

Operating instructions for SAMBO SB-SR series spur gear operator

1 Introduction

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

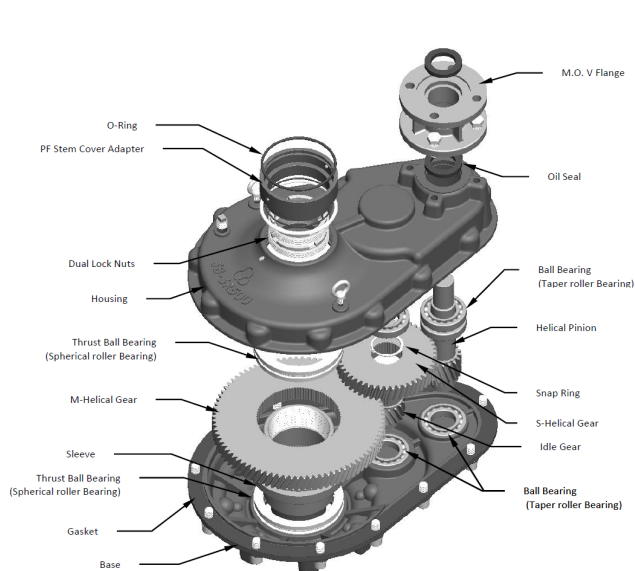


Figure 1: SR Exploded View

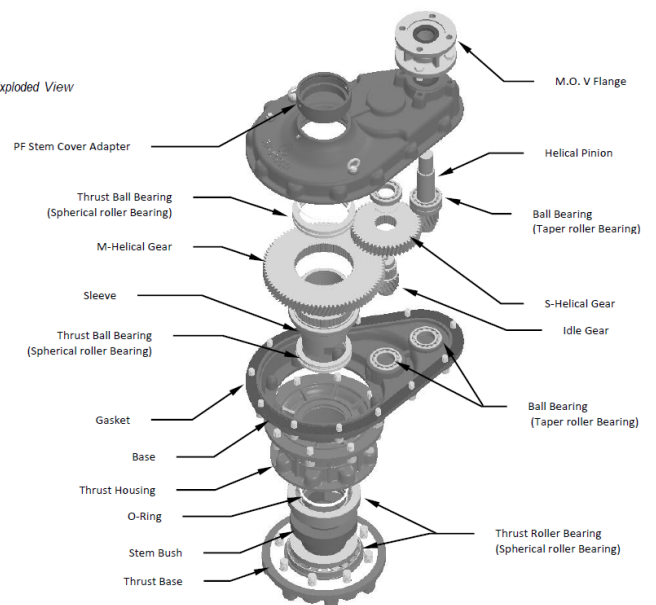




Figure 2: SRH Exploded View

WARNING: Do not manually operate the SR(H) gearbox (see figures 1 and 2) 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 gearbox handwheel, wrench or wrench nut may cause serious personal injury and/or damage to the gearbox 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. 

NOTE: 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.



WARNING: Do not manually operate the gearbox with devices other than the installed hand-wheel. Using force beyond the ratings of the gearbox and/or using additive force devices such as cheater bars, wheel wrenches, pipe wrenches, or other devices on the gearbox hand-wheel may cause serious personal injury and/or damage to the gearbox 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: 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 SB-SR(H) 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 SR(H) 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

The mounting instructions for the SB-SR(H) spur gearboxes are outlined below. The SR50 through SR800 gearboxes are designed with a splined top-entry Stem Nut which is retained in the Drive Sleeve by two Lock Nuts.

The SR200H through SR800H gearboxes are designed with a Stem Nut which is retained by two Thrust Roller Bearings within the Thrust Housing and Thrust Base. Partial disassembly of the Thrust Base is required for Stem Nut removal and/or installation.

6.1 Installing a Gearbox with a Threaded Stem Nut – SR50 through SR800 and SR200H through SR800H

1. Position the gearbox above the valve stem.
2. Rotate the gearbox handwheel or wrench nut several turns until there is positive engagement between the valve stem and the gearbox Stem Nut.
3. Rotate the handwheel to lower the gearbox onto the valve until contact has been made with the valve flange.
4. Bolt the gearbox securely to the valve mounting flange.

6.2 Installing a Gearbox with a Blank Stem Nut – SR50 through SR800

1. Remove the two threaded Lock Nuts (item no. 27) from the Drive Sleeve (item no. 10), accessed through the top of the Housing (item no. 1).
2. Remove the Stem Nut (item no. 26) from the Drive Sleeve (item no. 10) through the top of the Housing (item no. 1).
3. Machine the Stem Nut (item no. 26) to suit the valve stem.

CAUTION: Care must be taken to ensure that the clamping devices used during machining do not damage splined surfaces of the Stem Nut.



4. Reinstall the Stem Nut (item no. 26) into the Drive Sleeve (item no. 10), ensuring the splines are properly engaged.
5. Reinstall the two threaded Lock Nuts (item no. 27) into the Drive Sleeve (item no. 10).
6. Mount the gearbox on the valve as detailed in Section 6.1.

6.3 Installing a Gearbox with a Blank Stem Nut – SR200H through SR800H

1. Place the gearbox upside down to access the mounting base.
2. Remove the Socket Head Cap Screws (item no. 20) which mount the Thrust Base (item no. 31) to the Thrust Housing (item no. 2).
3. Remove the Thrust Base (item no. 30) and Gasket (item no. 28) from the Thrust Housing (item no. 21).

CAUTION: Care must be taken to ensure that the O-ring (item no. 29) located in the Thrust Base (item no. 30) is not damaged during disassembly.



4. Remove the Stem Nut (item no. 26) and lower Thrust Roller Bearing (item no. 27).
5. Remove the upper Thrust Roller Bearing (item no. 25). Place all bearings in a clean, dry area until reassembly.
6. Machine the Stem Nut (item no. 26) to suit the valve stem.

CAUTION: Care must be taken to ensure that the clamping devices used during machining do not damage splined surfaces of the Stem Nut (item no. 26).



7. Reinstall the upper Thrust Roller Bearing (item no. 25) into the Thrust Housing (item no. 21).
8. Install the Stem Nut (item no. 26) into the Thrust Housing (item no. 21) and upper Thrust Roller Bearing (item no. 25).
9. Install the lower Thrust Roller Bearing (item no. 27) onto the Stem Nut (item no. 26).
10. Place the Gasket (item no. 20) onto the Thrust housing (item no. 21).
11. Separately, install the O-Ring (item no. 29) in the Thrust Base (item no. 30).
12. Install the Thrust Base (item no. 30) with O-Ring (item no. 29) onto the Thrust Housing (item no. 21) and Stem Nut (item no. 26), using Socket Head Cap Screws (item no. 31).

CAUTION: Care must be taken to ensure that the O-ring (item no. 29) located in the Thrust Base (item no. 30) is not damaged during installation.



13. Mount the gearbox on the valve as detailed in Section 6.1.

7 Stem Cover Mounting Instructions

The gearbox is supplied with a Stem Cover Adapter (item no. 38) which accepts unthreaded Stem Covers of standard NPS pipe sizes. Optionally, the adapter may be removed to access PF (BSPP) pipe threads, if required.

7.1 Installing an unthreaded Stem Cover using the supplied Stem Cover Adapter

CAUTION: Care must be taken to ensure the Stem Cover does not damage the O-ring during installation.



NOTE: Lubricate the O-ring (item no. 40) before installing the Stem Cover.

1. Loosen the quantity (4) set screws (item no. 41) in the Stem Cover Adapter (item no. 38).
2. Install the Stem Cover into the Stem Cover Adapter (item no. 38) and secure using the quantity (4) set screws.

7.2 Installing a threaded Stem Cover using the optional PF (BSPP) pipe threads

CAUTION: Care must be taken during installation to prevent damage to the Stem Cover and Housing threads.



NOTE: Apply thread sealant to external threads on Stem Cover before installing.

1. Loosen the set screw (item no. 35) in the Housing (item no. 1).
2. Remove the Stem Cover Adapter (item no. 38) with O-ring (item no. 40) by unthreading it from the Housing (item no. 1).
3. Remove and discard the O-ring (item no. 39).
4. Install the threaded Stem Cover into the Housing (item no. 1) and tighten.

8 Lubrication

SAMBO SB-SR gearboxes are shipped with the following lubricants:

Product	Lubricant	Soap/Base	Temperature range
SR50 Through SR800	Zenith EPSB-2	Calcium	-20 °C to 200 °C
SR200H through SR800H	Zenith EPSB-2	Calcium	-20 °C to 200 °C

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

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



Quantity

SAMBO gearboxes are built to operate on the partial immersion principle. The primary concern regarding the amount of lubricant is whether the bevel gear assembly 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 gearbox 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 gearboxes 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 the gearbox with fresh lubricant.

Consistency

The main gearbox 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 Flowserve, provided they are of a formulation similar to those listed above for the respective product.

9 Safety Practices

The following checkpoints should be performed to maintain safe operation of the SAMBO gearbox:

- 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 V gearbox are correctly and appropriately adjusted.

10 Product Weights

SB-SR Gearbox Weights

SB-SR Gearbox Weights		
Model	[lbs]	[kg]
SB-SR50	35	16
SB-SR100	77	35
SB-SR200	106	48
SB-SR300	154	70
SB-SR400	291	132
SB-SR500	485	220
SB-SR600	716	325
SB-SR700	987	448
SB-SR800	1389	630

SB-SRH Gearbox Weights

SB-SRH Gearbox Weights		
Model	[lbs]	[kg]
SB-SR200H	172	78
SB-SR300H	278	126
SB-SR400H	414	188
SB-SR500H	727	330
SB-SR600H	1045	474
SB-SR700H	1565	710
SB-SR800H	2191	994

11 Disassembly and Reassembly Instructions

CAUTION: See sections 2 and 9 before undertaking the steps below.



11.1 Disassembly and Reassembly of SR50 through SR800

Disassembly Instructions

Refer to Figure 3 and 4

1. Remove the two threaded Lock Nuts (item no. 27) from the Drive Sleeve (item no. 10), accessed through the top of the Housing (item no. 1).
2. Remove the Stem Nut (item no. 26) from the Drive Sleeve through the top of the Housing (item no. 1).
3. Remove the Stem Cover Adapter (item no. 28) and O-Rings (item no. 29 and item no. 30).
4. Remove Bearings (item no. 6 and item no. 14) from the Helical Pinion (item no. 12).
5. Place the gearbox upside down to access the mounting base.
6. Remove the Thrust Base (item no. 17) with O-Ring (item no. 18) and Gasket (item no. 16) by removing Socket Head Cap Screws (item no. 20).
7. Remove the lower Thrust Ball Bearing (item no. 15).
8. Remove the assembled Drive Sleeve (item no. 10) and Helical Gear (item no. 11).
9. Separately, remove the Helical Gear (item no. 11) from the Drive Sleeve (item no. 10).
10. Remove the Input Flange (item no. 32) with Oil Seal (item no. 33) and Gasket (item no. 2).
11. Remove the Helical Pinion subassembly from the Housing (item no. 1).
12. Remove the upper Thrust ball Bearing (item no. 4) from the housing (item no. 1).
13. Remove the O-Ring (item no. 3) from the Housing (item no. 1).

Reassembly Instructions

Refer to Figure 3 and 4

1. Place the Housing (item no. 1) upside down for internal access.
2. Install the O-Ring (item no. 3) in the Housing (item no. 1).

NOTE: Lubricate all O-Rings before installation.

3. Install the upper Thrust Bearing (item no. 4) in the Housing (item no. 1).
4. Separately, install the Helical Gear (item no. 11) onto the Drive Sleeve (item no. 10), engaging the Helical Gear and Drive Sleeve lugs.
5. Install the assembled Helical Gear (item no. 11) and Drive Sleeve (item no. 10) into the Housing (item no. 1) and Thrust Bearing (item no. 4).
6. Install the lower Thrust Bearing (item no. 15) onto the Drive Sleeve (item no. 10).
7. Install the Bearing (item no. 13 and item no. 15) at Housing and Base.
8. Install the Idle Gear (item no. 7) and Helical Gear (item no. 8). After that, put the retaining ring (item no. 9) on.
9. Install the Helical Pinion (item no. 12) subassembly into the Housing (item no. 1).
10. Replace the oil Seal (item no. 2 and item no. 33) in the Input Flange (item no. 32), if required.
11. Replace the Gasket (item no. 16) onto the Housing (item no. 1).

12. Separately, install the O-Ring (item no. 18) in the Thrust Base (item no. 17).

NOTE: Lubricate all O-Rings before installation.

13. Install the Thrust Base (item no. 17) with O-Ring (item no. 18) onto the Housing (item no. 1) and Drive Sleeve (item no. 10) using Socket Head Cap Screws (item no. 20).

CAUTION: Care must be taken to ensure that the O-ring located in the Thrust Base is not damaged during installation.



14. Place the gearbox in the upright position.

15. Install the Stem Cover Adapter (item no. 28) and O-Rings (item no. 29 and item no. 30) on the Housing (item no. 1).

CAUTION: For proper backlash of the Helical gear set, ensure supplied gaskets and shims (if applicable) are placed between Base (or Spur Gear Attachment) and Housing.



NOTE: Ensure binding does not occur between the Helical Pinion and Helical Gear.

NOTE: Lubricate all Oil Seals before installation.

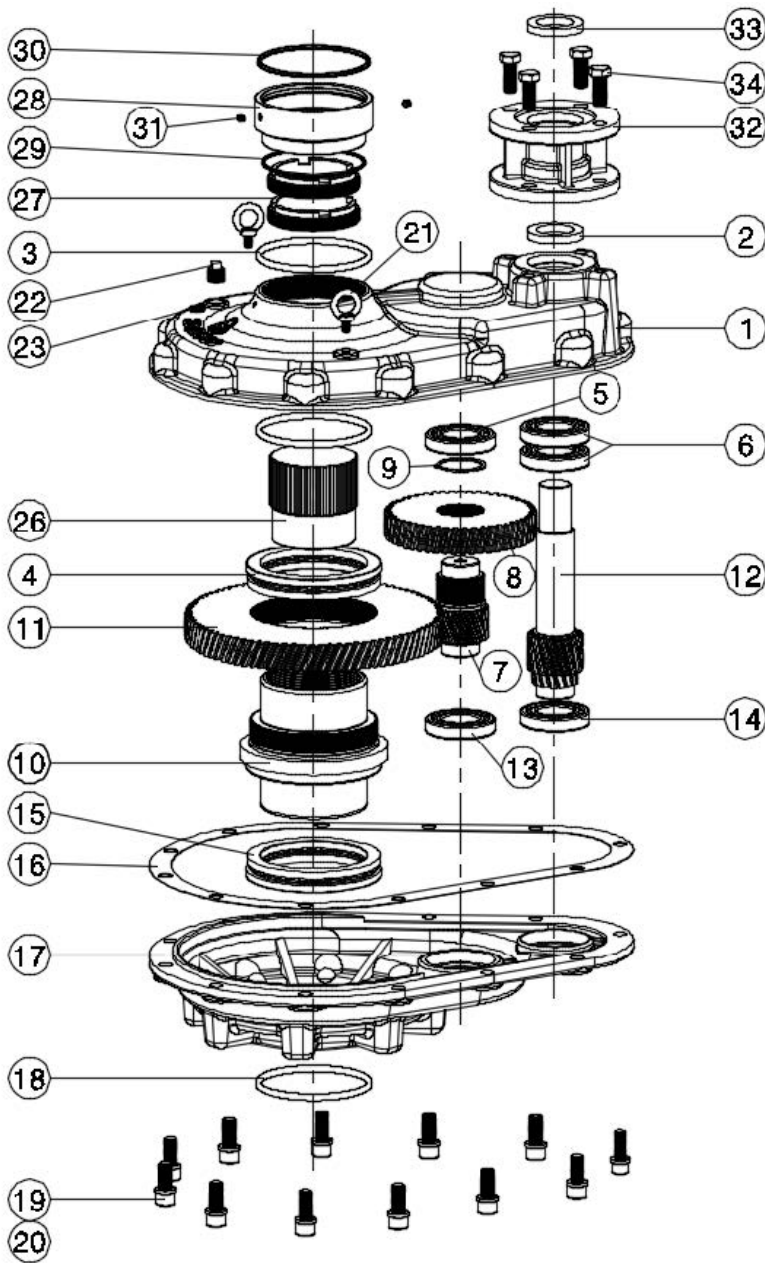


Figure 3: SB-SR50 through SB-SR800 Explosion View

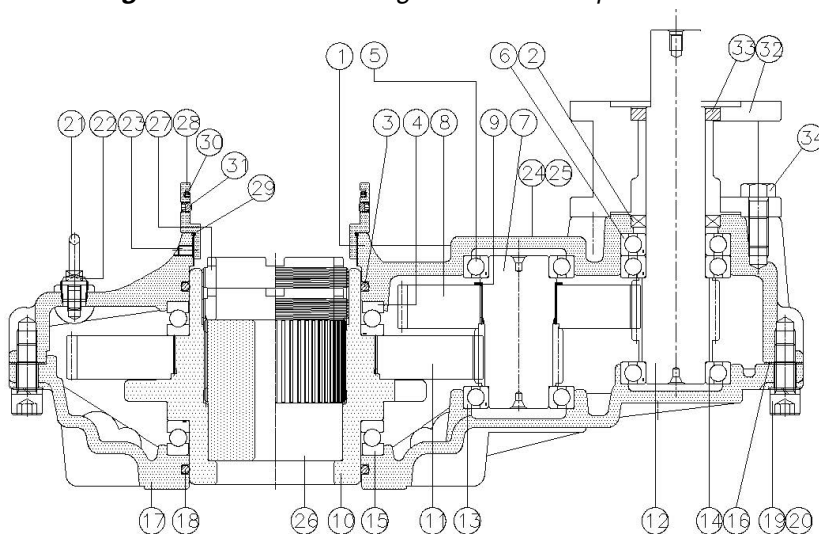


Figure 4: SB-SR50 through SB-SR800 Assembly View

Table 1: SB-SR50 through SB-SR800 Parts List

Parts List	
Item	Description
1	Housing
2	Oil Seal
3	O-Ring for Housing
4	Thrust Ball Bearing
5	Ball Bearing for Idle Gear
6	Ball Bearing for Helical Pinion
7	Idle Gear
8	S-Helical Gear
9	Retaining Ring
10	Drive Sleeve
11	M-Helical Gear
12	Helical Pinion
13	Ball Bearing for Idle Gear
14	Ball Bearing for Helical Pinion
15	Thrust Ball Bearing
16	Gasket for Base
17	Base
18	O-Ring for Base
19	Washer
20	Socket Head Cap Screw
21	Eye Bolt
22	Square Head Plug
23	Set Screw
24	Type Plate
25	Rivet
26	Stem Bushing
27	Dual Lock Nuts
28	PF Adapter
29	O-Ring
30	O-Ring
31	Set Screw
32	Input Flange
33	Oil Seal
34	Hex Head Cap Screw

11.2 Disassembly and Reassembly of SR50H through SR800H

Disassembly Instructions

Refer to Figure 5 and 6

1. Remove the Stem Cover Adapter (item no. 38) and O-Rings (item no. 39 and (item no. 40).
2. Remove the Input Flange (item no. 42) with Oil Seal (item no. 43 and item no. 2) by removing Socket Head Hex Screws (item no. 44).
3. Place the gearbox upside down to access the mounting base.
4. Remove the Socket Head Cap screws (item no. 31), Thrust Base (item no. 30) and Gasket (item no. 28) from the Thrust Housing (item no. 21).
5. Remove the Stem Nut (item no. 26) with upper and lower Thrust Roller Bearings (item no. 25 and item no. 27).
6. Remove the Thrust Housing (item no. 21) with O-Ring (item no. 22) and Gasket (item no. 20) by removing Socket Head Cap Screws (item no. 23).
7. Remove the Base (item no. 17) and Gasket (item no. 20) by removing Socket head Cap Screws (item no. 19).
8. Remove the lower Thrust Ball Bearing (item no. 15).
9. Remove the assembled Drive Sleeve (item no. 10) and Helical Gear (item no. 11).
10. Separately, remove the Helical Gear (item no. 11) from the Drive Sleeve (item no. 10).
11. Remove the upper Thrust Ball Bearing (item no. 4) from the Housing (item no. 1).
12. Remove the Idle Gear (item no. 7) from the Housing (item no. 1).
13. Separately, remove the Helical Gear (item no. 8) from the Idle Gear (item no. 7) by removing Snap Ring (item no. 9).
14. Remove the Helical Pinion subassembly from the Housing (item no. 1).

Reassembly Instructions

Refer to figure 5 and 6.

1. Place the Housing (item no. 1) upside down for internal access.
2. Install the O-Ring (item no. 3) in the Housing (item no. 1).

NOTE: Lubricate all O-Rings before installation.

3. Install the upper Thrust Ball Bearing (item no. 4) in the Housing (item no. 1).
4. Separately, install the Helical Gear (item no. 11) onto the Drive Sleeve (item no. 10), engaging the Helical Gear and Drive Sleeve lugs.
5. Install the assembled Helical Gear (item no. 11) and Drive Sleeve (item no. 10) into the Housing (item no. 1) and upper Thrust Ball Bearing (item no. 4).
6. Install the lower Thrust Ball Bearing (item no. 15) onto the Drive Sleeve (item no. 10).
7. Install the Bearing (item no. 13 and item no. 5) at Housing and Base.
8. Install the Idle gear (item no. 7) and Helical Gear (item no. 8). After that, put Snap Ring (item no. 9).
9. Install the Helical Pinion (item no. 12) subassembly into the Housing (item no. 1).
10. Replace the Oil Seal (item no. 2 and item no. 33) in the Input Flange (item no. 32), if required.
11. Place the Gasket (item no. 16) onto the Housing (item no. 1).
12. Install the Base (item no. 17) onto the Housing (item no. 1) and Drive Sleeve (item no. 10) using Socket Head Cap Screws (item no. 19).
13. Install the Thrust Housing (item no. 21) with O-Ring (item no. 22) onto the Base (item no. 17) using Socket Head Cap Screws (item no. 24).

Caution: Care must be taken to ensure that the O-ring located in the Thrust Base is not damaged during installation.



14. Install the upper Thrust Roller Bearing (item no. 25) into the Thrust Housing (item no. 21).
15. Install the Stem Nut (item no. 26) into the Thrust Housing (item no. 21) and upper Thrust Roller Bearing (item no. 25).
16. Install the lower Thrust Roller Bearing (item no. 27) onto the Stem Nut (item no. 26).
17. Place the Gasket (item no. 28) onto the Thrust base (item no. 30).
18. Separately, install the O-Ring (item no. 29) into the Thrust Base (item no. 30).
19. Install the Thrust Base (item no. 31) with O-Ring (item no. 15) onto the Thrust Housing (item no. 2) and Stem Nut (item no. 26) using Socket head Cap Screws (item no. 34).

CAUTION: Care must be taken to ensure that the O-ring located in the Thrust Base is not damaged during installation.



20. Place the gearbox in the upright position.
21. Install the Stem Cover Adapter (item no. 38) and O-Rings (item no. 39 and item no. 40) on the Housing (item no. 1).
22. Replace the Oil Seal (item no. 43) in the Input Flange (item no. 42), if required.
23. Replace the Oil Seal (item no. 2) onto the Housing (item no. 1) and install the Input Flange (item no. 42) using Socket Head Cap Screws (item no. 44).

CAUTION: For proper backlash of the Helical gear set, ensure supplied gaskets and shims (if applicable) are placed between Base and Housing.



Note: Ensure binding does not occur between the Helical Pinion and Helical Gear.

Note: Lubricate all Oil Seals before installation.

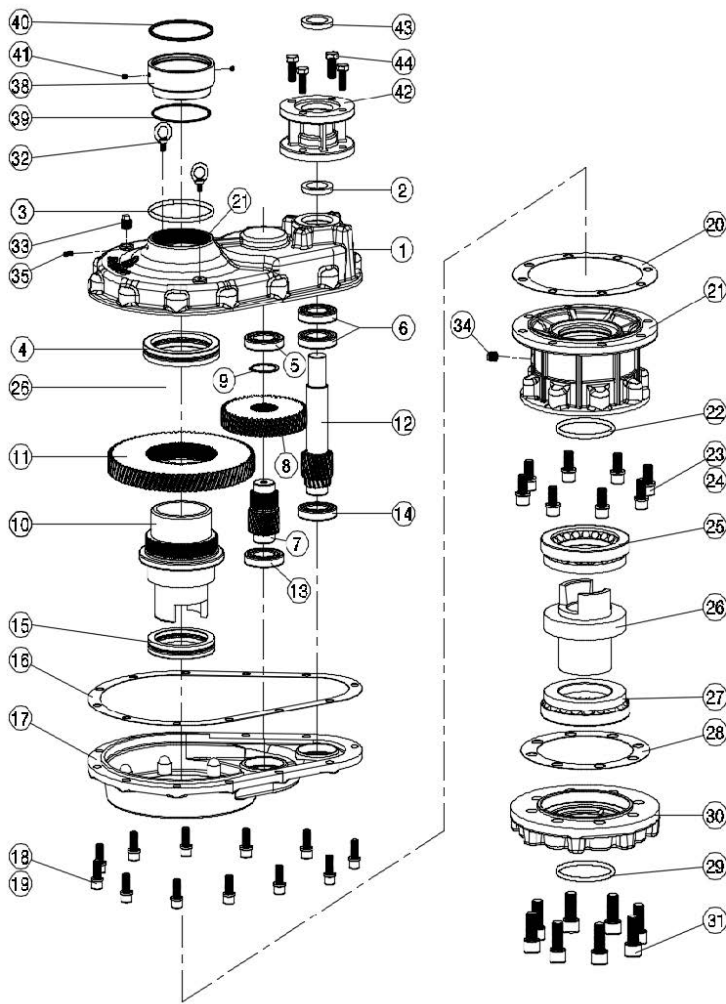


Figure 5: SB-SR200H through SB-SR800H Explosion View

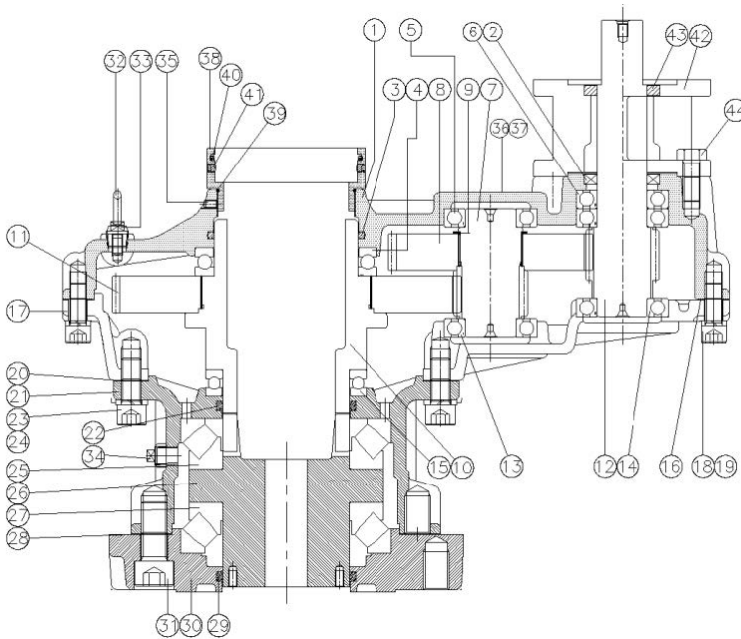


Figure 6: SB-SR200H through SB-SR800H Assembly View

Table 2: SB-SR200H through SBW-SR800H Parts List

Parts List	
Item	Description
1	Housing
2	Oil Seal
3	O-Ring for Housing
4	Thrust Ball Bearing
5	Ball Bearing for Idle Gear
6	Ball Bearing for Helical Pinion
7	Idle Gear
8	S-Helical Gear
9	Retaining Ring
10	Drive Sleeve
11	M-Helical Gear
12	Helical Pinion
13	Ball Bearing for Idle Gear
14	Ball Bearing for Helical Pinion
15	Thrust Ball Bearing
16	Gasket for Base
17	Base
18	Spring Washer
19	Socket Head Cap Screw
20	Gasket for Thrust Housing
21	Thrust Housing
22	O-Ring for Thrust Housing
23	Spring Washer
24	Socket Head Cap Screw
25	Thrust Roller Bearing
26	Stem Bushing
27	Thrust Roller Bearing
28	Gasket for Thrust Base
29	O-Ring for Thrust Base
30	Thrust Base
31	Socket Head Cap Screw
32	Eye Bolt
33	Square Head Plug
34	Square Head Plug
35	Set Screw
36	Name Plate
37	Rivet
38	PF Adapter
39	O-Ring
40	O-Ring
41	Set Screw
42	Output Flange
43	Oil Seal
44	Hex Head Cap Screw