

Installation, Operation & Maintenance Instructions
I/P CONTROLLER FOR KINETROL POSITIONER
(92 Model)

Summary

Range and zero setting is done using the positioner adjustment. In case of blockage due to contamination the air bleed can be adjusted externally without detaching unit. The I/P unit may be detached from the positioner leaving the diaphragm assembly attached to the positioner.

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3. Setting Range and Zero
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5. Removal of I/P unit from positioner
6. Disassembly
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8. Fig. 2 (Positioner Range and Zero Adjustment)
9. Fig. 3 (I/P Controller Disassembly)

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Installation, Operation & Maintenance Instructions

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(92 Model)

1. Description of Operation

Refer to fig. 1 supply air enters through filter 'A'. It passes through the restriction 'B' into the diaphragm chamber 'C'. The chamber 'C' is exhausted to cover the enclosure through the nozzle 'D'. The exhaust from the nozzle is restricted by the flapper 'E' which is pressed against the nozzle exhaust by the force of the coil 'F'. The force is produced by the 4-20 mA current reacting on the magnetic field produced by the magnet 'G'. The restriction of the nozzle by the flapper produces a back pressure in the chamber 'C', which acts as the control signal pressure for the positioner.

2. Operating Conditions

2.1 The I/P unit should be supplied with clean, dry, oil free air.

2.2 Supply pressure should be regulated and between 60-80 psi (4-5.5 bar). For lower pressure consult Kinetrol.

2.3 Temperature range -20 to 80°C.

3. Setting Range and Zero

Range and zero are normally adjusted on the positioner. Range may be adjusted on the I/P using the preset potentiometer, however this is intended for factory setting and it is not necessary for the user to adjust it.

To adjust range and zero remove the positioner cover and follow adjustment instructions for the positioner (see figure. 2)

4. Air Bleed Adjustment

Flow rate of air into the supply port should be in the range 2.5 - 3.5 1/min. Free air.

The air flow can become blocked by contamination. This can be cleared without removing the unit from the positioner. The air supply should be disconnected or switched off. The needle valve should be unscrewed and cleaned. Refit and screw fully in. Connect air supply. Unscrew needle valve (rotating counter-clockwise) 1/2 to 3/4 giving a flow rate into the unit of 2.5 - 3.5 1/min. Free air.

Alternatively reset the unit with the 80 psi air supply and the 20 mA signal connected, then carefully open the needle valve until the positioner moves to 90° fully open.

5. Removal of I/P Unit from the Positioner (Refer to Fig. 3)

I/P unit is detached from the positioner as a unit by removing the screws 'A'. The diaphragm assembly remains attached to the positioner. Electrical connections and air supply must be removed before detaching the unit.

6. Disassembly and Inspection of Magnet/Coil Assembly

6.1 Detach cover by removing two attachment screws. Detach magnet/coil assembly from I/P base by removing two fixing screws 'B'.

6.2 It is very important that the coil is COMPLETELY free to move in the magnet. (The force produced by the coil at 20 mA signal is only about 10 gm).

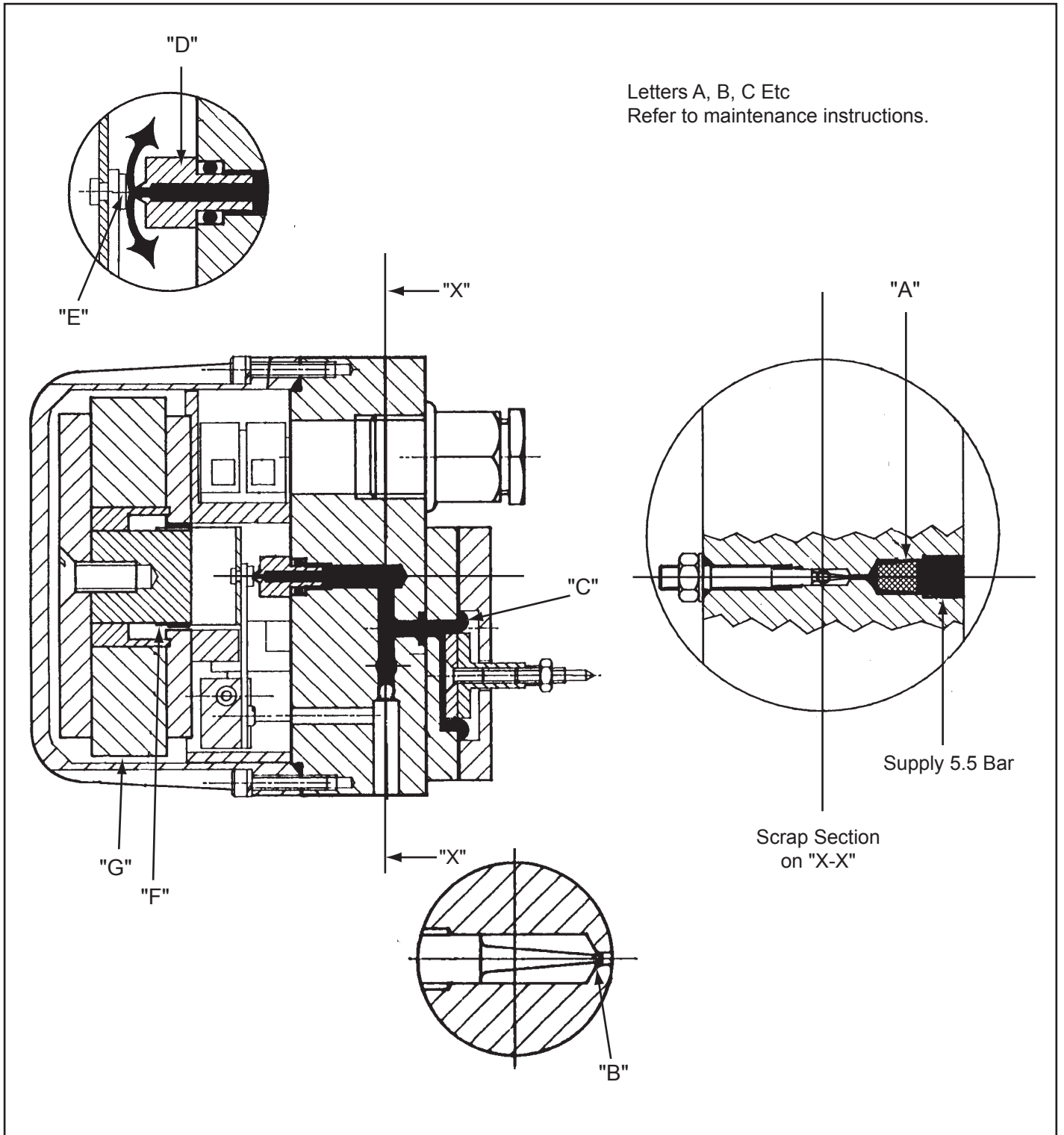
6.3 To check for free movement detach magnet/coil assembly from base as in '4' above. Stand assembly on flat surface (non-magnetic) with coil and flapper upwards. Apply 4mA signal to terminals; coil should rise by 1-2mm (full travel). Remove 4mA signal; coil should fall back to bottom of travel.

6.4 If coil is not free to move, the magnet may be detached from coil mounting block. Magnet gap should be checked for dirt or swarf. Great care should be exercised in refitting mounting block and coil to magnet.

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FIGURE 1. I/P CONTROLLER FOR KINETROL POSITIONER DIAGRAMATIC



Installation, Operation & Maintenance Instructions I/P CONTROLLER FOR KINETROL POSITIONER (92 Model)

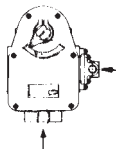
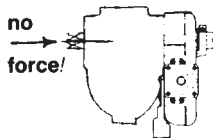
FIGURE 2, POSITIONER RANGE & ZERO ADJUSTMENT

KINETROL POSITIONER

INSTRUCTIONS TO INSTALLATION FITTER

The Positioner is normally already fitted to a KINETROL rotary Actuator at the factory. As far as the Actuator is concerned, see 'Kinetrok Actuator Installation Instructions', but note anyway

- Actuator must be mounted concentric with the part (such as ball valve) being driven
- Mounting must not put an end load on Actuator driver square — coupling must be free to slide endwise slightly
- No air connections to be made to Actuator — these are integral with Positioner



AIR CONNECTIONS

There are two air connections to be made to the positioner

1 SIGNAL AIR. This is the air pressure which controls the positioner, usually varying between 3 psi and 15 psi. The air flow in and out is very small, so a small dia (3mm bore) tube may be used. Beware leaks! (If a pressure regulator is employed this should be of the self-relieving type)

2 SUPPLY AIR. This is the air that supplies the power to move the actuator and is controlled by (1). Usually it comes from the factory air line or some other large source of air at 50-100 psi and the pressure may vary minute by minute, without affecting the positioning. It is controlled by a close fitting bobbin valve and so must be very clean. An airline filter/drier unit is recommended in this supply pipe immediately before the positioner and this should have a capacity of not less than 6 cu. ft per minute. The positioner incorporates a small filter to protect against dirt ingress when coupling up the pipe, but this would easily become blocked by a dirty air supply. The flow of air to move the actuator must not be choked so this pipe should be larger diameter (6mm bore).

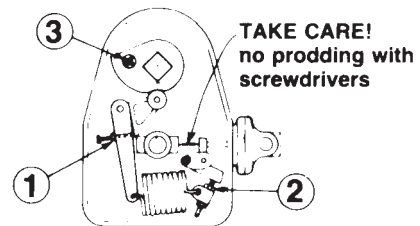
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ADJUSTMENTS

Leave this to the instrument man. Normally the Positioner is despatched correctly adjusted to the specified requirement, and should not be tampered with unnecessarily.

Should it be necessary to alter the adjustment the weather-tight cover must be taken off by unscrewing the 6 screws, and disconnecting the air SUPPLY line. TAKE CARE of the sealing O-ring in the lid recess, don't damage or drop in the dirt!

The 3 adjustments which can then be made are shown below



1. ZERO ADJUSTMENT

The screw in the lever can be turned after releasing locknut, use M3 spanners. This alters the position the Actuator will move to for a given signal, throughout the range. It gives a sensitive adjustment of this position (e.g. 0° or against end stop) resulting from the bottom or zero signal pressure (usually 3 psi).

When actuating a ball or butterfly valve, the Actuator end stop could first be set up to give the exact valve-closed position.

Remember — re-tighten locknut

2. RANGE ADJUSTMENT

Use M4 spanner to loosen the nuts each side of the spring end pivot block, which may then be moved towards (or away from) the pivot of the lever on which it is mounted. This will change the force the spring puts on at the top end of the lever where the Signal-pressure diaphragm pushes against it to balance it. If these forces are not in balance, the bobbin valve is moved and air pressure turns the actuator until balance is obtained. If full-travel (90°) actuator movement is obtained at too low a signal pressure (for instance 14 psi instead of 15 psi) the block must be moved away from the lever pivot until the correct range of movement is obtained. Due to the angularity of the lever this does not affect zero adjustment (1, or 13).

3. CAM DATUM ADJUSTMENT

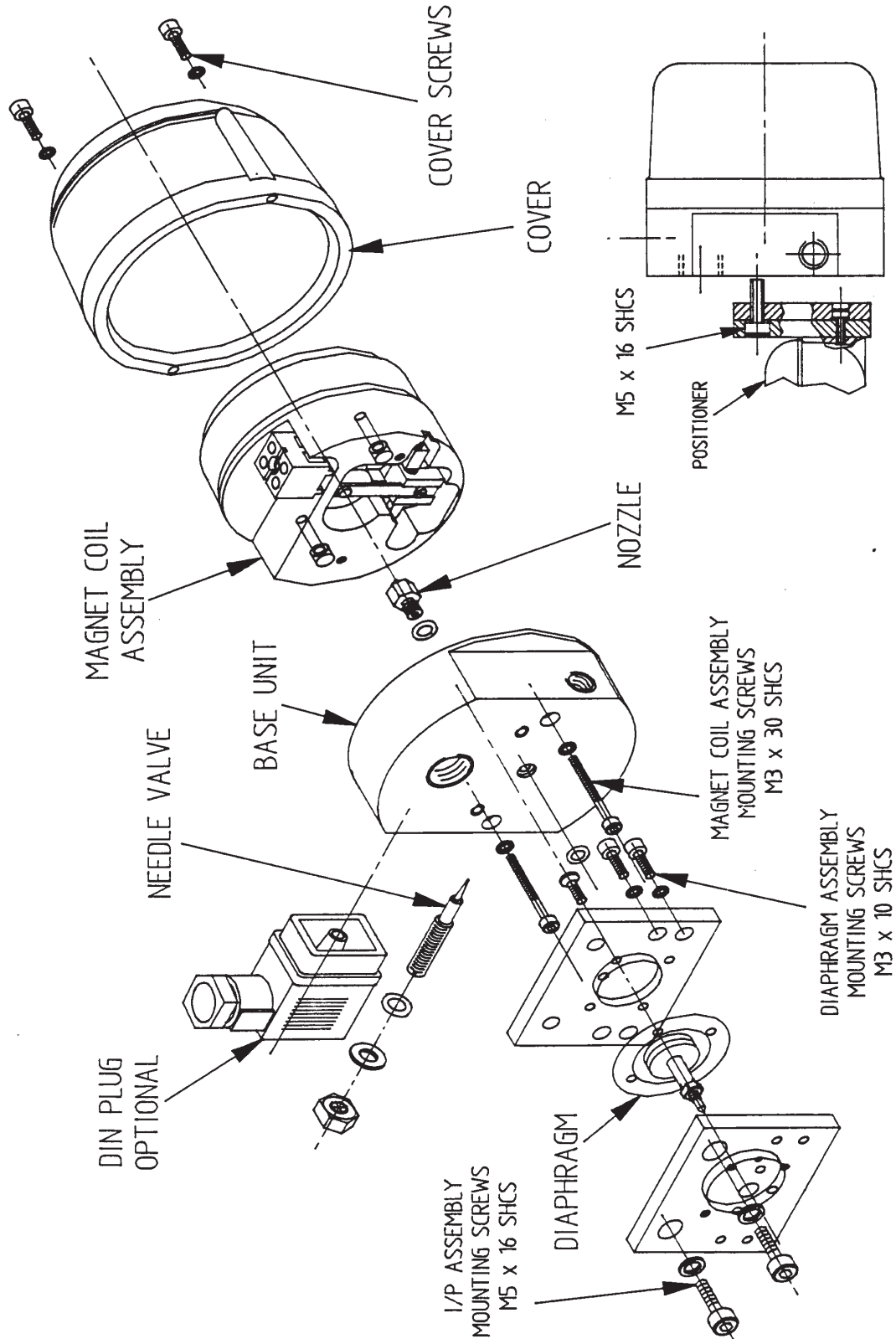
Seldom needs to be used. Slackening the screw enables the cam to be rotated a few degrees each way, changing the actuator vane position at which positioning starts, similar to giving coarse adjustment and enables correct portion of cam-track to be used. Cam-tower should be fully in (or nearly so) at bottom of cam at the zero (3 psi signal) position.

IF IN DOUBT — RING Technical Sales —

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FIG 3. I/P CONTROLLER ASSEMBLY



Installation, Operation & Maintenance Instructions

KINETROL 4-20mA TWO WIRE ANGLE TRANSDUCER

If Angle Transducer is supplied fitted on a positioner then start from 2.0 below

MOUNTING ON A POSITIONER

- 1.1. Remove existing cover. The transducer is normally supplied fitted to a new cover.
- 1.2. Line up angle transducer spring coupling by eye so that it will slide onto the positioner shaft square, with the yellow dot orientated as in sketch opposite.
- 1.3. Mount transducer & cover assembly on positioner and tighten screws.

MAKING ELECTRICAL CONNECTION

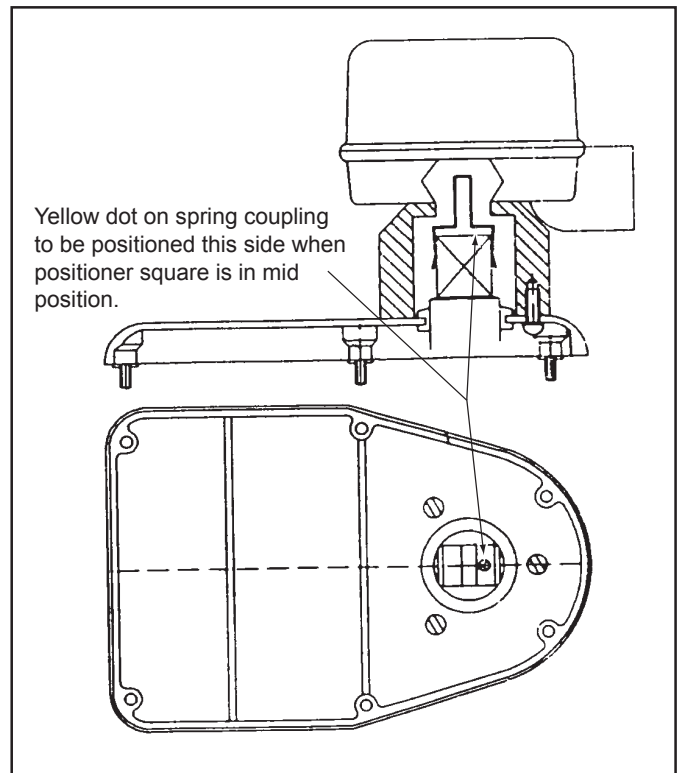
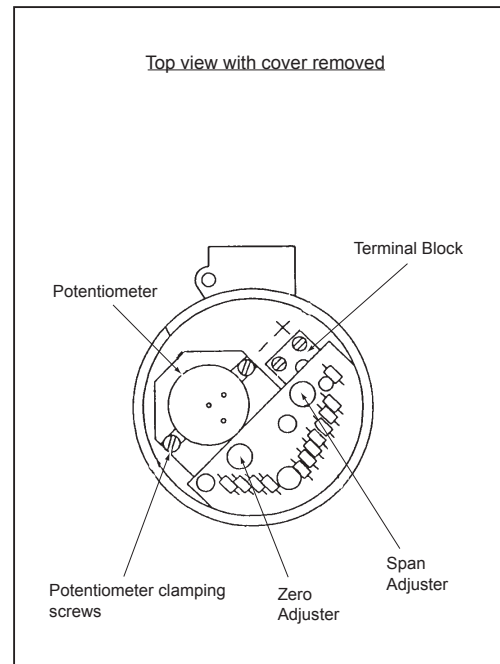
- 2.1. Remove cover.
- 2.2. Connect a 24V DC supply to the terminal block (positive to the red terminal).
- 2.3. Measure the current drawn by the transducer by connecting an ammeter in series with the transducer. If the current drawn is zero either there is a bad connection or the polarity is incorrect. The transducer is protected against this.

CHECKING AND ADJUSTING (if necessary) POTENTIOMETER POSITION

- 3.1. Rotate actuator/positioner to the fully anti-clockwise position.
- 3.2. If the current reading is not between 18 & 22mA then slacken two potentiometer clamping screws & rotate potentiometer until current is approx. 20mA. Retighten screws.

ZERO AND SPAN ADJUSTMENT

- 4.1. Rotate actuator/positioner to fully clockwise position.
- 4.2. Turn zero adjuster (with small screwdriver) until current is 4mA.
- 4.3. Rotate positioner to fully anti-clockwise position.
- 4.4. Turn span adjuster until current is 20mA.
- 4.5. Repeat 4.1 to 4.4 until zero & span settings are correct. Replace cover.



KINETROL EHD ½ TURN ELECTROHYDRAULIC ACTUATOR

DOUBLE ACTING ON/OFF FAIL FREE MODELS

Numbers in brackets refer to the exploded diagram (figure 1)

1. Pump and Reservoir Orientation (check before filling or making electrical connection).

Ignore this section if unit is supplied full of fluid, in which case it will be fitted with a temporary vent plug (20).

The pump/reservoir/motor unit (1) must be mounted with the motor axis as near as possible to the vertical. In order to achieve this, the mating flange on the control box (2) is designed to accept oil flow with the pump in any rotary orientation, and the mounting bolts (3) can be used to set the orientation at 90° intervals. The pump's power supply passes along wires (4) through the centre of this flange.

The unit is supplied with the pump/reservoir/motor unit correctly positioned for a vertical actuator axis. If the actuator is to be used with its axis horizontal, it is necessary firstly to mount the whole actuator so that the pump-control box interface plane is vertical. Then remove the control box lid (5) by undoing the position indicator (6) and the four M4 bolts (7) and lift it off, taking care to prevent the control box shaft (8) being pulled up with the lid by friction on its seal; damage to the limit switches (9) can be caused if this occurs. Unscrew the pump mounting bolts (3) with the pump supported so that the wires through the interface centre are not sheared off by the weight of the pump. The pump should be rotated to allow the motor (10) to be vertically above the pump/reservoir unit (11) and bolted back to the control box in that position. During the whole of this manoeuvre, care should be taken not to damage the wires through the interface centre; it should be carried out with the pump/reservoir unit empty of oil.

2. Wiring Connections

A wiring conduit with the required degree of environmental protection should be connected to the threaded conduit entry hole (12) in the actuator control box (2). All wiring to the unit should enter by this route.

Access to the connector block (13) inside the control box is obtained by removing the position indicator (6) and the lid (5) which is held down by four M4 bolts (7).

BEFORE REMOVAL OF THE LID, ENSURE THAT ALL POWER TO THE ACTUATOR HAS BEEN DISCONNECTED.

When removing lid, take care to prevent the control box shaft (8) being pulled up or pushed sideways by the lid as it is pulled off; downward pressure on the end of the shaft square is necessary to counteract the friction force exerted by the seal. Excessive shaft movement can damage the feedback potentiometer and/or the limit switches.

Figure 2 shows the wiring connections to be used.

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3. Limit Switch Adjustment

Disconnect power before adjusting limit switch cams (14). The two limit switches (9) at the bottom of the stack are the actuator travel limit switches, factory adjusted to stop the actuator just before the mechanical endstops are reached. These switches can be adjusted by the user to limit travel as required; however, care should be taken to avoid leaving the actuator motor driving against its own endstop or against the load's travel limit.

Any further limit switches are optional auxiliary switches to allow the user to signal position as required.

The bottom switch should be adjusted first, then the next one up, etc., so that for each one the clamp screw (15) is not obscured by a cam which has already been set.

To set a cam, first slacken its clamp screw using a hexagon socket spanner, without completely undoing it and letting the clamp nut (16) drop off underneath. Rotate the cam into position on the shaft, and re-tighten the clamp screw.

Before replacing the lid, ensure that no wires are trapped between the lid and control box flange.

4. Optional Flow Adjustment

The optional flow adjustment screws (17) are located between the two solenoid valves inside the control box. They are held in place by lock nuts (18). Each screw adjusts oil flow in one direction of travel independently of the other. When a screw is screwed down, the flow is reduced and the travel speed reduced. Do not force screws beyond the point where resistance is encountered, and do not withdraw more than 4 turns from this point. Figure 1 shows which screw adjusts each travel direction.

5. Filling with Oil

(a) If the unit is supplied full of oil, it will be fitted with a temporary vent plug (20) which can be removed simply by pulling it out in the direction shown; this must be done before the unit is operated. The following filling instructions do not apply to units supplied full.

(b) If the unit is supplied empty, it will not have a temporary vent plug (20) fitted, and it will be supplied with enough silicone fluid to fill it. If more oil is added subsequently, only silicone fluid with a viscosity of 50 centistokes at 25°C should be used. This is usually readily available, but if any difficulty is encountered it can be obtained from Kinetrol. Consult Kinetrol before using other oils. Strict cleanliness of all surfaces in contact with the oil is necessary to avoid dirt contamination.

(c) To fill the unit, first remove the filler plug (19) and pour about 275 ml of oil into the reservoir (a small funnel is useful here). Switch on the actuator to move in the direction which gives the greatest travel and keep pouring oil into the reservoir until the actuator has moved to the end of its travel and switched itself off; try to keep the reservoir nearly full during this process, and fill it right up to the bottom of the filler thread when it stops at the

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5. Filling With Oil (Continued)

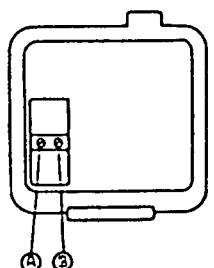
(c) Continued

end of the stroke. Replace the filler plug, and switch on the actuator to move in the opposite direction. At the end of travel remove the plug and top up the reservoir. Repeat this process until all air has been expelled from the system and no more oil can be poured in.

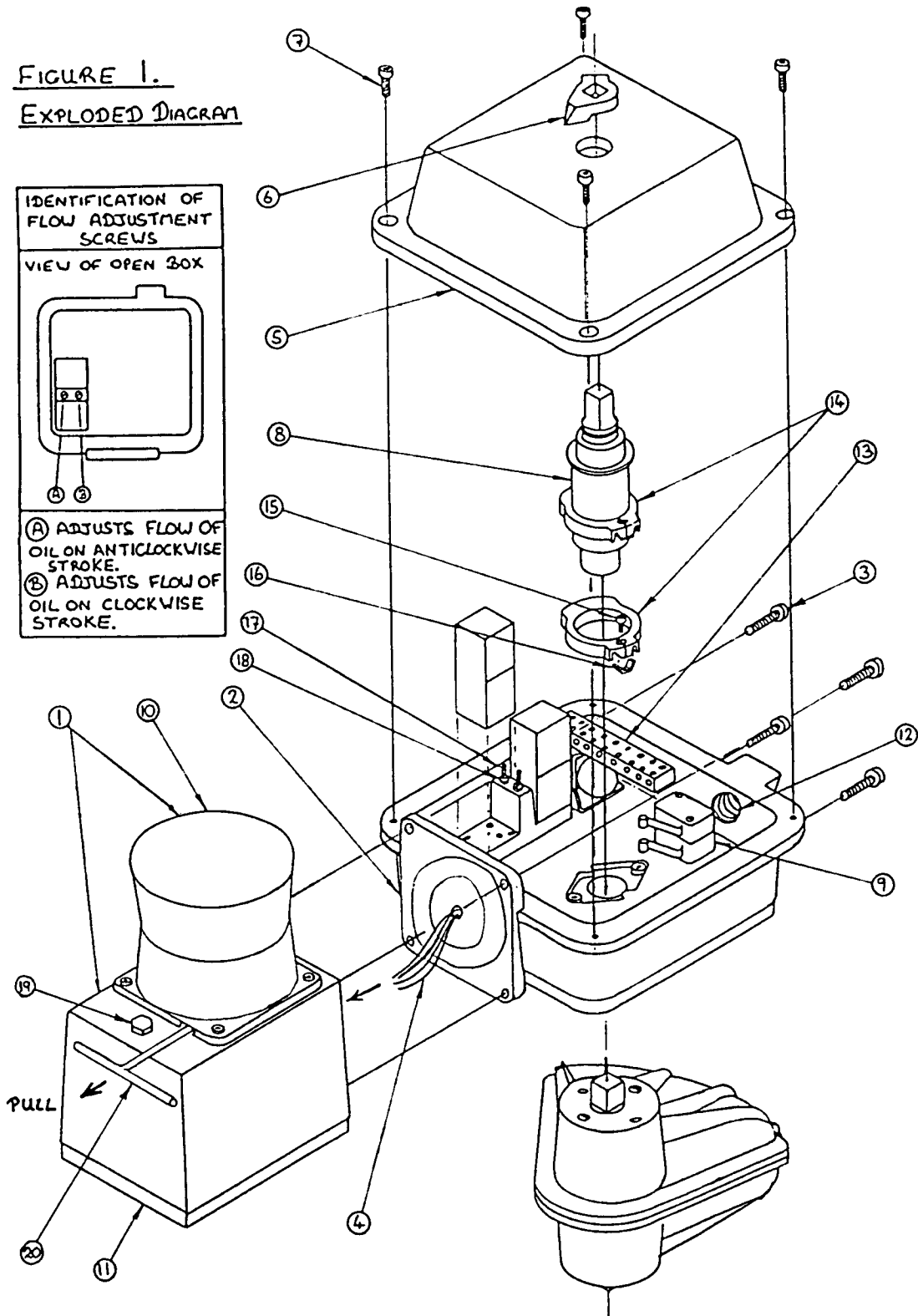
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FIGURE 1.
EXPLODED DIAGRAM

IDENTIFICATION OF FLOW ADJUSTMENT SCREWS
VIEW OF OPEN BOX



(A) ADJUSTS FLOW OF OIL ON ANTICLOCKWISE STROKE.
(B) ADJUSTS FLOW OF OIL ON CLOCKWISE STROKE.



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FIGURE 2

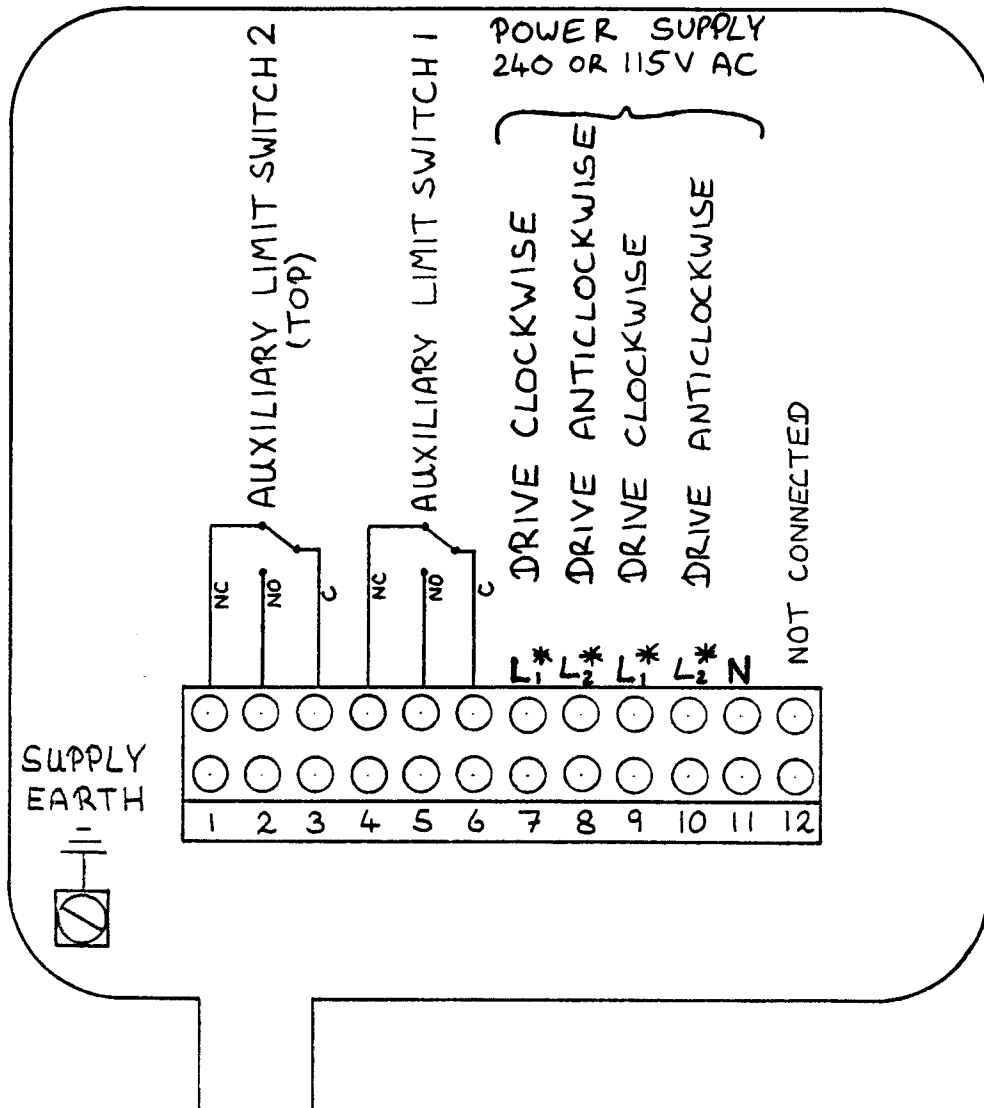
WIRING CONNECTIONS - OPEN BOX VIEW

	TERMINAL			
	7	8	9	10
DRIVE CLOCKWISE	L	NC	L	NC
DRIVE ANTICLOCKWISE	NC	L	NC	L

L = LIVE

NC = NOT CONNECTED

N.B. TWO TERMINALS IN NC CONDITION (EG. 8 & 10 DURING CLOCKWISE DRIVE) MUST NOT BE CONNECTED TO EACH OTHER.



* USE 2A FUSE ON LIVE POWER LINES

NOTE: AUXILIARY LIMIT SWITCHES ARE OPTIONAL - IF ONLY ONE IS FITTED, TERMINALS 1 - 3 WILL BE UNCONNECTED.

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KINETROL EHD ¼ TURN ELECTROHYDRAULIC ACTUATOR

SPRING RETURN DIRECT SWITCHED ON/OFF MODELS

Numbers in brackets refer to the exploded diagram (figure 1)

1. Pump and Reservoir Orientation (check before filling or making electrical connection).

Ignore this section if unit is supplied full of fluid, in which case it will be fitted with a temporary vent plug (20).

The pump/reservoir/motor unit (1) must be mounted with the motor axis as near as possible to the vertical. In order to achieve this, the mating flange on the control box (2) is designed to accept oil flow with the pump in any rotary orientation, and the mounting bolts (3) can be used to set the orientation at 90° intervals. The pump's power supply passes along wires (4) through the centre of this flange.

The unit is supplied with the pump/reservoir/motor unit correctly positioned for a vertical actuator axis. If the actuator is to be used with its axis horizontal, it is necessary firstly to mount the whole actuator so that the pump-control box interface plane is vertical. Then remove the control box lid (5) by undoing the position indicator (6) and the four M4 bolts (7) and lift it off, taking care to prevent the control box shaft (8) being pulled up with the lid by friction on its seal; damage to the limit switches (9) can be caused if this occurs. Unscrew the pump mounting bolts (3) with the pump supported so that the wires through the interface centre are not sheared off by the weight of the pump. The pump should be rotated to allow the motor (10) to be vertically above the pump/reservoir unit (11) and bolted back to the control box in that position. During the whole of this manoeuvre, care should be taken not to damage the wires through the interface centre; it should be carried out with the pump/reservoir unit empty of oil.

2. Wiring Connections

A wiring conduit with the required degree of environmental protection should be connected to the threaded conduit entry hole (12) in the actuator control box (2). All wiring to the unit should enter by this route.

Access to the connector block (13) inside the control box is obtained by removing the position indicator (6) and the lid (5) which is held down by four M4 bolts (7).

BEFORE REMOVAL OF THE LID, ENSURE THAT ALL POWER TO THE ACTUATOR HAS BEEN DISCONNECTED.

When removing lid, take care to prevent the control box shaft (8) being pulled up or pushed sideways by the lid as it is pulled off; downward pressure on the end of the shaft square is necessary to counteract the friction force exerted by the seal. Excessive shaft movement can damage the feedback potentiometer and/or the limit switches.

Figure 2 shows the wiring connections to be used.

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3. LIMIT SWITCH ADJUSTMENT

Disconnect power before adjusting limit switch cams (14). In this actuator any switches are optional auxiliary switches to allow the user to signal position as required; there is no internally wired switch to prevent the actuator motor driving against its own endstop, or an external one. For this reason it is important that the user arranges to switch off the motor before the actuator reaches an endstop.

The bottom switch should be adjusted first, then the next one up, etc. so that for each one the clamp screw (15) is not obscured by a cam which has already been set.

To set a cam, first slacken its clamp screw using a hexagon socket spanner, without completely undoing it and letting the clamp nut (16) drop off underneath. Rotate the cam into position on the shaft, and re-tighten the clamp screw.

Before replacing the lid, ensure that no wires are trapped between the lid and control box flange.

4. Optional Flow Adjustment

The optional flow adjustment screws (17) are located between the two solenoid valves inside the control box. They are held in place by lock nuts (18). Each screw adjusts oil flow in one direction of travel independently of the other. When a screw is screwed down, the flow is reduced and the travel speed reduced. Do not force screws beyond the point where resistance is encountered, and do not withdraw more than 4 turns from this point. Figure 1. shows which screw adjusts each travel direction.

5. Filling with Oil

(a) If the unit is supplied full of oil, it will be fitted with a temporary vent plug (20) which can be removed simply by pulling it out in the direction shown; this must be done before the unit is operated.

(b) If the unit is supplied empty, it will not have a temporary vent plug (20) fitted, and it will be supplied with enough silicone fluid to fill it. If more oil is added subsequently, only silicone fluid with a viscosity of 50 centistokes at 25°C should be used. This is usually readily available, but if any difficulty is encountered it can be obtained from Kinetrol. Consult Kinetrol before using other oils. Strict cleanliness of all surfaces in contact with the oil is necessary to avoid dirt contamination.

(c) SMALL MODELS (05, 07, 09)

To fill these models, first unscrew the filler plug (19). A small funnel is useful to avoid spilling oil. Pour in 275 ml of oil. Replace the plug. Run the actuator for about 20 seconds, switch off for 20 seconds, then run again for 20 seconds and leave unopened for 20 seconds. Unscrew the plug again and pour in oil up to the level of the bottom of the filler hole thread (if you try to pour in much more, it will overflow).

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5. Filling with oil (Continued)

(c) Contd.

Replace the plug, and repeat the runs as above. This should be repeated until no more oil is required to reach the bottom of the filler hole thread.

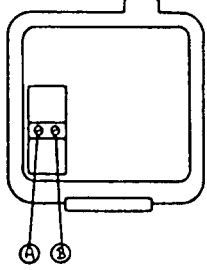
(d) LARGE MODELS (12, 14)

For these models, keep pouring in oil during the actuator's first run until either the actuator reaches the end of its travel, or no more oil can be poured in. Replace the plug, then switch off the actuator. Leave switched off for several minutes. Remove the plug, fill up the reservoir, then replace the plug and switch on the actuator. Continue to cycle and top up this way until the air in the system has been eliminated.

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FIGURE 1.
EXPLODED DIAGRAM

IDENTIFICATION OF FLOW ADJUSTMENT SCREWS
VIEW OF OPEN BOX



(A) ADJUSTS FLOW OF OIL ON POWER STROKE
(B) ADJUSTS FLOW OF OIL ON SPRING RETURN STROKE

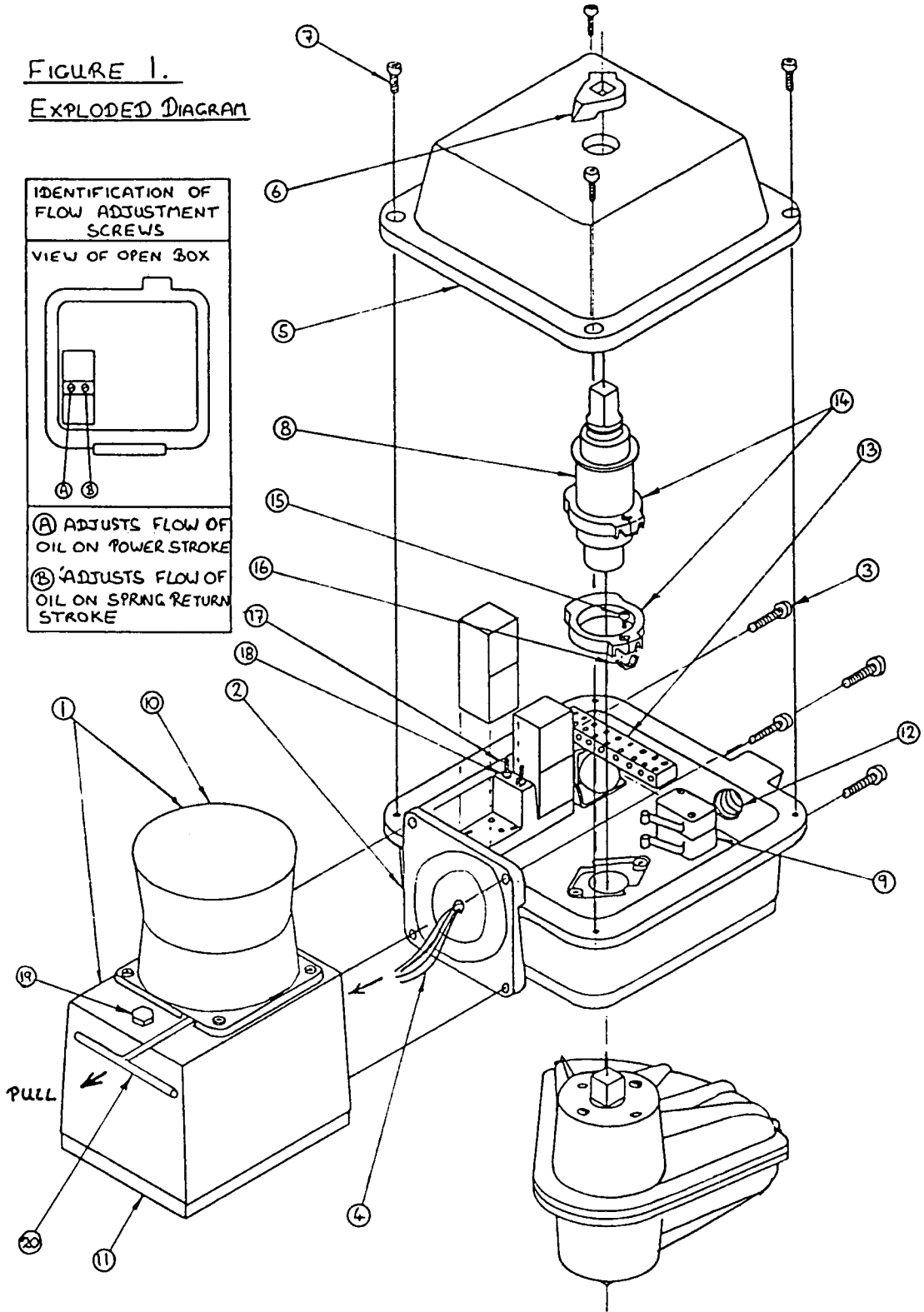
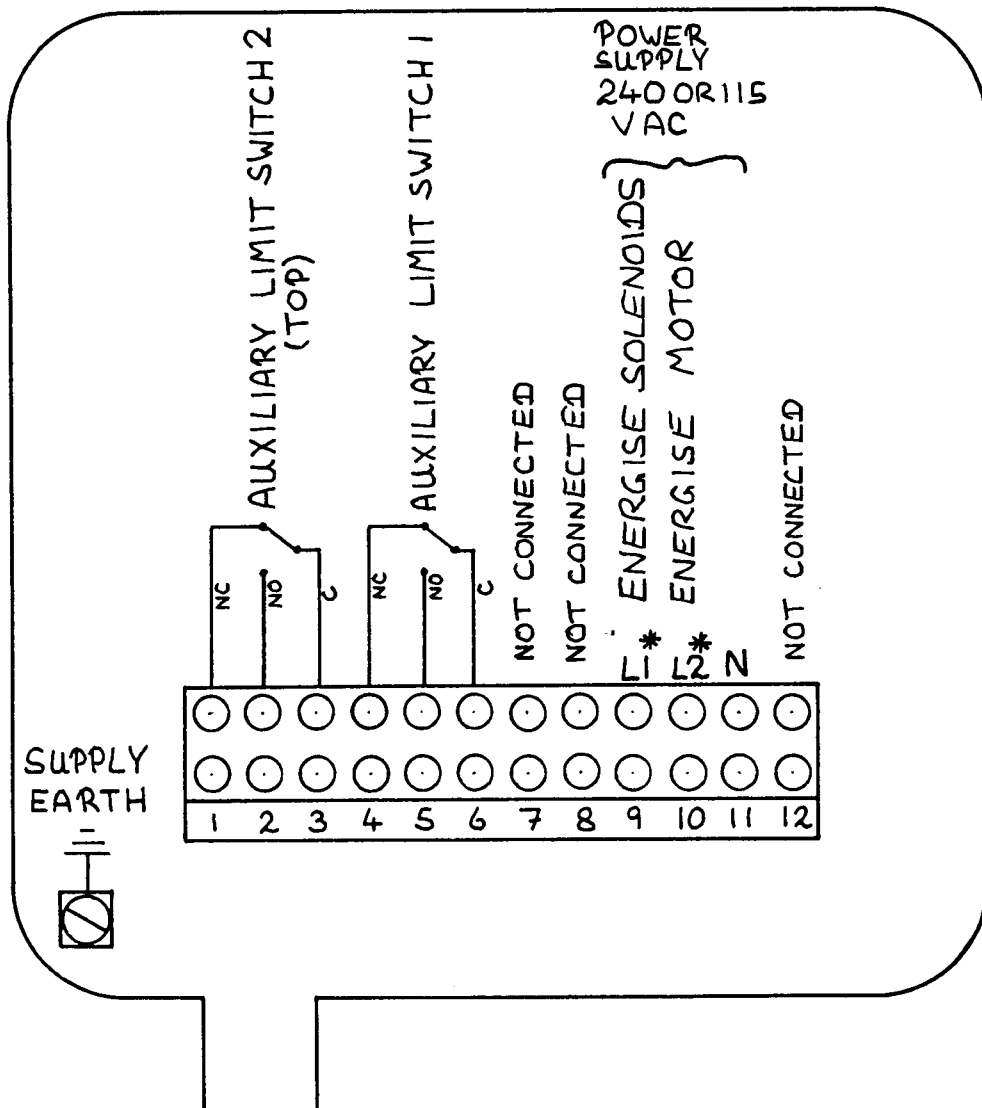


FIGURE 2

WIRING CONNECTIONS - OPEN BOX VIEW

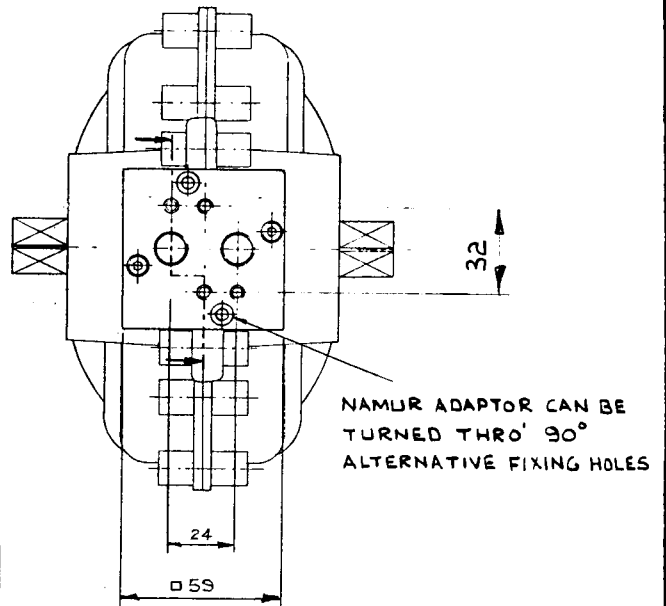
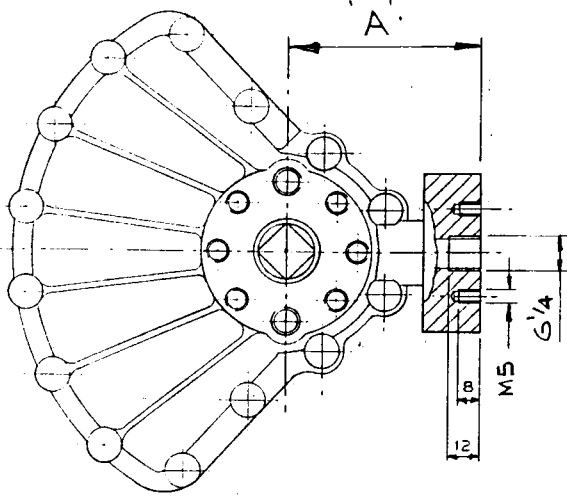


* USE 2A FUSE ON LIVE POWER LINE

NOTE: AUXILIARY LIMIT SWITCHES ARE OPTIONAL - IF ONLY ONE IS FITTED, TERMINALS 1 - 3 WILL BE UNCONNECTED.

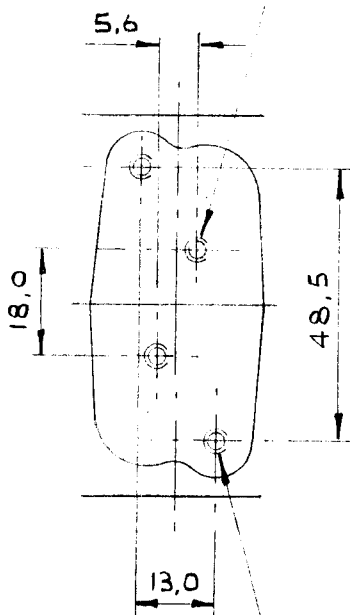
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DETAIL OF NAMUR ADAPTOR FOR KINETROL 03 TO 14 ACTUATORS



MODEL	05	07	09	12	14	03
DIM 'A'	54	64	76	89	105	48,5

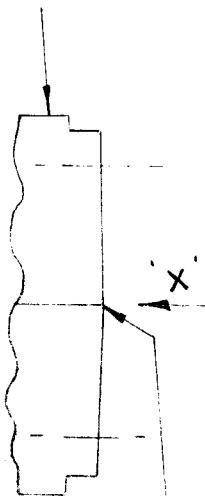
2 AIR PORTS
(NORMALLY PLUGGED)



2 - M4 x 6 DEEP
NAMUR ADAPTOR MOUNT HOLES

VIEW ON 'X' SHOWING
ACTUATOR BOSS DETAIL

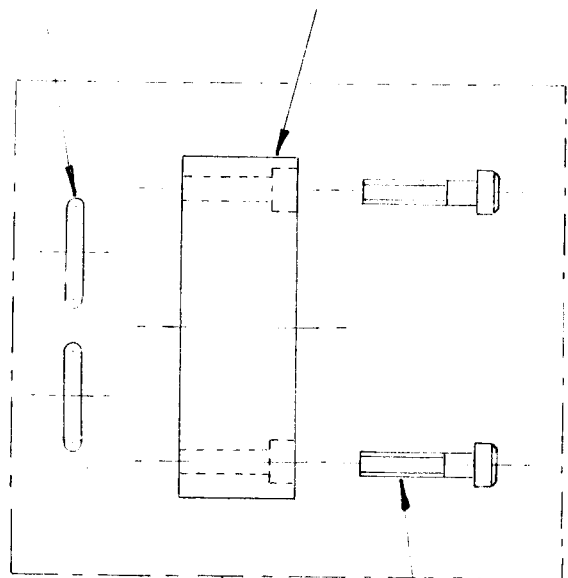
03 TO 14 ACTUATOR
(NOTE! REMOVE AIR
PORT PLUG SCREWS)



APPLY SILASTIC TO EXTERNAL
CASE SPLIT LINE TO FILL GAP
IF NECESSARY

2 - 'O' RINGS

NAMUR ADAPTOR PLATE



SP 633

2 - M4 x 20 SHC SCREWS
(CHEMICALLY LOCK WITH
LOCTITE 222 OR EQUIV.)

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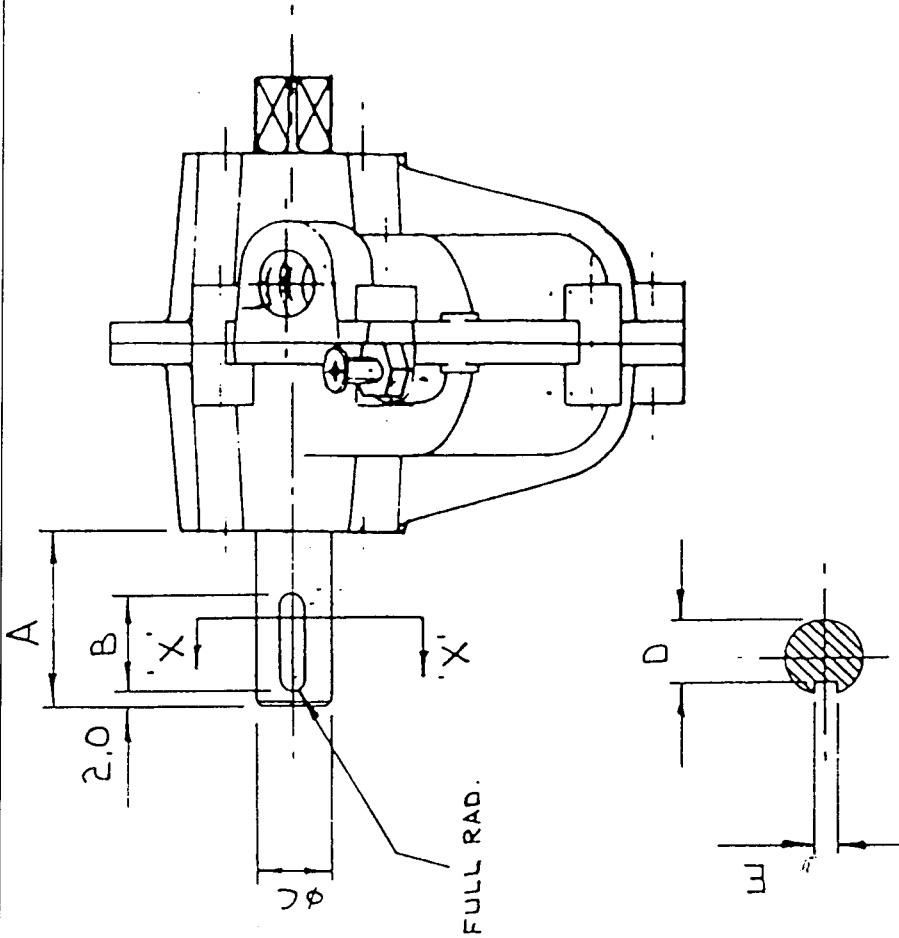
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KINETROL

Trading Estate Farnham Surrey England

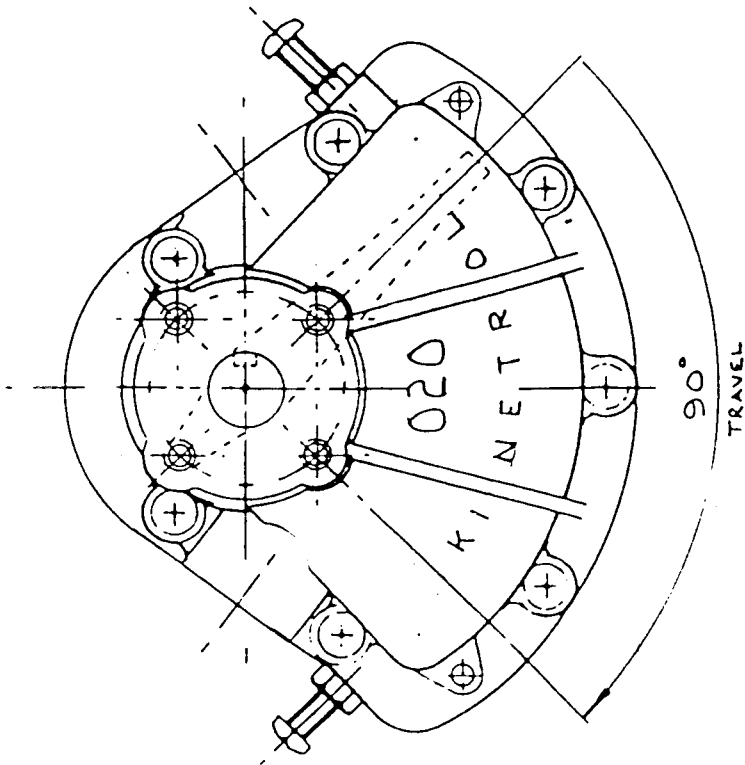
SHEET No.
TD 11

Title: Actuators with extended shaft and keyway.



SECTION X-X

FOR ACTUATOR DIMENSIONS SEE CATALOGUE



SALES CODE (PARENT PART NO.)	PRODUCT VARIATIONS	
	DESCRIPTION	SUFFIX NO. 2103
020-100-2103	02 ACTUATOR, ISO, WITH ONE SQUARE AND ONE ROUND SHAFT WITH KEYWAY	
028-100-2103	02 ACTUATOR, DIN, WITH ONE SQUARE AND ONE ROUND SHAFT WITH KEYWAY	
029-100-2103	02 ACTUATOR, ANSI, WITH ONE SQUARE AND ONE ROUND SHAFT WITH KEYWAY	
030-100-2103	03 ACTUATOR, ISO, WITH ONE SQUARE AND ONE ROUND SHAFT WITH KEYWAY	
038-100-2103	03 ACTUATOR, DIN, WITH ONE SQUARE AND ONE ROUND SHAFT WITH KEYWAY	
039-100-2103	03 ACTUATOR, ANSI, WITH ONE SQUARE AND ONE ROUND SHAFT WITH KEYWAY	
050-100-2103	05 ACTUATOR, ISO, WITH ONE SQUARE AND ONE ROUND SHAFT WITH KEYWAY	
058-100-2103	05 ACTUATOR, DIN, WITH ONE SQUARE AND ONE ROUND SHAFT WITH KEYWAY	
059-100-2103	05 ACTUATOR, ANSI, WITH ONE SQUARE AND ONE ROUND SHAFT WITH KEYWAY	
070-100-2103	07 ACTUATOR, ISO, WITH ONE SQUARE AND ONE ROUND SHAFT WITH KEYWAY	
078-100-2103	07 ACTUATOR, DIN, WITH ONE SQUARE AND ONE ROUND SHAFT WITH KEYWAY	
079-100-2103	07 ACTUATOR, ANSI, WITH ONE SQUARE AND ONE ROUND SHAFT WITH KEYWAY	

ACTUATOR MODEL	EXTENDED SHAFT DIMENSIONS				
	A	B	φC	D	E (N9)
02	23	12.30	9.992 9.972	8.2 8.1	2.996 2.971
03	30	18.30	11.992 11.972	9.5 9.4	4.00 3.97
05	30	18.30	12.70 12.67	9.7 9.6	5.00 4.97
07	20	15.0	11.994 11.983	14.50 14.46	5.988 5.958

ISSUE
C

A. Kealy
09.03.98

KINETROL

Trading Estate Farnham Surrey England

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STAINLESS STEEL SCREWS

The table below shows those actuators and add on units which have stainless steel external fastenings.

<u>MODEL</u>	<u>ACTUATOR</u>	<u>SPRING</u>	<u>LIMIT SWITCH</u>	<u>POSITIONER</u>
0M	✓	-	-	-
01	✓	x	-	-
02	✓	x	✓	-
03	✓	✓*	✓	✓*
05	✓	✓*	✓	✓*
07	✓	✓	✓	✓*
08	x	x	✓	✓*
09	✓	✓	✓	✓*
12	✓	✓**	✓	✓*
14	✓	x	✓	✓*
16	✓	x	✓	6
18	✓	✓*	✓	-
01A	✓	x		
101	✓	✓		
14-SR-4900	✓	✓*	✓	✓*

x = not stainless steel
 ✓ = all stainless steel
 ✓* = mostly stainless steel

**Title: ACTUATOR & MODULAR ADD-ON UNIT MATERIALS
OF CONSTRUCTION & STANDARD FINISHES**

<u>PART</u> (Actuator Model No.)	<u>STANDARD</u> <u>FINISH</u>	<u>RELATED SPECIFICATIONS</u>		
		B.S. Spec.	AISI/SAE/UNS	ASTM
Actuator Casing (OM, 01, 02,03, 05, 07 09, 10, 12, 14)	Epoxy Stove Enamel	ILZRO 16		
Actuator Casing (16, 18, 20, 30)	Epoxy Stove Enamel	Aluminium Alloy LM25 to BS 1490	SAE 323	356.1
Spring Casing (02, 03, 05, 07, 08, 09, 10, 12)	Epoxy Stove Enamel	ILZRO 16		
Spring Casing (14, 16, 18, 20)	Epoxy Stove Enamel	Aluminium Alloy LM25 to BS 1490	SAE 323	356.1
Limit Switch Casing (02, 03, 05, 07, 08, 09, 10, 12, 14, 16, 18, 20, 30)	Epoxy Stove Enamel	MAZAK 3 S 1004A	SAE 903	AG40A
Positioner Casing (AP & EL)	Epoxy Stove Enamel	ILZRO 16		
EHD Control Box Hydraulic Pump & Motor	Epoxy Stove Enamel	ILZRO 16		
Vane (07, 08, 09, 10, 12, 16, 18, 20, 30)	Zinc Plate	S.G.Iron BS 2789:1985 410/12	-	A536-711
Vane (14)	Zinc Plate	600/3	-	65-45-12
Vane (OM, 01, 02, 03, 05)	-	13% Cr. Steel BS 3146:1975 TYPE ANC 1 Grade B	SAE 410	100-70-03
Couplings	Zinc Plate	080M15	SAE 1016	-
Side Plates (01, 08, 16, 18, 20, 30)	Epoxy Stove Enamel	220M07	SAE 1109	-
Side Plates (02, 03, 05, 07, 09,10,12,14)	-	Moulded – Glass Filled Nylon 66		
Side Plate (OM)	-	ILZRO 16		
Seal Expanders	-	302S25	AISI 302	-
Clock Type Spring	-	CS 80 to BS 1449	SAE 1074/1080	-

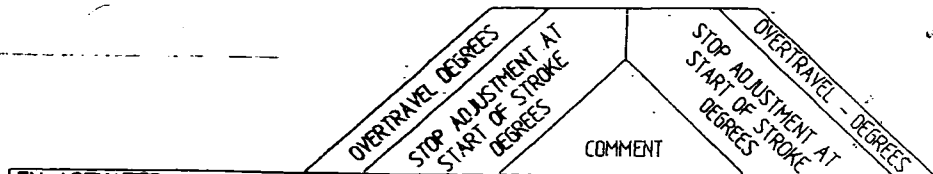
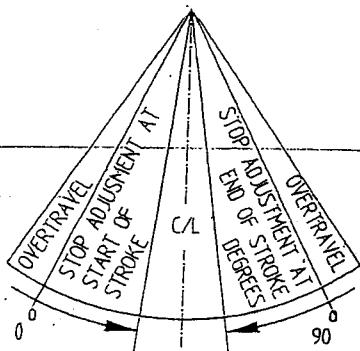
Issue	Signed	Date	KINETROL Trading Estate Farnham Surrey England	Doc.No. TD14
E	<i>Rec</i>	20/10/03		Page 1 of 2

**Title: ACTUATOR & MODULAR ADD-ON UNIT MATERIALS
OF CONSTRUCTION & STANDARD FINISHES**

<u>PART</u> (Actuator Model No.)	<u>STANDARD</u> <u>FINISH</u>	<u>RELATED SPECIFICATIONS</u>		
		B.S. Spec.	AISI/SAE/UNS	ASTM
Vane Seals (Std.) (High Temp.)	-	Polyurethane Viton		
Shaft Seals (Std.) (High Temp.)	-	NBR Viton		
Override Square (L/Switches 05, 07, 08, 09, 10,12,14,16,18, Spring Returns, 02, 03,05, 07, 09 and EHD)	Zinc Plate	220M07		
Override Square (L/Switches 02, 03, Spring Returns 01, 08, 12,14,16,18)	Zinc Plate	080M15	SAE 1016	
Actuator Case Screws	-	BS 6105 Stainless Steel		
Actuator Bearing (all actuators except OMO)	-	DU Bushes		
Spring Return Bushes (all sizes except 02)	-	DU		
Spring Return Bushes (02 & OMO actuator bearing)	-	Plastic - Delrin		
Din Flange	Epoxy Stove Enamel	ILZRO		
Din Flange Fixing Screws	Zinc Plate	High Tensile Steel		
Positioner Indicator	-	Glass filled Nylon 66		
Namur Adaptor	Epoxy Stove Enamel	ILZRO 16		
ISO Adaptor	Epoxy Stove Enamel	ILZRO 16		
Position Monitor – Std. – Chemically resistant	- -	Polycarbonate Polyurethane		
K-Box – casing	Epoxy Stove Enamel	Aluminium Alloy LM25 to BS1490		
– handwheel (sizes 05, 07, 09, 10 & 12)	Epoxy Stove Enamel	Aluminium Alloy LM25 to BS1490		
– handwheel (size 14)	Epoxy Stove Enamel	Low Carbon Steel		
– input shaft	Zinc Plate	212A42 (EN8) to BS970		
– output shaft	Zinc Plate	Low Carbon Steel		

Issue E	Signed <i>RCC</i>	Date 20/10/03	KINETROL	Trading Estate Farnham Surrey England	Doc.No. TD14
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ACTUATOR STOP CHART



	OVERTRAVEL DEGREES	STOP ADJUSTMENT AT START OF STROKE DEGREES	COMMENT	STOP ADJUSTMENT AT END OF STROKE DEGREES	OVERTRAVEL - DEGREES
0M ACTUATOR STOP SCREW M3 x 12	5	0 - 5	STANDARD	85 - 90	5
01A ACTUATOR STOP SCREW M3,5 x 20	5	0 - 6	STANDARD	84 - 90	5
STOP SCREW M3,5 x 25	5	0 - 15	(60-90 about C/L)	75 - 90	5
STOP SCREW M3,5 x 30	5	0 - 25	(40-90 about C/L)	65 - 90	5
02 ACTUATOR STOP SCREW M4 x 20	5	0 - 5	STANDARD	85 - 90	5
STOP SCREW M4 x 25	5	0 - 13		77 - 90	5
STOP SCREW M4 x 30	5	0 - 20	(50-90 about C/L)	70 - 90	5
STOP ASSY 68-000-019+		20 - 37	(16-50 about C/L)	53 - 70	
STOP ASSY 68-000-020+		32 - 47	(0-26 about C/L)	43 - 58	
STOP ASSY 68-000-044+		22.5 - 32.5	(45-65 about C/L)	67.5 - 57.5	
03 ACTUATOR STOP SCREW M5 x 25	5	0 - 5	STANDARD	85 - 90	5
STOP SCREW M5 x 30	5	0 - 11	(78-90 about C/L)	79 - 90	5
STOP SCREW M5 x 35	5	0 - 17	(56-90 about C/L)	73 - 90	5
STOP ASSY 78-000-022+		9 - 28	(34-72 about C/L)	62 - 81	
STOP ASSY 78-000-023+		27 - 46	(0-36 about C/L)	44 - 63	
05 ACTUATOR STOP SCREW M5 x 25	5	0 - 3	STANDARD	87 - 90	5
STOP SCREW M5 x 30	5	0 - 8	(74-90 about C/L)	82 - 90	5
STOP SCREW M5 x 35	5	0 - 13	(64-90 about C/L)	77 - 90	5
STOP SCREW M5 x 40	5	0 - 19	(52-90 about C/L)	71 - 90	5
STOP SCREW M5 x 45	5	0 - 26	(38-90 about C/L)	64 - 90	5
STOP ASSY 19-000-064+		11 - 35	(20-68 about C/L)	55 - 79	
STOP ASSY 19-000-068+		30 - 46	(0-30 about C/L)	44 - 60	
07 ACTUATOR STOP SCREW M6 x 35	5	0 - 5	STANDARD	85 - 90	5
STOP SCREW M6 x 50	5	0 - 16	(58-90 about C/L)	74 - 90	5
STOP ASSY 65-000-061+		0 - 20	(50-90 about C/L)	70 - 90	
STOP ASSY 65-000-056+		18 - 28	(34-54 about C/L)	62 - 72	
STOP ASSY 65-000-058+		30 - 46	(0-30 about C/L)	44 - 60	
08 ACTUATOR STOP SCREW M6 x 35	1.5	0 - 9	STANDARD	81 - 90	1.5
STOP SCREW M6 x 40	1.5	0 - 12	(66-90 about C/L)	78 - 90	1.5
STOP SCREW M6 x 50	1.5	0 - 19	(52-90 about C/L)	71 - 90	1.5
STOP SCREW M6 x 55	1.5	0 - 22.5	(45-90 about C/L)	67.5 - 90	1.5
STOP ASSY 11-000-607+	1.5	32 - 46	(0-26 about C/L)	44 - 58	
09 ACTUATOR STOP SCREW M6 x 40	5	0 - 5	STANDARD	85 - 90	5
STOP SCREW M6 x 60	5	0 - 15	(60-90 about C/L)	75 - 90	5
STOP ASSY 64-000-058+		0 - 20	(50-90 about C/L)	70 - 90	
STOP ASSY 64-000-027+		12.5 - 27.5	(35-65 about C/L)	62.5 - 77.5	
STOP ASSY 64-000-063+		25 - 46	(0-40 about C/L)	44 - 65	
10 ACTUATOR STOP SCREW M8 x 45	5	0 - 6	STANDARD	84 - 90	5
STOP SCREW M8 x 60	5	0 - 15	(60-90 about C/L)	75 - 90	5
STOP ASSY 88-000-051+		0 - 30	(30-90 about C/L)	60 - 90	
STOP ASSY 88-000-047+		20 - 30	(30-50 about C/L)	60 - 70	
12 ACTUATOR STOP SCREW M10 x 55	6	0 - 5	STANDARD	85 - 90	6
STOP SCREW M10 x 70	6	0 - 11	(78-90 about C/L)	79 - 90	6
STOP ASSY 46-000-039+		3 - 21	(48-84 about C/L)	69 - 87	
STOP ASSY 46-000-040+		20 - 32	(26-50 about C/L)	58 - 70	
STOP ASSY 46-000-059+		35 - 45	(0-20 about C/L)	45 - 55	
14 ACTUATOR STOP SCREW M10 x 55	1.5	0 - 6	STANDARD	84 - 90	1.5
STOP SCREW M10 x 80	1.5	0 - 12.5	(78-90 about C/L)	77.5 - 90	1.5
STOP SCREW M10 x 100	1.5	0 - 20	(50-50 about C/L)	70 - 90	1.5
STOP ASSY 27-000-036+		2.5 - 17.5	(55-85 about C/L)	72.5 - 87.5	
STOP ASSY 27-000-037+		15 - 30	(30-60 about C/L)	60 - 75	
STOP ASSY 27-000-038+		22.5 - 37.5	(15-45 about C/L)	52.5 - 67.5	
16 ACTUATOR STOP SCREW M16 x 100	5	0 - 5	STANDARD	85 - 90	5
STOP SCREW M16 x 160	5	0 - 13	(54-90 about C/L)	67 - 90	5
18 ACTUATOR STOP SCREW M20 x 150	5	0 - 5	STANDARD	85 - 90	5

NOTE:

To provide asymmetrical travel about C/L - for a particular actuator any stop on one side of the C/L can be specified with any stop on the other side of the C/L.

Suffix + represents one stop only.

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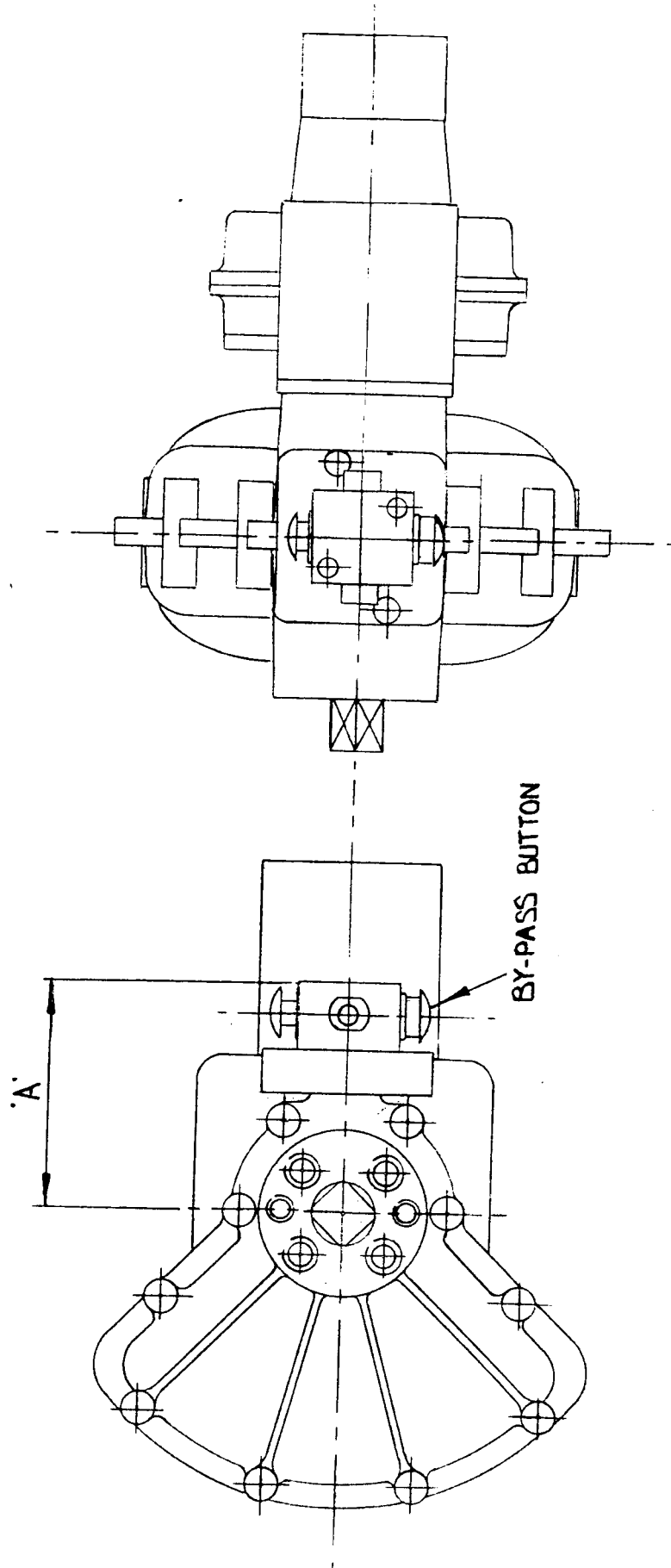
ISSUE	AJK.	KINETROL Trading Estate Farnham Surrey England	SHEET No.
F	13-12-01		TD 15

Title: Results of operating time tests with Namur Valves

ACTUATOR MODEL	RGS NEPA 125/18 WP		HONEYWELL LUCIFER 341 L 95 34		JOUCOMATIC 55190087	
	NO LOAD	50% LOAD	NO LOAD	50% LOAD	NO LOAD	50% LOAD
05	0.36s		0.35s			
07	0.62s		0.57s			
09	1.17s		1.06s		0.95s	
12	2.42s		2.21s		1.98s	
14	6.65s		5.84s			

TRAVEL TIMES MEASURED FROM SOLENOID SIGNAL ON TO END OF STROKE.

Title: Manual By-Pass Valve for EH Actuator installation



MODEL	03	05	07	09	12	14
DIM 'A'		82	92	104	117	133

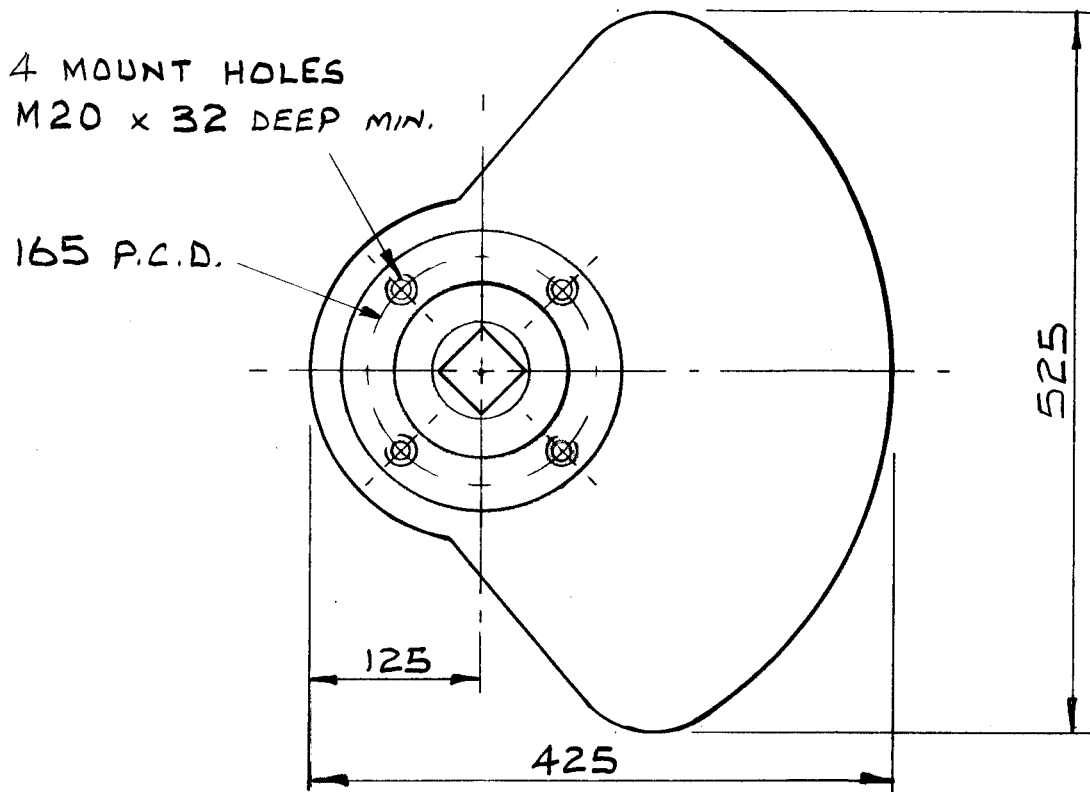
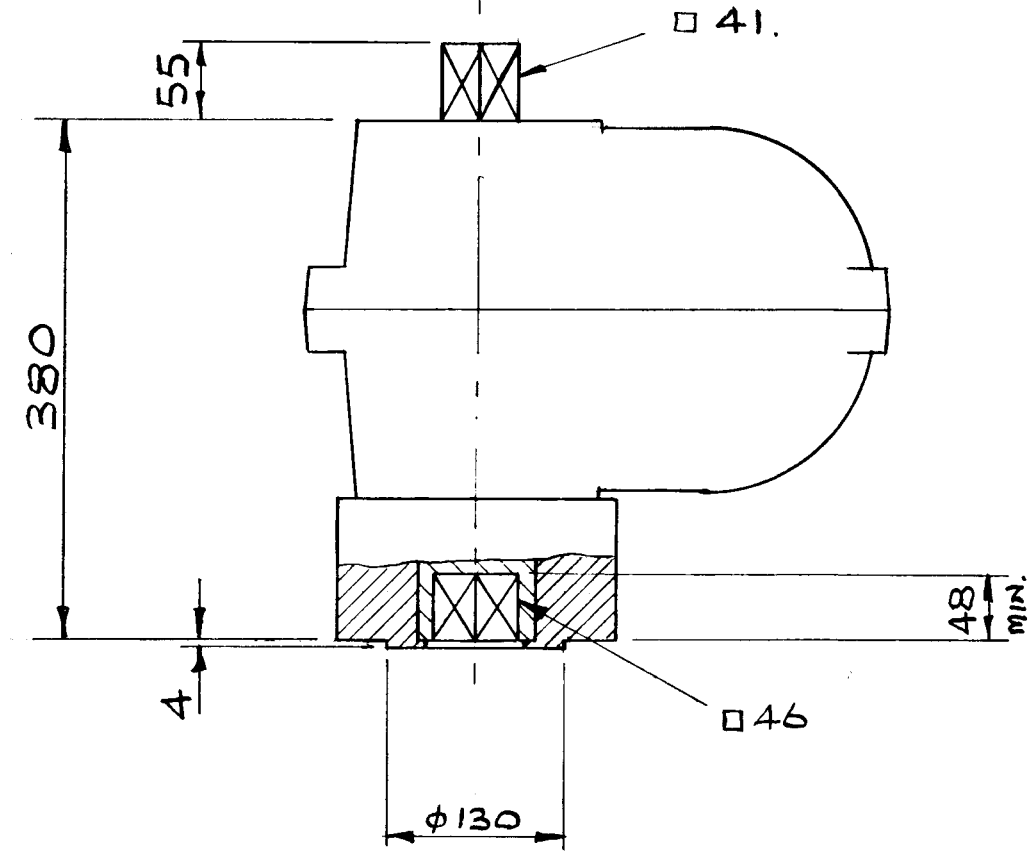
ISSUE
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Title: Model 16 Actuator with F16 DIN Flange



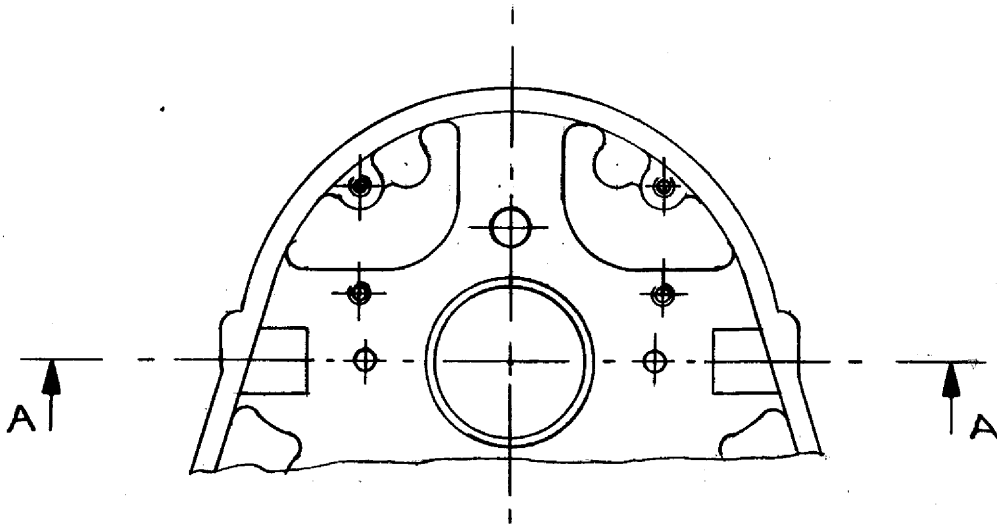
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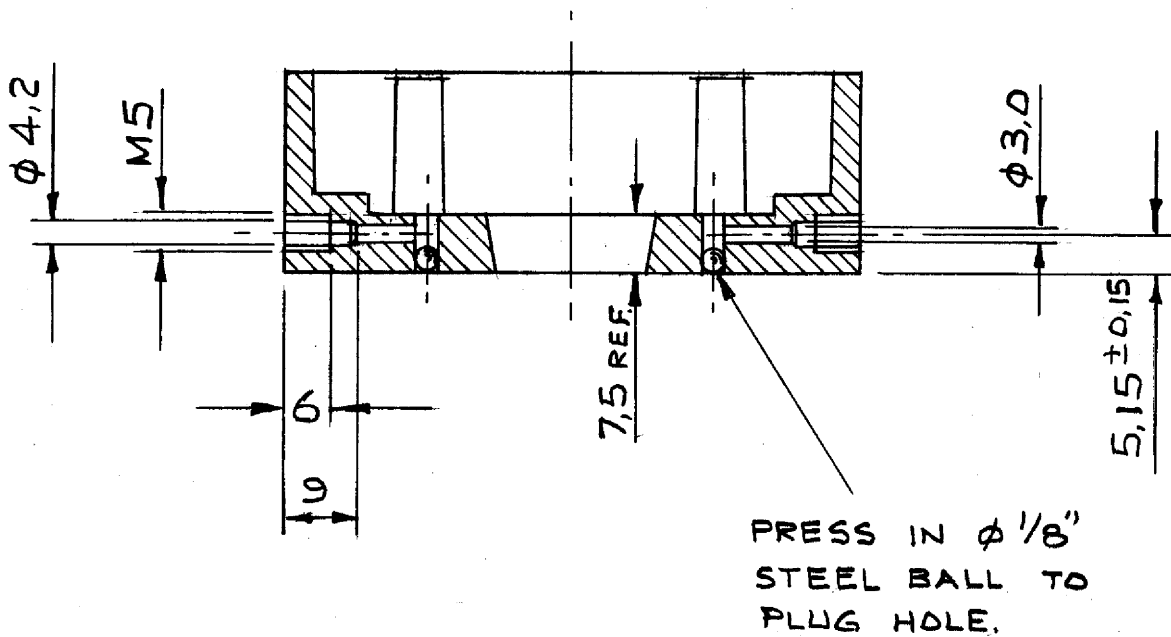
KINETROL Trading Estate, Farnham, Surrey, England

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Title: Drilling detail for M5 side ports in 05 and 07 positioner boxes

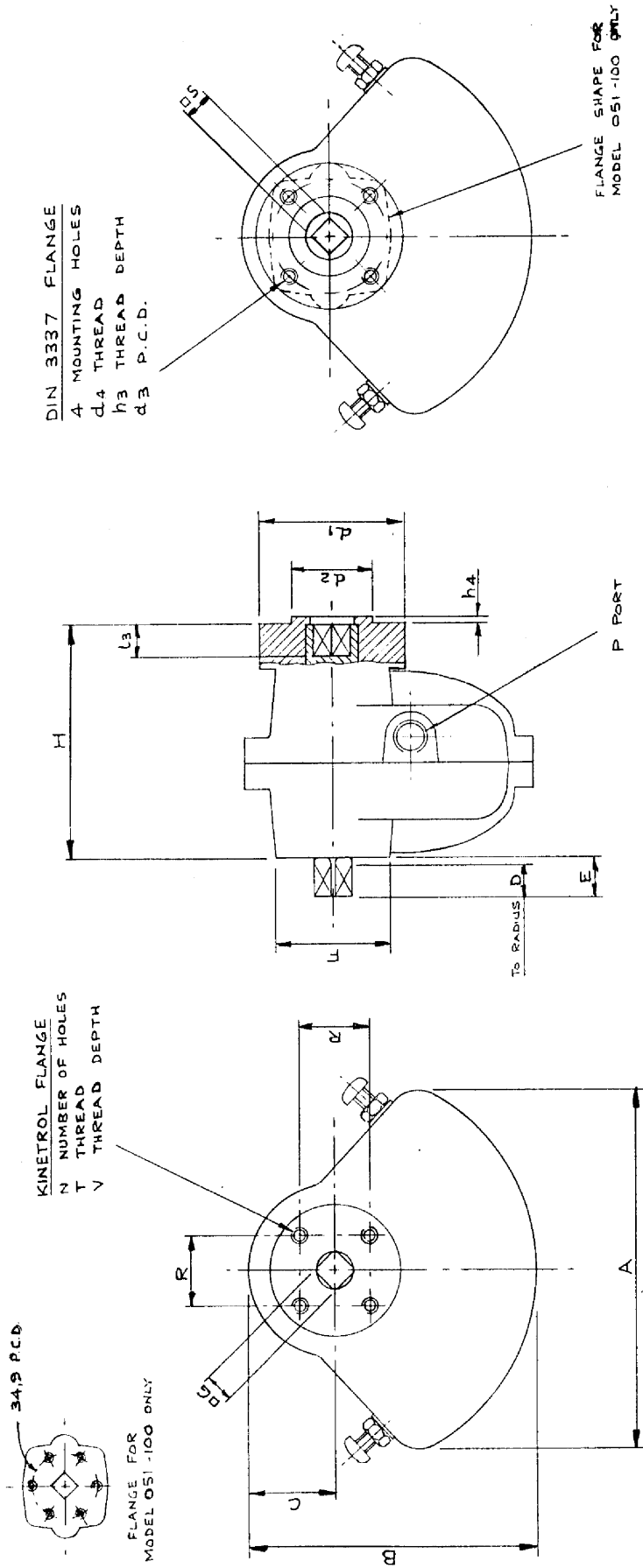


SCRAP VIEW OF 05 BOX



SECTION 'A-A'

Title: Kinetrol ISO/DIN Female drive actuators



MODEL	A	B	C	D	E	F	G	H	R	N	T _{ISO}	V	P PORT	DIN FLANGE No.	d5 (H11)	d1	d2 (f8)	d3	d4	h3 MIN.	h4	L3 MIN.	L4
031-100	113	91	27.5	10.5	12	33.6	8.98 8.93	74	22	4	M5	10	G 1/8	F03	9	46	25	36	M5	8	2	10	10
051-100	136	112	33.6	11	13	45	9.53 9.47	81	—	6	M5	10	G 1/8	F04	11	54	30	42	M5	8	2	12	12
071-100	178	146.5	43.4	18	20	64	15.98 15.93	117	36	4	M8	16	G 1/4	F05	14	64	35	50	M6	10	3	16	16
091-100	226	187	54.7	23.5	26	84	18.98 18.93	146	46	4	M10	20	G 1/4	F07	17	90	55	70	M8	13	3	19	19
121-100	294	239	68	27	31	100	24.98 24.93	180.5	55	4	M12	24	G 3/8	F10	22	125	70	102	M10	16	3	24	24
141-100	353	306	84	34	36	127	28.98 28.93	226.5	63.85	4	M16	28.5	G 1/2	F12	27	150	85	125	M12	20	3	29	29
161-100	525	425	125	49	55	200	40.98 40.87	380	108	4	M24	38	G 1/2	F16	46	203	130	165	M20	32	4	48	48

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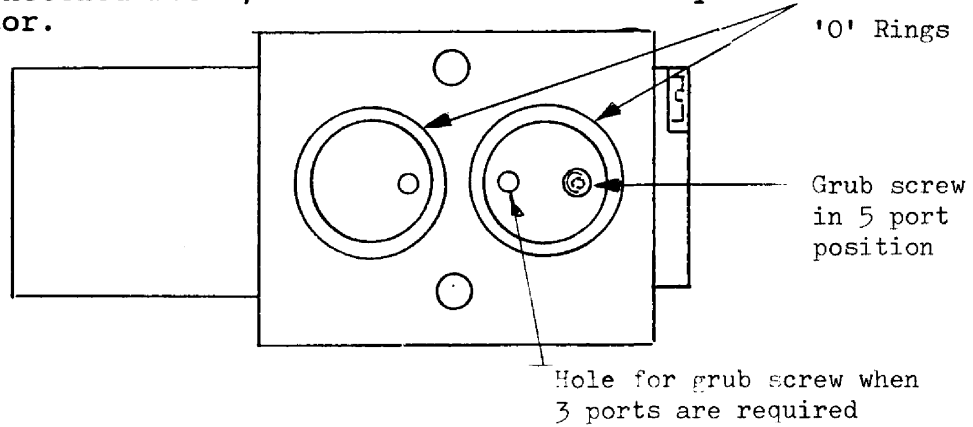
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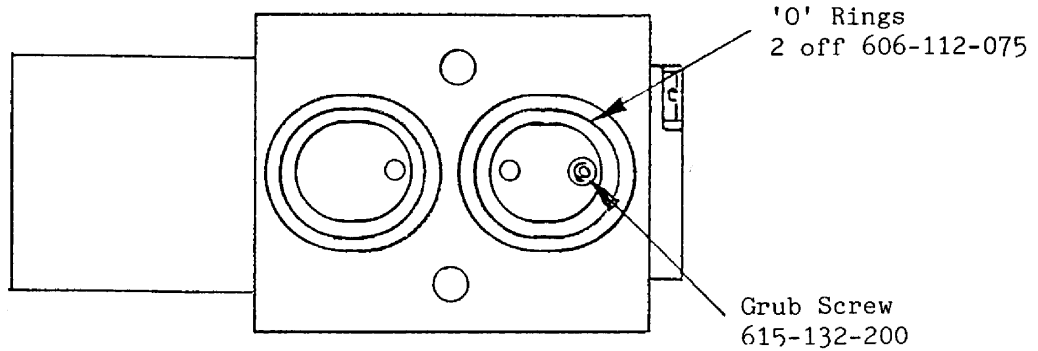
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Title: Fitting RGS Solenoid valves to Kinetrol Namur adaptors

The original RGS Namur Standard Solenoid with 'O'rings and grub screw, as sketched below, could be fitted directly to the KINETROL Namur Adaptor.

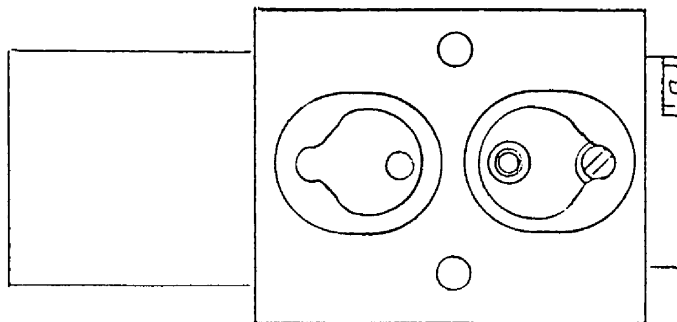


An 'Interim' RGS type has been manufactured with flat oval seals and hexagon headed screw. This has to be adapted to fit the KINETROL Namur Adaptor. First remove the headed screw and replace with a grub screw which should be sealed in position.



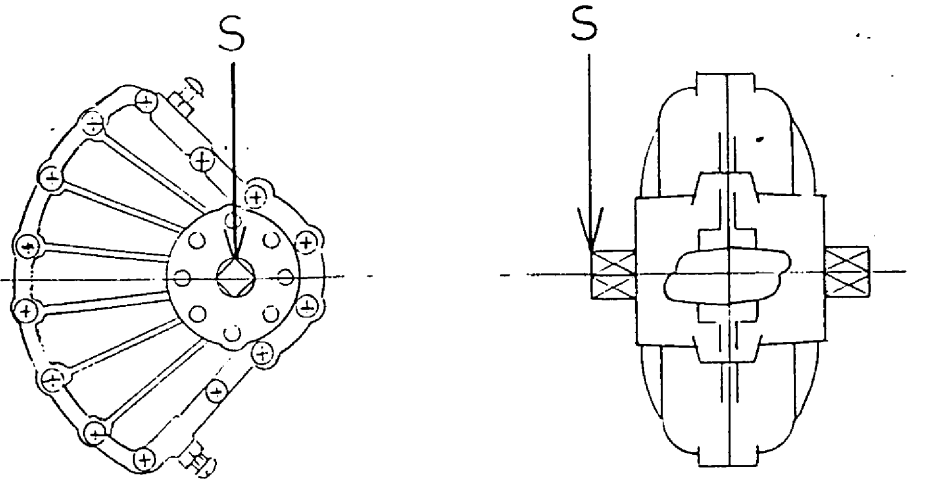
Then fit two additional 'O'rings inside the flat oval seals.

The final RGS solenoid has flat seals as shown below and this version fits directly without any modification.



NOTE: Grub screw shown in 5 port position - move grub screw to other hole when 3 port operation is required.

Title: Maximum permissible side loads for Kinetrol actuator shafts



Sideload S must not act at a point beyond end of square.

ACTUATOR MODEL	MAXIMUM S		
	N	lb	kg
OMO	23	5	2,2
02	250	55	25
03	400	90	40
05	450	100	45
07	1000	220	100
08	800	180	80
09	1600	360	160
12	2600	580	260
14	4100	920	410
16	5900	1300	590
18	15000	3300	1500

Title: Results of operating time tests with RGS valves-bkt mounted

ACTUATOR MODEL		DOUBLE ACTING				SPRING RETURN			
		SOLENOID VALVE TYPE AND SIZE	TIME FOR TRAVEL		SOLENOID VALVE TYPE	TIME FOR TRAVEL		50% LOAD	
			NO LOAD	50% LOAD MEASURED		NO LOAD	AIR SPRING		
020	RGS 1/8" BSP EPA125/18/M3067	0.03s	0.1s	RGS 1/8" BSP EP100/MO/WP	0.1s	0.4s			
030	RGS 1/8" BSP EPA125/18/M3067	0.11s	0.2s	RGS 1/8" BSP EP100/MO/WP	0.3s	0.8s			
050	RGS 1/8" BSP EPA125/18/M3067	0.2s	0.34s	RGS 1/8" BSP EP/100/MO/WP	0.4s	1.4s			
070	RGS 1/8" BSP EPA125/18/M3067	0.5s	0.9s	EP123/18/WP/MO	0.4s	0.5s			
080	RGS 1/8" BSP EPA125/18/M3067	0.7s	1.3s	EP123/18/WP/MO	0.6s	0.6s			
090	RGS 1/8" BSP EPA125/18/M3067	1.0s	1.7s	EP123/18/WP/MO	0.8s	0.9s			
100	RGS 1/8" BSP EPA125/18/M3067	1.14s	1.93s	EP123/18/WP/MO	1.02s	1.6s	2.12s	2.37s	
120	RGS 1/4" BSP EPA255/181/SB	0.9s	1.6s	EPA253/180	1.2s	0.7s			
140	RGS 1/4" BSP EPA255/181/SB	2.1s	4.0s	EPA253/180	3.6s	1.5s			
160	RGS 1/2" BSP	1.6s	2.6s						

Travel times measured from Solenoid signal on to end of stroke.

RCN 11/84

**ISSUE
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**AJK
09/08/93**

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Doc.No.TD 29
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**Title: Results of operating time tests with RGS valve integral mounted-Namur
(based on report No. 48 23-5-90)**

DOUBLE ACTING		SPRING RETURN							
ACTUATOR MODEL	SOLENOID VALVE TYPE	TIME FOR TRAVEL		ACTUATOR MODEL	TIME FOR TRAVEL				
		NO LOAD ENERGISE	50% LOAD ENERGISE		NO LOAD AIR SPRING	50% LOAD AIR SPRING	PSI		
030-100	RGS NEPA 125/18 WP (652-064)	0.13	0.23	030-120	0.13	0.13	0.24	0.24	
050-100		0.27	0.49	050-120	0.19	0.27	0.34	0.49	
070-100		0.67	1.3	070-120	0.55	0.78	0.99	1.4	
090-100		1.4	2.4	090-120	-	-	-	-	80
100-100		1.38	2.43	100-120	1.09	1.68	2.24	2.55	
120-100		2.6	4.7	120-100	2.0	3.4	3.6	6.1	
140-100		6.1	11.0	140-100	4.4	8.2	7.9	14.8	
				140-120-4900	4.8	8.5	8.7	15.3	45.5
			140-120-4900	4.6	8.2	8.3	14.8	60	

**ISSUE
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08/08/93**

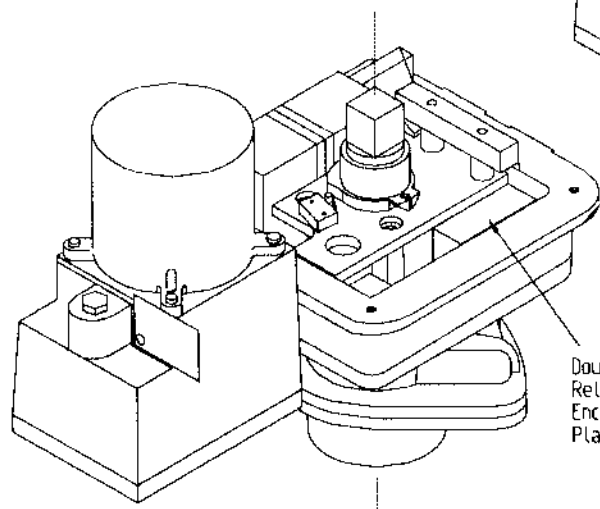
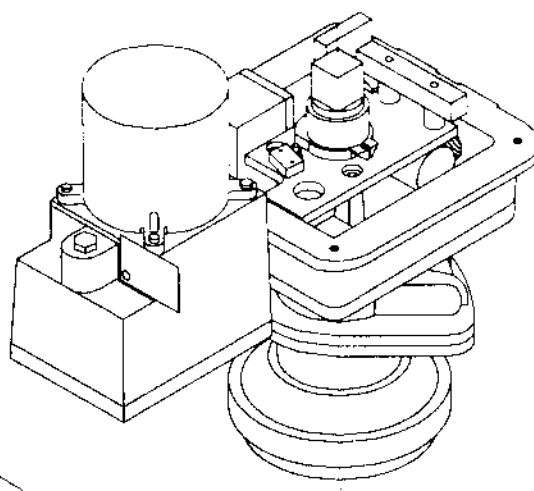
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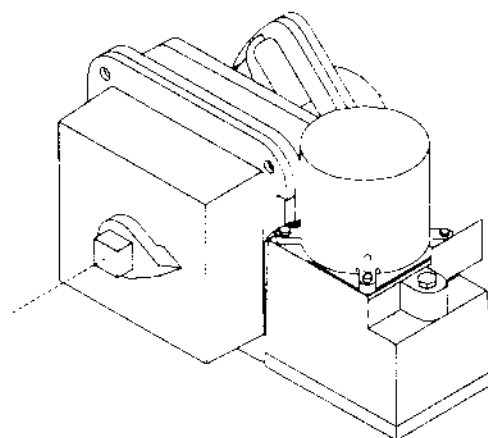
Operating Instructions for EHD Electrohydraulic 1/4 Turn Actuators

BASIC SPRING RETURN EHD
WITH CONTROL BOX LID REMOVED
PUMP SET FOR VERTICAL AXIS



Double Acting
Relay Circuit
Enclosed in
Plastic Box

BASIC DOUBLE ACTING EHD
WITH CONTROL BOX LID REMOVED
PUMP SET FOR VERTICAL AXIS



DOUBLE ACTING EHD WITH
CONTROL BOX LID IN PLACE
PUMP SET FOR HORIZONTAL AXIS

Contents

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Page 15	Inspection, Maintenance and Troubleshooting



Preparation for Use

Key to Exploded Diagram on Page 3

1 - Pump/Reservoir Unit	8 - Limit Switch Plate	14 - External Connector Block
2 - Vent Plug	9 - Fuse Board Mount Assembly	15 - Connector Number Plate
3 - Filler Plug	10 - Limit Switch	16 - Connector Block Support Pillars
4 - Pump Motor	11 - Limit Switch Striker	17 - Motor Capacitor
5 - Control Box Body	12 - Control Box Lid	18 - Limit Switch Mounting Pillars
6 - Solenoid Valve	13 - External Indicator	19 - Spring Return Vane Actuator
7 - Limit Switch Shaft		

Numbers in brackets refer to the exploded diagram on page 3.

Before mounting the actuator, check that pump/reservoir orientation is correct.

The EHD actuator can be used with its output axis oriented horizontally or vertically - see page 1 for illustrations of these two options. The pump/reservoir unit (1) however must be oriented with the motor (4) above the pump (1). In order to achieve this, the interface between the pump (1) and the control box (5) is rotationally adjustable at 90 degree intervals. The actuator should have been ordered with the interface adjusted to suit the user's application - however, if necessary the orientation can be changed to suit a different axis requirement.

In order to rotate the pump-to-control box interface, carry out the following steps:

1. Read through the following procedure and assemble the necessary tools, tubes, containers etc.
2. Support the whole actuator with the pump filler pointing upwards.
3. Unscrew the filler plug (3) - put both it and its sealing ring somewhere safe ready to be re-used later.
4. Drain the oil from the reservoir (1) into a clean container about 500ml (1 pint) in capacity.
Syphoning with a U-shaped plastic tube works well here - start the flow by sucking with a squeeze bottle. About 270 ml of oil should come out. Don't lose any oil, because you need to pour it back in again later.
5. Remove the external indicator (13) and the control box lid (12).
6. Remove the four M6 socket head screws holding the pump (1) to the control box (5). As these screws are loosened, support the pump body and don't let it move much relative to the control box flange, because the wires to the pump motor pass through the middle of this interface, and will be damaged or sheared off if much movement occurs. A small amount of oil may drop from the interface at this point.
7. Rotate the pump relative to the control box as required - again, take care not to damage or shear off the wires through the middle during this process. Refit the M6 screws and tighten in place.
8. Rotate the whole actuator so that the filler hole again points upwards, and support it in this position.
9. Pour back the oil and replace the filler plug plus the sealing ring - note that the sealing ring is vital to keep dust and water out of the reservoir.

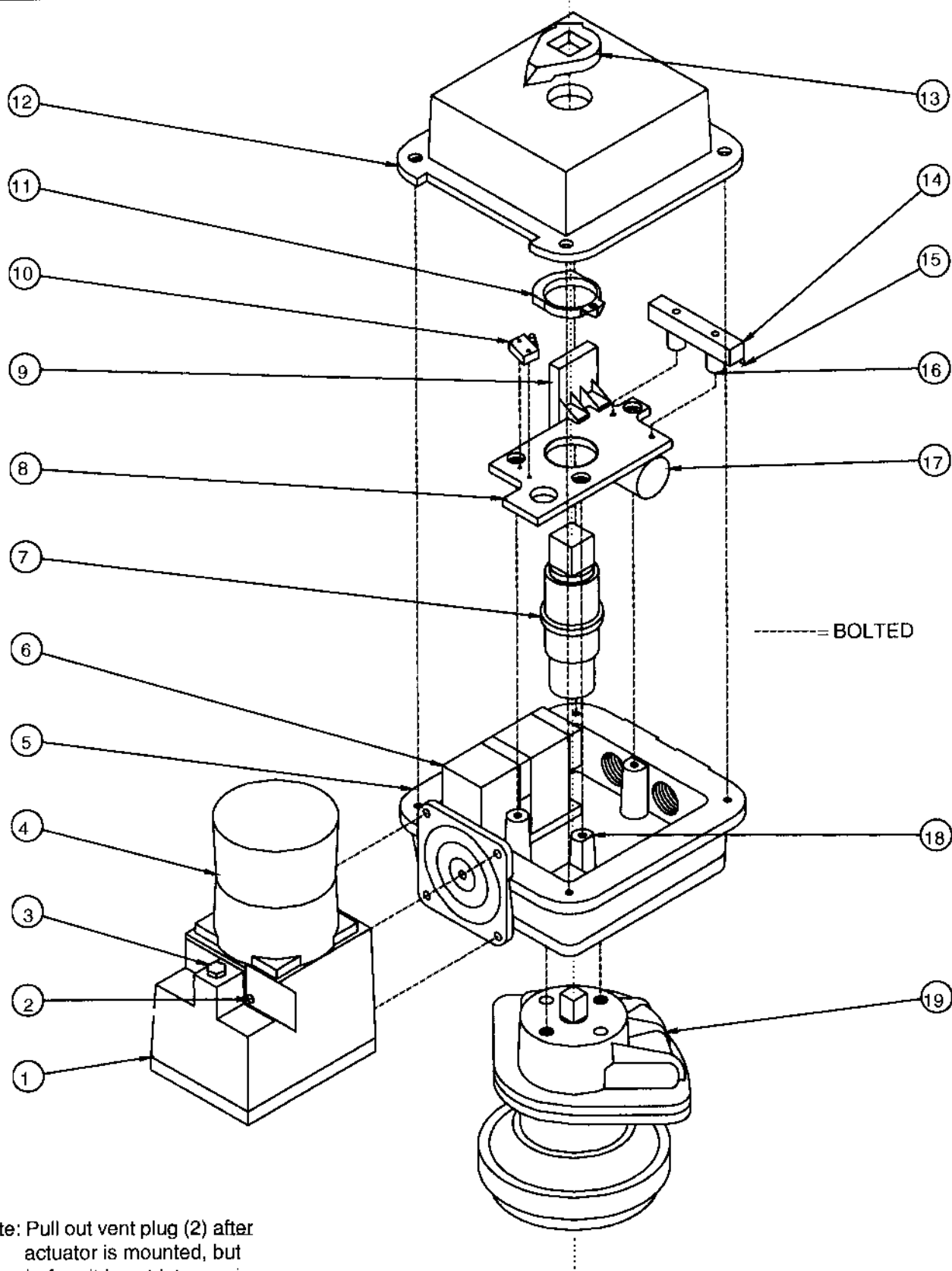
ABSOLUTE CLEANLINESS OF OIL IS ESSENTIAL FOR RELIABLE PERFORMANCE.

IF ANY EXTRA OIL IS ADDED AT ANY TIME IN THE ACTUATOR'S LIFE, USE ONLY 50cSt SILICONE FLUID - UNLESS PURCHASED AS A SILICONE FREE UNIT IN WHICH CASE USE ENERGOL OIL HLP-HM32.
These fluids are available from Kinetrol.

AFTER mounting the actuator, but BEFORE running it, pull out the vent plug (2). The vent plug is fitted only to prevent loss of fluid while the actuator is in transit - once the actuator is in its fixed position, this plug must be removed. If the vent plug is left in during extended running, thermal expansion and contraction of the fluid can damage the actuator.



Exploded Diagram - Base SR Model



Note: Pull out vent plug (2) after actuator is mounted, but before it is put into service.



External Wiring Connections

WIRING CONNECTIONS - ALL MODELS

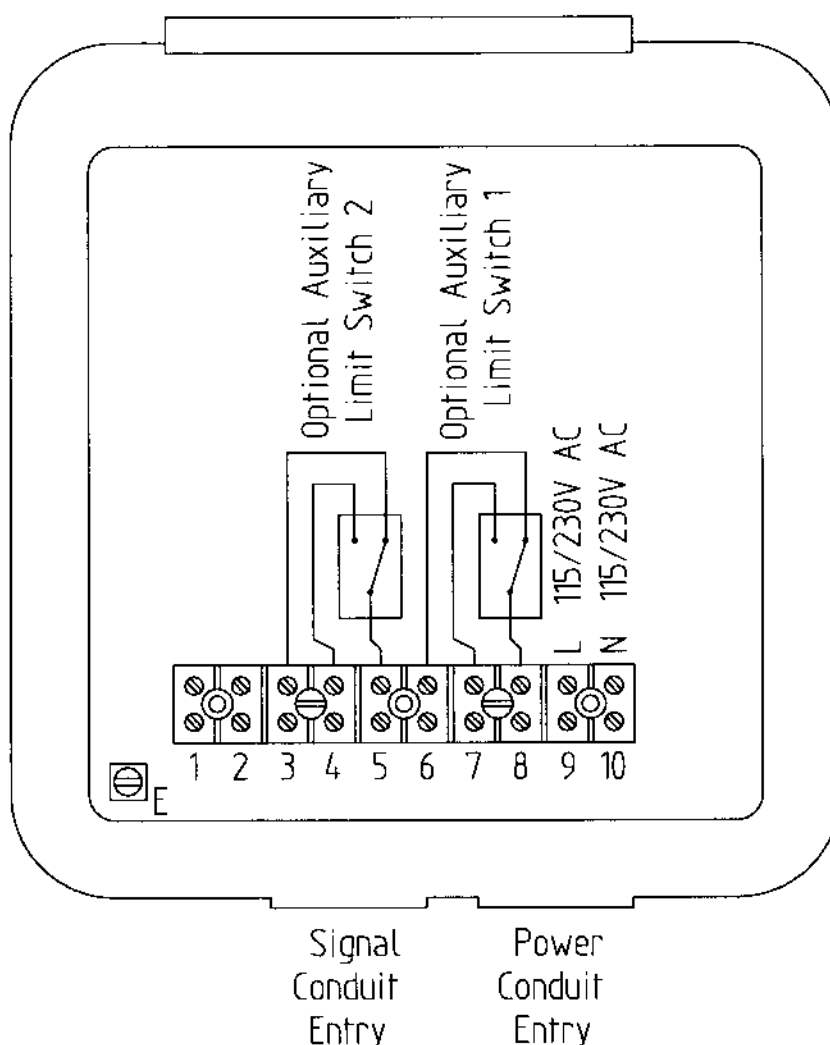
Wiring conduits with the required degree of environmental protection should be connected to the threaded conduit entry holes in the actuator control box. If the signal port is not being used, then it must be blocked using the plug supplied with all units except positioner models.

Access to the connector block is obtained by removing the external indicator and the control box lid, which is held on by four M4 slot headed screws.

BEFORE REMOVAL OF THE LID, ENSURE THAT POWER HAS BEEN DISCONNECTED

When wiring is complete, examine the sealing flange face of the control box to make sure no wires (either internal or external) can become trapped when the lid is replaced, and also make sure that the O ring is properly positioned in its groove.

Spring Return On/Off EHD Wiring Connections Top View of Control Box with Lid Off



IMPORTANT

The terminal fixed to the control box casting, labelled "E" on the diagram, must be connected to an earth or ground line.

All live supply lines, labelled "L" on the diagram, must be fitted with 2A fuses external to the EHD Actuator.

All EHD models fall into one of four groups for wiring purposes:

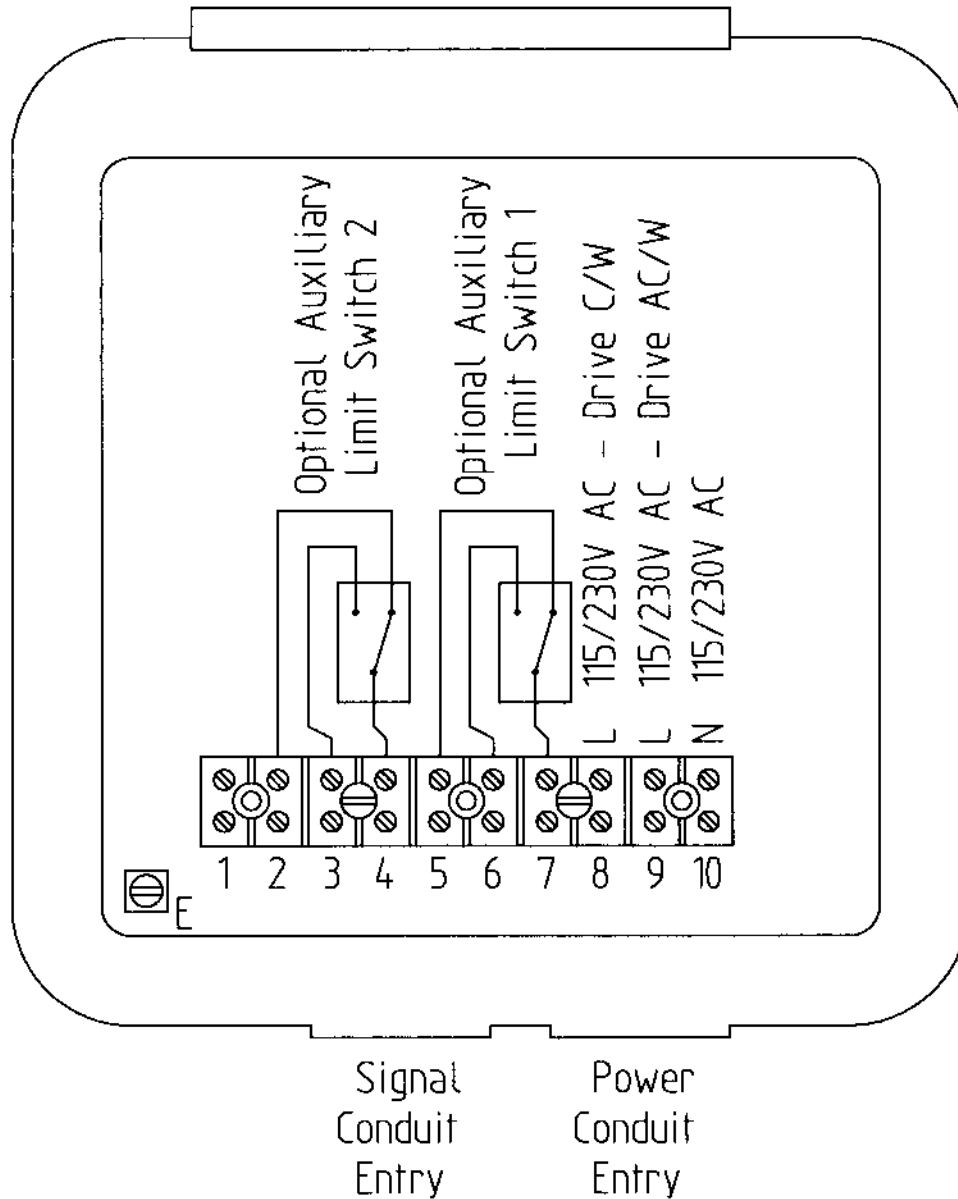
- (1) Spring Return On/Off
- (2) Double Acting On/Off
- (3) Positioners
- (4) Direct Switched SR

Diagrams showing external wiring connector identities for these groups follow on pages 4 to 7.



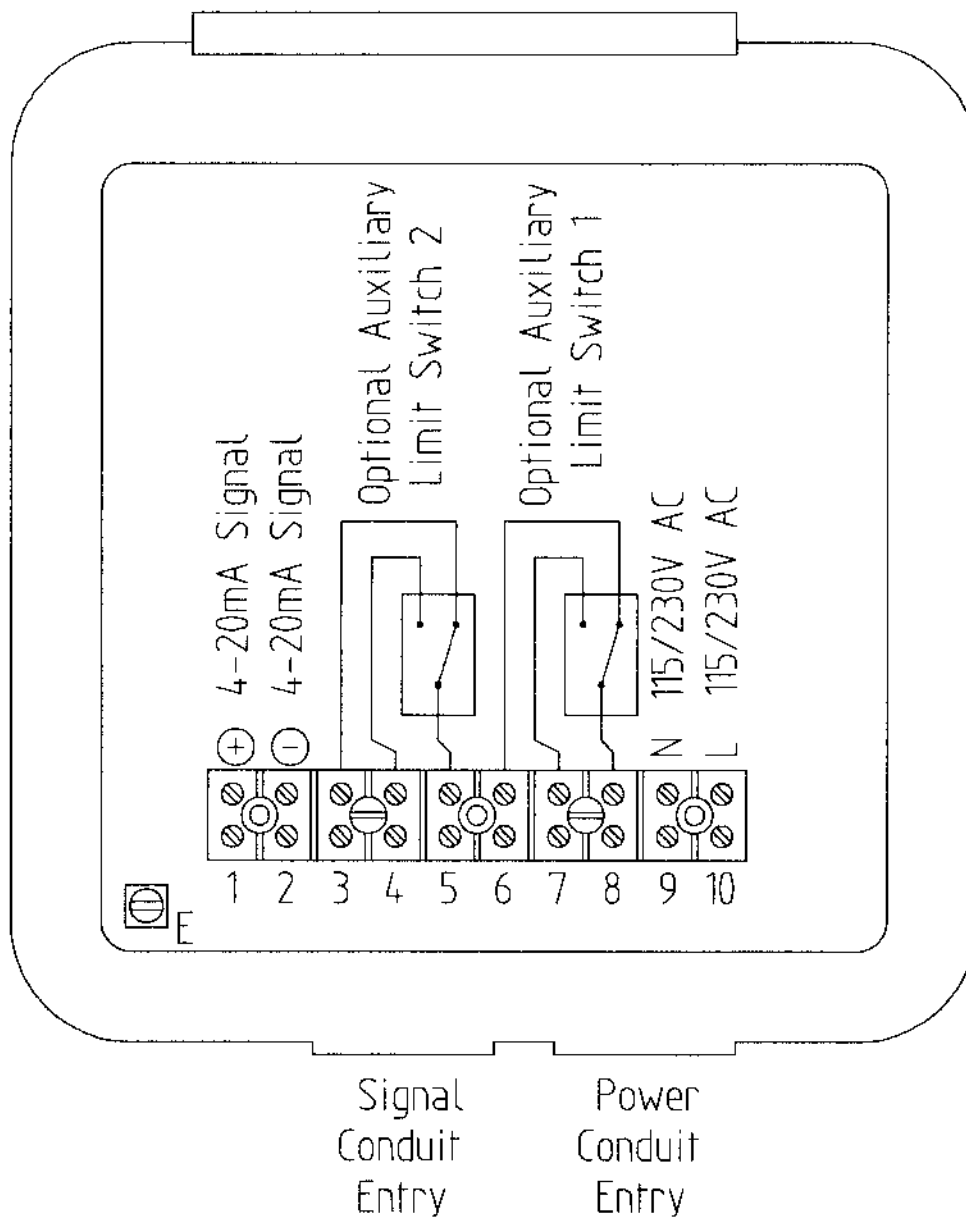
Wiring Connections - DA On/Off Models

Double Acting On/Off EHD Wiring Connections
Top View of Control Box with Lid Off



Wiring Connections - Positioner Models

Positioner EHD Wiring Connections
Top View of Control Box with Lid Off

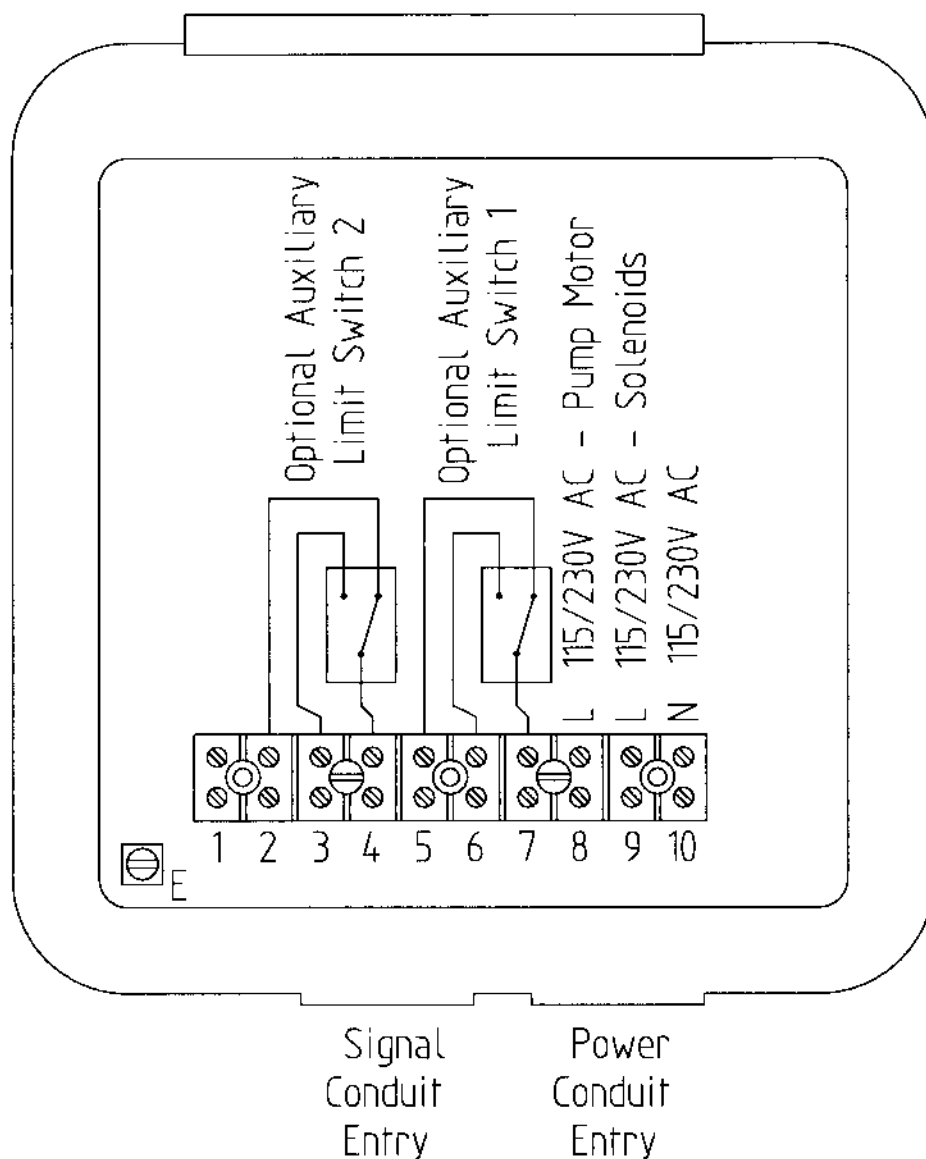




Wiring Connections

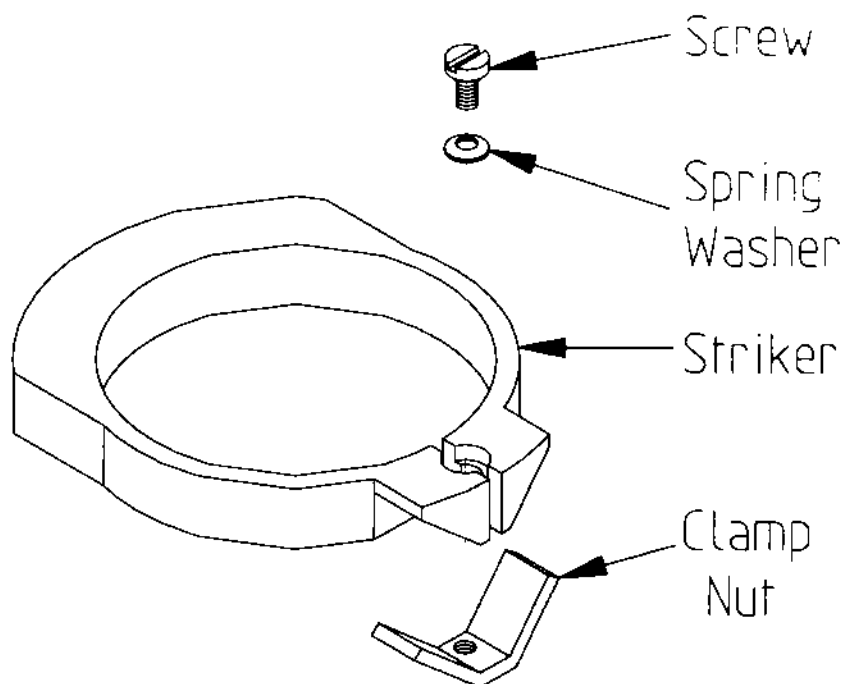
Direct Switched Spring Return Models

Direct Switched Spring Return EHD Wiring Connections
Top View of Control Box with Lid Off





Limit Switch Adjustment



Limit Switch Striker Assembly

Disconnect power before adjusting limit switch strikers.

The one or two limit switches at the bottom of the stack (one for spring return units, two for double acting units) are the actuator travel limit switches, with strikers factory-set to stop the actuator just before the actuator's mechanical endstop is reached. These switches can be adjusted by the user to limit travel as required - however, care should be taken to avoid leaving the actuator motor driving against its own endstop, or against the load's travel limit.

Any further limit switches are optional auxiliary switches to allow the user to signal position as required.

The bottom switch should be adjusted first, then the next one up, etc., so that for each one the clamp screw is not obscured by a cam which has already been set.

To set a cam, first slacken its clamp screw using a slot headed screwdriver, without completely undoing it and letting the clamp nut drop off underneath. Rotate the cam into position on the shaft, and re-tighten the clamp screw.



Fuses and Internal Connections

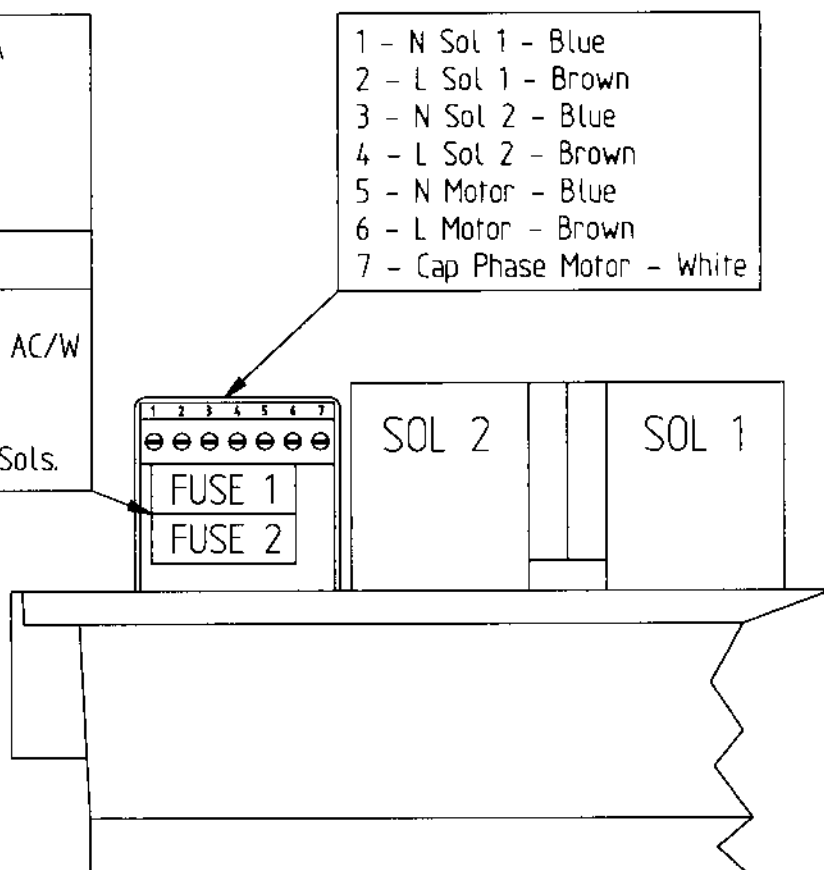
Fuses – 20mm Quick Blow Type 2A
 Held in plastic insert – to remove
 pull towards you on this view
 Function of fuse depends
 on model as follows:

MODEL	FUSE 1	FUSE 2
SR ON/OFF	In Use	Spare
DA ON/OFF	In Use C/W	In Use AC/W
SR POS'NER	Spare	In Use
DA POS'NER	In Use	Spare
DIRECT SW.	In Use Pump	In Use Sols.

- 1 – N Sol 1 – Blue
- 2 – L Sol 1 – Brown
- 3 – N Sol 2 – Blue
- 4 – L Sol 2 – Brown
- 5 – N Motor – Blue
- 6 – L Motor – Brown
- 7 – Cap Phase Motor – White

Note: On SR models only one
 solenoid valve is normally fitted:
 SOL 1 for CW spring units
 SOL 2 for ACW spring units

**SIDE VIEW OF EHD
 CONTROL BOX, SHOWING
 FUSEBOARD, SOLENOID
 VALVES, AND INTERNAL
 WIRE IDENTITIES.**



All internal wiring on an EHD actuator is connected via the fuseboard. Wires to the solenoid valves and the pump motor connect to the accessible upper row of connectors shown in the diagram above. All the other wiring, connecting to the lower two rows of connectors, will come out as part of the limit switch plate assembly when it is removed, since it connects only to parts mounted on the limit switch plate.

The fuseboard also contains Metal Oxide Varistor suppressor devices, which will act to blow the fuse(s) if the supply voltage rises to a level which may damage the actuator components.

The fuses are mounted as shown in the diagram above. On some models (positioners and on/off spring return types) where only one live supply line is connected, only one fuse is needed, and so the second fuse can be used as a spare.

Disconnect supply before removing or replacing fuseholder

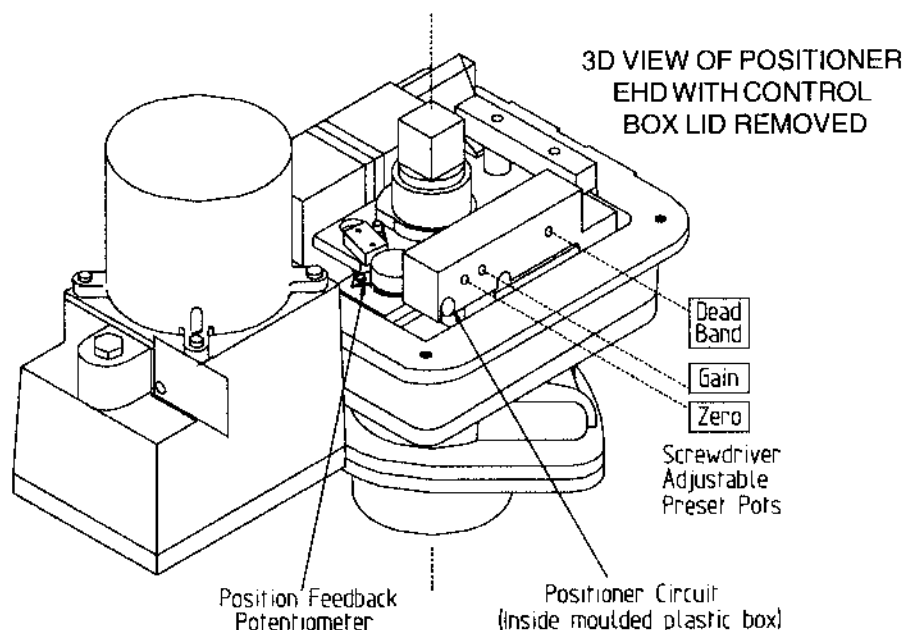
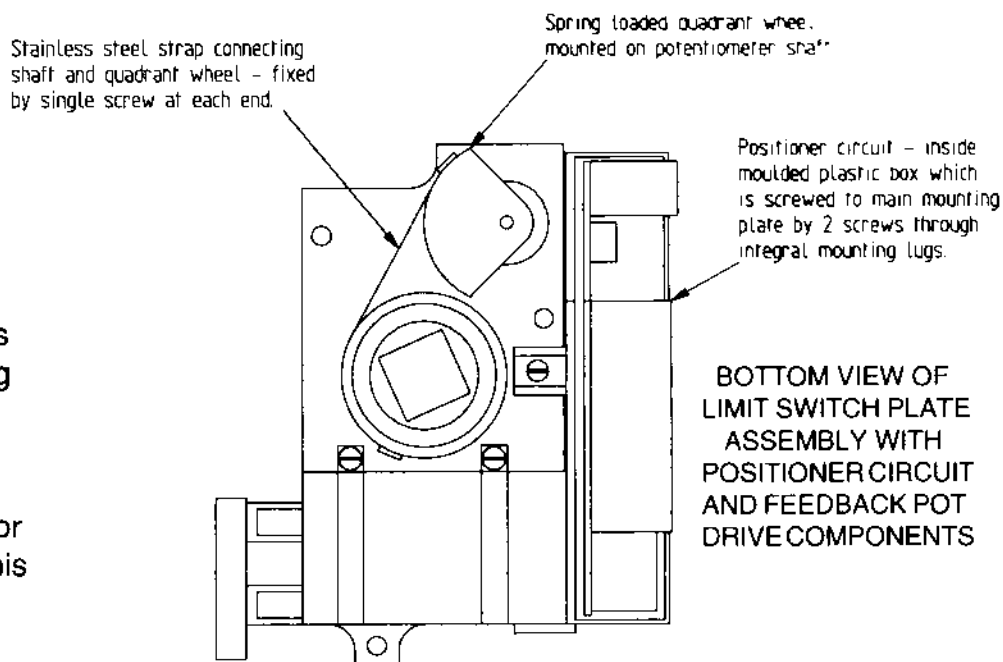


Optional Positioner - Setup

The positioner circuit is mounted inside a moulded plastic box, which in turn is mounted together with the position feedback potentiometer and drive strap on the limit switch plate inside the control box. The unit is factory-adjusted to give 90 degree movement as the signal is changed from 4 to 20 mA. Zero-adjust and gain-adjust preset potentiometers are available to allow tuning of start position and range, to fit a user's exact requirements (see below). A deadband-adjust preset potentiometer is also available to maximise accuracy in a particular application.

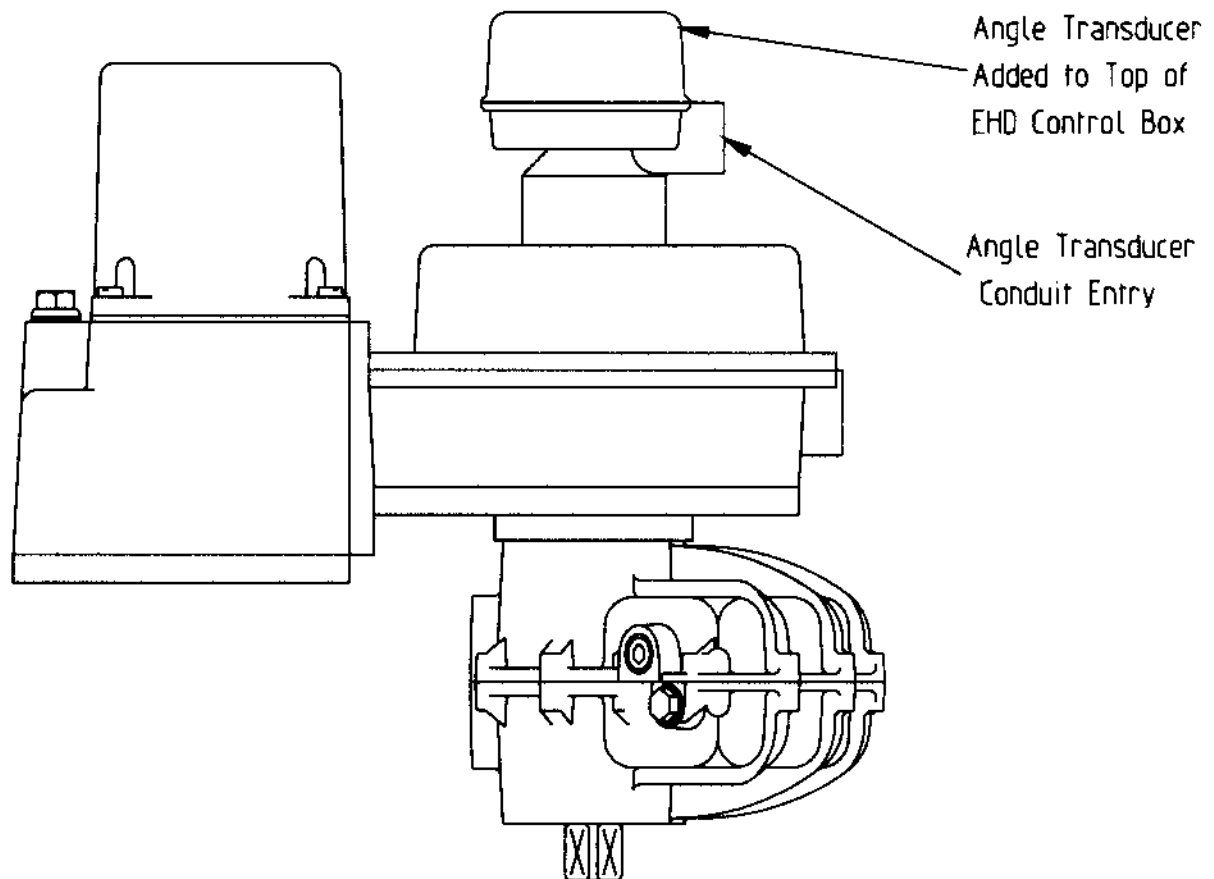
When the actuator is in operation with its load, it is recommended that the deadband adjustment is altered until the actuator begins to oscillate in position (ie. switches on and off in alternating directions) - then the deadband adjustment should be altered slightly until the actuator is stable in position - this will give maximum accuracy.

Take care not to connect the power supply to the signal input connector. See page 6 for identity of connector terminals. If a positioner limit switch plate is being fitted to a control box, make sure you know which end of its travel the actuator is at, and hold the shaft and its following pot assembly at the corresponding end of its travel - a mistake here will result in a damaged pot and drive assembly.





Optional Angle Transducer



SIDE VIEW OF EHD ASSEMBLY WITH ANGLE TRANSDUCER UNIT FITTED

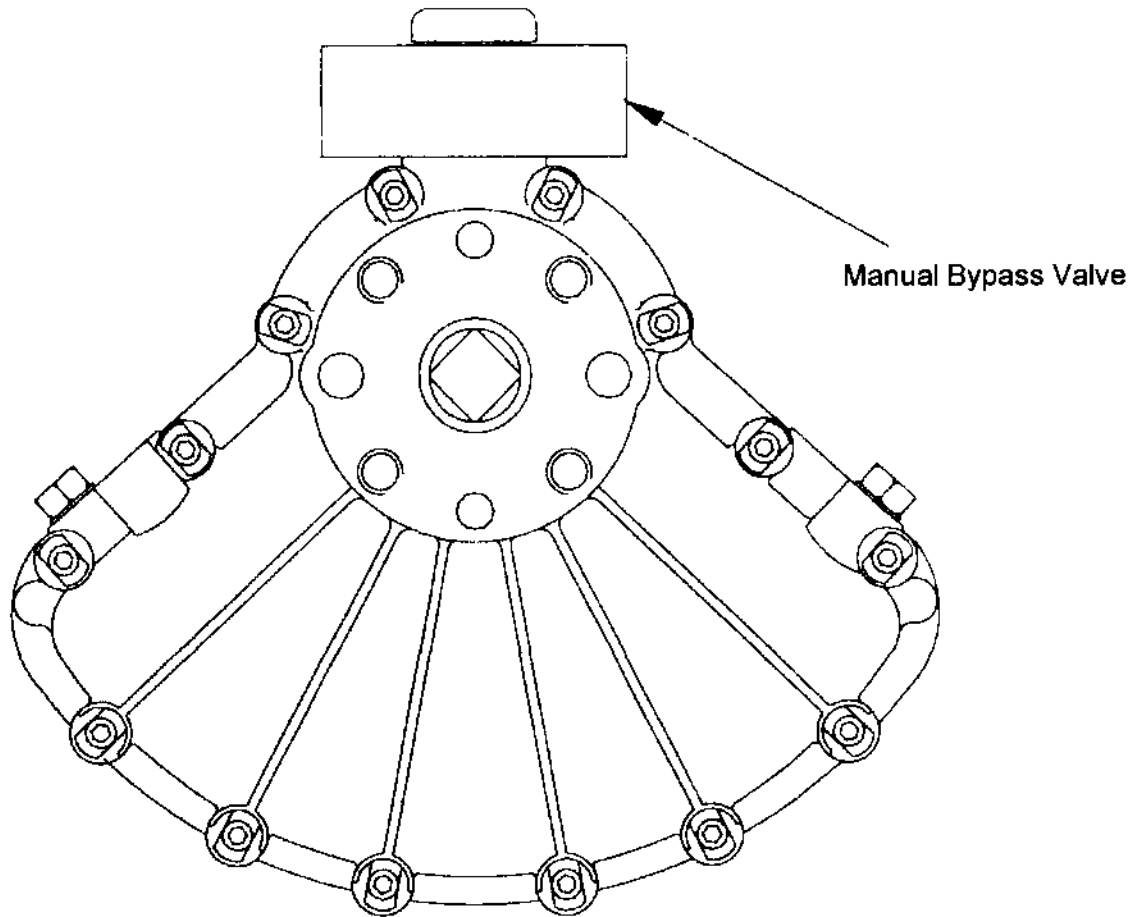
The standard Kinetrol angle transducer unit is bolted to a modified EHD lid to give an entirely independent position feedback signal to the user, which in no way depends on either the potentiometer or the electronic circuit of the positioner in the EHD.

External visual position indication is no longer possible because the output square is covered by the angle transducer mounting parts.

See the attached angle transducer instruction sheet TD5 for connection and adjustment of angle transducer.



Optional Double Acting Manual Bypass Valve



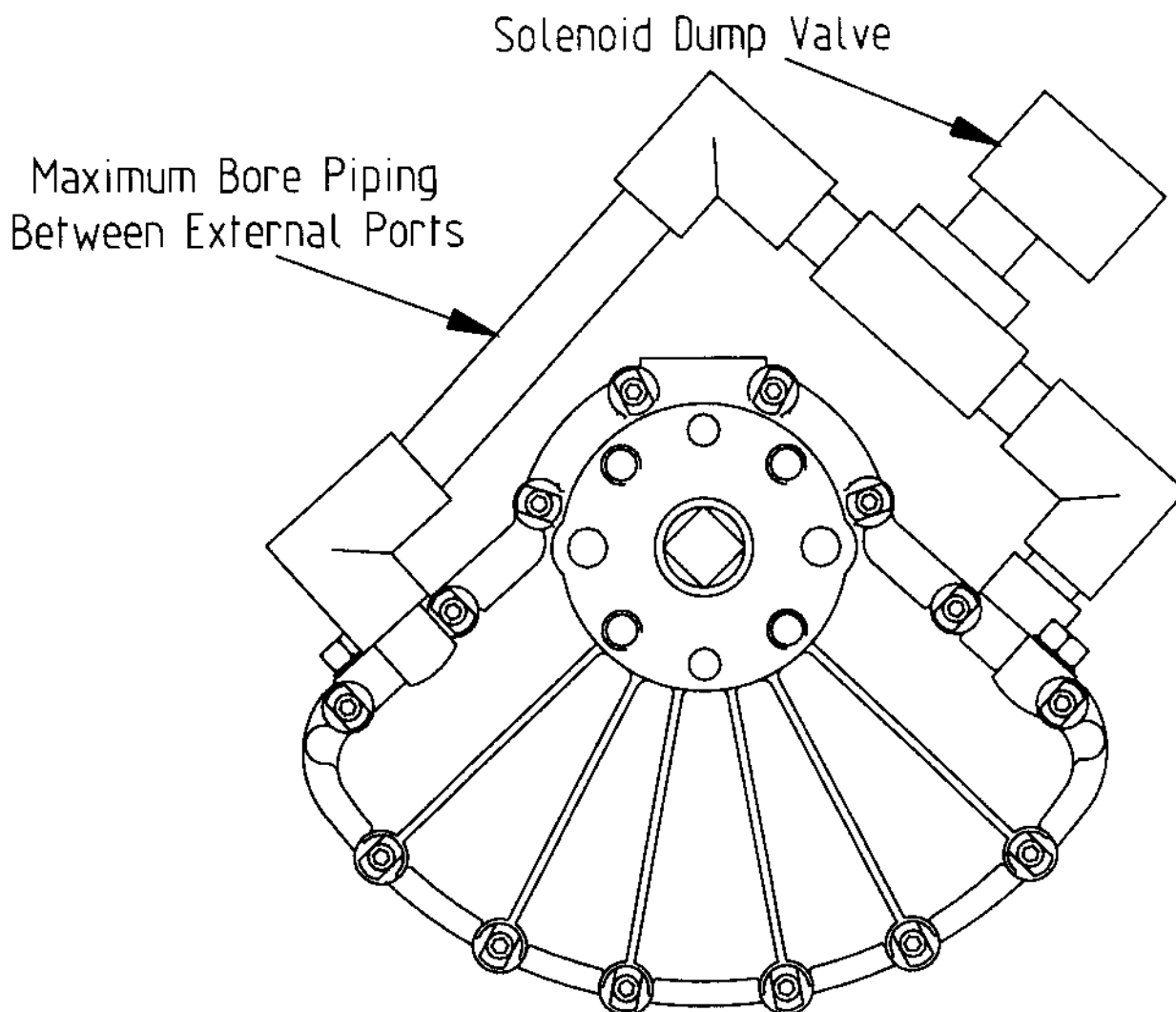
VANE ACTUATOR WITH INTEGRAL MANUAL BYPASS VALVE FITTED FOR EHD USE

The manual bypass valve is mounted directly on the vane actuator, allowing an operator to open an oil port between the two sides of the actuator, which in turn allows a fail-locked double acting actuator to be manually over-ridden when the power supply has failed. To open the valve turn the slotted knob counter clockwise until the slot is in line with the 'OPEN' mark. For normal powered actuator operation it is necessary that the valve be left closed, so that full operating pressure can be developed in the actuator - the valve is closed by turning the slotted knob clockwise until the slot is in line with the 'SHUT' mark.

The oil ports to this valve are small, so it will not be possible to move the actuator by manual override at a speed much greater than its normal operating speed (see sales literature at the end of this document) - trying to move it too fast may generate excessive pressures and forces which can damage the actuator.



Optional Solenoid Operated Rapid Spring Return Dump Valve

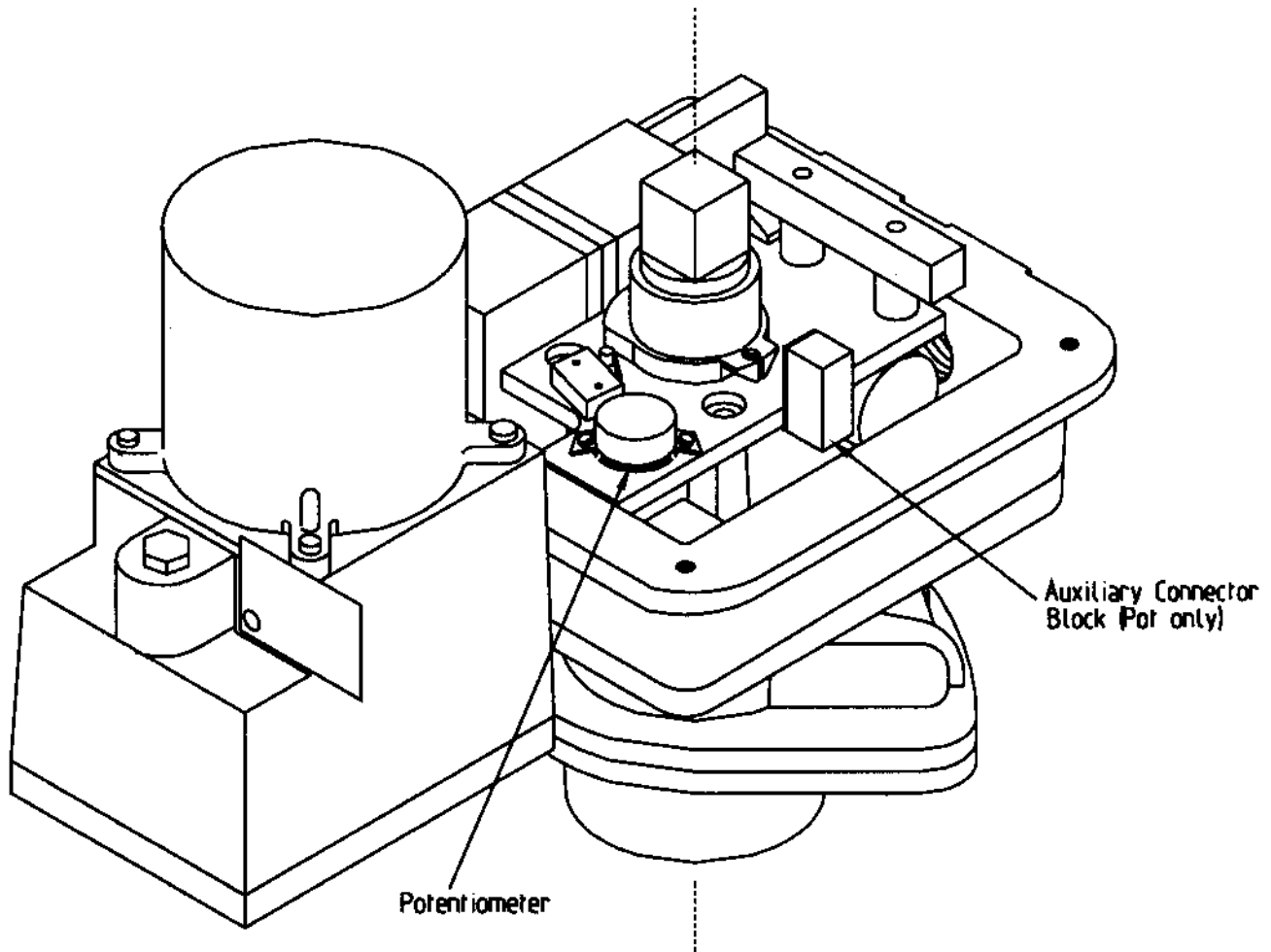


VANE ACTUATOR WITH SOLENOID
OPERATED RAPID DUMP VALVE
FOR USE WITH SPRING RETURN EHD

A large capacity 2/2 solenoid valve is piped to the two external actuator ports using the widest bore tube and fittings compatible with the ports. It is additional to the normal internal EHD solenoid valves, and does not prevent them working. Wiring connection of the dump valve is left to the user, since there are several functions possible, all requiring different arrangements. The standard coil has a DIN 43650 3-pin interface.



Optional External Feedback Potentiometer



3D VIEW OF ON/OFF EHD ACTUATOR
WITH EXTERNAL FEEDBACK POT.

A 20K conductive plastic servo potentiometer (with dual ball bearings and laser trimmed track giving linearity better than 1.0% of full scale range) is fitted to the standard limit switch plate, and driven by a spring tensioned stainless steel strap attached to the limit switch shaft. The pot gives its full range over 340 degrees, so this application uses about 30% of its track. Three wires connect the two ends of the pot track plus its wiper to three terminals in an auxiliary connector block mounted to one side of the limit switch plate. External connections should be made to this terminal block.



Inspection, Maintenance and Troubleshooting

Inspection and Maintenance

For reliable long term operation, it is recommended that the following inspection procedure is carried out at least once per year, and the recommended actions taken if necessary.

(1) Observe a complete operating cycle of the actuator, and if it fails to operate correctly as detailed here then see the troubleshooting guide below for recommended remedial actions.

When power is switched on, the actuator should run smoothly through 90 degrees. At the end of its travel, the limit switch should cut out the pump. In the case of a spring return, after the pump cuts out the unit should hold position without dropping back as long as power is on, and when power is switched off the spring stroke should be smooth and not too slow.

(2) Disconnect power from the actuator, remove the position indicator, then remove the control box lid.

(3) Remove the oil filler plug and its sealing ring, and keep them for re-use. Check the oil level by looking into the filler hole - the oil level should be just below the bottom of the threaded filler hole, which extends to 23mm (0.9 inch) from the upper surface. If it is low, then top up to the bottom of the threaded hole with 50cSt silicone fluid - don't use any other type of oil. Replace the filler cap and sealing ring. It is essential that the oil in the reservoir stays completely clean - take care not to add any dirt or grit via the filler.

(4) Look at the reservoir breather vent entry, and make sure it is clear of debris.

(5) Observe the control box interior, and make sure that the wiring, the limit switch(es), the solenoid valve, the fuseboard etc. are in good condition. Any damaged components should be replaced.

In order to replace any control box component, first disconnect the motor and solenoid wires from the upper connector block on the fuseboard (see page 9), then undo the three screws holding down the limit switch plate assembly (see page 5) and lift out this assembly complete with shaft and fuseboard. When this has been done, all the components become easily accessible either on the plate assembly or in the disencumbered control box.

(6) Make sure that the top shaft seal O-ring is in good condition and well greased - this is necessary to ensure that the control box remains weathertight.

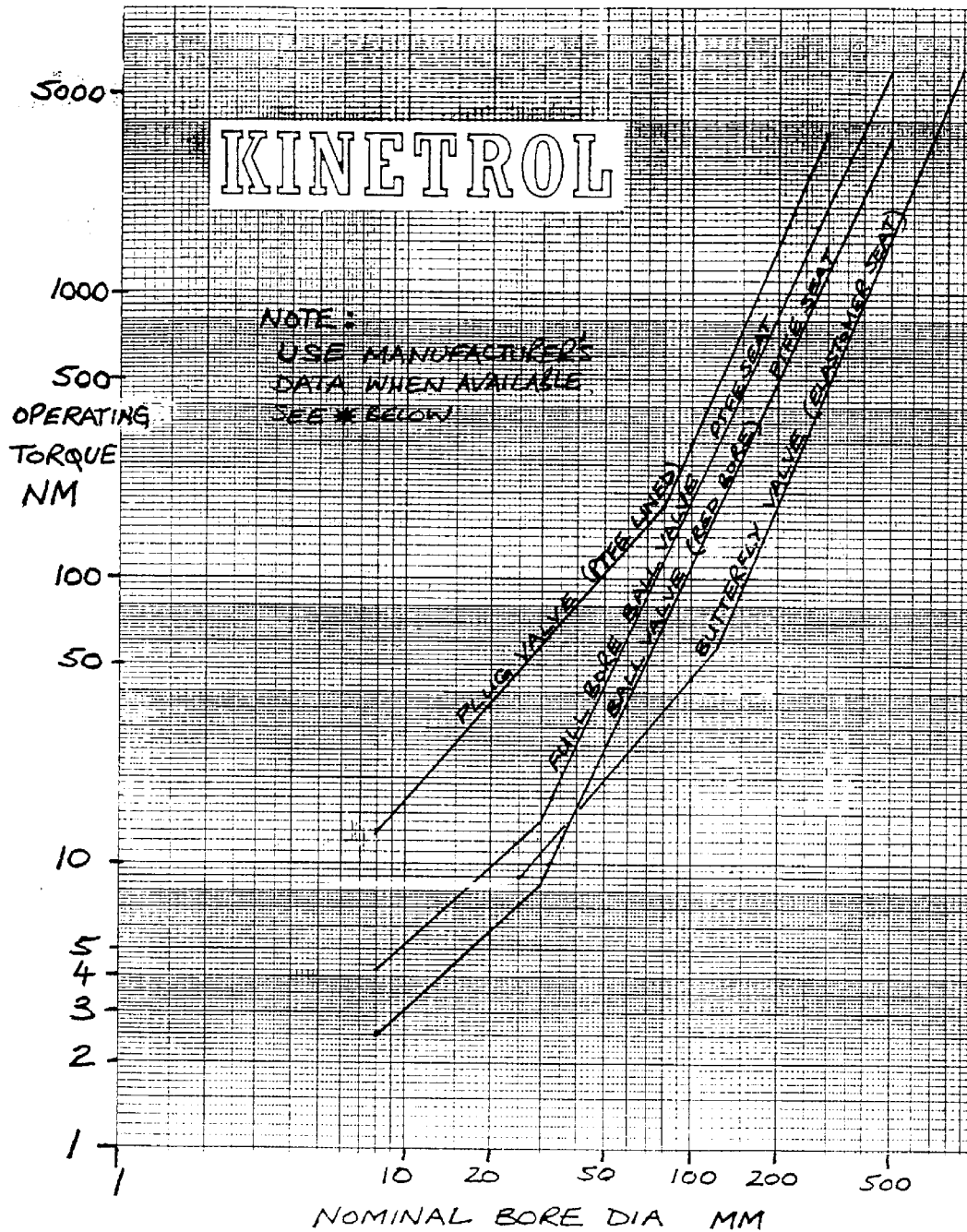
(7) Replace the control box lid, taking care that the lid flange O-ring is well seated in its groove and that no wires are trapped between the lid and the control box. Replace the position indicator.

Troubleshooting Guide

This is a guide to simple problems only - contact Kinetrol's distributor if this does not solve your problem.

Problem	Possible Cause	Action
Irregular motion under power.	Load takes too much torque. Incorrect supply voltage. Lack of oil.	Fit larger model actuator. Correct it. Find where oil has gone: Was axis orientation correct? If not, correct it (see page 4). If there is a leak, correct it. Refill with oil.
Pump fails to stop at end of power stroke.	Striker maladjusted. Limit switch failed.	Reset striker. Replace limit switch.
Actuator drops back when holding at end of power stroke.	Damaged solenoid valve.	Replace solenoid valve.
Spring stroke slow or irregular.	Load takes too much torque. Oil debris blocking solenoid valve.	Fit larger model actuator. Clear out debris from valve.
Complete failure to run.	Fuse blown.	Replace fuse - if it blows again, trace fault. Note high voltage transients can blow the fuse as part of the protective action of the MOV suppressor device.
Solenoid clicks but pump dead.	Limit switch failed.	Replace limit switch.

Title: Guide to valve operating torque



ISSUES

A	7/98
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FACTORS TO BE APPLIED (DO NOT USE TOTAL FACTOR > 3)	
- BALL VALVE : GLASS FILLED PTFE SEATS	x 1.5
- BALL VALVE : GRAPHITE SEATS x 1.5
- DIFFICULT MEDIUM [POWDERS, SLURRIES CORROSIVE LIQUIDS, DRY GAS (BUTTERFLY)]	x 1.5
- INFREQUENT OPERATION x 1.33
- LINE PRESSURE P > 10 BAR (0.5 + 0.05P)

REF : KTR 32

* THIS GRAPH IS INTENDED AS GUIDANCE ONLY. KINETROL LTD WILL NOT BE HELD RESPONSIBLE FOR ACTUATOR SIZING DECISIONS MADE ON THE BASIS OF THIS DATA. REFER TO KINETROL FOR ADVICE.

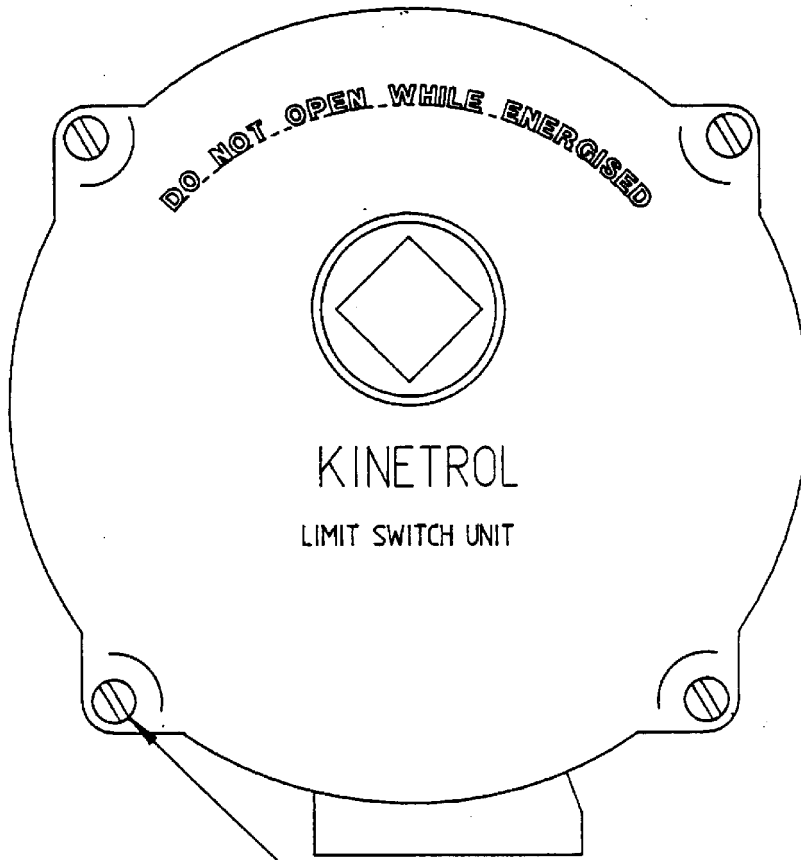
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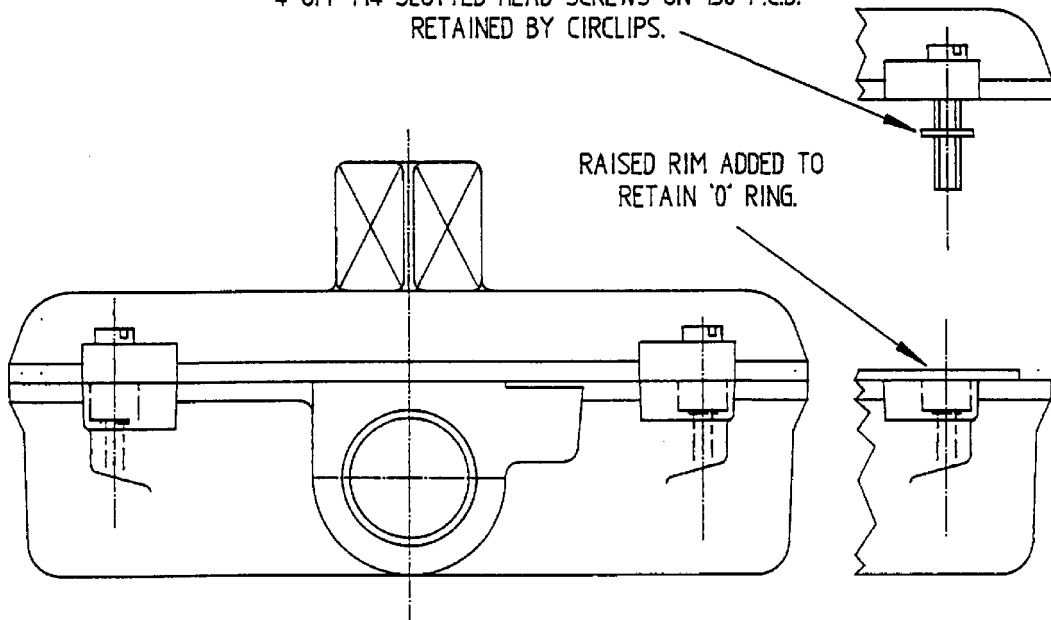
KINETROL Trading Estate, Farnham, Surrey, England

Doc.No.TD 33
Page 1 of 1

Title: 05 Limit Switch Box - New Fixings for lid



4 OFF M4 SLOTTED HEAD SCREWS ON 130 P.C.D.
RETAINED BY CIRCLIPS.



RAISED RIM ADDED TO
RETAIN 'O' RING.

Title: Temporary solution for converting a positioner to the opposite hand

1. Remove the Positioner from the Actuator.
2. Manually rotate the Actuator Vane thro' 90° to the opposite side.
3. Rotate the Positioner thro' 180° and reassemble it to the Actuator Fig.3
4. Remove the cam from the coupling and if the slot is 9mm (.35") long elongate it Fig.1
5. There are two set screws which retain the coupling to the Actuator output square. Change one of these over to the opposite side, also remove set screw from lug and discard Fig. 2
6. Turn the cam over and reassemble it.

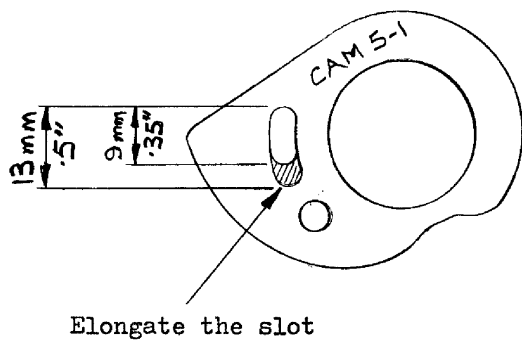


FIG.1

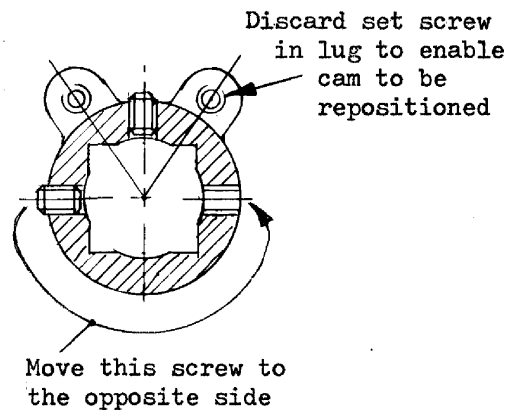


FIG.2

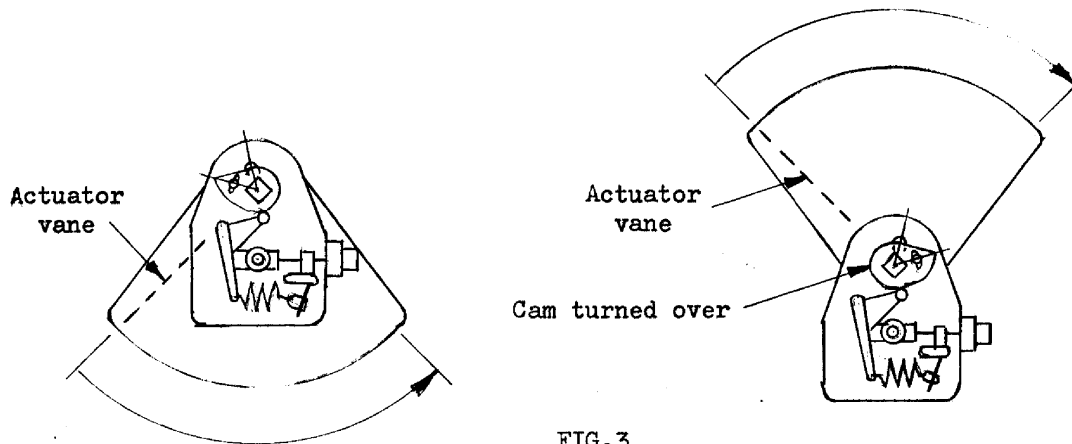


FIG.3

EXAMPLE OF

ANTICLOCKWISE POSITIONER — CONVERTED TO — CLOCKWISE POSITIONER

NOTES:

1. The following Cams 5-12, 5-15, 5-17, 5-20 and 5-23 cannot be converted because their slope is sharp and would damage the Positioner
2. Please note that when a Positioner is converted as described above the linearity will alter slightly.

**Title: ALLOWABLE MOMENTS OF INERTIA FOR KINETROL
STANDARD ACTUATORS/AP POSITIONER COMBINATIONS**


Actuator/ Positioner Size (Valve size)	Calculated Allowable M of I	Weight at Effective Radius Arm			
		0.125m 5"	0.25m 10"	0.5m 20"	1m 40"
050 (AP)	0.07 Kg m ² 227 lb.in ²	4.24 Kg. 9.06 lb.	1.06 Kg. 2.27 lb.	0.26 Kg. 0.57 lb.	0.07 Kg. 0.14 lb.
070 (AP)	0.43 Kg m ² 1,456 lb.in ²	27.22 Kg. 58.23 lb.	6.81 Kg. 14.56 lb.	1.70 Kg. 3.64 lb.	0.43 Kg. 0.91 lb.
090 (AP)	3.65 Kg m ² 12,500 lb.in ²	233.76 Kg. 500 lb.	58.44 Kg. 125 lb.	14.61 Kg. 31.25 lb.	3.65 Kg. 7.81 lb.
100 (MP)	10.81 Kg m ² 36,996 lb.in ²	691.84 Kg. 1480 lb.	172.96 Kg. 370 lb.	43.24 Kg. 92.49 lb.	10.81 Kg. 23.12 lb.
120 (MP)	25.91 Kg m ² 88,675 lb.in ²	1658 Kg. 3547 lb.	415 Kg. 887 lb.	104 Kg. 222 lb.	26 Kg. 55 lb.
140 (MP)	336.7 Kg m ² 1,152,319 lb.in ²	- -	5,387 Kg. 11,523 lb.	1,347 Kg. 2,881 lb.	337 Kg. 720 lb.
160 (HP)	173.1 Kg m ² 592,407 lb.in ²	- -	2,770 Kg. 5,924 lb.	692 Kg. 1,481 lb.	173 Kg. 370 lb.
180 (HP)	1,544 Kg m ² 5,285,354 lb.in ²	- -	- -	6,177 Kg. 13,213 lb.	1,544 Kg. 3,303 lb.
200 (HP)	12,214 Kg m ² 41,800,403 lb.in ²	- -	- -	- -	12,214 Kg. 26,125 lb.

NOTE: The moments of inertia given above are the maximum figures allowable for the load which the positioner/actuator is driving. If these moments of inertia are exceeded, it is possible that the actuator/positioner will hunt due to the high moment of inertia on the output shaft causing the actuator to overshoot the desired position repeatedly.

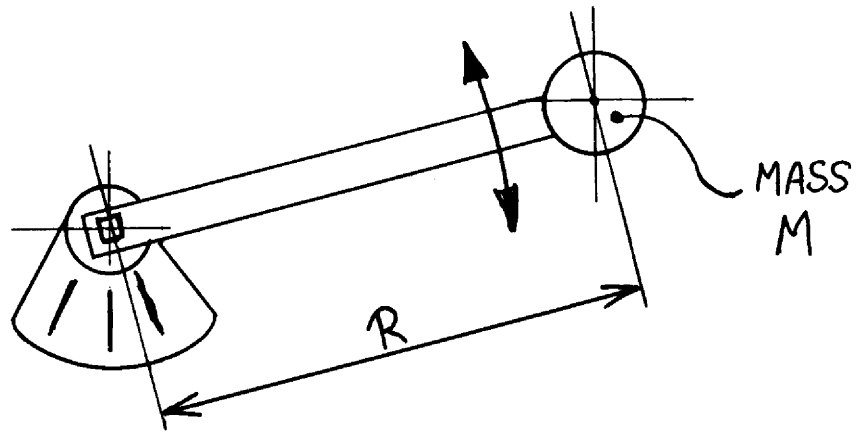
By changing the positioner control valve, higher inertia valves may be obtained but operating time may be reduced, consult Kinetrol for details.

These figures are issued for guidance only. Hunting problems can be caused by other factors such as friction.

Kinetrol Limited will not be responsible for sizing decisions made using this data.

Issue C	Signed 	Date 1/8/03	KINETROL Trading Estate Farnham Surrey England	Doc.No. TD 36 Page 1
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Title: **METHOD FOR CALCULATION OF LIMITS ON EXTERNAL MOMENTS OF INERTIA ATTACHED TO ACTUATOR SHAFTS**



Time for 90° travel = T sec.
 Moment of Inertia = I kg m²
 (for a mass M at radius R: I = MR²)

ACTUATOR MODEL	MAX. MOMENT OF INERTIA HITTING ACTUATOR STOPS
0M	I = 0.004 T ² kg m ²
01	I = 0.015 T ² kg m ²
02	I = 0.033 T ² kg m ²
03	I = 0.07 T ² kg m ²
05	I = 0.13 T ² kg m ²
07	I = 0.33 T ² kg m ²
09	I = 0.71 T ² kg m ²
10	I = 1.0 T ² kg m ²
12	I = 1.55 T ² kg m ²
14	I = 4.0 T ² kg m ²
16	I = 8.0 T ² kg m ²
18	I = 12.0 T ² kg m ²
20	I = 12.0 T ² kg m ²

NOTE: 1. These figures are for guidance only.

2. If the moments of inertia given by the above formulae are exceeded, the actuator end stops must NOT be used to arrest movement of the load.

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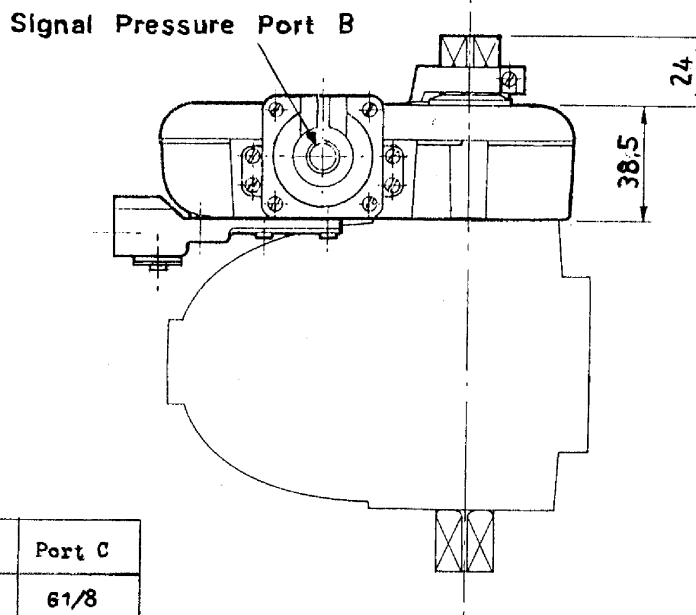
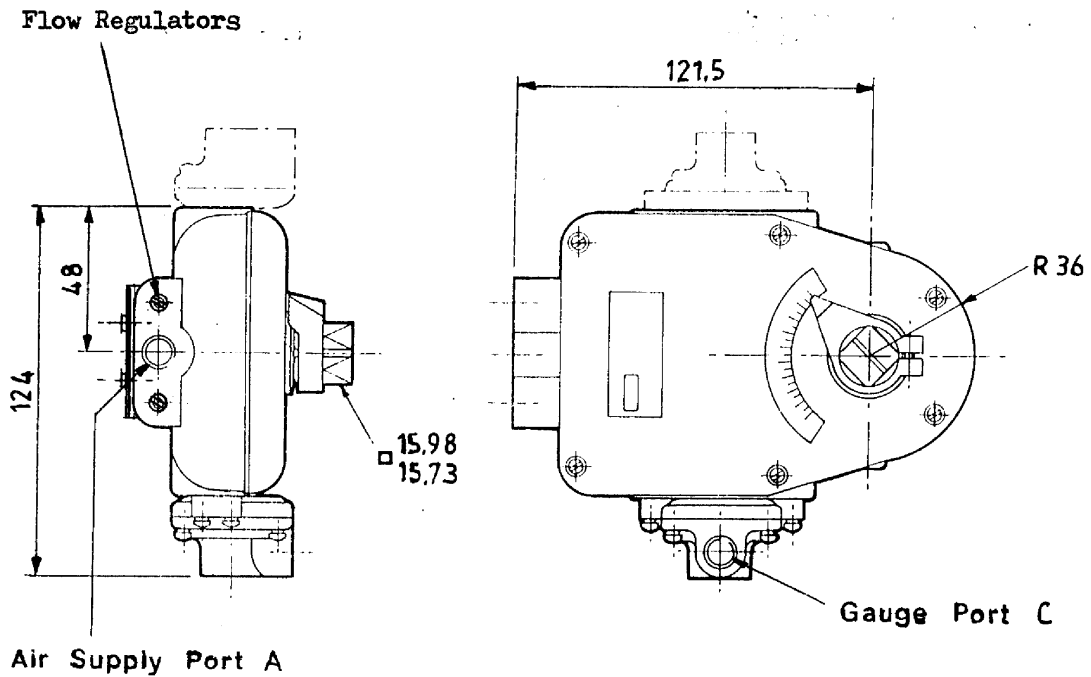
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Positioner

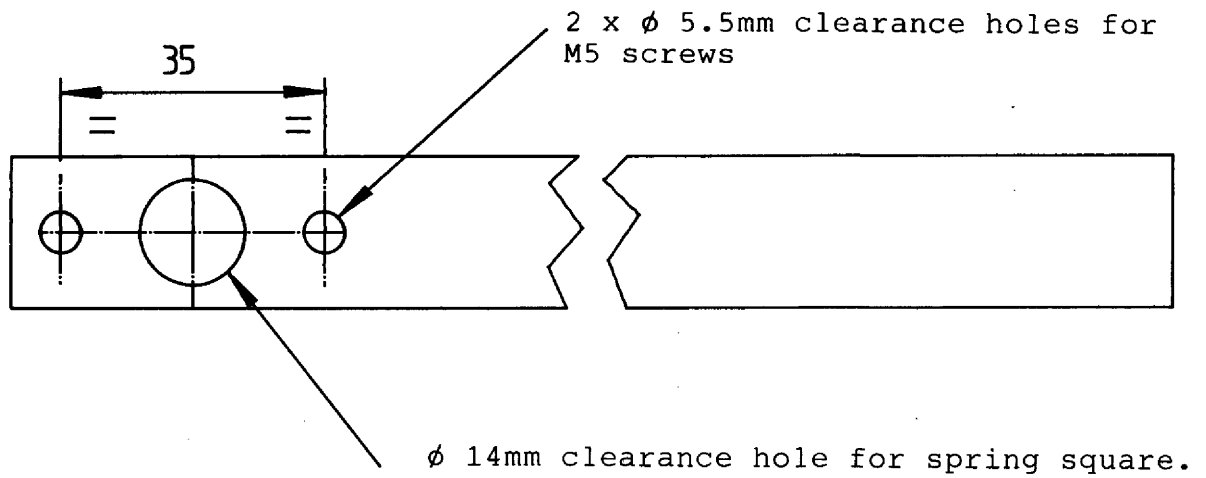
	Port A	Port B	Port C
ISO/DIN	G1/8	G1/8	G1/8
ANSI	1/4 NPT	1/4 NPT	1/8 NPT

The latest modification to the Positioner has an Inlet Manifold which incorporates the air supply port and two flow regulators. The advantage of this arrangement is that the cover may now be removed to make any adjustments without first disconnecting the air supply.

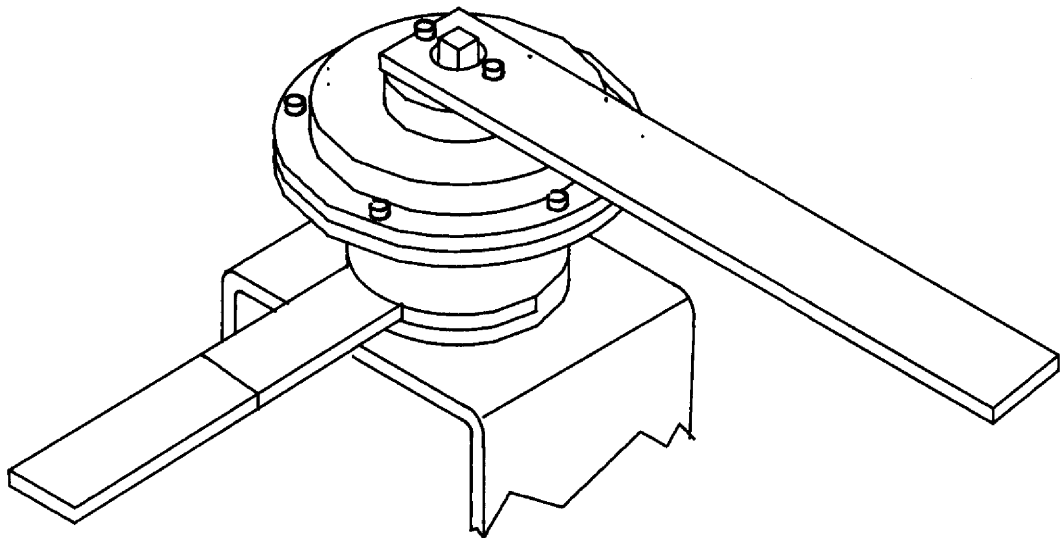
MANUAL FAIL-SAFE SPRING TORQUE ADJUSTMENT PROCEDURE

NEW 05 UNIT

1. Obtain 10" long capstan.



2. Attach capstan to top of spring housing.



3. Loosen spring case flange screws and move capstan slightly in the direction of the arrow on the spring housing to facilitate removal of the screws.

AT THIS POINT THE SPRING TENSION MUST BE TAKEN VIA THE CAPSTAN.

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4. Increase the tension by rotating the capstan in the direction of the arrow on the spring housing and vice versa.
5. Align the spring case flange holes and replace the screws.
6. As a rule of thumb, in dexing each of the 24 holes in the bottom of the spring case flange (15° pitch) will change the spring tension by 0.8Nm.

OLD 05 UNIT

1. Remove manual fail-safe spring unit from mounting bracket and invert the assembly.
2. Unfold the handle and clamp the handle in a vice.
3. Attach the capstan (see previous section) to the spring housing.
4. Loosen spring case flange screws and move capstan slightly in the direction of the arrow on the spring housing to facilitate removal of the screws.

AT THIS POINT THE SPRING TENSION MUST BE TAKEN VIA THE CAPSTAN.

5. Increase the spring tension by rotating the capstan in the direction of the arrow on the spring housing and vice versa.
6. The spring can only be reset in 60° increments because the shaft square must align with the spring housing mounting holes.
7. The following figures are approximate and for guidance only when adjusting the spring tension.

<u>Original Spring Stroke Torque</u>	<u>Torque after 60° Relaxation</u>
26Nm	24Nm
24Nm	22Nm
22Nm	21Nm
21Nm	19Nm
19Nm	17Nm
17Nm	15Nm
15Nm	13Nm
13Nm	10Nm

07 UNIT

1. Remove manual fail-safe spring unit from mounting bracket and invert the assembly.
2. Unfold the handle and clamp the handle in a vice.
3. Loosen the two worm locking screws.
4. Turn the socket headed worm clockwise to increase the spring tension and vice versa.
5. The spring casing can only be reset in 90° increments because the shaft square must align with the spring housing mounting holes.
6. The following figures are approximate and for guidance only when adjusting the spring tension.

Cont'd.....

Original Spring
Start Stroke Torque

Torque after 90°
Relaxation

52Nm
47Nm
40Nm
30Nm

47Nm
40Nm
30Nm
20Nm

IMPORTANT

1. NEVER BACKWIND (RELAX) SPRINGS BEYOND THE FREE STATE.
This can lead to failure of the spring tang.
2. Do not use a capstan to measure spring torques as this
can introduce frictional components that can distort
measurements.

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TD40

I/P AND ANGLE TRANSDUCER PERFORMANCE SPECIFICATION

I/P CONTROLLER (on Kinetrol Positioner/Actuator)

Linearity 1½%

Hysteresis <1%

Sensitivity 0.1 mA

Supply pressure regulation 0.2°/psi between 80 and 60 psi.

ANGLE TRANSDUCER (on Positioner/Actuator)

Linearity 0.5%

Hysteresis <0.25%

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TD 41



3-Stop Positioner Instructions

Power Connections - Double Acting Models

- 1 - Mid Position - Live (AC) or ⊕ (24VDC)
- 2 - Supply - Neutral (AC) or ⊖ (24VDC)
- (3 - Solenoid 1 - Neutral or ⊖)
- (4 - Solenoid 2 - Neutral or ⊖)
- 5 - End Posn. Rising Signal - Live or ⊕
- (6 - Solenoid 1 - Live or ⊕)
- 7 - End Posn. Falling Signal - Live or ⊕
- (8 - Solenoid 2 - Live or ⊕)

Terminals in brackets are used for wiring to solenoids only.

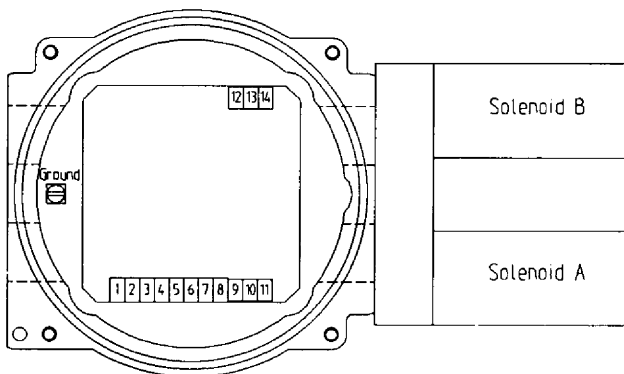
Power Connections - Spring Return Models

- 1 - Mid Position - Live (AC) or ⊕ (24VDC)
- 2 - Supply - Neutral (AC) or ⊖ (24VDC)
- (3 - Solenoid 1 - Neutral or ⊖)
- (4 - Solenoid 2 - Neutral or ⊖)
- 5 - End Position Air Stroke - Live or ⊕
- (6 - Solenoid 1 - Live or ⊕)
- 7 - End Position Air Stroke - Live or ⊕
- (8 - Solenoid 2 - Live or ⊕)

Terminals in brackets are used for wiring to solenoids only.

IMPORTANT - CASE MUST BE GROUND

When Terminal 1 is Live (ie. when actuator is switched to mid position). Terminals 5 and 7 must be disconnected both from the supply and from each other.



INTERNAL CONNECTIONS - USE THESE TO CONVERT

Actuator Type & Movement on Rising Signal	Terminal Number to which Connected						
	Solenoid A		Solenoid B		Feedback Potentiometer		
	Brown	Blue	brown	Blue	Red	Green	Yellow
D/A ACW	8	3	6	4	12	13	14
D/A CW	6	3	8	4	12	14	13
S/R ACW (120)	6	3	8	4	12	13	14
S/R CW (130)	8	3	6	4	12	14	13

See Sales literature for order codes and dimensions of box, plus typical user wiring arrangements.

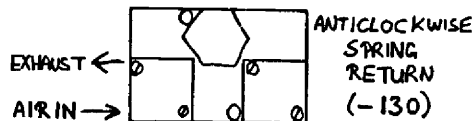
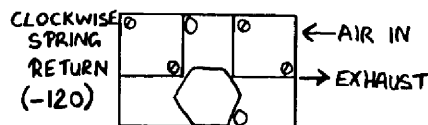
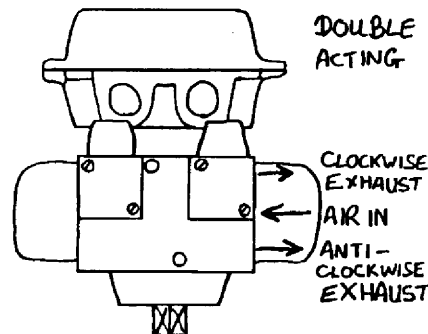
To optimise positioning performance, set deadband pot to minimum (actuator will oscillate), then increase until oscillation ceases. If this is not stable, then slow down travel speed with flow regulators.

Flow regulator/silencer kits available for all models. (see sales literature).

4-20mA signal sources must be floating relative to power supply.

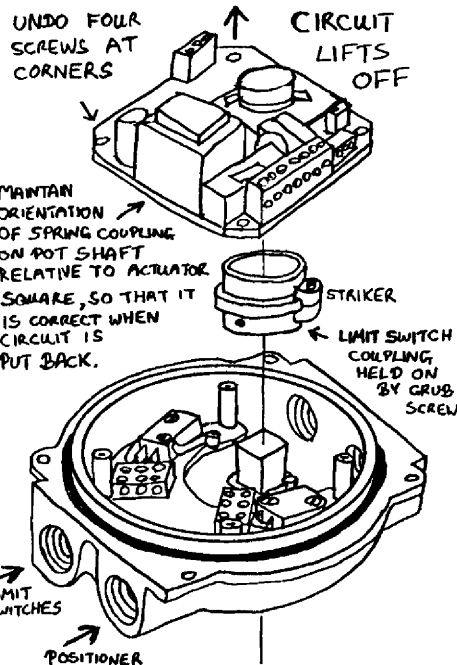
Setpoint Types - Terminal and Jumper Configuration				Double Acting/Spring Return Selection	
Jumper shown thus:	Jumpers	Terminals			
1 - On-Board Setpoint Pot:		Not Connected		Double Acting	
2 - User's External Setpoint Pot: (Minimum 2K, Maximum 20K)		9 10 11		Spring Return	
3 - User's External 4-20mA Signal: (Must be floating relative to power supply)		9 10 11	NC		

AIR CONNECTIONS: ISO/DIN - G1/8 ANSI - 1/8NPS

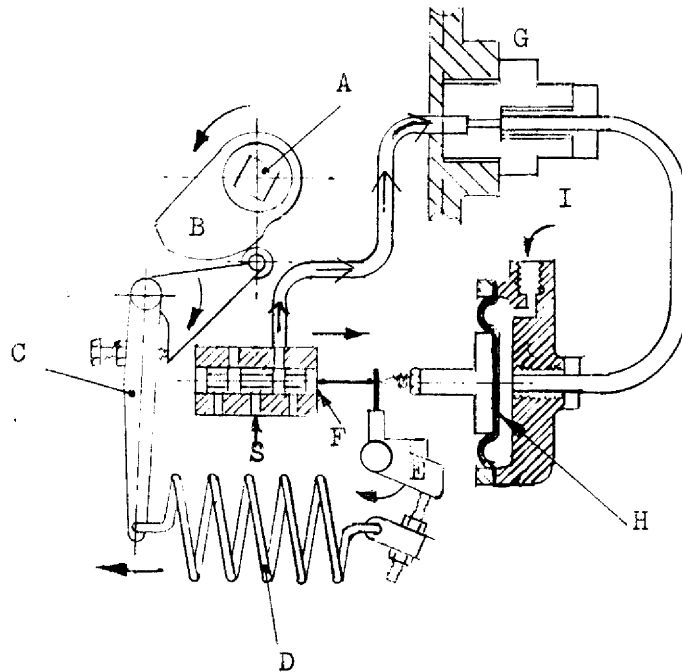


MAX SUPPLY PRESSURE 5,5 BAR or 80psi

ACCESS TO OPTIONAL LIMIT SWITCHES

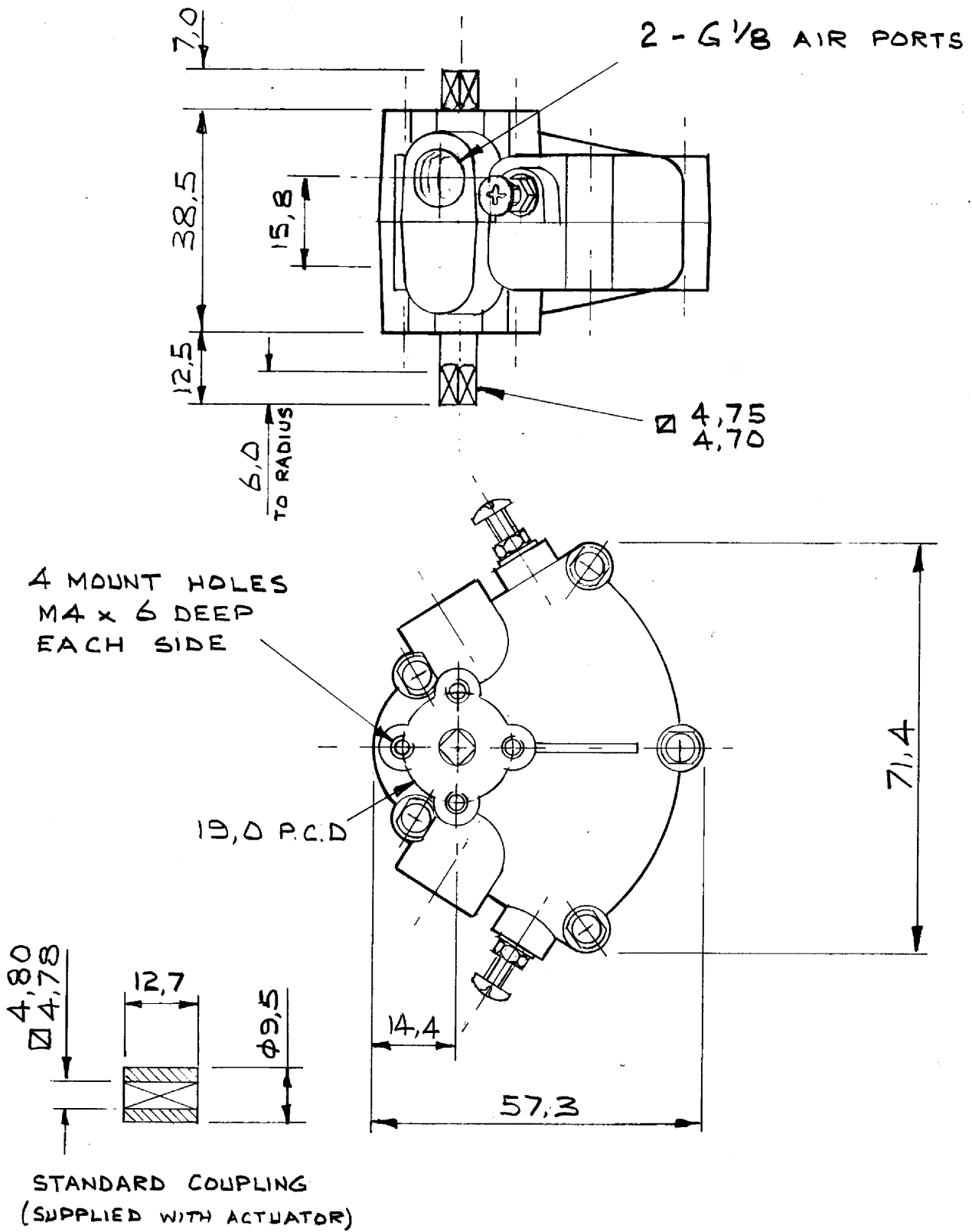


Title: Pneumatic angle transducer based on discrete positioner
Description of operation

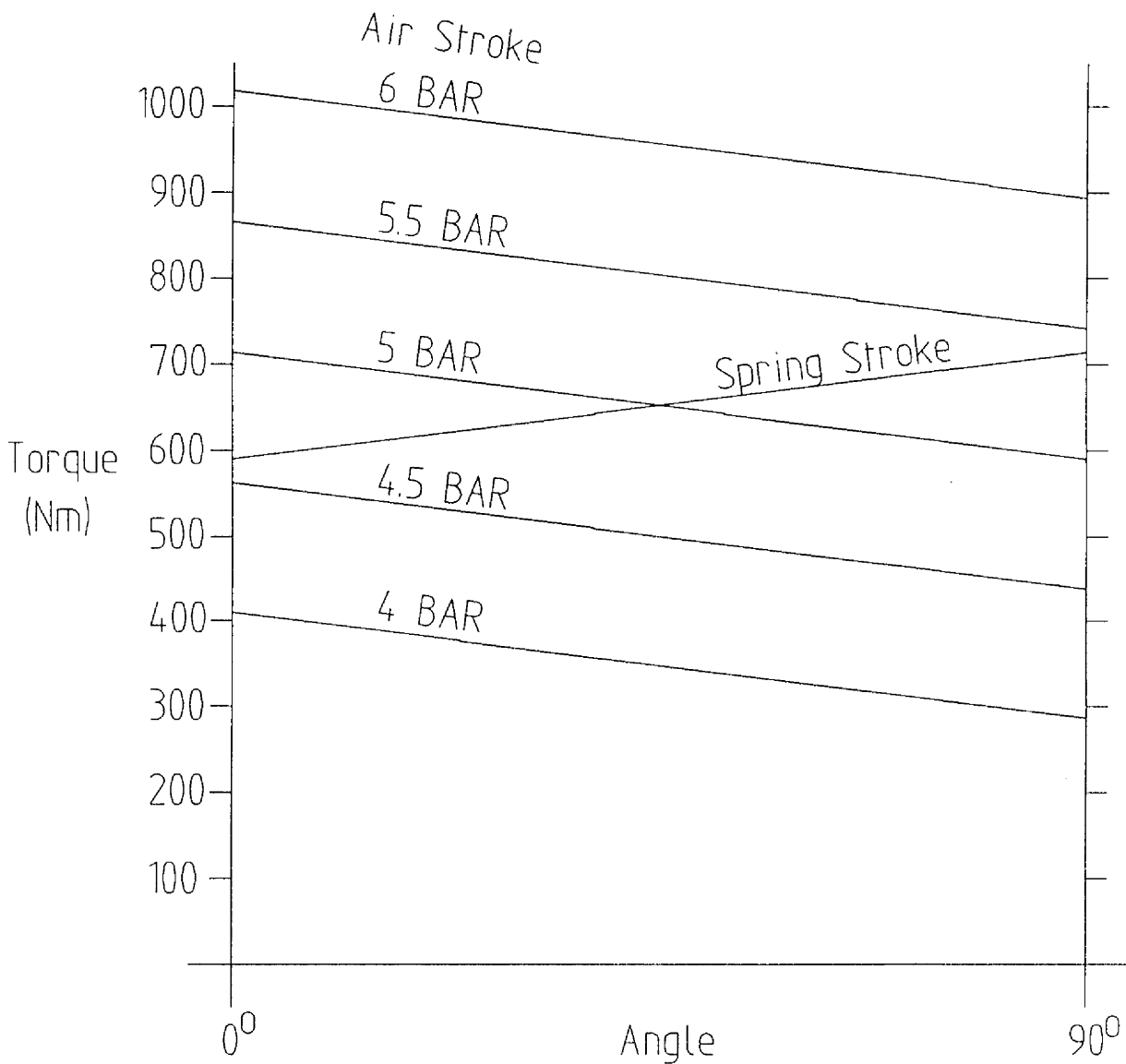


- Input shaft (A) rotates to input angle.
- Cam (B) rotates causing spring lever (C) to apply a tension to the spring (D).
- Tension in spring causes force balance lever (E) to rotate which moves spool valve (F) to right.
- Movement of spool valve allows air from supply to pass to output port (G) and hence to the diaphragm (H).
- Air pressure on the diaphragm builds up until the force produced is sufficient to balance the spring tension and the force balance lever moves the spool back to the central position preventing the pressure on the diaphragm from increasing
- The pressure on the diaphragm is taken out thro the exhaust port I. This pressure is proportional to the input angle.

Title: Model 010-100A Actuator

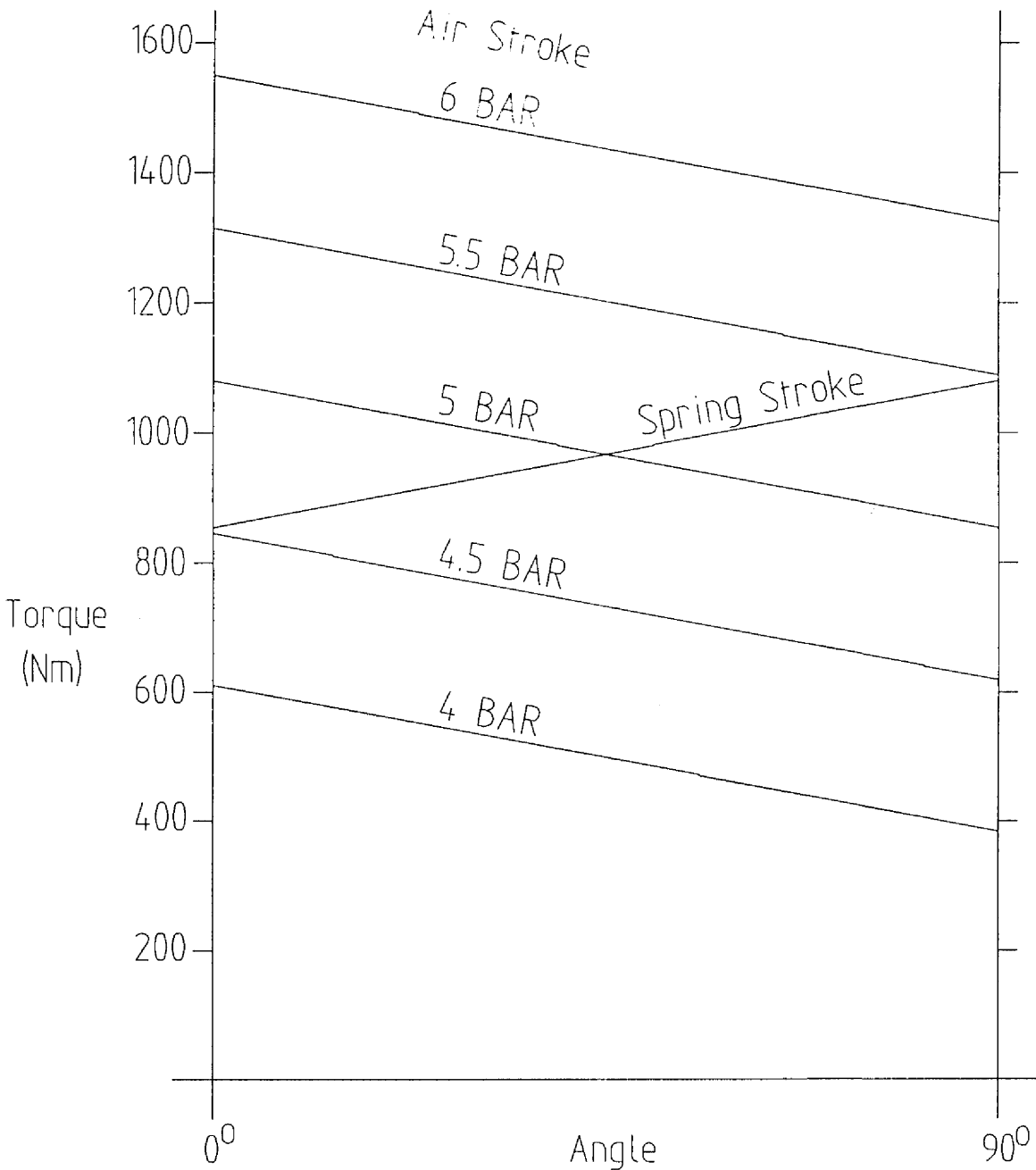


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Output Torque vs. Angle for 14-120-4800 Spring Return Actuator with Spring Wound for Balanced Torque at 5 Bar Supply Pressure

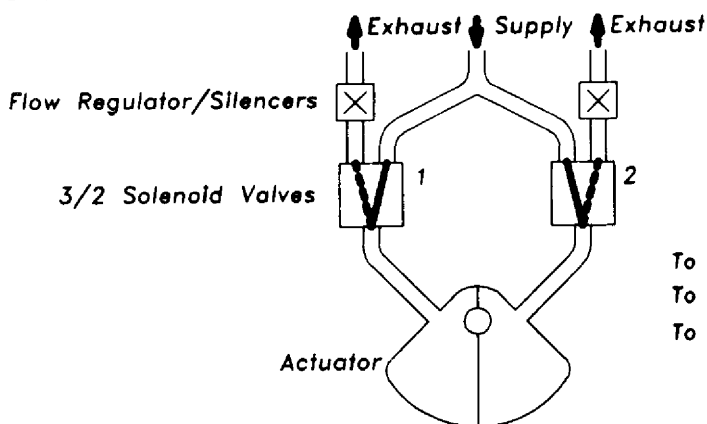
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Output Torque vs. Angle for 16-120 Spring Return Actuator with Spring Wound for Balanced Torque at 5 Bar Supply Pressure

3-STOP POSITIONER OPTIONS - PNEUMATIC CIRCUITS

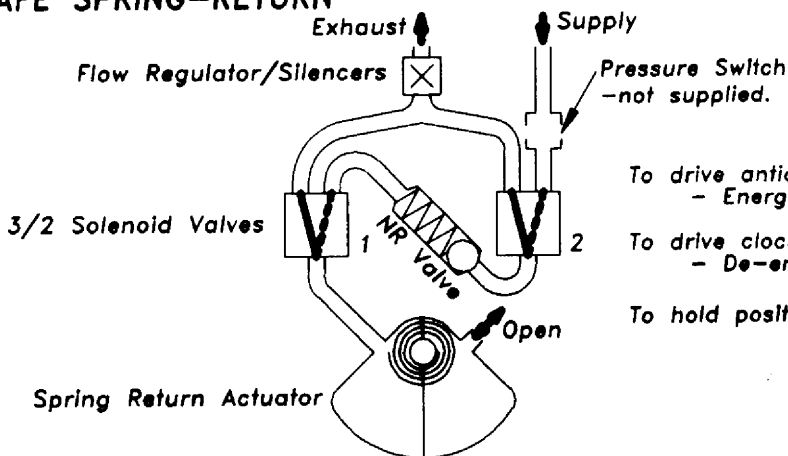
(1) DOUBLE-ACTING FAIL-FREE



Solenoid Valve Air Paths:
 — De-energised
 - - - - - Energised

To drive clockwise - Energise Valve 1
 To drive anticlockwise - Energise valve 2
 To hold position - De-energise both valves

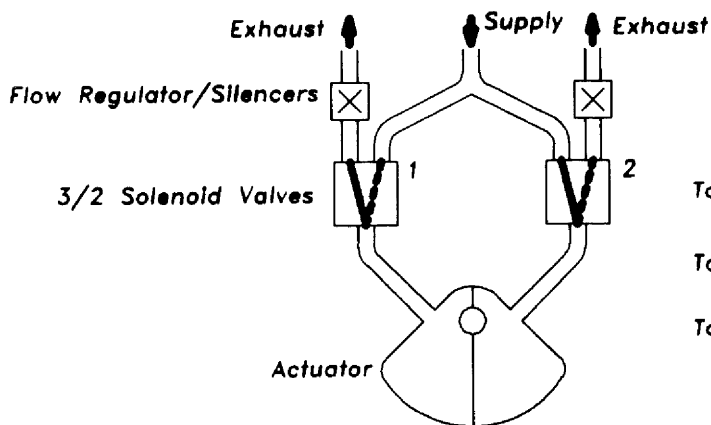
(2) FAIL-SAFE SPRING-RETURN



Solenoid Valve Air Paths:
 — De-energised
 - - - - - Energised

To drive anticlockwise (air stroke)
 - Energise both valves
 To drive clockwise (spring stroke)
 - De-energise both valves
 To hold position - Energise valve 1

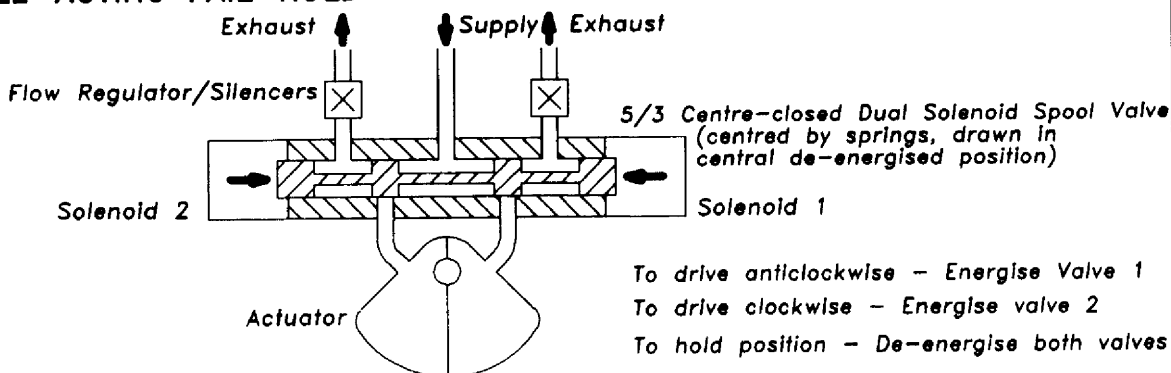
(3) DOUBLE-ACTING FAIL-DOWN



Solenoid Valve Air Paths:
 — De-energised
 - - - - - Energised

To drive anticlockwise (Upscale)
 - Energise both valves
 To drive clockwise (Downscale)
 - De-energise both valves
 To hold position - Energise valve 1

(4) DOUBLE-ACTING FAIL-HOLD



To drive anticlockwise - Energise Valve 1
 To drive clockwise - Energise valve 2
 To hold position - De-energise both valves

Title: Procedure for converting pneumatic positioner to opposite hand Using conversion Kit SP 036 or SP 037

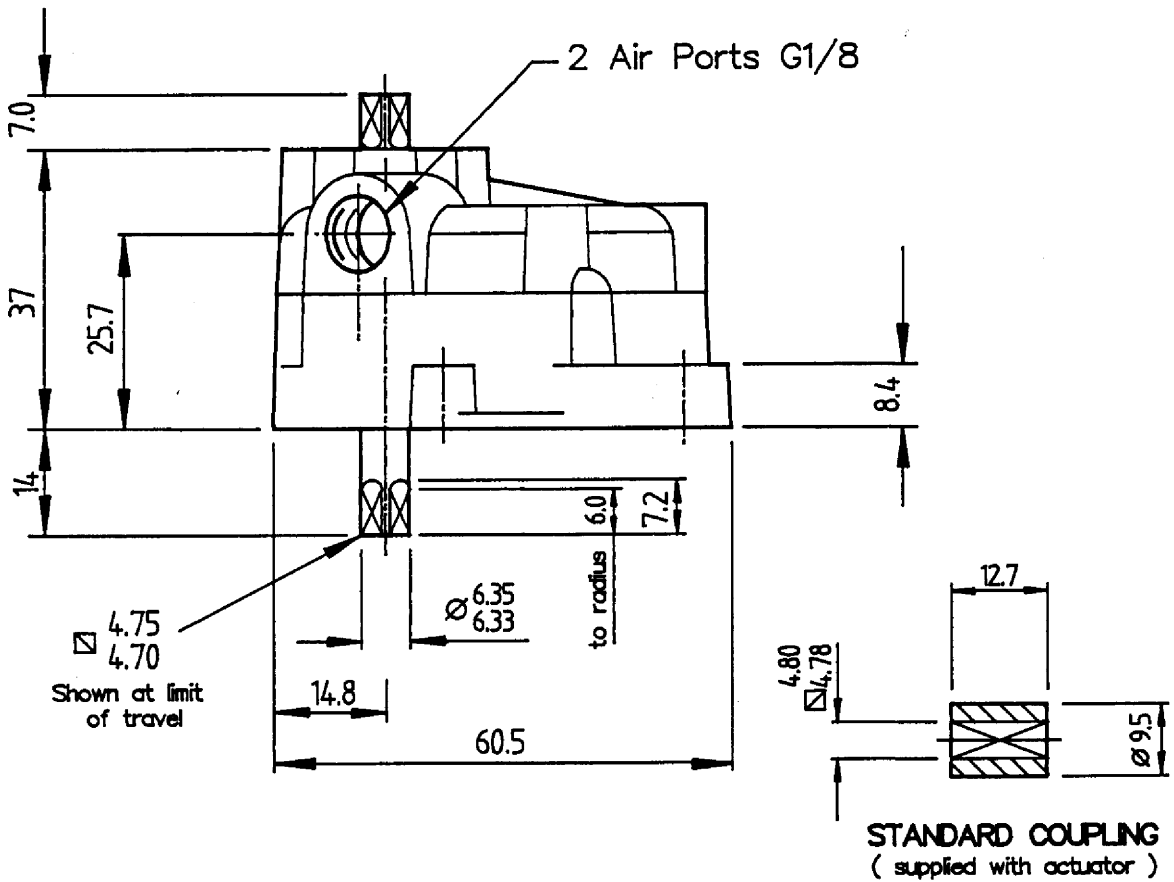
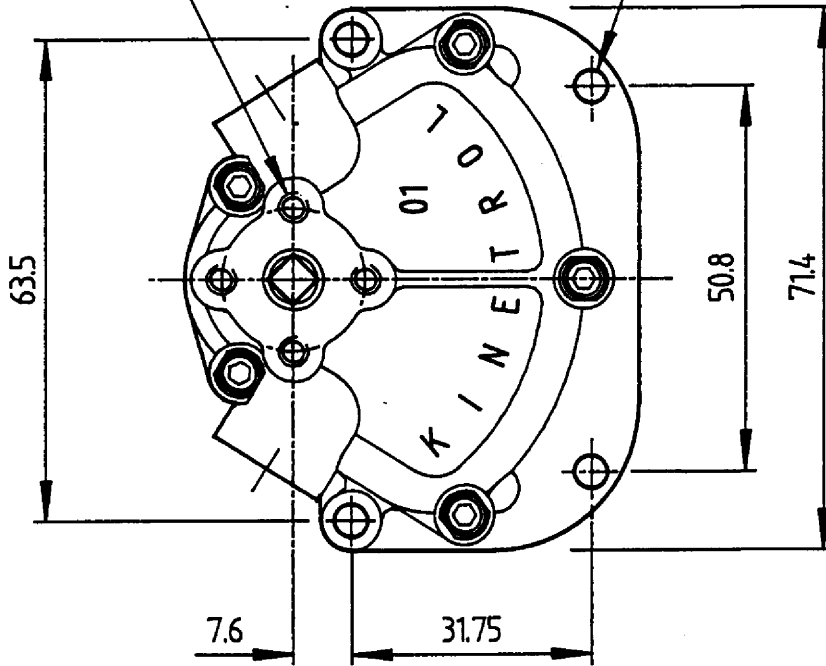
This document must be read in conjunction with: Kinetrol Rotary 1/4 Turn Actuator/Add-On Units Installation, Operation and Maintenance Leaflet K109.

Caution: to avoid possible damage or injury, always disconnect air supply before removing any parts from the positioner.

1. Remove the cover of the positioner.
2. Note which face of cam is visible from above. Remove the cam from the coupling.
3. Loosen the two grub screws in the coupling, and remove the coupling.
4. There are tapped holes on three sides of the coupling, two of which are fitted with grub screws. Remove one grub screw and replace it in the hole 180° opposite.
5. There are two lugs on the coupling. One of these lugs is fitted with a blanking grub screw. Remove this screw and fit it to the other lug.
6. Manually rotate the Actuator vane through 90° to the opposite end of travel.
7. Remove the feedback spring lever assembly, complete with roller cam follower.
8. Remove feedback tension spring.
9. Loosen screw in force balance lever which holds spool valve ferrule.
10. Remove force balance lever, leaving spool in place.
11. Undo the four screws which fix the complete diaphragm housing assembly to the positioner body. Remove complete diaphragm housing.
12. Remove PVC plug and four grub screws from side of positioner opposite diaphragm housing, and fit to other side of positioner
13. Replace diaphragm housing on opposite side of positioner.
14. Remove spool, turn around and replace .
15. Fit replacement force balance lever into the positioner case, on the opposite side from which original lever was removed.
16. Referring to leaflet K109, fit the spool into the force balance lever.
17. Refit the coupling with its blocked lug towards the top of the box, facing away from the moving levers etc.
18. Tighten the two grub screws in the coupling.
19. Connect spring force balance lever and replacement feedback spring lever assembly.
20. Fit replacement lever over pivot post, and replace shim and circlip.
21. Refit the cam to the coupling "upside down". (So that the face which was visible previously is now facing downwards). Set the angular position of the cam as per leaflet K109.
22. Reset the positioner in accordance with installation, operation and maintenance instruction leaflet K109.

4 Aux. Mount Holes
M4 x 6 deep on 19.0 p.c.d.

4 Mount Holes M4 clearance



MODEL 010-100 ACTUATOR

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3-Stop Positioner - Maximum Travel Speeds

Table shows maximum angular speed (Degrees per Second) with an air supply pressure of 5.5 Bar (80 psi) and no load on the actuator.

Model	Double Acting	Spring Return
05	150	80
07	75	45
09	36	20
12	18	11
14	8	4.5

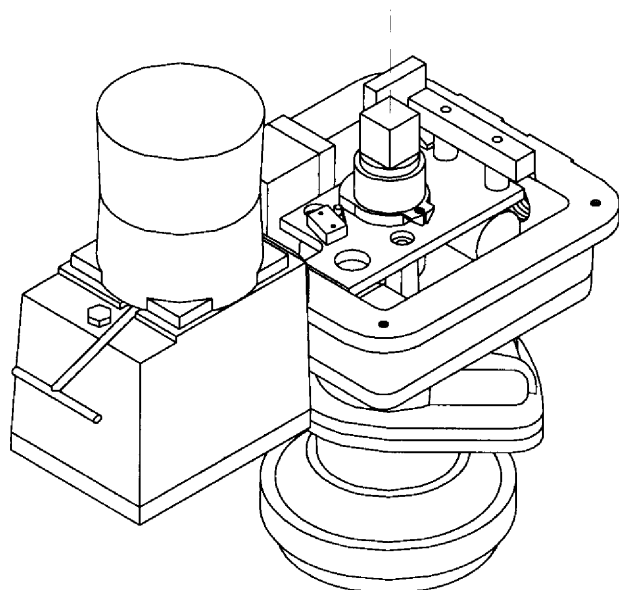
These maximum speeds are the average achieved during a full 90 degree stroke of the actuator. Speeds over smaller angles from rest may be lower, since the time spent pressurising or depressurising one side of the actuator becomes a greater proportion of the total.

For stable positioning with a particular load, it may be necessary to slow down the actuator - whether this is necessary, and if so, by how much, depends on the balance between load inertia, dead band adjustment (itself dependant on the angular precision required) and maximum actuator speed. It is most likely to be necessary for smaller faster actuators with large inertial loads. Snubber/silencer kits are available from Kinetrol to fit all 3-stop models.

Speeds will be lower than the above if significant torques are required to shift the load, or if supply pressure is lower than 5.5 Bar (80 psi).

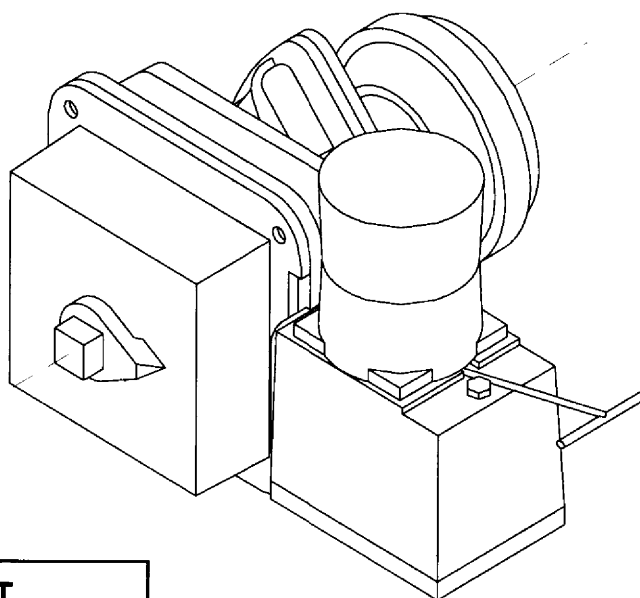


Operating Instructions - US Div 2 On-Off SR Electrohydraulic 1/4 Turn Actuators



SPRING RETURN EHD WITH
CONTROL BOX LID REMOVED
PUMP SET FOR VERTICAL AXIS

SPRING RETURN EHD WITH
CONTROL BOX LID IN PLACE
PUMP SET FOR HORIZONTAL AXIS



**FMRC CONTROLLED DOCUMENT.
NO CHANGES WITHOUT PRIOR FMRC APPROVAL.**

Contents

Page 1	Contents and Diagrams of Axis Orientation Configurations
Page 2	Functional Description
Page 3	Circuit Diagram
Page 4	Preparation for Use
Page 5	Exploded View of Assembly
Page 6	External Wiring Connections
Page 7	Internal Wiring Diagrams
Page 8	Limit Switch Adjustment
Page 9	Fuses and Internal Connections
Page 10	Inspection, Maintenance and Troubleshooting
Page 11	Optional Rapid Dump Valve



Functional Description

This document is the user instructions for a KINETROL EHD on-off spring-return electrohydraulic actuator, approved by Factory Mutual Research Corporation (FMRC) for use in Class 1 Division 2 Group A-D hazardous locations (as defined in US National Electrical Code NFPA No. 70 Article 500), but NOT in locations with acetone vapour present.

The unit is intended for use in applications requiring 90 degree rotary movement using single phase 115v 60Hz mains electricity as the only power source, where fail-safe spring-return action is needed when power is not applied to the unit. By correctly orienting the pump/reservoir unit relative to the control box (see pages 4 and 5), the unit can be set up for use with its main output shaft on a vertical axis or on a horizontal axis.

The actuator is made up of a liquid-filled vane-type 90 degree actuator, with a clock-type spiral spring return unit in a housing bolted onto one face, and an electrically driven hydraulic power and control unit bolted onto the other.

When no electrical power is supplied to the unit, the solenoid valve between the two sides of the vane actuator drops open and the pump remains switched off, so that the full torque of the spring unit is available at the output shaft to give reliable, simple failsafe action.

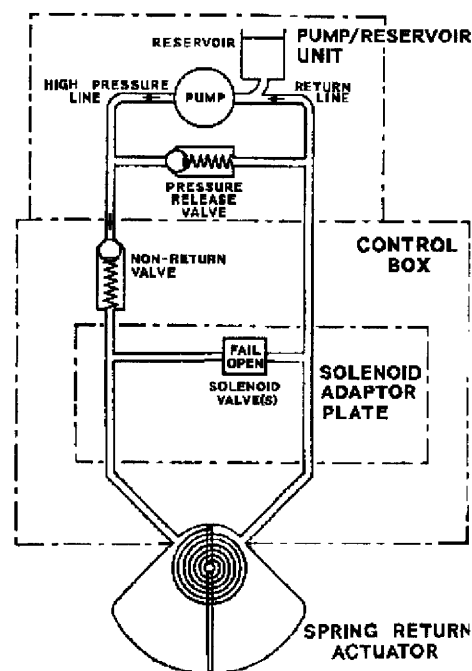
When power is applied to the unit, the solenoid valve closes and the pump pressurizes one side of the actuator, which moves against the torque of the spring through 90 degrees, until the main limit switch is activated by a cam on the control box shaft to cut out the pump. While power is applied, the solenoid valve remains closed, and this plus the non-return valve on the pump supply line blocks reverse flow between the two sides of the actuator, and holds the position of the actuator against the torque of the spring. Spring torque and pump pressure are balanced to give similar maximum output torques during powered and spring strokes.

A gear pump immersed in its own reservoir transfers silicone fluid from the low pressure to the high pressure side of the vane actuator via the control box. The pump runs on ball bearings, and is driven by a single phase permanent capacitor induction motor which is brushless, and 100% rated (ie. suitable for running continuously without overheating). A pressure release valve is built into the pump, which prevents excessive build-up of pressure, and hence prevents excessive output torque or motor stalling, if the user's load gets jammed or if the main limit switch fails to stop the actuator before it runs into its internal mechanical endstop. A self-resetting thermal cutout is built into the motor windings to prevent dangerous overheating if the motor stalls.

The entire internal electrical circuitry, including the limit switch and the motor, are non-incendive in normal operation, so that the unit can be used in Class 1 Division 2 Group A-D hazardous locations (EXCEPT for locations with acetone vapour present) where explosion hazard is not present under normal conditions.

WARNING

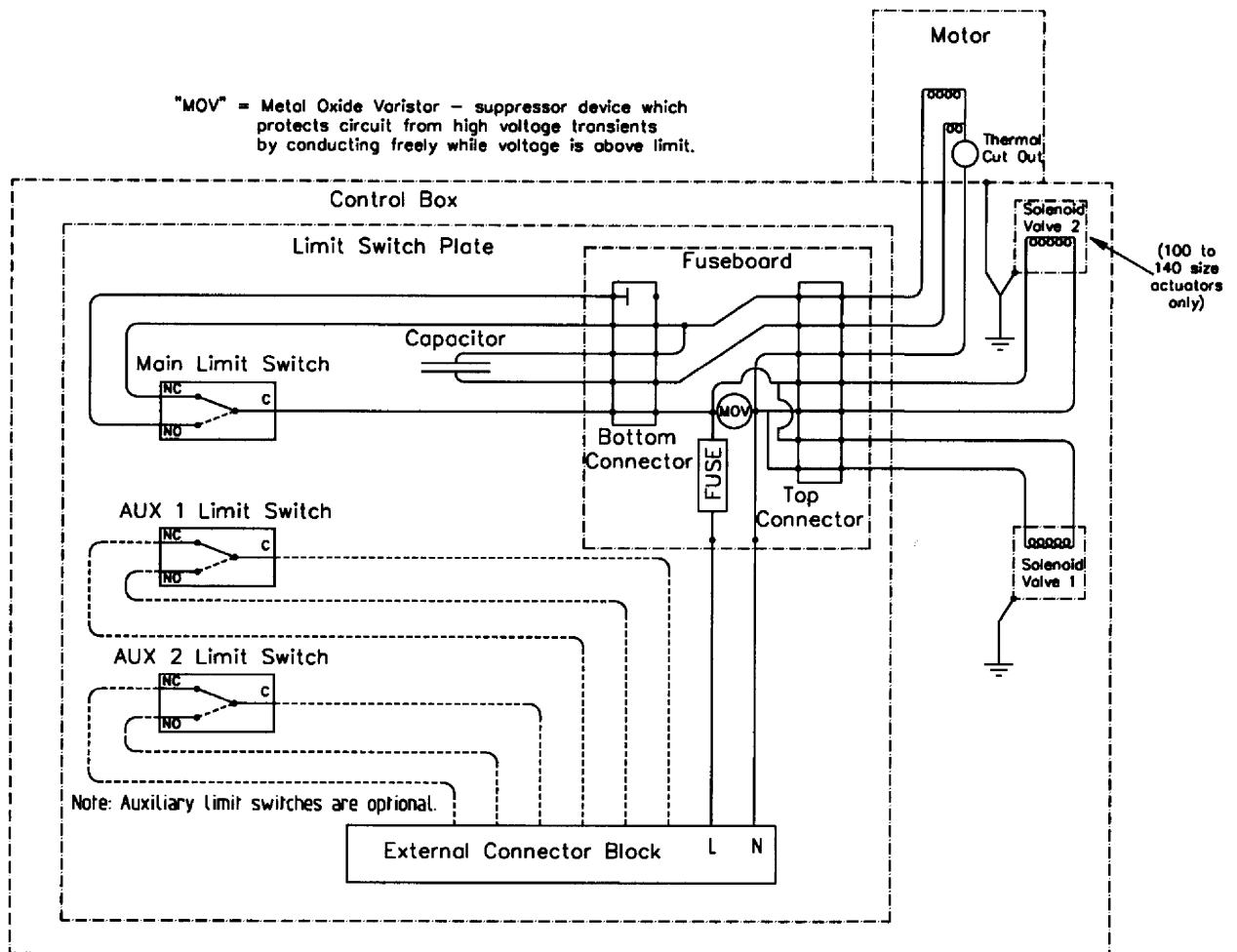
WHEN THE ACTUATOR IS LOCATED IN A HAZARDOUS AREA AND POWER IS CONNECTED TO IT , DO NOT CHANGE A FUSE OR DISCONNECT ANY WIRES , SINCE THIS MAY CAUSE ARCING CAPABLE OF SETTING OFF AN EXPLOSION.



HYDRAULIC CIRCUIT DIAGRAM



Circuit Diagram



ELECTRICAL CIRCUIT DIAGRAM FOR ON-OFF SPRING RETURN EHD ACTUATORS



Preparation for Use

Key to Exploded Diagram on Page 5

1 - Pump/Reservoir Unit	8 - Limit Switch Plate	14 - External Connector Block
2 - Vent Plug	9 - Fuse Board Mount Assembly	15 - Connector Number Plate
3 - Filler Plug	10 - Limit Switch	16 - Connector Block Support Pillars
4 - Pump Motor	11 - Limit Switch Striker	17 - Motor Capacitor
5 - Control Box Body	12 - Control Box Lid	18 - Limit Switch Mounting Pillars
6 - Solenoid Valve	13 - External Indicator	19 - Spring Return Vane Actuator
7 - Limit Switch Shaft		

Numbers in brackets refer to the exploded diagram on page 5.

Before mounting the actuator, check that pump/reservoir orientation is correct.

The EHD actuator can be used with its output axis oriented horizontally or vertically - see page 1 for illustrations of these two options. The pump/reservoir unit (1) however must be oriented with the motor (4) above the pump (1). In order to achieve this, the interface between the pump (1) and the control box (5) is rotationally adjustable at 90 degree intervals. The actuator should have been ordered with the interface adjusted to suit the user's application - however, if necessary the orientation can be changed to suit a different axis requirement.

In order to rotate the pump-to-control box interface, carry out the following steps:

1. Read through the following procedure and assemble the necessary tools, tubes, containers etc.
2. Support the whole actuator with the pump filler pointing upwards.
3. Unscrew the filler plug (3) - put both it and its sealing ring somewhere safe ready to be re-used later.
4. Drain the oil from the reservoir (1) into a clean container about 500ml (1 pint) in capacity. Syphoning with a U-shaped plastic tube works well here - start the flow by sucking with a squeeze bottle. About 270 ml of oil should come out. Don't lose any oil, because you need to pour it back in again later.
5. Remove the external indicator (13) and the control box lid (12).
6. Remove the four M6 socket head screws holding the pump (1) to the control box (5). As these screws are loosened, support the pump body and don't let it move much relative to the control box flange, because the wires to the pump motor pass through the middle of this interface, and will be damaged or sheared off if much movement occurs. A small amount of oil may drop from the interface at this point.
7. Rotate the pump relative to the control box as required - again, take care not to damage or shear off the wires through the middle during this process. Refit the M6 screws and tighten in place. Will only operate horizontally with pump on right hand side unless an adaptor plate is used.
8. Rotate the whole actuator so that the filler hole again points upwards, and support it in this position.
9. Pour back the oil and replace the filler plug plus the sealing ring - note that the sealing ring is vital to keep dust and water out of the reservoir.

ABSOLUTE CLEANNESS OF OIL IS ESSENTIAL FOR RELIABLE PERFORMANCE.

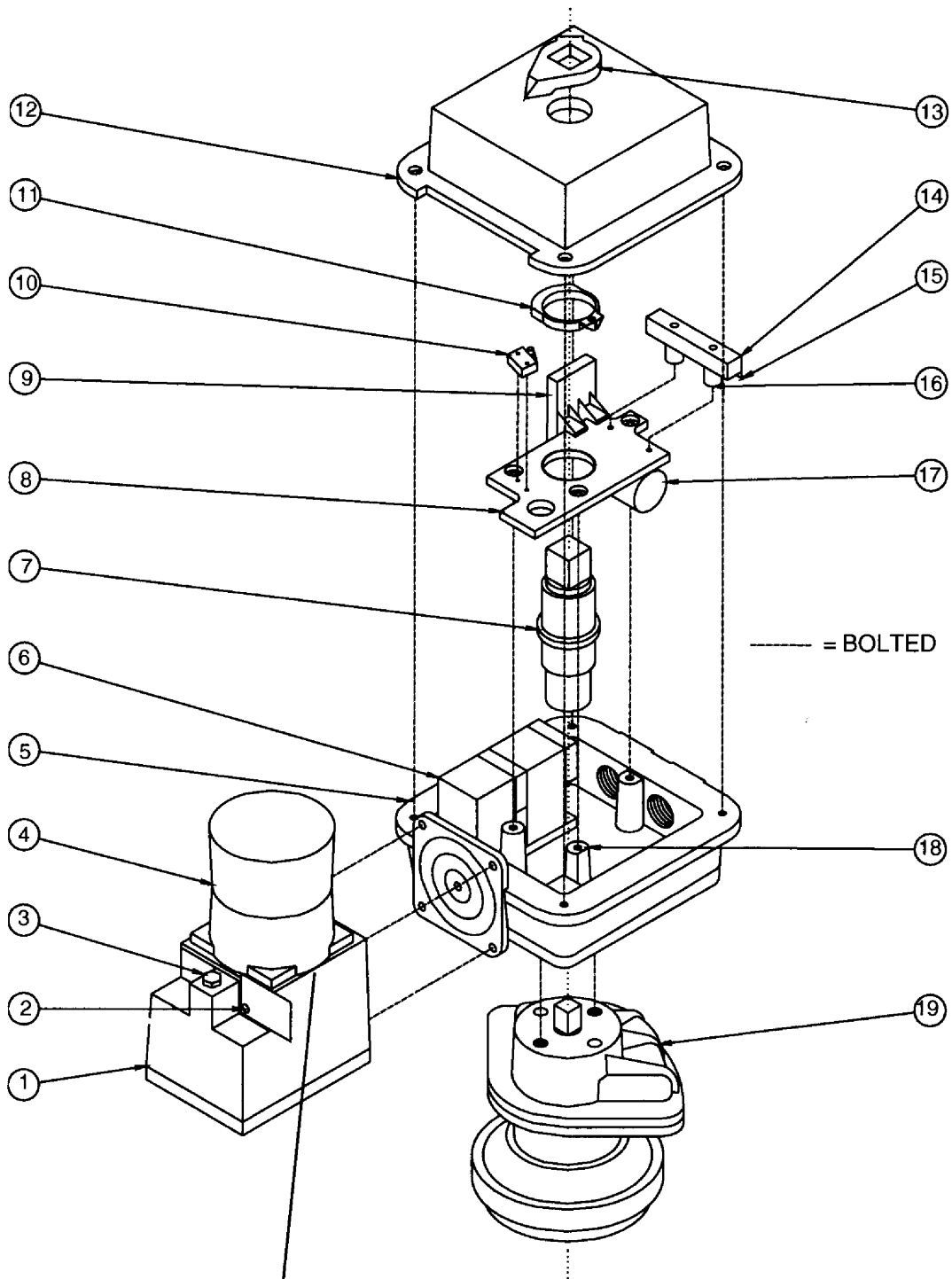
IF ANY EXTRA OIL IS ADDED AT ANY TIME IN THE ACTUATOR'S LIFE, USE ONLY 50cSt SILICONE FLUID.

This oil is available from Kinetrol.

AFTER mounting the actuator, but BEFORE running it, pull out the vent plug (2). The vent plug is fitted only to prevent loss of fluid while the actuator is in transit - once the actuator is in its fixed position, this plug must be removed. If the vent plug is left in during extended running, thermal expansion and contraction of the fluid can damage the actuator.



Exploded Diagram



Note(1): Pull out vent plug (2) after actuator is mounted, but before it is put into service.

Note(2): Motor/Pump interface is factory sealed with RTV sealant compound. If this seal is disturbed, new compound must be applied to maintain NEMA 4 environmental sealing.



External Wiring Connections

WIRING CONNECTIONS - ALL MODELS

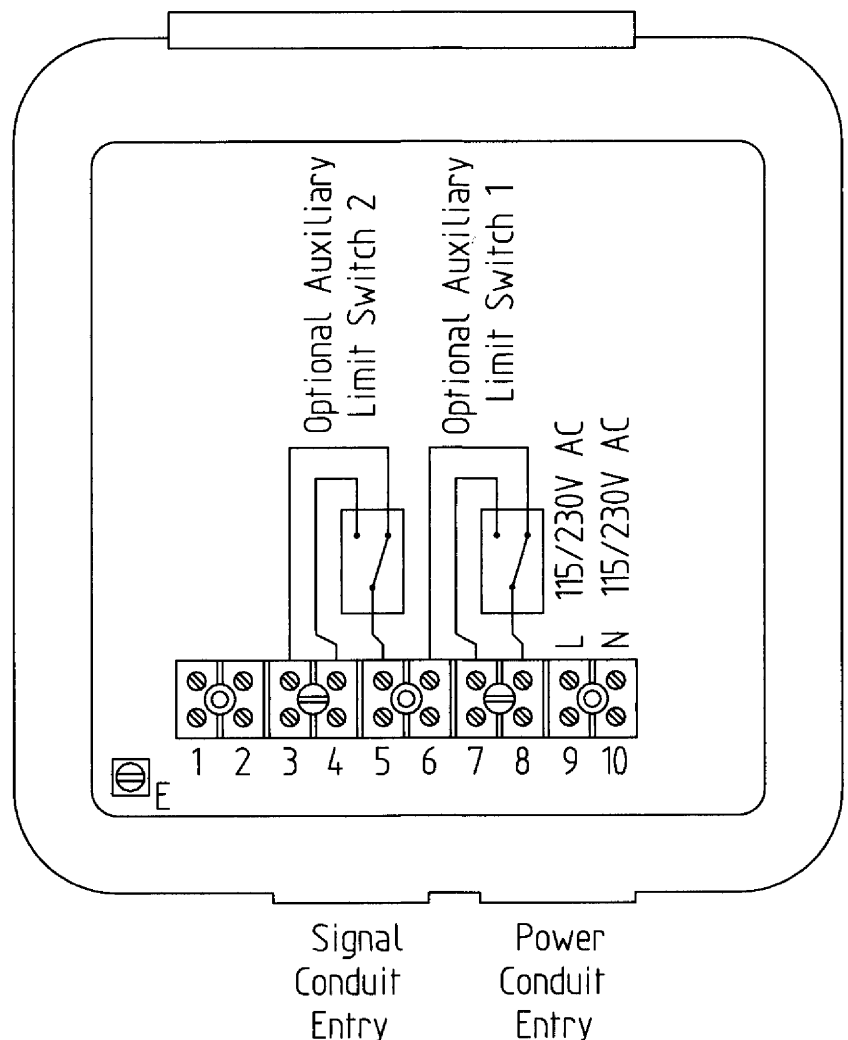
Wiring conduits with the required degree of environmental protection should be connected to the threaded conduit entry holes in the actuator control box. If the signal port is not being used, then it must be blocked using the plug supplied with all units except positioner models.

Access to the connector block is obtained by removing the external indicator and the control box lid, which is held on by four M4 slot headed screws.

BEFORE REMOVAL OF THE LID, ENSURE THAT POWER HAS BEEN DISCONNECTED

When wiring is complete, examine the sealing flange face of the control box to make sure no wires (either internal or external) can become trapped when the lid is replaced, and also make sure that the O ring is properly positioned in its groove.

Spring Return On/Off EHD Wiring Connections
Top View of Control Box with Lid Off



IMPORTANT

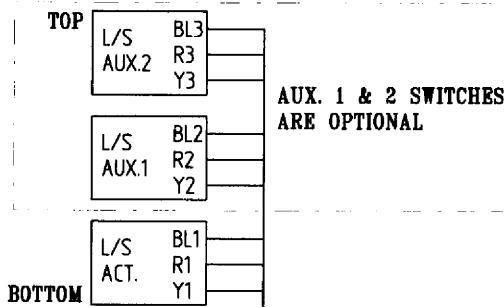
The terminal fixed to the control box casting, labelled "E" on the diagram, **must** be connected to an earth or ground line.

All live supply lines, labelled "L" on the diagram, **must** be fitted with 2A fuses external to the EHD Actuator.

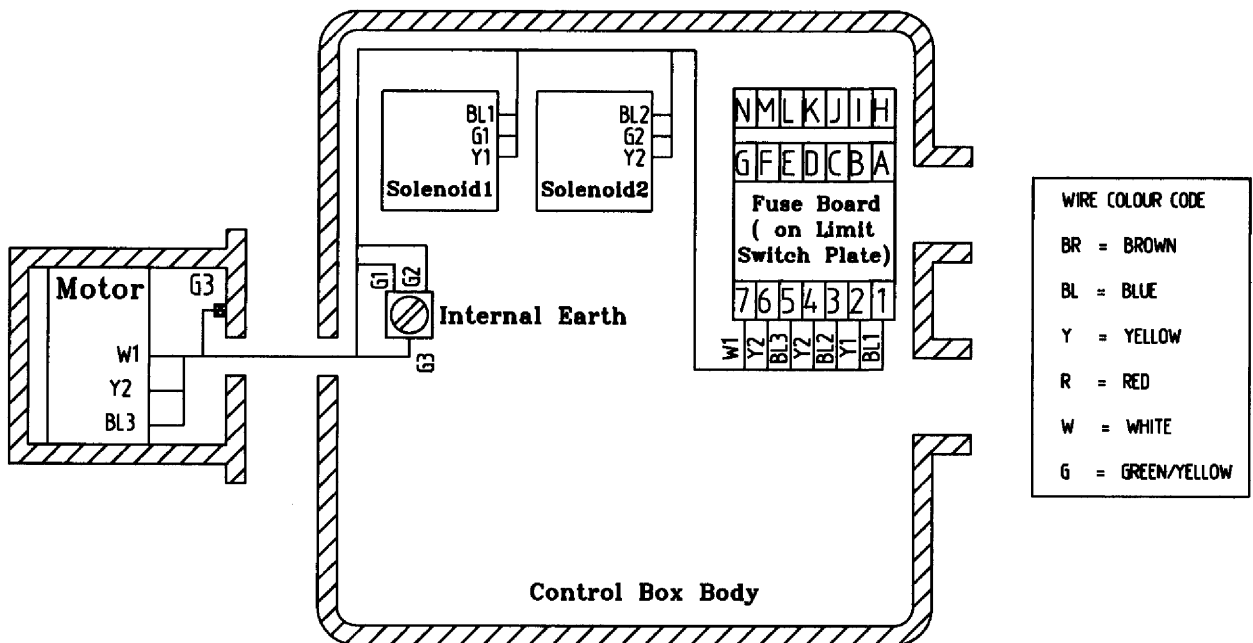
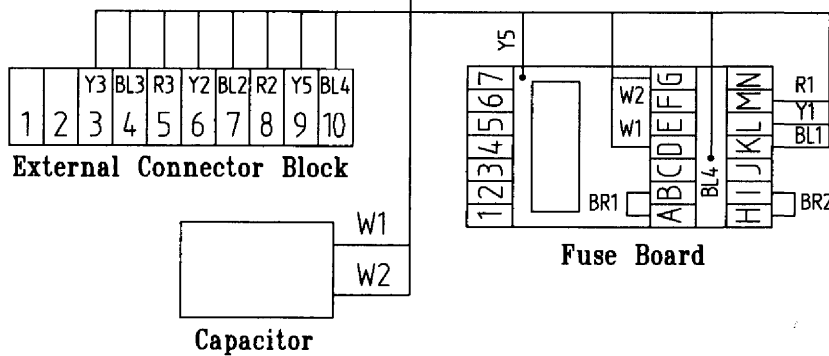


Internal Wiring Diagrams

Limit Switch Stack



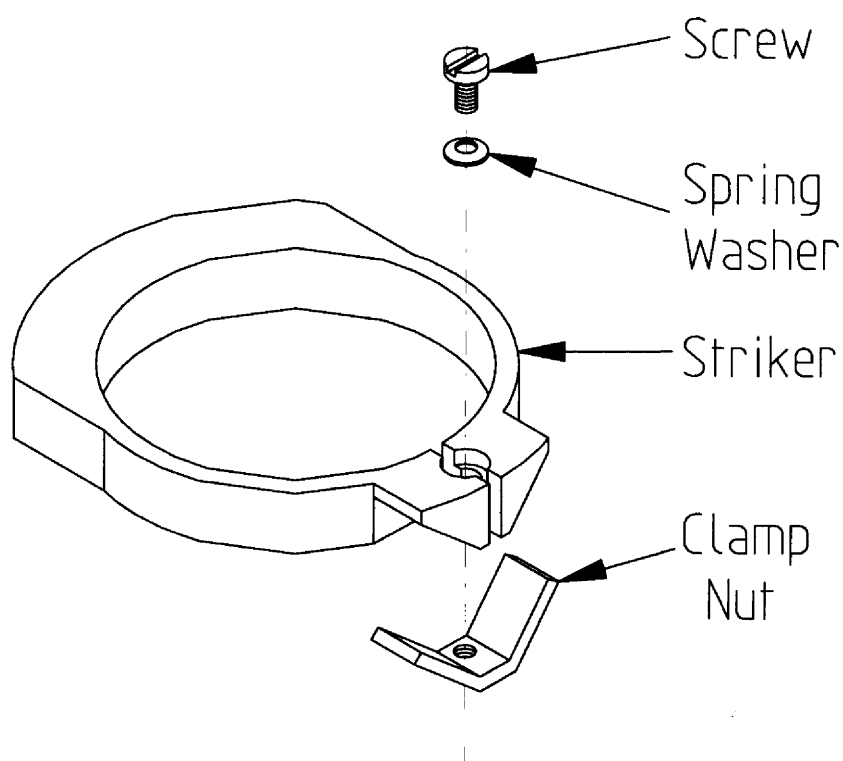
Limit Switch Plate Wiring Diagram.



Control Box Wiring Diagram - Excluding Wiring Already on Limit Switch Plate.



Limit Switch Adjustment



Limit Switch Striker Assembly

Disconnect power before adjusting limit switch strikers.

The limit switch at the bottom of the stack is the actuator travel limit switch, with its striker factory-set to stop the actuator just before the actuator's mechanical endstop is reached. This striker can be adjusted by the user to limit travel as required - however, care should be taken to avoid leaving the actuator motor driving against its own endstop, or against the load's travel limit.

Any further limit switches are optional auxiliary switches to allow the user to signal position as required.

The bottom striker should be adjusted first, then the next one up, etc., so that for each one the clamp screw is not obscured by a striker which has already been set.

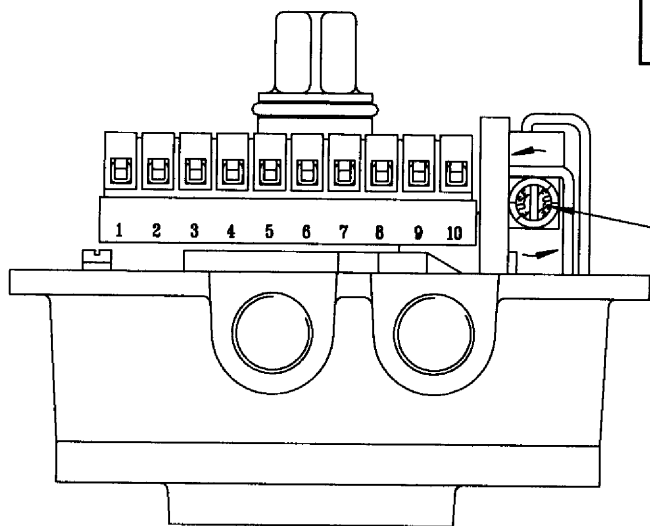
To set a striker, first slacken its clamp screw using a slot headed screwdriver, without completely undoing it and letting the clamp nut drop off underneath. Rotate the striker into position on the shaft, and re-tighten the clamp screw.



Fuses and Fuseboard Connections

WARNING

DO NOT DISCONNECT FUSE OR WIRES WHILE CIRCUIT IS LIVE UNLESS LOCATION IS KNOWN TO BE NON-HAZARDOUS



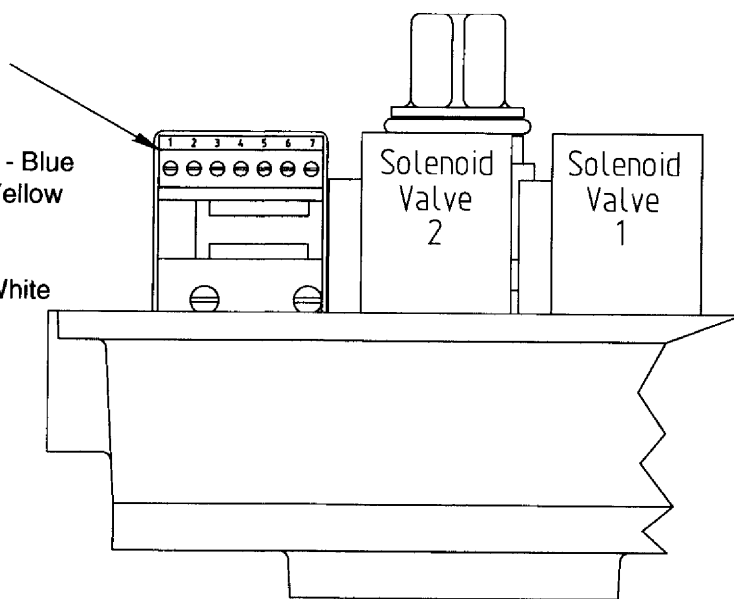
To remove fuse, push in fuseholder with a screwdriver and turn anticlockwise until fuseholder is free to spring out

Fuse must be 2A Quick Acting (F) Sand Filled 20mm x 5mm dia, to IEC127

END VIEW OF CONTROL BOX WITH LID OFF SHOWING POSITION OF FUSEHOLDER

Identity of Wires Connected to Top Fuseboard Terminals

- 1 - Solenoid Neutral - Blue
- 2 - Solenoid Live - Yellow
- 3 - Solenoid Valve 2 - Neutral - Blue
- 4 - Solenoid Valve 1 - Live - Yellow
- 5 - Motor Neutral - Blue
- 6 - Motor Live - Yellow
- 7 - Motor Capacitor Phase - White



SIDE VIEW OF CONTROL BOX WITH LID OFF SHOWING SOLENOID VALVE AND FUSEBOARD TOP TERMINALS



Inspection, Maintenance and Troubleshooting

Inspection and Maintenance

For reliable long term operation, it is recommended that the following inspection procedure is carried out at least once per year, and the recommended actions taken if necessary.

(1) Observe a complete operating cycle of the actuator, and if it fails to operate correctly as detailed here then see the troubleshooting guide below for recommended remedial actions.

When power is switched on, the actuator should run smoothly through 90 degrees. At the end of its travel, the limit switch should cut out the pump. After the pump cuts out, position should be held indefinitely without any dropping back under spring return load. When power is switched off, the spring stroke should be smooth and similar in speed to the power stroke.

(2) Disconnect power from the actuator, remove the position indicator, then remove the control box lid.

(3) Remove the oil filler plug and its sealing ring, and keep them for re-use. Check the oil level by looking into the filler hole - the oil level should be just below the bottom of the threaded filler hole, which extends to 23mm (0.9 inch) from the upper surface. If it is low, then top up to the bottom of the threaded hole with 50cSt silicone fluid - don't use any other type of oil. Replace the filler cap and sealing ring. It is essential that the oil in the reservoir stays completely clean - take care not to add any dirt or grit via the filler.

(4) Look at the reservoir breather vent entry, and make sure it is clear of debris.

(5) Observe the control box interior, and make sure that the wiring, the limit switch(es), the solenoid valve, the fuseboard etc. are in good condition. Any damaged components should be replaced.

In order to replace any control box component, first disconnect the motor and solenoid wires from the upper connector block on the fuseboard (see page 9), then undo the three screws holding down the limit switch plate assembly (see page 5) and lift out this assembly complete with shaft and fuseboard.

When this has been done, all the components become easily accessible either on the plate assembly or in the disencumbered control box.

(6) Make sure that the top shaft seal O-ring is in good condition and well greased - this is necessary to ensure that the control box remains weathertight.

(7) Replace the control box lid, taking care that the lid flange O-ring is well seated in its groove and that no wires are trapped between the lid and the control box. Replace the position indicator.

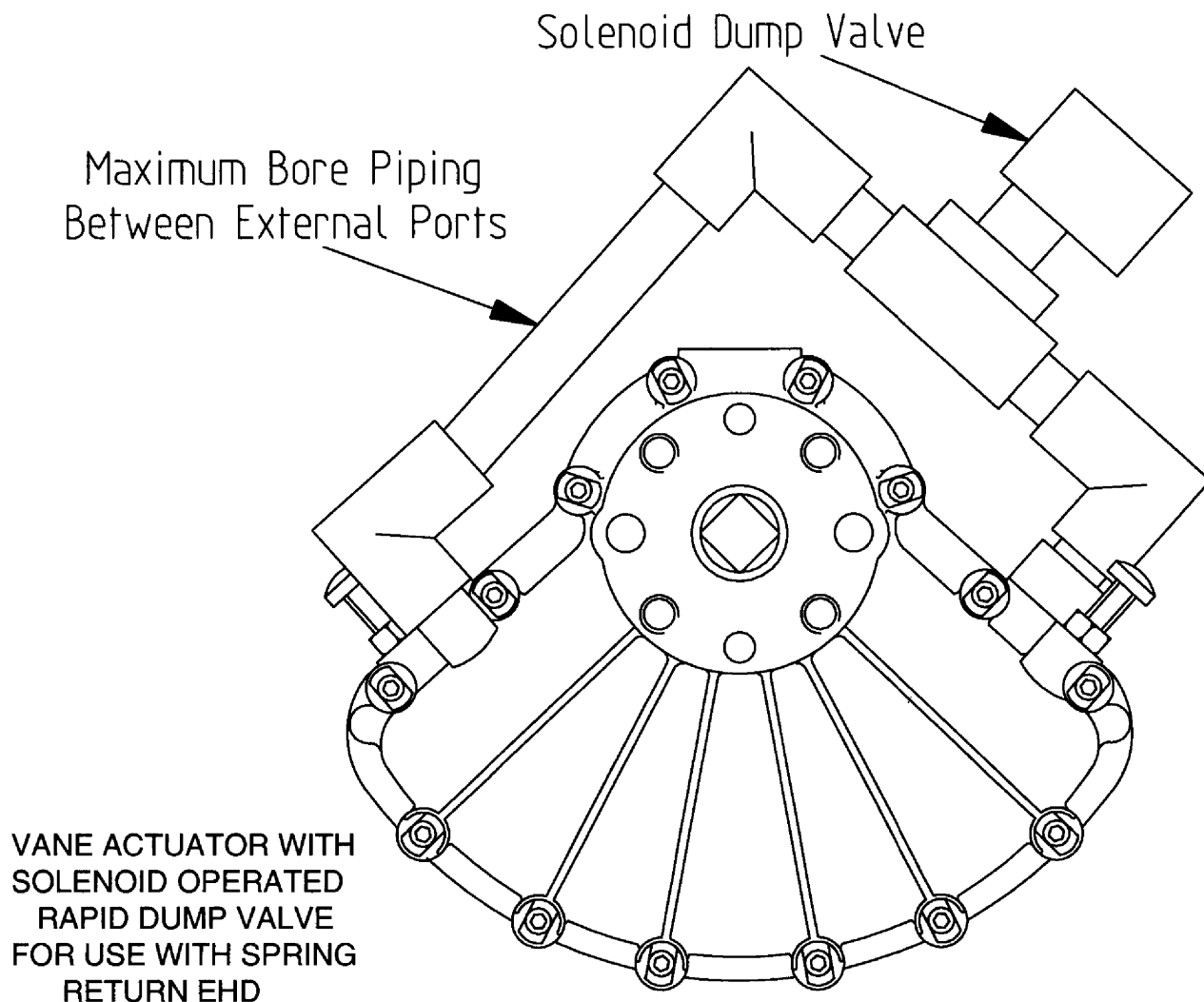
Troubleshooting Guide

This is a guide to simple problems only - contact Kinetrol's distributor if this does not solve your problem.

Problem	Possible Cause	Action
Irregular motion under power.	Load takes too much torque. Incorrect supply voltage. Lack of oil.	Fit larger model actuator. Correct it. Find where oil has gone: Was axis orientation correct? If not, correct it (see page 4). If there is a leak, correct it. Refill with oil.
Pump fails to stop at end of power stroke.	Striker maladjusted. Limit switch failed.	Reset striker. Replace limit switch.
Actuator drops back when holding at end of power stroke.	Damaged solenoid valve.	Replace solenoid valve.
Spring stroke slow or irregular.	Load takes too much torque. Oil debris blocking solenoid valve.	Fit larger model actuator. Clear out debris from valve.
Complete failure to run.	Fuse blown.	Replace fuse - if it blows again, trace fault. Note high voltage transients can blow the fuse as part of the protective action of the MOV suppressor device.
Solenoid clicks but pump dead.	Limit switch failed.	Replace limit switch.



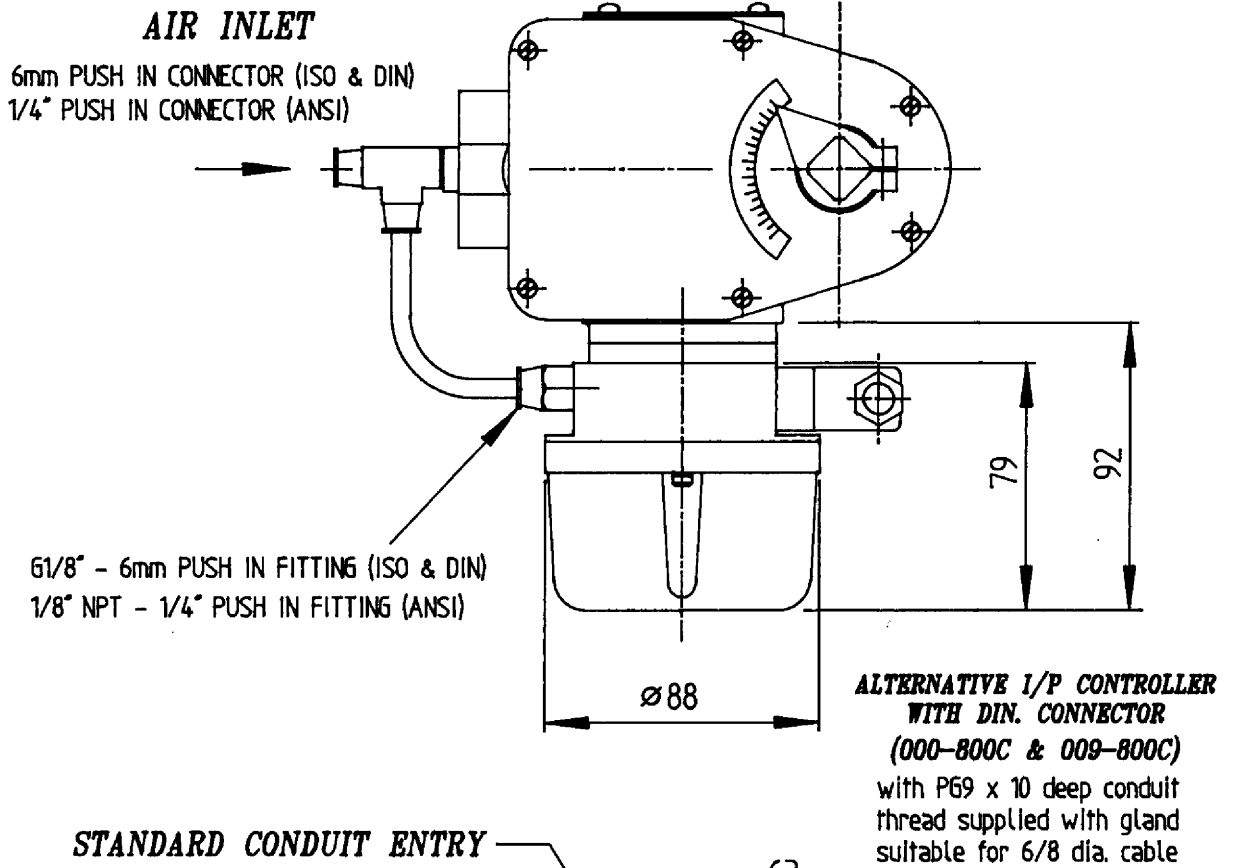
Optional Solenoid Operated Rapid Spring Return Dump Valve



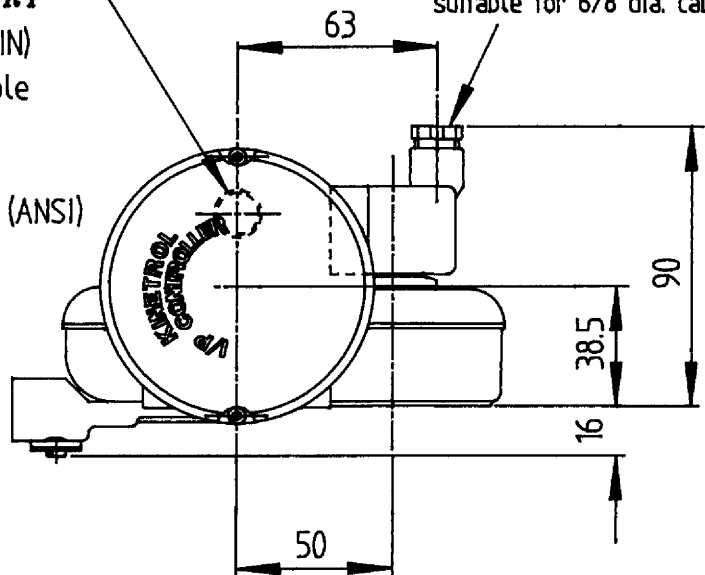
A large capacity 2/2 solenoid valve is piped to the two external actuator ports using the widest bore tube and fittings compatible with the ports. It is additional to the normal internal EHD solenoid valves, and does not prevent them working. Wiring connection of the dump valve is left to the user, since there are several functions possible, all requiring different arrangements. The valve closes when energised, allowing the actuator to hold position or move under power against the failsafe return spring. When the valve is de-energised, it opens, giving rapid spring failsafe action. The standard coil has a DIN 43650 3-pin interface, and is supplied complete with a plastic connector which has a female 1/2" NPTF thread on the wire input (suitable for connection to a steel conduit). Strength of the connector limits the torque which can be applied during installation via the conduit thread to 6.7 lb.ft.

I/P CONTROLLER 000-800 & 009-800

MARK 2



STANDARD CONDUIT ENTRY
M16 x 15 x 14 deep (ISO/DIN)
supplied with gland suitable
for 7/10.5 dia. cable
OR
3/8"-18 NPSM x 0.55" deep (ANSI)



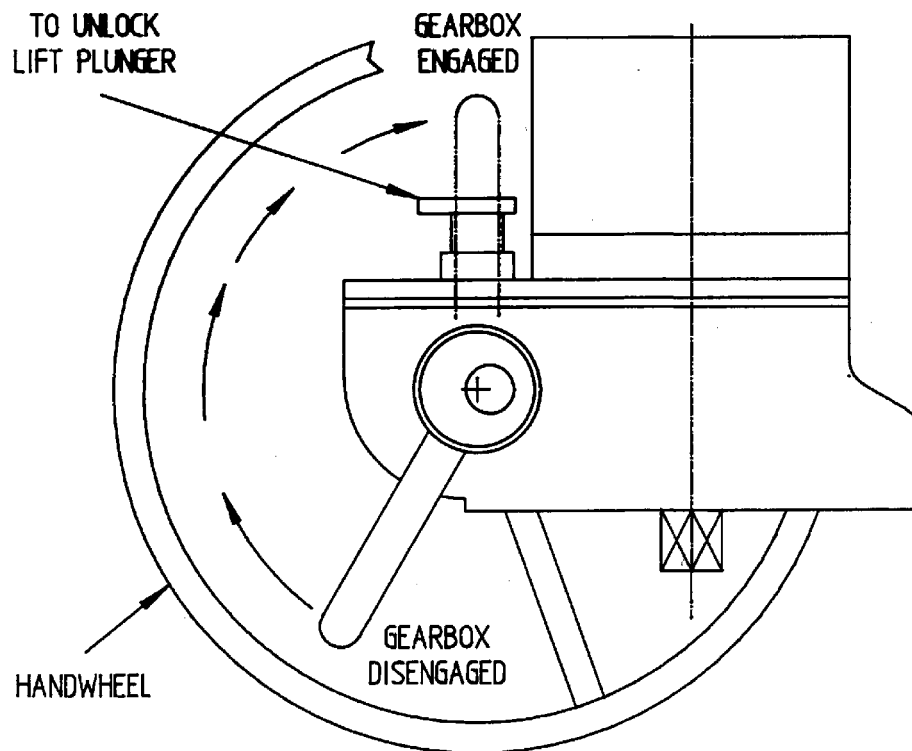
NOTE :-

Standard Conduit Entry will be fitted with water tight plug when DIN Connector is specified.
Wire Entry hole for DIN Connector will be plugged when Standard Conduit Entry is specified.

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Title: Operating Procedure for S/R EHD Manual Gearbox



1. Disconnect Electrical Power

2. Lift plunger

3. While holding plunger out rotate bar through 150° to vertical position

4. Release plunger

5. Gearbox is now engaged & actuator/valve can now be moved manually using the handwheel

6. Move valve/actuator assembly to spring returned position before reverting to electrical control in order to unload manual drive before declutching

ISSUE
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KINETROL Trading Estate, Farnham, Surrey, England

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Instructions for Converting Standard D/A 3-Stop Positioners to D/A Fail Down Function on Power Loss

This instruction sheet describes how the parts supplied in conversion kit SP 563 can be used to convert a standard double acting 3-stop positioner (which fails in last position when electrical power is disconnected but air pressure remains) to give fail down function when electrical power is disconnected but air pressure remains. "Fail Down" means that the actuator moves to the low signal position on loss of power - ie. for a standard unit as supplied with anticlockwise movement on rising signal, the unit will move to the clockwise end of its travel on loss of power.

(1) Conversion to give clockwise movement on loss of power.

1. Detach solenoid B from its mounting by undoing the two M4 screws at its diagonally opposite corners.
2. Remove the third screw holding solenoid B together.
3. Retain the orientation of the main body of solenoid B, but rotate the base and lid by 180 degrees relative to it, and refit the third bolt holding them together.
4. Fit solenoid B back to its mounting block, with the special adaptor plate between the solenoid and the block with its O-ring side to the block, and in the opposite orientation to the solenoid's base. (See diagram below). Use the longer screws supplied with the conversion kit, with two spring washers under the head of each screw.
5. Change over jumper J3 on the circuit board from DA to SR end of its connector.
6. Stick self adhesive label with SR user connection information to inside of lid in place of DA label.

(2) Conversion to give anticlockwise movement on loss of power.

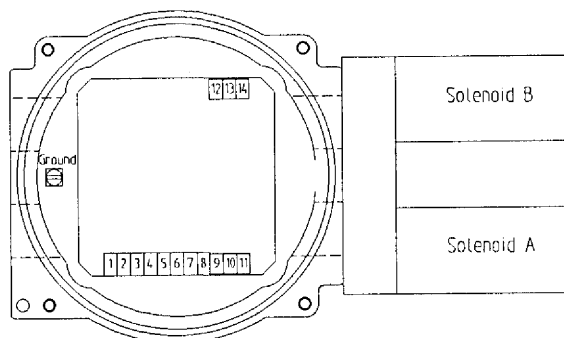
1. Carry out the procedure listed above (including 5 & 6), only do so for solenoid A instead of solenoid B.
2. Swap over the terminals for the brown wires from solenoids A and B; after this procedure, the brown wire from solenoid A should connect to terminal 6, and that from solenoid B to terminal 8.
3. Swap over the terminals for the green and yellow wires from the feedback potentiometer; after this procedure, the yellow wire should connect to terminal 13, and the green to terminal 14.
4. After air and power have been connected, it will be necessary to rotate the body of the feedback potentiometer to range in the positioner correctly. This is most easily done if the internal mid position preset pot was adjusted to 45 degrees before the conversion started - then the resetting procedure can be done simply by loosening the feedback pot clamps and rotating it until the positioner (switched to its mid position) moves the actuator to the 45 degree position.

WARNING

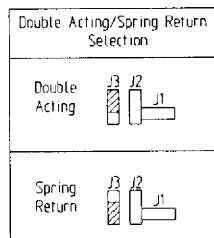
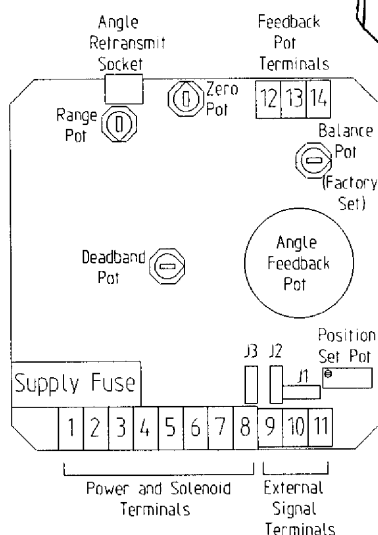
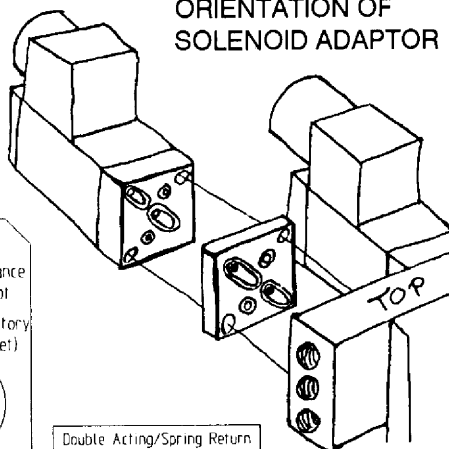
Disconnect electrical power and air before starting conversion procedure

Note: After conversion, user connections must be as for Spring Return units, not as for the original Double Acting configuration. See self adhesive label supplied with kit for terminal details.

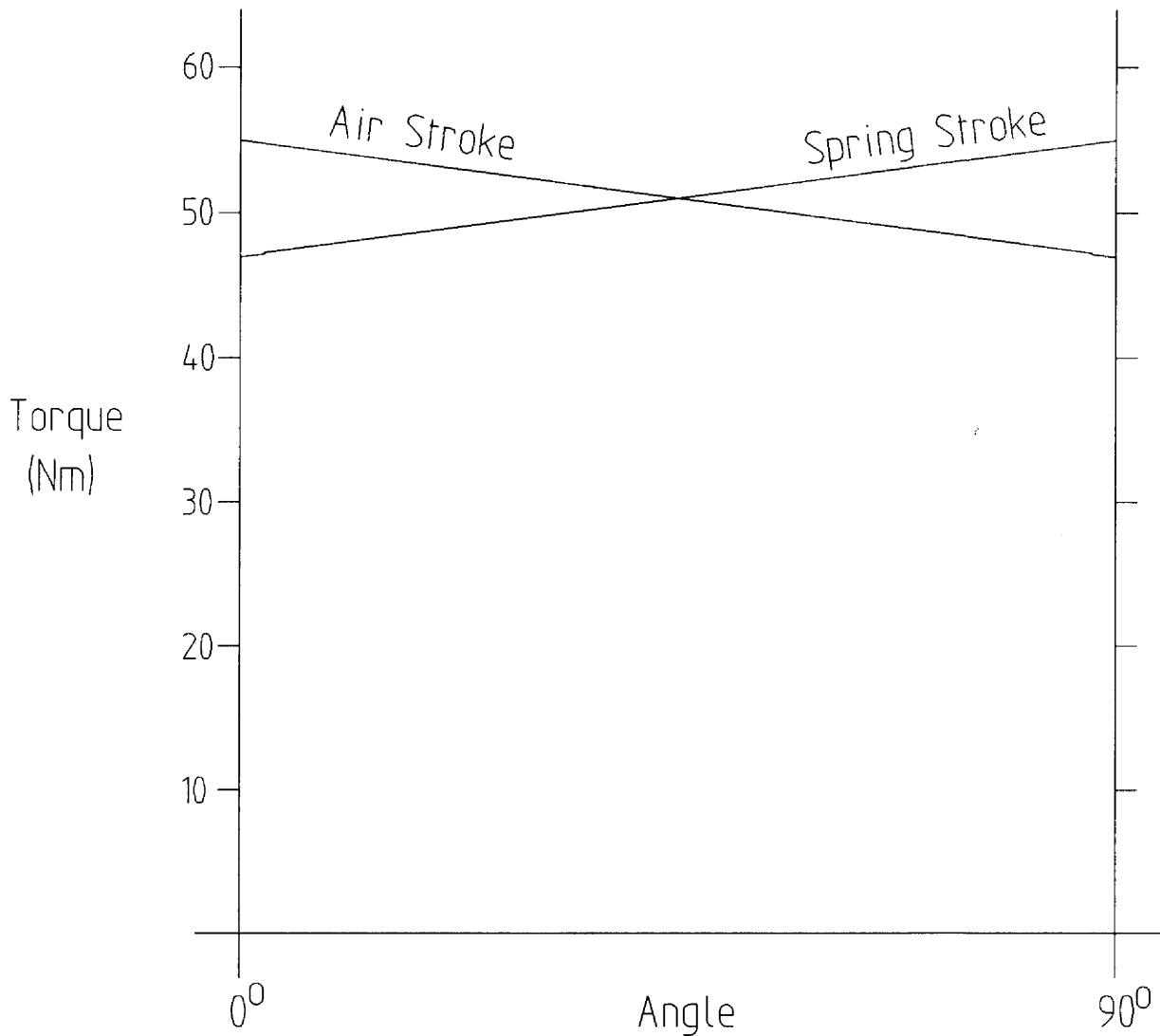
SOLENOID AND TERMINAL IDENTITIES



ORIENTATION OF SOLENOID ADAPTOR

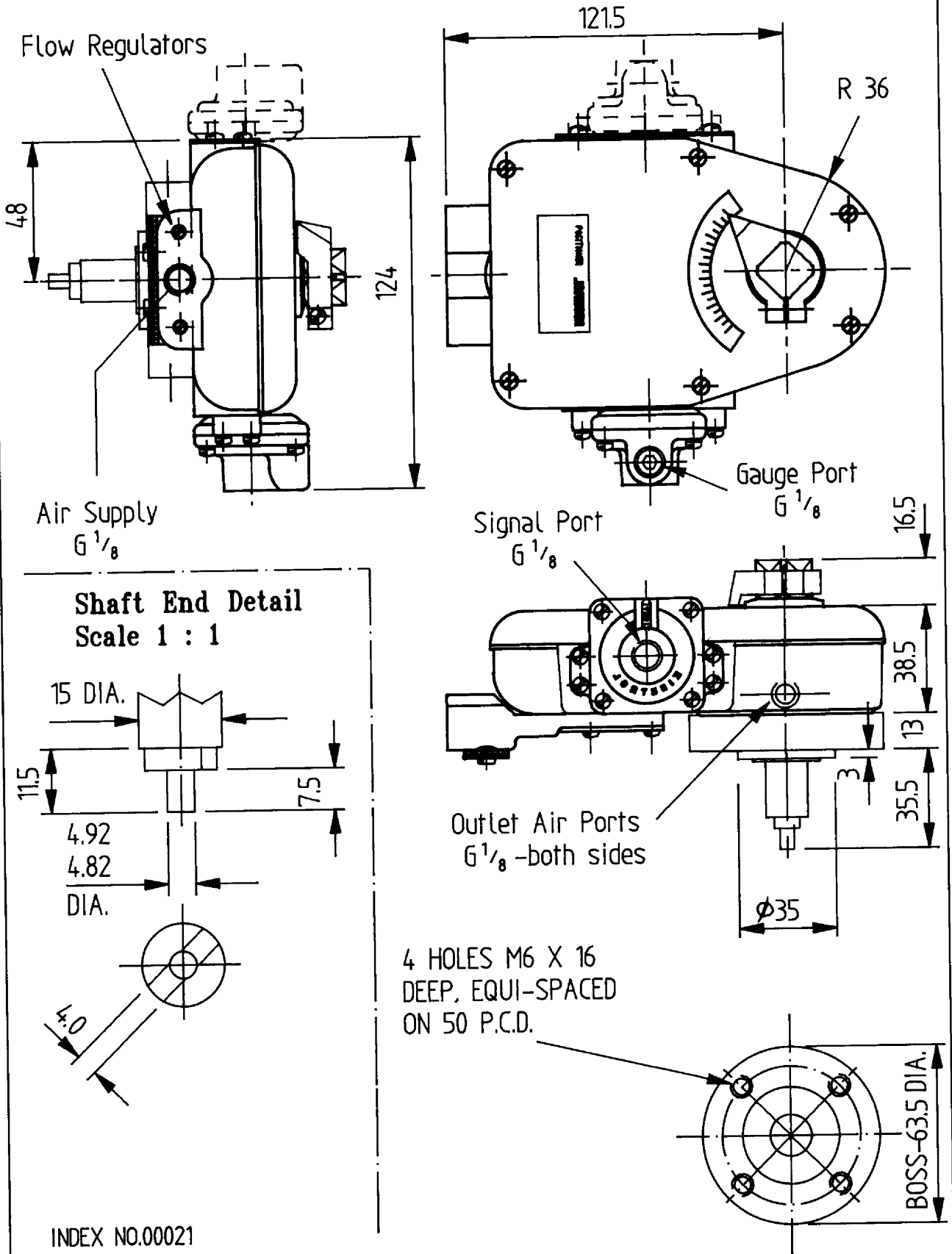


KINETROL



Output Torque vs. Angle for 072-120 Spring Return Actuator with Spring Wound for Balanced Torque at 6 Bar Supply Pressure

Discrete Positioner - NAMUR - Outline Drawing



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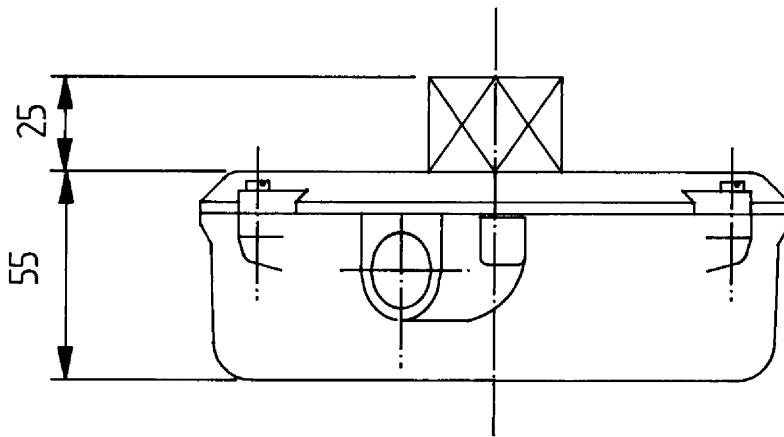
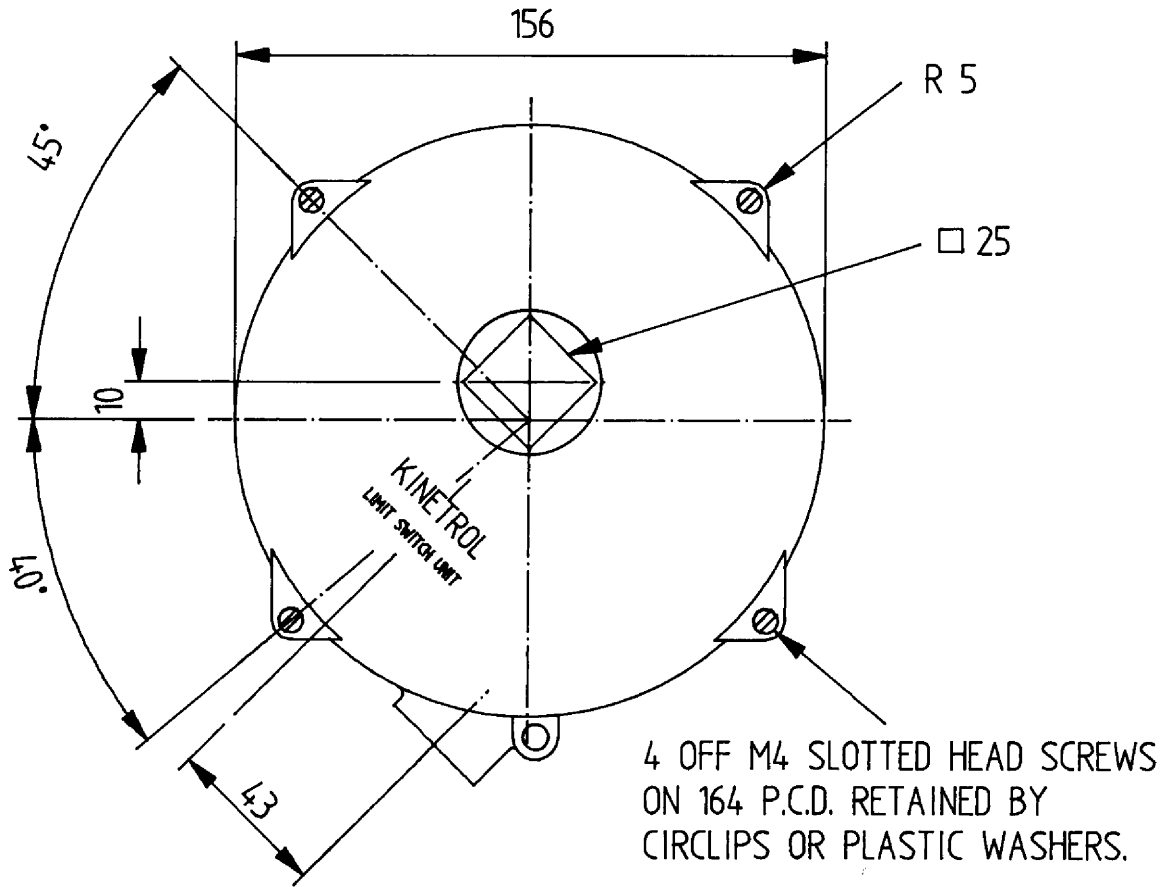
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a.f. Kelly

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Trading Estate Farnham Surrey England

SHEET No.
TD 58

120/180 LIMIT SWITCH BOX - NEW FIXINGS FOR LID



NOTE: RAISED RIM ADDED ON LOWER HALF OF LIMIT SWITCH BOX TO RETAIN 'O'RING AS 05 BOX.

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14-5-92

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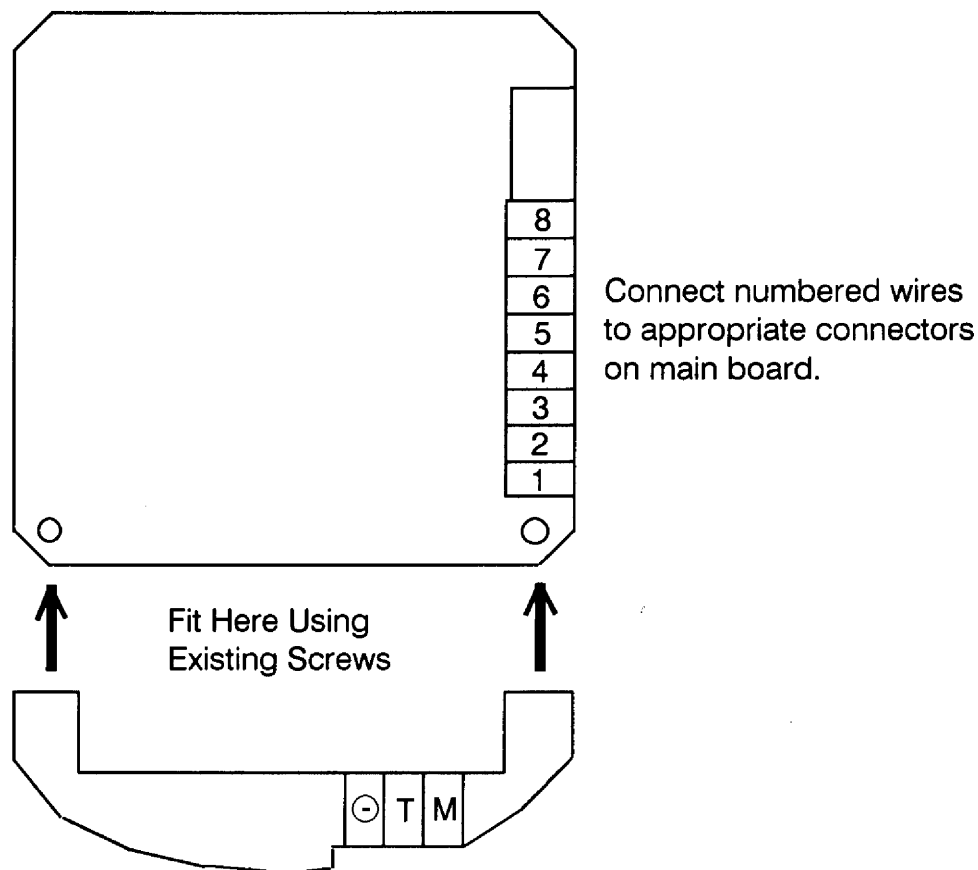
Trading Estate Farnham Surrey England

SHEET No.
TD 63



Instructions for 24 Volt Relay Circuit 87-048 Retrofitted to Fail-Down DA or SR 3-Stop Positioner

NOTE: This relay circuit is only suitable for converting 24v DC Fail-Down Double Acting or Failsafe Spring Return 3-Stop Positioners from the standard 4-wire control function to a simplified 3-wire arrangement.

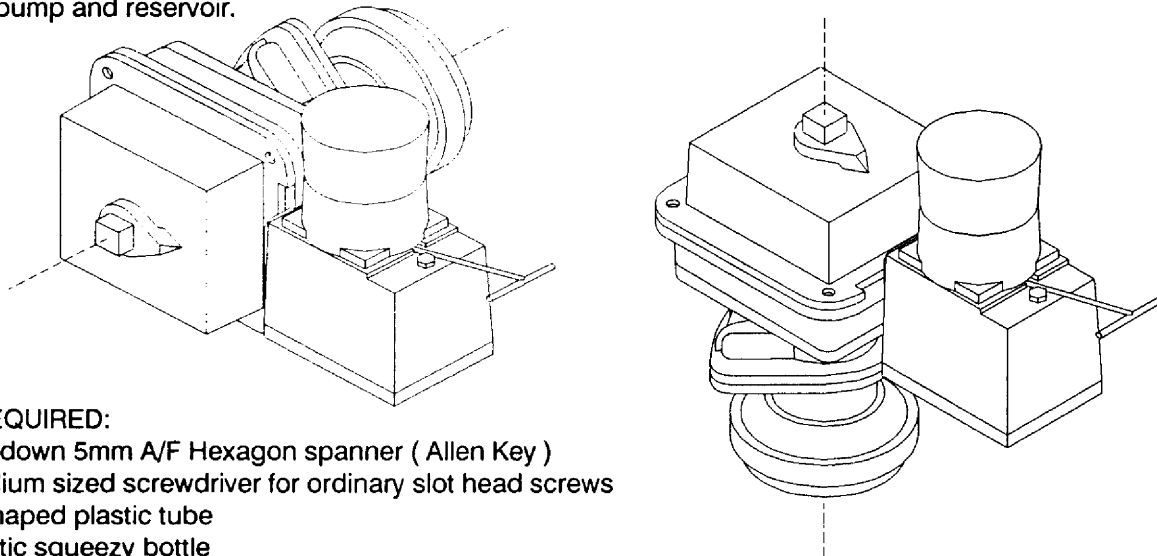


1. Disconnect all power from 3- stop positioner, and remove cover.
2. Disconnect all external wires from main circuit terminals, leaving solenoids and feedback potentiometer connected.
3. Screw relay circuit into 3-stop box using two existing circuit mounting screws as shown above. Relay circuit mounts partly on top of existing circuit, and above main earth terminal. If the earth terminal has not yet been connected, then do this before it is covered by the relay circuit.
4. Connect the four numbered flying leads on the relay circuit to the equivalently numbered terminals on the main circuit, as indicated above.
5. Connect negative power line to left hand terminal on relay board (marked \ominus above).
6. To move to mid position, supply +24v power to terminal M on relay board.
7. To move to top position (upscale or opposite to failsafe position), supply +24v power to terminal T on relay board.
8. To move to bottom position (Failsafe or Fail-Down position), disconnect all power.



Detailed Instructions for Rotating the Orientation of the Pump-Control Box Interface on an EHD Actuator

PURPOSE: To allow the main output axis of the actuator to be changed from horizontal to vertical (or vice-versa) while maintaining the orientation of the pump motor and reservoir filler cap vertically above the pump and reservoir.



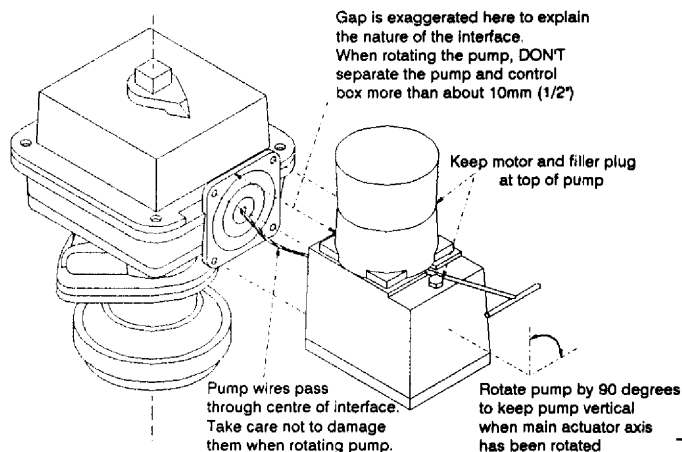
TOOLS REQUIRED:

- Cut-down 5mm A/F Hexagon spanner (Allen Key)
- Medium sized screwdriver for ordinary slot head screws
- U-shaped plastic tube
- Plastic squeeze bottle
- Clean jug, about 1 pint (500ml) capacity, capable of pouring
- Paper towel to absorb stray fluid
- Recommended - 1l of 50 cSt silicone fluid to top up actuator after rotation completed

PROCEDURE:


- (1) Read through the following procedure and assemble the necessary tools etc.
- (2) Support the whole actuator with the pump filler facing upwards.
- (3) Unscrew the brass filler plug, and put both it and its sealing ring somewhere safe ready to be used later.
- (4) Drain the oil from the reservoir into the clean jug, preferably by syphoning it out via the filler hole using the U-shaped plastic tube. The squeeze bottle is used to start the syphoning process. About 270ml of oil will come out. Don't lose any oil, because you will need to pour it back in again later.
- (5) Remove the external red plastic indicator and the control box lid using screwdriver.
- (6) Remove the four M6 socket head screws holding the pump to the control box, using the cut down hexagon spanner. As these screws are loosened, support the pump body and don't let it move much relative to the control box flange, because the wires to the pump motor pass through the middle of this interface, and will be damaged or sheared off if much movement occurs. A little oil may drop from the interface at this point.
- (7) Rotate the pump relative to the control box as required - again, take care not to damage or shear off the wires through the middle during this process. Refit the M6 screws and tighten in place.
- (8) Rotate the whole actuator so that the filler hole again points upwards, and support it in this position.
- (9) Pour back the oil and top up to the level of the bottom of the threaded filler hole. Replace the filler plug plus the sealing ring - note that the sealing ring is vital to keep dust and water out of the reservoir.

ABSOLUTE CLEANNESS OF OIL IS ESSENTIAL FOR RELIABLE PERFORMANCE



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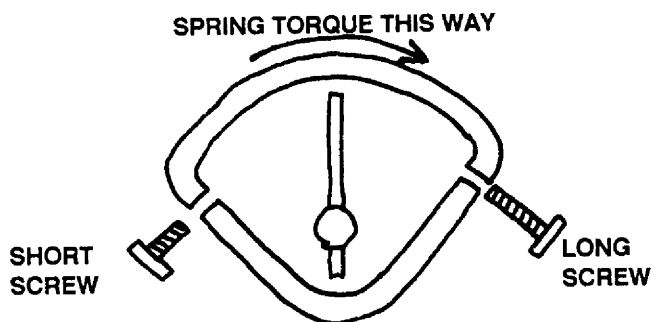
KINETROL



Retrofitting Non-adjustable Endstop Screws to EHD (Electrohydraulic) Actuators

The new-type non-adjustable endstops give improved reliability because they are fixed in position (and hence not subject to unnecessary attempts to adjust them which disturb the O-rings and cause leaks), do not protrude (and hence are not vulnerable to impact damage which could bend over the old-type stop screws and make them leak), and are double sealed (by thread sealing compound and by a static O-ring under the screw head).

For spring return units, a short and a long endstop screw are needed. For double acting units, both screws are the same. The longer screw on spring return units is used at the end to which the spring returns the actuator, and the shorter one at the other end.



FITTING SCREWS:

(1) Tip actuator onto its side, and turn it so that one of the endstop screws is at the highest point in the unit. Support unit in this position - this is necessary to prevent oil emerging during the rest of the fitting process.

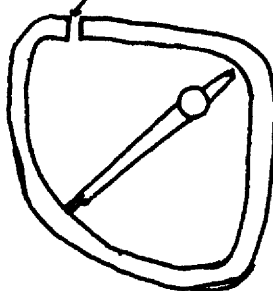
(2) Unscrew existing endstop screw, lock nut, O-ring seal, and washer, and remove them.

(3) Wipe oil from threads in actuator case using paper towel, and degrease threads using trichloroethane (Genklene) on another paper towel. N.B. degreasing is essential for successful use of the thread sealant.

(4) Apply thread sealant compound to threads, and screw in the new endstop screw with its O-ring on the screw just under the head. Tighten hard down until the O-ring is concealed, and the screw head is hard down onto the actuator case surface. Leave in position for one minute.

(5) Turn actuator over to raise the other endstop to the top position, and again support unit in position. Repeat procedure listed above.

HOLD ACTUATOR SO THAT HOLE (OPEN DURING FITTING)
IS AT TOP SO THAT OIL STAYS INSIDE ACTUATOR



SPRING RETURN ACTUATORS

TRAVEL TIME FOR SPRING STROKE

	Direct Mounting Solenoid Valve (Napur Type)		Externally Piped Solenoid Valve		Externally Piped & Quick Exhaust Valve	
	<u>No Load</u>	<u>50% Load</u>	<u>No Load</u>	<u>50% Load</u>	<u>No Load</u>	<u>50% Load</u>
050-120	0.3s	0.6s	-	-	-	-
070-120	0.8s	1.4s	0.5s	0.9s	0.1s	0.2s
080-120	1.3s	2.3s	0.7s	1.3s	0.2s	0.3s
090-120	1.8s	3.2s	0.9s	1.6s	0.2s	0.3s
120-120	3.4s	6.1s	0.7s	1.3s	0.4s	0.7s

Title: VALVE APPLICATION DESIGN FACTORS

Minimum Design Factor $F = 1.25$

Ball Valve Seat Material Correction Factors (S)

Glass filled PTFE	$S = 1.5$
Carbon filled PTFE	$S = 1.5$
Peek	$S = 2.5$

Medium Correction Factors (M)

Dry gas	$M = 1.3$
Slurry/pulp/paste	$M = 1.5$
Powder/abrasive content	$M = 1.5$

Line Temperature Correction Factors (T)

-100°C to 0°C	$T = 1 - ([\text{Line temp } (^\circ\text{C})/100] \times 3.0)$
0°C to 100°C	$T = 1.0$
100°C to 200°C	$T = ([\text{Line temp}(^\circ\text{C})/100] \times 1.5) - 0.5$

Operating Frequency Correction Factors (O)

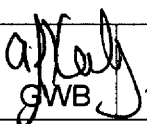
At least once a week	$O = 1.0$
At least once a month	$O = 1.5$
Once a year - See shut down duty	

Duty Correction Factors (D)

General purpose	$D = 1.0$
Critical application	$D = 1.5$
Emergency shutdown	$D = 2.0$

Maximum Design Factor $(F \times S \times M \times T \times O \times D) = 3.0$

Check valve stem torque capability or consult Engineering Manager if overall design factor exceeds 3.0.

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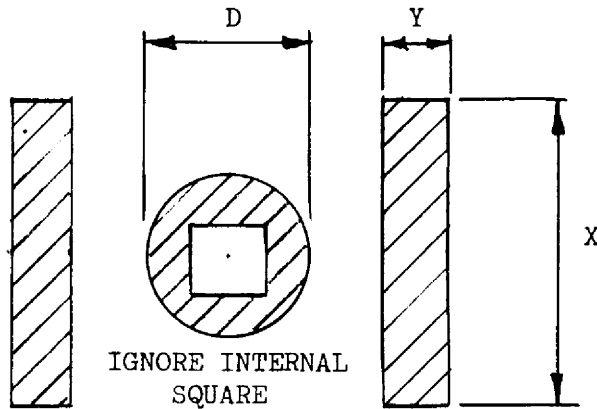
Title: PROCEDURE FOR CALCULATING DISTANCE OF ACTUATOR FROM HOT VALVE

For steel RHS mount kits, standard (80°C Max.) actuators

In ambient 50°C air

1. Calculate cross sectional area of mounting and coupling arrangement in mm².

TYPICAL:



$$\text{Area } A(\text{mm}^2) = \frac{2XY + \pi D^2}{4}$$

2. T = Temperature of valve (°C)

L = Length of mount kit required at calculated section (mm)

$$L = \frac{A}{P} \times 4.5 \times 10^{-2} \times (T-80) \quad \text{-(Carbon Steel)}$$

$$L = \frac{A}{P} \times 1.5 \times 10^{-2} \times (T-80) \quad \text{-(Stainless Steel)}$$

where P is given by following table (model dependent)

Model	P(w)	Measured experimentally = power required to raise each actuator 30°C above ambient.
05	11	
07	20	
09	30	
10	40	
12	53	
14	86	

NUCLEAR RADIATION RESISTANCE OF ACTUATOR MATERIALS

<u>ACTUATOR MODEL</u>	<u>PART</u>	<u>MATERIAL SPECIFICATION</u>	<u>NUCLEAR RADIATION RESISTANCE</u> (Max. Gamma Ray Dose)	<u>SOURCE OF INFORMATION</u>		
OMO to 14	Actuator Casing	Zinc Alloy: ILZRO 16	} $> 10^9$ rads	Jet Joint Undertakings		
16 & 18	Actuator Casing	Aluminium. BS.1490:1988 LM 25				
01 to 09	Spring Casing	Zinc Alloy. MAZAK 3. BS.1004A				
12 to 18	Spring Casing	Aluminium. BS.1490:1988 LM 25				
OMO to 05	Vane	13% Cr.Steel. BS.3146:1975 Type ANC 1 Grade B				
07 to 18	Vane	S.G.Iron. BS.2789:1985 420/12				
OMO to 18	Coupling	Carbon Steel. BS.970:1983 080A15				
01 to 18	Spring Return Coupling	Carbon Steel. BS.3146:1975 CLA 1 Grade A				
01 to 18	Clock Type Spring	Carbon Steel. BS.1449:1983 CS 80				
01 to 18	Seal Expanders	Stainless Steel. BS.970:1970/72 302S25				
01,08,16 & 18	Side Plates	Carbon Steel. BS.970:1983 080A15				
02 to 07 & 09 to 14	Side Plates (Moulded)	Glass Filled Nylon 66			10^7 rads	Du Pont (U.K.) Ltd.
OMO to 18	Vane Seals	Polyurethane			10^9 rads	Du Pont (U.K.) Ltd.
OMO to 05	Bush	Delrin 500 NC10 (Polyacetal)			6×10^5 rads	Du Pont (U.K.) Ltd.
01,07 to 18	Bush	Glacier DU	10^8 rads	Glacier Metal Co. Ltd.		
OMO to 18	'O' Rings & Shaft Seals	Nitrile	10^6 rads	Dowty Seals Ltd.		
01 to 18	Spring Return Gasket	HP Nebar (Cork & Nitrile)	10^7 rads	James Walker & Co. Ltd.		
02 to 07 & 09 to 14	Indicator	Nylon 6	10^7 rads	Du Pont (U.K.) Ltd.		
01 to 18	Label	0,5mm Alum. Sheet	$> 10^9$ rads	Jet Joint Undertakings		
<u>SCREWS, NUTS & WASHERS</u>						
Socket Head Screws & Nuts		Stainless Steel Grade A4 Property Class 70	} $> 10^9$ rads	Jet Joint Undertakings		
Pozidriv Head Screws		Grade A2				
Washers		Stainless Steel				
Spring Pins		High Tensile Steel				
<u>MISCELLANEOUS MATERIALS FOR ALL ACTUATOR MODELS</u>						
Loctite 270		High strength chemical lock for studs				
Permabond A011		Low strength chemical lock for screws & nuts				
Permabond A130		For sealing pneumatic threads				
Loctite Instant Gasket		For sealing case joints				
Lithium No.2 Medium Grease		General purpose				
Molytex 2 Grease		For Actuator Cases				
Chevron Polyurea EP2 Grease		For Springs				

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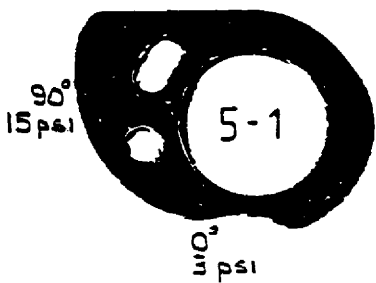
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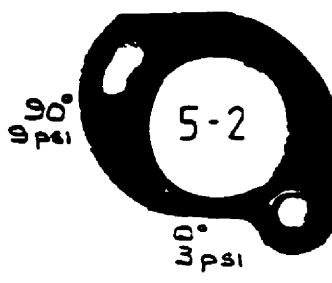
Trading Estate Farnham Surrey England

SHEET No.

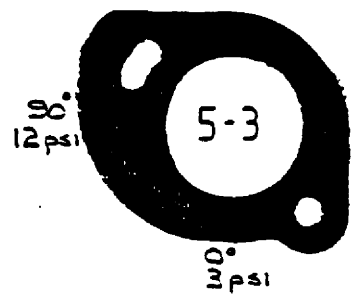
TD 70



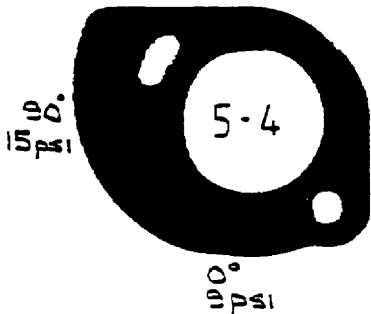
STANDARD LINEAR



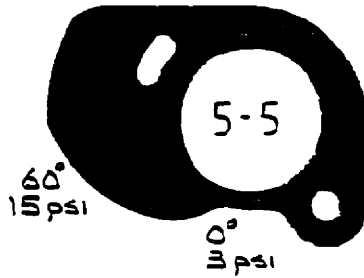
LINEAR



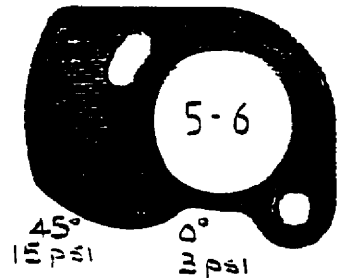
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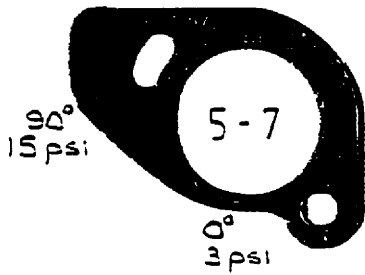
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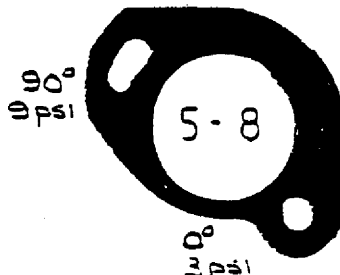
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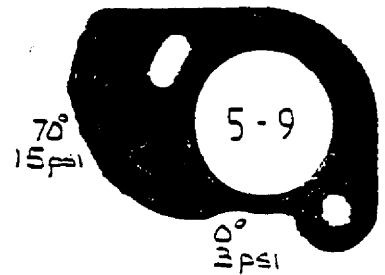
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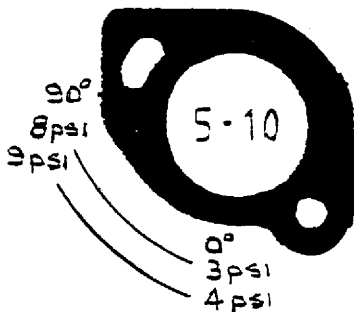
PROPORTIONAL FLOW



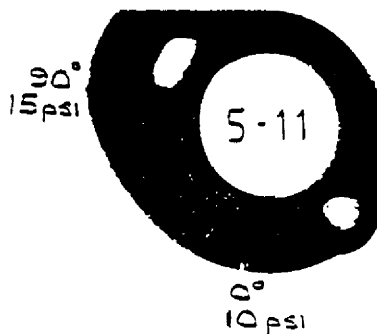
PROPORTIONAL FLOW



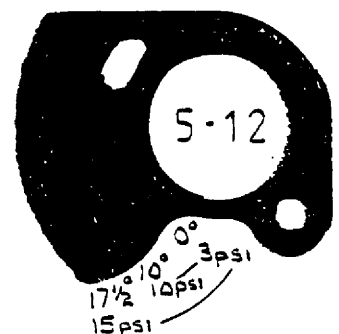
LINEAR



PROPORTIONAL FLOW



PROPORTIONAL FLOW



LINEAR

POSITIONER CAMS No's. 5-1 to 5-12

ISSUE

B

R.A.C.
14.06.94

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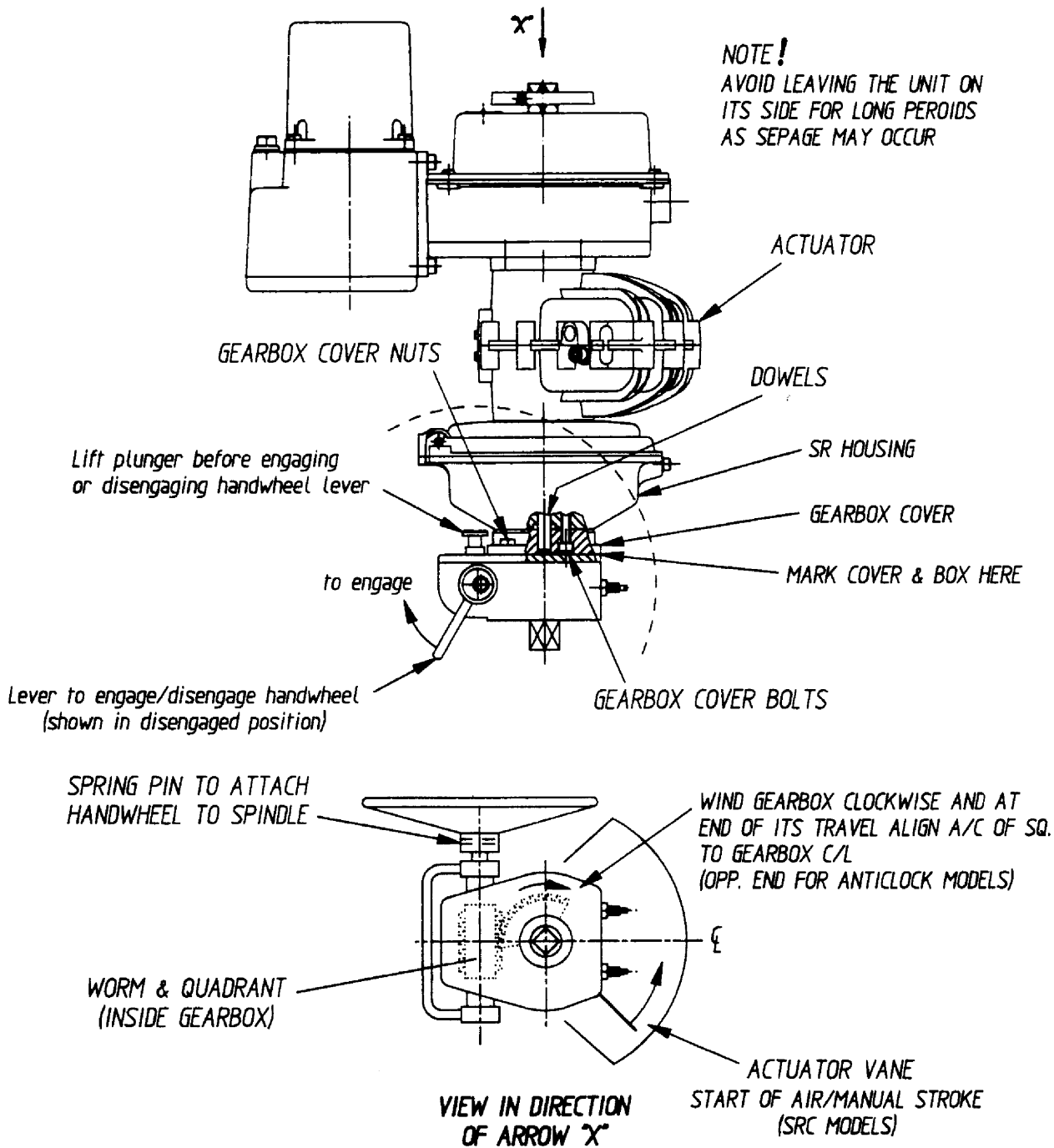
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SHEET No.

TD 71

ASSEMBLY OF GEARBOX TO KINETROL EHD/SR UNIT (VERTICAL MOUNT)

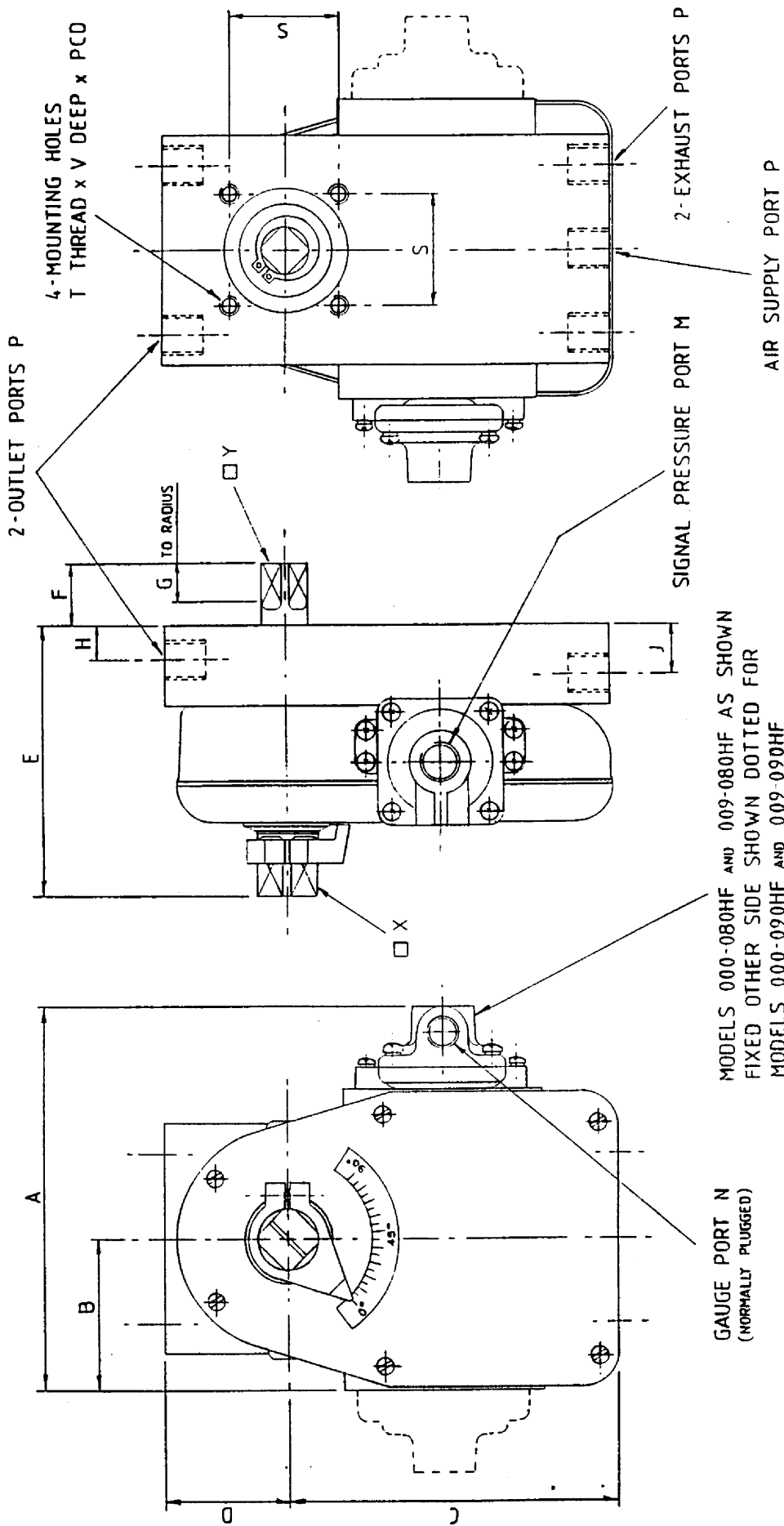
- 1) MARK POSITION OF THE GEARBOX COVER RELATIVE TO ITS BODY AND THEN REMOVE. (SEE BELOW FOR POSITION OF MARK)
- 2) INSERT THE DOWELS SUPPLIED INTO THE GEARBOX COVER WITH THE CROSS PIN IN THE DOWEL ON THE OUTSIDE OF THE COVER AND THEN ATTACH IT TO THE EH UNIT (eg. SR HOUSING) USING THE BOLTS SUPPLIED - MAKING SURE THE COVER IS IN THE CORRECT ORIENTATION eg. THE MARK ON THE COVER IS AT THE LARGE RADIUS OF THE ACTUATOR. (CHEMICALLY LOCK BOLTS WITH LOW STRENGTH ADHESIVE).
- 3) WIND THE QUADRANT IN THE GEARBOX TO THE END OF ITS TRAVEL BY ROTATING THE GEARBOX SPINDLE - SEE BELOW.
- 4) REFIT THE GEARBOX COVER/EH UNIT TO THE GEARBOX BODY - LINING UP THE GUIDE MARKS - CHEMICALLY LOCK THE COVER NUTS WITH LOW STRENGTH ADHESIVE.
- 5) ATTACH THE HANDWHEEL TO THE GEARBOX SPINDLE USING THE SPRING PIN SUPPLIED.



NB- DISENGAGE GEARBOX BEFORE USING UNIT ON POWER

INDEX 00021

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MODEL CODE ANTI-CLOCK CLOCKWISE	DIMS IN mm	A	B	C	D	E	F	G	H	J	PORT M G 1/8"	PORT N G 1/8"	PORTS P G 1/2"	S	T	V	PCD	X	Y	
000-080HF		125	49	106	40	87.5	20	12.5	11.5	16.5	G 1/8"	G 1/8"	G 1/2"	36	M6	13	50.9	15.98	11.98	
009-080HF		4.92	1.93	4.17	1.57	3.45	.79	.49	.45	.65	1/8" NPT	1/8" NPT	1/2" NPT	1.42	1/2"-28UNF	.51	2.0	.629	4.72	
	inch																		.619	4.70

KINETROL HIGH FLOW DISCRETE POSITIONER

ISSUE
A

R.A.C.
17.06.94

KINETROL

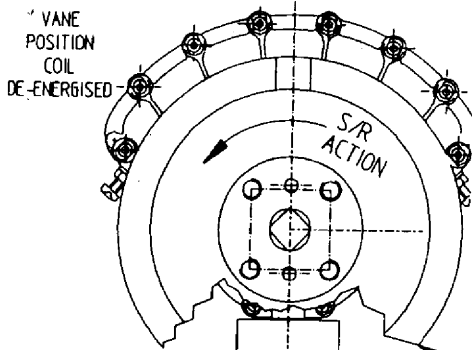
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SHEET No.

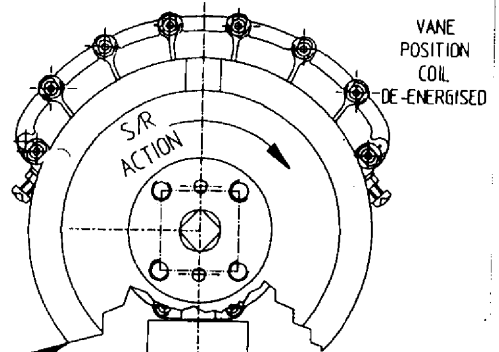
TD 73

DIAGRAMS OF ACTUATORS WITH SOLENOIDS SHOWING DIRECTION OF ACTION

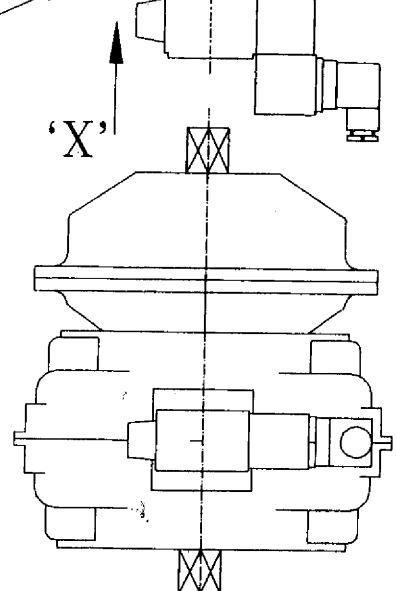
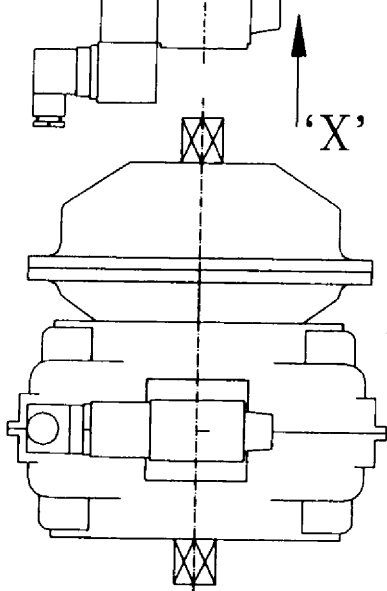
ACTUATOR VANE MOVES CLOCKWISE WHEN COIL IS ENERGISED



ACTUATOR VANE MOVES ANTI-CLOCKWISE WHEN COIL IS ENERGISED

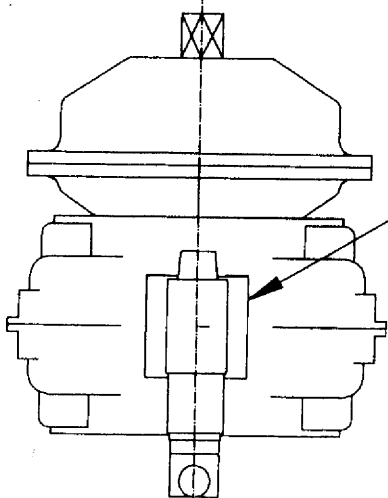


S/R CUT AWAY TO SHOW SOLENOID MOUNTING

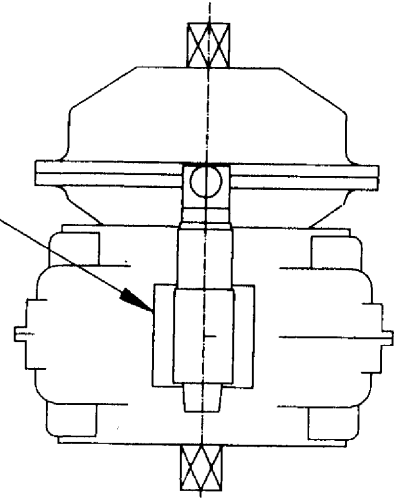


REAR VIEW IN DIRECTION OF ARROW 'X'

REAR VIEW IN DIRECTION OF ARROW 'X'



NAMUR BLOCK HAS TO BE TURNED WITH SOLENOID



ALTERNATIVE MOUNTING OF SOLENOID TO GIVE CLOCKWISE DIRECTION WITH COIL ENERGISED

ALTERNATIVE MOUNTING OF SOLENOID TO GIVE ANTI-CLOCKWISE DIRECTION WITH COIL ENERGISED

SOLENOID SUPPLIED BY KINETROL UP TO 1998

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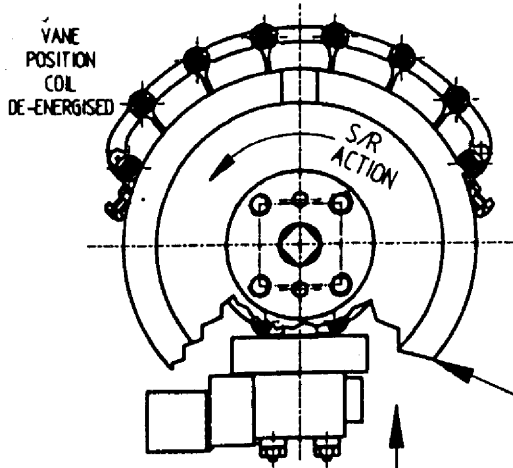
KINETROL

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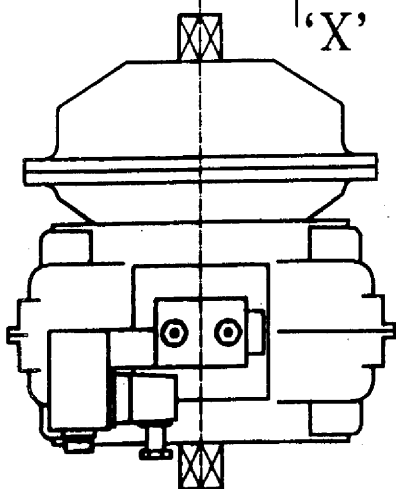
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DIAGRAMS OF ACTUATORS WITH SOLENOIDS SHOWING DIRECTION OF ACTION

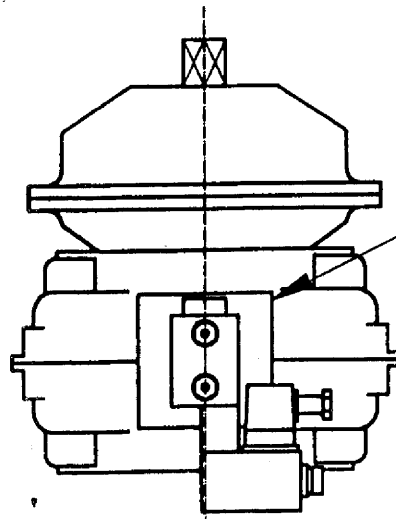
ACTUATOR VANE MOVES CLOCKWISE WHEN COIL IS ENERGISED



S/R CUT AWAY TO SHOW SOLENOID MOUNTING

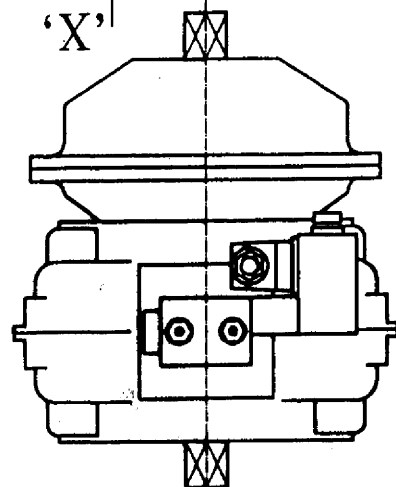
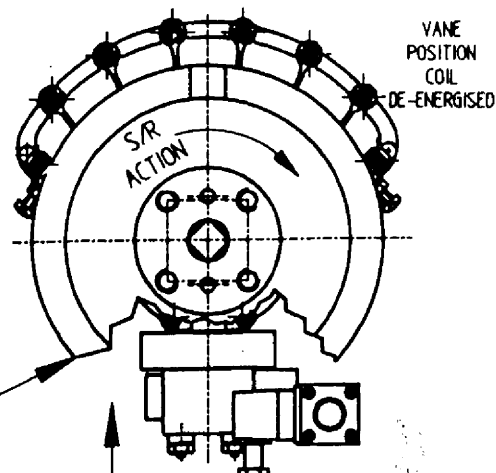


REAR VIEW IN DIRECTION OF ARROW 'X'

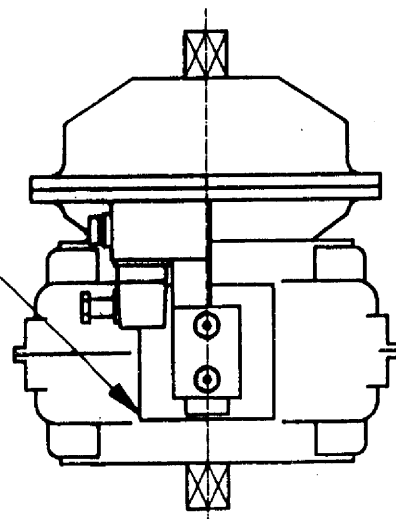


ALTERNATIVE MOUNTING OF SOLENOID TO GIVE CLOCKWISE DIRECTION WITH COIL ENERGISED

ACTUATOR VANE MOVES ANTI-CLOCKWISE WHEN COIL IS ENERGISED



REAR VIEW IN DIRECTION OF ARROW 'X'



NAMUR BLOCK HAS TO BE TURNED WITH SOLENOID

ALTERNATIVE MOUNTING OF SOLENOID TO GIVE ANTI-CLOCKWISE DIRECTION WITH COIL ENERGISED

SOLENOID SUPPLIED BY KINETROL FROM JAN 1998

ISSUE

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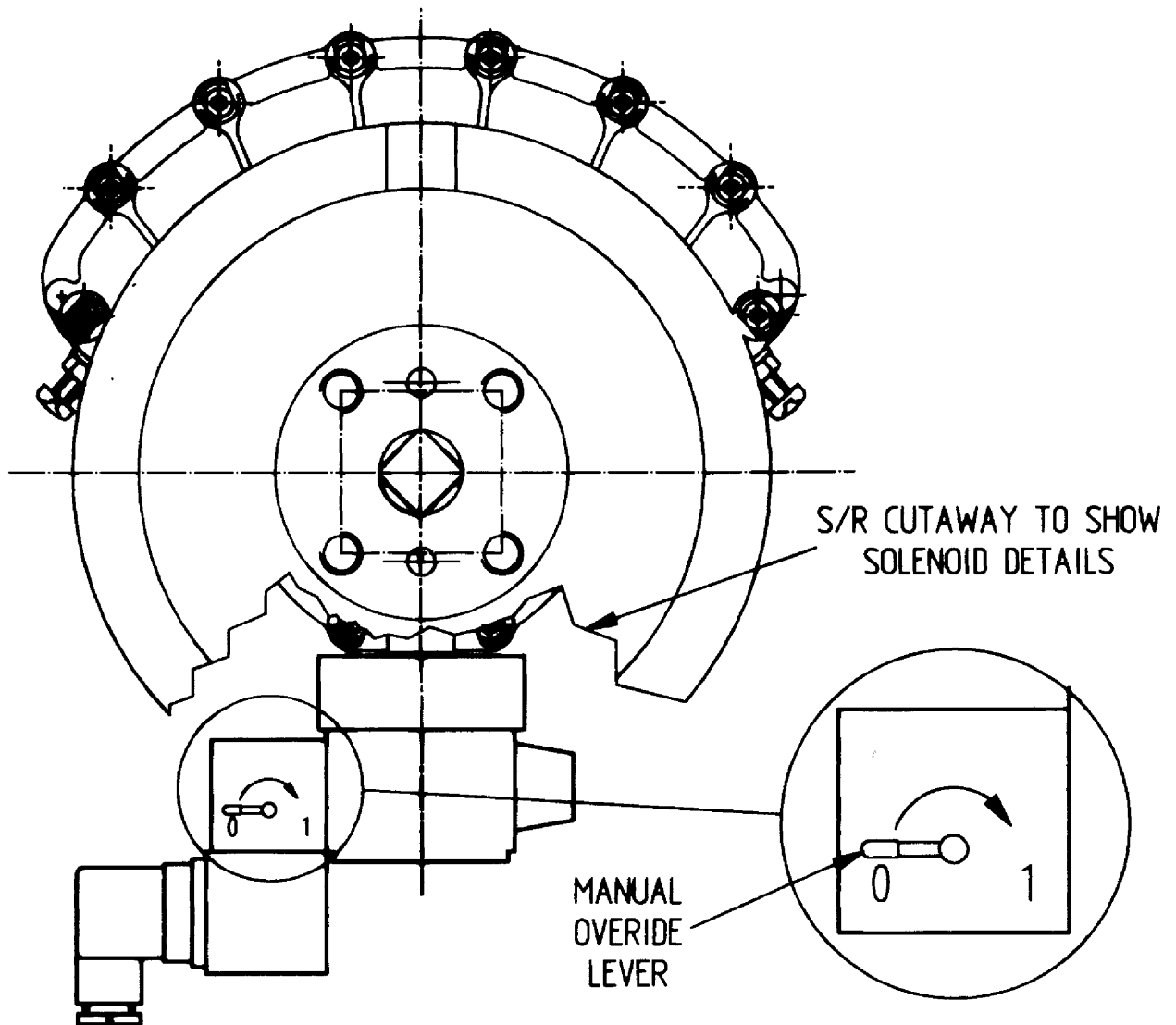
D. Carlson
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DETAIL OF SOLENOIDS FITTED WITH MANUAL OVERRIDE



NOTE:

The purpose of the manual override lever is to operate the solenoid and hence the valve locally - with or without an electric signal.

The manual override lever functions: LEVER ON '0' Solenoid works normally.

(No signal = No movement / Signal = Movement)

LEVER ON '1' Solenoid simulates ENERGISED ONLY

(No signal = Movement / Signal = Movement)

WARNING- MANUAL OVERRIDE CAN ONLY SIMULATE ENERGISED CONDITION CARE SHOULD BE TAKEN TO ENSURE THAT IT IS NOT LEFT ACCIDENTLY IN THE '1' POSITION.

(A push-button spring return version is also available).

ISSUE
A

a.j. Kelly
14.07.94

KINETROL

Trading Estate Farnham Surrey England

SHEET No.
TD 75

**NOTE - THIS INSTRUCTION SHEET APPLIES ONLY TO NON INTRINSICALLY SAFE MODELS WITH DIGITAL POSITIONER CIRCUITS.
IF YOUR APPLICATION IS IN AN AREA WITH AN EXPLOSION HAZARD, DO NOT USE THE FOUR TERMINAL MODELS DESCRIBED HERE.**



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9	4.11 Resetting the Feedback Pot.
9	4.12 EEPROM Checksum Error.
10	4.13 Selecting and Setting Up Non-Linear Curves.
11	4.14 Setting Optional Angle Retransmit Span and Zero Adjustments.
11	4.15 Adjustment of Position of Optional Clearcone Monitor.
12	5. Maintenance and Troubleshooting.

2. INSTALLATION

2.0 Introduction

Positioners can be supplied direct-mounted, or ready to be direct-mounted, onto Kinetrol rotary actuators, or in stand-alone (discrete) form for fitting via a mount kit to any 90 degree rotary actuator. If the positioner is supplied ready mounted on an actuator, sections 2.1 and 2.2 can be bypassed. Positioner-type Kinetrol actuators (ready for direct mounting of positioners) are available in models 03 to 14 inclusive.

These instructions cover the possible use of both metal and moulded feedback coupling. It is expected that most units will contain a moulded coupling.

2.1 Mounting of Direct Mounting Units onto Kinetrol Positioner-Type Actuators

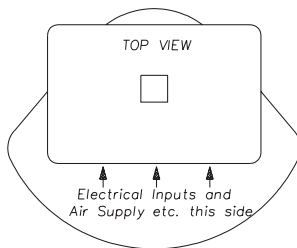


FIGURE 1. Mid Travel Orientation of Actuator Square and Positioner Box.

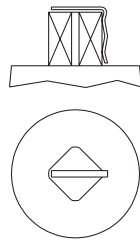


FIGURE 2. Location of Anti-Backlash Spring on 07 & Larger Squares. (Metal Coupling only)

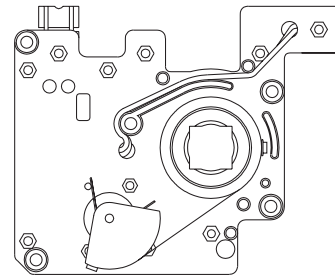


FIGURE 3. Bottom View of Carrier Plate Assembly Showing Shaft and Potentiometer in Mid Travel, Ready to be Fitted to Actuator in Mid Travel.

2.1.1 Move actuator vane to mid travel position, with its output square as shown in Figure 1. This is essential to prevent subsequent error in orienting positioner square.

2.1.2 Remove positioner cover, and undo the five M4 slot-headed screws holding the red plastic carrier plate into the body. Disconnect the two wires to the servo valve, and lift out the whole carrier plate assembly complete with shaft and circuit etc.

2.1.3 Bolt the positioner body to the actuator in the orientation shown in Figure 1, taking care that O-rings are in place to seal the ports into the actuator, and that the actuator shaft is centred in its hole.

2.1.4 (a) Metal coupling versions on 07 and larger models: fit anti-backlash spring over one corner of the actuator square as shown in Figure 2.

(b) Moulded coupling versions: on all direct mount versions, untighten central screw in coupling shaft so that the collet is not closed, and fit coupling over shaft square.

2.1.5 Observe the range of motion available to the positioner shaft, limited by the correct running of the potentiometer quadrant wheel, driven by the stainless steel strap (see Figure 3). Fit the carrier plate/shaft assembly back into the positioner box with the shaft near mid-range, "feeling" the female square in the positioner shaft onto the male actuator square while maintaining its position near mid range. It is essential that the two shafts are correctly oriented relative to each other, since if they are 90 degrees out, the quadrant wheel can be forced too far and damage done to the drive mechanism during subsequent actuator movements. It is possible to fit the positioner correctly with the actuator square at one end of its travel, but experience indicates a high probability of mistaking the direction of movement of the actuator - hence it is strongly advised that the positioner be fitted with the actuator square at the mid-travel position, where there is no ambiguity possible.

Moulded coupling version: Ensure coupling is fully engaged before tightening the central screw to close the collet and therefore removing any backlash.

2.2 Mounting of Discrete Positioner

Design and manufacture of the mount kit between positioner and actuator is outside the scope of this document. It is essential that the shaft of the actuator is well aligned with the positioner shaft, and that the two are coupled together with a minimum of backlash - any backlash acts to deteriorate the performance of the positioner/actuator combination.

It is also essential that the 90 degree travel of the actuator moves the positioner shaft through the correct 90 degree range of travel. The easiest way to ensure that this happens is to mount the discrete unit with the lid and indicator in place - set both the actuator and positioner to mid travel, and mate the two in this orientation. Don't take any chances with this, since misorientation of the positioner shaft and consequent movement beyond its designed range of travel will probably result in damage to the positioner pot drive mechanism.

With moulded coupling versions, the Namur drive or Kinetrol square option is an insert in the coupling which can be removed by releasing the central screw.

2.3 Air and Electrical Connections.

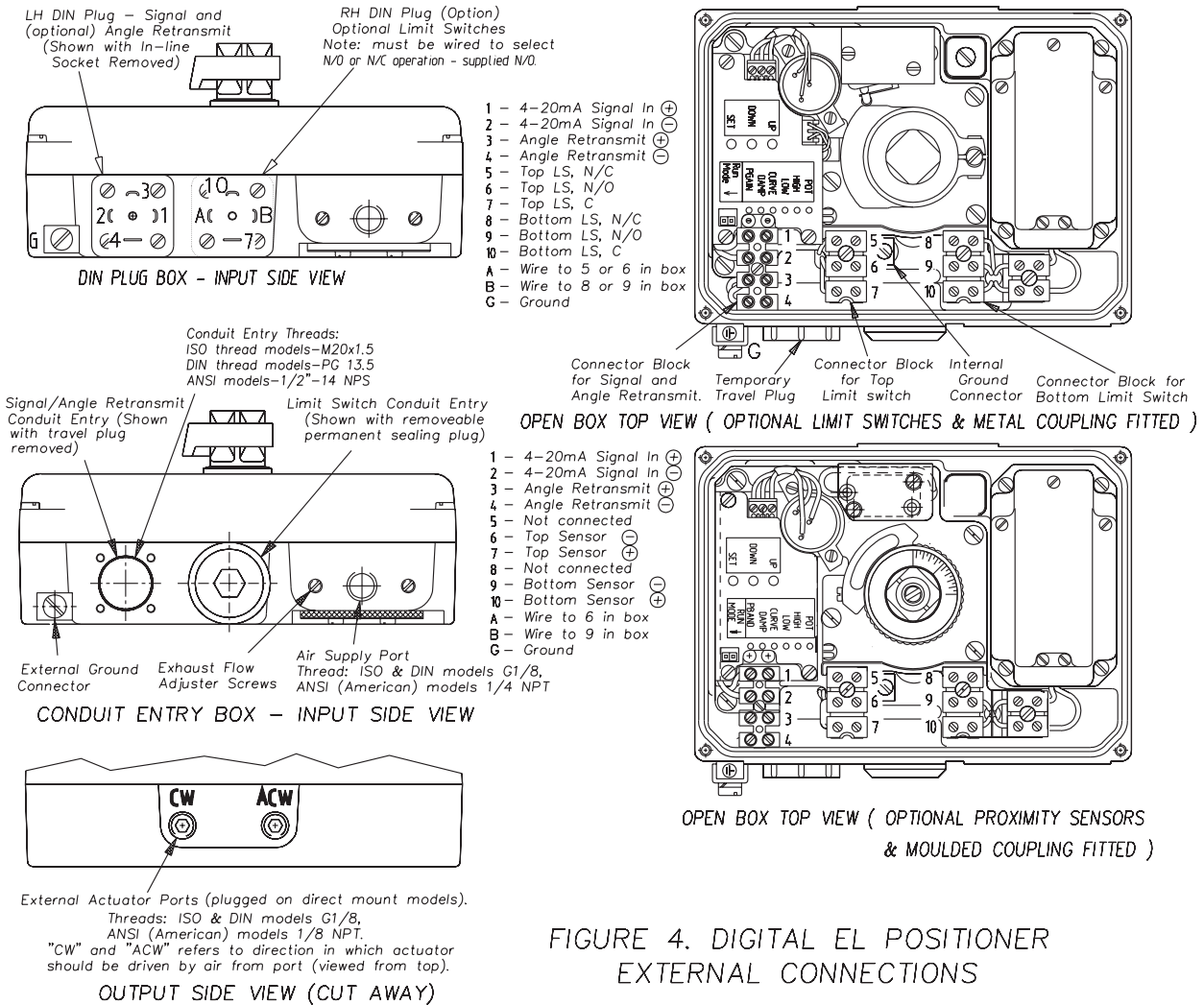


FIGURE 4. DIGITAL EL POSITIONER EXTERNAL CONNECTIONS

NOTE: External electrical connector terminals are also identified on a label inside the lid. When the lid is removed for connection/adjustment, do not wipe grease from cover shaft seal.

2.3.1 Air Supply.

Connect air supply (pressure between 3.5 and 7 bar, 50 and 100psi.) to the supply port. It is essential that the air is clean, dry and oil-free. Quality class 3.4.4 (according to ISO standard 8573.1) is easily adequate - this implies 5 micron max. particle size, 3 deg. C dew point max., and 5mg/cubic metre max. oil content.

2.3.2 DIN Plug Option.

DIN plug models without the optional limit switches are supplied with only one 4-way DIN plug on the positioner box, and a removeable permanent sealing plug covering the second conduit entry, where another DIN plug can be fitted if it subsequently becomes necessary. If a DIN plug model does have the limit switch option, then a second 4-way DIN plug is fitted; because each limit switch is a 3-terminal device, and there are only two terminals available on the DIN plug for each of the two switches, it is necessary to select normally-open or normally-closed function for each switch by connecting the internal wires from DIN terminals A and B to the appropriate terminal inside the box (see Figure 4 above) - the units are supplied connected for normally-open function. If proximity sensors are fitted, then this problem does not arise.

2.3.3 Positioner Signal.

The positioner signal must be 4-20mA. The positioner gives a positioning response between 0 and 90 degrees linearly or non-linearly related to the signal. The positioner is loop powered - that is the signal itself supplies all the electrical power, and no separate power source is needed. In order to supply enough power, the unit needs between approximately 6 and 8 volts to drive the signal current through it - it behaves electrically like a resistor in series with a zener diode. A typical 4-20mA source with a 24v DC supply is compatible with this input, and can drive a maximum of 2 units in series on one loop.

2.3.4 Angle Retransmit Supply.

The optional angle retransmit circuit is also loop powered, requiring 14 to 30 volts DC to drive the 4-20mA current through it - the current passed is linearly proportional to the actual positioner shaft angle. The retransmit circuit reads the same angle transducing potentiometer as the positioner circuit - however, the angle retransmit circuit remains functional on loss of positioning signal and/or air supply, and the positioner remains functional as long as the signal is present, even if the angle retransmit circuit is fitted and there is no supply to energise its loop. Nevertheless, the angle retransmit circuit is electrically isolated from the positioner signal circuit.

3. SCHEMATIC FUNCTIONAL DIAGRAM .

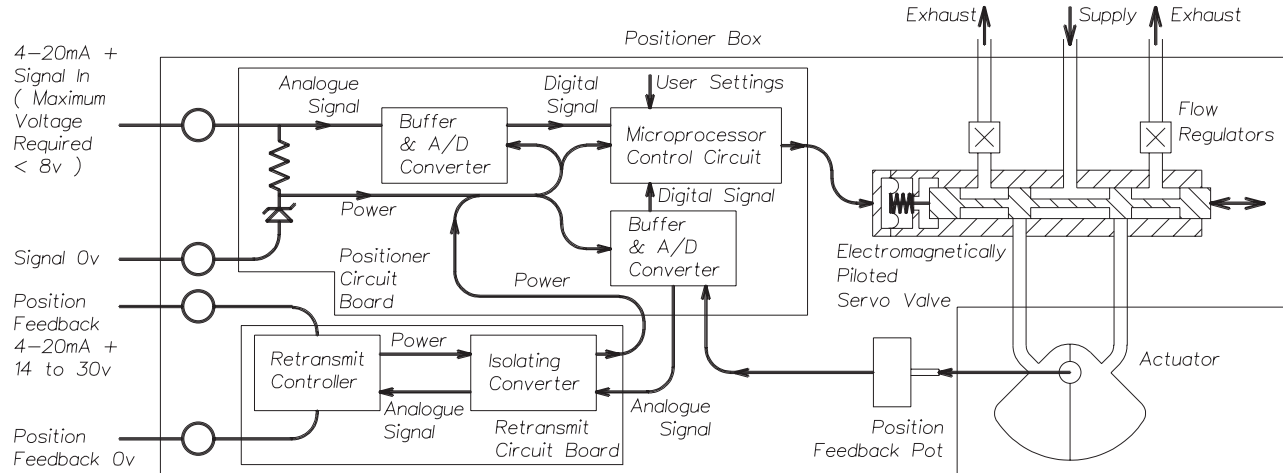


FIGURE 5. SCHEMATIC FUNCTIONAL DIAGRAM OF DIGITAL EL POSITIONER

4. SET UP .

4.0 Introduction

When the positioner/actuator combination is installed in its application, set up the control adjustments if necessary. For most applications, it is likely that the factory settings will be satisfactory - the low and high current points are set to give 0-90 degree movement in response to a 4-20mA signal, the flow regulators are set for maximum travel speed, and the proportional gain and damping settings adjusted for a good level of sensitivity and smoothness suitable for most applications. The jumper is set in the "off" position to give a linear characteristics with travel extrapolated beyond the low and high current settings. If you need to change the settings, read the following section carefully.

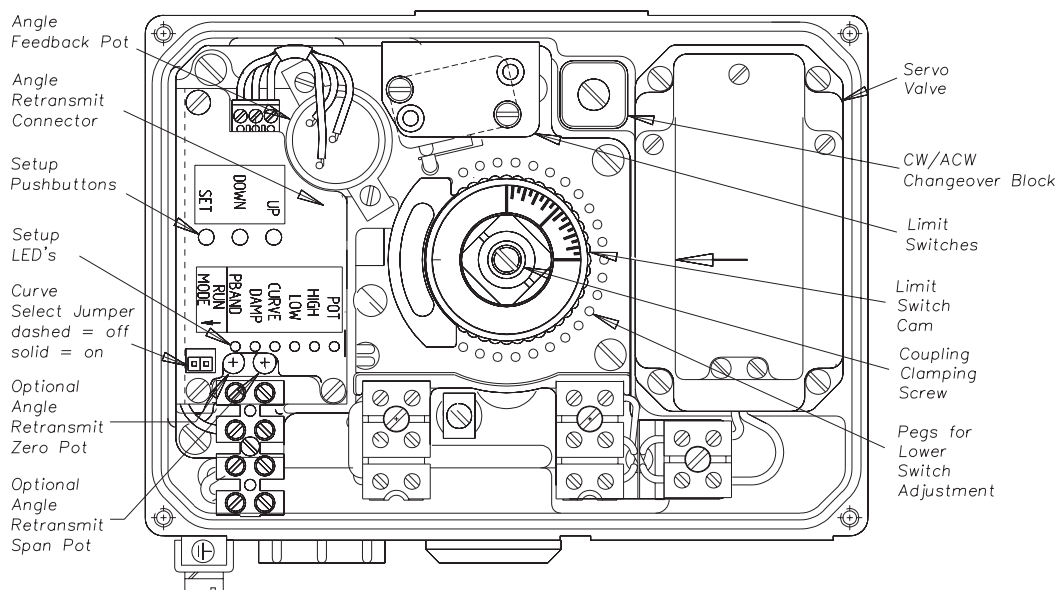


FIGURE 6a. DIGITAL EL CONTROL ADJUSTMENTS. OPEN BOX, TOP VIEW - MOULDED COUPLING.

4. SETUP (continued).

4.1 Setting Travel Speed.

Set the travel speed using the exhaust flow adjuster screws (see Figure 4.). This only applies if you want to reduce the speed from its supplied maximum factory setting.

4.2 Setting Optional Limit Switch Cams.

Optional limit switch cams are factory set to give end-of-travel switching with one switch each end. The switching can be set to occur anywhere in the travel range for each switch, by relaxing the cam clamp screw and rotating the cam to position. Set the lower cam first. Take care to avoid the clamp section of a cam striking a switch at any point in the actuator's travel. Two possible types of coupling require slightly different approaches to setting:

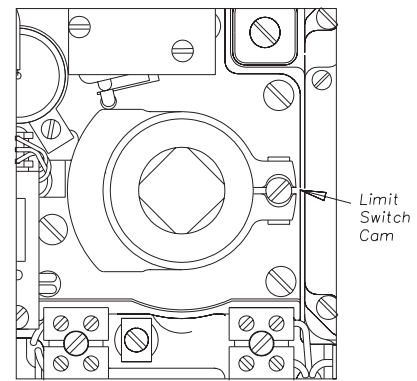


FIGURE 6b. DIGITAL EL SWITCH STRIKER METAL COUPLING. OPEN BOX, TOP VIEW.

4.2.1 Moulded coupling cams, shown in figure 6a, can be adjusted using light pressure to rotate in 1 degree increments. Adjust the lower cam first using a screwdriver to lever against special pegs moulded into the carrier plate or use finger pressure. Secondly move the upper cam using finger pressure only. Graduated marks on the top of the coupling are provided to gauge the position of the actuator with the lid removed. This can be lined up with an arrow marked on the servo valve lid.

4.2.2 Metal coupling cams are adjusted by releasing the screw shown in figure 6b, moving to desired position and retightening. Set the lever cam first. Ensure the clamp section of the cam does not strike a switch at any part in the actuator's travel.

4.3 Overview - Electronic Settings.

The EL digital positioner circuit can operate to give actuator position accurately proportional to input current, or it can operate as a non-linear device accurately following one of a number of fast open, or slow open, exponential curves. Linear or non-linear, it can easily be calibrated to scale its operating line, or curve, between any two user-defined points in its operating range. The positioner circuit is powered entirely from the 4-20 mA input signal. It is tuned and calibrated by simple and quick operation of its three pushbuttons, with red LED (light emitting diode) indication of the selected parameter. The positioner can also calibrate itself automatically to the actuator or valve endstops. The actuator dynamic response can be optimised by simple adjustment of the positioner circuit proportional gain and damping variables. All tuning and calibration data is stored digitally, and is retained in non-volatile memory, so that the positioner powers up with all the same settings it had when last powered down.

The positioner may be operated either as a linear or non-linear device. Non-linear operation is enabled by fitting a jumper link to the positioner with the positioner (and position retransmit if fitted) powered down (ie. input current at 0 mA). When the positioner is powered up with the link "on" (see figure 6 for its position), it will then operate as a non-linear device for as long as it remains powered up. Conversely, when the positioner is powered up with the link "off", it will operate as a linear device as long as it remains powered up. Changing the link from "on" to "off" or vice-versa while the circuit remains powered up will not cause a change from non-linear to linear operation - the position of the link is only effective during power up.

Whether operating as a linear or non-linear device, the positioner has two distinct modes of operation, Normal Mode and Setup Mode.

In Normal Mode the positioner simply positions its actuator in response to the 4-20mA input signal. When the positioner is powered up, it always starts in Normal Mode. In Normal Mode, the LEDs are not lit. The positioner stays in Normal Mode until Setup Mode is selected manually.

In Setup Mode the positioner can be tuned and calibrated for its application. Although the position is still controlled, it does not always follow the input signal. When tuning and calibration is complete the positioner should always be returned to Normal Mode for continued normal use.

Operating in Setup Mode is described in the following sections.

4. SETUP (continued).

4.4 Default Settings and Reset Procedure.

The positioner can be reset with a complete set of default values when powered up in any operating mode, by pressing all three pushbuttons (UP, DOWN and SET) simultaneously. This will overwrite all the existing proportional gain, damping, curve selection and calibration data with default values which are suitable for a typical forward acting linear positioner with mid range values for proportional gain and damping (but not necessarily optimised for a particular application). This procedure is useful in the case where errors in calibration have resulted in positioner behaviour which seems incomprehensible, and it is necessary to return to a predictable basic setup. The positioner should always be tuned and then recalibrated immediately after this resetting process.

4.5 Entering and Leaving Setup Mode.

Setup Mode is selected from Normal Mode by simultaneously pressing the UP and the SET pushbuttons (ie. the two outside ones). This causes the LED labelled PGAIN (short for Proportional Gain) to light continuously. In Setup Mode, each of the parameters in the list below may be selected for adjustment by pressing the UP or DOWN pushbuttons as required. The parameter selected is indicated on the positioner circuit by an LED lighting next to the parameter's name.

PGAIN	-	Proportional Gain
DAMP	-	Damping
CURVE	-	Non-Linear Curve Selection
LOW	-	Low Current Point Calibration
HIGH	-	High Current Point Calibration
POT	-	Feedback Potentiometer Bottom of Range Setting

When the required parameter has been selected for adjustment, the SET pushbutton is pressed to allow adjustments to be made - the LED next to the selected parameter starts to blink, to indicate that Adjust Mode is active. Operation in the Adjust Mode for each parameter is described in the following sub-sections. To leave Adjust Mode, press the SET pushbutton again - this causes the LED to light continuously, and allows movement between parameters again.

Note: There is no Adjust Mode for the feedback potentiometer bottom of range setting, but the automatic endstop finding sequence can be initiated when this parameter is selected.

To leave setup mode (when the adjustments have been made and the SET pushbutton pressed to leave Adjust Mode), press the DOWN pushbutton repeatedly to move down the parameters and off the end of the list - at this point the LEDs cease to light, and the positioner is back in Normal Mode.

4.6 Automatic Endstop Finding Procedure.

The positioner can automatically calibrate itself to range between any mechanical endstops (either the built-in actuator stops, or any external stops built into the application). During the finding sequence, the positioner moves the actuator up to the top and bottom stops and records their positions. It then uses these positions as the HIGH and LOW positions in the calibration data, and applies the existing values for HIGH and LOW current input. Note that if the positioner was reverse acting before the sequence, it remains so after the sequence.

The End Stop Finding Sequence starts when the POT parameter is selected, and the UP and SET pushbuttons (ie. the two outside pushbuttons) are pressed simultaneously. The POT LED starts to blink, and the actuator moves steadily upscale from its set position. When its movement is stopped by the top physical endstop, the positioner waits briefly, then moves the actuator steadily downscale until it runs against the bottom physical endstop, where again it waits briefly, and finally moves quickly back to the set position. The calibration data is written to non-volatile memory while the actuator pauses at its bottom stop.

If the positioner is in service on an application where excursions to the endstops will be disruptive, avoid initiating this sequence.

4. SETUP (continued).

4.7 Proportional Gain and Damping Settings (for Smoothness and Sensitivity).

Select Setup Mode, and the first parameter selected is automatically PGAIN - Proportional Gain. Press the SET pushbutton, and the PGAIN LED will start blinking. The value of the parameter can now be increased or decreased by pressing the UP or DOWN pushbuttons as required. There are twenty nine (29) PGAIN settings which can be selected, the setting altering by a factor of about 1.1 each time the UP or DOWN button is pressed. The default setting lies in the middle of the range, giving fourteen settings above and fourteen below. Any button presses beyond the last (fourteenth) will have no effect.

Note: As soon as the UP or DOWN pushbutton is pressed, the new PGAIN value is stored in non-volatile memory and is retained even if the positioner is deenergised before leaving Adjust and Setup Modes.

The positioner is active while adjusting the PGAIN setting, and continues to follow the input signal. This gives the opportunity to change the input signal in a manner typical of the application, and to observe qualitatively the response of the positioner, and how it has been affected by changing the PGAIN setting, so as to optimise the response. Pressing the UP button maximises the sensitivity and accuracy, at the cost of increased jerkiness of response when the signal is ramped smoothly, and if you go too far this increases the proportional gain so much that the positioner becomes unstable and hunts around the position set by the signal. Pressing the DOWN button maximises smoothness during ramping of the signal, at the cost of losing rapidity of response to small changes in signal. When the right setting has been found, press the SET button again to leave Adjust Mode - the PGAIN LED will now light continuously.

The DAMP (damping) parameter should be set after the PGAIN has been optimised. In Setup Mode select the DAMP parameter (second up from PGAIN) by pressing the UP button until the DAMP LED lights continuously. Press the SET button to select Adjust Mode, and the DAMP LED will blink. Damping can be increased and decreased by pressing the UP or DOWN buttons. There are twenty nine damping settings which can be selected, the setting altering by a factor of 1.1 each time the UP or DOWN pushbutton is pressed. The default setting lies in the middle of the range, giving fourteen settings above and fourteen below. Any button presses beyond the last (fourteenth) setting will have no effect.

Note: As soon as the UP or DOWN button is pressed, the new DAMP value is stored in non-volatile memory, and is retained even if the positioner is deenergised before leaving Adjust and Setup Modes.

The positioner is active while adjusting the DAMP setting, and continues to follow the input signal. This allows the signal to be waggled to optimise the response while still adjusting the DAMP setting. Try stepping the signal suddenly so that the positioner approaches setpoint at full speed having travelled 45 degrees or more, and adjust the DAMP setting to just avoid overshoot here. Try this travelling up and downscale. When the right setting has been found, press the SET button again to leave Adjust Mode - the DAMP LED will now light continuously.

4.8 Low Current Point and High Current Point Settings. (Replaces Zero and Span Adjustment).

The positioner characteristic can be accurately calibrated by setting two points, the Low Current Point (LCP) and the High Current Point (HCP). Each point is defined by a position and an input current. These points can lie anywhere in the range of travel of the actuator, and in the input signal range of 4 to 20 mA. The only other restriction is that the input current at the HCP must exceed the input current at the LCP by at least 5mA. To obtain the best accuracy, it is necessary to select the two points as far apart as possible. In both linear and non-linear operation this allows forward acting, reverse acting, and forward or reverse acting split range characteristics to be implemented. Table 1 below shows some illustrative examples.

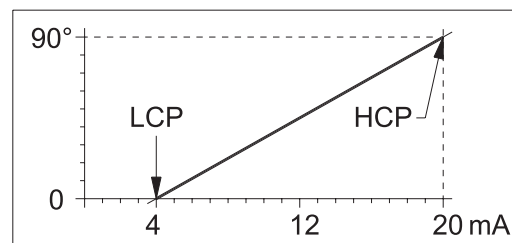


Figure 7. Illustration of LCP and HCP

4. SETUP (continued).

4.8 Low Current Point and High Current Point Settings. (continued).

Table 1 . Various Sets of LCP and HCP Settings

Low Current Point		High Current Point		Description
Input Current, mA	Angle Degrees	Input Current, mA	Angle Degrees	
4	0	20	90	Forward Acting, 100% range
4	90	20	0	Reverse Acting, 100% range
4	0	12	90	Split Range Forward Acting, 50% bottom range
4	90	12	0	Split Range Reverse Acting, 50% bottom range
12	0	20	90	Split Range Forward Acting, 50% top range
12	90	20	0	Split Range Reverse Acting, 50% top range
4	0	20	45	Forward Acting, 200% range
4	45	20	0	Reverse Acting, 200% range

To set LCP, select the LOW parameter in Setup Mode by pressing the UP button until the LOW LED lights continuously. Press the SET button to select Adjust Mode, and the LOW LED will blink. Adjust the input signal current within the range 4-20mA to the value you want to define for the Low Current Point - note that changes in input current within the 4-20 mA band do not result in positioner movement at this stage - the positioner holds the actuator at the angle where it was before Adjust Mode was selected, irrespective of input current. Press the UP or DOWN buttons to move the positioner to the angle you want to define for the Low Current Point - if you hold the button down continuously, the positioner will traverse the actuator steadily, or if you give short blips it will move approximately 1/40 degree (one fortieth) for each blip, to allow precise edging into exactly the required position. When the actuator is in exactly the position you want, and the signal is adjusted to exactly the value you want (this can be readjusted after the position has been set if you want), press the SET button again to record the signal and position as the Low Current Point, whereupon the actuator will make a small leap and then settle back to the LCP again, the positioner will return to Setup Mode, and the LOW LED will light continuously. The positioner will now respond to its input signal again.

Note: As soon as the SET button is pressed, the LCP position and signal are stored in non-volatile memory, and are retained even if the positioner is deenergised before leaving Setup Mode.

To set HCP, select the HIGH parameter in Setup Mode by pressing the UP button until the HIGH LED lights continuously. Press the SET button to select Adjust Mode, and the HIGH LED will blink. Adjust the input signal current within the range 4-20mA to the value you want to define for the High Current Point - note that changes in input current within the 4-20 mA band do not result in positioner movement at this stage - the positioner holds the actuator at the angle where it was before Adjust Mode was selected, irrespective of input current. Press the UP or DOWN buttons to move the positioner to the angle you want to define for the High Current Point - if you hold the button down continuously, the positioner will traverse the actuator steadily, or if you give short blips it will move approximately 1/40 degree (one fortieth) for each blip, to allow precise edging into exactly the required position. When the actuator is in exactly the position you want, and the signal is adjusted to exactly the value you want (this can be readjusted after the position has been set if you want), press the SET button again to record the signal and position as the High Current Point, whereupon the actuator will make a small leap and then settle back to the HCP again, the positioner will return to Setup Mode, and the HIGH LED will light continuously. The positioner will now respond to its input signal again.

Note: As soon as the SET button is pressed, the HCP position and signal are stored in non-volatile memory, and are retained even if the positioner is deenergised before leaving Setup Mode.

4.9 Reversing Clockwise/Anticlockwise Sense of the Positioner.

The LCP and HCP settings described in the previous section can be used with complete success to reverse the sense of the positioner, using settings such as the reverse settings listed in Table 1. However, this will not change the direction of movement on loss of signal - see the next section for how to set this as desired.

4. SETUP (continued).

4.10 Changing the Direction of Movement on Loss of Signal.

On being deenergised with air supply still fully pressurised (ie. on disconnection of the signal, or when the signal falls below 3.5mA), the positioner moves the actuator in a direction set by the deenergised position of the servo valve. This direction of movement is independent of the LCP and HCP settings described in the sections above.

Movement on loss of air pressure is unpredictable for double acting positioners - if position needs to be held on loss of pressure, then it is necessary to order an external pressure sensing lockout valve assembly, and if a definite end of travel position is required on loss of pressure, then it is necessary to order a spring return unit.

On double acting actuators, the unit is factory set to move clockwise (as viewed from the positioner lid) on loss of signal.

On spring return actuators, the unit is factory set to move in the spring return direction on loss of air, or on loss of both air and signal, but it is set to move clockwise (as viewed from the positioner lid) irrespective of spring direction on loss of signal only.

To change the direction of movement on loss of signal, carry out the following steps:

- (1) Disconnect air supply and signal.
- (2) Undo screw holding down changeover block (see Figure 6).
- (3) Rotate changeover block 90 degrees, taking care to keep rubber gasket lined up with holes in body.
- (4) Re-tighten screw holding down changeover block.
- (5) Undo outer two angle pot wire terminal screws, swap blue and yellow wires over to reverse sense of pot connection, and re-tighten screws.
- (6) Re-connect air supply and signal, and carry out Resetting Feedback Pot procedure (see next section).

4.11 Resetting the Feedback Pot.

This procedure is necessary only if the pot has been moved from its factory setting, or if the direction of movement on loss of signal has been changed as instructed in the previous section.

The positioner circuit needs the feedback pot to be positioned at the correct angle, such that its wiper reads the right voltage when the actuator is against its downscale endstop - ie. against the endstop it reaches when the air supply is connected, but the signal is disconnected. The circuit itself can identify this voltage when it is powered up in Setup Mode with the POT parameter selected - when the pot is adjusted correctly, the POT LED changes from lighting continuously to blinking.

To set the pot, first move the actuator to the downscale endstop by connecting the air supply and disconnecting the signal. When it is in this position, hold it there by fitting a keeper plate if the unit has a spring return set to fail against the opposite stop, or by simply disconnecting the air supply if the unit is double acting or has a spring return set to fail against this stop. Re-connect the signal, and set to any current between 4 and 20 mA. Select Setup Mode, and press the UP button until the POT LED lights continuously. Unclamp the pot clamp screws, taking care not to unscrew them too far such that they disengage from the nuts in the carrier plate. Rotate the pot until the POT LED changes from continuous to blinking illumination. Re-tighten the clamp screws, and reconnect the air supply. If the unit needed a keeper plate, drive it downscale by disconnecting the signal, and then remove the keeper plate with the air supply on.

4.12 EEPROM Checksum Error

Each time calibration or setting data is written to EEPROM (non-volatile memory) by the positioner circuit, a checksum of all EEPROM data is calculated and written to EEPROM. Hence if there is a power supply (ie. signal) interruption during the EEPROM write procedure, the checksum will not be written correctly, or at all. After the interruption, during its initialisation routines the positioner carries out a checksum calculation of the data stored in EEPROM. If the newly calculated checksum and the stored checksum are not identical, the positioner enters an error routine, and does not start Normal Mode operation. This condition is indicated by the LEDs lighting one after the other in sequence. If this condition is achieved, carry out the reset procedure described in section 4.3 , and then recalibrate as detailed in sections 4.5 to 4.8.

4. SETUP (continued).

4.13 Selecting and Setting Up Non-Linear Curves.

The positioner may be operated either as a linear or non-linear device. Non-linear operation is enabled by fitting a jumper link to the positioner with the positioner (and position retransmit if fitted) powered down (ie. input current at 0 mA). When the positioner is powered up with the link "on" (see figure 6 for its position), it will then operate as a non-linear device for as long as it remains powered up. Conversely, when the positioner is powered up with the link "off", it will operate as a linear device as long as it remains powered up. Changing the link from "on" to "off" or vice-versa while the circuit remains powered up will not cause a change from non-linear to linear operation - the position of the link is only effective during power up.

When the positioner is powered up with the jumper link "on" and the air supply connected, then any one of eleven characteristic curves may be selected. Press the SET button to go into Setup Mode, and select the CURVE variable by pressing the UP button until the CURVE LED lights continuously. It is easiest to select the required curve from the eleven available by setting the input signal current to midway between the LCP and HCP signal current values - for instance, if the LCP is 4 mA and the HCP is 20 mA, then set the input current to 12 mA for this purpose.

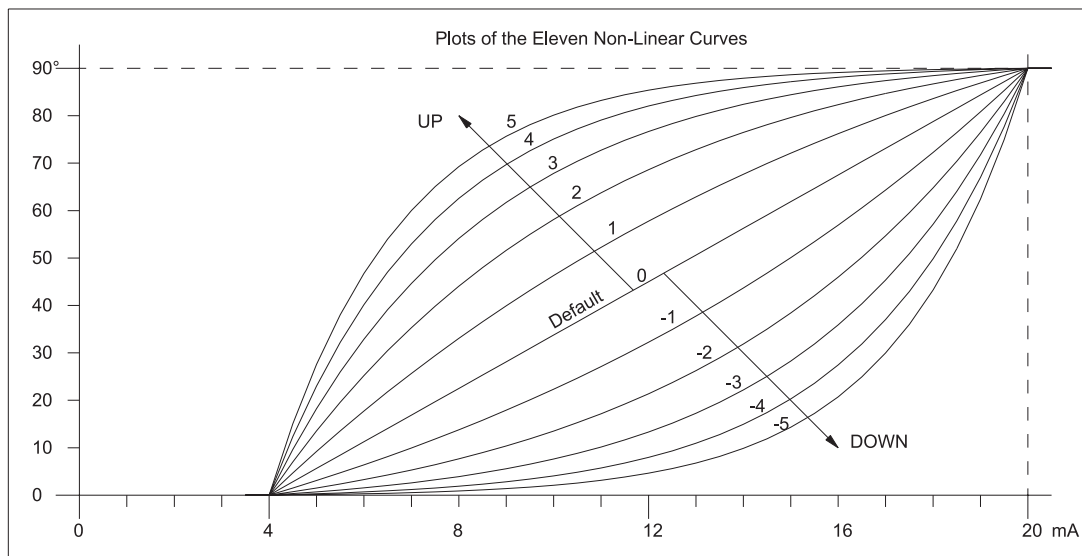


Figure 8. Plots of the Eleven Non-Linear Curves

With the signal set at midway between LCP and HCP values, select Adjust Mode by pressing the SET button, and the CURVE LED will now blink. The default curve is in fact the linear curve midway between the other non-linear curves (see Figure 8). To select one of the other curves, press the UP or the DOWN button, and observe the movement of the positioner as its position conforms to the intersection of the mid value signal with the different curves selected from those defined in Figure 8. Each button press steps from one curve to the next one, until at the last curve further button presses have no effect. When the desired curve has been selected, press the SET button to return to Setup Mode.

Note: As soon as the UP or DOWN button has been pressed to select a particular curve, the new curve selection is stored in non-volatile memory and is retained even if the positioner is deenergised before leaving Adjust and Setup Modes.

Each curve is scaled between the two calibration points LCP and HCP. If input currents are reduced below LCP current or increased above HCP current, the positioner stops dead at the LCP or HCP position respectively. This is in fact the difference between the linear curve selected as the default "non-linear" curve, and the linear curve selected when the positioner is powered up with the jumper "off" - the latter gives positions extrapolated on the same linear characteristic beyond the LCP and HCP positions for signals beyond the LCP and HCP signals, whereas the former stops dead at the LCP and HCP positions.

4. SETUP (continued).

4.14 Setting Optional Angle Retransmit Span And Zero Adjustments.

The angle retransmit circuit is mounted directly underneath the positioner circuit, and its ZERO and SPAN preset pots are accessible using a small instrument screwdriver through the two access holes in the positioner circuit (see Figure 6). Connect the air supply, positioner signal and angle retransmit reader supply. To set the ZERO, move the positioner to its minimum signal position (usually 4mA), and set the ZERO preset pot to give the desired retransmit current. Then set the SPAN by moving the positioner to its maximum signal position (usually 20 mA), and adjusting the SPAN preset pot to give the desired retransmit current. Recheck and readjust these two settings until both are correct - as the SPAN is adjusted, it has a small effect on the ZERO reading, and vice-versa, so a few readjustments may be necessary.

The angle retransmit circuit is fitted with a jumper, which should be fitted to bridge its two pins if you want the circuit to read 4-20 mA over 45 degrees or near, rather than the usual 90 degrees. The range adjustment pot is adjustable to give ranges in between these two values. To gain access to this jumper, it is necessary to remove the whole carrier plate assembly from the positioner - see Section 2.1 for instructions on this.

4.15 Adjustment of Position of Optional Clearcone Monitor.

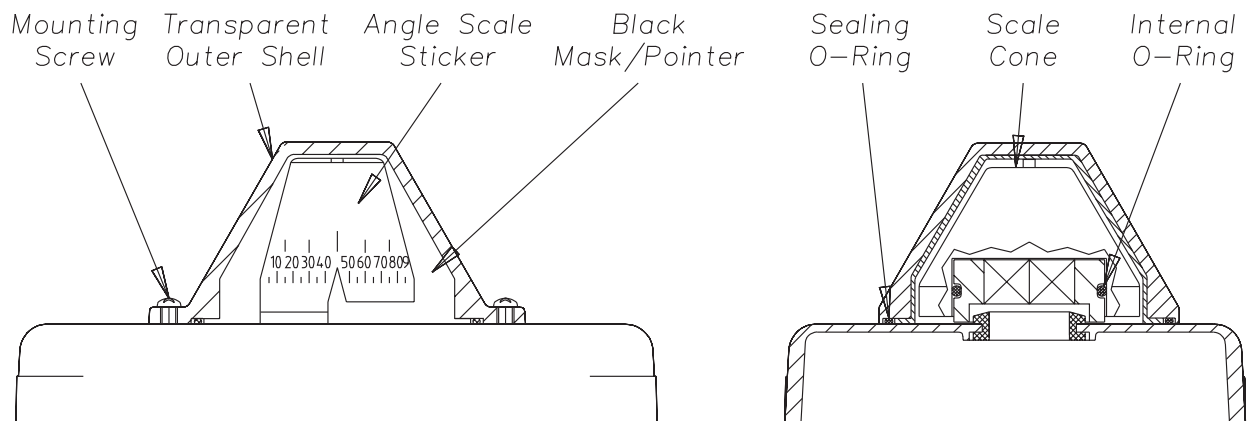


Figure 9. EL Lid - ClearCone Monitor Adjustment

If your positioner is fitted with a Clearcone position monitor, you may need to adjust its angle to read correctly after you have set up the positioner. The internal O-ring slides to give a coarse setting, and the shell mounting slots give a few degrees of fine adjustment.

To adjust the position of the angle scale, first unscrew the two self-tapping stainless mounting screws which hold the transparent outer shell to the lid, and lift off the shell complete with its black mask/pointer moulding. Don't lose the screws or the sealing O-ring which seals round the outside of the shell-lid interface.

If you have reversed the clockwise/anticlockwise sense of the positioner, you may at this stage need to replace the self adhesive angle scale sticker with one marked in the opposite sense. Take care to stick it to the scale cone moulding accurately.

Rotate the scale cone by sliding it round on its internal O-ring against the coupling inside it, which is located on the positioner shaft square. This may take some effort if the O-ring has stuck on. Move it until it is reading as near correctly as you can achieve against the pointer on the mask/pointer moulding, which you should hold in position with the outer shell mounting slots centrally located above the screw holes in the lid. Refit the mounting screws, making sure that the mask moulding and the sealing O-ring are well located in the outer shell moulding. Adjust the pointer position to its final position by rotating the outer shell slots against the mounting screws, taking care to position the screws at equivalent positions in both slots so that the shell remains central relative to the rotating parts inside, then tighten the screws to clamp it into position.

5. MAINTENANCE AND TROUBLESHOOTING

The EL positioner is designed to be maintenance free during a long life, if it is supplied with clean, dry oil-free air, and electrical signals free of noise and high voltage spikes.

When the lid is removed, take care not to wipe all grease from shaft lip seal.

Table 2 is a troubleshooting guide, which aims to assist only with simple easily remedied problems. If problems persist, contact Kinetrol or a Kinetrol distributor for further assistance.

TABLE 2. Troubleshooting Guide.

Failure to move when signal and air are connected:

- Check air pressure - must be above 50psi/3.5 Bar.
- Check signal is connected with correct polarity.
- Check signal is really above 4 mA
- Discrete units - is shaft connected in correct orientation? The feedback pot strap may need replacing if orientation is incorrect.
- Has main feedback pot been rotated, or does it need rotating because the unit has been subjected to change in direction of movement on loss of signal? See Section 4.11 - Resetting Feedback Pot.
- Is air supply clean, dry, and oil free ?

Unit moves slower than expected upscale or downscale:

- Check air pressure - above 50psi /3.5 Bar ?
- Check flow adjuster screws - has one been screwed in?
- Is air supply clean, dry and oil free ? If not there is a possibility that the positioner servo has been damaged.

Movements are too jerky:

- Adjust proportional gain to increase smoothness - then reset damping and setpoints as instructed in Section 4.

Lack of sensitivity to changes in signal:

- Adjust proportional gain to increase sensitivity - then reset damping, and setpoints as instructed in Section 4.

Set point is overshoot when positioner moves rapidly:

- Adjust damping to eliminate overshoot.

Title:**METHOD FOR CALCULATING C_v FOR SOLENOID VALVE GIVEN REQUIREMENT TORQUE & STROKE TIME**

ACTUATOR MODEL	FOMULAR FOR C_v
05	$0.07/T$
07	$0.18/T$
08	$0.24/T$
09	$0.38/T$
10	$0.60/T$
12	$1.23/T$
14	$3.1 /T$
16	$7.3 /T$
18	$16 /T$
20	$32 /T$

NOTES: T = Stroke time secs. for 90° travel
 C_v given in US. Gals/Min/psi
 Supply pressure = 80 psi
 No load condition

Refer to graph on sheet 2 to determine loaded stroke time.

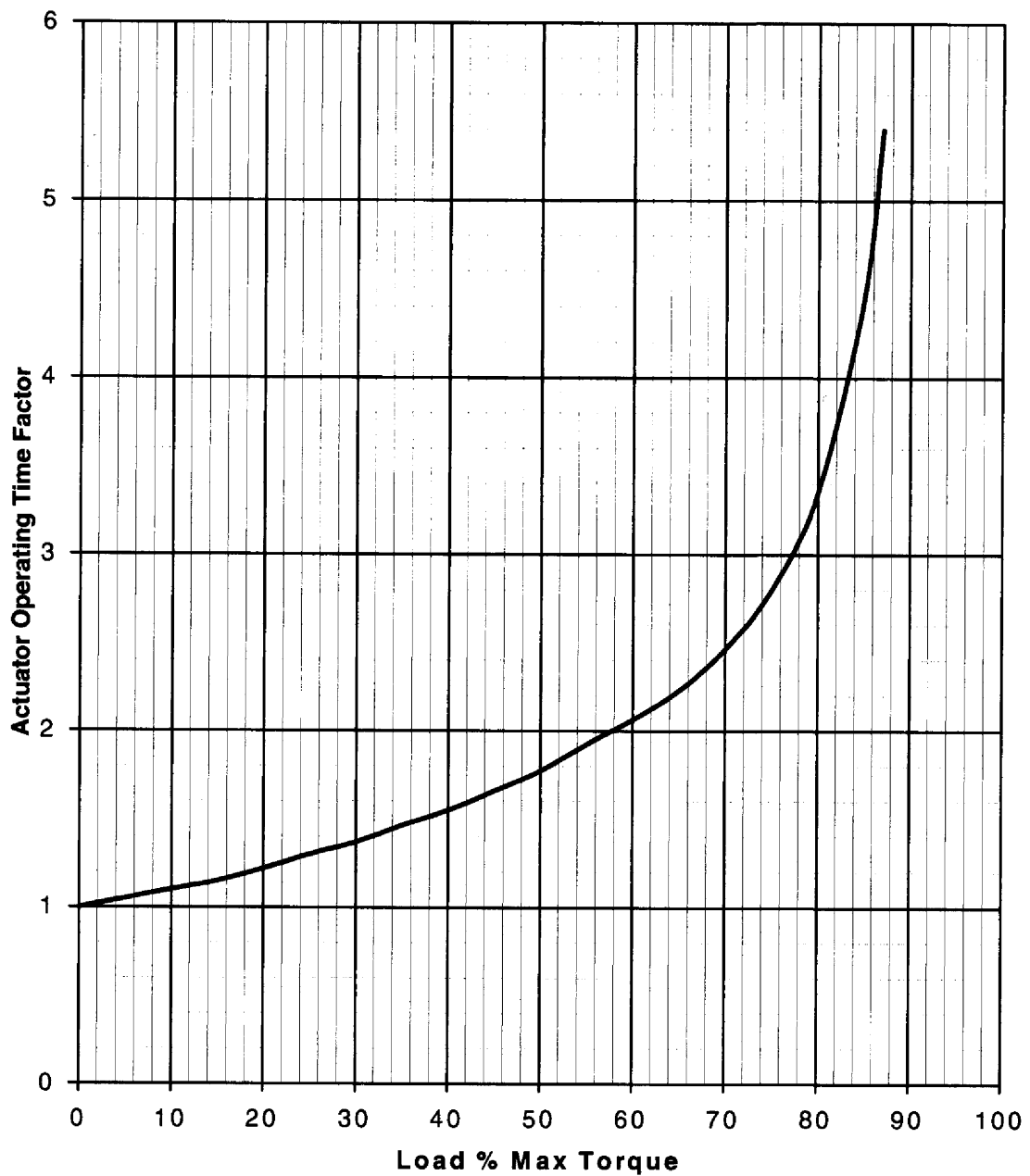
EXAMPLES: 099-100 Torque required is 100 Nm (890 lbf.in). Stroke time required is 1.8 seconds. Use Kinetrol catalogue to obtain actuator torque. Loading is therefore 50%.
 Using graph on sheet 2, load factor is 1.8.
 No load time $T = 1.8/1.8 = 1$ second.
 From table above
 $C_v = 0.38/T = 0.38/1 = 0.38$

099-120 Torque required is 47 Nm (415 lbf.in). Stroke time is 3.6 seconds. Use Kinetrol catalogue to obtain spring return torque. Loading is therefore 50%. From graph on sheet 2, load factor is 1.8.
 No load time $T = 3.6/1.8 = 2$ seconds.
 From table above
 $C_v = 0.38/T = 0.38/2 = 0.18$

Title:

METHOD FOR CALCULATING C_v FOR SOLENOID VALVE GIVEN
REQUIREMENT TORQUE & STROKE TIME

**Actuator Operating Time Factor
Against % Load**



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Trading Estate, Farnham, Surrey, England

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Page 2 of 2

- 1. Machinery Directive 89/392/EEC as amended by Directives 91/368/EEC and 93/44 / EEC.

Kinetrol will mark pneumatic actuators with a CE mark from 1st January 1995 in accordance with the CE Marking Directive 93/68/EEC.

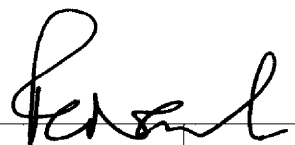
This will indicate that the Kinetrol range of pneumatic actuators and associated equipment comply with the safety requirements of the directives. A technical file will be available to regulatory authorities on demand. Certificates of Conformance will be supplied with batches of products.

- 2. Electro-Magnetic Compatibility Directive 89/336/EEC as amended by 91/263/EEC and 92/31/EEC

By 1st January 1996 Kinetrol will carry out tests where necessary and produce technical files to show compliance with the requirements for emissions of, and immunity to, electro-magnetic radiation.

- 3. Low Voltage Electrical Equipment Directive 73/23/EEC

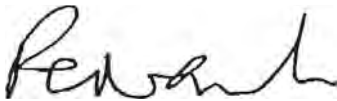
By 1st January 1996 documentation to show conformity with relevant harmonised European standards will be available to support CE marking of relevant products. This will cover products not otherwise covered by the Machinery Directive or the Electro-Magnetic Compatibility Directive.



EU MACHINERY DIRECTIVE DECLARATION OF CONFORMITY - ACTUATORS

Electrical and electronic products manufactured by Kinetrol (Limit Switch Units, Angle Retransmit Units, I/P Positioners, 3 - Stop Positioners, EL Positioners plus internal Limit Switch and Angle Retransmit circuits, and EHD Actuators plus internal Limit Switches - all described in catalogue KF 84 or sheet KF 125) conform to the requirements of the EMC Directive 89/336/EEC as amended by directives 92/263/EEC, 92/31/EEC and 93/68/EEC.

Conformity is achieved by keeping emissions within the limits set by harmonised European standard EN 50081-1 (Generic Emission Standard - Domestic, Commercial and Light Industrial Environment) and immunity within the limits set by harmonised European standard EN 50082-2 (Generic Immunity Standard - Industrial Environment).



R. C. Nash

Managing Director

**Title: DECLARATION - EU MACHINERY DIRECTIVE (GERMAN)
ACTUATORS**

KONFORMITÄTSERKLÄRUNG ZUR EU-MASCHINENRICHTLINIE

Die von der KINETROL LTD, Farnham, UK, hergestellten pneumatischen Schwenkantriebe und deren Zubehör entsprechen den Erfordernissen der Maschinenrichtlinie 98/37/EC, und deren Anforderungen hinsichtlich der Sicherheit und der Unbedenklichkeit für die Gesundheit.



J.V.Nash
Managing Director

Issue	Signed	Date	KINETROL Trading Estate Farnham Surrey England	Doc.No. TD80
B	<u>J.V.N</u>	09/06/03		Page 1 of 1

Title:

16 & 18 SPRING TORQUES (NEW SPRING UNITS)

SR80MMPR

16 & 18 SPRING TORQUES (NEW SPRING UNITS)

25.1.95

MODEL:	TORQUE (LBF IN) AT BALANCED PRESSURE SETTINGS (PSI)															
	20	25	30	35	40	45	50	55	60	65	70	75	80			
Setting:																
16-120-6100 1 SPRING	Start 2566	3178	3790	4401	-	-	-	-	-	-	-	-	-	-	-	-
	End 1394	2172	2950	3729	-	-	-	-	-	-	-	-	-	-	-	-
16-120-6400 2 SPRING	Start 3486	4098	4710	5321	5933	6544	7156	7768	8379	8991	9602	-	-	-	-	-
	End 474	1252	2030	2809	3587	4366	5144	5922	6701	7479	8258	-	-	-	-	-
16-120 3 SPRING	Start 5630		1110	1889	2667	3446	4224	5002	5781	6559	7338	8116	8894	9602	10522	11134
	End 1110															
18-120-6200 3 SPRING	Start 6398	7758	9118	10477	11837	13196	-	-	-	-	-	-	-	-	-	-
	End 2362	4092	5822	7553	9283	11014	-	-	-	-	-	-	-	-	-	-
18-120-6300 4 SPRING	Start 7318	8678	10038	11397	12757	14116	15476	16836	18195	-	-	-	-	-	-	-
	End 1442	3172	4902	6633	8363	10094	11824	13554	15285	-	-	-	-	-	-	-
18-120 5 SPRING	Start 8238	9598	10958	12317	13677	15036	16396	17756	19115	20475	21834	23194	24554	26000	27400	28800
	End 522	2252	3982	5713	7443	9174	10904	12634	14365	16095	17826	19556	21286	23016	24746	26476

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KINETROL

Trading Estate Farnham Surrey England

Doc.No. TD81
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**Title: DECLARATION – EU MACHINERY DIRECTIVE (GERMAN)
DASHPOTS**

**HERSTELLERERKLÄRUNG IM RAHMEN DER 98/37/EC RICHTLINIE
FÜR MASCHINEN**

Hiermit erklären wir, daß bei Einbau der von KINETROL LTD, hergestellten Rotationsdämpfer in eine Maschine deren Inbetriebnahme bis zur Feststellung, daß die Gesamtanlage der EG-Richtlinie 98/37/EC entspricht, untersagt ist.

Für Einbau, Betrieb, Wartung und Reparatur sind die Hinweise in unseren Katalogunterlagen und die anerkannten Regeln der Technik zu beachten.



J.V.Nash
Managing Director

B	Signed	Date	KINETROL Trading Estate Farnham Surrey England	Doc.No. TD84
	<i>J.V.N</i>	09/06/03		Page 1 of 1

Title: Instructions - I.S. SCS and FM Approved EL Electropneumatic Positioners

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2	"	3.2 Mounting of Discrete Positioners.
3	"	3.3 Air and Electrical Connections.
4	4. Schematic Functional Diagram.	
4	5. Setup -	Diagram and General.
5	"	(1) Travel Speed.
5	"	(2) Smoothness and Sensitivity.
5	"	(3) Span and Zero.
5	"	(4) Optional Limit Switch Cams.
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2. SAFETY REQUIREMENTS.

2.1 Certification.

This instruction document is for special versions of Kinetrol's EL electropneumatic positioner which are certificated for use in areas with a risk of explosion. The unit is approved by SCS (SIRA Certification Services) as intrinsically safe (IS) to the European classification EEx ia IIC T4, allowing it to be used in Zone 0 areas, provided it is installed according to approved procedures - see relevant pages of Certificate of Conformity no.Ex 95C2023 reproduced at the end of this document, and Harmonized European Standard EN 50039 (equivalent to BS 5501 Part 9) ' Specification for Intrinsically Safe Electrical Systems "i" '. It is also approved by FM (Factory Mutual Research Corporation) as intrinsically safe for Class I, Division 1, Group A, B, C and D hazardous locations in accordance with entity requirements and system diagram TD 90 Issue A (see sections 10 and 11 of this document for details).

2.2 Barrier.

The unit is powered by compressed air, and controlled by a 4-20mA signal. In hazardous area applications the 4-20mA signal is sourced outside the hazardous area, usually from a normal industrial control source; the signal current must be passed into the hazardous area through an approved 28v 300ohm shunt zener diode barrier device, which acts to prevent dangerous levels of electrical energy being available inside the hazardous area.

Without an approved 28v 300ohm barrier the positioner is not safe in a hazardous area.

2.3 Identification.

SCS-approved positioners are identified by a black anodized aluminium label attached to the lid carrying the SCS logo, reproduced as Figure 7 on page 6 of this document. FM-approved positioners carry a similar black label with the FM diamond logo, reproduced as Figure 8 on page 6 of this document. Non-IS versions carry a red label.

Do not use positioners with red labels in hazardous areas.

2.4 Limit Switches

If the unit is fitted with the limit switch option, each limit switch must also be connected via a 28v 300ohm barrier, and each of the three possible circuits (4-20mA signal, Top limit switch, Bottom limit switch) must be electrically isolated from each other.

2.5 Other Requirements

Fittings attached to the conduit entries should be made of brass or stainless steel. None of the three possible circuits should be connected to ground at the positioner. See Section 11 (TD 90) for full FM specified requirements.

3. INSTALLATION

Positioners can be supplied direct-mounted, or ready to be direct-mounted, onto Kinetrol rotary actuators, or in stand-alone (discrete) form for fitting via a mount kit to any 90 degree rotary actuator. If the positioner is supplied ready mounted on an actuator, sections 3.1 and 3.2 can be bypassed. Positioner-type Kinetrol actuators (ready for direct mounting of positioners) are available in models 03 to 14 inclusive.

3.1 Mounting of Direct Mounting Units onto Kinetrol Positioner-Type Actuators

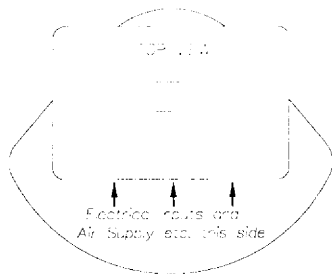


FIGURE 1. Mid Travel Orientation of Actuator Square and Positioner Box.



FIGURE 2. Location of Anti-Backlash Spring on 07 & Larger Squares.

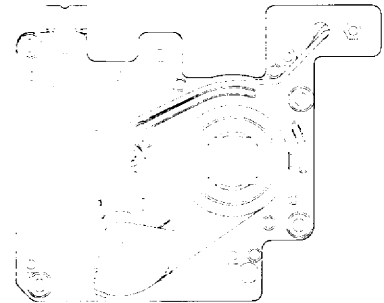


FIGURE 3. Bottom View of Carrier Plate Assembly Showing Shaft and Potentiometer in Mid Travel, Ready to be Fitted to Actuator in Mid Travel.

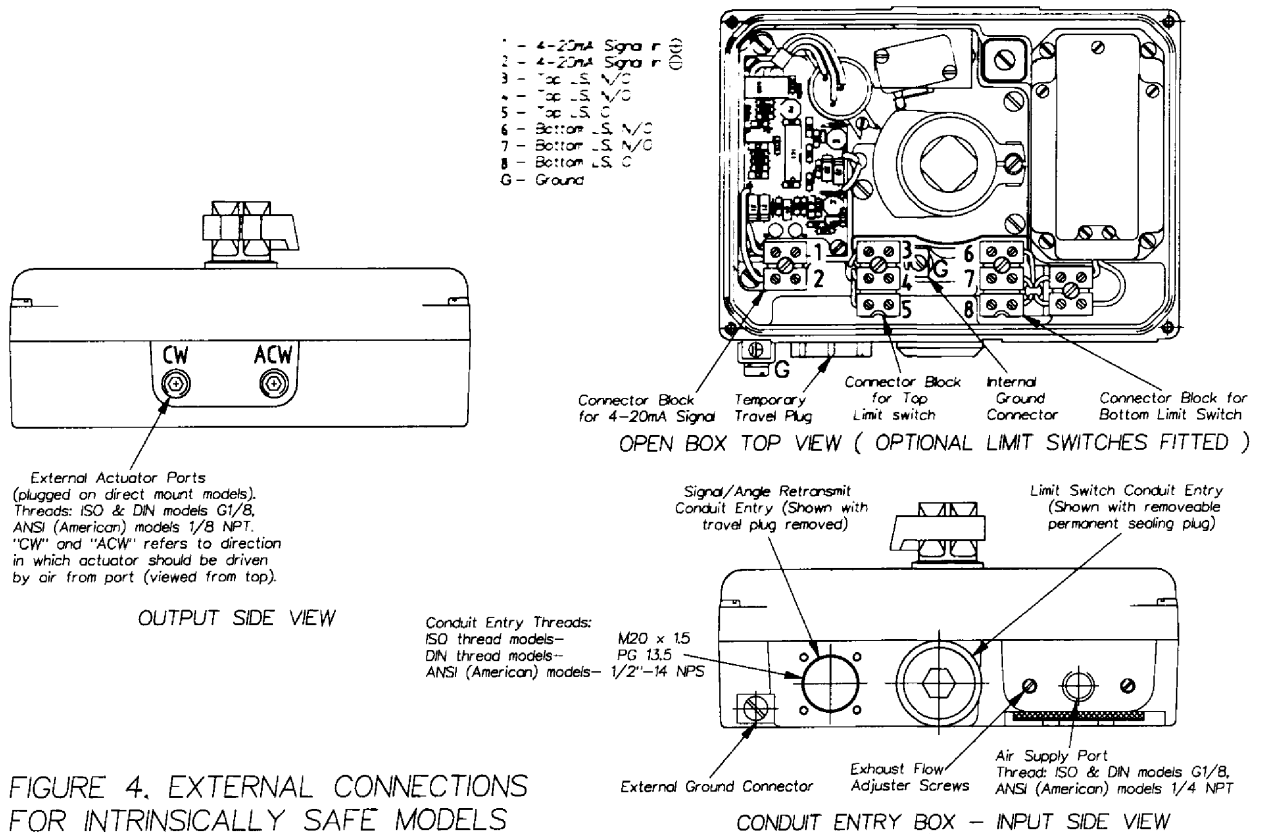
- (1) Move actuator vane to mid travel position, with its output square as shown in Figure 1. This is essential to prevent subsequent error in orienting positioner square.
- (2) Remove positioner cover, and undo the five M4 slot-headed screws holding the red plastic carrier plate into the body. Disconnect the two wires to the servo valve, and lift out the whole carrier plate assembly complete with shaft and circuit etc.
- (3) Bolt the positioner body to the actuator in the orientation shown in Figure 1, taking care that O-rings are in place to seal the ports into the actuator, and that the actuator shaft is centred in its hole.
- (4) On 07 and larger models, fit anti-backlash spring over one corner of the actuator square as shown in Figure 2.
- (5) Observe the range of motion available to the positioner shaft, limited by the correct running of the potentiometer quadrant wheel, driven by the stainless steel strap (see Figure 3). Fit the carrier plate/shaft assembly back into the positioner box with the shaft near mid-range, "feeling" the female square in the positioner shaft onto the male actuator square while maintaining its position near mid range. It is essential that the two shafts are correctly oriented relative to each other, since if they are 90 degrees out, the quadrant wheel can be forced too far and damage done to the drive mechanism during subsequent actuator movements. It is possible to fit the positioner correctly with the actuator square at one end of its travel, but experience indicates a high probability of mistaking the direction of movement of the actuator - hence it is strongly advised that the positioner be fitted with the actuator square at the mid-travel position, where there is no ambiguity possible.

3.2 Mounting of Discrete Positioner

Design and manufacture of the mount kit between positioner and actuator is outside the scope of this document. It is essential that the shaft of the actuator is well aligned with the positioner shaft, and that the two are coupled together with a minimum of backlash - any backlash acts to deteriorate the performance of the positioner/actuator combination.

It is also essential that the 90 degree travel of the actuator moves the positioner shaft through the correct 90 degree range of travel. The easiest way to ensure that this happens is to mount the discrete unit with the lid and indicator in place - set both the actuator and positioner to mid travel, and mate the two in this orientation. Don't take any chances with this, since misorientation of the positioner shaft and consequent movement beyond its designed range of travel will probably result in damage to the positioner pot drive mechanism.

3.3 Air and Electrical Connections



NOTE: External electrical connector terminals are also identified on a label inside the lid.
 When lid is removed for connection/adjustment, take care not to wipe grease from cover shaft seal.

(1) Air Supply.

Connect air supply (pressure between 3.5 and 7 Bar, 50 and 100psi) to the supply port. It is essential that the air is clean, dry, and oil-free. Quality class 3.4.4 (according to ISO standard 8573.1) is easily adequate - this implies 5 micron max. particle size, 3 deg.C dew point max., and 5mg/cubic metre max. oil content.

(2) DIN Plug Option.

The DIN plug option is not available on intrinsically safe positioners.

(3) Positioner Signal.

The positioner signal must be 4-20mA. The positioner gives a positioning response between 0 and 90 degrees linearly proportional to the signal. The positioner is loop powered - that is the signal itself supplies all the electrical power, and no separate power source is needed. In order to supply enough power, the unit requires between approximately 7 and 9 volts to drive the signal current through it - it behaves electrically like a resistor in series with a zener diode. A typical 4-20mA source with a 24v supply is compatible with this input, and will be capable of driving a full signal through both a 28v 300ohm barrier and the positioner.

(4) Angle Retransmit Option.

The angle retransmit option is not currently available on intrinsically safe positioners.

4. SCHEMATIC FUNCTIONAL DIAGRAM.

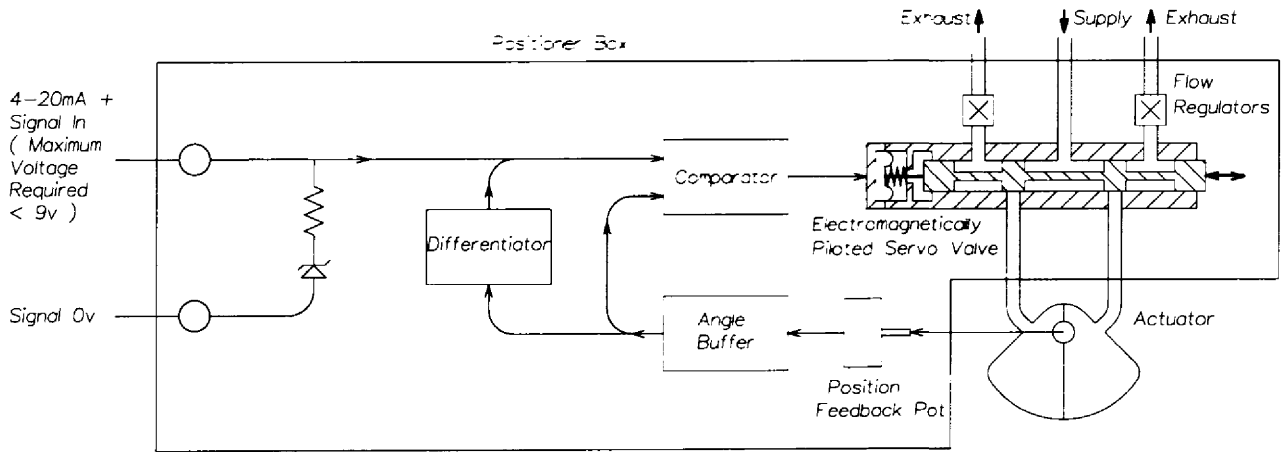


FIGURE 5. SCHEMATIC FUNCTIONAL DIAGRAM OF INTRINSICALLY SAFE EL POSITIONER

5. SET UP

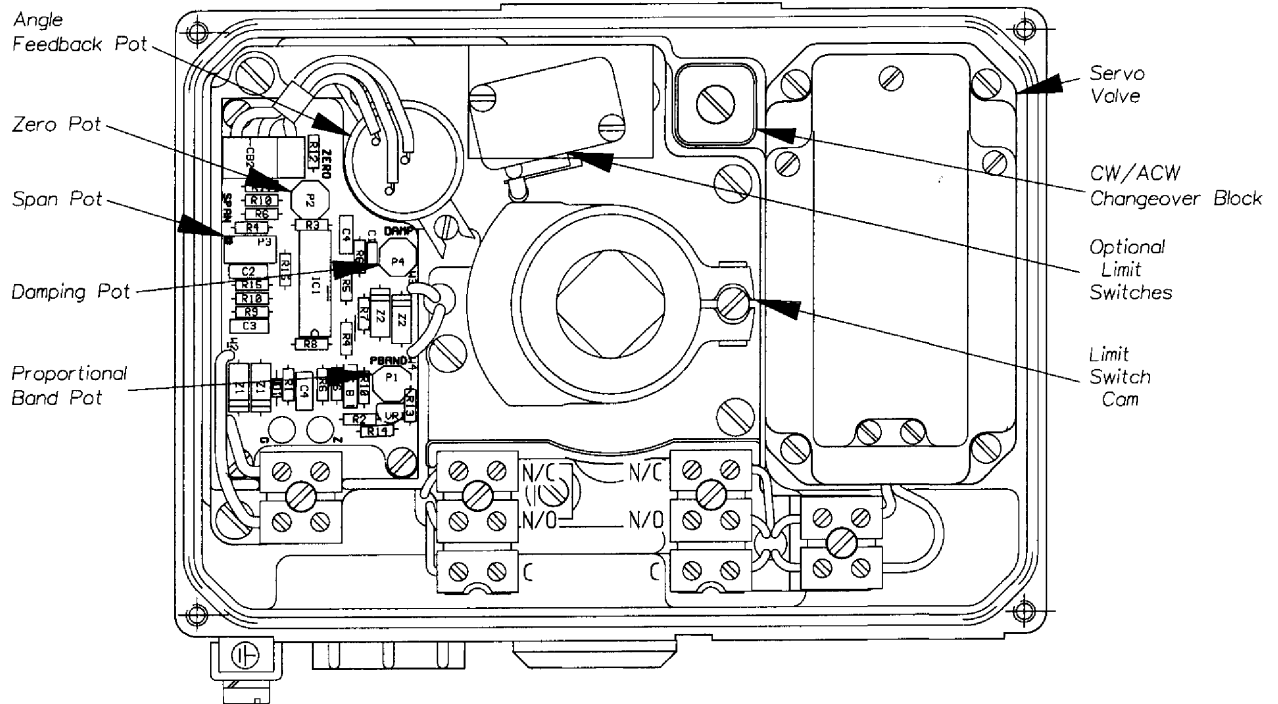


FIGURE 6. CONTROL ADJUSTMENTS, INTRINSICALLY SAFE VERSIONS. OPEN BOX, TOP VIEW.

When the positioner/actuator combination is installed in its application, set up the control adjustments if necessary. For most applications, it is likely that the factory settings will be satisfactory - the span and zero pots are set to give 0-90 degree movement in response to a 4-20mA signal, the flow regulators are set for maximum travel speed, and the proportional band and damping pots set for a good level of sensitivity and smoothness suitable for most applications. If you need to change the settings, do so in the order given below on page 5.

5. (continued)

(1) Travel Speed Setting.

Set the travel speed using the exhaust flow adjuster screws (see Figure 4.). This only applies if you want to reduce the speed from its supplied maximum factory setting.

(2) Setting Smoothness and Sensitivity.

Adjust the proportional band and damping potentiometers (see Figure 6) to optimize the sensitivity and smoothness of the positioner. With the proportional band pot, you can maximize sensitivity and accuracy, but at the cost of increased jerkiness of response when the signal is ramped smoothly, or you can maximize smoothness at the cost of losing rapidity of response to small changes in signal. When you are happy with the proportional band setting, adjust the damping pot to just avoid overshoot when the signal is stepped suddenly so that the positioner approaches set point at full speed having travelled 45 degrees or more. Try this travelling up and down scale.

(3) Setting Span and Zero.

Adjust the span and zero pots to give exactly the travel you require from your 4-20mA signal. Span and zero should be set last of all because they are affected by adjustments to the proportional band setting. Big adjustments in zero setting are best carried out by centring the fine zero pot (blue preset on the PCB - see Figure 6), and rotating the the main angle feedback pot having relaxed its clamp screws - avoid undoing the screws too much so that you maintain engagement with the nuts on the other end, and retighten them when you have finished setting the pot position. Adjust the zero setting first, with the signal at 4mA, then the span setting with the signal at 20mA - it may be necessary to repeat this 2 or 3 times to get both set right. The positioner needs a minimum of 3.8mA in order to function correctly (i.e. to supply enough loop power to drive it) - therefore do not aim to position with a signal below 3.8 mA.

(4) Setting Optional Limit Switch Cams.

Optional limit switch cams are factory set to give end-of-travel switching with one switch each end. The switching can be set to occur anywhere in the travel angle for each switch, by relaxing the cam clamp screw and rotating the cam to position. Set the lower cam first. Take care to avoid the clamp section of a cam striking a switch at any point in the actuator's travel.

6. CONVERTING CLOCKWISE / ANTI-CLOCKWISE SENSE OF POSITIONER

Positioners can be converted from clockwise to anti-clockwise movement on rising signal or visa-versa as follows:-

- (1) Disconnect air supply and signal.
- (2) Undo screw holding down changeover block (see Figure 6).
- (3) Rotate changeover block 90 degrees, taking care to keep rubber gasket lined up with holes in body.
- (4) Re-tighten screw holding down changeover block.
- (5) Undo outer two angle pot wire terminal screws, and swap blue and yellow wires over to reverse sense of pot connection; re-tighten screws.
- (6) Re-connect air supply and signal, and re-zero positioner by unclamping angle pot and rotating pot to give correct travel for 4-20mA signal. Avoid undoing clamp screws too much so that you maintain engagement with the nuts on the other end. Re-tighten screws when pot is positioned correctly.

7. MAINTAINANCE AND TROUBLESHOOTING

The EL positioner is designed to be maintenance free during a long life, if it is supplied with clean, dry oil-free air, and electrical signals free of noise and high voltage spikes.

When the lid is removed, take care not to wipe all grease from shaft cover seal.

Table 1 is a troubleshooting guide, which aims to assist only with simple easily remedied problems. If problems persist, contact Kinetrol or a Kinetrol distributor for further assistance.

TABLE 1. Troubleshooting Guide.

<p>Failure to move when signal and air are connected:</p> <ul style="list-style-type: none"> - Check air pressure - must be above 50psi./3.5 Bar. - Check signal is connected with correct polarity. - Check signal is really above 4 mA - Discrete units - is shaft connected in correct orientation ? - Has main feedback pot been rotated, or does it need rotating because unit has been swapped from/to clockwise/anti-clockwise on rising signal ? - Is air supply clean, dry, and oil free ?
<p>Unit moves slower than expected upscale or downscale:-</p> <ul style="list-style-type: none"> - Check air pressure - above 50psi /3.5 Bar ? - Check flow adjuster screws - has one been screwed in ? - Is air supply clean, dry and oil free ?
<p>Movements are too jerky:-</p> <ul style="list-style-type: none"> - Adjust proportional band pot to increase smoothness - then reset damping, span and zero pots as instructed in Section 4.
<p>Lack of sensitivity to changes in signal:-</p> <ul style="list-style-type: none"> - Adjust proportional band to increase sensitivity - then reset damping, span and zero pots as instructed in Section 4.
<p>Set point is overshoot when positioner moves rapidly:-</p> <ul style="list-style-type: none"> - Adjust damping pot to eliminate overshoot.

8. IDENTITY LABELS.

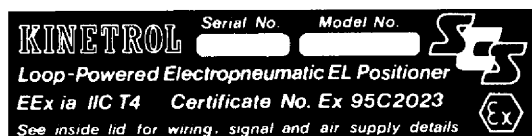
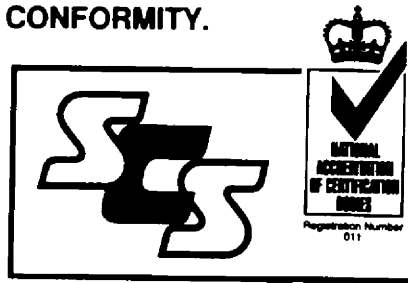


FIGURE 7. SCS I.S. LABEL - ACTUAL SIZE



FIGURE 8. FM I.S. LABEL - ACTUAL SIZE

9. FACSIMILE OF SCS CERTIFICATE OF CONFORMITY.



1 **CERTIFICATE OF CONFORMITY**

2 SCS No: Ex 95C2023

3 This Certificate is issued for the electrical apparatus:

Kinetrol Electro-pneumatic positioner

4 Manufactured by:

Kinetrol Limited
Trading Estate
Farnham
Surrey GU9 9NU

5 and submitted for certification by:

The Manufacturer.

6 This electrical apparatus and any acceptable variation thereto is specified in the schedule to this Certificate and the documents therein referred to.

7 Sira Certification Service being an Approved Certification Body in accordance with Article 14 of the Council Directive of the European Communities of 18 December 1975 (76/117/EEC) certifies that the apparatus has been found to comply with the Harmonised European Standards:

BS5501:Part 1:1977 Amendments 1 to 7
BS 5501:Part 7:1977 Amendments 1 to 16

EN 50 014:1977 A1 to A5
EN 50 020:1977 A1 to A5

and has successfully met the examination and test requirements which are recorded in a confidential ST&C Test Report No. R/510/2691/A.



9. (Continued)



Certificate SCS No: Ex 95C2023

- 8 The apparatus marking shall include the code:
EEx ia IIC T4
- 9 The supplier of the electrical apparatus referred to in this Certificate has the responsibility to ensure that the apparatus conforms to the specification laid down in the schedule to this Certificate and has satisfied the routine verifications and tests referred to therein.
- 10 This apparatus may be marked with the Distinctive Community Mark specified in Annex II to the Council Directive of 16 January 1984 (84/47/EEC).

Date: 7 September 1995

File No: PS/0618/00

A handwritten signature in black ink, appearing to read 'I D Knott'.

I D Knott BSc CEng
MIMechE MInstMC
Chief Executive

Sira Certification Service
South Hill
Chislehurst
Kent BR7 5EH
England

The use of this apparatus will normally be the subject of National Legislation and/or Installation Codes.

This certificate and its schedules should always be reproduced in its totality.

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SCS/SF/055
May 1995

SIRA CERTIFICATION SERVICE

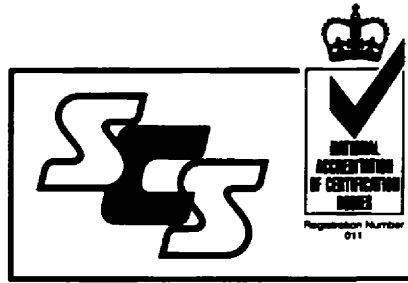
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18/09/96

KINETROL Trading Estate, Farnham, Surrey, England

Doc.No.TD 85
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9. (Continued)



CERTIFICATE OF CONFORMITY

NUMBER: Ex 95C2023

DATED: 7 September 1995

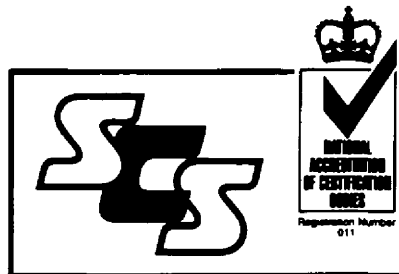
APPARATUS:

The Kinetrol positioner is an electropneumatic device intended to be powered from a 28V, 300Ω shunt zener diode barrier. It uses a large coil to control air flow and hence to rotate a shaft to a specific angle. The apparatus may also contain up to two limit switches which are each powered from a 28V, 300Ω barrier each comprising a separate intrinsically safe circuit.

The apparatus contains up to three separate intrinsically safe circuits with the following safety description.

Main Circuit	Top Limit Switch	Bottom Limit Switch
U _i = 28V	U _i = 28V	U _i = 28V
I _i = 93mA	I _i = 93mA	I _i = 93mA
P _i = 0.655W	P _i = 0.655W	P _i = 0.655W
Leq = 0	Leq = 0	Leq = 0
Ceq = 0 (at 28V)	Ceq = 0	Ceq = 0

9. (Continued)



CERTIFICATE OF CONFORMITY

NUMBER: Ex 95C2023

DATED: 7 September 1995

DRAWING NUMBER	SHEETS	ISSUE	DATE	DESCRIPTION
91-077/A4	1	A	21 Mar 95	IS EL Positioner EEx ia IIC T4 SCS Approved Product Label
91-003/A2	1	F	06 Dec 94	EL Positioner Lid Diecasting
91-049/A3	1	D	07 Jun 95	EL Positioner Limit Switch cover
91-001/A1	1	F	02 Jul 94	Torquemotor Positioner Body Diecasting
91-000-0-2/A1	1	C	27 Mar 95	EL Positioner Servo Valve Assembly
91-000-001/A1	1	O	15 Jul 95	EL Positioner Assembly
86-063/A4	1	A	24 May 90	Potentiometer Drive Strap and 240V Capacitor Clamp
91-000-009/A2	1	F	27 Jul 95	LS Option Assembly
91-048-001				'EL' Positioner Top and Bottom LS Switch Assemblies
91-048-002/A3	1	B	05 Aug	
91-017-001/A3	1	G	21 Apr 95	EL Positioner Basic Wound Coil Low Inductance Variant
91-079/A3	1	A	10 Apr 95	EL Positioner Melinex Terminal Separator
91-080/A3	1	A	10 Apr 95	EL Positioner Melinex Limit Switch Separator
91-081/A3	1	A	11 Apr 95	EL POS 2 Pin Plug
91-075/A3	1	A	20 Mar 95	KF 291 Intrinsically Safe EL Positioner External Wiring Label for Inside Lid, SCS and FM Approved Types
91-017/A3	1	B	19 Aug 94	EL Positioner Nylon Coil Former
91-062/A3	1	B	20 Jun 95	EL Positioner IS Positioner PCB
91-062-001/A3	1	D	02 Aug 95	EL Positioner IS Version Assembled Main Control Circuit
91-000-003/A3	1	E	11 Apr 95	EL Positioner Coil Assembly
91-00-45 & 046/A2	1	C	14 Jul 95	'EL' Pos IS Carrier Plate Assembly 05 & 07
91-000-050/A3	1	F	27 Jul 95	'EL' Positioner Wiring Diagram

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SCS/SF/055
May 1995

SIRA CERTIFICATION SERVICE

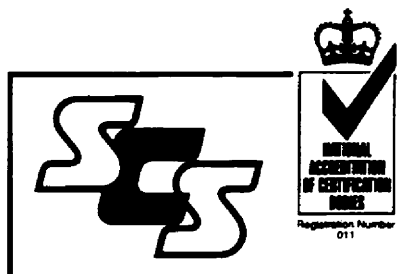
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18/09/96

KINETROL Trading Estate, Farnham, Surrey, England

Doc.No.TD 85
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9. (Continued)



DRAWING NUMBER	SHEETS	ISSUE	DATE	DESCRIPTION
SK1907/A4	1	F	22 Feb 95	Circuit Diagram for EEx i 2-wire TQM Positioner Circuit
91-083/A3	1	A	27 Apr 95	EL Positioner Insulating Delrin Mandrel For Feedback Pot Spring
91-087/A3	1	A	18 Jul 95	IS EL Positioner Feedback Potentiometer Quadrant Follower Wheel
91-051-001 etc/A3	1	E	18 Jul 95	EL POS WIRES

Parts Lists:

Parent Part No	Sheets	Issue	Date	Description
91-000-002	1	P	18 Jul 95	Servo Valve Assy
91-000-045C	1	B	18 Jul 95	EL IS C/PLT. ASSY COM PTS.
91-048-002	1	B	18 Jul 95	Top Switch & Wire Assy
91-048-001	1	B	18 Jul 95	Bottom Switch & Wire Assy
91-000-003	1	C	18 Jul 95	Coil Assembly
91-000-009	1	F	18 Jul 95	LS Option Parts
91-000-071	1	B	18 Jul 95	EL M/ASSY COM.PTS EEx ia
91-062-001	1	C	02 Aug 95	EL.POS. IS. P.C.B. ASSY

9. (Continued)



CERTIFICATE OF CONFORMITY

NUMBER: Ex 95C2023

DATED: 7 September 1995

CONDITIONS OF CERTIFICATION

- 1 The use of the Sira Certification Service Mark is subject to the regulations applicable to the holders of SCS certificates.
- 2 This certificate relates only to the apparatus specified herein as executed in the samples supplied for evaluation.
- 3 In affixing the SCS certificate number to the apparatus the manufacturer attests on his own responsibility that the apparatus conforms to the documents listed herein.

If the marked apparatus is found not to comply Sira Certification Service should be notified immediately at their office at South Hill, Chislehurst, Kent BR7 5EH, England.

ADDITIONAL CONDITIONS OF CERTIFICATION

- 1 The apparatus contains three separate IS circuits, and any field wiring must maintain this separation, for example if multicore cable is used by using 'type A' cable with each circuit enclosed by an individual conducting screen, or 'type B' cable according to the method of installation of the cable.
- 2 All barriers must be of positive polarity.
- 3 Any plugs used to stop unused cable entries must contain less than 6% magnesium.

SPECIAL CONDITIONS

None.

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10. FACSIMILE OF FM APPROVAL REPORT.



Factory Mutual Research

1151 Boston-Providence Turnpike
 P.O. Box 9102
 Norwood, Massachusetts 02062

1Z5A4.AX
 (3610)

May 3, 1996

EL ELECTROPNEUMATIC POSITIONER
 MODEL RST-UVW EL F00Z
 for
 HAZARDOUS (CLASSIFIED) LOCATIONS

from

KINETROL LIMITED
 TRADING ESTATE, FARNHAM
 SURREY GU9 9NU
 UNITED KINGDOM

I. INTRODUCTION

1.1 Kinetrol Limited requested Approval of the apparatus listed in Section 1.2 to be in compliance with the applicable requirements of the standards listed below. Examination and testing to determine compliance to these standards was conducted by SIRA Test & Certification Limited in Chester, England under their Project Ref. Numbers R/515/3221/A, R/510/2691/A and N 0100 in accordance with the FMRC/SIRA inter-laboratory agreement for mutual recognition of test results.

Title	FMRC No.	Issue Date
Electrical Equipment for Use in Hazardous (Classified) Locations General Requirements	Class No. 3600	March 1989
Intrinsically Safe Apparatus for Use in Class I, II and III, Division 1 Hazardous (Classified) Locations. Note: 1.5 factor applied to voltage and current rather than energy.	Class No. 3610	October 1988
Enclosures for Electrical Equipment (1000V max)	NEMA Pub. 250	1991

10. (Continued)

FACTORY MUTUAL RESEARCH CORPORATION

Job Identification 1Z5A4.AX

1.2 The following was evaluated as intrinsically safe apparatus for Class I, Division 1, Group A, B, C and D hazardous (classified) indoor/outdoor (NEMA Type 4) locations in accordance with entity requirements and System Diagram TD90, Issue A, and will appear in the Approval Guide as follows;

Entity Parameters:

$$27.5V \leq V_{max} \leq 30V \quad I_{max} = 93mA$$
$$C_i = 0 \quad L_i = 0$$

IS/I/ABCD - TD90/Issue A; Entity

EL Electropneumatic Positioner. Order Code abc-defELF00g

- a = Actuator Model 0 or 1.
- b = Actuator Model 0, 1, 2, 3, 4, 5, 6, 7, 8 or 9.
- c = Actuator Model 0, 1, 2, 3, 4, 5, 6, 7, 8 or 9.
- d = Assembly Type 0, 4 or 7.
- e = Spring Return 0, 2, 3, 4 or 7.
- f = Limit Switch 0 or 4.
- g = Interface Type 0 or N.

II DESCRIPTION

2.1 **Kinetrol EL Electropneumatic Positioner** - This apparatus is an electropneumatic device intended to be powered from a 28V, 93mA shunt zener diode intrinsic safety barrier. It uses a large coil to control air flow to rotate a shaft to a specific angle. It may contain up to two limit switches which are each powered from separate 28V, 93mA barriers. The enclosure body is diecast ILZRO 16 zinc alloy. Further electrical and construction details may be found in the Project Data Record and documentation file for this project. The operating ambient temperature range is -20°C to 40°C.

III EXAMINATION AND TESTS

3.1 Representative samples of the assemblies were examined and tested by SIRA Test & Certification Limited to determine their acceptability for use in the specified hazardous locations and for compliance to the FMRC Approval Standards referenced in Section 1.1. Results were satisfactory. Details of the examination were reviewed by FMRC and are contained in FMRC Project data Record 1Z5A4.AX

3.2 **Intrinsic Safety Examination - Entity** - Representative samples of the assemblies were examined and tested by SIRA Test & Certification Limited to determine their acceptability for use in the specified hazardous locations and for compliance to the FMRC Approval Standards referenced in Section 1.1. Results were satisfactory. Details of the examination were reviewed by FMRC and are contained in FMRC Project Data Record 1Z5A4.AX.

Entity - Under "entity" requirements, the concept allows interconnection of intrinsically safe apparatus to associated apparatus, not specifically examined in such combination. The criteria for interconnection is that the voltage (V_{max}) and current (I_{max}) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal to or greater than the voltage (V_{oc} or V_t) and current (I_{sc} or I_t) levels which can be delivered by the associated apparatus, considering faults and applicable factors. In addition, the maximum unprotected capacitance (C_i) and inductance (L_i) of the intrinsically safe apparatus, including interconnecting wiring, must be equal to or less than the capacitance (C_a) and inductance (L_a) which can be safely connected to the associated apparatus. If these criteria are met the combination may be connected.

10. (Continued)

FACTORY MUTUAL RESEARCH CORPORATION

Job Identification 1Z5A4.AX

3.2.1 Capacitance Assessment - Circuits within the positioner are all suitably clamped by zener diodes and were determined to be incapable of spark ignition.

3.2.1.1 Unprotected Internal Capacitance (Ci) - Analysis determined that the unprotected capacitance at the field wiring terminals of the positioner may be specified to be negligible ($C_i = 0$) provided the power supply voltage is suitably clamped within the range of 27.5V to 30V by an FMRC Approved intrinsic safety barrier.

$$27.5V \leq V_{max} \leq 30V \quad C_i = 0$$

3.2.2 Inductance Assessment - The only inductive component within the positioner was spark ignition tested in a GP A,B mixture of hydrogen-and-air and found to not be a source of spark ignition.

3.2.2.1 Unprotected Internal Inductance (Li) - Internal protective components prevent inductive energy from appearing at the field wiring terminals. The unprotected inductance, Li, is zero, and the specified $I_{max} = 93mA$ is satisfactory.

$$I_{max} = 93mA \quad L_i = 0$$

3.2.3 Temperature Assessment - Sources of thermal ignition considered during the examination was the heating of small gage wire, and hot surfaces of components. Temperature testing and analysis determined that, referred to a 40°C ambient temperature, a Temperature Identification Number of T4 (135°C) must appear on the apparatus.

$$\text{Temperature Identification Number} = T4$$

3.2.4 Protective Component Derating - The protective components are listed below. All were found to be derated to 2/3 or more under both normal and fault conditions. Protective component testing was not required.

<u>Location</u>	<u>Designation</u>	<u>Type and Rating</u>
Main Board	Z1, Z2	Zener Diode, 18V, 5%, 5W, 1N5355B

3.2.5 Construction - Creepage and clearance distances measured between conducting parts of the circuit affecting intrinsic safety meet FMRC requirements. The Comparative Tracking Index (CTI) of the printed wiring board laminate is satisfactorily specified to be 90 minimum.

3.2.6 Dielectric Strength Testing - Dielectric testing was conducted at 500Vrms applied between the internal circuits and the enclosure; between the internal circuits and the two limit switches; between the two limit switch circuits. The test voltage held for over a minute verifying the suitability of the insulation and spacings.

3.3 Enclosure Environmental Testing - A representative sample of the positioner was subjected to water hosedown, water submersion, and dust-exclusion tests. Results satisfied the requirements of BS EN 60529:1992, Classification IP66/IP68 (Category I dust test). Corrosion testing of the enclosure was not required because the materials are non-corrosive. This testing meets FMRC requirements for an enclosure rating of NEMA Type 4.

IV MARKING

Marking meets standard requirements as illustrated by the attachments.

10. (Continued)

FACTORY MUTUAL RESEARCH CORPORATION

Job Identification 1Z5A4.AX

V REMARKS

5.1 Installation must be in accordance with the National Electrical Code (ANSI/NFPA 70) and the manufacturers installation instructions.

5.2 Tampering or replacement with nonfactory components may adversely affect the safe use of the system.

VI FACILITIES AND PROCEDURES AUDIT

The manufacturing site in Surrey, England, is examined on a periodic basis with regard to facilities and quality control procedures. Satisfactory results in the level of performance assures continued product quality as originally Approved herein.

VII RESPONSIBILITIES OF THE MANUFACTURER

7.1 The documentation listed in Sec. VIII is applicable to this Approval and is on file at Factory Mutual Research Corporation (FMRC). No changes of any nature shall be made unless notice of the proposed change has been given and written authorization obtained from FMRC. The Approved Product - Revision Report, FMRC Form 797, shall be forwarded to FMRC as notice of proposed changes.

7.2 On 100% of production, as a routine production line test, the apparatus shall be subjected, without electrical breakdown, to the application of a test voltage between the primary circuit terminals connected together and accessible conductive parts (enclosure). The test potential shall be 600 Vrms, 45 to 60 Hz, or 860 Vdc, applied for one second. Alternatively, the test potential shall be 500 Vrms, at a frequency between 45 to 65 Hz, or 707 Vdc applied for one minute.

7.3 The manufacturer must supply all users with System Diagram TD90.

10. (Continued)

FACTORY MUTUAL RESEARCH CORPORATION

Job Identification 1Z5A4.AX

VIII DOCUMENTATION

The following documentation is applicable to this Approval and is on file at Factory Mutual Research Corporation.

Document No.	Revision	Title
91-000-001/A1	O	EL POSITIONER ASSEMBLY
91-000-002/A1	C	EL POSITIONER SERVO VALVE ASSEMBLY
91-000-003/A3	E	COIL ASSEMBLY
91-000-009/A2	F	LS OPTION ASSEMBLY
91-000-045 & 046/A2	C	IS CARRIER PLATE ASSY., 05 & 07
91-000-050/A3	F	WIRING DIAGRAM
91-001/A1	F	TORQUEMOTOR POSITIONER BODY DIECASTING
91-003/A2	G	EL POS LID DIECASTING
91-017-001	G	EL POS BASIC WOUND COIL LOW INDUCTANCE VARIANT
91-048-001,002/A3	B	EL POS TOP & BOT LS SWITCH ASSY'S
91-049/A3	D	LIMIT SWITCH COVER
91-051-001/A3	E	EL POS WIRES
91-062/A3	B	EL POSITIONER PCB
91-075/A3	A	IS EL POSITIONER EXT WIRING LABEL
91-078/A4	A	FM APPROVED PRODUCT LABEL, IS EL POSITIONER
91-079/A3	A	EL POS. MELINEX LIMIT TERMINAL SEPARATOR
91-080/A3	A	EL POS. MELINEX LIMIT SW SEPARATOR
SK 1907/A4	F	CIRCUIT DIAGRAM, 2-WIRE TQM POSITIONER CKT
TD90	A	SYSTEM DIAGRAM FOR FMRC-APPROVED EL POS.

10. (Continued)

FACTORY MUTUAL RESEARCH CORPORATION

Job Identification 1Z5A4.AX

IX CONCLUSION

The apparatus described in Section 1.2 meets Factory Mutual Research Corporation requirements. Approval is effective when the Approval Agreement is signed and received by FMRC.

EXAMINATION AND TESTS BY: P. J. Walsh, SIRA Test & Certification Ltd.

REVIEWED BY: Ralph Masi, FMRC.

ATTACHMENTS: Product Label Dwg. 91-078/A4, Issue A
Control Drawing TD90, Issue A

COPIES OF SIRA TEST DATA: Project Data Record 1Z5A4.AX.

WRITTEN BY:



Ralph V. Masi, PE
Project Engineer
Instrumentation Section
Approvals Division

REVIEWED BY:



F. J. McGowan, Manager
Instrumentation Section
Approvals Division

11. TD 90 Issue A

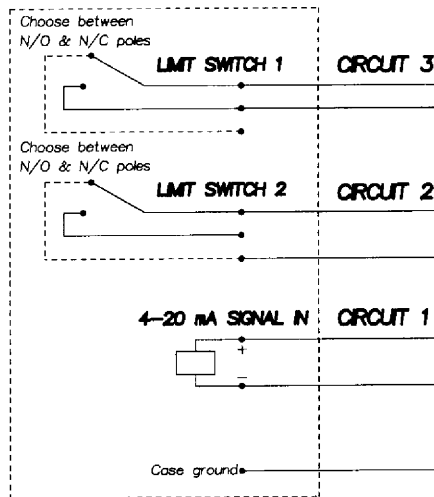
CONTROL DRAWING

HAZARDOUS AREA

SAFE AREA

NEMA 4

CLASS I, DIVISION 1, GROUPS A, B, C & D

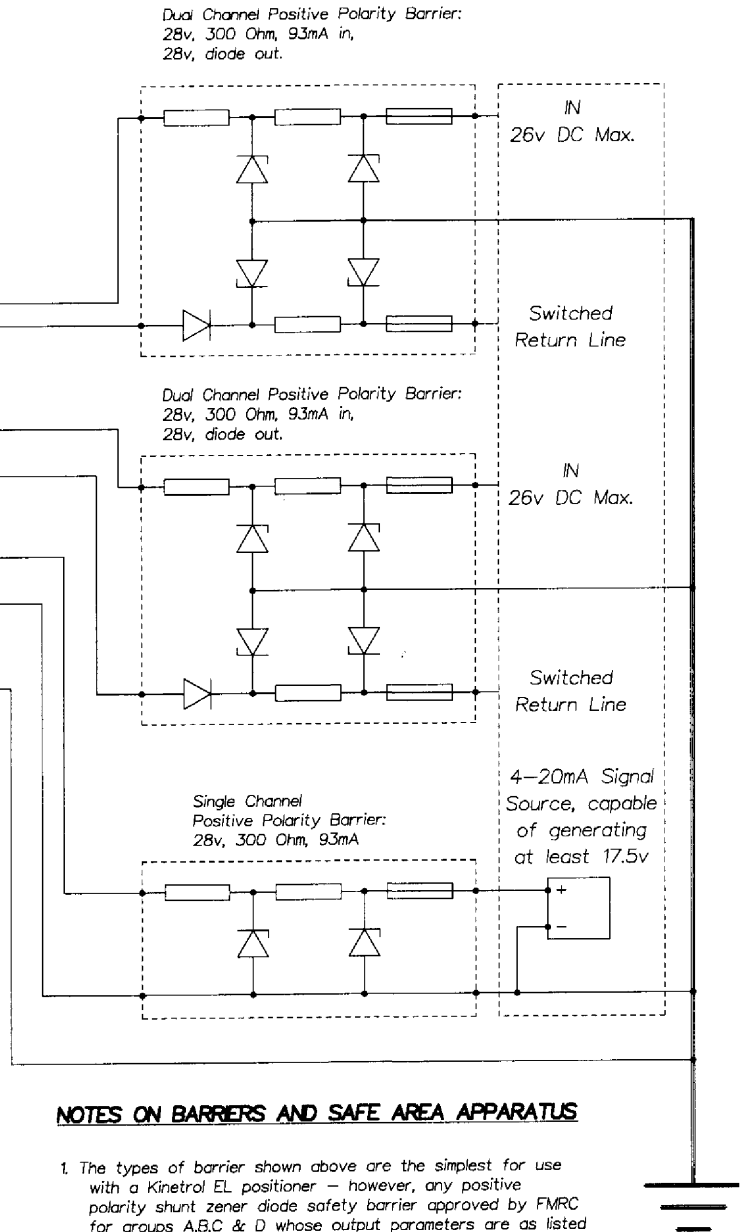


KINETROL IS APPROVED ELECTROPNEUMATIC POSITIONER

NOTES ON INTRINSICALLY SAFE APPARATUS

- Circuits 1, 2, & 3 must be in separate cables or in one cable which has suitable insulation between circuits. Refer to Instrument Society of America Recommended Practice ISA RP12.6 for installing intrinsically safe loops.
- Intrinsically Safe Apparatus Parameters.

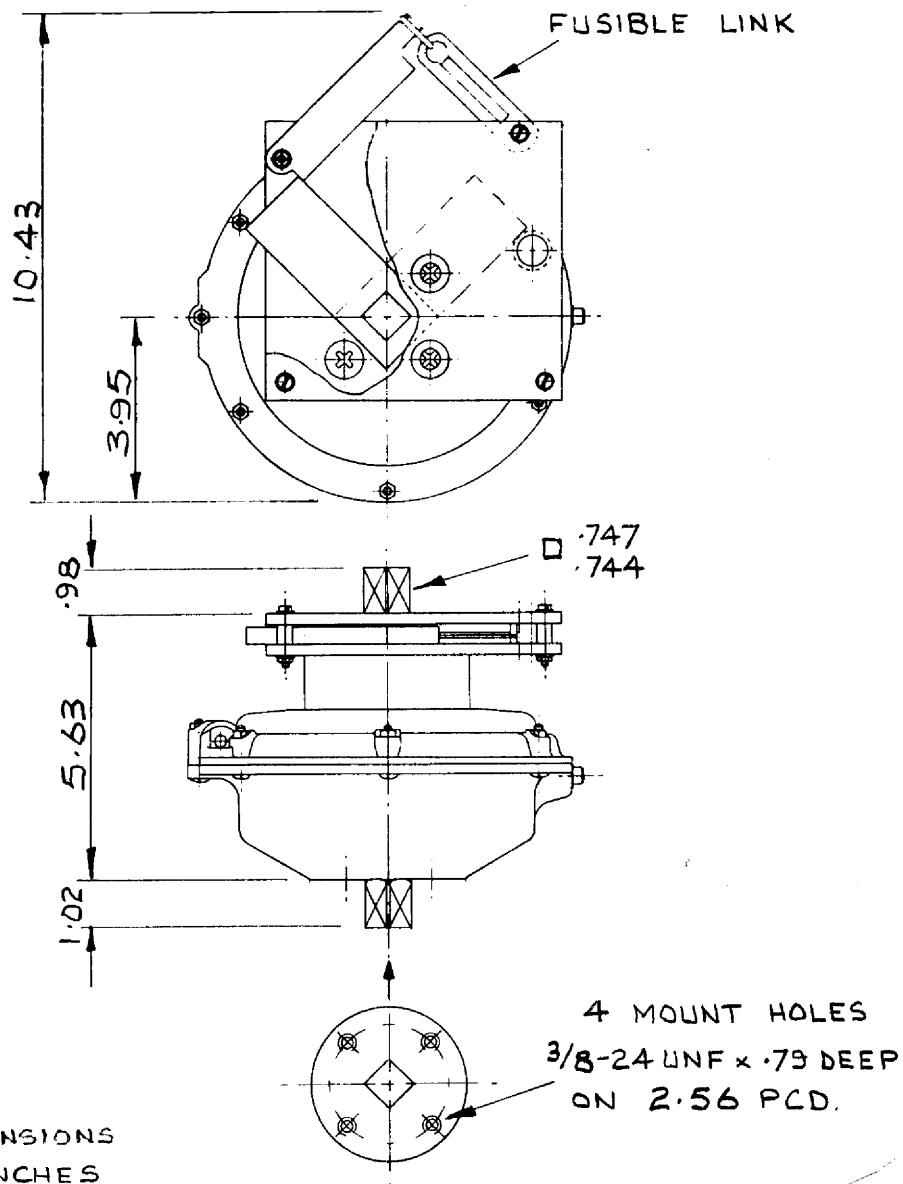
Circuit 1: V _{max} = 30v I _{max} = 93 mA C _i = 0 L _i = 0	Circuit 2: V _{max} = 30v I _{max} = 93 mA C _i = 0 L _i = 0	Circuit 3: V _{max} = 30v I _{max} = 93 mA C _i = 0 L _i = 0
--	--	--
- Cable capacitance and inductance must not exceed the allowed capacitance (C_a) and inductance (L_a) indicated on the associated apparatus.
- Circuits 1, 2, & 3 must not be connected to the case ground at the positioner.
- Circuits 2 & 3 exist only if the limit switch option is in use.



NOTES ON BARRIERS AND SAFE AREA APPARATUS

- The types of barrier shown above are the simplest for use with a Kinetrol EL positioner – however, any positive polarity shunt zener diode safety barrier approved by FMRC for groups A,B,C & D whose output parameters are as listed below can be used for any one circuit:
V_{oc} or V_t: minimum = 27.5v, maximum = 30v
I_{sc} or I_t = 93 mA max.
- Associated apparatus must not be paralleled unless this is permitted by the associated apparatus Approval.
- Safe area apparatus must not be supplied from nor contain under normal or abnormal conditions a source of potential with respect to ground in excess of 250v RMS or 250v DC.

TD90 ISSUE A. 9.04.96. SYSTEM DIAGRAM FOR FMRC-APPROVED IS EL POSITIONER.



1. For safety, when despatched the Fusible Link is disconnected.
2. Mount the Fire Fail-safe unit onto the valve or other load.
Note: The valve must be in its failed position.
3. To latch the fusible link turn the valve using a spanner at least 24" long connected to the top square, turn anti-clockwise for more than 90 degrees and latch the ring of the fusible link onto the lever as shown, gently release the spring tension and remove the spanner, the unit is now ready for service.
4. No maintenance of the unit is required but spare fusible links are available. The standard is 162 deg.F. other temperatures are 199 deg.F. and 286 deg.F.
5. WARNING: The spanner is dangerous if released in an uncontrolled manner, do not leave it attached to the unit when the spring is cocked.

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KINETROL

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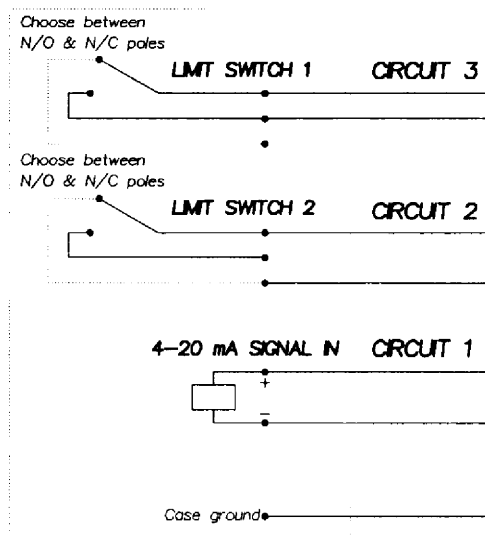
CONTROL DRAWING

HAZARDOUS AREA

SAFE AREA

NEMA 4

CLASS I, DIVISION 1, GROUPS A, B, C & D



**KINETROL IS APPROVED
ELECTROPNEUMATIC POSITIONER**

NOTES ON INTRINSICALLY SAFE APPARATUS

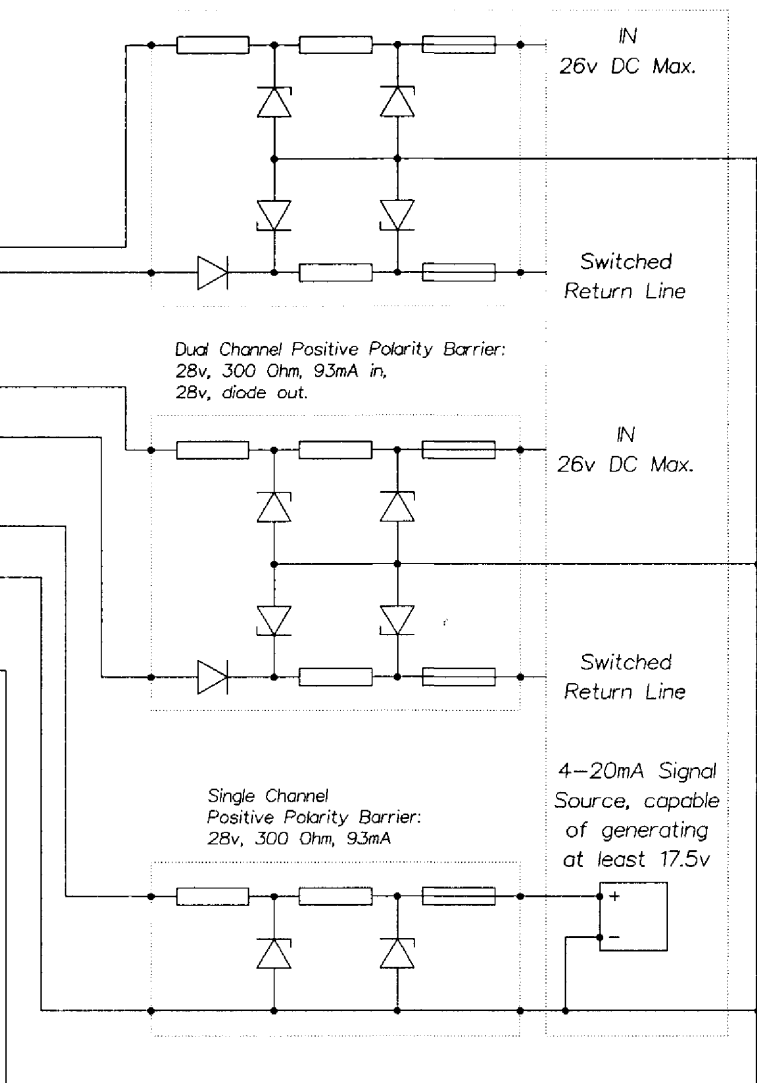
- Circuits 1, 2, & 3 must be in separate cables or in one cable which has suitable insulation between circuits. Refer to Instrument Society of America Recommended Practice ISA RP12.6 for installing intrinsically safe loops.
- Intrinsically Safe Apparatus Parameters.

Circuit 1:	Circuit 2:	Circuit 3:
$V_{max} = 30v$	$V_{max} = 30v$	$V_{max} = 30v$
$I_{max} = 93 mA$	$I_{max} = 93 mA$	$I_{max} = 93 mA$
$C_i = 0$	$C_i = 0$	$C_i = 0$
$L_i = 0$	$L_i = 0$	$L_i = 0$
- Cable capacitance and inductance must not exceed the allowed capacitance (C_a) and inductance (L_a) indicated on the associated apparatus.
- Circuits 1, 2, & 3 must not be connected to the case ground at the positioner.
- Circuits 2 & 3 exist only if the limit switch option is in use.

Dual Channel Positive Polarity Barrier:
28v, 300 Ohm, 93mA in,
28v, diode out.

Dual Channel Positive Polarity Barrier:
28v, 300 Ohm, 93mA in,
28v, diode out.

Single Channel
Positive Polarity Barrier:
28v, 300 Ohm, 93mA



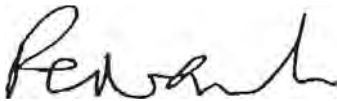
NOTES ON BARRIERS AND SAFE AREA APPARATUS

- The types of barrier shown above are the simplest for use with a Kinetrol EL positioner - however, any positive polarity shunt zener diode safety barrier approved by FMRC for groups A,B,C & D whose output parameters are as listed below can be used for any one circuit:
 V_{oc} or V_t : minimum = 27.5v, maximum = 30v
 I_{sc} or $I_t = 93 mA$ max.
- Associated apparatus must not be paralleled unless this is permitted by the associated apparatus Approval.
- Safe area apparatus must not be supplied from nor contain under normal or abnormal conditions a source of potential with respect to ground in excess of 250v RMS or 250v DC.

EU EMC DIRECTIVE - DECLARATION OF CONFORMITY

Electrical and electronic products manufactured by Kinetrol (Limit Switch Units, Angle Retransmit Units, I/P Positioners, 3 - Stop Positioners, EL Positioners plus internal Limit Switch and Angle Retransmit circuits, and EHD Actuators plus internal Limit Switches - all described in catalogue KF 84 or sheet KF 125) conform to the requirements of the EMC Directive 89/336/EEC as amended by directives 92/263/EEC, 92/31/EEC and 93/68/EEC.

Conformity is achieved by keeping emissions within the limits set by harmonised European standard EN 50081-1 (Generic Emission Standard - Domestic, Commercial and Light Industrial Environment) and immunity within the limits set by harmonised European standard EN 50082-2 (Generic Immunity Standard - Industrial Environment).



R. C. Nash

Managing Director

**Title: DECLARATION - EU MACHINERY DIRECTIVE (FRENCH)
ACTUATORS**

DIRECTIVE No. 98/37/EC- RELATIVE AUX MACHINES
DECLARATION DE CONFORMITE

Toute la gamme des actionneurs pneumatiques rotatifs fabriqués par KINETROL, ainsi que tous les modules additionnels (ressorts de rappel, contacts de fin de course, positionneurs, duplicateur pour rotation 180°, lecteurs d'angles, tous présentés dans le catalogue KF-263) sont conformes aux dispositions de la directive 98/37/CEE et aux dispositions essentielles sur la santé et la sécurité imposées par cette directive.



J.V.Nash

Managing Director


Issue B	Signed <i>J.V.N.</i>	Date 09/06/03	KINETROL Trading Estate Farnham Surrey England	Doc.No. TD92 Page 1 of 1
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Title: French Language Certificate of Conformity with EU EMC Directive.

DIRECTIVE n° 89-336 / CEE " Compatibilité électromagnétique "
DECLARATION DE CONFORMITE

Les appareils électriques et électroniques fabriqués par KINETROL (boîtiers de contacts de fin de course, lecteurs d'angle, convertisseurs I/P, actionneurs à 3 positions, positionneurs électropneumatiques EL et leurs contacts de fin de course intégrés ainsi que leurs circuits lecteurs d'angle, les actionneurs électrohydrauliques EHD et leurs contacts de fin de course intégrés, tous présentés dans le catalogue KF-263 et la notice K012) sont conformes aux dispositions de la directive 89/336/CEE "Compatibilité électromagnétique", modifiée par les directives 92/263/CEE, 92/31/CEE et 93/68/CEE.

La conformité est obtenue en maintenant les émissions électromagnétiques entre les limites imposées par la norme harmonisée européenne EN 50081-1 (Norme Générique Emission - environnement résidentiel, commercial, industrie légère) et l'immunité entre les limites imposées par la norme harmonisée européenne EN 50082-2 (Norme Générique Immunité - environnement industriel).



J.V.Nash

Directeur Technique - Technical Director

ISSUE
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JVN
1/05/96

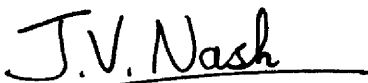
KINETROL Trading Estate, Farnham, Surrey, England

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EU EMC RICHTLINIE - KONFORMITÄTSEKKLÄRUNG

Die von Kinetrol hergestellten elektrischen und elektronischen Produkte (Endschalter, Stellungsrückmeldungen, elektropneumatischer Stellungsregler, Dreistellungsregler, elektronischer I/P-Stellungsregler mit Endschaltern und Stellungsrückmeldung sowie der elektrohydraulische Stellungsregler mit Endschaltern - beschrieben im Kinetrol-Katalog KF84 u. Datenblatt KF125) entsprechen den Anforderungen der EMC-Richtlinie 89/336/EEC mit den Anpassungen 92/263/EEC, 92/31/EEC und 93/68/EEC.

Die Konformität wird durch Einhaltung der Emissionswerte gemäß den Anforderungen der harmonisierten europäischen Norm EN 50081-1 (Elektromagnetische Verträglichkeit Fachgrundnorm Störaussendung - Wohn-Geschäftsgewerbe sowie Kleinbetriebe) sowie der Störfestigkeit im Rahmen der harmonisierten europäischen Norm EN 50082-2 (Elektromagnetische Verträglichkeit Fachgrundnorm Störfestigkeit Industriebereich) erreicht.

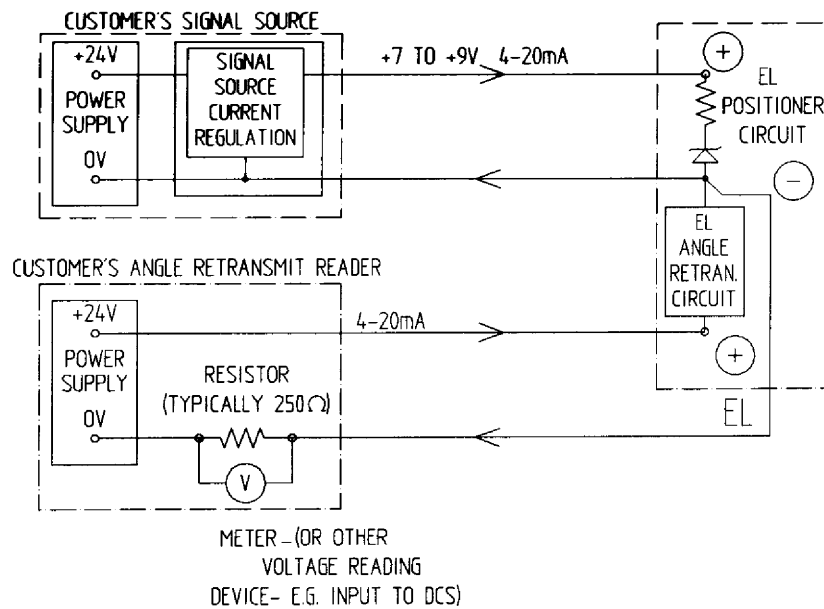


J.V.Nash
Managing Director

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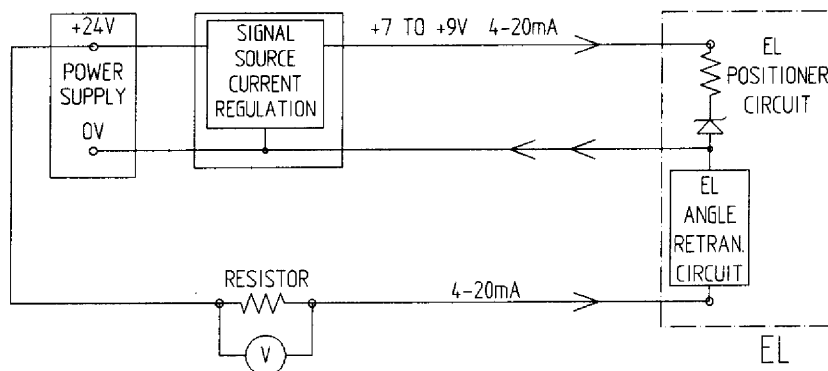
Title: Typical Circuits for 3-Wire EL Positioner Control & Angle Retransmit

(1) CUSTOMER HAS INDEPENDENT POWER SUPPLIES FOR SIGNAL SOURCE & ANGLE RETRANSMIT LOOPS.



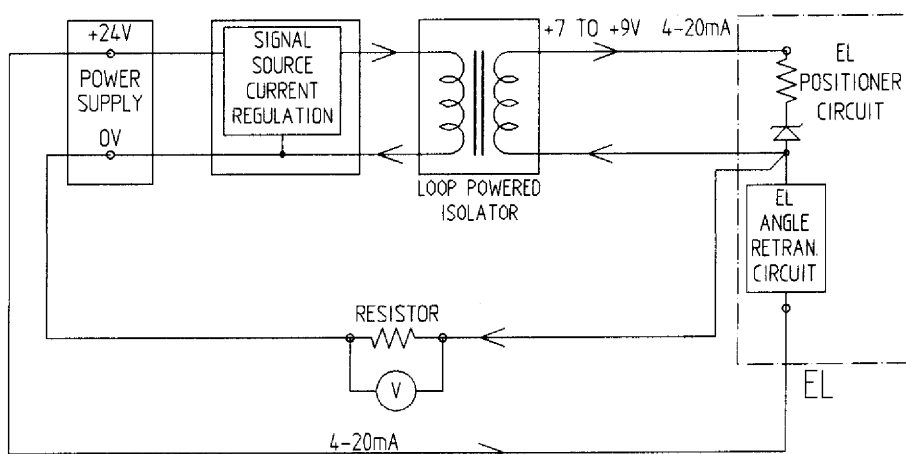
NOTE: THIS CIRCUIT DOES NOT WORK IF THE TWO CUSTOMER POWER SUPPLIES ARE CONNECTED TOGETHER AT THE 0V LINE, SINCE THIS SHORTS OUT THE RESISTOR - THEREFORE THE CIRCUIT CAN'T WORK WITH ONE POWER SUPPLY.

(2) CUSTOMER HAS ONE POWER SUPPLY (OR TWO CONNECTED AT 0V LINE) BUT CAN ALLOW ANGLE RETRANSMIT VOLTAGE OUTPUT TO FLOAT RELATIVE TO 0V LINE



NOTE:- THIS CIRCUIT DOES NOT WORK IF EITHER SIDE OF RESISTOR IS CONNECTED TO THE 0V LINE, SINCE THIS SHORTS OUT EITHER THE ANGLE RETRANSMIT (AR) CIRCUIT, OR THE RESISTOR + AR CIRCUIT.

(3) CUSTOMER HAS ONE POWER SUPPLY (OR TWO CONNECTED AT 0V LINE) PLUS A LOOP POWERED 4-20mA SIGNAL ISOLATOR.



NOTE:- NO REQUIREMENT FOR FLOATING OUTPUT OR SEPARATE POWER SUPPLIES.

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J.V. Nash
9-7-97

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Title: EL AIR CONSUMPTION COSTS

Based on a power cost of £0.045 per kWh, the annual compressed air cost for a typical plant demand of 500 l/s (1000 cfm) at 7 barg, delivered by a 165 kW compressor operating at 75% on-load, is £14,900 when operating 48 hours per week. *

The quiescent air consumption of an EL Positioner does not exceed 0.283 l/s.

The cost of continuous quiescent EL air consumption may be estimated as follows:

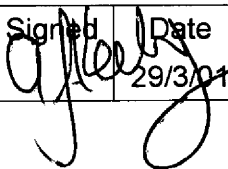
$$\frac{£14,900}{(500 \text{ l/s} \times 0.75)} \times 0.283 \text{ l/s} = £11.24 \text{ p.a.}$$

If operated in the quiescent state continuously 24 hours per day throughout the year, the cost rises to £39.36 p.a.

Since the purpose of positioners is to modulate, it is unlikely that units will spend more than a fraction of their operating time in the quiescent state.

When modulating, all positioner devices consume the air necessary to move the actuator and quiescent air usage is irrelevant.

* Reference 'Compressed Air Costs'
DoE Good Practice Guide No. 126
March Consulting Group 6/96

Issue	Signed	Date	KINETROL Trading Estate Farnham Surrey England	Doc.No. TD96
B		29/3/01		Page 1 of 1

Title:

KINETROL 09 & 12 Fire Fail-Safe Spring Units.

WARNING - These units contain springs which harness a large amount of energy, do not attempt to dismantle spring assemblies from mounting plates or to remove spring housing.

1. The units supplied have been fitted to the valves and are in the closed position.

Binding cord has been used to keep the fire-fail safe link and latch in position to prevent damage during transportation.

(Note. Position of main latching arm between plates see fig. 1).

2. When the Fire fail-safe spring unit and valve is fitted into the pipeline the unit can now be latched.

The task requires two people, one to control the spring, the other to connect the links.

The person connecting the links **MUST** stand outside the spring release zone to prevent injury if the spring arm is accidentally released before it has been latched.

3. Remove binding cord connecting link and fire-fail link and position latch to allow main link to be rotated past the latch see fig.2.

4. Using wrench and extension tube (or a Kinetrol lever), ensuring that the wrench is a good fit on the square (see sizes below) and that you have a firm and secure stance, pull square round 90 degrees anticlockwise. While held in this position the second person should engage the latch and latch it to the fire-fail link.

Gently release pressure on the wrench and extension tube, the spring is now held in position by the fire-fail safe link with valve in the open position.

Remove wrench and extension tube immediately unit has been latched.

	SQUARE SIZE	SPRING TORQUE	LEVER LENGTH	KINETROL LEVER No.
09	19mm	1015 lb.f.in.	20"	64-036
12	25mm	2320 lb.f.in.	45"	--

5. The unit requires no maintenance although if the spring operation has to be checked, fit wrench extension arm to square, pull anti-clockwise until fire-fail safe link can be disconnected, then **SLOWLY** walk round clockwise holding extension tube until the main latch locates on the stop. The same safety precautions should be applied to releasing the unit as to latching it in position.

6. Check application using HSE Guidance on regulation for manual handling (Manual Handling Operating Regulations 1992).

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G. Kelly
24.03.98

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TD 99 -09+12 INSTALLATION & MAINTENANCE OF FIRE FAIL-SAFE UNITS
 SUPPLIED COMPLETE WITH VALVES.

Figure 1: Unit as supplied.

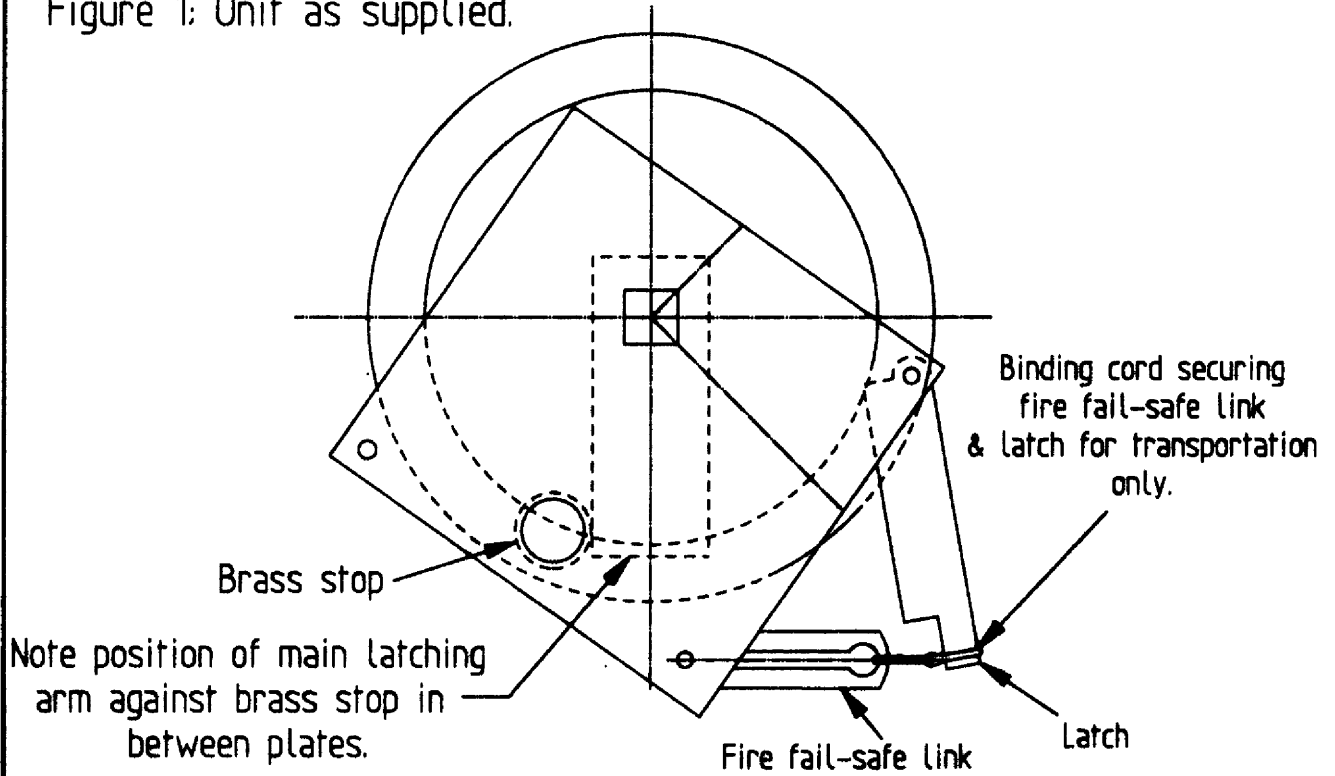
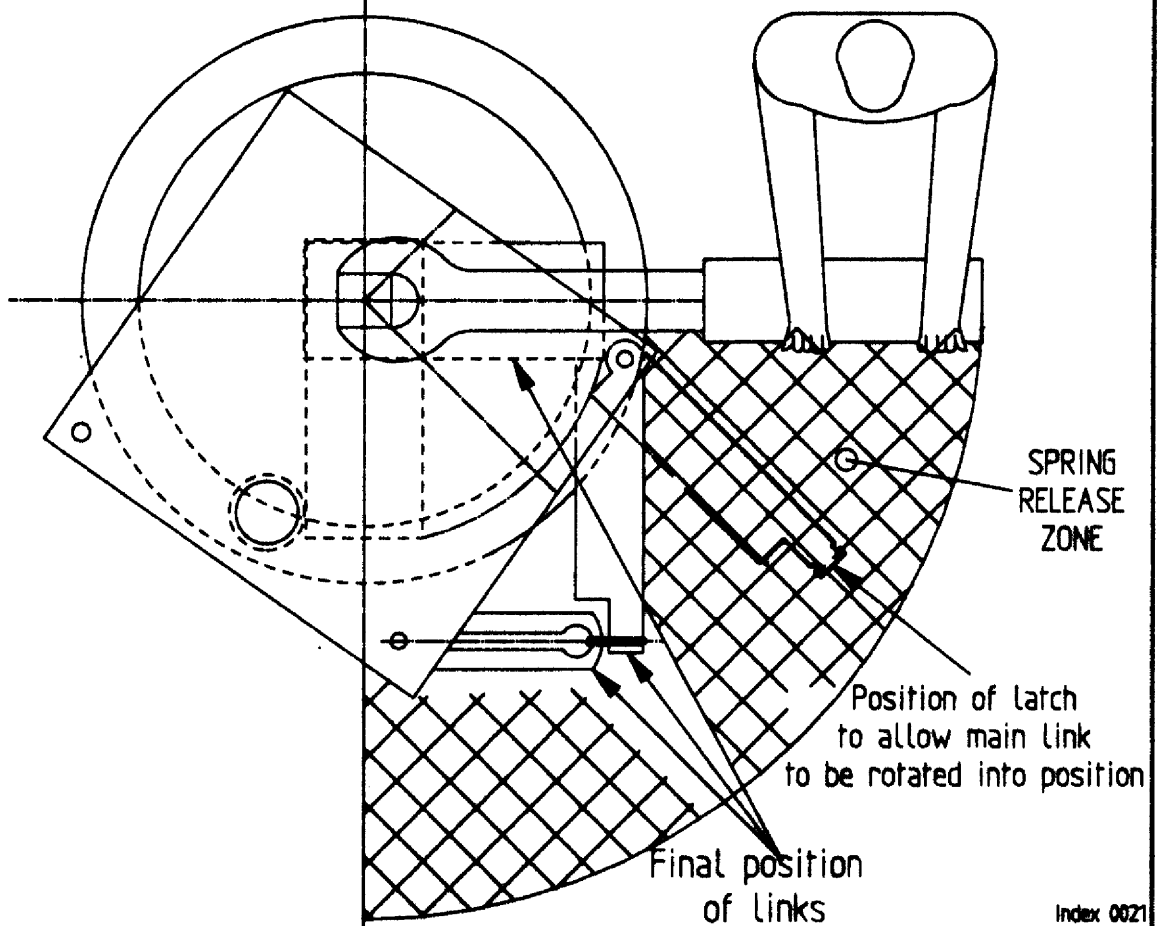


Figure 2: Installation of unit.



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A. Kelly
26-3-98

KINETROL

Trading Estate, Farnham, Surrey, England

SHEET No.
TD 99

Title: Kinetrol 140-020-49-1200 Fire Fail-Safe Spring Units

WARNING: These units contain springs which harness a large amount of energy, do not attempt to dismantle spring assemblies from mounting plates or to remove spring housing.

1. The units supplied are to be fitted to the valves in the "closed" position. The units have the Fire Fail- Safe link attached to the latch to prevent damage during transportation. The Kinetrol Gearbox is disengaged.
2. Fit assembly to valve in closed position.
3. Fit handwheel to Kinetrol Gearbox with pin supplied.
4. Remove cord securing Fire Fail-Safe link to latch and rotate latch out of position so that main link can be rotated to final position.
5. Engage Kinetrol Gearbox and rotate handwheel AC until main latch just goes by link.
6. Put latch against main link & engage Fire-Fail Safe link.
7. Rotate handwheel CW until spring force is taken by Fire-Fail Safe link - Handle becomes loose.
8. Disengage Kinetrol Gearbox.
9. Unit is now set.
10. The unit requires no maintenance- if the operation requires to be checked reverse the above procedure and then reset the unit again.
11. Check application using the HSE Guidance on regulations for manual handling (Manual Handling Operating Instructions 1992).

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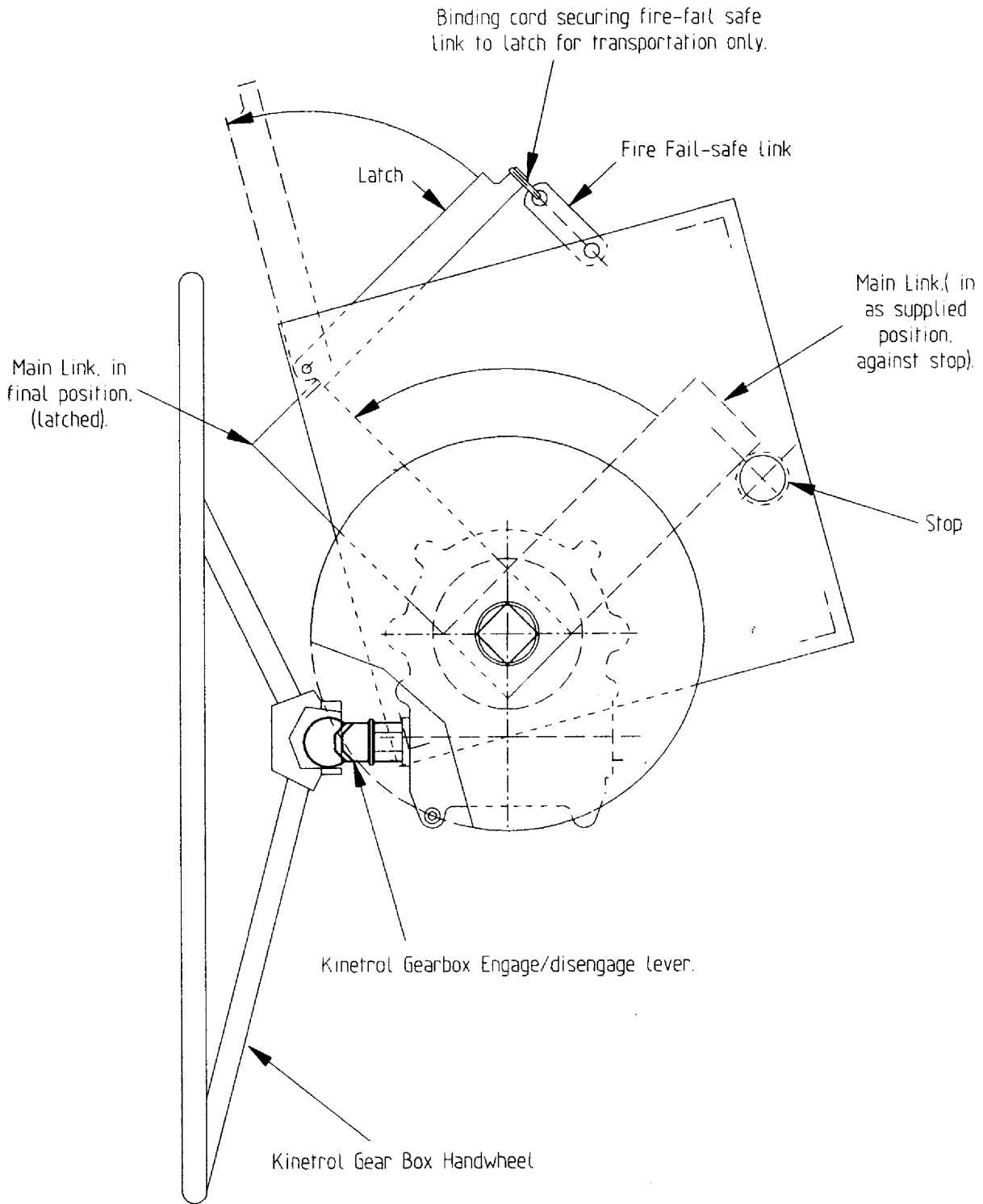
G.J. Kelly
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KINETROL

Trading Estate Farnham Surrey England

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Page 1 of 2

Title: KINETROL 140-020-49-1200 FIRE FAIL-SAFE SPRING UNITS



TD 101 INSTALLATION

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KINETROL

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Title:

**MAINTENANCE INSTRUCTIONS FOR
200/209 DOUBLE ACTING & SPRING RETURN ACTUATORS
SEAL REPLACEMENT INSTRUCTIONS FOR
MODEL 200/209 ACTUATORS**

1. Dismantling Actuators

Caution: Before dismantling, remove any burrs that there might be on square drive shafts to avoid damage to bearings and seals during dismantling/reassembly. In the case of spring return actuators, remove spring unit (refer to spring removal section) before dismantling actuators.

Note: Page 3 contains cross-section through actuator for reference.

- 1.1 Securely support the actuator by use of a bracket which is connected to the actuator mounting flange such that the actuator shaft axis is vertical.
- 1.2 Loosen case screws on upper half only but do not remove.
- 1.3 Separate this one case half by connecting an air line to inlet port and "blow" apart. Procedure is safe although produces a "bang". Re-tighten four screws at opposite corners of case.
Caution: Do not hammer casings or shaft end as this may damage sealing surfaces.
- 1.4 Repeat 1.2 and 1.3 for opposite case.
- 1.5 Remove top case screws completely and lift off top case.
- 1.6 Lift out uppermost vane with two people, one person gripping square on vane and the other lifting by the endstops on side plates.
Caution: Ensure gloves and sleeved overalls are used, as the vane expander fingers are sharp and can easily cut hands and forearms.
- 1.7 Clean case halves and vane and remove silicone rubber sealant from joint faces using surgical spirit.
- 1.8 Attach lifting equipment to intermediate casing or a bar which can be bolted to flange for two people to lift casing. Lift casing clear of lower case. Ensure that splined coupling does not drop and damage cases as this is now unsupported.
- 1.9 Lift lower vane from lower case as 1.6 except this time both lift points are on the side plates.
- 1.10 Clean intermediate casing, lower casing, lower vane and splined coupling using surgical spirit and remove silicone rubber from joint faces.
- 1.11 Replace and lubricate shaft seals.
- 1.12 Remove nuts from vane studs and remove sideplates, old expanders and seals. Clean vanes and remove surplus silicone rubber from around vane studs.
- 1.13 Check cases for any damage from vane and carefully remove any small end-loading damage using emery paper or a stone. If any of the damage is deep and likely to cause a high leakage, then fit a replacement case.

2. Re-Assemble Vanes

- 2.1 Check studs are tight through vane and equal length each side. If not, apply Loctite 270 to thread and re-locate correctly in vane. Allow 1 hour minimum to cure.
- 2.2 Apply Silastic 732 RTV sealant around bottom of studs (to prevent air leakage through seal on vane stud holes).
- 2.3 Fit new vane seal over studs after checking profile matches vane profile and fit seal expanders.
- 2.4 Fit side plates over studs.

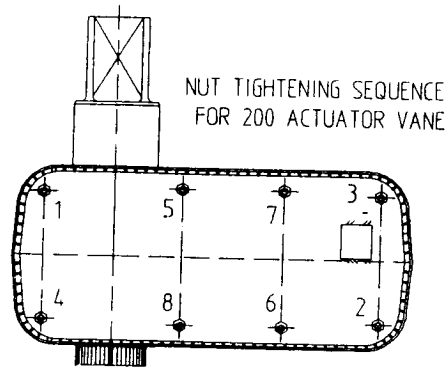
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Title:

MAINTENANCE INSTRUCTIONS FOR 200/209 DOUBLE ACTING & SPRING RETURN ACTUATORS

- 2.5 Fit new nylon inserted nuts to studs and tighten gradually in sequence as shown below to 50 lb.in.



3. Re-Assemble Actuator Case

- 3.1 Coat bearing bushes and brush inside of cases with molybdenum disulphide grease, keeping grease away from case joints faces.
- 3.2 Extrude a small bead of Silastic 732 RTV sealant onto lower case flange approximately 10mm from inside edge.
- 3.3 Insert lower vane into lower case, turning it as it is lowered to ease it through the shaft seal.
- 3.4 Mark position of vane on case outer surface so that upper vane can be placed in line at a future stage.
- 3.5 Coat splined coupling with molybdenum disulphide grease and fit onto vane.
- 3.6 Slowly lower intermediate case over vane spline coupling and locate on the two dowels.
- 3.7 Apply low strength thread adhesive to case screws and tighten screws to 1050 lb.ins. Wipe away any excess sealant that has extruded from case joint.
- 3.8 Lower upper vane into splined coupling ensuring that the vane lines up with the mark previously made on the lower vane.
Caution: If the splines are not lined up correctly then full movement will not be obtained from the actuator. An alternative check on vane position can be made by checking the alignment of the squares.
- 3.9 Apply another bead of Silastic 732 RTV sealant to intermediate case flange (as in 3.2).
- 3.10 Lower upper actuator case over end of vane shaft again ensuring that shaft seal is not trapped and locate on dowels.
- 3.11 Fit bolts to case as in 3.7
- 3.12 Rotate vane to ensure one complete swipe of vane over joint face to spread excess Silastic on joint face as soon as possible after assembly. This can be achieved by applying just enough air to inlet port to make vane move.
- 3.13 Allow setting time for sealant before applying any more air.
- 3.14 Move vane to central position before refitting spring as described in spring fitting procedure, if necessary.

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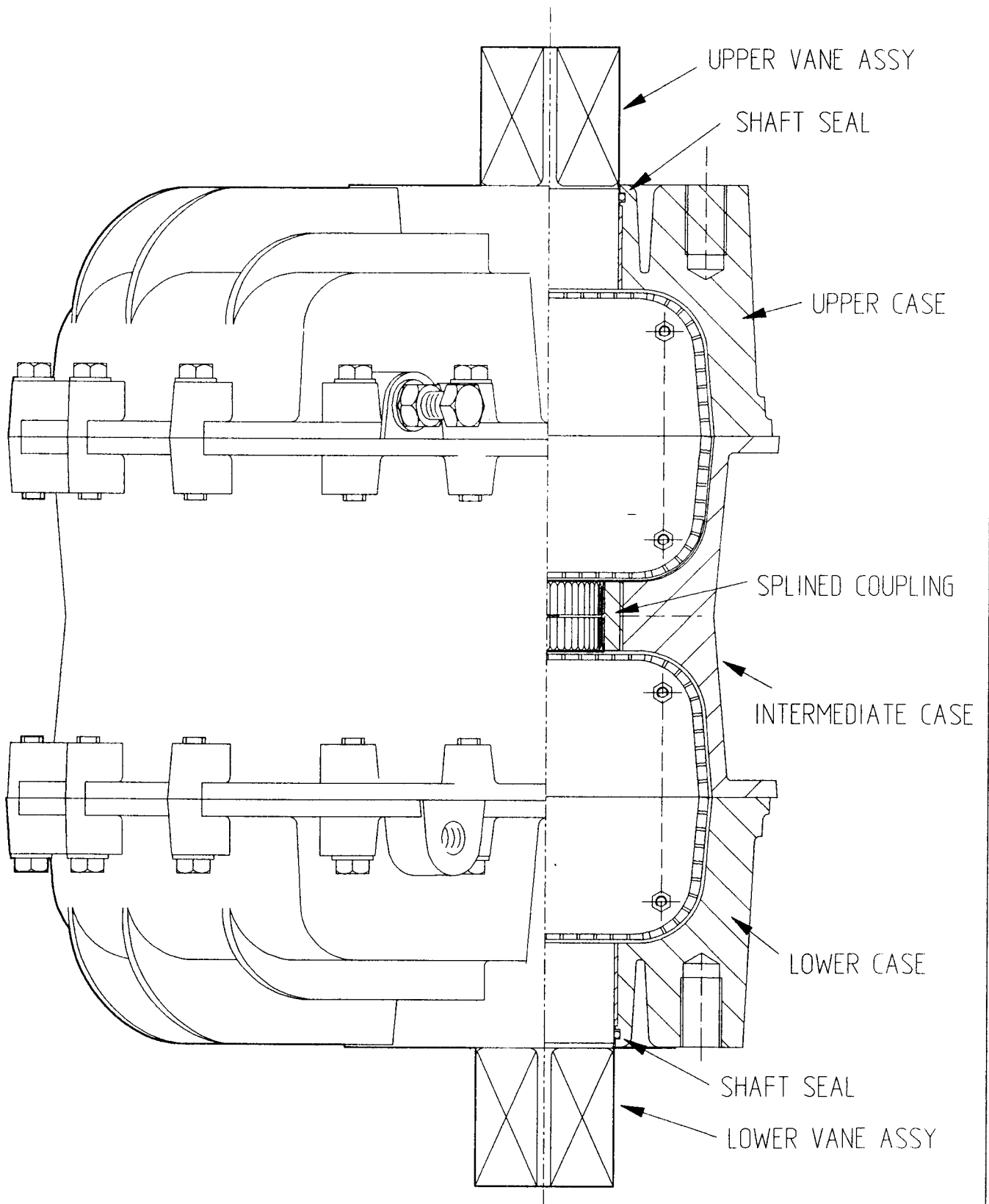
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Title:

MAINTENANCE INSTRUCTIONS FOR
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Title:

**MAINTENANCE INSTRUCTIONS FOR
200/209 DOUBLE ACTING & SPRING RETURN ACTUATORS**

**SPRING REMOVAL/REPLACEMENT INSTRUCTIONS
FOR 200/209 SPRING RETURN ACTUATORS (INTEGRAL DESIGN)**

4. Removal of Spring Pack

Warning: The wound-up springs store a large amount of energy which, if suddenly released, can be dangerous.

Note: Page 6 shows main elements of spring pack.

- 4.1 Securely support actuator/spring unit in a vertical position by use of a bracket which is connected to the actuator mounting flange. This bracket will either need to be fixed to the floor or have a large stable base.
- 4.2 A keeper plate strong enough to take the full torque must be fitted in order to remove S/R pack without spring tension (Kinetrol keeper plate 67-051 is recommended).
- 4.3 Connect airline via a pressure regulating valve to actuator air inlet.
- 4.4 Place the keeper plate over square shaft protruding from S/R pack.
- 4.5 Increase air pressure slowly until actuator vane turns to mid-travel position. Keeper plate holes will then line up with threaded holes in spring housing.
- 4.6 Insert four bolts through keeper plate holes and tighten to lock keeper plate in position and disconnect air supply.
- 4.7 Fit two lifting eyes to keeper plate and connect to suitable lifting equipment to later lift the spring pack from the actuator.
- 4.8 Remove four lower retaining nuts which retain the spring pack to the spring pack base. To remove the lower nuts may not be easy because the bolts may rotate. This can be overcome by either applying some actuator torque to hold the bolts or by sawing off the nuts. Once completed and the spring pack removed following the procedure below, then it is recommended that the pack be returned to Kinetrol Ltd. for updating. Remove air supply.
- 4.9 Slowly lift the spring pack vertically from the actuator ensuring that the actuator does not lift as well and that lower spring coupling moves with the spring pack.
- 4.10 Lower the spring pack on its side and fit a baseplate to the underside of the spring pack to protect the springs during storage/shipment.
- 4.11 Kinetrol recommend that this type of spring pack is returned to the factory for alteration to later design. For instructions for fitting later dismountable design, refer to page 5.

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**MAINTENANCE INSTRUCTIONS FOR
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**SPRING REMOVAL/REPLACEMENT INSTRUCTIONS
FOR 200/209 SPRING RETURN ACTUATORS (DISMOUNTABLE DESIGN)**

5. Removal of Spring Pack

Warning: The wound-up springs store a large amount of energy which, if suddenly released, can be dangerous.

- 5.1 Securely support actuator/spring unit in a vertical position by use of a bracket which is connected to the actuator mounting flange. This bracket will either need to be fixed to the floor or have a large stable base.
- 5.2 A keeper plate strong enough to take the full torque must be fitted in order to remove S/R pack without spring tension (Kinetrol keeper plate 67-051 is recommended).
- 5.3 Connect airline via a pressure regulating valve to actuator air inlet.
- 5.4 Place the keeper plate over square shaft protruding from S/R pack.
- 5.5 Increase air pressure slowly until actuator vane turns to mid-travel position. Keeper plate holes will then line up with threaded holes in spring housing.
- 5.6 Insert four bolts through keeper plate holes and tighten to lock keeper plate in position and disconnect air supply.
- 5.7 Fit two lifting eyes to keeper plate and connect to suitable lifting equipment to later lift the spring pack from the actuator.
- 5.8 Remove four lower retaining screws which retain the spring pack to the spring pack base.
- 5.9 Slowly lift the spring pack vertically from the actuator ensuring that the actuator does not lift as well and that lower spring coupling moves with the spring pack.
- 5.10 Lower the spring pack on its side and fit a baseplate to the underside of the spring pack to protect the springs during storage/shipment.
- 5.11 In the unlikely event that the spring pack is thought to be faulty, it is recommended that the pack is returned to Kinetrol for refurbishment.

6. Re-Assembly of the Spring Return Pack

- 6.1 Support the actuator as in 5.1.
- 6.2 If necessary replace spring base plate gasket.
- 6.3 Apply air pressure to actuator to move it to mid-travel position.
- 6.4 Fit new O ring seal onto baseplate register.
- 6.5 Lift spring pack using crane attached to lifting eyes in keeper plate.
- 6.6 Lower spring pack and locate on actuator square end and then onto baseplate register.
- 6.7 Rotate actuator vane by using air pressure to allow bolts to be fitted which retain the spring pack to base plate and tighten screws.
- 6.8 Adjust air pressure until the actuator balances the spring tension.
- 6.9 Loosen keeper plate screws. If the air pressure balances spring tension correctly the screws can be removed easily.
- 6.10 Remove keeper plate.
- 6.11 Disconnect air supply.

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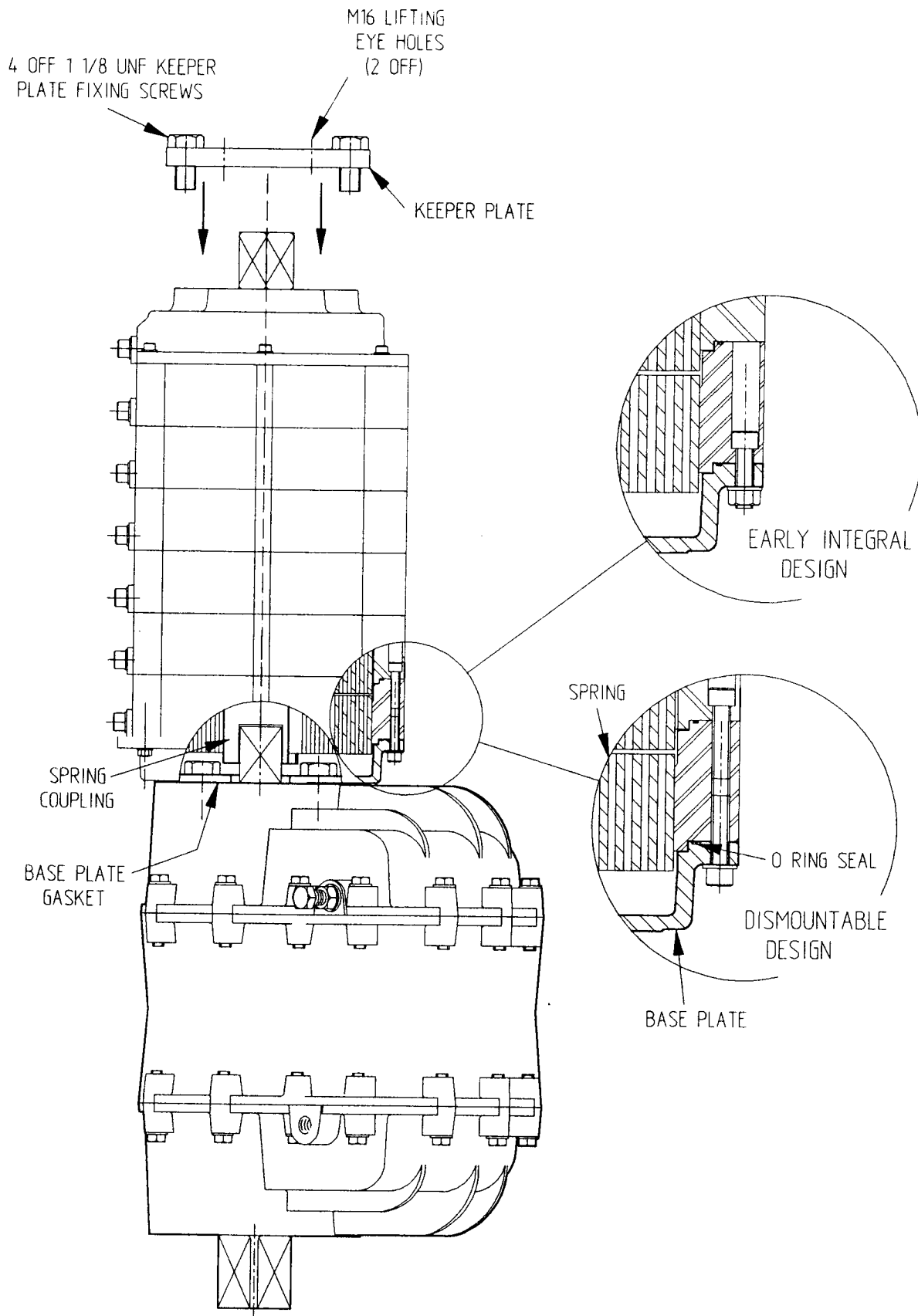
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**MAINTENANCE INSTRUCTIONS FOR
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**SPRING PACK INTEGRITY CHECK FOR
200/209 SPRING RETURN ACTUATORS**

7. To check the integrity of a 200/209 spring return actuator, the actuator must first be removed from the valve so that all external loads are removed.
- 7.1 Connect an airline via a pressure regulating valve to the air inlet port (minimum of 3/8 air ports to be used).
- 7.2 Fit an indicator to the top of the spring pack shaft (e.g. a length of weld wire) so that small movements of shaft can be detected.
- 7.3 Increase the air pressure to the actuator gradually until the pointer can be seen to move and record the setting. Note: ensure that the leakage from the actuator is not excessive and the pressure change is very gradual otherwise a false reading may be obtained. The reading must always be taken as a rising signal.
- 7.4 The setting should be within the range below:

<u>Actuator Type</u>	<u>Min.rising pressure at start of movement</u>
209-120-6500	27 psi
209-120-6600	35 psi

- 7.5 It may be wise to check the pressure settings a few times to ensure a consistent reading is obtained.
- 7.6 Lower pressure and remove regulated inlet and pointer.

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**Title: ACTUATOR – DISPLACED VOLUMES, DEAD VOLUMES
AND AIR CONSUMPTION**

Actuator Size	*Displaced Volume	*Dead Volume	Total Volume	Free Air Consumption per Stroke @ 5.5 Bar	Free Air Consumption per Stroke @ 7 Bar
	in ³	in ³	in ³	cu ft	cu ft
OMO	0.15	0.015	0.16	0.0006	0.0007
01/01A	0.91	0.18	1.10	0.0040	0.0050
020	1.89	0.24	2.13	0.0079	0.0097
030	3.66	0.61	4.27	0.0157	0.0194
050	6.89	0.79	7.68	0.0284	0.0351
070	18.3	2.6	20.9	0.077	0.095
080	23.9	6.0	29.9	0.109	0.135
090	39.3	4.8	44.1	0.163	0.201
100	62.5	8.2	70.7	0.261	0.323
120	86.0	9.5	95.4	0.353	0.436
140	201	14	215	0.80	0.99
160	465	150	615	2.23	2.76
180	1047	362	1409	5.09	6.31
200	2034	619	2652	9.62	11.92
300	3050	928	3978	14.43	17.88
	cm ³	cm ³	cm ³	litres	litres
OMO	2.4	0.25	2.65	0.017	0.021
01/01A	15	3	18	0.114	0.141
020	31	4	35	0.224	0.276
030	60	10	70	0.445	0.550
050	113	13	126	0.806	0.995
070	300	42	342	2.18	2.69
080	392	98	490	3.09	3.82
090	644	79	723	4.62	5.71
100	1025	135	1160	7.41	9.15
120	1410	155	1565	10.0	12.4
140	3294	227	3521	22.7	27.9
160	7630	2459	10089	63.1	78.3
180	17170	5933	23103	144.2	178.9
200	33350	10150	43500	272.6	337.9
300	50025	15225	65250	408.9	506.8

*These values for 90° movement



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3		2.3 Air and Electrical Connections
4	3. Description of Operation	
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2. INSTALLATION.

Positioners can be supplied direct-mounted, or ready to be direct mounted, onto Kinetrol rotary actuators, or in stand-alone (discrete) form for fitting via a mount kit to any 90 degree rotary or linear actuator. If the positioner is supplied ready mounted on an actuator, sections 2.1 & 2.2 can be bypassed. Positioner-type Kinetrol actuators (ready for direct mount of positioners) are available in models 050 to 140 inclusive.

2.1 Mounting of Direct Mounting Units onto Kinetrol Positioner-Type Actuators (without angle retransmit)

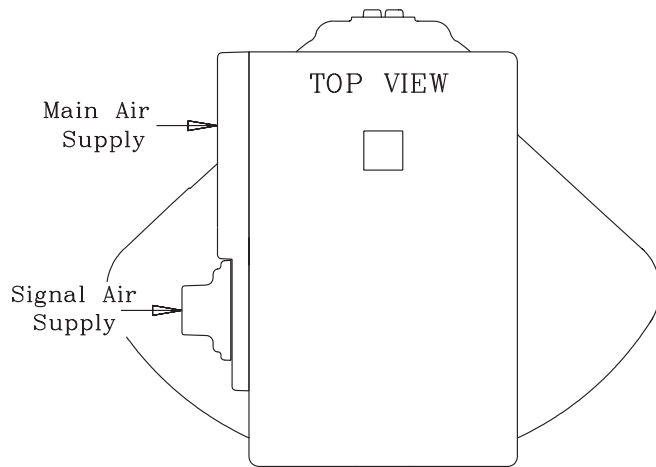


Figure 1. Mid Travel Orientation of Actuator Square and Positioner Box

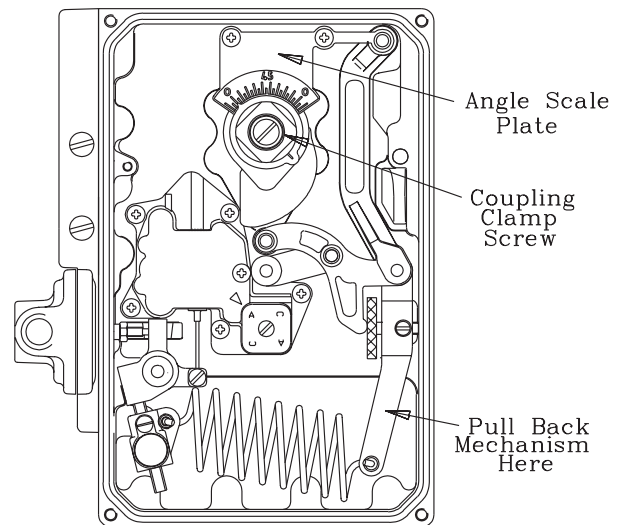


Figure 2. View of inside of Positioner Box Showing Parts for Removal During Installation.

Note: For angle retransmit versions, refer to section 6.1

2.1.1 Move actuator vane to mid travel position, with its output square as shown in Figure 1. This is advisable to prevent subsequent error in orientating positioner coupling. (This is not necessary with spring return actuators as there can be no confusion with square orientation)

2.1.2 Remove positioner cover and undo the two M4 screws retaining the red angle scale plate and remove coupling as shown in figure 2.

2.1.3 Bolt the positioner body to the actuator in the orientation shown in figure 1 taking care that the two O’rings are in place to seal the ports to the actuator (place a small amount of grease onto the O’rings to keep them in place) and that the actuator shaft is centred in the body.

2.1.4 Observe the direction that the cam moves with a rising signal and, if correct, place the coupling on the actuator square with one hand whilst pulling back the mechanism with the other (refer to figure 2). If the direction is not as required then refer to section 4.1. If the actuator has been correctly positioned near mid-stroke, the cam follower will contact the cam at approximately half way. Ensure that the coupling is pushed fully onto the actuator square and tighten the central fixing screw which will have the effect of centralising the cam follower on cam. Refit the angle scale plate.

2.2 Mounting of Discrete Positioner.

The design and manufacture of the mount kit between the positioner and actuator is outside the scope of this document. It is essential that the shaft of the actuator is well aligned with the positioner shaft and that the two are coupled together with a minimum of backlash as this will reduce the performance of the positioner/actuator combination.

It is essential that the 90 degree travel of the actuator moves the positioner coupling through the correct 90 degrees of travel. This can be achieved by either observing the position of the indicator on the lid or the position of the cam or internal indicator with the lid removed.

2.3 Pneumatic and Electrical Connections.

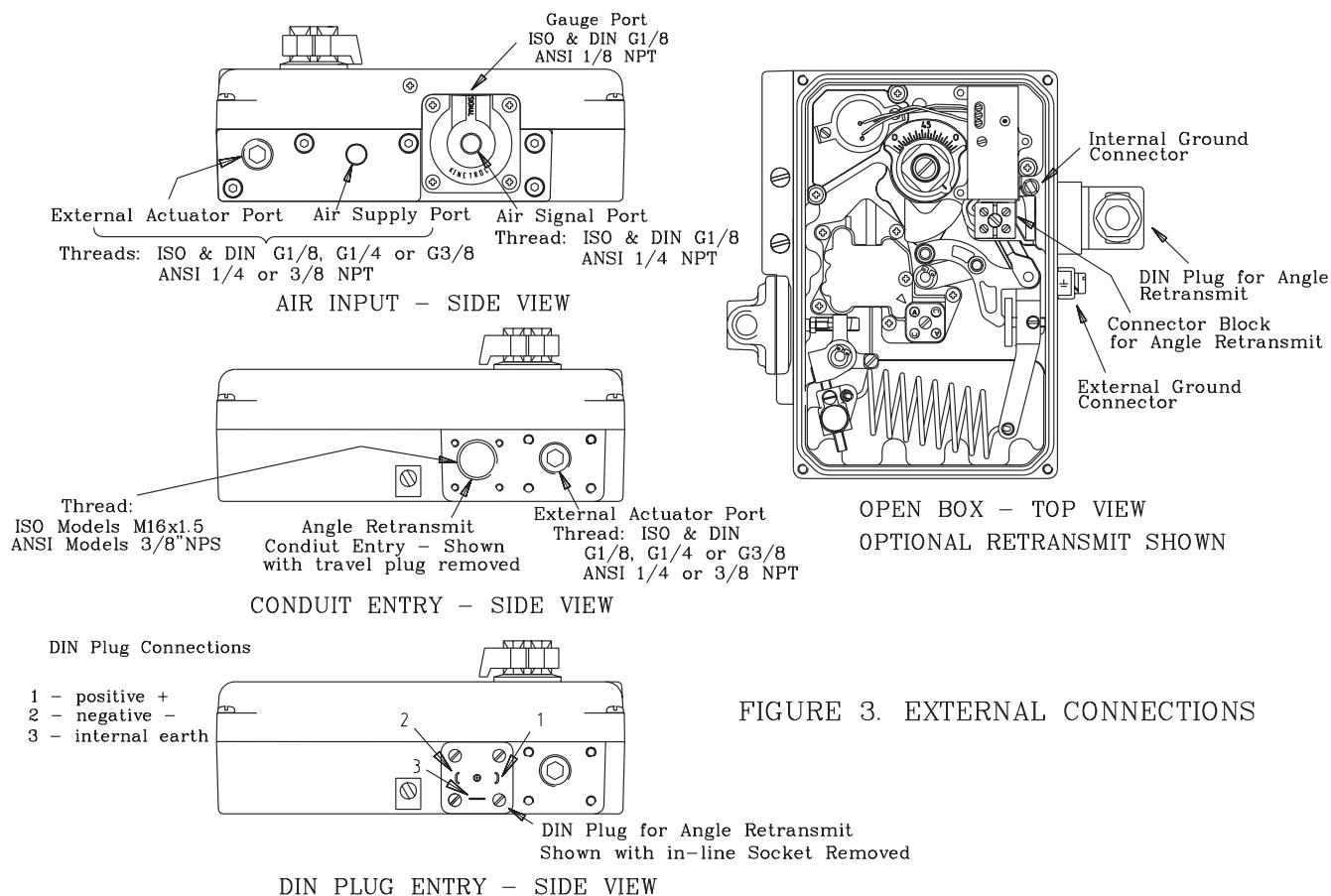


FIGURE 3. EXTERNAL CONNECTIONS

2.3.1 Air Supply.

Connect main air supply (pressure between 3.5 and 7 bar or 50 and 100psi) to the supply port indicated in figure 3. Also connect signal air supply (pressure between 0.2 bar and 1 bar or 3 psi and 15psi) to the inlet of the diaphragm housing. It is important that the air is clean, dry and oil free. Quality class 3.4.4 (taken from ISO standard 8573.1) is adequate. This implies 5 micron max. Particle size, 3 deg. C dew point max. and 5mg per cubic metre max. oil content.

2.3.2 Angle Re-transmit Option Supply.

The optional angle re-transmit circuit is loop powered, requiring 8 to 30 volts to drive the 4-20mA current through it. The current which passes is linearly proportion to the shaft angle.

The cable entry has the option of a cable gland fitting or 4-way DIN plug. With the cable gland entry the wires are directly connected to the internal Connector Block. An internal earth connection is provided if required. If the DIN plug option is fitted then the internal connections have already been made as shown in Figure 3. An external earth connection is also provided if this is required.

2.3.3 External Actuator Ports.

For positioners not fitted directly onto Kinetrol Positioner type Actuators, two external ports are provided for connecting the positioner outlets to the actuator. The size of the ports is dependant on the positioner ordering code. These ports can also be used for fitting pressure gauges if desired.

3. DESCRIPTION OF OPERATION.

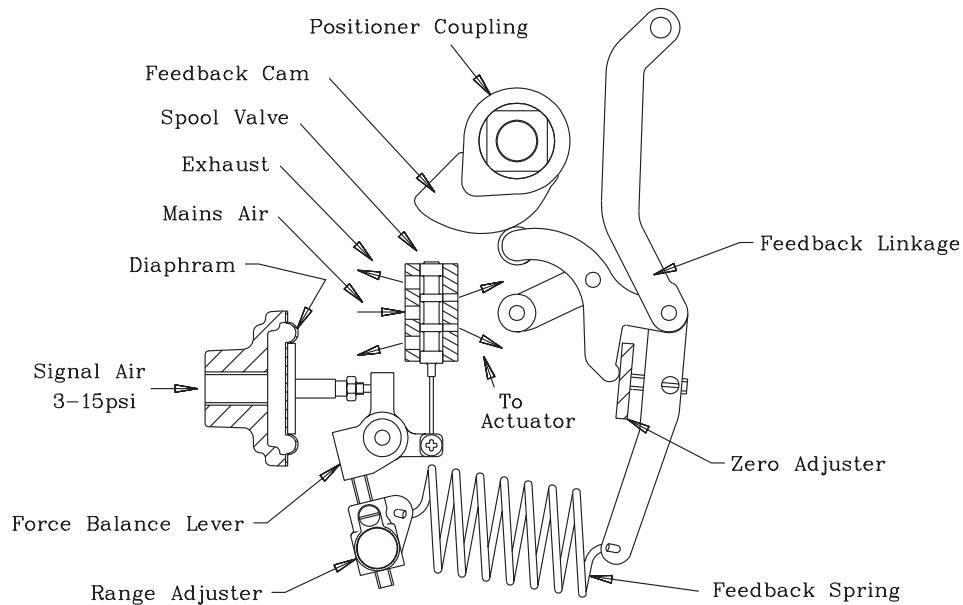


FIGURE 4. PRINCIPAL OF OPERATION.

The AP Positioner works using the principal of a ‘force balance’ spool system with mechanical cam feedback.

The air input signal (normally 3-15psi) is applied to a diaphragm which produces a force on the force balance lever which is proportional to the signal pressure. The resulting torque on the lever is balanced by the force produced from the feedback spring which is also joined to the lever.

A proportional flow spool valve is the third element attached to the lever. This is positioned at its central closed position when the lever is at the mid-stroke position which occurs when the actuator is at the desired angle. Several different versions of this valve are available with different flow capacities designed to give optimum performance when fitted to the range Kinetrol actuators.

The feedback cam is retained by a coupling which, in the case of a Kinetrol direct mounted positioner, is held onto the vane square by a collet. For discrete versions, the coupling is retained in bearings and connected by either a male square or ‘Namur’ style connector.

The cam provides positional feedback via a unique four bar linkage which ensures a linear movement of the cam follower whether the cam is set for clockwise or anticlockwise movement for a rising signal. The lower part of the linkage is attached to the other end of the feedback spring which stretches the spring as the cam is rotated to produce the feedback force mentioned earlier. The standard cam produces a linear characteristic, but alternative profiles are available.

The common adjustments are split into zero and range. Both are achieved without the need for special tools and the actual adjustments are made using finger pressure only.

Air passages in the main body are provided with the capability of many options with a minimum of changes. External ports are provided on all models to allow for external connection to the actuator or for the fitting of pressure gauges if desired. Three main air flow options are available (as detailed in the AP literature). The two lower flow rate options (AP & MP) are affected by change of valve size and tapping size in the body. The largest flow rate option (HP) not only has a larger valve but also a different port plate with 3/8 tapping and external combination silencer/snubbers.

The mounting options are accommodated by three different channel plate designs. The channel plate is the plate fitted to the base of the unit. The smallest is dedicated to direct mounting on an 050 Actuator. The second is used for direct mounting on Actuators 070 to 140. The third is used for discrete models having a Namur mounting hole pattern.

An optional angle retransmit can be fitted within the positioner body and additional options of I/P controller and limit switch box can also be fitted allowing a wide range of switch options to be specified.

4. SETTINGS and ADJUSTMENTS.

The positioner will have been factory set to the requirements given in the ordering code (i.e. the direction of rotation for a rising pressure signal and the range and zero settings). However, if these settings need to be changed, the following section describes the procedure for achieving this.

4.1 Change of Direction for Rising Signal (direct mounting units only).

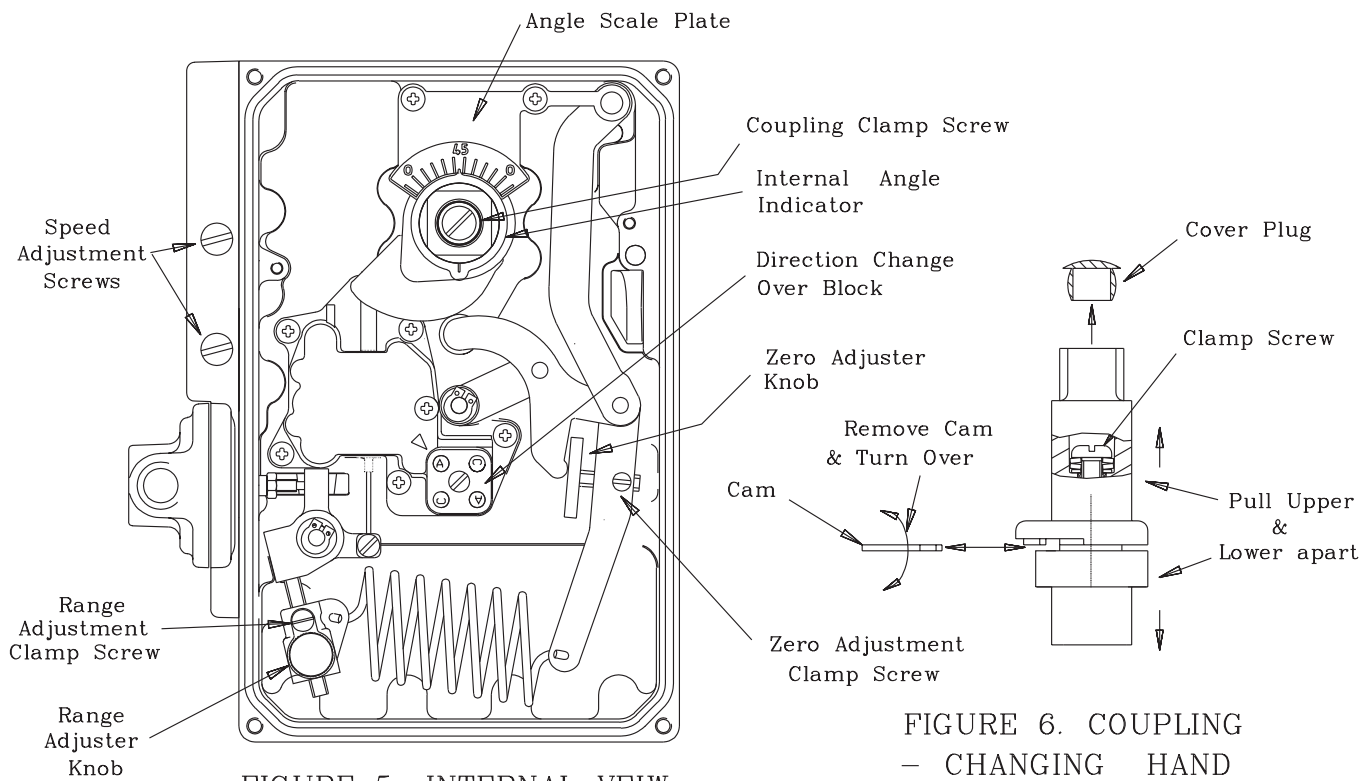


FIGURE 6. COUPLING
— CHANGING HAND

4.1.1 Move the actuator to approximately mid-position to avoid problems in correct orientation later. This is obviously not possible or necessary with spring return models because the position of the vane will be known. Reduce both main supply and signal pressures to zero.

4.1.2 Remove positioner cover and undo the two M4 screws retaining the red angle scale plate and remove, as shown in figure 5. Loosen the central coupling screw sufficiently to draw the coupling off the actuator square.

4.1.3 Pull the two halves of the coupling apart sufficiently to allow the cam to be withdrawn from its location peg as shown in figure 6. Flip the cam over and push it back into the slot between the two coupling halves and locate it back on the peg.

4.1.4 If when the coupling was removed, the collet was left behind on the actuator square, remove the collet from the square and push it into the lower half of the coupling ensuring that it locates in the semicircular 'pip'. Tighten the clamping screw by two turns before placing it back on the actuator square such that the cam follower is approximately half way up the rise of the cam and tighten the clamping screw. Replace the angle scale plate.

4.1.5 Undo the changeover block central screw and rotate it by a quarter turn and replace and tighten screw. For your convenience, the changeover block is marked 'A' and 'C' which refers to 'anticlockwise' and 'clockwise' respectively. Ensure the required letter is placed opposite the arrow marked on the top of the valve block.

4.2 Zero and Range Adjustment (refer to Figure 4).

4.2.1 Move the actuator/positioner to the zero end of the stroke (i.e. when the cam follower is at the beginning of its rise). This can be most easily achieved by pressurising the main air supply without any signal air pressure (spring return models will already be at this position). Exhaust the supply air and move the internal indicator to indicate just below zero on the angle scale.

4.2.2 Set the coarse zero by slackening the coupling screw by approximately half of a turn until the top part of the coupling can be rotated by hand and rotate until the cam follower just starts to rise up the cam profile. Retighten the screw.

4.2.3 Turn on the main air supply and carefully increase the signal supply pressure to 3psi (0.2Bar). Slacken the fine zero adjustment clamp screw and rotate zero adjuster using thumb pressure so that the actuator moves to indicate zero on the internal indicator. Tighten clamp screw.

4.2.4 Increase the signal pressure to 15psi (1Bar). Slacken the range adjuster clamp screw and rotate the adjuster knob between thumb and forefinger until the actuator moves to the desired end stroke position (normally 90 degrees) as indicated on the internal indicator. Retighten the clamp screw.

4.2.5 Reduce the signal air pressure again to 3psi and to check that the zero position has not changed.

4.3 Speed Control.

Maximum actuator speed can be regulated by the two following methods:

a) changing the valve spool/liner size. The valve size is normally specified at the point of ordering by the letters 'AP', 'MP' or 'HP'. This method, however, not only effects the actuator speed but also effects the 'gain' and therefore control stability of the unit and care must be taken not to specify a too high flow valve for a given size of actuator. Kinetrol Ltd has recommendations (shown in the AP literature) for each size of actuator

or

b) adjustment of the built in flow restrictors (shown in Figure 4) is achieved using a screwdriver. There are two restrictors, one for each direction of travel. Clockwise rotation, they will reduce the actuator speed. 'AP' and 'MP' size units with 1/8 or 1/4 ports are controlled in this way but 'HP' size units having 3/8 ports are fitted with external silencer/restrictors which are adjusted using an allen key fitted down the centre of the adjuster.

4.4 Change of Direction for Rising Signal (discrete units).

4.4.1 Move actuator as in Section 4.1.1.

4.4.2 Remove positioner cover and undo the three M4 screws retaining the red retransmit plate, as shown in figure 7. Loosen the central coupling screw sufficiently to pull the coupling complete with the retransmit assembly off the actuator connection.

4.4.3 Remove the internal indicator from the coupling and withdraw the coupling from the retransmit plate.

4.4.4 Pull the two halves of the coupling apart sufficiently to allow the cam to be withdrawn from its location peg. Flip the cam over and push it back into the slot between the two coupling halves and locate it back on the peg.

4.4.5 Refit the coupling to the retransmit plate and slide the internal indicator over the top of the coupling.

4.4.6 If when the coupling was removed, the collet was left behind on the actuator connection, remove the collet from the connection and push it into the lower half of the coupling ensuring it locates in the semicircular 'pip' and tighten the clamping screw by two turns. Place the coupling and retransmit plate back on the actuator connection such that the cam follower is approximately half way up the rise of the cam and pull back the spring lever with the other hand and tighten the coupling clamping screw. Retighten the retransmit plate retaining screws.

4.4.7 The internal changeover block is not effective with a discrete positioner. The changeover of the air flow path is achieved by swapping over the external connections. It may be also preferred to turn the positioner through 180 degrees to simplify the external pipe runs.

4.4.8 The adjustment of zero and range is completed as in section 4.2

5. MAINTENANCE and TROUBLESHOOTING.

The AP positioner is designed for a long life with very little maintenance required if it is supplied with clean, dry oil free air, as recommended in section 2.3.

When the positioner lid is removed, take care not to remove all grease from the lid/coupling seal. If it does need replenishing then ensure that a synthetic grease is used as a mineral oil grease will adversely affect this seal.

If, however, any of the parts do need replacement because of adverse conditions, then refer to Kinetrol Ltd for spare parts together with any instructions for replacing and resetting.

The following troubleshooting guide should help in the unlikely event of a problem with the performance of the unit. If problems persist, contact your local Kinetrol distributor or Kinetrol Ltd for further advice.

TABLE 1. Troubleshooting Guide

Failure to move when signal air and mains air is applied

- Check mains air pressure is sufficient to produce enough torque from actuator
- Check signal pressure using pressure gauge in gauge port or check that the force balance lever is being pushed by the input diaphragm with the lid removed
- Has the coupling been positioned at the correct angular position on the actuator?
- Has the changeover block been set correctly for the direction of rotation (direct mounted units) or the external port connections been fitted the correct way around (discrete units)?
- Is the air quality poor causing the spool to jam? This can be checked by manually moving the spool carefully by hand with the lid removed.
- Is the actuator or whatever it is connected to jammed? This can be checked by again moving the force balance lever manually to check if the actuator responds (air will normally be heard hissing into the actuator when this is done).

Actuator moves too slowly upscale or down scale:

- Is the mains air pressure too low for the load being moved or the actuator too small?
- Have one or both flow adjuster screws been screwed in too far?
- Is the air contaminated causing the spool movement to become sluggish?
- Is the actuator volume too large for the spool flow rate chosen?

Lack of sensitivity:

- Is the spool sticky caused by a contaminated air supply?
- Does the actuator exhibit poor stick slip qualities? This maybe especially true if it is not Kinetrol and will normally be seen also as a jerky movement.

Excessive Hysteresis:

- Has the inside of the positioner box become contaminated causing the force balance mechanism bearings to become sticky?
- Is the actuator load excessive causing it to struggle to achieve position?

Overshoot/Instability:

- Is the spool valve chosen too large for the size of the actuator?
- Is the inertia loading too great for the size of actuator chosen? Refer to Kinetrol for allowable limits.
- Have the snubbers been used to slow the load down?

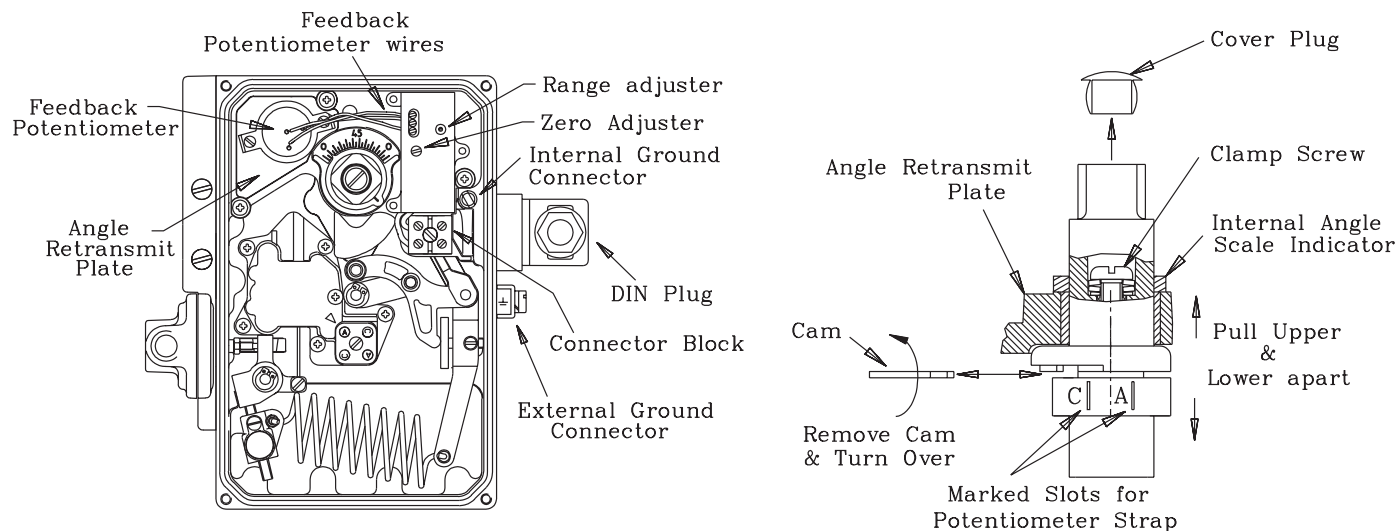


FIGURE 7. ANGLE RETRANSMIT.

FIGURE 8. COUPLING
- CHANGING HAND

6.1.1 Move actuator vane to mid travel position, with its output square as shown in Figure 1. This is advisable to prevent subsequent error in orientating positioner coupling. (This is not necessary with spring return actuators as there can be no confusion with square orientation)

6.1.2 Remove positioner cover and unscrew the three M4 screws retaining the red retransmit plate, release the two wires on the terminal block connected to the DIN plug (if fitted), as shown in figure 7, and carefully remove coupling and retransmit assembly as one unit.

6.1.3 Bolt the positioner body to the actuator in the orientation shown in figure 1 taking care that the two O' rings are in place to seal the ports to the actuator (place a small amount of grease onto the O' rings to keep them in place) and that the actuator shaft is centred in the hole in the body.

6.1.4 Observe the direction that the cam moves with a rising signal and that the retransmit strap is fitted to the correct slot in the lower coupling as marked (C & A for clockwise and anticlockwise respectively). If the direction is not as required then refer to section 6.2. If correct, place the coupling and retransmit assembly on the actuator square with one hand whilst pulling back the mechanism and two DIN plug wires with the other (refer to figure 6). If the actuator has been correctly positioned near mid-stroke, the cam follower will contact the cam at approximately half way.

6.1.5 Ensure that the coupling is pushed fully onto the actuator square and tighten the central fixing screw which will have the effect of centralising the cam follower on the cam track. Retighten the three angle retransmit retaining screws and refit the two DIN plug wires (if fitted).

6.2 Change of Direction for Rising Signal (direct mounting units only).

6.2.1 Move the actuator to approximately mid-position to avoid problems in correct orientation later. This is obviously not possible or necessary with spring return models because the position of the vane will be known. Reduce both main supply and signal pressures to zero.

6.2.2 Remove positioner cover and undo the three M4 screws retaining the red retransmit plate, release the two wires on the terminal block connected to the DIN plug (if fitted), as shown in figure 7. Loosen the central coupling screw sufficiently to carefully pull the coupling complete with the retransmit assembly off the actuator square.

6.2.3 Release the potentiometer strap from the slot in the lower coupling, as shown in figure 8, remove the internal indicator from the coupling and withdraw the coupling from the retransmit plate.

6.2.4 Pull the two halves of the coupling apart sufficiently to allow the cam to be withdrawn from its location peg. Flip the cam over and push it back into the slot between the two coupling halves and locate it back on the peg.

6.2.5 Refit the coupling to the retransmit plate, slide the internal indicator over the top of the coupling and refit the potentiometer strap into one of the two marked slots of the lower coupling (marked 'A' and 'C' for anticlockwise and clockwise movement respectively).

6.2.6 If when the coupling was removed, the collet was left behind on the actuator square, remove the collet from the square and push it into the lower half of the coupling ensuring it locates in the semicircular 'pip' and tighten the clamping screw by two turns. Place the coupling and retransmit assembly back on the actuator square such that the cam follower is approximately half way up the rise of the cam whilst holding back the two retransmit wires and pull back the spring lever with the other hand and tighten the coupling clamping screw. Retighten the retransmit plate retaining screws and refit the retransmit wires to the terminal block.

6.2.7 To ensure a rise in retransmit signal with rising input pressure signal, the top and bottom wires on the feedback potentiometer must be reversed in the connector located on the circuit. The central wire does not change.

6.2.8 Undo the changeover block central screw and rotate it by a quarter turn and replace and tighten screw. The changeover block is marked 'A' and 'C' which refers to 'anti-clockwise' and 'clockwise' respectively. Ensure the required letter is placed opposite the arrow marked on the top of the valve block.

6.3 Zero and Range Adjustment (refer to Figure 7).

Setting of the mechanical zero and range for the positioner with an angle retransmit is the same as described in section 4.2. The retransmit circuit must also be set for zero and range which is described below.

6.3.1 Set the circuit zero adjustment to the central position and connect a 4-20ma electrical source via the DIN plug or terminal block.

6.3.2 Set the positioner to zero degrees or the input pressure to 3psi (0.2 Bar)

6.3.3 Slacken the two screws which clamp the potentiometer to the retransmit plate but do not remove. Rotate the potentiometer slowly using finger pressure until the electrical display shows 4ma.

6.3.4 Increase the air signal pressure to 15psi (1Bar) to set the positioner at 90 degrees. Adjust the Span potentiometer to read 20ma.

6.3.5 Repeat steps 6.3.2 to 6.3.4 until the desired readings are obtained at both ends of the stroke. The fine zero potentiometer can be used to obtain a more precise reading at the zero position.

6.3.6 Tighten the two potentiometer clamp screws.

6.4 Change of Direction for Rising Signal (discrete units).

6.4.1 Move actuator as in Section 6.2.1.

6.4.2 Remove positioner cover and undo the three M4 screws retaining the red retransmit plate, release the two wires on the terminal block connected to the DIN plug (if fitted), as shown in figure 7. Loosen the central coupling screw sufficiently to pull the coupling complete with the retransmit assembly off the actuator connection.

6.4.3 Release the potentiometer strap from the slot in the lower coupling, as shown in figure 8, remove the internal indicator from the coupling and withdraw the coupling from the retransmit plate.

6.4.4 Pull the two halves of the coupling apart sufficiently to allow the cam to be withdrawn from its location peg. Flip the cam over and push it back into the slot between the two coupling halves and locate it back on the peg.

6.4.5 Refit the coupling to the retransmit plate and slide the internal indicator over the top of the coupling and refit the potentiometer strap into one of the two marked slots of the lower coupling (marked 'A' and 'C' for anticlockwise and clockwise movement respectively).

6.4.6 If when the coupling was removed, the collet was left behind on the actuator connection, remove the collet from the connection and push it into the lower half of the coupling ensuring it locates in the semicircular 'pip' and tighten the clamping screw by two turns. Place the coupling and retransmit plate back on the actuator connection such that the cam follower is approximately half way up the rise of the cam whilst holding back the two retransmit wires and pull back the spring lever with the other hand and tighten the coupling clamping screw. Retighten the retransmit plate retaining screws and refit the retransmit wires to the terminal block.

6.4.7 The internal changeover block is not effective with a discrete positioner. The changeover of the air flow path is achieved by swapping over the external connections. It may be also preferred to turn the positioner through 180 degrees to simplify the external pipe runs.

6.4.8 The adjustment of zero and range is completed as in section 6.3.

6.5 Change of Angle Retransmit Direction Without Changing Positioner Direction

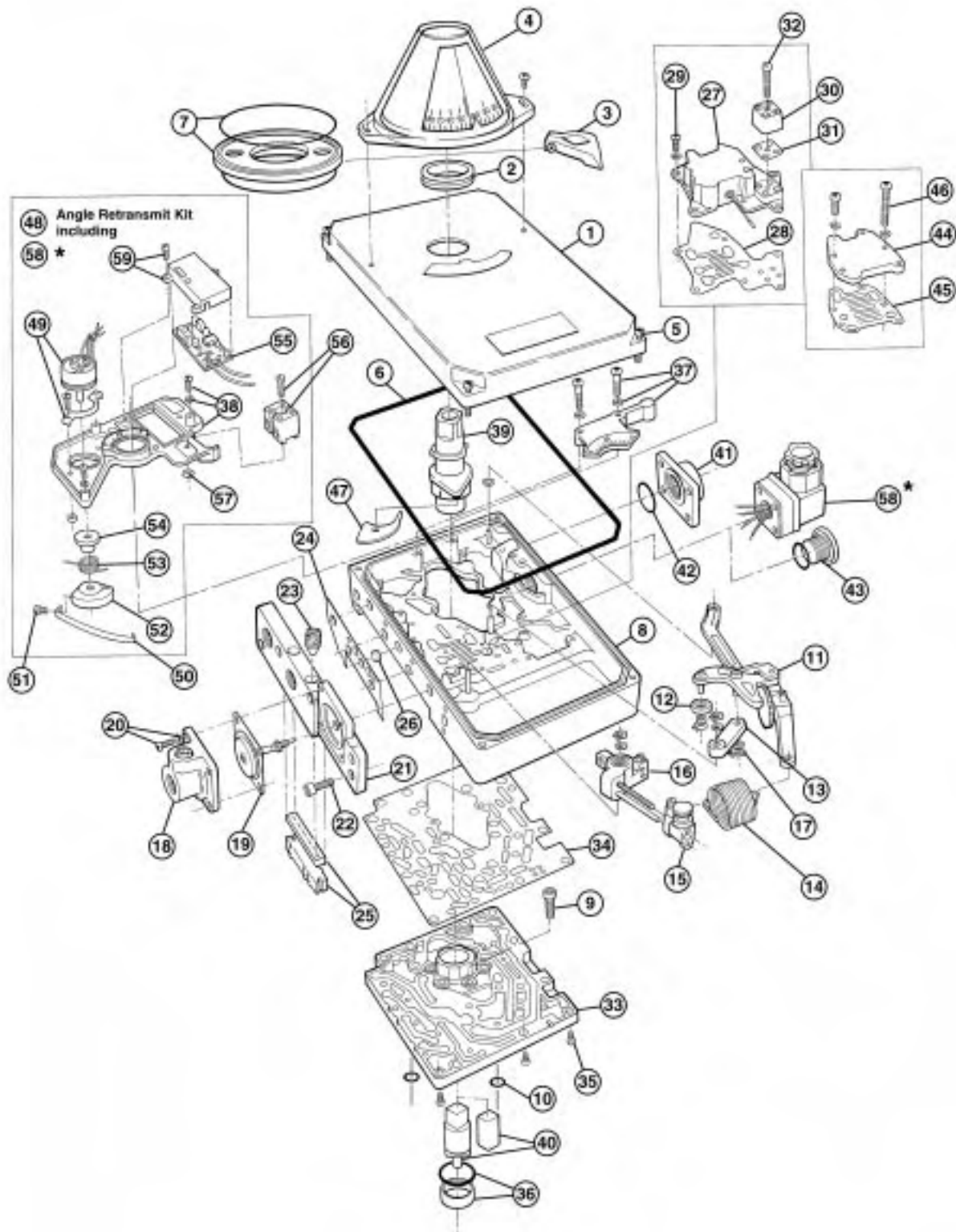
If a non-standard rise in retransmit signal is required without a change in positioner direction, then this can be achieved by the following procedure.

6.5.1 Swap the top and bottom wires on the angle retransmit circuit which connect to the potentiometer.

6.5.2 Repeat the zero and range set-up procedure described in section 6.3.

7. SPARE PARTS

7.1 Exploded View



Title: Installation & Maintenance Instructions - AP Pneumatic Positioner

7.2 AP Positioner Spare Part List

ITEM NO.	DESCRIPTION	SPARES PART NUMBER				
		AP			MP	HP
		050	070	090	10 / 12 / 14	16/18/20/30
1	Cover Assembly - standard *	SP1200	SP1200	SP1200	SP1200	SP1200
	Cover Assembly - for switch box *	SP1201	SP1201	SP1201	SP1201	SP1201
2	Cover Seal & Grease - NBR	SP1202	SP1202	SP1202	SP1202	SP1202
	Cover Seal & Grease - Viton	SPV1202	SPV1202	SPV1202	SPV1202	SPV1202
3	Indicator Assembly	SP703	SP703	SP703	SP703	SP703
4	Monitor Kit ACW	SP978	SP978	SP978	SP978	SP978
	Monitor Kit CW	SP979	SP979	SP979	SP979	SP979
5	Cover Screws	SP1203	SP1203	SP1203	SP1203	SP1203
6	'O' Ring (Lid) - NBR	SP1204	SP1204	SP1204	SP1204	SP1204
	'O' Ring (Lid) - Viton	SPV1204	SPV1204	SPV1204	SPV1204	SPV1204
7	Switch Box Spacer Plate & 'O'Rings	SP1205	SP1205	SP1205	SP1205	SP1205
8	Positioner Body *	SP1206	SP1207	SP1207	SP1207	SP1207
9	Screws (Pos/Act. Interface) *	SP732	SP733	SP733	SP733	-
10	'O' Rings (Pos/Act. Interface)	SP734	SP735	SP735	SP735	-
11	Cam/Spring Lever Assembly	SP1208	SP1208	SP1208	SP1208	SP1208
12	Cam Follower	SP1209	SP1209	SP1209	SP1209	SP1209
13	Short Link	SP1210	SP1210	SP1210	SP1210	SP1210
14	Feedback Spring	SP716	SP716	SP716	SP716	SP716
15	Range Adjuster Assembly	SP1211	SP1211	SP1211	SP1211	SP1211
16	Force Balance Lever Assembly	SP1212	SP1212	SP1212	SP1212	SP1212
17	Washer & Circlip	SP1213	SP1213	SP1213	SP1213	SP1213
18	Diaphragm Cover	SP720	SP720	SP720	SP720	SP720
19	Diaphragm Assembly - Polyurathane	SP1214	SP1214	SP1214	SP1214	SP1214
	Diaphragm Assembly - Viton	SPV1214	SPV1214	SPV1214	SPV1214	SPV1214
20	Screws & Washers (Diaphragm Cover)	SP721	SP721	SP721	SP721	SP721
21	Port Plate *	SP1215	SP1216	SP1216	SP1216	SP1217
22	Screws (Port Plate)	SP1218	SP1218	SP1218	SP1218	SP1219
23	Exhaust Regulators	SP1220	SP1220	SP1220	SP1220	SP1221
24	Port Plate Gasket	SP1222	SP1222	SP1222	SP1222	SP1223
25	Silencer & Silencer Clamp	SP1224	SP1224	SP1224	SP1224	SP1221
26	Inlet Filter	SP1225	SP1225	SP1225	SP1225	SP1226
27	Valve Block & Bobbin	SP1227	SP1228	SP1228	SP1229	SP1230
28	Valve Block Gasket - NBR	SP1240	SP1240	SP1240	SP1240	SP1240
	Valve Block Gasket - Viton	SPV1240	SPV1240	SPV1240	SPV1240	SPV1240
29	Screws & Washers (Valve Block)	SP1241	SP1241	SP1241	SP1241	SP1241
30	Changeover Block	SP1242	SP1242	SP1242	SP1242	SP1242
31	Changeover Gasket - NBR	SP1243	SP1243	SP1243	SP1243	SP1243
	Changeover Gasket - Viton	SPV1243	SPV1243	SPV1243	SPV1243	SPV1243
32	Screw & Washer (Changeover Block)	SP1244	SP1244	SP1244	SP1244	SP1244
33	Channel Plate - Standard *	SP1245	SP1246	SP1246	SP1246	SP1247
	Channel Plate - Discrete *	SP1247	SP1247	SP1247	SP1247	SP1247
34	Channel Plate Gasket	SP1248	SP1248	SP1248	SP1248	SP1248
35	Screws (Channel Plate)	SP1249	SP1249	SP1249	SP1249	SP1249
36	Bearing Bush & 'O' Ring (Discrete)	SP1250	SP1250	SP1250	SP1250	SP1250
37	Angle Scale & Screws	SP1251	SP1251	SP1251	SP1251	SP1251
38	Retransmit Plate, Bush and Screws (Discrete)	SP1252	SP1252	SP1252	SP1252	SP1252
39	Coupling	SP1253	SP12544	SP1254	SP1254	SP1253
	Discrete Coupling	SP1253	SP1253	SP1253	SP1253	SP1253
40	Discrete Drive Adaptor - Kinetrol	SP1255	SP1255	SP1255	SP1255	SP1255
	Discrete Drive Adaptor - Namur	SP1256	SP1256	SP1256	SP1256	SP1256
41	3/8 External Port Adaptor *	-	-	-	-	SP1257

Title: Installation & Maintenance Instructions - AP Pneumatic Positioner

7.2 AP Positioner Spare Part List - Continued

ITEM NO.	DESCRIPTION	SPARES PART NUMBER				
		AP			MP	HP
		050	070	090	10 / 12 / 14	16/18/20/30
42	'O' Ring (Port Adaptor)	-	-	-	-	SP1258
43	Blanking Plug *	SP1259	SP1259	SP1259	SP1259	SP1259
44	Valve Block Cap	-	-	-	-	SP1260
45	Valve Block Cap Gasket	-	-	-	-	SP1261
46	Valve Block Cap Screws & Washers	-	-	-	-	SP1262
47	Cam (See catalogue)	-	-	-	-	-
48	Angle Retransmit Kit (See catalogue)	-	-	-	-	-
49	Potentiometer	SP1263	SP1263	SP1263	SP1263	SP1263
50	Potentiometer Drive Strap	SP1264	SP1264	SP1264	SP1264	SP1264
51	Screw (Strap)	SP1265	SP1265	SP1265	SP1265	SP1265
52	Quadrant Wheel	SP1266	SP1266	SP1266	SP1266	SP1266
53	Torsion Spring	SP1267	SP1267	SP1267	SP1267	SP1267
54	Bush (Torsion Spring)	SP1268	SP1268	SP1268	SP1268	SP1268
55	Circuit	SP1269	SP1269	SP1269	SP1269	SP1269
56	Terminal Block	SP1270	SP1270	SP1270	SP1270	SP1270
57	Nuts (Angle Retransmit Plate)	SP1271	SP1271	SP1271	SP1271	SP1271
58	Din Plug *	SP1272	SP1272	SP1272	SP1272	SP1272
-	Recommended Spares Kit (NBR)	SP1280	SP1280	SP1280	SP1280	SP1280
-	Recommended Spares Kit (Viton)	SPV1280	SPV1280	SPV1280	SPV1280	SPV1280

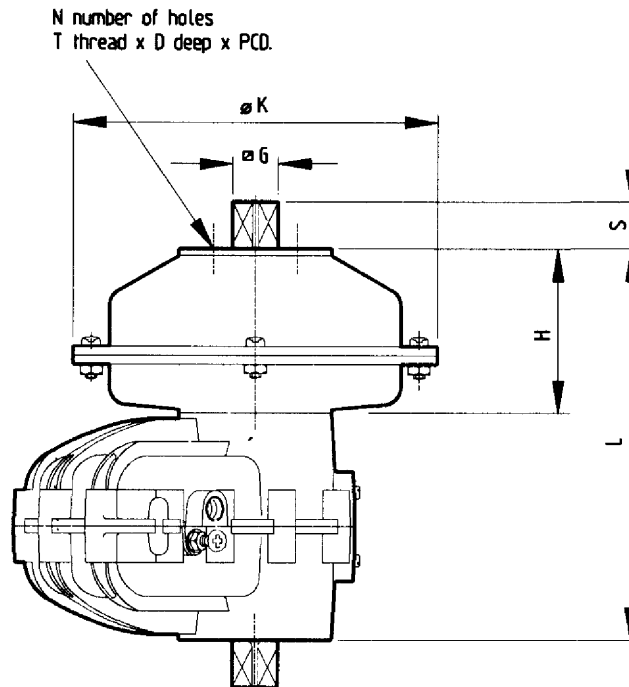
Title: 160 SPRING ASSEMBLY DIMENSIONS

160 Spring Assembly Dimensions - Metric Units.

Actuator Model	No of Springs	L (mm)	H (mm)	ØK (mm)	□G (mm)	S (mm)	N (No)	T (ISO)	D (mm)	PCD (mm)	Wt (Kg)
16-120	1	485.5	211.5	524	41.0	55.0	4	M24	38.0	152.7	123
18-120-7000	1	571.5	211.5	524	57.0	78.0	4	M30	50.0	226.3	161
18-120	2	671.5	311.5	524	57.0	78.0	4	M30	50.0	226.3	240
20-120-7200	2	931.5	311.5	524	73.0	100.0	8	M30	50.0	226.3	350
20-120-7300	3	1031.5	411.5	524	73.0	100.0	8	M30	50.0	226.3	408
20-120	4	1131.5	511.5	524	73.0	100.0	8	M30	50.0	226.3	479
30-120-7600	3	1293	411.5	524	73.0	100.0	8	M30	50.0	226.3	524
30-120-7700	4	1393	511.5	524	73.0	100.0	8	M30	50.0	226.3	606
30-120-7800	5	1493	611.5	524	73.0	100.0	8	M30	50.0	226.3	688
30-120	6	1593	711.5	524	73.0	100.0	8	M30	50.0	226.3	770

160 Spring Assembly Dimensions - English Units.

Actuator Model	No of Springs	L (inch)	H (inch)	ØK (inch)	□G (inch)	S (inch)	N (No)	T (UNC)	D (inch)	PCD (inch)	Wt (lb)
16-120	1	19.11	8.33	20.63	1.614	2.17	4	7/8-9	1.50	6.01	272
18-120-7000	1	22.50	8.33	20.63	2.244	3.07	4	1 1/8-7	1.97	8.91	356
18-120	2	26.44	12.26	20.63	2.244	3.07	4	1 1/8-7	1.97	8.91	530
20-120-7200	2	36.67	12.26	20.63	2.874	3.94	8	1 1/8-7	1.97	8.91	773
20-120-7300	3	40.61	16.20	20.63	2.874	3.94	8	1 1/8-7	1.97	8.91	901
20-120	4	44.55	20.14	20.63	2.874	3.94	8	1 1/8-7	1.97	8.91	1058
30-120-7600	3	50.91	16.20	20.63	2.874	3.94	8	1 1/8-7	1.97	8.91	1158
30-120-7700	4	54.84	20.14	20.63	2.874	3.94	8	1 1/8-7	1.97	8.91	1339
30-120-7800	5	58.78	24.07	20.63	2.874	3.94	8	1 1/8-7	1.97	8.91	1520
30-120	6	62.72	28.01	20.63	2.874	3.94	8	1 1/8-7	1.97	8.91	1701



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Title: 160 SPRING – SPRING RETURN TORQUES

Metric Units Nm

Actuator Model	Position of Air OR Spring Stroke	Pressure Setting (bar)											
		1.7	2.0	2.4	2.8	3.1	3.5	3.8	4.1	4.5	4.8	5.2	5.5
16-120	Start						864	939	1004	1097	1165	1256	1321
	Finish						576	660	742	832	906	1002	1081
18-120-7000	Start	807	970	1182	1260								
	Finish	484	736	967	1040	1040	1040	1040	1040	1040	1040	1040	1040
18-120	Start				1457	1637	1875	2053	2206	2426	2585	2800	2954
	Finish				874	1036	1250	1441	1630	1840	2011	2234	2417
20-120-7200	Start	1621	1940	2325	2692								
	Finish	1025	1362	1763	2203	2203	2203	2203	2203	2203	2203	2203	2203
20-120-7300	Start				2788	3072	3471	3739	4023				
	Finish				1958	2271	2632	2983	3291	3291	3291	3291	3291
20-120	Start								4121	4514	4798	5181	5456
	Finish								3046	3423	3732	4133	4464
30-120-7600	Start	2433	2878	3466	4038								
	Finish	1622	2127	2696	3304	3304	3304	3304	3304	3304	3304	3304	3304
30-120-7700	Start				4112	4554	5113						
	Finish				3118	3542	4183	4183	4183	4183	4183	4183	4183
30-120-7800	Start						5237	5676	6072	6648			
	Finish						3871	4304	4844	5440	5440	5440	5440
30-120	Start									6771	7197	7772	8184
	Finish									5134	5598	6200	6696

English Units lbf.ins.

Actuator Model	Position of Air OR Spring Stroke	Pressure Setting (psi)											
		25	30	35	40	45	50	55	60	65	70	75	80
16-120	Start						7646	8310	8885	9708	10310	11116	11691
	Finish						5098	5841	6567	7363	8018	8868	9567
18-120-7000	Start	7142	8585	10461	11151								
	Finish	4283	6514	8558	9204	9204	9204	9204	9204	9204	9204	9204	9204
18-120	Start				12894	14487	16594	18169	19523	21470	22877	24780	26143
	Finish				7735	9169	11063	12753	14426	16284	17797	19771	21390
20-120-7200	Start	14346	17169	20576	23824								
	Finish	9071	12054	15603	19497	19497	19497	19497	19497	19497	19497	19497	19497
20-120-7300	Start				24674	27187	30718	33090	35604				
	Finish				17328	20098	23293	26400	29125	29125	29125	29125	29125
20-120	Start								36471	39949	42462	45852	48286
	Finish								26957	30294	33028	36577	39506
30-120-7600	Start	21532	25470	30674	35736								
	Finish	14355	18824	23860	29240	29240	29240	29240	29240	29240	29240	29240	29240
30-120-7700	Start				36391	40303	45250						
	Finish				27594	31347	37020	37020	37020	37020	37020	37020	37020
30-120-7800	Start						46347	50233	53737	58835			
	Finish						34258	38090	42869	48144	48144	48144	48144
30-120	Start									59923	63693	68782	72428
	Finish									45436	49542	54870	59260

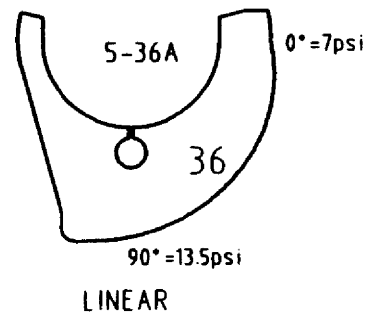
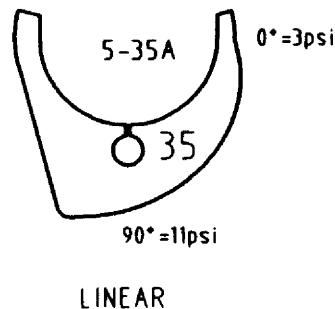
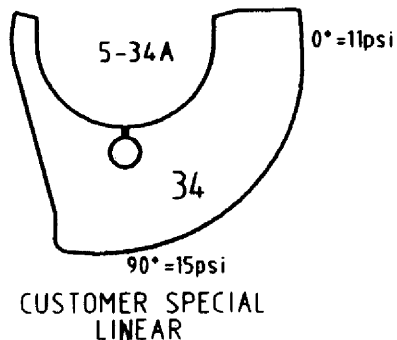
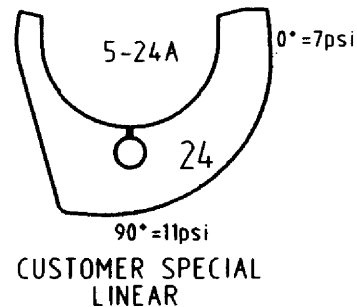
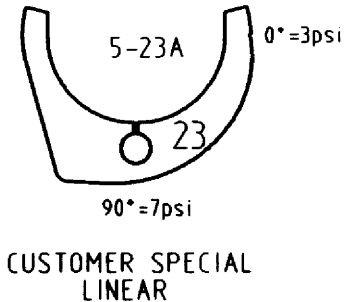
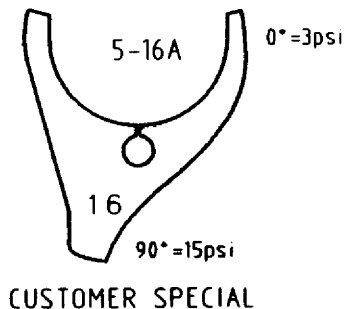
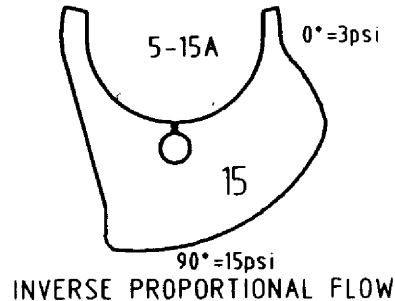
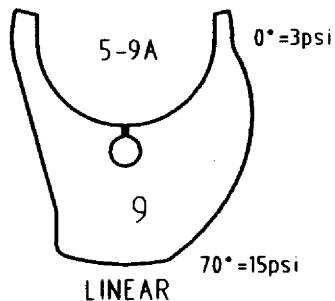
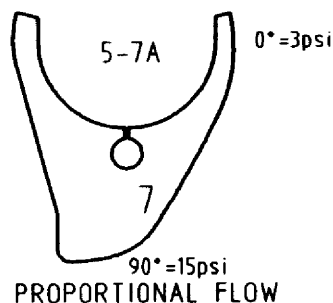
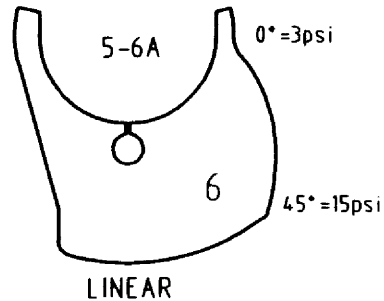
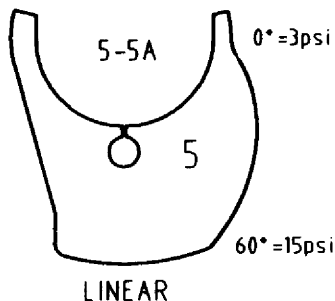
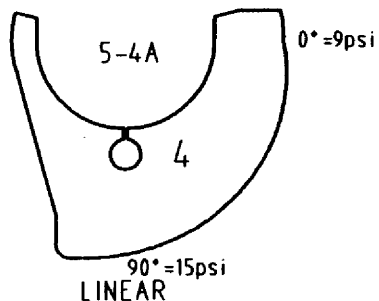
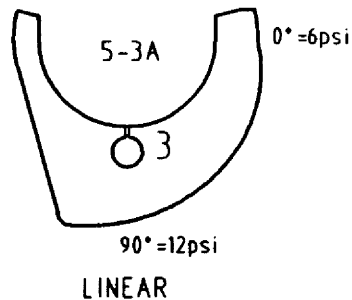
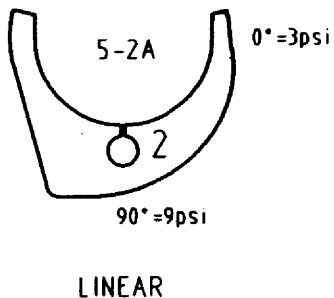
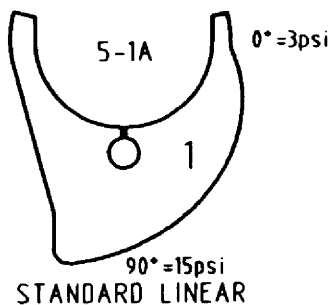
Torque outputs identical for Counter Clockwise Models.

Italic figures apply to spring end torque only - air torque will be greater.

Issue	Signed	Date	KINETROL Trading Estate Farnham Surrey England	Doc.No. TD 110
B	<i>RC</i>	1/8/01		Page 1 of 1

Title:

Cams for AP Positioner



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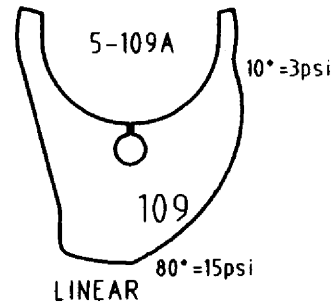
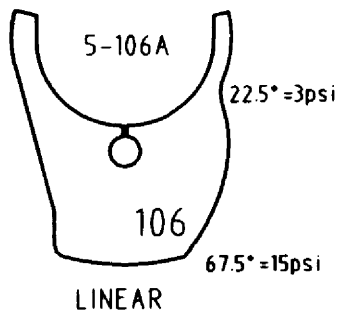
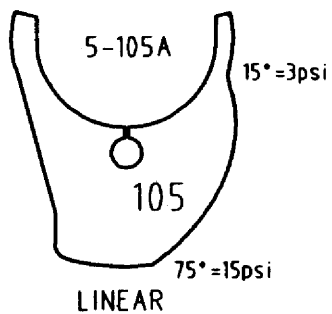
KINETROL

Trading Estate Farnham Surrey England

SHEET No. TD112
Page 1 of 2
(DX 30406)

Title:

Cams for AP Positioner



ISSUE
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A. Keels
05.06.01

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SHEET No. TD112
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(DX 30406)

Title: 200/209 Actuator – Fitting of Two Additional End Travel Stops
200/209 & 300/309 – Adjustment of End Travel Stops

1. Introduction

The 200/209 actuator was originally designed with 2 end travel stops to be used in the same way as all other standard Kinetrol actuators.

However, due to the actuators occasionally being used in applications where the travel time is faster than anticipated and/or higher inertia loads are applied (e.g. large butterfly valves) it is now thought necessary, as a precautionary measure, to fit 2 extra end stops to existing actuators and present production actuators until further notice. All 300/309 actuators are fitted with 3 end stops per side.

All 200/209 actuators have been drilled to accept 4 stop screws, but on older actuators two of the holes may have been fitted with short screws to seal the holes.

2. Fitting of End Travel Stop Screws (200/209 actuator)

Figure 1 below shows a 200/209 actuator fitted with 4-end travel stop screws.

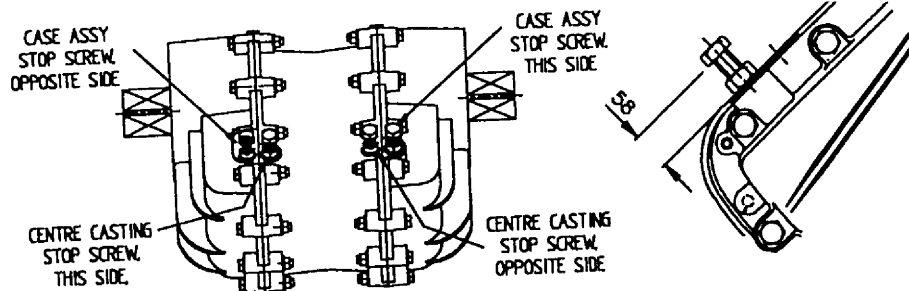


Figure 1

Figure 2

Existing actuators, fitted with only 2 stop screws, will also be fitted with two M20 screws at the same end of the actuator. The following procedure should be followed to replace these screws with end stop screws:

- Clean the actuator near the area of the M20 screws.
- Carefully remove these screws using a 30mm A/F spanner and blow away any loose thread adhesive and check that the entrance to the stop screw hole is clean and that it is not damaged.
- Fit pre-assembled stop screw assembly Kinetrol part No.SP397 that includes screw, locknut, washer & O-ring seal.

3. Adjustment of End Stop Screws (200/209 & 300/309 actuators)

200/209 actuators should be fitted with 2 travel stops on each side of actuator and 300/309 fitted with 3 stops. It is desirable that the stop screws are adjusted such that the stopping load is shared equally. To achieve this the following procedure should be followed:

- To achieve a start position of 90 deg. travel, it is recommended that all of the travel stop screws are set as shown in figure 2. One screw on each side should be untouched, while the others are withdrawn by approximately 2 turns from this figure.
- With the actuator fitted on the application (e.g. valve or damper) adjust the two working screws nearest the application to give the desired operating angle always ensuring that other screws protrude further from the side of the actuator case. Lock these two screws into position when the desired angle has been achieved using the lock nuts provided.
- With air pressure applied to the actuator, screw in a non-working stop on the relevant side (the centre screw on 300/309 actuator) until it can be felt to contact the vane and screw in a further ½ turn (3 flats) for M20 stop screws or 1/3 turn (2 flats) for later actuators having M24 stop screws. For 300/309 actuators repeat this with the remaining screw. Lock into position using the lock nut provided.
- Turn the actuator to the other end of its stroke and repeat the above procedure.
- Apply 4 self-adhesive labels to cleaned areas of case adjacent to the stop screws.

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THE NON-APPLICABILITY TO KINETROL PNEUMATIC ACTUATORS OF EUROPEAN COMMISSION PRESSURE EQUIPMENT DIRECTIVE 97/23/EC

Kinetrol Pneumatic actuators are excluded from the scope of the Pressure Equipment Directive , because they comprise casings where the dimensions, choice of material and manufacturing rules are based primarily on requirements for sufficient strength, rigidity and stability to meet the static and dynamic operational requirements, and pressure is not a significant design factor.

The CE markers attached to Kinetrol actuators are required to signify their adherence to other European Commission directives from the scope of which they are not excluded.



J. V. Nash
Managing Director

TITRE: La non-applicabilité aux actionneurs pneumatiques Kinetrol de la directive européenne 97/23/EC relative aux équipements sous pression

Les actionneurs pneumatiques Kinetrol sont exclus du champ d'application de la directive relative aux équipements sous pression, car ils comportent des carters dont le dimensionnement, le choix des matériaux et les règles de construction reposent essentiellement sur des critères de résistance, de rigidité et de stabilité à l'égard des sollicitations statiques et dynamiques en service ou à l'égard d'autres caractéristiques liées à leur fonctionnement et pour lesquels la pression ne constitue pas un facteur significatif au niveau de la conception.

Les marques CE apposées sur les actionneurs Kinetrol attestent leur conformité aux autres directives européennes du champ d'application desquelles ils ne sont par exclus.

J.V. Nash

Issue A	Signed	Date 4.1.02	KINETROL Trading Estate Farnham Surrey England	Doc.No. TD 117 Page 1 of 1
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Title: Installation and Operating Instructions for 189 Damper Drive

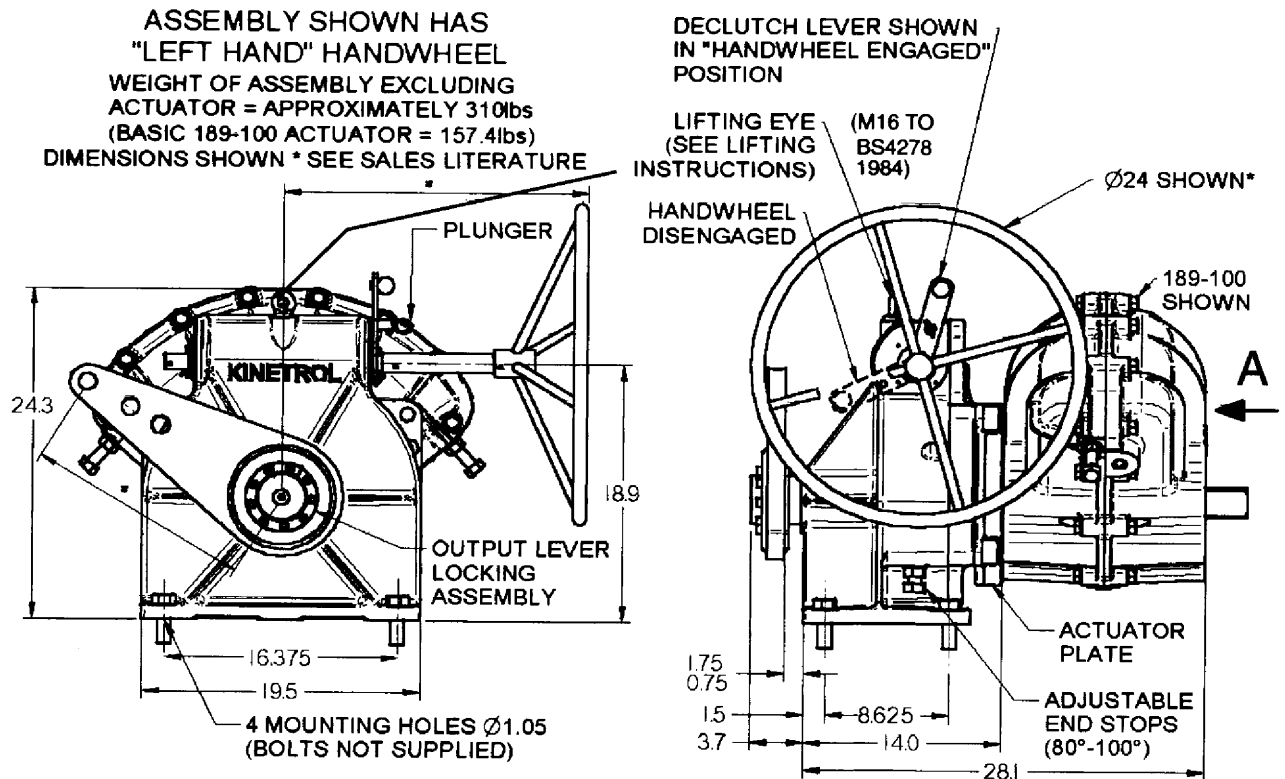


FIGURE 1. ALL DIMENSIONS IN INCHES

LIFTING: When the assembly is NOT fitted with an actuator, the lifting eye provided can be used on its own; When an actuator IS fitted, suitable slinging must be provided to support the actuator, in addition to using the lifting eye provided.

MOUNTING: The assembly must be fitted on to a rigid, flat surface using the 4 mounting holes

OUTPUT LEVER: Ensure there is adequate clearance between output lever and other parts. Therefore, whenever possible the output lever should be located on the opposite side of the assembly to the handwheel / declutch lever. In any case **the output lever should always be guarded (in accordance with local legislation) to prevent risk of injury.**

ASSEMBLING AND SETTING OUTPUT LEVER ON SHAFT: Do NOT use any molybdenum disulphide between shaft / locking assembly / lever. 1. Fit screws in 3 equispaced jacking holes (fitted with plastic plugs): this prevents the rings from tilting during fitting. 2. Gently tighten the 6 remaining screws until the locking assembly is in the required position along the shaft, and the lever is at the desired angle (The "bore" of the locking assembly must be in full contact (i.e. no overhang) with the shaft, and the outside of the locking assembly must be fully enclosed by the lever hub). Remove the 3 screws and fit them like others.

3. Tighten the screws in the sequence shown in figure 2. Tighten the ring of screws in 5-6 stages, with the applied torque increasing gradually with each stage, until the final screw torque of 69Nm / 610lb.in / 51lb.ft is achieved on every screw. At least 2 circuits are required at full torque to ensure every screw is fully tightened to specified torque. **Failure to follow this procedure may seriously damage the shaft / locking assembly.**

REMOVAL OF LEVER: If necessary, the lever can be removed by taking out all 9 screws and refitting them into the jacking holes, (after removing the plugs), tightening them in the same sequence as for fitting.

CAUTION: The output lever is heavy, and once the locking device is loosened, the lever must be supported, or it may rotate under its own weight with the risk of causing injury.

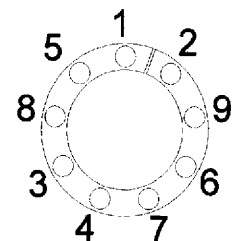


FIGURE 2.

Title: Installation and Operating Instructions for 189 Damper Drive

OPERATING: Do not operate the Damper Drive unless suitable safety guarding is installed.

MOVING THE DECLUTCH LEVER: To move the declutch lever, first pull the ring-pull to extract the Plunger from its locating hole; After turning declutch lever to the required position, ensure that the plunger is fully latched into its locating hole. To Engage the handwheel, it may be necessary to slowly rotate the handwheel until gear teeth are aligned. **DO NOT** attempt to select "engaged" lever position while the Output shaft is in motion (i.e. the actuator & output lever are turning); Likewise, **DO NOT** attempt to "disengage" the declutch lever if the actuator air supply is set such that it is likely to cause the actuator to turn, thus applying a force through the manual override gears. Failure to observe the above may seriously damage the unit.

MANUAL OPERATION: To operate the assembly manually, the Declutch Lever must be latched in the "Handwheel Engaged" position. When unit has "Left Hand" Handwheel (see sketch on page 1), clockwise rotation of handwheel produces counter-clockwise rotation of shaft/output lever when viewed from arrow "A". When handwheel is fitted to "Right Hand" side, clockwise rotation of handwheel produces clockwise rotation of shaft when viewed from arrow "A".

IMPORTANT: The handwheel provided is sized such that a rim force of 125lbs should be sufficient to produce full rated output torque; **DO NOT** use extra levers on handwheel to increase the handwheel torque, as this may seriously damage the unit.

PNEUMATIC OPERATION (using actuator): The Declutch lever must be latched in the "Handwheel Disengaged" position.

FITTING ACTUATOR: Firstly, the "actuator plate" should be fitted to the actuator so that the curved edge of the plate is pointing away from the actuator ribs. The 4 fixing screws should be coated with thread locking fluid, and tightened to 700Nm/516lb.ft. Next, establish whether the actuator shaft is set to its CW end, mid, or CCW end of travel. Locate the handwheel to its "engaged" position, and, using the handwheel, drive the output lever so that its square hole is aligned with the actuator square. Using suitable lifting equipment, lift the actuator and engage its shaft fully into the Damper Drive shaft. The 4 fixing screws should be coated with thread locking fluid, inserted through the corner holes in the actuator plate, and screwed into the tapped holes on the rear of the Damper Drive. If necessary, turn the handwheel to align the holes. Tighten the screws to 700Nm/516lb.ft.

REMOVING ACTUATOR: Removal is basically the reverse of fitting. It is recommended that the handwheel is engaged before the actuator is removed; If the handwheel is not engaged, the output lever must be supported, or it may be free to rotate under its own weight, with the risk of causing injury.

CHANGING SIDE OF HANDWHEEL: If required, the handwheel and declutch lever can be re-located to the other side of the Damper Drive as follows: 1) Remove the pin attaching the "handwheel extension shaft" to the "worm shaft", and remove the extension shaft / handwheel assembly. 2) Undo the 2 screws holding the declutch lever on, and the 2 screws fixing the "Worm shaft retainer" ring on the opposite side of the Damper Drive. Using thread locking fluid on the screws, refit the components to the required sides of the unit. 3) Refit the handwheel assembly to the declutch lever side of the unit. Note: It is important to perform this procedure in the 1,2,3 order stated, so that the worm shaft is at all times fully axially located by the lever & retaining ring while the handwheel is being removed and refitted.



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5	3. Description of Operation
6-7	4. Settings and Adjustments - 4.1 Change of Direction for rising signal (direct mounted) 4.2 Zero and Range Adjustment 4.3 Speed Control 4.4 Change of Direction for rising signal (Discrete)
8	5. Maintenance and Troubleshooting
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12-14	7. Spare Parts - 7.1 Exploded View 7.2 Spare Part Numbers
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1. SAFETY REQUIREMENTS

1.1 Certification

This instruction document is for special versions of Kinetrol AP positioners which are certificated for use in areas containing possible explosive atmospheres. The unit is approved by Baseefa (2001) Ltd. as intrinsically safe (IS), when fitted with one of the electrically powered options, to the European classification II 1G EEx ia IIC T4 allowing it to be used in Zone O areas. When it does not contain electrical devices, it is approved for use in Zone O areas to 'g' (inherent safety) standards to EN 13463-1:200. Electrical options must be installed according to the approved procedures (see relevant pages of Certificate of Conformity reproduced in section 9 and Harmonised European Standard EN 50039 'Specification for Intrinsically Safe Electrical Systems 'i'').

1.2 Barrier

The unit is powered and controlled by compressed air. The optional angle retransmit is loop powered, requiring 8 to 30 volts DC to drive the 4-20 mA current through it – the current passed is proportional to the positioner shaft angle. In hazardous applications, the supply is sourced outside the hazardous area. The current must be passed onto the hazardous area through an approved 28V 300 Ohm shunt zener diode barrier device, which acts to prevent dangerous levels of electrical energy being available inside the hazardous area.

Without an approved 28V 300 Ohm barrier, the positioner angle retransmit is not safe in a hazardous area.

1.3 Identification

IS approved positioners are identified by a black aluminium label adhered to the lid of the unit. A copy of the label is shown in section 8 of this document. Non-IS versions carry a red label.

Do not use AP positioners with red labels in hazardous areas.

1.4 Limit Switches & I/P

If the unit is fitted with a limit switch box attached to the lid, each switch must also be connected via a suitable barrier as defined on pages 15 & 16 of these instructions.

The same is true if an I-safe I/P unit is fitted to the signal air inlet side of the positioner. If a hazardous area I/P is specified and fitted to this positioner then it must have its own approval/markings and instructions. If the unit is approved to Category 2 then the whole assembly, including this positioner, should not be fitted in a Zone O area. All three options must be kept electrically isolated from one another.

1.5 Other Requirements

Fittings attached to the positioner should be made from brass or stainless steel. None of the possible circuits should be connected to ground at the positioner.

1.6 Environmental Conditions

The ambient temperature range allowed for use of this equipment is -20°C to +80°C. The user must ensure the environmental conditions are compatible with the materials in the construction of this positioner.

Title: Installation, Operation & Maintenance Instructions - IS Approved AP Pneumatic Positioner

2. INSTALLATION

2.0 Introduction

Positioners can be supplied direct-mounted, or ready to be direct-mounted, onto Kinetrol rotary actuators, or in stand-alone (discrete) form for fitting via a mount kit to any 90 degree rotary or linear actuator. If the positioner is supplied ready mounted on an actuator, sections 2.1 and 2.2 can be by-passed. Positioner-type Kinetrol actuators (ready for direct mounting of positioners) are available in models 050 to 140 inclusive.

2.1 Mounting of Direct Mounting Units onto Kinetrol Positioner-Type Actuators (without angle retransmit)

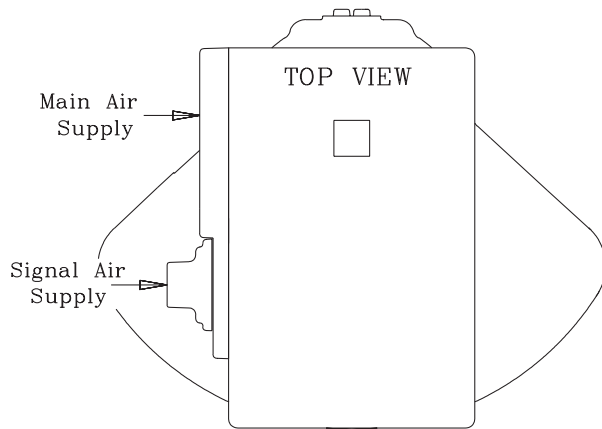


Figure 1. Mid Travel Orientation of Actuator Square and Positioner Box

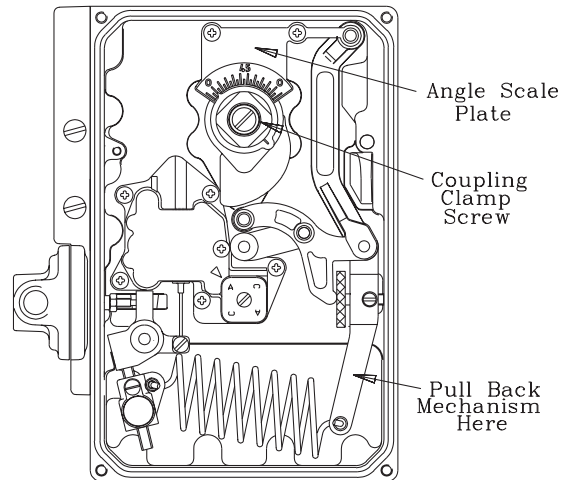


Figure 2. View of inside of Positioner Box Showing Parts for Removal During Installation.

Note: For angle retransmit versions, refer to section 6.1

2.1.1 Move actuator vane to mid travel position, with its output square as shown in Figure 1. This is advisable to prevent subsequent error in orientating positioner coupling. (This is not necessary with spring return actuators as there can be no confusion with square orientation)

2.1.2 Remove positioner cover and undo the two M4 screws retaining the red angle scale plate and remove coupling as shown in figure 2.

2.1.3 Bolt the positioner body to the actuator in the orientation shown in figure 1 taking care that the two O' rings are in place to seal the ports to the actuator (place a small amount of grease onto the O' rings to keep them in place) and that the actuator shaft is centred in the body.

2.1.4 Observe the direction that the cam moves with a rising signal and, if correct, place the coupling on the actuator square with one hand whilst pulling back the mechanism with the other (refer to figure 2). If the direction is not as required then refer to section 4.1. If the actuator has been correctly positioned near mid-stroke, the cam follower will contact the cam at approximately half way. Ensure that the coupling is pushed fully onto the actuator square and tighten the central fixing screw which will have the effect of centralising the cam follower on cam. Refit the angle scale plate.

2.2 Mounting of Discrete Positioner.

The design and manufacture of the mount kit between the positioner and actuator is outside the scope of this document. It is essential that the shaft of the actuator is well aligned with the positioner shaft and that the two are coupled together with a minimum of backlash as this will reduce the performance of the positioner/actuator combination.

It is essential that the 90 degree travel of the actuator moves the positioner coupling through the correct 90 degrees of travel. This can be achieved by either observing the position of the indicator on the lid or the position of the cam or internal indicator with the lid removed.

Title: Installation, Operation & Maintenance Instructions - IS Approved AP Pneumatic Positioner

2.3 Pneumatic and Electrical Connections

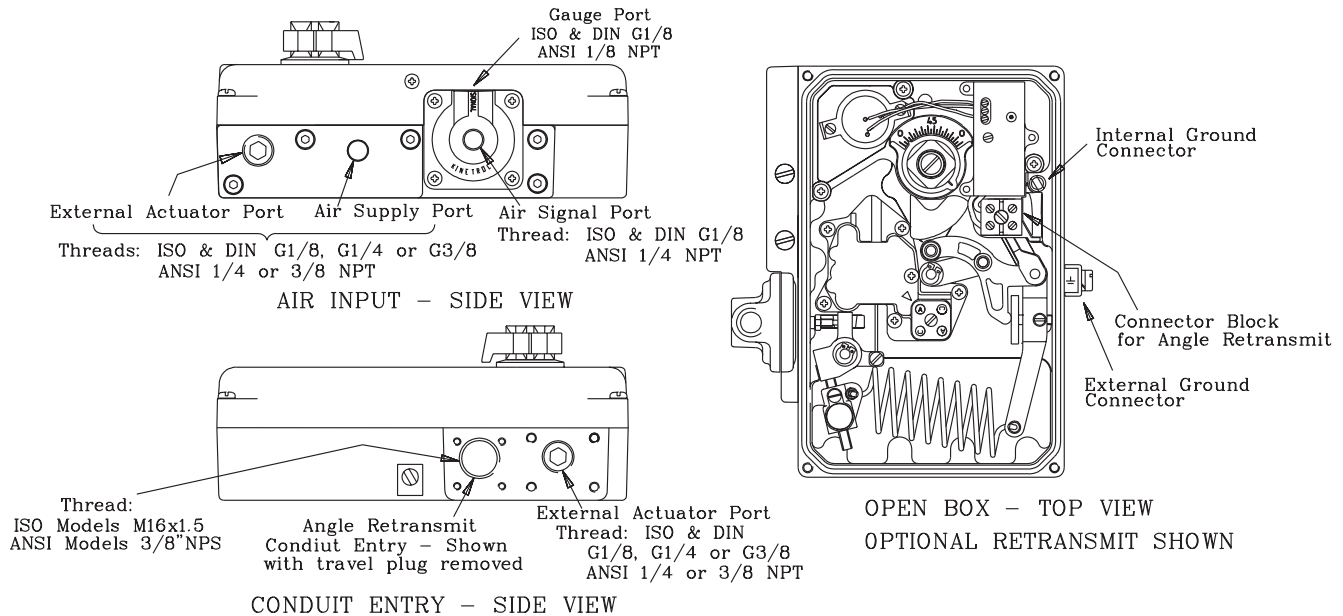


FIGURE 3. EXTERNAL CONNECTIONS

2.3.1 Air Supply.

Connect main air supply (pressure between 3.5 and 7 bar or 50 and 100psi) to the supply port indicated in figure 3. Also connect signal air supply (pressure between 0.2 bar and 1 bar or 3 psi and 15psi) to the inlet of the diaphragm housing. It is important that the air is clean, dry and oil free. Quality class 3.4.4 (taken from ISO standard 8573.1) is adequate. This implies 5 micron max. Particle size, 3 deg. C dew point max. and 5mg per cubic metre max. oil content.

2.3.2 Angle Retransmit Option Supply.

The optional angle retransmit circuit is loop powered, requiring 8 to 30 volts to drive the 4-20mA current through it. The current which passes is linearly proportion to the shaft angle.

The cable entry has the option of a cable gland fitting. Ensure a suitable 28v 300 ohms barrier is used. With the cable gland entry the wires are directly connected to the internal Connector Block, as shown in Figure 3. An internal earth connection is provided if required. An external earth connection is also provided if this is required.

2.3.3 External Actuator Ports.

For positioners not fitted directly onto Kinetrol Positioner type Actuators, two external ports are provided for connecting the positioner outlets to the actuator. The size of the ports is dependant on the positioner ordering code. These ports can also be used for fitting pressure gauges if desired.

2.3.4 Switch Box Options.

Refer to pages 15 and 16 for instructions for fitting the switch box options.

3. DESCRIPTION OF OPERATION.

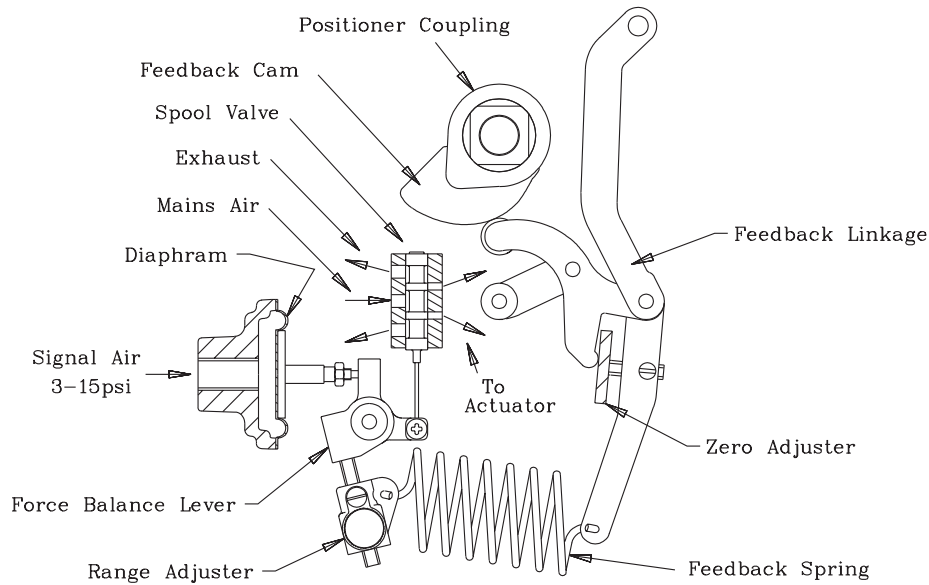


FIGURE 4. PRINCIPAL OF OPERATION.

The AP Positioner works using the principal of a 'force balance' spool system with mechanical cam feedback.

The air input signal (normally 3-15psi) is applied to a diaphragm which produces a force on the force balance lever which is proportional to the signal pressure. The resulting torque on the lever is balanced by the force produced from the feedback spring which is also joined to the lever.

A proportional flow spool valve is the third element attached to the lever. This is positioned at its central closed position when the lever is at the mid-stroke position which occurs when the actuator is at the desired angle. Several different versions of this valve are available with different flow capacities designed to give optimum performance when fitted to the range Kinetrol actuators.

The feedback cam is retained by a coupling which, in the case of a Kinetrol direct mounted positioner, is held onto the vane square by a collet. For discrete versions, the coupling is retained in bearings and connected by either a male square or 'Namur' style connector.

The cam provides positional feedback via a unique four bar linkage which ensures a linear movement of the cam follower whether the cam is set for clockwise or anticlockwise movement for a rising signal. The lower part of the linkage is attached to the other end of the feedback spring which stretches the spring as the cam is rotated to produce the feedback force mentioned earlier. The standard cam produces a linear characteristic, but alternative profiles are available.

The common adjustments are split into zero and range. Both are achieved without the need for special tools and the actual adjustments are made using finger pressure only.

Air passages in the main body are provided with the capability of many options with a minimum of changes. External ports are provided on all models to allow for external connection to the actuator or for the fitting of pressure gauges if desired. Three main air flow options are available (as detailed in the AP literature). The two lower flow rate options (AP & MP) are affected by change of valve size and tapping size in the body. The largest flow rate option (HP) not only has a larger valve but also a different port plate with 3/8 tapping and external combination silencer/snubbers.

The mounting options are accommodated by three different channel plate designs. The channel plate is the plate fitted to the base of the unit. The smallest is dedicated to direct mounting on an 050 Actuator. The second is used for direct mounting on Actuators 070 to 140. The third is used for discrete models having a Namur mounting hole pattern.

An optional angle retransmit can be fitted within the positioner body and additional options of I/P controller and limit switch box can also be fitted allowing a wide range of switch options to be specified.

4. SETTINGS and ADJUSTMENTS.

The positioner will have been factory set to the requirements given in the ordering code (i.e. the direction of rotation for a rising pressure signal and the range and zero settings). However, if these settings need to be changed, the following section describes the procedure for achieving this.

4.1 Change of Direction for Rising Signal (direct mounting units only).

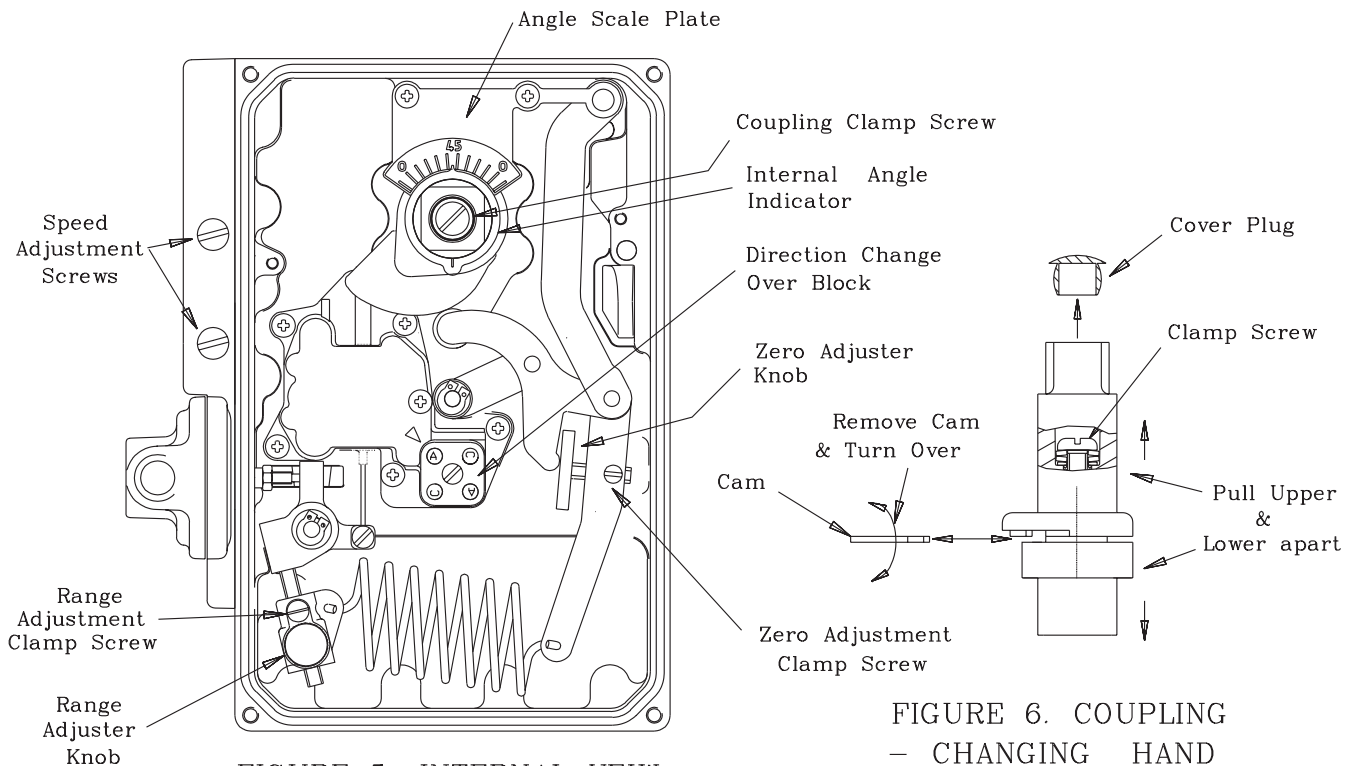


FIGURE 5. INTERNAL VIEW

FIGURE 6. COUPLING
- CHANGING HAND

4.1.1 Move the actuator to approximately mid-position to avoid problems in correct orientation later. This is obviously not possible or necessary with spring return models because the position of the vane will be known. Reduce both main supply and signal pressures to zero.

4.1.2 Remove positioner cover and undo the two M4 screws retaining the red angle scale plate and remove, as shown in figure 5. Loosen the central coupling screw sufficiently to draw the coupling off the actuator square.

4.1.3 Pull the two halves of the coupling apart sufficiently to allow the cam to be withdrawn from its location peg as shown in figure 6. Flip the cam over and push it back into the slot between the two coupling halves and locate it back on the peg.

4.1.4 If when the coupling was removed, the collet was left behind on the actuator square, remove the collet from the square and push it into the lower half of the coupling ensuring it locates in the semicircular 'pip'. Tighten the clamping screw by two turns before placing it back on the actuator square such that the cam follower is approximately half way up the rise of the cam and tighten the clamping screw. Replace the angle scale plate.

4.1.5 Undo the changeover block central screw and rotate it by a quarter turn and replace and tighten screw. For your convenience, the changeover block is marked 'A' and 'C' which refers to 'anticlockwise' and 'clockwise' respectively. Ensure the required letter is placed opposite the arrow marked on the top of the valve block.

Title: Installation, Operation & Maintenance Instructions - IS Approved AP Pneumatic Positioner

4.2 Zero and Range Adjustment (refer to Figure 4).

4.2.1 Move the actuator/positioner to the zero end of the stroke (i.e. when the cam follower is at the beginning of its rise). This can be most easily achieved by pressurising the main air supply without any signal air pressure (spring return models will already be at this position). Exhaust the supply air and move the internal indicator to indicate just below zero on the angle scale.

4.2.2 Set the coarse zero by slackening the coupling screw by approximately half of a turn until the top part of the coupling can be rotated by hand and rotate until the cam follower just starts to rise up the cam profile. Retighten the screw.

4.2.3 Turn on the main air supply and carefully increase the signal supply pressure to 3psi (0.2Bar). Slacken the fine zero adjustment clamp screw and rotate zero adjuster using thumb pressure so that the actuator moves to indicate zero on the internal indicator. Tighten clamp screw.

4.2.4 Increase the signal pressure to 15psi (1Bar). Slacken the range adjuster clamp screw and rotate the adjuster knob between thumb and forefinger until the actuator moves to the desired end stroke position (normally 90 degrees) as indicated on the internal indicator. Retighten the clamp screw.

4.2.5 Reduce the signal air pressure again to 3psi and to check that the zero position has not changed.

4.3 Speed Control.

Maximum actuator speed can be regulated by the two following methods:

a) changing the valve spool/liner size. The valve size is normally specified at the point of ordering by the letters 'AP', 'MP' or 'HP'. This method, however, not only effects the actuator speed but also effects the 'gain' and therefore control stability of the unit and care must be taken not to specify a too high flow valve for a given size of actuator. Kinetrol Ltd has recommendations (shown in the AP literature) for each size of actuator

or

b) adjustment of the built in flow restrictors (shown in Figure 4) is achieved using a screwdriver. There are two restrictors, one for each direction of travel. Clockwise rotation, they will reduce the actuator speed. 'AP' and 'MP' size units with 1/8 or 1/4 ports are controlled in this way but 'HP' size units having 3/8 ports are fitted with external silencer/restrictors which are adjusted using an allen key fitted down the centre of the adjuster.

4.4 Change of Direction for Rising Signal (discrete units).

4.4.1 Move actuator as in Section 4.1.1.

4.4.2 Remove positioner cover and undo the three M4 screws retaining the red retransmit plate, as shown in figure 7. Loosen the central coupling screw sufficiently to pull the coupling complete with the retransmit assembly off the actuator connection.

4.4.3 Remove the internal indicator from the coupling and withdraw the coupling from the retransmit plate.

4.4.4 Pull the two halves of the coupling apart sufficiently to allow the cam to be withdrawn from its location peg. Flip the cam over and push it back into the slot between the two coupling halves and locate it back on the peg.

4.4.5 Refit the coupling to the retransmit plate and slide the internal indicator over the top of the coupling.

4.4.6 If when the coupling was removed, the collet was left behind on the actuator connection, remove the collet from the connection and push it into the lower half of the coupling ensuring it locates in the semicircular 'pip' and tighten the clamping screw by two turns. Place the coupling and retransmit plate back on the actuator connection such that the cam follower is approximately half way up the rise of the cam and pull back the spring lever with the other hand and tighten the coupling clamping screw. Retighten the retransmit plate retaining screws.

4.4.7 The internal changeover block is not effective with a discrete positioner. The changeover of the air flow path is achieved by swapping over the external connections. It may be also preferred to turn the positioner through 180 degrees to simplify the external pipe runs.

4.4.8 The adjustment of zero and range is completed as in section 4.2

5. MAINTENANCE and TROUBLESHOOTING.

The AP positioner is designed for a long life with very little maintenance required if it is supplied with clean, dry oil free air, as recommended in section 2.3.

When the positioner lid is removed, take care not to remove all grease from the lid/coupling seal. If it does need replenishing then ensure that a synthetic grease is used as a mineral oil grease will adversely affect this seal.

If, however, any of the parts do need replacement because of adverse conditions, then refer to Kinetrol Ltd for spare parts together with any instructions for replacing and resetting.

The following troubleshooting guide should help in the unlikely event of a problem with the performance of the unit. If problems persist, contact your local Kinetrol distributor or Kinetrol Ltd for further advice.

TABLE 1. Troubleshooting Guide.

Failure to move when signal air and mains air is applied:

- Check mains air pressure is sufficient to produce enough torque from actuator
- Check signal pressure using pressure gauge in gauge port or check that the force balance lever is being pushed by the input diaphragm with the lid removed
- Has the coupling been positioned at the correct angular position on the actuator?
- Has the changeover block been set correctly for the direction of rotation (direct mounted units) or the external port connections been fitted the correct way around (discrete units)?
- Is the air quality poor causing the spool to jam? This can be checked by manually moving the spool carefully by hand with the lid removed.
- Is the actuator or whatever it is connected to jammed? This can be checked by again moving the force balance lever manually to check if the actuator responds (air will normally be heard hissing into the actuator when this is done).

Actuator moves too slowly upscale or down scale:

- Is the mains air pressure too low for the load being moved or the actuator too small?
- Have one or both flow adjuster screws been screwed in too far?
- Is the air contaminated causing the spool movement to become sluggish?
- Is the actuator volume too large for the spool flow rate chosen?

Lack of sensitivity:

- Is the spool sticky caused by a contaminated air supply?
- Does the actuator exhibit poor stick slip qualities? This maybe especially true if it is not Kinetrol and will normally be seen also as a jerky movement.

Excessive Hysteresis:

- Has the inside of the positioner box become contaminated causing the force balance mechanism bearings to become sticky?
- Is the actuator load excessive causing it to struggle to achieve position?

Overshoot/Instability:

- Is the spool valve chosen too large for the size of the actuator?
- Is the inertia loading too great for the size of actuator chosen? Refer to Kinetrol for allowable limits.
- Have the snubbers been used to slow the load down?

Title: Installation, Operation & Maintenance Instructions -
IS Approved AP Pneumatic Positioner

6. ANGLE RETRANSMIT OPTION.

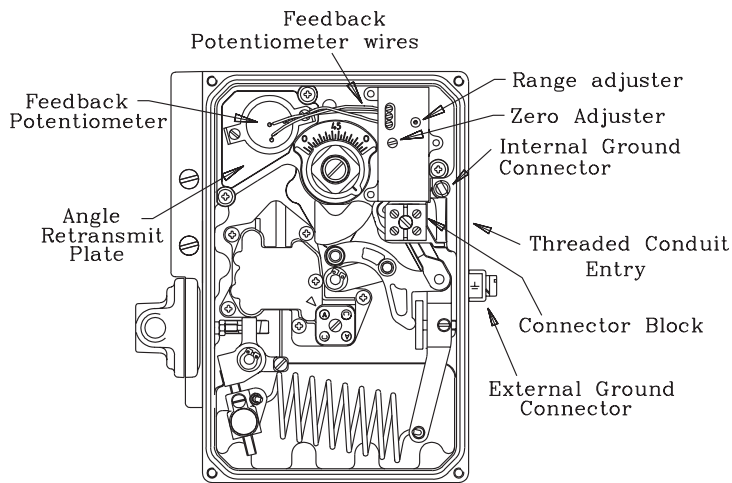


FIGURE 7. ANGLE RETRANSMIT.

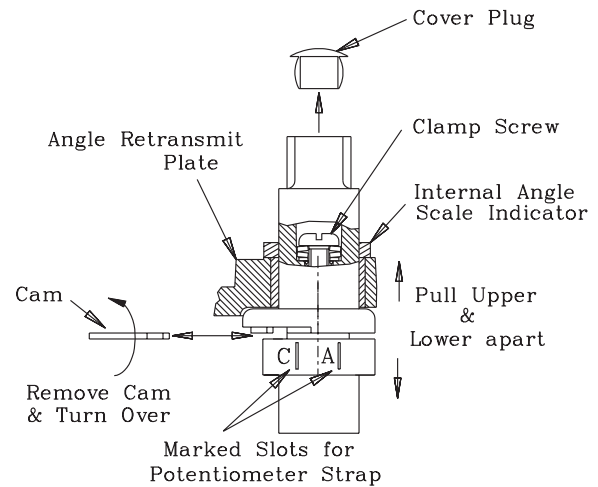


FIGURE 8. COUPLING
- CHANGING HAND

6.1 Installation

6.1.1 Move actuator vane to mid travel position, with its output square as shown in Figure 1. This is advisable to prevent subsequent error in orientating positioner coupling. (This is not necessary with spring return actuators as there can be no confusion with square orientation)

6.1.2 Remove positioner cover and unscrew the three M4 screws retaining the red retransmit plate, release the two wires on the terminal block connected to the DIN plug (if fitted), as shown in figure 7, and carefully remove coupling and retransmit assembly as one unit.

6.1.3 Bolt the positioner body to the actuator in the orientation shown in figure 1 taking care that the two O' rings are in place to seal the ports to the actuator (place a small amount of grease onto the O' rings to keep them in place) and that the actuator shaft is centred in the hole in the body.

6.1.4 Observe the direction that the cam moves with a rising signal and that the retransmit strap is fitted to the correct slot in the lower coupling as marked (C & A for clockwise and anticlockwise respectively). If the direction is not as required then refer to section 6.2. If correct, place the coupling and retransmit assembly on the actuator square with one hand whilst pulling back the mechanism and two DIN plug wires with the other (refer to figure 6). If the actuator has been correctly positioned near mid-stroke, the cam follower will contact the cam at approximately half way.

6.1.5 Ensure that the coupling is pushed fully onto the actuator square and tighten the central fixing screw which will have the effect of centralising the cam follower on the cam track. Retighten the three angle retransmit retaining screws and refit the two DIN plug wires (if fitted).

6.2 Change of Direction for Rising Signal (direct mounting units only).

6.2.1 Move the actuator to approximately mid-position to avoid problems in correct orientation later. This is obviously not possible or necessary with spring return models because the position of the vane will be known. Reduce both main supply and signal pressures to zero.

6.2.2 Remove positioner cover and undo the three M4 screws retaining the red retransmit plate, release the two wires on the terminal block connected to the DIN plug (if fitted), as shown in figure 7. Loosen the central coupling screw sufficiently to carefully pull the coupling complete with the retransmit assembly off the actuator square.

Title: Installation, Operation & Maintenance Instructions - IS Approved AP Pneumatic Positioner

6.2 Change of Direction for Rising Signal (direct mounting units) - continued

6.2.3 Release the potentiometer strap from the slot in the lower coupling, as shown in figure 8, remove the internal indicator from the coupling and withdraw the coupling from the retransmit plate.

6.2.4 Pull the two halves of the coupling apart sufficiently to allow the cam to be withdrawn from its location peg. Flip the cam over and push it back into the slot between the two coupling halves and locate it back on the peg.

6.2.5 Refit the coupling to the retransmit plate, slide the internal indicator over the top of the coupling and refit the potentiometer strap into one of the two marked slots of the lower coupling (marked 'A' and 'C' for anticlockwise and clockwise movement respectively).

6.2.6 If when the coupling was removed, the collet was left behind on the actuator square, remove the collet from the square and push it into the lower half of the coupling ensuring it locates in the semicircular 'pip' and tighten the clamping screw by two turns. Place the coupling and retransmit assembly back on the actuator square such that the cam follower is approximately half way up the rise of the cam whilst holding back the two retransmit wires and pull back the spring lever with the other hand and tighten the coupling clamping screw. Retighten the retransmit plate retaining screws and refit the retransmit wires to the terminal block.

6.2.7 To ensure a rise in retransmit signal with rising input pressure signal, the top and bottom wires on the feedback potentiometer must be reversed in the connector located on the circuit. The central wire does not change.

6.2.8 Undo the changeover block central screw and rotate it by a quarter turn and replace and tighten screw. The changeover block is marked 'A' and 'C' which refers to 'anti-clockwise' and 'clockwise' respectively. Ensure the required letter is placed opposite the arrow marked on the top of the valve block.

6.3 Zero and Range Adjustment (refer to Figure 7).

Setting of the mechanical zero and range for the positioner with an angle retransmit is the same as described in section 4.2. The retransmit circuit must also be set for zero and range which is described below.

6.3.1 Set the circuit zero adjustment to the central position and connect a 4-20ma electrical source via the DIN plug or terminal block.

6.3.2 Set the positioner to zero degrees or the input pressure to 3psi (0.2 Bar)

6.3.3 Slacken the two screws which clamp the potentiometer to the retransmit plate but do not remove. Rotate the potentiometer slowly using finger pressure until the electrical display shows 4ma.

6.3.4 Increase the air signal pressure to 15psi (1Bar) to set the positioner at 90 degrees. Adjust the Span potentiometer to read 20ma.

6.3.5 Repeat steps 6.3.2 to 6.3.4 until the desired readings are obtained at both ends of the stroke. The fine zero potentiometer can be used to obtain a more precise reading at the zero position.

6.3.6 Tighten the two potentiometer clamp screws.

6.4 Change of Direction for Rising Signal (discrete units).

6.4.1 Move actuator as in Section 6.2.1.

6.4.2 Remove positioner cover and undo the three M4 screws retaining the red retransmit plate, release the two wires on the terminal block connected to the DIN plug (if fitted), as shown in figure 7. Loosen the central coupling screw sufficiently to pull the coupling complete with the retransmit assembly off the actuator connection.

6.4.3 Release the potentiometer strap from the slot in the lower coupling, as shown in figure 8, remove the internal indicator from the coupling and withdraw the coupling from the retransmit plate.

6.4.4 Pull the two halves of the coupling apart sufficiently to allow the cam to be withdrawn from its location peg. Flip the cam over and push it back into the slot between the two coupling halves and locate it back on the peg.

6.4.5 Refit the coupling to the retransmit plate and slide the internal indicator over the top of the coupling and refit the potentiometer strap into one of the two marked slots of the lower coupling (marked 'A' and 'C' for anticlockwise and clockwise movement respectively).

6.4 Change of Direction for Rising Signal (discrete units) - continued

6.4.6 If when the coupling was removed, the collet was left behind on the actuator connection, remove the collet from the connection and push it into the lower half of the coupling ensuring the it locates in the semicircular 'pip' and tighten the clamping screw by two turns. Place the coupling and retransmit plate back on the actuator connection such that the cam follower is approximately half way up the rise of the cam cam whilst holding back the two retransmit wires and pull back the spring lever with the other hand and tighten the coupling clamping screw. Retighten the retransmit plate retaining screws and refit the retransmit wires to the terminal block.

6.4.7 The internal changeover block is not effective with a discrete positioner. The changeover of the air flow path is achieved by swapping over the external connections. It may be also preferred to turn the positioner through 180 degrees to simplify the external pipe runs.

6.4.8 The adjustment of zero and range is completed as in section 6.3.

Title: Installation, Operation & Maintenance Instructions -
IS Approved AP Pneumatic Positioner

7.2 AP POSITIONER SPARE PART LIST

ITEM NO.	DESCRIPTION	SPARES PART NUMBER				
		AP			MP	HP
		050	070	090	10 / 12 / 14	16/18/20/30
1	Cover Assembly - standard *	SP1200	SP1200	SP1200	SP1200	SP1200
	Cover Assembly - for switch box *	SP1201	SP1201	SP1201	SP1201	SP1201
2	Cover Seal & Grease - NBR	SP1202	SP1202	SP1202	SP1202	SP1202
	Cover Seal & Grease - Viton	SPV1202	SPV1202	SPV1202	SPV1202	SPV1202
3	Indicator Assembly	SP703	SP703	SP703	SP703	SP703
4	Monitor Kit ACW	SP978	SP978	SP978	SP978	SP978
	Monitor Kit CW	SP979	SP979	SP979	SP979	SP979
5	Cover Screws	SP1203	SP1203	SP1203	SP1203	SP1203
6	'O' Ring (Lid) - NBR	SP1204	SP1204	SP1204	SP1204	SP1204
	'O' Ring (Lid) - Viton	SPV1204	SPV1204	SPV1204	SPV1204	SPV1204
7	Switch Box Spacer Plate & 'O'Rings	SP1205	SP1205	SP1205	SP1205	SP1205
8	Positioner Body *	SP1206	SP1207	SP1207	SP1207	SP1207
9	Screws (Pos/Act. Interface) *	SP732	SP733	SP733	SP733	-
10	'O' Rings (Pos/Act. Interface)	SP734	SP735	SP735	SP735	-
11	Cam/Spring Lever Assembly	SP1208	SP1208	SP1208	SP1208	SP1208
12	Cam Follower	SP1209	SP1209	SP1209	SP1209	SP1209
13	Short Link	SP1210	SP1210	SP1210	SP1210	SP1210
14	Feedback Spring	SP716	SP716	SP716	SP716	SP716
15	Range Adjuster Assembly	SP1211	SP1211	SP1211	SP1211	SP1211
16	Force Balance Lever Assembly	SP1212	SP1212	SP1212	SP1212	SP1212
17	Washer & Circlip	SP1213	SP1213	SP1213	SP1213	SP1213
18	Diaphragm Cover	SP720	SP720	SP720	SP720	SP720
19	Diaphragm Assembly - Polyurathane	SP1214	SP1214	SP1214	SP1214	SP1214
	Diaphragm Assembly - Viton	SPV1214	SPV1214	SPV1214	SPV1214	SPV1214
20	Screws & Washers (Diaphragm Cover)	SP721	SP721	SP721	SP721	SP721
21	Port Plate *	SP1215	SP1216	SP1216	SP1216	SP1217
22	Screws (Port Plate)	SP1218	SP1218	SP1218	SP1218	SP1219
23	Exhaust Regulators	SP1220	SP1220	SP1220	SP1220	SP1221
24	Port Plate Gasket	SP1222	SP1222	SP1222	SP1222	SP1223
25	Silencer & Silencer Clamp	SP1224	SP1224	SP1224	SP1224	SP1221
26	Inlet Filter	SP1225	SP1225	SP1225	SP1225	SP1226
27	Valve Block & Bobbin	SP1227	SP1228	SP1228	SP1229	SP1230
28	Valve Block Gasket - NBR	SP1240	SP1240	SP1240	SP1240	SP1240
	Valve Block Gasket - Viton	SPV1240	SPV1240	SPV1240	SPV1240	SPV1240
29	Screws & Washers (Valve Block)	SP1241	SP1241	SP1241	SP1241	SP1241
30	Changeover Block	SP1242	SP1242	SP1242	SP1242	SP1242
31	Changeover Gasket - NBR	SP1243	SP1243	SP1243	SP1243	SP1243
	Changeover Gasket - Viton	SPV1243	SPV1243	SPV1243	SPV1243	SPV1243
32	Screw & Washer (Changeover Block)	SP1244	SP1244	SP1244	SP1244	SP1244
33	Channel Plate - Standard *	SP1245	SP1246	SP1246	SP1246	SP1247
	Channel Plate - Discrete *	SP1247	SP1247	SP1247	SP1247	SP1247
34	Channel Plate Gasket	SP1248	SP1248	SP1248	SP1248	SP1248
35	Screws (Channel Plate)	SP1249	SP1249	SP1249	SP1249	SP1249
36	Bearing Bush & 'O' Ring (Discrete)	SP1250	SP1250	SP1250	SP1250	SP1250
37	Angle Scale & Screws	SP1251	SP1251	SP1251	SP1251	SP1251
38	Retransmit Plate, Bush and Screws (Discrete)	SP1252	SP1252	SP1252	SP1252	SP1252
39	Coupling	SP1253	SP12544	SP1254	SP1254	SP1253
	Discrete Coupling	SP1253	SP1253	SP1253	SP1253	SP1253
40	Discrete Drive Adaptor - Kinetrol	SP1255	SP1255	SP1255	SP1255	SP1255
	Discrete Drive Adaptor - Namur	SP1256	SP1256	SP1256	SP1256	SP1256
41	3/8 External Port Adaptor *	-	-	-	-	SP1257

Title: Installation, Operation & Maintenance Instructions -
IS Approved AP Pneumatic Positioner

7.2 AP POSITIONER SPARE PART LIST - CONTINUED

ITEM NO.	DESCRIPTION	SPARES PART NUMBER				
		AP			MP	HP
		050	070	090	10 / 12 / 14	16/18/20/30
42	'O' Ring (Port Adaptor)	-	-	-	-	SP1258
43	Blanking Plug *	SP1259	SP1259	SP1259	SP1259	SP1259
44	Valve Block Cap	-	-	-	-	SP1260
45	Valve Block Cap Gasket	-	-	-	-	SP1261
46	Valve Block Cap Screws & Washers	-	-	-	-	SP1262
47	Cam (See catalogue)	-	-	-	-	-
48	Angle Retransmit Kit (See catalogue)	-	-	-	-	-
49	Potentiometer	SP1263	SP1263	SP1263	SP1263	SP1263
50	Potentiometer Drive Strap	SP1264	SP1264	SP1264	SP1264	SP1264
51	Screw (Strap)	SP1265	SP1265	SP1265	SP1265	SP1265
52	Quadrant Wheel	SP1266	SP1266	SP1266	SP1266	SP1266
53	Torsion Spring	SP1267	SP1267	SP1267	SP1267	SP1267
54	Bush (Torsion Spring)	SP1268	SP1268	SP1268	SP1268	SP1268
55	Circuit	SP1269	SP1269	SP1269	SP1269	SP1269
56	Terminal Block	SP1270	SP1270	SP1270	SP1270	SP1270
57	Nuts (Angle Retransmit Plate)	SP1271	SP1271	SP1271	SP1271	SP1271
58	Din Plug *	SP1272	SP1272	SP1272	SP1272	SP1272
-	Recommended Spares Kit (NBR)	SP1280	SP1280	SP1280	SP1280	SP1280
-	Recommended Spares Kit (Viton)	SPV1280	SPV1280	SPV1280	SPV1280	SPV1280

Title: Installation, Operation & Maintenance Instructions - IS Approved AP Pneumatic Positioner

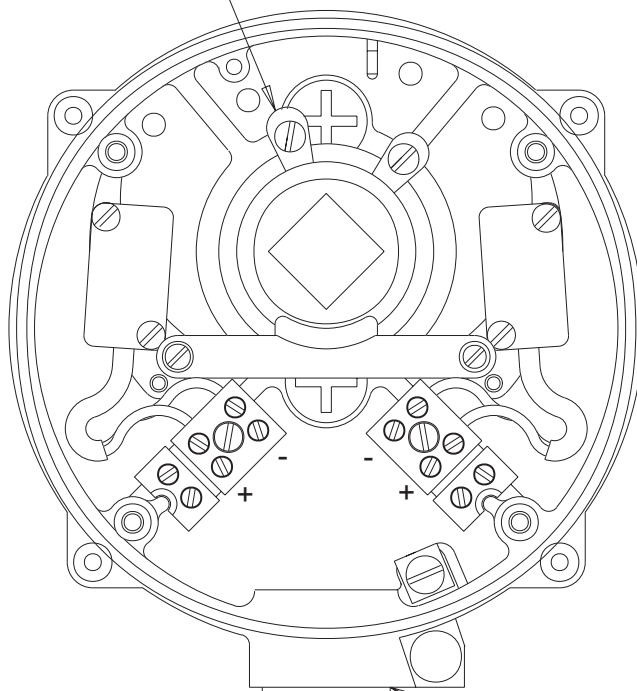
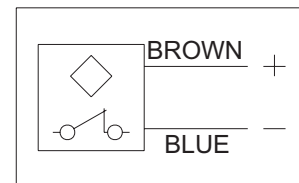
8.1 TYPE 52 LS BOX WITH I'SAFE SWITCHES FITTED TO AP POSITIONER EExia IIC T4 INSTALLATION INSTRUCTIONS

1. Remove threaded plug.
2. Customer to supply and fit cable gland to maintain IP54 Environmental Protection.
3. Connect cable to terminals as required. Ensure that switches are each connected to its own 16V or low energy barrier.
4. Circuits NOT to be connected to ground at this positioner.

NOTE:-

The certification will only be valid when the box is factory fitted to the appropriate AP Positioner.

MICROSWITCH STRIKERS
CAN BE ADJUSTED TO SUIT:-
SLACKEN M3 SCREW



PEPPERL & FUCHS NJ2-V3-106406
8Vdc NOMINAL. INTRINSICALLY
SAFE. THE TWO CIRCUITS MUST
REMAIN SEPERATE AND EACH MUST
HAVE ITS OWN 16V LOW ENERGY
BARRIER TO THE FOLLOWING
SPECIFICATION:-

$U_i = 16V$
 $I_i = 25mA$
 $P_i = 64mW$
 $C_i = 40nF$
 $L_i = 50\mu H$

TEMPORARY THREADED PLUG
TO MAINTAIN IP54
ENVIRONMENTAL PROTECTION

M20 x 1.5.
PG13.5 or
1/2"-14 NPS
CONDUIT THREAD DEPENDANT
ON MARKET.

Title: Installation, Operation & Maintenance Instructions - IS Approved AP Pneumatic Positioner

8.2 TYPE 52 LS BOX WITH EExia IIC T6 APPROVED SWITCHES FITTED TO AP POSITIONER

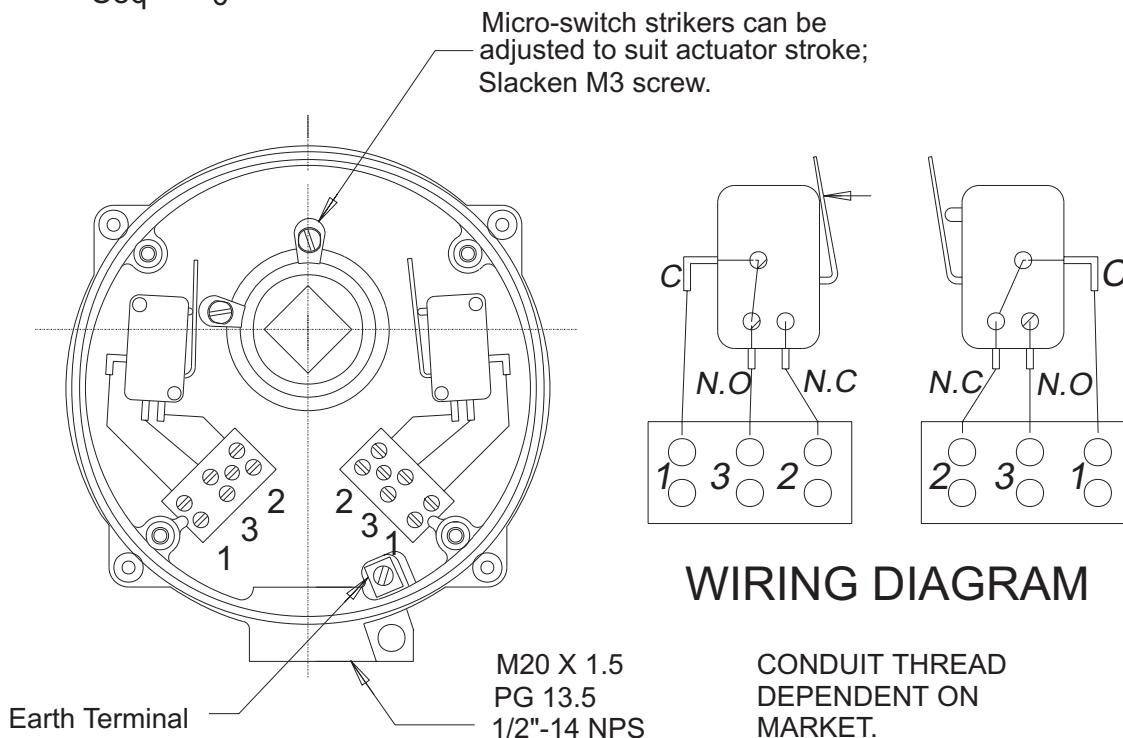
Installation instructions

- 1) Remove temporary threaded plug.
- 2) Fit cable gland to maintain IP54 Environmental protection: Use only brass fittings.
- 3) Connect cable terminals as required. Ensure that switches are each connected to its own 28V 300ohm (or lower energy) barrier.
- 4) Circuits NOT to be connected to ground at this positioner.

NOTE: The certification will only be valid when the box is factory fitted to the appropriate AP positioner.

Barrier information for each switch

Unimax = 28V
^{^J}
 Limax = 93mA
^{^J}
 Pi max = 0.655w
^{^J}
 Leq = 0
^{^J}
 Ceq = 0



Title: Installation, Operation & Maintenance Instructions -
IS Approved AP Pneumatic Positioner

9. BASEEFA (2001) EC TYPE CERTIFICATE OF CONFORMITY - Page 1

Certificate Number
Baseefa02ATEX0197



Issued 14th May 2003
Page 1 of 3

1 **EC - TYPE EXAMINATION CERTIFICATE**

2 **Equipment or Protective System Intended for use in Potentially Explosive Atmospheres
Directive 94/9/EC**

3 EC - Type Examination Certificate Number : **Baseefa02ATEX0197**

4 Equipment or protective system: **AP POSITIONER**

5 Manufacturer : **KINETROL LIMITED**

6 Address : **Trading Estate, Farnham, Surrey, GU9 9NU, England**

7 This equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

8 Baseefa (2001) Ltd. Notified body number 1180 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential Report No. **02(C)0173**

9 Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN50014:1997 + Amendments 1 & 2 EN50020:2002 EN50284:1999

except in respect of those requirements listed at item 18 of the Schedule.

10 If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions of safe use specified in the schedule to this certificate.

11 This EC - TYPE EXAMINATION CERTIFICATE relates only to the design and construction of the specified equipment or protective system. If applicable, further requirements of this Directive apply to the manufacture and supply of this equipment or protective system.

12 The marking of the equipment or protective system shall include the following :

⊕ II 1 G g 90°C EEx ia IIC T4 (-20°C ≤ Ta ≤ +80°C)

This certificate may only be reproduced in its entirety, without any change, schedule included.

Baseefa (2001) Ltd. Customer Reference No. **0622**

Project File No. **02/0173**

This certificate is granted subject to the general terms and conditions of Baseefa (2001) Ltd. It does not necessarily indicate that the equipment may be used in particular industries or circumstances.

R S SINCLAIR

DIRECTOR

On behalf of

Baseefa (2001) Ltd.

Re-issued 29th May 2003

Baseefa (2001) Ltd.
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Telephone +44 (0) 1298 28255 Fax +44 (0) 1298 28216
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KINETROL

Trading Estate, Farnham, Surrey, England

Doc.No.TD 119
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9. BASEEFA (2001) EC TYPE CERTIFICATE OF CONFORMITY - page 2

Certificate Number
Baseefa02ATEX0197



Issued 14th May 2003
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Schedule

15 Description of Equipment or Protective System

The AP Positioner is designed to drive a rotary or linear actuator to a position set by a compressed air input signal and hold it there until the input signal changes. An option is for the AP Positioner to be supplied with Angle Retransmit, this is provided by a potentiometer that is mechanically connected to the actuator interface, and electrically connected to the angle retransmit circuit.

This circuit provides a linear 4-20mA feedback signal and is externally powered. The circuit is mounted on a PCB which is itself located inside the positioner enclosure. The PCB is protected by means of a plastic cover. External electrical connections are made via a terminal block inside the AP Positioner.

This certificate covers the AP Positioner when supplied in the following build arrangements:

- The Angle Retransmit circuit is an option.
- Switch-box fitted (with either micro-switches or Pepperl & Fuchs NJ 2-V3-N Type 1 inductive proximity switches).
- One of three different flow-rate options (standard, medium and high).
- Either Kinetrol or NAMUR Discrete builds.
- Mounted directly on a Kinetrol actuator.
- The O-ring may be either NBR or Viton.

Input parameters

Angle Retransmit circuit:

$U_i = 28V$ $C_i = 0$
 $I_i = 93.3mA$ $L_i = 0$
 $P_i = 0.653W$

Switch-box (micro-switches):

$U_i = 28V$ $C_i = 0$
 $I_i = 93.3mA$ $L_i = 0$
 $P_i = 0.653W$

Switch-box (Pepperl & Fuchs NJ 2-V3-N Type 1 inductive proximity switches to Certificate No. PTB00ATEX2032X)

$U_i = 16V$ $C_i = 40nF$
 $I_i = 25mA$ $L_i = 50\mu H$
 $P_i = 34mW$

16 Report No.

02(C)0173

17 Special Conditions for Safe Use

None

18 Essential Health and Safety Requirements

None additional to those covered by the standards listed at item 9

9. BASEEFA (2001) EC TYPE CERTIFICATE OF CONFORMITY - page 3

Certificate Number
Baseefa02ATEX0197



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19 Drawings and Documents

<u>Number</u>	<u>Sheets</u>	<u>Issue</u>	<u>Date</u>	<u>Description</u>
304-000-001/A1	1	D	29-04-03	General Assembly
304-000-024/A3	1	A	11-06-99	Angle retransmit assembly
304-000-029/A1	1	B	05-05-00	Assembly Positioner High Flow
304-000-060/A3	1	A	19-11-99	Lid assembly with limit switch box
304-000-070/A4	1	C	15-03-01	Position transmitter for pneumatic positioner
304-066-001/A3	1	D	06-02-03	Angle retransmit for positioner
304-066/A3	1	D	09-12-02	PCB for angle retransmit circuit for AP Pneumatic Positioner IS Version
304-103/A3	1	D	28-04-03	Serial number label (Ex Approved)
52-000-045/A2	1	W	20-10-98	GA of -004 Limit Switch Unit
52-000-300/A2	1	H	14-10-96	GA of -001, -005 & -006 Limit Switch Unit
TD119 Page 15	1	A	10-94	Limit switch wiring diagram
TD119 Page 16	1	A	10-94	Inductive proximity switch wiring diagram

10. IDENTITY LABEL

KINETROL "AP" Positioner SURREY, UK
© 0518 Baseefa02ATEX0197
⊕ II 1G g 90°C EEx ia IIC T4 -20°C ≤ Ta ≤ +80°C
Serial No. <input type="text"/> 20 <input type="text"/>



1. CONTENTS

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1	1. Contents
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3	3. Installation –
4	3.1 Mounting of Direct Mounting Units onto Kinetrol Positioner-Type Actuators.
4	3.2 Mounting of Discrete Positioner.
	3.3 Air and Electrical Connections.
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8	" 5.5 Entering and Leaving Setup Mode.
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9	" 5.8 Low Current Point and High Current Point Settings.
10	" 5.9 Reversing Clockwise/Anticlockwise Sense of the Positioner.
10	" 5.10 Changing the Direction of Movement on Loss of Signal.
11	" 5.11 Resetting the Feedback Pot.
11	" 5.12 EEPROM Checksum Error.
12	" 5.13 Selecting and Setting Up Non-Linear Curves.
13	" 5.14 Setting Optional Angle Retransmit Span.
13	6. Maintenance & Troubleshooting.
14-16	7. Baseefa (2001) EC Type Certificate of Conformity.

2. SAFETY REQUIREMENTS

2.1 Certification

This instruction document is for special versions of Kinetrol's EL electropneumatic positioner which are certified for use in areas with a risk of explosion. The unit is approved by Baseefa (2001) as intrinsically safe (IS) to the European classification EEx ia IIC T4 in accordance with ATEX directive 94/1/EC allowing it to be used in Zone 0 areas, provided it is installed according to approved procedures – see relevant pages of Certificate of Conformity No. EX Baseefa 03 ATEX 0098 reproduced at the end of this document, and Harmonised European Standard EN 50039 (equivalent to BS 5501 Part 9) 'Specification for Intrinsically Safe Electrical Systems "i"'.

2.2 Barrier

The unit is powered by compressed air and positioning is controlled by a 4-20mA signal. The angle retransmit option is also loop powered, requiring 8 to 24 volts to drive the 4-20 mA current through it. In hazardous area applications, electrical sources for both circuits must be located outside the hazardous area and the currents passed through two separate approved 28v 300 ohm shunt zener diode barrier devices. These will act to prevent dangerous levels of electrical energy being available inside the hazardous area.

Without approved 28v 300 ohm barriers, the positioner is not safe in a hazardous area.

2.3 Identification & Label

IS approved positioners are identified by a black anodised aluminium label attached to the lid. This is reproduced below. Non-IS versions carry a red label.

Do not use positioners with red labels in hazardous areas.

KINETROL GU9 9NU, UK.	Serial No.	Model No.	Year
	<input type="text"/>	<input type="text"/>	20 <input type="text"/>
EL Electropneumatic Positioner			
CE 0518 Ex II 1G EEx ia IIC T4 Baseefa 03ATEX0098			
Amb. Temp: -20°C TO +70°C			

2.4 Limit Switches and Proximity Sensors

If the unit is fitted with the limit switch option, each limit switch must also be connected via a suitable barrier. This could make in total up to four possible circuits, each of which must be electrically isolated from each other.

If proximity sensors are fitted in place of the limit switches, then these again must be connected separately and electrically isolated and wired via a suitable barrier as defined in section 3.3.

Without approved barriers, these switches are not safe in a hazardous area.

2.5 Environment Conditions

The ambient temperature range allowed for use of this equipment is -20°C to 70°C. It is the responsibility of the user to ensure that the environmental conditions are compatible with the materials used in the construction of this device. If in doubt, contact Kinetrol.

3. INSTALLATION

3.0 Introduction

Positioners can be supplied direct-mounted, or ready to be direct-mounted, onto Kinetrol rotary actuators, or in stand-alone (discrete) form for fitting via a mount kit to any 90 degree rotary actuator. If the positioner is supplied ready mounted on an actuator, sections 2.1 and 2.2 can be bypassed. Positioner-type Kinetrol actuators (ready for direct mounting of positioners) are available in models 03 to 14 inclusive.

These instructions cover the possible use of both metal and moulded feedback coupling. It is expected that most units will contain a moulded coupling.

3.1 Mounting of Direct Mounting Units onto Kinetrol Positioner-Type Actuators

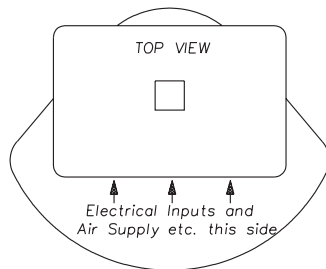


FIGURE 1. Mid Travel Orientation of Actuator Square and Positioner Box.

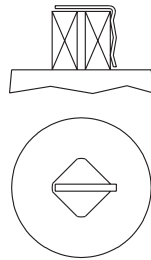


FIGURE 2. Location of Anti-Backlash Spring on 07 & Larger Squares. (Metal Coupling only)

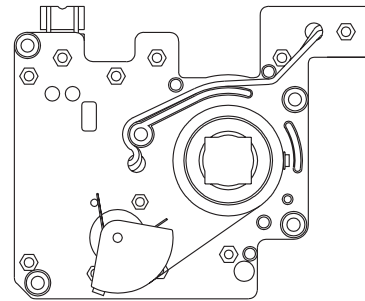


FIGURE 3. Bottom View of Carrier Plate Assembly Showing Shaft and Potentiometer in Mid Travel, Ready to be Fitted to Actuator in Mid Travel.

3.1.1 Move actuator vane to mid travel position, with its output square as shown in Figure 1. This is essential to prevent subsequent error in orienting positioner square.

3.1.2 Remove positioner cover, and undo the five M4 slot-headed screws holding the red plastic carrier plate into the body. Disconnect the two wires to the servo valve, and lift out the whole carrier plate assembly complete with shaft and circuit etc.

3.1.3 Bolt the positioner body to the actuator in the orientation shown in Figure 1, taking care that O-rings are in place to seal the ports into the actuator, and that the actuator shaft is centred in its hole.

3.1.4 (a) Metal coupling versions on 07 and larger models: fit anti-backlash spring over one corner of the actuator square as shown in Figure 2.

(b) Moulded coupling versions: on all direct mount versions, untighten central screw in coupling shaft so that the collet is not closed, and fit coupling over shaft square.

3.1.5 Observe the range of motion available to the positioner shaft, limited by the correct running of the potentiometer quadrant wheel, driven by the stainless steel strap (see Figure 3). Fit the carrier plate/shaft assembly back into the positioner box with the shaft near mid-range, "feeling" the female square in the positioner shaft onto the male actuator square while maintaining its position near mid range. It is essential that the two shafts are correctly oriented relative to each other, since if they are 90 degrees out, the quadrant wheel can be forced too far and damage done to the drive mechanism during subsequent actuator movements. It is possible to fit the positioner correctly with the actuator square at one end of its travel, but experience indicates a high probability of mistaking the direction of movement of the actuator - hence it is strongly advised that the positioner be fitted with the actuator square at the mid-travel position, where there is no ambiguity possible.

Moulded coupling version: Ensure coupling is fully engaged before tightening the central screw to close the collet and therefore removing any backlash.

3.2 Mounting of Discrete Positioner

Design and manufacture of the mount kit between positioner and actuator is outside the scope of this document. It is essential that the shaft of the actuator is well aligned with the positioner shaft, and that the two are coupled together with a minimum of backlash - any backlash acts to deteriorate the performance of the positioner/actuator combination.

It is also essential that the 90 degree travel of the actuator moves the positioner shaft through the correct 90 degree range of travel. The easiest way to ensure that this happens is to mount the discrete unit with the lid and indicator in place - set both the actuator and positioner to mid travel, and mate the two in this orientation. Don't take any chances with this, since misorientation of the positioner shaft and consequent movement beyond its designed range of travel will probably result in damage to the positioner pot drive mechanism.

With moulded coupling versions, the Namur drive or Kinetrol square option is an insert in the coupling which can be removed by releasing the central screw.

3.3 Air and Electrical Connections

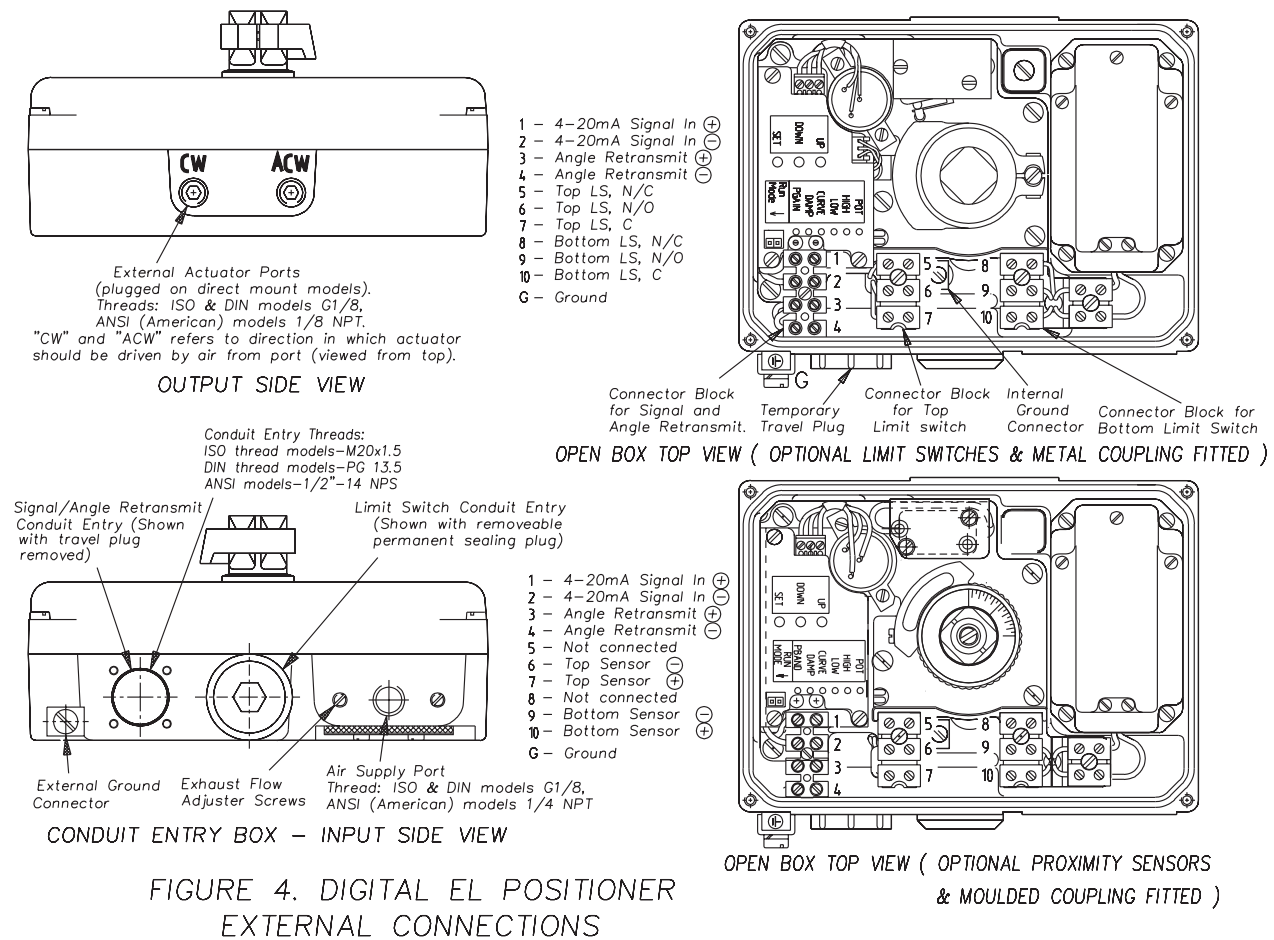


FIGURE 4. DIGITAL EL POSITIONER EXTERNAL CONNECTIONS

3.3.1 Air Supply

Connect air supply (pressure between 3.5 and 7 bar, 50 and 100 psi) to the supply port. It is essential that the air is clean, dry and oil-free. Quality class 3.4.4 (according to ISO standard 8573.1) is easily adequate - this implies 5 micron max. particle size, 3 deg. C dew point max, and 5mg/cubic metre max. oil content.

3.3.2 DIN Plug Option

The DIN plug option is not available on intrinsically safe positioners.

3.3.3 Positioner Signal

The positioner signal must be 4-20mA. The positioner gives a positioning response between 0 and 90 degrees linearly or non-linearly related to the signal. The positioner is loop powered - that is the signal itself supplies all the electrical power, and no separate power source is needed. In order to supply enough power, the unit requires between approximately 6 and 8 volts to drive the signal current through it - it behaves electrically like a resistor in series with a zener diode. A typical 4-20mA source with a 24 DC supply is compatible with this input, and can drive a full signal through both a 28v 300 ohm barrier and the positioner.

3.3.4 Angle Retransmit Supply

The optional angle retransmit circuit is also loop powered, requiring 14 to 24 volts DC to drive the 4-20mA current through it - the current passed is linearly proportional to the actual positioner shaft angle. Like the signal supply, it must also be powered through a separate 28v 300 ohm barrier. The retransmit circuit reads the same angle transducing potentiometer as the positioner circuit - however, the angle retransmit circuit remains functional on loss of positioning signal and/or air supply and conversely the positioner remains functional, as long as a signal is present, even if the angle retransmit circuit is fitted and there is no supply to energise its loop. Nevertheless, the angle retransmit circuit is electrically isolated from the positioner signal circuit.

3.3.5 Feedback Switches

There are two types of feedback switches that can be fitted, these are:

- (a) Two V3 type micro switches with independent adjustable operating strikers. Each switch must be connected to its own barrier - suggested 28v 300 ohm barrier.
- (b) Two V3 type proximity sensors. These are powered from a nominal 8v source and must be connected independently to a barrier having the following maximum parameters: $U_i = 16v$, $I_i = 25mA$, $P_i = 64mW$.

4. SCHEMATIC FUNCTIONAL DIAGRAM

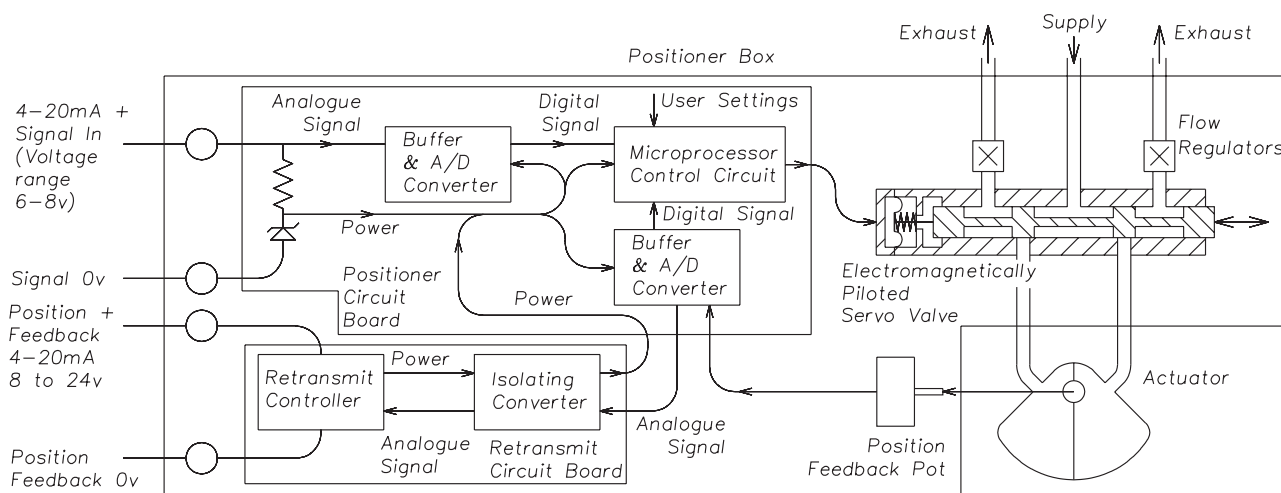


FIGURE 5. SCHEMATIC FUNCTIONAL DIAGRAM OF DIGITAL EL POSITIONER

5. SET UP

5.0 Introduction

When the positioner/actuator combination is installed in its application, set up the control adjustments if necessary. For most applications, it is likely that the factory settings will be satisfactory - the low and high current points are set to give 0-90 degree movement in response to a 4-20mA signal, the flow regulators are set for maximum travel speed, and the proportional gain and damping settings adjusted for a good level of sensitivity and smoothness suitable for most applications. The jumper is set in the "off" position to give a linear characteristic with travel extrapolated beyond the low and high current settings. If you need to change the settings, read the following section carefully.

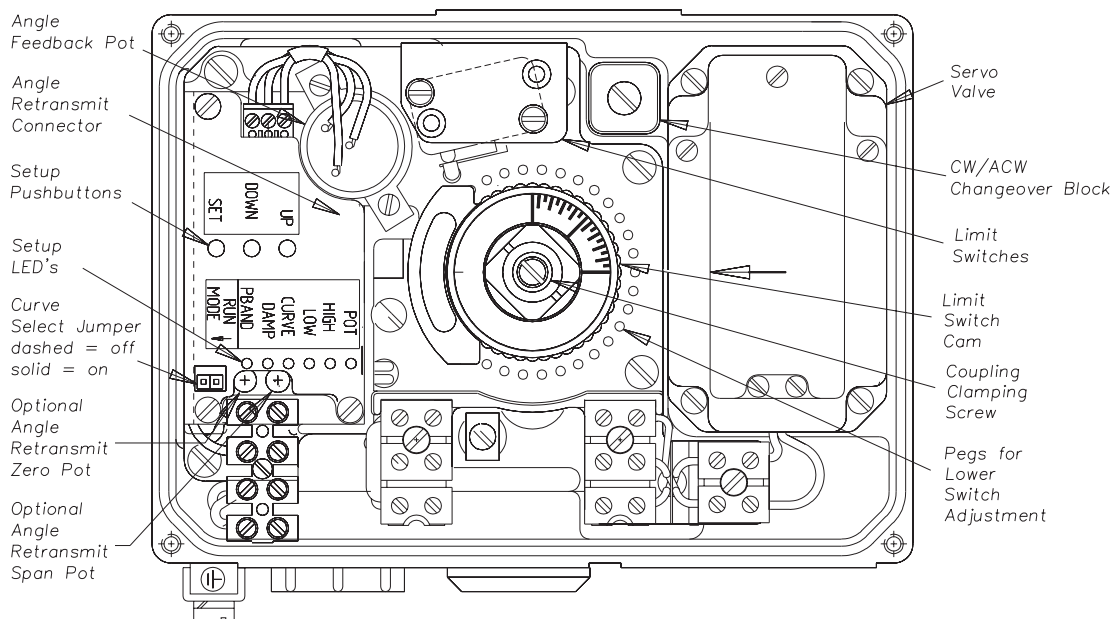


FIGURE 6a. DIGITAL EL CONTROL ADJUSTMENTS. OPEN BOX, TOP VIEW - MOULDED COUPLING.

5.1 Setting Travel Speed.

Set the travel speed using the exhaust flow adjuster screws (see Figure 4.). This only applies if you want to reduce the speed from its supplied maximum factory setting.

5.2 Setting Limit Switch Cams (Optional Equipment).

Limit switch cams are factory set (if fitted) to give end-of-travel switching with one switch at each end. The two possible types of coupling require slightly different approaches to setting.

5.2.1

Moulded coupling cams, shown in figure 6a, can be adjusted using light pressure to rotate in 1 degree increments. Adjust the lower cam first using a screwdriver to lever against special pegs moulded into the carrier plate or use finger pressure. Secondly move the upper cam using finger pressure only. Graduated marks on the top of the coupling are provided to gauge the position of the actuator with the lid removed. This can be lined up with a printer marked on the servo valve lid.

5.2.2

Metal coupling cams are adjusted by releasing the screw shown in figure 6b, moving to desired position and retightening. Set the lever cam first. Ensure the clamp section of the cam does not strike a switch at any part in the actuator's travel.

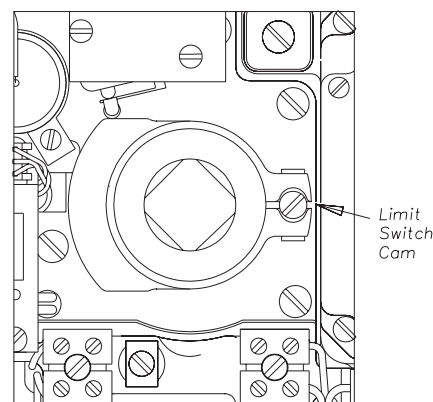


FIGURE 6b. DIGITAL EL SWITCH STRIKER METAL COUPLING. OPEN BOX, TOP VIEW.

5. SET UP (Continued)

5.3 Overview - Electronic Settings.

The EL digital positioner circuit can operate to give actuator position accurately proportional to input current, or it can operate as a non-linear device accurately following one of a number of fast open, or slow open, exponential curves. Linear or non-linear, it can easily be calibrated to scale its operating line, or curve, between any two user-defined points in its operating range. The positioner circuit is powered entirely from the 4-20 mA input signal. It is tuned and calibrated by simple and quick operation of its three pushbuttons, with red LED (light emitting diode) indication of the selected parameter. The positioner can also calibrate itself automatically to the actuator or valve endstops. The actuator dynamic response can be optimised by simple adjustment of the positioner circuit proportional gain and damping variables. All tuning and calibration data is stored digitally, and is retained in non-volatile memory, so that the positioner powers up with all the same settings it had when last powered down.

The positioner may be operated either as a linear or non-linear device. Non-linear operation is enabled by fitting a jumper link to the positioner with the positioner (and position retransmit if fitted) powered down (ie. input current at 0 mA). When the positioner is powered up with the link "on" (see figure 6 for its position), it will then operate as a non-linear device for as long as it remains powered up. Conversely, when the positioner is powered up with the link "off", it will operate as a linear device as long as it remains powered up. Changing the link from "on" to "off" or vice-versa while the circuit remains powered up will not cause a change from non-linear to linear operation - the position of the link is only effective during power up.

Whether operating as a linear or non-linear device, the positioner has two distinct modes of operation, Normal Mode and Setup Mode.

In Normal Mode the positioner simply positions its actuator in response to the 4-20mA input signal. When the positioner is powered up, it always starts in Normal Mode. In Normal Mode, the LEDs are not lit. The positioner stays in Normal Mode until Setup Mode is selected manually.

In Setup Mode the positioner can be tuned and calibrated for its application. Although the position is still controlled, it does not always follow the input signal. When tuning and calibration is complete the positioner should always be returned to Normal Mode for continued normal use.

Operating in Setup Mode is described in the following sections.

5.4 Default Settings and Reset Procedure.

The positioner can be reset with a complete set of default values when powered up in any operating mode, by pressing all three pushbuttons (UP, DOWN and SET) simultaneously. This will overwrite all the existing proportional gain, damping, curve selection and calibration data with default values which are suitable for a typical forward acting linear positioner with mid range values for proportional gain and damping (but not necessarily optimised for a particular application). This procedure is useful in the case where errors in calibration have resulted in positioner behaviour which seems incomprehensible, and it is necessary to return to a predictable basic setup. The positioner should always be tuned and then recalibrated immediately after this resetting process.

5. SET UP (Continued)

5.5 Entering and Leaving Setup Mode.

Setup Mode is selected from Normal Mode by simultaneously pressing the UP and the SET pushbuttons (ie. the two outside ones). This causes the LED labelled PGAIN (short for Proportional Gain) to light continuously. In Setup Mode, each of the parameters in the list below may be selected for adjustment by pressing the UP or DOWN pushbuttons as required. The parameter selected is indicated on the positioner circuit by an LED lighting next to the parameter's name.

PGAIN	-	Proportional Gain
DAMP	-	Damping
CURVE	-	Non-Linear Curve Selection
LOW	-	Low Current Point Calibration
HIGH	-	High Current Point Calibration
POT	-	Feedback Potentiometer Bottom of Range Setting

When the required parameter has been selected for adjustment, the SET pushbutton is pressed to allow adjustments to be made - the LED next to the selected parameter starts to blink, to indicate that Adjust Mode is active. Operation in the Adjust Mode for each parameter is described in the following sub-sections. To leave Adjust Mode, press the SET pushbutton again - this causes the LED to light continuously, and allows movement between parameters again.

Note: There is no Adjust Mode for the feedback potentiometer bottom of range setting, but the automatic endstop finding sequence can be initiated when this parameter is selected.

To leave setup mode (when the adjustments have been made and the SET pushbutton pressed to leave Adjust Mode), press the DOWN pushbutton repeatedly to move down the parameters and off the end of the list - at this point the LEDs cease to light, and the positioner is back in Normal Mode.

5.6 Automatic Endstop Finding Procedure.

The positioner can automatically calibrate itself to range between any mechanical endstops (either the built-in actuator stops, or any external stops built into the application). During the finding sequence, the positioner moves the actuator up to the top and bottom stops and records their positions. It then uses these positions as the HIGH and LOW positions in the calibration data, and applies the existing values for HIGH and LOW current input. Note that if the positioner was reverse acting before the sequence, it remains so after the sequence.

The End Stop Finding Sequence starts when the POT parameter is selected, and the UP and SET pushbuttons (ie. the two outside pushbuttons) are pressed simultaneously. The POT LED starts to blink, and the actuator moves steadily upscale from its set position. When its movement is stopped by the top physical endstop, the positioner waits briefly, then moves the actuator steadily downscale until it runs against the bottom physical endstop, where again it waits briefly, and finally moves quickly back to the set position. The calibration data is written to non-volatile memory while the actuator pauses at its bottom stop.

If the positioner is in service on an application where excursions to the endstops will be disruptive, avoid initiating this sequence.

5.7 Proportional Gain and Damping Settings (for Smoothness and Sensitivity).

Select Setup Mode, and the first parameter selected is automatically PGAIN - Proportional Gain. Press the SET pushbutton, and the PGAIN LED will start blinking. The value of the parameter can now be increased or decreased by pressing the UP or DOWN pushbuttons as required. There are twenty nine (29) PGAIN settings which can be selected, the setting altering by a factor of about 1.1 each time the UP or DOWN button is pressed. The default setting lies in the middle of the range, giving fourteen settings above and fourteen below. Any button presses beyond the last (fourteenth) will have no effect.

Note: As soon as the UP or DOWN pushbutton is pressed, the new PGAIN value is stored in non-volatile memory and is retained even if the positioner is deenergised before leaving Adjust and Setup Modes.

5. SET UP (Continued)

5.7 Proportional Gain and Damping Settings (for Smoothness and Sensitivity) - continued

The positioner is active while adjusting the PGAIN setting, and continues to follow the input signal. This gives the opportunity to change the input signal in a manner typical of the application, and to observe qualitatively the response of the positioner, and how it has been affected by changing the PGAIN setting, so as to optimise the response. Pressing the UP button maximises the sensitivity and accuracy, at the cost of increased jerkiness of response when the signal is ramped smoothly, and if you go too far this increases the proportional gain so much that the positioner becomes unstable and hunts around the position set by the signal. Pressing the DOWN button maximises smoothness during ramping of the signal, at the cost of losing rapidity of response to small changes in signal. When the right setting has been found, press the SET button again to leave Adjust Mode - the PGAIN LED will now light continuously.

The DAMP (damping) parameter should be set after the PGAIN has been optimised. In Setup Mode select the DAMP parameter (second up from PGAIN) by pressing the UP button until the DAMP LED lights continuously. Press the SET button to select Adjust Mode, and the DAMP LED will blink. Damping can be increased and decreased by pressing the UP or DOWN buttons. There are twenty nine damping settings which can be selected, the setting altering by a factor of 1.1 each time the UP or DOWN pushbutton is pressed. The default setting lies in the middle of the range, giving fourteen settings above and fourteen below. Any button presses beyond the last (fourteenth) setting will have no effect.

Note: As soon as the UP or DOWN button is pressed, the new DAMP value is stored in non-volatile memory, and is retained even if the positioner is deenergised before leaving Adjust and Setup Modes.

The positioner is active while adjusting the DAMP setting, and continues to follow the input signal. This allows the signal to be waggled to optimise the response while still adjusting the DAMP setting. Try stepping the signal suddenly so that the positioner approaches setpoint at full speed having travelled 45 degrees or more, and adjust the DAMP setting to just avoid overshoot here. Try this travelling up and downscale. When the right setting has been found, press the SET button again to leave Adjust Mode - the DAMP LED will now light continuously.

5.8 Low Current Point and High Current Point Settings. (Replaces Zero and Span Adjustment).

The positioner characteristic can be accurately calibrated by setting two points, the Low Current Point (LCP) and the High Current Point (HCP). Each point is defined by a position and an input current. These points can lie anywhere in the range of travel of the actuator, and in the input signal range of 4 to 20 mA. The only other restriction is that the input current at the HCP must exceed the input current at the LCP by at least 5mA. To obtain the best accuracy, it is necessary to select the two points as far apart as possible. In both linear and non-linear operation this allows forward acting, reverse acting, and forward or reverse acting split range characteristics to be implemented. Table 1 below shows some illustrative examples.

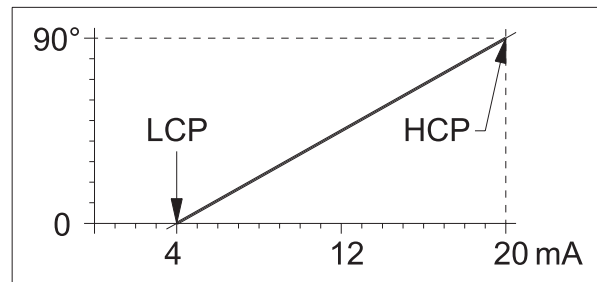


Figure 7. Illustration of LCP and HCP

Table 1. Various Sets of LCP and HCP Settings

Low Current Point		High Current Point		Description
Input Current, mA	Angle Degrees	Input Current, mA	Angle Degrees	
4	0	20	90	Forward Acting, 100% range
4	90	20	0	Reverse Acting, 100% range
4	0	12	90	Split Range Forward Acting, 50% bottom range
4	90	12	0	Split Range Reverse Acting, 50% bottom range
12	0	20	0	Split Range Forward Acting, 50% top range
12	90	20	0	Split Range Reverse Acting, 50% top range
4	0	20	45	Forward Acting, 200% range
4	45	20	0	Reverse Acting, 200% range

5. SET UP (Continued)

5.8 Low Current Point and High Current Point Settings. (continued).

To set LCP, select the LOW parameter in Setup Mode by pressing the UP button until the LOW LED lights continuously. Press the SET button to select Adjust Mode, and the LOW LED will blink. Adjust the input signal current within the range 4-20mA to the value you want to define for the Low Current Point - note that changes in input current within the 4-20 mA band do not result in positioner movement at this stage - the positioner holds the actuator at the angle where it was before Adjust Mode was selected, irrespective of input current. Press the UP or DOWN buttons to move the positioner to the angle you want to define for the Low Current Point - if you hold the button down continuously, the positioner will traverse the actuator steadily, or if you give short blips it will move approximately 1/40 degree (one fortieth) for each blip, to allow precise edging into exactly the required position. When the actuator is in exactly the position you want, and the signal is adjusted to exactly the value you want (this can be readjusted after the position has been set if you want), press the SET button again to record the signal and position as the Low Current Point, whereupon the actuator will make a small leap and then settle back to the LCP again, the positioner will return to Setup Mode, and the LOW LED will light continuously. The positioner will now respond to its input signal again.

Note: As soon as the SET button is pressed, the LCP position and signal are stored in non-volatile memory, and are retained even if the positioner is deenergised before leaving Setup Mode.

To set HCP, select the HIGH parameter in Setup Mode by pressing the UP button until the HIGH LED lights continuously. Press the SET button to select Adjust Mode, and the HIGH LED will blink. Adjust the input signal current within the range 4-20mA to the value you want to define for the High Current Point - note that changes in input current within the 4-20 mA band do not result in positioner movement at this stage - the positioner holds the actuator at the angle where it was before Adjust Mode was selected, irrespective of input current. Press the UP or DOWN buttons to move the positioner to the angle you want to define for the High Current Point - if you hold the button down continuously, the positioner will traverse the actuator steadily, or if you give short blips it will move approximately 1/40 degree (one fortieth) for each blip, to allow precise edging into exactly the required position. When the actuator is in exactly the position you want, and the signal is adjusted to exactly the value you want (this can be readjusted after the position has been set if you want), press the SET button again to record the signal and position as the High Current Point, whereupon the actuator will make a small leap and then settle back to the HCP again, the positioner will return to Setup Mode, and the HIGH LED will light continuously. The positioner will now respond to its input signal again.

Note: As soon as the SET button is pressed, the HCP position and signal are stored in non-volatile memory, and are retained even if the positioner is deenergised before leaving Setup Mode.

5.9 Reversing Clockwise/Anticlockwise Sense of the Positioner.

The LCP and HCP settings described in the previous section can be used with complete success to reverse the sense of the positioner, using settings such as the reverse settings listed in Table 1. However, this will not change the direction of movement on loss of signal - see the next section for how to set this as desired.

5.10 Changing the Direction of Movement on Loss of Signal.

On being de-energised with air supply still fully pressurised (ie. on disconnection of the signal, or when the signal falls below 3.5mA), the positioner moves the actuator in a direction set by the deenergised position of the servo valve. This direction of movement is independent of the LCP and HCP settings described in the sections above.

Movement on loss of air pressure is unpredictable for double acting positioners - if position needs to be held on loss of pressure, then it is necessary to order an external pressure sensing lockout valve assembly, and if a definite end of travel position is required on loss of pressure, then it is necessary to order a spring return unit.

5. SET UP (Continued)

5.10 Changing the Direction of Movement on Loss of Signal (continued).

On double acting actuators, the unit is factory set to move clockwise (as viewed from the positioner lid) on loss of signal.

On spring return actuators, the unit is factory set to move in the spring return direction on loss of air, or on loss of both air and signal, but it is set to move clockwise (as viewed from the positioner lid) irrespective of spring direction on loss of signal only.

To change the direction of movement on loss of signal, carry out the following steps:

- (1) Disconnect air supply and signal.
- (2) Undo screw holding down changeover block (see Figure 6).
- (3) Rotate changeover block 90 degrees, taking care to keep rubber gasket lined up with holes in body.
- (4) Re-tighten screw holding down changeover block.
- (5) Undo outer two angle pot wire terminal screws, swap blue and yellow wires over to reverse sense of pot connection, and re-tighten screws.
- (6) Re-connect air supply and signal, and carry out Resetting Feedback Pot procedure (see next section).

5.11 Resetting the Feedback Pot.

This procedure is necessary only if the pot has been moved from its factory setting, or if the direction of movement on loss of signal has been changed as instructed in the previous section.

The positioner circuit needs the feedback pot to be positioned at the correct angle, such that its wiper reads the right voltage when the actuator is against its downscale endstop - ie. against the endstop it reaches when the air supply is connected, but the signal is disconnected. The circuit itself can identify this voltage when it is powered up in Setup Mode with the POT parameter selected - when the pot is adjusted correctly, the POT LED changes from lighting continuously to blinking.

To set the pot, first move the actuator to the downscale endstop by connecting the air supply and disconnecting the signal. When it is in this position, hold it there by fitting a keeper plate if the unit has a spring return set to fail against the opposite stop, or by simply disconnecting the air supply if the unit is double acting or has a spring return set to fail against this stop. Re-connect the signal, and set to any current between 4 and 20 mA. Select Setup Mode, and press the UP button until the POT LED lights continuously. Unclamp the pot clamp screws, taking care not to unscrew them too far such that they disengage from the nuts in the carrier plate. Rotate the pot until the POT LED changes from continuous to blinking illumination. Re-tighten the clamp screws, and reconnect the air supply. If the unit needed a keeper plate, drive it downscale by disconnecting the signal, and then remove the keeper plate with the air supply on.

5.12 EEPROM Checksum Error

Each time calibration or setting data is written to EEPROM (non-volatile memory) by the positioner circuit, a checksum of all EEPROM data is calculated and written to EEPROM. Hence if there is a power supply (ie. signal) interruption during the EEPROM write procedure, the checksum will not be written correctly, or at all. After the interruption, during its initialisation routines the positioner carries out a checksum calculation of the data stored in EEPROM. If the newly calculated checksum and the stored checksum are not identical, the positioner enters an error routine, and does not start Normal Mode operation. This condition is indicated by the LEDs lighting one after the other in sequence. If this condition is achieved, carry out the reset procedure described in section 5.3 , and then recalibrate as detailed in sections 5.5 to 5.8.

5. SET UP (Continued)

5.13 Selecting and Setting Up Non-Linear Curves.

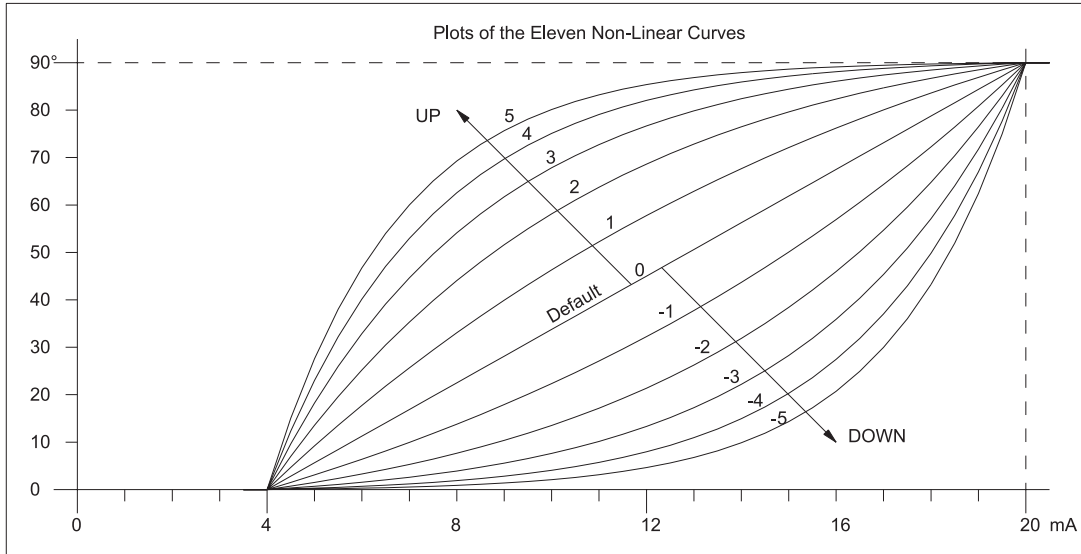


Figure 8. Plots of the Elevent Non-Linear Curves

The positioner may be operated either as a linear or non-linear device. Non-linear operation is enabled by fitting a jumper link to the positioner with the positioner (and position retransmit if fitted) powered down (ie. input current at 0 mA). When the positioner is powered up with the link "on" (see figure 6 for its position), it will then operate as a non-linear device for as long as it remains powered up. Conversely, when the positioner is powered up with the link "off", it will operate as a linear device as long as it remains powered up. Changing the link from "on" to "off" or vice-versa while the circuit remains powered up will not cause a change from non-linear to linear operation - the position of the link is only effective during power up.

When the positioner is powered up with the jumper link "on" and the air supply connected, then any one of eleven characteristic curves may be selected. Press the SET button to go into Setup Mode, and select the CURVE variable by pressing the UP button until the CURVE LED lights continuously. It is easiest to select the required curve from the eleven available by setting the input signal current to midway between the LCP and HCP signal current values - for instance, if the LCP is 4 mA and the HCP is 20 mA, then set the input current to 12 mA for this purpose. With the signal set at midway between LCP and HCP values, select Adjust Mode by pressing the SET button, and the CURVE LED will now blink. The default curve is in fact the linear curve midway between the other non-linear curves (see Figure 8). To select one of the other curves, press the UP or the DOWN button, and observe the movement of the positioner as its position conforms to the intersection of the mid value signal with the different curves selected from those defined in Figure 8. Each button press steps from one curve to the next one, until at the last curve further button presses have no effect. When the desired curve has been selected, press the SET button to return to Setup Mode.

Note: As soon as the UP or DOWN button has been pressed to select a particular curve, the new curve selection is stored in non-volatile memory and is retained even if the positioner is de-energised before leaving Adjust and Setup Modes.

Each curve is scaled between the two calibration points LCP and HCP. If input currents are reduced below LCP current or increased above HCP current, the positioner stops dead at the LCP or HCP position respectively.

This is in fact the difference between the linear curve selected as the default "non-linear" curve, and the linear curve selected when the positioner is powered up with the jumper "off" - the latter gives positions extrapolated on the same linear characteristic beyond the LCP and HCP positions for signals beyond the LCP and HCP signals, whereas the former stops dead at the LCP and HCP positions.

5. SET UP (Continued)

5.14 Setting Optional Angle Retransmit Span And Zero Adjustments.

The angle retransmit circuit is mounted directly underneath the positioner circuit, and its ZERO and SPAN preset pots are accessible using a small instrument screwdriver through the two access holes in the positioner circuit (see Figure 6). Connect the air supply, positioner signal and angle retransmit reader supply. To set the ZERO, move the positioner to its minimum signal position (usually 4mA), and set the ZERO preset pot to give the desired retransmit current. Then set the SPAN by moving the positioner to its maximum signal position (usually 20 mA), and adjusting the SPAN preset pot to give the desired retransmit current. Recheck and readjust these two settings until both are correct - as the SPAN is adjusted, it has a small effect on the ZERO reading, and vice-versa, so a few readjustments may be necessary.

The angle retransmit circuit is fitted with a jumper, which should be fitted to bridge its two pins if you want the circuit to read 4-20 mA over 45 degrees or near, rather than the usual 90 degrees. The range adjustment pot is adjustable to give ranges in between these two values. To gain access to this jumper, it is necessary to remove the whole carrier plate assembly from the positioner - see Section 2.1 for instructions on this.

6. MAINTAINANCE AND TROUBLESHOOTING

The EL positioner is designed to be maintainance free during a long life, if it is supplied with clean, dry oil-free air, and electrical signals free of noise and high voltage spikes.

When the lid is removed, take care not to wipe all grease from shaft lip seal.

Table 2 is a troubleshooting guide, which aims to assist only with simple easily remedied problems. If problems persist, contact Kinetrol or a Kinetrol distributor for further assistance.

TABLE 2. Troubleshooting Guide.	
<p>Failure to move when signal and air are connected:</p> <ul style="list-style-type: none"> - Check air pressure - must be above 50psi./3.5 Bar. - Check signal is connected with correct polarity. - Check signal is really above 4 mA - Discrete units - is shaft connected in correct orientation? The feedback pot strap may need replacing if orientation is incorrect. - Has main feedback pot been rotated, or does it need rotating because the unit has been subjected to change in direction of movement on loss of signal? See Section 4.11 - Resetting Feedback Pot. - Is air supply clean, dry, and oil free ? 	
<p>Unit moves slower than expected upscale or downscale:</p> <ul style="list-style-type: none"> - Check air pressure - above 50psi /3.5 Bar ? ° - Check flow adjuster screws - has one been screwed in? - Is air supply clean, dry and oil free ? If not there is a possibility that the positioner servo has been damaged. 	
<p>Movements are too jerky:</p> <ul style="list-style-type: none"> - Adjust proportional gain to increase smoothness - then reset damping and setpoints as instructed in Section 4. 	
<p>Lack of sensitivity to changes in signal:</p> <ul style="list-style-type: none"> - Adjust proportional gain to increase sensitivity - then reset damping, and setpoints as instructed in Section 4. 	
<p>Set point is overshoot when positioner moves rapidly:</p> <ul style="list-style-type: none"> - Adjust damping to eliminate overshoot. 	

7. BASEEFA (2001) EC TYPE CERTIFICATE OF CONFORMITY - Page 1

Certificate Number
Baseefa03ATEX0098



Issued 16th May 2003
Page 1 of 3

1 **EC - TYPE EXAMINATION CERTIFICATE**

2 **Equipment or Protective System Intended for use in Potentially Explosive Atmospheres
Directive 94/9/EC**

3 EC - Type Examination Certificate **Baseefa03ATEX0098**
Number :

4 Equipment or protective system: **EL ELECTROPNEUMATIC POSITIONER**

5 Manufacturer : **KINETROL LIMITED**

6 Address : **Trading Estate, Farnham, Surrey, GU9 9NU, England**

7 This equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

8 Baseefa (2001) Ltd. Notified body number 1180 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential Report No. **02(C)0445**

9 Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN50014:1997 + Amendments 1 & 2 EN50020:2002 EN50284:1999

except in respect of those requirements listed at item 18 of the Schedule.

10 If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions of safe use specified in the schedule to this certificate.

11 This EC - TYPE EXAMINATION CERTIFICATE relates only to the design and construction of the specified equipment or protective system. If applicable, further requirements of this Directive apply to the manufacture and supply of this equipment or protective system.

12 The marking of the equipment or protective system shall include the following :

 **H I G EEx ia IIC T4 (-20°C ≤ Ta ≤ +70°C)**

This certificate may only be reproduced in its entirety, without any change, schedule included.

Baseefa (2001) Ltd. Customer Reference No. **0622**

Project File No. **02/0445**

This certificate is granted subject to the general terms and conditions of Baseefa (2001) Ltd. It does not necessarily indicate that the equipment may be used in particular industries or circumstances.

Baseefa (2001) Ltd.

Health and Safety Laboratory Site, Harpur Hill,
Buxton, Derbyshire SK17 9JN
Telephone +44 (0) 1298 28255 Fax +44 (0) 1298 28216
e-mail info@baseefa2001.biz web site www.baseefa2001.biz
Registered in England No. 4305578 at 13 Dovedale Crescent, Buxton,
Derbshire. SK17 9BJ

pp.

R S SINCLAIR
DIRECTOR
On behalf of
Baseefa (2001) Ltd.

ISSUE
A

RCC
08/07/03

KINETROL

Trading Estate, Farnham, Surrey, England

Doc.No.TD 120
Page 14 of 16

7. BASEEFA (2001) EC TYPE CERTIFICATE OF CONFORMITY - Page 2

Certificate Number
Baseefa03ATEX0098



Issued 16th May 2003
Page 2 of 3

13

Schedule

14

Certificate Number Baseefa03ATEX0098

15 Description of Equipment or Protective System

The EL Electropneumatic Positioner is designed to drive a rotary or linear actuator to a position set by a 4 – 20 mA input signal and hold it there until the input signal changes.

The apparatus comprises a microprocessor based digital positioner circuit which controls a servo valve according to the 4 – 20 mA input signal and an optional angle retransmit circuit which provides a linear 4-20mA feedback signal which is electrically isolated from the positioner signal loop. The circuits are mounted on two PCBs which are located inside the positioner enclosure together with the position feedback potentiometer and the servo valve. There are also two optional limit switches (either micro-switches or Pepperl & Fuchs NJ 2-V3-N Type 1 inductive proximity switches to Certificate No. PTB00ATEX2032X) which form two separate intrinsically safe circuits which are electrically isolated from the input and feedback signals.

External electrical connections are made via separate terminal blocks inside the positioner enclosure.

Input parameters

Angle Retransmit circuit:

$U_i = 28V$ $C_i = 0$
 $I_i = 93.3mA$ $L_i = 0$
 $P_i = 0.653W$

Limit Switches (micro-switches):

$U_i = 28V$ $C_i = 0$
 $I_i = 93.3mA$ $L_i = 0$
 $P_i = 0.653W$

Limit Switches (Pepperl & Fuchs NJ 2-V3-N Type 1 inductive proximity switches to Certificate No. PTB00ATEX2032X)

$U_i = 16V$ $C_i = 40nF$
 $I_i = 25mA$ $L_i = 50\mu H$
 $P_i = 34mW$

16 Report Number

02(C)0445

17 Special Conditions for Safe Use

None

18 Essential Health and Safety Requirements

All relevant Essential Health and Safety Requirements are covered by the standards listed at item 9.

7. BASEEFA (2001) EC TYPE CERTIFICATE OF CONFORMITY - Page 3

Certificate Number
Baseefa03ATEX0098



Issued 16th May 2003
Page 3 of 3

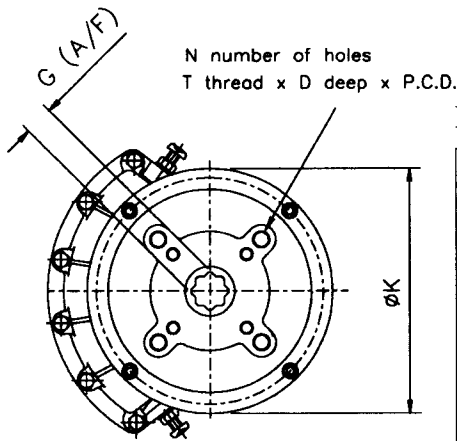
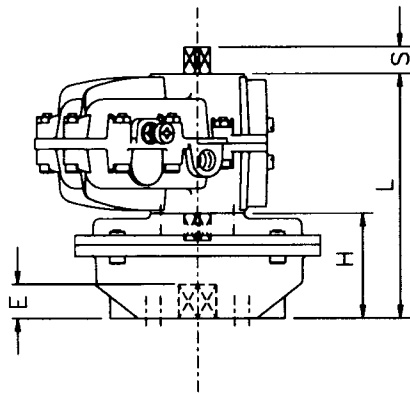
19 Drawings and Documents

Number	Sheet	Issue	Date	Description
91-000-001/A1	1	P	27.03.03	General Assembly
91-000-003/A3	1	E	11-4-95	Coil Assembly
91-000-010/A3	1	D	14-04-03	Angle Retransmit Assembly
91-000-082/A2	1	C	10-03-03	LS Option Assembly (Proximity Switches)
91-000-135/A1	1	D	25-06-02	Servo Valve Assembly
91-000-185/A2	1	A	06-01-03	LS Option Assembly (Otehall Switches)
91-000-191/A2	1	A	06-01-03	Carrier Plate Assembly Moulded Coupling
91-000-200/A3	1	B	10-03-03	Wiring Diagram
91-000-208/A2	1	A	06-01-03	LS Option Assembly (Proximity Sensors)
91-000-210/A2	1	A	13-05-03	LS Option Assembly (Mechanical Limit Switches)
91-000-211/212/A2	1	A	13-05-03	05 & 07 Models Carrier Plate Assembly
91-017-001/A3	1	H	25-11-98	Basic Wound Coil (Low Inductance Variant)
91-048-001	1	B	05-08-94	Top & Bottom IS Switch Assemblies
91-048-002/A3				
91-048-005	1	A	03-03-03	Top & Bottom LS Switch Assemblies (Otehall Switches)
91-048-006/A3				
91-158-001/A3	1	B	14-04-03	PCB Surface Mount Assembled
91-159-001/A3	1	A	10-03-03	Isolated Angle Retransmit Surface Mount
91-158/A3	1	A	18-09-02	PCB Surface Mount
91-159/A3	1	A	18-09-02	Isolated Angle Retransmit PCB
91-160/A3	1	D	15-05-03	Certification Label
91-161-001/A4	1	B	27.02.03	5V Regulator Demand & Feedback Amps Schematic
91-161-002/A4	1	B	27.02.03	MCU, Reset & Clock EEPROM, A/D, LEDs Schematic
91-162-001/A4	1	B	27.02.03	11.1V Regulators & Signal Circuits Schematic
91-162-002/A4	1	B	27.02.03	Current Controlled Switching Supply Circuit Schematic
91-162-003/A4	1	B	27.02.03	Positioner Interface Protection Circuits Schematics
91-168/A3	1	B	12-05-03	Extra Information Label for Inside Lid (Proximity Sensor Types)
91-176/A3	1	A	12-05-03	Extra Information Label for Inside Lid (Mechanical Limit Switch Types)
91-177/A3	1	A	12-05-03	External Wiring Label for Inside Lid (Showing Optional Mechanical Limit Switches)
91-179/A3	1	A	12-05-03	External Wiring Label for Inside Lid (Showing Optional Proximity Sensors)
650-098-8	1	A	09-04-03	Switch Assemblies (IS Proximity, Top & Bottom)
650-098-9/A3				

Title: ISO FLANGE FEMALE SPRING RETURN ACTUATOR DIMENSIONS

Metric Units

Actuator Model	ISO Flange No.	L mm	H mm	ØK mm	G mm	S mm	E mm	N No.	T ISO	D mm	PCD mm
031F120	F03 F05	102	42	107	11	12	12	4	M5/M6	8/10	36/50
031F180	F04	102	42	107	11	12	12	4	M5	10	42
051F120	F03/F05 F07	117	50	118	14	13	16	4	M5/M6 /M8	10/12 /13	36/50 /70
051F180	F04	117	50	118	14	13	16	4	M5	10	42
071F120-4000	F03 F05 F07	150	50	118	14	20	16	4	M5/M6 M8	10/12 13	36/50 /70
071F120	F05 F07	182	82	152	17	20	19	4	M6/M8	10/13	50/70
091F120-4200	F05 F07	208	82	152	17	26	19	4	M6/M8	10/13	50/70
091F120	F07 F10	218	92	200	22	26	24	4	M8/M10	13/16	70/102
101F120-5800	F07 F10	265	92	200	22	26	24	4	M8/M10	13/16	70/102
101F120	F10	285	112	206	22	26	25	4	M10	16	102
121F120-4300	F10	248	92	200	22	26	24	4	M10	16	102
121F120-4400	F10	340	184	200	22	31	24	4	M10	16	102
121F120	F10	293	136	258	22	31	25	4	M10	16	102
121F180	F12	293	136	258	22	31	25	4	M12	20	125
141F120-4900	F12	417	217	258	27	38	29	4	M12	20	125
141F120-5000	F12	337	136	258	22	38	25	4	M12	20	125
161F120*	F14	486	212	524	36	55	38	4	M16	24	140
181F120-7000*	F16	572	212	524	46	78	48	4	M20	30	165
181F120*	F16	672	312	524	46	78	48	4	M20	30	165
200F120-7200*	F25	932	312	524	55	100	57	8	M16	24	254
201F120-7300*	F25	1032	412	524	55	100	57	8	M16	24	254
201F120*	F25	1132	512	524	55	100	57	8	M16	24	254



NOTES :
 CONTACT KINETROL FOR SPECIAL FEMALE COUPLING DRIVE SHAPES.
 ALL FEMALE DRIVES ARE "STAR" TYPE EXCEPT FOR SIZES MARKED "*" WHERE SQUARE ORIENTATION IS SHOWN BY DIMENSION "G".

English Units

Actuator Model	ISO Flange No.	L inch	H inch	ØK inch	G inch	S inch	E inch	N No.	T UNC	D inch	PCD inch
039F120	F03/F05	4.02	1.65	4.21	0.433	0.47	0.47	4	10-24 1/4	0.31/0.39	1.41/1.97
039F180	F04	4.02	1.65	4.21	0.433	0.47	0.47	4	10-24	0.39	1.65
059F120	F03/F05 /F07	4.61	1.97	4.65	0.551	0.51	0.63	4	10-24 1/4 5/16	0.47/0.51	1.42 1.97/2.76
059F180	F04	4.61	1.97	4.65	0.551	0.51	0.63	4	10-24	0.39	1.65
079F120-4000	F03/ F05/F07	5.91	1.97	4.65	0.551	0.79	0.63	4	10-24 1/4 5/16	0.39 0.47/0.51	1.42 1.97/2.76
079F120	F05/F07	7.17	3.23	5.98	0.669	0.79	0.75	4	1/4 5/16	0.39	1.97/2.76
091F-120-4200	F05/F07	8.19	3.23	5.98	0.669	1.02	0.75	4	1/4 5/16	0.39/0.51	1.97/2.76
099F120	F07/F10	8.58	3.62	7.87	0.866	1.02	0.94	4	5/16 3/8	0.51/0.63	2.76/4.01
109F120-5800	F07/F10	10.43	3.62	7.87	0.866	1.02	0.94	4	5/16 3/8	0.51/0.63	2.76/4.01
109F120	F10	11.22	4.41	8.11	0.866	1.02	0.98	4	3/8	0.63	4.02
129F120-4300	F10	9.76	3.62	7.87	0.866	1.02	0.94	4	3/8	0.63	4.02
129F120-4400	F10	13.39	7.24	7.87	0.866	1.22	0.94	4	3/8	0.63	4.02
129F120	F10	11.54	5.35	10.16	0.866	1.22	0.98	4	3/8	0.63	4.02
129F180	F12	11.54	5.35	10.16	0.866	1.22	0.98	4	1/2	0.79	4.92
149F120-4900	F12	16.42	8.54	10.16	1.063	1.50	1.14	4	1/2	0.79	4.92
149F120-5000	F12	13.27	5.35	10.16	0.866	1.50	0.98	4	1/2	0.79	4.92
169F120*	F14	19.13	8.35	20.63	1.417	2.17	1.50	4	5/8	0.94	5.51
189F120-7000*	F16	22.52	8.35	20.63	1.811	3.07	1.89	4	3/4	1.18	6.50
189F120*	F16	26.46	12.28	20.63	1.811	3.07	1.89	4	3/4	1.18	6.50
209F120-7200*	F25	36.70	12.28	20.63	2.165	3.94	2.24	8	5/8	0.94	10.00
209F120-7300*	F25	40.63	16.22	20.63	2.165	3.94	2.24	8	5/8	0.94	10.00
201F120*	F25	44.57	20.16	20.63	2.165	3.94	2.24	8	5/8	0.94	10.00

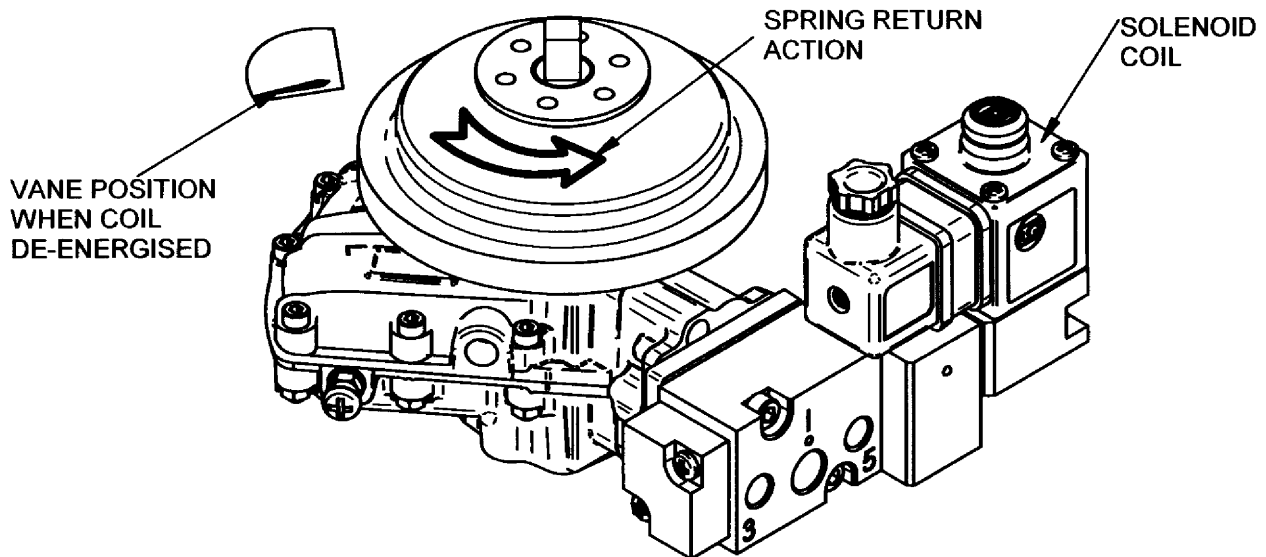
Issue B
 Signed *RLC*
 Date 04/11/03

KINETROL Trading Estate Farnham Surrey England

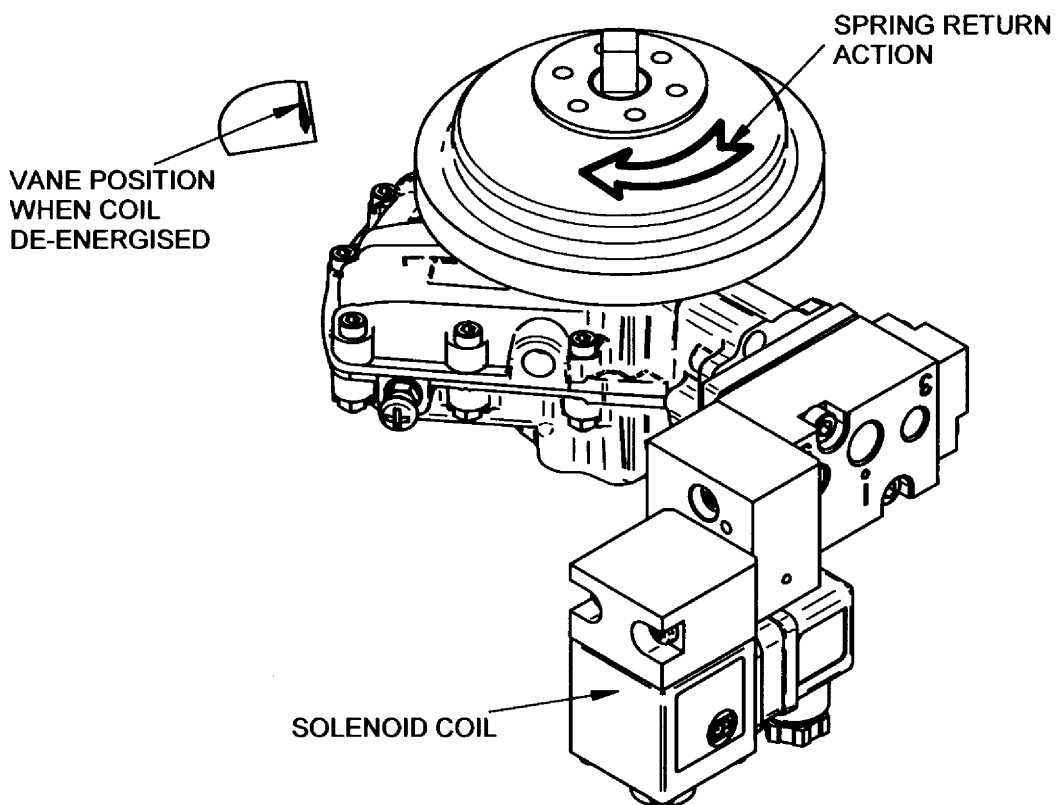
Doc.No. TD 121
 Page 1 of 1

ACTUATOR DIRECTION OF ROTATION WITH RGS C15 SOLENOID VALVE USING NAMUR ADAPTOR (SP 638)

ACTUATOR VANE MOVES CLOCKWISE
WHEN COIL IS ENERGISED



ACTUATOR VANE MOVES ANTI-CLOCKWISE
WHEN COIL IS ENERGISED



ISSUE
B

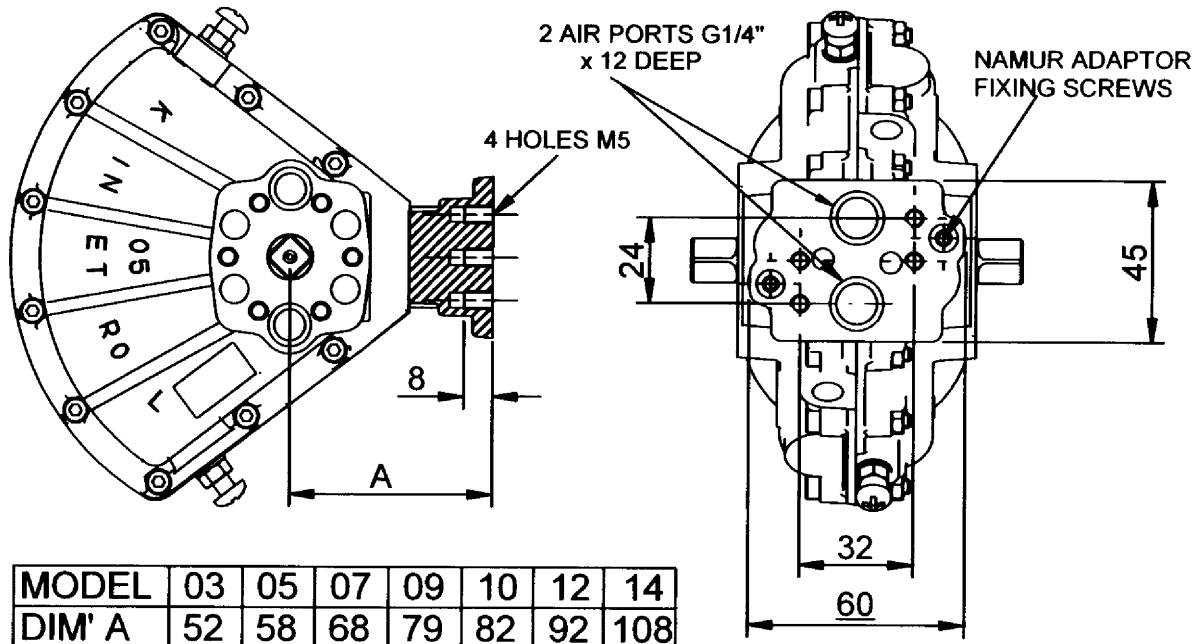
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KINETROL

Trading Estate Farnham Surrey England

SHEET No.
TD122

DETAILS OF NAMUR ADAPTOR (SP 638) FOR KINETROL 03 TO 14 ACTUATORS

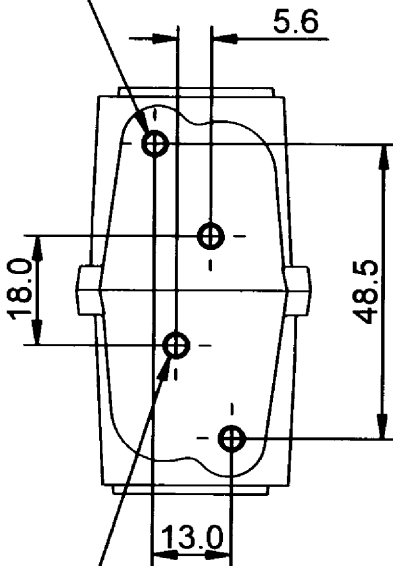


MODEL	03	05	07	09	10	12	14
DIM' A	52	58	68	79	82	92	108

INSTALLATION INSTRUCTIONS

FIRSTLY, FIT PRESSURE PLUGS TO NORMAL ACTUATOR SIDE PORTS

2 M4 x 6 DEEP
NAMUR ADAPTOR
MOUNTING HOLES



2 AIR
PORTS M4
(NORMALLY
PLUGGED)

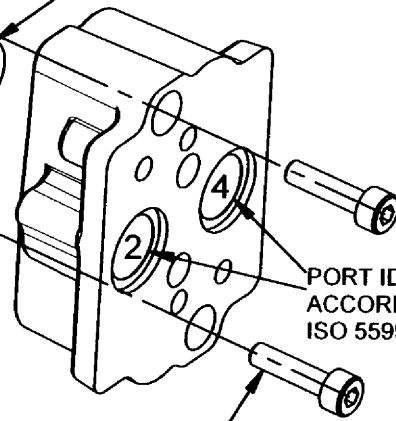
03 TO 14 ACTUATOR
(NOTE: REMOVE AIR
PORT PLUG
SCREWS)

NO SILASTIC
REQUIRED WITH
THIS BLOCK



REMOVE DUST
PROTECTION
LABEL BEFORE
CONNECTING
PORTS

2 O-RINGS (USE GREASE
TO RETAIN DURING ASSY)



PORT IDENTIFICATION
ACCORDING TO
ISO 5599-2:2001

2 M4 X 16 SHC
SCREWS (CHEMICALLY
LOCK WITH LOCTITE
222 OR EQUIVALENT)

ISSUE
B

10.02.04

KINETROL

Trading Estate Farnham Surrey England

SHEET No.
TD123

Title: EU ATEX DIRECTIVE 94/9/EC - DECLARATION OF CONFORMITY

Non Electrical

The non-electrical rotary actuator range of products manufactured by Kinetrol, as listed below, conform to the requirements of the ATEX Directive 94/9/EC.

Equipment Group: II (Non-mining). Explosive Gas and Dust Atmospheres (GD). Gases Group: IIC. Quality Assurance Notification No. SIRA 02 ATEX M166.

Actuators & Spring Units - ATEX Category 1 - Certificate No. BASEEFA 03 ATEX 0443X.

Actuators, Spring Units & other products - ATEX Category 2 - Self cert. report No. KTR118 ATEX.

Clear Cone Monitor: SP493-1 ATEX Category 3 - Self certificate report No. KTR120 ATEX.

" " " SP493-2/3 ATEX Category 2 - Gas Group IIB – Self cert. report No. KTR124 ATEX.

Pneumatic switch box assemblies – ATEX category 2 – self-certification report No. KTR121 ATEX.


	Category of Approval for each Actuator Size													
	01	02	03	05	07	08	09	10	12	14	16	18	20	30
**0-100	1	1	1	1	1	1	1	-	1	1	2	2	2	2
**9-100	1	1	1	1	1	1	1	1	1	1	2	2	2	2
**1-100	-	-	1	1	1	-	1	1	1	2	2	-	-	-
**2-100	-	-	1	1	1	-	1	1	1	2	2	-	-	-
***F100	-	-	1	1	1	-	1	-	-	-	-	-	-	-
***-120	1	1	1	1	1	1	1	1	1	2 ^x	2	2	2	2
***F120	-	-	1	1	1	-	1	1	1	2 ^x	2	2	2	-
***S120	-	-	-	1	1	-	1	-	-	-	-	-	-	-
***-1001	-	2	2	2	2	-	2	2	2	2	2	-	-	-
***-1205	-	-	2	2	2	-	2	-	2	2	-	-	-	-
***-1206	-	-	2	2	2	-	2	-	2	-	-	-	-	-
020-020-1006	-	2	-	-	-	-	-	-	-	-	-	-	-	-
050-020-1001	-	-	-	2	-	-	-	-	-	-	-	-	-	-
0*0 K/BOX	-	-	-	2	2	-	2	2	2	2	2	-	-	-
_*L	2	2	2	2	2	2	2	2	2	2	2	2	2	2
_-2100	-	-	-	1	1	-	1	1	1	1	2	2	2	2
_-2104	1	1	1	1	1	1	1	1	1	1	2	2	2	2
***_**2	-	2	2	2	2	2	2	2	2	2	-	-	-	-
***_**2U0020*0	-	-	2	2	2	2	2	2	2	2	2	2	2	2

*** Denotes actuator size and thread option. Refer to Kinetrol catalogue for full details.

^x 14**120 & 14**120-4900 available to Category 2 only.

- 'L' option for low temperature grease lowers minimum ambient temperature to -40°C.
- All spring options can be 120, 130, 180 or 190 depending on direction of wind of spring or mounting flange option.
- "Low pressure" spring options are approved to Category 2 – refer to catalogue KF84.
- Kinetrol valve mounting brackets and couplings are included to Category 1.
- Restricted stroke actuators are approved to Category 2 as referred to in TD15.
- Kinetrol AP positioner is approved as a mechanical device to Category 1 – refer to Kinetrol for separate certificate for this approval.
- EL positioner options, limit switch options and AP electrical options are also available with ATEX approval to Category 1 or 2 – refer to Kinetrol for further information.

R.C.Chapman
Engineering Manager

Issue	Signed	Date	KINETROL	Trading Estate, Farnham, Surrey, GU9 9NU, England	Doc.No. TD 125
F		02/03/05			Page 1 of 1

Title: Manual Fail-Safe spring torque adjustment for Part No. 051-020-1006 & 051-020-1006/F4

Procedure:

1. Mount manual spring return on bracket (SP 836) with two M5 x 12, or M8 x 16 screws and secure bracket in bench vice as shown in figure 1.

Figure 1



Figure 2



2. Insert handle (SP 837) to the female square of the manual unit as shown in figure 2.
3. Pulling handle off stop to relieve spring pressure remove screw, cover & manual unit handle, whilst maintaining pulling force on tensioned handle as shown in figure 3. **(It is hazardous to release the tensioned handle!)**

Figure 3

Remove screw, cover and handle only whilst maintaining force on tensioned handle.

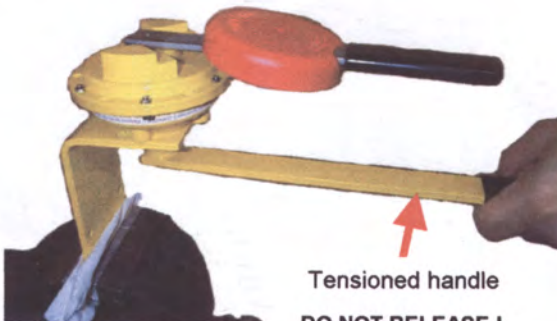


Figure 4

Refit handle, cover and screw



4. Whilst maintaining pressure on handle, allow handle to rotate and unwind about 1/4 turn (90 deg.) in spring direction then refit the manual unit handle, cover and screw as shown in figure 4.
5. Check lever torque is satisfactory then remove assembly from bracket. If a further reduction in torque is necessary repeat the procedure.

Issue B	Signed WBS	Date 12/9/2003	KINETROL Trading Estate Farnham Surrey England	Doc.No. TD 126 Page 1
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Title: INSTALLATION INSTRUCTIONS FOR KINETROL ISO ADAPTORS

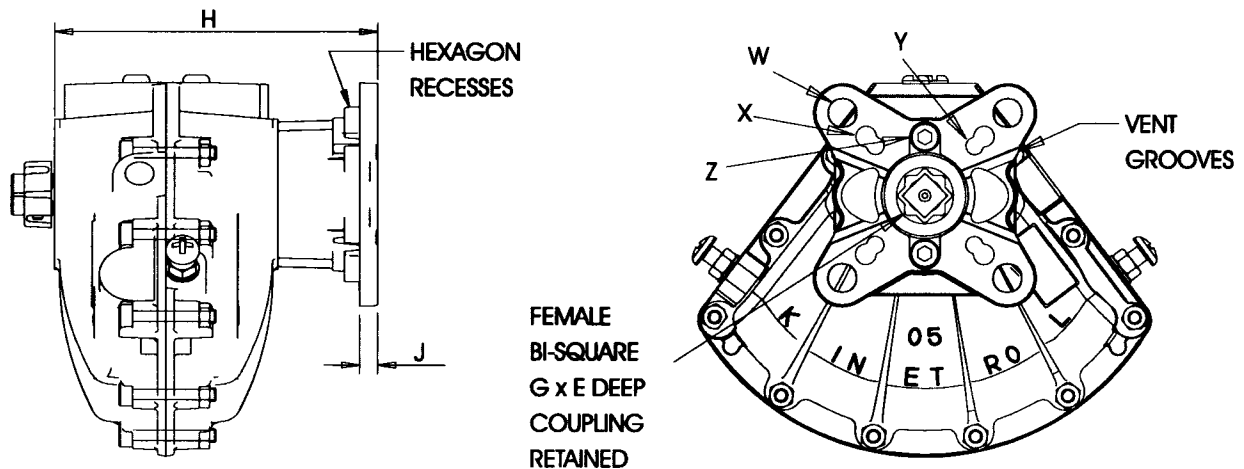
1. INTRODUCTION

ISO adaptor kits are designed for converting a standard male drive Kinetrol actuator (double or single acting) to a mounting compliant with ISO 5211:2001. They are available in sizes 03, 05, 07 and 09.

2. MATERIALS OF CONSTRUCTION

	MATERIAL	FINISH
ISO adaptor body:	Ilzro zinc alloy	Epoxy
Coupling (Other materials maybe available on request)	Low carbon steel	Zinc plate & passivate
Fixing Screws	High strength socket head cap screws	Zinc plated (de-embrittled)

3. PRINCIPAL DIMENSIONS



Adaptor Kit	Sales Codes Assy.	ISO Flange Sizes	H mm	J mm	G mm	E mm	WP.CD mm	XP.CD mm	YP.CD mm	Wt. kg.
SP1449	031F100	F03/F05	84	5.0	11	12	Ø6.650	Ø5.536		0.13
SP1454		F04	84	5.0	11	12	Ø5.542			0.13
SP1450	051F100	F04/F05/F07	97	5.4	14	17	Ø9.070	Ø6.650	Ø5.542	0.27
SP1451	071F100	F05/F07	140	8	17	19	Ø9.070	Ø6.650		0.53
SP1452	091F100	F07/F10	176	10	22	24	Ø11.0102	Ø9.070		1.04

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Title: **INSTALLATION INSTRUCTIONS FOR KINETROL ISO ADAPTORS**

4. FITTING TO ACTUATOR

The coupling is retained by the ISO adaptor and therefore must be fitted to the actuator male square first. The ISO adaptor body locates on male pegs which fit into corresponding holes in the actuator mounting face. The ISO adaptor is retained by 2 or 4 high tensile screws (Z). These should be fitted with a low strength retainer such as Loctite 222 and tightened to the torque given in the chart below:

	<u>Screw</u> <u>Size (Z)</u>	<u>No.</u> <u>Off</u>	<u>Recommended Tightening</u> <u>Torque: Nm (lbf.ins)</u>
SP 1449/1454	M4 x 12	4	2.8 (25)
SP 1450	M5 x 25	2	8.5 (75)
SP 1451	M8 x 25	2	28 (250)
SP1452	M8 x 25	2	28 (250)

5. FITTING TO VALVE OR OTHER LOAD


There are multiple sets of mounting holes available in the mounting flange as shown in section (3). The actuator side of the mounting face contains hexagon recesses suitable for fitting standard metric nuts. Screws can be fitted through the mounting flange or bracket into these nuts and tightened as normal. Socket head cap screws can also be fitted the other way round so that the mounting screws can be fixed into tapped holes in the valve mounting flange. In order to tighten screws fitted this way, a "shortened" allen key will be needed.

The connecting coupling contains a bi-square that can be reduced down using inserts in order that it fits on to the stem of the valve.

Do not apply end loading to this product. It is also advisable to ensure that the ISO adaptor is fitted concentrically to the valve/load in order to avoid excessive side loads.

NOTE: Ensure that materials and finishes are suitable for the environment in which they are to be used. If unsure, contact Kinetrol Ltd.

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SPARE PART ORDERING CODES

SPARE PART ORDERING CODES FOR STANDARD ACTUATOR

ITEM NO.	DESCRIPTION	QTY	SPARE NO'S FOR ACTUATORS																
			OMO	010	010A	020	030	050	070	080	090	101	120	140	160	180	200	300	
1	Seal Kit	1	SP055	SP040	SP040	SP041	SP054	SP042	SP043	SP044	SP045	SP056	SP046	SP047	SP053	SP048	SP051	SP052	
2	Standard Vane assembly	1	SP081	SP061	SP331	SP091	SP471	SP121	SP151	SP181	SP211	DSP800	SP241	SP271	SP371	SP311	SP400	-	
	Positioner Vane assembly	1	-	-	-	-	SP472	SP142	SP169	SP202	SP212	DSP801	SP242	SP272	-	-	-	-	
3	Standard case assembly	Matched Pair	SP083	SP069	SP338	SP099	SP479	SP129	SP159	SP190	SP221	DSP811	SP253	SP283	-	-	-	-	
	Positioner case assembly	Matched Pair	-	-	-	-	SP480	SP130	SP160	SP191	SP222	DSP812	SP254	SP284	-	-	-	-	
4	Stop assembly	2	-	-	SP345	SP104	SP485	SP138	SP165	SP204	SP227	DSP817	SP260	SP292	SP384	SP324	SP396	SP396	
5	Coupling	1	-	SP074	SP343	SP106	SP487	SP140	SP167	SP200	SP229	-	SP264	SP386	SP326	SP326	SP406	SP406	
6	Indicator assembly	1	-	-	-	SP108	SP489	SP146	SP171	-	SP231	DSP820	SP267	SP301	-	-	-	-	
	New namur adaptor	1	-	-	-	-	SP638								-	-	-	-	-

For actuators built to 'ANSI' standard (e.g. 059-100) change spare part number prefix from 'SP' to 'ASP' (e.g. for actuator 059-100 item 23 becomes ASP139)

SPARE PART ORDERING CODES FOR ISODIN ACTUATOR

ITEM NO.	DESCRIPTION	QTY	SPARE NO'S FOR ACTUATORS							
			032	052	072	092	102	122	142	162
1	Seal Kit	1	SP054	DSP042	DSP043	DSP045	SP056	SP046	SP047	SP053
2	Standard Vane assembly	1	DSP471	DSP121	DSP151	DSP211	DSP800	DSP241	DSP271	DSP371
	Positioner Vane assembly	1	DSP472	DSP142	DSP169	DSP212	DSP801	DSP242	DSP272	-
3	DIN case assembly	Matched Pair	DSP479	DSP129	DSP159	DSP221	DSP811	DSP253	DSP283	DSP379
	DIN positioner assembly	Matched Pair	DSP480	DSP130	DSP160	DSP222	DSP812	DSP254	DSP284	-
4	Stop assembly	2	SP485	SP138	SP165	SP227	SP817	SP260	SP292	SP384
6	Indicator assembly	1	SP489	SP146	SP171	SP231	DSP820	SP267	SP2301	-
	New namur adaptor	1	SP638							

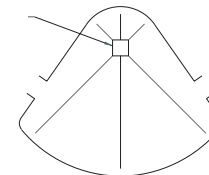
GENERAL ACTUATORS & SPRING RETURNS

1. INSTALLATION

Mounting hole sizes – Standard actuator

Model	Number of Holes	ISO Thread	Depth of Thread	ANSI Thread	Depth of Thread
01-A	4	M4 x 0.7	6mm	8-32 UNC	15/64"
02	4	M4 x 0.7	8mm	8-32 UNC	5/16"
03	4	M5 x 0.8	10mm	10-24 UNC	3/8"
05	6	M5 x 0.8	10mm	10-32 UNC	3/8"
07	4	M8 x 1.25	16mm	5/16-18 UNC	5/8"
08	6	M8 x 1.25	16mm	5/16-18 UNC	5/8"
09	4	M10 x 1.5	20mm	3/8-16 UNC	25/32"
12	4	M12 x 1.75	24mm	1/2-13 UNC	15/16"
14	4	M16 x 2	28mm	5/8-11 UNC	1 1/8"
16	4	M24 x 3	38mm	7/8-9 UNC	1 1/2"
18	4	M30 x 3.5	50mm	1 1/8-7 UNC	2"
20	8	M30 x 3.5	50mm	1 1/8-7 UNC	2"
30	8	M30 x 3.5	50mm	1 1/8-7 UNC	2"

Position of output square in mid-travel position.



Note:

Position of output shaft when vane at mid-travel position.

- Take particular care in aligning models 05/08. 6-hole mounting means 30° misalignment possible if flange has 60° error and coupling 90° error.
- There must be no end load on actuator drive shaft. Check clearance between actuator and driven unit drive shaft, allowing for coupling to be used.
- Care must be taken to ensure concentricity between actuator shaft and driven unit shaft.
- Actuator can be mounted in any plane.
- When side loading of actuator shaft is unavoidable, ensure load does not exceed guide lines given in Kinetrol Technical data sheet TD28.

Model 010 has 4 M4 clearance holes.

Mounting hole sizes – DIN actuators

Model suffix 1 is without Namur.

Model suffix 2 is with Namur solenoid valve mounting.

Model	Number of Holes	ISO Thread	Depth of Thread	PCD
031 & 032	4	M5 x 0.8	8mm	36mm
051 & 052	4	M5 x 0.8	8mm	42mm
071 & 072	4	M6 x 1	10mm	50mm
091 & 092	4	M8 x 1.25	13mm	70mm
- 102	4	M10 x 1.5	16mm	102mm
121 & 122	4	M10 x 1.5	16mm	102mm
141 & 142	4	M12 x 1.75	20mm	125mm
161	4	M20 x 2.5	32mm	165mm

Mounting hole sizes for ISO adaptor models refer to Kinetrol technical data sheet TD124.

Mounting hole sizes for female spring return assemblies refer to Kinetrol technical data sheet TD121.

Note: It is essential that full number of bolts are used and all tightened evenly.

CAUTION:

NEVER HAMMER OR USE OTHER UNDUCE FORCE ON ACTUATOR DIECAST CASES. DAMAGE TO INTERNAL SEALING FACES WILL RESULT.

3. Drive Coupling

- Square hole standard drive coupling supplied in mild steel and may be welded or brazed to coupling part to suit drive on driven unit.
NOTE: This is not supplied with ISO/DIN, ISO adaptor or female spring drive models.
- When mounting tightened down, check there is minimum 0.5mm (0.020") end play of coupling on actuator square drive shaft to avoid end load on actuator shaft.

4. Air/Gas Supply

- Operating air pressure should not exceed 7 bar (100 psi).
- Air/Gas supply must be reasonably clean and dry and to a quality class 4.5.5 (according to ISO standard 8573.1). This implies 25 micron maximum particle size, 7°C dew point maximum (or lower than ambient temperature below 7°C) and 25 mg/cubic metre maximum oil content.
- Plastic or other non-conductive tubing is not recommended for use unless it is proven to comply with EN13463-1-2001 section 7.4.4. Size should be relative to supply/exhaust port size on actuator concerned. Undersize tubing or fittings will restrict actuator performance.
- The actuator can be driven by a hazardous gas as long as:
 - The gas is not corrosive (e.g. natural gas "sweet" and not "sour" gas is used).
 - The gases must not be used within their flammable range.

Installation, Operation & Maintenance Instructions
ROTARY 1/4 TURN ACTUATOR / DOUBLE ACTING & SPRING RETURN MODELS
 Suitable for use in safe area and hazardous gas/dust atmospheres (ATEX)

5. Operation

- 5.1 External stops are strongly recommended when actuator is operating a mechanism with cantilevered load. However, Kinetrol technical data sheet, TD37, can be used to ensure load inertia and travel speed remain within allowable limits.
- 5.2 Second square end of drive shaft may be used for visual position indication, emergency manual operation or driving of add-on units (spring-return unit, limit switch unit, etc.).
- 5.3 Ambient operating temperature range of actuator is -20°C to 80°C. This range may be extended to +100°C with viton seals. Special care should be taken to ensure that heat conducted from, for example, a hot valve, does not increase the actuator temperature above these limits. Refer to Kinetrol technical data sheet TD69 for guidance. A low temperature version of the actuator, having an 'L' at the end of the type code allows the unit to be used at an ambient temperature range of -40°C to 70°C, such actuators may be labelled with a special ATEX label (see section 8).
- 5.4 Visual position indicators are available. Coloured red, made from Nylon 6, they can be fitted over square shaft at top of actuator or top of add-on unit.
- 5.5 Ensure environmental conditions, such as corrosive environments, are compatible with the materials of construction and protective finishes (Kinetrol technical data sheet TD14 refers). If unsure contact Kinetrol. Excessive corrosion of the actuator may cause it to fail in service.
- 5.6 Ensure operating speeds are less than 1 m/s for Cat 1 atmospheres and 4m/s for cat 2 atmospheres, see table below for maximum operating travel times:

Model	Category 1 operating time for 90° travel (sec)	Category 2 operating time for 90° travel (sec)
01	0.056	0.014
02	0.067	0.017
03	0.085	0.021
05	0.107	0.027
07	0.143	0.036
08	0.161	0.040
09	0.184	0.046
10	0.187	0.047
12	0.242	0.060
14	0.324	0.081
16	N/A	0.415
18	N/A	0.545
20/30	N/A	0.540

6. Maintenance

Maintenance is limited to replacement of seals when wear affects actuator performance. Seal life will vary according to application, conditions of cycle frequency, temperature, condition of air supply, etc. Detailed seal replacement instructions in next section.

7. Recommended Spare Parts (Refer to pages 5 & 6)

Standard seal kits, available for each actuator model, consist of the following:

- 2 off vane seal
- 2 off expander
- 2 off shaft seal
- Plus all necessary O-rings, studs/screws, nuts and grease for all sizes up to model 08.
- Studs are not included for models 09 and above.

In addition, a tube of sealant will be required to seal case halves. Spring return units are not user servicable and therefore no spare parts are available other than complete units.

8. Labelling (ATEX)

All Kinetrol actuators that are approved for use in areas where explosives, dust & gases are present, are marked with one of the following labels:

Ex TYPE: XXX-XXX
Serial No. xxxxxxxx
Baseefa 03 ATEX 0443X
II 1GD c g 90°C -20°C Ta 80°C

Category 1 Standard

Ex TYPE: XXX-XXX-2100
Serial No. xxxxxxxx
Baseefa 03 ATEX 0443X
II 1GD c g 110°C -20°C Ta 100°C

Category 1 Viton

Ex TYPE: XXX-XXX
Serial No. xxxxxxxx
Tech File KTR118 ATEX
II 2GD c 90°C -20°C Ta 80°C

Category 2 Standard

Ex TYPE: XXX-XXX-2100
Serial No. xxxxxxxx
Tech File KTR118 ATEX
II 2GD c 110°C -20°C Ta 100°C

Category 2 Viton

Ex TYPE: XXX-XXX L
Serial No. xxxxxxxx
Tech. File. KTR118 ATEX
II 2GD c 80°C -40°C Ta 70°C

Low Temperature Label

Ensure that the details on the label such as the ambient temperature range is suitable for the application. Also ensure that any other equipment fitted to the actuator (e.g. limit switch box or positioner) does not restrict the use within the parameters shown on the above labels. Certificate of Conformance, TD125, shows the category of actuator approval for different sizes of actuator.

9. Adjustment

- 9.1 Stroke Adjustment – only applies to models with adjustable stops.

Table of standard stroke adjustments available

Models	Adjustment range available each stop
03/07/08/09/16/18	10°
02/05/14	8°
01A/10/12	11°

Greater adjustment range possible with non-standard stop screws. Contact KINETROL for details.

9.2 Speed Adjustment

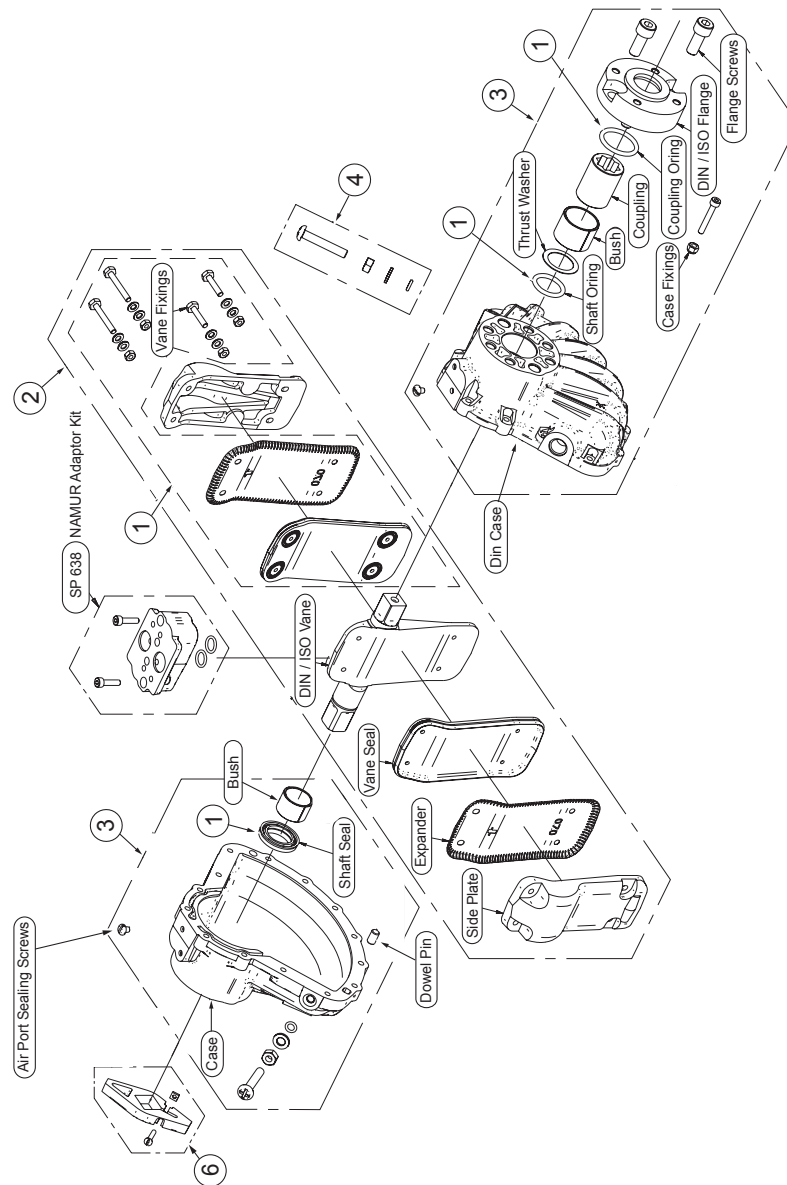
Slower operation of actuator is possible, without significant torque output reduction, by external fitment of flow regulator valves.

Faster operation can be achieved under certain conditions by fitting quick exhaust valves.

For full details contact KINETROL.

Installation, Operation & Maintenance Instructions
ROTARY 1/4 TURN ACTUATOR / DOUBLE ACTING & SPRING RETURN MODELS
 Suitable for use in safe area and hazardous gas/dust atmospheres (ATEX)

EXPLODED VIEW OF A TYPICAL ISO/DIN ACTUATOR

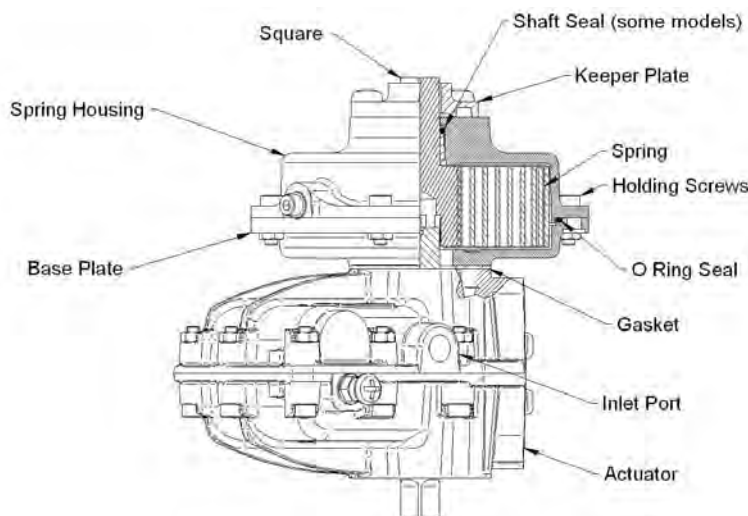


SPRING RETURN UNITS

1. REMOVAL OF SPRING RETURN UNIT

WARNING – the wound-up steel springs are storing a large amount of energy which, if suddenly released, can be dangerous.

- pressure until balanced.
- 2.7 Remove keeper plate completely.
- 2.8 Disconnect air supply.



- 1.1 A keeper plate strong enough to take full spring torque must be fitted in order to remove S/R unit without releasing spring tension. Note: Keeper plates and screws available from KINETROL.
- 1.2 Connect air line via pressure regulating valve to actuator air inlet.
- 1.3 Place keeper plate over square shaft protruding from S/R unit. Keeper plates with male squares can be provided for female drive spring packs.
- 1.4 Increase air pressure slowly until actuator vane turns to mid-travel position. (See sketch at 2 of ACTUATOR section.) Keeper plate holes will then line up with threaded holes in spring housing.
- 1.5 Insert all screws through keeper plate holes and tighten to lock keeper plate in position. Disconnect air supply.
- 1.6 Separate spring housing from base plate by removing holding screws. Then remove spring housing.
- 1.7 If necessary to gain access to actuator screws also remove base plate by removing screws. Take care with gasket between base plate and actuator. (Service actuator as required per Seal Replacement Instructions).

2. REASSEMBLY OF SPRING RETURN UNIT

- 2.1 If necessary replace base plate after replacing gasket.
- 2.2 Ensure actuator vane is in mid-travel position.
- 2.3 Locate spring housing on shaft, rotate it to line up holding screw holes with base plate and replace holding screws.
- 2.4 Connect air supply (as in 1.2) to actuator inlet port.
- 2.5 Adjust air pressure until it balances the spring tension.
- 2.6 Loosen keeper plate screws. If air pressure correctly balancing spring tension will not bind. If binding, adjust air

3. ADJUSTMENT SPRING TENSION

WARNING: The wound-up steel springs are storing a large amount of energy which, if suddenly released, can be dangerous.

3.1 Tension Setting Definitions

- 3.1.1 Optimum setting is when S/R unit is able to provide as much output torque on the spring return stroke as that produced by the corresponding air stroke at a particular air supply pressure.
- 3.1.2 Differential setting is when S/R unit produces more or less output torque on spring return stroke as that produced by the corresponding air stroke at a particular air supply pressure.
- 3.1.3 Operating air pressure in these instructions means the actual air supply pressure at which the actuator will be operated.

3.2 Optimum Spring Setting Test

- 3.2.1 Detach actuator/spring return from valve or mechanism operated by them.
- 3.2.2 Attach air supply to actuator through pressure regulating valve and gauge with supply shut off at regulator.
- 3.2.3 Gradually open regulator to increase air supply to actuator until actuator output shaft just begins to move.
- 3.2.4 Note actual pressure at which actuator output shaft moved.
- 3.2.5 If actual pressure noted at 3.2.4 is about half the operating air pressure then spring tension is at optimum. If actual pressure noted at 3.2.4 is significantly less than half operating air pressure then spring tension is below optimum, i.e. output torque on S/R stroke will be less than that produced on corresponding air stroke at operating air pressure.

Conversely if actual pressure at 3.2.4 is significantly greater than half operating pressure then spring tension is above the optimum, i.e. S/R torque will be greater than air stroke torque.

3.3 Tension Adjustment Method (Standard S/R units without worm drive)

- 3.3.1 Equipment/facilities required:
Air supply with pressure regulator valve and gauge in line. Keeper plate with bolts and spacers (KINETROL supply). Spanner/tools to suit.

Means of securely fixing assembly to a suitable work bench.
 3.3.2 Detach actuator/spring return from valve/mechanism.
 3.3.3 Connect air supply to actuator with regulator shut off.
 3.3.4 Carry out optimum spring setting test as at 2.2 above to determine whether spring tension needs to be increased or decreased.

3.3.5 Gradually open air supply regulator until actuator vane is at centre of travel (45°) position (see sketch at page 1).
 3.3.6 Place keeper plate over S/R square shaft at top of S/R unit.

CAUTION: If keeper plate of flat type, spacer washers at least 3mm (1/8") thick must be used under keeper plate. KINETROL die cast keeper plates do not need spacer washers.

3.3.7 If bolt holes of keeper plate do not line up with corresponding tapped holes in S/R unit, carefully open or close air supply regulator until S/R square shaft turns so that holes do line up.

- 3.3.8 Insert and tighten keeper plate bolts.
- 3.3.9 Shut off air supply to actuator.
- 3.3.10 Undo and remove all spring housing flange bolts. Leave spring housing resting on base plate.
- 3.3.11 Turn spring housing in required direction according to:

- a) S/R operating direction, i.e. clockwise or anticlockwise operation of spring force, and
- b) Tension required to be increased or decreased.

NOTE: Larger sizes of actuator/spring return will require spanner and possibly extension bar to turn spring housing through square shaft on S/R unit.

3.3.12 Dependent on the age of S/R unit concerned there will be 12 or 24 bolt holes around the base plate flange (except for 010 model which has only 4, and 140 model which now has 36).

Therefore older models (12 holes) can only be adjusted by 30° steps, whereas new models can be adjusted by 15° steps (010 by 90° steps and current 140 by 10° steps).

3.3.13 As a rough guide 30° adjustment of spring housing relative to base plate will give 8% change of spring torque output providing spring is already tensioned within its operating air pressure range, i.e. standard S/R units between 50 and 80 p.s.i. Low air supply S/R units between 25 and 50 p.s.i. See catalogue for full details.

3.3.14 Maximum adjustment in one step will be 45° controlled by available vane movement in actuator.

3.3.15 After turning spring housing by amount required (or possible) line up bolt holes in spring housing and base plate flanges. Insert flange bolts and tighten nuts.

3.3.16 Carefully open air supply to actuator until side load on keeper plate bolts is relieved.

3.3.17 Remove keeper plate.

3.3.18 Repeat optimum spring setting test as at 4.2 above.
 3.3.19 If necessary, repeat operations 4.3.5 to 4.3.17 to further increase or decrease spring tension.

WARNING: Spring tension must not be further increased if air pressure noted at 4.2.4 is 40 p.s.i. or more for standard S/R units or 30 p.s.i. for special low air supply types.

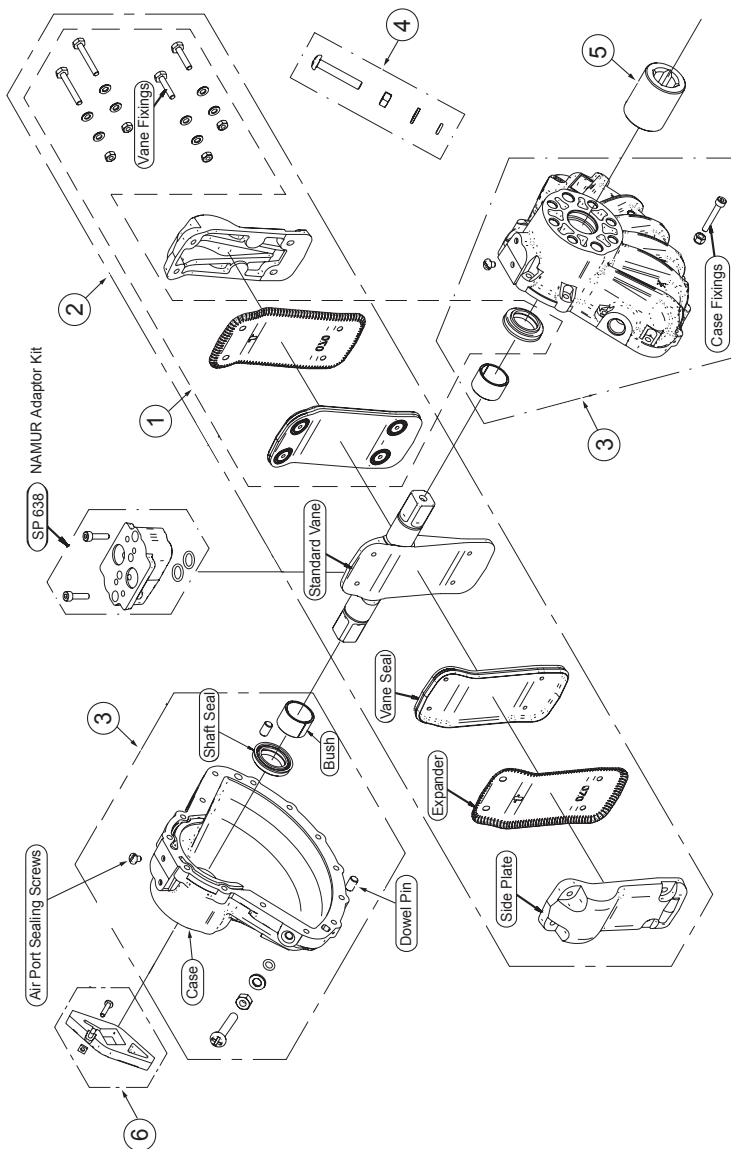
Note: If alignment of mounting holes to square is important, then the spring tension should only be moved in 90° increments. This is especially important with female drive spring units where the mounting angle to the valve will determine correct opening/closing of valve.

4. LABELLING (ATEX)

All spring units that are suitable for use in explosive areas are labelled with one of the labels as shown in 8 in actuator section above.

Ensure that the details on the label such as the ambient temperature range is suitable for the application.

Also ensure that any other equipment fitted to the spring return (e.g. limit switch box or positioner) does not restrict the use within the parameters shown on the above labels. Certificate of Conformance, TD125, shows the category of spring return approval for different sizes of spring units.



ACTUATOR SEAL REPLACEMENT INSTRUCTIONS

1. **DISMANTLING ACTUATOR (see exploded drawing/parts list)** CAUTION: Before dismantling, check there are no burrs on square drive shafts. If there are, remove to avoid damage to bearings and shaft seals during removal of case halves. In the case of spring return actuators, remove spring unit (according to following section) before opening actuator case.

FOR DISMANTLING/RE-ASSEMBLY INSTRUCTIONS FOR 20/30 SIZE ACTUATOR REFER TO KINETROL TECHNICAL DATA SHEET TD107.

- 1.1 Models with visible spring pins in case flanges: using correct size flat end, punch tap these halfway out.
- 1.2 All models: loosen, but do not remove, all case screws.
- 1.3 Separate case halves by connecting air line to inlet port and blowing them apart. Procedure is safe although producing a "bang". Pull off one case half.
CAUTION: Do NOT hammer diecast castings or shaft end. It will damage internal sealing surfaces.
- 1.4 Clean both case halves removing silicone rubber sealant. Clean joint surfaces of case flange with surgical spirit.
- 1.5 Replace and lubricate shaft seals.
- 1.6 Undo vane nuts and bolts (if fitted) and remove old expanders and seals from vane. Take care not to damage side plates. Clean vane. Some later models use nuts on one side of vane with bolts on other side.

2. REASSEMBLY VANE
Vane sub assembly with studs

- 2.1 Check studs are tight through vane and equal length each side (if studs are fitted). If not, apply Loctite to thread and relocate correctly in vane.
- 2.2 Model 18: Apply SILASTIC 732 RTV sealant around bottom of studs (to prevent air leakage through seal on vane stud holes).
- 2.3 Fit new seal over studs after checking profile matches vane profile.
- 2.4 Fit seal expander – the hole in it shaped like vane outline shows correct way round – teeth pointing away from vane.
- 2.5 Model 08 only: fit 'O' ring over studs on top of expanders.
- 2.6 Fit side plate over studs.
- 2.7 Fit new nuts to studs after applying Loctite medium strength sealant to threads.
- 2.8 Tighten nuts to following torques:

01/01A	6 lbf.ins	0.07 m kg
02	6 lbf.ins	0.07 m kg
03	6 lbf.ins	0.07 m kg
05	8 lbf.ins	0.09 m kg
07	8 lbf.ins	0.09 m kg
08	20 lbf.ins	0.23 m kg
09	10 lbf.ins	0.12 m kg
10	20 lbf.ins	0.23 m kg
12	30 lbf.ins	0.35 m kg
14	30 lbf.ins	0.35 m kg
16	60 lbf.ins	0.69 m kg
18	60 lbf.ins	0.69 m kg

Vane sub assembly with hex head bolts

- 2.9 Check vane for any obvious defects and make sure it is free of burrs, then place vane in cradle and place face down on a bench or hold in a vice.
- 2.10 Push hex headed bolts with plain washer through side plate, expander (teeth facing towards head of bolt) and seal (base of seal away from bolt head).

- 2.11 After checking that expander and seal are right way round - expander has vane shaped hole, seal has shaft centre line marked - thread first few threads of each bolt into vane.
- 2.12 While holding up side plate, expander and seal, apply a low strength anaerobic adhesive to bolt thread.
- 2.13 Screw bolts down and tighten to torques given below.
- 2.14 Turn vane over then fit seal, expander and side plate over end of bolts. Check orientation as before.
- 2.15 Screw Nyloc nuts down thread.
- 2.16 Position vane assembly in coupling on bench, hold head of bolt with a spanner, torque up Nyloc nut to torque specified below.

Hex Head Bolts		Nyloc Nuts	
07	8lbf./ins 0.09 m kg	12lbf./ins	0.14 m kg
09	10lbf./ins 0.12 m kg	20lbf./ins	0.23 m kg
10	15lbf./ins 0.17 m kg	15lbf./ins	0.17 m kg
12	30lbf./ins 0.35 m kg	30lbf./ins	0.35 m kg
14	32lbf./ins 0.37 m kg	32lbf./ins	0.37 m kg

3. RE-ASSEMBLING ACTUATOR

- 3.1 Coat bearing bushes and inside both case halves with molybdenum disulphide grease or grease supplied by KINETROL.
- 3.2 Lightly and evenly coat joint face on each case half with INSTANT GASKET sealant (up to Model 14) available from Kinetrol (SP057) or Loctite, or SILASTIC 732 RTV sealant (Model 16 up) obtainable from ironmongers, etc. may be used as a substitute). CAUTION: EXCESS SEALANT, if extruded inside case, WILL IMPAIR OPERATION OF SEALS. Remove all excess sealant especially from inside edge.
- 3.3 Insert vane into one case half, turning it to ease square on drive shaft through shaft seal. Watch that lip seals at ends of vane easily work down into case without damage.
- 3.4 Fit remaining case half on top of the other, turning it to ease square through shaft seal.
- 3.5 For models 01, 01A, 05 and 120 only, carefully tap the spring pins back into the other case half before tightening screws (if fitted).
CAUTION: Check that lip seals are not trapped at case joint face when Viton seals are fitted. Ensure minimal time delay to closing of case once sealant has been applied.
- 3.6 Tighten case screws to the following torques:

01	10 lbf.ins	0.12 m kg
01A	10 lbf.ins	0.12 m kg
02	10 lbf.ins	0.12 m kg
03	10 lbf.ins	0.12 m kg
05	20 lbf.ins	0.23 m kg
07	24 lbf.ins	0.27 m kg
08	70 lbf.ins	0.8 m kg
09	60 lbf.ins	0.7 m kg
10	80 lbf.ins	0.9 m kg
12	100 lbf.ins	1.2 m kg
14	120 lbf.ins	1.4 m kg
16	860 lbf.ins	10 m kg
18	1140 lbf.ins	13 m kg

- 3.7 Rotate vane manually to check movement and wipe away sealant extruded internally.
- 3.8 Allow setting time for sealant before applying test air pressure.

Ordering Female Springs For Retrofitting

Kinetrol spring units are available for retro fitting on our complete range of actuators and are available with either a clockwise or counter clockwise spring action.

The spring action direction is always determined by looking at the top of the assembly down towards the valve/application.

The ordering suffixes are listed below:

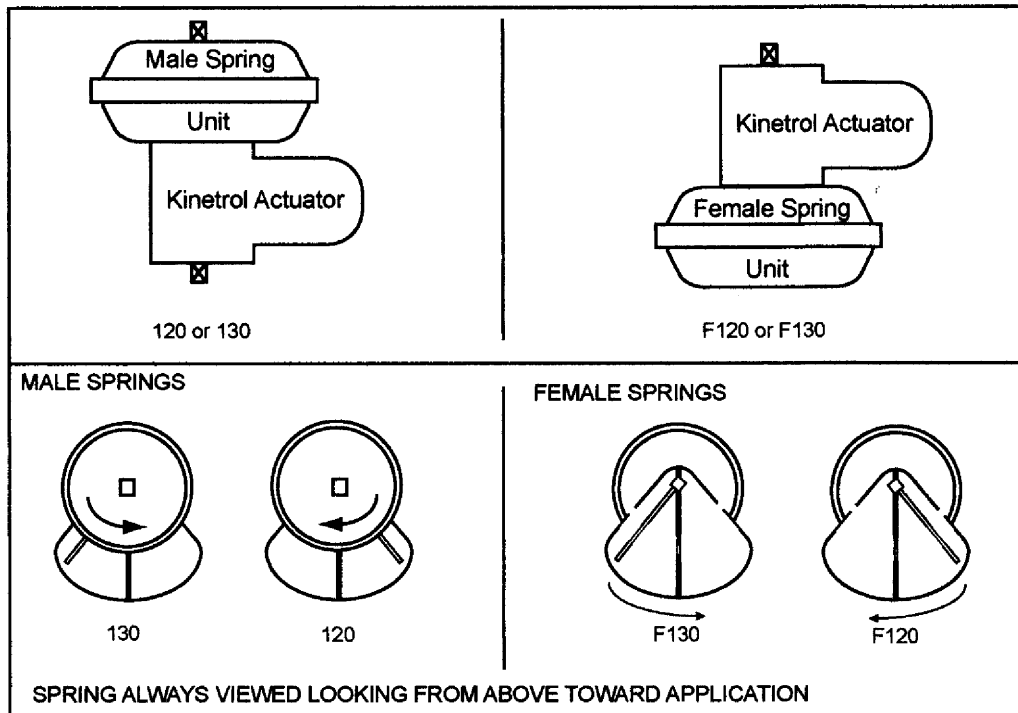
020 = clockwise spring action

030 = anticlockwise spring action

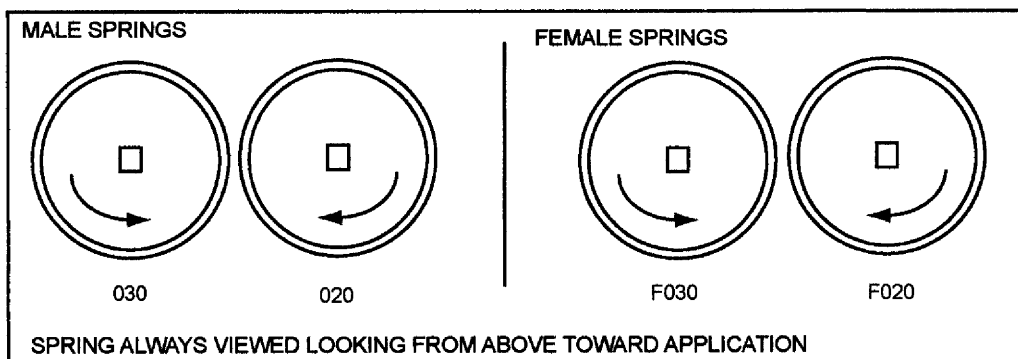
To order a female spring simply place an 'F' in front of the above suffix, for example 090 - 020 becomes 090F020 for a female clockwise spring, 090 - 030 becomes 090F030 for a female anti clockwise spring.

DUE TO THE FACT THAT THE FEMALE SPRING IS MOUNTED BELOW THE ACTUATOR, IT IS IMPORTANT TO NOTE THAT IN ORDER FOR A FEMALE SPRING TO ACHIEVE A CLOCKWISE SPRING ACTION THE SPRING WILL BE WOUND ANTICLOCKWISE, AS IT IS UP SIDE DOWN WHEN MOUNTED, UNLIKE THE MALE SPRING UNIT. LIKEWISE A FEMALE SPRING WILL BE WOUND CLOCKWISE TO PRODUCE AN ANTI CLOCKWISE ACTION AFTER BEING FITTED. (see diagram below).

SPRINGS WITH ACTUATORS



SPRINGS WITHOUT ACTUATORS



Title: EL positioner option: Special characteristic to give butterfly valve control for linear valve flow vs. input signal

Upon request Kinetrol can supply a positioner fitted with a circuit that will provide an output characteristic to suit a butterfly valve. By replacing the standard circuit (with 10 non-linear and one linear control response curves) by one containing a microprocessor programmed with 10 different non-linear curves and one linear, the valve can be controlled to give optimum flow control with a butterfly valve.

In general the pressure drop across a valve will change as the valve opens, and this changes the flow/valve position characteristic. The five solid line curves on the graph linearise the response for valve pressure drops which fall to a range of values as the valve is opened fully, see below.

The values below are the pressure drop with the valve full open expressed as a percentage of the pressure drop with the valve closed.

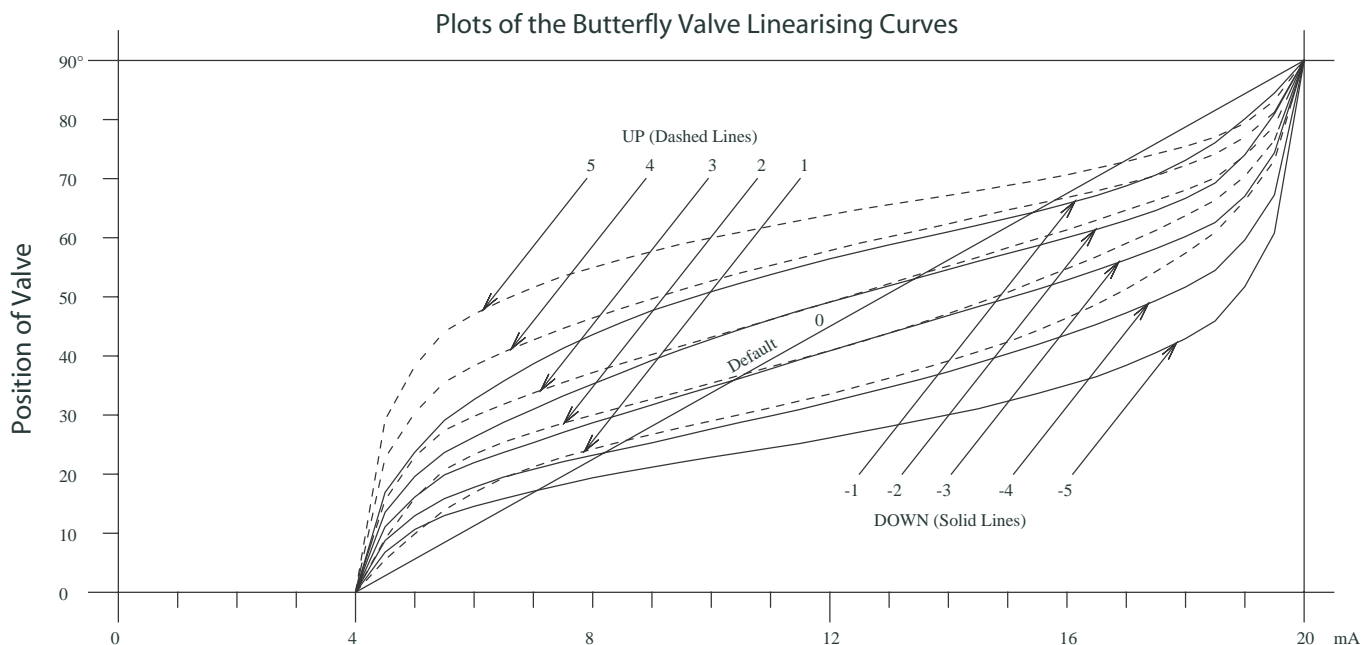
Curve -1 for 100% (this should be used to linearise a butterfly valve which is operating with a constant pressure drop)

Curve -2 for 30%

Curve -3 for 10%

Curve -4 for 3%

Curve -5 for 1%



Example

A butterfly valve controlling the flow of a fluid with a 10% constant pressure drop, gives 50% of its fully open flow at an angle of opening of roughly 40 degrees. We would thus recommend the user set the control response to curve -3, here 12mA (half signal) would open the valve to 40 degrees to allow 50% flow rate. The user can select one of the eleven pre-programmed curves by going into SETUP mode (see TD 76 section 4.13).

Installation, Operation & Maintenance Instructions

3-Stop Positioner



Power Connections - Double Acting Models

- 1 Mid Position - Live (AC) or ⊕ (24VDC)
- 2 Supply - Neutral (AC) or ⊖ (24VDC)
- (3 Solenoid 1 - Neutral or ⊖)
- (4 Solenoid 2 - Neutral or ⊖)
- 5 End Position, Rising Signal - Live or ⊕
- (6 Solenoid 1 - Live or ⊕)
- 7 End Position, Falling Signal - Live or ⊕
- (8 Solenoid 2 - Live or ⊕)

Power Connections - Spring Return Models

- 1 Mid Position - Live (AC) or ⊕ (24VDC)
- 2 Supply - Neutral (AC) or ⊖ (24VDC)
- (3 Solenoid 1 - Neutral or ⊖)
- (4 Solenoid 2 - Neutral or ⊖)
- 5 End Position, Air Stroke - Live or ⊕
- (6 Solenoid 1 - Live or ⊕)
- 7 End Position, Air Stroke - Live or ⊕
- (8 Solenoid 2 - Live or ⊕)

Terminals in brackets are used for wiring to solenoids only.

fig 1.

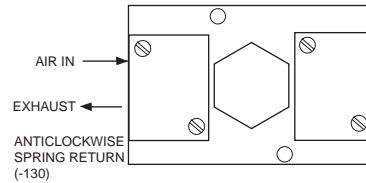
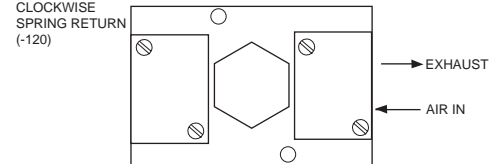
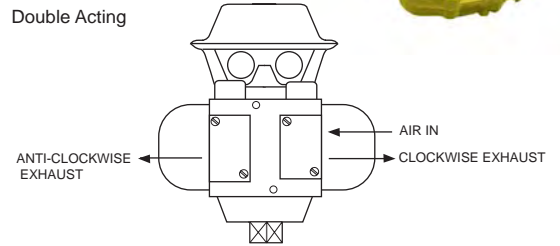
IMPORTANT - CASE MUST BE GROUNDED

When terminal 1 is live (ie. when actuator is switched to mid position). Terminals 5 and 7 must be disconnected both from the supply and from each other.

AIR CONNECTIONS:

ISO/DIN - G 1/8
ANSI - 1/8 NSP

Double Acting



MAX SUPPLY PRESSURE 5.5 BAR or 80psi

fig 3.

SOLENOID ORIENTATION

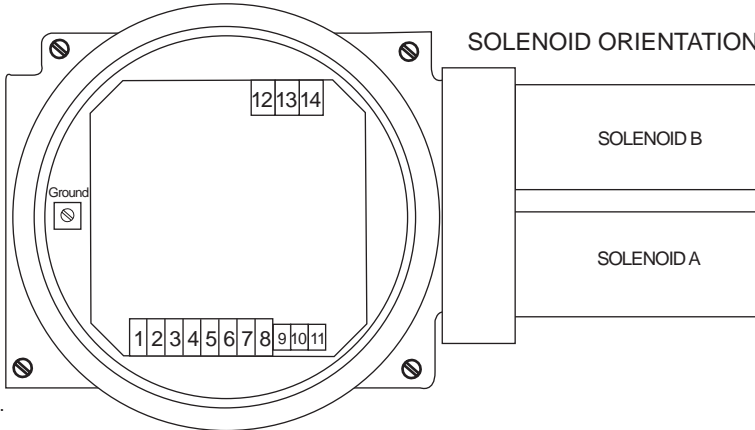


fig 2.

INTERNAL CONNECTIONS - USE THESE TO CONVERT

Actuator Type & movement on Rising signal	Terminal number to which connected						
	Solenoid A		Solenoid B		Feedback Potentiometer		
	Brown	Blue	Brown	Blue	Red	Green	Yellow
D/A ACW	8	3	6	4	12	13	14
D/A CW	6	3	8	4	12	14	13
S/R ACW (120)	6	3	8	4	12	13	14
S/R CW (130)	8	3	6	4	12	14	13

fig 4.

See sales literature for order codes and dimensions of box, plus typical user wiring arrangements.

To optimise positioning performance, set deadband pot to minimum (actuator will oscillate), then increase until oscillation ceases. If this is not stable, then slow down travel speed with flow regulators.

Flow regulator/silencer kits available for all models. (See sales literature).

4-20mA signal sources must be floating relative to power supply.

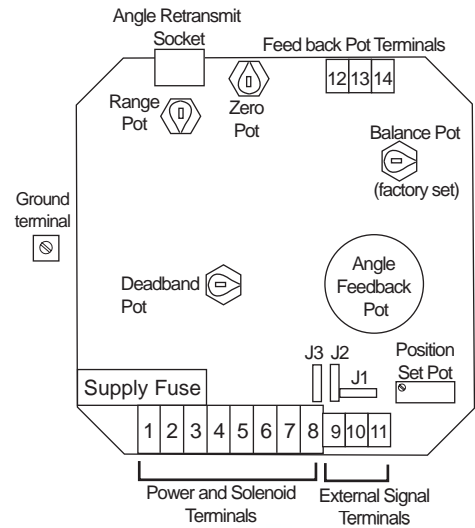


fig 5.

ACCESS TO OPTIONAL LIMIT SWITCHES

Maintain orientation of spring coupling on pot shaft relative to actuator square, so that it is correct when circuit is put back.

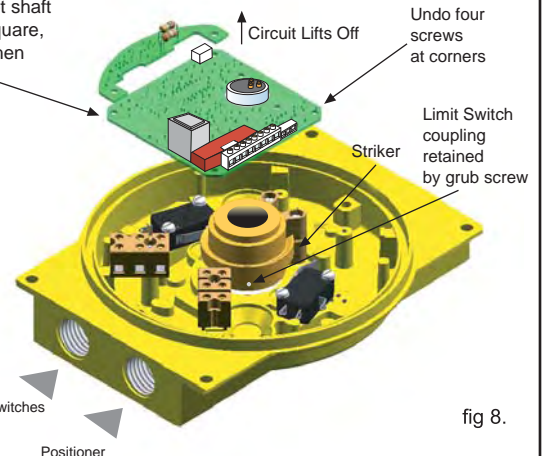


fig 8.

Setpoint Types - Terminal and Jumper Configuration

Jumper shown thus: <input type="checkbox"/>	Jumpers	Terminals
1 - On-board Setpoint Pot:		Not Connected
2 - User's external Setpoint Point: (Minimum 2K, Maximum 20K)		9 10 11
3 - User's External 4-20mA Signal: (Must be floating relative to power supply)		9 10 11 - + NC

fig 6.

Double Acting/Spring Return Selection

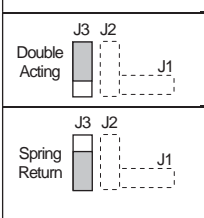


fig 7.

Installation, Operation & Maintenance Instructions

3-Stop Positioner

CONVERSION OF D/A FAIL FREE TO FAIL DOWN.

These instructions describe how to convert a standard double acting 3-stop positioner (which fails in last position when electrical power is disconnected but air pressure remains) to give fail down function when electrical power is disconnected but air pressure remains. ("Fail Down" means that the actuator moves to the low signal position on loss of power - ie. for a standard unit as supplied with anti-clockwise movement on rising signal, the unit will move to clockwise end of its travel on loss of power).

Conversion to give clockwise movement on loss of power

- 1 - Detach solenoid B (refer to figure 2) din plug from valve and detach valve from its mounting by undoing the two M4 screws at its diagonally opposite corners which do not contain "tell-tale" paint.
- 2 - Rotate Solenoid B 180°, and reattach to the mounting by replacing the M4 screws.
- 3 - Rotate the inner part of din plug by 180° and reattach to plug and then reconnect to solenoid.
- 4 - Change over jumper 3 (refer to figure 5) on the circuit board from DA to SR end of its connector.
- 5 - Stick self adhesive label (supplied with your fail down 3-stop), with SR user connection information to inside of lid in place of DA label.

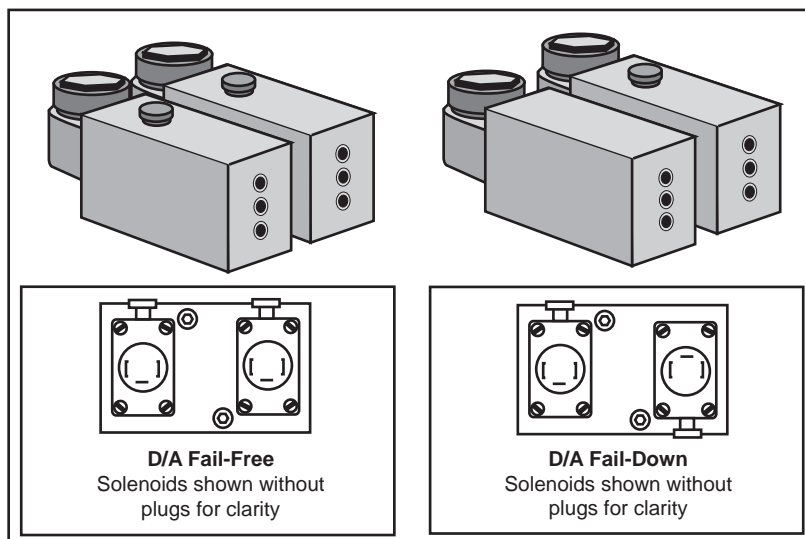
Conversion to anti-clockwise movement

- 1 - Carry out the procedure listed above, only do so for solenoid A instead of Solenoid B.
- 2 - Swap over the terminals for the brown wires from solenoids A and B; after this procedure, the brown wire from solenoid A should connect to terminal 6, and that from solenoid B to terminal 8 (refer to figure 8).
- 3 - Swap over the terminals for the green and yellow wires from the feedback potentiometer; after this procedure, the yellow wire should connect to terminal 13, and the green to terminal 14 (refer to figure 8).
- 4 - After air and power have been connected, it will be necessary to rotate the body of the feedback potentiometer to range in the positioner correctly. This is most easily done if the internal mid-position preset pot was adjusted to 45 degrees before the conversion started - then the resetting procedure can be done simply by loosening the feedback pot clamps and rotating it until the positioner (switched to its mid position) moves the actuator to the 45 degree position.

WARNING

Disconnect electrical power and air before starting conversion procedure

Note: After Conversion, user connections must be as for spring return units, not as for the original double acting configuration. See the self adhesive label attached for terminal details.



Instructions For Installing Angle Retransmit Module Into 3-Stop Positioner

Installation:

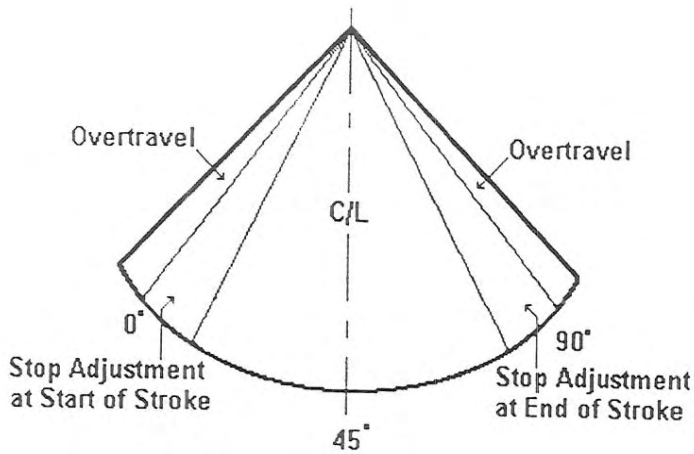
1. Disconnect all power from 3-Stop positioner and remove cover.
2. Remove two existing control circuit mounting screws as shown above.
3. Plug angle retransmit module into existing control circuit angle retransmit socket.
4. Screw angle retransmit module into 3-stop box using two existing circuit mounting screws that were removed in step two. Retransmit module mounts partly on top of existing circuit.
5. Assure angle retransmit jumper configuration is set to your choice of either 4-20mA or 1-5vDC feedback. The angle retransmit circuit board has both of these setting options printed on it next to the jumper.
6. Connect your positive and negative feedback wires to angle retransmit terminal block. The angle retransmit circuit is powered by the existing control circuit - it is not loop powered.
7. Reconnect all power to 3-Stop positioner.
8. The angle retransmit circuit reads the same angle transducing potentiometer as the positioner circuit.

Calibration:

1. If you purchased the angle retransmit circuit option from the factory, it will be set to give a linearly proportional 4-20mA output in response to the 0-90 degree position of the actuator.
2. If you have just installed the angle retransmit module, then it will be necessary to adjust the zero and span pots on this circuit only.
3. First, set the zero pot to give 4mA (or 1vDC depending on the jumper setting) output when the actuator is at 0 degrees.
4. Second, set the span pot to give 20mA (or 5vDC depending on the jumper setting) output when the actuator is at 90 degrees.
5. The zero and span pot adjustments are interactive, therefore, more than one cycle of adjustments may be required to achieve desired accuracy.
6. For other 3-Stop positioner calibration or adjustment procedures, see Kinetrol's technical data document "TD42."

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ACTUATOR STOP CHART

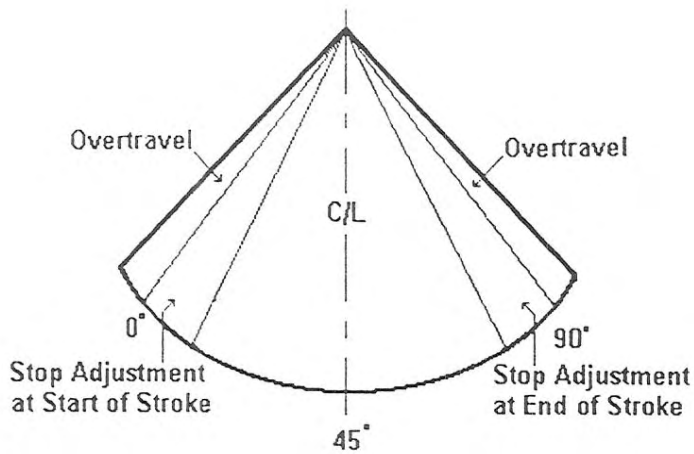


Note: To provide asymmetrical travel about the centerline (C/L) for a particular actuator, any stop on one side of the C/L can be specified with any stop on the other side of the C/L.

Actuator Size Stop Screws or Built-up Vane Required to Limit Travel	Over- travel degrees	Stop Adjustment at Start of Stroke (degrees)	Comment	Stop Adjustment at End of Stroke (degrees)	Over- travel degrees
OM Actuator Stop Screw M3 x 12 (standard)	5	00 - 05	Standard	85 - 90	5
01A Actuator Stop Screw M3.5 x 20 (standard) Stop Screw M3.5 x 25 Stop Screw M3.5 x 30	5 5 5	00 - 06 00 - 15 00 - 25	Standard 60 - 90 about C/L 40 - 90 about C/L	84 - 90 75 - 90 65 - 90	5 5 5
02 Actuator Stop Screw M3.5 x 20 (standard) Stop Screw M3.5 x 25 Stop Screw M3.5 x 30 Built-up Vane 68-000-019 Built-up Vane 68-000-020	3 3 3	00 - 05 00 - 13 00 - 20 20 - 37 32 - 47	Standard 64 - 90 about C/L 50 - 90 about C/L 16 - 50 about C/L 00 - 26 about C/L	85 - 90 77 - 90 70 - 90 53 - 70 43 - 58	3 3 3
03 Actuator Stop Screw M5 x 25 (standard) Stop Screw M5 x 30 Stop Screw M5 x 35 Built-up Vane 78-000-022 Built-up Vane 78-000-023	5 5 5	00 - 05 00 - 11 00 - 17 09 - 28 27 - 46	Standard 68 - 90 about C/L 56 - 90 about C/L 34 - 72 about C/L 00 - 36 about C/L	85 - 90 79 - 90 73 - 90 62 - 81 44 - 63	5 5 5
05 Actuator Stop Screw M5 x 25 (standard) Stop Screw M5 x 30 Stop Screw M5 x 35 Stop Screw M5 x 40 Stop Screw M5 x 45 Built-up Vane 19-000-064 Built-up Vane 19-000-068	5 5 5 5 5	00 - 03 00 - 08 00 - 13 00 - 19 00 - 26 11 - 35 30 - 46	Standard 74 - 90 about C/L 64 - 90 about C/L 52 - 90 about C/L 38 - 90 about C/L 20 - 68 about C/L 00 - 30 about C/L	87 - 90 82 - 90 77 - 90 71 - 90 64 - 90 55 - 79 44 - 60	5 5 5 5 5
07 Actuator Stop Screw M6 x 35 (standard) Stop Screw M6 x 50 Built-up Vane 65-000-061 Built-up Vane 65-000-056 Built-up Vane 65-000-058	5 5	00 - 05 00 - 16 00 - 20 18 - 28 30 - 46	Standard 58 - 90 about C/L 50 - 90 about C/L 34 - 54 about C/L 00 - 30 about C/L	85 - 90 74 - 90 70 - 90 62 - 72 44 - 60	5 5
08 Actuator Stop Screw M6 x 35 (standard) Stop Screw M6 x 40 Stop Screw M6 x 50 Stop Screw M6 x 55 Built-up Vane 11-000-607	1.5 1.5 1.5 1.5	00 - 09 00 - 12 00 - 19 00.00 - 22.50 32 - 46	Standard 66 - 90 about C/L 52 - 90 about C/L 45 - 90 about C/L 00 - 26 about C/L	81 - 90 78 - 90 71 - 90 67.50 - 90.00 44 - 58	1.5 1.5 1.5 1.5

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ACTUATOR STOP CHART



Note: To provide asymmetrical travel about the centerline (C/L) for a particular actuator, any stop on one side of the C/L can be specified with any stop on the other side of the C/L.

Actuator Size Stop Screws or Built-up Vane Required to Limit Travel	Over- travel degrees	Stop Adjustment at Start of Stroke (degrees)	Comment	Stop Adjustment at End of Stroke (degrees)	Over- travel degrees
09 Actuator					
Stop Screw M6 x 40 (standard)	5	00 - 05	Standard	85 - 90	5
Stop Screw M6 x 60	5	00 - 15	60 - 90 about C/L	75 - 90	5
Built-up Vane 64-000-058		00 - 20	50 - 90 about C/L	70 - 90	
Built-up Vane 64-000-027 ←		12.50 - 27.50	35 - 65 about C/L	62.50 - 77.50	
Built-up Vane 64-000-063		25 - 46	00 - 40 about C/L	44 - 65	
10 Actuator					
Stop Screw M8 x 45 (standard)	5	00 - 06	Standard	84 - 90	5
Stop Screw M8 x 60	5	00 - 15	60 - 90 about C/L	75 - 90	5
12 Actuator					
Stop Screw M10 x 55 (standard)	6	00 - 05	Standard	85 - 90	6
Stop Screw M10 x 70	6	00 - 11	68 - 90 about C/L	79 - 90	6
Built-up Vane 46-000-039		03 - 21	48 - 84 about C/L	69 - 87	
Built-up Vane 46-000-040		20 - 32	26 - 50 about C/L	58 - 70	
Built-up Vane 46-000-059		35 - 45	00 - 20 about C/L	45 - 55	
14 Actuator					
Stop Screw M10 x 55 (standard)	1.5	00 - 06	Standard	84 - 90	1.5
Stop Screw M10 x 80	1.5	00 - 12.50	65 - 90 about C/L	77.5 - 90	1.5
Stop Screw M10 x 100	1.5	00 - 20	50 - 90 about C/L	70 - 90	1.5
Built-up Vane 27-000-036		02.50 - 17.50	55 - 85 about C/L	72.5 - 87.5	
Built-up Vane 27-000-037		15 - 30	30 - 60 about C/L	60 - 75	
Built-up Vane 27-000-038		22.50 - 37.50	15 - 45 about C/L	52.5 - 67.5	
16 Actuator					
Stop Screw M16 x 100 (standard)	5	00 - 05	Standard	85 - 90	5
Stop Screw M16 x 160	5	00 - 13	64 - 90 about C/L	67 - 90	5
18 Actuator					
Stop Screw M20 x 150 (standard)	5	00 - 05	Standard	85 - 90	5
Stop Screw M20 x 165	5	00 - 10	70 - 90 about C/L	80 - 90	5

Instructions for Installing SP931 (Limit Switches) into EL Positioner

I. Parts included in SP931:

QTY	DESCRIPTION
2	V3 limit switch, ref. no. 83161, CSA & UL approved
1	Limit switch cover (red plastic)
1	Limit switch striker (cam) complete with M3 x 4 slot head screw + clamp nut
1	Bearing ring (cam spacer)
2	Terminal block 3/3
1	Limit switch spacer (thin white plastic w/ 2 holes)
4	M3 s/s nut
4	M3 x 25 s/s slot head screws

II. Installation:

1. Remove cover of EL positioner
2. Remove 5 screws which secure "Carrier Plate" (see Drawing A for screw location).
3. Remove Carrier Plate (see Drawing B for identification) complete with shaft by pulling upward by shaft. **IMPORTANT:** Carrier plate and shaft should remain together. **PLEASE** insure shaft and carrier plate remain in proper orientation as shown in Drawing B. As you will see in Drawing C, Carrier Plate and shaft are attached to each other by a s/s spring loaded shaft. If proper care is not taken, strap may break.
4. Once Carrier Plate is removed, install switches as follows (shown in Drawing D):
 - a) Switches shall be stacked on top of each other with white plastic spacer positioned between the switches (black part of switch facing upward). Red plastic switch cover shall be positioned on top of switches and 2 x M3 screws shall be threaded through the switch assembly.
 - b) The switch assembly shall be positioned on carrier plate into 2 x holes indicated on Drawing B.
 - c) Thread 2 x M3 nuts on bottom side of Carrier Plate.
 - d) Guide limit switch wires through hole on Carrier Plate shown on Drawing B.
5. Install terminal blocks as follows (shown in Drawing D):
 - a) Push M3 screws through center of terminal blocks.
 - b) Position terminal blocks as shown in Drawing D.
 - c) Route limit switch wiring along bottom side of Carrier Plate and terminate wires into terminal strips as indicated on Drawing D.
 - d) Secure terminal strips to Carrier Plate with M3 nuts.

6. Reinstall Carrier Plate into EL housing with 5 screws.
7. Install Bearing Ring (cam spacer) over shaft.
8. Install remaining Limit Switch Striker (cam) on shaft and tighten.

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Description of Bolts for Items Mounted to Kinetrol Actuators - Universal Coarse Thread (UNC)

	SR to Act	Pos to Act	LS to Act	KE Gear to Act	LK to Act
OMO	-	-	-	-	Qty4 M3 x 5 Hex Head Capscrew
019	Qty4 8 - 32 x 1/4 Slotted Flat Head Screw	-	-	-	Qty4 8 - 32 UNC x 1/4 Hex Head Capscrew
029	Qty4 8 - 32 x 1/4 Slotted Flat Head Screw	-	-	-	Qty4 8 - 32 UNC x 1/4 Hex Head Capscrew
039	Qty4 10 - 24 UNC x 3/8 Slotted Flat Head Screw	-	-	-	Qty4 10 - 24 UNC x 3/8 Hex Head Capscrew
059	Qty6 10 - 24 UNC x 3/8 Slotted Flat Head Screw	Qty6 10 - 24 UNC x 3/8 Socket Head Capscrew	Qty6 10-24 UNC x 3/8 Slotted Flat Head Screw	-	Qty6 10 - 24 UNC x 3/8 Hex Head Capscrew
079	Qty4 5/16 - 18 x 3/4 Slotted Flat Head Screw	Qty2 5/16 - 18 x 3/4 Socket Head Capscrew	Qty2 5/16 - 18 x 3/4 Slotted Flat Head Screw	Qty4 5/16 - 18 x 3/4 Hex Head Capscrew	Qty4 5/16 - 18 x 3/4 Hex Head Capscrew
089	Qty4 5/16 - 18 x 3/4 Slotted Flat Head Screw	Qty2 5/16 - 18 x 3/4 Socket Head Capscrew	Qty2 5/16 - 18 x 3/4 Slotted Flat Head Screw	Qty4 5/16 - 18 x 3/4 Hex Head Capscrew	Qty4 5/16 - 18 x 3/4 Hex Head Capscrew
099	Qty4 3/8 - 16 x 3/4 Slotted Flat Head Screw	Qty2 5/16 - 18 x 3/4 Socket Head Capscrew	Qty2 3/8 - 16 x 3/4 Slotted Flat Head Screw	Qty4 3/8 - 16 x 3/4 Hex Head Capscrew	Qty4 3/8 - 16 x 3/4 Hex Head Capscrew
109	Qty4 3/8 - 16 x 3/4 Slotted Flat Head Screw	Qty2 5/16 - 18 x 3/4 Socket Head Capscrew	Qty2 3/8 - 16 x 3/4 Slotted Flat Head Screw	Qty4 3/8 - 16 x 3/4 Hex Head Capscrew	Qty4 3/8 - 16 x 3/4 Hex Head Capscrew
129	Qty4 1/2 - 13 x 1-1/4 Flat Socket Head Capscrew	Qty2 M8 - 1.25 x 20 Metric Socket Head Capscrew	Qty2 1/2 - 13 x 1 Slotted Flat Head Screw	Qty4 1/2 - 13 x 1-1/4 Hex Head Capscrew	Qty4 1/2 - 13 x 1-1/4 Hex Head Capscrew
149	Qty4 5/8 - 11 x 1-1/4 Flat Socket Head Capscrew	Qty2 M8 - 1.25 x 20 Metric Socket Head Capscrew	Qty2 5/8 - 11 x 1 Slotted Flat Head Screw	Qty4 5/8 - 11 x 1-1/4 Hex Head Capscrew	Qty4 5/8 - 11 x 1-1/4 Hex Head Capscrew
169	Qty4 7/8 - 9 x 1-1/2 Hex Head Capscrew	-	-	* Qty4 7/8 - 9 x 1-1/2 Hex Head Capscrew	Qty4 7/8 - 9 x 1-1/2 Hex Head Capscrew
189	Qty4 1-1/8 - 7 x 2-1/2 Hex Head Capscrew	-	-	* Qty4 1-1/8 - 7 x 2-1/2 Hex Head Capscrew	Qty4 1-1/8 - 7 x 2-1/2 Hex Head Capscrew
209	Qty4 1-1/8 - 7 x 2-1/2 Hex Head Capscrew	-	-	* Qty4 1-1/8 - 7 x 2-1/2 Hex Head Capscrew	Qty4 1-1/8 - 7 x 2-1/2 Hex Head Capscrew
309	Qty4 1-1/8 - 7 x 2-1/2 Hex Head Capscrew	-	-	* Qty4 1-1/8 - 7 x 2-1/2 Hex Head Capscrew	Qty4 1-1/8 - 7 x 2-1/2 Hex Head Capscrew

Slotted Flat Head Screw



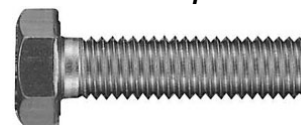
Socket Head Capscrew



Flat Socket Head Capscrew



Hex Head Capscrew

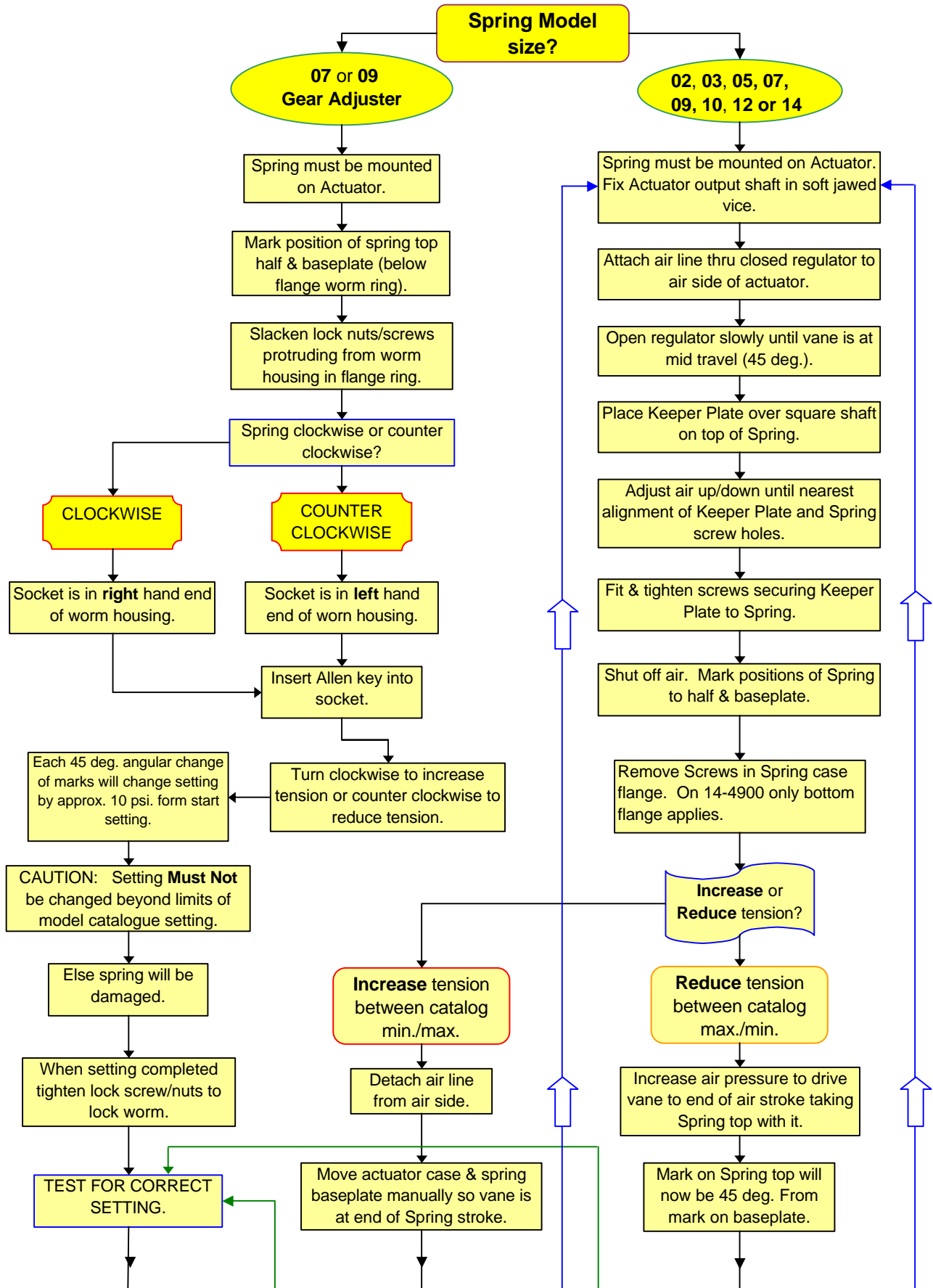


All bolts must be grade 8 carbon steel or 304-316 stainless steel.

*Note: Requires bolts with heads milled to a maximum thickness of 5/16".

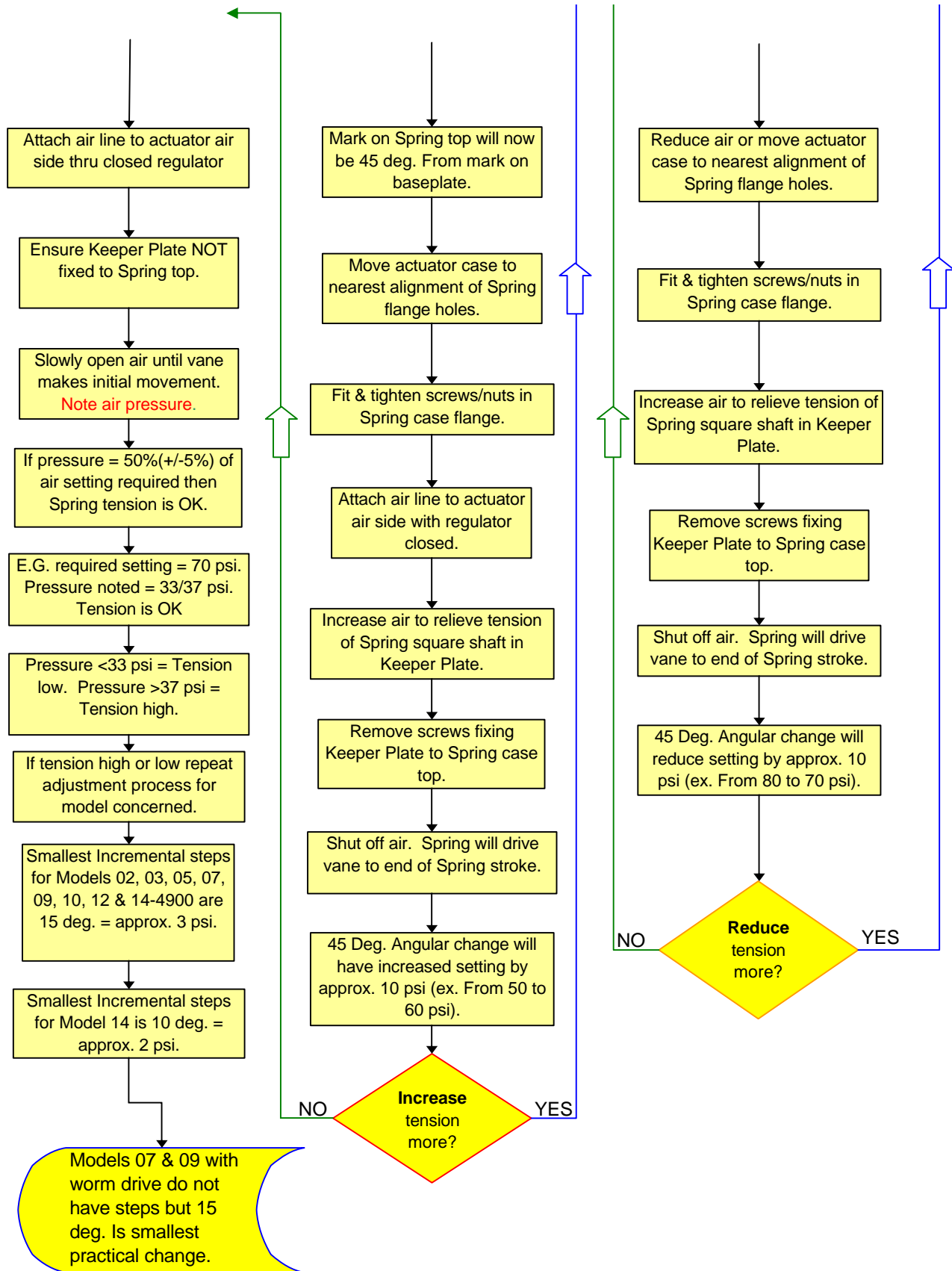
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Spring Tension Adjustment for Non-Modulating SR Actuators



KINETROL USA

Spring Tension Adjustment for Non-Modulating SR Actuators



KINETROL USA, Inc.

Positioner Fail-Mode Options

<u>Fail Mode</u>			
Loss of Air Only	Loss of Signal Only	Loss of Air & Signal	Fail Code
<i>NEMA Type IV (Weatherproof):</i>			
<u>3-15 or 0-30psig Input Control Signal:</u>			
Free	Low	Free	10
AP pneumatic positioner (direct or discrete mount versions)			
Hold	Low	Hold	20
AP pneumatic positioner (discrete mount version only) + air pressure sensing lock-up valves between positioner and actuator			
<u>4-20mA Input Control Signal:</u>			
Free	Low	Free	30
AP pneumatic positioner + I/P transducer			
Free	Hold	Free	35
AP pneumatic positioner + loop-powered input current sensing lock-up I/P transducer			
Hold	Low	Hold	40
AP pneumatic positioner (discrete mount version only) + I/P transducer + air pressure sensing lock-up valves between positioner and actuator			
Hold	Hold	Hold	50
AP pneumatic positioner (discrete mount version only) + loop-powered input current sensing lock-up I/P transducer + air pressure sensing lock-up valves between positioner and actuator			
Free	Choice of Low or High	Free	60
EL electro-pneumatic digital positioner			
Hold	Choice of Low or High	Hold	70
EL electro-pneumatic digital positioner (discrete mount version only) + air pressure sensing lock-up valves between positioner and actuator			
<u>NEMA Type IV & VII (Weatherproof & Explosionproof):</u>			
<u>3-15 or 0-30psig Input Control Signal:</u>			
Free	Low	Free	80
AP pneumatic positioner (direct or discrete mount versions)			
Hold	Low	Hold	90
AP pneumatic positioner (discrete mount version only) + air pressure sensing lock-up valves between positioner and actuator			
<u>4-20mA Input Control Signal:</u>			
Free	Low	Free	100
AP pneumatic positioner + I/P transducer			
Hold	Low	Hold	110
AP pneumatic positioner (discrete mount version only) + I/P transducer + air pressure sensing lock-up valves between positioner and actuator			

Notes:

1. To fail "Low" or "High" means the positioner would drive the actuator to its' mechanical travel stop in either the low or high input control signal direction.
2. If fail-hold on loss of air is required, the actuator must be sized to produce proper torque output at the trip valve's low-pressure trip set point.
3. If fail-hold on loss of signal is required, the signal must be lost suddenly rather than slowly for the unit to fail-hold properly. A slow drifting signal loss would cause the positioner to slowly close or open the actuator.
4. Air supply pressure should be in the range of 50 to 100psig for the positioners to operate correctly.
5. Please specify travel rotation, if other than 90 degrees, when using "AP" positioners for proper cam selection. This is not a requirement for "EL" positioners as they are digitally controlled and do not have a cam.



KINETROL USA Inc.

Air Quality

The air quality for Kinetrol actuators can be defined with reference to International Standard ISO 8573.1, which gives quality class numbers for dirt, water and oil content (see table below).

General purpose compressed air is said to conform to classes 2.3.3 for these three materials (i.e. class 2 for dirt, 3 for water, 3 for oil) - this means it should be filtered to remove particles greater than 1 micron in size, with water content at pressure dewpoint -20C at 7 Bar gauge, and oil content (including vapor) of less than 1 mg. per cubic meter. We believe that 1 micron filtration is seldom necessary; 40 micron filtration for non-modulating applications and 5 micron filtration for modulating applications is usually adequate. Higher oil content on its own will not result in any serious problems in on/off actuators. Water content is usually only intermittently high - if it remains high continuously, or if it carries a load of corrosion products from the piping, then serious damage can be done.

QUALITY CLASS	DIRT Particle size in Micron	WATER Pressure Dewpoint deg. C (ppm. vol.) at 7 bar gauge	OIL (Including vapor) mg/m ³
1	0.1	-70(.3)	0.01
2	1	-40(16)	0.1
3	5	-20(128)	1
4	40	+3(940)	5
5	-	+7(1240)	25
6	-	+10(1500)	-