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Title: Rotork G-Series Scotch Yoke Fitting to C-Series  
Reason for use: Information  
Document Owner: Bill Burrows

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- The Rotork actuators are supplied as standard from DES Ltd with a high temperature trim and invariably a mounting kit in order to protect the actuator from any conducted or radiated heat that the valve can give out when under temperature as per Mogas Engineering Standard **ESK-3106**. However this does not mean that when lagging the valve after installation, it can be lagged right up to the actuator. This will create a heat spike which will eventually ‘cook’ the actuator seals and thus hinder its operation and efficiency leading to the eventual breakdown.
- The cause of valve failure usually compromises of three faults: incorrect setting of actuator stops; or valve stem being driven into valve during the mounting of the actuator; or ball being reversed so that unlapped side of ball paired with lapped seat.
- DES Ltd is providing this report is a guide to handling the valve and actuator packages when installing and commissioning them on site.
- Please note: **Clockwise to close; Counter Clockwise to open**. Mogas Ball Valves have a **96°** travel, allowing an extra 3° of travel either side of open or closed. This is to allow thermal expansion of the stem under temperature and avoid ‘camming’ of the ball during cycling.

### Actuator Installation:

- Ideally the valve actuator packages supplied by DES Ltd will be Factory Acceptance Tested at the DES Ltd workshop, and thus will have the appropriate Mechanical limits set, including ideal rotational speeds where appropriate.
- When the DES Ltd actuators are removed for welding & PWHT, please mark the bracket and actuator so that when the actuator is re-installed, if the marks line up, no mechanical limit adjustment is required. The only point that **Mogas** and **DES Ltd** stress when welding is to leave the valve open. This will allow the free movement of air/heat in the line otherwise the ball in the closed position will act as a barrier and allow the heat to build up around the ball and hence conduct through the stem. Further to this, do not insulate or wrap the thermocouples around the entire valve.
- Where ever possible, try and fit site supplied actuators to the valves in workshop as opposed to in line. It is easier to check to see if the valve is fully open (smooth bore) or fully closed.

### *Workshop:*

1. Set valve to fully open position. This is your reference point to establish the fully open stop.

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2. Attach Mounting Bracket (adaptor plate) and Stem Adaptor (stem coupling) made to Mogas Engineering Standard ESD-4116. Please do not tighten bolts as you may need the initial play later to help line up the bolt holes for the actuator. PLEASE NOTE: Take special note the position of the Actuator Keyways and make sure the Stem Adaptor keyways are orientated to suit. If the actuator has to be cycled to line up w/ the valve position, the Stem Adaptor Keyway orientation needs to take this into account.
3. Before attaching Actuator, find out what position the valve is in (Open or Closed). The actuator needs to be cycled to that position first. PLEASE NOTE: If this is a spring return actuator, and in order to get the actuator into the correct position requires the actuator being cycled on air; then the actuator has to have air isolation valves attached to the air cylinder in order to lock the actuator in that position (thereby locking the air in and keeping the springs under compression). DES Ltd recommend going w/ double isolation.
4. When lifting the actuator in order to mount it to the valve, the actuator will be lifted in a horizontal position and must be lifted from the Centre Body stop screw and the eyelet on the Pneumatic Cylinder. Attach the actuator to the mounting bracket ensuring that a slide fit has occurred between the male insert of adaptor (coupling) and the female connection of the actuator drive bush.
5. If you cannot achieve a slide fit, DO NOT FORCE THE ACTUATOR on to the coupling. This will potentially cause the stem to be pushed in and thus rolling the ball off the seat (guaranteed leakage). Please use emery cloth or any other means necessary to ensure a slide fit. DES Ltd recommends lubricating the actuator bore with an anti-corrosive agent to prevent it jamming due to rust.
6. Once the actuator has been successfully placed on to the valve, this is where all the nuts & bolts need to be tightened. Please note that all fittings should come with shake-proof washers, if not please inform DES Ltd or supply own. This helps to secure actuator to the valve, especially under any continuous vibration which may cause the actuator to shake loose.
7. When adjusting the closed/open stops on the actuator, there are two screws located in the upper end of the pneumatic cylinder and in the lower end of the centre body housing respectively to regulate the length of the piston stroke and hence the rotation angle of the actuator shaft. The Pneumatic Cylinder Stop Screw (see below picture) adjusts the closed position and the Centre Body Stop Screw adjusts the open position.
8. Setting the open stop on the actuator, the valve should be cycled fully open. When the full open stop has been reached on the actuator but the ball of the valve is found to be encroaching into the flow path (look up the bore of valve), cycle the valve closed. Then wind/unwind the Centre Body Stop Screw a couple of turns, lock in position w/ the locking nut and cycle the valve open. This will require some trial and error until full bore (and smooth bore) is achieved so repeat above until smooth bore achieved.
9. To set the closed stop, please cycle the valve closed so that the scribe line on the stem just passes the scribe line on the flange (by width of scribe line), then set Pneumatic Cylinder Stop Screw. If the scribe line on the stem has under-travelled the scribe line on the gland flange or has significantly over-travelled the scribe line on the gland flange, the valve has to be cycled open and the Pneumatic Cylinder Stop Screw adjusted until the scribe line on the stem as just over-travelled the scribe line on the flange by the width of the scribe line.
10. Once desired positions is achieved, tighten the respective stop nuts (for both Open & Closed), ensuring sealing washers are properly centered on the shaft and fitted in the machined recess in the flange. Re-install stop covers, ensuring sealing washers are properly centered on the shaft and fitted in the machined recess in the stop cover

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**Please note: There is an allowance for a 5% Over/Under Travel in the Mogas design. However the above ensures that you are well within tolerance.**

*In Line Installation:*

We all wish we had the luxury of fitting anything on the work bench rather than in line, alas this is not always possible.

1. It is not important whether the valve stops are set from the open position or not. Yet to maintain the discipline you may find it easier to do this. Whether setting open or closed first, **MAKE SURE THAT THE ACTUATOR OPEN/CLOSE POSITION CORRESPONDS TO THE VALVE OPEN/CLOSE POSITION.** You can ascertain if the valve is fully open or closed by two methods:
  - Scribe Lines on Valve Stem and Gland flange. On the C-Series range, the scribe line in the closed position will be pointing downstream in line with the flow and will be in line (roughly) with the scribe line on the flange. In the open position, the scribe line will be perpendicular to the flow. (Remember Clockwise to Close, etc...)
  - T-stamp on top of Valve Stem. If flat part of 'T' (rather than trunk) is pointing downstream (direction of flow) then valve is closed and ball is in correct orientation to the seat (lapped side to lapped).
2. Attach mounting kit and stem adaptor (as above). If kit already mounted, it would be advisable to slacken the bolts to allow some play so that you can line up actuator bolt holes easily to the bracket.
3. Attach the actuator to the mounting bracket ensuring that a slide fit has occurred between the male insert of adaptor (coupling) and the female connection of the actuator drive bush. If you cannot achieve a slide fit, **DO NOT FORCE THE ACTUATOR** on to the coupling. This will potentially cause the stem to be pushed in and thus rolling the ball off the seat (guaranteed leakage). Please use emery cloth or any other means necessary to ensure a slide fit.
4. Once the actuator has been successfully placed on to the valve, this is where all the nuts & bolts need to be tightened. Please note that all fittings should come with shake-proof washers, if not please inform DES Ltd or supply own. This helps to secure actuator to the valve, especially under any continuous vibration which may cause the actuator to shake loose.
5. When adjusting the closed/open stops on the actuator, there are two screws located in the upper end of the cylinder and in the lower end of the housing respectively to regulate the length of the piston stroke and hence the rotation angle of the actuator shaft. The Pneumatic Cylinder Stop Screw (see picture in above section) adjusts the closed position and the Centre Body Stop Screw adjusts the open position.
6. To set the open stop, please cycle the valve so that the scribe line on the stem just over-travels the scribe line on the flange (by width of scribe line), then set Centre Body Stop Screw. If the scribe line on the stem has under-travelled the scribe line on the gland flange or has significantly over-travelled the scribe line on the gland flange, the valve has to be cycled closed and the Centre Body Stop Screw adjusted until the scribe line on the stem as just over-travelled the scribe line on the flange by the width of the scribe line.

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7. To set the closed stop, please cycle the valve closed so that the scribe line on the stem just passes the scribe line on the flange (by width of scribe line) then set Pneumatic Cylinder Stop Screw. If the scribe line on the stem has under-travelled the scribe line on the gland flange or has significantly over-travelled the scribe line on the gland flange, the valve has to be cycled open and the Pneumatic Cylinder Stop Screw adjusted until the scribe line on the stem as just over-travelled the scribe line on the flange by the width of the scribe line.
8. Once desired positions is achieved, tighten the respective stop nuts (for both Open & Closed), ensuring sealing washers are properly centered on the shaft and fitted in the machined recess in the flange. Re-install stop covers, ensuring sealing washers are properly centered on the shaft and fitted in the machined recess in the stop cover.

