
Title: IQ Multi-Turn Electric Actuator Fitting to C-Series
Reason for use: Information
Document Owner: Bill Burrows

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- Gearboxes are supplied in order to convert existing site ‘multi-turn’ electric actuators to a quarter turn application.
- The gearboxes that DES Ltd primarily supply 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.
- 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 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.

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 ½ **turn** 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.

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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 Rotork actuator to the gearbox stops. (If the Gearbox stops do need to be set, please refer to WSMS029).
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 the Rotork as this is threaded, and the new drive nut will be bore and keyed as per the gearbox input shaft.
3. There may be a thrust base on the bottom of the Rotork 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. To engage the Rotork setting tool to the IQ, please follow the Rotork IQ IOM manual. Once you are into the IQ setting menu, you will first off need to confirm the Rotation of the actuator, i.e. clockwise to close, counter clockwise to open.
5. Then confirm close/open action, either on limit, or torque. In most cases, this will be set to limit.
6. Then the torque setting needs to be set next. Even though the actuator is set to go out on limits, the open & closed torques are set so that the actuator does not exceed the mast limitation. DES Ltd supply (typically) 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:

C-Series Model	C-Series Mast Limitation Torques	IQ Multi-Turn Model Max Torques (up to 36RPM)	Gearbox Model & Mechanical Advantage	IQ Torque Setting
Gen-X 600#	686Nm max	IQ10 = 34Nm IQ12 = 81Nm IQ18 = 108Nm	IW3 40:1 = 15 MA IW4 40:1 = 15 MA IW4 40:1 = 15 MA	IQ10 = 100% max IQ12 = 52% max IQ18 = 40% max
Gen-X 1500#	2,000Nm Max	IQ12 = 81Nm IQ18 = 108Nm IQ20 = 203Nm	IW4 40:1 = 15 MA IW4 40:1 = 15 MA IW5 40:1 = 17 MA	IQ12 = 100% max IQ18 = 52% max IQ20 = 40% max
SC-3PC 2500#	3,456Nm Max	IQ18 = 108Nm IQ20 = 203Nm For Bigger sizes = TBC	IW4 40:1 = 15 MA IW5 40:1 = 17 MA	IQ18 = 100% max IQ20 = 76% max
C-Series (TBC)	TBC	TBC	TBC	TBC

7. Make sure the actuator has manually cycled the valve either fully open or closed. Before setting IQ Limit stops, please back off ½ a turn away from where the Gearbox Mechanical stops have been set at each end of the cycle. Then confirm the Actuator Limit on the setting menu. Please note that this has to be conducted for both open and closed, so once one electrical limit has been set, the valve needs to be manually cycled in the opposing direction in order to set the other in exactly the same manner.

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8. When electrically cycling the valve open and closed, it would do well to check the actual valve position:
- Scribe Lines on Valve Stem and Gland flange. On the C-Series (Gen-X) 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 (only if Gearbox has been removed); if flat part of the '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 seat).

To check the open or closed stop, please cycle the valve so that the scribe line on the stem just passes the scribe line on the flange by width of scribe line (see schematic below).

If the scribe line on the valve stem in either open or closed as gone past more than the width of a scribe line, return to step 7 and instead of backing of ½ a turn, back off ¼ a turn instead.

If the scribe line on the valve stem in either open or closed has **NOT** gone past the width of a scribe line, return to step 7 and instead of backing of ½ a turn, back off ¾ turn instead.

If this cannot be achieved at all by backing off from the Gearbox mechanical stop, then the Gearbox mechanical Stop needs to be adjusted until full travel can be achieved; see WSMS029.

If there are any concerns, this can easily be rectified when DES Ltd Sales & Service 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.

