

Operating instructions for SAMBO SBWG series worm gear operator

1 Introduction

This installation and maintenance manual explains, how to install and maintain the Sambo SBWG operator. Information on installation, disassembly, reassembly, lubrication and spare parts is provided.

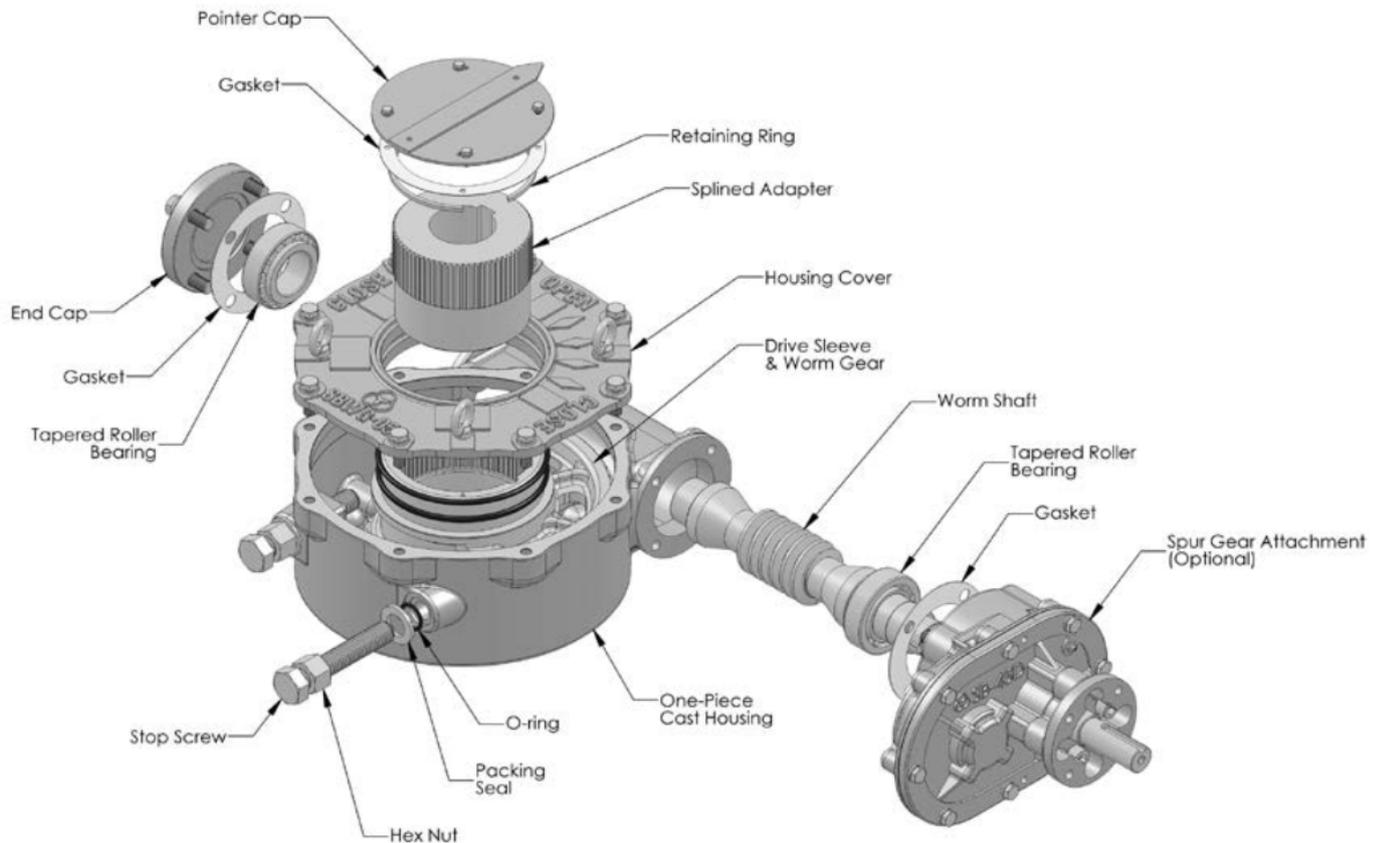


Figure 1: Typical SBWG Exploded View

WARNING: Do not manually operate the SBWG operator (see figure 1) with devices other than the installed handwheel or wrench nut. Using additive force devices (cheater bars, wheel wrenches, pipe wrenches, or other devices of this nature) on the operator handwheel, wrench or wrench nut may cause serious personal injury and/or damage to the operator or valve. 

2 Safety instructions

NOTE: Read this installation, operation and maintenance manual carefully and completely before attempting to install, operate or troubleshoot the SAMBO gearbox.

CAUTION: Work undertaken must be carried out in accordance with the instructions in this and any other relevant manuals. The user and those persons working on this equipment should be familiar with their responsibilities under any statutory provisions relating to the Health and Safety of their workplace. Due consideration of additional hazards should be taken when using the gearbox with other equipment. Should further information and guidance relating to the safe use of the SAMBO products be required, it will be provided on request. 

CAUTION: The mechanical installation should be carried out as outlined in this manual and also in accordance with relevant standards. No inspection or repair should be undertaken unless it conforms to the specific hazardous area certification requirements. For maintenance of the actuator, refer to the actuator installation and maintenance manual.



WARNING: Potential HIGH-PRESSURE vessel —be aware of high-pressure hazards associated with the attached valve or other actuated device when installing or performing maintenance on the gearbox. Do not remove the gearbox mounting bolts from the valve or actuated device unless the valve or device stem is secured or there is no pressure in the line.



CAUTION: For maintenance and/or disassembly of the gearbox while installed on the valve, ensure that the gearbox is not under thrust or torque load. If the valve must be left in service, the valve stem must be locked in such a way as to prevent any movement of the valve stem.



CAUTION: Do not exceed any design limitations or make modifications to this equipment without first consulting SAMBO.



CAUTION: Use of this product must be suspended any time it fails to operate properly.



CAUTION: Damage to protective coatings should be correctly rectified and may invalidate warranty.



CAUTION: If a motor actuator is driving the gearbox, do not operate the valve under motor operation without first checking and setting the limit switch and checking for correct motor rotation.



WARNING: Do not use replacement parts that are not genuine SAMBO parts, as serious personal injury and/or damage to the gearbox and valve may result.



3 Storage

WARNING: Read this installation and maintenance manual carefully and completely before attempting to store the operator. If an electric actuator is attached to the SBWG manual operator, be aware of the electrical hazards. Consult the electric actuator installation and maintenance manual for guidance.



NOTE: The following is the recommended storage procedure to retain maximum product integrity during storage. Failure to comply with recommended procedure will void the warranty.

Storage (less than one year)

Store the gearboxes on wooden skids to protect the machined mounting flange. Place the wooden skids containing the gearboxes in a clean, dry, protected warehouse. If the gearboxes must be stored outside, they must be covered in polyethylene protection with silica gel crystals to absorb moisture.

If an electric actuator is attached to the V gearbox, refer to the storage procedures in its respective manual for appropriate storage procedures. Rotate input shafts every three months to mix the lubricant.

Recommended storage temperature range: 0°C to 40°C (32°F – 104°F).

4 Unpacking

Gearboxes are packed in a variety of configurations depending on size, type and quantity of the consignment. It is the responsibility of the individual unpacking and handling the combination to carry out a risk assessment for the supplied arrangement to ensure safe working.

Packaging material used may include wood, cardboard, polyethylene and steel. Packaging should be recycled according to local regulations.

5 Handling

CAUTION: Only trained and experienced personnel should carry out handling. At all times, safe handling must be ensured.



Each combination must be assessed to identify all risks associated with handling.

The gearboxes must be fully supported until full valve shaft/stem engagement is achieved and the gearbox is secured to the valve flange.

Once connected to the valve, each assembly must be assessed on an individual basis for safe handling/lifting. Never lift the complete combination-valve assembly via the gearbox.

If it is necessary to lift the gearbox using lifting equipment, certified soft slings are recommended. Damage to protective coatings should be correctly rectified and may invalidate warranty.

6 General Mounting Instructions

CAUTION: To avoid the potential for disengaging the worm gear segment, ensure that the pointer cap pointer is oriented to the mid-point of the 90° valve travel. Full stroke rotation of the quadrant should not move the pointer past the corresponding Open or Close ID marks on the housing cover.



The mounting instructions for the SBWG series worm gearboxes are outlined below. The SBWG-00 through SBWG-35 gearboxes are designed with a bottom entry splined adapter. The SBWG-04 through SBWG-12 gearboxes are designed with a top entry splined adapter. A separate set of instructions for each design is

provided. See Section 6.1 for the SBWG-00 through SBWG-35 and Section 6.2 for the SBWG-04 through SBWG-12.

6.1 SBWG-00 through SBWG-35

1. Place the valve disk in the full closed position.

NOTE: If the Splined Adapter is already installed in the operator, go to step 6.

2. Remove the Pointer Cap.
3. Turn the gearbox upside down so that the bottom of the housing is accessible.
4. Remove the Retaining Ring, and install the Splined Adapter.

NOTE: The notch in the Worm Gear at the Closed position must be aligned with the keyway in the Splined Adapter.

5. Reinstall the Retaining Ring.
6. Place the gearbox in the upright position so that the top of the gearbox is accessible.
7. Mount the operator on the valve and bolt securely.
8. Rotate the input shaft to align the keyway of the Splined Adapter with the keyway of the Valve Shaft and install the key.
9. Confirm that the gearbox Stop Screws are properly set for valve disk travel in both the Open and Close directions of travel. See Section 6.4.
10. Reinstall the Pointer Cap.

6.2 SBWG-04 through SBWG-12

1. Place the valve disk in the full closed position.
2. Remove the Pointer Cap (see section 9.3 for removal instructions).

NOTE: If the Splined Adapter is already installed in the operator, go to step 6.

3. Remove the Retaining Ring and install the Splined Adapter.

NOTE: The notch in the Worm Gear at the Closed position must be aligned with the keyway in the Splined Adapter.

4. Reinstall the Retaining Ring.
5. Mount the operator on the valve and bolt securely.
6. Rotate the input shaft to align the keyway of the Splined Adapter with the keyway of the Valve Shaft and install the key.
7. Confirm that the gearbox Stop Screws are properly set for valve disk travel in both the Open and Close directions of travel. See Section 6.4.
8. Reinstall the Pointer Cap.

6.3 Assembly Positions

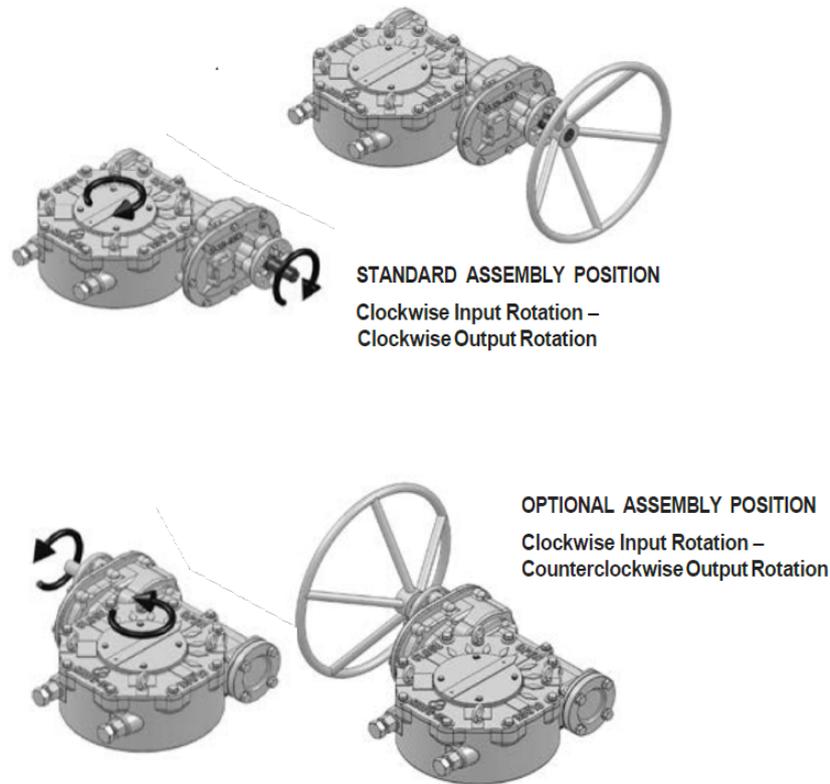


Figure 2: Position A (above), Position B (below)

6.4 Setting Position Limit Stops – SBWG-00 Through SBWG-12

Refer to figure 3

1. Loosen the Hex Nut (item no. 16) and turn it several turns to allow for stop screw adjustment.
2. Adjust the Stop Screw by turning it counterclockwise to back the screw away from the Worm Gear/Drive Sleeve (item no. 5).
3. Place the valve disk in the full closed position.
4. Turn the Stop Screw (item no. 15) in the clockwise direction until the end of the screw contacts the Worm Gear/Drive Sleeve.
5. Tighten the Hex Nut to secure the closed set position.
6. Move the valve disk to the full open position.
7. Follow steps 1 through 5.

CAUTION: If the valve is operated with an electric actuator/gear operator combination, and the valve is position-seated, set the actuator limit switches to trip prior to engagement of the SBWG Worm Gear/Drive Sleeve with the Stop Screws. Damage to the operator could result from the Worm Gear/Drive Sleeve contacting the Stop Screw under motorized operation.



NOTE: The stops are adjustable to +/- 5° of total travel to allow for proper positioning of the worm gear quadrant.

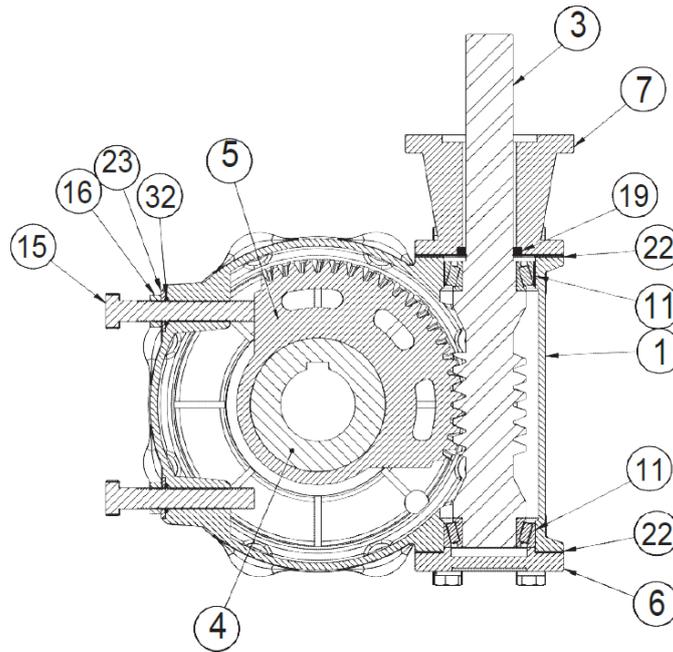


Figure 3: Setting Position Limit Stops – SBWG-00 through SBWG-12

7 Lubrication

Sambo SBWG operators are shipped with the following lubricants:

Product	Lubricant	Soap/Base	Temperature range
SBWG-00 through SBWG-12	Zenith EPSB 2 (Shell Alvania EP2)	Calcium	-20°C to 100°C (-4°F to 248°F)

NOTE: The lubricant should be checked every 18 months for manual operators.

CAUTION: Do not add a different lubricant to a Sambo operator unless it is of the same soap base as the existing lubricant, or you have received the approval of the lubricant manufacturer.



Quantity

Sambo operators are built to operate on the partial immersion principle. The primary concern regarding the amount of lubricant is whether the “worm” is totally immersed in grease. This can be verified by the use of one or more of the “fill” and “drain” plugs provided on the operator housing in most sizes.

Quality

When removing a “fill” or “drain” plug to inspect the lubricant level, remove a small amount and ensure that it is clean and free of any contaminant, including water. Should dirt, water or other foreign matter be found, the operators should be flushed with a commercial degreaser/cleaner which is non-corrosive and does not affect seal materials such as Buna-N or Viton. Repack operator with fresh lubricant.

Consistency

The main gear box lubricant should be slightly fluid, approximating a standard NLGI-2 grade consistency or less. Alternate lubricants may be used in place of the standard lubricants supplied by Sambo, provided they are of a formulation similar to those listed above for the respective product.

8 Safety Practices

The following checkpoints should be performed to maintain safe operation of the SBWG gear operator:

- Set up a periodic operating schedule on infrequently used valves.
- Ensure that the limit and/or torque switches on any electric actuator fitted to the SBWG worm gear operator are correctly and appropriately adjusted.

9 Disassembly and Reassembly Instructions

9.1 Safety Precautions

CAUTION: Read this Installation, Operation and maintenance manual carefully and completely before attempting to install, operate or troubleshoot the Sambo operator.



WARNING: Potential HIGH-PRESSURE vessel — be aware of high-pressure hazards associated with the attached valve or other actuated device when installing or performing maintenance on the operator. Do not remove the operator mounting bolts from the valve or actuated device unless the valve or device stem is secured or there is no pressure in the line.



CAUTION: For maintenance and/or disassembly of the operator while installed on the valve, ensure that the operator is not under thrust or torque load. If the valve must be left in service, the valve stem must be locked in such a way as to prevent any movement of the valve stem.



WARNING: Do not manually operate the operator with devices other than the installed handwheel. Using force beyond the ratings of the operator and/or using additive force devices such as cheater bars, wheel wrenches, pipe wrenches, or other devices on the operator handwheel may cause serious personal injury and/or damage to the operator and valve.



CAUTION: Do not exceed any design limitations or make modifications to this equipment without first consulting Sambo.



CAUTION: Use of this product must be suspended any time it fails to operate properly.



CAUTION: If a motor actuator is driving the manual operator, do not operate the valve under motor operation without first checking and setting the limit switch and checking for correct motor rotation.



WARNING: Do not use replacement parts that are not genuine Sambo parts, as serious personal injury and/or damage to the operator and valve may result.



9.2 Disassembly and Reassembly of SBWG-00 through SBWG-35

Disassembly Instructions

Refer to figures 4 - 9

1. Place the operator upside down to access the mounting base.
2. Remove Retaining Ring (item no. 10) and Splined Adapter (item no. 4, see Figure 4).
3. Return the operator to the upright position (mounting base down) and remove the Hex Head Cap Screws (item no. 14), Pointer Cap (item no. 8) and O-rings (item no. 18 & 31).
4. Remove the Hex Head Cap Screws (item no. 12), Housing Cover (item no. 2) and Cover Gasket (item no. 21).
5. Remove the Input Flange (item no. 7), with Oil Seal (item no. 19) and Gasket (item no. 22), or remove the Spur Gear Attachment.
6. Remove Worm Shaft (item no. 3) with Tapered Roller Bearing (item no. 11) from the Housing (item no. 1).
7. Remove the Tapered Roller Bearing (item no. 11) from the Worm Shaft (item no. 3), if required.
8. Remove the End Cap (item no. 6) and Gasket (item no. 22).
9. Remove the Tapered Roller Bearing (item no. 11).
10. Remove the Worm Gear/Drive Sleeve (item no. 5), O-Rings (item no. 17), and Thrust Washers (item no. 9).
11. Remove the Stop Screws (item no. 15) with Hex Nuts (item no. 16), Packing Seals (item no. 23) and O-rings (item no. 32).

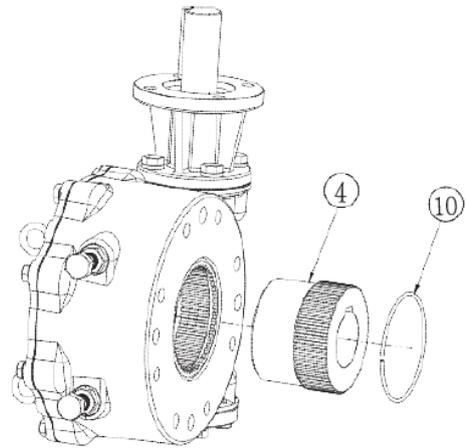


Figure 4: Splined Adapter Assembly

Reassembly Instructions

Refer to figures 4 - 9

1. Install the Stop Screws (item no.15), including the O-Rings (item no. 32), Packing Seals (item no. 23) and Hex Nuts (item no. 16).
2. Place the lower Thrust Washer (item no. 9) in the Housing (item no. 1).
3. Replace the lower O-Rings (item no. 17) in the base of the Housing (item no. 1).

NOTE: Lubricate all O-Rings before installation.

4. Install the Worm Gear/Drive Sleeve (item no. 5).
5. Install the Tapered Roller Bearing (item no. 11) into the Housing bore on the End Cap side.
6. Install the End Cap (item no. 6) and Gasket (item no. 22).

7. Insert the Worm Shaft (item no. 3) into the Housing bore.
8. Install the Tapered Roller Bearing (item no. 11) onto the Worm Shaft in the Housing bore.
9. Replace the Oil Seal (item no. 19) in the Input Flange (item no. 7), if required.
10. Install the Input Flange (item no. 7) with Gasket (item no. 22) or install the Spur Gear Attachment.

NOTE: Lubricate the worm gear mesh to replace lubricant lost during disassembly.

11. Place the upper Thrust Washer (item no. 9) on the Worm Gear/Drive Sleeve (item no. 5).
12. Replace the upper O-Ring (item no. 20) in the Housing Cover (item no. 2).

CAUTION: Lubricate all O-Rings before installation.

13. Install the Housing Cover (item no. 2) with Cover Gasket (item no. 21).
14. Replace the upper O-Ring (item no. 18) in the Housing Cover (item no. 2).
15. Replace the Pointer Cap O-ring (item no. 31) in the top of the Worm Gear/Drive Sleeve (item no. 5).

CAUTION: Lubricate all O-Rings before installation.

16. Install the Pointer Cap (item no. 8).
17. Turn the operator upside down and insert the Splined Adapter (item no. 4).
18. Install the Splined Adapter Retaining Ring (item no. 10).

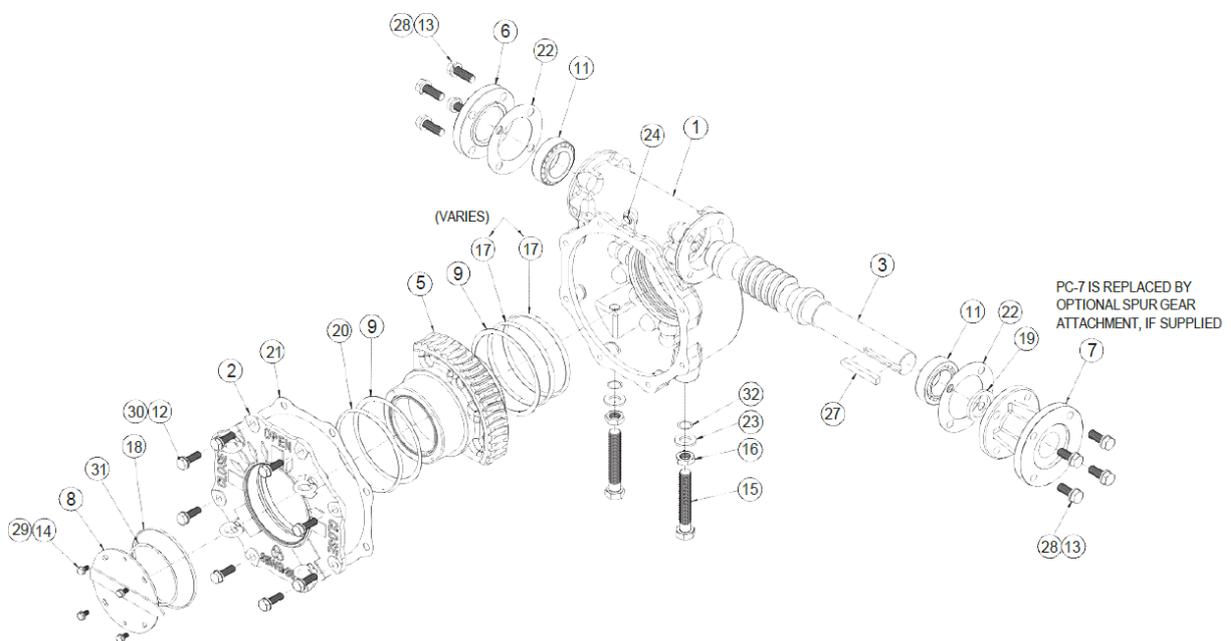


Figure 5: WG-00 through WG-35 Exploded View

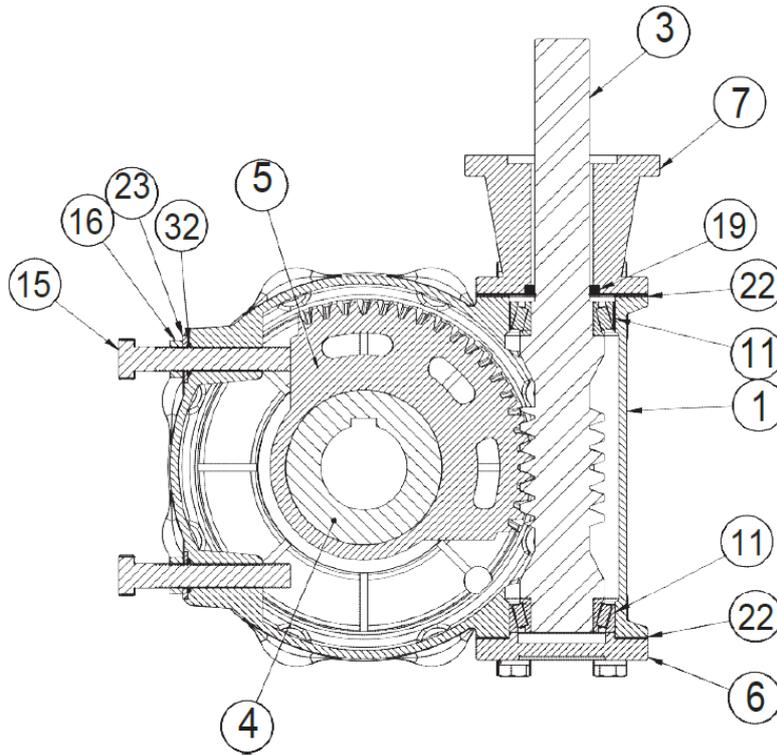


Figure 6: SBWG-00 through SBWG-35 Assembly View

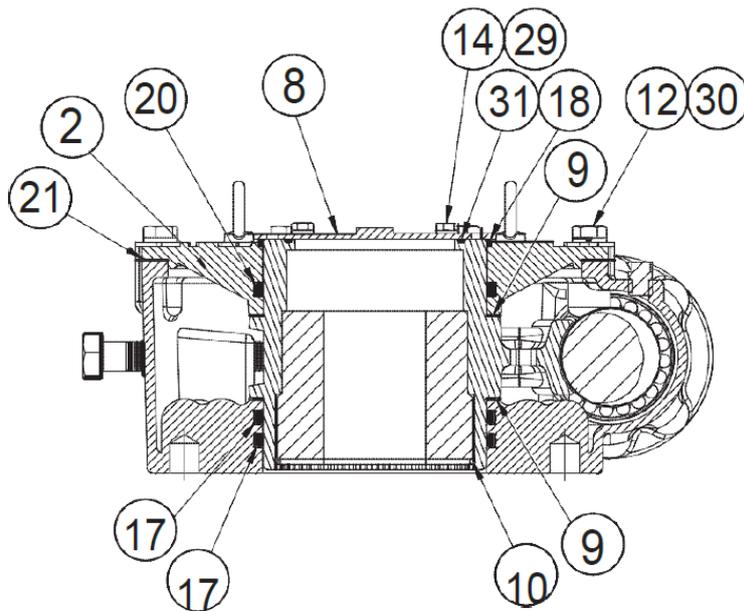


Figure 7: SBWG-00 through SBWG-35 Assembly View

Table 1: SBWG-00 through SBWG-35 Parts List

Parts List		
Item	Description	Qty
1	Housing	1
2	Housing Cover	1
3	Worm Shaft	1
4	Splined Adapter	1
5	Worm Gear/Drive Sleeve	1
6	End Cap	1
7	Input Flange	Varies
8	Pointer Cap	1
9	Thrust Washer	2
10	Splined Adapter Retaining Ring	1
11	Tapered Roller Bearing	2
12	Hex Head Cap Screw	8
13	Hex Head Cap Screw	4
14	Hex Head Cap Screw	4
15	Stop Screw	2
16	Hex Nut	2
17	Drive Sleeve O-Ring	Varies
18	Drive Sleeve O-Ring	1
19	Oil Seal	1
20	Drive Sleeve O-Ring	1
21	Cover Gasket	1
22	Gasket	2
23	Packing Seal	2
24	Pipe Plug/Grease Fitting	1
25	Eye Bolt	4
26	N/A	
27	Key	1
28	Lock Washer	4
29	Lock Washer	4
30	Lock washer	8
31	Pointer Cap O-Ring	1
32	Stop Screw O-Ring	2

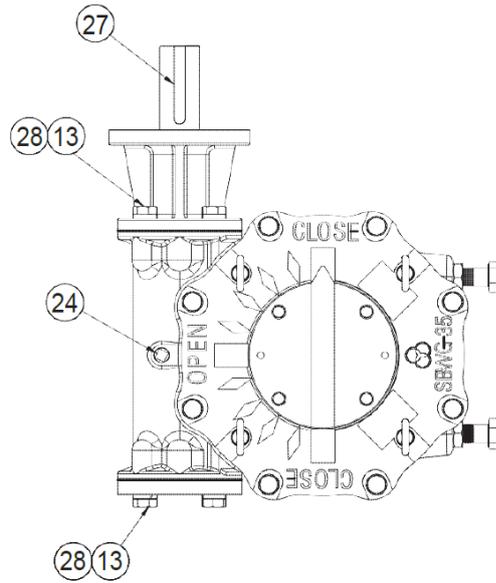


Figure 8: SBWG-00 through SBWG-35 Assembly View

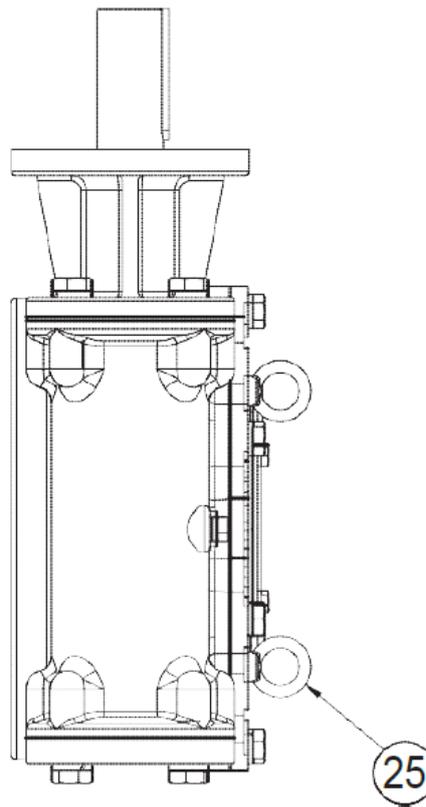


Figure 9: SBWG-00 through SBWG-35 Assembly View

9.3 Disassembly and Reassembly of SBWG-04 through SBWG-12

Disassembly Instructions

Refer to Figures 10 to 15

1. Remove the Stem Cover Adapter (item no. 28) and O-Rings (item no. 26 and item no. 27).
2. Remove the Hex head Cap Screws (item no. 14), Pointer Cap (item no. 8), Gasket (item no. 31) and O-ring (item no. 18).

NOTE: Remove O-Ring (item no. 18) if applicable.

3. Remove Retaining Ring (item no. 10) and Splined Adapter (item no. 4).
4. Remove the Hex head cap Screws (item no. 12), Housing Cover (item no. 2), Cover Gasket (item no. 21), and O-Ring (item no. 20).
5. Remove the Input Flange (item no. 7) and Gasket (item no. 22), or remove the Spur Gear Attachment (see chapter 9.4 or 9.5).
6. Remove Worm Shaft (item no. 3) with Tapered Roller Bearing (item no. 11) and Ball Bearing (item no. 26) from the Housing (item no. 1).
7. Remove the Tapered Roller Bearing (item no. 11) and Ball Bearing (item no. 26) from the Worm Shaft (item no. 3), if required.
8. Remove the End Cap (item no. 6) and Gasket (item no. 22).
9. Remove the Tapered Roller Bearing (item no. 11) and Ball Bearing (item no. 26).
10. Remove the Worm Gear/Drive Sleeve (item no. 5), O-Rings (item no. 17), and Thrust Washers (item no. 9).
11. Remove the Stop Screws (item no. 15) with Hex Nuts (item no. 16), Packing Seals (item no. 23) and O-Rings (item no. 32), if applicable.

Reassembly Instructions

1. Install the Stop Screws (item no. 15), including the Hex Nuts (item no. 16), Packing Seals (item no. 23) and O-Rings (item no. 32), if applicable.
2. Place the lower Thrust Washer (item no. 9) in the Housing (item no. 1).
3. Replace the lower O-Rings (item no. 17) in the base of the Housing (item no. 1).

NOTE: Lubricate all O-Rings before installation.

4. Install the Worm Gear/Drive Sleeve (item no. 5).
5. Install the Ball Bearing (item no. 26) and the Tapered Roller Bearing (item no. 11) into the Housing Bore on the End Cap side.
6. Install the End Cap (item no. 6) and the Gasket (item no. 22).
7. Insert the Worm Shaft (item no. 3) into the Housing bore.
8. Install the Ball Bearing (item no. 26) and the Tapered Roller Bearing (item no. 11) onto the Worm Shaft in the Housing bore.
9. Replace the oil Seal (item no. 19) in the Input Flange (item no. 7), if required.
10. Install the Input Flange (item no. 7) with gasket (item no. 22) or install the Spur gear Attachment (see chapter 9.4 or 9.5).

NOTE: Lubricate the worm gear mesh to replace lubricant lost during disassembly (see Lubrication, Section 7).

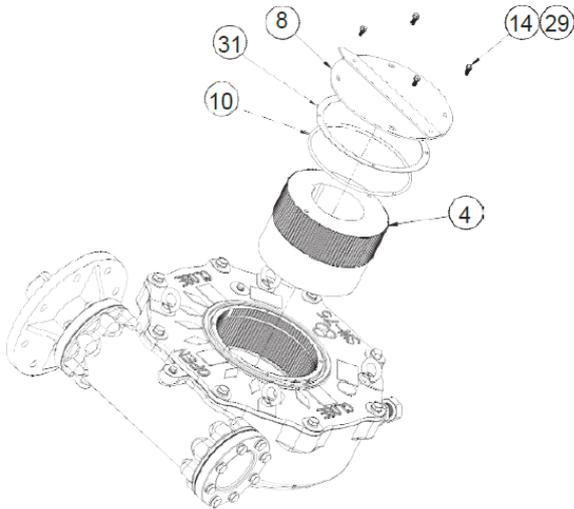


Figure 10: Splined Adapter Assembly

11. Place the upper Thrust washer (item no. 9) on the Worm gear/Drive Sleeve (item no. 5).
12. Replace the O-Rings (item no. 20) in the Housing Cover (item no. 2).

NOTE: Lubricate the O-Rings before installation.

13. Install the Housing Cover (item no. 2) with the Cover Gasket (item no. 21).
14. Insert the Splined Adapter (item no. 4) into the Worm Gear/Drive Sleeve (item no. 5).
15. Install the Splined Adapter Retaining Ring (item no. 10).
16. Install the Pointer Cap (item no. 8), Gasket (item no. 31) and Drive Sleeve O-Ring (item no. 18).

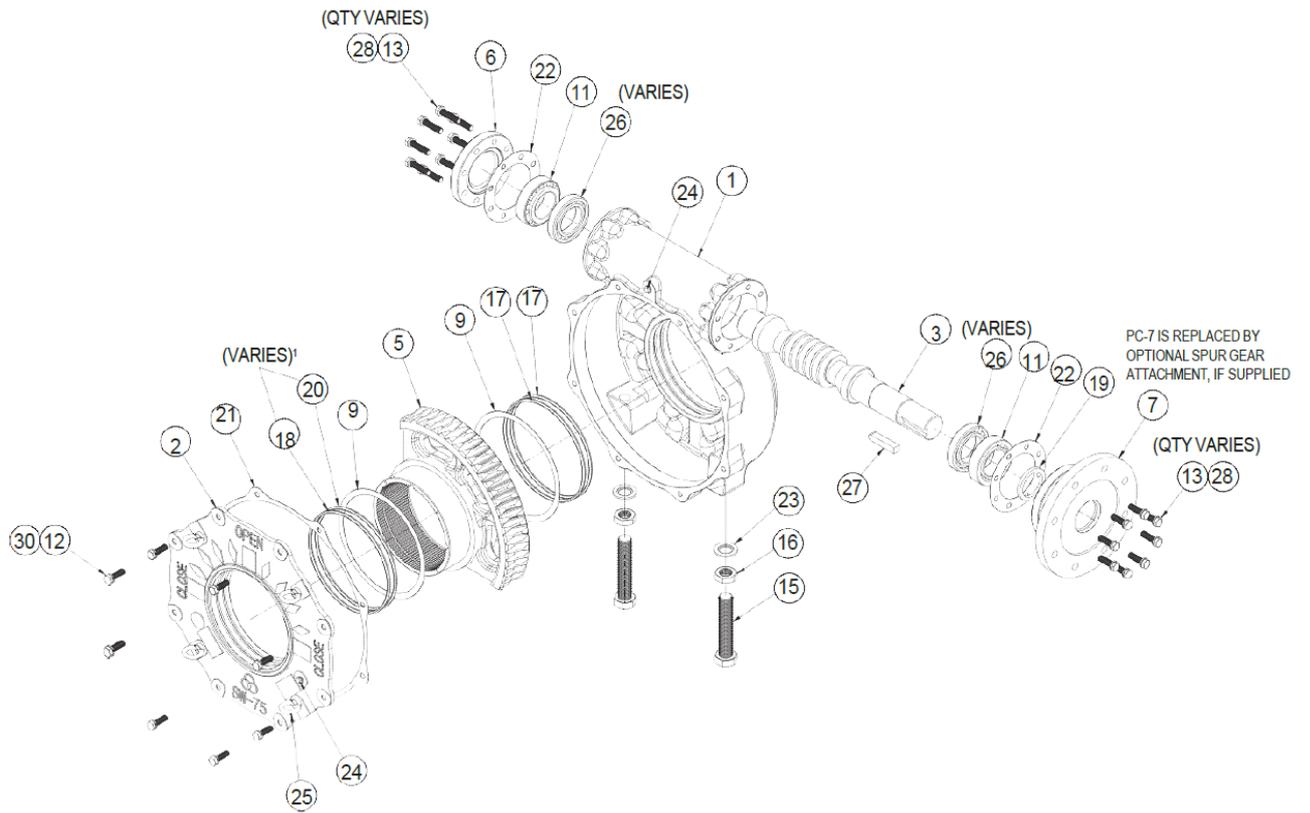


Figure 11: SBWG04 - SBWG12 Assembly View

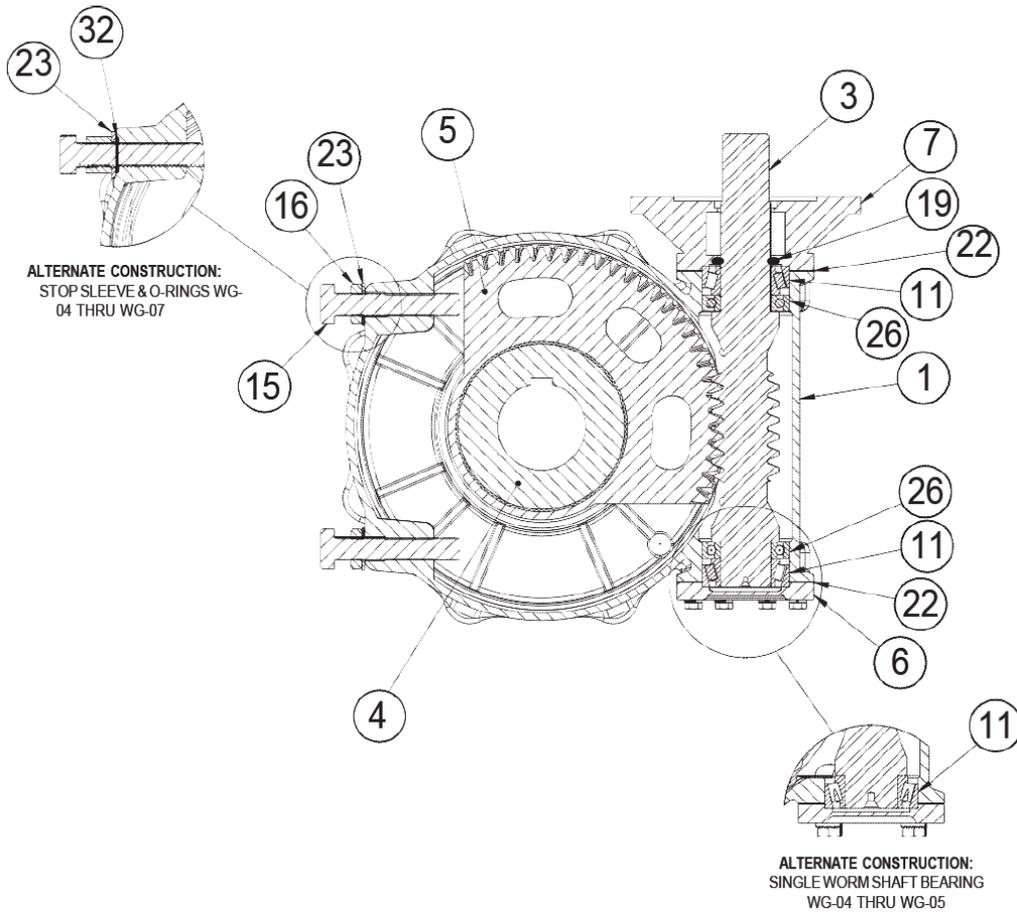


Figure 12: SBWG04 - SBWG12 Assembly View

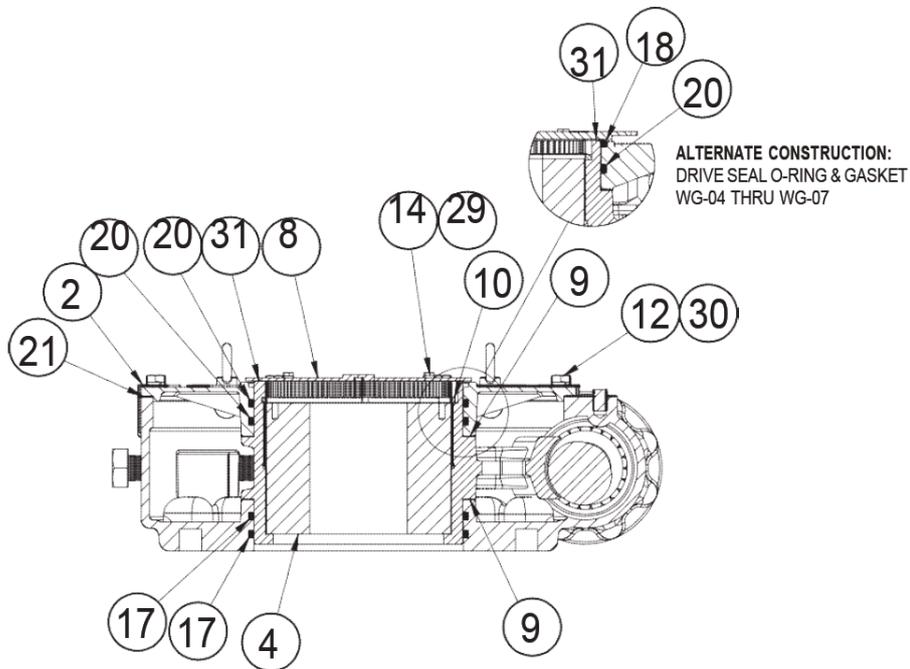


Figure 13: SBWG04 - SBWG12 Assembly View

Table 2: SBWG-04 through SBWG-12 Parts List

Parts List		
Item	Description	Qty
1	Housing	1
2	Housing Cover	1
3	Worm Shaft	1
4	Splined Adapter	1
5	Worm Gear/Drive Sleeve	1
6	End Cap	1
7	Input Flange	1
8	Pointer Cap	1
9	Thrust Washer	2
10	Splined Adapter Retaining Ring	1
11	Tapered Roller Bearing	2
12	Hex Head Cap Screw	8
13	Hex Head Cap Screw	Varies
14	Hex Head Cap Screw	4
15	Stop Screw	2
16	Hex Nut	2
17	Drive Sleeve O-Ring	2
18	Drive Sleeve O-Ring	Varies
19	Oil Seal	1
20	Drive Sleeve O-Ring	Varies
21	Cover Gasket	1
22	Gasket	2
23	Packing Seal	2
24	Pipe Plug/Grease Fitting	2
25	Eye Bolt	4
26	Ball Bearing	Varies
27	Key	1
28	Lock Washer	Varies
29	Lock Washer	4
30	Lock washer	8
31	Pointer Cap O-Ring	1
32	Stop Screw O-Ring	Varies

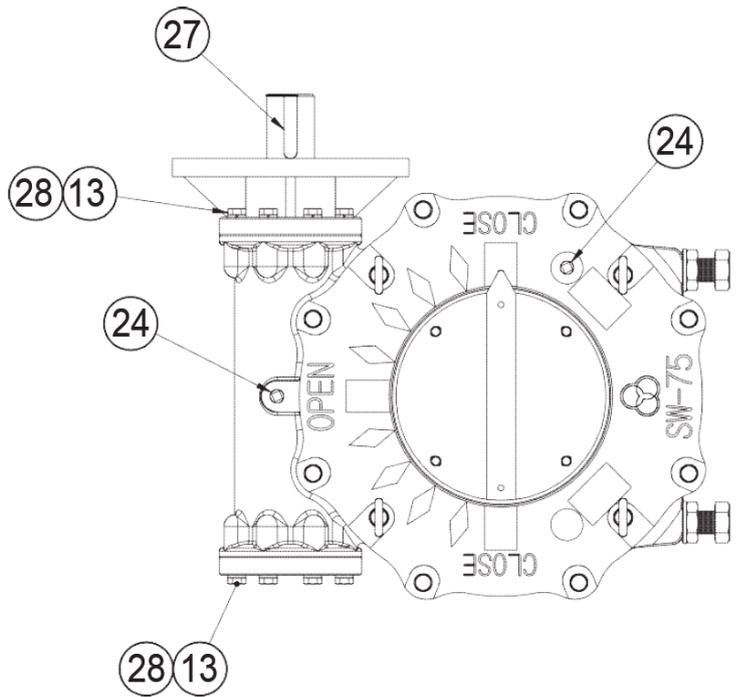


Figure 14: SBWG-04 through SBWG-12 Assembly View

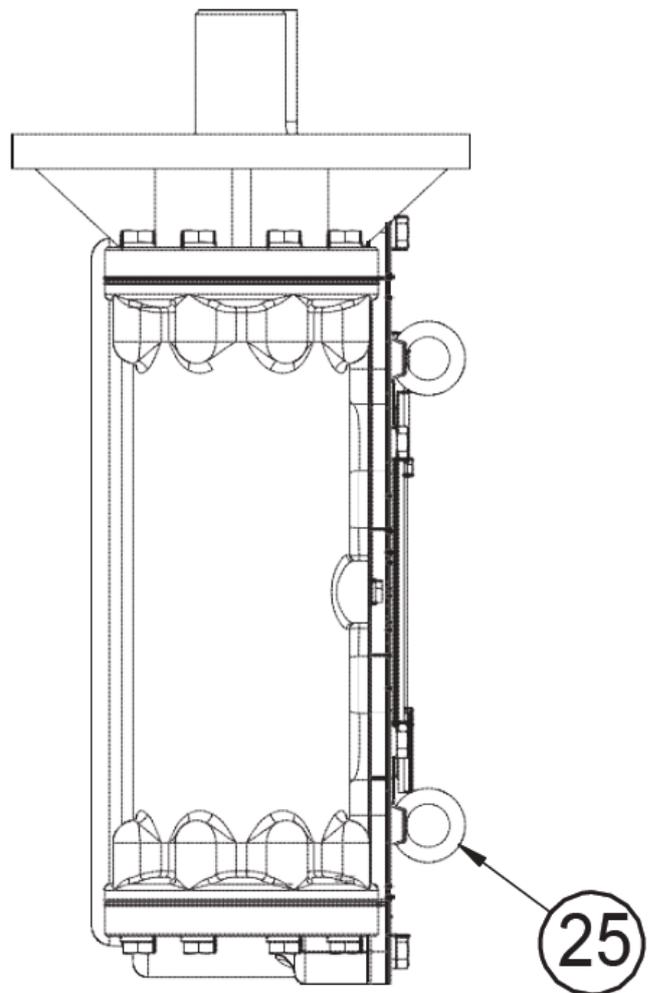


Figure 15: SBWG-04 through SBWG-12 Assembly View

9.4 Disassembly and Reassembly of Single Reduction Spur Gear Attachment (1S)

Disassembly Instructions

Refer to Figure 16

1. Remove the Socket Head Cap Screws and input Flange (not shown) from the Cover (item no. 4).
2. Remove the Hex Head Cap Screws (item no. 12) and Cover (item no. 4).
3. Remove all traces of the Cover Gasket (item no. 9).
4. Remove the Input Shaft/Pinion (item no. 3) and Ball Bearings (item no. 6) from the Cover (item no. 4).
5. Remove the Ball Bearing (item no. 10) and Retaining Ring (item no. 5) from the Worm Shaft.
6. Remove Gear (item no. 2) and Key (item no. 8) from the Worm Shaft.
7. Remove the Socket Head Cap Screws (not shown) which mount the Spur Gear Attachment to the SBWG Gearbox and remove the Spur Gear Housing (item no. 1).
8. If disassembly of the SBWG Gearbox is required, see chapter 9.2 or 9.3.

Reassembly Instructions

1. Install the Spur Gear Housing (item no. 1) on the SBWG Gearbox, ensuring proper gasket is installed between Gearbox and Spur Gear Housing (see section 9.2 or 9.3).
2. Install Gear (item no. 2) onto the SBWG Gearbox Worm Shaft with Key (item no. 8). Fasten with Retaining Ring (item no. 5).
3. Install Ball Bearing (item no. 10) onto the Worm Shaft.
4. Install Ball Bearing (item no. 6) into the Spur Gear Housing (item no. 1).
5. Install the Input Shaft/Pinion (item no. 3).
6. Install Ball Bearing (item no. 6) onto the Input Shaft/Pinion (item no. 3).
7. Replace the Cover Gasket (item no. 9).
8. Replace the Oil Seal (item no. 11) in the Cover (item no. 4).

NOTE: Lubricate the Spur Gearing. See Section 7.

9. Install the Cover (item no. 4), mounting with Hex Head Cap Screws (item no. 12).
10. Install the Input Flange (not shown) onto the Cover (item no. 4) using Socket head Cap Screws (not shown).

NOTE: Replace any worn or damaged O-Rings or Gaskets to ensure proper sealing and operation.

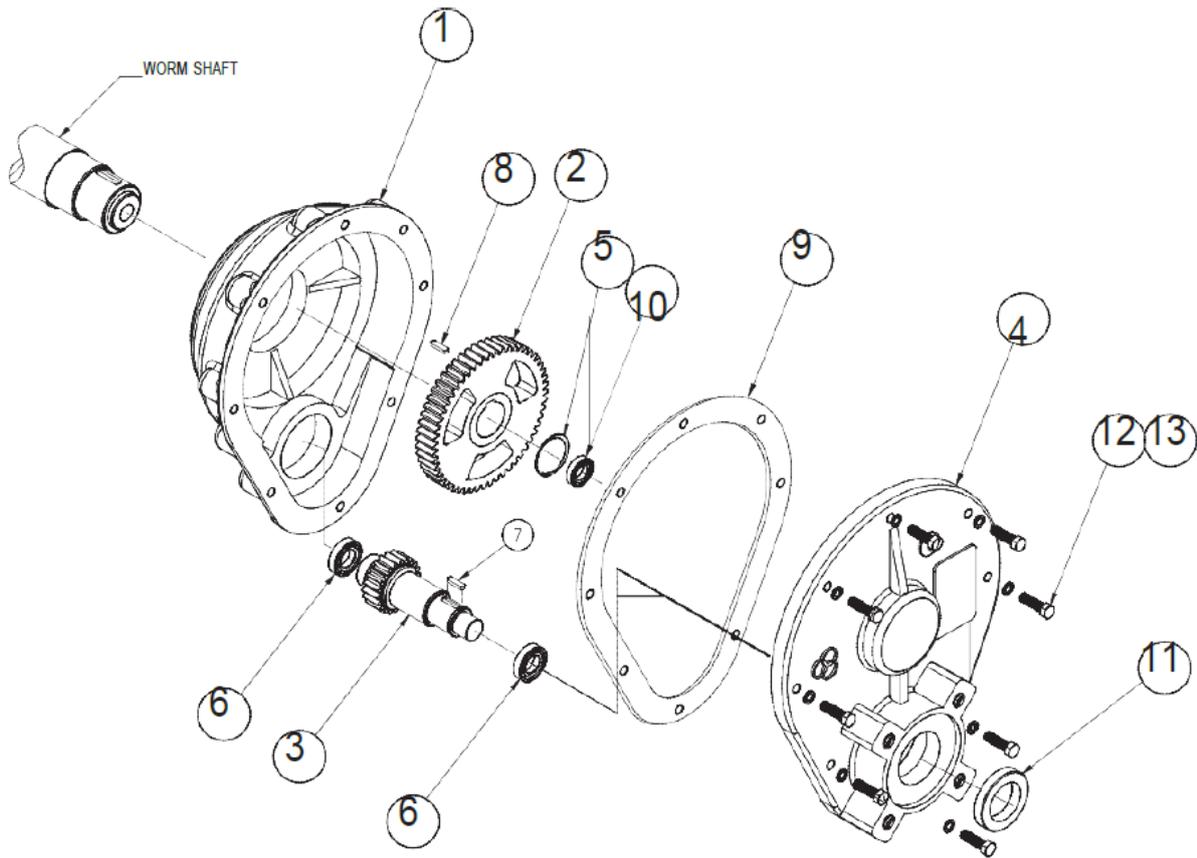


Figure 16: SBWG-00 through SBWG-12 - Single Reduction Spur Gear Attachment (1S) Exploded View

Table 3: SBWG-00 through SBWG-12 - Single Reduction Spur Gear Attachment (1S) Parts List

Parts List		
Item	Description	Qty
1	Housing	1
2	Gear	1
3	Input Shaft/Pinion	1
4	Cover	11
5	Retaining Ring	1
6	Ball Bearing	2
7	Key	1
8	Key	1
9	Gasket	1
10	Ball Bearing	1
11	Oil Seal	1
12	Hex Head Cap Screw	8
13	Lockwasher	8

9.5 Disassembly and Reassembly of Double Reduction Spur Gear Attachment (1SD)

Disassembly Instructions

Refer to Figure 17

1. Remove the Socket Head Cap Screws (item no. 19) and Input Flange (item no. 18) from the Cover (item no. 12).
2. Remove the Hex Head Cap Screws (item no. 14) and Cover (item no. 12).
3. Remove the Helical Gear/2nd Set Pinion Subassembly.
4. Remove all traces of the Cover Gasket (item no. 13).
5. Remove the Input Shaft/Pinion Subassembly from the Cover (item no. 12) by removing the Retaining Ring (item no. 16).
6. Remove the Retaining Ring (item no. 4) and Ball Bearings (item no. 11) from the Input Shaft/Pinion (item no.9).
7. Remove the Ball Bearing (item no. 8)from the 2nd Set Pinion (item no. 5).
8. Remove the Retaining Ring (item no. 4) and the Helical Gear (item no. 2) from the 2nd Set Pinion (item no. 5).
9. Remove the Retaining Ring (item no. 4) and the Helical Gear (item no. 2) from the Worm Shaft.
10. Remove the Socket Head Cap Screws (item no. 20) from the Spur Gear Housing (item no. 1) and remove the Spur Gear Housing (item no. 1) from the SBWG Gearbox.
11. If disassembly of the WG Gearbox is required, see sections 9.2 and 9.3.

Reassembly Instructions

1. Install the Spur Gear Housing (item no. 1) on the SBWG Gearbox, ensuring proper gasket is installed between Gearbox and Spur Gear Housing (see section 9.2 or 9.3).
2. Install the Helical Gear (item no. 2) on the SBWG Gearbox Worm Shaft with two Keys (item no. 3). Fasten with Retaining Ring (item no. 4).
3. Insert the Bushing (item no. 10) into the end of the Input Shaft/Pinion (item no. 9).
4. Install the Ball Bearings (item no. 11) and Retaining Ring onto the Input Shaft/Pinion (item no. 9).
5. Install the Input Shaft/Pinion with Ball Bearings (item no. 11) into the Cover (item no. 12) using Retaining Ring (item no. 16).
6. Install the Ball Bearing (item no. 6) in the Spur Gear Housing (item no. 1).
7. Assemble the Helical Gear (item no. 2) on the 2nd Set Pinion (item no. 5) with two Keys (item no. 7). Fasten with Retaining Ring (item no. 4).
8. Install the Ball Bearing (item no. 8) on the 2nd Set Pinion (item no. 5).
9. Install the Helical Gear/2nd Set Pinion Subassembly in the Ball Bearing (item no. 6).

NOTE: Lubricate the Spur Gearing. See Section 7.

10. Replace the Gasket Cover (item no. 13).
11. Install the Cover (item no. 12) with Input Shaft/Pinion Subassembly onto the Spur Gear Housing, ensuring proper mesh of gear teeth on Input Shaft/Pinion (item no. 9) and Helical Gear (item no. 2), and alignment of Ball Bearing (item no. 8) with Cover (item no. 12).
12. Replace the Oil Seal (item no. 15).

13. Install the Input Flange (item no. 18).

NOTE: Replace any worn or damaged O-Rings or Gaskets to ensure proper sealing and operation.

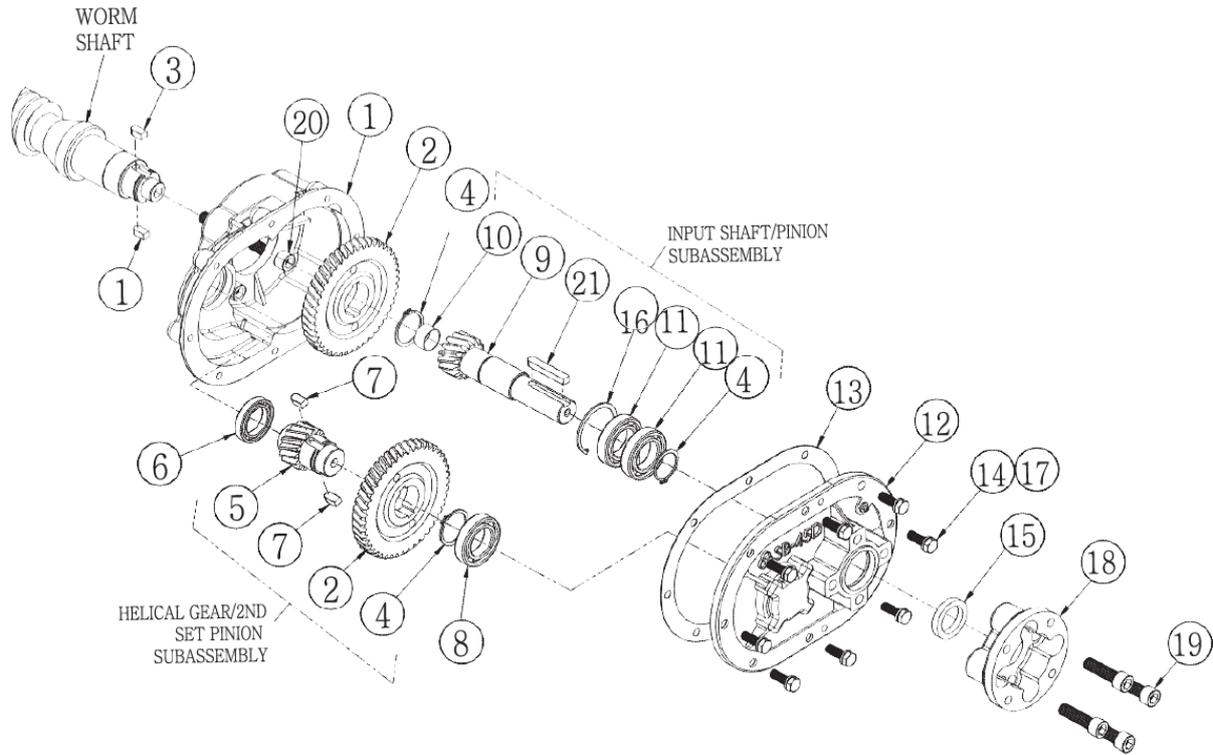


Figure 17: SBWG-00 through SBWG-12 Spur Gear Attachment (1SD) Exploded View

Table 4: SBWG-00 through SBWG-12 Spur Gear Attachment (1SD) Parts List

Parts List					
Item	Description	Qty	Item	Description	Qty
1	Housing	1	11	Ball Bearing	2
2	Helical Gear	2	12	Cover	1
3	Key	2	13	Gasket-Cover	1
4	Retaining Ring	3	14	Hex Head Cap Screw	8
5	2 nd Set Pinion	1	15	Oil Seal	1
6	Ball Bearing	1	16	Retaining Ring	1
7	Key	2	17	Lockwasher	8
8	Ball Bearing	1	18	Input Flange	1
9	Input Shaft/Pinion	1	19	Socket Head Cap Screw	4
10	Bushing	1	20	Socket Head Cap Screw	Varies