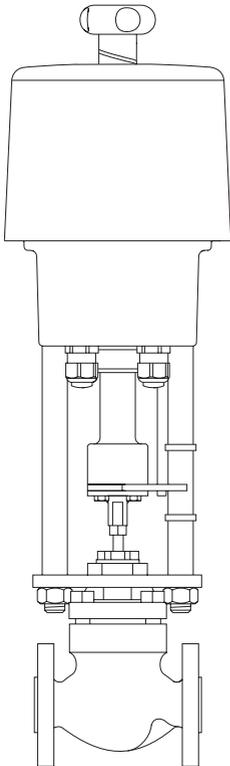

AEL5 Series
Electric Linear Actuators
Installation and Maintenance Instructions



- 1. Safety information
- 2. General product information
- 3. Installation
- 4. Commissioning
- 5. Maintenance

1. Safety information

Safe operation of this product can only be guaranteed if it is properly installed, commissioned, used and maintained by qualified personnel (see Section 1.13) in compliance with the operating instructions. General installation and safety instructions for pipeline and plant construction, as well as the proper use of tools and safety equipment must also be complied with.

See separate Installation and Maintenance Instructions for the control valve.

If the actuator is handled improperly or not used as specified, the resultant may:



- cause danger of the life and limb of the third party,
- damage the actuator and other assets belonging to the owner,
- hinder the performance of the actuator.

1.1 Wiring notes

Every effort has been made during the design of the actuator to ensure the safety of the user, but the following precautions must be followed:

- Maintenance personnel must be suitably qualified in working with equipment containing hazardous live voltages.**
- Ensure correct installation. Safety may be compromised if the installation of the product is not carried out as specified in this manual.**
- Isolate the actuator from the mains supply before opening the unit.**
- The actuator is designed as an installation category II product, and is reliant on the building installation for overcurrent protection and primary isolation.**
- Wiring should be carried out in accordance with IEC 60364 or equivalent.**
- Fuses should not be fitted in the protective earth conductor. The integrity of the installation protective earth system must not be compromised by the disconnection or removal of other equipment.**
- A disconnecting device (switch or circuit breaker) must be included in the building installation. This must be in close proximity to the equipment and within easy reach of the operator.**
 - There must be a 3 mm contact separation in all poles.
 - It must be marked as the disconnecting device for the actuator.
 - It must not interrupt the protective earth conductor.
 - It must not be incorporated into a mains supply cord.
 - The requirements for the disconnecting device are specified in IEC 60947-1 and IEC 60947-3 or equivalent.
- The actuator must not be located in such a way that the disconnecting device is made difficult to operate.**

1.2 Safety requirements and electromagnetic compatibility

This product is CE marked. It complies with the requirements of 73/23/EEC as amended by 93/68/EEC on the harmonisation of the law of Member States relating to electrical equipment designed for use within certain voltage limits (LVD), by meeting the standard for safety of electrical equipment for measurement control and laboratory use.

This product complies with the requirement of 89/336/EEC as amended by 92/31/EEC and 93/68/EEC on the approximation of laws of the Member States relating to Electromagnetic Compatibility, by meeting the generic standard of emissions for an industrial environment and the generic standard of immunity for an industrial environment.

The product may be exposed to interference above the limits of industrial immunity if:

- The product or its wiring is located near to a radio transmitter.
- Excessive electrical noise occurs on the mains supply.
- Cellular telephones and mobile radios may cause interference if used within approximately one metre of the product or its wiring. The actual separation necessary will vary according to the power of the transmitter.
- Power line protectors (ac) should be installed if mains supply noise is likely.
- Protectors can combine filtering, suppression, surge and spike arrestors.

For a copy of the declaration of conformity contact Spirax Sarco.

1.3 Intended use

Referring to the Installation and Maintenance Instructions, name-plate and Technical Information Sheet, check that the product is suitable for the intended use/application.

- i) Check material suitability, pressure and temperature and their maximum and minimum values. If the maximum operating limits of the product are lower than those of the system in which it is being fitted, or if malfunction of the product could result in a dangerous overpressure or overtemperature occurrence, ensure a safety device is included in the system to prevent such over-limit situations.
- ii) Determine the correct installation situation.
- iii) Spirax Sarco products are not intended to withstand external stresses that may be induced by any system to which they are fitted. It is the responsibility of the installer to consider these stresses and take adequate precautions to minimise them.

1.4 Access

Ensure safe access and if necessary a safe working platform (suitably guarded) before attempting to work on the product. Arrange suitable lifting gear if required.

1.5 Lighting

Ensure adequate lighting, particularly where detailed or intricate work is required.

1.6 Hazardous liquids or gases in the pipeline

Consider what is in the pipeline or what may have been in the pipeline at some previous time. Consider: flammable materials, substances hazardous to health, extremes of temperature.

1.7 Hazardous environment around the product

Consider: explosion risk areas, lack of oxygen (e.g. tanks, pits), dangerous gases, extremes of temperature, hot surfaces, fire hazard (e.g. during welding), excessive noise, moving machinery.

1.8 The system

Consider the effect on the complete system of the work proposed. Will any proposed action (e.g. closing isolation valves, electrical isolation) put any other part of the system or any personnel at risk?

Dangers might include isolation of vents or protective devices or the rendering ineffective of controls or alarms. Ensure isolation valves are turned on and off in a gradual way to avoid system shocks.

1.9 Pressure systems

Ensure that any pressure is isolated and safely vented to atmospheric pressure. Consider double isolation (double block and bleed) and the locking or labelling of closed valves. Do not assume that the system has depressurised even when the pressure gauge indicates zero.

1.10 Temperature

Allow time for temperature to normalise after isolation to avoid danger of burns.

1.11 Tools and consumables

Before starting work ensure that you have suitable tools and/or consumables available. Use only genuine Spirax Sarco replacement parts.

1.12 Protective clothing

Consider whether you and/or others in the vicinity require any protective clothing to protect against the hazards of, for example, chemicals, high/low temperature, radiation, noise, falling objects, and dangers to eyes and face.

1.13 Permits to work

All work must be carried out or be supervised by a suitably competent person.

Installation and operating personnel should be trained in the correct use of the product according to the Installation and Maintenance Instructions.

Where a formal 'permit to work' system is in force it must be complied with. Where there is no such system, it is recommended that a responsible person should know what work is going on and, where necessary, arrange to have an assistant whose primary responsibility is safety.

Post 'warning notices' if necessary.

1.14 Handling

Manual handling of large and/or heavy products may present a risk of injury. Lifting, pushing, pulling, carrying or supporting a load by bodily force can cause injury particularly to the back. You are advised to assess the risks taking into account the task, the individual, the load and the working environment and use the appropriate handling method depending on the circumstances of the work being done.

1.15 Residual hazards

In normal use the external surface of the product may be very hot. If used at the maximum permitted operating conditions the surface temperature of some products may reach temperatures of 90 °C (194 °F).

Many products are not self-draining. Take due care when dismantling or removing the product from an installation (refer to 'Maintenance instructions').

1.16 Freezing

Provision must be made to protect products which are not self-draining against frost damage in environments where they may be exposed to temperatures below freezing point.

1.17 Disposal

Unless otherwise stated in the Installation and Maintenance Instructions, this product is recyclable and no ecological hazard is anticipated with its disposal providing due care is taken.

1.18 Returning products

Customers and stockists are reminded that under EC Health, Safety and Environment Law, when returning products to Spirax Sarco they must provide information on any hazards and the precautions to be taken due to contamination residues or mechanical damage which may present a health, safety or environmental risk. This information must be provided in writing including Health and Safety data sheets relating to any substances identified as hazardous or potentially hazardous.

2. General product information

2.1 Use

AEL5 series electric linear actuators are for use with LE, KE and JE two-port control valves, QL three-port valves and all bellows sealed options. Actuators will normally be supplied fitted to the control valve. When supplied separately, ensure the actuator selected is capable of giving the force necessary to close the two-port or three-port control valve against the expected differential pressure. See the appropriate product specific Technical Information Sheet for full details of the control valve.

AEL5 actuators are available with 4 supply variants, **230 Vac**, **115 Vac**, **24 Vac** and **24 Vdc** all being suitable for a VMD (Valve Motor Drive) input power signal. At extra cost, the actuator may have been supplied with a positioner input card fitted that can accept a 4 - 20 mA or 2 - 10 Vdc control signal - Please note that this option is not available for the 24 Vdc supply variant.

Full details of the actuator types, and reference numbers, are given in Table 1:

Table 1 Series in the range AEL5

Feature	Nomenclature	Feature	Nomenclature
Product	A = Actuator		2 = 50 mm (AEL51_, AEL52_, AEL53_ and AEL54_ series only)
Type	E = Electric	Stroke (mm)	3 = 65 mm (AEL55_ series only)
Movement	L = Linear		4 = 100 mm (AEL56_ series only)
Series	5	Maximum speed	1 = 0 - 1.0 mm/s
	1 = 1 kN		1 = 230 Vac
	2 = 2 kN		2 = 115 Vac
	3 = 4.5 kN	Supply voltage	3 = 24 Vac
Thrust (kN)	4 = 8 kN		4 = 24 Vdc (not available for the AEL56_)
	5 = 14 kN		F = Integral 24 V VMD (only for actuators with 24 V supply voltage)
	6 = 25 kN	Control signal *	G = Integral 115 V VMD (only for actuators with 115 V supply voltage)
			J = Integral 230 V VMD (only for actuators with 230 V supply voltage)
		Failure mode	X = No mechanical/electrical fail safe device
		Potentiometer	A = With 1 k Ω potentiometer
			S = Without

* For 0/2-10 Vdc and 0/4-20 mA modulating control signal the appropriate positioner card must be ordered at time of order.

2.2 Operation

The motor rotation is transmitted through low wear and low backlash spur gears to provide linear movement of the actuator spindle. An anti-rotation plate is fitted to prevent rotation of the spindle during operation. Top and bottom travel switches are provided, which are activated by a switching rod that runs in parallel with the actuator spindle.

The actuator is fitted to the valve with two mounting pillars. The disc springs transmits the thrust movement to the valve stem. In relation to the limit switch setting the disc springs are compressed at the valve closing position to give a defined closing force and valve shut-off.

2.3 Manual operation

The handwheel is used to operate the actuator if the power supply has failed or during installation work such as mounting onto a valve or setting the limit positions.

- The handwheel is permanently engaged and turns during motor operation for all the models, with the exception of the AEL56_.
- The AEL56_ actuator has a handwheel which must be engaged for manual operation. The ball-headed button on the cover has to be depressed to engage the handwheel.



Do not exceed the set stroke limits when operating manually.

Do not operate the handwheel using excessive force.

Failure to observe this warning may result in damage to the actuator.

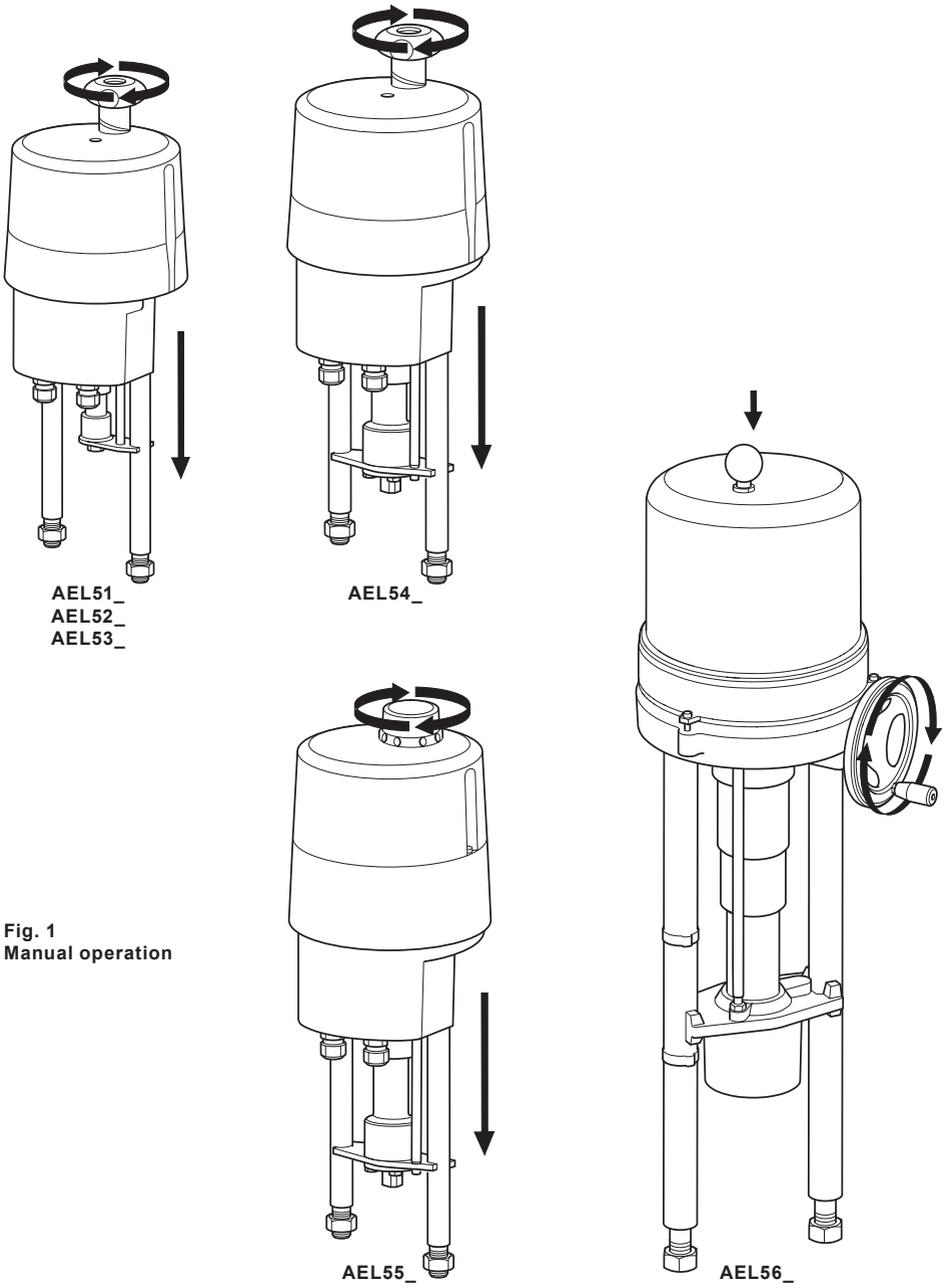


Fig. 1
Manual operation

AEL5 Series Electric Linear Actuators



3. Installation

Note: Please read Section 1, 'Safety information' before proceeding with installation.

3.1 Location

The actuator should be mounted above the valve with sufficient space to remove the cover and general ease of access. When selecting the location, make sure that the actuator is not exposed to an ambient temperature exceeding the range -20 °C to + 60 °C (-20 °C to +50 °C for actuators fitted with positioners). If necessary, provide insulation to prevent overheating. The actuator is rated at IP65, but only when the lid is correctly fitted (see Section 3.3). It is recommended that adequate shelter is provided for outdoor installations. If condensation is present a heating resistor should be installed. Refer to Technical Information Sheets for details.

The operating modes for these electric actuators are for S2 - short time service and S4 - intermittent service as stated in IEC 6034 - 1, 8.

3.2 Connecting the actuator to the valve

Normally the AEL5 actuator will be supplied already fitted to the valve. However, should it be necessary to fit an actuator, the following procedure should be adopted:-



When mounting an actuator on a valve, never drive the actuator electrically, instead use the handwheel.

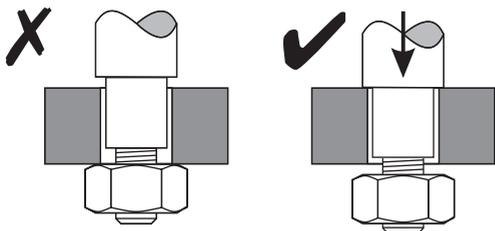
Note: When mounting the actuator to the valve it is advised that the polystyrene packaging remains on the head of the actuator. The actuator can become damaged if it dropped or if it topples down onto a hard surface without the packaging.

3.2.1 AEL51_, AEL52_, AEL53_, AEL54_ and AEL55_ actuators

1. If the diameter of the valve is smaller than DN65 the AEL6911 adaptor must be used for the Spira-trol™ K valve or the AEL6911 J adaptor for the Spira-trol™ J valve.
The mounting flange is:
EL5970 for the DN15 - DN50 Spira-trol™ K valve or
EL5971 for the DN65 - DN100 Spira-trol™ K valve or
AEL5971J for the DN15 - DN100 Spira-trol™ J valve.
2. Remove the actuator retaining nut (8) from the valve and place the mounting flange over the valve bonnet thread.
3. Refit the actuator retaining nut (8) and tighten (50 Nm for M34 or 100 Nm for M50).
4. Remove the actuator pillar nuts (3). Using the handwheel retracts the actuator spindle.
5. Untighten the four screws (2) until the nut comes free (about 2 turns)
6. Screw the valve stem lock-nut (5) 2 x valve stem diameters onto the valve stem.
7. Put the actuator onto the mounting flange.
8. Refit and tighten the pillar nuts (3) to a torque of 100 Nm.



Before the pillar nuts are tightened, make sure that the pillar ends are completely inserted into the bores of the valve mounting flange. If necessary, correct the position of the actuator using the handwheel.



9. Using the handwheel lower the actuator stem until it touches the valve stem connecting.
10. Lift the valve stem up into the actuator stem until it comes to a stop. Screw actuator stem onto the valve stem 12 mm, then lock the lock-nut. It is important that this operation is not carried out with the valve plug on its seat.
11. Screw the 4 items (2) 8 Nm, the lock-nut (5) 15 Nm.

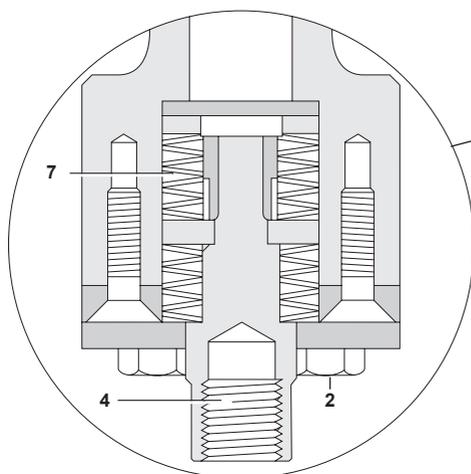
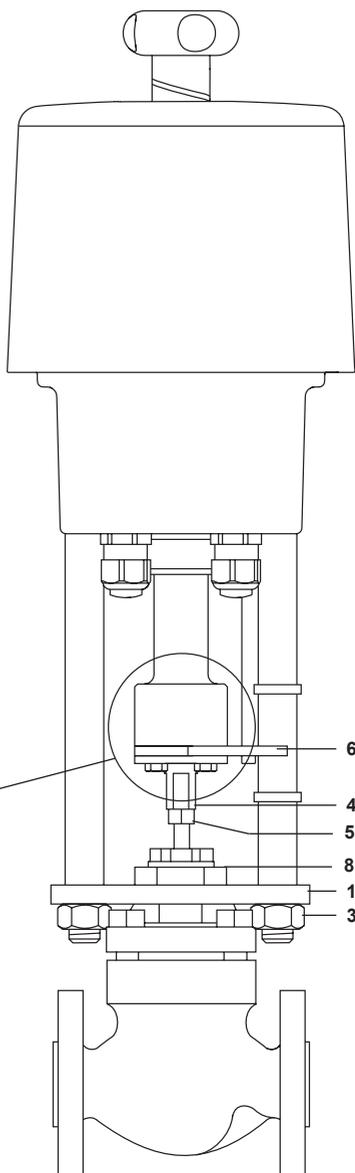


Fig. 2



3.2.2 AEL56_ actuator connection to valve



Important: Disc springs must be assembled correctly.

There are 2 sets of 3 disc springs, which must be assembled in the correct order. The convex side of a spring must be assembled to the convex side of the next spring. Conversely, the concave side of the spring must be assembled to the concave side of the next spring.

Insert the first set of springs (9, see Figure 5) inside the actuator adaptor mounting. Next push the valve adaptor (10) inside the actuator mounting so that the springs are pushed up to the top. Push the second set of disc springs (9) over the adaptor nut (11) into the actuator by hand. The nut should be screwed in until the adaptor is held firmly inside the actuator, but not too tight such that the adaptor cannot be rotated.



When mounting an actuator on a valve, never drive the actuator electrically, instead use the handwheel.

1. When coupling the actuator to the valve a mounting flange (12) type EL5972 or type EL5973 is required.
2. Remove the actuator retaining nut (15) from the valve and place the mounting flange over the valve bonnet thread.
3. Refit the actuator retaining nut (15) and tighten.
4. Remove the actuator pillar nuts (13). Using the handwheel retract the actuator spindle.
5. Screw the valve stem lock-nut (14) 2 x valve stem diameters onto the valve stem.
6. Lower the actuator onto the valve so that the pillar shoulders sit squarely against the mounting flange.
7. Refit and tighten the pillar nuts (13).
8. Lift the valve stem up into the actuator connecting piece (10), until it stops.
9. Screw the valve adaptor (10) onto the valve stem until it meets the lock-nut or comes to a stop (whichever is first).
10. Screw the retaining nut (11) into the actuator spindle until the returning unit is level with the housing.

Use the peg spanner (found tied to the pillar) to tighten the retaining nut (11).

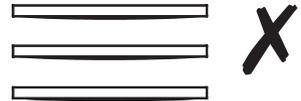


Fig. 3
Assembling the disc springs

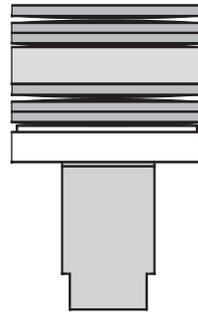


Fig. 4
Correct assembly of the valve adaptor for the AEL56_ actuator



It is important that when the retaining nut is screwed hand tight, the valve plug must not be on its seat. Ensure that one marking ring is exposed 1 mm below the bottom of the retaining nut.

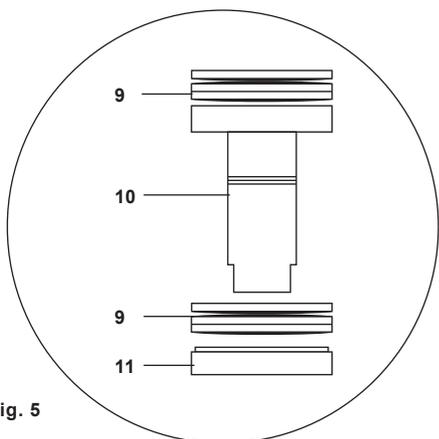
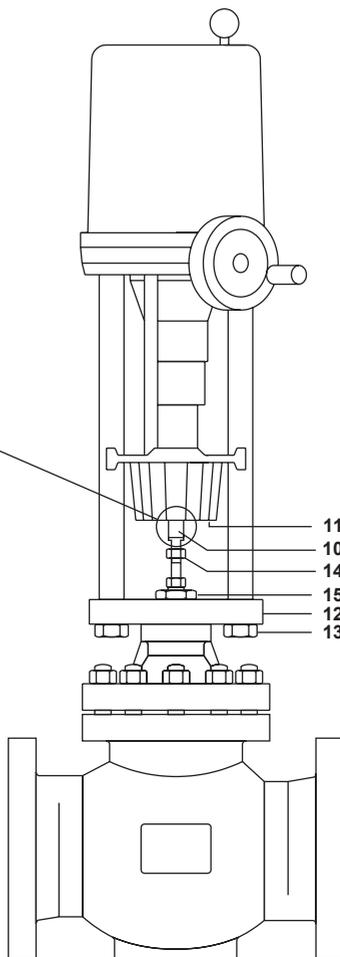
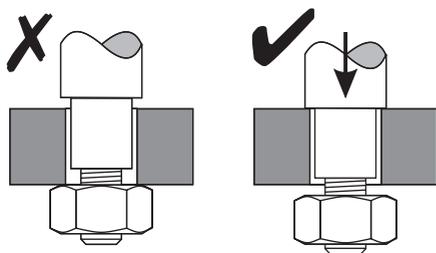


Fig. 5



Before the pillar nuts are tightened, make sure that the pillar ends are completely inserted into the bores of the mounting flange. If necessary, correct the position of the actuator using the handwheel.

3.3 Removing and fitting the actuator cover

3.3.1 AEL51_, AEL52_, AEL53_ and AEL54_ actuators

Remove the handwheel by loosening the socket headed grub screw (4 mm A/F allen key). Hold both of the actuator pillars at the top. Using your thumbs gently ease the lid off.

Note: When replacing the cover ensure that the two longest locating guides on the interior of the cover are aligned with the two recesses on the actuator housing. Firmly press down the actuator housing ensuring the 'O' ring on the actuator is completely concealed.

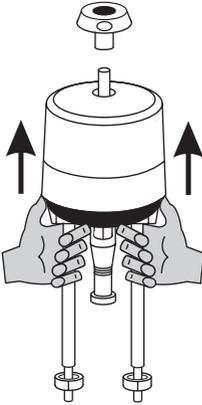


Fig. 6 Removing cover

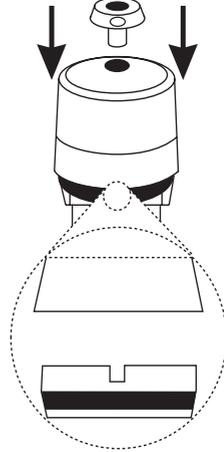


Fig. 7 Fitting cover

3.3.2 AEL55_ and AEL56_ actuators

For the AEL55_ actuator remove the handwheel first by loosening the grub screw.

For the AEL56_ actuator unscrew the 3 fixing screws around the bottom edge of the lid, then gently lift the lid off.

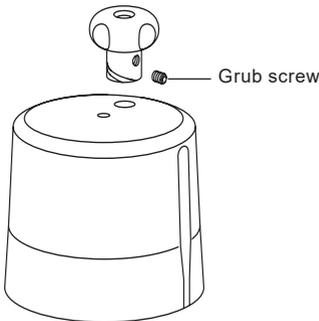


Fig. 8 AEL55_ actuator

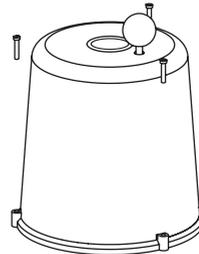


Fig. 9 AEL56_ actuator

To fit the lid ensure that it is orientated correctly. Push the cover over the handwheel shaft on the AEL55_. For the AEL56_, the operating rod for the handwheel must align with the button inside the actuator. Align the 3 fixing screws over the tapped holes in the gearbox housing. Tighten the fixing screws with a suitable screwdriver.



AEL56_ actuator.
 After the lid is fitted ensure the handwheel button can be pushed down to engage the handwheel.

3.4 Fitting the positioner card (Figure 10)

To fit the positioner card insert the contact pins (16) into the terminal strip, on the actuator PCB (17) by engaging the board into the retaining pegs on the metal main frame and tighten the terminal screws.

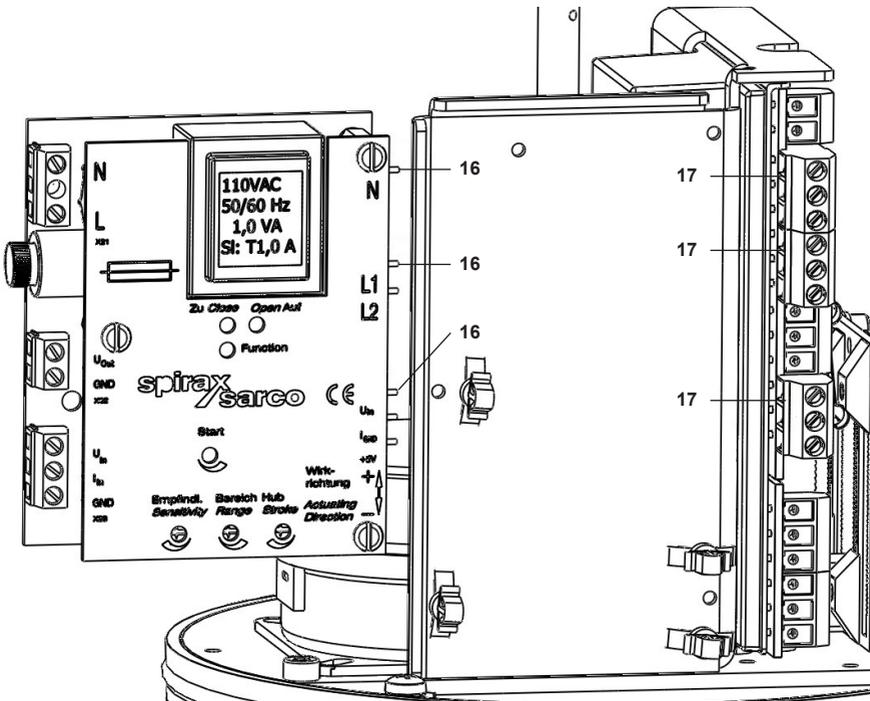


Fig. 10

3.5 Fitting accessories

Should it be necessary to fit any accessories, the following procedure should be adopted.

AEL5951	Auxiliary switches
AEL5952	Feedback potentiometer 1 k Ω . Note: Fitted as standard.
AEL5953	Tandem feedback potentiometer 2 x 1 k Ω
AEL5954	Anti-condense heater (110 - 250 Vac)
AEL5956	Anti-condense heater (12 - 36 Vac/Vdc)

Options

3.5.1 Fitting the additional limit switches

All actuators can be provided with additional limit switches (Figure 11). Mounting locations are on the limit switch, angle bracket to the right of the standard limit switches.

To fit limit switches remove the screws holding the switching plate and carefully remove.

The cams are fitted to the switching plate (10), with infinitely variable adjustment. The direction of travel of the cam is from the lever pivot point towards the roller.

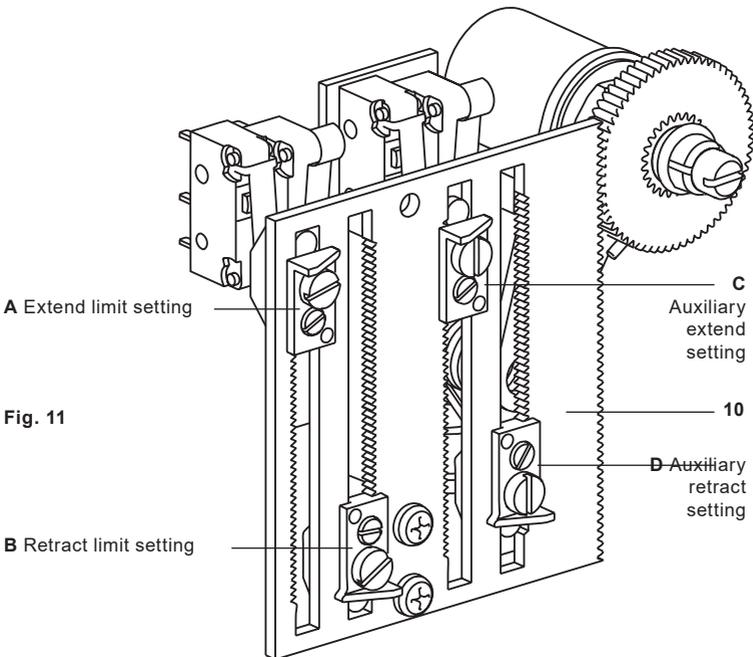


Fig. 11

Section 3.6.6 shows how the switches are wired to the terminals. Fit the extend cam and the retract cam to position **C** and **D** respectively in Figure 11.

Insert auxiliary limit switches adjacent to the existing switch by a simple snap-in connection. Refit the switching plate and tighten the screws.

Note: When removing the auxiliary limit switches carefully lever the limit switch housing using a screwdriver and remove the switch.

Refer to Section 3.6.4 in order to fit the additional terminal blocks for the auxiliary limit switches.

3.5.2 Fitting the feedback potentiometer

If a potentiometer was requested at the point of order placement the AEL5952 it will be supplied fitted as standard to the actuator. The potentiometer is located on a metal bracket.

If an AEL5953 or AEL5952 needs fitting, proceed as follows:

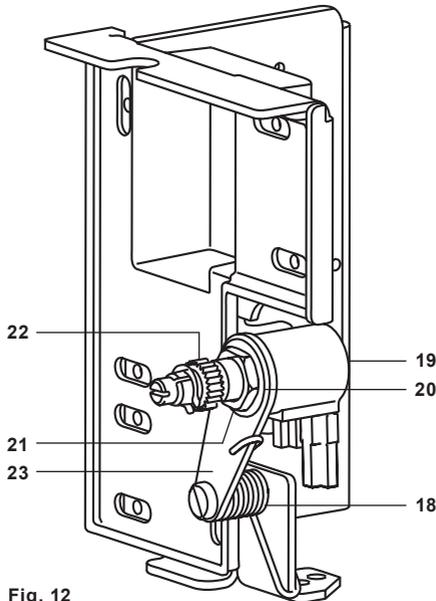
- Insert the potentiometer (19) in to the actuator metal bracket (23).
- Replace the locating washer (20) and firmly secure the nut (21).
- Slide the pinion kit (22 and check the securing circlip ring) onto the potentiometer ensuring the pinion is engaged into the teeth of the switching plate.
- Then insert the spring (18) to the housing bracket as shown in Figure 12.

Refer to Section 3.6.5 in order to connect the wires for the potentiometer.

The **AEL56_ actuator** can be fitted to either a Spira-trol™ or QL control valve with 30 mm travel, or a KE/QL control valve with 50 mm travel. The difference between the two travels will affect the way the feedback potentiometer works. The standard pinion (22) fitted to the AEL56_ actuator is for 30 mm travel. For 50 mm travel the standard pinion must be replaced with a bigger pinion (with 50 teeth instead of 30 teeth). If the actuator is supplied fitted to a valve, the correct pinion will already be fitted. If this is not the case, the replacement pinion (for 30 mm travel) can be found under the actuator lid.

Pinion for 30 mm travel:	30 teeth, dia 12.70 mm.
Pinion for 50 mm travel:	50 teeth, dia 20.75 mm.

For setting the drive, run the actuator to its extended position and adjust the feedback potentiometer shaft to its anti-clockwise stop by turning the shaft.



3.5.3 Fitting the anti-condense heater

Fitted in accordance with wiring diagram in Section 3.6.7, Figure 26.

Location of the fixing holes as shown in Figure 13.

Refer to Section 3.6.7 in order to fit the additional terminal blocks for the anti-condense heater.

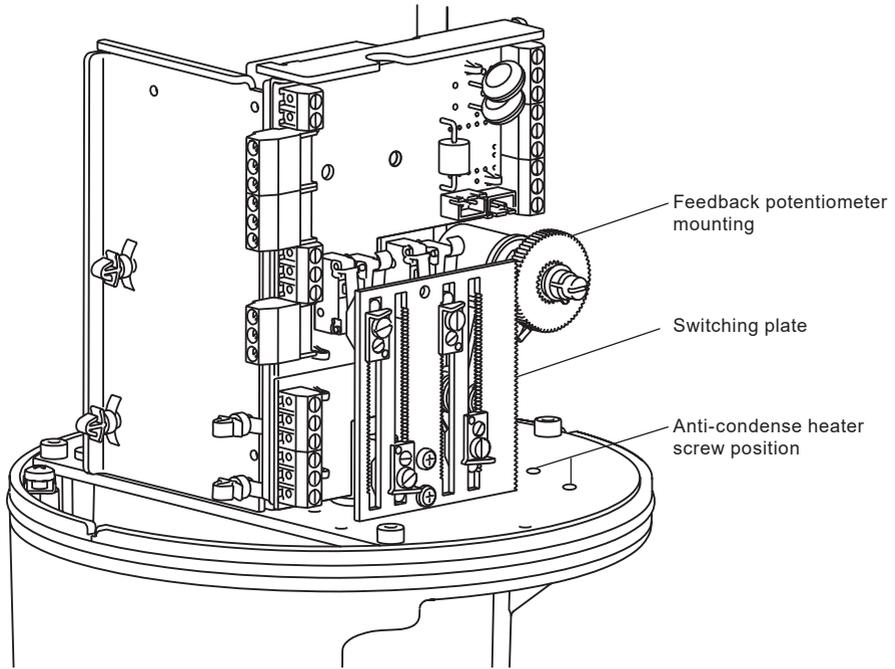


Fig. 13

3.6 Wiring details



Connection to the mains supply

Important

1. Read Section 1 'Safety information', before attempting to wire the supply to the actuator.
2. Slow blow fuses (rated as shown in Table 2) should be fitted in all phases, but not in the protective earth conductor.
3. The protective earth internal must be connected to the installation protective earth system. The integrity of the installation protective earth system must not be compromised by the disconnection or removal of other equipment.
4. For supply connections, use 1.5 mm² wire, double insulated as stated in IEC 60364 (or equivalent), if wires are exposed to touch.

Table 2
Fuse ratings for all variants of the
AEL5 _ _ _ _ actuators

Actuator	Power supply/ frequency		Fuse (A)
AEL51211	230 V	50/60 Hz	0.125
AEL51212	115 V	50/60 Hz	0.25
AEL51213	24 V	50/60 Hz	1
AEL51214	24 V	Continuous	1.6
AEL52211	230 V	50/60 Hz	0.16
AEL52212	115 V	50/60 Hz	0.315
AEL52213	24 V	50/60 Hz	1.6
AEL52214	24 V	Continuous	1
AEL53211	230 V	50/60 Hz	0.25
AEL53212	115 V	50/60 Hz	0.5
AEL53213	24 V	50/60 Hz	1.6
AEL53214	24 V	Continuous	1.6
AEL54211	230 V	50/60 Hz	0.63
AEL54212	115 V	50/60 Hz	1.25
AEL54213	24 V	50/60 Hz	3.15
AEL54214	24 V	Continuous	1.6
AEL55311	230 V	50/60 Hz	0.63
AEL55312	115 V	50/60 Hz	1.25
AEL55313	24 V	50/60 Hz	3.15
AEL55314	24 V	Continuous	4
AEL53211	230 V	50/60 Hz	0.8
AEL53212	115 V	50/60 Hz	1.6
AEL53213	24 V	50/60 Hz	6.3

3.6.1 Valve motor drive models

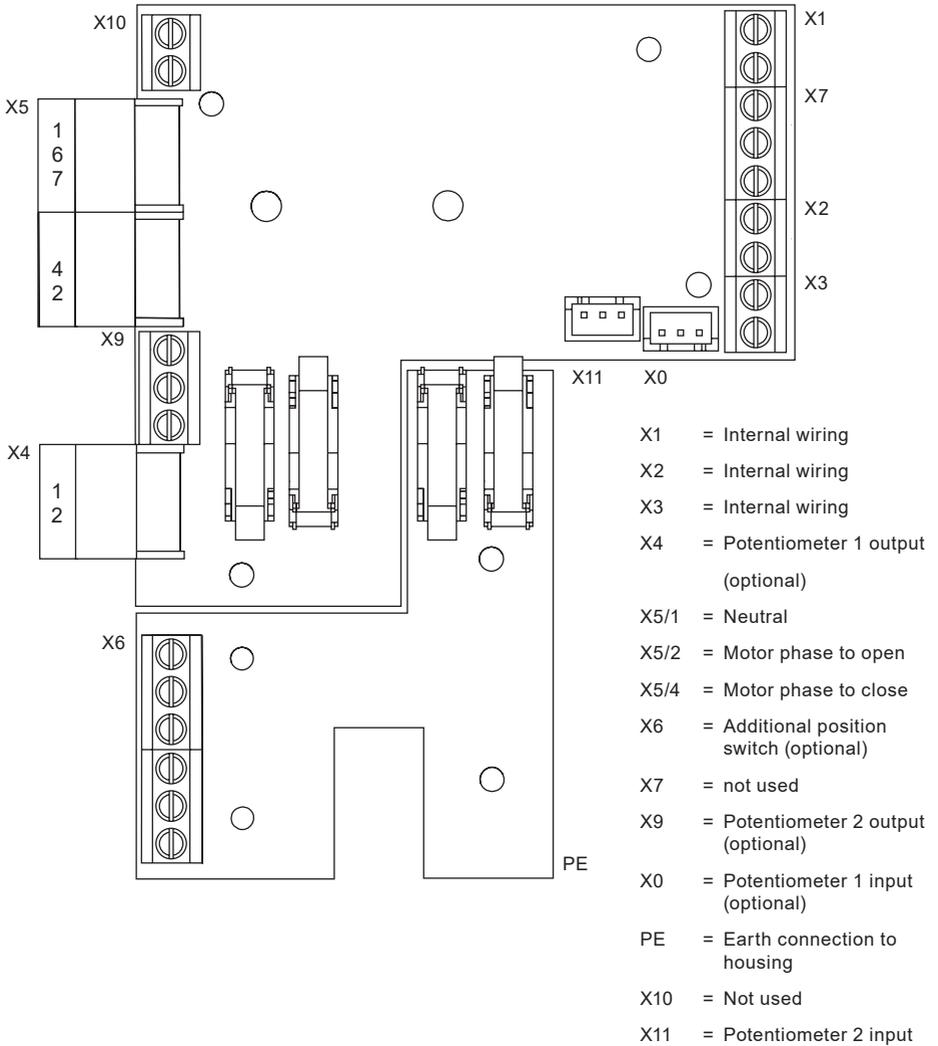


Fig. 14
Actuator termination PCB
 (Note: PE protective earth connection is on housing plate).

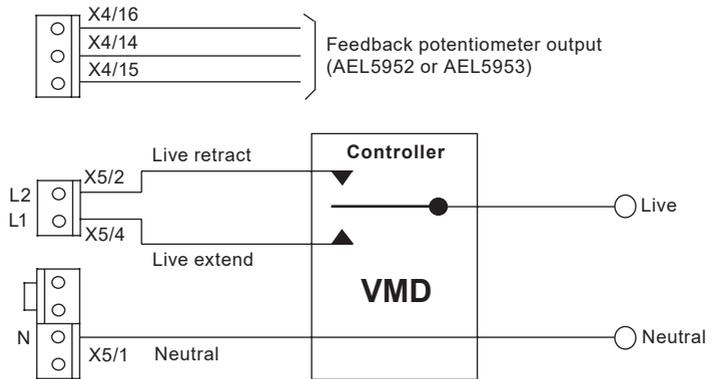


Fig. 15
VMD (Valve motor drive) connection details
 (see page 26 for AEL5952/AEL5953 wiring details).

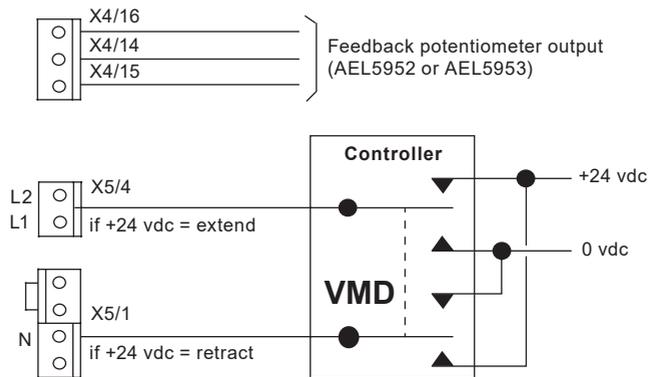


Fig.16
VMD (Valve Motor drive) connection detail for the 24 vdc power supply.

3.6.2 Models with positioner cards (4 - 20 mA signal)

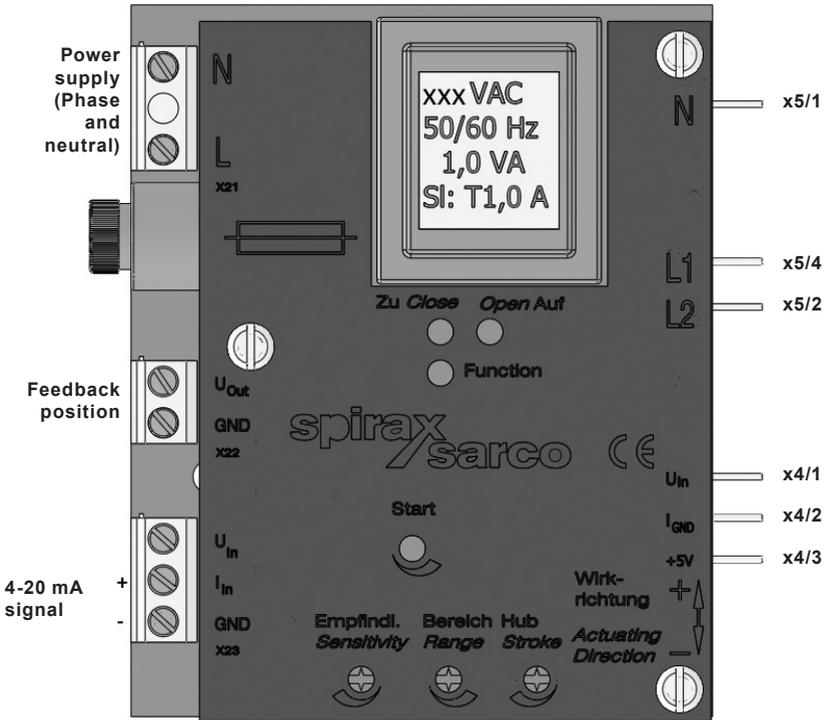


Fig. 17
 4 - 20 mA connection details
 (Note: GND connection is isolated from the mains and earth).

3.6.3 Models with positioner cards (2 - 10 V signal)

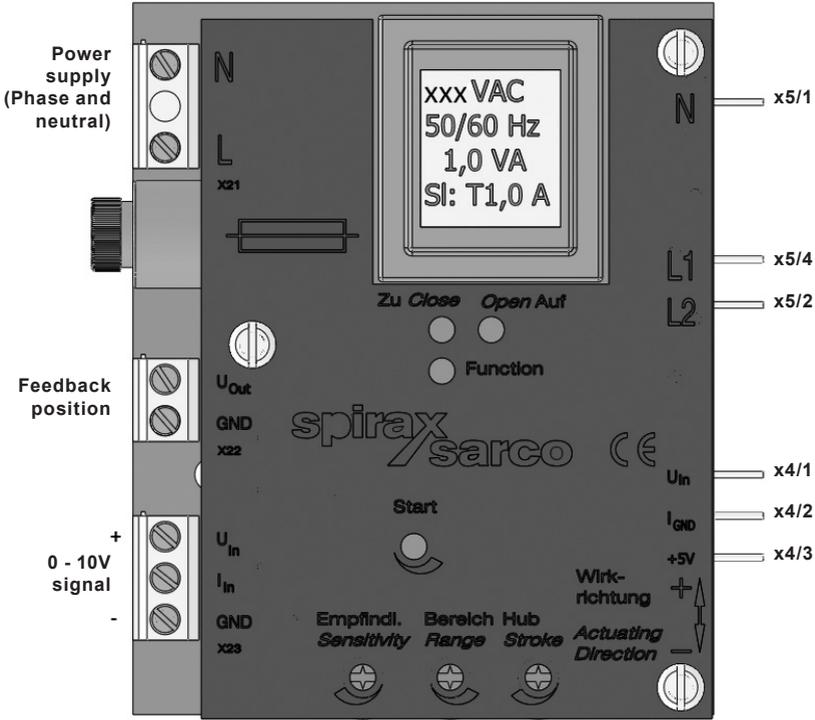


Fig. 18
 2 - 10 V connection details
 (Note: GND connection is isolated from the mains and earth).

3.6.4 Fitting an additional auxiliary switch card:

- Remove the switching plate (Figures 19 and 20).
- Mount the auxiliary switch card (Figure 21).
- Remount the switching plate (Figure 22).



Ensure the mains power is isolated.

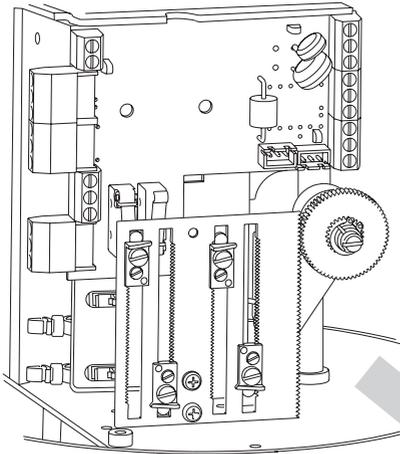


Fig. 19

**Unmount the
switching plate**

**Mount the auxiliary
switches card**

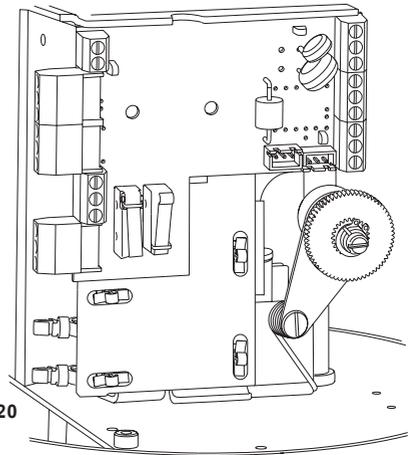


Fig. 20

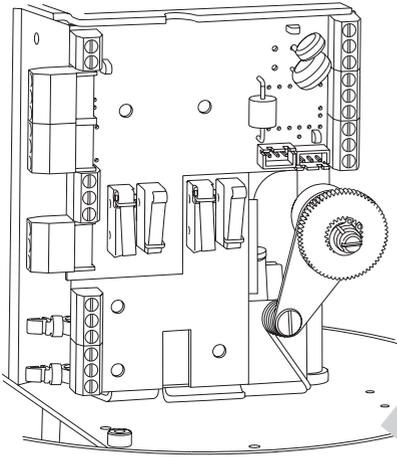


Fig. 21

Mount the
switching plate

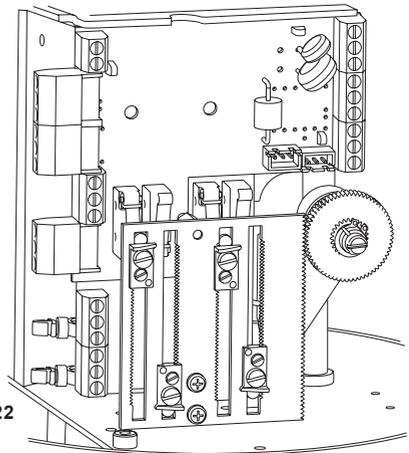


Fig. 22

3.6.5 The AEL5952 potentiometer can be used for remote indication on valve motor drive actuators, or for use with a positioner.
 The AEL5953 tandem potentiometer can be used for both functions simultaneously.

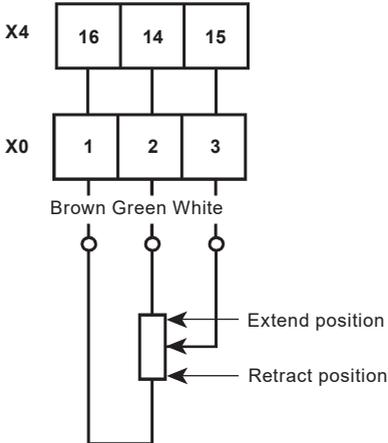


Fig. 23 AEL5952 feedback potentiometers and AEL5953 1st output from tandem potentiometer

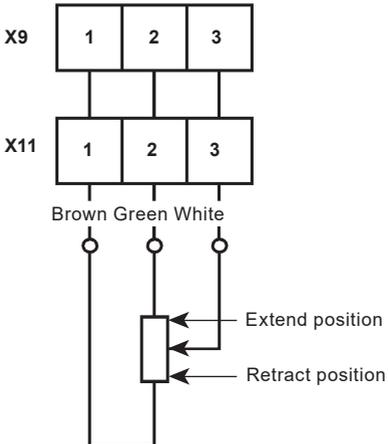


Fig. 24 AEL5953 2nd output from tandem potentiometer

3.6.6 The switches are shown in the normally closed condition i.e. when the switches are not engaged with the cams.

Example: If the retract switch is engaged, terminals 1 and 2 will be shorted together.

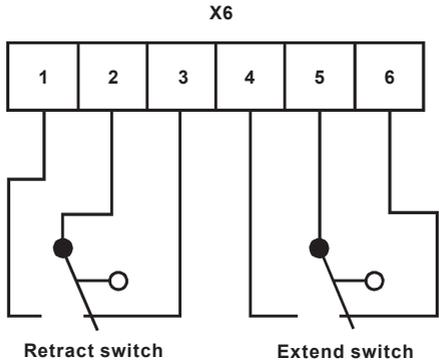


Fig. 25 AEL5951 auxiliary switches

3.6.7 Fitting an anti-condensate heater

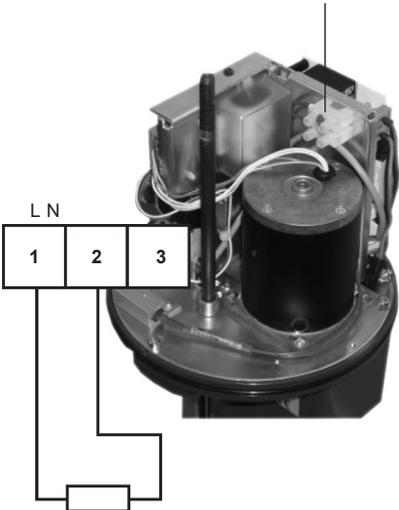


Fig. 26 Anti-condensate heater AEL5954 110 - 250 V and AEL5956 12 - 36 V

4. Commissioning

Actuators supplied already fitted to control valves would be supplied already commissioned. However, should it be necessary to commission an actuator, the following procedure should be adopted.

4.1 Preliminary checks - All actuators

1. Check that the actuator voltage corresponds to that required.
2. Ensure the wiring corresponds to that outlined in Section 3.6.

Ensure the assembly of the valve and actuator has been carried out according to the instructions in Section 3.2.

4.2 2-port valves

1. Using the handwheel extend the actuator until the valve plug stops against the seat, then extend so that the coupling piece is observed to compress (24). Marking rings are located along the length of the coupling shaft (25). The correct compression should be set to the lower marking ring (higher marking ring for the retract position on the 3-port valve). This compression gives the correct closing force to the valve when shut.
2. With the actuator in this position the 'Extend' limit switch (27) must be set.
3. Unlock the set screw, use the other screw to move the cam down until the switch contact 'breaks' and tighten the set screw. For 3-port valves now go to Section 4.3.
4. The lower stroke indicator (28) should then be butted against the bottom of the spindle nut anti-rotation plate and a distance of the valve stroke + 1.1 mm (1 mm for AEL54_ and AEL55_) measured from the top of the spindle nut anti-rotation plate. The top stroke indicator should then be positioned at this point.
5. Using the handwheel retract the spindle so that the top of the anti-rotation plate butts with the bottom of the top stroke indicator.
6. With the actuator in this position the 'Retract' limit switch (26) must be set.
7. Unlock the set screw, use the other screw to move the cam up until the switch contact 'breaks' and tighten the set screw.
8. The actuator can now be run electrically to check the limit switch settings. Power the actuator to both ends ensuring that when closed 1 ring is compressed and that the travel is valve stroke + 1.1 mm (1 mm for AEL54_ and AEL55_). The motor must switch off at either end.

Note: For VMD input signal actuators, commissioning is complete after the limit switches have been set.

Please note that the set screws 26 and 27 are the bigger ones on the switching plate.

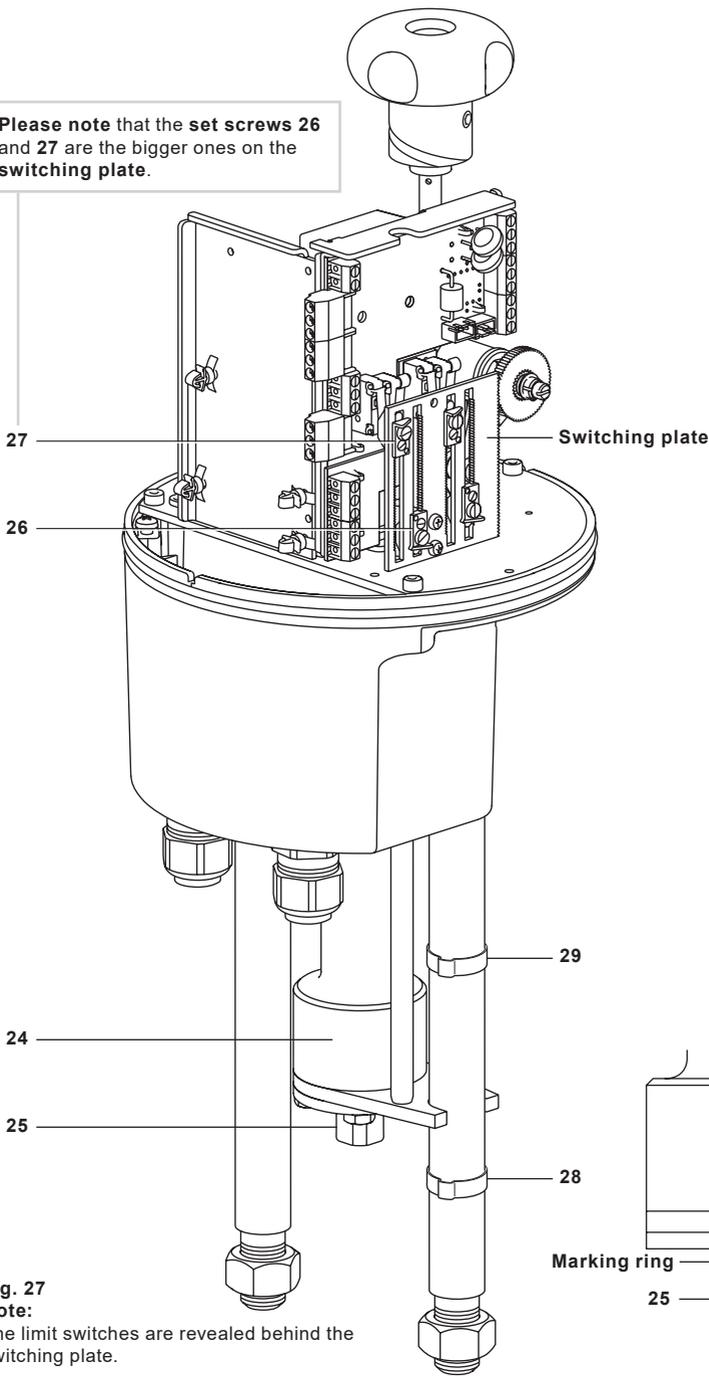
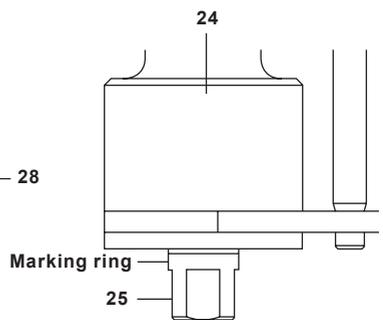


Fig. 28



AEL5 Series Electric Linear Actuators



From 4.2 2-port valves

1. Using the handwheel extend the actuator until the valve plug stops against the seat, then extend so that the coupling piece is observed to compress (**24**). Marking rings are located along the length of the coupling shaft (**25**). The correct compression should be set to the lower marking ring (higher marking ring for the retract position on the 3-port valve). This compression gives the correct closing force to the valve when shut.
2. With the actuator in this position the 'Extend' limit switch (**27**) must be set.
3. Unlock the set screw, use the other screw to move the cam down until the switch contact 'breaks' and tighten the set screw. For 3-port valves now go to Section 4.3.

4.3 3-port valves

4. The lower stroke indicator (**28**) should then be butted against the bottom of the spindle nut anti-rotation plate.
5. Using the handwheel retract the actuator until the plug stops against the seat, then retract so that the coupling piece (**24**) is observed to compress. Marking rings are located along the coupling shaft (**25**). The correct compression should be set to the higher marking ring. This compression gives the correct closing force to the valve when shut. Then follow steps 6 and 7 as defined in Section 4.2 for the retract switch. The higher stroke indicator (**29**) should then be butted against the top of the spindle nut anti-rotation plate. The actuator can now be run electrically to check the limit switch settings. Power the actuator to both ends ensuring that when stopped at either end 1 ring is compressed and that the travel is valve stroke + 2.2 mm (2 mm for AEL54_ and AEL55_). The motor must switch off at either end.

Please note that the set screws 26 and 27 are the bigger ones on the switching plate.

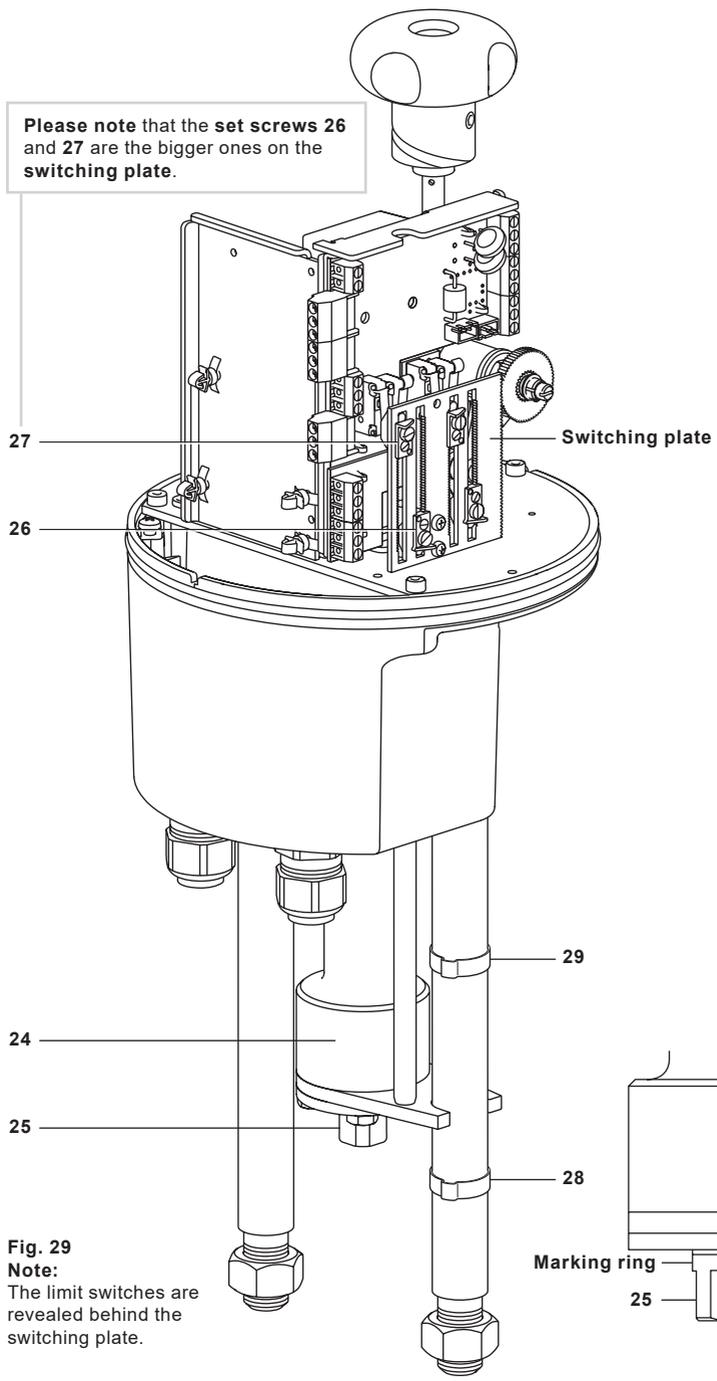


Fig. 30

Fig. 29
Note:
 The limit switches are revealed behind the switching plate.

AEL5 Series Electric Linear Actuators



4.4 Positioner (for 4 - 20 mA or 2 - 10 Vdc signals)

1. A 1000 ohm precision potentiometer must be installed in the actuator (Section 3.5.2).
2. Fit the positioner card (Section 3.4). Insert the contact pins into the right side of the terminal strip, engage the board into the retaining pegs. Tighten the terminal screws.
3. Connect up the actuating signal according to the required signal range at the top right (4 - 20 mA or 2 - 10 V), see Section 3.6.2. Set multimeter to 10 Vdc and connect test leads into the terminal points 'GND' and 'U out' of the positioner card. Connect mains supply to the mains terminals at the lower left side of the positioner card. Connect the protection earth of the mains supply to the 'PE' point of the actuator housing.

WARNING

The AEL5961 and AEL5962 positioners use parts supplied with mains voltage (terminal points, fuses etc). These parts are covered but all adjustments should be made using an insulated screwdriver held at the grip.

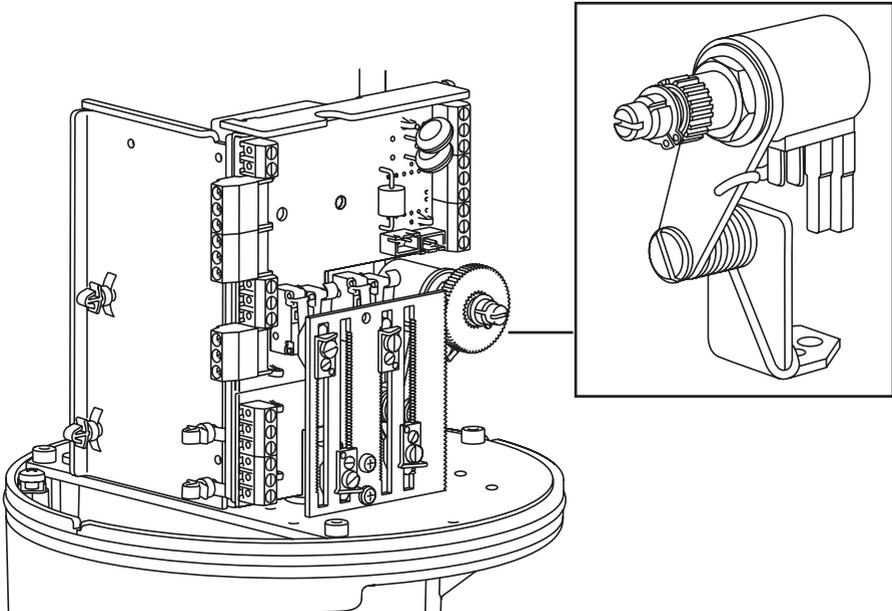


Fig. 31

4. Turn the potentiometers (P2, P3 and P4) to the left with the exception of the sensitivity potentiometer (P1) which should be turned to the middle position.
5. Set the 'Direction' switch to (+) (increase signal to retract spindle). Set the actuating signal to 4 mA (2 V). Switch on the mains supply.
The actuating drive will move to the lower end position and will be cut off by the limit switch.

6. At this point the multimeter should read 0 V. If it does not turn the shaft of the feedback potentiometer until the multimeter reads the required 0 V (Figure 31) adjust the start potentiometer P2 (Figure 31) until the close LED just switches off.
7. Set the actuating signal to 20 mA (10 V). The UP direction LED will light up and the actuating drive will run to the upper end position and cut off. Gently turn the potentiometer P4 (stroke) until the multimeter reads 10 Vdc. Gently turn the potentiometer P3 (range) clockwise until both LEDs indicating the direction of action just extinguish.
8. Adjust the actuating signal through the whole range and check that the actuator positions accordingly. Correct the sensitivity if required (P1). (Amount of signal variation to move actuator. Decrease to reduce hunting).
9. Please note that if the potentiometer (P1) is adjusted, Steps 4 - 8 (Section 4.4) must be repeated.

Similarly, split range settings can be set. The start and end signals must be set to the required range which differ from the above example.

For increase signal to extend spindle set direction switch to "-". Manually set the actuator to the uppermost set position and adjust the potentiometer to clockwise stop. Set up as above (directions will be reversed).

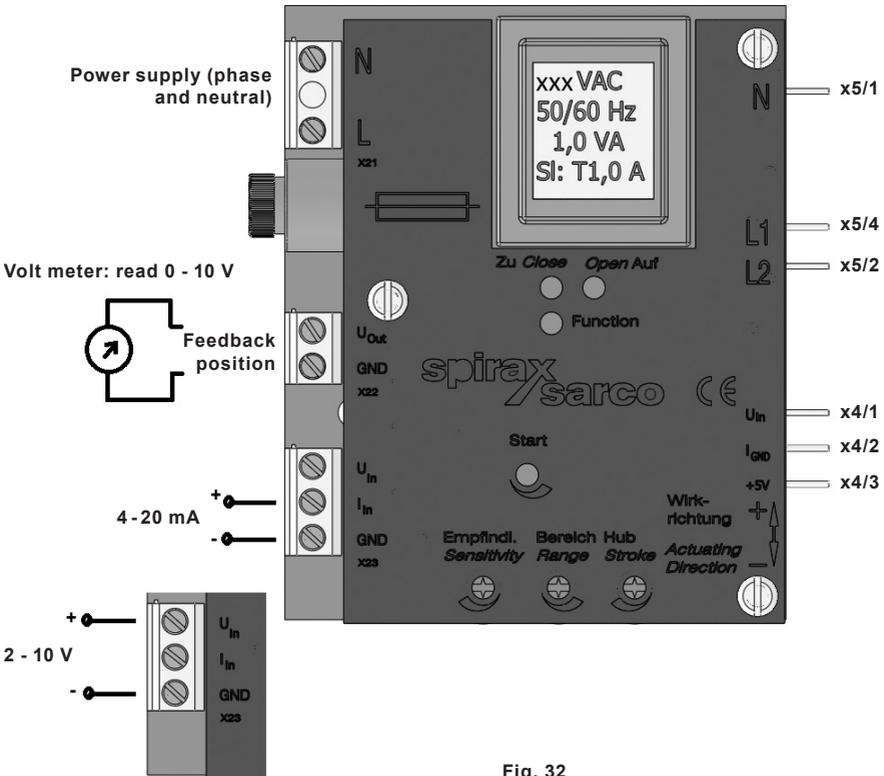


Fig. 32

5. Maintenance



Always make sure that the electrical supply is switched off when carrying out maintenance on the actuator or valve.

The actuators have a design life of approximately 200 000 full strokes or alternatively 1.5 million starts (1 start is 1 movement of the spindle). The maintenance required for the AEL5 actuator range is to inspect the condition inside of the spindle nut and to lubricate it. If the actuator has been operating beyond its design limits the spindle nut may require replacing.

Spare parts

Maintenance spare kits are available for the actuators. The kits contain replacement spindle nuts, 'O' rings, the correct lubricating grease, plus full instructions to carry out the inspection, lubrication/spindle nut replacement. For more information contact your local Spirax Sarco branch or distributor.

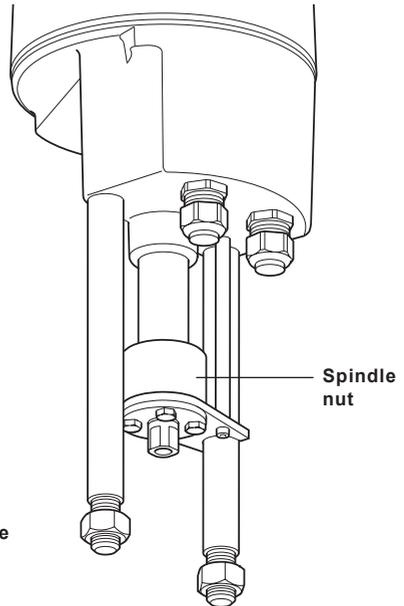


Fig. 33 Spindle nut maintenance

Table 3

Actuator model number	Spindle nut material	Thread (RH or LH)
AEL51_	Plastic	Right Hand
AEL52_	Plastic	Right Hand
AEL53_	Plastic	Right Hand
AEL54_	Brass	Left Hand
AEL55_	Brass	Left Hand
AEL56_	Brass	Right Hand

