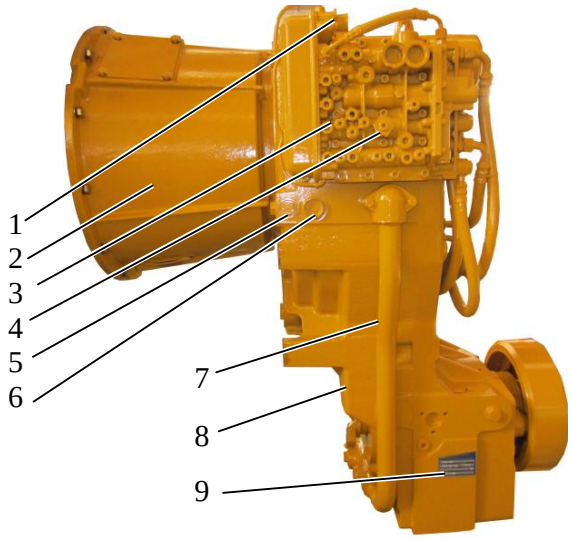
2 Transmission System

2.1 Transmission Introduction

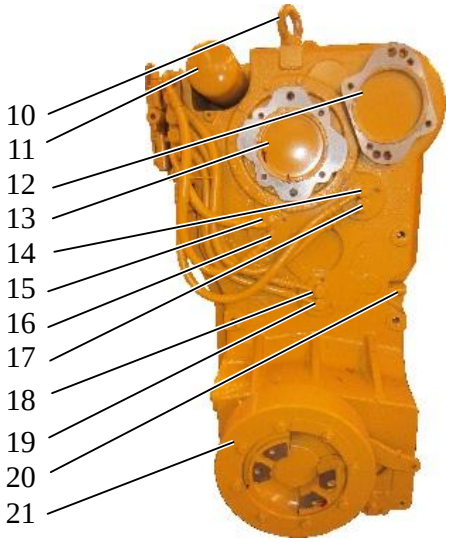
2.1.1 General Overview of the Transmission

The ZF power gearshift transmission is composed of the hydraulic torque converter and rear-mounted countershaft transmission with multi-sheet friction clutch. The SDLG 938L、948L wheel loader adopts the 4WG158 gearbox assembly ，the SDLG 958L、959、968 wheel loader adopts the 4WG200 gearbox assembly which can realize speed switching between 4 forward gears and 3 reverse gears. The SDLG G9190 grader adopts the 6WG200 gearbox assembly which can realize speed switching between 6 forward gears and 3 reverse gears



1. Connecting socket
2. Torque converter shell
3. Transmission control valve
4. Transmission pressure measuring port
5. Torque converter oil temperature measuring port
6. Transmission oil outlet
7. Oil suction pipe
8. Transmission housing
9. Nameplate

Figure 2-1



10. Lifting ring screw
11. Oil filter
12. Auxiliary PTO
13. Main PTO
14. KV
15. KR
16. K2
17. K1
18. K3
19. K4
20. Rotation speed sensor
21. Parking brake

Figure 2-2

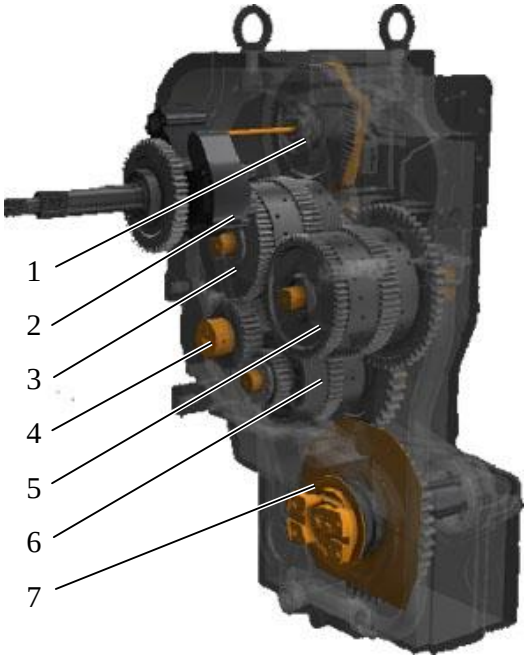


Figure 2-3

1. Auxiliary PTO
2. Variable speed pump
3. KVK1 clutch assembly
4. Intermediate shaft component
5. KRK2 clutch assembly
6. K3K4 clutch assembly
7. Output shaft assembly

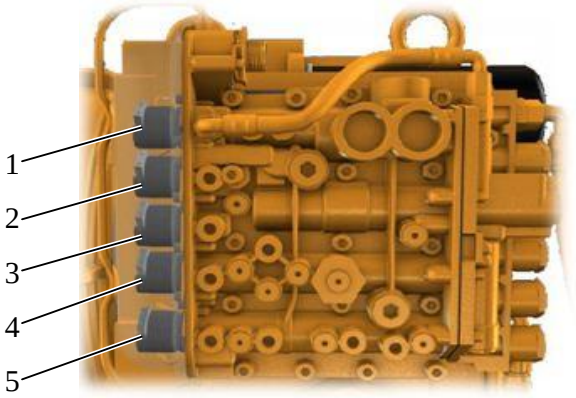


Figure 2-4

1. M4 2. M3 3. M5 4. M2 5. M1

2.1.2 Basic Parameters of the Transmission-torque Converter Assembly

Table 2-1

Item \ Type	4WG158	4WG200	6WG200
Transmission gear	Four forward gears and three reverse gears		Six forward gears and three reverse gears
Torque converter inlet oil pressure (bar)	8.5		
Torque converter outlet oil pressure (bar)	5		
Transmission working pressure (bar)	16&18		
Gearbox oil draining capacity（L）	35		

2.1.3 Mechanical Principles of the Gears of the Transmission (4WG158/200)

1. First forward gear

$Z_0 \rightarrow Z_V \rightarrow Z_{V1} \rightarrow Z_1 \rightarrow Z_2 \rightarrow Z_3 \rightarrow Z_{output}$

The solenoid valves M2, M3, M4 act and the transmission pressure oil flows into KVK1 clutch, thus respectively pushing the piston to move; pressing the interior friction lining out of the clutches and forming the transmission subassembly.

The power transmission route: Driving gear Z_0→ forward gear input gear Z_V→ forward gear clutch KV→ KV1 ring gear assembly Z_{V1}→ first gear clutch K1→ gear Z_1 of the first gear→ second gear combination gear Z_2→ gear Z_3 of the third gear→ output shaft gear Z_{output}→ output shaft, as shown in Figure 2-5

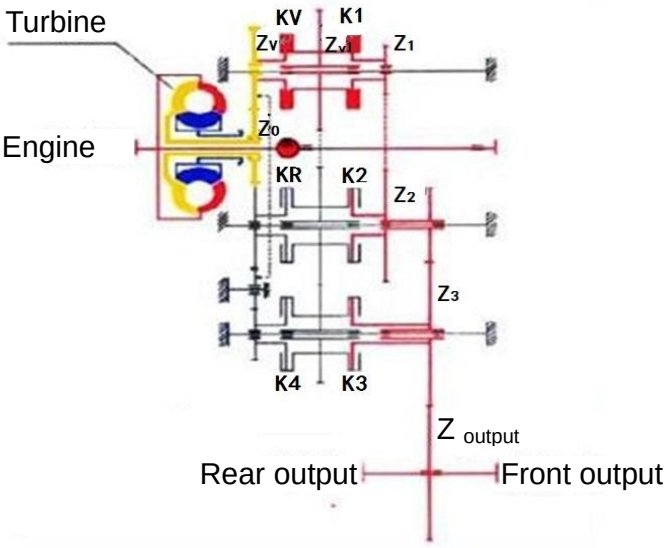


Figure 2-5

2. Second forward gear

The solenoid valves M3 and M4 act and the transmission pressure oil flows into KVK2 clutch, thus respectively pushing the piston to move; pressing the interior friction lining out of the clutches and forming the transmission subassembly.

The power transmission route: Driving gear Z_0→ forward gear input gear Z_V→ forward gear clutch KV→ KV1 ring gear assembly Z_{V1}→ KR2 ring gear assembly Z_{R2}→ second gear clutch K2→ second gear combination gear Z_2→ gear Z_3 of the third gear→ output shaft gear Z_{output}→ output shaft, as shown in Figure 2-6

$Z_0 \rightarrow Z_V \rightarrow Z_{V1} \rightarrow Z_{R2} \rightarrow Z_2 \rightarrow Z_3 \rightarrow Z_{output}$

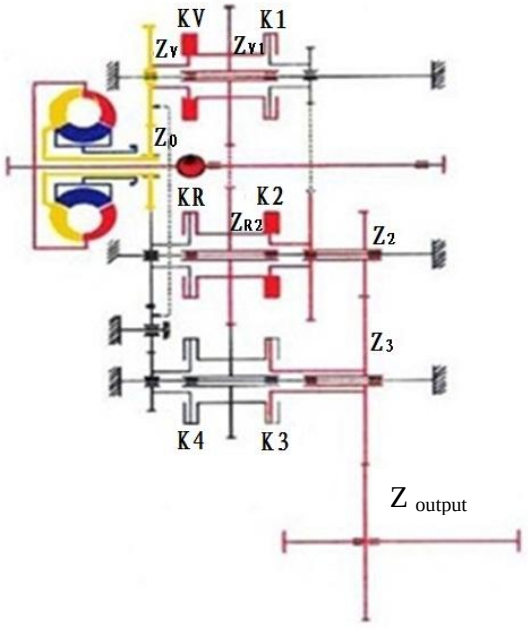


Figure 2-6

3. Third forward gear

The solenoid valve M3 acts and the transmission pressure oil flows into KVK3 clutch, thus respectively pushing the piston to move; pressing the interior friction lining out of the clutches and forming the transmission subassembly.

The power transmission route: Driving gear Z_0→ forward gear input gear Z_V→ forward gear clutch KV→ KV1 ring gear assembly Z_{V1}→ KV2 ring gear assembly Z_{R2}→ K34 ring gear assembly Z_{34}→ third gear clutch K3→ gear Z_3 of the third gear→ output shaft gear Z_{output}→ output shaft, as shown in Figure 2-7

$Z_0 \rightarrow Z_V \rightarrow Z_{V1} \rightarrow Z_{R2} \rightarrow Z_{34} \rightarrow Z_3 \rightarrow Z_{output}$

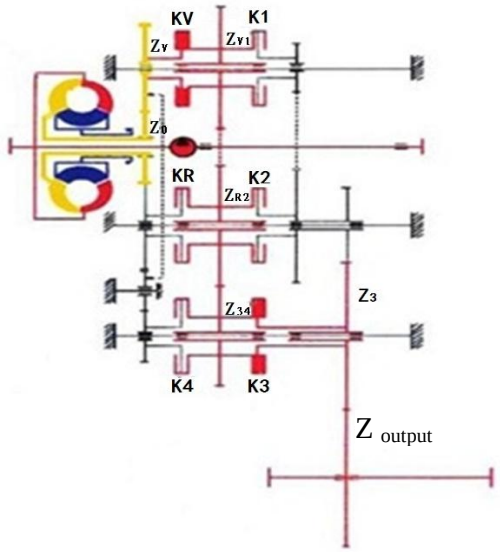


Figure 2-7

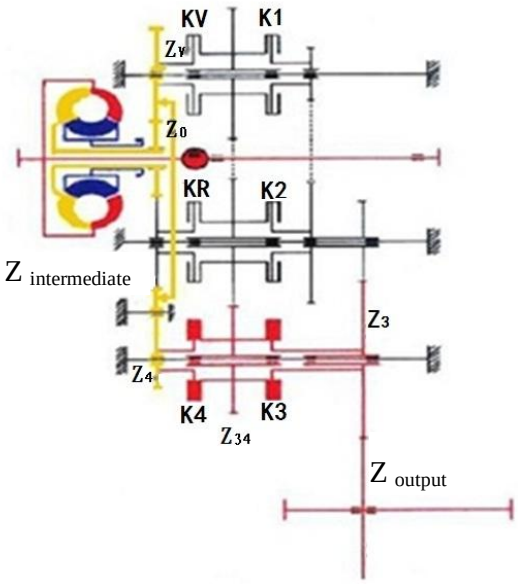


Figure 2-8

4. Fourth forward gear

The solenoid valve M5 acts and the transmission pressure oil flows into K3K4 clutch, thus respectively pushing the piston to move; pressing the interior friction lining out of the clutches and forming the transmission subassembly.

The power transmission route: Driving gear Z_0→ forward gear input gear Z_V→ intermediate gear $Z_{intermediate}$→ gear Z_4 of the fourth gear→ fourth gear clutch K4→ K34 ring gear assembly Z_{34}→ third gear clutch K3→gear Z_3 of the third gear→ output shaft gear Z_{output}→ output shaft, as shown in Figure 2-8

$Z_0 \rightarrow Z_V \rightarrow Z_{intermediate} \rightarrow Z_4 \rightarrow Z_{34} \rightarrow Z_3 \rightarrow Z_{output}$

5. First reverse gear

The solenoid valves M1, M2, M4 act and the transmission pressure oil flows into KRK1 clutch, thus respectively pushing the piston to move; pressing the interior friction lining out of the clutches and forming the transmission subassembly.

The power transmission route: Driving gear Z_0→ reverse gear input gear Z_R→ reverse gear clutch KR→ KR2 ring gear assembly Z_{R2}→ KV1 ring gear assembly Z_{V1}→ first gear clutch K1→ gear Z_1 of the first gear→ second gear combination gear Z_2→ gear Z_3 of the third gear→ output shaft gear Z_{output}→ output shaft, as shown in Figure 2-9

$Z_0 \rightarrow Z_R \rightarrow Z_{R2} \rightarrow Z_{V1} \rightarrow Z_1 \rightarrow Z_2 \rightarrow Z_3 \rightarrow Z_{output}$

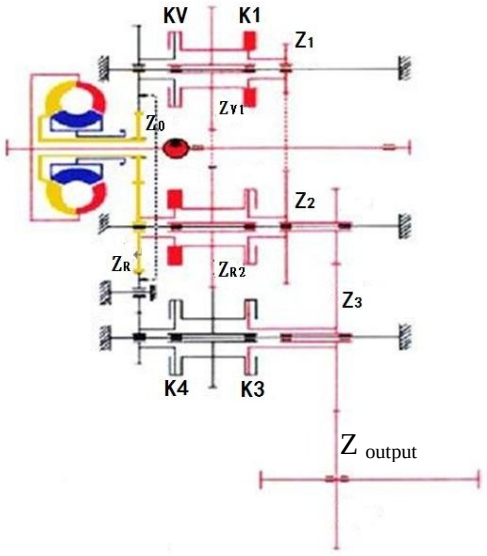


Figure 2-9

6. Second reverse gear

The solenoid valves M1 and M4 act and the transmission pressure oil flows into KRK2 clutch, thus respectively pushing the piston to move; pressing the interior friction lining out of the clutches and forming the transmission subassembly.

The power transmission route: Driving gear Z_0→ reverse gear input gear Z_R→ reverse gear clutch KR→ KR2 ring gear assembly Z_{R2}→ second gear clutch Z_2→second gear combination gear Z_2→ gear Z_3 of the third gear→ output shaft gear Z_{output}→ output shaft, as shown in Figure 2-10

$Z_0 \rightarrow Z_R \rightarrow Z_{R2} \rightarrow Z_2 \rightarrow Z_3 \rightarrow Z_{output}$

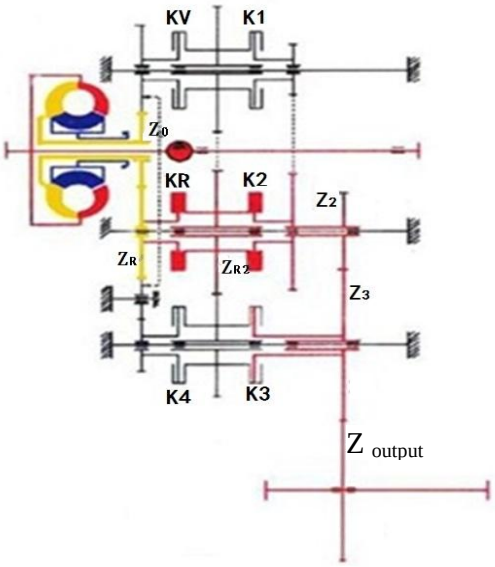


Figure 2-10

7. Third reverse gear

The solenoid valve M1 acts and the transmission pressure oil flows into KRK3 clutch, thus respectively pushing the piston to move; pressing the interior friction lining out of the clutches and forming the transmission subassembly.

The power transmission route: Driving gear Z_0→ reverse gear input gear Z_R→ reverse gear clutch KR→ KR2 ring gear assembly Z_{R2}→ K34 ring gear assembly Z_{34}→ third gear clutch K3→ gear Z_3 of the third gear→ output shaft gear Z_{output}→ output shaft, as shown in Figure 2-11

$Z_0 \rightarrow Z_R \rightarrow Z_{R2} \rightarrow Z_{34} \rightarrow Z_3 \rightarrow Z_{output}$

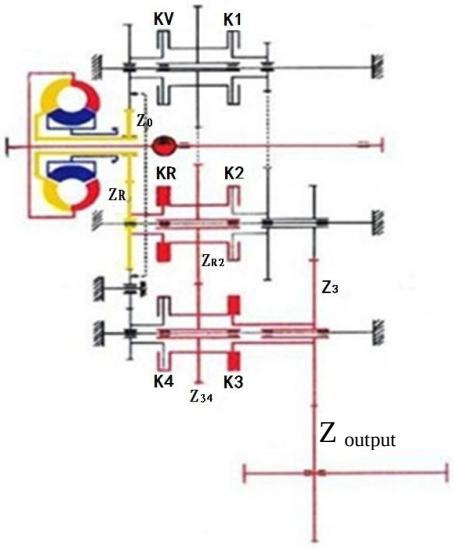


Figure 2-11

The working conditions of the corresponding solenoid valves and clutches are shown in Table 2-2:

Table 2-2

	●Electrified solenoid valve										
	Forward gear				Reverse gear			Neutral gear			
Gear	1	2	3	4	1	2	3	1	2	3	4
M1					●	●	●				
M2	●				●			●			
M3	●	●	●								
M4	●	●			●	●		●	●		
M5				●							
Clutch	KV	KV	KV	K4	KR	KR	KR	K3			
Clutch	K1	K2	K3	K3	K1	K2	K3				

The pressure measuring ports of all gears are shown in Figure 2-12:

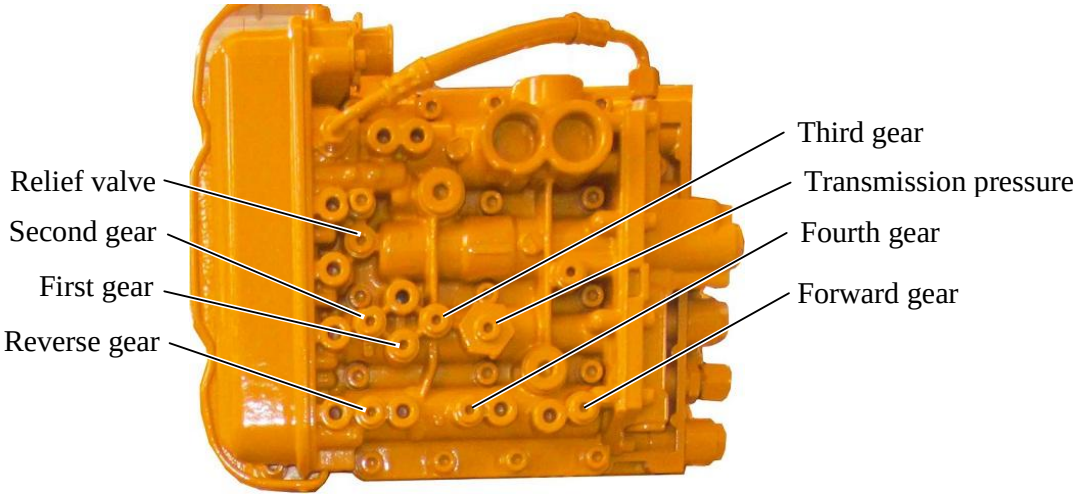


Figure 2-12

Standard pressure of all measuring ports: The pressure of the first gear and the second gear is 16bar; the pressure of the third gear and the fourth gear is 18bar, and the relief valve pressure is 10bar. The KV (forward)/KR (reverse) clutch pressure will change along with gear changes, and the transmission pressure is same as that of the corresponding gear.

2.1.4 Introduction to KD Key Functions (4WG158/200)

(1) KD (Kick-Down) function, namely the low gear shift function.

There is one button at the end of DW-2 gearshift handle, which is the KD key, and it can be used to decrease the vehicle speed to the first forward gear from the second forward gear.

(2) Brake power cutoff function of the first gear and the second gear.

In the electric control system, two pressure cutoff switches (one is the service brake pressure switch and one is the emergency/parking brake pressure switch) can be connected. When the driver steps down the foot brake pedal for brake; due to interaction between the brake pressure and the service brake pressure switch, the pressure switch will turn on the power circuit and the computer (namely the electric control box) circuit (equivalent to one electric signal of the computer), and then the computer will command the transmission control valve to act and cut off the pressure oil passage of the transmission clutch, namely the transmission power from the engine. In such case, all power of the engine will be transmitted to the working pump of the loader. Accordingly, when the first and second gears work, the working hydraulic system of the loader will have more sufficient power to perform excavation operation, thus improving the working efficiency of the working device.

In addition, when pressing down the emergency/parking brake button, the emergency/parking brake pressure switch will also act; the pressure switch will turn on the power circuit and the computer circuit, and then the computer will command the transmission control valve to act (namely the transmission power from the engine will be cut off in case of emergency brake), thus improving the brake effect.

(3) Neutral gear locking function and neutral gear start interlock function for vehicle safety improvement.

The gear control handle DW—2 is designed and installed at the lower left part of the steering wheel; if rotating the handle, the speed can be changed to the first, second, third and fourth gears, as shown in Figure 2-13. If pushing the control handle forwards, the vehicle will be driven forwards; if pushing the control handle backwards, the vehicle will be driven backwards; if the control handle stays at the neutral gear, the vehicle will keep still.



Figure 2-13 Gear Control Handle of 4WG200 Transmission

The neutral gear safety lock is used to avoid vehicle movement due to misoperation. When turning the safety lock to position “D”, the vehicle gear will be engaged for traveling; when turning the safety lock to position “N”, the vehicle will be locked at the neutral gear.

If engaging the neutral gear and rotating the locking button of the neutral gear safety lock of the gearshift handle to the locking position (at position “N”), the vehicle will be locked at the neutral gear to avoid gear engagement due to misoperation.

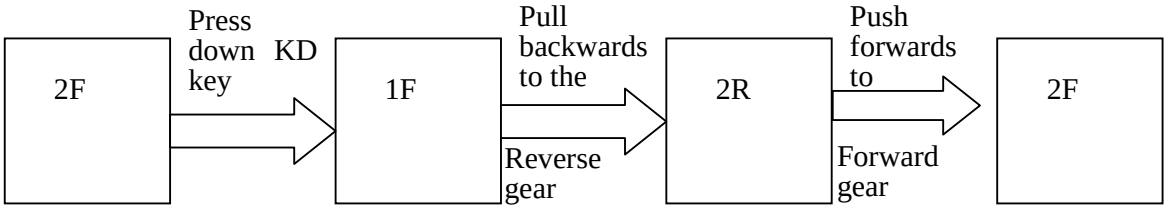
The engine can be started if engaging the neutral gear. When engaging the neutral gear and opening the electric lock, the gearshift handle will send an electric signal to the start interlock relay, and then the start circuit will be connected; or else, the engine can't be started.

(4) Working process of KD key of ZF transmission

With KD function (namely the forced low gear shift function), the loader working efficiency can be greatly enhanced. During operation, the loader will be started at the second gear and then driven at the third gear; when approaching to sand and stone material piles, the second gear will be engaged. In case of material excavation, if pressing down KD key (without rotating the gearshift handle), the vehicle speed will be automatically reduced to the first gear. When the bucket is full, pull the gearshift handle backwards to the reverse gear, and the vehicle can be automatically turned to the second reverse gear from the first forward gear.

When being driven backwards to a proper position, push the gearshift handle forwards to the forward gear and change speed according to following process: 2R → 2F → 3F → 2F. Before being driven to the dump truck and discharging materials onto the dump truck, change speed according to following process: 2F → 2R → 3R → 2R, and then the loader will return to the start point. KD function will be released after rotating the gearshift handle.

In case of material excavation, it is unnecessary to rotate the loader handle to select the speed gear, just perform operation according to steps shown in Figure 2-14:



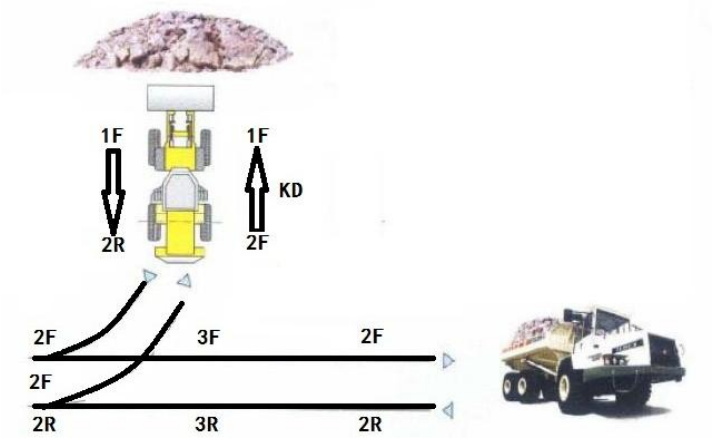


Figure 2-14

2.1.5 Operation and Maintenance of ZF Power Gearshift Transmission

1. Application precautions

(1) When checking the transmission oil level, the engine shall run at idle speed (about 1000 rpm) and the oil temperature shall be kept at the normal working temperature;

(2) When the oil temperature is 40℃, the oil level shall be between the middle and lower scale lines of the oil dipstick.

When the oil temperature is 80℃, the oil level shall be between the middle and upper scale lines of the oil dipstick.

(3) Strictly follow the maintenance requirements and periodically replace the transmission oil and the filter.

(4) Before starting the vehicle engine, ensure that the control handle is at the neutral gear.

(5) Before every traveling, loosen the parking brake (release the brake).

(6) In case of engaging or separating the engine and the transmission and lifting the transmission, try to avoid torque converter detachment.

(7) During parking, the gearshift handle shall be turned to the neutral gear.

(8) The normal working oil temperature shall be kept between 80—110℃; when bearing the heavy load, it can rise to 120℃ in a short time. It is necessary to pay special attention to the control oil pressure of the transmission. If transmission is discovered to be abnormal during use, it is necessary to stop the vehicle for check.

(9) When the vehicle has malfunction and needs electric welding maintenance, it is necessary to remove the cable plug on EST—computer controller (cut off the circuit leading to the computer controller); or else, the computer controller may be burnt due to impact current during electric welding.

2. Operation

(1) Preparations and maintenance before traveling

Before transmission operation, it is recommended to properly fill the lubricating oil with specified specification. In case of initial oil filling of the transmission, it is necessary to consider that the oil radiator, filter and connecting pipe shall be filled with oil. Accordingly, the lubricating oil in the first filling shall be much more than that for the subsequent normal maintenance. As the torque converter oil on the vehicle will flow to the transmission via the oil radiator and oil pipe under a stationary state, the oil level shall be correctly controlled under the thermal equilibrium temperature in case of neutral gear engagement upon parking, idle engine running and normal transmission operation.

The oil level can be tested when the control handle is turned to the neutral gear. When checking the oil level, it is necessary to insert the oil dipstick to the lower limit of the oil pipe. When cleaning the main oil circuit filter, pay attention that no dirt and sediment can enter into the oil circuit. In addition, it is necessary to place a cover plate to prevent the parking brake from oil immersion.

When installing the filter, it shall not be screwed down too tightly.

(2) Traveling and gear shift

In case of engine start, it is necessary to confirm that the gearshift handle is turned to the neutral gear. For the sake of safety, before engine start, the parking brake shall be in a brake

state, so as to ensure that the vehicle will not be started due to engine start. After engine start, release the parking brake; properly select the traveling direction and gear; slowly throttle up the vehicle for start. In case of vehicle traveling, the torque converter will replace the function of the main clutch. When the road conditions are good, the vehicle can be driven with a high gear.

If the vehicle is stopped but the engine still runs and the transmission gear is engaged, the engine will not be stopped. For some traction force may be produced when the engine passes the torque converter at idle speed, the vehicle may crawl on a straight pavement. The rational method is to turn the parking brake to a brake state upon each parking.

To park the vehicle for a long time, the control handle shall be turned to the neutral gear. During traveling, it is recommended to loosen the parking brake of the vehicle. From experience, we draw a conclusion that the operator is hard to immediately find out that: When the torque converter speed changes, due to large output torque ratio of the torque converter, the vehicle can overcome the brake torque and forcedly travel even under the normal operation conditions. The consequence is that the torque converter oil temperature will rise and the brake will become too hot.

Due to impact of the torque converter, when shifting to low speed gear from the high speed gear, the engine rotation speed will increase, specially the gear shift with skipping a grade. Accordingly, if conditions permit, when shifting to low speed gear from the high speed gear, firstly step down the foot brake; perform deceleration slowly and then shift gear. When the vehicle travels at high speed and the traveling direction is changed, it is necessary to reduce the engine rotation speed.

(3) Suspension and parking

As there is no rigid connection between the engine and the torque converter output shaft, when the vehicle is parked on the slope (upslope or downslope) while the driver wants to leave the vehicle, to avoid vehicle sliding, we recommend to apply the parking brake and place stop blocks under wheels.

(4) Dragging

The max. dragging speed is 10km/h and the max. dragging distance is 10km.

When the distance is longer, the vehicle with malfunction shall be placed on other vehicle for transportation.

(5) Oil temperature

The transmission oil temperature shall be monitored with the temperature sensor. The max. oil temperature of the torque converter outlet shall not be higher than 120℃; the normal control component and the transmission with sufficient traveling mileage will not have higher temperature. If the oil temperature is higher than 120℃, the vehicle shall be stopped for oil leakage check. And, the transmission shall be turned to the neutral gear and the engine shall run at 1200~1500rpm. In such case, the oil temperature will quickly reduce to the normal value (within about 2~3 min.). If the oil temperature doesn't fall down, it means that the system has malfunction, and operation can be continued after troubleshooting.

Normal gear shift oil pressure range: 1.6&1.8MPa (16~18bar). To monitor the control pressure, it is necessary to install a pressure gauge or pressure monitoring meter. In case of engaging

some gear and applying the clutch but the pressure drops to the min. pressure lower than the specified pressure (the pressure will quickly drop temporarily in case of gear shift), it is necessary to do troubleshooting. If the control pressure is too low, the clutch will be damaged, for the clutch without sufficient contact pressure will make the friction lining continuously slip and become too hot.

3. Maintenance

(1) Oil level check

—— Park the vehicle in a flat place

—— Turn the transmission gearshift handle to the neutral gear (“N”) and the parking brake to the brake position.

—— Idly run the engine with about 1000rpm

—— Counterclockwise loosen the oil dipstick and then take it out and wipe it off

—— Insert the oil dipstick in the oil level pipe and screw it down; keep it for about 3s after reaching the target position, and then take it out (twice measurement at the least)

—— At 40℃, the oil level shall be between the lower scale “cold” and the middle scale

—— At 80℃, the oil level shall be between the upper scale “hot” and the middle scale

The cold vehicle oil level check is only to ensure that the transmission and the torque converter have sufficient circulating flow. The final standard to determine the oil level is to meet the hot vehicle oil level requirements.

★ **Attention**

If the oil level is lower than the min. scale, it is necessary to fill the recommended lubricating oil till the oil level rises to the correct scale range of the corresponding temperature (see Figure 2-15).

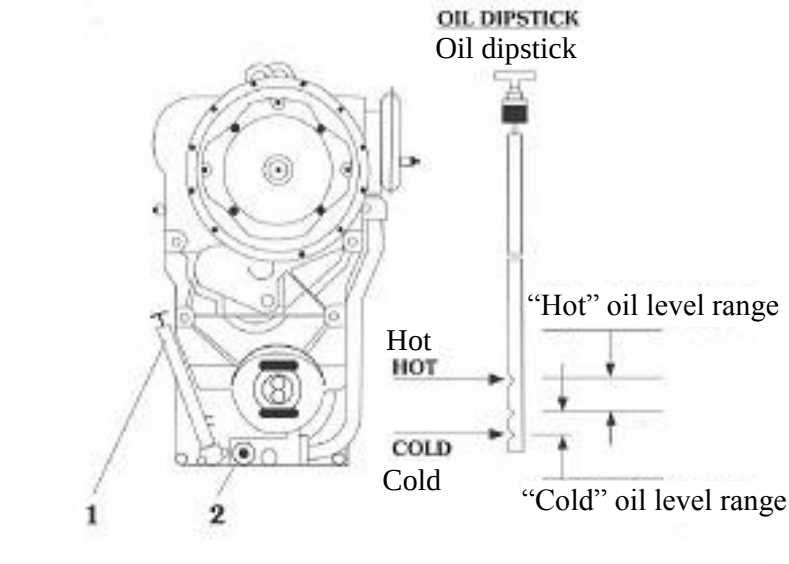
★ **Attention**

According to different types of transmissions, the oil dipstick and filler pipe will have different lengths and shapes. In addition, the filler pipe and transmission have two connection methods: One is to connect the filler pipe at the side of the torque converter and another is to connect the filler pipe at the brake side.

The following Figure shows the connection condition between the filler pipe (and the oil dipstick) and the transmission:

—Torque converter side

—Insert the oil dipstick and clockwise screw it down.



1. Oil filler with oil dipstick

2. Oil drain plug (M38×1.5)

Figure 2-15

(2) Oil replacement

When the vehicle reaches the first 100 working hours, the first oil replacement shall be done. After that, the oil replacement shall be done once every 1000 working hours or every year.

During oil replacement, it is recommended to stop the vehicle in a flat place; keep the transmission at the working temperature; take out the oil drain plug and seal ring, and drain out residual oil.

——Start the engine and run it at idle speed

——Turn the transmission control handle to the neutral gear ("N")

——Fill oil till reaching the upper scale in the "cold" oil area

——Turn the parking brake to the safe position

——Select all gears once

——Check the oil level again

——If necessary, fill oil again

—— At 40℃, the oil level shall be between the lower scale "cold" and the middle scale

——At 80℃, the oil level shall be between the upper scale "hot" and the middle scale

★ **Attention**

When you drain the oil out, the oil in the torque converter cooler should be drained out too.

Oil Replacement Period Table: Table 2-3

Part name	First oil replacement	Normal oil replacement	Oil product standard	Oil level check
Transmission	Upon 100 working hours, the filter shall also be replaced	Upon every 1000 working hours, not longer than one year, and the filter shall also be replaced	SAE15W40 Mobil Delvac Super 1300 or TITAN universal engine oil HD15W—40 (produced by Shanghai Desi Oil Product Company)	Before daily use

Other optional oil product: Table 2-4

Domestic oil grade	Kinematic viscosity (100℃) mm^2/s	Similar foreign oil product grade		
6# hydraulic transmission oil Q/SHO18.44.03-1994	5~7	CALTEX	ESSO	SHELL
		Torque fluid 175; RPM Torque fluid NO.5	Torque Fluid 47	Rotella 10 w

(3) Oil filter replacement

In case of each oil replacement, ZF coarse filter shall also be replaced. The replacement requirements are as follows:

——Coat the seal ring with a thin layer of oil

——Press down the filter till it contacts with the sealing surface of the transmission; after that, screw it down for 1/3 to 1/2 circles by hand

——Fill oil

——Start the engine

——When the engine idly runs (about 1000rpm) and the transmission oil has a working temperature, check the transmission oil level.

——When the oil temperature is 40℃, it shall be within the “cold” oil level range.

——When the oil temperature is 80℃, it shall be within the “hot” oil level range.

——Check if it is screwed down. If necessary, screw it down by hand again.

3 Transmission Removal

3.1 Transmission Assembly Removal

3.1.1 Torque Converter Removal



Figure 3-1

1 Torque converter

2 Intermediate ring

1. Pull out the intermediate ring and the torque converter from the transmission; completely drain out residual oil in the torque converter and place it aside.



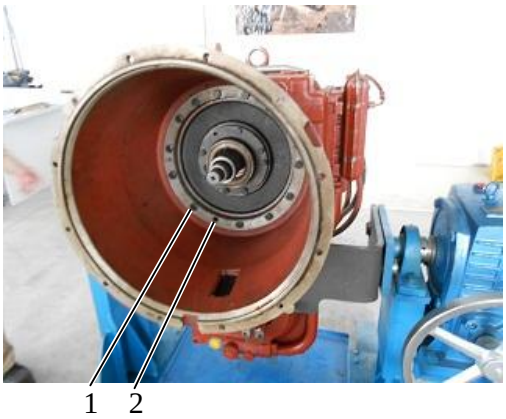


Figure 3-2

1 Hexagon screw (M10*50)×14

2 Tension pin

2. Remove the bolt connecting with the shell and the transmission.



Figure 3-3

1 Connecting shell

3. Adjust the transmission to a proper position; slightly knock the connecting shell periphery with the copper rod, and take down the connecting shell.

kg

★ **Attention**

Upon knocking, ensure that the force which is applied on the connecting shell periphery is uniform.

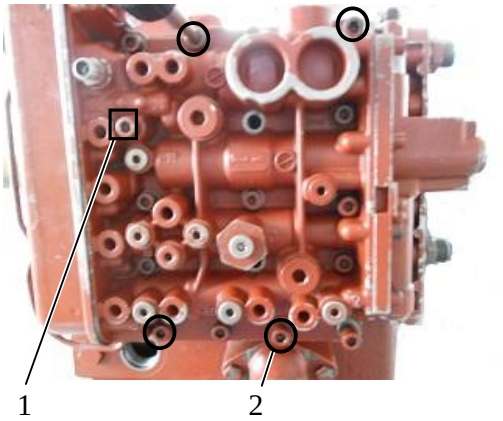


Figure 3-4

1 Head cap screw×1

2 Head cap screw×5

3.1.2 Transmission Control Valve Removal

1. Take down 6 hexagon socket head cap bolts from the transmission control valve with the hexagon socket spanner.

★ **Attention**

Strictly follow the sequence of "From outside to inside and diagonal removal" to remove bolts.

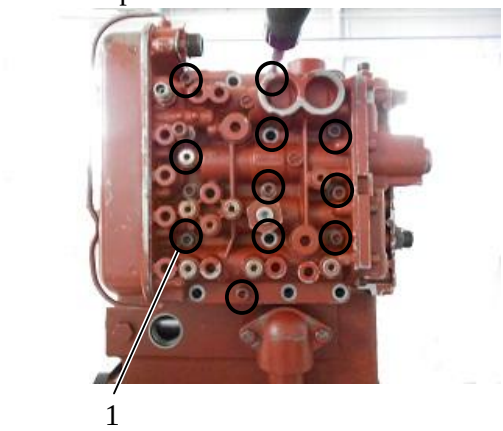


Figure 3-5

1 Head cap screw×11

2. Respectively take down 11 hexagon socket head cap bolts from the transmission control valve with the hexagon socket spanner.

★ **Attention**

It is recommended to place two screws in the removed thread holes at the top, so as to avoid control valve sliding due to removal of the head cap screws.

Strictly follow the sequence of "From outside to inside and diagonal removal" to remove bolts.

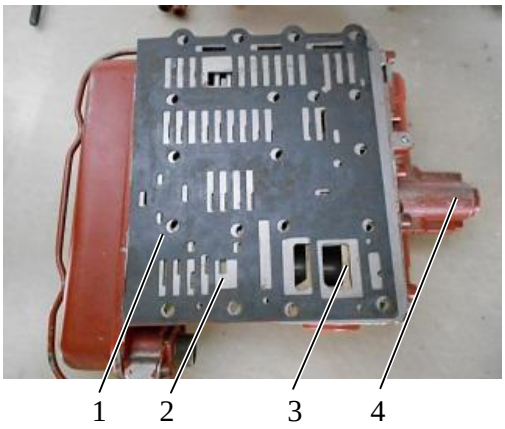


Figure 3-6

1 Valve pad 2 Cover plate

3 Paper pad 4 Transmission control valve

3. Take down the transmission control valve, paper pad, cover plate and valve pad.

★ **Attention**

After removing the transmission control valve, do well in its cleaning and protection.

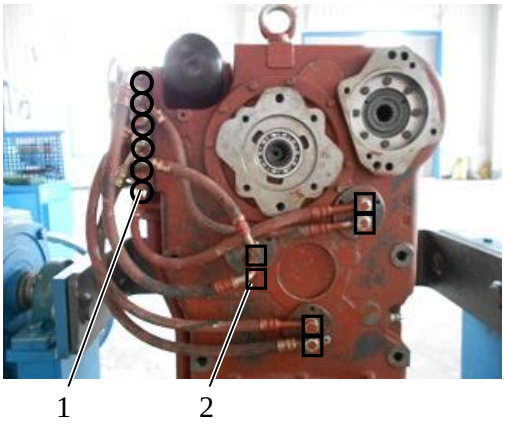


Figure 3-7

1 Oil pipe connector of the oil passage plate

2 Oil passage connector of the clutch shaft

4. Take down six oil pipes from the oil passage plate in turn, which are K2, K1, K3, K4, KR and KV from top to bottom. In addition, remove the oil passage connector on the clutch shafts and take down six oil pipes.

★ **Attention**

Do well in oil pipe connector protection, and mark the oil pipe number with the marker.

After removing the connectors, do well in their cleaning and protection.

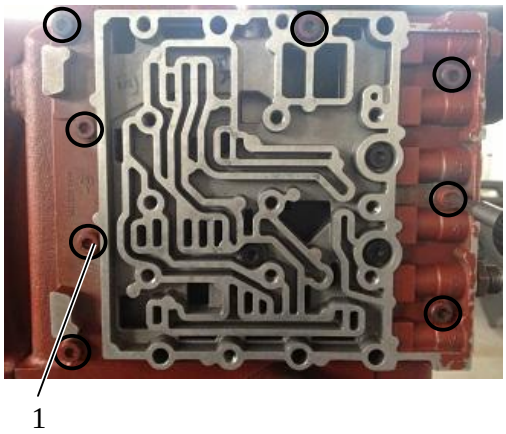


Figure 3-8

1 Head cap screw ×8

5. Take down 8 hexagon socket head cap bolts between the oil passage plate and the transmission.

★ **Attention**

Strictly follow the sequence of "From outside to inside and diagonal removal" to remove bolts.

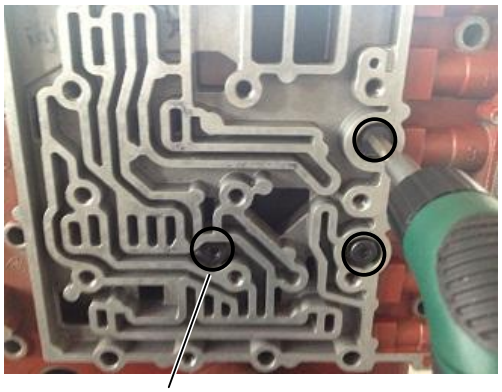


Figure 3-9

1 Head cap screw×3

6. Take down 3 hexagon socket head cap bolts between the oil passage plate and the transmission.

★ **Attention**

It is recommended to place two screws in the removed thread holes at the top, so as to avoid control valve sliding due to removal of the head cap screws.

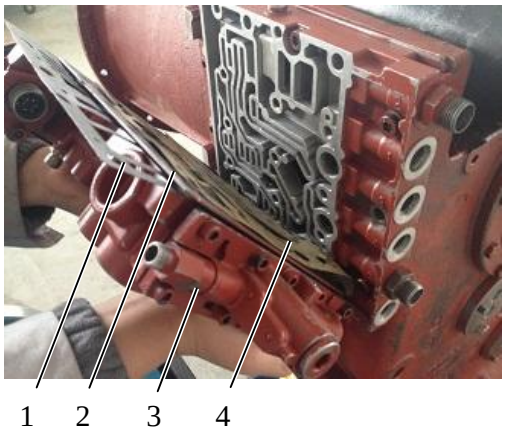


Figure 3-10

1 Packing 2 Cover plate

3 Oil passage plate 4 Paper pad

7. Take down the oil passage plate, packing 1, cover plate and paper pad.

★ **Attention**

After removing the oil passage plate, do well in its cleaning and protection.

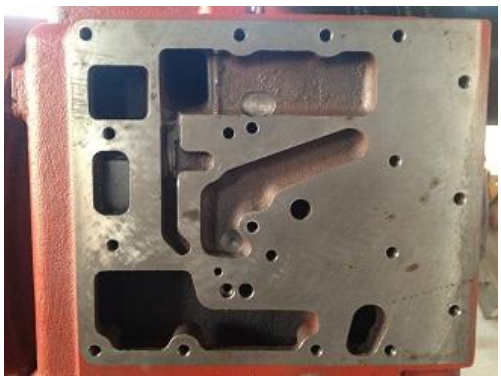


Figure 3-11

8. The transmission control valve removal is completed.

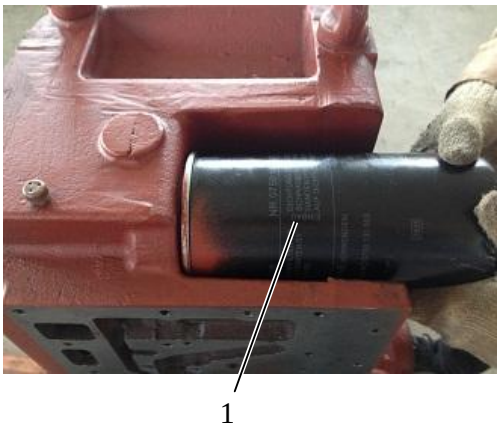


Figure 3-12

1 Oil filter

3.1.3 Oil Filter Removal

1. Rotate the oil filter with the belt spanner for removal.

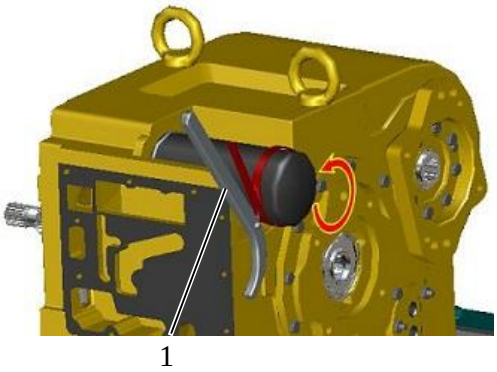


Figure 3-13

1 Belt spanner



2. After taking down the O-ring, the removal is completed.

Figure 3-14

1 O-ring

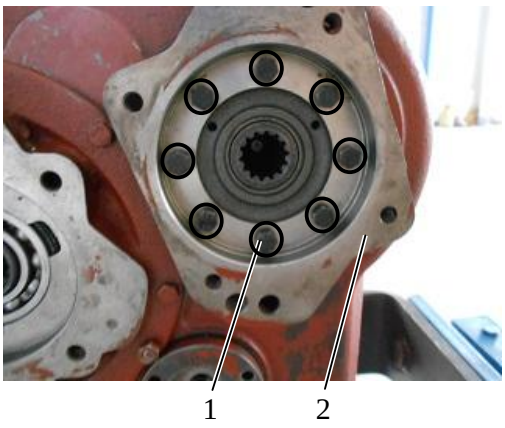


Figure 3-15

1 Hexagon head screw (M8*16)×8

2 Auxiliary PTO wheel hub

3.1.4 Removal of the Auxiliary PTO Wheel Hub

1. Take down the bolt between the auxiliary PTO wheel hub and the transmission body.

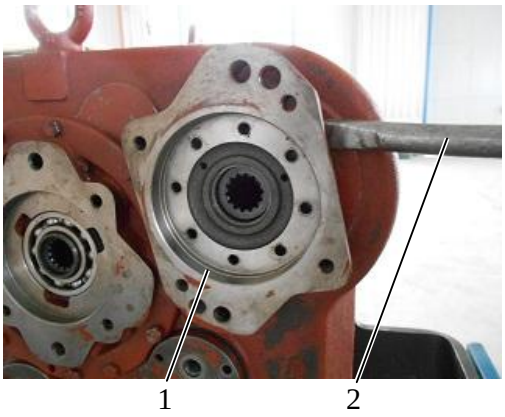


Figure 3-16

1 Auxiliary PTO wheel hub

2 Crowbar

2. After pushing out the wheel hub with the crowbar and taking down the PTO wheel hub and its seal ring, the removal is completed.

3.1.5 Input Device Removal

1. Remove the hexagon bolts between the pump impeller bearing seat and the oil feed flange.

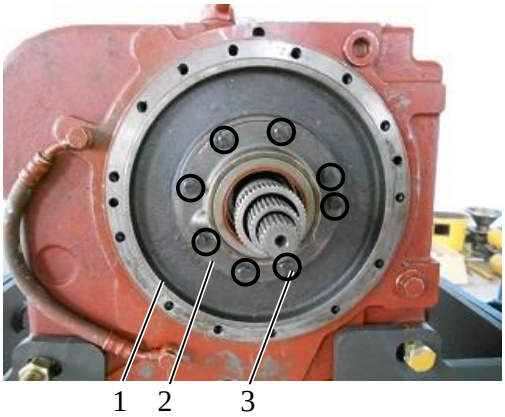


Figure 3-17

1 Oil feed flange 2 Pump impeller bearing seat

3 Hexagon head screw (M8*28)×8

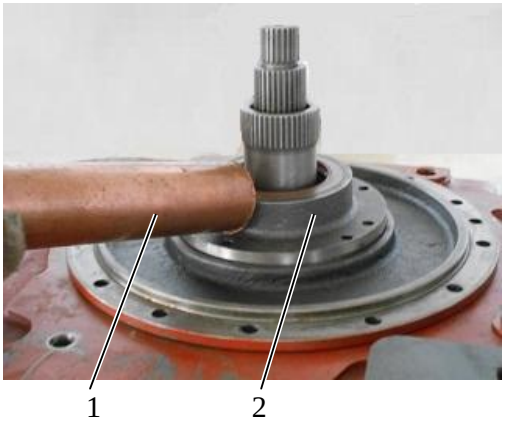


Figure 3-18

1 Copper rod

2 Pump impeller bearing seat

2. Slightly knock the bearing seat with the copper rod for loosening.



Figure 3-19

1 Pump impeller bearing seat

2 Packing

3. Take down the bearing seat and the packing.

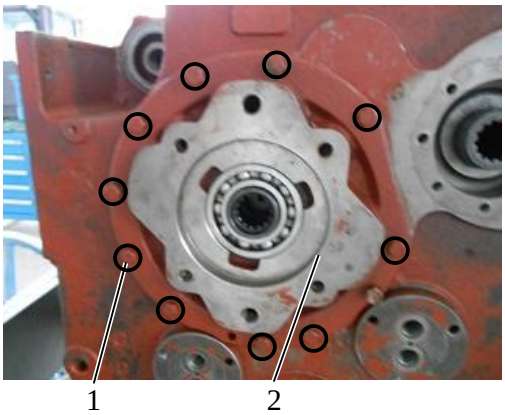


Figure 3-20

1 Hexagon head screw (M8*20)×10

2 Main PTO wheel hub

4. Take down the bolt between the main PTO wheel hub and the transmission body.

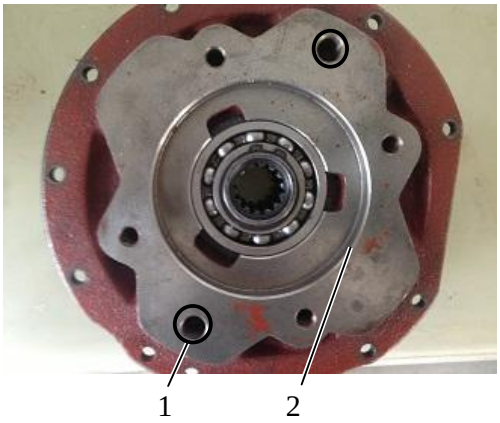


Figure 3-21

1 Shackle bolt mounting hole

2 Main PTO

5. Pull out the main PTO component with two shackle bolts (M20).

kg

★ Attention

During removal, the transmission shall be placed flatly; the PTO port shall face upwards and the force applied on two shackle bolts shall be uniform.

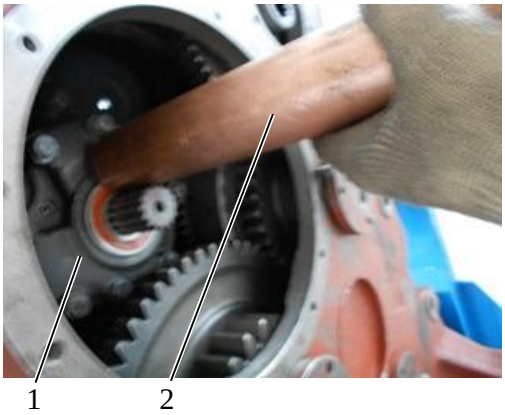


Figure 3-22

1 Variable speed pump component

2 Copper rod

6. Hold one about φ30*400mm copper rod by left hand to jack up the variable speed pump end cover, and hold another copper rod by right hand to knock out the oil feed flange and the variable speed pump component and place them aside.

kg

Attention

The copper rod shall be used to slightly knock the oil feed flange and the variable speed pump component, so as to avoid component slipping.

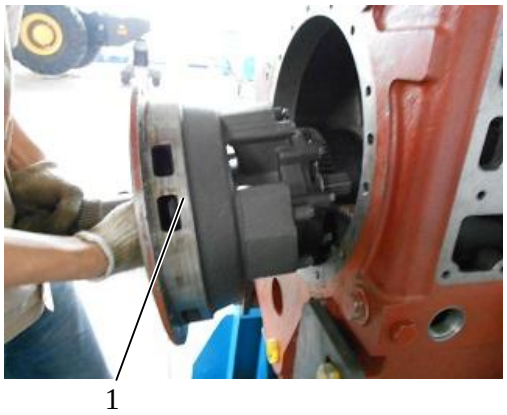


Figure 3-23

1 Input device

7. After taking down the input device, the removal is completed.

Attention

Slowly take down the input device to avoid slipping.

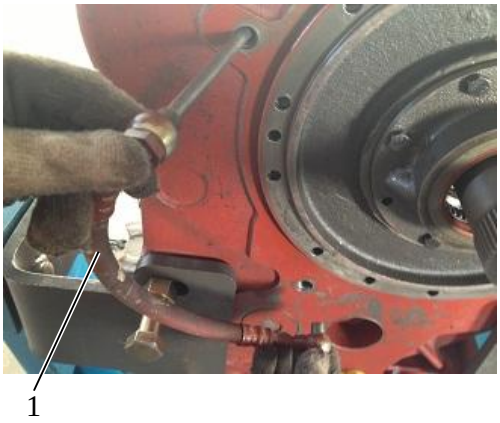


Figure 3-24

1 Lubricating oil pipe component

3.1.6 Removal of the Lubricating Oil Pipe Component and Auxiliary PTO

1. Respectively screw off hollow bolts (M18) at both ends of the transmission lubricating oil pipe and then take out the oil pipe.

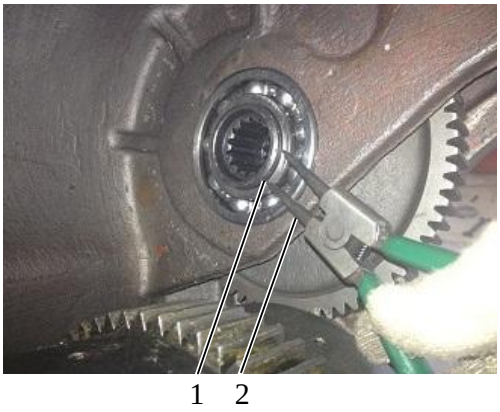


Figure 3-25

1 Snap ring (45*1.75)

2 Snap ring pliers

2. Take down the snap ring from the PTO shaft with the snap ring pliers.

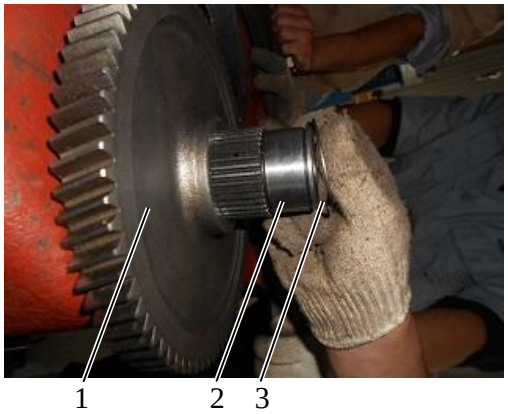


Figure 3-26

1 Driving gear 2 PTO shaft

3 Retainer ring (SW47)

3. Knock out the PTO shaft with the copper rod and take down the PTO driving gear.



Figure 3-27

1 Ball bearing

4. The auxiliary PTO removal is completed.

3.1.7 KVK1 Clutch Assembly Removal

1. Screw off two hexagon nuts on the KVK1 clutch shaft and pull out the clutch shaft with tooling.

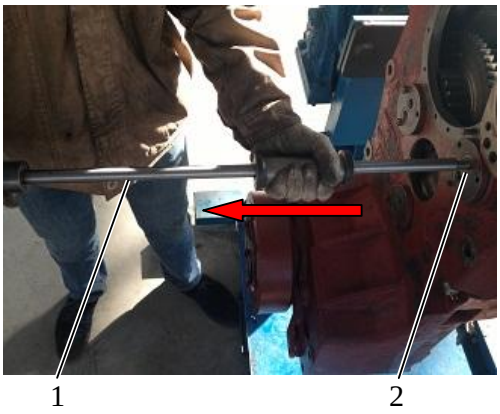


Figure 3-28

1 Clutch shaft removal tooling

2 KVK1 clutch shaft

2. Take down the thrust washer and the compensation washer from the KVK1 clutch shaft.

★ **Attention**

When taking down the thrust washer and the compensation washer, the transmission shall be placed flatly to prevent the washer falling down to the bottom of the transmission body.

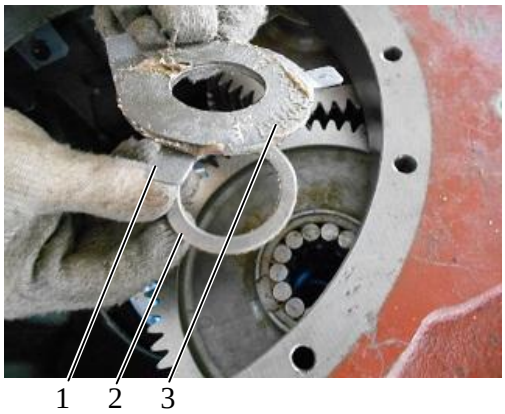


Figure 3-29

1 Thrust washer 2 Thrust washer

3 Compensation washer