

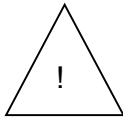
DOUBLE ACTING PNEUMATIC ROTARY ACTUATOR INSTALLATION, OPERATION AND MAINTENANCE MANUAL

Checks to be carried out on receipt of the actuator

1. Check that the actuator has not been damaged. The actuator has been packed to provide protection during shipment, however it can be damaged in transit. If damages found , file a claim with the carrier/insurance.
2. Check that the fitted accessories comply with those listed in the order acknowledgement and the delivery challan.
3. If the actuator arrives already assembled onto the valve, the setting of the mechanical stops and of the electric limit switches (if existing) has already been made by the person who supplies the actuator with valve. If the actuator arrives separately from the valve, the setting of the mechanical stops and of the electric limit switch (if existing) must be checked and, if necessary, carried out while assembling the actuator onto the valve.

Safety Messages

All safety messages in the instruction and the on the product(s) are flagged with an exclamation symbol and the word Caution, Warning or Danger. These messages must be followed exactly to avoid equipment damage, personal injury or death. If a safety label becomes difficult to see, or if the label has been removed, please contact *KENWOOD VALVE CONTROLS* for getting the same.



WARNING !

DO NOT EXCEED 100 PSI AIR PRESSURE

This cylinder is a pressure vessel. Release pressure from both ends of the cylinder before attempting any disassembly or repair. Failure to release pressure from both ends before disassembling could result in personal injury.

Storage

The actuator leaves the factory in excellent working conditions. In order to maintain these characteristics until the actuator is installed on the plant, it is necessary to observe a few rules and take appropriate measure during the storage period.

1. Make sure that the plugs are fitted in the air connections (either cylinder ports or the Solenoid ports) and in the cable entries of Limit switch. The plastic plugs which close the inlet do not have a weatherproof function, but are only means of protection against the entry of foreign matter during transport and short term storage.

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2. If the actuators are to be supplied separately from the valves, they must be placed onto a Wooden pallet so as not to damage the coupling flange to the valve. If possible blank off the Flange by a protective cover.
3. In case of long-term storage, it is advisable to keep the actuators in a dry place or to provide at least some means of weather protection. If possible, it is advisable to periodically (once in three months) operate the actuator with filtered and dry air. Lubricated air is not required. After such operation all the threaded connections of the actuator and solenoid valve (if present) should be carefully plugged.

Assembling the actuator onto the valve

1. Prior to assembly, manually open and close the valve, if possible, to ensure freeness of operation. Be sure valve and the actuator rotates in the same direction and are in the same position (i.e. valve closed, actuator closed).
2. The actuator can be directly mounted onto the valves having mounting flange details as per ISO 5211, since the actuator mounting flange is with ISO 5211 details unless different mounting detail is asked by the customer. Actuator can also be assembled by using a bracket/adaptor to suit the valve mounting details.
3. The assembly position of the actuator, with reference to the valve, must comply with the plant requirements (cylinder axis parallel or perpendicular to the pipeline axis).
4. To assemble the actuator onto the valve proceed as follows:
 - 4.1. check the mounting surface, stem extension/adaptor and the bracket to assure proper fit.
 - 4.2. bring the valve to "Closed" position with the stem vertical.
 - 4.3. lubricate the valve stem/adaptor with oil or grease in order to make the assembly easier. Be careful not to pour any of it onto the flange.
 - 4.4. clean the valve flange and remove anything that might prevent a perfect adherence to the Actuator flange and especially all traces of grease, **since the torque is transmitted by friction between the flanges.**
 - 4.5. bolt the bracket onto the valve (when direct mounting of actuator is not possible) and place the stem coupling/adaptor onto the valve stem.
 - 4.6. bring the actuator to the "Closed" position.
 - 4.7. connect a sling to the lifting lugs/plates provided to lift the actuator: make sure that the sling is suitable for the actuator weight. Lift the actuator to a suitable height and clean the actuator flange and remove anything that might prevent adherence to the valve flange, especially all the traces of grease. Caution: The lifting points are sized to pull up only the actuator : do not use the same, to lift the actuator assembly + valve.
 - 4.8. lower the actuator onto the valve in such a way that the valve stem or stem adaptor/coupling enters the actuator drive bore. This coupling must take place without forcing and only with the weight of the actuator. When the stem or the stem adaptor/coupling check the holes of the valve flanges. If they do not meet with the holes

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of actuator flange or the stud bolt screw into them, turn or stroke the actuator a few degree, so that alignment is proper.

4.9. tighten the bolts/nuts of the connecting studs evenly with the torque prescribed in the table-1 below. Use ASTM A193 Gr.B7 bolts and ASTM A194 Gr.2H nut for better clamping and torque transmission.

Table-1

| Thread size | Recommend tightening torque(NM) |
|-------------|---------------------------------|
| M8 | 20 |
| M10 | 40 |
| M12 | 70 |
| M14 | 110 |
| M16 | 160 |
| M20 | 320 |
| M22 | 420 |
| M24 | 550 |
| M27 | 800 |
| M30 | 1100 |
| M33 | 1400 |
| M36 | 1700 |

4.10. operate the actuator several times with clean filtered, dry and controlled air (Caution: Do not exceed 100 PSI pressure) to check that it moves the valve smoothly. If the actuator is equipped with Limit switch or other accessories adjust them at this time.

Travel stop adjustments

All the actuated valves require accurate mechanical travel-stop adjustments at both ends of the actuator stroke (and not those of the valve) to obtain optimum performance and valve seat life. The accumulation of tolerance in the adaptor of valve to actuator is such that there must be a range of adjustment for both ends of the stroke to achieve the expected performance. These heavy-duty actuators have travel stop adjustments in both the clockwise and anti-clockwise directions. The 10 degree over travel feature provides –5 to + 95 degrees.

The setting of open valve position is performed by adjusting the travel stop screw in the left wall of the actuator housing (when viewed from top and pressure connection facing towards operator). The setting of close valve position is performed, by adjusting the travel stop screw in the right wall of the actuator housing (when viewed from top and pressure connection facing towards operator).

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Proceed as follows for travel stop adjustment :

-loosen the lock nuts (top and bottom)

-if the actuator angular stroke is stopped before reaching the end position (fully open or close), unscrew the travel stop studs/bolts (top and bottom) by turning it anticlockwise, until the valve reaches the correct position. Ensure that the both top and bottom stud/bolts are in contact with the yoke, so that end force on travel stops are distributed among top and bottom stud/bolt

-tighten the lock nuts

Preparation for start-up

1. Pneumatic connection

Connect the actuator to the pneumatic feed line with fittings and pipes in accordance to the plant specifications. They must be sized correctly in order to guarantee the necessary airflow for the operation of the actuator. The shape of the connecting pipes should not cause excessive stress to the inlet of actuator. The piping must be suitably fastened so as not to cause excessive stress or loosening of threaded connection, if the system undergoes strong vibrations.

Every precaution must be taken to ensure that any solid or liquid contaminants, which may be present in the pneumatic pipe work to the actuator, are removed to avoid possible damages to the unit or loss of performance. The inside of the pipes used for the connections must be well cleaned before use: wash them with suitable substances and blow through them with air or nitrogen. The ends of the tubes must be well deburred and cleaned. Pneumatic connection to solenoid valve is to be made as per the instruction given by the solenoid valve supplier.

Once the connections are completed, operate the actuator and check that it functions correctly, and that there are no leakages in the pneumatic connections. Ensure that all the exhaust ports of solenoid valves are plugged with bug-screens or breathers to avoid entry of foreign particle, but they should not be plugged with blind plugs.

2. Electrical connection

Connect the electrical feed, control and signal lines to the solenoid valve, limit switch, by linking them up with the terminal blocks of the electrical components. In order to do this, the housing covers of limit switch box must be removed without damaging the O-rings or the gaskets.

Remove the plugs from the cable entries. For electrical connections use components (cable glands, cables, hoses, conduits) which meet the requirements and codes applicable to the plant specifications (mechanical protection and/or explosion proof protection). Screw the cable glands tightly into the threads inlets, so as to guarantee the weatherproof and/or explosion proof protection (when applicable).

Once the connections are completed, check that the controls and signals work properly.

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Start-up

During the start-up of the actuator, proceed as follows:

- check that the pressure and the quality of the air supply are as prescribed. Check that the feed voltage values of electrical components (solenoid valve coils, micro switches, pressure switch, electro-pneumatic positioner, I/P converter, etc.) are as prescribed
- check that the actuator controls works properly (remote control, local control, emergency controls, etc.)
- check that the required remote signals(valve position, air pressure, etc.) are correct
- check that the setting of the components of the actuator control unit (pressure regulators, pressure switches, flow control valves, etc.) meet the plant requirements.
- check that there are no leaks in the pneumatic connections. If necessary tighten the nuts of the pipe fittings
- remove all the rust if any, in accordance with the applicable painting specifications, repair paint-coat that has been damaged during transport, storage or assembly.

Maintenance

a. Routine maintenance

These actuators have been designed to work for long period in the severest condition and do not need maintenance. It is, however, advisable to periodically check the actuator as follows:

- check that the actuator operates the valve correctly and smoothly. If the actuator operation is very infrequent, carry out a few opening and closing operations with all the existing controls (remote, local, emergency controls, etc.), if this is allowed by the plant conditions
- check that the signals to the remote control desk are correct.
- check that the air supply pressure value is within the required range
- if there is an air filter on the actuator, bleed the condensed water accumulated in the cup by opening the drain cock. Disassemble the cup periodically and wash it with soap and water; disassemble the filter; if this is made of sintered cartridge, wash it with nitrate solvent and blow through it with air. If the filter is made of cellulose, it must be replaced when clogged
- check all the paint-coat of the actuator. If some areas are damaged, repair the paint-coat according to the applicable specification
- check that there are no leakages in the pneumatic connections. If necessary tighten the nuts of the pipefittings.

b. Preventive or breakdown maintenance

Caution: before carrying out any maintenance operation, it is necessary to close the pneumatic feed line and exhaust the pressure from both side of actuator cylinder and from the control unit, to ensure the safety of maintenance staff.

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If there are air leakages in the pneumatic cylinder or a malfunction in the mechanical components, or in case of scheduled preventive maintenance, the actuator must be disassembled and seals must be replaced with reference to the sectional drawing (page 9) and adopting the following procedures:

b1. Replacement of cylinder seals

(see sectional drawing)

Disassembly:

- disassemble the actuator from the valve. Also disassemble all the accessories like limit switch, solenoid valve, positioner and etc.,
- keep the actuator in open position by supplying little air to port "B".
- open the yoke pin cover (13) by pulling it since it is press fit.
- see whether the yoke pin is positioned such that it can be slipped off from the hole. If not supply little air pressure to either port "A" or port "B" such that yoke pin can be easily removed from the hole beneath yoke pin cover (13).
- remove all air connection to the actuator.
- remove the position indicator (2) by unscrewing indicator screws (1).
- unscrew the Housing cover bolts (15).
- by inserting two jack screw (M8 metric bolt) into the tapped holes (23 & 41), remove the housing cover.
- remove the circlip (5) and remove the roller (6).
- slide the yoke pin (7) out of piston rod through the hole in the housing.
- remove the cylinder cover (37) by unscrewing the nuts (38). Use mallet hammer if required to slide the cylinder cover out of cylinder tube.
- remove all the tie rods (32).
- pull out the cylinder tube (31).
- unscrew piston rod nut (45) and remove the piston.
- remove the piston rod (22) out of cylinder head (26).
- disassemble the cylinder head (26) form the housing (21) by removing the screws (28) only if there is any leakage through the housing and cylinder head joint. It is advised , not to remove the cylinder head, if there is no joint leakage.
- remove the yoke (24) from the housing.

Seal replacement

Prior to reassembly check that the actuator components are in good condition and clean. Lubricate all the surfaces of the parts, which move in contact with other components by a recommended grease (see paragraph b2 below). If the O-rings needs to be replaced, remove the existing one from its groove, clean the groove carefully and lubricate it with the recommended grease. Assemble the new O-ring into the groove and lubricate it.

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- replace the seals beneath head screws (28), if required.
- replace the O-rings (14), (16), (25), (27), (30), (34), (36).
- replace the piston bearing (35).

Reassembly:

- Spread anaerobic adhesive sealant (PTFE sealant) "ANR171 of FEVICOL" or a Polyester urethane based sealant "Hylomar Universal blue 960" gasket sealant on housing where the cover will be seated. This is to be applied to side faces of housing if side cover (19) and cylinder head (26) are disassembled. This is to ensure the weather proof protection of housing (This is not a must, but preferred).
- apply a thin coat of lubricant on inside surface of bearing (3) & (10) and place the yoke (24) into the housing (21) with out damaging the O-rings.
 - assemble the cylinder head (26) if removed. Ensure that the seals (28a) wetted with lubricant are placed beneath the cylinder head screws (28b). While assembling, the pressure port should be positioned as shown in the drawing or as it was assembled from factory.
- apply a thin coat of lubricant onto the inside surface of piston rod bearing (20) & (29) and yoke slot (24).
- insert the piston rod (22) into the cylinder head (26) and pass it into the side cover (19). Move the piston rod and the Yoke such that the yoke slot & the piston rod hole are aligned at yoke pin cover hole for easy insertion of yoke pin (7).
- apply a thin coat of lubricant on inside and outside of rollers (6 & 8) and on yoke pin (7). Insert the yoke pin(7) with roller (8), from the insertion hole of housing so as to pass through yoke as shown in the sectional drawing. Then place the roller (6) and insert the circlip (5).
- assemble the piston (33) with an O-ring (30).
- carefully clean the inside surface of cylinder tube (31) and lubricate with the recommended lubricant. Slid the cylinder tube carefully onto the piston (33) and cylinder head (26), taking care not to damage the O-rings (27 & 34) and piston bearing (35).
- fix all the tie rods (32) and tighten it to the head.
- assemble the cylinder cover (37) by centering it on the inside diameter of tube, taking care not to damage the O-ring (36) and the pressure port is at the proper place as shown in the drawing or as it was assembled from the factory.
- assemble the nut (38) onto the tie rods (32).
- tighten the nuts to the recommended torque as per the table-2.

Table-2

| Thread size | Recommend tightening torque(NM) |
|-------------|---------------------------------|
| M8 | 18 |
| M12 | 35 |
| M16 | 42 |
| M20 | 54 |

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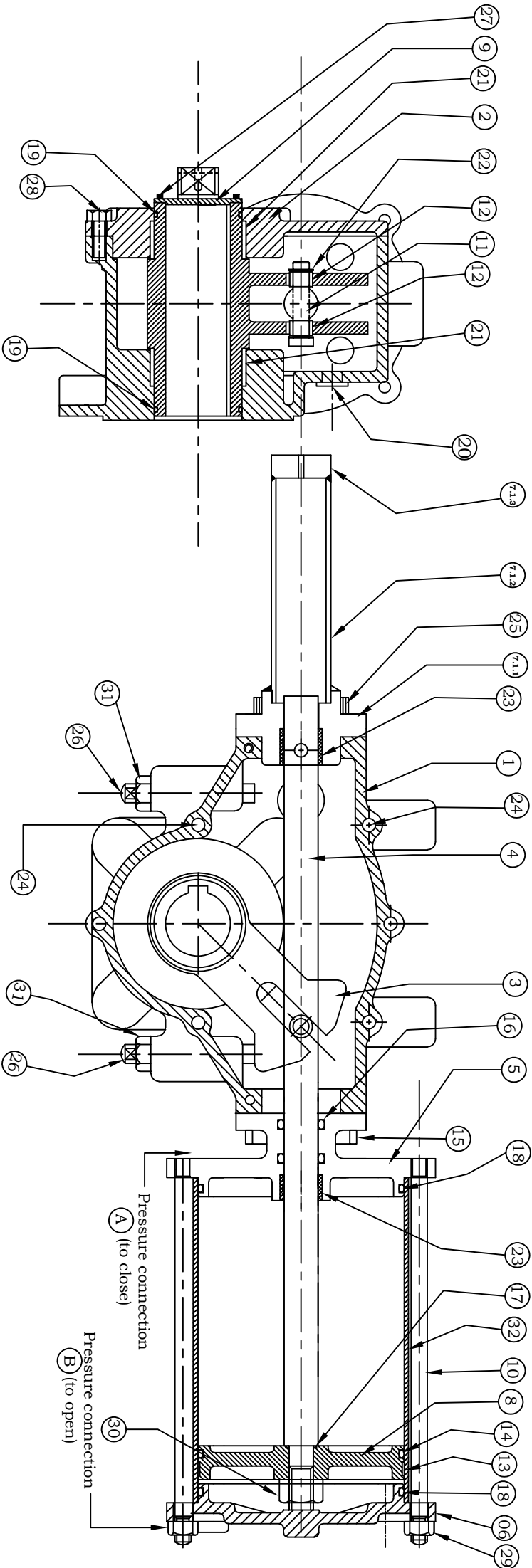
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KENWOOD VALVE CONTROLS - DOUBLE ACTING ACTUATOR

| sl.no. | Description | sl.no. | Description | sl.no. | Description | sl.no. | Description | sl.no. | Description |
|--------|------------------------|--------|--------------------------|--------|---------------------|--------|-----------------------|--------|----------------------|
| 1 | Body painted | 8 | Piston machined | 17 | O ring - piston rod | 26 | Hex bolt | 35* | Safety lable-sticker |
| 2 | Cover painted | 9 | Indicator painted | 18 | O ring-Cy tube | 27 | Hex bolt | 36* | Rivets |
| 3 | Yokedrilled/tapped | 10 | The rod finished | 19 | O ring-yoke | 28 | Socket head cap screw | 37* | Molycoat grease |
| 4 | Piston rod finished | 11 | Yoke pin finished | 20 | Yoke pin cap | 29 | Nyloc nut | | |
| 5 | Cylinder head painted | 12 | Yoke pin roller finished | 21 | Yoke bearing | 30 | Nyloc nut | | |
| 6 | Cylinder cover painted | 13 | Piston bearing | 22 | Circlip | 31 | Hex nut | | |
| 7.1.1 | Side cover drilled | 14 | O ring - piston | 23 | Piston rod bearing | 32 | Cylinder Tube | | |
| 7.1.2 | Side cover tube | 15 | Cy head mounting bolt | 24 | Dowel pin | 33* | Name plate-SS304 | | |
| 7.1.3 | Side cover tube cap | 16 | O ring - cylinder head | 25 | Hex bolts | 34* | Safety lable-SS304 | | |

Recommended spare kit---part No 13, 14, 16, 17 and 18: Replace part No. 16 only if you find any leakage through piston rod or near part 20.

* Not shown

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| Date | DCN | REV.No | Date | DCN | REV.No | Drawn: | NMS | Title: Assembly drawing |
|------|-----|--------|------|-----|--------|-----------|-----------|-------------------------|
| | | 04 | | | 01 | Checked: | NMS | A04D to C12D |
| | | 05 | | | 02 | Approved: | NMS | Drq No: AA-0005 |
| | | 06 | | | 03 | date: | 1-10-2007 | Rev No: 00 |

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b2. Lubrication schedule

For normal duty the scotch yoke mechanism of the actuator is lubricated "for life time". In case of high load and high frequency of operation it may be necessary to periodically lubricate the mechanism. It is advised to apply a coating of grease on the contact surfaces of yoke and rollers, yoke pin, piston and piston rod. For this operation it is necessary to remove the cover (4).

The following grease is used by **KENWOOD VALVE CONTROLS (INDIA) PRIVATE LIMITED** for standard working temperature and suggested for relubrication :

Manufacturer : Dow corning
Type/grade : MOLYKOTE 111
Colour : White, translucent
Base : Silicone oil, inorganic thickener
Drop point (°C) : None
Penetration (dmm) : 210-250
(worked, IP50)
Density at +25°C (g/cm³) : 1.0
Temperature, °C : -40 to +200

For High temperature application beyond the above standard range consult **KENWOOD VALVE CONTROLS (INDIA) PRIVATE LIMITED**.

After maintenance, carry out a few actuator operations to check that the operations are smooth and there is no air leak through the seals.

Contents may change without notice.

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