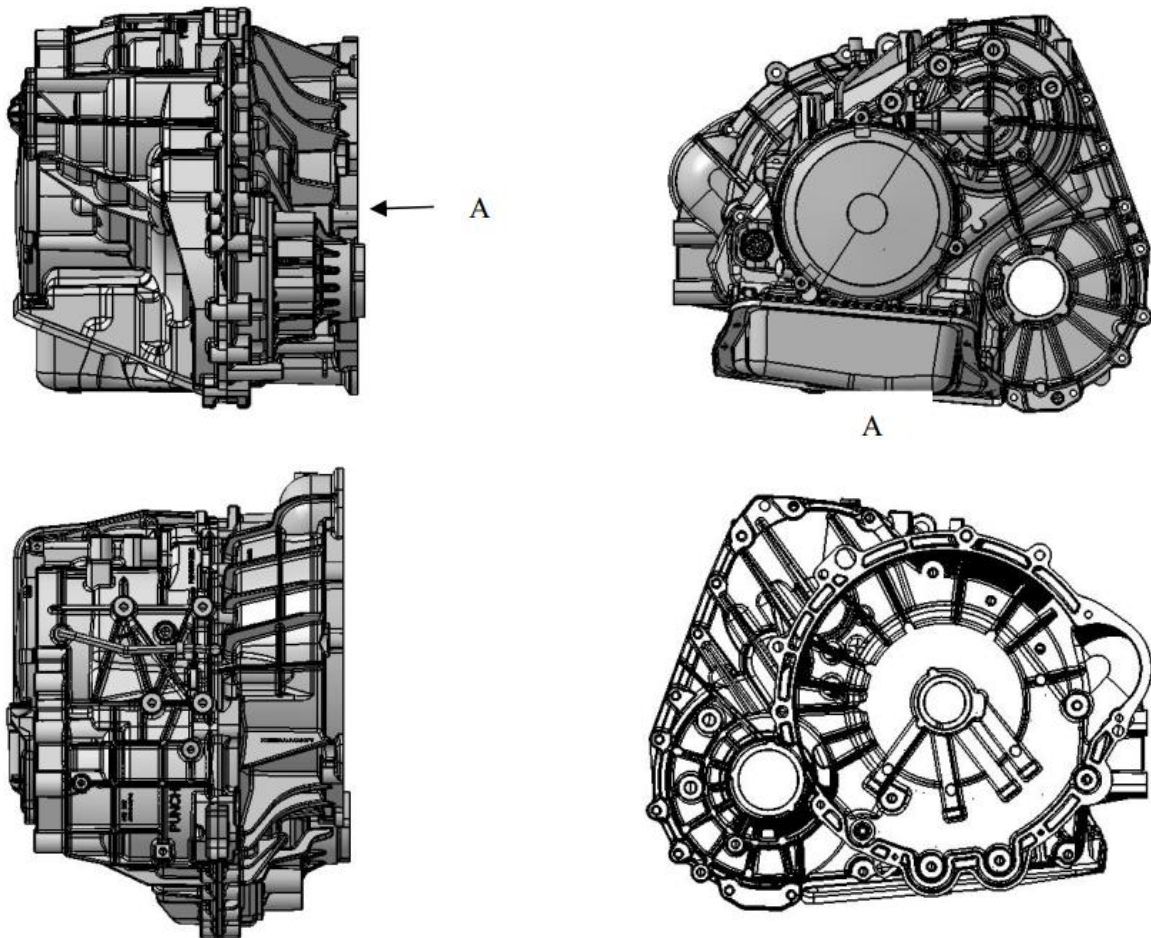


Speed ratio change diagram of CVT transmission (left) and 4-gear automatic transmission (right)

## 1.2 Transmission Schematic Diagram

### 1.2.1 Transmission Three View Drawing



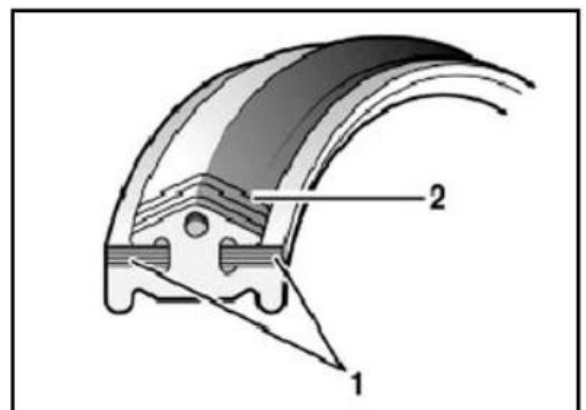
### 2.1.3 Bevel Gear and Steel Belt

The main design feature of the CVT transmission is a pair of V-shaped bevel gear connected by a steel belt. The center distance between the drive gear and the driven gear is 155mm. Each bevel gear is divided into two half: one half is fixed, the other half slides along the axial direction, the inclination angle of both are  $11^\circ$ . The 24mm wide "Van Doorne" push-drive belt is used to transfer torque between wheels (a 30mm belt is available for larger torque values). Lubricate and cool the belt with a nozzle by means of an oil jet. To reduce the angle error of the transmission belt when shifting gears, two moving half-wheels are placed on the diagonal of the two, and each moving half-wheel is connected to the hydraulic cylinder/piston. Hydraulic pressure is controlled by control system, see "control system". Spherical splines prevent moving the half wheel relative to their fixed half wheel rotation.

Since the sun wheel is splined to the active cone wheel, the torque transmitted by the planetary gear set can be directly applied to the active cone wheel. The steel belt transfers power from the driving cone to the driven cone, and then from the driven cone to the intermediate gear shaft.

The torque and speed of the driven wheel are determined by the position of the belt. The size of the two wheels is designed to provide a transmission ratio of 2.416:1 ~ 0.443:1, with the maximum transmission ratio 5.45 times of the minimum one. The fuel consumption is lowest when overspeed transmission ratio.

The transmission steel belt consists of 450 steel plates and 24 steel belts fixed together with 12 steel belts on each side.



The drive belt

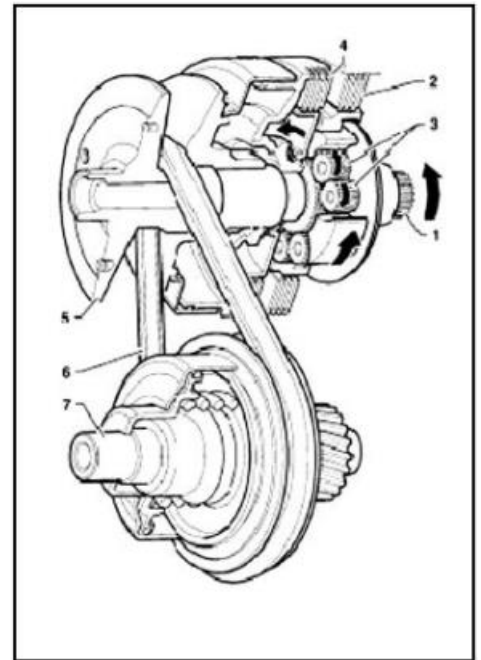
- 1. Steel belt
- 2. Steel plate

### 2.1.4 Countershaft

- Gear selecting handle is in neutral or parking position
- In this state, reversing clutch (2) and forward clutch (4) separates, can't make the wheel move.
- Transmission input shaft (1) and engine speed are the same.
- Backward clutch (2) separates.
- Forward clutch (4) separates.
- Planet gear (3) idle running around sun gear
- Sun gear not move, drive gear (5), driven gear (7) and the vehicle

also keep still.

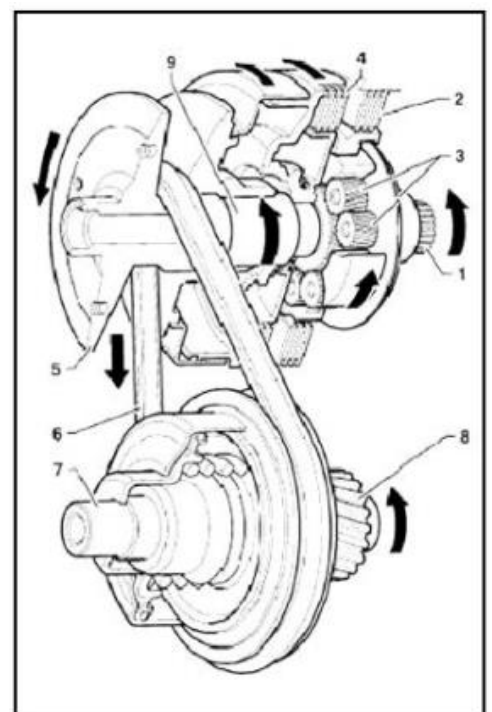
For all automatic transmissions, the engine can only be started in neutral or in park gear. In parking gear, the mechanical lock prevents the vehicle from moving back and forth. In order to avoid damage to the transmission, the parking gear can only be used when the vehicle is not moving.



- 1. Input shaft      5. Drive gear
- 2. Backward clutch    6. Driven steel belt
- 3. Planet gear      7. Driven bevel gear
- 4. Forward clutch

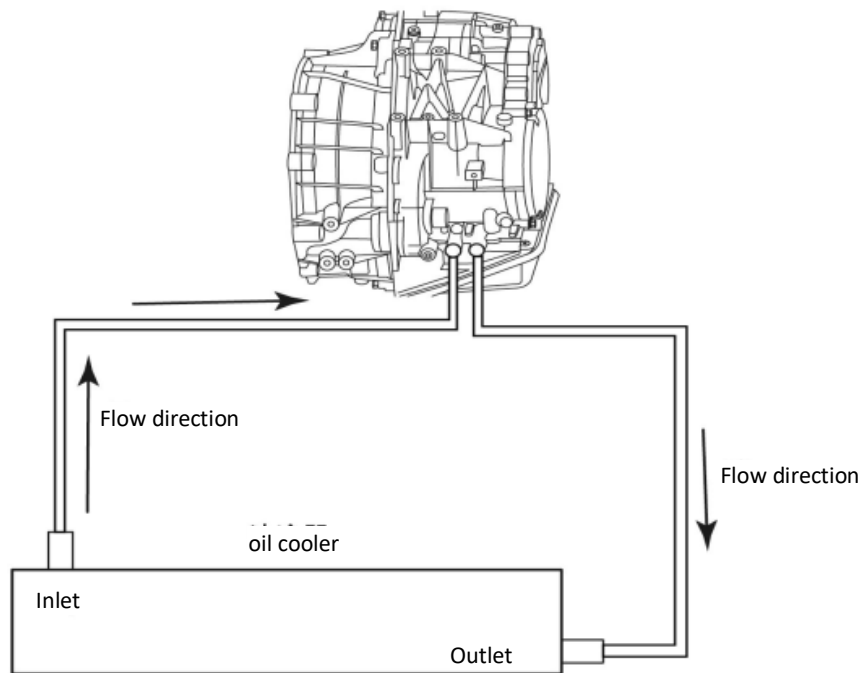
- Gear selecting lever is in forward gear, in this state, the forward clutch (4) engages to make the wheels move.

- Transmission input shaft (1) is the same with the engine speed.
- Reversing clutch (2) separates.
- Forward clutch (4) engages
- Planet gear (3) of planet mechanism, sun gear and gear ring rotate together.
- Drive gear (5) is the same with the engine speed, the direction is forward gear direction.
- Driven gear (7) is the forward gear direction, its speed



the oil cooler.

The oil of the oil cooler enters into the transmission from the port on the left side of the transmission, so the port on the left side of the transmission should be connected to the upper port of the oil cooler.



Oil cooler pipe connector

### 2.3.2 Shift lever

The gear position of VT3 transmission may include stop gear (P), reverse gear (R), neutral gear (N), forward gear (D), and sport mode (S).

Customer can customize the configuration of the shift lever. For the sake of safety, it is recommended to apply gear shift locking device as starting protection.

CVT transmission can also achieve manual mode, which requires the addition of new pins on the TCU to receive signals, and the calibration of the maximum speed of the engine within a certain range. All JAC CVT transmissions have manual mode.

### 2.3.3 Main Connector

Main connector is on transmission housing, includes 16 pins. The wiring harness connects through circular connector.

### **1.2.3 Creep**

According to the performance of automatic transmission, when the shift lever is in forward gear (D) or reverse gear (R), if the driver releases the brake pedal, the vehicle will start crawling (flat road). If the road slope is less than  $8^\circ$ , the vehicle also can crawl; If the road slope is greater than  $8^\circ$ , the vehicle will be slightly backward, which is the same with the vehicle equipped with hydraulic torque transmission, it will not backward if the slope degree is not large. Regardless of the slope of the road, the maximum speed at which the vehicle climb will be less than a limit (8kph). Especially downhill, the control system will allow the clutch to switch from separation to "engage" mode, allowing the engine to brake during the glide.

### **1.2.4 Idling parking (only for D gear state)**

The VT3 transmission can idle stop. The vehicle (battery status, A/C ON/OFF) and the transmission (without affecting the transmission durability) can idle stop under certain conditions. If all conditions are met, the internal combustion engine can stop at rest. Only when the brake pedal is released and the engine starts up again and the transmission works quickly can the vehicle move forward and backward.

The idle stop feature is particularly useful for hybrid drives, but is useless for standard drives without a special starter or starter motor.

### **1.2.5 Acceleration and deceleration**

The acceleration process mainly provides acceleration according to the driver's requirements and driving conditions. At this time, the change trend of engine speed corresponds to the initial speed, so as to achieve the best driving comfort.

The clutch controller also provides some means of compensating for the difference in clutch wear (it differs between different vehicles) to ensure driving comfort.

### **1.2.6 Acceleration support**

In order to achieve optimal driving comfort, it is necessary to determine the most appropriate engine speed, which is between the minimum traction engine speed and the engine speed when the vehicle maintains a constant speed (economic speed) cruise state.

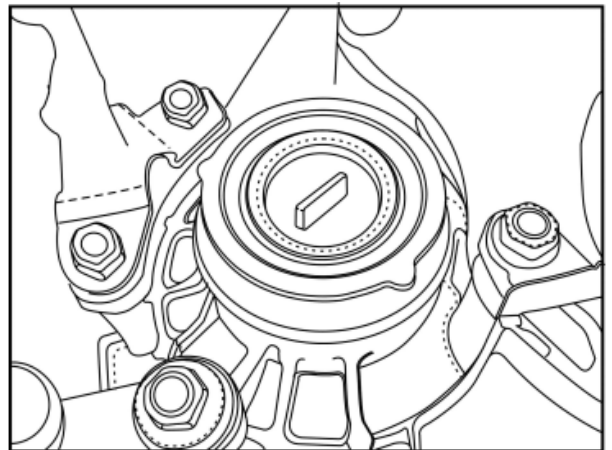
The transmission control system provides functionality to meet these requirements by using a combined control mode between the transmission (ratio control) and the starting clutch. Therefore, when the vehicle starts, the control target is always focused on the driving performance of the higher engine speed related to the acceleration of the vehicle, while when the vehicle cruises or glides, the control target is transferred to the fuel economy of the transmission system.

## 3. Half shaft

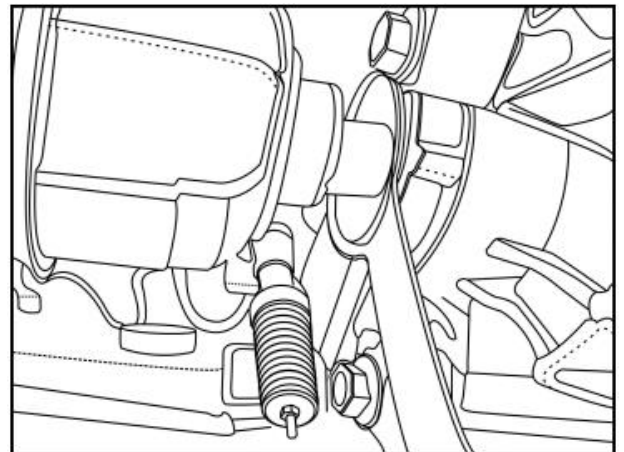
### 3.1 installment

When installing the half-shaft to the full transmission, we strongly recommend using PUNCH 480145 tool to protect the differential oil seal. If the differential shaft is damaged, the transmission will inevitably leak oil. Using special tool will significantly reduce the chance of oil seal damage.

1) Remove the oil seal protective cover.



2) Install the tool on the half-shaft oil seal and install it well.



3) Put the half-shaft into the transmission at a maximum depth of 4cm.

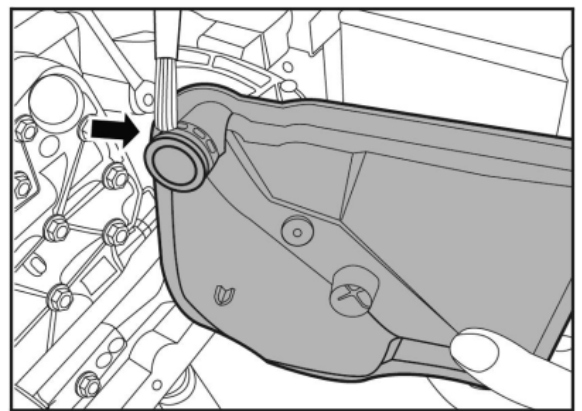
## 12. Oil Filter

### 12.1 Fault code instruction

Oil filters should be replaced at least every 60,000km or 2 years (whichever comes first), and the period can be reduced according to the standard of each manufacturer.

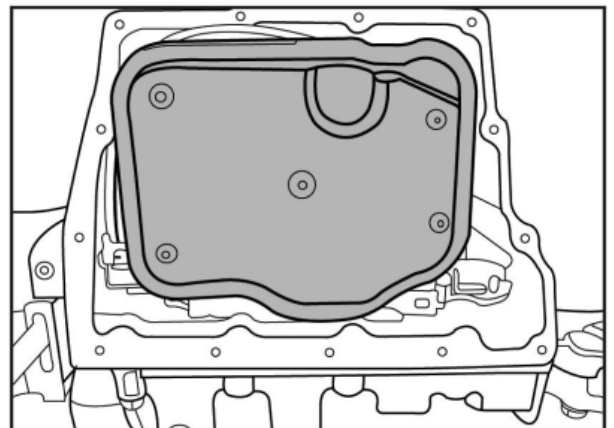
### 12.2 disassemble

1. Discharge the transmission oil.
2. Remove the oil pan. Refer to the oil pan.
3. Remove the oil filter.
  - 1) Take out the oil filter slightly and abandon it.



### 12.3 installment

1. Install the oil pan.
  - 1) Install oil filter with a new O-ring, and lubricate it with ESSO EZL799 (A).
  - 2) Gently press the oil filter in place.  
**▲Note:** The hole in the middle of the oil filter is matched with the middle bolt on the hydraulic control block.
  - 3) Clean the magnet and the oil pan.
- 2) Install oil pan.
3. Fill the transmission oil.



## 4. Adaptive Update

### 4.1 System description

Adaptive learning is required in the following situations:

- Refresh the TCU software
- Replace the transmission
- Replace the TCU The clutch needs to be adaptively renewed (self-learning) to compensate for tolerances in the production process in order to achieve this function

by shifting gears at idle. Before the self-learning is completed, the TCU fault indicator flashes every 2 seconds. Once the first self-learning is complete, it is automatic throughout the life cycle.

### 4.2 Demand Condition

This condition needs to be completed before self-learning:

- Engine torque and speed are required to be stable at idle. Self-learning of the engine is also required to be completed in advance. For more information about self-learning of the engine, please read the document provided by the ECU supplier.

- Engine speed requirement: ECU target value  $\pm 200$ rpm.
- Engine torque demand: ECU target value  $\pm 12$ N·m
- Transmission temperature should be between 30 °C to 80 °C.
- The A/C is turned off.
- An unadaptive TCU will keep making request to the engine for idling up to 1150rpm.

If TCU has done self-learning before, this includes: 1. Refresh the software; 2. Replace transmission TCU, first need to delete the self-learning value. This can be done with MLT software, or with a factory tester.

### 4.3 Program

When we have fulfilled all the conditions, we will perform the following operations:

- Vehicle speed =0kph.
- Not step accelerator pedal.
- Step on the brake pedal during the whole process.
- Shift gear to "D" gear.



	rapidly, the vehicle rushes	Driven bevel gear speed sensor failure	Check self-learning	
7	The vehicle can not start (without accelerating), shift to D gear, after releasing the brake pedal, the vehicle completely keep still, then accelerate, wait for the engine speed to about 2000rpm, the vehicle suddenly rushed forward, with a greater impact	Check there is failure when the vehicle is cold	Check self-learning	
		There is failure in the brake signal. When there is no brake, the brake signal is actually in the braking state, which will	Check the brake signal and wiring harness	
		If none of the above is found to be a problem, it may be the valve body problem	Replace valve body. and do self-learning	

No.	DTC code	TCU solution	Maintenance instruction
17	P1763 Start lock grounding or	All three pressure regulators are power off, fault indicator	Check the wire, if the gear sensor has failure, sometimes it may has this fault code
			Replace TCU
18	P1764 Start lock short circuit	All three pressure regulators are power off, fault indicator lamp is on	Check the wire
			Replace TCU
19	P1768 Reversing lamp grounding	All three pressure regulators are power off, fault indicator lamp is on	Check the wire
			Replace TCU
20	P1769 Reversing lamp short circuit or open circuit	All three pressure regulators are power off, fault indicator lamp is on	Check the wire
			Replace TCU
21	P0868 Pressure pre-tension regulating failure	All three pressure regulators are power off, fault indicator	Check the oil level and the oil quality
			Replace the oil pump
			Replace the hydraulic control module
			Replace the transmission
22	P0811 Clutch (forward or backward) slipping	The failure indicating lamp is on, the clutch is open	Do self-learning again, this fault code may occur in the cold vehicle state, so do self-learning in the cold vehicle state
			Check oil level and oil type
			Replace the hydraulic control module
			Replace the transmission

without too much thrust.

### 1.3. Maintenance

1. For the initial maintenance, after the transmission is running-in, the first warranty does not need to replace the new transmission oil; then do regular maintenance. Its maintenance should be in the vehicle special maintenance station.

2. Regular maintenance: replace mileage: check every 30000km or 3 years (supplement or replace if necessary), replace every 100000km or 5 years;

Replace period: check every 3 years (if necessary add or replace), replace every 5 years.

▲Note: B: replace transmission oil when necessary for maintenance inspection; H: replace the transmission oil; a. The maintenance period shall be based on the odometer reading or the number of months, whichever is reached first.

b. Suitable for various driving conditions (repeated short distance driving; driving on uneven or muddy roads; driving on dusty roads; driving on extremely cold or saline roads; a short, repetitive drive in extremely cold weather).

c. Replace transmission oil when necessary for maintenance inspection.

d. For other maintenance operations but not oil replacement, when lifting the vehicle, should also check whether the transmission leaks oil. 3. Maintenance and troubleshooting under the condition of the vehicle;

4. During maintenance, check the transmission oil as follows:

a. Confirm whether the vehicle is in horizontal state to check the oil level.

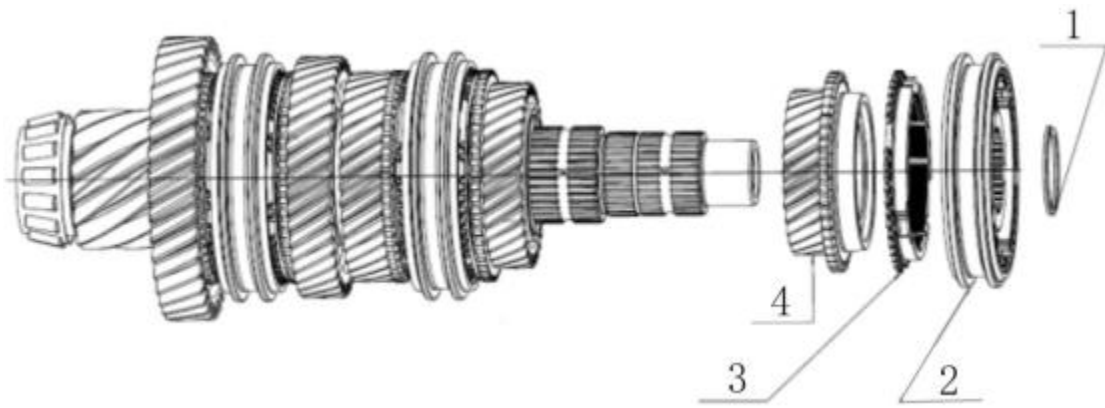
b. Check the transmission for oil leakage. If so, repair the leaking part. See the maintenance manual for the repair method. c. Remove the oil filling screw plug.

d. Check the oil level. The oil level can be roughly checked through the oil filling hole, that is, remove the oil filling screw plug, if the transmission oil flows out from the oil inlet hole, or the oil level can be seen to reach the oil inlet hole, the oil level is normal. Otherwise, should add the transmission oil until to the oil inlet hole. 5. During maintenance, replace the transmission oil as follows:

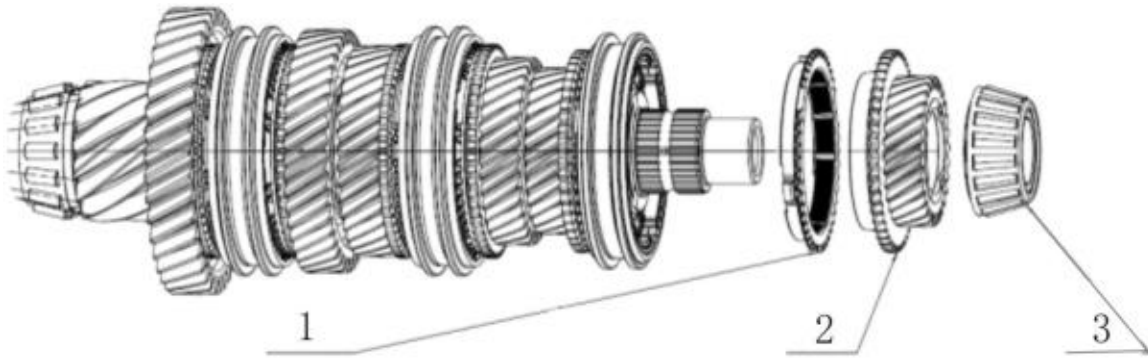
a. Before replacing the oil, the engine must stop and lift the vehicle horizontally.

b. Under the condition of lifting the vehicle, check the oil level and whether there is oil leakage. If there is oil leakage, deal with it.

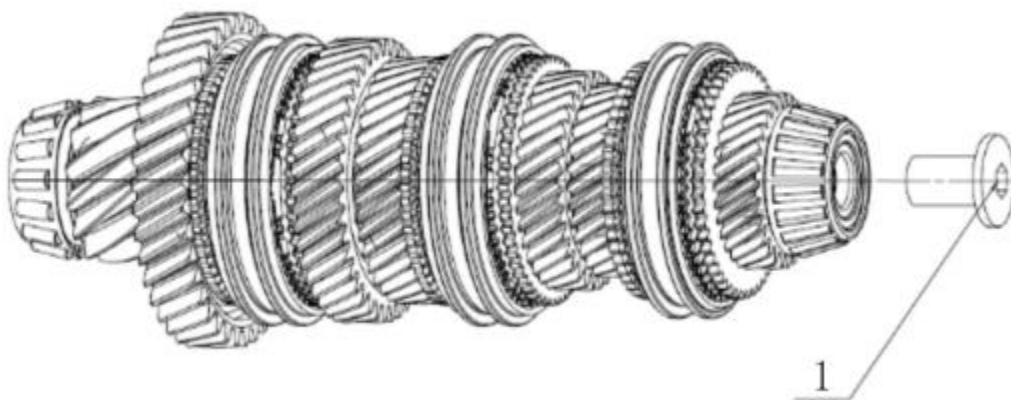
c. Remove the oil screw plug, discharge the waste oil, and add the specified new oil according to the specified oil quantity (add it to the oil level hole). d. Oil drain screw plug is coated with sealant and tighten it according to the specified torque.



1. 3rd/4th gear synchronizer stop ring 2. 1st/2nd gear synchronizer assembly 3. Double cone synchronizer gear ring assembly 4. Countershaft 5th gear assembly

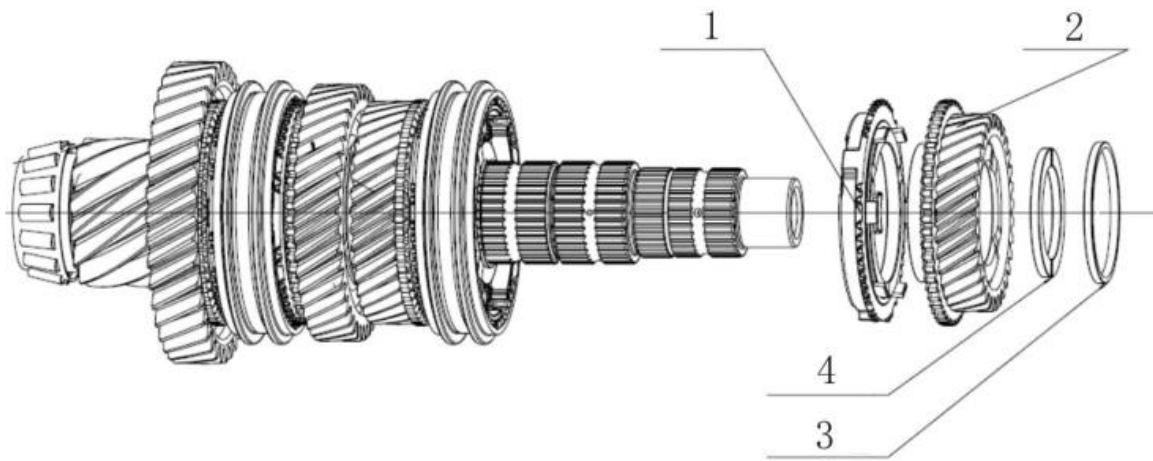


1. Single cone synchronizer gear ring 2. Countershaft 6th gear assembly 3. Countershaft left bearing inner ring

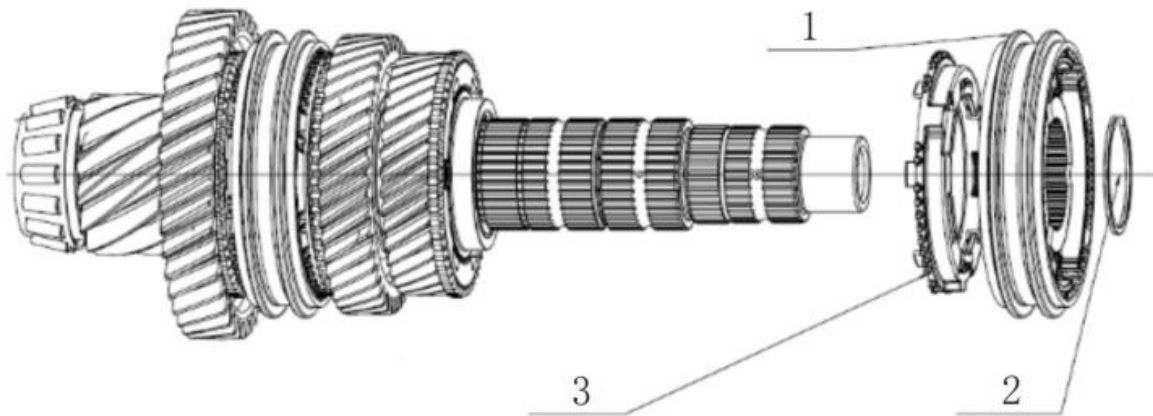


1. Tighten screw sleeve

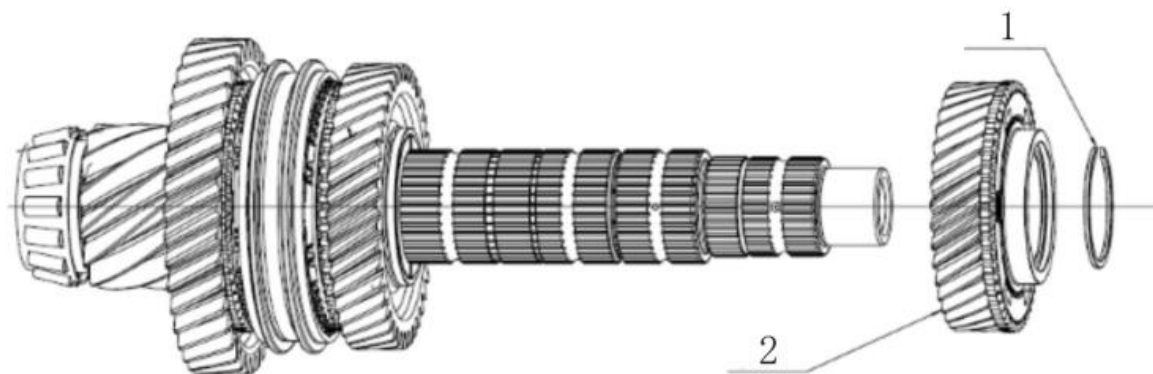
Precautions:



1. Double cone synchronizer gear ring assembly 2. Countershaft 4th gear assembly 3. 2nd/3rd gear clamp ring 4. 4th/5th gear clamp ring 2



1. 1st/2nd gear synchronizer assembly 2. 3rd/4th gear synchronizer stop ring 3. Double cone synchronizer gear ring assembly



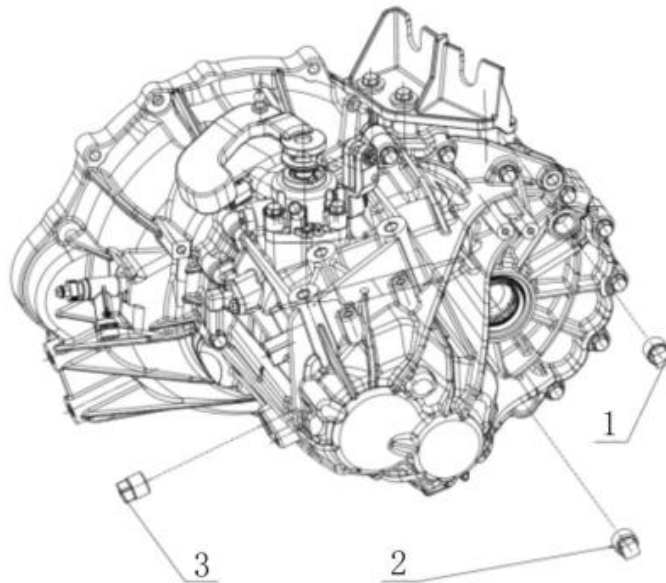
1. 3rd/4th gear synchronizer stop ring 2. Countershaft 3rd gear assembly

# Chapter IV Maintenance guide

## 1. Removal under the vehicle

### 1.1 Loosen the oil drain screw plug to drain the oil

As shown in the figure below, loosen and remove the oil filling screw plug, the oil level screw plug and the oil drain bolt to release the transmission oil;



1. Oil level screw plug 2. Oil drain screw plug 3. Oil filling screw plug

### 1.2 Remove hydraulic separating bearing

As shown in the figure below, first remove the clip on the separating bearing, then pull out the air discharging valve connector, then remove the hydraulic separating bearing bolt (2 in total), then remove the clutch hydraulic separating bearing, and finally remove the transmission assembly bolts in right transmission body (5 in total);

12	1709904-MF622D31	Oil drain screw plug	1	
13	0904060016F7	Hex flange bolt	1	Neutral signal sensor bolt
14	1707110-MF618A11	Neutral gear signal sensor	1	
15	1700531-MF622D31	Gear shift shaft assembly	1	
16	0928060012	Cylindrical pin	1	
17	1709711-MF626A01	Shift fork shaft sleeve	4	
18	1709208-MF622C01	Countershaft adjusting gasket	1	
19	1709421-MF622C01	Countershaft left bearing outer ring	1	
20	1701726-MF622D01	Countershaft oil collecting tray	1	
21	1709411-MF622C01	Countershaft right bearing outer ring	1	
22	1701726-MF622C01	Reversing shaft oil collecting tray	1	
23	1709110-MF620A11	Input shaft oil seal	1	
24	1706211-MF622A01	Air discharging valve connection	1	
25	1701711-MF622D11	Right box	1	
26	0904080030F7	Hex flange bolt	3	Cable bracket bolt
27	0971080F7	Big washer A class	3	
28	1706190-MF622D11	Cable bracket assembly	1	