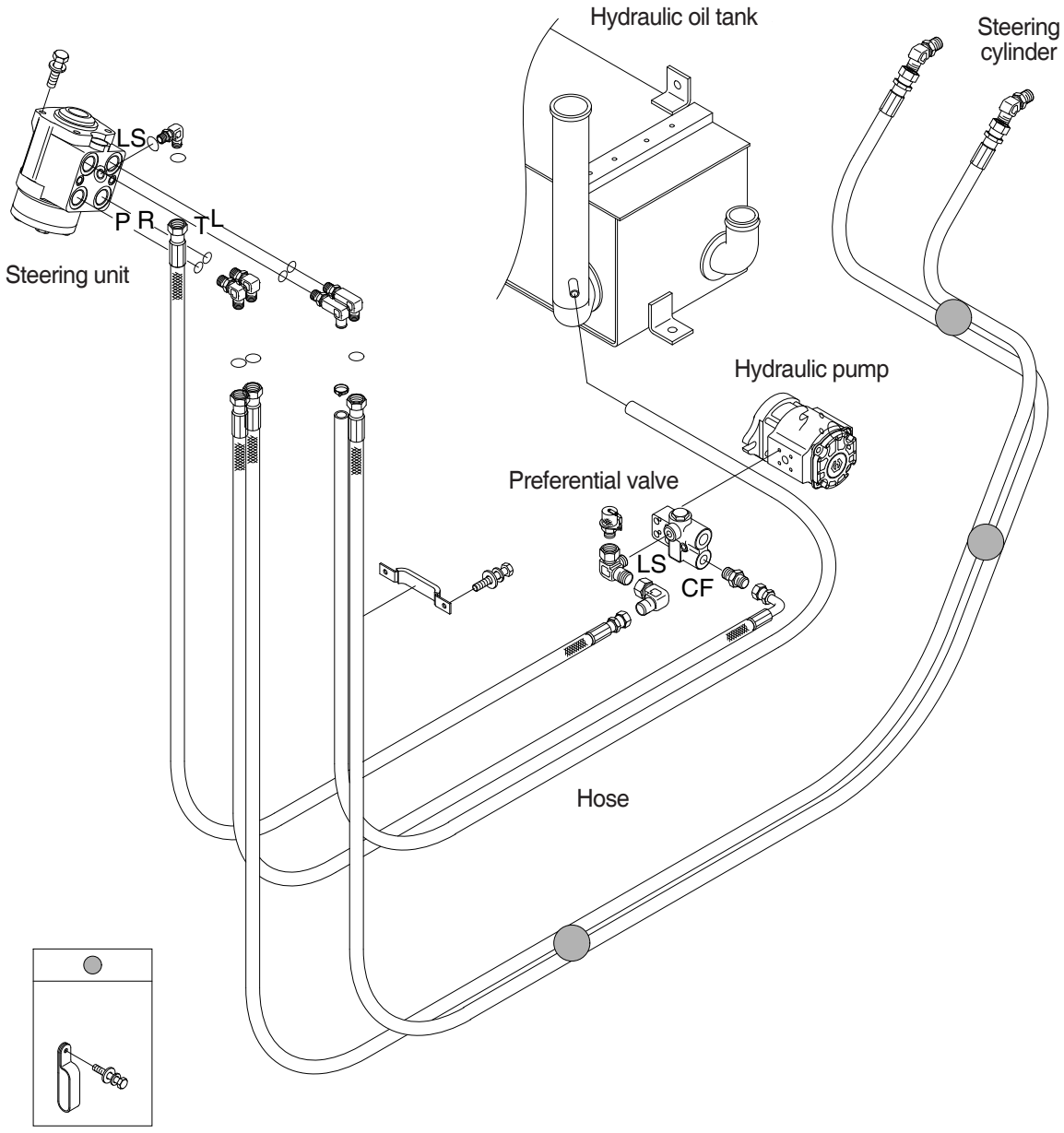
SECTION 5 STEERING SYSTEM

GROUP 1 STRUCTURE AND FUNCTIONS

1. INTRODUCTION



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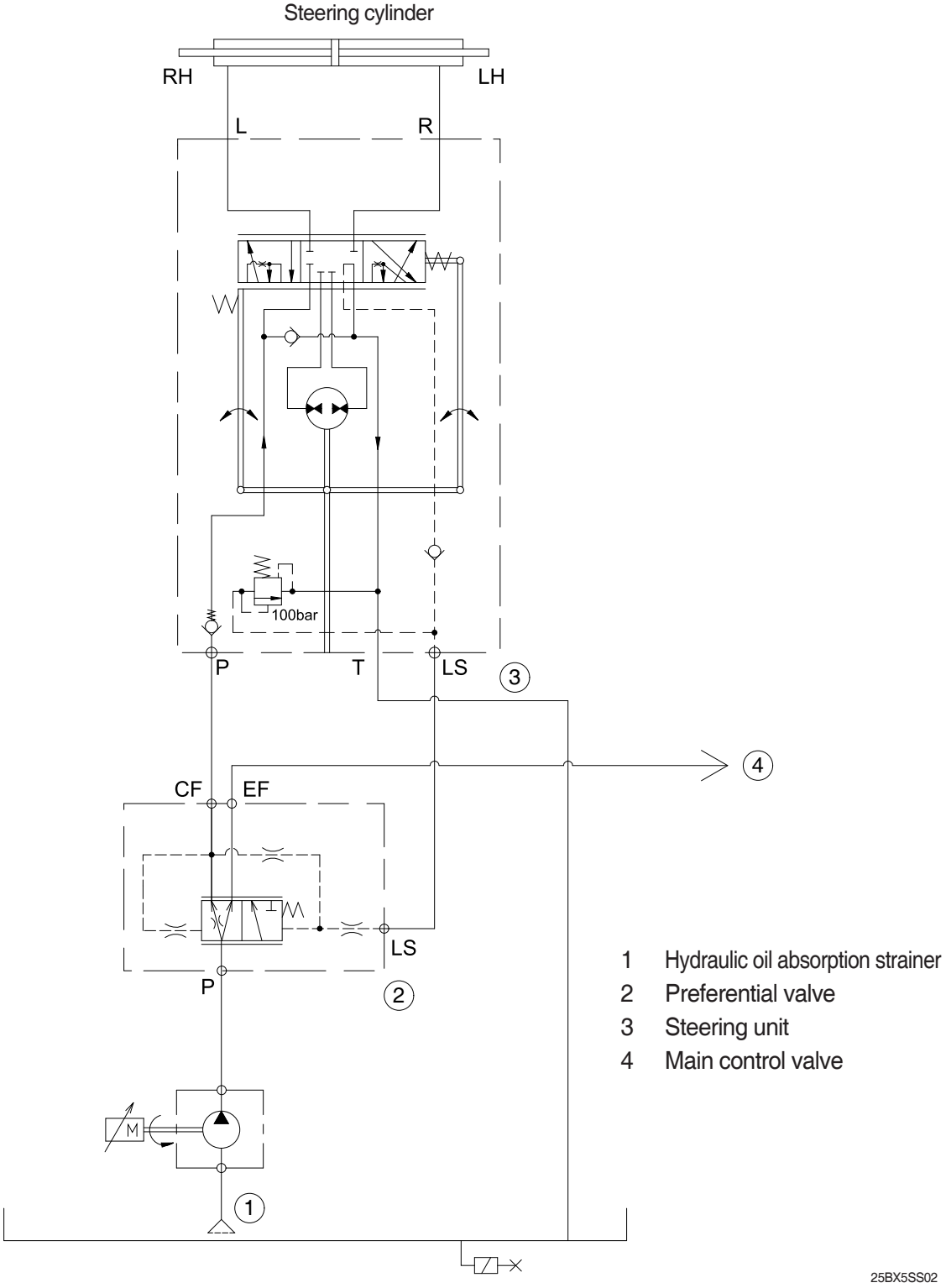
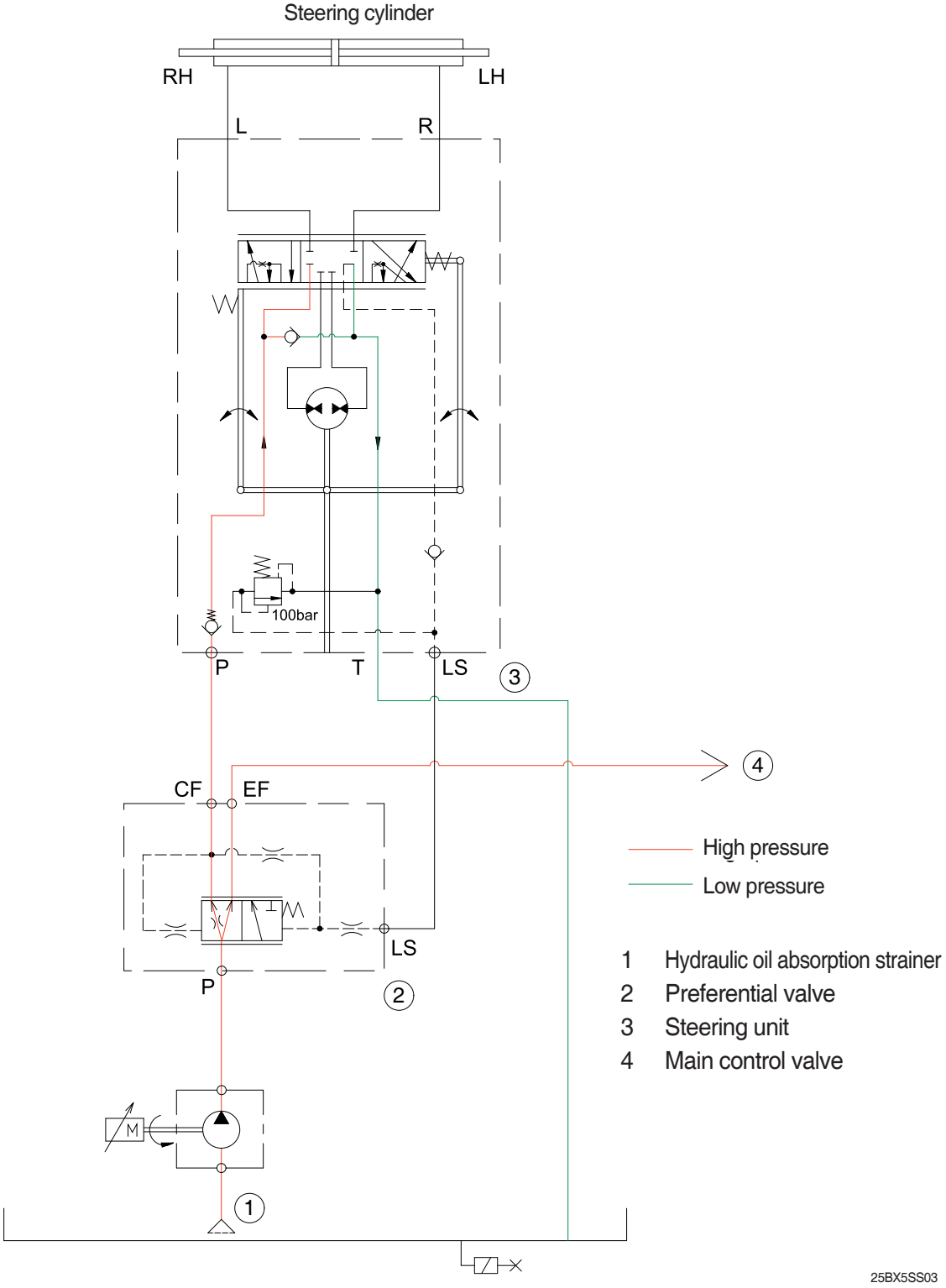
Steering system consists of hydraulic pump, steering wheel assembly, steering unit, preferential valve, steering cylinder, and piping. Steering axle with integrated rear wheel tire and cylinder supports the weight of forklift truck. Steering axle is of structure with steering knuckles installed on the both sides of king pin. Hubs and wheels are fastened on spindles of knuckles. When turning steering wheel to move forklift struck to the left or right, rotational torque is transferred to steering unit, and hydraulic oil in steering unit flows to steering axle hydraulic cylinder through hose. Force generated from steering cylinder moves knuckle of rear wheel through intermediate link. See the figure for locations of steering system components.

2. HYDRAULIC CIRCUIT



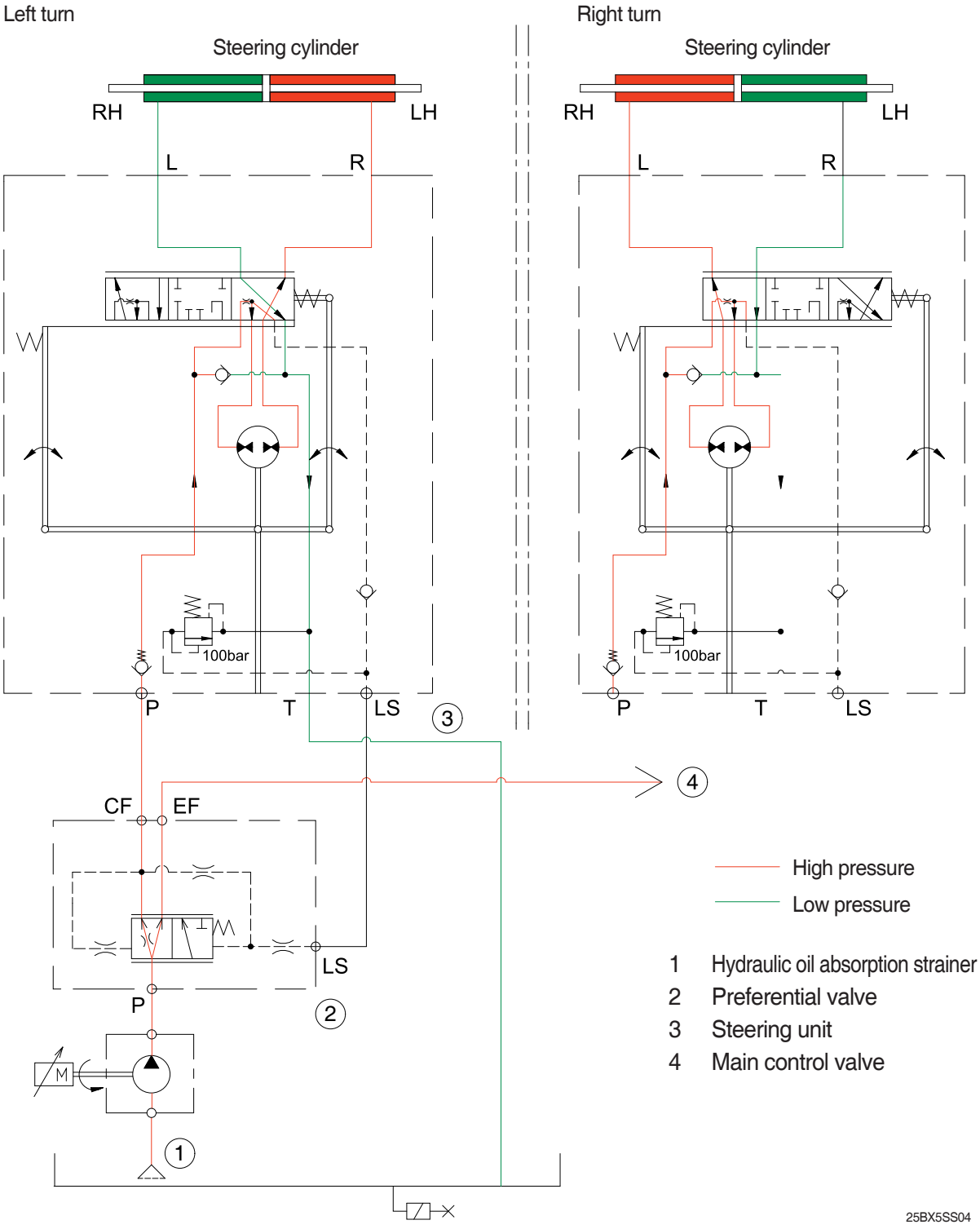
Hydraulic oil is supplied from hydraulic pump to preferential valve. When driver turns steering wheel, hydraulic oil is supplied first to steering unit by working circuit inside preferential valve. Hydraulic oil inside steering unit is expanded or shrunk, and then supplied to steering cylinder of forklift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

1) NEUTRAL



When hydraulic motor 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 valve is blocked to the left and right steering ports. Pressure on pilot of preferential 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.

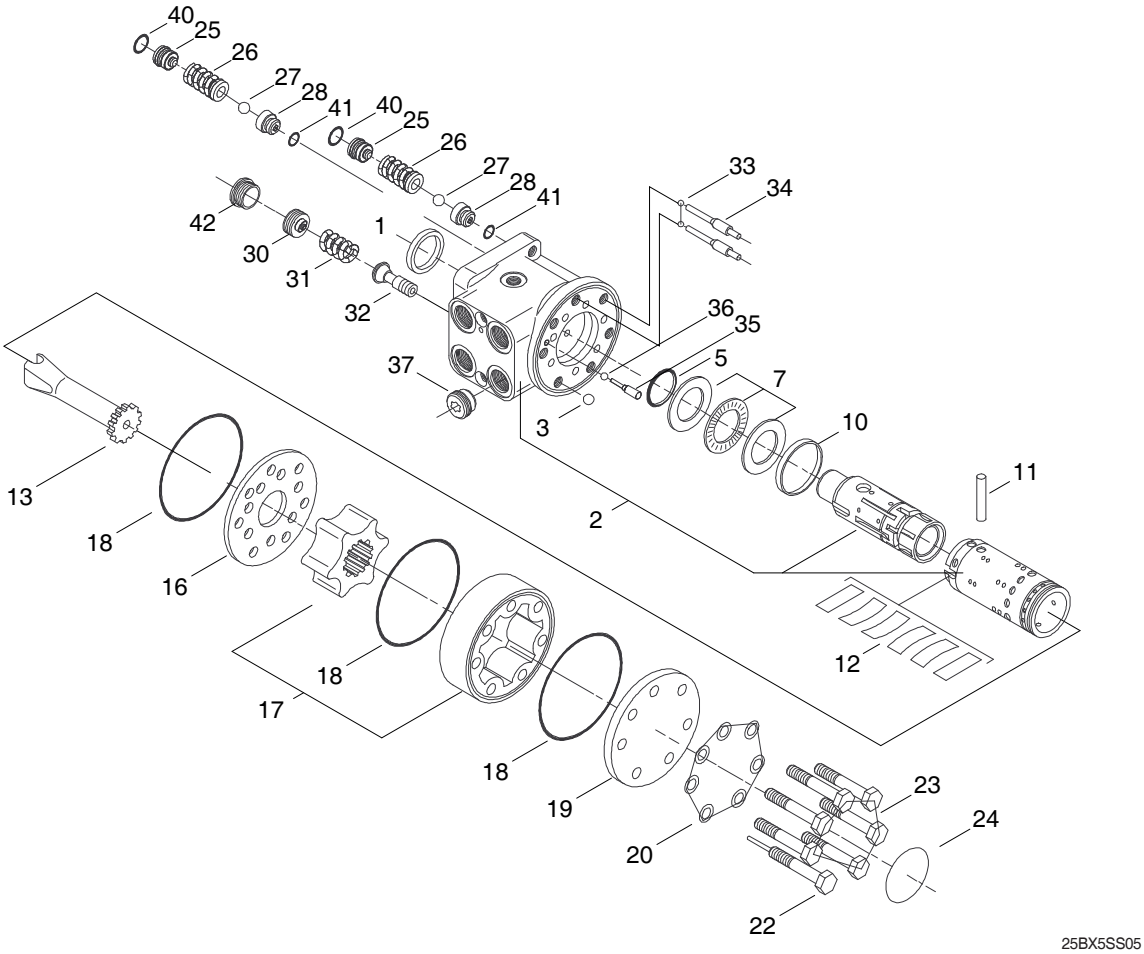
2) TURING LEFT OR RIGHT



When hydraulic motor 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. Preferential valve spool moves to supply hydraulic oil to main control valve through EF port.

3. STEERING UNIT

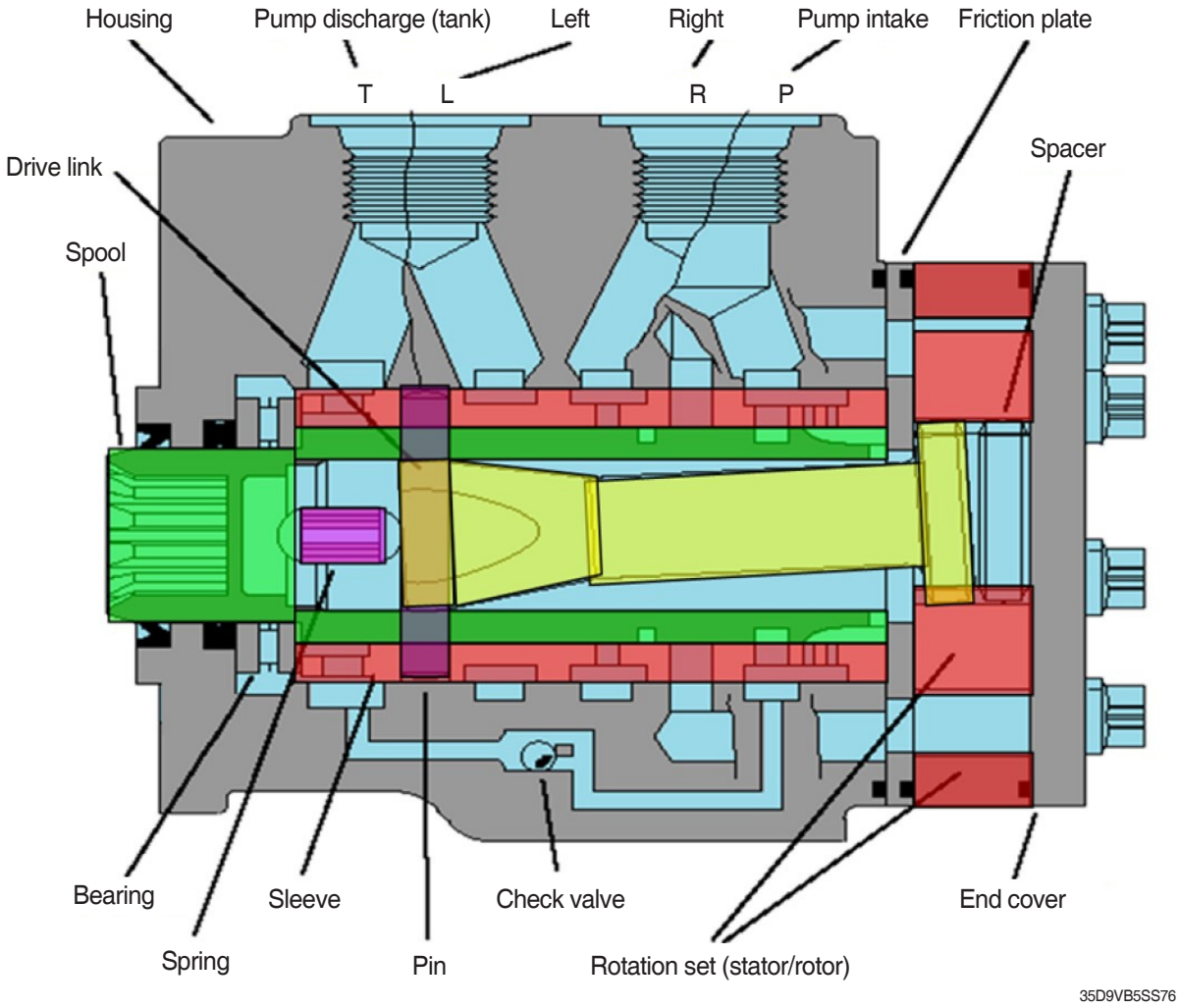
1) STRUCTURE



1	Dust sealing ring	19	End cover	33	Ball
2	Housing spool and sleeve	20	Washer	34	Bushing
3	Ball	22	Pin bolt screw	35	Ball stop thread
5	Shaft seal	23	Screw	36	Ball (Ø3)
7	Bearing assembly	24	Model/code label	37	Check valve
10	Ring	25	Adjusting screw	39	Sealing ring
11	Cross pin	26	Spring	40	O-ring
12	Spring set	27	Ball	41	O-ring
13	Cardan shaft	28	Seat	42	Plug
16	Distributor plate	30	Adjusting screw		
17	Gear wheel set	31	Spring		
18	O-ring	32	Piston		

※ **Seal kit: 1, 5, 18, 20, 40, 41**

2) OPERATION



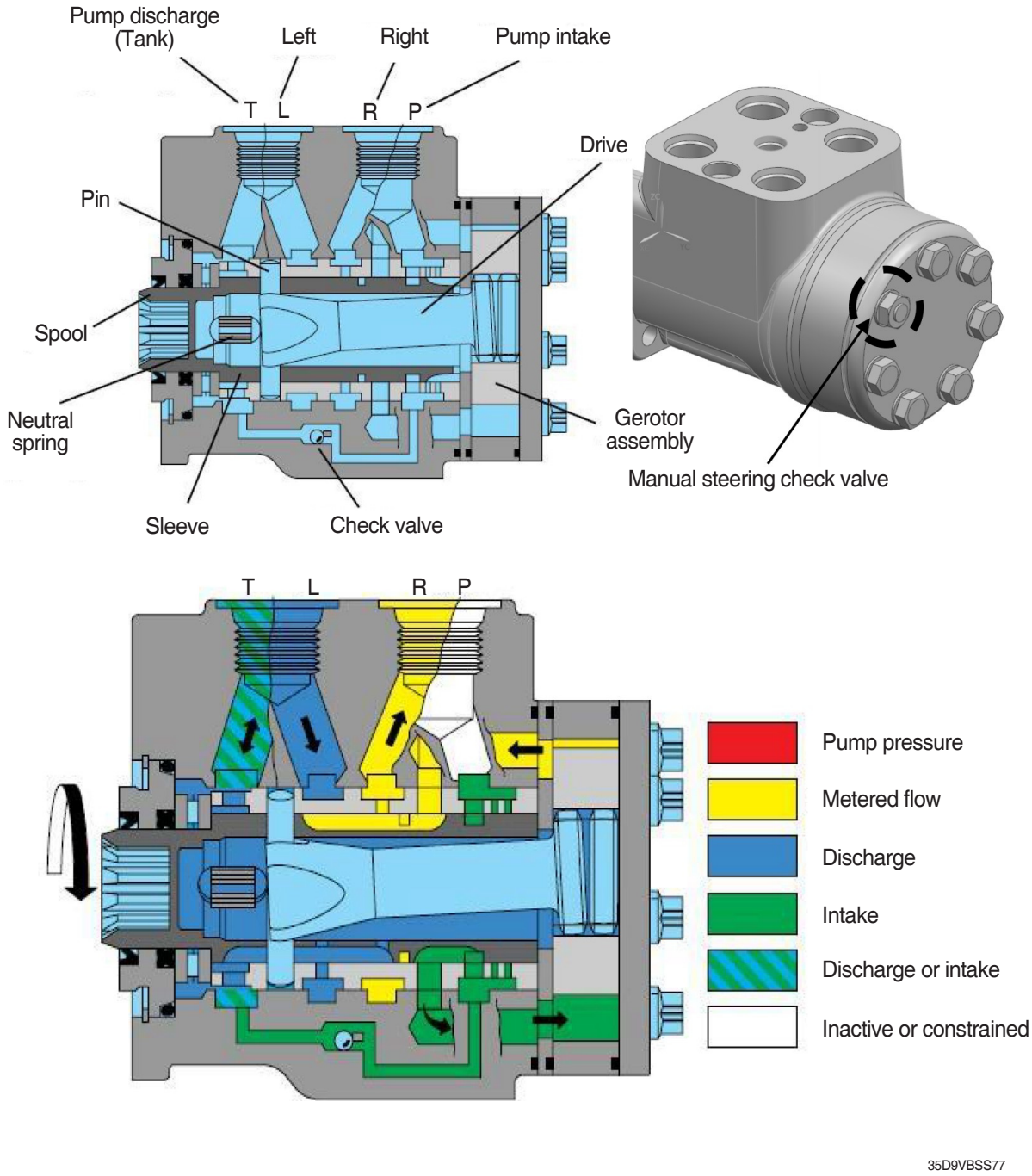
Steering unit is a closed neural circuit and a gauging gear set consisted of rotation valve (spool + sleeve set). Steering unit mitigates impact of sudden rotation or kickback of tire on steering wheel together with LS (load sensing) dynamic circuit to ensure smooth movement of steering wheel without 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.

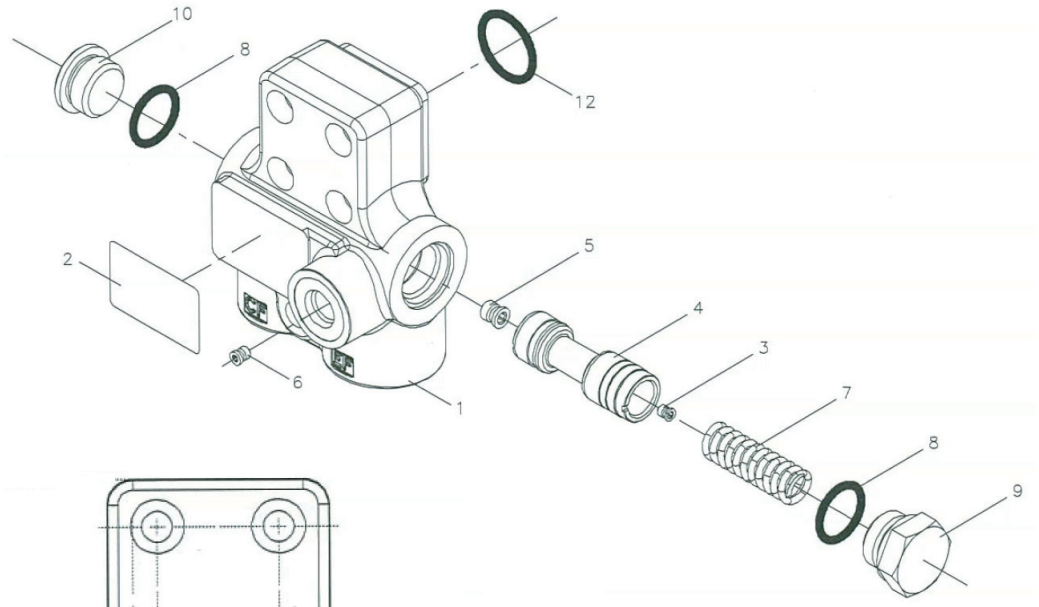
3) MANUAL STEERING IN EMERGENCY

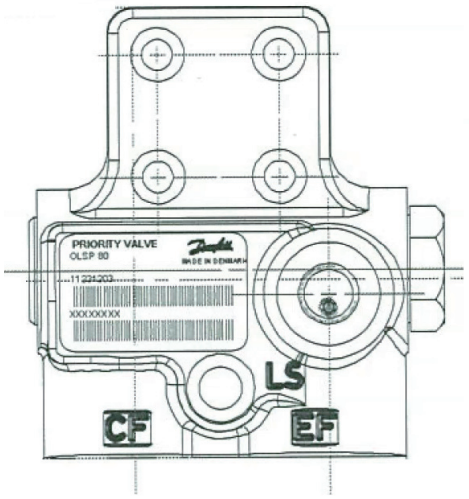


Hydraulic motor stops, and preferential valve spool is pushed to the end by spring force when turning steering wheel. In such a case, hydraulic oil flows to spool and sleeve set, and EF port is closed. Turing steering wheel forms vacuum in supply line between preferential valve and steering unit spool 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. PREFERENTIAL VALVE

1) STRUCTURE





Port	Port dimensions	Fastening torque	
		kgf · m	lbf · ft
EF	7/8-14UNF	10	72.3
CF	3/4-16 UNF	4	28.9
LS	7/16-20 UNF	2	14.5

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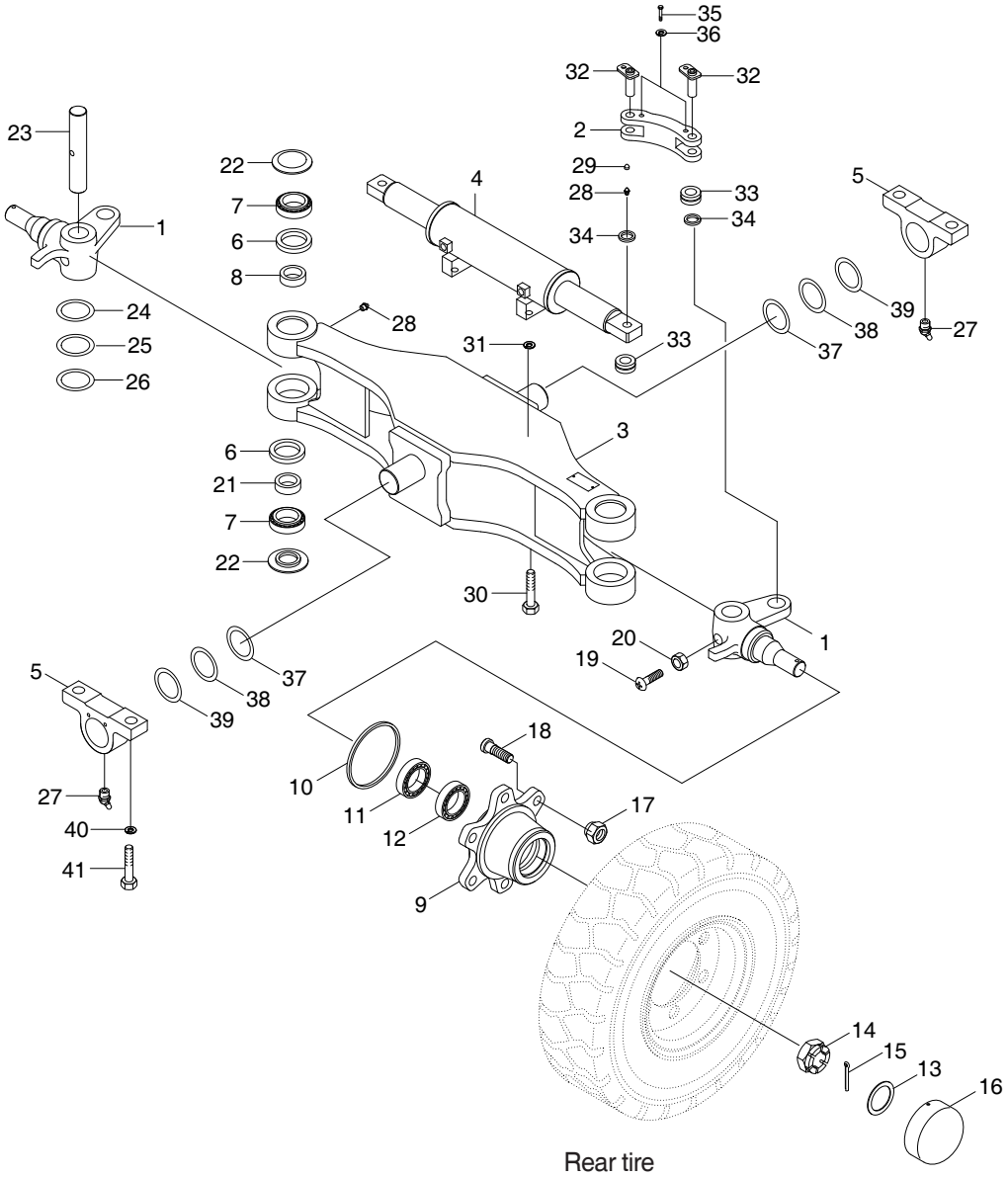
1	Housing	5	Orifice	9	Plug
2	Model/code label	6	Orifice	10	Plug
3	Orifice	7	Spring	12	O-ring
4	Spool	8	O-ring		

※ **Seal kit : 8, 12**

Preference 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

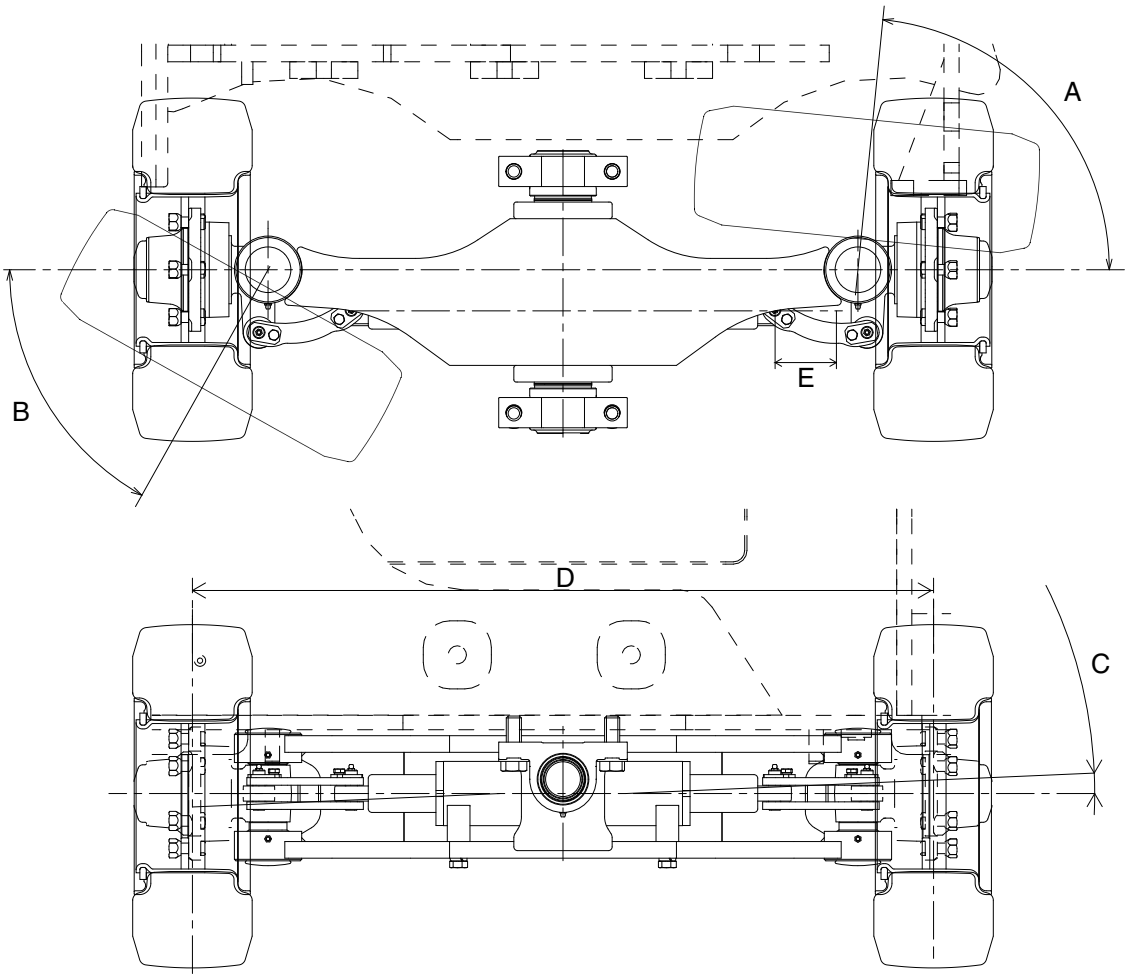
1) STRUCTURE



Rear tire

1	Steering knuckle	15	Hub pin	29	Dust cap
2	Steering link	16	Hub cap	30	Bolt
3	Axle frame	17	Hub nut	31	Washer
4	Steering cylinder	18	Hub bolt	32	Steering link pin
5	Trunnion block	19	Screw	33	Oscillating bearing
6	Oil seal	20	Nut	34	Bushing
7	Bearing	21	Rod ring	35	Bolt
8	Rod ring	22	Top cover	36	Washer
9	Wheel hub	23	King pin	37	Bushing
10	Oil seal	24	Shim (0.2 t)	38	Adjusting shim kit
11	Bearing	25	Shim (0.1 t)	39	Adjusting shim kit
12	Bearing	26	Shim (0.5 t)	40	Hardening washer
13	Washer	27	Nipple	41	Hexagonal bolt
14	Nut	28	Nipple		

2) SPECIFICATION TABLE



Item			Unit	Specifications
Max. steering angle	Inner side	A	Degree	84.3
	Outer side	B		60.8
Reciprocating angle		C		2.5
Distance between wheels		D	mm	980
Stroke		E	mm	82

GROUP 2 OPERATIONAL CHECKS AND TROUBLESHOOTING

1. OPERATIONAL CHECK

Inspection items	Inspection procedures
Knuckle	· Inspect knuckle with visual checking, or crack inspection method. Bent knuckle indicates non-uniform abrasion of tires. Check abrasion of tires.
Steering axle	· Make request to assistant to drive the truck in the min. turning radius. · Affix chalk on outer edge of counterweight for drawing turning radius. · Min. turning radium (outside): see Page 1-5 'Dimensions.'
Power steering pressure	· Install hydraulic pressure gauge on bidirectional pump. · Turn steering wheel as far as possible, and check hydraulic pressure. · Hydraulic pressure : 100 bar

2. TROUBLESHOOTING

1) STEERING UNIT

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

Trouble	Possible cause	Troubleshooting
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

2) 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

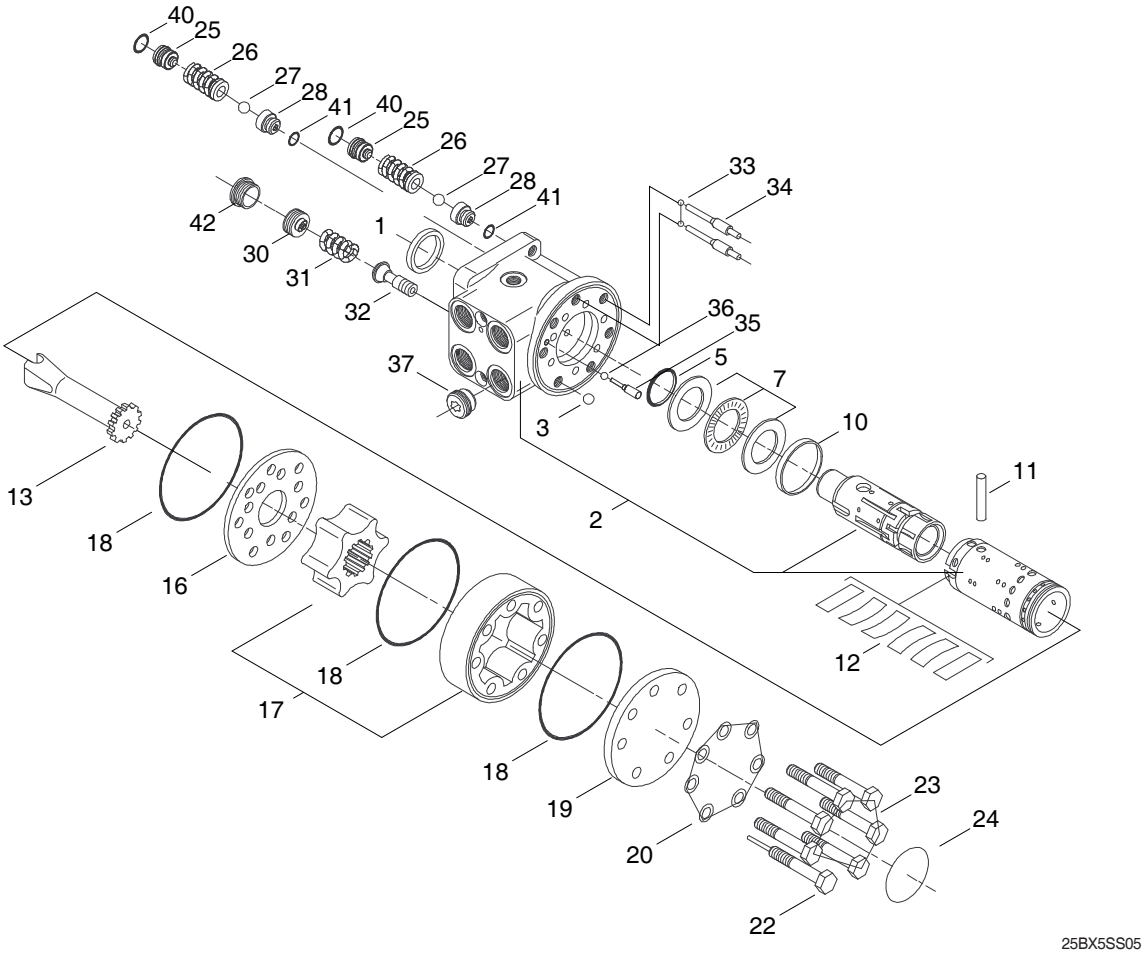
3) STEERING CYLINDER

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



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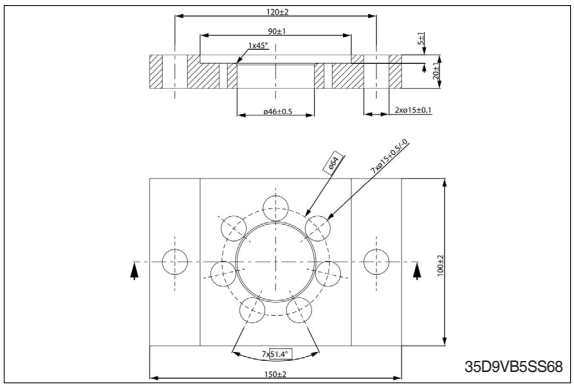
1	Dust sealing ring	19	End cover	33	Ball
2	Housing spool and sleeve	20	Washer	34	Bushing
3	Ball	22	Pin bolt screw	35	Ball stop thread
5	Shaft seal	23	Screw	36	Ball (Ø3)
7	Bearing assembly	24	Model/code label	37	Check valve
10	Ring	25	Adjusting screw	39	Sealing ring
11	Cross pin	26	Spring	40	O-ring
12	Spring set	27	Ball	41	O-ring
13	Cardan shaft	28	Seat	42	Plug
16	Distributor plate	30	Adjusting screw		
17	Gear wheel set	31	Spring		
18	O-ring	32	Piston		

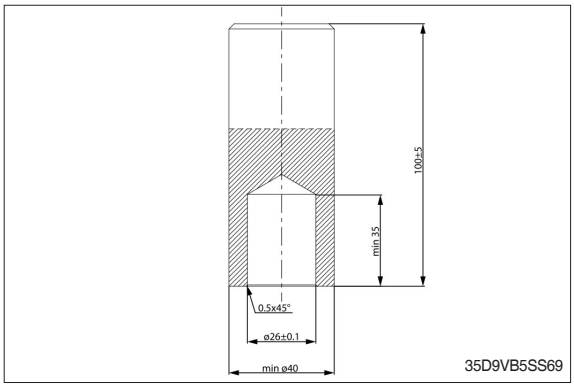
※ **Seal kit: 1, 5, 18, 20, 40, 41**

2) TOOL

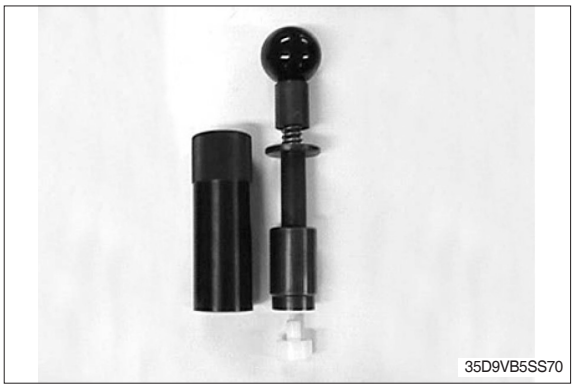
(1) Fastening tool for steering unit
Material : Metal or hard plastics



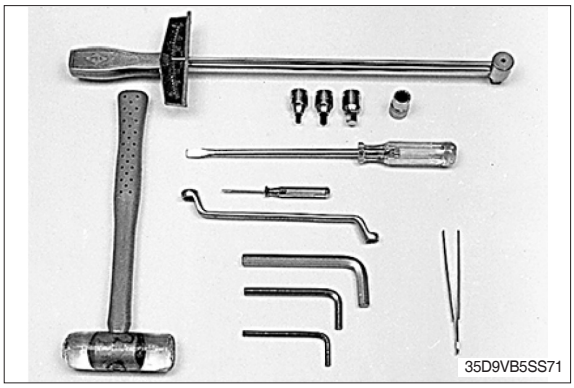
(2) Assembly tool for dust seal
Material : Free cutting steel



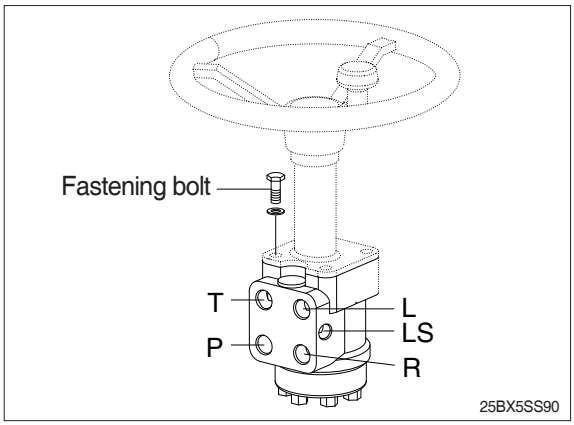
(3) Tool for shaft seal, O-ring, rotor glide
Code : 11092408.



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



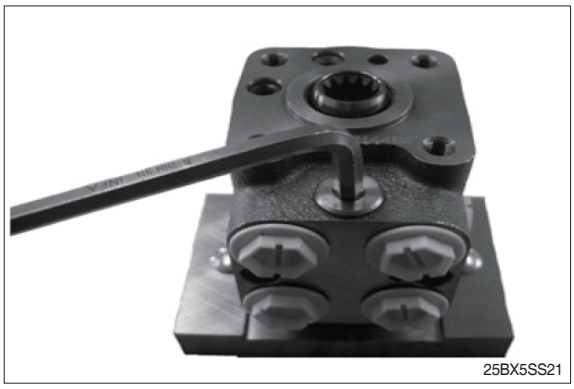
3) Fastening torque
   L : Left port
   R : Right port
   T : Tank port
   P : Pump port
   LS : Load sensing port



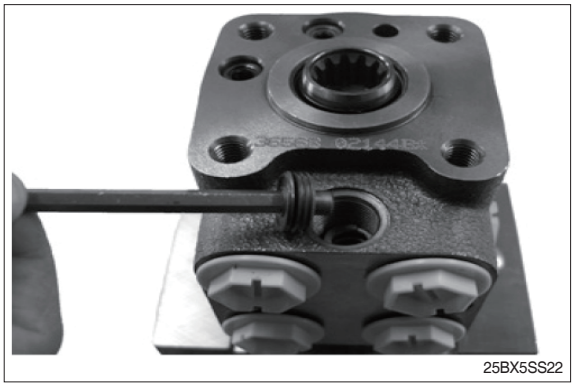
Port	Port dimensions	Fastening torque
		kgf · m
L, P, R, T	3/4-16 UNF	6
LS	7/16-20 UNF	2
Mounting bolt	M10	3

4) DISASSEMBLING

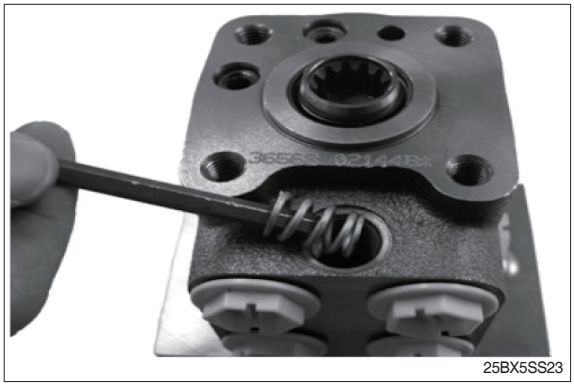
(1) As shown on the figure, put steering unit on fastening tool, and remove plug (42) with 8-㎜ Allen key.


25BX5SS21

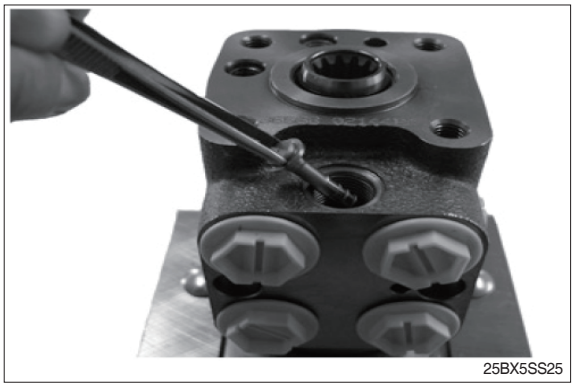
(2) Make use of 6-㎜ Allen key to remove adjusting screw (30).


25BX5SS22

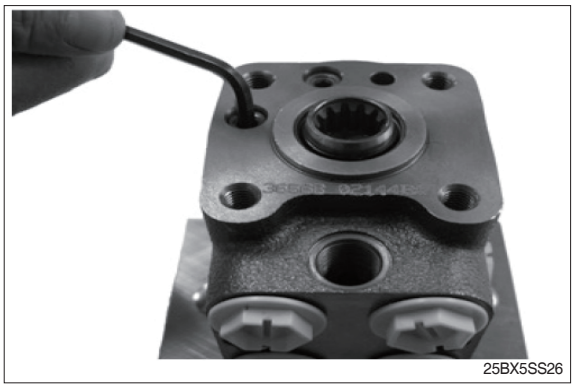
(3) Remove spring (31).


25BX5SS23

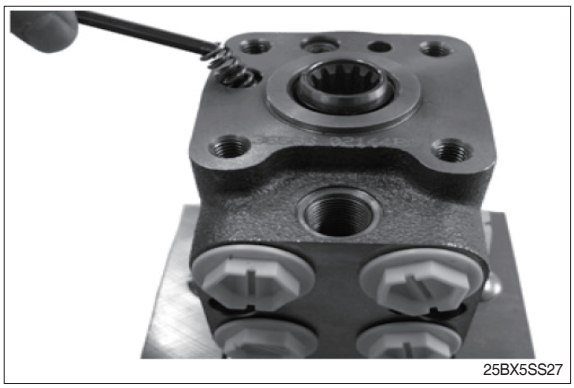
(4) Remove piston (32).


25BX5SS25

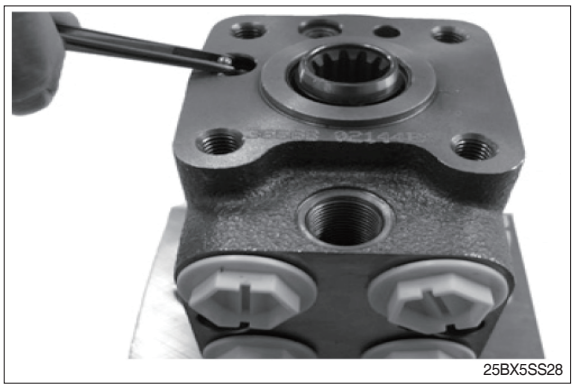
(5) Make use of 5-mm Allen key to remove adjusting screw (25) mounted with O-ring (40).


25BX5SS26

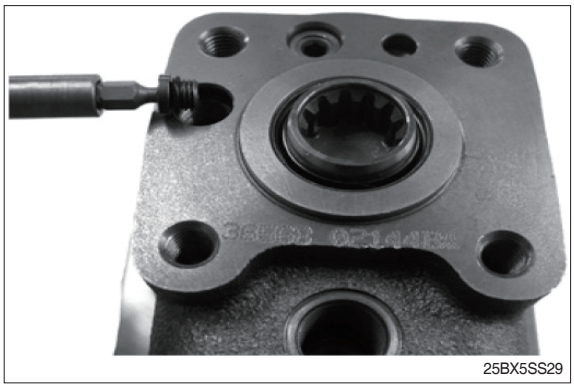
(6) Remove spring (26).


25BX5SS27

(7) Remove ball (27).


25BX5SS28

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

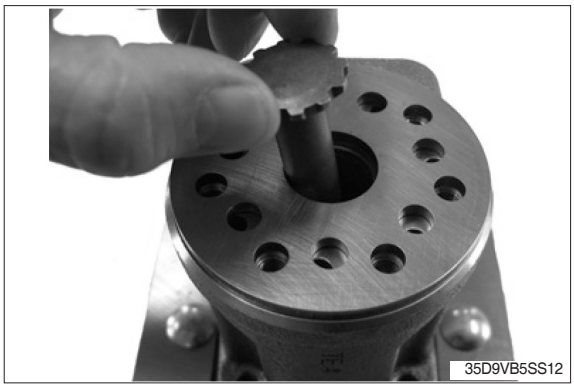

25BX5SS29

(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).

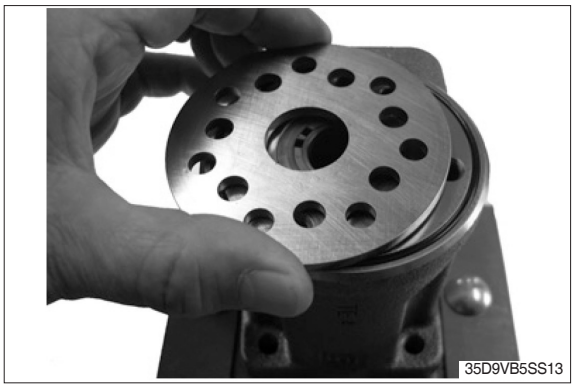
(10) Remove end cover (19).

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

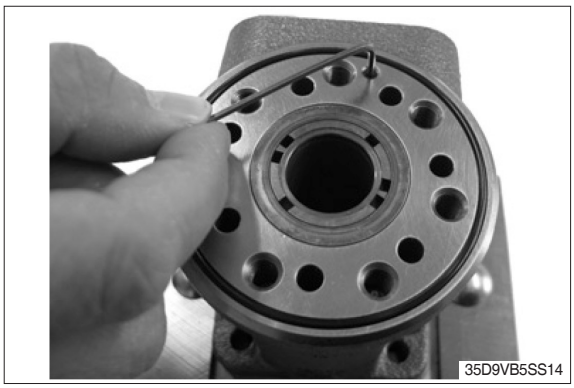
(12) Remove cardan shaft (13).



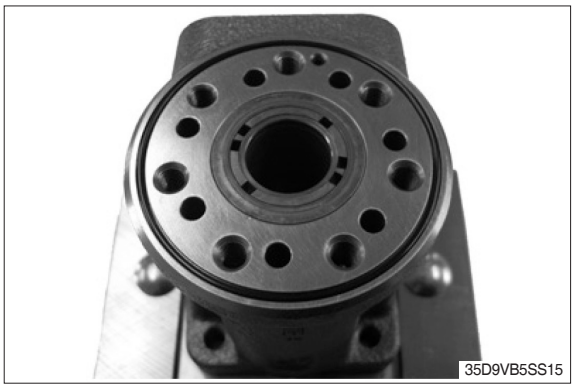
(13) Remove distributor plate (16).



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

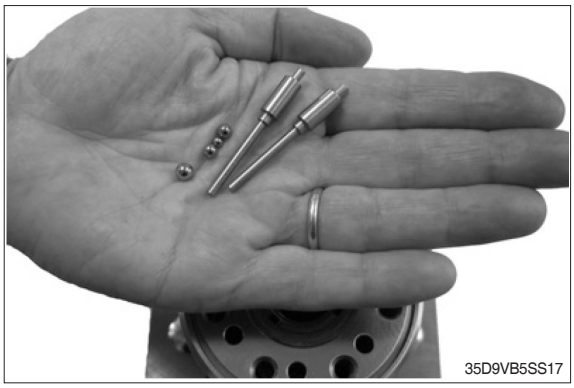


(15) Remove O-ring (18) from housing.

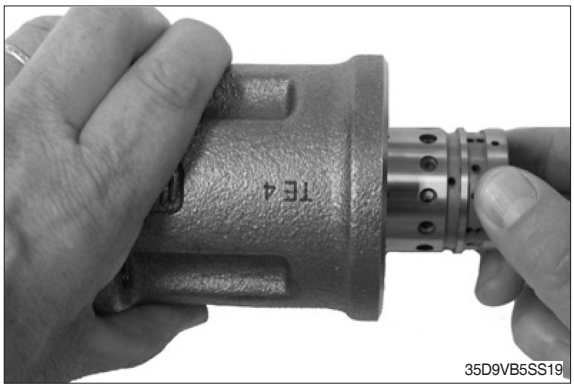


(16) Make use of Torx bit of size T50 to remove check valve (37).

(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.

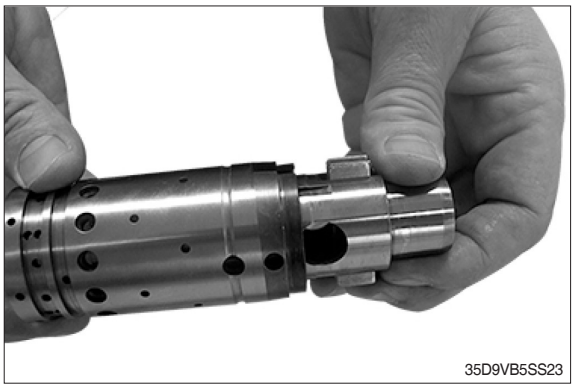


(19) Remove bearing assembly (7) from spool and sleeve (2). Outer bearing may be caught inside housing. Make sure that bearing is normally pulled out.

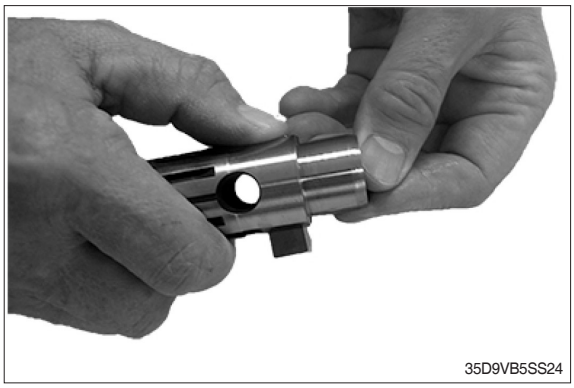
(20) Remove cross pin (11).

(21) Remove ring (10).

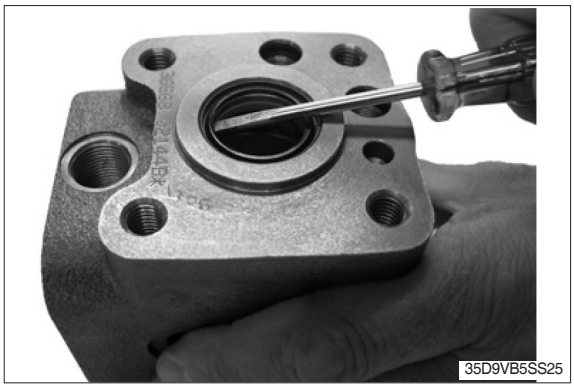
(22) Carefully remove spool from sleeve.



(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

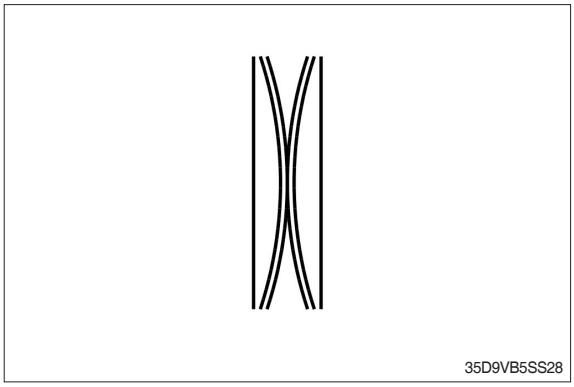
※ **Clean all of parts with solvent.**

※ **Replace seal and washer. Inspect all of parts, and replace parts, if required.**

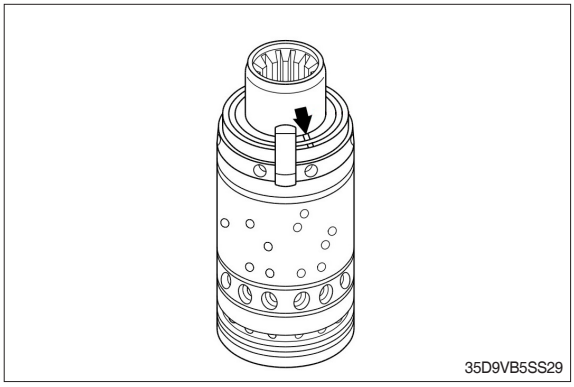
5) ASSEMBLING

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

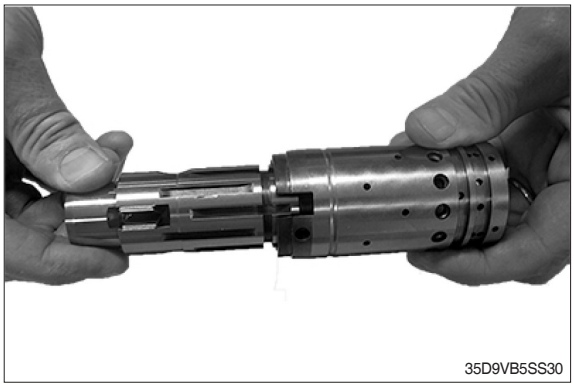
(2) Number of curved springs may vary dependent upon configuration of leaf spring set (12). There may be 2, 4 or 66 curved springs.



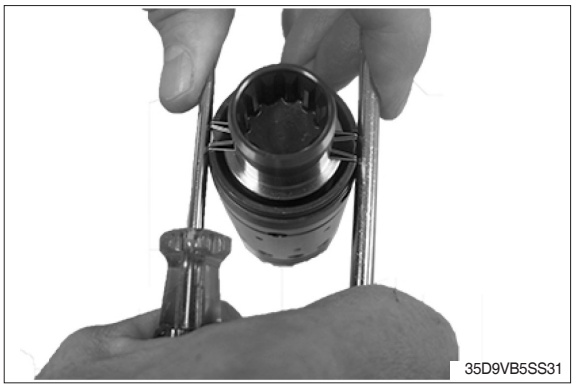
(3) Spool and sleeve set for steering unit should precisely be aligned to each other for mounting., Small marks are on the nearest slot of spring set, and all of sleeves. There are no marks on most of spools and sleeve sets. They are arranged facing each other on 1 of 2 available locations.



(4) Mount spool on sleeve, and make sure that leaf spring (12) is mounted on slot.



(5) Align leaf spring (12).

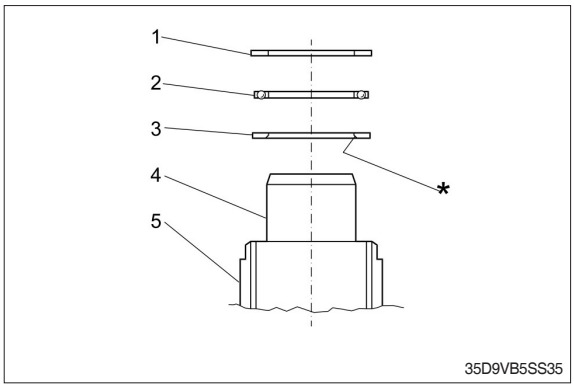


(6) Mount ring (10) on sleeve. Ring should move freely independent from spring.

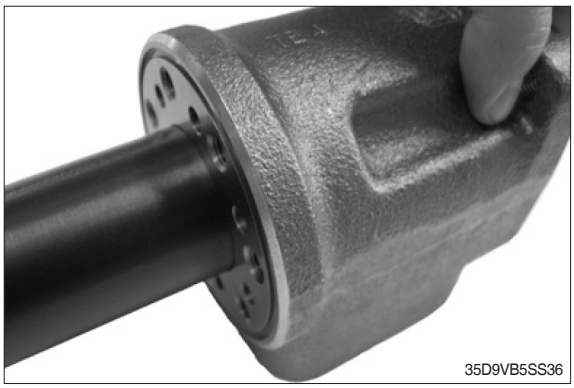
(7) Mount cross pin (11) on assembly.

(8) Mount bearing assembly (7).

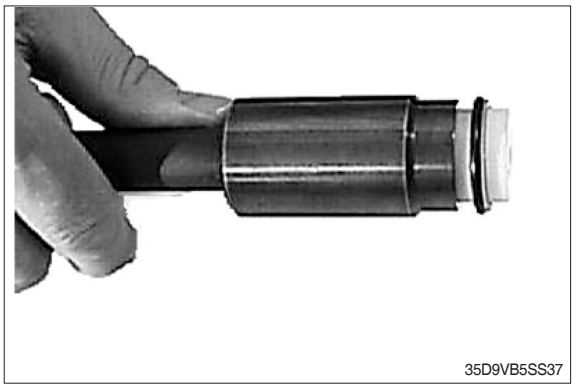
(9) Assemble parts in order as shown below:
1 Outer bearing race → 2 Needle bearing → 3 Inner bearing race → 4 Spool → 5 Sleeve.
The inside corner of inner bearing race should be aligned with the inside corner of spool.



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

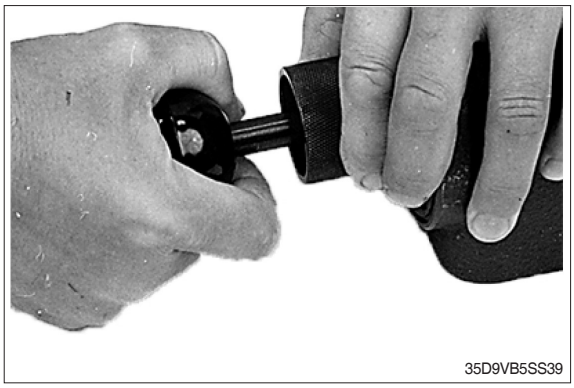


(10) Lubricate shaft seal (5) with hydraulic oil, and put it on tool. Make sure that shaft seal (5) is correctly positioned on insertion tool.

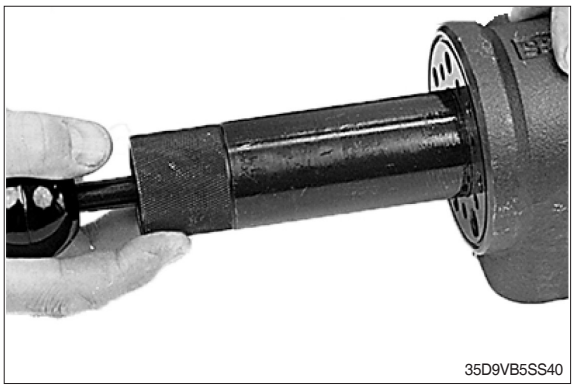


(13) Insert assembling tool into the bottom of steering unit.

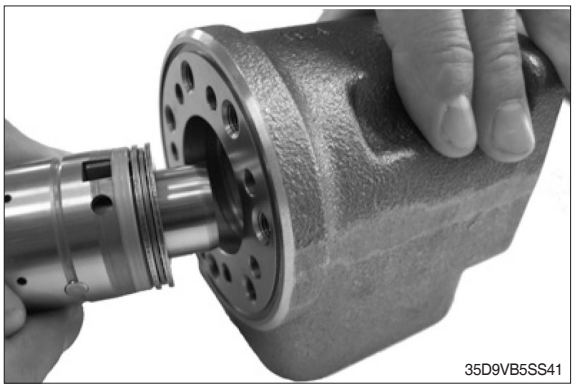
(14) Press the tool into housing, and rotate shaft seal (5).



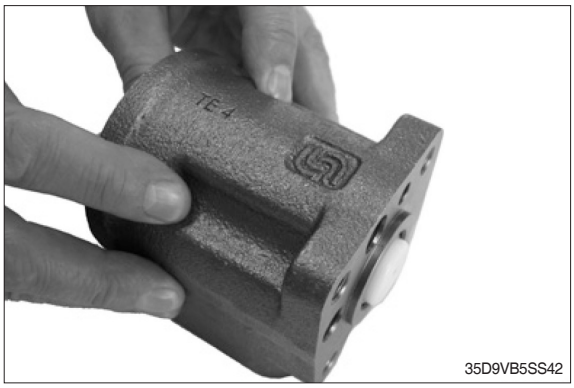
(15) Withdraw assembling tool from steering unit.



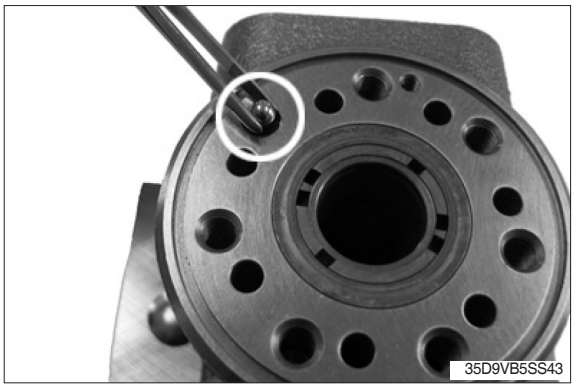
(16) Assemble spool and sleeve assembly on cross pin (11) in parallel direction while rotating the assembly a little.



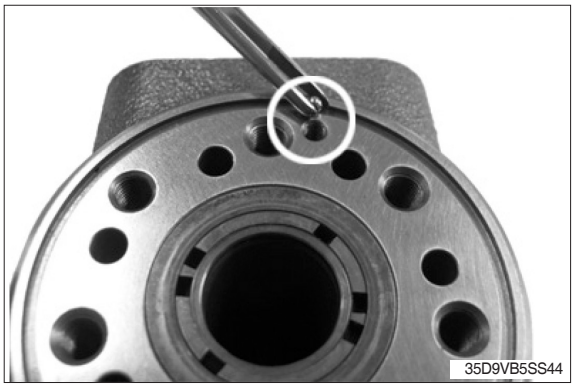
(17) Assembling tool is pulled out of spool assembly, and shaft seal (5) is mounted.



(18) Put steering unit housing on assembly fastening device toward the tip of steering column. Insert ball (3) into indicated hole.

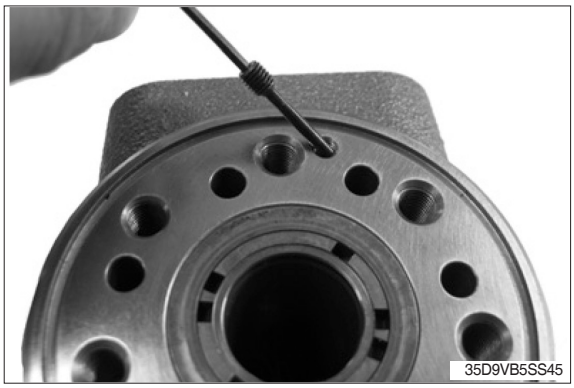


(19) Insert ball (36) into indicated hole.

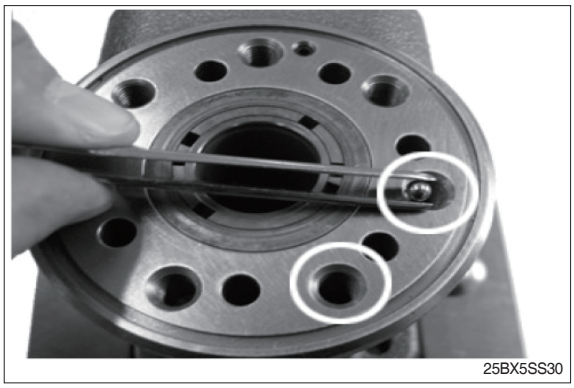


(20) Make use of 2-㎜ Allen key to insert ball stop thread toward ball (36), and then fasten the thread.

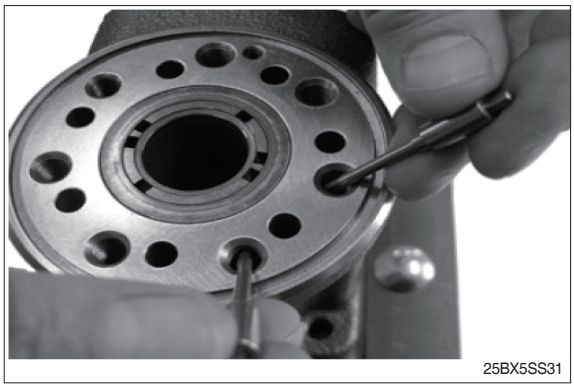
· Fastening torque : 0.1±0.01 ㎏f · ㎜



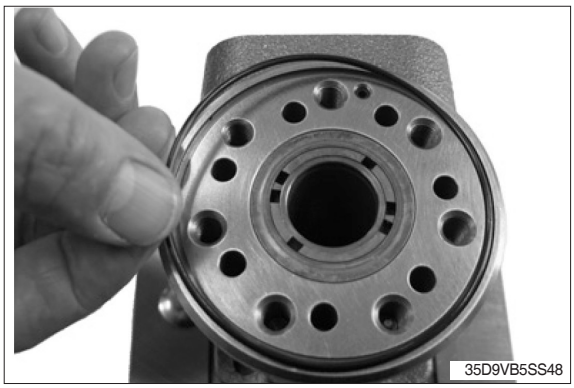
(21) Insert ball (33) into two indicated holes respectively.



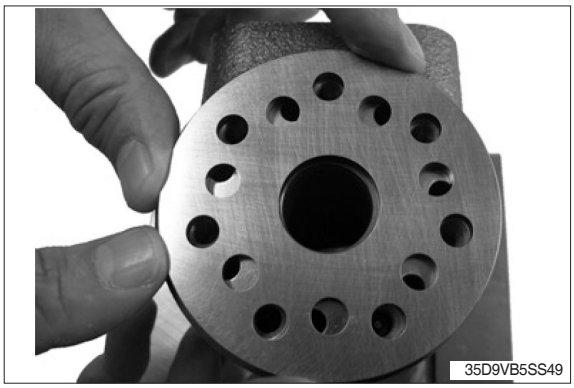
(22) Insert pin (34) into 2 identical holes respectively.



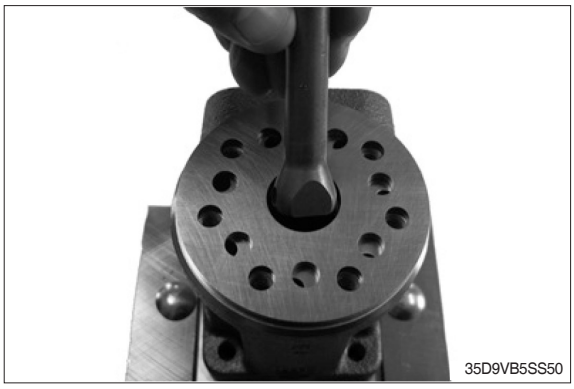
(23) Mount O-ring (18) on housing.



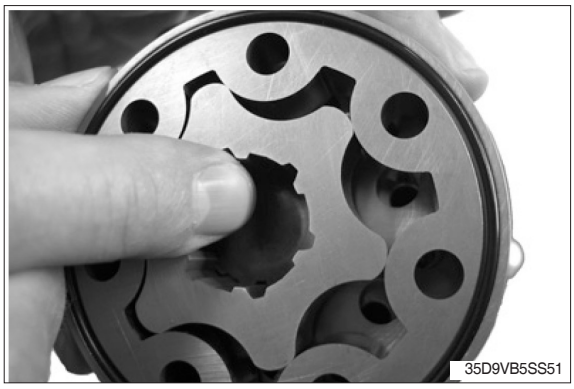
(24) Put distributor plate (16) on housing while aligning with thread holes.



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

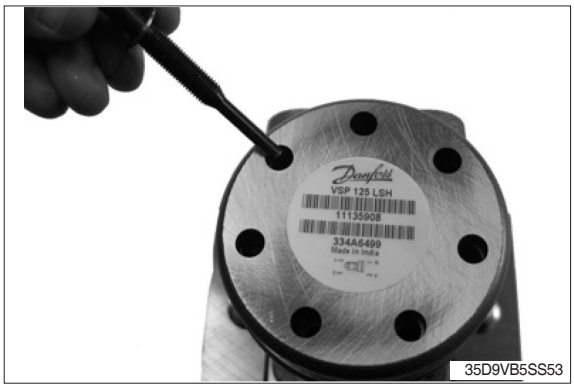


(26) Mount 2 O-rings (18) on gear wheel set (17), and put the set on cardan shaft (13). Align holes of gear wheel set with those of housing thread.



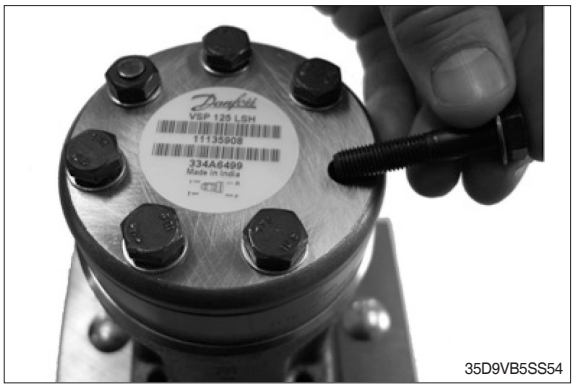
(27) Put end cover (19) on port while ensuring that product code is positioned parallel with port.

(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).

· Fastening torque : 3.1 ± 0.6 kgf · m

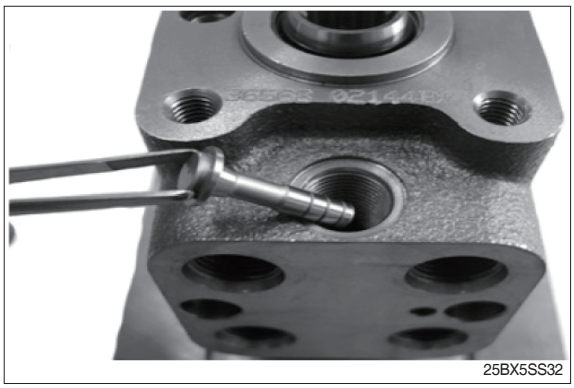


(30) Make use of Torx bit of size T50 to fasten check valve (37).
· Fastening torque : 2.6±0.5 kgf · m


35D9VB5SS55

※ **Manually test functional operation of VSP. Inner shaft should rotate at torque less than 3.5 N·m.**

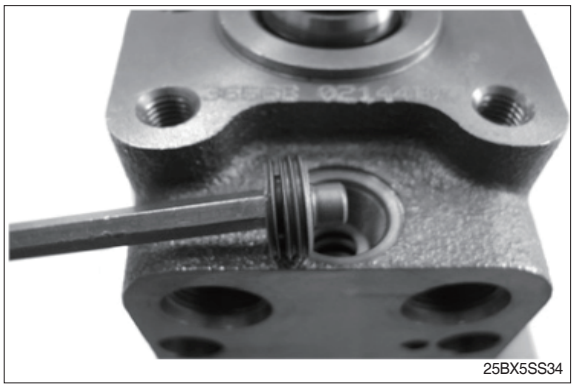
(31) Put steering unit assembly on assembling device on opposite side. Assemble piston (32) on housing.


25BX5SS32

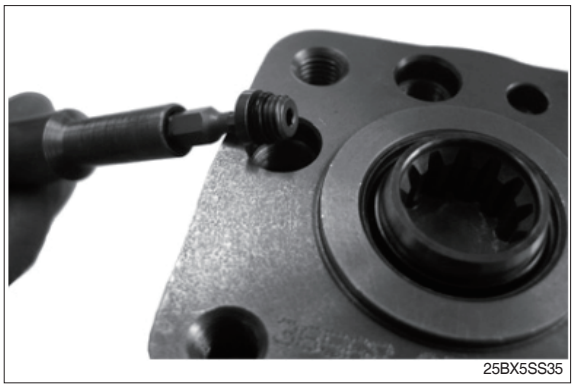
(32) Insert spring (31) into piston.


25BX5SS33

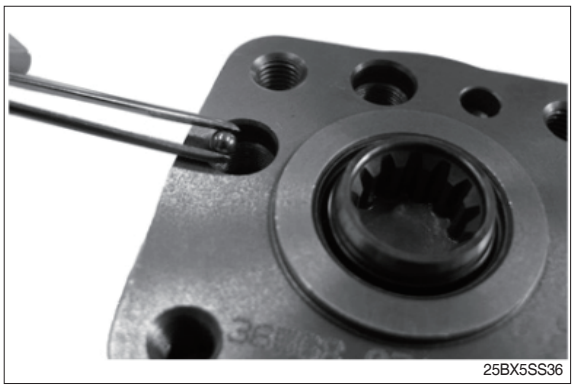
(33) Mount O-ring on adjusting screw (30), and fasten the screw with 6-㎜ Allen key. Set pressure on test panel in accordance with valve setup specifications.


25BX5SS34

(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


25BX5SS35

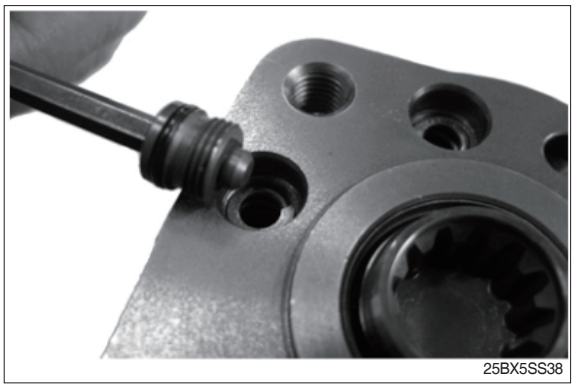
(35) Insert ball (27) into the same hole.


25BX5SS36

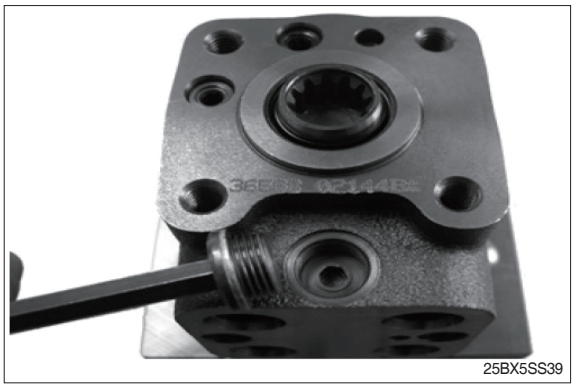
(36) Insert spring (26) onto ball.


25BX5SS37

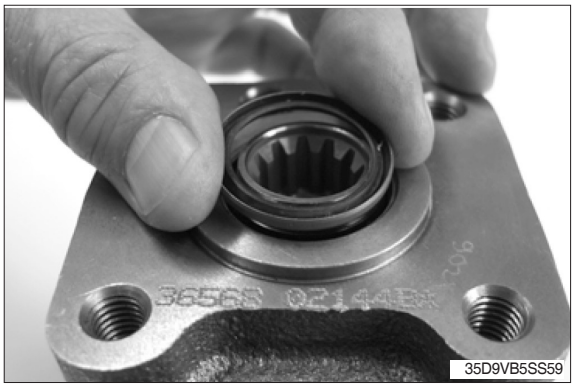
(37) Mount O-ring (40) on adjusting screw (25). Make use of 5-mm Allen key to fasten adjusting screw. Set pressure on test panel in accordance with valve setup specifications.


25BX5SS38

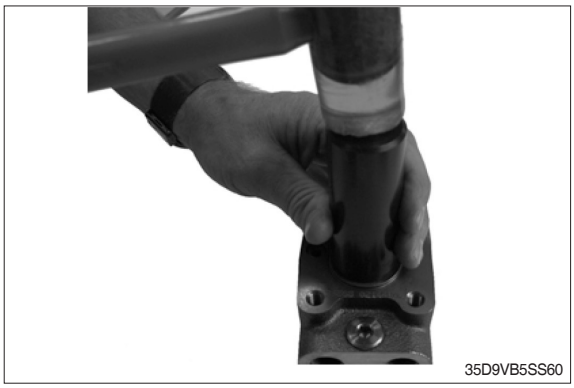
(38) Make use of 8-mm Allen key to fasten plug (42).
· Fastening torque : 6.6±0.5 kgf · m


25BX5SS39

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


35D9VB5SS59

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

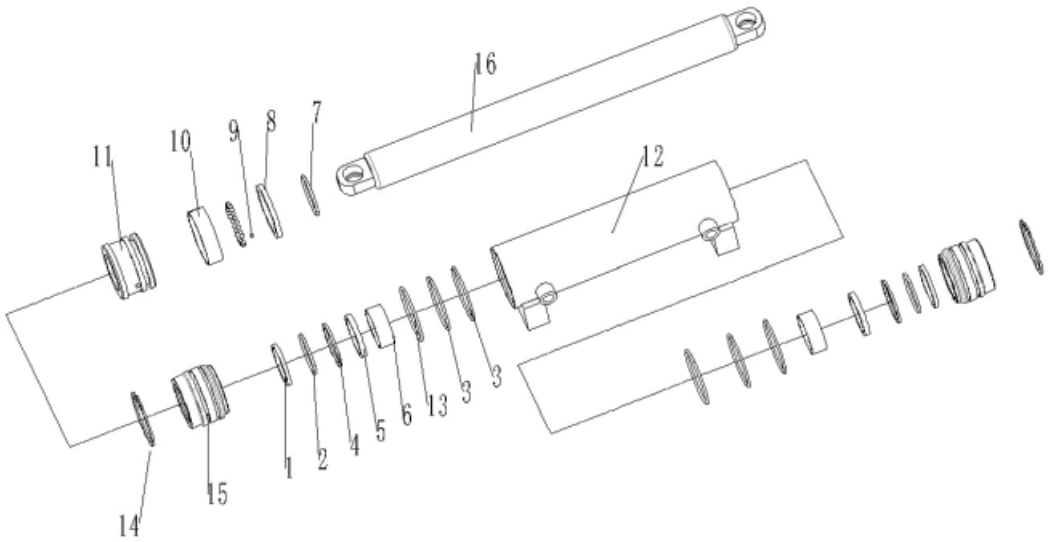

35D9VB5SS60

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


25BX5SS40

2. STEERING CYLINDER

1) STRUCTURE



25BX5SS14

1	Dust wiper	7	O-ring	13	Snap ring
2	O-ring	8	Piston	14	Circlip
3	O-ring	9	Ball	15	Rod cover
4	Shaft seal	10	Ring	16	Piston rod
5	Slice block	11	Piston		
6	Bearing	12	Tube assembly		

2) Disassembling

※ Drain oil from cylinder before attempting disassembling steering cylinder.

(1) Remove circlip (14).

(2) Push rod cover (15) toward tube assembly (12), and remove snap ring (13).

(3) Remove rod cover (15).

(4) Repeat Steps (1) to (3) to remove rod cover on the opposite side.

(5) Remove piston rod (16) and piston (11) from tube assembly (12).

(6) Check seal part for abrasion. If abraded, replace the part.

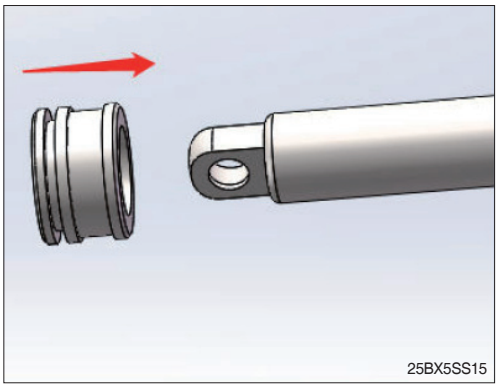
3) CHECKING AND INSPECTION

mm

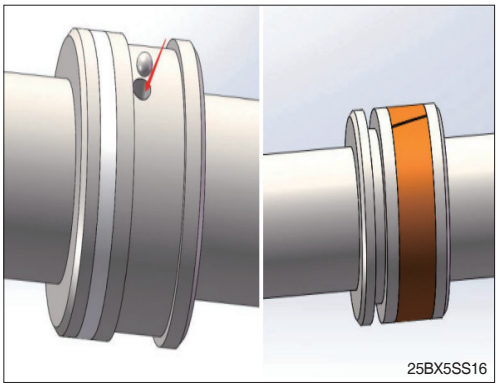
Inspection items	Criteria		Troubleshooting
	Standard dimensions	Limit on repair	
Play between cylinder tube and piston	0.080 - 0.220	0.3	Piston seal Replacing
Play between cylinder tube and bushing	0.024 - 0.174	0.2	Bushing Replacing
Seal, O-ring	Damaged		Replacing
Cylinder rod	Dented		Replacing
Cylinder tube	Corroded		Replacing

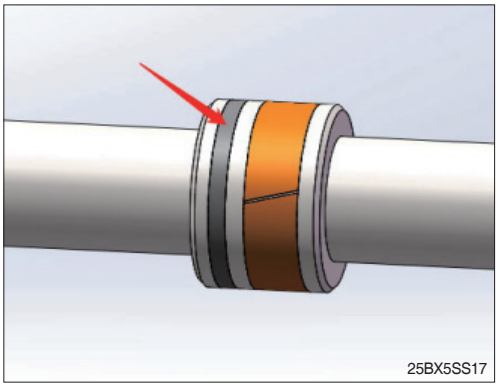
4) ASSEMBLING

(1) Insert piston (11) into piston rod (16).

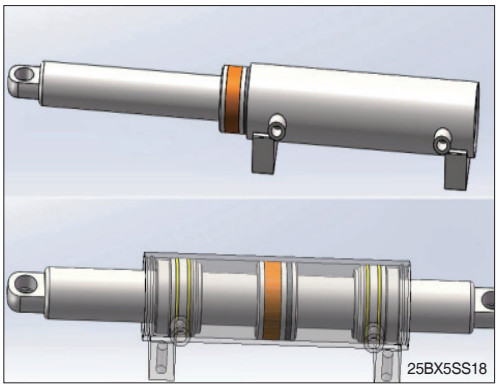


(2) Insert balls (9) until piston (11) is fully filled, and then mount ring (10) on piston groove and mount piston seal (8).

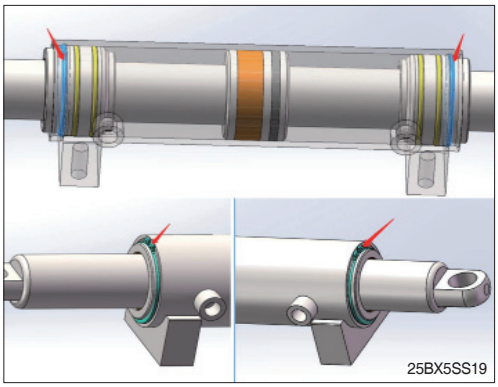




(3) Make use of tool to fasten piston rod (16), and insert piston rod into tube assembly (12). Mount rod covers (15) on the both sides of tube assembly.



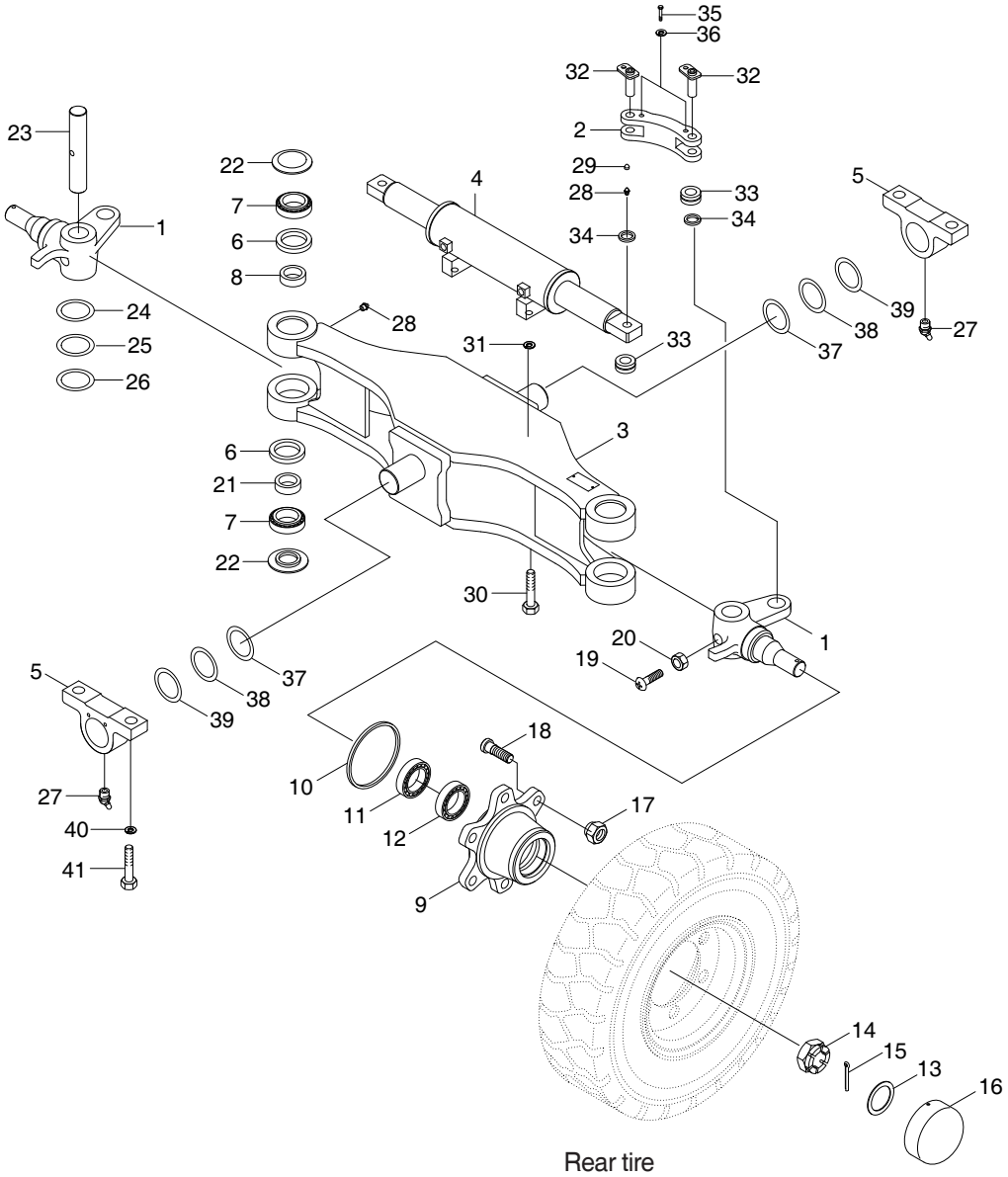
(4) Mount snap ring (13) on tube assembly (12) groove. Move piton rod (16) to the limited position. Mount circlip.



(5) Move piston rod several times for ensuring max. stroke. Mount O-rings and seals correctly before hydraulic oil plays on cylinder.

3. STEERING AXLE

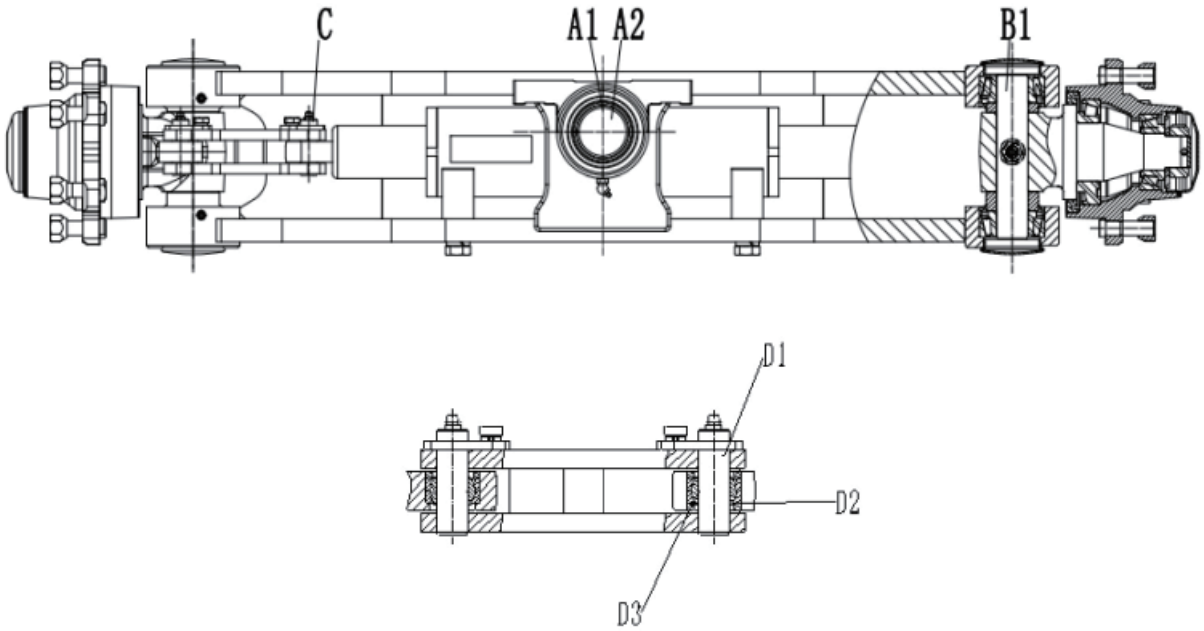
1) STRUCTURE



Rear tire

1	Steering knuckle	15	Hub pin	29	Dust cap
2	Steering link	16	Hub cap	30	Bolt
3	Axle frame	17	Hub nut	31	Washer
4	Steering cylinder	18	Hub bolt	32	Steering link pin
5	Trunnion block	19	Screw	33	Oscillating bearing
6	Oil seal	20	Nut	34	Bushing
7	Bearing	21	Rod ring	35	Bolt
8	Rod ring	22	Top cover	36	Washer
9	Wheel hub	23	King pin	37	Bushing
10	Oil seal	24	Shim (0.2 t)	38	Adjusting shim kit
11	Bearing	25	Shim (0.1 t)	39	Adjusting shim kit
12	Bearing	26	Shim (0.5 t)	40	Hardening washer
13	Washer	27	Nipple	41	Hexagonal bolt
14	Nut	28	Nipple		

2) CHECKING AND INSPECTION



25BX5SS20

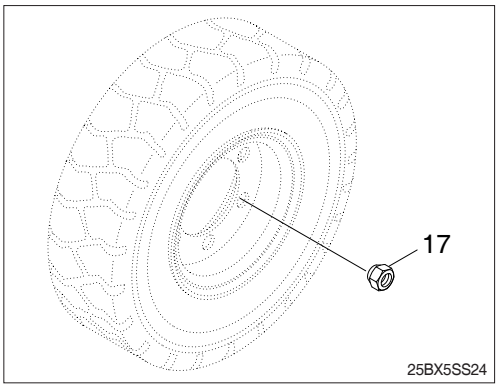
Unit : mm

Sequences	Inspection items			Criteria		Troubleshooting
				Standard dimensions	Limit on repair	
A	Shaft	A1	Shaft diameter	Ø50	Ø49.5	Replacing
		A2	Bushing inner diameter	Ø50	Ø49.5	
B	King pin diameter			Ø30	Ø29.8	
C	steering cylinder pin diameter			Ø16	Ø15.8	
D	Knuckle	D1	Pin diameter	Ø16	Ø15.8	
		D2	Vertical play	-	-	Adjusting with shim
		D3	Bushing inner diameter	Ø16	Ø16.2	Replacing

3) DISASSEMBLING

※ **It is allowed to repair knuckle part without removing shaft assembly from chassis.**
Lift up balance weight of system, and perform repair work.

(1) Loosen hub nut (17), and then remove tire.



(2) Remove hub cap (16).

(3) Pull dividing pin (15) out, and then remove washer (13) from slot nut (14).

(4) Make use of puller to remove wheel hub (9) together with taper roller bearings (11, 12).

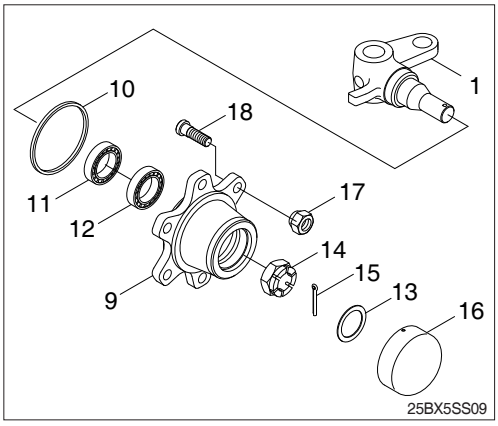
※ **Care should be exercised for preventing fall of taper roller bearings (11, 12) before removing wheel hub (9).**

(5) Remove inner wheel of bearings (11, 12) after removing wheel hub (9).

(6) Pull oil seal (10) out.

※ **Do not use same seal for twice or more.**

(7) Perform the same procedures on the opposite side.
Once disassembling is complete, assemble slot nut (14) on knuckle (1) for protecting threads.



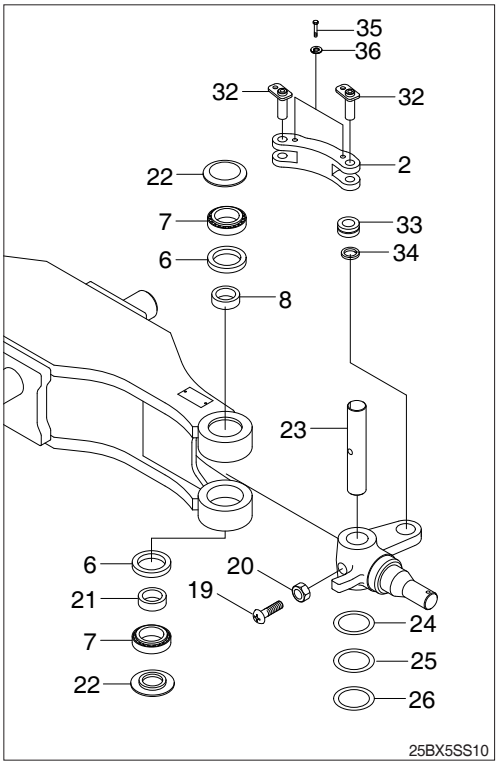
(8) Loosen bolt (19) and nut (20).

(9) Remove top cover (22).

(10) Push king pin (23) out while protecting knuckle from damage.

(11) Check bearing (7) for any damage, and pull it out if damaged.

(12) Loosen bolt (35), and remove steering link pin (32) and washer (36).



4) ASSEMBLING

※ **Before reassembling, clean all of parts, apply grease on lubrication parts, and replace dispensable parts such as oil seal and spring washer with new parts.**

(1) Assemble the parts in reverse order of disassembling.

※ **Fasten bolt (19), nut (20) and king pin (5).**

(2) There is groove on the center of king pin (5), and such groove should be toward bolt (19) during assembling.

(3) Always use dedicated tools. Fastening ring of bearing should be toward knuckle (1) when assembling bearing (7).

① Wheel hub

② Mount bolt (18) on wheel hub (9).

※ **Mount oil seal (10) and bearing races (11, 12) on wheel hub (9).**

③ Apply grease on bearing and oil seal before assembling.
Assemble wheel hub assembly on knuckle (1). Fasten slot nut (14) and washer (13), and lock them with division pin (15). When locking with division pin, rotate nut by one sixth turn to check hole for inserting division pin. Adjust preload of bearing.

④ Mount hub cap (16).