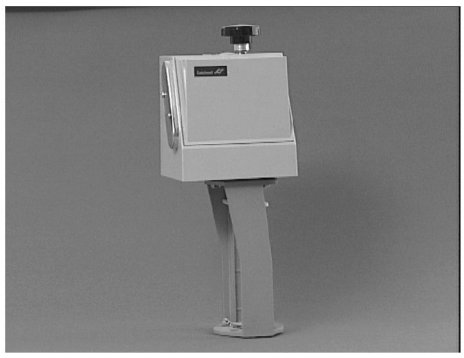
Satchwell

LINEAR ACTUATORS
Types ALM, ALX, ALE

Specification no. 477-X-XXX†

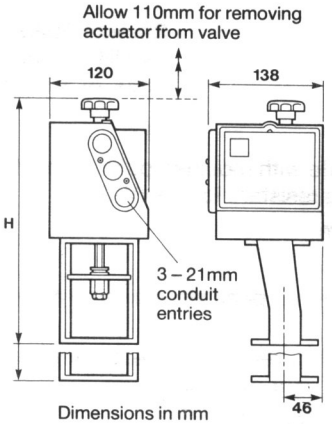
Satchwell Linear Actuators type 'AL' are reversing actuators having a linear output, for direct coupling to Satchwell seat-type control valves or other seat valves requiring a linear drive over stroke lengths of up to 38mm (1½"), within the limits of output thrust stated below and with compatible mounting arrangements.

These actuators are suitable for either two-position or modulating control, dependent on the controller or other switching device providing the input signal. The ALM is suitable for a 220–240V power supply, the ALX is 24V, and the ALE is 24V, but accepts a 0–10V dc input signal.



FEATURES

- **Direct coupling to Satchwell seat valves without extra mounting brackets or linkage kits, saving site time**
- **Direct coupling to other makes of seat valves, where stroke, thrust and mounting are compatible**
- **Universal for valve strokes, up to 38mm (1½"). Actuator stroke is self-setting to suit valve stroke, including ALE by simple adjustment**
- **Alternative stroke times, to suit application**
- **Manual operation or override facility built-in**
- **Case sealed to IP 54 as standard**
- **Auxiliary switch and potentiometer kits available, see 'Accessories'**



Dimensions in mm

Refer to 'Maximum Stroke' details below

Short Stroke Version
*H = 295mm (height)
Weight: 2.2 Kg approx.

Standard Stroke Version
**H = 340mm (height)
Weight: 2.4 Kg approx.

† For the full specification number replace the 4 X's with the appropriate figures from the 'TYPE' column in the table below.

SPECIFICATIONS

TYPES	ALM 1601	ALM 1626	ALM 1651	ALX 1201	ALX 1226	ALX 1251	ALE 1302	ALE 1327	ALE 1352	ALE 1376
STROKE	Standard	Fast	Short	Standard	Fast	Short	Standard	Fast	Short	Super Fast
POWER SUPPLY:	220-240V +10% to –15%, 50/60 Hz			24V ±10%, 50/60Hz			24V ±10%, 50/60Hz			
POWER CONSUMPTION:	3.5 VA	6 VA	3.5 VA	3.5 VA	6 VA	3.5 VA	9.5 VA	12 VA	9.5 VA	12 VA
LIMIT & TRANSFER SWITCH RATING:	5A	5A	5A	0.75A	0.75A	0.75A	–	–	–	–
RUNNING SPEED:										
8.5 s/mm (216 s/in)	●	–	–	●	–	–	●	–	–	–
2.5 s/mm (64 s/in)	–	●	–	–	●	–	–	●	–	–
5.0 s/mm (127 s/in)	–	–	●	–	–	●	–	–	●	–
1.8 s/mm (46 s/in)	–	–	–	–	–	–	–	–	–	●
MAXIMUM STROKE:										
* 16mm (5/8")	–	–	●	–	–	●	–	–	●	–
** 38mm (1 1/2")	●	●	–	●	●	–	●	●	–	●
THRUST:										
311N	–	–	●	–	–	●	–	–	●	–
538N	●	●	–	●	●	–	●	●	–	●
AUXILIARY SWITCHES:	Two 5A, 250V Adjustable Use kit 831-1-211		One 5A, 250V Fixed Built-in	Two 5A, 250V Adjustable Use kit 831-1-211		One 5A, 250V Fixed Built-in	Two 5A, 250V Adjustable Use kit 831-1-211		One 5A, 250V Fixed Built-in	Two 5A, 250V Adjustable. Use kit 831-1-211
AUXILIARY POTENTIOMETER:	One 135 ohm Use kit 831-1-212 to 215 to suit valve stroke			One 135 ohm Use kit 831-1-212 to215 to suit valve stroke			–			
INPUT: CONTROL SIGNAL (for modulation)	Pulsed – Mains Voltage			Pulsed – 24V			0–10V dc			
APPLICATION:	Two-position control from thermostat, time switch or other switching device having mains rated changeover contacts. Modulating control from any controller having a 3-wire mains output.			Modulating control from any controller having a pulsed 24V output. Use auxiliary potentiometer where feedback is required e.g. with CZT Mk3 or CZH.			Modulating control from any controller providing a 0–10V dc positioning signal. Start and Span adjustments, also DA/RA switch included. Refer to 'Operation'.			
ASSOCIATED CONTROLLERS:	CMC, CSMC			MMC, CXR & CXT Mk4, CVR			MMC, FSC, FSS, KZT, KZH, KET, CZU, CVR, SSU, DRTE, DDTE, DSTE, DWTE, CZT Mk4, BAS			
	CSC (2702 or 2777)	–	–	CSC (2701 2703 or 2776)	CSC (2001 or 2002)	CSC (2001 or 2002)				
ASSOCIATED VALVES: 2-Port: See DS 4.16	VSF up to 25mm VZ up to 2"			VSF up to 25mm VZ up to 2"			VSF up to 25mm VZ up to 2"			
	VSF 32 to 50mm VZF 65 to 150mm		– –	VSF 32 to 50mm VZF 65 to 150mm		– –	VSF 32 to 50mm VZF 65 to 150mm		– –	VSF 32 to 50mm VZF 65 to 150mm
3-Port: See DS 4.36	MJF up to 25mm MZ up to 2"			MJF up to 25mm MZ up to 2"			MJF up to 25mm MZ up to 2"			
	MJF 32 to 50mm MZF 65 to 150mm		– –	MJF 32 to 50mm MZF 65 to 150mm		– –	MJF 32 to 50mm MZF 65 to 150mm		– –	MJF 32 to 50mm MZF 65 to 150mm

Action: Reversing – modulating

Stroke Time: See table below

Protection Class: IP 54

Mounting Attitude: See 'Installation Instructions' on page 4

Ambient Temperature Limits: Operating: –20 to 50°C
Storage: –40 to 70°C

Max. Ambient Humidity:
Operation & Storage: 95% rh non-condensing

Manual Operator and Override:
Standard feature with all types

ACCESSORIES

Auxiliary Switches: Kit 831-1-211 available for internal mounting. Two voltage-free change-over switches rated 5A, 250V. Adjustable, one from position 0 to 5, the other from position 5 to 10 (see Table on page 1 for usage).

Auxiliary Potentiometer (ALM and ALX only): Kit available for internal mounting. Single 135 ohm potentiometer; use when feedback is required to controller, or to transmit position signals to another instrument.

Select kit to match valve stroke:
9.5mm (⅜") stroke – 831-1-212
15.9mm (⅝") stroke – 831-1-213
25.4mm (1") stroke – 831-1-214
38mm (1½") stroke – 831-1-215

Spring Kit: Available for use with VSF, VZ and VZF two-port seat valves, to increase maximum operating differential pressure. See DS 4.16 for full details (not suitable for ALM 1651, ALX 1251 or ALE 1351).

Spindle Adaptor: Kit 862-1-402, ¼" 32-UNEF female x ⅜" 24-UNF male. One supplied with each actuator, except ALM 1651, ALX 1251 and ALE 1351, for which it is not required.

CONSTRUCTION

Case: Mild steel baseplate with moulded polycarbonate housing and removable terminal cover (fire resistant to UL94V-0).

Mounting Bracket: Die cast aluminium

Protection Class: IP 54

Drive: Operates on screw-jack principle, driven by a reversible synchronous motor via a gear train.

Motor: Split phase, capacitor reversing type, continuously rated.

Gear Ratio:

Standard speed	(8.5 s/mm) 89:1
Medium speed	(5.0 s/mm) 51:1
Fast speed	(2.5 s/mm) 51:1
Super Fast speed	(1.8 s/mm) 27:1

Spindle Coupling: Freely rotating coupling, screwed:
⅜" 24-UNF, female (ALM 1601, 1626, ALX 1201, 1226, ALE 1301, 1326, 1376)
¼" 32-UNEF, female (ALM 1651, ALX 1251, ALE 1351)

Manual Operator & Override: Hand operator with gear train disengagement feature.

Position Indicator: Spindle anti-rotation plate moves against stroke scale on mounting bracket. Marked 0 to 10, representing 0 to 100% stroke. Fix scale to suit valve stroke, see 'Commissioning'.

Limit & Transfer Switches: ALM & ALX: Load dependent switches, self-adjusting to match valve stroke. Control signal transfers from terminal 1 to 1T and 2 to 2T at respective limits of valve stroke (not electrically separate).

ALE: Limit switches operate as for other actuators, but are internally connected between electronics card and motor windings. The transfer function is not necessary as multi-stage sequencing is derived from the 0–10 volt output signals from the MMC 2402 or other multi-stage controllers.

Electronic Positioner: (ALE only) Built-in printed circuit board connected by plug and socket for easy servicing. Internally connected to 1000 ohm position feedback potentiometer, driven via gears from output shaft. Separate 0–10V dc output signal available to monitor position or as a service aid.

Terminals: Accept 2 x 1.5mm^2 or 1 x 2.5mm^2 cable.

Conduit Entries: Three x 21mm dia. knockout (detachable plate).

Auxiliary Switches: Available as add-on accessory, see 'Specification'.
Note: ALM 1651, ALX 1251 and ALE 1351 have one voltage-free single pole change-over switch rated 5A, 250V, built-in. Operating point, non-adjustable, is just before limit switch at position '0'.

Auxiliary Potentiometer: Available as add-on accessory for use with ALX and ALM type actuators only, see 'Specification'.

VALVE STROKE TIME

This table gives total stroke time related to type, size and stroke of valve with type of actuator used.

VALVE TYPE AND SIZE		VALVE STROKE	VALVE STROKE TIME (Secs.)			
			Actuator speed 8.5 s/mm	Actuator speed 5.0 s/mm	Actuator speed 2.5 s/mm	Actuator speed 1.8 s/mm
VZ & MZ VSF & MJF	½" & ¾" 15mm	9.5mm (⅜")	81	48	24	17
VZ & MZ VSF & MJF	1" – 2" 20, 25mm	15.9mm (⅝")	135	80	40	29
VSF & MJF VZF & MZF	32–50mm 65–100mm	25.4mm (1")	216	–	64	46
VZF & MZF	125, 150mm	38mm (1½")	323	–	95	69

OPERATION

The stroke of the 'AL' Linear Actuator is self-setting, using load-dependent switches, and is determined by the stroke of the valve. The ALE requires only a simple adjustment. Consequently, all specifications of actuator are universal and can be fitted to any seat valve having a stroke length within its nominal range, see details under 'Specifications' on page 1 and 'Valve Stroke Time' on page 2.

Manual operation of the actuator is achieved by means of an Auto/Manual push button, used in conjunction with an adjacent spring-loaded hand wheel. With the push button depressed in the 'Auto' position and by depressing and turning the hand wheel, the actuator and valve can be moved to a new position, until the controller signals a further change. With the push button in the 'Manual' position, the actuator and valve will remain in the new position until manually changed again.

ALM and ALX Actuators

The load-dependent switches perform a combined limit and transfer function. The limit switches de-energise the actuator at the end of stroke, whilst the transfer switches are used basically for sequence operation in multi-stage applications. Where additional switching or interlocking functions are required, use the add-on auxiliary switch accessory or built-in auxiliary switch detailed under 'Specifications'.

When energised between terminals 1 and 3, the actuator moves its spindle towards the fully extended position, to open a Satchwell 2-port or 3-port valve to the heat exchanger.

Conversely, when energised between terminals 2 and 3, the actuators moves its spindle towards the fully retracted position, to close the valve.

The load-dependent limit switches transfer the control signal from terminal 1 to 1T and from terminal 2 to 2T at the respective limits of valve stroke.

ALE Actuators

The ALE incorporates an electronic positioner and provides modulating control from any controller having a 0–10V dc output. Using the 'START' and 'SPAN' adjustments, the actuator can be set to make a complete stroke over any span from 4 to 10 volts, starting at any point within the signal range, providing the sum of 'START' volts plus 'SPAN' volts does not exceed 10. The load-dependent limit switches operate basically as described for the ALM and ALX, but are internally connected between the electronics card and the motor windings.

Where additional switching or interlocking functions are required, use the add-on auxiliary switch accessory or built-in auxiliary switch detailed under 'Specifications'.

A separate 0–10V dc output is available (terminal blade 11) for indicating actuator position to a Building Management System or as a Service and Commissioning aid.

The following adjustments are made on the electronic printed circuit board, accessible behind the removable front cover.

ADJUSTMENT	MARKED	FUNCTION	Factory set at:
Slide Switch	⊕/⊖	Selects Direct or Reverse Action ⊕ signifies increase of actuator position with increasing input dc volt signal. ⊖ signifies the reverse of this.	⊕
Potentiometer	START (0–10V)	Sets the command signal voltage at which the actuator commences to move from zero position	0V
Potentiometer	SPAN (4–10V)	Sets the change in command signal voltage which will cause actuator to move through complete stroke to position 10	10V
Potentiometer	STROKE	Matches operation of actuator to desired valve stroke	16mm

ALE Actuator Position for typical settings of 'START', 'SPAN' and 'ACTION'

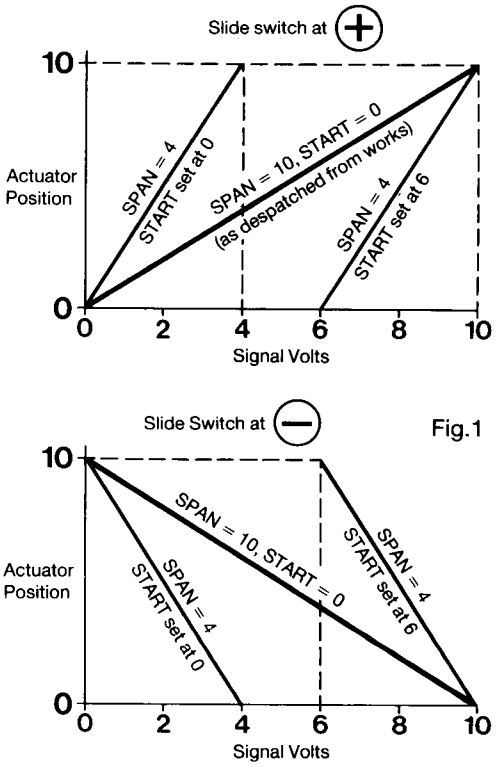


Fig.1

AUXILIARY SWITCHES

An auxiliary switch kit 831-1-211, comprising two single-pole changeover switches, is available as a separate accessory. The two electrically-separate switches can be independently set, one to operate at any point between positions 0 and 5 and the other between positions 5 and 10.
(Not applicable to ALM 1651, ALX 1251 or ALE 1351, which have one fixed auxiliary switch built in).

AUXILIARY POTENTIOMETER (ALM and ALX only)

A range of auxiliary potentiometer kits is available as accessory items, for use where a 135 ohm feedback is required, for example, when the ALX actuator is used with the CZT Mk 3 controller. (See details under 'Accessories' and select specification to suit valve stroke).

INSTALLATION

Observe the following IMPORTANT points:

- **Steam Applications: Following a shutdown of the steam system it is important that the control valve is fully open before introducing steam into the pipeline (purging) or damage may occur to the actuator spindle or valve plug.**
- Ambient temperature must be within limits –20 to 50°C.
- Do not install valve with actuator directly underneath it.
- When operating a valve handling fluid above 100°C, DO NOT mount actuator above valve, but to one side.
- Allow sufficient clearance for fitting and wiring, also minimum of 110mm between manual operator knob and nearest obstruction.
- Complete mechanical fitting of actuator to valve BEFORE connecting electrical wiring. This avoids damage which may occur, due to load-dependent limit switches not being operated.
- Ensure location is reasonably clean and dry.

Note: The following diagrams are typical internal views (ALM 1651, ALX 1251 and ALE 1351 are not shown).

ACTUATOR FITTING INSTRUCTIONS

1. a) Actuators ALM 1601, 1626, ALX 1201, 1226 and ALE 1301, 1326, 1376 are supplied with adaptor 'A' fitted, for direct coupling to valves with 1/4" diameter spindle. When coupling any of these actuators to valves with 3/8" diameter spindle, first loosen locknut 'F' then remove and discard adaptor 'A'.
   b) Actuators ALM 1651, ALX 1251 and ALE 1351 have coupling 'E' to suit valves with 1/4" diameter spindle only. Adaptor 'A' is not applicable.
2. Remove lug nut 'C' from valve bonnet, locate actuator mounting bracket over valve bonnet, replace lug nut and tighten, with actuator correctly positioned to give clear access for conduit entry and wiring.
3. For size 125 and 150mm valves, remove and discard lug nut and fix actuator mounting bracket to valve bonnet, using the four screws 'D' supplied.
4. Lift valve spindle into actuator coupling 'E' or adaptor 'A', as applicable and screw on fully. Do not over-tighten. Lock using nut 'B' supplied. Use manual operator to position coupling 'E' to required extension, as necessary, particularly when assembling to small size valves, but avoid over-extending or retracting actuator spindle to prevent malfunction or damage.
5. If subsequently removing the actuator to service valve gland, for example, it is IMPORTANT to isolate power supply to controller or actuator or otherwise select the 'Manual' position on the manual operator push button. This will avoid malfunction or damage due to actuator spindle being accidentally driven beyond its normal stroke limits.
6. Instructions for fitting spring kit, used to increase maximum operating differential pressure, are supplied with accessory kit, where applicable.

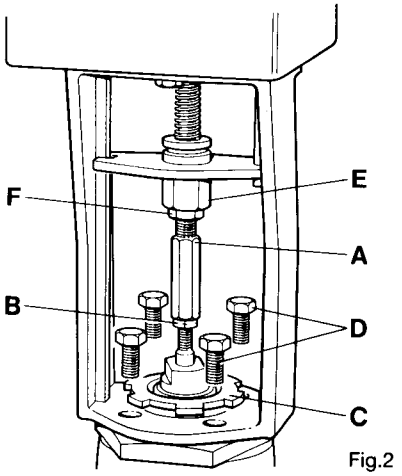


Fig.2

WIRING

1. Remove cover 'A' and conduit plate 'B'. Fit flexible conduit to plate, allowing sufficient length to permit removal of the actuator.
2. Connect cables in accordance with system wiring diagram or refer to diagram inside cover in conjunction with controller diagram. Earth actuator, where applicable, using the top (ALM, ALX) or bottom (ALE) terminal screw. Observe 'Wiring Precautions' (page 5). Keep wiring clear of internal moving parts.
3. Replace conduit plate and cover. DO NOT switch on power supply until Commissioning checks 1 to 6 have been completed.

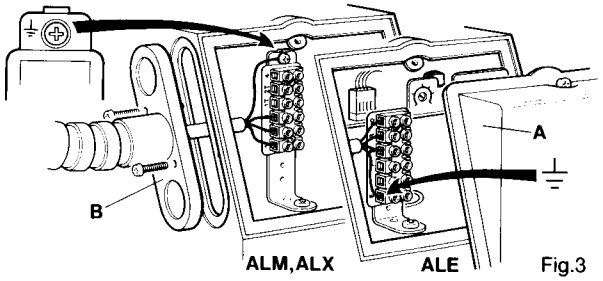


Fig.3

FITTING AUXILIARY SWITCHES – Kit 831-1-211

Note: When used with the ALE actuator, fit auxiliary switch kit AFTER carrying out stroke setting procedure. See 'Commissioning'.

1. Remove cover.
2. Undo fixing screw of main terminal block bracket 'A' and reposition adjacent to conduit entry (fig.4). Use the locating hole to position bracket and tighten fixing screw. (Not applicable to ALE).
3. Fit auxiliary switch kit bracket 'B' in original position of main terminals, adjacent to vertical switch operating rod 'C' (fig.5). Use the locating holes provided and tighten fixing screw.
4. Note that micro-switches are adjustable, one (S1, S2 & S3) between actuator positions 0 and 5, the other (S4, S5 & S6) between positions 5 and 10.
5. To adjust the switches, energise actuator (if commissioning in progress) at correct voltage and run to position at which one switch is required to operate. Alternatively, use manual operator facility.
6. Loosen micro-switch fixing screws 'D' and slide assembly with terminal block to point at which vertical operating rod 'C' just operates switch (fig.6). Hold assembly in this position and re-tighten fixing screws.
7. Now energise actuator, or use manual operator, to run actuator in opposite direction to position at which second switch is required to operate, then repeat the setting procedure, as items 5 & 6.
8. Connect cables in accordance with system wiring diagram. Ensure that all wiring is kept clear of internal moving parts. Replace cover.

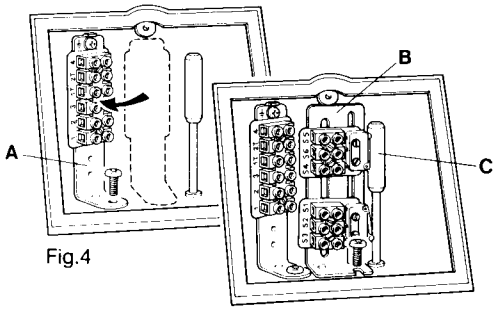


Fig.4

Fig.5

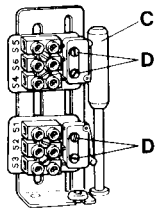


Fig.6

FITTING AUXILIARY POTENTIOMETER

(ALM and ALX only, see 'Specifications')

1. Select accessory kit to match stroke of valve, as follows:
   9.5mm (3/8") stroke – 831-1-212
   15.9mm (5/8") stroke – 831-1-213
   25.4mm (1") stroke – 831-1-214
   38mm (1 1/2") stroke – 831-1-215
2. Remove cover.
3. Fit auxiliary potentiometer kit bracket 'A' adjacent to drive gear 'B', on opposite side to conduit entry (fig.7). Use the locating hole to position bracket and appropriate fixing hole to suit potentiometer (fig.9). Do not mesh gear or fully tighten fixing screw at this stage.
4. Energise actuator (if commissioning in progress) at correct voltage between terminals 2 and 3 to move actuator spindle to fully retracted position. Alternatively, use manual operator facility.
5. Manually rotate potentiometer gear to extreme anti-clockwise position, then back-turn by 2-3 gear teeth.
6. Taking care not to move potentiometer gear, rotate bracket 'A' anti-clockwise in towards drive gear 'B' until potentiometer gear is in good close mesh (fig.8). Hold assembly firmly in position and tighten bracket fixing screw.
7. Connect cables in accordance with system wiring diagram. Ensure that all wiring is kept clear of internal moving parts. Replace cover.

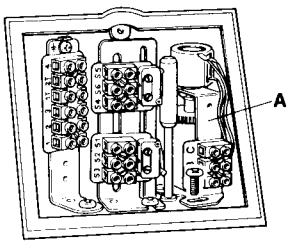


Fig.7

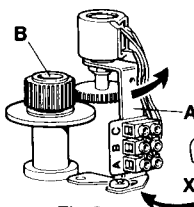


Fig.8

Kit No.	Fixing Hole
831-1-212 831-1-214	X
831-1-213 831-1-215	Y

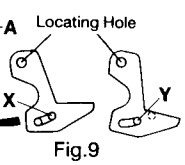


Fig.9

COMMISSIONING

BEFORE SWITCHING ON POWER SUPPLY:

ALM and ALX Actuators

1. Check that all control equipment is correctly located and fitted.
2. Check ambient temperature conditions.
3. Check that actuator has been correctly assembled to valve, up to the stage when electrical power is called for.
4. Remove terminal cover and check that all control circuit wiring is correct and in accordance with the overall control system wiring diagram. Check that the electrical supply voltage is correct.

   Note: Wiring errors not only cause malfunctions; they may also damage controllers and/or actuators.
5. Replace terminal cover. Set manual override push button to 'Auto' position.
6. Now switch on power supply.
7. Check that the actuator functions correctly by operating the controlling switch or adjusting the controller set value above and below the temperature (or humidity) currently existing at the sensor (or simulated). This must be within the scale limits.

   If the actuator forms part of a multi-stage system in which several actuators operate in sequence, wait until the appropriate stage is reached.
8. Whilst checking actuator travel over full stroke of valve, run actuator to fully retracted position. Select self-adhesive indication scale to match valve stroke, from set of four scales provided. Fix scale along outside edge of actuator mounting bracket, in position where it will be most clearly visible, lining up top edge of anti-rotation plate on actuator spindle with position '0' on scale (fig.10).
9. If auxiliary switches are fitted, remove terminal cover to check for correct operation and switching functions. Replace terminal cover.
10. If auxiliary potentiometer is fitted, remove cover to check for correct 135 ohm resistance change over full valve stroke. Replace cover.

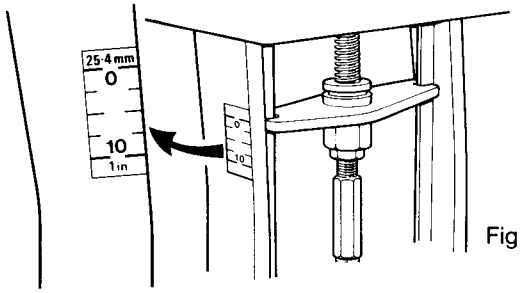


Fig.10

ALE Actuators

Follow steps 1 to 4, as for ALM & ALX.

Setting the Actuator

Note: The following instructions MUST be followed to initially set the actuator stroke to match the valve stroke or if the actuator is subsequently transferred to another valve having a different stroke.

1. Set all adjustments as follows:

Adjustment	Setting
START 'C'	10
SPAN 'D'	10
STROKE 'A'	Max.
DA/RA SWITCH 'B'	+ (DA)

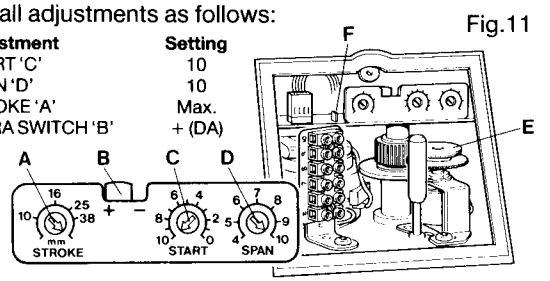


Fig.11

2. Set manual override push button to 'Auto' position. Remove wire from terminal 9. Switch on power supply and adjust controller set value to give 10V dc output signal to ALE. The actuator will run to position '0' (spindle fully retracted) and operate its limit switch.
3. Using thumbwheel 'E', zero the feedback potentiometer by turning fully anti-clockwise.
   Check that the voltage between terminal 7 and test blade 11 ('F' on diagram) is 0V dc ± 50mV. Reconnect wire to terminal 9.
   Check that the voltage between terminals 7 and 9 is approximately 10V dc.
4. Change the 'START' setting from '10' to '0'. The actuator will now run to position '10' (spindle fully extended).
5. Adjust 'STROKE' setting in anti-clockwise direction until voltage measured between terminal 7 and test blade 11 is 10V ±50 mV.
6. Note indicated stroke length from potentiometer scale. Select and fix appropriate self-adhesive stroke indication label to actuator bracket as described for ALM and ALX (section 8), except lining up anti-rotation plate with position '10'.
7. Re-set 'START', 'SPAN' and 'DA/RA' adjustments as required, to suit control system. DO NOT alter 'STROKE' setting.
   Re-check operation by adjusting controller set value so that actuator runs to position '0'. If limit switch does not operate, adjust 'START' setting very slightly anti-clockwise for 'DA' switch mode (clockwise for 'RA' switch mode) until limit switch does operate.
   Now adjust controller set value so that actuator runs to position '10'. If limit switch does not operate, adjust 'STROKE' setting very slightly clockwise (applicable to both 'DA' and 'RA' switch modes) until limit switch does operate.
   Re-adjust controller set value as required, to suit control system.
8. Fit, set and check auxiliary switches, if used, as described for ALM and ALX (section 9).
9. Replace terminal cover.

ALM, ALX WIRING PRECAUTIONS

Wiring from actuator to controller*:	Max. length of 1.5mm² cable unscreened	Max. resistance per conductor
24V/240V ~ supply	100m	5 Ω
Feedback wiring from controller to auxiliary potentiometer, where fitted	100m	15 Ω

For longer lengths, increase cable size and observe max. resistance. Screen feedback wiring, or use MICC or run in a separate conduit, when applicable.

Note: DO NOT CONNECT ALM OR ALX ACTUATORS IN PARALLEL

ALM actuators and auxiliary switches, where fitted, are at mains potential. Observe local wiring regulations, earthing requirements and all usual safety precautions.

*When wiring to BAS 2000 outstations refer to the appropriate outstation data sheet for the wiring precautions.

ALE WIRING PRECAUTIONS

Wiring from actuator to controller*:	Max. length of 1.5mm² cable unscreened	Max. resistance per conductor
24V ~ supply	100m	3 Ω
0 – 10V dc signal	100m	50 Ω

For longer lengths of 24 volt supply wiring, increase cable size and observe maximum resistance, also run separate return from terminal 7, as fig.15.

Terminals 7 and 10 are both at ground potential, provided for convenience of wiring.

Where screening is required, use either screened cable, MICC or cables run in a separate conduit.

If auxiliary switches are fitted and used at mains potential, observe local wiring regulations, earthing requirements and all usual safety precautions.

*When wiring to BAS 2000 outstations refer to the appropriate outstation data

CONNECTION DIAGRAMS

BASIC DIAGRAM FOR ALM MAINS ACTUATORS

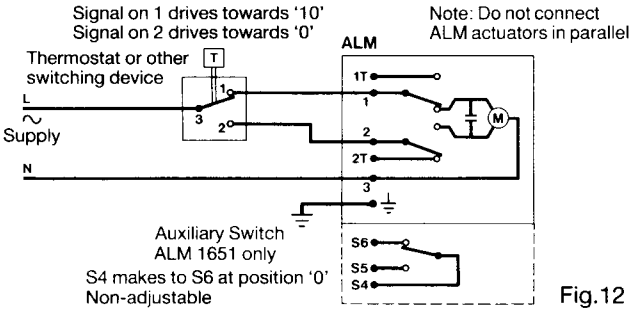


Fig.12

BASIC DIAGRAM FOR ALX 24 VOLT ACTUATORS

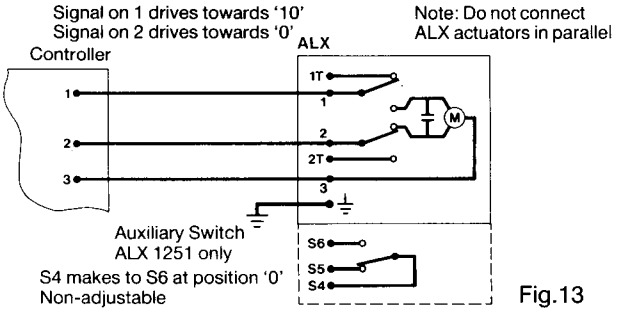


Fig.13

BASIC DIAGRAM FOR ALE ACTUATORS

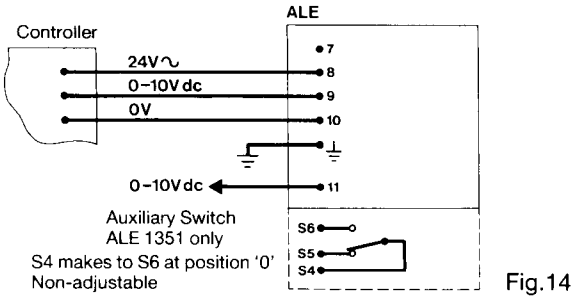


Fig.14

SEPARATE 24 VOLT POWER SUPPLY TO ALE

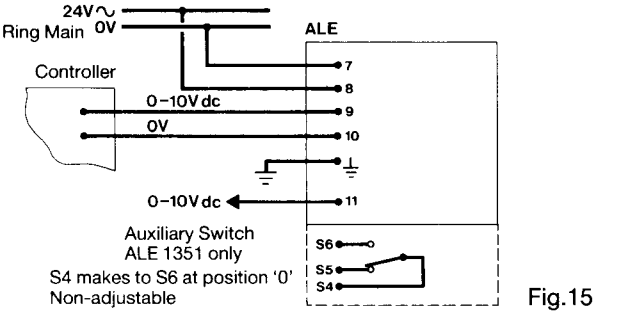
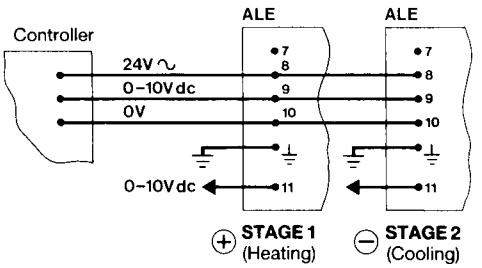


Fig.15

TWO-STAGE SEQUENTIAL OPERATION
from one 0–10 volt command signal, incorporating dead zone



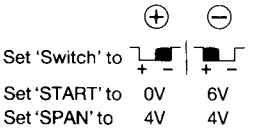
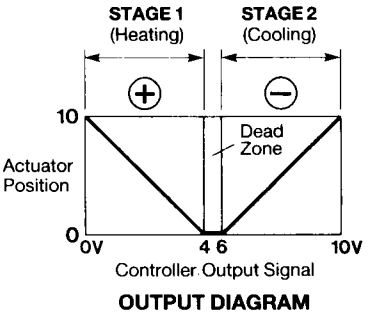
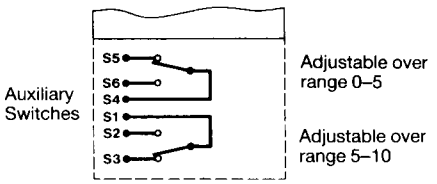


Fig.16



OUTPUT DIAGRAM

AUXILIARY SWITCH KIT 831-1-211



S4 makes to S6 at '0', or set position
S1 makes to S2 at '10', or set position

Fig.17

AUXILIARY POTENTIOMETER KITS
831-1-212 TO 215 INCLUSIVE (ALM & ALX ONLY)

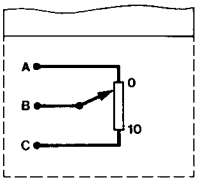


Fig.18

CAUTION

- **Certain models (and auxiliary switches where fitted) are at mains potential. Local wiring regulations and usual safety precautions must be observed. Note earthing requirements.**
- **Observe installation instructions on page 4.**
- **Observe wiring precautions on page 5.**
- **Do not switch on power supply until commissioning checks have been completed – see page 5.**
- **Ensure wires are not inadvertently crossed over. Wiring errors not only cause malfunctions; they may also damage controllers and/or actuators.**
- **Steam Applications: Following a shutdown of the steam system it is important that the control valve is fully open before introducing steam into the pipeline (purging) or damage may occur to the actuator spindle or valve plug.**
- Observe maximum and minimum ambient temperatures.
- Check thrust requirements and maximum differential of pressure of valve to be driven. Do not exceed rated output thrust.
- Interference with those parts under sealed covers renders the guarantee void.
- Design and performance of Satchwell equipment are subject to continual improvement and therefore liable to alteration without notice.
- Information is given for guidance only and Satchwell do not accept responsibility for the selection and installation of its products unless information has been given by the Company in writing relating to a specific application.
- A periodic system and tuning check of the control system is recommended. Please contact your local Satchwell service office for details