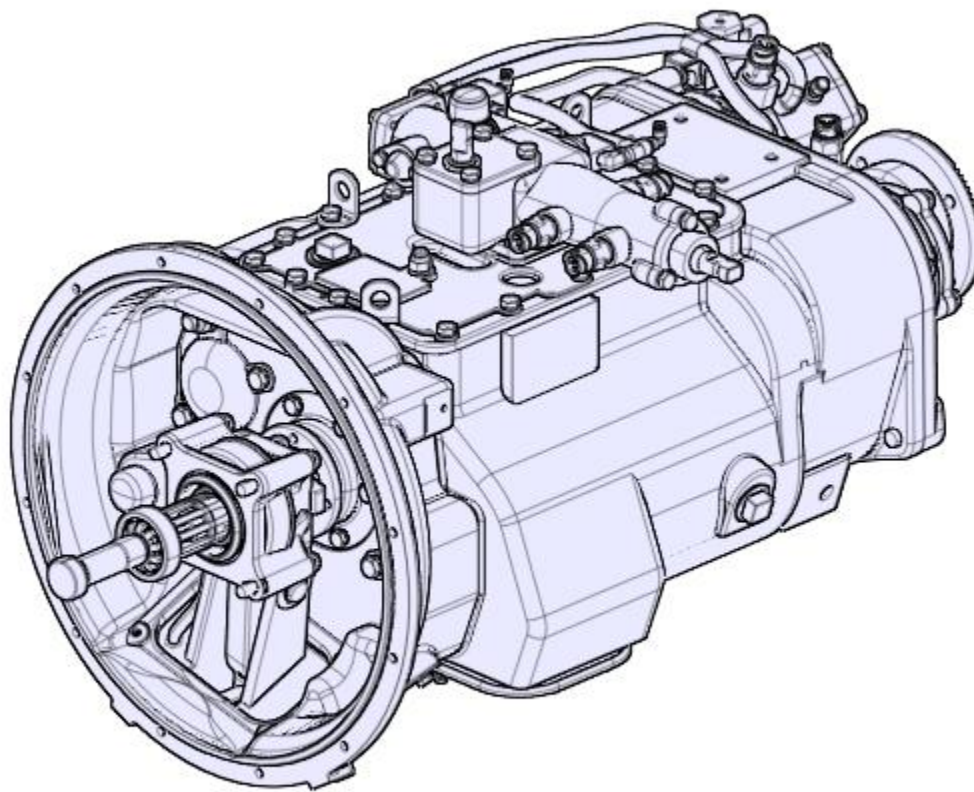


Gearbox, mechanical, component description

General information



The gear box is a 12 speed, in which 12 forward gears are fully-synchronised and 2 reverse gear is unsynchronised. The gearbox combines a design of main and auxiliary case, the main case is manually controlled and auxiliary case is pneumatic control. The gearbox is a range group of planet gears with 12 fully synchronised forward gears and an unsynchronised 2 reverse gear.

Terminology

Type	STO2012 (12 speed)	
Symbols	S T	Synchronised Transmission

	O 20 12	Overdrive Maximum Torque (2000 Nm) Number of forward gears
Range gear	Synchronized	

Power take-off variants

A clutch-dependent PTO (Power Take-Off) can be connected to the gearbox for different superstructures.

Variant symbol	Variant description
PTOTRA-S	Single PTO transmission
UPTOTRA	Without PTO transmission
PTR-F	Rear PTO transmission, Flange, 100% speed
PTR-D	Rear PTO transmission, DIN- CONN, pump

Retarder variant

Variant symbol	Variant description
URET	Without retarder

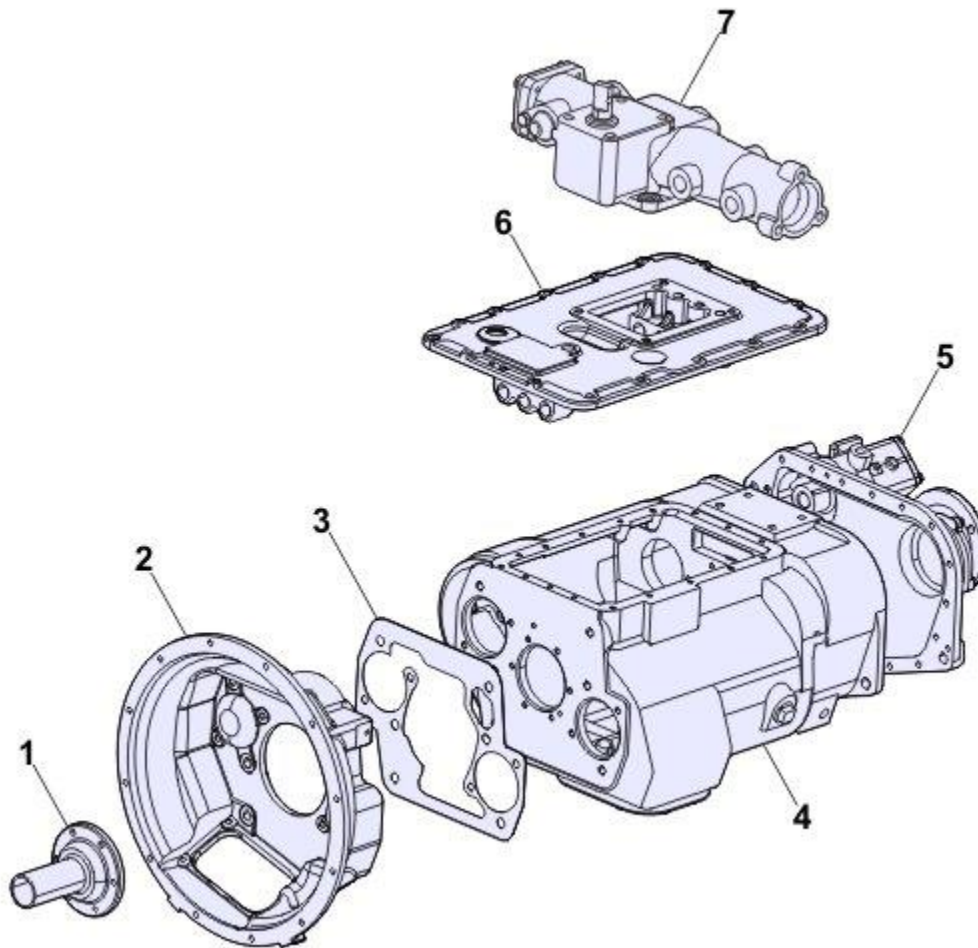
Transmission cooler variant

Variant symbol	Variant description
TC- MWOH2	Mechanical transmission, Oil cooler, Water/oil, HIGH PERF. VERS 2, Gearbox mount

UTCool | Without transmission cooler

Overview

Housing



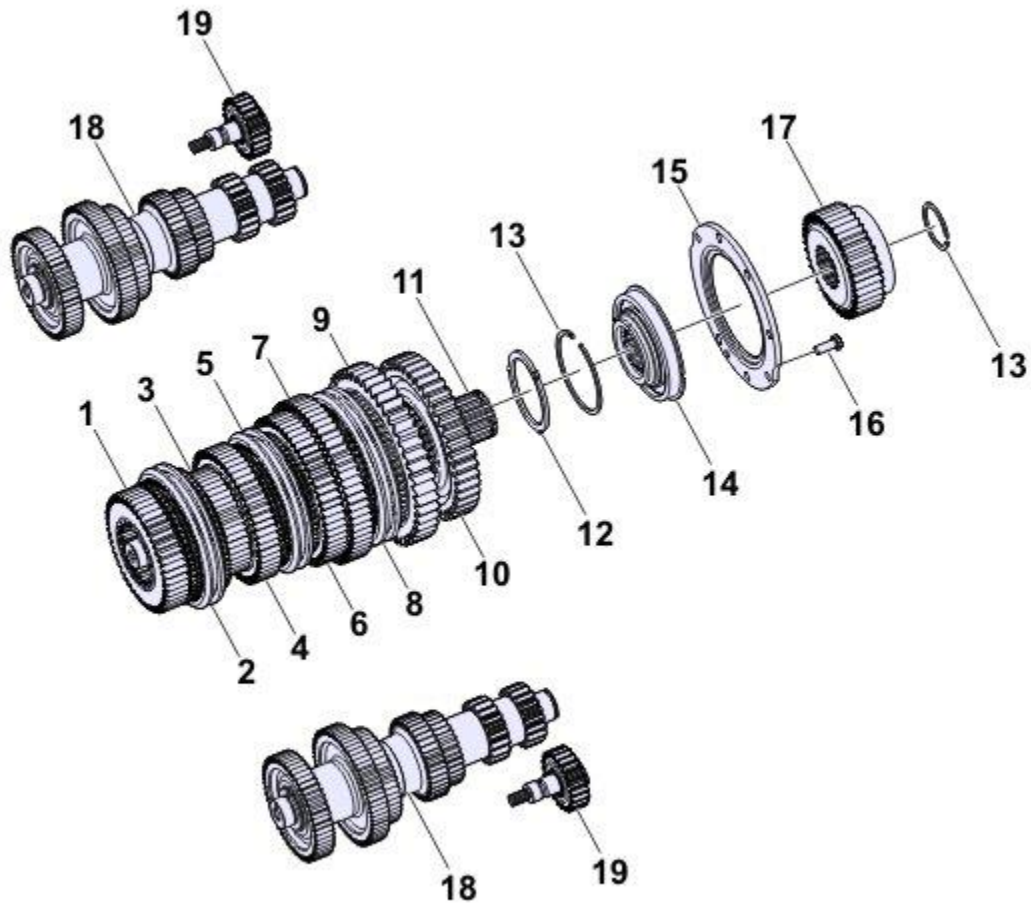
1. Bearing cover
2. Clutch housing
3. Gasket
4. Main housing
5. Range housing
6. Top cover
7. Control housing

The main sections of the gearbox are the clutch housing (2), main housing (4), range housing (5) and control housing (7).

The clutch housing (2) contains the input shaft as well as clutch servo. The main housing (4) contains the

main shaft, intermediate shaft, reverse shaft and shift mechanism. The range housing (5) contains the planetary gears, shift mechanism, actuator and output shaft.

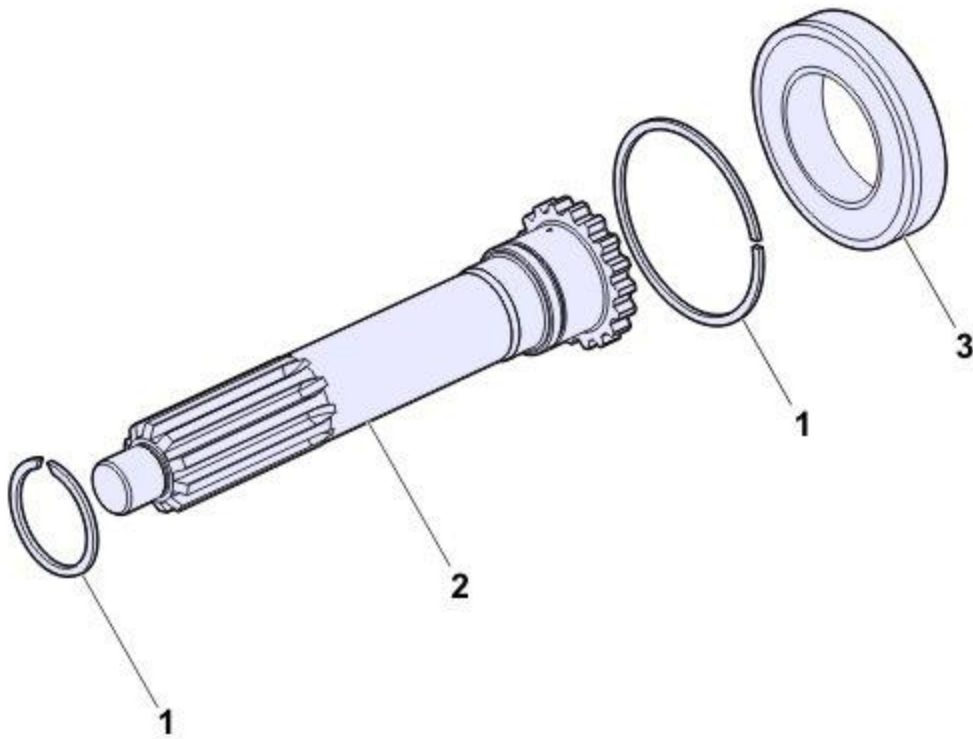
Internal Parts



1. 5th gear
2. Synchronizer assembly
3. 6th gear
4. 4th gear
5. Synchronizer assembly
6. 3rd gear
7. 2nd gear
8. Synchronizer assembly
9. 1st gear
10. Reverse gear
11. Main shaft
12. Spacer
13. snap ring
14. Bearing assembly

15. Retainer
16. Hexagonal bolt
17. Auxiliary drive gear
18. Countershaft assembly
19. Reverse gear

Input shaft



1. Snap ring
2. Input shaft
3. Bearing

The input shaft transfers the engine power to the gearbox via the clutch disc,

Note: The input shaft always rotates in a clockwise direction (viewed from the front).

Counter shaft

The front and rear end of the Counter shaft is mounted in the bearings. Each countershaft transfers half torque.

The advantage of the countershafts are:

- It reduces the gear width.
- It reduces the size and weight of the transmission.

Main shaft

Both ends of the main shaft are mounted in bearings. The front end is mounted in the end of the input shaft, whereas the rear end is mounted in the rear of the main housing.

Output shaft

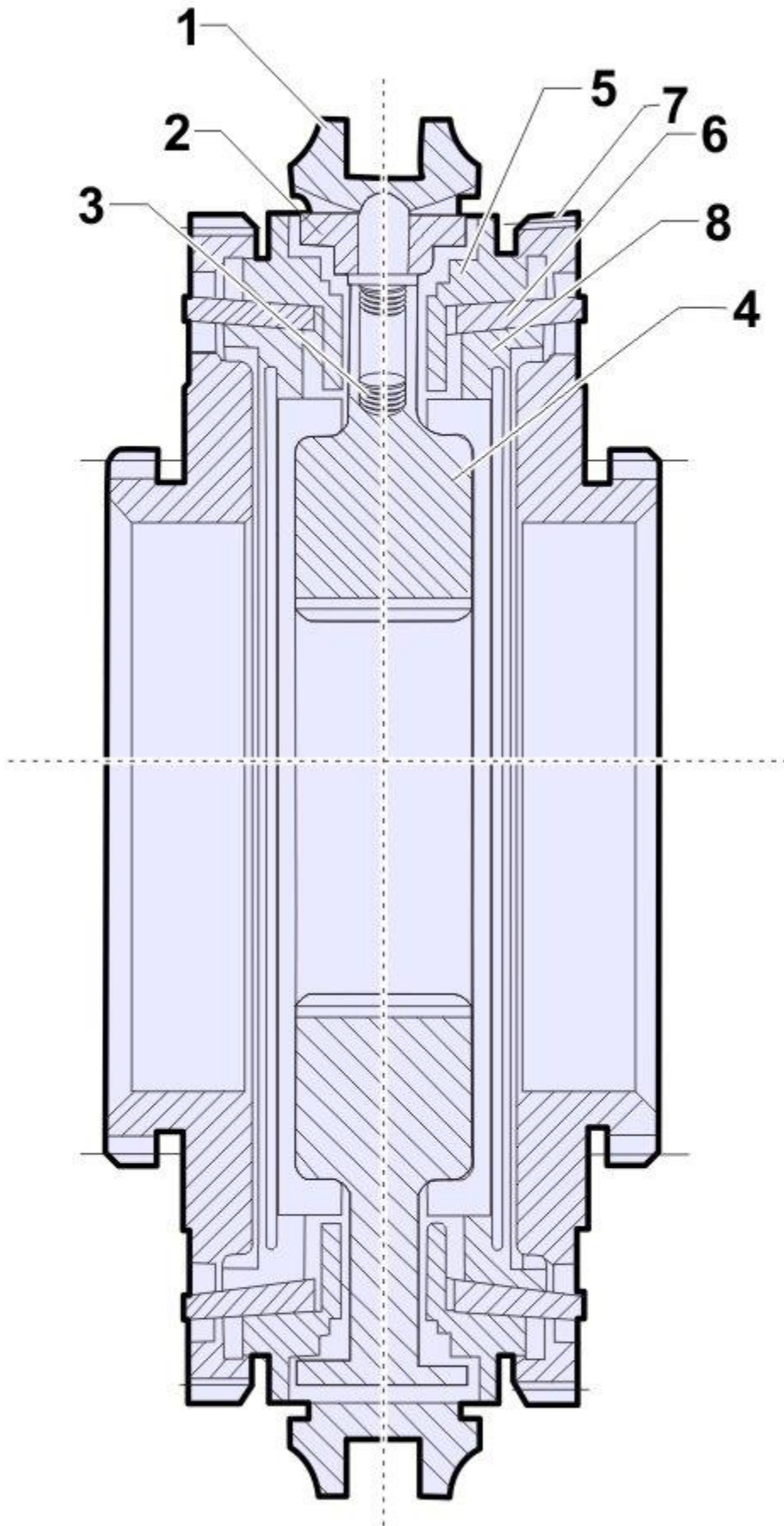
The output shaft is mounted in the range housing with roller bearing and is linked to the range gear.

Note: The cross-tooth flange is standard for all types of gearbox.

Reverse gear

There are two reverse gear which is meshed to the two countershaft. The reverse gear changes the direction of the rotation, which allows the vehicle to move in reverse direction.

Synchronization



5. Hexagonal bolt
6. Auxiliary lengthened countershaft
7. Speedo meter pulse ring
8. Baffle plate, main shaft gears
9. Main shaft, auxiliary case
10. Rear cover
11. Sealing gasket
12. Auxiliary shift cylinder
13. Hexagonal bolt

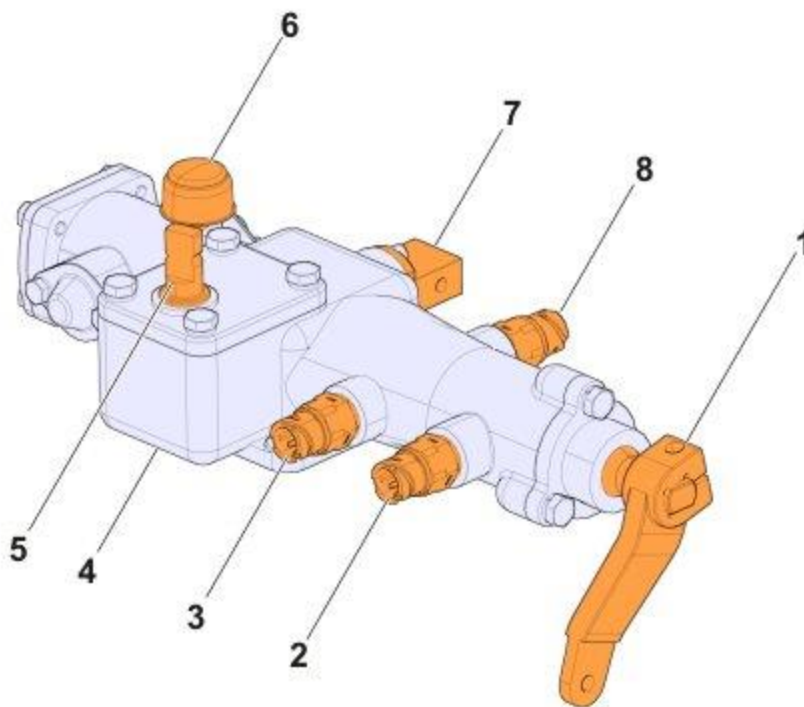
The range gear or auxiliary gear is installed behind the main case.

The input shaft of the auxiliary unit is connected directly to the output shaft of the primary gear case.

Gearbox selection

Control housing

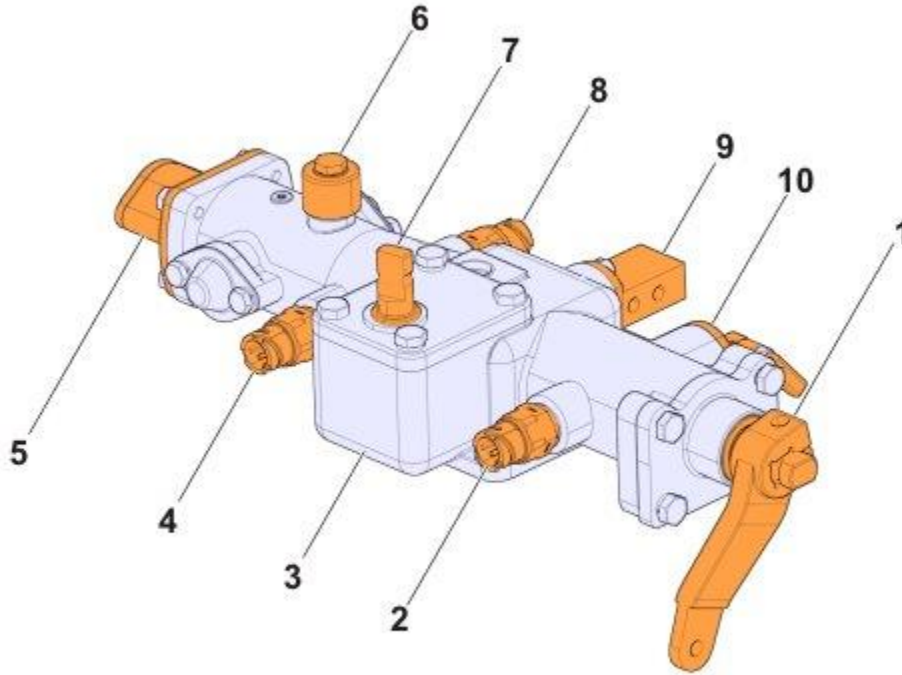
Without inhibitor



1. Shift cable joint
2. Neutral sensor
3. Reverse sensor
4. Control housing
5. Selector cable joint
6. Breather
7. Control valve

8. Reverse sensor

With inhibitor

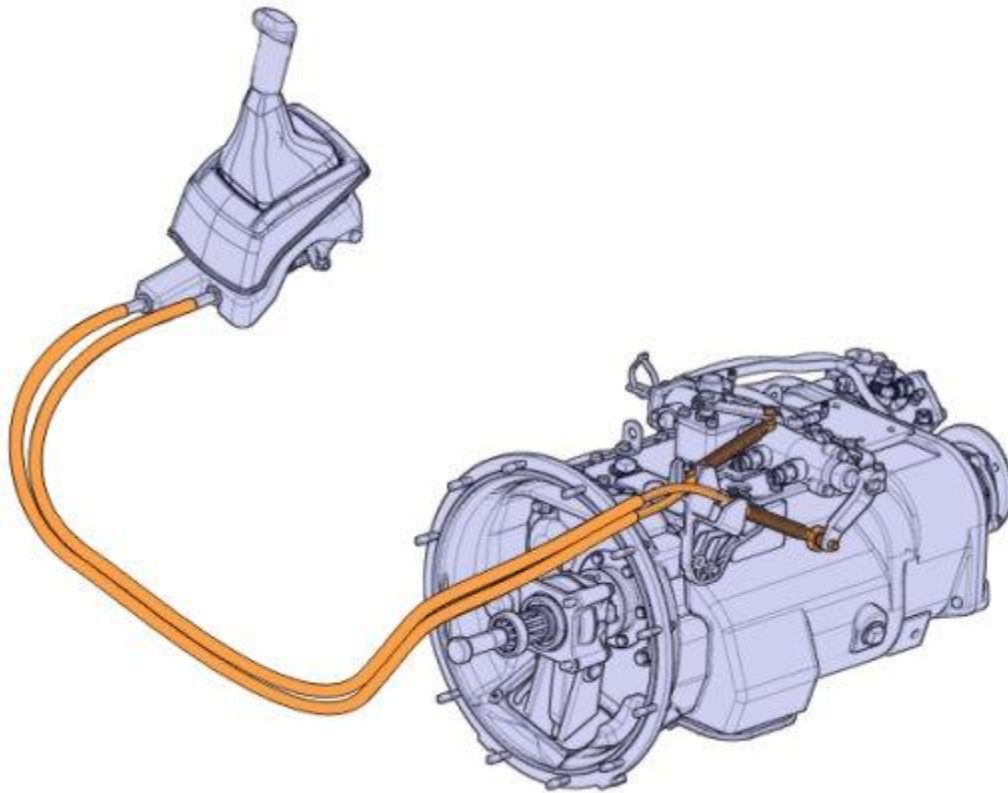


1. Shift cable joint
2. Reverse sensor
3. Control housing
4. Neutral sensor
5. Inhibitor actuator
6. Breather
7. Selector cable joint
8. Reverse sensor
9. Control valve
10. Interlock Actuator

The control housing is located on the top of the gearbox and it is intended to transfer the motion of the gear lever to the gearbox shift rods. The position of the control housing can be adjusted for both left and right hand drive truck variants.

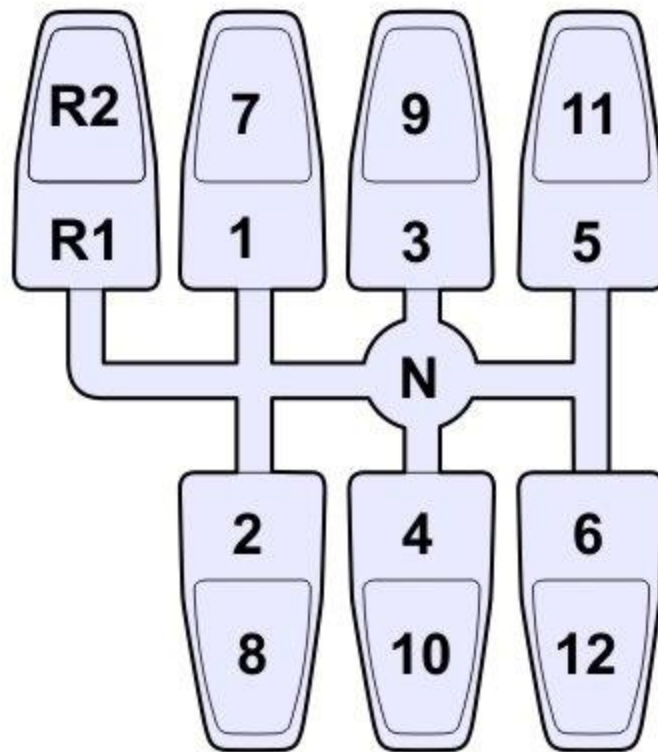
The control housing consists of a gear selector to which is secured a selector shaft. The gear selector is controlled by a gear selector cable and a side control cable.

Gearshift cable



The cable gear shift system has two cables that is shift cable and select cable, which transfer force between the gear lever and the control housing on the gearbox.

Gear shift

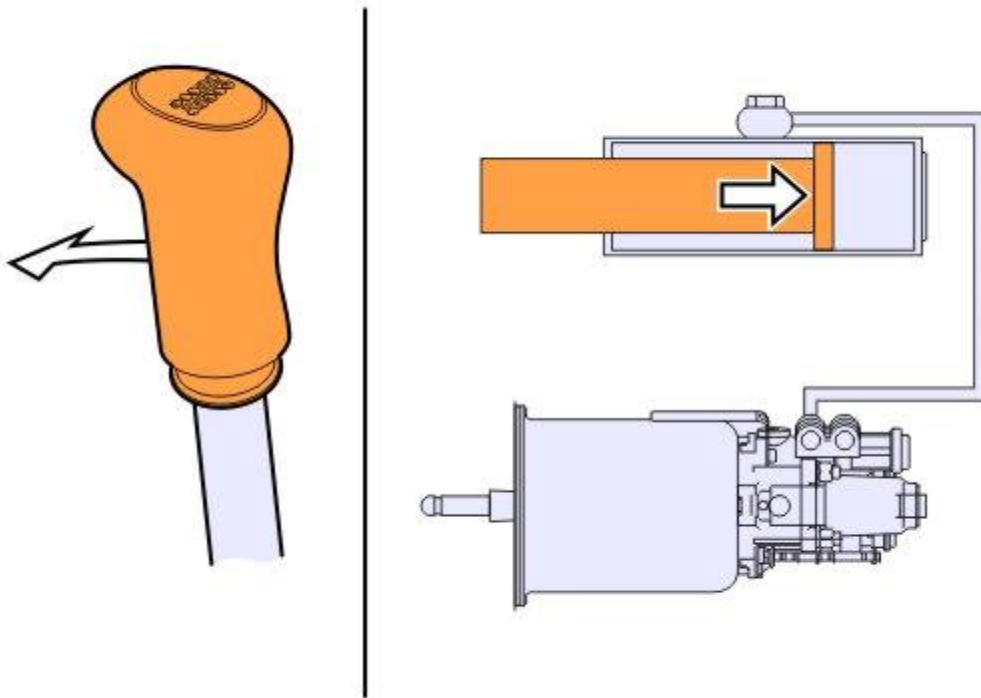


The range gears at the rear of the gearbox double the number of gears in the synchronised section. There are totally of 12 forward gears, Gears 1, 2, 3, 4, 5 and 6 are low range and gears 7, 8, 9, 10, 11 and 12 are high range.

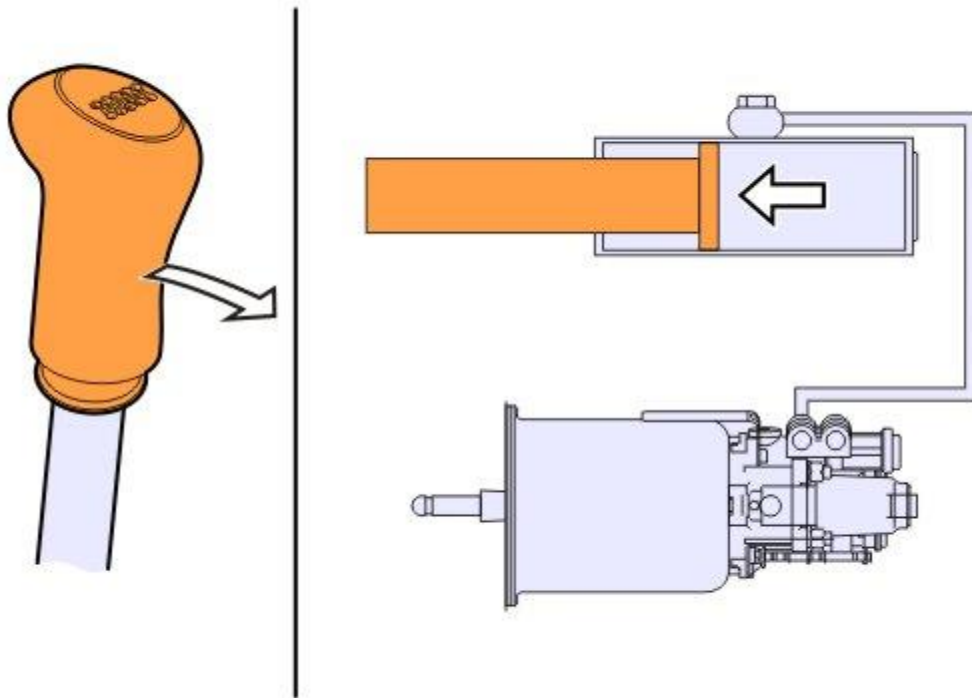
The gear change gate has 3 parallel gear selection paths. In the path between gears 3/4 and 9/10 is a spring-loaded neutral position. The pneumatic range changes from 3 to 4 and from 5 to 6, and vice versa, are selected by pressing the button on the side of the gear lever.

There are zone, range and reverse blocking functions to protect the synchronisation from being damaged while changing gear. The zone block prevents changing into 1st gear by blocking 1st gear if the output shaft speed is too high. The range block prevents changing into the low range gears if the output shaft speed is not low enough. The reverse block prevents reverse gear selection if the main shaft and intermediate shaft are rotating, i.e. if the vehicle is not stationary

Gear changing sequence



Gear changing servo movements when changing gear: Reverse- 1, 1, 3, 5, 7, 9 and 11



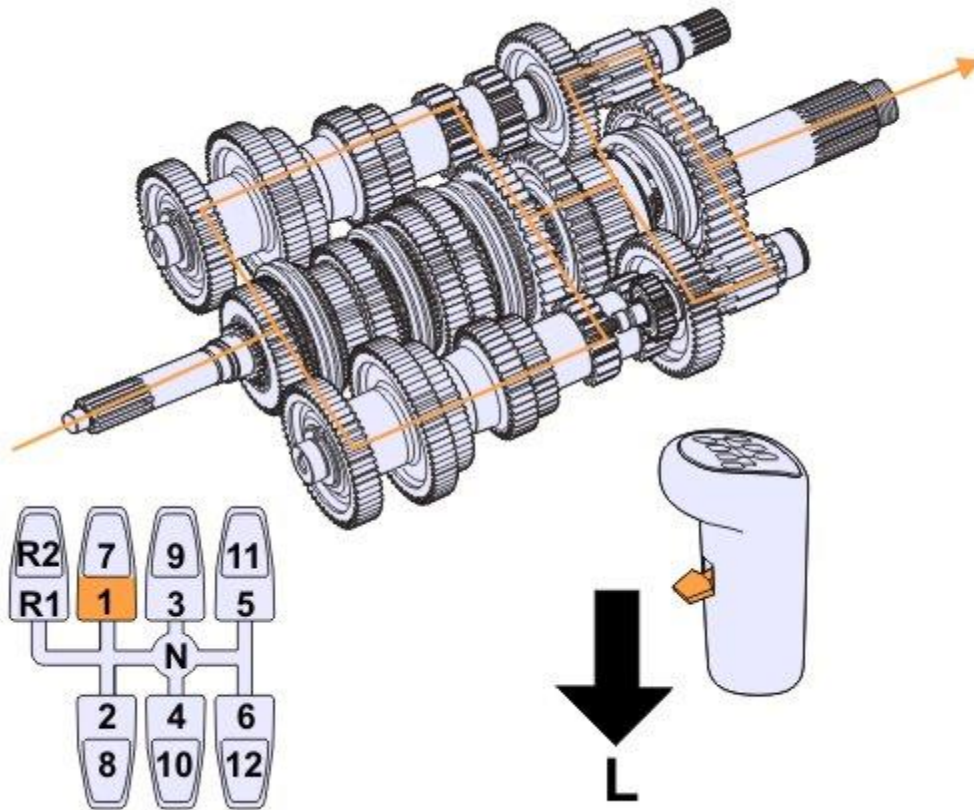
Gear changing servo movements when changing gear: Reverse- 2 , 2, 4, 6 and 8

Compressed air is not directly connected to the gear shift, but is fed via a control valve on the clutch cylinder. When the clutch pedal is depressed, the gear shift is operated mechanically via the gear lever and control housing. Then the gear shift completes the gear change.

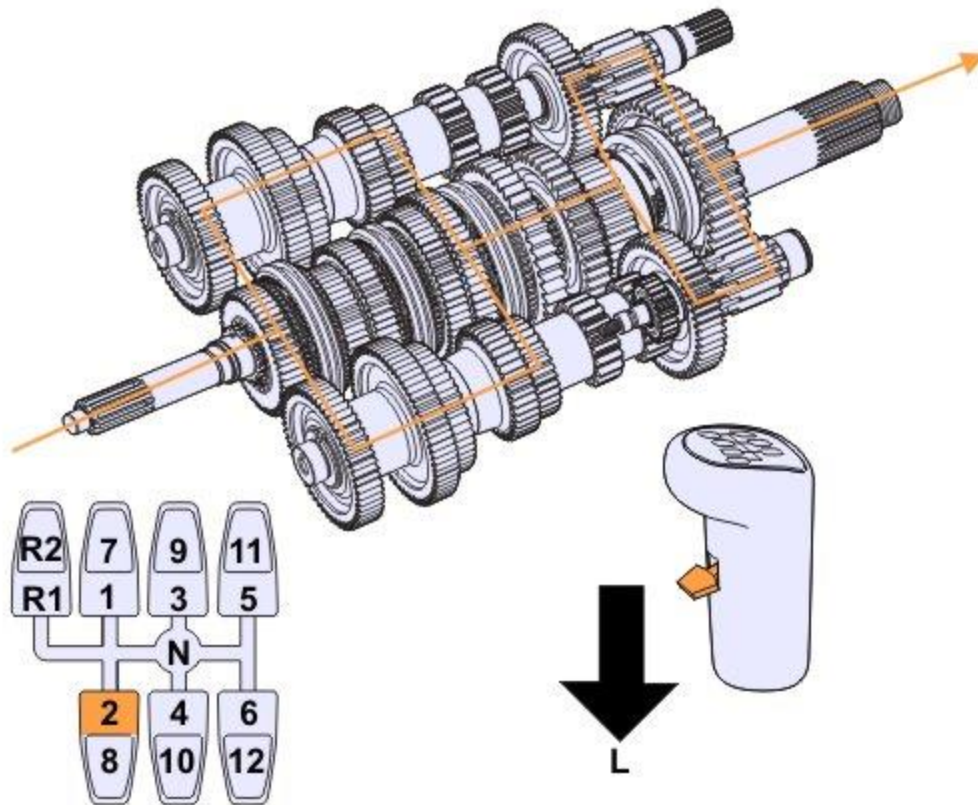
Compressed air first reaches the gear shift when the clutch cylinder begins to move and opens a little. The control valve in the clutch cylinder automatically readjusts according to the amount of clutch wear.

Power flow

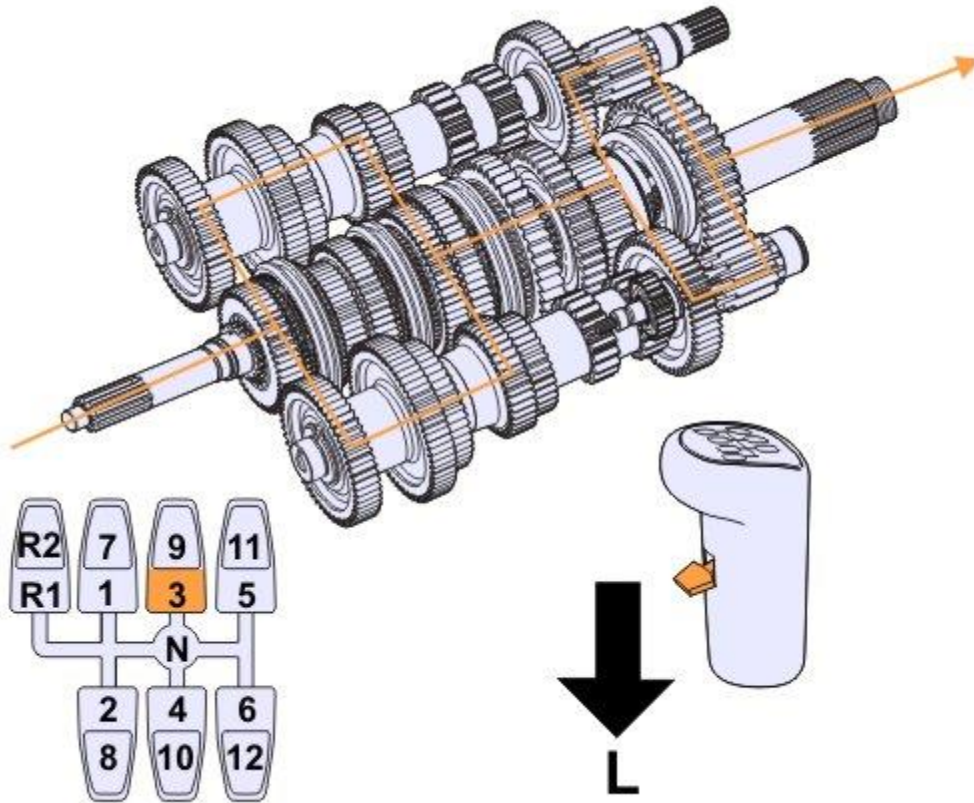
1st gear, low range



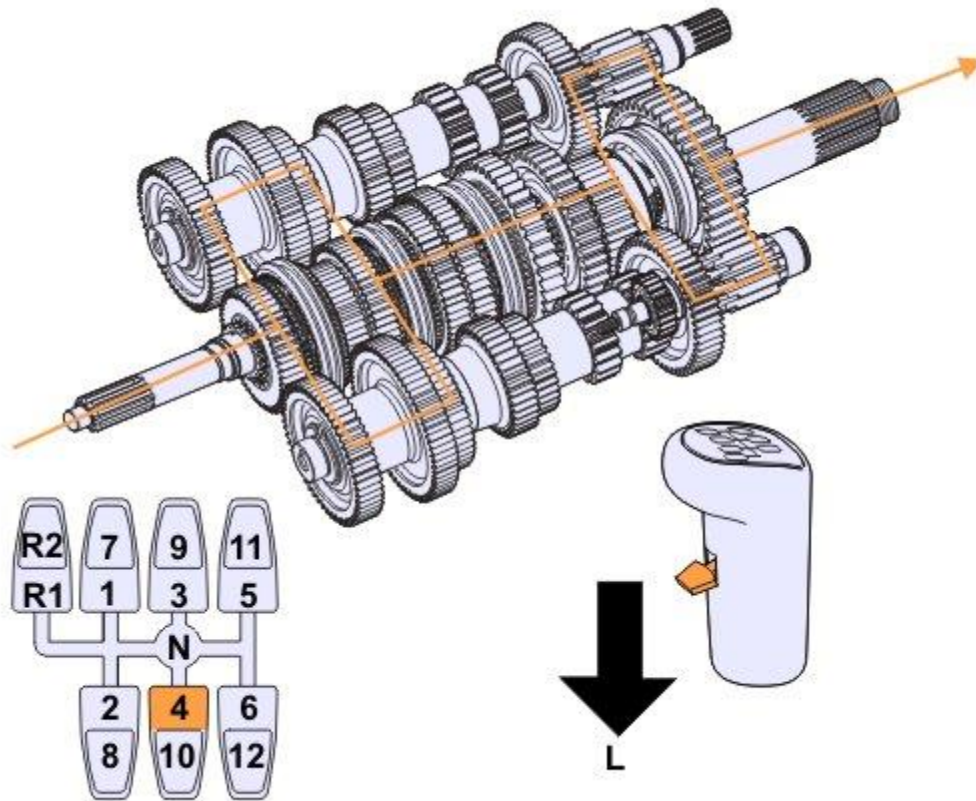
2nd gear, low range



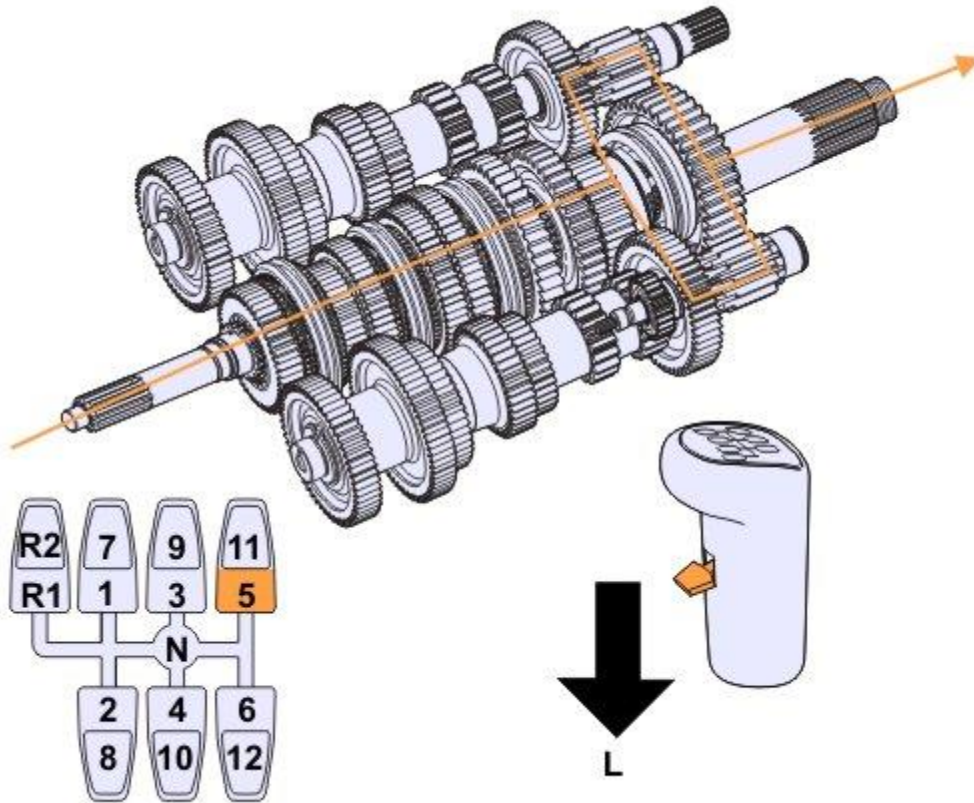
3rd gear, low range



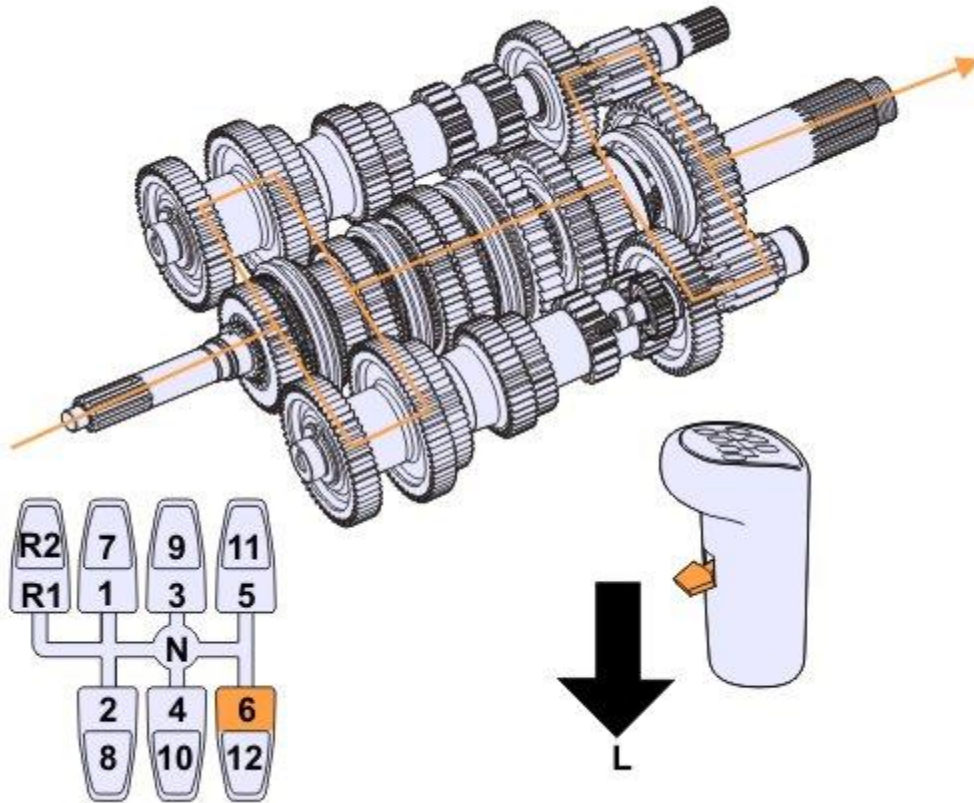
4th gear, low range



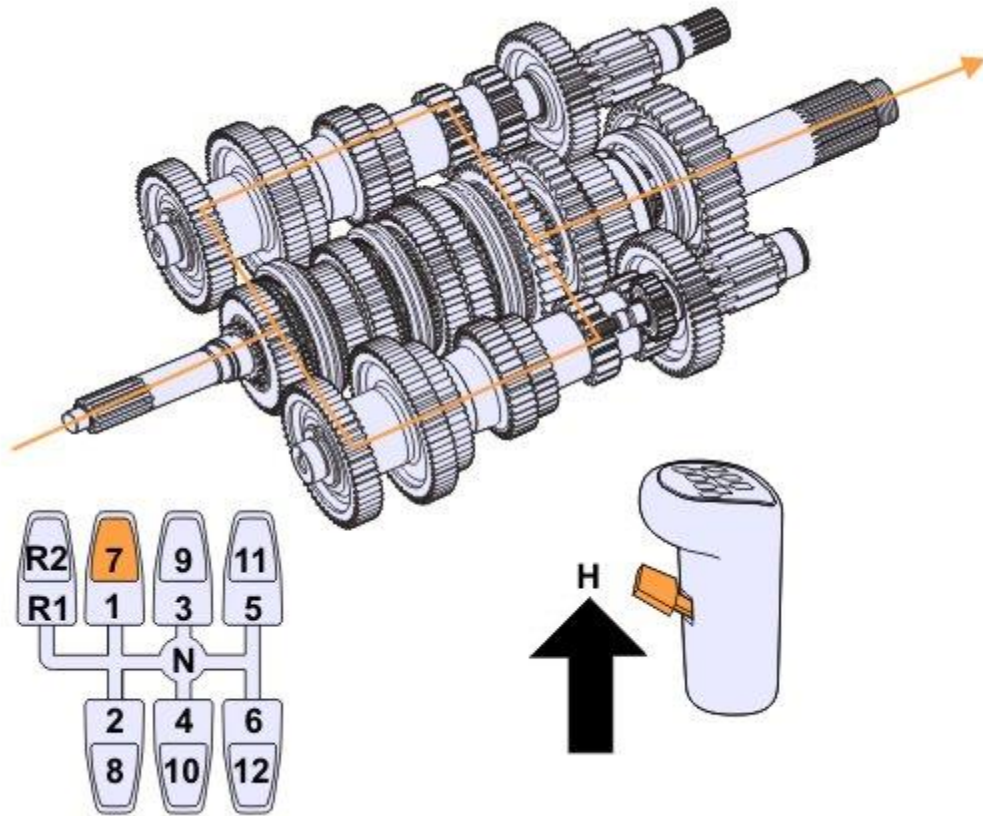
5th gear, high range



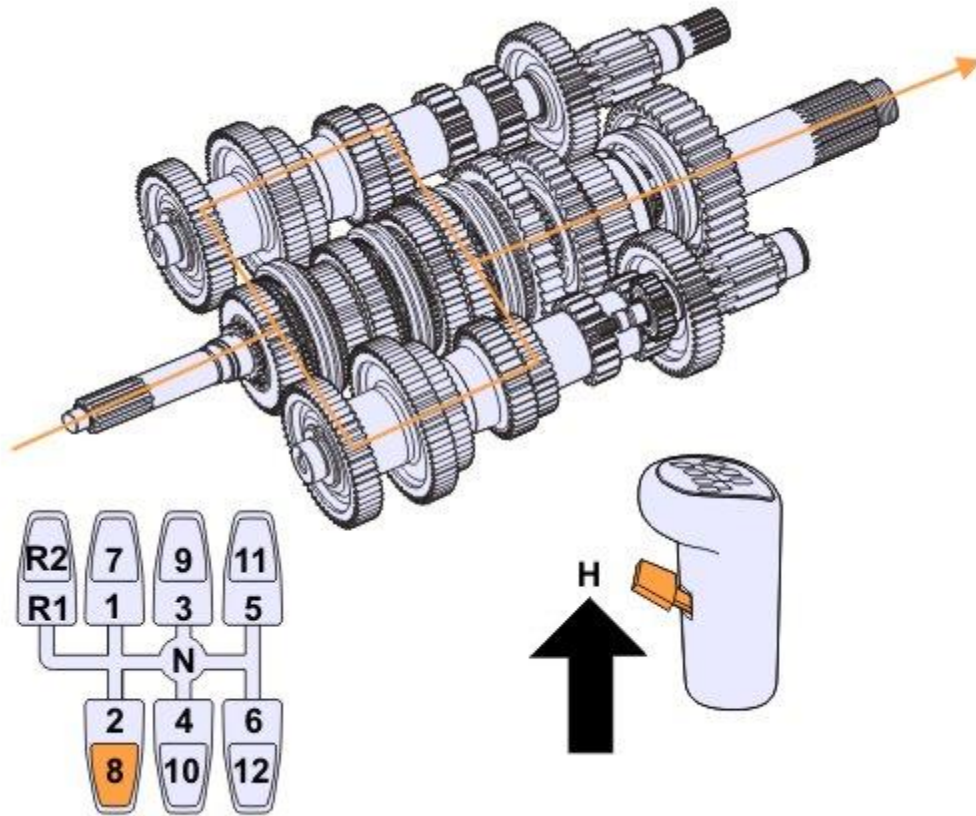
6th gear, high range



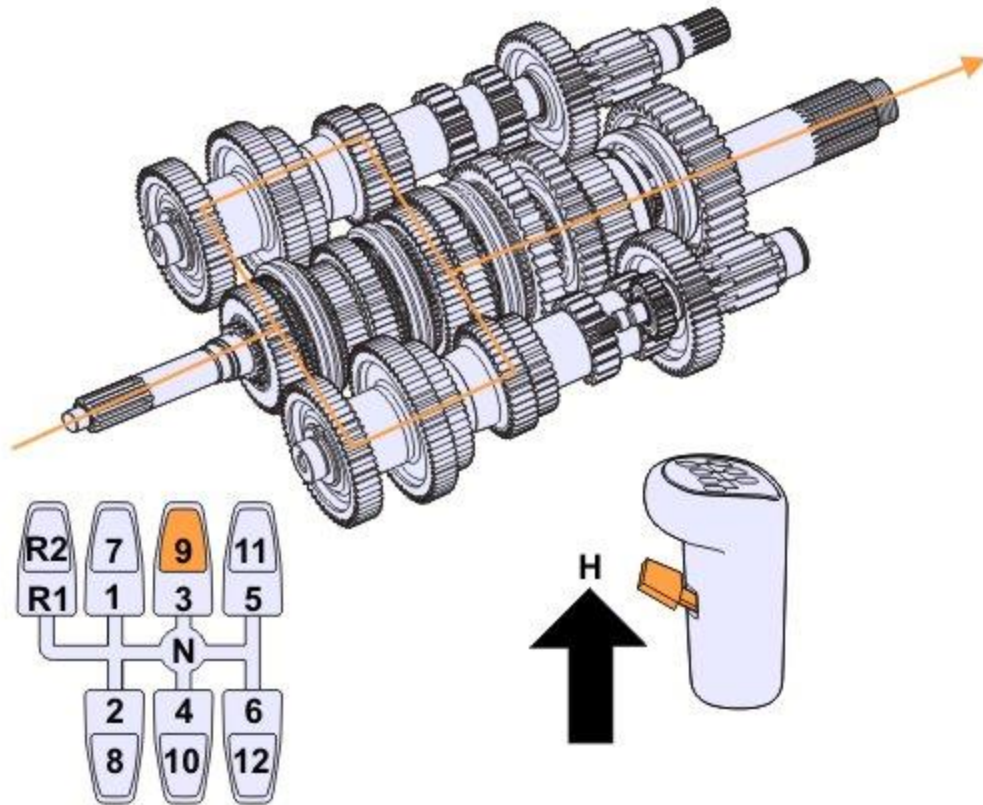
7th gear, high range



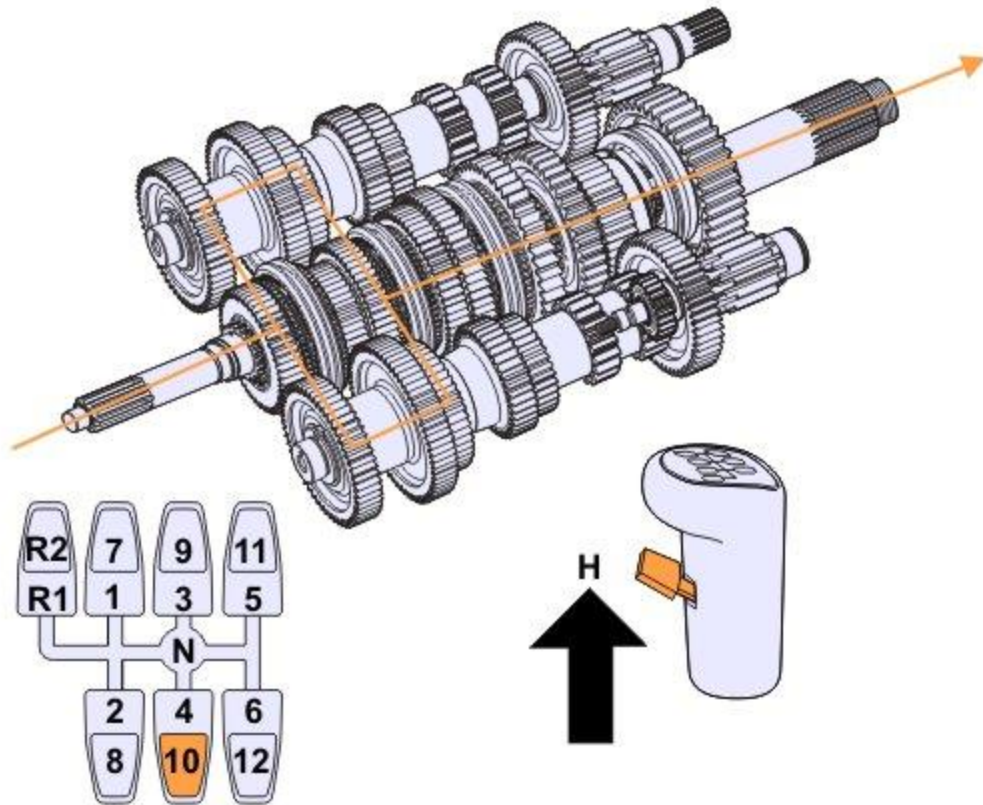
8th gear, high range



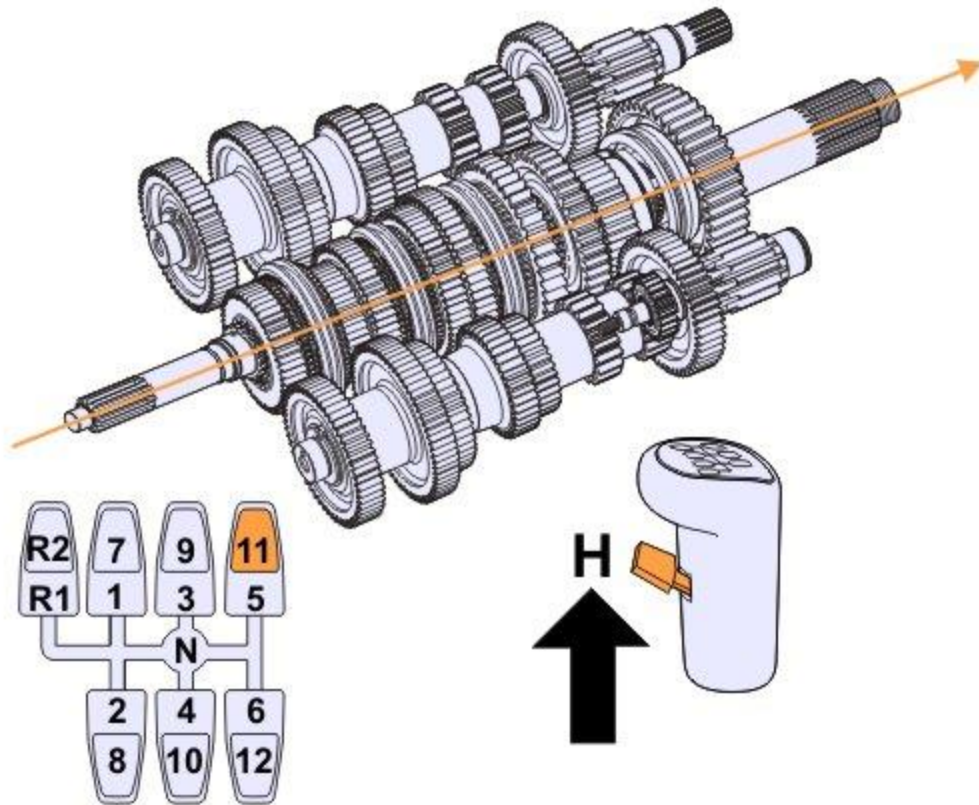
9th gear, high range



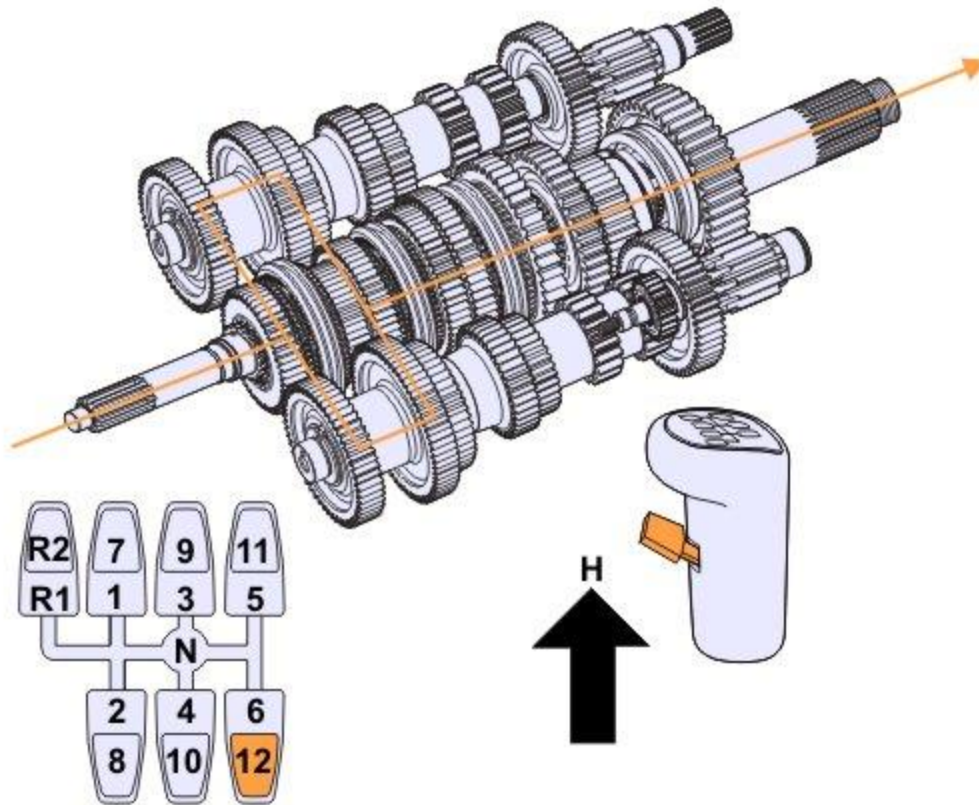
10th gear, high range



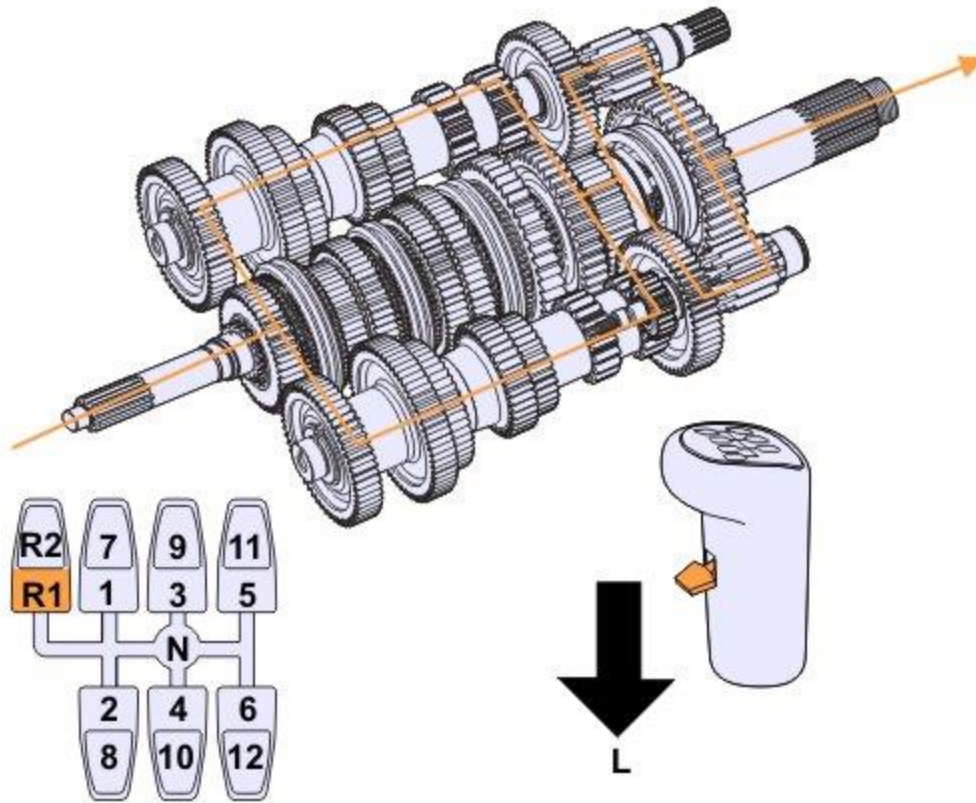
11th gear, high range



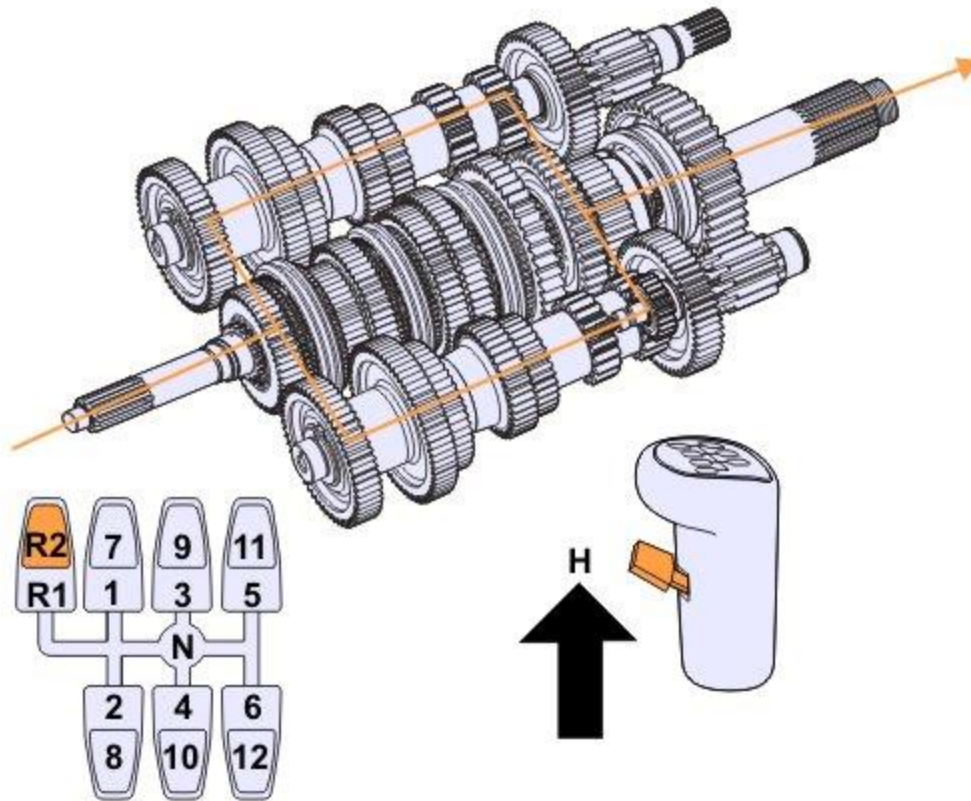
12th gear, high range



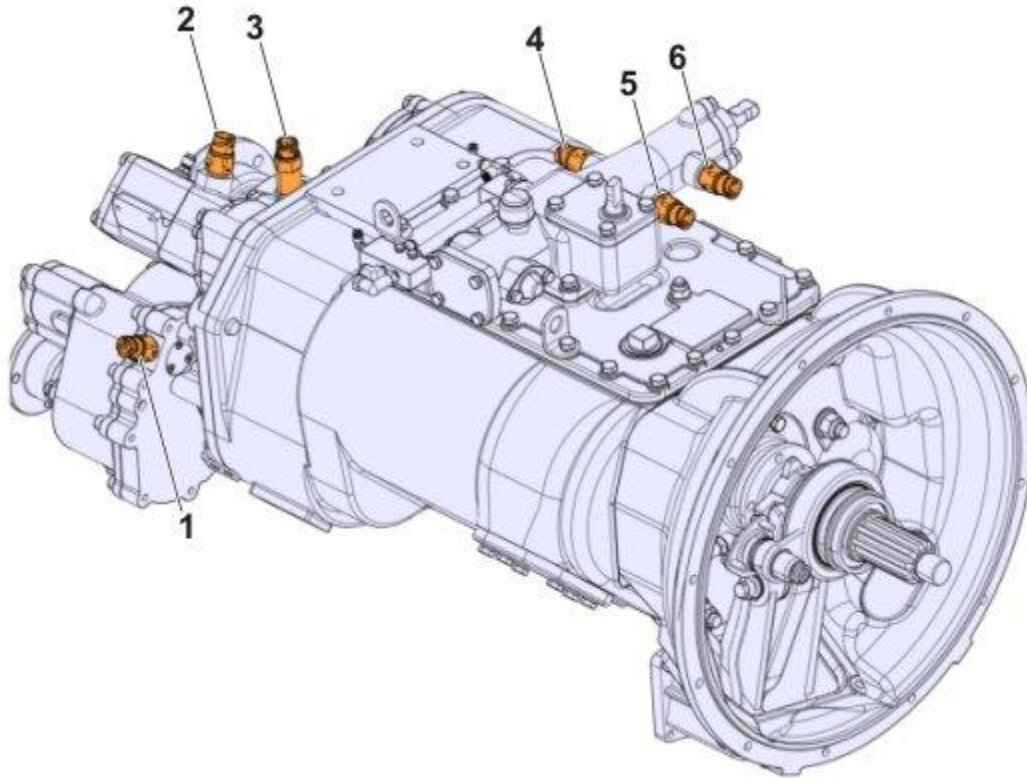
Reverse gear – 1, low range



Reverse gear – 2, high range



Electrical components



1. PTO actuator switch
2. Low Range sensor
3. Speed sensor
4. Reverse sensor
5. Reverse sensor
6. Neutral sensor

PTO sensor

- The PTO sensor gives the signal about engagement and disengagement of the PTO.

Low Range sensor

- The range sensor enable the signal when the range gear is activated.

Speed sensor

- The speed sensor sends the signal to the IECU unit.

Reverse sensor

- The reverse sensor gives the signal when the gear is shifted to reverse gear.

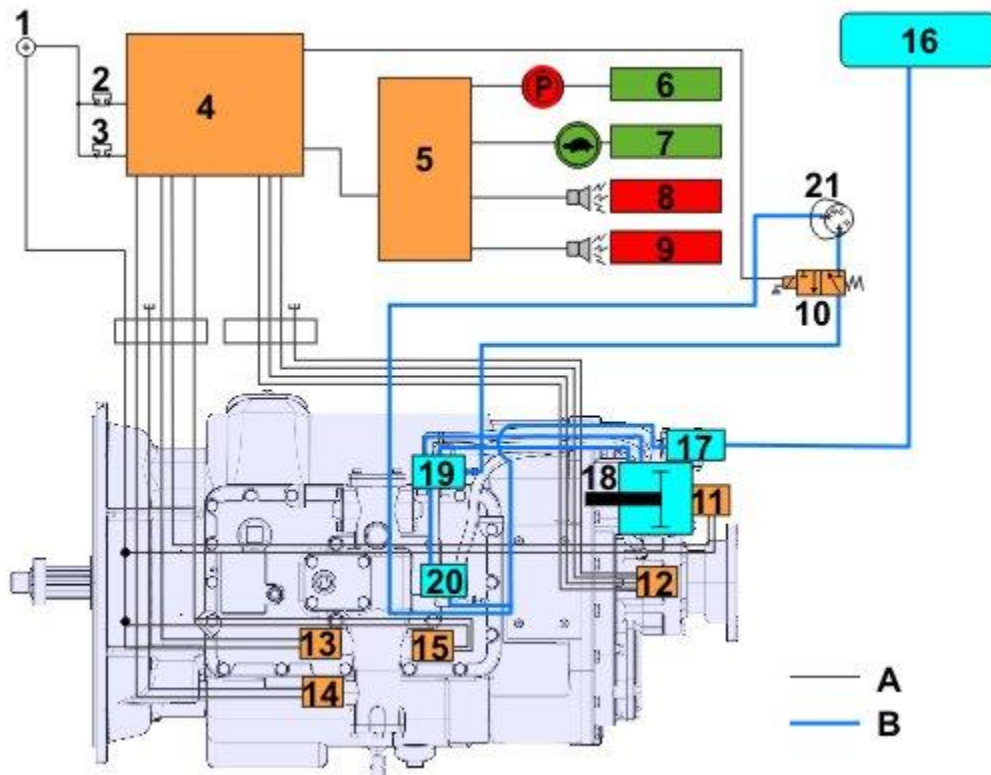
Neutral sensor

- The neutral sensor gives a signal when the gear is in neutral position.

Pneumatic and Electrical schematic drawing

Without inhibitor

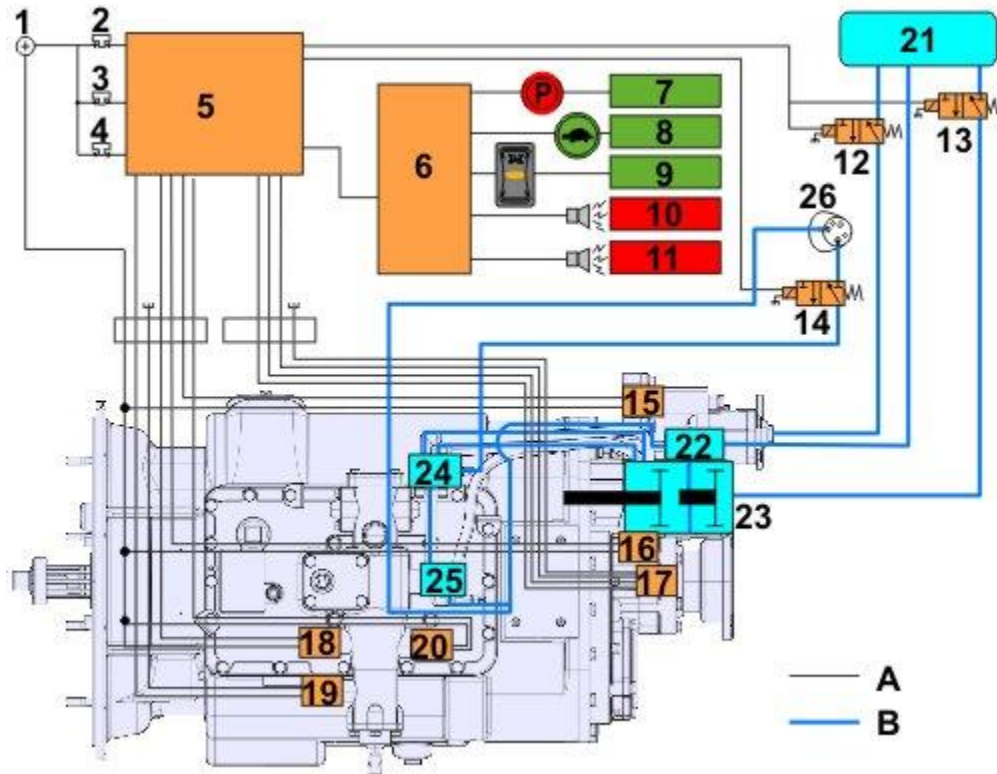
Without PTO



- A Electrical harness
 - B Pneumatic supply
1. Ignition Switch
 2. Clutch switch
 3. Wheel park switch
 4. IECU
 5. Instrument cluster
 6. Wheel park lamp
 7. Range low lamp
 8. Gate warning
 9. Wheel park warning
 10. Inhibitor solenoid valve
 11. Low Range sensor
 12. Wheel speed sensor
 13. Reverse sensor
 14. Neutral sensor
 15. 1- 2 switch
 16. Air tank
 17. Air filter regulator

- 18. Range cylinder
- 19. Single H valve
- 20. Control valve
- 21. Shift knob

With PTO



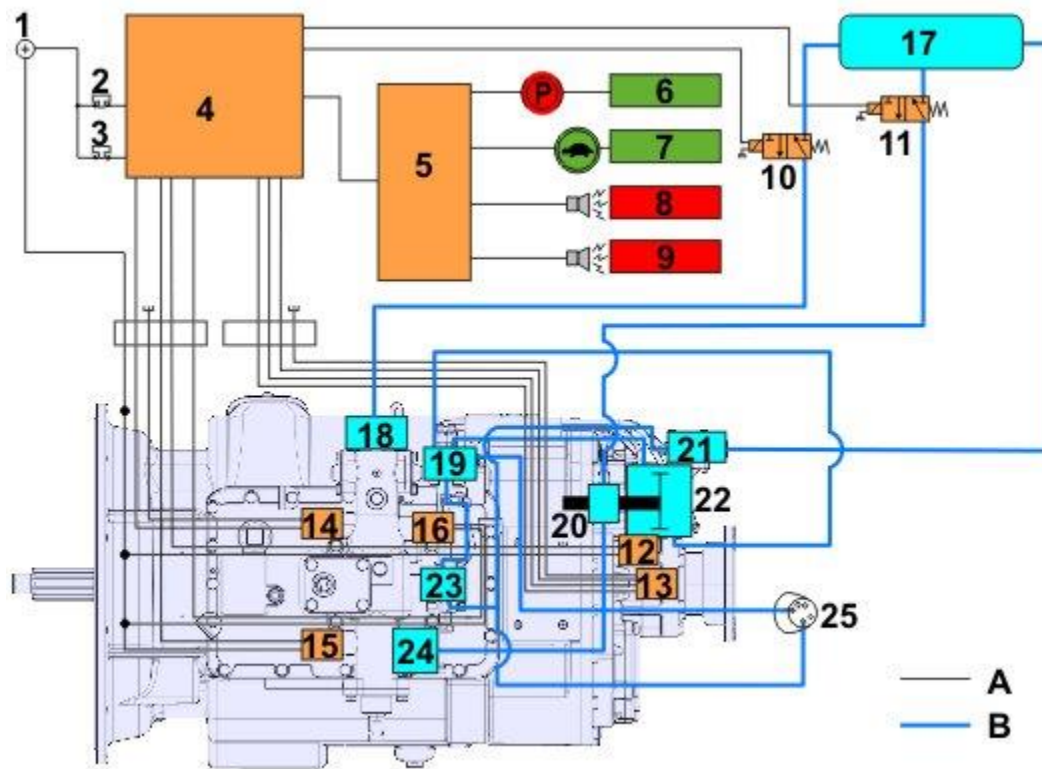
- **A** Electrical harness
- **B** Pneumatic supply

- 1. Ignition Switch
- 2. PTO switch
- 3. Clutch switch
- 4. Wheel park switch
- 5. IECU
- 6. Instrument cluster
- 7. Wheel park lamp
- 8. Range low lamp
- 9. PTO lamp
- 10. Gate warning
- 11. Wheel park warning
- 12. PTO solenoid valve
- 13. Range solenoid valve
- 14. Inhibitor solenoid valve
- 15. PTO actuator switch
- 16. Low Range sensor
- 17. Wheel speed sensor

- 18. Reverse sensor
- 19. Neutral sensor
- 20. 1- 2 select switch
- 21. Air tank
- 22. Air filter regulator
- 23. Range cylinder
- 24. Single H valve
- 25. Control valve
- 26. Shift knob

With inhibitor

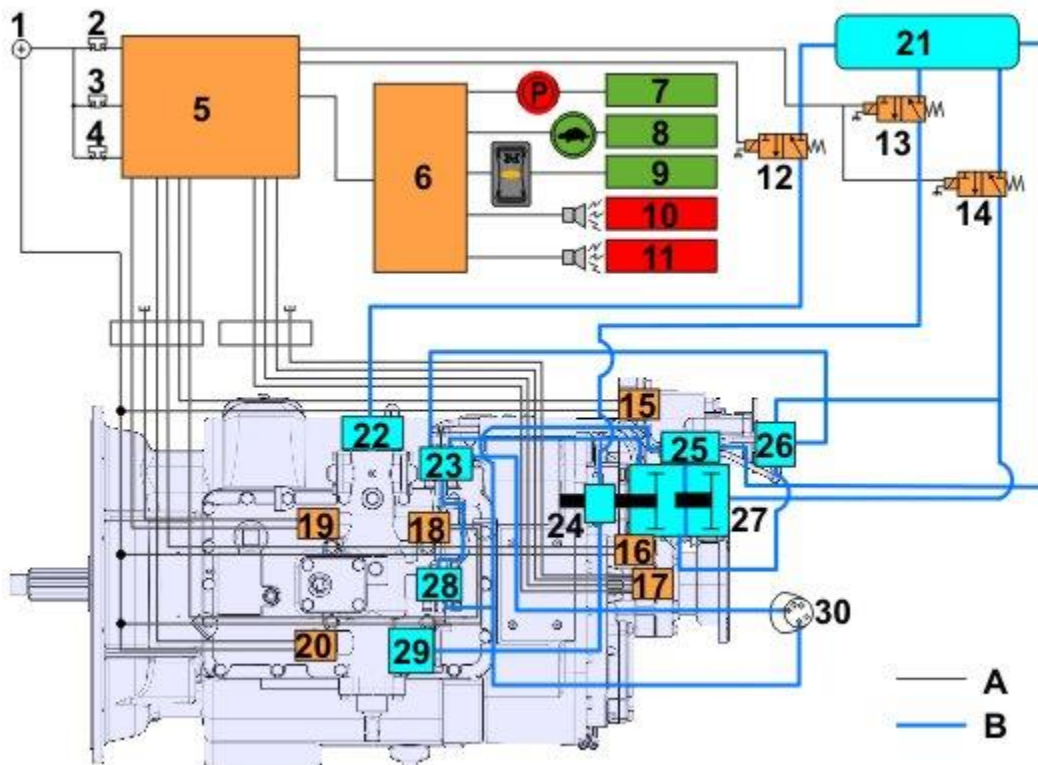
Without PTO



- **A** Electrical harness
 - **B** Pneumatic supply
- 1. Ignition Switch
 - 2. Clutch switch
 - 3. Wheel park switch
 - 4. IECU
 - 5. Instrument cluster
 - 6. Wheel park lamp
 - 7. Range low lamp
 - 8. Gate warning
 - 9. Wheel park warning
 - 10. Inhibitor solenoid valve

11. Interlock solenoid valve
12. Low Range sensor
13. Wheel speed sensor
14. Neutral sensor
15. Reverse sensor
16. 1- 2 select switch
17. Air tank
18. Inhibitor actuator
19. Single H valve
20. Interlock valve
21. Air filter regulator
22. Range cylinder
23. Control valve
24. Interlock actuator
25. Shift knob

With PTO



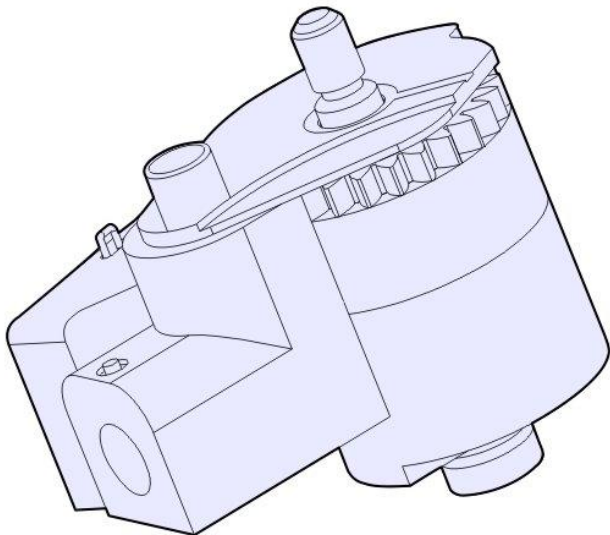
- A Electrical harness
- B Pneumatic supply

1. Ignition Switch
2. PTO switch
3. Clutch switch
4. Wheel park switch
5. IECU
6. Instrument cluster

7. Wheel park lamp
8. Range low lamp
9. PTO lamp
10. Gate warning
11. Wheel park warning
12. Inhibitor solenoid valve
13. Interlock solenoid valve
14. PTO solenoid valve
15. PTO actuator switch
16. Low Range sensor
17. Wheel speed sensor
18. 1- 2 select switch
19. Neutral sensor
20. Reverse sensor
21. Air tank
22. Inhibitor actuator
23. Single H valve
24. Interlock valve
25. Air filter regulator
26. PTO protection valve
27. Range cylinder
28. Control valve
29. Interlock actuator
30. Shift knob

Lubrication

Oil pump



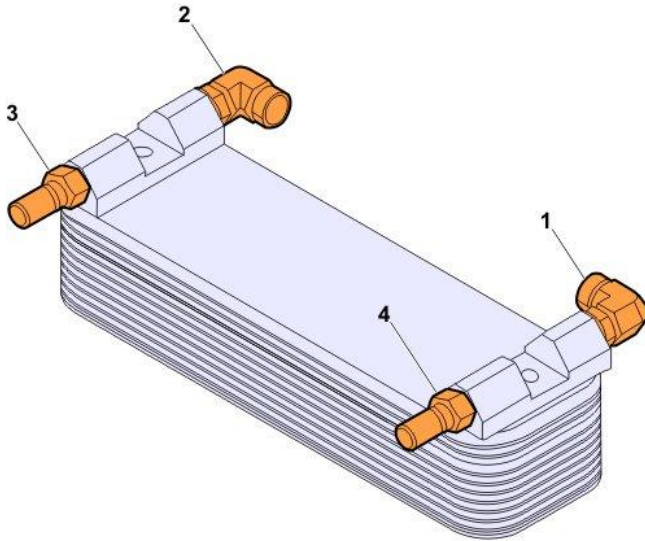
The gear box is lubricated through a splash system, the gear box is equipped with oil pump, it is located in between the main case and auxiliary case, which is driven by the left countershaft.

Gearbox oil is affected by vehicle usage such as gross combination weight, topography, vehicle speed

and so on. High oil temperature shortens transmission life and also causes serious damages to transmission. To avoid such kinds of problems, oil cooler is equipped to cool the oil according to the conditions

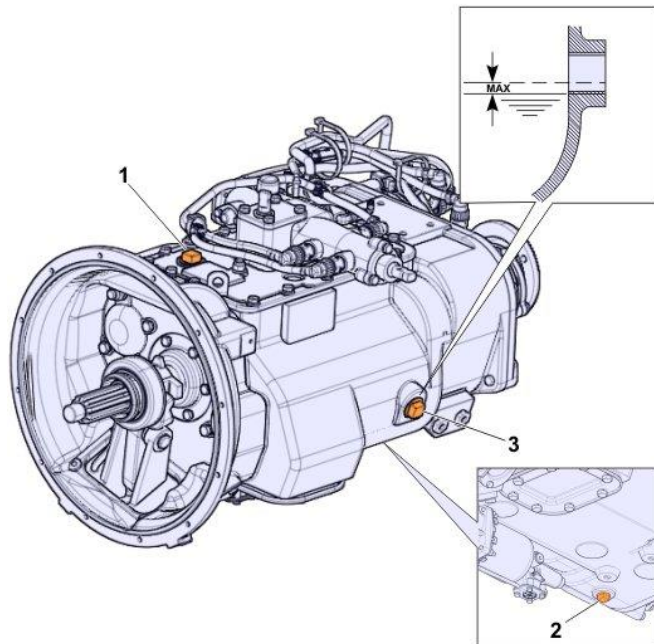
Oil cooler

TC-MWOH2



- 1. Oil inlet
- 2. Oil outlet
- 3. Coolant inlet
- 4. Coolant outlet

Oil level



1. Filling plug
2. Draining plug
3. Level plug

The drain plug **(2)** is located on the bottom of the gearbox. after draining, fill the gearbox oil through the filling plug **(1)**.

After filling the gearbox oil, check the oil level through oil level plug **(3)**.