DUTCH ENGINEERING

Workshop/Site Method Statement

Title:	Auma ¼-Turn Electric Actuator fitting to i-RSVP
Reason for use:	Information
Document Owner:	Bill Burrows

- The Auma Part-Turn range is rated to 80C maximum thus DES Ltd supply a mounting kit in order to protect the actuator 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 actuator. This will create a heat spike which will eventually 'cook' the electrics and thus hinder its operation and efficiency leading to the eventual breakdown.

- The common causes of valve failure usually compromises of four faults: incorrect setting of actuator mechanical stops & electrical limits; 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 as 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^{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.

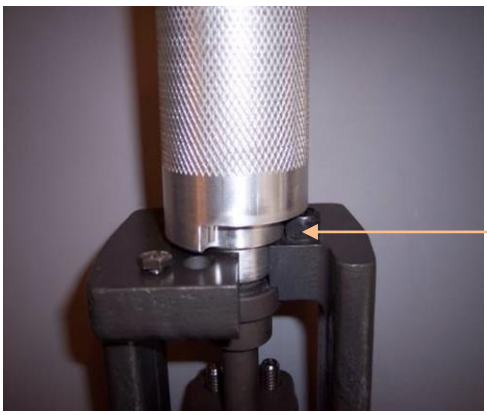
<u>Actuator Installation:</u>

- 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 and Electrical limits set.
- 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 electrical or 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/In line Installation:

1. Set valve to fully closed position. This is your reference point to establish the fully closed stop with respect to the Auma mechanical limit set-up procedure.

2. Attach Mounting Bracket (adaptor plate) and Stem Adaptor (stem coupling). Please do not tighten bolts as you may need the initial play later to help line up the bolt holes for the actuator.
3. Before attaching actuator, please ensure that the actuator is fully closed (rotate clockwise fully).
4. 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 gearbox/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.
5. 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 Norlock or other type of 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.
6. When adjusting the mechanical stop on the Auma Part-Turn actuators, the Auma design utilizes a 'running' nut principle of travel span limitation. Please note that there is only one adjustable stop, the closed aspect of the 'running nut' is fixed, only the open aspect can be adjusted. This is an adjustable stop that is locked in place with a grub screw.
   In addition the 'running nut' principle is based on a locking plate that locks a hexagonal tube that the 'running nut' runs up and down in in-place. This locking plate has four cap head screw fasteners that just need to be loosened to that the tube can be rotated and thus the running nut.
7. Setting the closed stop on the Part-Turn Auma, the valve should be fully closed and the manufacturer's machined profile on the supplied stem adaptor is touching the Mechanical Position Stop (MPS) on the valve mounting pad (please see p8 of the Mogas IOM manual also).



The Auma 'running nut' should be free of the back stop at this point. If it is tight against the back stop, then the locking plate needs to be re-tightened and the valve needs to be cycled open so it off the back stop. Then the locking plate fasteners need to be loosened again and the valve cycled until the machined profile of the stem adaptor hits the MPS.
The hexagonal tube is rotated clockwise so that the 'running nut' makes contact with the back stop, and then rotated away $1/8^{th}$ turn. Re-tighten all four fasteners to secure the locking plate in place before cycling the valve open to set the adjustable travel stop.

8. Setting the Open stop on the actuator, the valve should be wound fully open (counter-clockwise) until the manufacturer's machined profile on the supplied stem adaptor is touching the 'fixed stop' on the valve mounting pad. If the actuator hits the adjustable stop before the machined profile of the adaptor hits the MPS, thus leaving the ball of the valve encroaching into the flow path (look up the bore of valve if in workshop) unwind the Part-Turn Auma adjustable stop out and keep cycling the valve until full bore (and adaptor makes contact with stop) and then mechanical travel stop can be set. At this point, the Part-Turn Auma mechanical stop should be wound in until just touching the 'running nut' and then backed away 1/8th of a turn, then the adjustable stop should be locked in place. Make sure the adjustable stop is held in position when tightening the grub screw.
9. The Auma Part-turn actuator cannot be allowed to go out on torque thus the electrical limits become critical. The casing and then the indicator plate need to be removed from the top of the Auma control unit which hosts the torque dials and electrical limits. Since the actuator is in the fully open position from the above set-up, the open electrical limit will be set up 1st. Double check to insure that the valve is at the mechanical stop (resistance is starting to build on the handwheel when rotating counter clockwise) but do not overforce the stop.
10. DES Ltd recommend rotating the Auma Handwheel clockwise by 3 whole turns (no more) so that the Auma is backed off the mechanical stops. The open electrical limit spindle (spindle D in the Auma Handbook) is pressed down using a screw driver and rotated in the direction of the arrow (which should
11. be clockwise) and thus observe the pointer E. While a ratchet is felt and heard, the pointer E moves 90 degrees every time. When the pointer is 90 degrees from mark F, continue more slowly. When the
12. pointer E has reached the mark F, stop turning and release the setting spindle. If you have inadvertently overridden the tripping point, continue turning the setting spindle in the same direction and repeat above. Once the pointer has been set, rotate the Auma Handwheel and thus the valve clockwise by 6 – 8 turns so that the actuator is backed of its electrical limit. Rotate the Handwheel counterclockwise until the pointer moves to mark F, hopefully this pointer moves before the torque switches are engaged, open limit is set. If the torque switches engage before the pointer moves to mark F, then we need to re-set the Electrical limits. This is done by rotating the Handwheel counterclockwise until it engages with the mechanical stops and backing off these stops clockwise by 4 turns. Then the above has to be repeated. In my experience, only 3 – 4 turns are required to set the electrical limits, no more.
13. With respect to the closed stops, the actuator needs to be rotated clockwise until it hits the closed mechanical stop. DES Ltd recommend rotating the Auma Handwheel counterclockwise by 3 whole turns (no more) so that the Auma is backed off the mechanical stop. The closed electrical limit spindle (spindle A in the Auma Handbook) is pressed down using a screw driver and rotated in the direction of the arrow (which should be counterclockwise) and thus observe the pointer B. While a ratchet is felt and heard, the pointer B moves 90 degrees every time. When the pointer is 90 degrees from mark C, continue more slowly. When the pointer B has reached the mark C, stop turning and release the setting spindle. If you have inadvertently overridden the tripping point, continue turning the setting spindle in the same direction and repeat above. Once the pointer has been set, rotate the Auma Handwheel and thus the valve counterclockwise by 6 – 8 turns so that the actuator is backed of its electrical limit. Rotate the Handwheel clockwise until the pointer moves to mark C, hopefully this pointer moves before the torque switches are engaged, closed limit is set. If the torque switches engage before the pointer moves to mark C, then

we need to re-set the Electrical limits. This is done by rotating the Handwheel clockwise until it engages with the mechanical stops and backing off these stops clockwise by 4 turns. Then the above has to be repeated. In DES Ltd experience, only 3 – 4 turns are required to set the electrical limits, no more.

14. 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. The Maximum Torque Figures as per the differential pressure across each type of RSVP is as follows:

RSVP Model	Differential Pressure	Auma Part-Turn Model Max Torques	SG Torque Setting
RSVP-UC 1500#	Up to 200 Barg DP	SG05/SQ05 = 150Nm	88Nm max
RSVP-UF 1500#	Up to 200 Barg DP	SG07/SQ07 = 300Nm	270Nm Max
RSVP-UL 1500#	Up to 70 Barg DP	SG07/SQ07 = 300Nm	300Nm max
	70 Barg - 135 Barg DP	SG10/SQ10 = 600Nm	600Nm Max
RSVP-UM 1500#	Up to 200 Barg DP	SG12/SQ12 = 1200Nm*	700Nm max
RSVP-UC 3100#	Up to 170 Barg DP	SG07/SQ07 = 300Nm	179Nm max
RSVP-UF 3100#	Up to 170 Barg DP	SG10/SQ10 = 600Nm	330Nm max
RSVP-UL 3100#	Up to 170 Barg DP	SG10/SQ10 = 600Nm	560Nm max
RSVP-UM 3100#	TBC		

15. When electrically cycling the valve open and closed, it would do well to check the actual valve stops 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 6 or seven and instead of backing of three turns, back off only 2 turns 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.

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.