



SL450A ROTARY SWIVEL

OPERATION MANUAL

SL450A-SM

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Please read the following operation manual before installing and operating the Swivel. It is necessary to confirm its maximum static loading for operation.

The design and operation temperature for the product is -20°C(-4 ° F). It is necessary to inform lowest working temp when order the product.

Regularly conduct NDT on main bearing parts (housing, central pipe, bail and bail pin).

I. Technical Specification

1. Max. Static Load	4500kN
2. Max. RPM	300r/min
3. Max. Working Pressure	35MPa
4. Central Pipe ID.	Ø75mm
5. Sub connection	65/8 REG L.H.
6. Gooseneck connection	4 LP API Std5B
7. Air motor model	FMS20
8. Air pressure	0.7-0.9MPa
9. Air consumption	20m ³ /min
10. Spinning speed	92rpm
11. Brake torque	2940N.m
12. Weight	3310kg

II. Structure Instructions

See Fig.1, SL450A rotary swivel consists of rotary part, fixed part, support part, sealing part and spinning part. Rotary part is composed of central pipe(14) and sub(24). Fixed part includes housing(15), upper cover(2), lower cover(18), gooseneck(10), bail(25) and bail pin (7). Support part consists of main bearing (16), guide bearing (12), and lower guide bearing (20). Seal part includes packing device and upper and lower seal rings. Spinning part covers air motor, air control clutch.

Central pipe supports whole weight of drill string and inner mud pressure. Its connection thread with sub and the connection thread of sub and kelly meet API Spec 7-1 and 7-2 requirements.

Central pipe is a kind of hollow part. Its upper end connects with packing device (Fig.1),

its lower end connects with sub, and its middle part sits on the main bearing with two guide bearings centralize it, among which the upper guide bearing also has the function to avoid central pipe going up. Rubber umbrella (4) on top of the central pipe prevents mud from entering into swivel body.

Bail which connects housing via two bail pins is to hang the swivel on the hook. Housing is a support part and is a oil pool for lubricating and cooling main bearings and guide bearings. On its two ends are top cover and bottom cover, on the external size is fitted with buffer (9) to avoid elevator ring impacting housing. Under the top cover is equipped with guide bearing and two oil seals(8). Those two seal rings should be installed in opposite directions, which will prevent oil leaking and mud entering. In top cover there is a thread hole fitted with an oil scale with relief valve function. When air pressure inside housing is higher than outside, the valve will auto open and discharge air. The gooseneck with a thread hole in the top is fixed on the top cover flange. The thread hole is designed for well logging. In drilling process, the hole is sealed with a plug (1) to avoid mud spilling. One end of gooseneck is connected with packing device, the other end is to connect with rotary hose via inner joint (API Std. 5B). Inside the lower cove is fitted with lower guide bearing with three oil seals (21).

The packing device connects with the central pipe and the gooseneck pipe, which forms passage for drilling fluid. The packing device is an important part for sealing high pressure mud. It features self-sealing and quick disassembling structure. When wash pipe and packings are worn and needed to be replaced, only need to screw off the upper and lower nuts, then you can take out the whole device from one side, no need to disassemble gooseneck or rotary swivel. Simple, convenient, and can replace any time.

Power reducer assembly (11) is secured with bolts and nuts on the upper plane of lower flange of top cover (2). It is an important part for spinning. Spinning is realized by control air valve. Look down at central pipe, clockwise rotation is called forward rotation and anti-clockwise rotation is reverse rotation.

III. Installation

Refer to Fig.2 for installation of the spinner. Main control valve (8, left) controls the swivel's spinning working and its stop. Reverse control valve is to invert the swivel's rotation. Care should be taken to shut off the main air-in valve (20) when need to change rotation direction of the spinner.

IV. Operation

Load test and dynamic pressure test for a new swivel have been conducted before leaving the manufacturing plant, and there is no oil in the swivel housing. So before use, must do the following.

1. Unscrew and remove the oil scale, fill with lubricate L-CKC150 (to max. scale), and be sure the oil is clean.
2. Inspect the central pipe. Rotate the pipe by a person with a one-meter long Chain tongs. The central pipe should turn evenly.
3. Lubricate all grease fittings with gun.
4. Check glands of upper and lower packing box (Fig.3, No.1 and No.10), gooseneck union nut (Fig.1, No.10) and sub (Fig.1, No.24) for tight. To ensure good connection and no damage on thread, it is necessary to screw off the sub and apply with thread grease, and tighten with rotary tong.
5. Check all air line connections for correct and ensure unobstructed air flow.
6. Air filter (Fig.2-19) should be fitted vertically.
7. Never allow air motor to run idly.
8. According to fields operation experience, new swivel should be used for shallow well, then to deep well, which is good for service life of the swivel.

V. Lubrication

1. Inspect oil level in the housing of the swivel every shift to see if oil level is higher than minimum limit(never allow oil being le. Replace lubrication oil every 2 months or every 200 hours for new and repaired swivels. Before injecting clean L-CKC150(winter), L-CKC220(summer), flush away dirty oil.
2. Lubricate bail pins, packing device and oil seals inside supporting frame with lithium based grease No.1 (winter),or No.2 (summer). Once every shift. Packing must be lubricated when no pump pressure, so the grease can squeeze into every corner of packing and lubricate wash pipe and packing perfectly.
3. Check oil level height inside lubricator. The lubricator should be injected with L-AN15 machine oil.

VI. Replacement of Packing Device

1. Disassemble (Refer to Fig.3)

Hammer the nut (LH)(1) until it loose and flush wash pipe(6), then push out packing device from one side of the supporting frame.

Separate lower packing box (12) from wash pipe, remove grease fitting (7), take out lower lantern ring (15), spacer rings (13,14), packings (4) and O-rings (9) from lower packing box.

Remove stop ring from top side of wash pipe. And take out wash pipe, lantern ring (3), packing and O-ring.

2. Inspection

2.1 Clean all parts thoroughly.

2.2 Check wear and tear. Replace worn and damaged parts.

3. Installation

Reassemble qualified and replaced parts.

3.1 Install packings and upper lantern ring coated with grease into upper packing box, and screw on nuts.

3.2 Put splined end of wash pipe through and install retainer ring.

3.3 Screw the nut on lower packing box. Put grease-coated packings, spacer ring, and lower lantern ring into lower packing box in proper order.

3.4 Put non-splined end of wash pipe through into packing carefully.

3.5 Put in the O ring and grease fitting.

3.6 Insert packing device into swivel and tighten upper and lower nuts.

VII. Maintenance

1. Disassemble as per the following steps. Refer to Fig.1.

1.1 It is recommended to unscrew the saver sub on end of stem prior to demounting the swivel from rig.

1.2 Hold straight the swivel while dismantling.

1.3 Screw out plug (27) and plug (28) and drain oil.

1.4 Dismount the reducer assembly (11).

1.5 Refer to Section V Replacement of Packing Device for demounting the packing device.

1.6 Remove rubber umbrella (4) from top end of central pipe.

1.7 Dismantle gooseneck (10) and upper cover(2).

1.8 Remove adjustment shims.

1.9 Dismantle central pipe assembly (including central pipe, upper seat ring of main

bearing, inner rings of upper and lower guide bearings, and upper and lower bushings.)

1.10 Take out main bearing carrier, lower seat ring and rollers from housing.

1.10 Remove gland (18), tap the outer ring of lower guide bearing (20) and take it out from lower cover, then remove gland on the lower cover. So it is available to take out two oil seal rings and space ring from lower cover. Then remove grease fitting and O seal ring.

2. Check and replace parts.

2.1 It is recommended to replace with new oil seals and O-rings when inspecting the swivel or replacing parts.

2.2 Check all bearing rollers and seats for broken, worn, corrosion and crack, especially for main bearing, if any defect occurs replace right away, to ensure reliable working performance. Upper seat and lower seat of the main bearing can not be interchanged, as upper seat is transition fitted with central pipe. For dismantling, only need to knock its seat off central pipe. If necessary, heat it to 65-100°C is favorable.

3. Reassemble

3.1 Apply enough grease on lips of two oil seals and then fit into upper cover. Remember the installation of two oil seals should be on the contrary, and separated by spacer ring for lubrication. Secure with stop ring and tap guide bearing (12) into upper cover.

3.2 Tap out-ring of lower guide bearing (20) into lower cover and fit lower cover into housing.

3.3 Set assembled housing upright on the supporter and put the lower ring of main bearing, rollers and holder into the housing.

3.4 Put central pipe assembly into the housing.

3.5 Turn central pipe assembly slightly to ensure the firm of main bearing.

3.6 Install the assembled upper cover to the housing.

3.7 Turn the central pipe assembly again to see if all the bearings is set firmly.

3.8 Check the clearance between the bottom face of upper cover flange and upper face of housing. Remove the lower cover and put enough adjusting shims (16) to ensure the axial clearance within range 0.05mm~0.25mm.

3.9 Enclose the upper cover to the housing. And tighten the screw bolt.

3.10 Install rubber umbrella, gooseneck, packing device and joint (sub).

3.11 Fix the grease fittings and screw in plugs. Then fill with oil and that will be ok for use.

VIII. Inspection and Debugging

Inspection and debugging is important in the course of assembly, which will affect

service life of parts. It is recommended to inspect and debug the swivel as per the following procedure.

1. The clearance between end faces of upper seat ring of main bearing and central pipe must not be more than 0.03mm.

2. Adjusting shims between upper cover and housing are for adjusting the axial clearance of upper guide bearing (12); the clearance should be within range 0.05~0.25mm.

3. Inspect the following radial run-out with micrometer.

3.1 Inspect upper cover hole as per Fig. 4. Radial run out should not be over 0.20mm.

3.2 Inspect gooseneck as per Fig. 5. Radial run out should not be over 0.30mm.

3.3 Inspect mud pipe as per Fig. 6. Radial run out should not be over 0.30mm.

If the radial run-out measured is more than the above range, you should adjust radial run-out of upper cover and gooseneck by releasing upper and lower packing box glands, tapping wash pipe and changing the tightening degree of bolts. Ensure radial run-out is within the specified range, and packing device working under best condition.

3.4 Reducer assembly (Fig.7)

3.4.1 When to install round nut, adjust bearing to its suitable tightness (Gear can turn freely by hand), then secure.

3.4.2 Check clearance between internal and external friction pieces (18,25), keep it in the range of 0.5mm~0.8mm, adjust with shims.

3.5 Contact point of gear ring of central pipe (Fig.1, 13) with gear shaft (Fig.7, 15) along depth of tooth should not be less than 40%, along length of tooth not less than 60%.

3.6 Connect well air motor, transmission system and air control system.

3.6.1 Check air line connection if correct.

3.6.2 Check air control console if smooth. Rotation in forward and reverse meets requirements.

3.6.3 One-way friction clutch engages normally.

IX. Packing and Shipping

1. Fix the swivel evenly on the supporter. Air directional valve and vent hole in the air motor should be wrapped with plastic cloth or insert with wood plug. Sub under central pipe should be fitted with a screw protector. Inner joint in the gooseneck should be fitted with protective cap.

2. Use a lifting device when move and install the swivel, do not tow it directing on the ground.

3. When the swivel is idle for a long time, keep it in a dry and ventilated place. Prior to storage, clean up oil and sediment inside the housing of the swivel, and apply anti-rust oil on threads, bearings, and exposed surface.

X. Recommended Spare Parts List

No.	Part No.	Description	Qty.
1	RS78.120.00	Packing device	1
2	RS78.120-04	Packing	10
3	RS78.120-07	Snap ring	1
4	RS78.120-06	Wash pipe	1
5	RS78.100-09	Bail pin	2
6	RS78.100-07	Upper bushing	1
7	RS78.100-18	Lower bushing	1
8	JB/ZQ4224	O-ring 120*5.7	5
9	JB/ZQ4224	O-ring 135*5.7	3
10	JB/ZQ4224	O-ring 560*8.6	1
11	JB/ZQ4224	O-ring 560*3.1	1
12	HG-692-67	Oil seal SD220*260*18	2
13	HG-692-67	Oil seal SD250*290*18	3
14	RS78.100-06	Rubber umbrella	1
15	RS78.310-24	Pinion	1
16		Bearing 94754 Q4	1
17	RS78.310-22	External friction piece I	1
18	RS78.310-21	External friction piece II	1
19	RS78.310-20	External friction piece III	1
20	RS78.310-18	External friction piece IV	1
21	RS78.310-17	External friction piece V	1
22	RS78.310-23	Internal friction piece I	2
23	RS78.310-19	Internal friction piece II	2
24	RS78.310-16	Internal friction piece III	2

Parts list for Figure 1:

No.	Part No.	Description	Qty.	No.	Part No.	Description	Qty.
1	RS76.100-02	Plug NPT2	1	16		Bearing 94754 Q4	1
2	RS78.300-04	Upper cover	1	17	JB/ZQ4224	O-ring 560*8.6	1
3	RS78.120.00	Packing device	1	18	RS78.100-13	Lower cover	1
4	RS78.100-06	Rubber umbrella	1	19	RS78.100-23	Lantern ring	1
5	HG4-692-67	Oil seal D220*260*18	2	20	GB/T283	Bearing NU1048	1
6	RS78.100-07	Upper bushing	1	21	HG4-692-67	Oil seal SD250*290*18	3
7	RS78.100-09	Bail pin	2	22	RS78.100-18	Lower bushing	1
8	JB/T7940.1	Grease fitting M10*1	3	23	RS78.100-15	Gland	1
9	RS78.110.00	Cushion	1	24	RS76.100-16	Sub	1
10	RS78.100-02	Gooseneck	1	25	RS78.100-01	Bail	1
11	RS78.310.00	Reducer assy.	1	26	RS78.320.00	Oil scale	1
12	GB/T297	Bearing 32040X2	1	27	JB/ZQ4446	Plug R1	1
13	RS78.300-02	Gear ring	1	28	JB/ZQ4450	Plug M12*1.25	1
14	RS78.300-05	Central pipe	1	29	JB982	Washer 12	1
15	RS78.300-03	Housing	1				

Parts list for Figure 2:



No.	Part No.	Description	Qty.	No.	Part No.	Description	Qty.
1	05-03	Goose neck	1	No.	Part No.	Description	Qty.
2	XSL160.2C-19	Transition joint M39*2-Rc11/2	1	13	GB/T3287	Reducing joint G11/2-G1	1
3	05-05	Transition joint M52*2-Rc11/2	1	14	GB/T3287	Inner joint R1	1
4	05.03.00	Hose with joint 25*20000	1	15	GB/T3287	Union joint G11/2	2
5		Hose 38I*20m	1	16	GB/T3287	Inner joint R11/2	4
6	A01.5200.000	Hose 10*20m	2	17	14.09.01-04A	Angle joint	3
7	05-07	Transition joint M18*1.5	1	18	05-04	Four-way joint	1
8	QF501A	Air valve Rc1/4	2	19	QSL-40	Filter G11/2	1
9	A01.5200.000	Hose 10*6m	3	20	Q11F-16	Ball valve G11/2	1
10	A01.5000-004	Joint	3	21	QIU-40	Lubricator G11/2	1
11	05-06	Transition joint M52*2-R1	1				

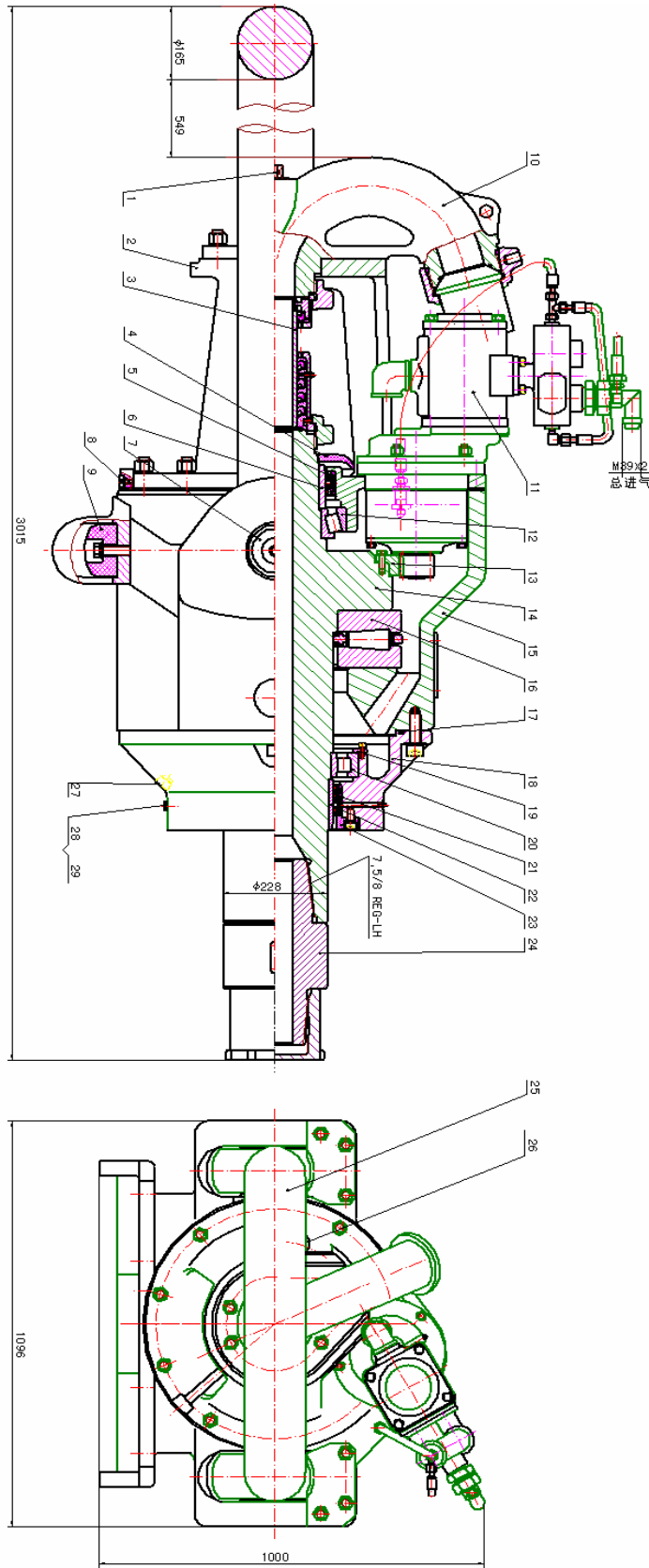


Fig.1 Outline of Swivel

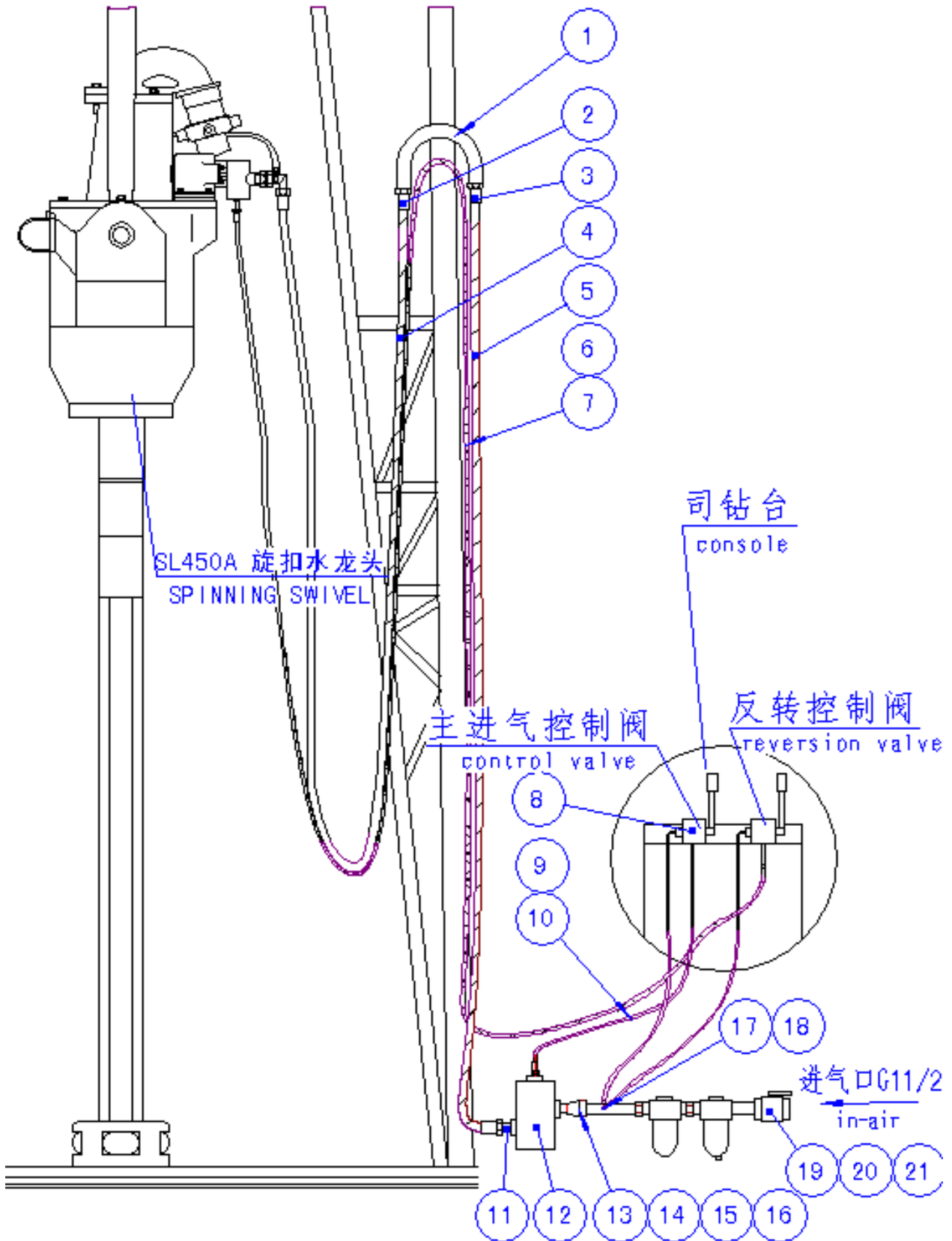
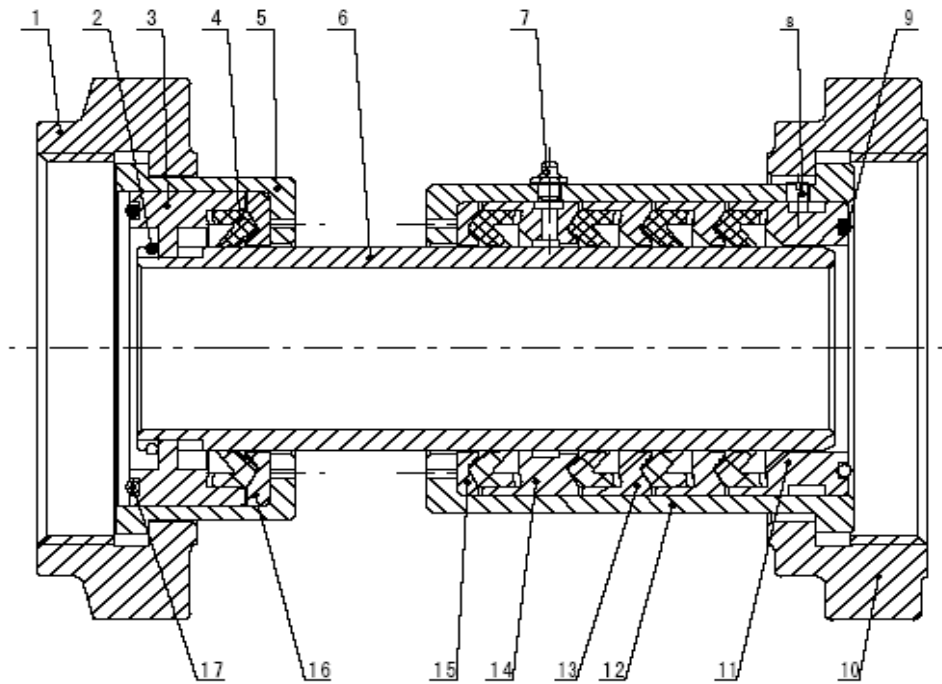


Fig.2 Installation of SL450A Swivel (recommended)



Fi.g3 Packing Device

No.	Part No.	Description	Qty.	remarks
1	RS78.120-01	Upper packing box gland	1	
2	RS78.120-07	Snap ring	1	
3	RS78.120-03	Upper seal gland	1	
4	RS78.120-04	Packing	5	
5	RS78.120-02	Upper packing box	1	
6	RS78.120-06	Wash pipe	1	
7	JB/T7940.1	Grease fitting M10*1	1	
8	GB/T75	Screw M10*12	1	
9	JB/ZQ4224	O seal ring 120*5.7	1	
10	RS78.120-13	Lower packing box gland	1	
11	RS78.120-12	Lowe seal gland	1	
12	RS78.120-10	Lower packing box	1	
13	RS78.120-11	Spacer ring II	2	
14	RS78.120-09	Spacer ring I	1	
15	RS78.120-08	Lower bush ring	1	
16	RS78.120-05	Upper bush ring	1	
17	JB/ZQ4224	O seal ring 135*5.7	1	

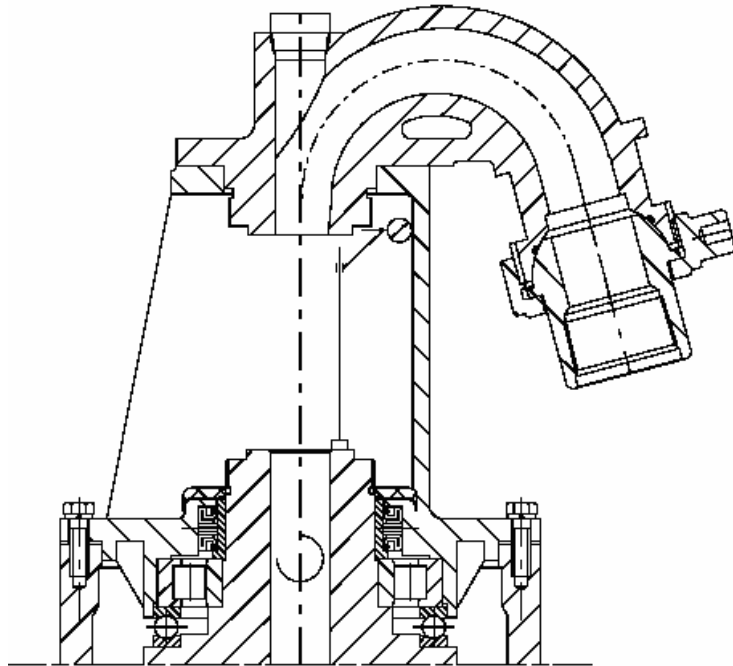


Fig.4 Inspection and Adjustment for Assembly

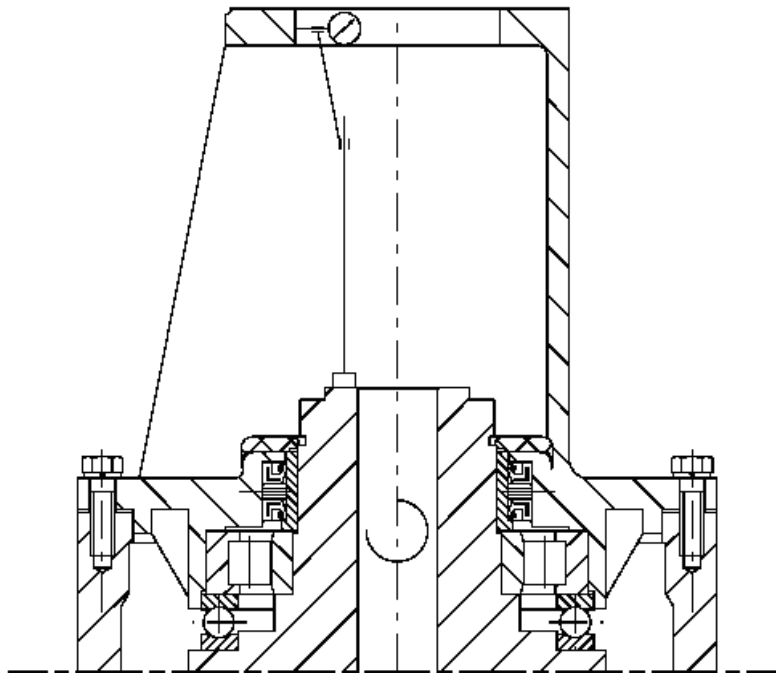


Fig.5 Inspection and Adjustment for Assembly

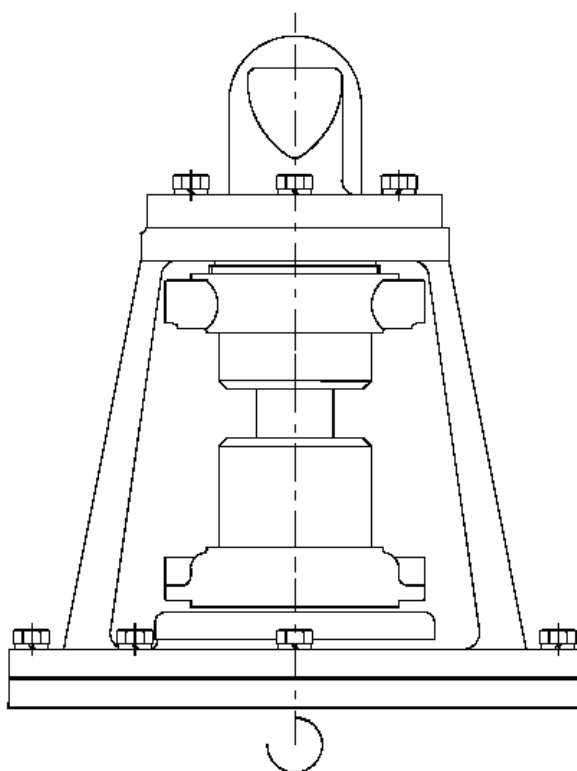


Fig.6 Inspection and Adjustment for Assembly

Parts list for Figure 7:

No.	Part No.	Description	Qty.	No.	Part No.	Description	Qty.
1	FMS20	Air motor	1	16	RS78.310-15	Spring	10
2		Bearing NU207	1	17	GB/T276	Bearing 6009	1
3	RS78.310-01	Gear	1	18	RS78.310-16	Friction piece III	2
4	GB/T292	Bearing 7010C	1	19	RS78.310-17	External friction piece V	1
5	RS78.310-03	Spacer plate	1	20	RS78.310-18	External friction piece IV	1
6	GB/T301	Bearing 51120	1	21	RS78.310-19	Internal friction piece II	2
7	RS78.310-04	Gasket	1	22	RS78.310-20	External friction piece III	1
8	RS78.310-25	Shims	1 组	23	RS78.310-21	External friction piece II	1
9	GB/T119.1	Pin 12n6*32	2	24	RS78.310-23	External friction piece I	1
10	GB/T301	Bearing 51118	1	25	RS78.310-22	Internal friction piece I	1
11	JB/ZQ4224	O-ring 175*8.6	1	26	JB/ZQ4224	O-ring 16*2.4	1
12	JB/ZQ4224	O-ring 110*5.7	1	27	RS78.310-24	Pinion	1
13	JB/ZQ4224	O-ring 180*3.1	1	28	A01.5200.00	Hose 10*500	1
14	GB/T283	Bearing NU2210M	1	29	K24JQ.L40.00	Directional valve	1
15	RS78.310-12	Gear shaft	1	30	05.01.50.00I	Hose joint	

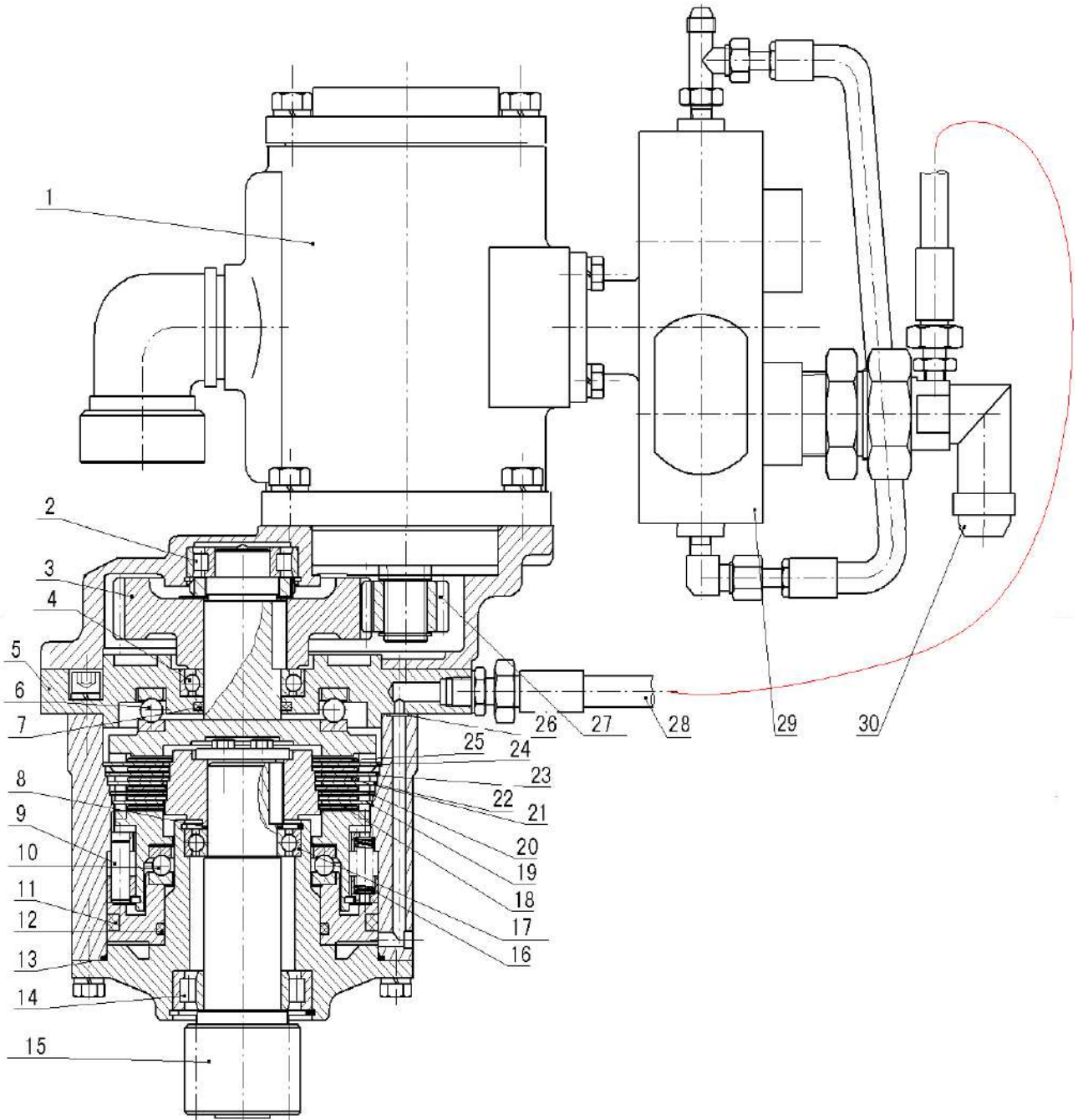


Fig.7 Power Reducer Assembly