

OPERATING & MAINTENANCE INSTRUCTIONS



INSTRUCTION MANUAL IN02

Series A & G Diaphragm Actuator

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Pneumatic Actuators Series A & G Diaphragm Actuators Sizes 38in², 75in², 150in², 300 in² Spring Opposed and Springless Types Series C Piston/Spring Opposed Series D Piston/Springless

ACTUATOR REMOVAL OR MAINTENANCE WORK MUST NEVER BE PERFORMED WHEN FITTED TO A LIVE VALVE

Series A & G Diaphragm Actuators - Spring Opposed

General

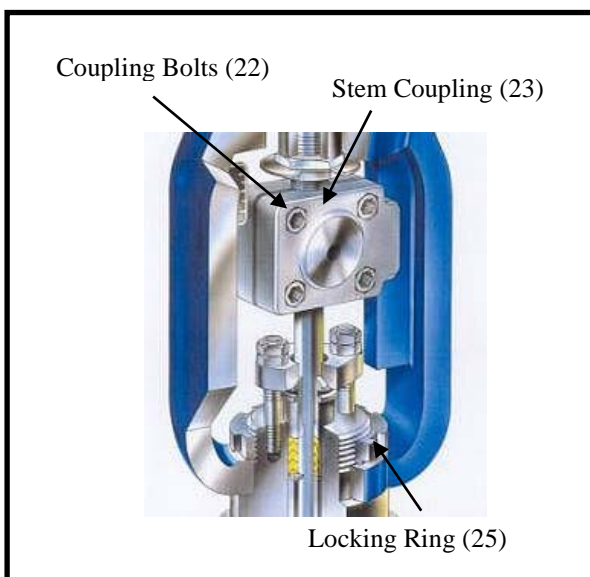
DIRECT ACTION Actuators (see Fig. 1) extend the actuator stem with increasing operating air pressure and retract the stem with decreasing pressure.

REVERSE ACTION Actuators (see Fig. 2) retract the actuator stem with increasing operating air pressure and extend the stem with decreasing pressure.

There are upper and lower pads on both sides of the yoke suitable for the mounting of most types of instrumentation.

To remove the actuator from the valve:

- a) Disconnect all the instrumentation coupling devices from the valve stem coupling (23).
- b) Ensure that the plug face is lifted slightly off the seat (apply air pressure to a reverse acting actuator).
- c) Carefully remove the coupling bolts (22), separate and remove the two halves of the coupling (23).
- d) Utilising a drift unscrew and remove the locking ring (25).
- e) Utilising a straight lift carefully remove the Actuator, taking care not to damage the valve stem or gland arrangement.
- f) Before commencing dis-assembly of the actuator remove all instrumentation.



To replace Diaphragm and 'O' rings: (See Figs. 1 & 2)

1. Remove the spring cover plate screws and the spring cover plate (541).
2. Relieve all spring compression by inserting a ¼" wide bar in the spring adjuster (537) slots / holes and rotating counter clockwise.
3. Remove the diaphragm case screws and nuts (596 & 597) and separate the diaphragm cases.
4. Unlock the travel stop nuts (523) and remove them and the travel indicator pointer (570) from the actuator stem.
5. Lift the diaphragm assembly and the actuator stem clear of the actuator, taking care to withdraw the stem perfectly straight to avoid damaging the threads and the 'O' rings in the reverse action arrangement.
6. To replace the 'O' rings, remove the yoke screws (575) and separate the yoke (502) from the diaphragm case or spring assembly.
7. Remove the old 'O' rings from the seal box (562) and replace with new ones.
8. To replace diaphragm (555) – unscrew and remove the diaphragm collar nut (544).
9. Carefully lift the diaphragm button (553) over the stem, remove and discard the old diaphragm.
10. Slide the new diaphragm (dusted with French chalk or Talc) over the actuator stem into position on the diaphragm collar (542).
11. Replace the diaphragm button (553) and lock the assembly together with the collar nut (544).
12. To reassemble the Direct Action (Fig. 1) secure the spring tube assembly (514) to the yoke (502) by means of the yoke screws (575).
To reassemble for Reverse Action (Fig. 2) secure the diaphragm case assembly (517) to the yoke (502) by means of the yoke screws (575), ensuring the air connection is facing the right direction.
13. Replace the travel stop tube (551) in its correct position on the actuator stem (531) – (see Figs. 1 and 2). Slide the actuator stem into position taking care to keep it straight. In the Reverse Action arrangement take care not to damage the diaphragm collar 'O' rings (565) – a rotary action whilst sliding the stem into position is helpful – Place the spring (584) over the stem on the diaphragm button (553).

14. In the Direct Action version bolt the diaphragm case assembly (517) to the spring tube assembly (514) ensuring air connection faces the right direction.
In the Reverse Action version slide the stem guide (546) in the spring tube assembly (514) over the actuator stem (531) and bolt the two diaphragm cases together.
15. Replace the two travel stop nuts (523) on the actuator stem with the travel indicator pointer (570) between them.
16. By rotating the spring adjuster (537) clockwise – apply compression to the spring until the actuator stem (531) starts to move at the required air pressure (i.e. 3 or 6 psig)
17. With the diaphragm assembly in its lowest position (apply air pressure for the Direct Action version) adjust the travel stop nuts (523) so that the distance between the top nut and the base of the lower travel stop (524) is the rated travel of the actuator or valve (see nameplate) +1/32". Lock the nuts together.

18. Mount the actuator on the valve.
 - a) Pass the yoke over the valve gland and valve bonnet to sit squarely on the bonnet shoulder. Rotate the yoke until the windows face in the required direction and then tighten the locking ring securely.
 - b) With the plug face in contact with the seat and with the actuator stem in its lowest position (apply air pressure to the Direct Action actuator) press the half of the stem coupling which is threaded for the coupling screw against the actuator stem and valve plug stem so that:
 - (i) The ends of the stems are equidistant from the tapped coupling screw holes.
 and
 - (ii) The tapped coupling screw hole is on the same side of the actuator as the positioned or other accessories, which may require attachment to the coupling screw.

Fig 1 Assembly for Direct Acting

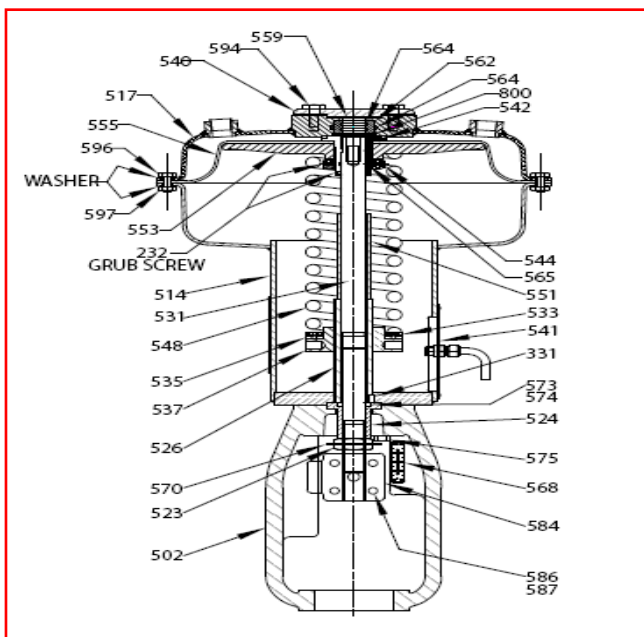
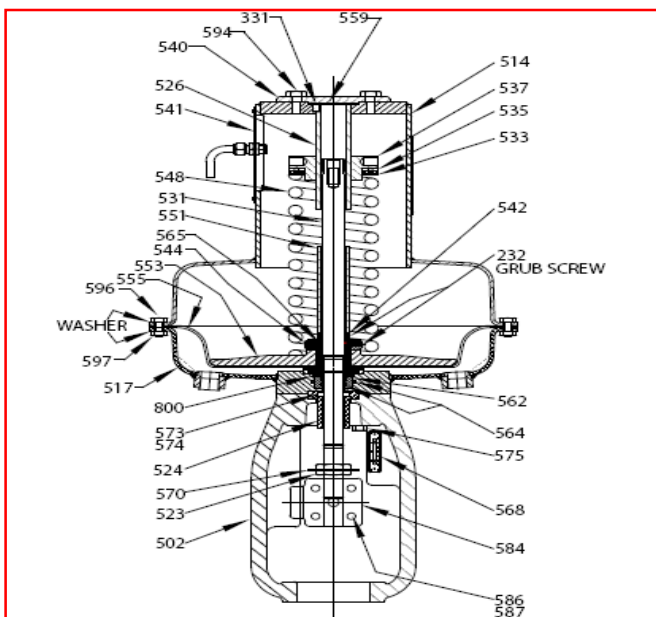


Fig 2 Assembly for Reverse Action



SPARES LIST FOR SIZES 75in², 150in², 300in².

PART NO.	NAME OF PART
232	Kel 'F' Pellet
331	Anti-Rotation Pin
502	Yoke
514	Spring Tube Assembly
517	Diaphragm Case Assembly
523	Travel Stop Nuts
524	Lower Travel Stop
526	Spring Adjusting Screw
531	Actuator Stem
533	Spring Carrier
535	Spring Thrust Bearing
537	Spring Adjuster
540	Cover Plate
541	Spring Cover Plate
542	Diaphragm Collar
544	Collar Nut
548	Spring
551	Travel stop tube
553	Diaphragm Button
555*	Diaphragm
559*	Cover Plate Joint
562	Seal Box
564*	Seal Box 'O' Rings
565*	Diaphragm Collar 'O' Ring
568	Travel Indicator Plate
570	Travel Indicator Pointer
573	Felt Wiper
574	Wiper Retainer
575	Yoke Screws
584	Stem Couplings
586	Stem Coupling Screws
587	Stem Coupling Screw Nut
594	Cover Plate Screws
596	Diaphragm Cast Screws
597	Diaphragm Cast Screw Nuts
601	Grub Screws
800	Circlip

ITEMS MARKED * ARE RECOMMENDED SPARES

Note: It may be necessary to move the plug off its seat by a slight amount in order to mesh the plug stem threads with the lower coupling threads.

- c) Apply the other half of the coupling carefully engaging the threads, then insert the coupling screws and tighten by hand.
- d) Move the plug off the seat by changing the air pressure on the diaphragm then unscrew the plug stem an additional turn out of the coupling to ensure positive seating.
- e) Fully tighten the coupling screws.
- f) Seat the valve firmly by means of the actuator.
- g) Adjust the dimension between the lower travel stop and the upper travel stop nut to equal the required valve travel. Position the travel indicator pointer to the nut and lock together with the second travel stop nut.
- h) Whilst the valve is on its seat adjust the travel indicator scale so that the shut mark is in line with the travel indicator pointer.

By varying the air pressure to the actuator ensure that the assembled unit travels correctly. Ensure that the spring is set correctly and adjust as required.

THE ACTUATOR IS NOW MOUNTED ON THE VALVE AND READY FOR THE FITTING OF ANY INSTRUMENTATION

To reverse Actuator Action

Kent Introl Series 'A' Diaphragm Actuators may be assembled for either direct or reverse action (see Figs 3 and 4). No extra parts are required and no alterations to components are involved, it is simply a question of reassembly of existing parts.

To change the action just simply remove the actuator from the valve and dismantle it as described above, but there is no necessity to dismantle the diaphragm assembly or to remove the 'O' rings from the seal box unless these parts are to be replaced with new ones.

It is necessary, however, to remove the cover plate screws and the cover plate from the top of the actuator and to unscrew the diaphragm assembly off the actuator stem. Care must be taken before attempting to unscrew the diaphragm collar from the stem to loosen adequately the grub screw which locks the diaphragm collar. Reposition on the actuator stem and screw the diaphragm collar complete with its diaphragm well home into its new position and lock it in position by tightening the grub screw.

Now reassemble and adjust the actuator as described above.

NOTE: In the direct action arrangement, the 'O' rings in the seal box have no function to perform, but they should be left in position as they will be required if the actuator has to be reassembled for reverse action.

SIDE MOUNTED HANDWHEEL UNIT

General

The Side Mounted Handwheel assembly enables the conventional spring/diaphragm operated Control Valve to be manually operated in the event of an emergency and also allows the valve travel to be limited in either "Open" or "closed" direction.

Method of Operation

For normal pneumatic operation of the valve, the handwheel is set in the NEUTRAL position. In this position the valve will move through full travel when air pressure is applied to the diaphragm. From the neutral position, CLOCKWISE ROTATION of the handwheel tends to CLOSE the valve. ANTI-CLOCKWISE ROTATION tends to OPEN the valve. The valve may be locked full open or fully closed, or the travel limited in any intermediate position as shown on the handwheel unit travel indicator.

REMOVING UNIT FROM THE VALVE

Remove unit from the valve in a similar manor to removing the actuator alone

Dismantling side mounted handwheel unit (Figs. 3 & 4)

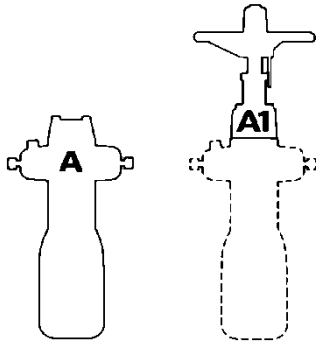
1. Set the Handwheel in NEUTRAL POSITION.
2. Proceed as for 'To replace Diaphragm and 'O' rings' up to and including Step 4.
3. Remove Actuator Stem Nut (629) by removing the 2 off socket head cap screws and separating the two halves.
4. Remove upper housing screws (639). Ensuring a straight lift and taking great care not to damage the actuator stem lift the actuator off the gear box assembly.
5. Unscrew the socket grub screw and taking care not to loose the key (632) remove the handweel (599) – Fig 6
6. Remove screw stem nut assembly (630) by first releasing locknut (283) and removing indicator stop peg (620) and then unscrew nut (641) from screw stem (611)

7. Remove lower housing screws (639) and lift off screw housing (605).
8. Unscrew Handwheel stem nut (628).
9. Withdraw Handwheel Stem (627) complete with worm gear (635) by rotating handwheel stem in anti-clockwise direction. If thrust bearing (636) does not come out when the handwheel stem is removed from the housing take out after lifting out the worm gear.
10. Lift out worm gear (635), screw stem (611) and thrust bearings (637).
11. The worm (634) is keyed to the handwheel (627) using a sunk key. Normally it should not be necessary to remove the worm; however, this can be done, when required, by holding the worm and lightly tapping the shaft at the opposite end to the handwheel boss.

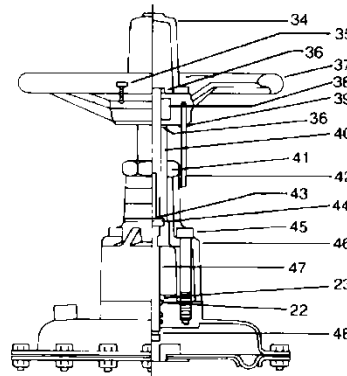
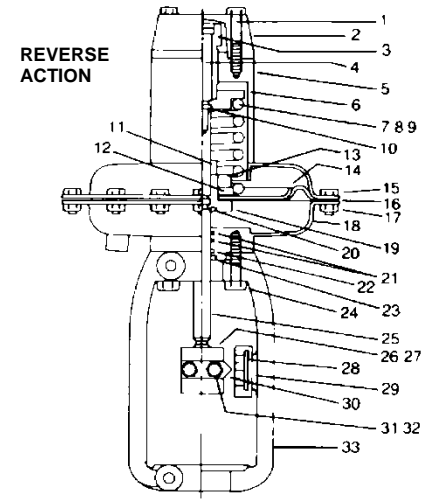
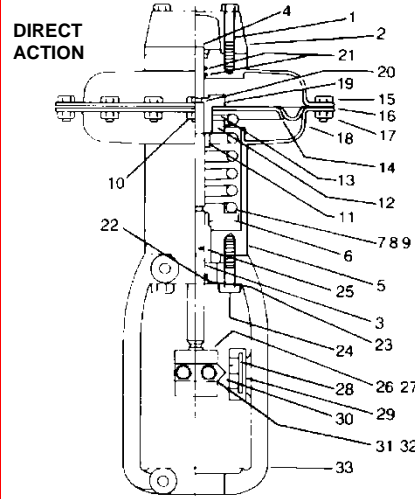
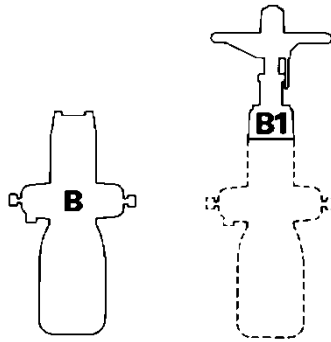
Carefully clean and inspect all the components should any show signs of wear or damage these should be refurbished or replaced.

Re-assembly of Side Mounted Handwheel Unit

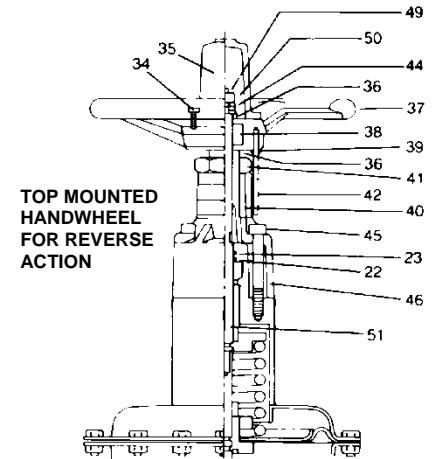
1. Replace worm (634) on handwheel stem (627), first ensuring that the two well greased thrust washers (636) are in position.
2. Apply grease to the screw stem (611) and screw into the worm gear (635) to approximately mid-position.
3. Place a well greased thrust bearing (637) on each side of the worm gear (635).
4. Replace the screw stem/worm gear assembly in the gear housing.
5. Re-engage the worm (634) and worm gear (635) by rotating handwheel stem clockwise as it is replaced in the gear housing
6. Replace handwheel stem nut (628) and pack grease around the worm and wheel
7. Replace screw housing (605) on top of the gear housing. (The position of the access windows in the gear housing does not affect the functioning of the valve, but for operating convenience, the travel indicator is usually arranged on the same side as the handwheel) fit and fully tighten the lower housing screws (639).
8. Replace the handwheel key, the handwheel and fully tighten the handwheel locknut, at this point, check that the complete gear assembly rotates freely.
9. Refit screw stem nut assembly (630). (See Figs. 7 and 8).
 - a. Replace screw stem nut (641) on screw stem (611). Top of nut should be approximately level with top of stem.
 - b. Rotate nut until the screwed hole aligns with the slot in the screw stem.
 - c. Rotate screw stem and nut together until both holes and slot align with travel indicator window in housing (605).
 - d. Replace indicator peg (620) as shown on Figs. 7 and 8 and lock with locknut (283).



A = Assembled for Direct Action.
 A1 = Top Mounted Handwheel for Direct Action.
 B = Assembled for Reverse Action..
 B1 = Top Mounted Handwheel for Reverse Action.



TOP MOUNTED HANDWHEEL FOR DIRECT ACTION



TOP MOUNTED HANDWHEEL FOR REVERSE ACTION

SPARES LIST FOR SIZES 38in²

ITEM	DESCRIPTION	PART NO.	QTY.
1	Screw	2177.14422	2
2	Cover	AB5-16-00070	1
3	Spring Adjuster	AB5-16-00180	1
4	Extension Stem	AB5-16-00230	1
5	Spring Tube Assembly	AC5-16-00010	1
6	Spring Cap	AB5-16-00190	1
7	Spring 3-9 PSI	AB5-16-00080	1
8	Spring 3+15 PSI	AB5-16-00090	1
9	Spring 6+30 PSI	AB5-16-00100	1
10	Washer	2202.0925	1
11	Nut	2210.6613	1
12	Nut	2012.7211	1
13	Washer	AB5-16-00170	1
14	Diaphragm Button	AB5-16-00160	1
15	Screw	2122.9443	12
16*	Diaphragm	AB5-16-00050	1
17	Nut	2011.1212	12
18	Diaphragm Case Assembly	AC5-16-00020	1
19	Collar	AB5-16-00150	1
20*	O-Ring	2000.2160	1
21*	O-Ring	2000.3060	2
22*	O-Ring	AB5-16-00200	1
23*	Felt Wiper	2200.0361	1
24	Screw	2126.3441	2
25	Actuator Stem	AB5-16-00060	1
26	Stem Coupling for Valves DN ½" – ¾" – 1"	AB-16-00110	1

SPARES LIST FOR SIZES 38in²

ITEM	DESCRIPTION	PART NO.	QTY.
27	Stem Coupling for Valves DN 1½" – 2"	AB5-16-00120	1
28	Screw	2108.5001	2
29	Travel Indicator Plate	AB5-16-00140	1
30	Travel Indicator Pointer	AB5-16-00130	1
31	Screw	2123.7441	2
32	Nut	2011.1212	2
33	Yoke	AB5-16-00010	1
34	Cover	AB5-16-00240	1
35	Screw	2163.4043	3
36	Circlip	2025.2125	2
37	Handwheel	AB5-16-00310	1
38	Square Key	2201.2512	1
39	Nut	2011.0811	1
40	Screw Spindle	AB5-16-00250	1
41	Nut	AB5-16-00300	1
42	Travel Indicator Pointer	AB5-16-00280	1
43	Circlip	2025.0625	1
44	Trust Bearing	2220.0014	1
45	Screw	2177.1043	2
46	Housing Screw	AB5-16-00290	1
47	Stem Connector	AB5-16-00260	1
48	O-Ring	2000.2160	1
49	Nut	2201.0612	1
50	Split Connector	2050.3110	1
51	Stem Connector	AB5-16-00270	1

ITEMS MARKED * ARE RECOMMENDED SPARES

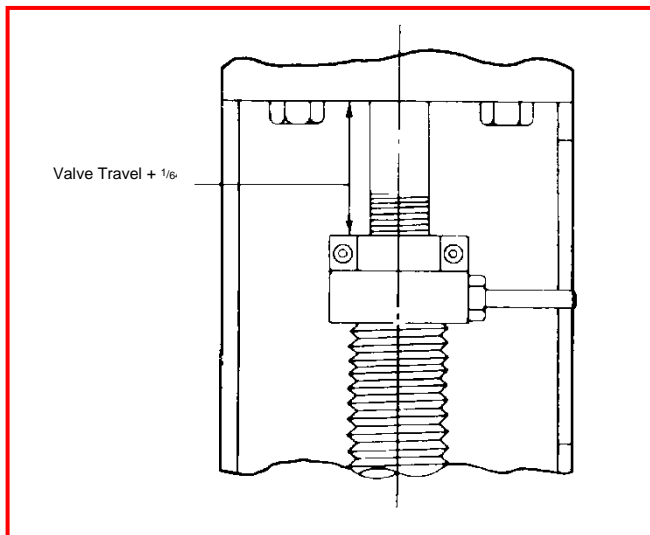
Top Mounted Handwheel and Jacking Screw

10. Rotate the handwheel until indicator is in neutral position.
11. Taking great care not to damage the stem replace the fully assembled diaphragm actuator and noting the orientation fit the upper housing screws (639) and fully tighten.
12. If the actuator has not had its spring set then initially adjust the spring compression by rotating adjuster (537) clockwise until an air pressure of approximately 3 psi is required to start the actuator moving,
13. **a, Reverse Acting Actuator**

With no air pressure on the diaphragm rotate the handwheel until indicator is below the NEUTRAL position. Replace actuator stem nut (629) onto the actuator stem. Adjust until distance between top of nut and underside of housing is equal to valve travel plus $\frac{1}{64}$ " and tighten nut onto stem. (Valve Travel is shown on the data plate attached to actuator).

b, Director Acting Actuator

First apply air pressure until actuator moves through full travel and then rotate handwheel until indicator is below NEUTRAL position. Replace actuator stem nut and set travel as for Reverse Acting Actuator described above.



14. Rotate handwheel until stem nut assembly (630) rises to touch underside of actuator stem nut (629), at the same time ensuring that actuator stem is not moved upwards. Side mounted handwheel mechanism is now in NEUTRAL position. Check that centre of indicator peg coincides with "NEUTRAL" on the handwheel setting indicator and, if not, correct the error by adjusting the plate accordingly.
15. Refit travel stop nuts (523) and indicator disc (570) so that the distance between top of nuts and underside of screw stem is equal to valve travel plus $\frac{1}{16}$ ". Check that indicator disc is aligned with "CLOSED" on travel plate. If not, adjust travel plate accordingly.
16. Refit actuator to valve as described on page 1.
17. Check that handwheel will fully open or close the valve and that actuator will move pneumatically through full travel with handwheel in neutral position.
18. Re-check spring compression and adjust as necessary by rotating spring adjuster (537).

General

The KentIntrol Top Mounted Handwheel is in effect a continuously connected handwheel – top mounted rather than side mounted. The handwheel is capable of providing operating force in both the upwards and downwards direction – it does not rely on the actuator spring to provide return motion. There is nothing to engage or unlatch. It can be used to operate the valve manually throughout its full stroke, or as a travel stop, limiting the amount of closing or opening of the valve. When set in the neutral position the actuator operates automatically under the influence of the air pressure and actuator spring. An indicator is provided to show the position of the handwheel mechanism, and the usual valve travel indicator is also supplied. A locknut is provided to lock the handwheel in any position.

Principle of Operation

Reverse Acting

When the top mounted handwheel is mounted on a reverse acting actuator – air to open, spring to close – with no air pressure acting on the diaphragm, the handwheel, when turned in a clockwise direction has no apparent effect on the valve, but is, in fact limiting the valve travel until in the extreme the valve is locked in the 'closed' position. When the handwheel is turned in an anti-clockwise direction, the valve stem starts to move upwards, opening the valve (or limiting the amount of closure) until in the extreme the valve is locked in the 'open' position.

Direct Acting Actuator

When the top mounted handwheel is mounted on a direct acting actuator – air to close, spring to open – with no air pressure acting on the diaphragm, the handwheel, when turned in a clockwise direction moves the valve stem downwards closing the valve and limiting the valve travel until in the extreme the valve is locked in the 'closed' position. When the handwheel is turned in an anti-clockwise direction, no apparent effect is noticed on the valve until in the extreme the valve is locked in the 'open' position.

Dis-assembly of Top Mounted Handwheel

1. Proceed as for disassembly of diaphragm actuator up to and including Step 3.
2. Remove the cover (645) by unscrewing the cheese head screws.
3. Remove the split coupling (584) from stem connector (609) and screw stem (611) by unscrewing coupling screw (586) from stop peg (620).
4. Unscrew the socket head capscrews and carefully remove the screw housing assembly.
5. The stem connector (609) can now be unscrewed ensuring that the actuator stem (531) is not allowed to rotate thus preventing position damage to the diaphragm.
6. Remove the circlip and then the indicator pointer (570).
7. Rotate the handwheel (599) anti-clockwise to withdraw the screw spindle (607) and screw stem (611) assembly from the screw housing (605). (if jacking screw arrangement remove spindle cover (610) and use spanner square provided).
8. Remove grub screw from screw plug (613) and remove screw plug from screw spindle, this will allow the screw stem to be withdrawn.
9. Remove handwheel lock nut and handwheel.

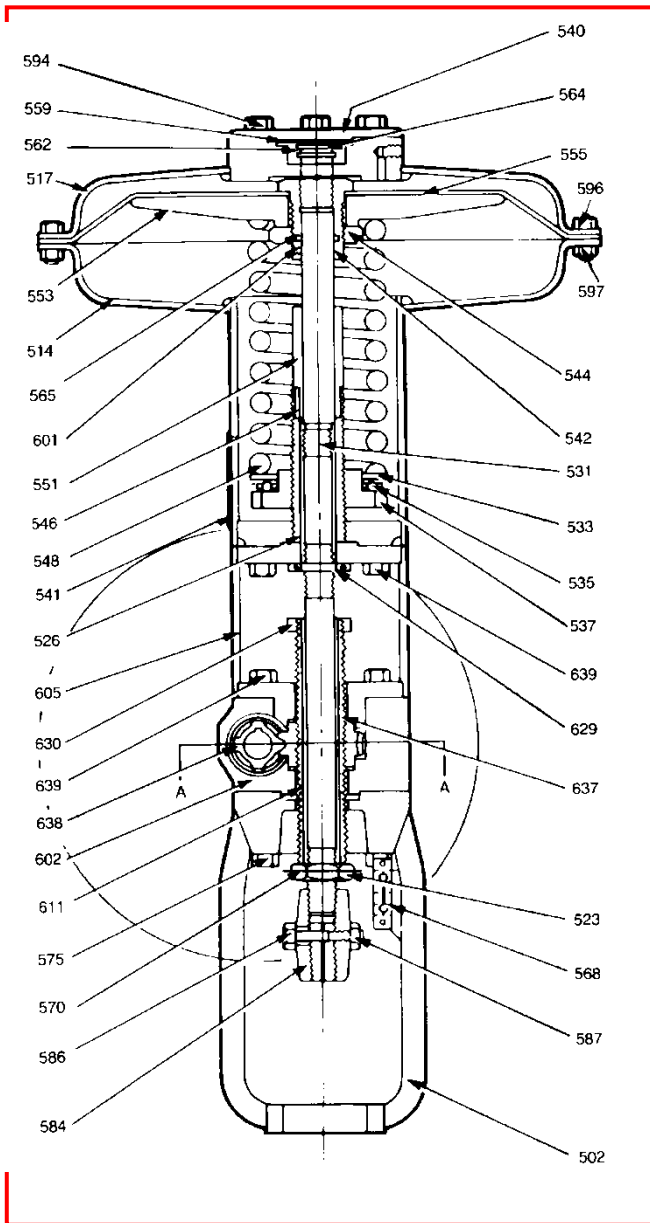


Fig. 3 Assembled for direct action

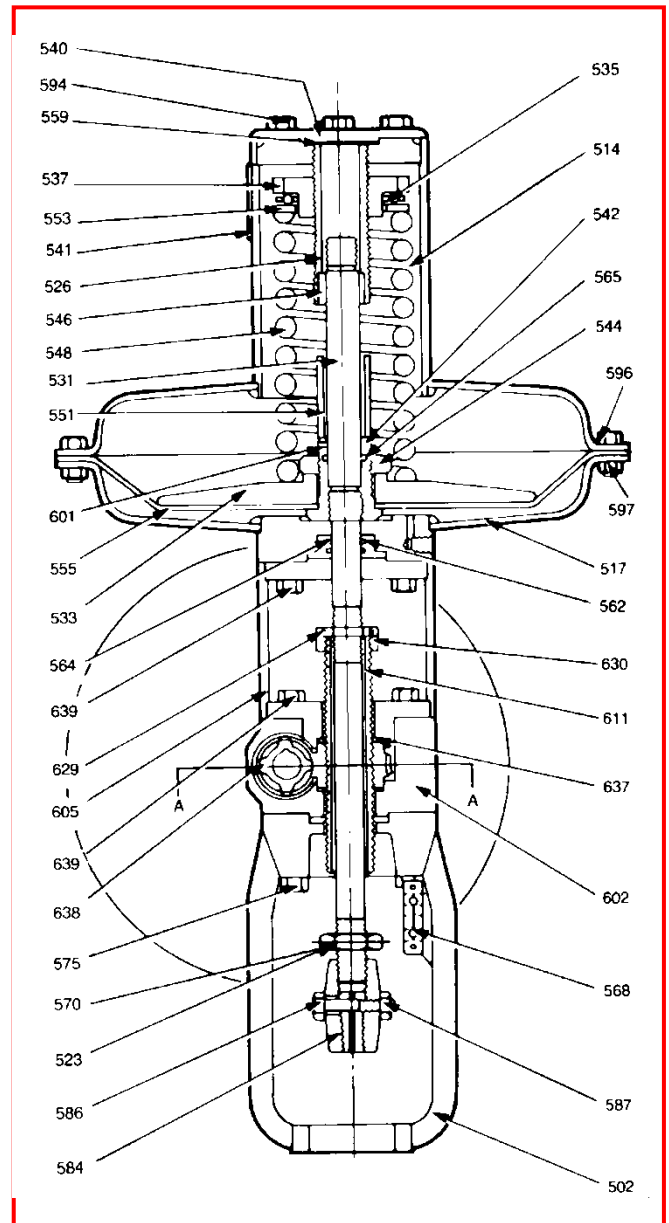


Fig. 4 Assembled for reverse action

PART NO.	NAME OF PART
502	Yoke
514	Spring Tube Assembly
517	Diaphragm Case Assembly
523	Travel Stop Nuts
526	Spring Adjusting Screw
531	Actuator Stem
533	Spring Carrier
535	Spring Thrust Bearing
537	Spring Adjuster
540	Cover Plate
541	Spring Cover Plate
542	Diaphragm Collar
544	Collar Nut
546	Stem Guide
548	Spring
551	Travel stop tube
553	Diaphragm Button
555*	Diaphragm
559*	Cover Plate Joint
562	Seal Box
564*	Seal Box 'O' Rings

ITEMS MARKED * ARE RECOMMENDED SPARES

PART NO.	NAME OF PART
565*	Diaphragm Collar 'O' Ring
568	Travel Indicator Plate
570	Travel Indicator Pointer
573	Felt Wiper
574	Wiper Retainer
575	Yoke Screws
584	Stem Couplings
586	Stem Coupling Screw
587	Stem Coupling Screw Nut
594	Cover Plate Screws
596	Diaphragm Cast Screws
597	Diaphragm Cast Screw Nuts
601	Grub Screw
602	Gear Housing
605	Screw Housing
611	Screw Stem
629	Actuator Stem Nut
630	Screw Stem Assembly
637	Worm Gear Thrust Bearing
638	Grease Nipple
639	Housing Screws

ITEMS MARKED * ARE RECOMMENDED SPARES

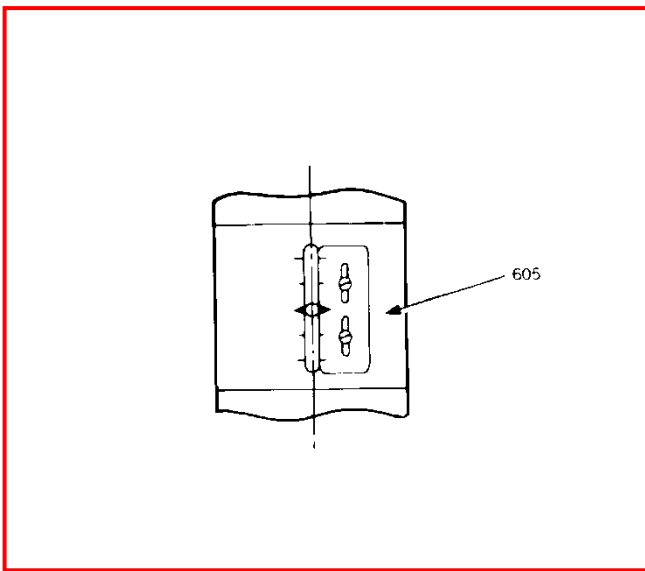


Fig. 5 Handwheel Setting Indicator

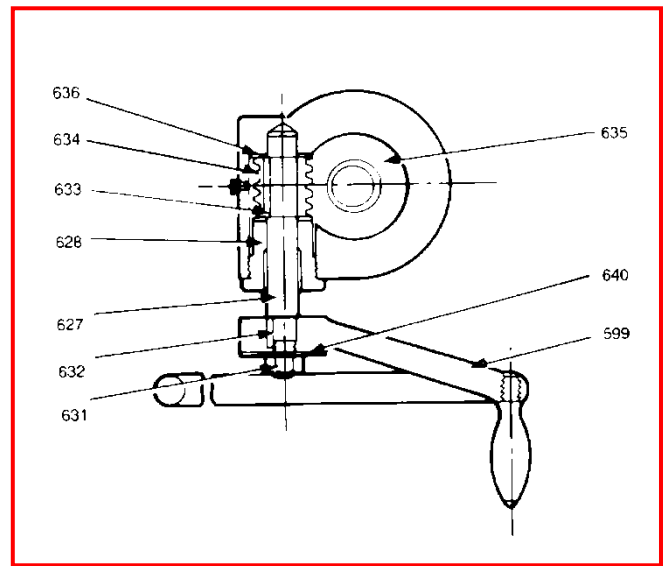


Fig. 6 Section at A-A

PART NO.	NAME OF PART
283*	Lock Nut
599	Handwheel
605	Screw Housing
611*	Screw Stem
620	Indicator-Stop Peg
627	Handwheel Stem
628	Handwheel Stem Nut
631	Handwheel Lock Nut
632	Handwheel Key

PART NO.	NAME OF PART
633	Worm Key
634	Worm
635	Worm Gear
636	Worm Thrust Bearing
637	Worm Gear Thrust Bearing
638	Grease Nipple
639	Housing Screws
640	Handwheel Indicator Plate
641*	Screw Stem Nut

ITEMS MARKED * CONSTITUTE SCREW NUT ASSEMBLY (REF 630)

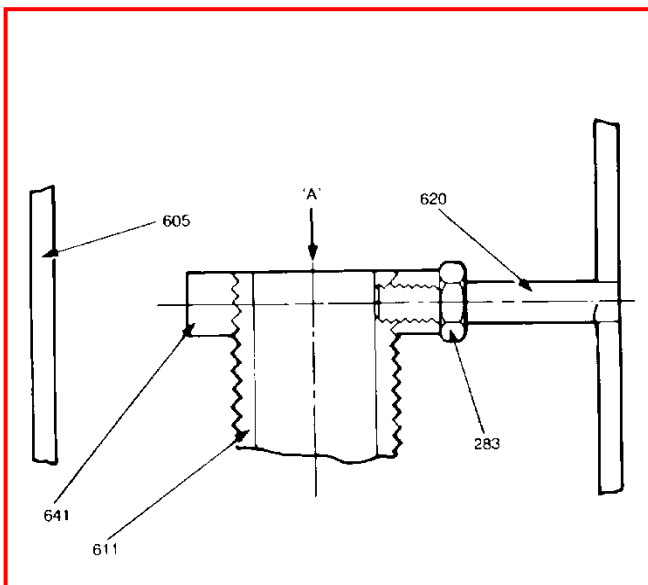


Fig. 7

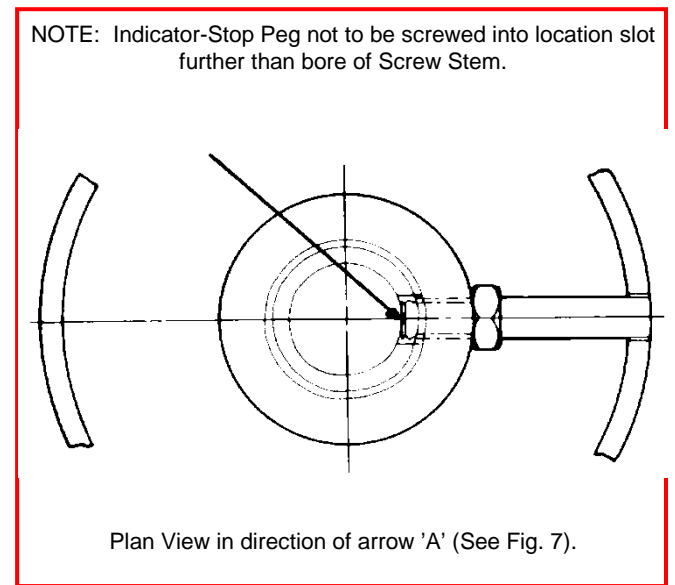


Fig. 8

Re-assembly of Top Mounted Handwheel

Carefully clean and inspect all the components, any showing signs of wear or damage should be refurbished or replaced.

This is essentially a reversal of the dismantling procedure noting the following points:

1. Screw the stem connector (609) into the actuator stem (531) ensuring that it is hard up against the shoulder and the actuator stem is prevented from turning. When fitted to Direct Acting actuators care must be taken not to damage the 'o' rings when connector is passed through the seal box.
2. When fitted to Direct Acting Actuator ensure that the wiper ring (573) has been soaked in light oil and is fitted in position in the screw housing (605) with the wiper retainer (574)
3. Noting the orientation mount the screw housing (605) over the stem connector (609) and onto the actuator fit and fully tighten the socket head cap screws.
4. Lubricate with grease the 2 thrust washers (621) and place each side of the screw stem inside the screw spindle. Screw the screw plug (613) fully into the screw spindle and lock in position with the grub screw.
5. Lubricate the screw spindle thread (607) and screw the locknut (626) on to the handwheel end. Fit the square key, handwheel fit and fully tighten the handwheel locknut.
6. Screw the screw spindle assembly into the screw housing. Locate the indicator pin on the screw plug and hold in place with the circlip.
7. Fit the split coupling ensuring that it has maximum hold on the threads of both the screw stem (611) and the stem connector (609). Ensure that the stop peg (620) is positioned in the slot on the screw housing (605) fit and fully tighten the coupling screw (586).
8. Refit the indicator cover plate (645)
9. Setting of Handjacks in 'Neutral Position'.
 - a. Reverse Acting Actuator

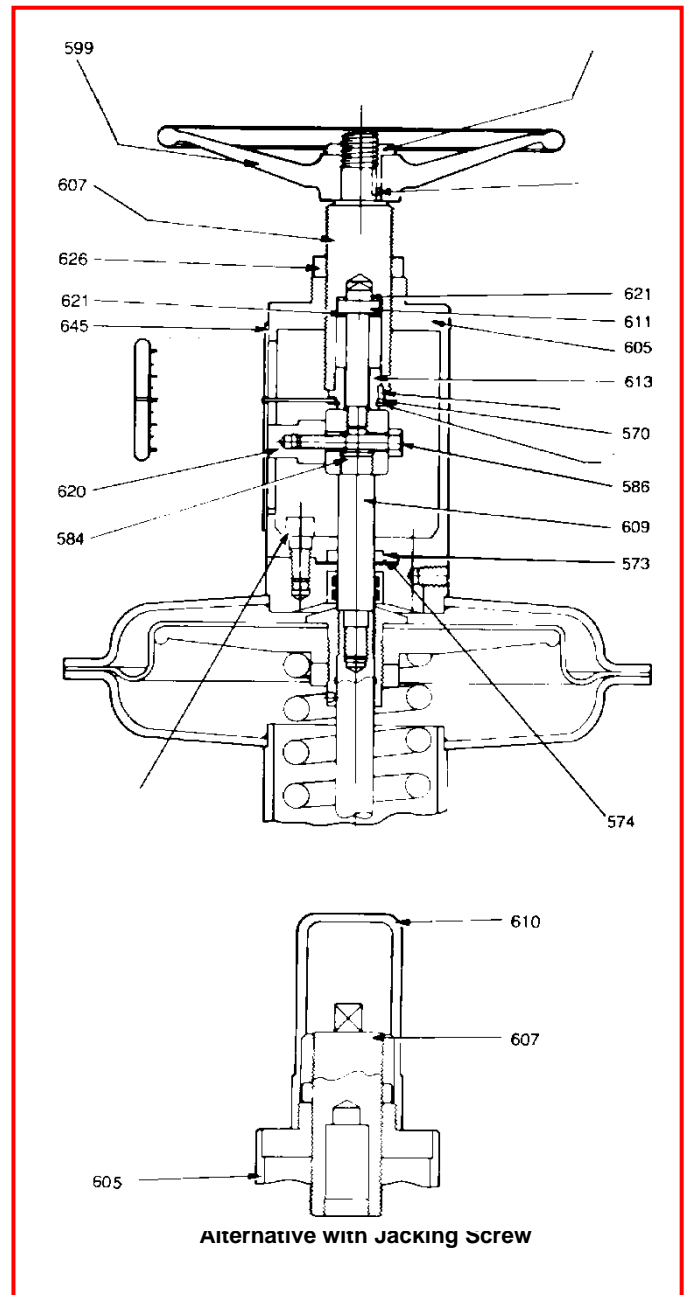
With the Actuator in the 'Down' position, turn the Screw Spindle (607) anti-clockwise until the Spring Tension is felt and the Actuator Stem (531) begins to move. Release this Spring Tension and with the Actuator back in the 'Down' position, the Handjack is now set in the 'Neutral' position (ie. Actuator will operate without being impeded by Handjack).
 - b. Direct Acting Actuator

With the Actuator in the 'Up' position, turn the Screw Spindle (607) clockwise until the Spring Tension is felt and the Actuator Stem (531) begins to move. Release this Spring Tension and with the Actuator back in the 'Up' position, the Handjack is now set in the 'Neutral' position (ie. Actuator will operate without being impeded by Handjack).
10. After setting Handjacks, check position of the indicator tab and adjust if required
11. Utilise locknut (626) if it is required that the handwheel be locked in a position after adjusting.

Koso KentIntrol Ltd.

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PART NO.	NAME OF PART
570	Indicator Pin
573	Wiper Ring
574	Wiper Retainer
584	Split Coupling
586	Coupling Screw
599	Handwheel
605	Screw Housing
607	Screw Spindle
609	Stem Connector
610	Spindle Cover
611	Screw Stem
613	Screw Plug
620	Stop Peg
621	Thrust Washer
626	Lock Nut
645	Indicator Cover Plate



The Company's policy is one of continuous product improvement and the right is reserved to modify the specifications contained herein without notice.

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