# FIGURE G731
## GEAR OPERATOR

This instruction manual includes installation, operation, and maintenance information for the Figure G731 gear operator. Figure G731 is particularly suited for the figure 7xx-series rubber seated valves, but can also be used on other butterfly, ball, or similar quarter-turn valves when properly sized and mated.




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## INSTALLATION

**WARNING:**
To avoid personal injury to your self, fellow workers, or damage to property from release of process fluid, before installation to valves in service, ensure that the valve:
- Can be safely worked on while in service.
- Can safely have current operator removed.
- Can be fully stroked (operated) for setting purposes.

If the valve can not be safely accessed in service, then the valve must be isolated, shut down, and system drained prior to installation. For best results, gears should be installed while the valves closing device (i.e., disc, ball, plug, etc.) is visible.

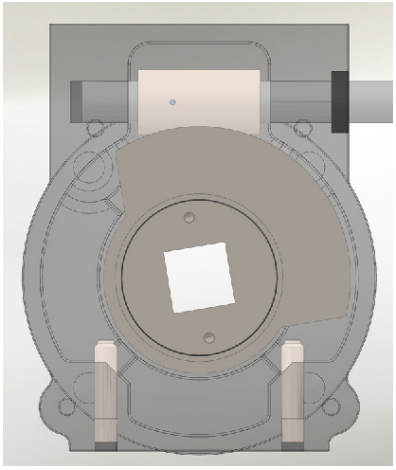
In the following instructions, part numbers are indicated by parentheses (x) and are referenced in the exploded view diagram and bill of materials at the back of this manual.

1. Figure G731 gear operator is designed for valves with clockwise-to-close functionality which is typical of most, but not all, quarter-turn valves. Verify that the gear's rotation is compatible with the valve.
2. Figure G731 gear operator mounting is optimized for FNW Figure 7xx-series rubber seated butterfly valves. Verify that stem and mounting hole dimensions are correct for a functional mechanical fit. Stem sleeves or mounting adaption may be required for dissimilar patterns.
3. Before installing the gear, inspect it and the valve for any damage that may have occurred and for any foreign matter that may have collected in shipping, storage, or operation. Inspect all mating surfaces, making sure they are free of dings and burrs that can obstruct smooth assembly.

**NOTE:**
The bore of the gear's output drive goes through the entire gear. When using stem sleeves, it may be necessary to secure the sleeve from vertical movement to maintain mechanical connection.

4. Move the valve and gear to the near-closed (clockwise) position as shown.
5. If needed, remove the indicator (13) to help line up the valve stem and gear bore.
6. Verify that the valve and gear are in the same near-closed position. Carefully lower the gear over the valve stem and onto the valve's mounting pad or mounting adaption.
7. Align the mounting holes of the gear operator with those on the valve mounting pad. If the holes are not aligned, adjust the gear position clockwise or counterclockwise to obtain proper alignment.
8. Secure the gear with bolts and lock washers (by others) and tighten.
9. If needed, reinstall the indicator (13) noting correct valve position.

**NOTE:**
The following diagrams show the gear with the cover (5) removed for illustration purposes only. Do not remove the cover for installation.

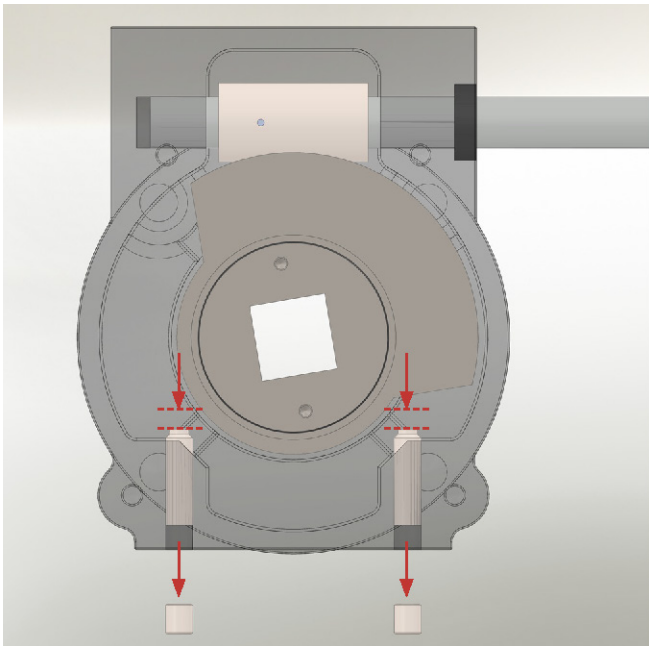


**Gear in Near Closed CW Position**

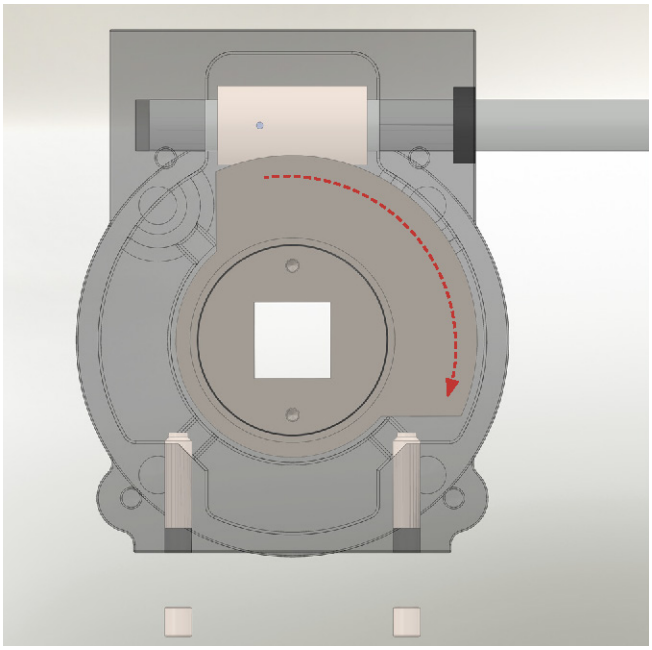


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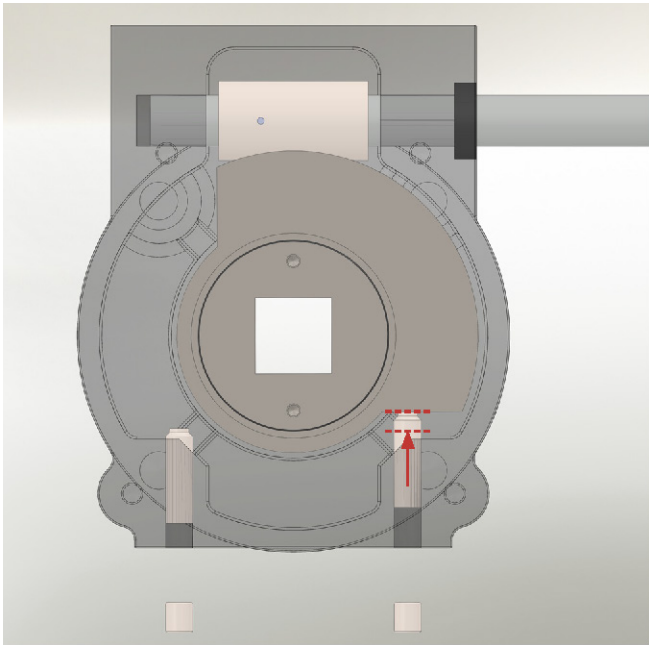
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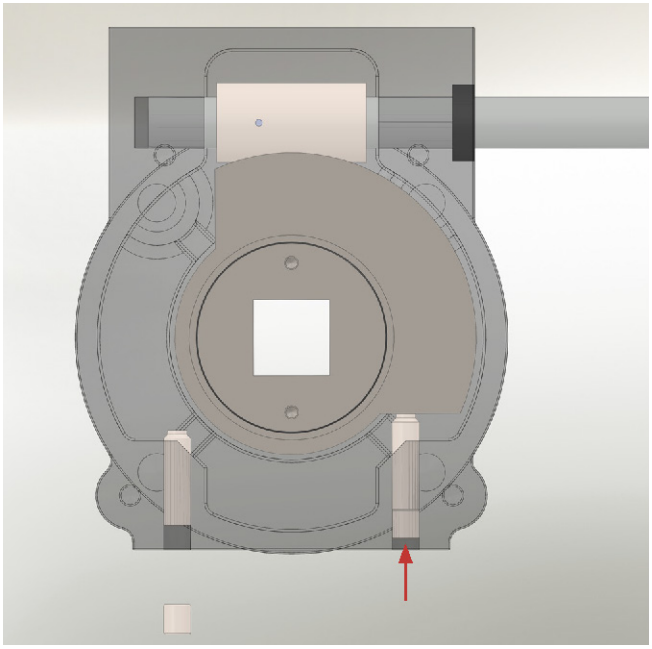
10. Remove the set screws (10) that are used to lock the stop screws (9) in place by turning them counter-clockwise with a hex wrench. In the same manner, back the stop screws (9) some to ensure full travel of the valve for setting purposes.



11. Use the handwheel (16) to adjust the gear so that the valve is in the closed position. If the valve is installed, downstream witness, pressure gauges, or feel must be used. If the stop screw (9) is reached before full closure, back it out some more.



12. With the valve and gear in the closed position, use the hex wrench to adjust the close stop screw (9) until it just makes contact with the worm gear (2) without moving the gear.



13. Return the set screw (10) over the close stop screw and tighten.



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14. Move the gear to the full open position and repeat steps 11 and 12 to set the open stop. For example, with a gear ratio of 50:1, turn the handwheel 12-1/2 turns to approximate full open.
15. Adjust the position indicator (13) as needed by loosening the indicator screws (14) and turning the indicator. Due to differences in the many types of valves, the position indicator on the top of the gear operator may not line up exactly with the closed and open marks. Correct setting of the gear should be determined by the position of the valves closing device (i.e., disc, ball, plug, etc.), not the indicator.

**NOTE:**
If the valve is installed and the full open position can not be seen, starting from the full closed position, count the number of handwheel turns that is equal to one-fourth the gear ratio cast on the gear cover.



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## OPERATION

**WARNING:**
Do not use cheater bars, motor devices, or oversized handwheels. The increased input torque could damage the gear operator or valve.

- Rotation will continue until the gear contacts a travel stop. **Do not attempt to excessively force the handwheel beyond the stop, as damage can occur to the gear or valve.** If full closure is not achieved, review the setting of the travel stop listed in the installation section.
- Clockwise handwheel rotation will turn the gear clockwise (typically towards the closed position).
- Counterclockwise handwheel rotation will turn the gear counterclockwise (typically towards the open position).



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## MAINTENANCE

Figure G731 gear operator is not designed for rebuilding, nor is it economical to do so. Nevertheless, the gear should be included in routine inspection cycles at least annually.

At most, the gear should be checked for signs of wear. Over time and/or with high frequency of use, internal parts can wear causing increased torque or loss of control. Verify functionality by operating the gear fully in both directions. Note if the stops (9) limit travel at the correct points and adjust if needed. Remove the indicator (13) and cover (5) to inspect the condition of the worm gear (2) and worm (3). If there is excessive wear, the gear operator should be replaced. Also, verify that there is sufficient grease present on the worm gear and worm. Add additional mechanical grade grease as needed.

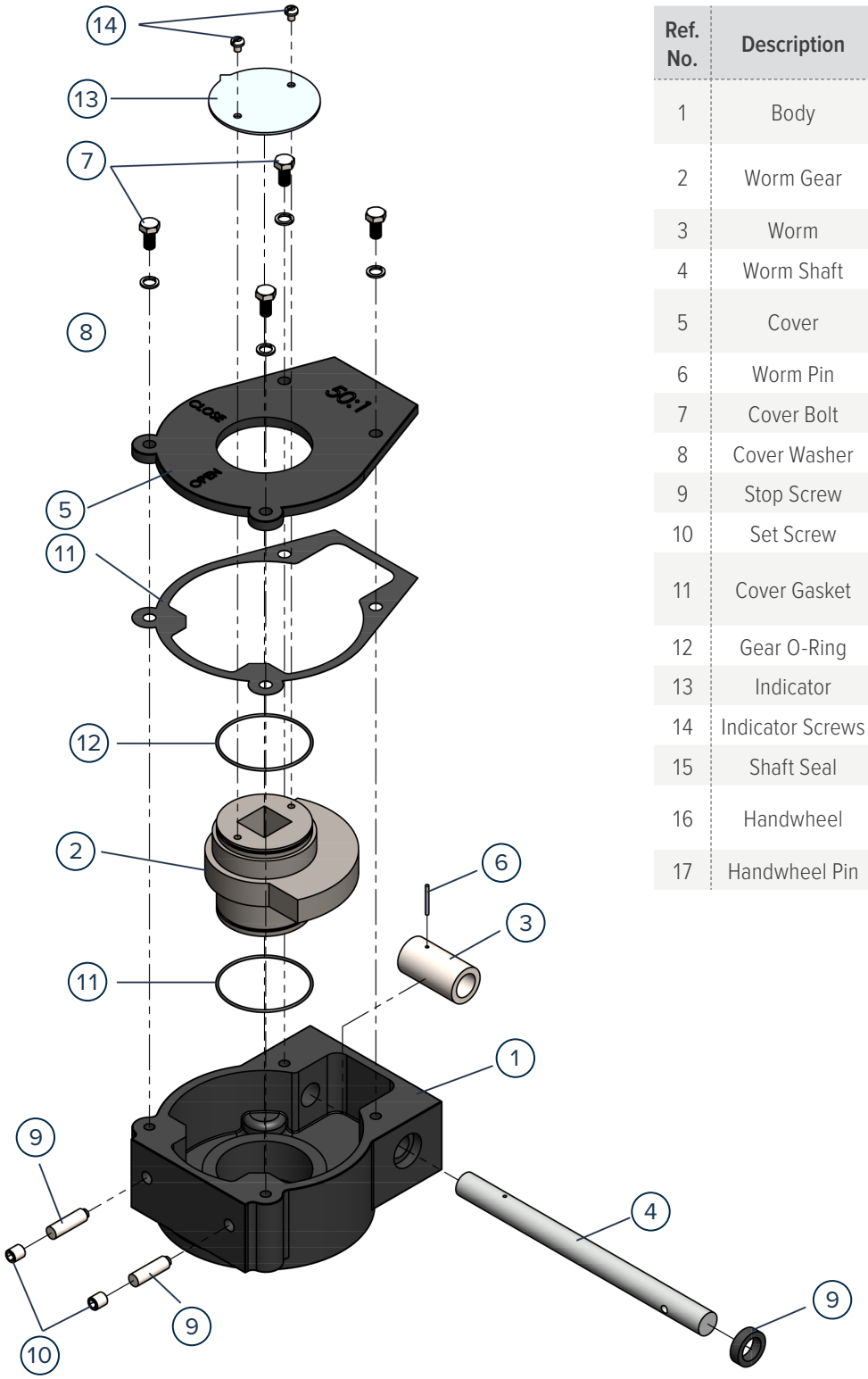
**WARNING:**

- Review safety checks prior to gear inspection as shown at the beginning of the installation section.
- Valves also wear over time or can be jammed with pipeline material. This can result in a seized valve or dramatic increase in torque. It may be necessary to remove the gear from the valve in order to isolate if the issue is valve or gear operator related. **Do not remove the gear operator until all safety concerns are met and the valve is decommissioned.** Removal of the gear operator from an “in service” valve can result in the loss of valve position, control, and process media.



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### STANDARD MATERIALS

| Ref. No. | Description | Material | Qty | Remarks |
|---|---|---|---|---|
| 1 | Body | Cast Iron ASTM A126 Cl. B | 1 | – |
| 2 | Worm Gear | Ductile Iron ASTM A536 65-45-12 | 1 | – |
| 3 | Worm | Steel | 1 | – |
| 4 | Worm Shaft | Steel | 1 | Nickel Plated |
| 5 | Cover | Cast Iron ASTM A126 Cl. B | 1 | – |
| 6 | Worm Pin | Steel | 1 | – |
| 7 | Cover Bolt | Steel | 4 | – |
| 8 | Cover Washer | Steel | 4 | – |
| 9 | Stop Screw | Steel | 2 | – |
| 10 | Set Screw | Steel | 2 | – |
| 11 | Cover Gasket | Rubber or Fiber Paper | 1 | – |
| 12 | Gear O-Ring | Rubber | 2 | – |
| 13 | Indicator | Aluminum | 1 | – |
| 14 | Indicator Screws | Steel | 2 | – |
| 15 | Shaft Seal | Rubber | 1 | – |
| 16 | Handwheel | Cast Iron ASTM A126 Cl. B | 1 | Not Shown |
| 17 | Handwheel Pin | Steel | 1 | Not Shown |



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## WARRANTY

**Limited Warranty**

Subject to the limitations expressed herein, Seller warrants that products manufactured by Seller shall be free from defects in design, material and workmanship under normal use for a period of one (1) year from installation but in no case shall the warranty period extend longer than eighteen months from the date of sale. This warranty is void for any damage caused by misuse, abuse, neglect, acts of God, or improper installation. For the purpose of this section, “Normal Use” means in strict accordance with the installation, operation and maintenance manual. The warranty for all other products is provided by the original equipment manufacturer.

**Remedies**

Seller shall repair or replace, at its option, any non-conforming or otherwise defective product, upon receipt of notice from Buyer during the Manufacturer’s warranty period at no additional charge. SELLER HEREBY DISCLAIMS ALL OTHER EXPRESSED OR IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS OR FITNESS FOR A PARTICULAR PURPOSE.

**Limitation of Liability**

UNDER NO CIRCUMSTANCES SHALL EITHER PARTY BE LIABLE TO THE OTHER FOR INCIDENTAL, PUNITIVE, SPECIAL OR CONSEQUENTIAL DAMAGES OF ANY KIND. BUYER HEREBY ACKNOWLEDGES AND AGREES THAT UNDER NO CIRCUMSTANCES, AND IN NO EVENT, SHALL SELLER'S LIABILITY, IF ANY, EXCEED THE NET SALES PRICE OF THE DEFECTIVE PRODUCT(S) PURCHASED DURING THE PREVIOUS CONTRACT YEAR.

**Labor Allowance**

Seller makes NO ADDITIONAL ALLOWANCE FOR THE LABOR OR EXPENSE OF REPAIRING OR REPLACING DEFECTIVE PRODUCTS OR WORKMANSHIP OR DAMAGE RESULTING FROM THE SAME.

**Recommendations by Seller**

Seller may assist Buyer in selection decisions by providing information regarding products that it manufacturers and those manufactured by others. However, Buyer acknowledges that Buyer ultimately chooses the product’s suitability for its particular use, as normally signified by the signature of Buyer’s technical representative. Any recommendations made by Seller concerning the use, design, application or operation of the products shall not be construed as representations or warranties, expressed or implied. Failure by Seller to make recommendations or give advice to Buyer shall not impose any liability upon Seller.

**Excused Performance**

Seller will make a good faith effort to complete delivery of the products as indicated by Seller in writing, but Seller assumes no responsibility or liability and will accept no back-charge for loss or damage due to delay or inability to deliver, caused by acts of God, war, labor difficulties, accidents, inability to obtain materials, delays of carriers, contractors or suppliers or any other causes of any kind whatever beyond the control of Seller. Under no circumstances shall Seller be liable for any special, consequential, incidental, or indirect damages, losses, or expense (whether or not based on negligence) arising directly or indirectly from delays or failure to give notice of delay.



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