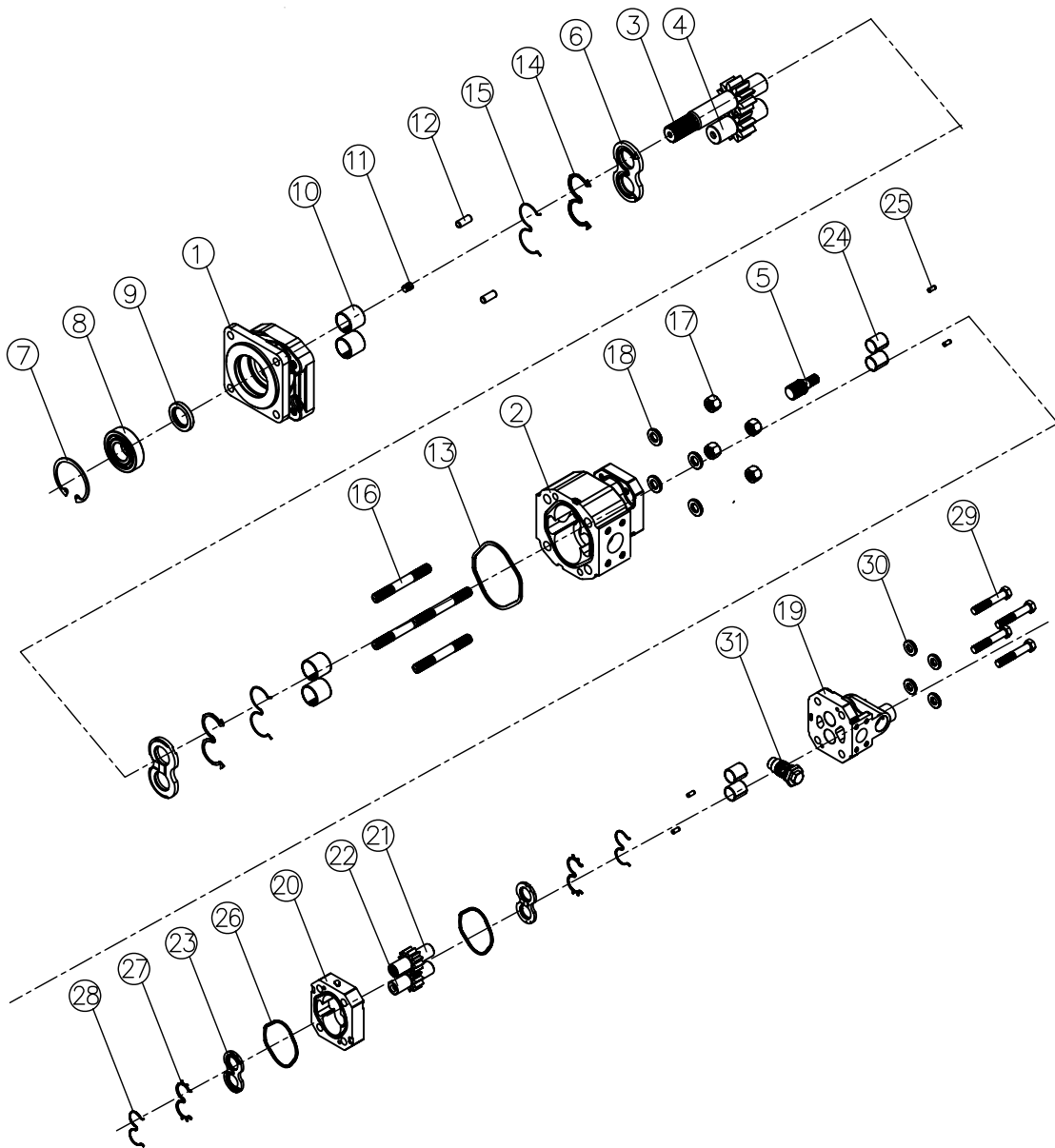


## GROUP 2 STRUCTURE AND FUNCTION

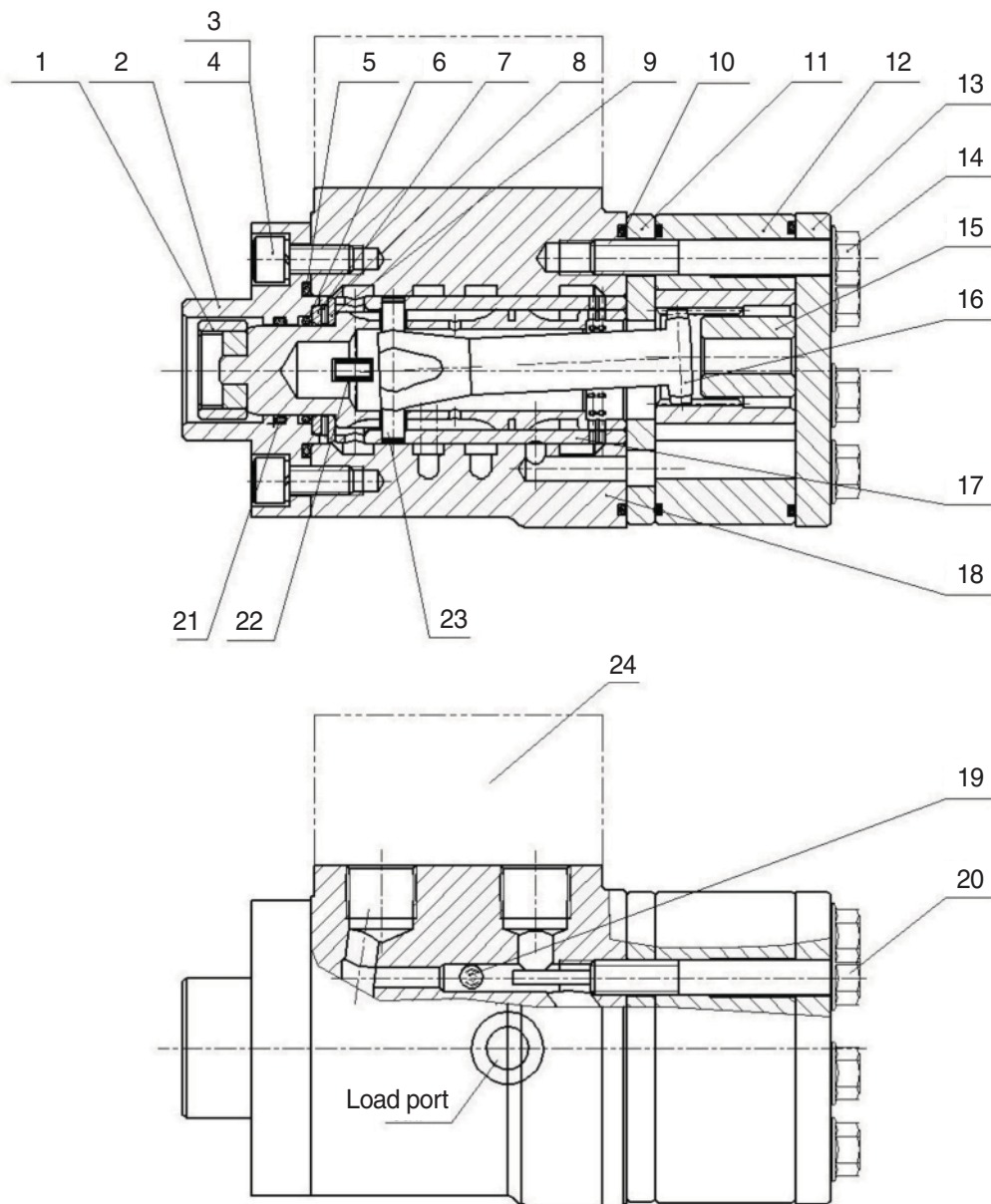
### 1. STEERING PUMP



1	Shaft end cover	12	Dowel pin	23	Thrust plate
2	Cover	13	O-ring seal	24	Bushing
3	Drive gear	14	Seal	25	Dowel pin
4	Idler gear	15	Back up ring	26	Seal
5	Connecting shaft	16	Stud	27	Seal
6	Thrust plate	17	Hexagon nut	28	Back up ring
7	Snap ring	18	Hardened washer	29	Stud
8	Outboard bearing	19	Cover	30	Hardened washer
9	Seal	20	Gear housing	31	Relief valve
10	Bushing	21	Drive gear		
11	Plug	22	Idler gear		

## 2. STEERING UNIT

### 1) STRUCTURE

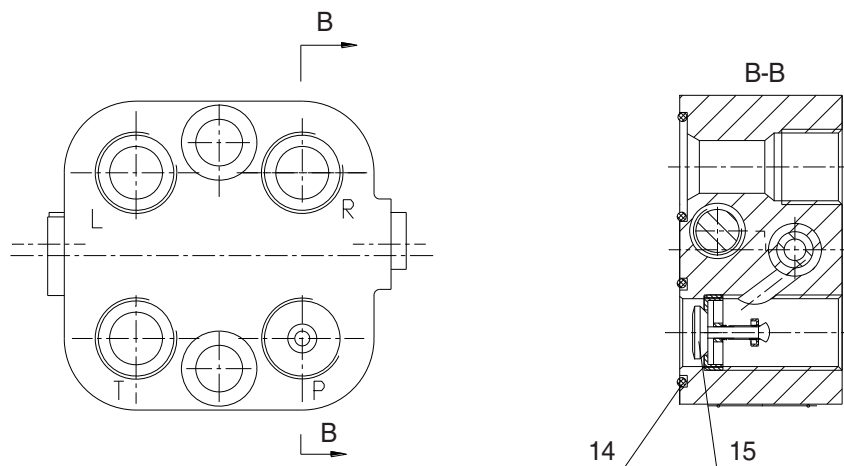


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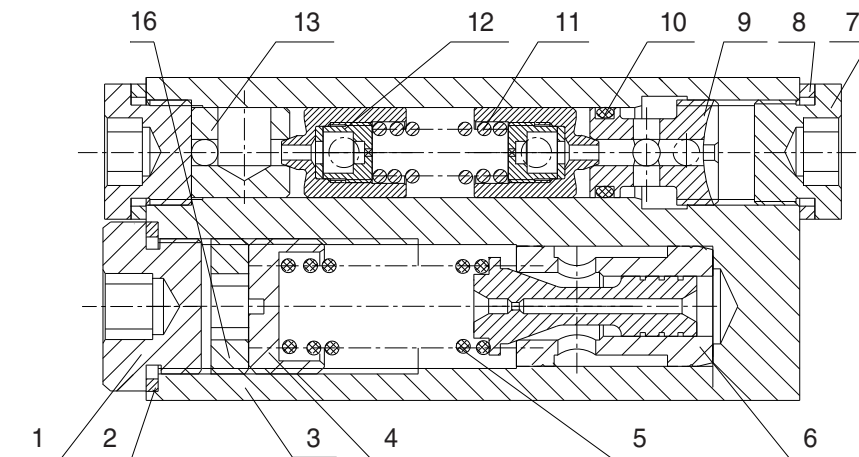
1	Coupler	9	Slip ring	17	Spool-sleeve
2	Front cover	10	O-ring	18	Body
3	Screw	11	Plate	19	Ball
4	Spring washer	12	Stator-rotor unit	20	Stop bolt
5	O-ring	13	Rear cover	21	O-ring
6	X-ring	14	Bolt	22	Spring
7	Snap ring	15	Stopper	23	Ping
8	Bearing	16	Drive	24	FK combination valve

## 2) PRINCIPLE

- (1) This steering unit has the function of flow amplification as well as load sensing. Besides flow amplification, this unit works in a same manner as normal load-sensing unit, combined with priority valve, constitute the load-sensing system. Once the steering wheel is turned, the spool of priority valve would be pushed due to a pressure signal from sensor, which would open new oil channel to steering unit and realize the function of turning. When the steering wheel is not being operated, oil would not flow into steering unit at all.
- (2) When the power steering system is applied, the pressure oil would partially flow into the stator-rotor unit with a certain ratio (flow amplification) and drive the rotor rotating along with the wheel column, the oil would correspondingly be pushed into a certain chamber of cylinders by this stator-rotor unit.  
When the mechanical steering system is applied, the stator-rotor unit plays a role as a pump, which would push the oil in steering cylinders from one chamber to another. The mechanical steering system provides limited turning torque.
- (3) Combination valve is available as an option for different systems depending on the requirements (some kind of systems are not required). This valve is used to integrate different kind of valves together such as safety valve, two-way overload valve, two-way oil fill valve and port check valve. The below figure shows the structure of combination valve.



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- |                 |                                |                     |
|-----------------|--------------------------------|---------------------|
| 1 Plug          | 7 Plug                         | 13 Base 2           |
| 2 Washer        | 8 Washer                       | 14 O-ring           |
| 3 Body          | 9 Overload-valve base1         | 15 Port check valve |
| 4 Plug          | 10 Seal                        | 16 Nut-lock         |
| 5 Spring washer | 11 Spring                      |                     |
| 6 Safety valve  | 12 Overload and oil fill valve |                     |

### 3) SPECIFICATION

Maximum system pressure	175 bar
Maximum operating back-pressure	21 bar
Maximum operating temperature	93°C
Maximum allowable temperature diff from system	28°C
Power steering torque (6.3 bar back-pressure)	1.7~2.8 NM
Magnification	1.6
Maximum torque allowable for mechanical-steering	136 NM
Recommended hydraulic oil	ISO VG32, 46, 68
FK combination valve pressure	Depend on system requirement

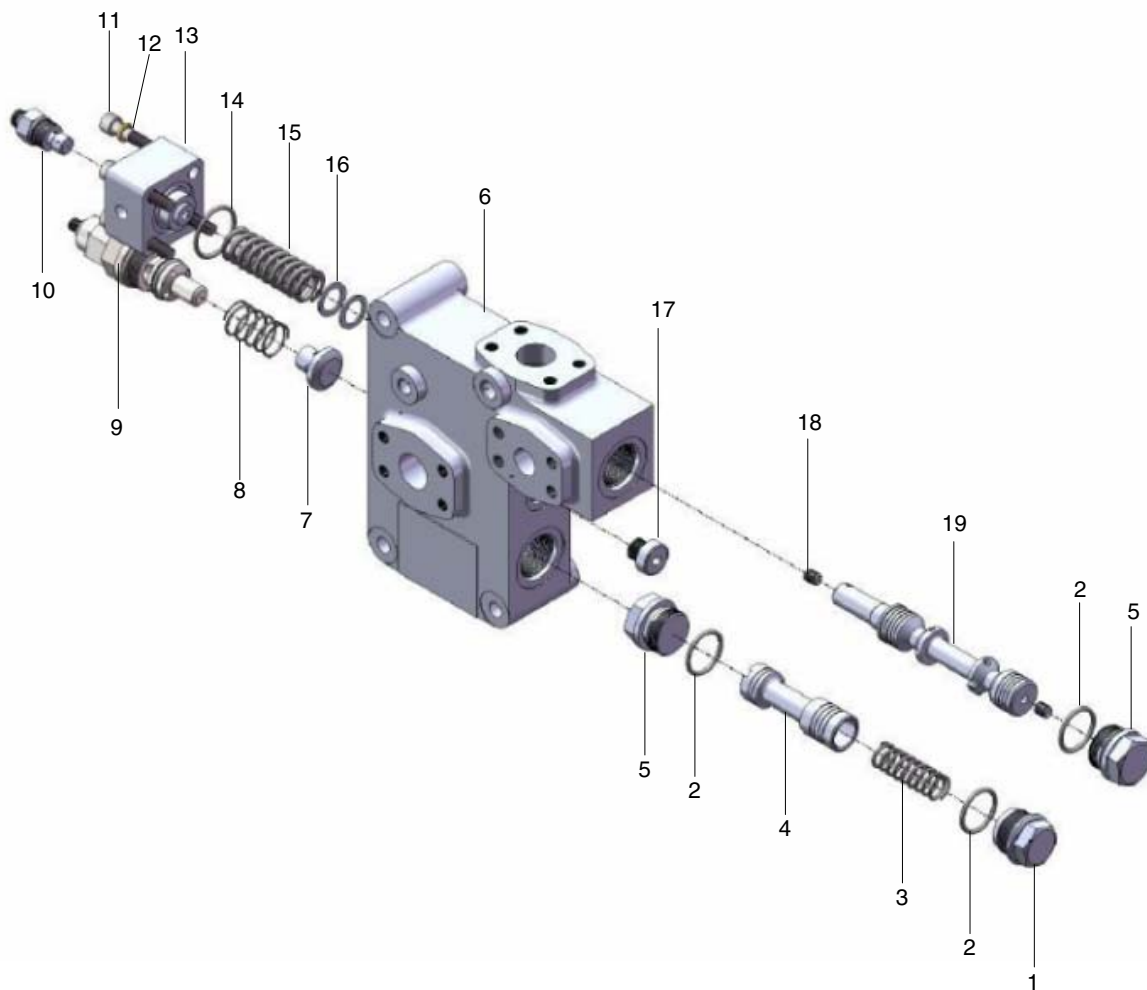
#### (4) Troubleshooting

Problem	Phenomenon	Cause	Remedy
Leakage	Junction leakage	Junctions polluted.	Check junctions and clean them up.
	Front cover leakage	Seals worn out.	Replace seals.
	Bolts (plugs) leakage	Insufficient pre-tightening torque.	Tighten bolts (plugs).
Heavy steering	Heavy steering when quick steering	Insufficient flow. Spool of priority valve was stuck.	Check pump and circuit. Check priority valve.
	Cylinder crawling Foam in fluid Sounding	Air in the system.	Release the air. Check air leakage of pump.
	Heavy steering, no reactions of steering cylinders	Damage on check valve of mechanical steering.	Check existence of steel ball. Check whether the check valve is stucked by dirt.
	No reactions of steering cylinders	Leakage on overload valve of combination valve. Internal leakage of cylinders.	Check internal leakage. Replace combination valve.
	Easy steering on light load Heavy steering on heavy load	Safety valve gasket leak or valve. spring failure.	Check and clean the safety valve in the priority valve.
	Heavy steering	High viscosity of fluid.	
Steering doesn't work	Spool cannot move back to neutral when not being operated	Invalid spring.	Replace spring.
	Severe pressure wave, even malfunction	Pin bended or fracture. Damage on slot of coupler.	Replace pin or coupler.
	Counter-steering or sway	Dislocation of shaft and rotor.	Reassemble.
	Drifting and no reaction	Two-way overload valve stucked by dirt. Invalid spring.	Check overload valve.
	No reaction	Priority valve stucked, no oil flows into steering unit through port "CF".	

Problem	Phenomenon	Cause	Remedy
Wheel column cannot rotate back to neutral automatically	Pressure loss at neutral position without unloading.	Steering column and spool are not co-axial.	Determined case by case.
		Steering column stuck spool at axial direction.	
		Too much resistant torque for steering wheel.	
Can't reach maximum turning angle	Cannot reach maximum turning angle and heavy steering.	Low relief pressure of safety valve.	Raise relief pressure of safety valve.
Endless	Slightly move can be applied with hard turn to wheel even the cylinder have reached the maximum angle.	Low relief pressure of overload valve.	Raise relief pressure of overload valve.
Steering weakness	No stop feeling at limiting position for power steering. Malfunction for mechanical steering.	Big clearance between stator and rotor at axial or radial direction.	Replace stator-rotorunit.

### 3. STEERING VALVE

#### 1) STRUCTURE



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- |   |                     |    |                   |    |                      |
|---|---------------------|----|-------------------|----|----------------------|
| 1 | Screw plug          | 8  | Spring            | 15 | Spring               |
| 2 | O-ring              | 9  | Safety valvel     | 16 | Washer               |
| 3 | Unload valve spring | 10 | Safety valve      | 17 | Hex socket plug      |
| 4 | Unload valve spool  | 11 | Bolt              | 18 | Damping plug         |
| 5 | Screw               | 12 | Shim              | 19 | Priority valve spool |
| 6 | Valve body          | 13 | Safety valve seat |    |                      |
| 7 | Check valve         | 14 | O-ring            |    |                      |

## 2) OVERVIEW

Steering valve is a control element of steering system. Upon supply of fluid for steering system in priority, excess fluid in steering system can be automatically relieved in a low pressure in case of a work condition with high pressure and small flow. Load relief pressure can be adjusted through pressure relief valve considering work condition to make up for deficiency of priority valve, reduce power loss, and decrease temperature rise in the system.

Steering valve features simple structure, reliable performance, and easy repair.

## 3) PRODUCT MODEL AND TECHNICAL DATA

(1) Product model : YSF 25 X

(2) Technical Data

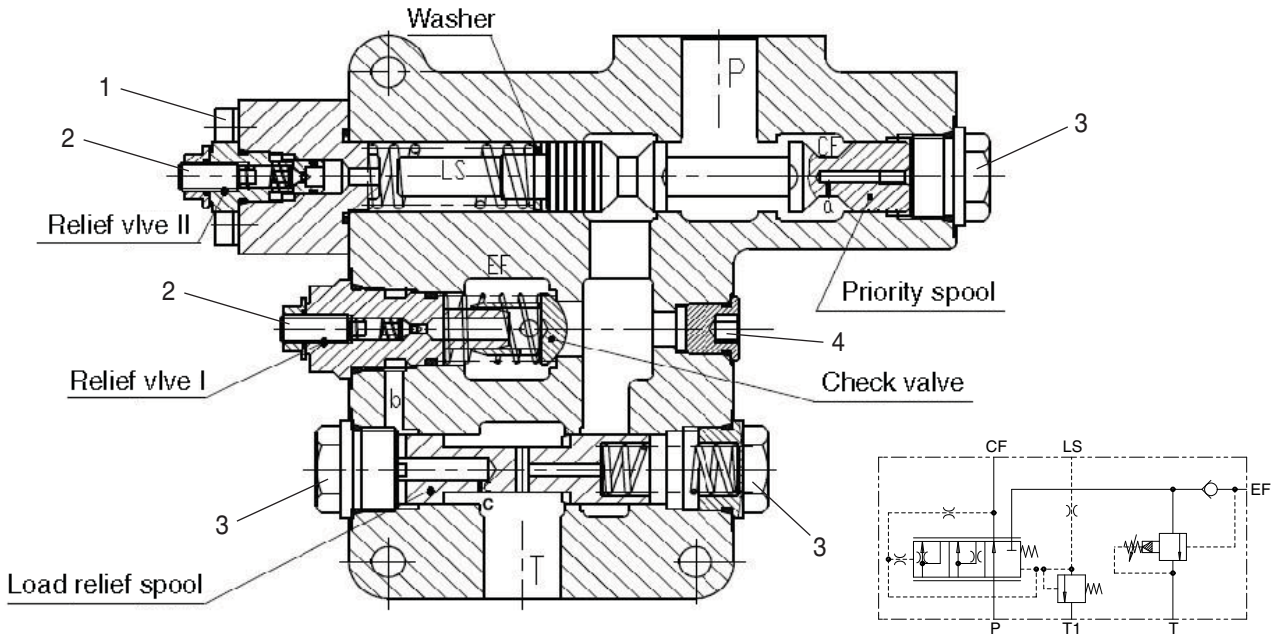
Item	Unit	Specification
Nominal pressure	MPa	20
Nominal flow	ℓ /min	160
Nominal internal diameter	mm	25
Nominal pressure of steering relief valve	MPa	16
Nominal pressure of load relief valve	MPa	14
Control pressure	MPa	1.1



#### 4) PRINCIPLE OF CIRCUIT AND CONNECTION SIZE

##### (1) Principle of circuit

- ① This valve is mounted on steering circuit, between steering pump and load sensor hydraulic steering control unit. P is inlet port connecting to steering pump. CF is steering port connecting to flow inlet of steering gear, EF is service port connecting to main control valve of working system, LS is control port connecting to load sensor port of steering gear, and T is load relief valve connecting to tank.



- ② When loader is in raising work, the flow from steering pump is directed to P port, orifice (a) through to the right end of priority spool. The pressure fluid will resist the control pressure from spring to push the priority spool to move to the left to make the flow from steering pump to open check valve which is then directed to EF port and then to working system by combination of flow, to meet requirement for a large quantity of flow. When loader is under high pressure and small flow working condition as excavating, high pressure fluid in EF port causes load relief valve to open and control fluid is directed to way (b) through to the left end of spool, then to orifice (c) and T. The difference in pressure formed in the process causes load relief spool to resist the force of spring of load relief valve to move to the right, and fluid in P is relieved directly through load relief port T.
- ③ When loader is in steering operation, the flow from steering pump is directed to CF, supplied to steering gear in priority. At the time, LS port receives load feedback signal of steering gear and, when the load is too much, steering relief valve opens, causing priority spool to move to the left, and the flow from steering pump is directed to check valve, EF port, main control valve and then relieved.

Item	Size	Torque		Quantity
		kgf · m	lbf · ft	
1	M10	4.5~5.9	32.5~42.8	4
2	M18 × 1	4.1	29.5	1
3	M30 × 1.5	9.7~12.7	70.1~92.2	4
4	M14 × 1.5	2.0	14.8	2

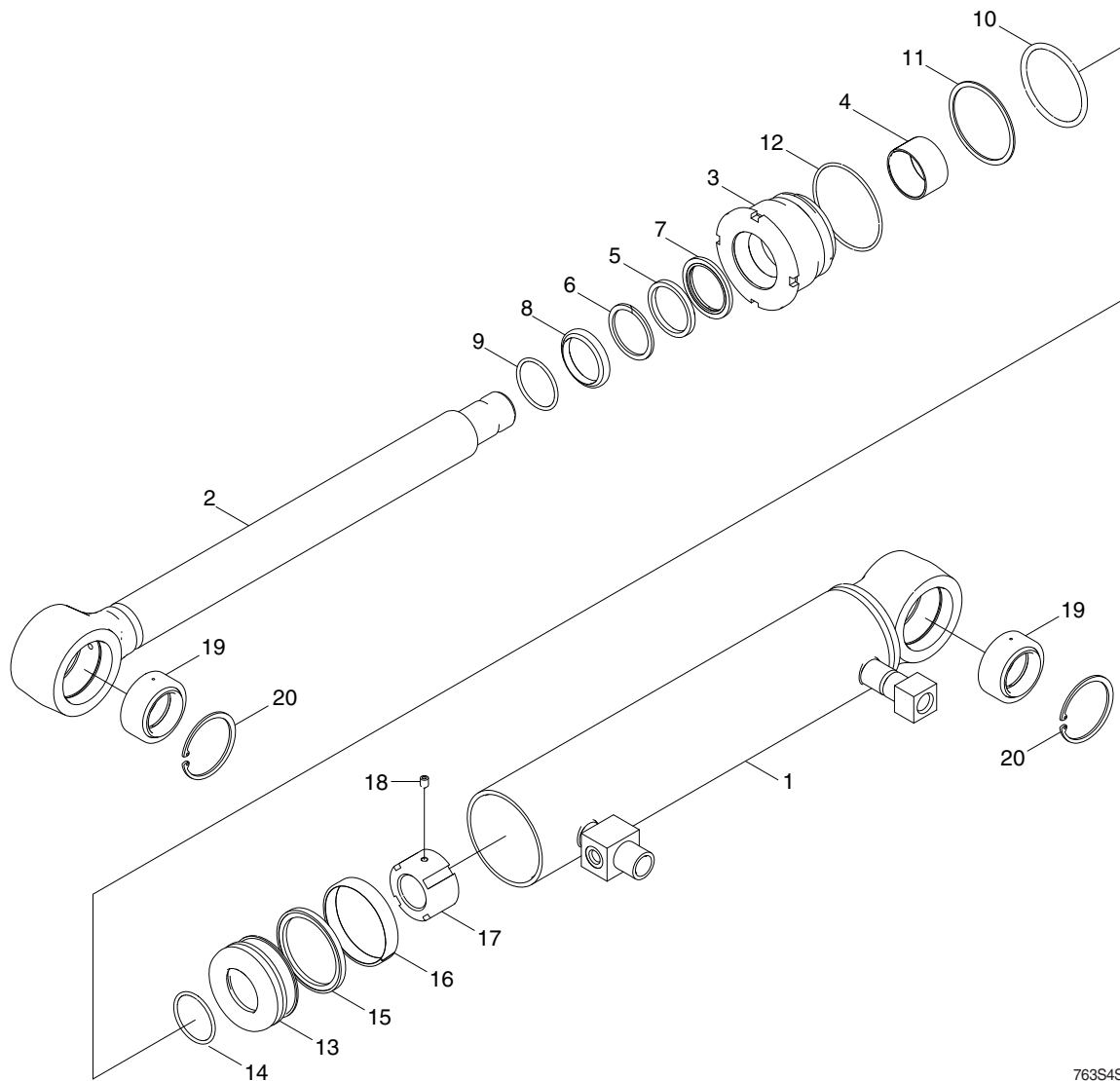
## 5) MOUNTING AND USING

- (1) When transporting, mounting, and storing the product, be careful that the product does not receive impacts that may damage the machined surface.
- (2) Never disassemble the product in a dusty place before assembling to machine to prevent dust from entering.
- (3) Before using the product, check there is no scratch or rust on the joint surface.
- (4) Operating fluid should be clean, cleanliness meeting ISO4406 19/16 grade and up.
- (5) Allowable oil temperature range : -20 ~ 110°C.

## 6) TROUBLESHOOTING

Problem	Cause	Remedy
Too low steering pressure or heavy steering	<ol style="list-style-type: none"> <li>1. Damaged steering relief valve.</li> <li>2. Dirt fluid has caused stuck spool.</li> </ol>	<ol style="list-style-type: none"> <li>1. Clean or replace with new relief valve.</li> <li>2. Change fluid, and disassemble and clean the valve.</li> </ol>
Insufficient flow in working system	<ol style="list-style-type: none"> <li>1. Damaged load relief valve</li> <li>2. Dirt fluid has caused stuck spool.</li> <li>3. Orifice <b>a</b> is clogged</li> </ol>	<ol style="list-style-type: none"> <li>1. Clean or replace with new relief valve.</li> <li>2. Change fluid, and disassemble and clean the valve.</li> <li>3. Clean the orifice.</li> </ol>
Too high fluid temperature	<ol style="list-style-type: none"> <li>1. Dirt has made the priority spool stuck.</li> <li>2. Damaged priority spool spring.</li> <li>3. Dirt has made the load relief valve stuck.</li> </ol>	<ol style="list-style-type: none"> <li>1. Remove and clean, and then replace.</li> <li>2. Replace with a good spring.</li> <li>3. Remove and clean, and then replace.</li> </ol>
Leakage	<ol style="list-style-type: none"> <li>1. Damaged or deteriorated O-ring.</li> <li>2. Poor sealing at flange joining port.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace with good O-ring.</li> <li>2. Check the sealing and make it even.</li> </ol>

## 4. STEERING CYLINDER



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- |   |              |    |              |    |                |
|---|--------------|----|--------------|----|----------------|
| 1 | Tube assy    | 8  | Dust wiper   | 15 | Piston seal    |
| 2 | Rod assy     | 9  | Snap ring    | 16 | Wear ring      |
| 3 | Gland        | 10 | O-ring       | 17 | Lock nut       |
| 4 | Bushing      | 11 | Back up ring | 18 | Set screw      |
| 5 | Rod seal     | 12 | O-ring       | 19 | Bearing        |
| 6 | Back up ring | 13 | Piston       | 20 | Retaining ring |
| 7 | Buffer ring  | 14 | O-ring       |    |                |