ROTOR K ‘K’ RANGE

ELECTRIC
WATERTIGHT
(IP 68/NEMA 6)
AND FLAMEPROOF
(IS 2148 / GAS
GROUPS IIA, IIB & IIC)
ACTUATORS
Rotork India’s Syncropak Flame Proof Actuator on a refinery tank farm

Features of the "K" Range 3
Syncroset or Syncropak? 4
"K" Range mechanical construction 5
Electrical construction 6
Electrical optional extras 7

ESTABLISHED LEADERS IN ACTUATION TECHNOLOGY

As one of the world’s leading manufacturers of actuation products Rotork has built an enviable reputation as the supplier of equipment which is both well-developed and durable. With over thirty years of experience of long-term installations in all environments we have evolved a design of uncompromising reliability. Today Rotork actuation equipment is ahead of the field in operating and safety applications for industry.
Any motorised valve requires a reversing contactor starter to switch the three-phase motor in response to control signals. This may be separately installed or incorporated in the actuator.

Rotork India Syncroset means an actuator requiring separate starter facilities. Rotork India Syncropak means an actuator containing its own starter and control equipment.

Everything required for operation from a three-phase supply, it can be tested on local control by the valvemaker and site contractor with undivided contractual responsibility by Rotork India for reliable operation. Note that normal isolating valve operation is so intermittent that contact wear and tear is insignificant.

No routine electrical maintenance other than a running check of infrequently used actuators is required because of the superior environmental protection. Properly sealed covers should be left undisturbed for as long as possible.

The Standard 1600 series Syncropak additional features are offered as standard for increased valve protection, increased actuator reliability, flexibility of control and supervision, for details ref. spec. for Syncropak 1600 series system catalogue.

**SYNCROSET AND SYNCROPAK CONSTRUCTION**

On Syncroset actuators, a terminal compartment with four threaded cable entries is bolted to the actuator gearcase. Behind its 'O' Ring sealed watertight cover, the housing contains a cylindrical terminal block with through connections which forms a complete weather seal between the terminal housing and the main actuator enclosure. Therefore, even with the terminal cover removed, the actuator is still permanently protected against the harmful effects of the atmosphere. Exactly the same terminal compartment is used on Syncropak actuators, in which case it is simply bolted to the Syncropak housing which in turn is bolted to the actuator gearcase, again providing permanent protection of the actuator’s electrical control and starting equipment when the terminal cover is removed. If required, on both Syncroset and Syncropak actuators, the terminal compartment can be replaced by a plate carrying plug and socket connections to the actuator. ‘K’ Range Syncropak employs a similar reversing contactor starter and local control assembly to the long established ‘A’ Range but, in order to simplify the internal wiring, the light current components are mounted on three printed circuit boards. The front cover of the Syncropak housing carries the Open/Stop/Close pushbutton and the padlockable Local/Off/Remote selector switch in an easily removable cover.

The electrical components, including three printed circuit boards are mounted on a withdrawable chassis.

**PRINTED CIRCUIT BOARD**

One printed circuit board carries the high tension circuits, including the control supply transformer, voltage selector and fuses. Another printed circuit board is associated with the remote control inputs, and interfaces with the main printed circuit board carrying the logic circuits.

The inter-connections between the local control switches and the circuit board and also the connections between the circuit board and the outgoing terminals and motor etc. are made by quick release connectors enabling the circuit board to be replaced easily in the field without the need to make solder connections.

The Transformer is feeding for 10W to 12W Heater in the Switch Mechanism compartments and a low voltage tap feeds the position indicator lamp.

**SYNCROSET OR SYNCROPAK?**

**SYNCROSET**

Syncroset actuators incorporate the motor with limit and torque switches only. This minimizes the electrical equipment at the valve location and is therefore particularly suitable for locations where access for maintenance is difficult. It must be borne in mind, however, that the valve function still depends on satisfactory operation of electrical equipment at the valve, which is where Rotork India double-sealing plays such an important part.

The reversing starter must be separately specified, purchased, installed and wired by the customer.

When starters are remotely mounted, local pushbuttons are desirable for start-up and maintenance purposes. These should be separately installed at this most convenient operating point for each group of valves as they are part of the starter circuit and do not need wiring to the actuators.

With Syncroset actuators, it should be noted that the valve control system is incomplete until wired in the field. The correct functioning and installed reliability of the motorised valve installation is thus dependent not only on the engineering co-ordination of the separately procured starters and actuators but fundamentally on the correctness and quality of the field wiring installation.

**SYNCROPAK**

Rotork India Syncropak actuators incorporate the starter and local controls with considerable economy in site wiring as shown. This arrangement also enables the essential elements of the valve control system to be factory wired and tested, and sealed by Rotork India Quality Control. Because Syncropak incorporates
GEAR DRIVE
Motor power is transmitted through oil immersed primary spur gears and a conventional torque-sensing worm and wheel drive, with hammerblow backlash feature, to provide reliable, simple and quiet operation. The valve can therefore be either run full travel or "inched" to any position. In direct proportion to the output torque the reaction force on the worm shaft, compressing the spring packs in either direction, is used to trip the 'open' or 'close' adjustable torque switches. The gearcase is oil-filled for normal operation in an ambient temperature range of -30°C to +70°C (-20°F to +160°F).

OUTPUT DRIVE
To provide maximum economy and flexibility of application, basic 'K' Range actuator gearboxes are equipped with a centre column terminating in two dogs to which can be coupled a separate base of Type A or Type B design for thrust or non-thrust applications respectively which is attached to the gearbox by four bolts. The Type A and Type B drives have dimensions conforming with ISO 5210/1 and DIN 3210 or North American standards.

HANDWHEEL OPERATION
The declutch mechanism is designed to ensure that the motor drive takes preference without rotating the handwheel. The handwheels is engaged by moving a padlockable hand/auto lever which declutches the worm wheel and couples the handwheel to the output shaft. A latch retains the drive in the manual position until the worm wheel is rotated by the motor, when the latch is tripped, the handwheel declutched and the motor drive re-engaged. Handwheel effectiveness is doubled by the hammerblow backlash feature for seating and unseating and overgearing is avoided as the hand drive does not use the motor gearing. When the hand/auto lever is padlocked in the 'hand' position, motor operation of the valve is completely inhibited. Similarly, with the lever padlocked in the 'auto' it is not possible to operate the valve manually.

Optional extra: appropriately geared side handwheels for larger size units.

STEM COVERS
Standard actuators are supplied with a sealing cap above the output shaft.

Optional extra: cover tubes of appropriate length for protection of rising valve stems.

LABELS
Actuator labels are available in English.

POSITION INDICATION
Position indication is not supplied as standard with 'K' Range actuators.

Optional extras: three position indication showing 'Open', 'Intermediate', 'Closed', optionally illuminated red/white/green on Syncropak actuators.

Continuous position indication showing 'Open', 'Intermediate', 'Closed', also optionally illuminated red/white/green on Syncropak actuators.

Three position indication is driven by and attached to the front of the actuator switch mechanism.

Continuous indication is driven by the Auxiliary Position Drive (APD) unit, which is fitted adjacent to the switch mechanism and can also drive intermediate auxiliary switches and one or two potentiometers. (See page 5)

For 'K' Range actuators with the following options please apply to Rotork India.

1. Linear output drive
2. Intermediate multi-turn and part-turn gearboxes.
3. Syncroset with push button assembly
MOTORS
The standard range of 3-phase, Class B insulated, 15 minute rated, squirrel cage motors are ‘O’ Ring sealed to provide complete environmental protection during long periods of inactivity, when condensation build-up can otherwise cause deterioration. The wide range of motors and gear ratios provides an exceptionally comprehensive range of output speeds from 4 1/2 to 192rpm for 50Hz supplies. ‘K’ Range motors are designed as standard for 3-phase supply voltages of 415 Volts, 50Hz.
Optional extras: higher classes of insulation; non-standard voltages

MOTOR PROTECTION
Standard motors incorporate a stator thermostat to give burn-out protection by direct temperature sensing.

TORQUE AND LIMIT SWITCHES
The ‘K’ Range limit and torque switch mechanism represents a major advance in actuator design. From a combined limit and torque switch with mechanical selection and end position latching enabled standard wiring diagrams to be used irrespective of valve type. The latch also inhibits unnecessary tripping of torque switches during unseating and prevents repetitive hammering of valve seats caused by self-resetting torque switches under sustained signal conditions. The ‘K’ Range not only retains these features, it combines them with a precision counter-type mechanism, easily and accurately set at each end position and permitting unlimited manual over-travel beyond the switch setting. In addition, the valuable anti-hammer feature of the torque switch latch, previously only available at end position, now operates throughout travel, so that control circuit designers do not need to know whether or not self-locking gearing is used.

Once the torque switch has tripped in either direction, it can only be reset by operation of the actuator electrically or manually in the opposite direction.

Independent ‘open’ and ‘close’ torque setting adjusters can be locked in any one of nine setting positions, down to a minimum that is not more than 40% of maximum.

The standard Syncroset limit and torque switch complement provides two V3 switches for each direction. One provides the torque/limit function for travel termination; the other is an auxiliary position switch for end position signalling, with changeover contacts brought to three terminals. For Syncropak, three V3 switches are provided for each direction as standard, giving separate make and break auxiliary contact instead of a changeover contact. Standard V3 switches have contact ratings for inductive circuit as follows.
AC 415V, 2A; 220V, 5A; 110V, 10A
DC 110V, 0.4A; 50V, 1A, 24V, 3A.
Optional extra: other switch types may be accommodated; apply to Rotork India.

TURNS RANGE
‘K’ Range Switch mechanism counters are geared as standard to provide a setting range of 1-240 turns in 1/8 turn increments on smaller models and 2-480 turns in 1/4 turn increments on larger “models.

Optional extra, 4-960 turns in 1/2 turn increments is available on all sizes on request.

TERMINALS AND WIRING
Internal wiring is tropical grade insulated, standard cable and each wire is number identified in accordance with terminal numbering. In both Syncropak and Syncroset actuators all electrical components are permanently connected to the cylindrical terminal block for reliability. The terminal block is ‘O’ Ring sealed with through terminals conveniently angled for customer wiring.

CONDUIT ENTRIES
All actuators have four conduit entries of 1” British metric as Std.
SYNCROSET

End of travel auxiliary switches
Up to a maximum of four can be provided for each direction in the switch mechanism, in addition to the torque/limit switch for travel termination.

Blinker
Provision is made for a switch providing intermittent make and break contact whilst actuator is running.

Space heater
A 10-12W heater for the switch compartment can be provided if the supply voltage is specified, standards being 110-120, 220-240 and 380-440.

Auxiliary Position Driver (APD)
As stated on page 3, the APD is fitted adjacent to the switch mechanism and is used for the following purposes.

Continuous local position indication
Mechanical function, see page 3.

Potentiometers
One or two 1W potentiometers of 2.5K or 15K Ohm resistance can be provided for continuous remote position transmission driven through a gear train incorporating an anti-backlash spring to minimise hysteresis. Where the potentiometer is used to feed a voltmeter type indicator, the voltmeter should preferably be scaled for not more than 75% of indicator supply voltage, and the remainder taken up by a trimming resistor adjacent to the instrument for easy calibration.

CPT stabilised current
Transmitter provides a stabilised 0-0mA, 0-20mA or 0-50mA, current signal output proportional to valve position to facilitate data scanning and logging by computer system.

Independent limit switches
Two, four or six auxiliary switches may be added to the APD, independently adjustable at any point throughout the stroke.

SYNCROPAK

End of travel auxiliary switches
As Syncroset.

Note that basic Syncropak actuators have one torque/limit switch and two end of travel auxiliary switches in each direction as standard.

Blinker
As Syncroset.

Space heater
As Syncroset - (Internally powered).

Auxiliary Position Driver (APD)
As Syncroset

Folomatic (proportional) control
'K' Range Syncropak actuators can be used to control the position of a valve in proportion to a continuous current or voltage signal (analogue) by the addition of the Folomatic control unit - see publication AE4/0. 1.

For further details on Syncropak refer publication BRV 11.

As we are continually developing our products, the design of Rotork India actuators is subject to change without notice.

PAKSCAN 2WIRE CONTROL SYSTEM

Pak-Scan brings improved plant control with vast cost savings. A micro-processor based system, Pak-Scan is capable of controlling and monitoring up to 240 field devices per loop via a two-wire serial-link. Using master stations, linked to field units, integral to the ‘K’ range or other Rotork actuators, Pak-Scan can also gather important digital and analog plant data.

For more information see brochure SIIOE
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