on power or signal failure. The actuators are available as spring to extend the actuator drive shaft or spring to retract, with thrusts from 11 kN (2,700 lbf) to 61.6 kN (14,000 lbf) and a stroke up to 105 mm (4").

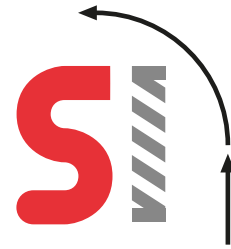
The actuators can be programmed with the *Bluetooth®* wireless setting tool to accept an analogue or digital input, with ESD and partial stroking or network cards options. A wide range of functions can also be selected through the setting tool such as zero and span limits, deadband, hysteresis, interrupter timer, ESD options partial stroke testing and alarms.

The actuator is provided with a built in datalogger to record the configuration settings and the last 1,024 events with 32 bits of status for each event. The data can be downloaded via the Rotork *Bluetooth®* Setting Tool *Pro*.

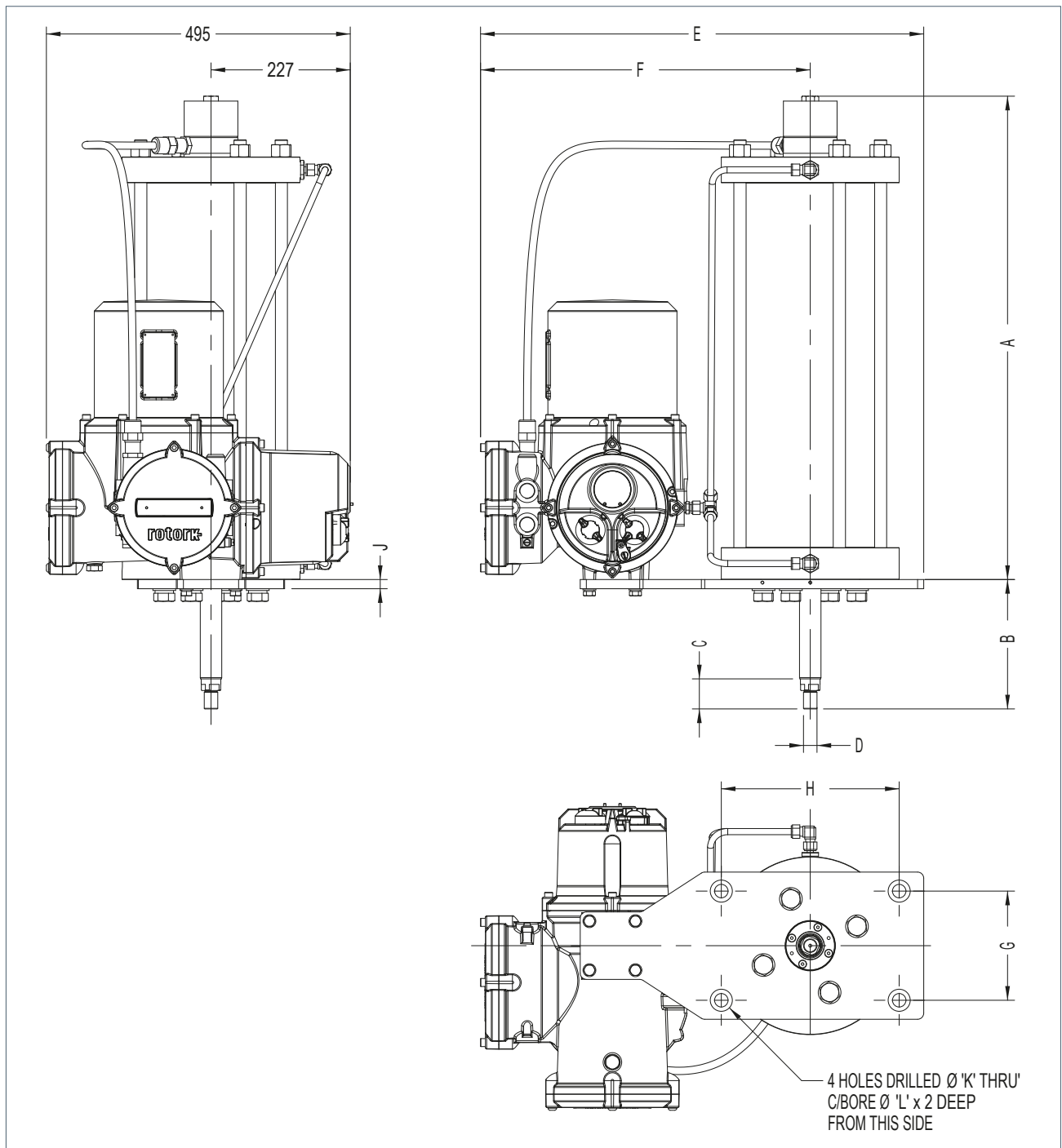
Optional internal fieldbus communication boards are also available for the Rotork *Pakscan™*, *DeviceNet®*, *Profibus®*, *Foundation Fieldbus®* and *Modbus®* digital control systems.

Specifically designed for modulating control applications, the control module provides a pulsed hydraulic signal to accurately position the spring-opposed cylinder. Resulting in accurately positioning a valve with a resolution better than 0.25 %.

Operating from a standard single-phase, three-phase or 24 VDC supply the actuators are also ideal for on/off duties where failsafe action is required. Lockable local controls are provided as standard. Electro-mechanical ends of stroke limit switches are offered as an option for safety critical applications. Manual override hand pump is available on all sizes.



SI-2.1L Dimensions and Mounting Details



CODE	A	B	C	D	E	E*	F	F*	G	H	J	K	L	Weight (kg)
SI-2.1-L200/105	787	210	30	M22x1.5P	722	799	537	614	178	290	15	22	36	~210
SI-2.1-L250/105	808	210	40	M33x2P	770	847	562	639	234	360	15	22	41	~330
SI-2.1-L280/105	811	210	40	M33x2P	795	872	562	639	265	400	20	26	51	~395
SI-2.1-L320/105	814	210	40	M33x2P	887	964	614	691	290	430	20	26	51	~530

Note:

Weights are approximate and for actuators with 1-Phase power units.

For 3-Phase actuators use E* instead of E, and use F* instead of F.

Mounting dimensions are for reference only, consult factory for detailed valve mounting adaptations.

All dimensions in mm.

Ordering Code

Ordering Code Example

SI-2.1-L320/105 - 0 1 2 - 1 0 - 0 0 - A A

Failure Mode

- 0 = Failsafe on loss of power supply (in direction of spring) (note 4.2)
- 1 = Fail in Position on loss of power supply (note 4.3)

Spring-return Speed & ESD Options

- 0 = Speed A – Single internal solenoid (note 4.2)
- 1 = Speed B – Dual internal solenoid (note 4.2 & 4.4)
- 2 = Speed C – Single internal solenoid & external solenoid (note 2.1 & 4.2)
- 3 = Speed D – Slow acting internal solenoid – Consult factory
- 6 = Speed A – Hardwired single internal solenoid (note 3.4 & 4.3)
- 7 = Speed C – Hardwired single internal & external solenoid (note 2.1 & 4.3)

Supply Voltage

- 0 = Single phase 115 VAC ± 10% 50/60 Hz
- 1 = Single phase 230 VAC ± 10% 50/60 Hz
- 2 = 24 VDC ± 10%
- 3 = Three phase 380-480 VAC ± 10% 50/60 Hz

Control

- 0 = Standard Digital control (open/close/partial stroke)
- 1 = Analogue Control 4-20 mA or 0-10 VDC (note 1.2 & 4.1)
- 2 = *Pakscan* (note 4.1)
- 3 = *Pakscan* - analogue input (note 4.1)
- 4 = Modbus single channel (note 4.1)
- 5 = Modbus dual channel (note 4.1)
- 6 = Profibus dual channel (note 4.1)
- 7 = DeviceNet (note 4.1)
- 8 = Foundation fieldbus (note 4.1)
- 9 = Profibus single channel (note 4.1)

Certifications

- 0 = WT – Watertight IP67
- 1 = ATEX – European – Hazardous area Gas group IIB (IP67)
- 1C = ATEX – European – Hazardous area Gas group IIC (IP67) (note 2.2)
- 2 = IEC Ex – International – Hazardous area Gas group IIB (IP67)
- 2C = IEC Ex – International – Hazardous area Gas group IIC (IP67) (note 2.2)
- 3 = FM – US – Hazardous area Gas group IIB (IP67)
- 3C = FM – US – Hazardous area Gas group IIC (note 2.2)
- 4 = CSA – Canada – Hazardous area Gas group IIB (IP67)
- 4C = CSA – Canada – Hazardous area Gas group IIC (note 2.2)
- 5 = EAC – Russia TR TS Hazardous area Gas Group IIB
- 5C = EAC – Russia TR TS Hazardous area Gas Group IIC (IP67) (note 2.2)
- 8 = CCC – China – Hazardous area Gas Group IIB (IP67)
- 8C = CCC – China – Hazardous area Gas Group IIC (IP67) (note 2.2)
- 9 = UKEX – UK – Hazardous area Gas Group IIB (IP67)
- 9C = UKEX – UK – Hazardous area Gas Group IIC (IP67) (note 2.2)

Cable Entries

- 0 = M25 x 1.5P
- 1 = M20 x 1.5P adaptors
- 2 = ½" NPT adaptors
- 3 = ¾" NPT adaptors
- 4 = 1" NPT adaptors

Hydraulic Fluid/Operating Temperature

- 0 = Mineral fluid –10 to +65 °C (note 3.2)
- 3 = Food grade fluid –10 to +65 °C (note 3.2)
- 4 = Silicone fluid –30 to +65 °C (note 2.2)
- 5 = Silicone fluid / Low temperature seals –40 to +65 °C (note 2.2)

Mounting

- A = Vertical stem above valve
- B = Vertical stem below-valve
- C = Valve stem horizontal
- D = Vertical stem above valve with valve mounting kit
- E = Valve stem vertical below valve with valve mounting kit
- F = Valve stem horizontal with valve mounting kit

Accessories

- A = None
- B = Manual override (Handpump)
- D = WT – Watertight IP68 7m for 72 hours (note 2.1)
- E = Mechanical indication switches (2 off)
- F = Two additional volt free SPDT limit switches (four total)
- G = Hardware ESD configuration (Failsafe actuators only) (note 4.2, 4.3, 4.4)
- H = All cable entries plugged
- J = Viton seals
- K = Paint colour change to standard specification
- L1 = Coastal Paint & Exd IIC applications (2 pack Epoxy 150 to 200 microns)
- L2 = Offshore Paint, watertight & Exd IIB applications (2 pack Epoxy to 250 to 350 microns)
- M = Proximity limit switches replacing standard V3 micro switches
- N = Flow control valve – to adjust the stroke speed in the spring direction
- O = Optional Low power external solenoid valve option for 'Spring-return Speed & ESD Options' code 2 or 7 – consult sales office
- T = Remote mounted EH power module (Max distance 5M from actuator drive)

Ordering Code

Notes:

General

- 1.1 Select one option from each section except accessories with multiple options
- 1.2 All actuators supplied with 4-20mA input/output as standard.

Certification

- 2.1 All actuators are watertight to IP67, the option of IP68 is available except for external solenoid option. (Spring-return speed and ESD options – code 2 & 7)
- 2.2 Explosionproof actuators for gas group IIC, available only for temperatures -20 to +65 °C. (Certifications – code 1C, 2C, 3C, 4C, 5C, 6C, 8C, 9C).

Operating Speed

- 3.1 Stroke speed is typical with no load at 20 °C. Speed can vary +/-15% (or +/- 1s, whichever is greater) at 20 °C.
- 3.2 Spring stroke speeds with mineral and food grade fluid are effected by ambient temperatures below 0 °C. Speed can change by up to 50%. Select silicone fluid where this is not acceptable.
- 3.3 Speed C, E or F not available for FM or CSA certified actuators. Consult sales office.
- 3.4 Spring return speed option '6'. ESD command - speed A. Standard close command - Speed A +10% nominal.

Functional Safety

- 4.1 Analogue control, local controls, partial stroking and communication circuits are not part of the functional safety circuit.
- 4.2 Functional safety applications (SIL) – Failsafe on loss of power supply or ESD. (Spring-return speed and ESD options – code 0, 1, 2 or 3 and accessories – code G).
- 4.3 Functional safety applications (SIL) – Fail in last position on loss of power supply, failsafe on loss of 24 VDC ESD signal. ESD signal powers solenoid directly. Consult factory for voltage and power requirements. (Spring-return speed and ESD options – code 6 or 7 and accessories – code G).
- 4.4 Functional safety applications (SIL) – If dual solenoid valves are for redundancy then refer to single solenoid speed 'A' (spring-return speed and ESD options – code 1).

Performance Data

CODE	Stroke Max.	Thrust kN (lbf)				Nominal Stroke Speed (mm/seconds +/-15%)			
		Hydraulic Stroke (Open)		Spring Stroke (Close)		Hydraulic Stroke Speed	Spring-Return Speed (see note 3.1 and 3.2)		
		Start	Finish	Start	Finish		Speed A	Speed B	Speed C
SI-2.1-L200/105	105mm (4")	15.43 (3469.25)	8.97 (2017.88)	18.05 (4058.92)	12.21 (2745.59)	4.72	4.8	6.8	32.5
SI-2.1-L250/105	"	23.89 (5370.91)	13.81 (3106.63)	28.32 (6366.81)	19.2 (4318.35)	3.03	3.3	4.2	19.5
SI-2.1-L280/105	"	30.06 (6758.88)	17.36 (3904.48)	35.84 (8058.05)	24.35 (5475.44)	2.40	2.6	3.8	14
SI-2.1-L320/105	"	40.03 (8999.1)	23.24 (5225.46)	46.73 (10505.32)	31.54 (7091.15)	1.82	2	2.5	12

CODE	Stroke Max.	Thrust kN (lbf)				Nominal Stroke Speed (mm/seconds +/-15%)			
		Hydraulic Stroke (Close)		Spring Stroke (Open)		Hydraulic Stroke Speed	Spring-Return Speed (see note 3.1 and 3.2)		
		Start	Finish	Start	Finish		Speed A	Speed B	Speed C
SI-2.1-LA200/105	105mm (4")	18.28 (4111.3)	11.83 (2659.94)	16.29 (3663.93)	10.45 (2350.6)	4.48	4.8	7	32.5
SI-2.1-LA250/105	"	28.48 (6404.35)	18.41 (4140.3)	25.52 (5739.14)	16.41 (3690.46)	2.88	3	4.2	19.5
SI-2.1-LA280/105	"	34.79 (7821.55)	22.09 (4967.15)	32.93 (7403.86)	21.44 (4821.25)	2.28	2.3	3.1	14
SI-2.1-LA320/105	"	41.54 (9338.56)	24.75 (5565.14)	46.73 (10505.32)	31.54 (7091.15)	1.74	1.8	2.5	12

Note:

Standard stroke lengths include an additional 5mm to pre-compress the internal spring. Add C for no pre-compressions of the internal spring i.e. SI-1L250/105C.

Specification

Hazardous Area Certification

ATEX – II 2G Ex db eb* IIB T4 Gb (Tamb -40 to +65 °C)
ATEX – II 2G Ex db eb* IIC T4 Gb (Tamb -20 to +65 °C)

IECEX – Ex db eb* IIB T4 Gb (Tamb = -40 to +65 °C)
IECEX – Ex db eb* IIC T4 Gb (Tamb = -20 to +65 °C)

FM – Class 1, Zone 1 AEx de* IIB T4 Gb
(Tamb = -40 to +65 °C)
FM – Class 1, Zone 1 AEx de* IIC T4 Gb
(Tamb = -20 to +65 °C)

CSA – Ex db eb* IIB T4 Gb (Tamb = -40 to +65 °C)
CSA – Ex db eb* IIC T4 Gb (Tamb = -20 to +65 °C)

EAC – 1 Ex de* IIB T4 Gb (Tamb = -40 to +65 °C)
EAC – 1 Ex de* IIC T4 Gb (Tamb = -20 to +65 °C)

CCC – Ex de* IIB T4 Gb (Tamb = -40 to +65 °C)
CCC – Ex de* IIC T4 Gb (Tamb = -20 to +65 °C)

UKEX – II 2G Ex db eb* IIB T4 Gb (Tamb = -40 to +65 °C)
UKEX – II 2G Ex db eb* IIC T4 Gb (Tamb = -20 to +65 °C)

*'e' or 'eb' increased safety available on single-phase and DC supply voltage only.

Certification temperatures are not operating temperatures; see operating temperature, page 4.

Rotork Bluetooth® Setting Tool Pro:

Ex ia, IIC T4 Ga (IP54)
Ex ia, Class 1, Div 1, Group A, B, C, D T4
FM, INT SAFE Class I, II DIV1 Group A B C D
CSA, EEia, Class I, II Div 1 Group A B C D

Functional Safety:

The Skilmatic range has been certified to meet the full functional safety requirements of IEC 61508 Parts 1-7 and is suitable for use in a SIL 2/3 system depending on the configuration.

Please refer to the appropriate safety manual for full failure rate data and any restrictions of use.

Enclosure:

Watertight to IP67 / NEMA 6, double-sealed protection with separate cable gland and termination compartment.
Optional Watertight models to IP68, Std 7 meters/72 hours, for alternative depths / pressures consult factory. External ESD solenoid option is only available to IP67.

Materials

Control Module: Aluminium
Actuator Body: Steel
Actuator Springs: Steel
Piping: 316 Stainless Steel (hard piped)
Paint Finish: Standard 2 Pack Epoxy silver grey (150 microns thick)

Mechanical

Operating Temperature: See page 4
Thrust / Speed: See page 5
Stroke: Up to 105 mm (4")
consult factory for options
Weight: See dimensional detail (page 3)
Failure Mode: Failsafe in the direction of the spring or Fail in last position
Action: Actuator shaft extends on spring return or actuator shaft retracts on spring return
Hydraulic Fluid: See page 4
Maximum Working Pressure: 12 bar (175 psi)
Manual Override: Optional hydraulic handpump
Internal Pressure Transmitter: Displayed as a percentage of maximum working pressure
Mounting: Valve stem vertical or horizontals (see page 4)

Specification

Electrical

Electrical Supply: Single-phase 115 or 230 VAC,
Three-phase 380 to 480 VAC or 24 VDC

Supply Tolerance: Supply voltage $\pm 10\%$,
frequency 50/60 Hz $\pm 5\%$

Power Consumption: Available upon request

Motor Protection: Thermal cutouts, insulation class F

Cable Entries: Power module has a minimum of four
spare entries. See page 4.
See Drg No SMW-SI-010 for options

Position Feedback: EX - Linear position transducer –
non-contact, magnetostrictive.
Alternative conductive plastic
potentiometer for both EX and WT

Remote Digital Inputs:
Open, Close, maintain, ESD and
Partial Stroke – Std 20 to 60 VAC/VDC
or 60 to 120 VAC. Other voltages
consult factory, 5 mA minimum
duration 300 ms. (DC inputs must be
+ve switched)

Optional Limit Switches:
Two electro-mechanical SPDT volt
free switches. Rating 5A minimum at
230 VAC (See page 4)

Non-Intrusive Setting:
Sealed control module with infrared /
Bluetooth setting from the Rotork
Bluetooth® Setting Tool *Pro*. All values
are held within EEPROM to maintain
settings within the memory on power
failure. Datalogger configurations and
recorders can be downloaded via the
Rotork Bluetooth® Setting Tool *Pro*

Display: Rotork LCD dual display with 32
character text to allow viewing of the
valve position, internal pressure and
diagnostics screens. LED's are provided
to indicate limits and intermediate
state in the remote mode

Control

Control Options: Remote Digital (Open, Close,
maintain), Emergency shutdown
and Partial stroking.
Or Analogue Modulating –
Input 4-20 mA or 0-10 VDC

Resolution: Speed 'A' <0.2%, Speed 'B' <0.5%,
Speed 'C' <1% of full scale

Repeatability: <0.2%

Duty Rating: 90%

Output: 4-20 or 20-4 mA, powered internally
by an isolated 24 VDC supply or
external customer supply

Function Settings: Control options, Deadband and
Hysteresis adjustable 0–99%, Partial
stroking adjustable 0–99%, interrupt
timer and ESD action

Interrupt Timer: To slow the rate of closing and / or
opening over. 0–99% of stroke, with
the time pulse ON and OFF duration
selectable from 100 ms to 99sec. Timer
does not operate with loss on power

Local Controls: Lockable Local / Stop / Remote selector
switch and local Open / Closed switch

Alarm and Limit Relays:
Relays: Volt free Normally Open or Normally
Closed contacts rated 5 mA to 5A
120/230 VAC, 30 VDC

Alarm Monitor Relay: De-energised on loss mains power,
hardware, local controls, position
sensor fault, and EEPROM error.
Optional signal inverted to
de-energise monitor relay for low
power applications

Three Independent Alarm and Status Relay:
Can be configured to customer specific
alarms and status indication

Fieldbus Communication Options (internally mounted):

Pakscan: Rotork fieldbus system for remote
control and status indication over a
fault tolerant two-wire serial link. Loop
distance up to 20 km. (See PUB059-048)

Modbus: Single and dual communication
highways RS485. Modbus protocol RTU
(See PUB091-001)

Profibus DP: Fully compatibility with EN 50170
(See PUB088-001)

Foundation Fieldbus: An IEC61158-2 compliant Foundation
interface module allows connection to a
foundation network. (See PUB089-001)

DeviceNet: ODVA certified DeviceNet interface, with
full status data feedback, digital and
analogue control (See PUB090-001)
For modulating applications consult factory
regarding resolution on all fieldbus cards

Rotork reserves the right to change the specifications without notice.



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

www.rotork.com

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Electric Actuators and Control Systems
Fluid Power Actuators and Control Systems
Gearboxes and Gear Operators
Precision Control and Indication
Projects, Services and Retrofit