DUTCH ENGINEERING

Workshop/Site Method Statement

Title:	Auma Multi-Turn Electric Actuator fitting to i-RSVP (AC Version)
Reason for use:	Information
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- The gearboxes that DES Ltd primarily supplies are the Rotork Gears range. These gearboxes are supplied as standard from DES Ltd with a high temperature trim and invariably a mounting kit in order to protect the gearbox from any conducted or radiated heat that the valve can give out when under temperature. However this does not mean that when lagging the valve after installation, it can be lagged right up to the gearbox. This will create a heat spike which will eventually 'cook' the gearbox and thus hinder its operation and efficiency leading to the eventual breakdown.

- Gearboxes are supplied in order to convert existing site 'multi-turn' electric actuators to a quarter turn application. By doing this, this will save a lot of extra cost and inconvenience that a dedicated actuator will cause in cost of unit and additional wiring up costs. However the gearbox is the cheapest component in the valve-actuator package, and for the majority of the time, the root cause of valve failure. The cause of valve failure usually compromises of three faults: incorrect setting of gearbox/actuator stops; or valve stem being driven into valve; 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 gearbox/actuator packages when installing and commissioning them on site.

- Please note: **Clockwise to close; Counter Clockwise to open.** Mogas Ball Valves have a 96^{o} travel, allowing an extra 3^{o} of travel either side of open or closed. This is to allow thermal expansion of the stem under temperature.

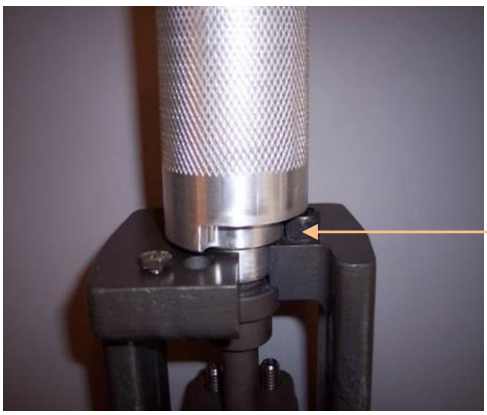
Gearbox/Actuator Installation:

- The majority of the time DES Ltd supply the Mogas Ball Valves complete with gearboxes fitted. Please note that the stops would have been set at our works allowing for a ¾ **- 1 turns** back-off for the actuation limits. DES Ltd recommends that if the valves are supplied with the gearboxes prior to installation (welding), they will not have to be altered, as these have been workshop set.

- Furthermore when welding the valves in line, even if the valves have to go through a Post Weld Heat Treatment process, there is no need to remove the gearboxes. These are mechanical devices purely (no chance of electrics being 'cooked') and with the high temp trim and mounting kit will be far away from the valve not to be cooked. 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.

Workshop/In line Installation:

1. As stated above, the gearbox stops have already been set to suit the Mogas ball valve. This section is concerning the set-up of the Auma AC actuator to the gearbox stops.
2. It does not matter if you start from the open or closed position, but since the valve should have been welded in with the valve in the open position, let's start from this position. The original drive nut needs to be removed from Auma as this is threaded, and the new drive nut will be bore and keyed as per the gearbox input shaft.
3. There is a thrust base on the bottom of the Auma actuators, this needs to be removed as well as this is redundant to the current requirement. What should be left is a base pad which should have a PCD (BCD) of 102mm (F10) or 140mm (F14) depending on the actuator type. The newly supplied drive nuts need to be fitted before the actuator can be mounted to the gearbox.
4. Once the actuators have been mounted and the fasteners fitted, it is now time to turn our attention to the limits. The selector switch on the local control needs to be set to '0' before the limits & torques can be adjusted. As DES Ltd size the gear to suit the stall torque of the actuator, the actuators can be set to go out on Torque seating. However most power stations consider for a ball valve that Limit seating is best practice if the site DCS system allows for this to be done. In the menu display, scroll through the 'settings' options until you find Seating Mode. Enter edit mode on the Display and enter default password of '0000' to access and change. Then set both the open and closed positions to Limit rather than Torque.
5. Then the Limit switches themselves need to be set to suit the valve. In the menu display, scroll through the 'settings' options until you find 'Set Limit Switches' and enter default password of '0000' to access and change. Enter edit mode on the Display and if you are setting up from the open position (assuming the valve is in the open position from welding) choose the Open Position option. Then engage manual operation and wind the valve fully open until it hits the gearbox mechanical stops and the mechanical position stop (MPS) on the valve (see below).



Then wind the handwheel in the opposite direction by ½ turn in the opposite direction. Accept the new end position setting at this point for the Open Limit. The LED's and display should indicate that the new end position has been accepted.

6. Then the 'Closed' limit needs to be set. Enter edit mode on the Display and choose Closed Position. Then engage manual operation and wind the valve fully closed until it hits the gearbox mechanical stops and the mechanical position stop (MPS) on the valve. Then wind the handwheel in the opposite direction by ½ turn in the opposite direction.

Accept the new end position setting at this point for the Closed Limit. The LED's and display should indicate that the new end position has been accepted.

7. Then the torque setting needs to be set next. Even though the actuator is set to go out on limits, the torques are set so that the actuator does not exceed the mast limitation. In the menu display, scroll through the 'settings' options until you find 'Torque' and enter edit mode on the Display. Then enter default password of '0000' to access and change.
8. DES Ltd supply 40:1 gearboxes sized to suit the actuator stall torque. These gearboxes have a mechanical advantage which can be used to calculate the limit of the Actuator torque output to below the valve mast limitation. The recommended maximum actuator torques are as follows:

RSVP Model	Max Recommended RSVP Torques	Auma Multi-Turn Model Max Torques	Gearbox Model & Mechanical Advantage	SAC Torque Setting
RSVP-UC 1500#	90Nm max	SA07 = 30Nm SA7.5 = 60Nm	IW3 40:1 = 15 MA IW3 40:1 = 15 MA	SAC07 = 20% Max SAC07.5 = 10% Max
RSVP-UF 1500#	250Nm Max	SA07 = 30Nm SA7.5 = 60Nm SA10 = 120Nm	IW3 40:1 = 15 MA IW3 40:1 = 15 MA IW4 40:1 = 15 MA	SAC07 = 55% Max SAC07.5 = 27% Max SAC10 = 13% Max
RSVP-UL 1500#	450Nm max	SA07 = 30Nm SA7.5 = 60Nm SA10 = 120Nm	IW3 40:1 = 15 MA IW3 40:1 = 15 MA IW4 40:1 = 15 MA	SAC07 = 100% Max SAC07.5 = 50% Max SAC10 = 25% Max
RSVP-UM 1500#	700Nm max	SA7.5 = 60Nm SA10 = 120Nm	IW3 40:1 = 15 MA IW4 40:1 = 15 MA	SAC07.5 = 77% Max SAC10 = 38% Max
RSVP-UC 3100#	175Nm max	SA07 = 30Nm SA7.5 = 60Nm SA10 = 120Nm	IW3 40:1 = 15 MA IW3 40:1 = 15 MA IW4 40:1 = 15 MA	SAC07 = 38% Max SAC07.5 = 19% Max SAC10 = 10% Max
RSVP-UF 3100#	330Nm max	SA07 = 30Nm SA7.5 = 60Nm SA10 = 120Nm	IW3 40:1 = 15 MA IW3 40:1 = 15 MA IW4 40:1 = 15 MA	SAC07 = 73% Max SAC07.5 = 36% Max SAC10 = 18% Max
RSVP-UL 3100#	560Nm max	SA7.5 = 60Nm SA10 = 120Nm SA14.1 = 250Nm	IW3 40:1 = 15 MA IW4 40:1 = 15 MA IW5 40:1 = 17 MA	SAC07.5 = 62% Max SAC10 = 31% Max SAC14 = 13% max
RSVP-UM 3100#	TBC			

9. When electrically cycling the valve open and closed, it would do well to check the actual valve MPS as well to double check that there is no significant under-travel. So when cycling the valve open and closed electrically, ensure that the gap between the machined profile and the cap head screw is no larger than 0.5mm or else the valve will be off its 'sweet spot' when it hits the closed limit and will not be tight shut-off. Also if the same gap appears on the opening stroke, if the gap is bigger than 0.5mm, then the seat ring is exposed to the flow. If this gap is bigger than 0.5mm, return to step 5 and/or 6 and instead of backing of ½ turn, back off only ¼ turn instead. DES Ltd do not believe this will be required and this can easily be rectified when DES Ltd visits site to commission the valves.
10. Conversely if the valve torques out, i.e. a torque fault is registered on the display, return to step 5 and/or 6 and instead of backing of ½ turn, back off ¾ turn instead.

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.