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ROTORK 'A' RANGE

DOUBLE SEALED 3 - PHASE ELECTRIC VALVE ACTUATORS

VOLVING RELIABILITY

Publication E210E issue 4/01

ESTABLISHED LEADERS IN ACTUATION TECHNOLOGY

As one of the world's leading manufacturers of actuation products Rotork has built as enviable reputation as the supplier of equipment which is both well-developed and durable. With over forty 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.

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THE'A' RANGE

'A' Range actuators combine the qualities of a robust electric motor and a well proven mechanical drive of the utmost simplicity. In addition, total environmental sealing and Rotork's positive attitude to quality, result in an actuator of the utmost reliability.

ROTORK 'A' RANGE SYNCROSET ACTUATORS ARE PARTICULARLY SUITABLE FOR:

■ Applications where actuators with separate mounted starters would be preferable. For example, where there are high levels of vibration, high ambient temperatures or where accessibility to the motor operated valve is limited after installation.

■ Installations where traditional electro-mechanical integral controls are preferred for the continuity of house specifications.

■ Sites using DC or single phase power supplies.

■ Failsafe operation by pneumatic or battery power.

For most 3 phase applications the Rotork 'IQ' actuator provides the best combination of economy and performance for the motorisation of valves and dampers. (See Publication E110E)

...RELIABILITY THROUGH DOUBLE SEALING OF ELECTRICAL ENCLOSURES

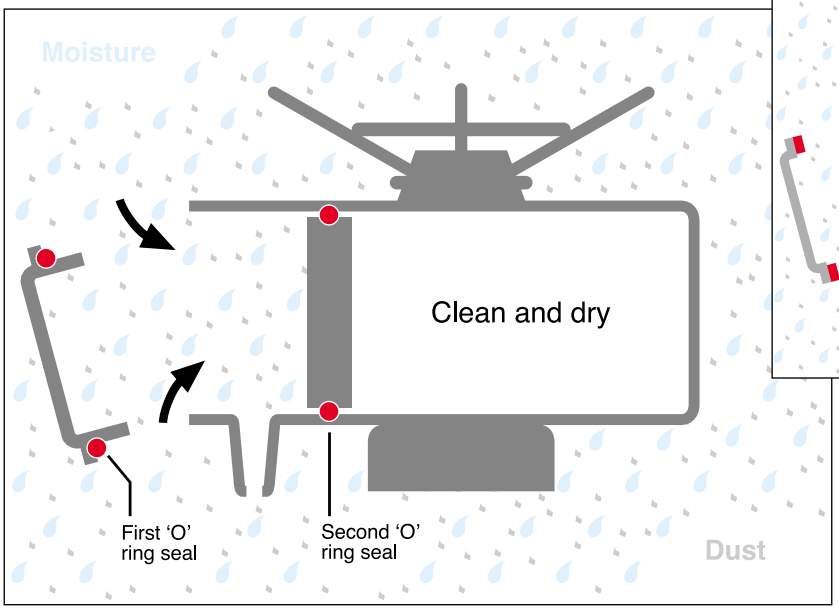
Without double sealing, investment in modern sophisticated controls can be rendered worthless, since moisture and dirt ingress will cause gradual, if not immediate, electrical or mechanical failure.

Rotork 'A' Range Actuators do not breathe. They are double sealed, watertight and dust tight to IP68 suitable for submersion to a depth of 3 metres for 48 hours - even in their flameproof versions.

They do not rely upon the care of the site electrician to fully seal the cable gland in order to maintain the integrity of the internal electrical equipment.

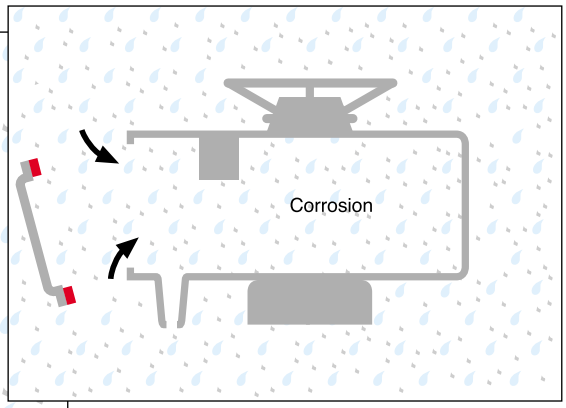
Some of the manufacturers try to imitate the double sealing by using enclosed limit switches. With this design approach any contactors and travel measurement mechanisms are still at risk from environmental effects.

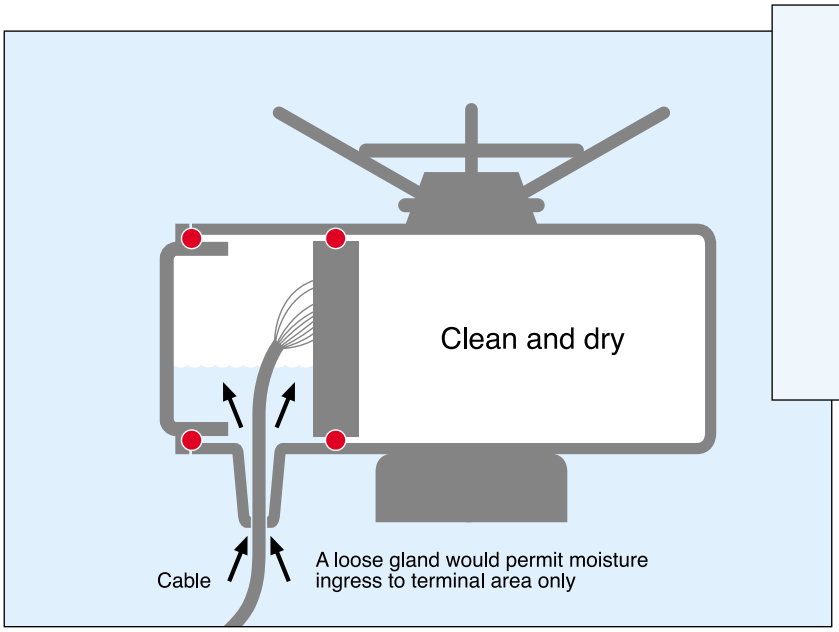
ROTORK DOUBLE SEALING SOLUTION



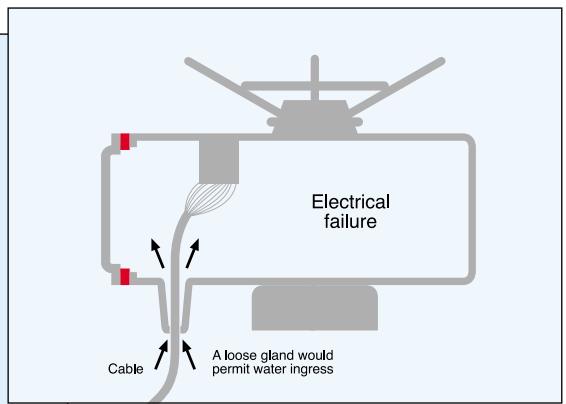
During construction, cabling or commisioning

Other 'sealed' designs





During operation



ROTORK 'A' RANGE

RELIABILTY THROUGH DESIGN SIMPLICITY

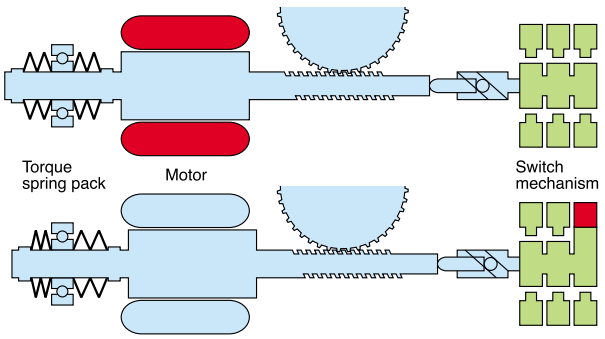
MECHANICAL SPECIFICATION

1 LOW INERTIA/HIGH TORQUE MOTOR

Three phase class F insulated squirrel cage motor of special high torque low inertia design, 15 minute rated with cyclic duration factor of 25% at 33% of actuator output rated torque giving a temperature rise not exceeding the permitted for Class B insulation. Peak torque is rapidly produced from starting and the motor has extremely low overrun when switched off. The winding thermostat provides accurate temperature sensing independent of ambient temperature conditions to optimize the motor's thermal capacity

2 TORQUE SPRINGS

The torque produced by the motor is sensed independently of voltage fluctuations. The pack of disk springs attached to the end of the motor shaft provides some mechanical resistance to the natural tendency of the wormshaft to move laterally when under



load. A mechanical setting is made in the combined torque/travel limit switch mechanism (see 4) in order to switch off the motor when a set proportion of torque has been reached.

3 SEPERATELY SEALED TERMINAL COMPARTMENT

Permits connection using various cabling practices including Flameproof Exd cable glands. Internal sealing of the terminal area ensures the integrity of the electrical equipment even during site wiring in wet locations.

4 LOCAL INDICATOR, TORQUE AND LIMIT SWITCHES

The unique combined torque and travel limit switch mechanism allows the same actuator to be specified for any type of valve, eg. either for:

■ Travel limitation as in the case of the closed position of a parallel slide valve or

■ Torque switch as in closing the gate of a wedge gate valve.

The actuator can therefore be moved from any one valve type to another in a plant provided the torque range is correct. In addition, the torque switch latch prevents the torque switches from interfering with operation during unseating. The end position limits are easily and accurately set to suit a wide range of valve sizes.

Once the actuator stroke has been set to suit a particular valve, no resetting of the mechanism is necessary if the actuator is taken off and replaced on the same valve. Winding the valve fully open and shut will re-position the mechanism.

In addition, two Open and two Close auxiliary switches are provided as standard for remote indication or interlocking purposes.

A mechanical 3 position pointer and dial showing the valve to be fully Open, Shut or in an Intermediate position, repeats the movement of the limit switch striker, enabling start-up personnel to check switch setting with out removing the cover. With Syncropak, the dial is illuminated Red/White/Green for Open, Intermediate and Shut by an internal lamp. See page 10 for additional indication features.

5 THRUST BASE

All valve thrust is absorbed in the cast iron thrust base which supports the output shaft by means of a thrust bearing. Therefore no thrust is taken up by the gearcase. This has the following advantages:

■ Weight saving for the gearcase

■ Even if the gearcase is damaged the valve stem remains secured and unauthorised valve motion leading to system failures will not occur.

■ The gearcase can be opened for examination with the valve in service without releasing the valve stem.

■ Thrust base bearings are permanently lubricated from the gearcase oil-bath, therefore external greasing sometimes associated with detachable designs is eliminated.

■ In a fire, the base, thrust bearing and drive bush will retain the closed or open valves in a secure position and will meet the requirements of API600 relating to temperature.

6 MANUAL OPERATION

When the hand/auto lever is engaged in the manual position, it disengages the electric drive mechanism and enables direct operation of the output shaft by the handwheel.

A geared side mounted handwheel is provided as standard on actuator sizes 70A and larger and is available as an optional extra on sizes 14A and larger.

■ As the hand/auto clutch is positioned on the low speed output shaft, power operation can be transferred to manual control in order to stop valve motion, if required. Syncroset actuators can be stopped locally in emergencies in this way, if running under remote control.

■ Hand operation of the valve is still possible even if the actuator gearing has failed.

■ Seating and unseating is assisted with the hammerblow effect feature so that hand operation is as quick and effective as comparable manual valves.

■ Motor operation is automatic and instantly restored when the motor is started. The declutch lever is padlockable in Hand to prevent motor drive, or in Auto to prevent handwheel drive. In combination with the Syncropak selector switch locked in 'Off', declutch locked in Auto will prevent any form of operation for safe working downstream of the valve.

7 DRIVE BUSHING

Detachable drive bushing, machinable to suit valve stem, underhung for convenient valve adaptation (see page 7).

8 GEAR CASE

Oil-bathed gearcase is sealed for any operating angle to provide maintenance-free reliability and to avoid 'tunnelling' problems associated with grease-filled designs.

9 QUALITY CONTROL SEAL

Shows actuator has passed full Rotork performance checks.

10 STANDARD ALTERNATIVE CONDUCT ENTRIES

■ 1 off 40mm, 2 off 32mm metric BS3643
■ 1 off 1.5 in, 2 off 1.25in, ASA NPT
■ 1 off PG29, 2 off PG21

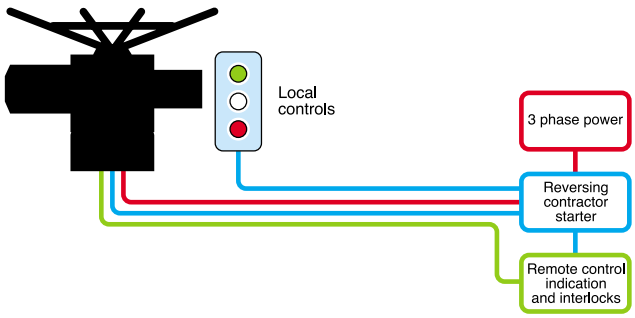
With Syncroset watertight actuators, 7A through 16A only the two smaller entries of each option are supplied (3 entries are available to special order)

ELECTRICAL SPECIFICATION

SYNCROSET CONTROL SYSTEM

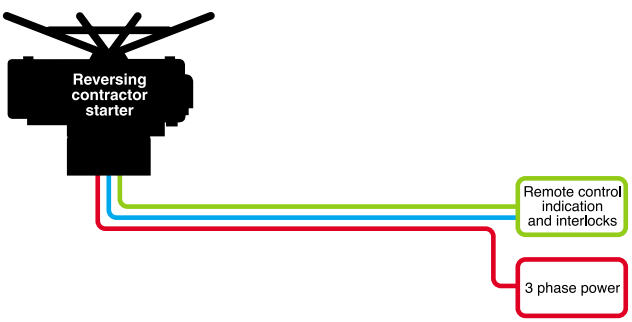
The Rotork Syncroset actuator comprises a 3 phase motor, reduction gearbox, torque and limit switch mechanism, valve position indicator and space heater. All integral connections are brought out via individually number identified wires to a terminal compartment with threaded conduit entries. Reversing contractors must be separately procured and installed.

Syncroset actuators are particularly suitable for situations in which the equipment at the valve location must be minimised. Where conditions permit it is possible to supply Syncroset actuators with integral local control push-buttons and lockable selector switch.



SYNCROPAK CONTROL SYSTEM

The Rotork Syncropak actuator comprises everything needed to operate a valve from a 3 phase supply: motor, reduction gearbox, limit and torque switch mechanism, space heater, reversing contactor starter with fused control transformer, illuminated dial indicator, Open/Stop/Close push-button and padlockable Local/Off/Remote selector switch all as a factory wired, tested and sealed package with three threaded conduit entries. The installation of Syncropak actuators requires only 2 cables and 19 site terminations. Responsibility for performance is undivided and is proved by testing at each stage; by the actuator manufacturer - the valve maker - the installation contractor, with only 3 phase having to be connected.



ROTORK 'A' RANGE

PERFORMANCE SUMMARY

PERFORMANCE DATA FOR 3 PHASE ACTUATORS

Actuator output speeds

rpm at 50Hz	18	24	36	48	72	96	144*	192*
rpm at 60Hz	21	29	43	57	86	115	172*	230*

Actuator Size	**Torque****	Nm	Ft lbf						**Nominal motor†**	Kw	hp	
									50Hz		60Hz	
7A	34	34	31	27	27	22			0.08	0.16	0.1	0.18
	25	25	23	20	20	16			0.11	0.21	0.13	0.25
11A	68	68	61	54	54	43			0.15	0.24	0.18	0.29
	50	50	45	40	40	32			0.2	0.32	0.24	0.38
13A		108	95	81					0.31		0.36	
		80	70	60					0.42		0.5	
14A	163	163	135	108	108	81	61*		0.36	0.67	0.43	0.7
	120	120	100	80	80	60	45*		0.5	0.9	0.6	1.1
16A	305	305	257	203	203	149	108*		0.75	1.1	0.9	1.3
	225	225	190	150	150	110	80*		1.0	1.5	0.96	1.8
30A	542	542	508	407	407	325	257*		1.25	2.2	1.5	2.6
	400	400	375	300	300	240	190*		1.7	3.0	2.0	3.6
40A	1020	1020	845	680	680	540	406*		2.1	3.7	1.9	4.3
	750	750	625	500	500	400	300*		2.8	5.0	2.5	5.4
70A	1480	1480	1290	1020	1020	745	645*	540*	2.75	4.8	3.3	5.8
	1100	1100	950	750	750	550	475*	400*	3.7	6.5	4.3	7.8
90A	2030	2030	1700	1355	1355	1020	865*	730*	4.5	7.5	5.4	9.0
	1500	1500	1250	1000	1000	750	640*	540*	6.0	10.0	7.2	12.0
91AR							1355*	1355*		13.0		15.6
							1000*	1000*		17.4		21.0
95AZ		3000							4.8		5.8	
		2200							6.5		7.8	

* Refer to Rotork if these speeds are required for direct mounted gate valve applications

† For Full motor data, refer to publication E230E

** Torque rating is maximum torque setting in both directions. Stall torque will be 1.4 to 2.0 times this value depending on speed and voltage.
If maximum torque is required for more than 20% of valve travel refer to Rotork.

MECHANICAL DATA

Actuator size		7A 11A 13A	13AL	14A 16A	30A	40A	70A	90A	91AR	95AZ
Group 'A' couplings (thrust)†										
Thrust rating	kN	44	33	67	110	220	220	334	N/A	445
	lbf	10,000	7,500	15,000	25,000	50,000	50,000	75,000	N/A	100,000
Stem acceptance diameter Type 'A1' (maximum)										
Rising	mm	26	38	38	54	64	70	70	N/A	N/A
	ins	1	1 1/2	1 1/2	2 1/8	2 1/2	2 3/4	2 3/4	N/A	N/A
Non-rising	mm	20	32	32	44	51	57	57	N/A	N/A
	ins	3/4	1 1/4	1 1/4	1 3/4	2	2 1/4	2 1/4	N/A	N/A
Type 'AZ' (maximum)										
Rising	mm	32	-	51	67	73	83	83	N/A	83
	ins	1 1/4	-	2	2 5/8	2 7/8	3 1/4	3 1/4	N/A	3 1/4
Non-rising	mm	26	-	38	51	57	73	73	N/A	73
	ins	1	-	1 1/2	2	2 1/4	2 7/8	2 7/8	N/A	2 7/8
Group 'B' couplings (non-thrust)† Stem acceptance diameter										
Type 'B1' (fixed)	mm	42	-	60	80	100	100	120	N/A	N/A
Type 'B3' (fixed bore)	mm	20	-	30	40	50	50	50	50	N/A
Type 'B4' (maximum)	mm	20	-	32	45	50	60	60	60	N/A
	ins	3/4	-	1 1/4	1 3/4	1 7/8	2 1/4	2 1/4	2 1/4	N/A
Handwheel ratio	Standard	Direct	Direct	Direct	Direct	Direct	15:1	15:1	15:1	15:1
	Optional			10:1	15:1	20:1	30:1	45:1	30:1	45:1
Flange size	ISO 5210	F10	F10	F14	F16	F25	F25	F30*	F25	F30
	MSS SP-102	FA10	**	FA14	FA16	FA25	FA25	FA30*	FA25	FA30

* 90A with Group B3 and B4 couplings have flange size F25.
** 13AL has FA10 base dimensions except that spigot diameter is 2.76".
† Valve stems or shafting should be adequately supported to prevent radial loads being imposed on the actuator drive bushings.

ROTORK ‘A’ RANGE

‘A’ RANGE VARIATIONS

SIDE MOUNTING

Large or slow speed valves can be motorized through thrust-taking bevel or spur gear operators on which the electric actuator is mounted. Because of their inherent high efficiency, such gears provide for satisfactory handwheel operation. The gearboxes are normally provided by the valvemaker, but can be supplied by Rotork in combination with actuators.

QUARTER TURN VALVES

Proprietary gearboxes can be offered in combination with ‘A’ Range actuators to provide increased torque at reduced speeds for the operation of ball, butterfly and plug valves.

FLOOR MOUNTING

Floorstands with upward and downward stub shafts are available for coupling via customer’s shaft and universal joints to remote valves.

DAMPER ACTUATION

Single blade and multi-vane dampers can be motorized either by direct connection to the spindle or by lever-arm. Apply to Rotork for details.

ACTUATOR FOR LOW TEMPERATURES

Standard actuators are designed to operate at temperatures down to -30°C, -22°F. Special provision is made at extra cost for temperatures of -40°C, -40°F or -60°C, -76°F.

FIREPROOFING

Standard ‘A’ range Syncropak and Syncroset actuators are available complete with fireproofing system which will guarantee motorised valve operation for up to 30 minutes after the commencement of an oil fire at the MOV installation. Satisfactory tests have been conducted where operating MOV’s were subjected to temperatures of 1065°C (1942°F) for upto 30 minutes.

HIGH SPEED ACTUATORS

Where unusually are high speeds are required Rotork torque limiting brake can be supplied to prevent excessive valve seat loading.

PLUGS AND SOCKETS

For applications where quick and simple method of disconnecting and reconnecting the power supply and control cables to an actuator is required, Rotork Syncropak and Syncroset actuators up to size 90A can be fitted with plug and socket connectors as an alternative to conventional hard wiring. The unique Rotork doubling sealing feature is maintained even with the plugs disconnected, giving protection to IP68. See publication AE4/0.2

NUCLEAR ACTUATORS TYPE NA

Type NA Syncroset actuators have been specially developed, qualified and supplied for safety related duty in nuclear powerlpants, particularly those involving light water reactors. The paramount importance of proper and auditable qualification having been recognised and documented primarily in the USA, the basis of qualification are the US standards IEEE 282, IEEE 323, IEEE 344 and IEEE 382, Rotork being a participant member of the committee responsible for their drafting. See publication AE 1/4

‘A’ RANGE VARIATIONS

SINGLE PHASE ‘A’ RANGE

Syncropak and Syncroset actuators up to size 30A are available for use with single phase power supplies of 110, 220 and 240 Volts 50Hz and 120V, 60Hz.

DC ‘A’ RANGE

DC powered Syncroset and Syncropak actuators are available for applications where valve operations must be maintained even in the event of single or 3 phase power failure. The DC version of the ‘A’ Range actuator has been developed from the standard Syncroset and Syncropak watertight and Factory Mutual certified designs, using a flange mounted permanent magnet DC motor. The range of supply voltages catered for as standard is 48V and 110V DC. For further information see publication E221E.

FOLOMATIC CONTROL

This electronic package enables a Syncropak actuator to position a valve in proportion to analogue current or voltage signal. It is suited to systems with relatively slow rates of change, eg. level controls in water and sewage systems. See publication AE4/0.1. Not available with size 13 actuators.

PAKSCAN TWO WIRE CONTROL

The Rotork two-wire control system for valve actuators offers considerable cost savings on cabling and control interface as well as design engineering.

The system consists of a master station which controls and monitors up to 240 actuators via field units mounted in the actuators and connected by a two wire loop.

The total installed cost of the conventional multicore cabling can be as much as twice the cost of the valve actuators. With a typical installation, such as an oil tank farm, savings of up to 75% can be made by the use of the two wire system, though savings will vary, depending on complexity and control distance.

Further considerable savings can also be achieved if the actuators are controlled by computer, since the master station equipped with RS232C port can be connected without the need for further interface.

The combination of two wire cabling and elimination of control interface greatly diminish the design engineering required as well as reducing commissioning time (less possibility of error) thereby achieving even greater savings.

The Rotork two wire control system can easily be fitted or retrofitted to the ‘IQ’ Range, 1400, 1600 Series ‘A’ Range or ‘AQ’ Range or ‘Q’ Range actuators. It can also be used with other devices such as pumps, level gauges, sensors etc. See publication S000E.

FAILSAFE SYSTEMS

A standard Rotork electric motor actuator provides a simple economic and reliable means of operating valves under all normal conditions except during electrical supply failure when the valve stays put. If the system is such that the valve must be operated during power failure, some form of stored energy is essential. Rotork are able to offer two such stored energy systems.

DC Actuator Emergency Shutdown System

This system is based on the use of Rotork DC powered ‘A’ Range Syncropak actuator in conjunction with an AC fed DC battery console. The system is designed to allow actuators to be powered from the DC battery source under both normal operating conditions and emergency shutdown conditions. This continuously confirms the availability of the DC power system. In addition a relay fitted inside the Rotork DC Syncopak actuator monitors availability of the DC battery supply and the actuator control circuit together with a battery status indication relay in the battery console. Each battery cubicle is designed to carry a single phase battery charger together with batteries for powering one DC Syncropak actuator. The battery cubicle also includes a relay for monitoring the single phase input power supply to the battery charger. Contacts of this relay are used to indicate AC power supply failure, initiate ESD operations of the actuator and to disconnect any existing control signal. While the actuator maybe supplied as watertight only or watertight and flameproof, Factory Mutual Certified, the battery cabinet is only available as watertight IP66. See publication E221E.

Electro-Pneumatic Valve Actuator Emergency Shutdown Systems

This uses the Rotork Type PA failsafe electro-pneumatic actuator. PA actuators are Rotork ‘A’ Range Type 11A, 16A, 30A, 40A, 70A or 90A actuators to the Syncroset or Syncropak Specification having a pneumatic air motor flange mounted onto the electric motor. Since the pneumatic motor maybe powered by stored or line gas at 5-7 bars (80 to 100psi). The pneumatic operation of the PA actuator requires the installation of suitable pneumatic controls. Rotork is able to supply lockable and weatherproof, IP55 cabinets containing these controls and suitable for either wall or stand mounting.

ROTORK 'A' RANGE

SPECIFICATION SUMMARY

4/1 Publication number for more detailed information

Basic specification

Standard 'adder' options

Special options

NA Not integrally supplied

	Syncropak 1600 Series	Syncropak 1400 Series	Sycroset 2200 Series
MAIN DRIVE UNIT			
Three phase electric actuator with double sealed watertight enclosure IEC IP68 (submersion in water to a depth of 3m for 48hrs. Other national enclosure standards also complied with, ie. CSA, NEMA, BS5410 specifications) complete with segregated terminal area to IEC. Declutchable lockable emergency handwheel. Class F insulated 15 min. rated, low/high torque motor with thermostat protection. Combined torque/limit switches for open and closed position and 2 each auxiliary limit switches for remote lamp indication or interlocks. 3 position local indicator.	E210 E210 E210	E210 E210 E210	E210 E210 E210
Illumination of local indicator (red-open/ white-travelling/green-closed).	4/2	4/2	NA
Integral reversing contactor starter mechanically and electrically interlocked.	E210	E210	NA
Local Open/Close/Stop push-buttons with lockable local Open/Close/Off selector switch.	E210	E210	E210
Additional time based motor protection system.	4/2	NA	NA
Automatic phase rotation correction with single phasing motor protection.	4/2	NA	NA
Phase rotatation discriminator with single phasing motor protection.	NA	4/2	NA
Instantaneous reversal protection.	4/2	NA	NA
Single phase power supplies.	E210 4/2		E210 E230
DC power supplies.			E221
Flameproof enclosures ie CENELEC, factory Manual.			
Pneumatic failsafe 'PA' system fitted to 3 phase actuators only.	1/3	1/3	1/3
Two speed or low speed operation	4/2		NA
Time rating greater than 15 minutes and/or higher motor insulation.			
ADDITIONAL VALVE STATUS INDICATION FACILITIES			
Potentiometer for remote continuous indication	4/2	4/2	4/2
Add-on-Pak 1 unit comprising potentiometer for continuous remote indication and 6 additional limit switches adjustable in banks of 3 to any valve position. Continuous local indicator.	4/2	4/2	4/2
Blinker switch for valve motion indicator.	4/2	4/2	4/2
Current Position Transmitter (CPT) for any range between 0 and 50mA,	4/2	4/2	4/2
Integral smooth DC power supply for CPT transmitter for external lamp indication.	4/2	4/2	NA
110 to 120 Volts AC supply for external driving of volt meter or lamps - 20VA	4/2	4/2	NA
'Valve running' indication (motor energised).	4/2	4/2	NA
'Valve available' indication.	4/2	4/2	NA
REMOTE CONTROL OPTIONS			
(A) Open/Stop/Close or Open/Close with mid travel reversal. Control maintained or 'push to run'	4/2	4/2	
(A) From volt free push-buttons up to 600 meters away from actuator.	4/2	4/2	
(A) From volt free push-buttons- but from longer distances.	4/2	NA	
(A) From Panel-fed remote controls with specified control supply.	4/2	4/2	
(A) From Panel-fed remote controls with unspecified control supply 12 Volts to 120 Volts AC or DC.	4/2	NA	
(B) From proportional Controller giving signals of 0-50mA Volts or 0hms with any zero offset.	4/0.1	4/0.1	
(C) 2 wire open/close from make/break switch.	4/2		
(D) Emergency shutdown circuit	4/2		
INTERLOCK AND MONITORING FACILITIES			
Interlock circuits to prevent/permit either or both closing and opening movements.	4/2	4/2	
Alarm or incomplete travel, sequence failure or unauthorised hand operation	4/2	4/2	
Alarm of local control switch set to 'stop', 'off' or 'local control'. Alarm of fuse blown, motor overhead, power supply disconnected, incomplete or incorrectly wired, integral monitor relay.	4/2	4/2	
Alarm of above individually supplied.			

STANDARD FINISH

Iron castings are fettled to present a smooth surface after which the are dipped, before machining, in a synthetic red oxide primer to seal all surfaces.

Aluminium actuators are then suitably masked and passed on a conveyor through a aqueous degreasing plant operating at 70ºC to the spraying stage.

THE SPRAYING STAGE

Preheated paint is applied as follows;

Undercoat

Make:	Croda
Type:	Multipurpose zinc phosphate anti-corrosion primer
Ref no:	TDS: 4112 (AC94)
Min dry film thickness:	2.00 mils (50.8 microns)
Application:	Spray with electrostatic or pneumatic deposition

Top Coat

Make:	Croda
Type:	Air dried urethane reinforced synthetic alkyd resin
Ref no:	XY01464
Colour:	Charcoal grey BS4800-00A13
Min film thickness:	1.00 (25.4 microns)
Application:	Spray with electrostatic or pneumatic deposition. Wet on dry.
Drying time:	12 hours to hard dry
Film thickness:	3 mils (76.2 microns)

Actuators finished with our standard preparations developed for exposed locations involving salt spray, high humidity and a wide band of ambient temperatures -40°C +70°C. The finish has successfully withstood a 672 hour Salt Mist Environmental Test based on BS2011 Part 21 Ka.

TEMPERATURE

Standard for ambients of -30°C to +70°C (-22°F to +158°F). For 'CSA EP' enclosures see below. For lower or higher ambient temperatures please apply.

DESIGN LIFE

For isolating duty torque ratings of actuators are based on a minimum maintenance free life of 10,000 valve operations or Open/ Close cycles assuming rated seating torque at stroke and 1/3 rated torque during operation. For modulating duty ratings please apply.

LIFE TESTS

These are based on 10,000 valve operating cycles at average of 1/3 seating torque. the actuator is also stalled against solid obstruction 50 times to prove durability.

FREQUENCY OF OPERATION

Standard 'A' Range actuators are suitable for up to a maximum of 60 starts per hour.

VIBRATION

Standard 'A' Range actuators should not be used on applications where they are likely to be subjected to levels of vibration exceeding the following:

Plant induced vibration- 0.5g over frequency range of 10-200Hz.

Seismic- in frequency range of 0.2-33Hz, 1.0g if it is to operate during and after the event, or 5.0g if it is only required to maintain structural integrity.

Where excessive plant induced vibration is anticipated, mounting the actuator remote from the valve and driving through extension shafting incorporating vibration absorbing couplings, may provide a satisfactory solution.

MAIN ALTERNATIVE ENCLOSURES

'CSA WT'

Canadian Standards Association approved wiring and components complying with CSA 4.

'CSA EP'

Canadian Standards Association approved for Class 1 Groups B, C and D, Division 1 hazardous areas. Ambient temperature -30°C to +40°C (-22°F to +104°F)

'FM'

Explosionproof Factory Mutual approved for Class 1 Groups B, C and D, Division 1. Hazardous areas to NEC Article 500.

'CENELEC EXd'

UK BASEEFA certified for EExdIIBT4 CENELEC Norm EN 50018, BS5501

'CENELEC EXd HYDROGEN'

UK BASEEFA certified for EExdIIB H_2 T4 CENELEC Norm EN50018, BS5501

'CENELEC EXe'

UK BASEEFA certified for EExdIIBT4 CENELEC Norm EN 50019, BS5501

'CENELEC EXe HYDROGEN'

UK BASEEFA certified for EExdIIB H_2 T4 CENELEC Norm EN50019, BS5501

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