SECTION 5 STEERING SYSTEM

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SECTION 5 STEERING SYSTEM

GROUP 1 STRUCTURE AND FUNCTIONS

1. INTRODUCTION



25BC9U5SS01

The steering system for this machine is composed of hydraulic gear pump, steering wheel assembly, steering unit, steering cylinder, steering axle and pipings. The steering force given to the steering wheel enters the steering unit through the steering column. The required oil flow is sensed by the function of the control section of the unit, and pressurized oil delivered from the hydraulic gear pump is fed to the steering cylinder through the priority valve. The force produced by the steering cylinder moves the knuckle of steering tires through the intermediate link.

The axle body is unit structure having steering knuckles installed to its both ends by means of king pins.

Hub and wheel are mounted through bearing to spindle of knuckle.

2. HYDRAULIC CIRCUIT



Hydraulic oil is supplied to priority valve built in hydraulic pump. When driver turns steering wheel, hydraulic oil is supplied first to steering unit by working circuit inside priority valve. Hydraulic oil inside steering unit is expanded or shrunk, and then supplied to steering cylinder of forklift truck. Also, hydraulic oil discharged from hydraulic pump flows to hydraulic oil tank along main control valve and priority valve EF port.

1) NEUTRAL



When hydraulic pump starts operating, and steering wheel is kept in neutral position, steering unit spool and sleeve are kept in neutral position. Flow of hydraulic oil through priority valve is blocked to the left and right steering ports. Pressure on pilot of priority valve spool controls spool to move it to the opposite direction. Hydraulic oil flows to main control valve through EF port with this type of control. Small quantity of hydraulic oil in neutral position is continuously discharged through orifice. Hydraulic oil flows in through LS hose piping, and then is discharged to hydraulic oil tank through steering unit spool and sleeve. Upon sudden steering, dynamic flow of hydraulic oil prevents initial hard spot.

2) TURING LEFT OR RIGHT



When hydraulic pump starts operating, and steering wheel is turned, steering unit spool and sleeve rotate. Path opens to allow supply of hydraulic oil to gear inside steering unit. Hydraulic oil causes rotation of pump. Hydraulic oil returns to steering valve spool and sleeve, and is supplied to left or right steering port by turning of steering wheel. LS port circuit is connected to CF port, which blocks return of hydraulic oil to hydraulic oil tank, and senses pressure required for turning of steering wheel. When pressure required for LS circuit increases or decreases, preferential valve spool moves to satisfy conditions of hydraulic oil and pressure required for rotating tires. Once steering cylinder reaches the maximum stroke, relief valve supplies hydraulic oil to hydraulic oil tank to adjust pressure. Priority valve spool moves to supply hydraulic oil to main control valve through EF port.

3. STEERING UNIT

1) STRUCTURE



22

25BX5SS05

- 1 Dust sealing ring
- 2 Housing spool and sleeve
- 3 Ball
- 5 Shaft seal
- 7 Bearing assembly
- 10 Ring
- 11 Cross pin
- 12 Spring set
- 13 Cardan shaft
- 16 Distributor plate
- 17 Gear wheel set

- 18 O-ring
- 19 End cover
- 20 Washer
- 22 Pin bolt screw
- 23 Screw
- 24 Model/code label
- 25 Adjusting screw
- 26 Spring
- 27 Ball
- 28 Seat
- 30 Adjusting screw

- 31 Spring 32 Piston
- 32 Pistor
- 33 Ball
- 34 Bushing
- 35 Ball stop thread
- 36 Ball (Ø3)
- 37 Check valve
- 39 Sealing ring
- 40 O-ring
- 41 O-ring
- 42 Plug

* Seal kit: 1, 5, 18, 20, 40, 41

2) OPERATION



Steering unit is a closed neural circuit and a gauging gear set consisted of rotation valve (spool + sleeve set). Steering unit mitigates impact of sudden rotation or kickback of tire on steering wheel together with LS (load sensing) dynamic circuit to ensure smooth movement of steering wheel without interference when oil viscosity is low in winter season. LS circuit inside valve is used for control of operation of preferential valve spool. Steering relief valve supplies hydraulic oil to hydraulic oil tank return hose through inner path., Pressure of relief valve is set lower than pressure of relief valve inside main control valve.

- · Manual steering check valve : Converts unit to manual operating pump for limited manual steering.
- Check valve (P port) : Used for blocking return of hydraulic oil to steering unit when pressure inside cylinder is higher than pressure inside the inlet for the purpose of preventing kickback of steering wheel.
- · LS relief valve : Limits maximum pressure inside steering circuit.

3) MANUAL STEERING IN EMERGENCY



35D9VBSS77

Hydraulic motor stops, and preferential valve spool is pushed to the end by spring force when turning steering wheel. In such a case, hydraulic oil flows to spool and sleeve set, and EF port is closed. Turing steering wheel forms vacuum in supply line between preferential valve and steering unit spool and sleeve set. Path is opened for allowing flow of hydraulic oil to gerotor gear inside steering unit to rotate spool and sleeve set. Hydraulic oil entrapped in steering port flows through manual steering check valve, and is supplied to opposite steering cylinder through gerotor gear.

4. PRIORITY VALVE

1) STRUCTURE

			5	4 3		8	9	
	A	B	Port	Port dimensi	ons	Fastenin	g torque	_
	D	ZB	EF	7/8-14UN	=	10	72.3	-
	1	9	CF	3/4-16 UN	F	4	28.9	
	1		LS	7/16-20 UN	IF	2	14.5	1
Housing Model/code label Orifice Spool	5 6 7 8	Orifice Orifice Spring O-ring		9 10 12	Plug Plug O-rii)) ng	25BX	(5SS08A

* Seal kit : 8, 12

Priority valve is directly connected to discharge port of hydraulic pump. The valve is subject to effects from steering unit by LS signal for ensuring sufficient supply of oil to steering circuit. The valve keeps constant force and speed of steering against variation of supply flow of pump hydraulic oil, and supplies hydraulic oil to steering circuit first.

5. STEERING AXLE

1) STRUCTURE



25LC95SS01A

- 1 Hub cap
- 2 Hub bolt
- 3 Nipple
- 4 Steering link
- 6 Steering axle
- 7 Nipple
- 8 Block
- 9 Steering knuckle
- 10 Rod ring
- 11 Upper cover
- 12 Bearing
- 13 Oil seal
- 14 Oil seal

- 15 Bearing
- 16 Nut
- 17 Washer
- 18 Pin
- 19 Wheel hub
- 20 Shim (0.2t)
- 21 Shim (0.1t)
- 22 Shim (0.5t)
- 23 Pin
- 24 Bolt
- 25 Washer
- 26 Adjusting shim
- 27
- - Adjusting shim

- 28 Bushing
- 29 Screw
- 30 Nut
- 31 Grease nipple
- 32 Steering link pin
- 33 Bushing
- 34 Oscillating bearing
- 35 Bolt
- 36 Washer
- 52 Hex bolt
- 53 Harden washer
- 54 Wheel nut
- 55 Steering cylinder

2) TIGHTENING TORQUE AND SPECIFICATION





25BC9U5SS09

Туре	Unit	Center pin support single shaft
Structure of knuckle	-	Elliott type
Toe-in	degree	0
Camber	degree	0
Caster	degree	0
King pin angle	degree	0
Max steering angle of wheels (Inside / Outside)	degree	80.79 / 56.49
Tread	mm (in)	901 (35.5)

GROUP 2 OPERATIONAL CHECKS AND TROUBLESHOOTING

1. OPERATIONAL CHECKS

Check item	Checking procedure
Steering wheel 30-60mm (1.2-2.4 in)	 Set rear wheels facing straight forward, then turn steering wheel to left and right. Measure range of steering wheel movement before rear wheel starts to move. Range should be 30~60 mm at rim of steering wheel. If play is too large, adjust at gear box. Test steering wheel play with forklift stopped.
Knuckle	Check knuckle visually or use crack detection method. If the knuckle is bent, the tire wear is uneven, so check tire wear.
Steering axle	 Put camber gauge in contact with hub and measure camber. If camber is not within 1±0.5°; rear axle is bent. Ask assistant to drive machine at minimum turning radius. Fit bar and a piece of chalk at outside edge of counterweight to mark line of turning radius. If minimum turning radius is not within±100 mm (±4 in) of specified value, adjust turning angle stopper bolt. Min turning radius (Outside) : Refer to page 1-5 (Specifications)
Hydraulic pressure of power steering	Remove plug from outlet port of flow divider and install oil pressure gauge. Turn steering wheel fully and check oil pressure. ※ Oil pressure : 100 kgf/cm ² (1420 psi)

2. TROUBLESHOOTING

1) STEERING SYSTEM

Problem	Cause	Remedy	
Steering wheel drags.	· Low oil pressure.	· Check lockout. Repair.	
	· Bearing faulty.	· Clean or replace.	
	 Spring spool faulty. 	· Clean or replace.	
	· Reaction plunger faulty.	· Replace.	
	· Ball-and-screw assembly faulty.	· Clean or replace.	
	· Sector shaft adjusting screw excessi-	· Adjust.	
	vely tight.		
	· Gears poorly meshing.	· Check and correct meshing.	
	· Flow divider coil spring fatigued.	· Replace.	
Steering wheel fails to return	· Bearing faulty.	· Clean or replace.	
smoothly.	· Reaction plunger faulty.	· Replace.	
	· Ball-and-screw assy faulty	· Clean or replace.	
	· Gears poorly meshing.	· Check and correct meshing.	

Problem	Cause	Remedy
Steering wheel turns unstea- dily.	 Lockout loosening. Metal spring deteriorated. 	· Retighten. · Replace.
Steering system makes abn- ormal sound or vibration.	 Gear backlash out of adjustment. Lockout loosening. Air in oil circuit. 	 Adjust. Retighten. Bleed air.
Abnormal sound heard when steering wheel is turned fully	Valve Faulty. (Valve fails to open.) Piping Pipe(from pump to power steering cylinder) dented or clogged. 	 Adjust valve set pressure and check for specified oil pressure. Repair or replace.
Piping makes abnormal sounds.	Oil pump · Lack of oil. · Oil inlet pipe sucks air. · Insufficient air bleeding.	 Add oil. Repair. Bleed air completely.
Valve or valve unit makes abnormal sounds.	 Oil pump Oil inlet pipe sucks air. Valve Faulty. (Unbalance oil pressure) Piping Pipe(from pump to power steering) dented or clogged. Insufficient air bleeding. 	 Repair or replace. Adjust valve set pressure and check specified oil pressure. Repair or replace. Bleed air completely.
Insufficient or variable oil flow.	· Flow control valve orifice clogged.	· Clean
Insufficient or variable dischar- ge pressure.	 Pipe(from tank to pipe) dented or clogged. 	· Repair or replace.
Steering cylinder head leakage (Piston rod)	 Packing foreign material. Piston rod damage. Rod seal damage and distortion. Chrome gilding damage. 	 Replace Grind surface with oil stone. Replace Grind
Steering cylinder head thread (A little bit leak is no problem)	· O-ring damage.	· Replace
Welding leakage	· Cylinder tube damage.	· Tube replace.
Rod	 Tube inside damage. Piston seal damage and distortion 	 Grind surface with oil store. Replace
Piston rod bushing inner diameter excessive gap	· Bushing wear.	· Replace

2) STEERING UNIT

Trouble	Possible cause	Troubleshooting
Steering not allowed	 Incorrect installation or damage of steering unit column shaft Oil pressure failed in reaching speci- fied value Defect or non-closing of relief valve Damage to piping 	 Checking, repair or replacing Checking, relief pressure adjusting Checking, repair Replacing
Unyielding turn of steering wheel	 Low tire pressure Oil pressure failed in reaching specified value High pressure and low pressure hoses connected in wrong way Steering cylinder rod damaged, or piston stuck 	 Pressure adjusting Checking, relief pressure adjusting Checking, repair Checking, repair or replacing
Oil pressure failed in reaching specified value	 High pressure and low pressure hoses connected in wrong way Damage or non-closing of relief valve Pump function degraded, or insufficient oil level Damage of steering cylinder piston package 	 Checking, repair Checking, repair Checking, repair or replacing Replacing
Steering wheel not restored to proper position	Low tire pressure Abnormal movement of steering unit spool Improper movement of steering knuckle	 Pressure adjusting Steering unit repair or replacing Lubricating or repair
Steering wheel not returning or slowly returning to neutral position	 Abnormal movement of steering unit spool Damage of steering unit column shaft Damage of neutral spring Piping blocked (compressed or clogged) 	 Steering unit repair or replacing Steering unit replacing Replacing Checking, repair or replacing
Excessive or vibratory movement	 Flow of oil inside steering system Abnormal movement of steering unit spool Air in piping Defect of steering unit column shaft 	 Steering unit replacing Steering unit repair or replacing Checking, repair or replacing Checking, repair or replacing
Tire moving in opposite direction of steering wheel	· Cylinder piping connected in opposite direction	· Checking, repair
unyielding turn of steering wheel during driving at low speed	 Flow of oil inside steering system Relief valve function degraded Air in piping Piping blocked (compressed or clogged) Fastening end cap screw with excessively high fastening torque 	 Steering unit replacing Inspecting, repair Checking, repair or replacing Checking, repair or replacing Adjusting fastening torque to specified value
Abnormal noise	 Defects of relief valve Air in piping Piping blocked (compressed or clogged) 	 Checking, repair or adjusting Checking, repair or replacing Checking, repair or replacing

3) PREFERENTIAL VALVE

Trouble	Item to check	Troubleshooting
Spring scratched, abraded, or stripped	· Replacing, if required	· Replacing
Spool surface scratched or abraded	 Removing minor scratch with sandpaper. Replacing, if required 	· Replacing
O-ring	· Replacing, if required	· Replacing

4) STEERING CYLINDER

Trouble	Possible cause	Troubleshooting
Oil leak from steering cylinder head (piston rod)	 Foreign substance packed Damage of piston rod Oil seal damaged and contaminated Chromium plating damaged 	 Replacing Grinding surface with oil stone Replacing Grinding
Steering cylinder head thread (minute oil leak ignorable)	· O-ring damaged	· Replacing
Oil leak from welding point	Damage in tube Piston seal damaged and contaminated	Grinding surface with oil stone Replacing
Rod	Damage in tube Piston seal damaged and contaminated	Grinding surface with oil stone Replacing
Excessive gap of diameter inside piston rod bushing	· Bushing abraded	· Replacing

GROUP 3 DISASSEMBLY AND ASSEMBLY

1. STEERING UNIT

1) STRUCTURE



25BX5SS05

- 1 Dust sealing ring
- 2 Housing spool and sleeve
- 3 Ball
- 5 Shaft seal
- 7 Bearing assembly
- 10 Ring
- 11 Cross pin
- 12 Spring set
- 13 Cardan shaft
- 16 Distributor plate
- 17 Gear wheel set
- * Seal kit: 1, 5, 18, 20, 40, 41

- 18 O-ring
- 19 End cover
- 20 Washer
- 22 Pin bolt screw
- 23 Screw
- 24 Model/code label
- 25 Adjusting screw
- 26 Spring
- 27 Ball
- 28 Seat
- 30 Adjusting screw

- 32 Piston
- 33 Ball

31

34 Bushing

Spring

- 35 Ball stop thread
- 36 Ball (Ø3)
- 37 Check valve
- 39 Sealing ring
- 40 O-ring
- 41 O-ring
- 42 Plug

2) TOOL

(1) Fastening tool for steering unit Material : Metal or hard plastics



(2) Assembly tool for dust seal Material : Free cutting steel



(3) Tool for shaft seal, O-ring, rotor glide Code : 11092408.



- (4) Torque wrenches 0 70 N·m.
 - · 13-mm socket spanner
 - $^{\cdot}$ 2 2.75, 5 6 and 8 mm Allen keys
 - \cdot Torx bit ; size of T50
 - · 12-mm screw driver
 - · 2-mm screw driver
 - · 13-mm ring spanner
 - · Plastic mallet
 - \cdot Tweezers



3) Fastening torque

- L : Left port
- R : Right port
- T : Tank port
- P : Pump port
- LS : Load sensing port



Port	Port dimonsions	Fastening torque	
	Fort dimensions	kgf · m	
L, P, R, T	3/4-16 UNF	6	
LS	7/16-20 UNF	2	
Mounting bolt	M10	3	

4) DISASSEMBLING

(1) As shown on the figure, put steering unit on fastening tool, and remove plug (42) with 8-mm Allen key.



(2) Make use of 6-mm Allen key to remove adjusting screw (30).



(3) Remove spring (31).







(5) Make use of 5-mm Allen key to remove adjusting screw (25) mounted with O-ring (40).



(6) Remove spring (26).



(7) Remove ball (27).



(8) Make use of 6-mm Allen key to remove seat (28).



(9) As shown on the figure, turn steering unit up side down, and put in on fastening tool. Make use of 13-mm ring or wrenches, remove screws (22, 23) and washer (20).



(10) Remove end cover (19).



(11) Lift gear wheel set (17) up, and remove 2 O-rings (18).







(13) Remove distributor plate (16).



(14) Make use of 2-mm Allen key to remove ball (35).



(15) Remove O-ring (18) from housing.



(16) Make use of Torx bit of size T50 to remove check valve (37).



(17) Shake housing to take check valve ball(3) and ball (36) out of housing.



(18) Put housing with the port kept on the bottom as shown on the figure. Make sure that cross pin (11) and sleeve set (2) are kept horizontal inside spool. You can check cross pin (11) when pulling the end of spool out. Pressing spool (2) inward out removes sleeve (2), ring (10) and bearing assembly (7) also.





(19) Remove bearing assembly (7) from spool and sleeve (2). Outer bearing may be caught inside housing. Make sure that bearing is normally pulled out.



(20) Remove cross pin (11).



(21) Remove ring (10).



(22) Carefully remove spool from sleeve.



(23) Remove leaf spring (12) from slot of spool.



(24) Make use of screw driver to carefully remove dust seal ring (1) and shaft seal (5).



- (25) Fully disassembled steering unit
- * Clean all of parts with solvent.
- * Replace seal and washer. Inspect all of parts, and replace parts, if required.



5) ASSEMBLING

 Put two leaf springs (12) on slot, and press curved spring down between flat springs to mount it.



- (2) Number of curved springs may vary dependent upon configuration of leaf spring set (12). There may be 2, 4 or 66 curved springs.
- (3) Spool and sleeve set for steering unit should precisely be aligned to each other for mounting., Small marks are on the nearest slot of spring set, and all of sleeves. There are no marks on most of spools and sleeve sets. They are arranged facing each other on 1 of 2 available locations.
- (4) Mount spool on sleeve, and make sure that leaf spring (12) is mounted on slot.





(5) Align leaf spring (12).



(6) Mount ring (10) on sleeve. Ring should move freely independent from spring.



(7) Mount cross pin (11) on assembly.



(8) Mount bearing assembly (7).



(9) Assemble parts in order as shown below:
1 Outer bearing race → 2 Needle bearing
→ 3 Inner bearing race → 4 Spool → 5 Sleeve.

The inside corner of inner bearing race should be aligned with the inside corner of spool.

(11) Put steering unit housing on worktable.Prepare assembling tools for mounting shaft seal (5) on spool and sleeve set (2).

(10) Lubricate shaft seal (5) with hydraulic oil, and put it on tool. Make sure that shaft seal (5) is correctly positioned on insertion tool.

(13) Insert assembling tool into the bottom of steering unit.











(14) Press the tool into housing, and rotate shaft seal (5).



(15) Withdraw assembling tool from steering unit.



(16) Assemble spool and sleeve assembly on cross pin (11) in parallel direction while rotating the assembly a little.



(17) Assembling tool is pulled out of spool assembly, and shaft seal (5) is mounted.



- (18) Put steering unit housing on assembly fastening device toward the tip of steering column. Insert ball (3) into indicated hole.
- (19) Insert ball (36) into indicated hole.
- 35D9VB5SS44
- (21) Insert ball (33) into two indicated holes respectively.

(20) Make use of 2-mm Allen key to insert ball stop thread toward ball (36), and then

 \cdot Fastening torque : 0.1 \pm 0.01 kgf \cdot m

fasten the thread.



(22)Insert pin (34) into 2 identical holes respectively.



(23) Mount O-ring (18) on housing.



(24) Put distributor plate (16) on housing while aligning with thread holes.



(25) Put cardan shaft (13) inside slot for connecting circumference port, and aligning cross pin (11).



(26) Mount 2 O-rings (18) on gear wheel set(17), and put the set on cardan shaft (13).Align holes of gear wheel set with those of housing thread.

(27) Put end cover (19) on port while ensuring that product code is positioned parallel with port.

(28) Insert new washer (20) into the next position together with pin bolt screw (22).

- (29) Insert new washer (20) and 6 screws (23), and make use of 13-mm wrench to fasten screws (22, 23).
 - \cdot Fastening torque : 3.1 \pm 0.6 kgf \cdot m









- (30) Make use of Torx bit of size T50 to fasten check valve (37).
 - \cdot Fastening torque : 2.6 \pm 0.5 kgf \cdot m



- Manually test functional operation of VSP. Inner shaft should rotate at torque less than 3.5 N·m.
- (31) Put steering unit assembly on assembling device on opposite side. Assemble piston (32) on housing.

(32) Insert spring (31) into piston.



25BX5SS32

(33) Mount O-ring on adjusting screw (30), and fasten the screw with 6-mm Allen key. Set pressure on test panel in accordance with valve setup specifications.



(34) Mount O-ring (41) on seat (28).
Make use of 2.75-mm Allen key to insert seat (28) into hole, and fasten the seat.
Fastening torque : 0.6±0.1 kgf · m



(35) Insert ball (27) into the same hole.



(36) Insert spring (26) onto ball.



(37) Mount O-ring (40) on adjusting screw (25). Make use of 5-mm Allen key to fasten adjusting screw. Set pressure on test panel in accordance with valve setup specifications.



- (38) Make use of 8-mm Allen key to fasten plug (42).
 - \cdot Fastening torque : 6.6 \pm 0.5 kgf \cdot m



(39) Put dust seal ring (1) on housing.



(40) Make use of tools and mallet for assembling dust seal to mount dust seal ring (1).



(41)Once assembling is complete, install plastic plugs for keeping inside of port clean.



2. PRIORITY VALVE



1 Housing

4

2 Name plate

Spool

- 3 Orifice, Dynamic
- Orifice, PP
 Orifice, LS
 Spring
 O-ring
- 9 Plug, LS10 Plug, PP12 O-ring

1) DISASSEMBLY

- (1) Screw out the plug (9) using a 22 mm spanner. O-ring (8) is fitted on plug.
- (2) Remove the spring \bigcirc using a hook.
- (3) Remove the spool ④ using a incide snap ring pliers. Orifices ③, ⑤ are includ to the spool. *** Before removing orifices ③, ⑤, fix the spool ④ in a vice with aluminum jaws.**
- (4) Remove the PP orifice 5 using a 2 mm allen-wrench.
- (5) Remove the dynamic orifice 3 using a 3 mm allen-wrench.
- (6) Screw out the plug 10 using an 8 mm allen-wrench. O-ring (8) is fitted on plug.
- (7) Remove the LS orifice ③ from LS-port of housing ① using a 2 mm allen-wrench.

2) ASSEMBLY

- (1) Assemble the orifices $(3),\,(5)$ to the spool (4).
- * Before assembling orifices ③, ⑤ to the spool : fix the spool in a vice with aluminum jaws.
- (2) Screw in PP orifice 5 using a 2 mm allen-wrench.
 - · Tightening torque : 0.1±0.01 kgf·m (0.72±0.07 lbf·ft)
- (3) Screw in dynamic orifice 3 using a 3 mm allen-wrench.
 - · Tightening torque : 0.35±0.05 kgf·m (2.53±0.36 lbf·ft)
- (4) Assemble the LS orifice 6 into the thread hole in the LS-port of housing 1 using a 2 mm allenwrench.
 - · Tightening torque : 0.1±0.01 kgf·m (0.72±0.07 lbf·ft)
- (5) Assemble the plug ${\rm I}{\rm O}$ using an 8 mm allen-wrench. O-ring ${\rm (8)}$ is fitted on plug.
 - · Tightening torque : 4±1 kgf·m (28.9±3.6 lbf·ft)
- (6) Insert the priority valve spool 4 with orifices 3, 5.
- (7) Insert the spring \bigcirc .
- (8) Assemble the plug (9) using a 22 mm spanner. O-ring (8) is fitted on plug. • Tightening torque : 4±1 kgf·m (28.9±3.6 lbf·ft)

3. STEERING CYLINDER

1) STRUCTURE



2) DISASSEMBLY

* Before disassembling steering cylinder, release oil in the cylinder first.

- (1) First remove the external circlips (14).
- (2) Tap the rod cover (15) into the tube (12) and remove the snap rings (13).
- (3) Remove the rod cover (15).
- (4) Repeat steps 1-3, disassembly the other rod cover.
- (5) Remove the piston rod (16) and piston (11) from the tude (12).
- (6) Check wear condition of the sealing parts. If there are some damage, replace with new parts.

3) CHECKING AND INSPECTION

			()
Charleiter	Crite	Demedu	
Check liem	Standard size	Repair limit	Remeay
Clearance between piston & cylinder tube	0.08~0.22 0.3 (0.003~0.009) (0.012)		Replace piston seal
Clearance between cylinder rod & bushing	0.024~0.174 (0.0009~0.007)	0.2 (0.008)	Replace bushing
Seals, O-ring	Dam	Replace	
Cylinder rod	De	Replace	
Cylinder tube	Biti	Replace	

4) ASSEMBLY

(1) Put the piston (11) into the piston rod (16)



(2) Put the steel ball (9) into the piston (11) until it is s full,and then install the support ring (10) to the groove on the piston,last install the piston sealing (8).





mm (in)

(3) Set a special tool on the piston rod (16), then put the piston rod into the tube (12), last put the rod cover (15) into both side of the tube (12).

- (4) Install the roundwire snap rings (13) to the groove on the tube. Then move the piston rod (16) to the limit position, last install the external circlips (14).
 - s (13) to the he piston rod Il the external
- (5) Move the piston rod (16) back and forth several times for the full distance of its stroke. This helps to seat the O-ring and seals before applying full hydraulic pressure to the cylinder. Install cylinder into trail axle.



25BX5SS19

4. STEERING AXLE

1) STRUCTURE



- 1 Hub cap
- 2 Hub bolt
- 3 Nipple
- 4 Steering link
- 6 Steering axle
- 7 Nipple
- 8 Block
- 9 Steering knuckle
- 10 Rod ring
- 11 Upper cover
- 12 Bearing
- 13 Oil seal
- 14 Oil seal

- 15 Bearing
- 16 Nut
- 17 Washer
- 18 Pin
- 19 Wheel hub
- 20 Shim (0.2t)
- 21 Shim (0.1t)
- 22 Shim (0.5t)
- 23 Pin
- 24 Bolt
- 25 Washer
- 26 Adjusting shim kit
- 27 Adjusting shim kit

- 28 Bushing
- 29 Screw
- 30 Nut
- 31 Grease nipple
- 32 Sterring link pin
- 33 Bushing
- 34 Oscillating bearing

25LC95SS01A

- 35 Bolt
- 36 Washer
- 52 Hex bolt
- 53 Harden washer
- 54 Wheel nut
- 55 Steering cylinder

2) CHECK AND INSPECTION





25BX5SS20A

unit : mm (in)

No		Chaolaitam		Criteria		Damada
INO.	Check Item		Standard size	Repair limit	Remedy	
^	Shoft	A1	OD of shaft	Ø50 (1.97)	Ø49.5 (1.95)	Replace
A Snaπ -	A2	ID of bushing	Ø50 (1.97)	Ø49.5 (1.95)		
В	B OD of king pin		Ø30 (1.18)	Ø29.8 (1.17)		
С	OD of steerin	ıg cyl	inder pin	Ø16 (0.63)	Ø15.8 (0.62)	
		D1	OD of pin	Ø16 (0.63)	Ø15.8 (0.62)	
D	Knuckle	D2	Verical play	-	-	
		D3	ID of bushing	Ø16 (0.63)	Ø15.8 (0.62)	Adjust with shims

· OD : Outer diameter

· ID : Inner diameter

3) DISASSEMBLY

- Servicing work on the knuckle part can be carried out without removing the axle assy from chassis. The work can be done by jacking up the counter weight part of the truck.
- (1) Loosen the hub nut (54) and take off the steering wheel tire.



- (2) Remove hub cap (1).
- (3) Pull out split pin (18) and remove slotted nut (16) and washer (17).
- (4) Using the puller, take off the hub (19) together with the taper roller bearing (12, 15).
- * Be very careful because just before the hub comes off, taper roller bearing will fall out.
- (5) After hub (19) is removed take off the inner race of the taper roller bearing (12, 15).
- (6) Pull out oil seal (14).
- * Do not use same oil seal twice.
- (7) Repeat the same procedure for the other side. Moreover, when disassembling is completed, part the slotted nut (16) in the knuckle (9) to protect the threaded portion.
- (8) Loosen the bolt (29) and the nut (30).
- (9) Remove the cover (11).
- (10) Push out the king pin (23) without damaging the knuckle arm (9).
- (11) If defect is observed in taper roller bearing (12), pull it out by using extractor.
- (12) Loosen the bolt (35). Remove the link pin (32) and the washer spring (36).
- (13) Remove the steering link (4) and remove the bushing (33) and oscillating bearing in turn with the tool.





4) ASSEMBLY

- In reassembling, have all parts washed, grease applied to lubricating parts, and all expendable items such as oil seal and spring washers replaced by new ones. Perform the disassembly in reverse order.
- (1) Tighten the bolt (29) and the nut (30) of the king pin (23).
- (2) There is a notch in the middle of the king pin(23), make sure that this notch is on the bolt side(29).
- (3) Do not hammer to drive in the bearing (5) because it will break.
- ※ Always use drive-in tool. Be sure that the fixed ring of the bearing is placed in position facing the knuckle (9).

(4) Hub

- Press the bolt (2) into the hub (19) mating hole with special tools.
- ② Press the outer ring of large (15) and small (12) bearing into the hub (19) mating hole respectively with special tools to ensure that the outer ring and the hub are in place.
- ③ Install hub bearing and fill the hub with grease.
- The amount of which is 1/3~1/2 of the hub's inner cavity
- ④ Apply grease to the working surface of oil seal (15), then install it into the hub mating hole.
- (5) Install hub assembly on the knuckle (9), set into the washer (17), tighten the nut (16) of hub, then loose it, adjust the starting force of the wheel hub until 40-70n, last install the pin cotter (18). Finally install hub cap (1) with special tooling.
 - Tightening torque : 15.3±5.1 kgf·m (111±36.9 lbf·ft)

