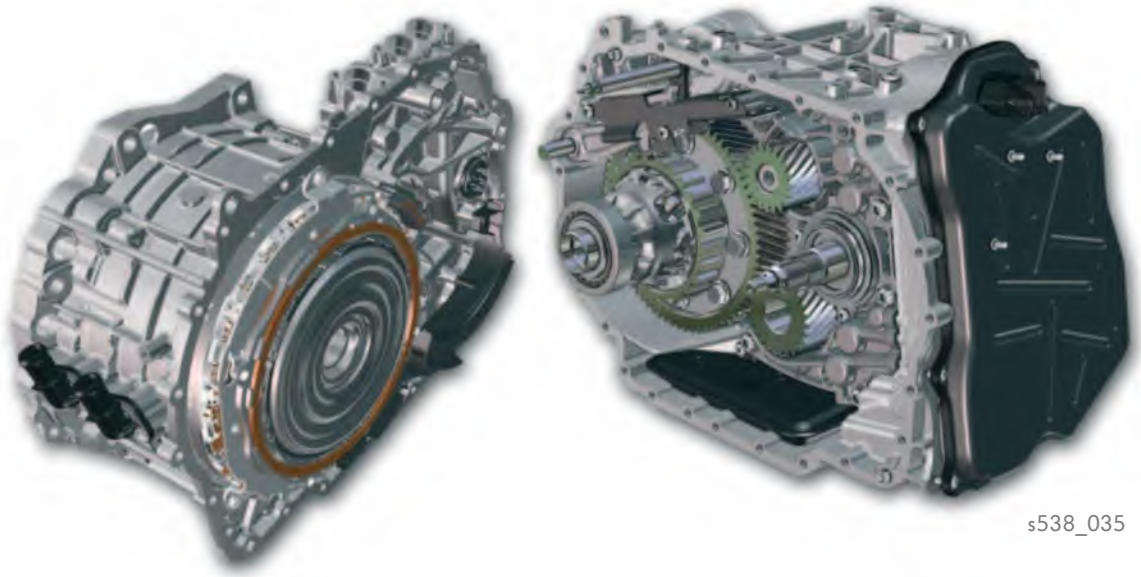
Service Training

Self-study Programme 538

The Dual Clutch Gearbox 0DD

Design and function

A new dual clutch gearbox is being introduced with the Golf GTE.
Its compact design also allows it to be installed in A0- and B-segment vehicles.
In the Golf GTE, the dual clutch gearbox 0DD is driven by a 1.4 l 110kW TSI engine and the electric drive motor V141 that delivers 75kW. The gearbox has been specially configured for this drive type and allows a high level of driving enjoyment with minimum fuel consumption.
You will find out more about the design and function of the dual clutch gearbox 0DD over the following pages.



s538_035

The Self-study Programme shows the design and function of new developments.
The contents will not be updated.

For current testing, adjustment and repair instructions, refer to the relevant service literature.

Important note

Contents

Volkswagen dual clutch gearboxes

The dual clutch gearbox 0DD was developed by Volkswagen specifically for the requirements of hybrid vehicles. The gearbox is produced at the Kassel factory and continues the success story of dual clutch gearboxes at Volkswagen.

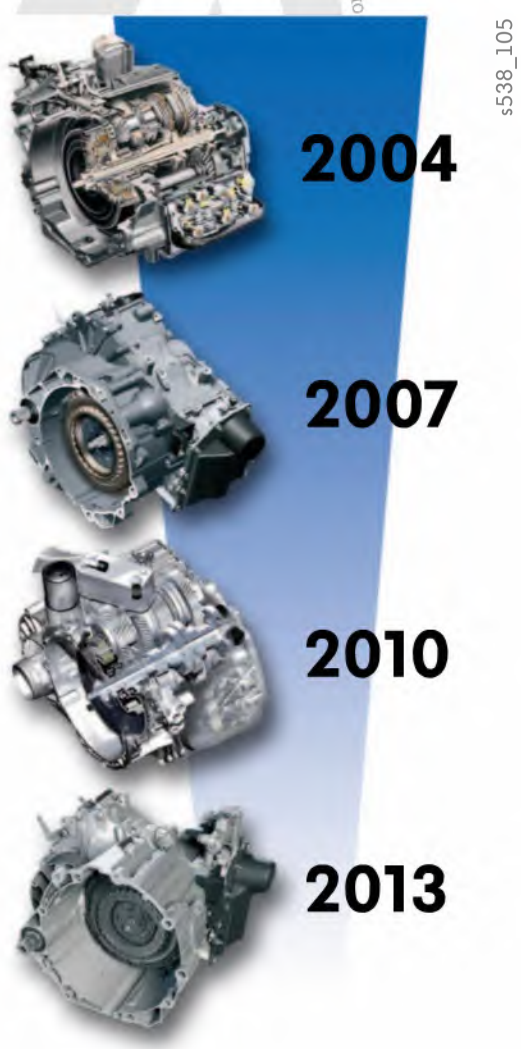
History of the dual clutch gearbox

2004
The first dual clutch gearbox 02E (0D9*) developed by Volkswagen was launched in the Golf R32. It had six forward gears and two wet clutches.

2007
The dual clutch gearbox 0AM (0CW*) with seven forward gears and two dry clutches was introduced.

2010
The dual clutch gearbox 0BH (0DL*) was introduced at Volkswagen Passenger Cars in the Tiguan 2010. It had seven forward gears and two multi-plate clutches.

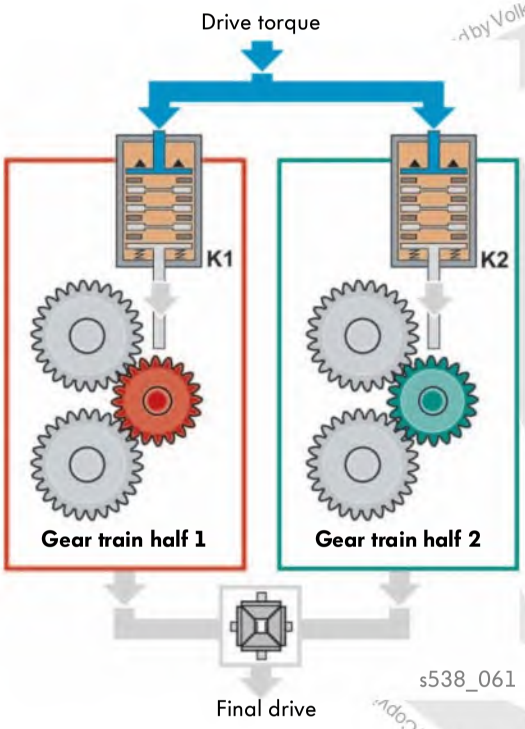
2013
The dual clutch gearbox 0CG was introduced in the Jetta Hybrid. The 0AM gearbox with an additional dry disengagement clutch formed the basis for this gearbox.



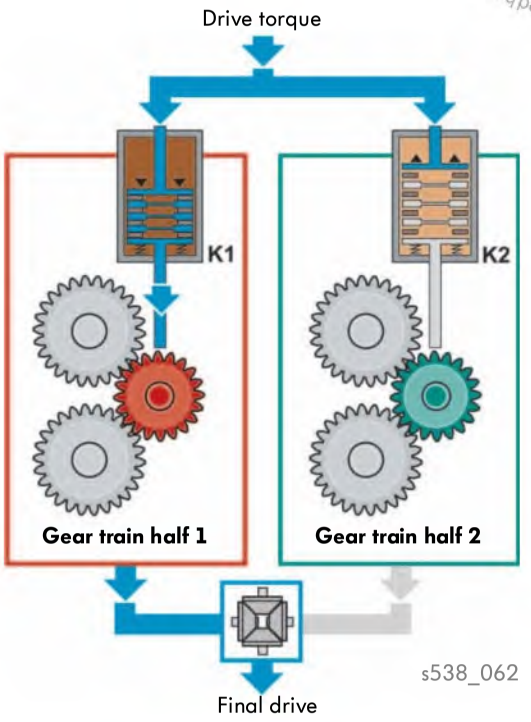
s538_105

*New codes assigned to the gearboxes upon introduction of the modular transverse matrix (MQB).

Basic principle of the dual clutch gearbox



The dual clutch gearbox consists of two manual gearboxes (gear train halves) with two clutches K1 and K2.
Clutch K1 transmits the drive torque to gear train half 1. Gears 1, 3 and 5 are selected in gear train half 1.
Clutch K2 transmits the drive torque to gear train half 2. Gears 2, 4, 6 and R are selected in gear train half 2.



This design enables fast gear changes without interruptions to traction.
When clutch K1 is engaged and a gear is selected in gear train half 1, the power is transmitted via this gear train half to the final drive.

When clutch K1 is disengaged, clutch K2 will engage at the same time. The power is then transmitted via the gear selected in gear train half 2 to the final drive.

The dual clutch gearbox 0DD in the Golf GTE

Being a hybrid vehicle, the Golf GTE runs in the following operating modes:
- Driving with only the electric drive motor (e-machine)
- Driving with only the combustion engine
- Driving with both power units together (boost)

In all operating modes, the dual clutch gearbox 0DD shifts between the gears without interrupting traction.

Golf GTE profile

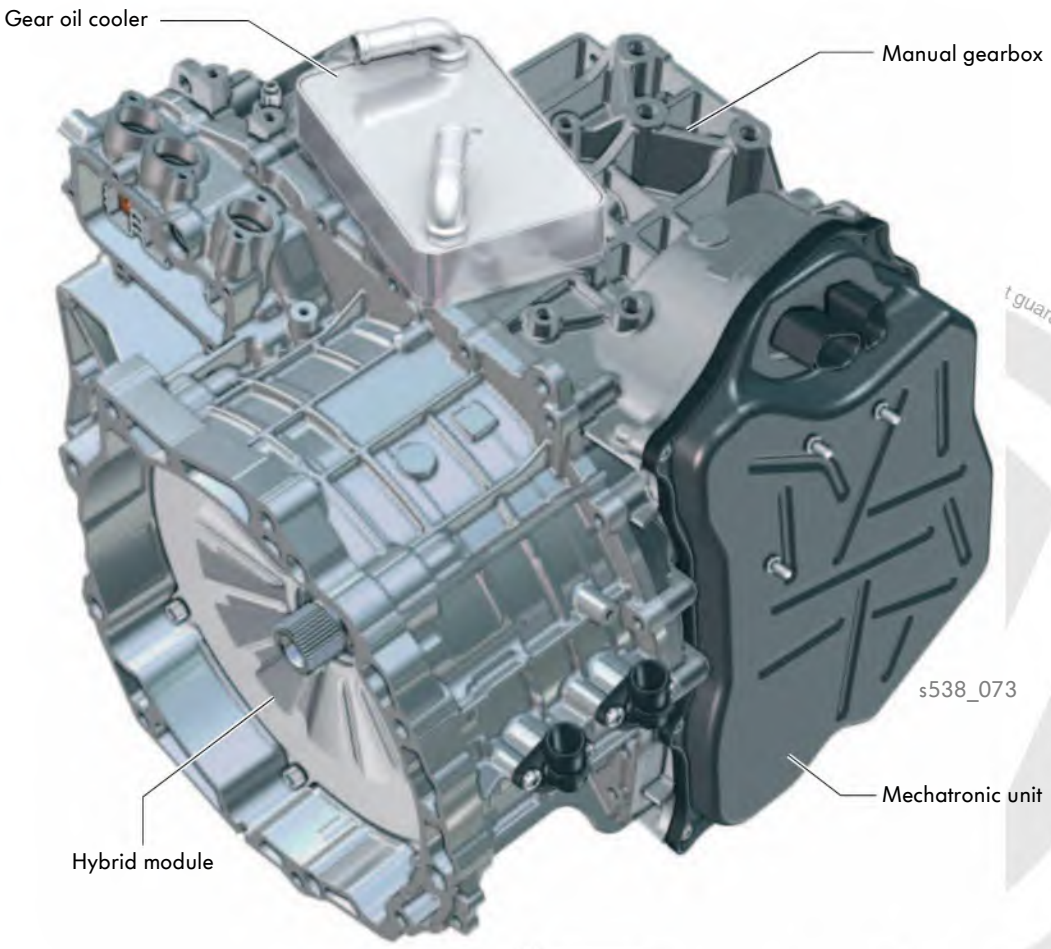
The vehicle switches between the operating modes by using a third clutch. The clutch connects or separates the two power units and is therefore called disengagement clutch K0.

Kerb weight	1,524 kg
Length, width, height	4,270 mm, 2,027 mm (with exterior mirrors), 1,457 mm
Combustion engine	1.4l 110kW TSI engine
Combustion engine torque	max. 250Nm
Electric drive motor	Electric drive motor V141
Electric drive motor output	max. 75kW
Electric drive motor torque	170Nm constant torque, 330 Nm maximum transmittable torque
Weight of electric drive motor	34kg (with connection box)
Gearbox	Dual clutch gearbox 0DD
Number of gears	6 forward gears, 1 reverse gear
Weight of gearbox	93kg (when filled with oil)
Weight of dual-mass flywheel	8kg
Oil quantity for DSG and hybrid module	8 litres
Oil change quantity	7 litres
Oil change interval	See ELSA

Dual clutch gearbox 0DD profile

The dual clutch gearbox 0DD consists of the following assemblies:

- Hybrid module
- Manual gearbox with gear oil cooler
- Mechatronic unit

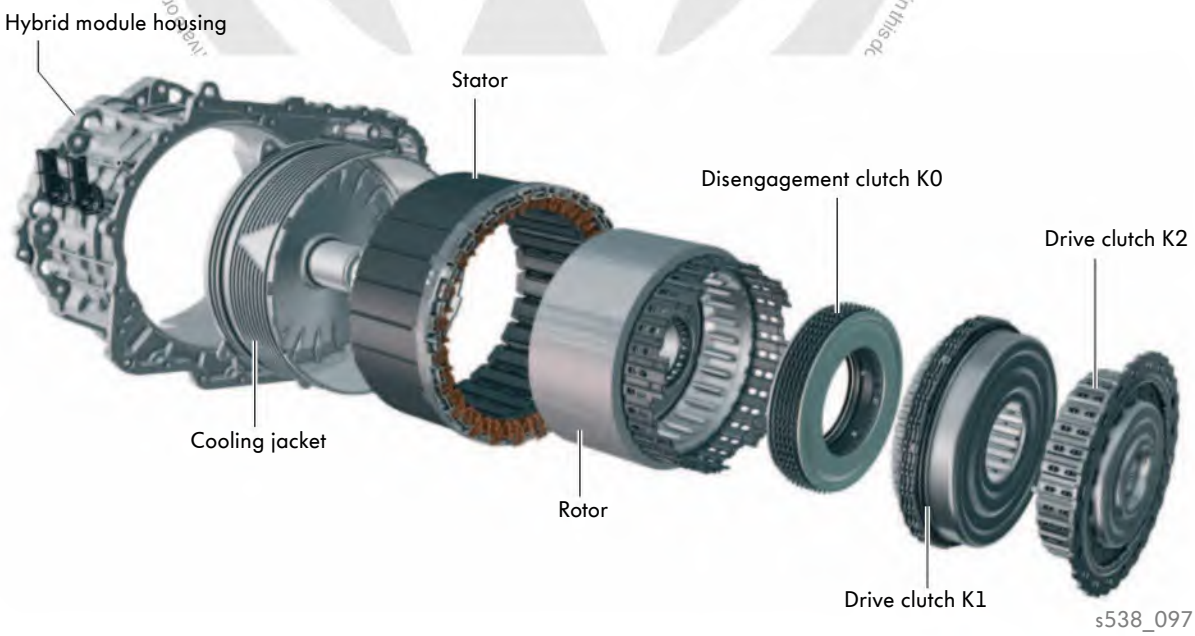


Hybrid module

Overview of design

The hybrid module consists of:
- The hybrid module housing
- A cooling jacket
- The electric drive motor V141 (e-machine)
- A clutch pack

The clutch pack consists of the disengagement clutch K0 and the drive clutches K1 and K2.
The basic components of the electric drive motor are the rotor and the stator.

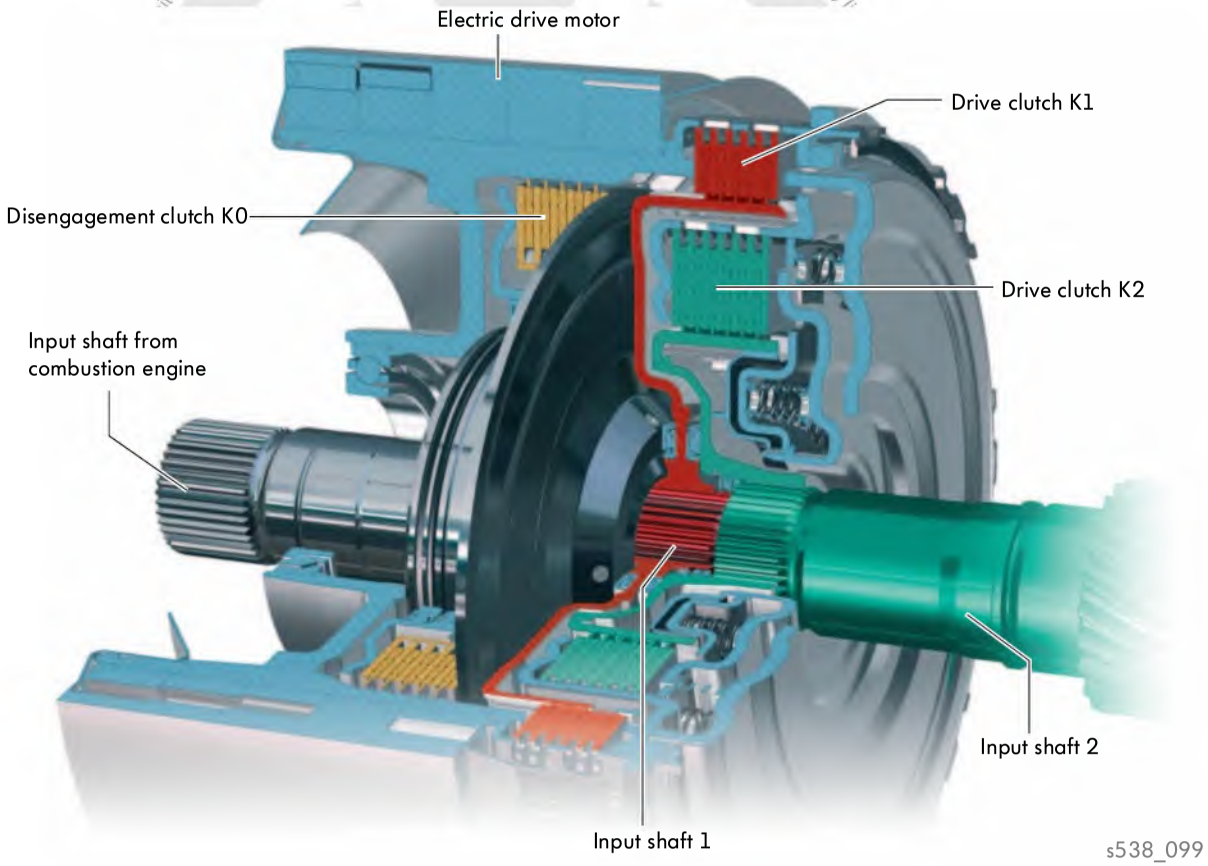


Clutch pack

The hybrid module contains the two drive clutches K1 and K2, the disengagement clutch K0 and the electric drive motor V141 (e-machine). All three clutches are wet clutches.
The disengagement clutch K0 connects or separates the combustion engine to/from the electric drive motor.

The disengagement clutch K0 is engaged:
- When the electric drive motor V141 starts the combustion engine.
- When the vehicle is being driven by the combustion engine.
- When both power units drive the vehicle.

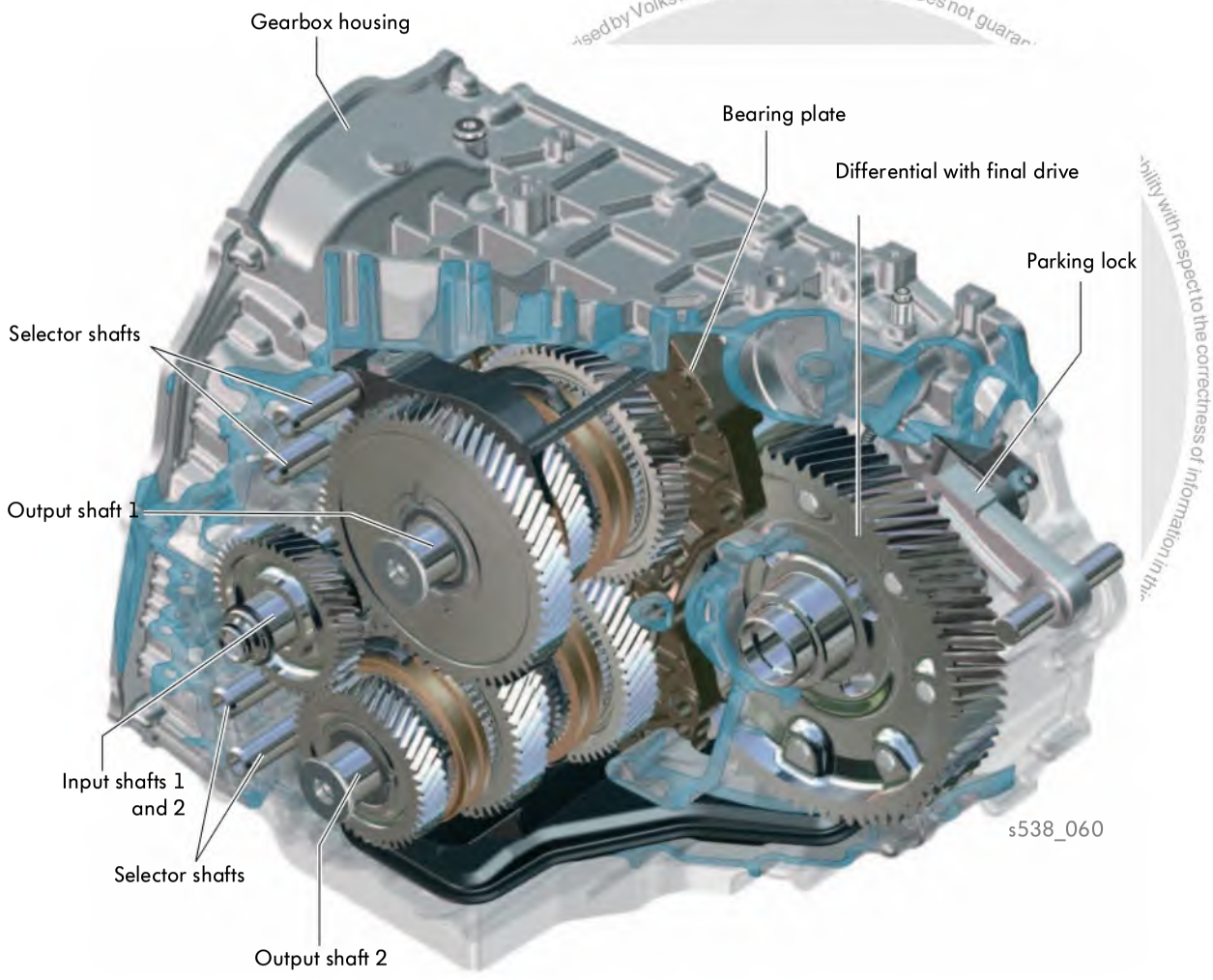
The disengagement clutch K0 is disengaged when the vehicle is driven exclusively by the electric drive motor.



Overview of design

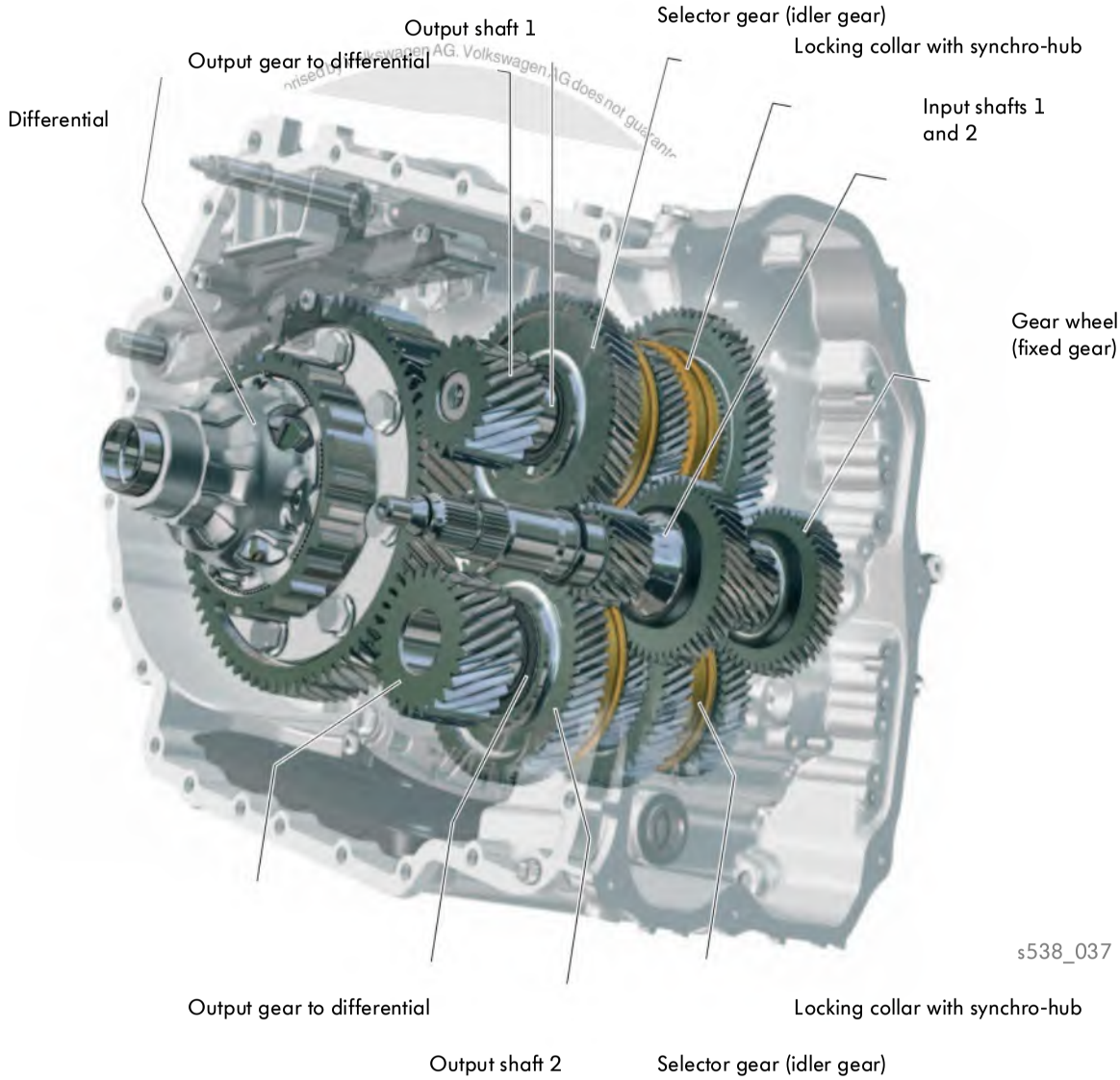
The gearbox housing is made of aluminium.
The following components are located inside the gearbox housing:

- Two input shafts that are concentric and rotate independently of each other
- Two output shafts
- Four selector shafts for selecting the gears
- A bearing plate that separates the gear case from the hybrid module
- A parking lock
- A differential with final drive



The gear wheels (fixed gears) are mounted on the input shafts.
The selector gears (idler gears), the locking collars with the synchro-hubs and the output gears to the differential are located on output shafts 1 and 2.

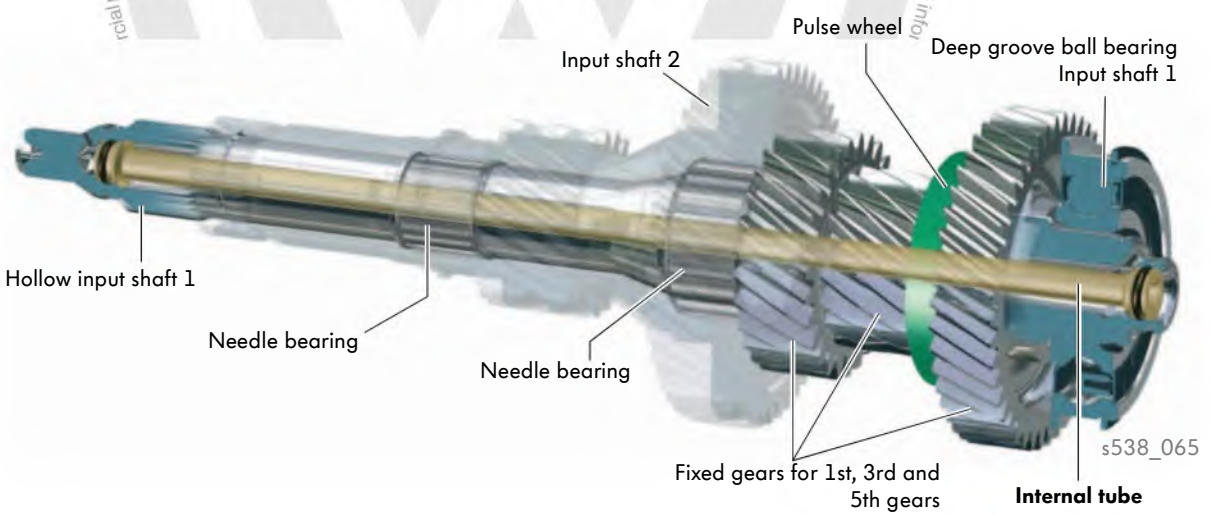
Both output shafts engage with the final drive gear of the differential.
All gears are helical-cut and thus ensure quiet running.



Input shaft 1

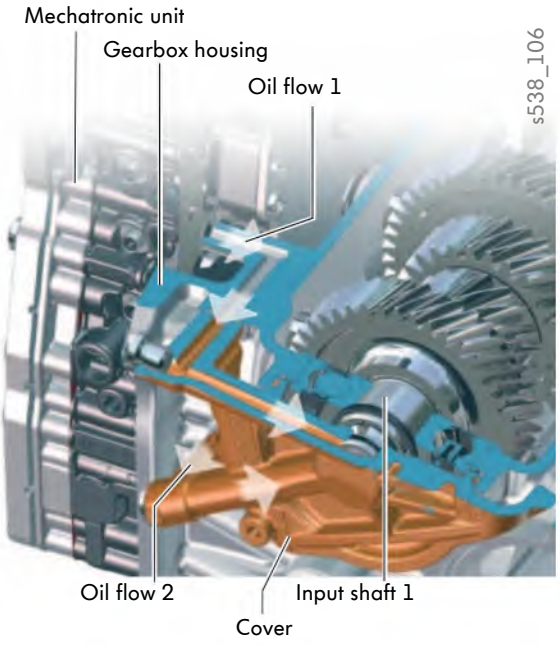
Input shaft 1 is a hollow shaft. The fixed gears for 1st, 3rd and 5th gears are mounted on it along with a pulse wheel to measure its speed. The fixed gears mesh with the selector gears on output shafts 1 and 2.

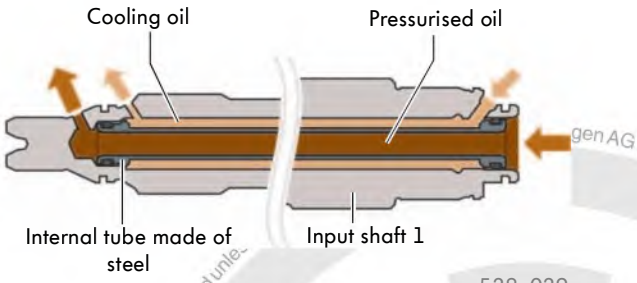
Input shaft 1 is mounted in a deep groove ball bearing in the gearbox housing. Two needle bearings run between input shafts 1 and 2.



Oil supply for disengagement clutch K0

The disengagement clutch K0 is supplied with oil via two connecting galleries in the cover and the gearbox housing.
The oil continues through the apertures in input shaft 1.





Internal tube in input shaft 1

An internal tube made of steel splits the two oil galleries inside input shaft 1.

The pressurised oil for actuating the disengagement clutch K0 flows inside the internal tube.

The cooling oil flows between the internal tube and input shaft 1.

The oil flows to the clutch from the apertures in input shaft 1.

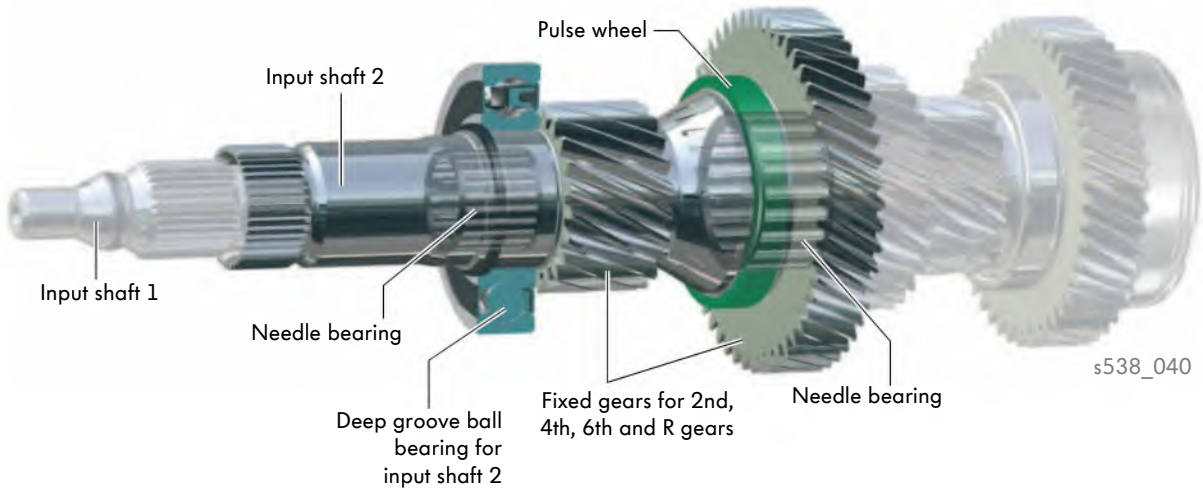
Input shaft 2

Input shaft 2 is fitted onto input shaft 1 using needle bearings. The fixed gears for 2nd, 4th, 6th and reverse gear are mounted onto this shaft.

The large fixed gear engages in the selector gears for both 4th gear and 6th gear.

Input shaft 2 also has a pulse wheel to measure its speed.

The deep groove ball bearing for input shaft 2 is fitted in the bearing plate.

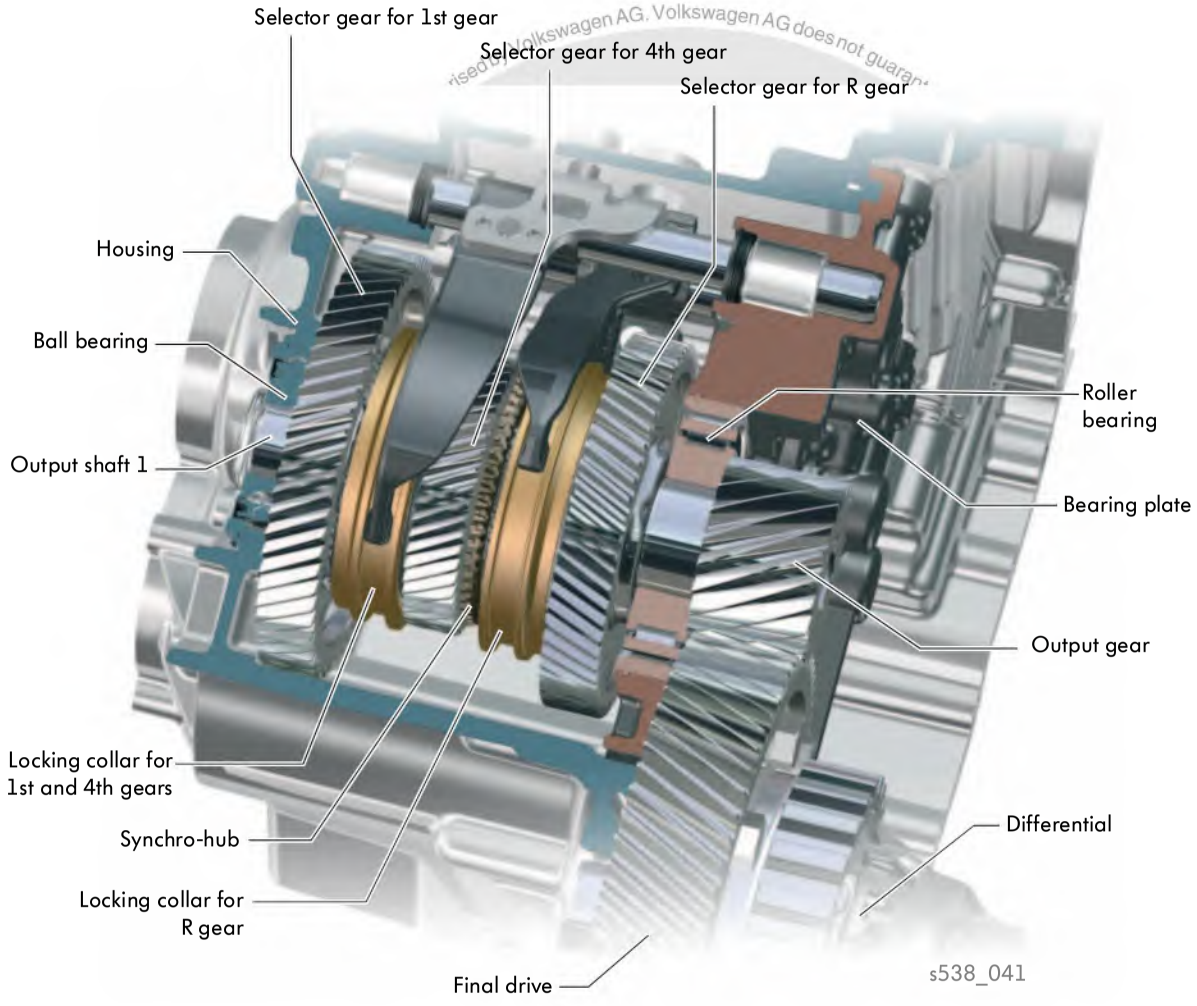


Output shaft 1

Output shaft 1 is mounted in a ball bearing (fixed bearing) in the gearbox housing. The output shaft is mounted in a roller bearing (floating bearing) in the bearing plate about two thirds along its length. The combination of fixed and floating bearings on the output shaft allows very good absorption of axial and radial forces.

The locking collars with the synchro-hubs and the selector gears for 1st, 4th and R gears are located between the gearbox housing and the bearing plate.
The output gear meshes with the final drive gear of the differential in front of the bearing plate.

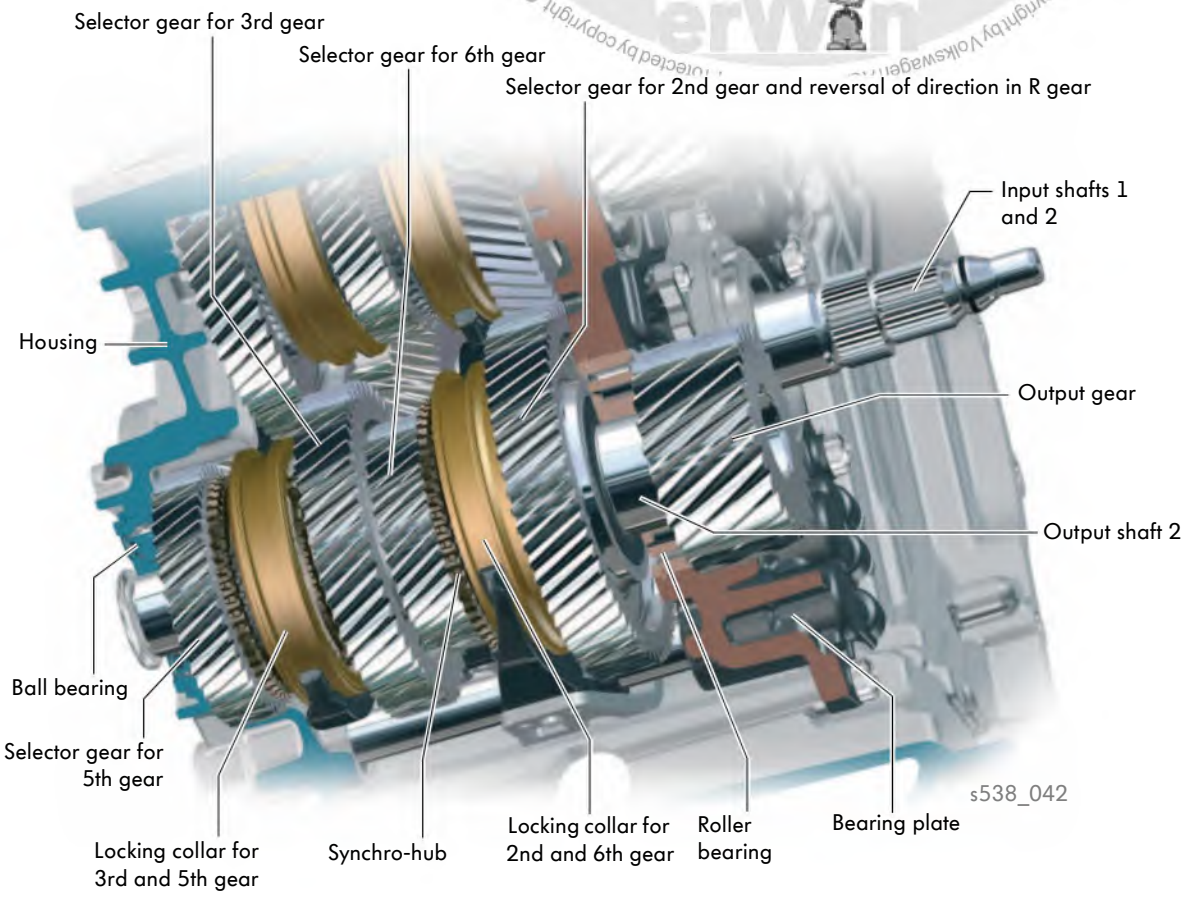
The flow of power between the selector gears and the output shaft is enabled by two locking collars and by the synchro-hubs. One locking collar engages 1st and 4th gears and the other reverse gear.



Output shaft 2

Output shaft 2 is mounted in a ball bearing in the gearbox housing. The output shaft is mounted in a roller bearing in the bearing plate about two thirds along its length.

The locking collars with the synchro-hubs and the selector gears for 2nd, 3rd, 5th and 6th gears are located between the gearbox housing and the bearing plate.
The output gear meshes with the final drive gear of the differential in front of the bearing plate.

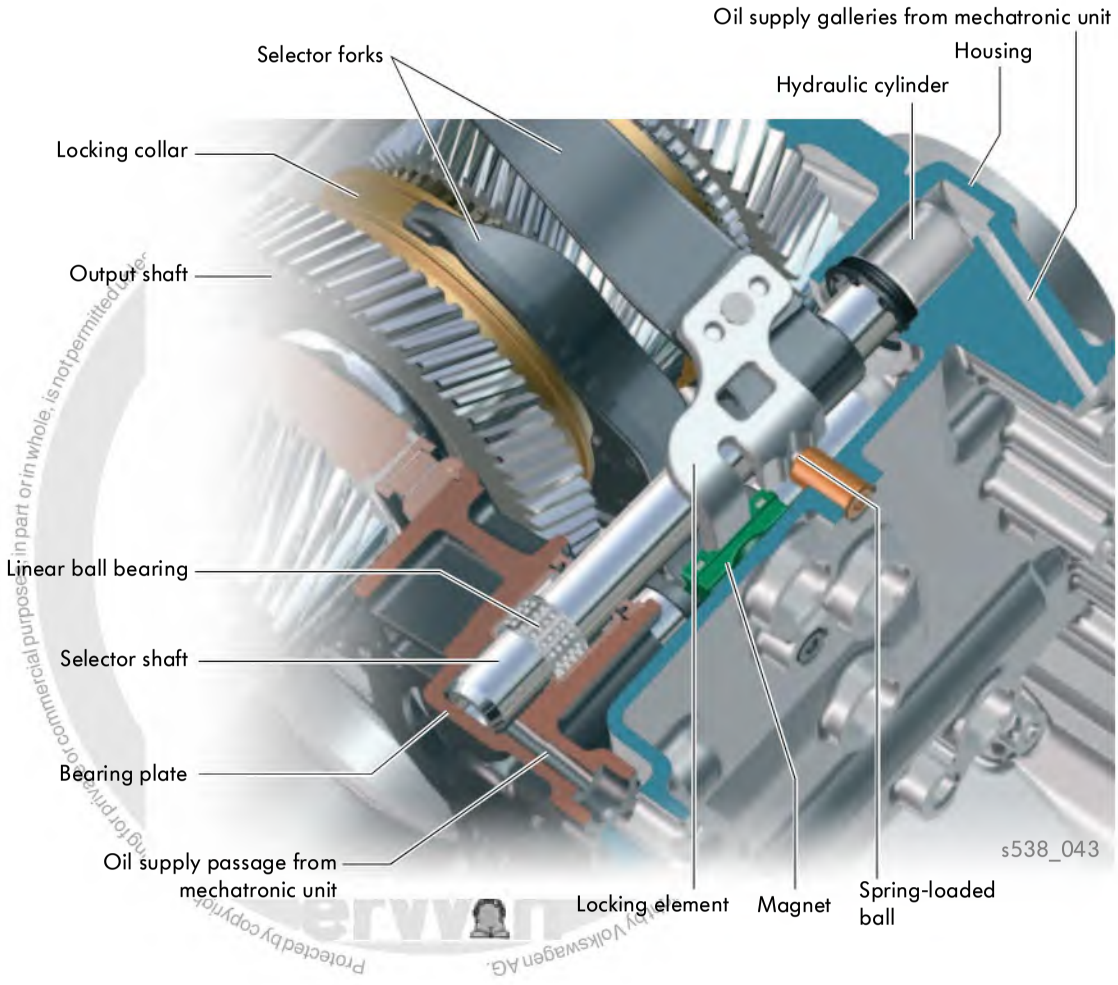


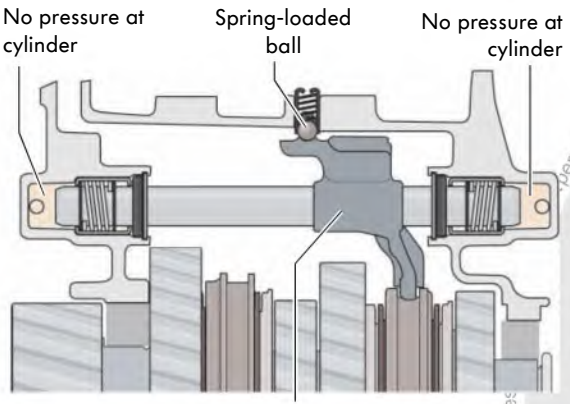
Selector shafts

The selector shafts run in linear ball bearings (linear-motion bearings) fitted in the gearbox housing and in the bearing plate. The selector forks that engage in the locking collars are located on the selector shafts.
The six forward gears and reverse gear are selected by four selector shafts.

The selector forks are moved hydraulically in this dual clutch gearbox.
Each selector shaft has a hydraulic cylinder at both ends.
The gear oil from the mechatronic unit passes through the oil supply galleries to the hydraulic cylinders and moves the selector shafts.

The spring-loaded ball and the locking element hold the selector shaft in position when no pressure is applied.
The magnet on the selector fork is used to measure its current position.

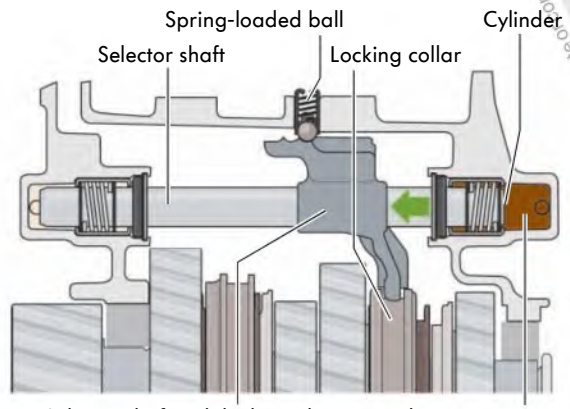




Selector shaft with locking element and selector fork in neutral position

s538_045

No pressure is applied to either of the two cylinders on the selector shaft.
A spring-loaded ball pushes against the locking element and holds the non-actuated selector shaft in the neutral position.



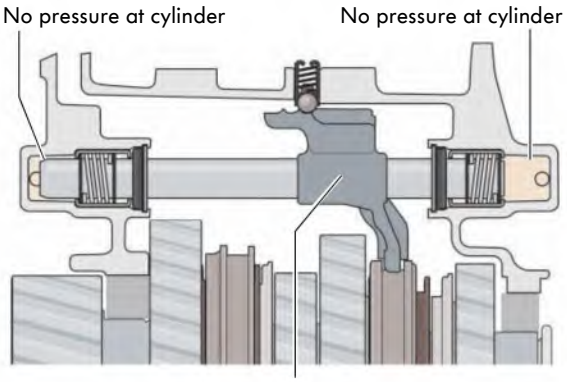
Selector shaft with locking element and selector fork upon engagement

Oil pressure

s538_044

Oil pressure is applied to the right-hand cylinder of the selector shaft and overcomes the pressure of the spring-loaded ball on the locking element.
The selector shaft is pushed to the left along with the selector fork. The ramp geometry of the locking element supports the movement of the selector shaft.

The gear is engaged.



Selector shaft with locking element and selector fork in selected position

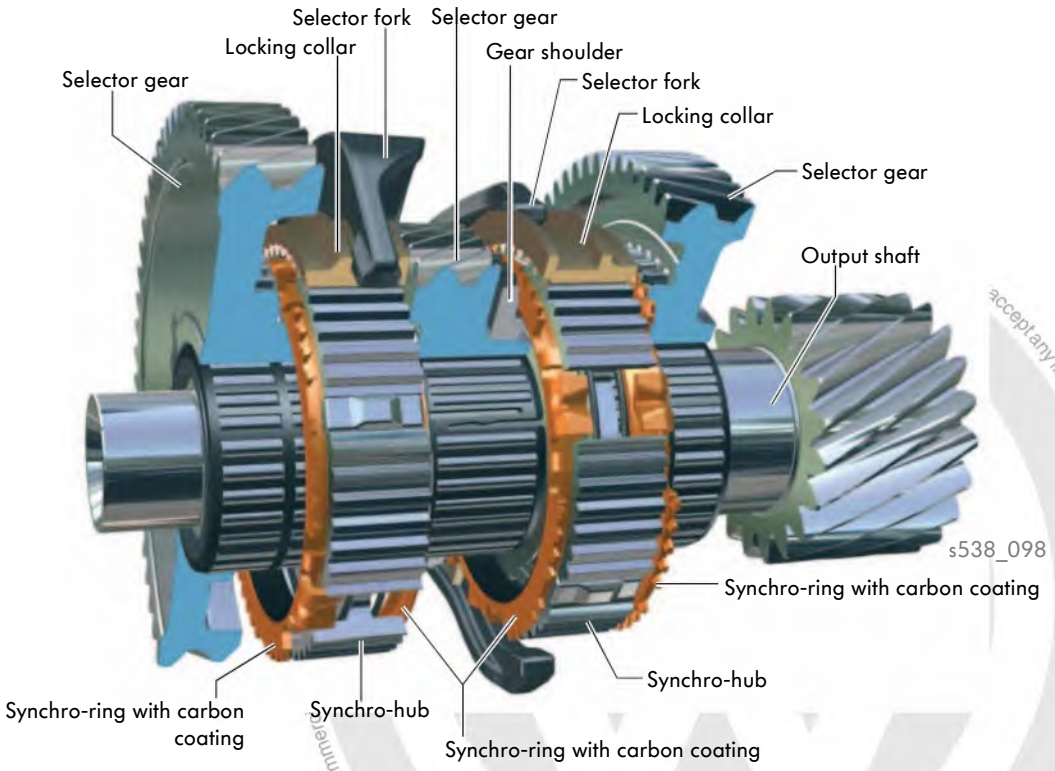
s538_078

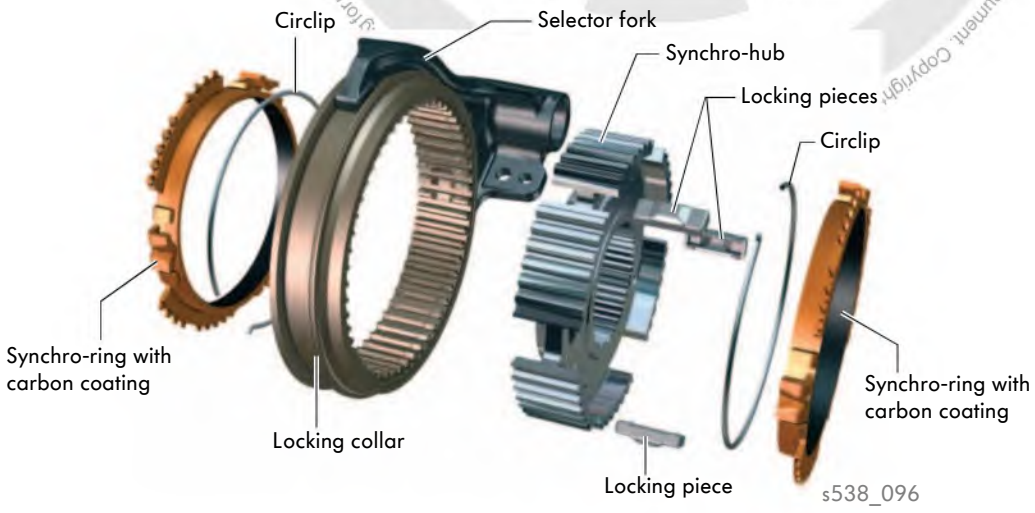
The hydraulic shifting process is complete. No pressure is applied to the cylinders.
The locking element and the relief-grinding of the selector gear hold the locking collar in position.

The gear remains engaged.

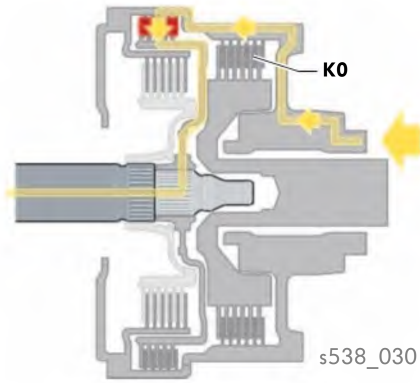
Single synchromesh

The synchro-rings for the forward gears and reverse gear have a carbon coating. The carbon material can withstand high mechanical and thermal loads without being damaged.
The carbon coating allows all gears to use a single synchromesh for the first time.



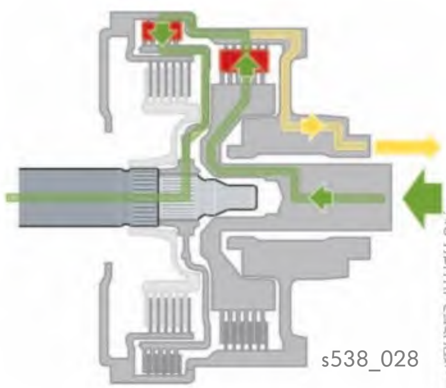


Interaction of clutches



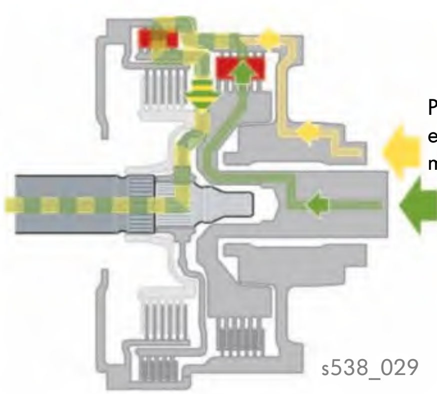
s538_030

Driving exclusively with the electric drive motor
The disengagement clutch K0 is disengaged.
The electric drive motor operates as a motor and drives the vehicle. The combustion engine is off and decoupled from the drive train.



s538_028

Driving with the combustion engine
The disengagement clutch K0 is engaged.
The combustion engine drives the vehicle and the electric drive motor can be used as an alternator as required.



s538_029

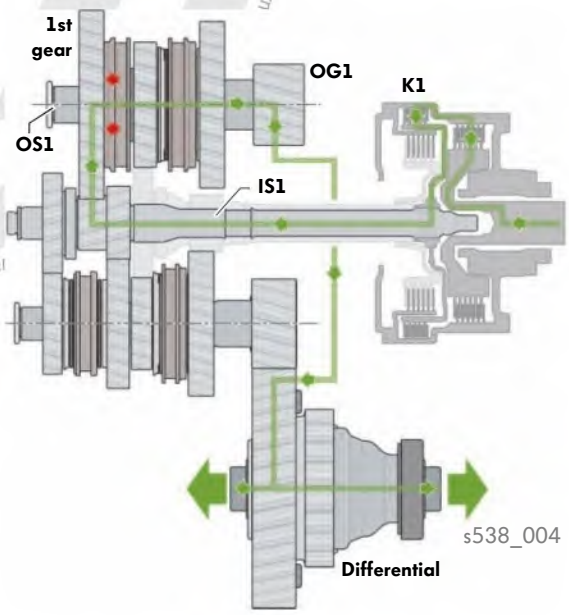
Driving with the electric drive motor and combustion engine (boost)
The disengagement clutch K0 is engaged.
The combustion engine drives the vehicle together with the electric drive motor. In boost mode, the electric drive motor supports the combustion engine up to the maximum possible torque.

Power transmission

Operation with the combustion engine is shown in the following illustrations.
This means that the drive power is transferred via the disengagement clutch K0.
The transmission of power inside the gearbox is identical in electric and boost mode.

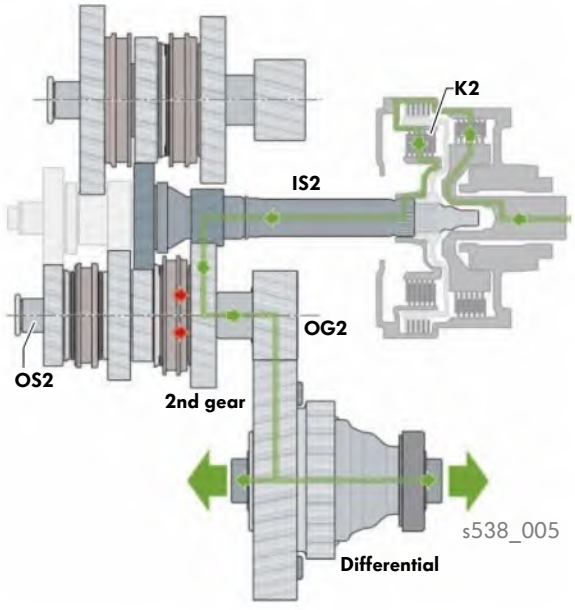
Power transmission in 1st gear

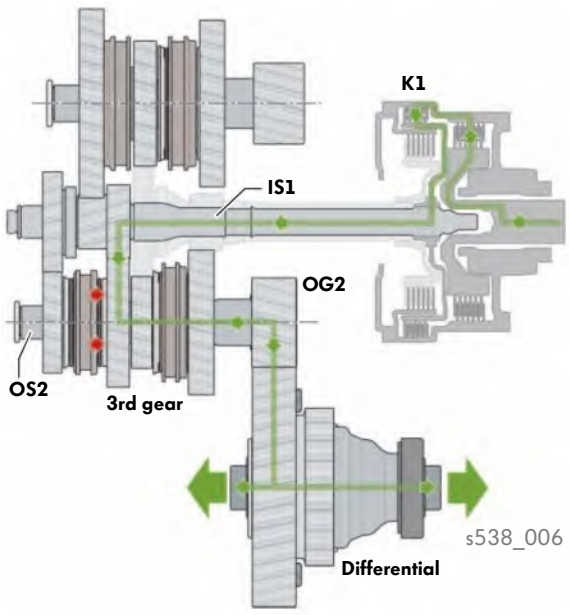
The drive torque is transmitted via the engaged clutch K1 to input shaft 1 (IS1). The centre gearwheel on input shaft 1 meshes with the selector gear for 1st gear on output shaft 1 (OS1). The synchro-hub locks the selector gear for 1st gear to output shaft 1. The output torque is transmitted via the output gear (OG1) to the differential and thus to the driven wheels.



Power transmission in 2nd gear

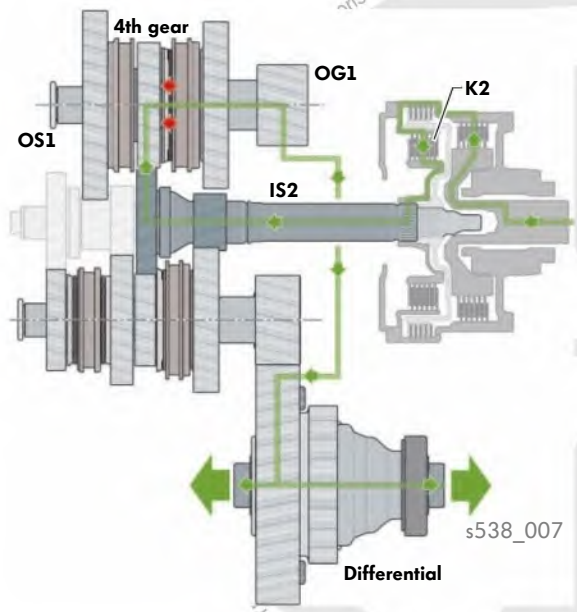
The drive torque is transmitted via the engaged clutch K2 to input shaft 2 (IS2). The small gearwheel on input shaft 2 meshes with the selector gear for 2nd gear on output shaft 2 (OS2). The synchro-hub locks the selector gear for 2nd gear to output shaft 2. The output torque is transmitted via the output gear (OG2) to the differential and thus to the driven wheels.





Power transmission in 3rd gear

The drive torque is transmitted via the engaged clutch K1 to input shaft 1 (IS1). The front gearwheel on input shaft 1 meshes with the selector gear for 3rd gear on output shaft 2 (OS2). The synchro-hub locks the selector gear for 3rd gear to output shaft 2. The output torque is transmitted via the output gear (OG2) to the differential and thus to the driven wheels.

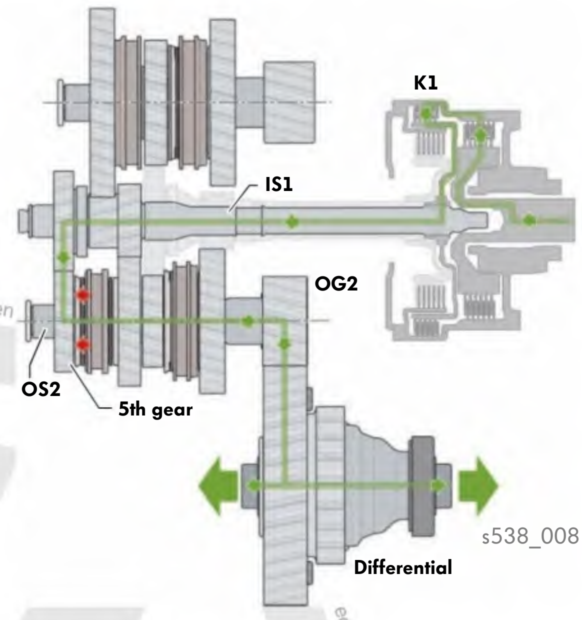


Power transmission in 4th gear

The drive torque is transmitted via the engaged clutch K2 to input shaft 2 (IS2). The large gearwheel on input shaft 2 meshes with the selector gear for 4th gear on output shaft 1 (OS1).
The synchro-hub locks the selector gear for 4th gear to output shaft 1. The output torque is transmitted via the output gear (OG1) to the differential and thus to the driven wheels.

Power transmission in 5th gear

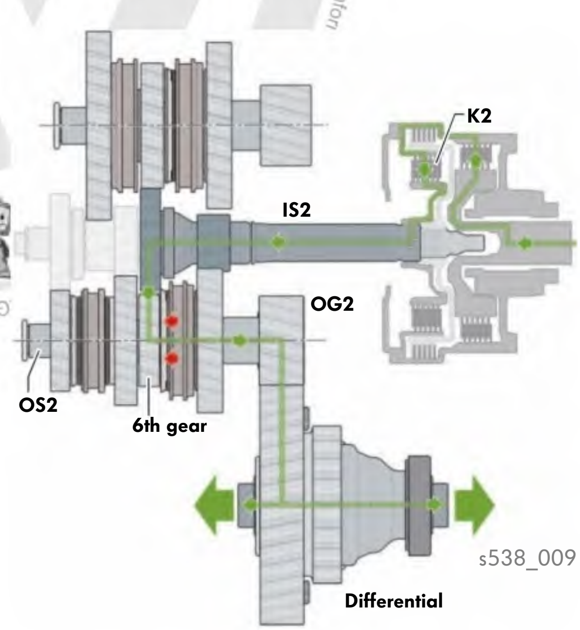
The drive torque is transmitted via the engaged clutch K1 to input shaft 1 (IS1). The rear gearwheel on input shaft 1 meshes with the selector gear for 5th gear on output shaft 2 (OS2). The synchro-hub locks the selector gear for 5th gear to output shaft 2. The output torque is transmitted via the output gear (OG2) to the differential and thus to the driven wheels.



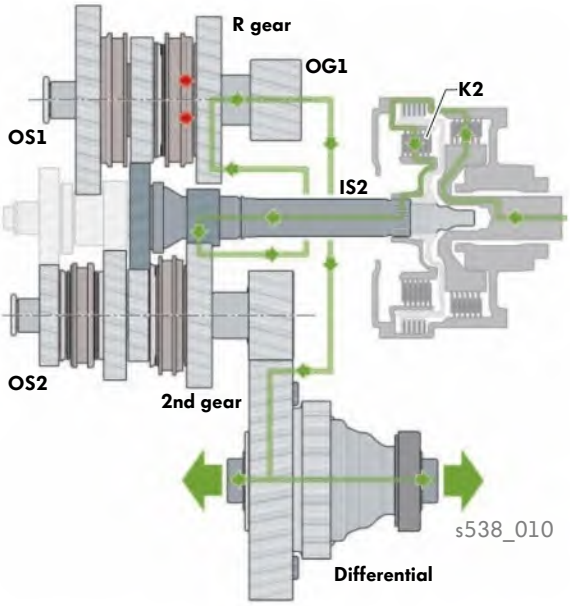
s538_008

Power transmission in 6th gear

The drive torque is transmitted via the engaged clutch K2 to input shaft 2 (IS2). The large gearwheel on input shaft 2 meshes with the selector gear for 6th gear on output shaft 2 (OS2). The synchro-hub locks the selector gear for 6th gear to output shaft 2. The output torque is transmitted via the output gear (OG2) to the differential and thus to the driven wheels.



s538_009



Power transmission in reverse gear

The drive torque is transmitted via the engaged clutch K2 to input shaft 2 (IS2). The small gearwheel on input shaft 2 meshes with the selector gear for 2nd gear on output shaft 2 (OS2). The selector gear for 2nd gear meshes with the selector gear for reverse gear on output shaft 1 (OS1). This changes the direction of rotation. An additional output shaft is therefore not required.

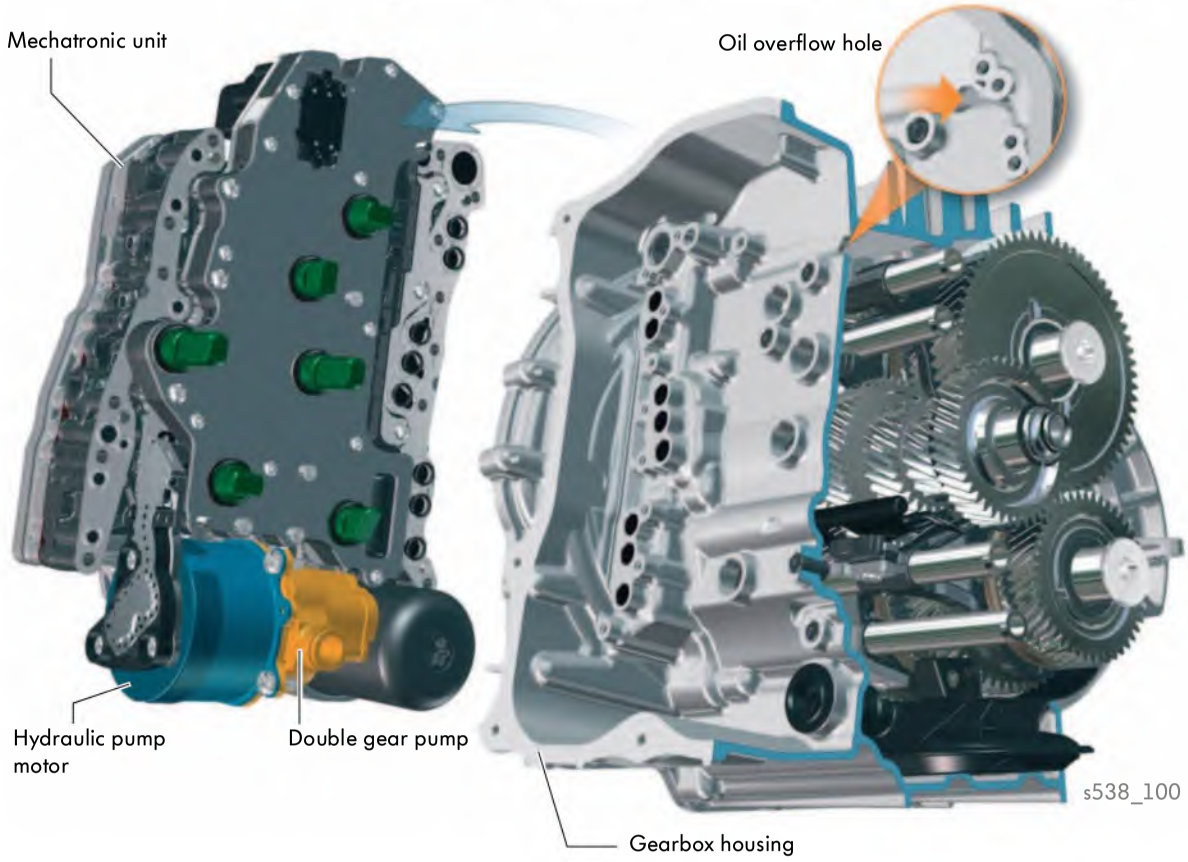
The synchro-hub locks the selector gear for reverse gear to output shaft 1. The output torque is transmitted via the output gear (OG1) to the differential and thus to the driven wheels.

Mechatronic unit

Overview of design

The mechatronic unit is installed in the gearbox and is separated from the gear case simply by a partition.

The apertures in the partition allow components to move and the speed sensors are sealed. The mechatronic unit is immersed in gear oil. This enables faster response times and quieter operation. Oil is exchanged between the mechatronic unit and the gear case via an oil overflow hole.



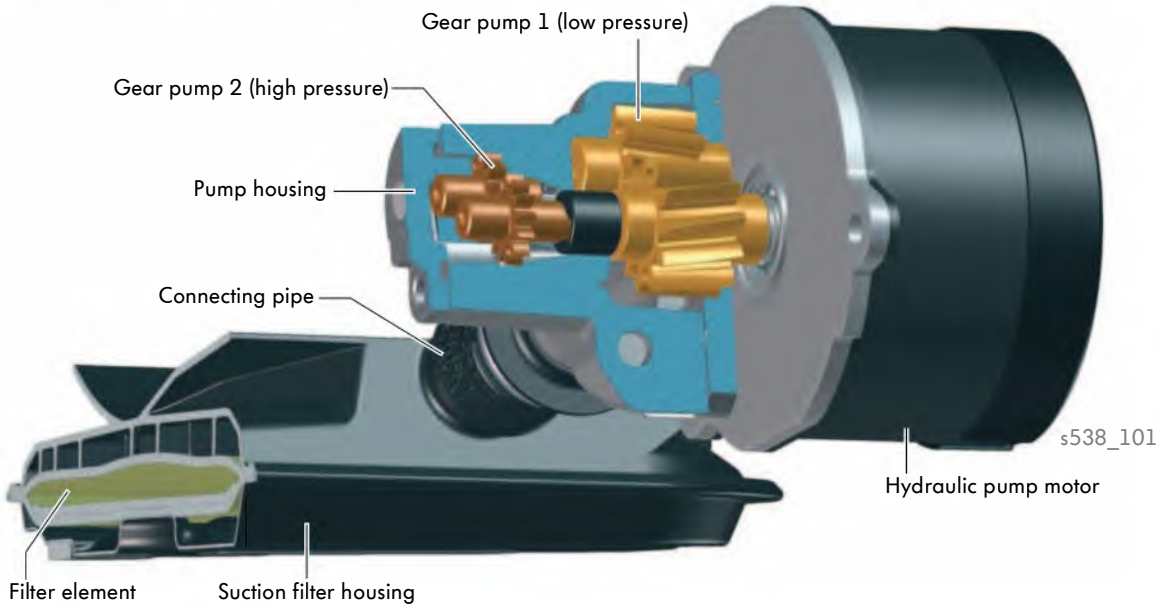
Highlighted in green:
sensors for measuring the selection positions of the selector shafts as well as the speeds of the input shafts.

Oil pump

The hydraulic pump motor V401 is a brushless direct current motor.
It drives two gear pumps simultaneously via one shaft.

The motor starts and oil pressure is built up when you open the driver's door.
The motor runs constantly in driving mode unless the selector lever is in the P or N positions.

The minimum speed is 450 rpm. Different loads in the gear case and in the clutches determine the delivery rate of the lubricating and cooling oil and influence the speed of the motor.

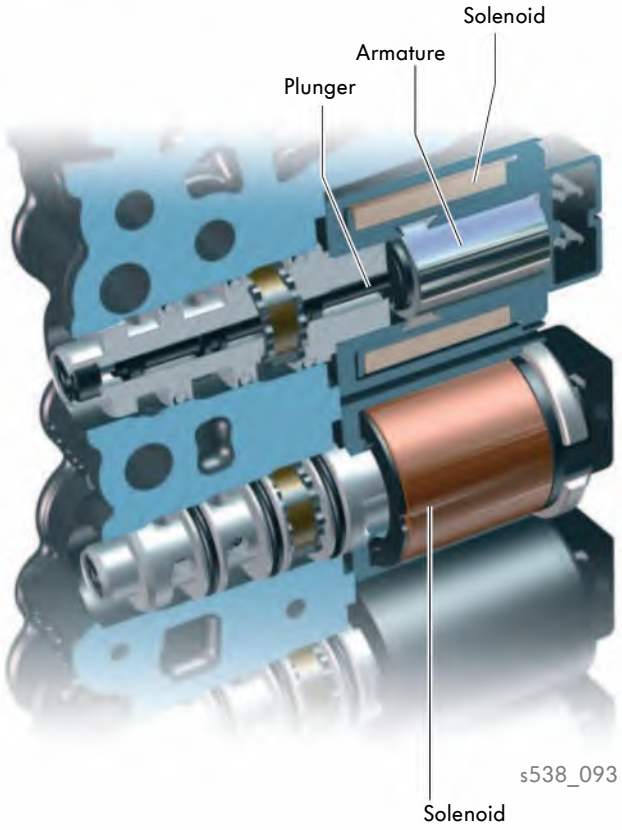


Valves

The mechatronic unit contains proportional solenoid valves.
The valves are activated by the mechatronic unit with a pulse-width modulation signal (PWM).

The duration of solenoid activation defines the strength of the magnetic field and thus the travel of the armature. The plunger moves with the armature and operates the valve proportionally to the received PWM signal. This activation allows the oil flow to be regulated according to the requirements.

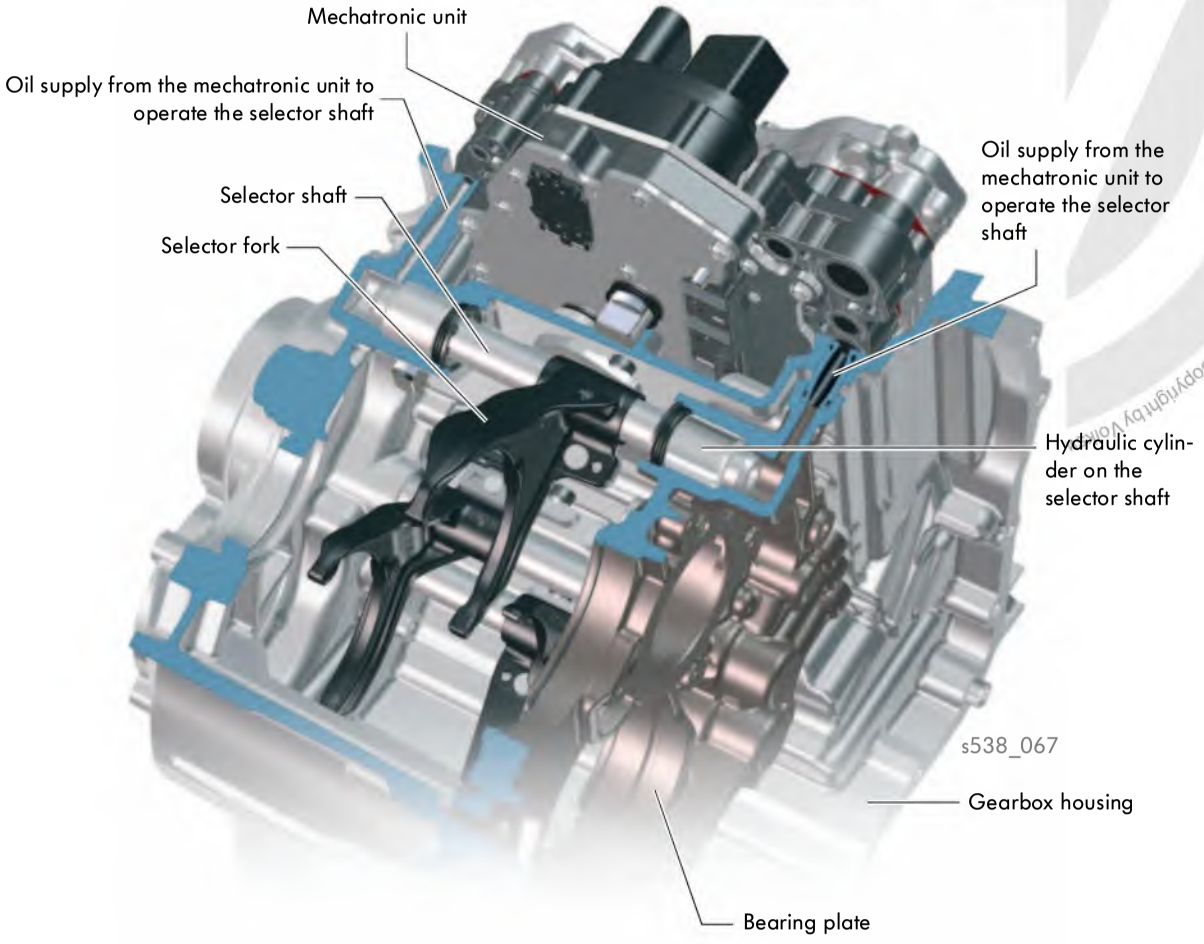
Valve unit with four proportional solenoid valves in mechatronic unit



A gear is engaged inside the dual clutch gearbox with the following steps:

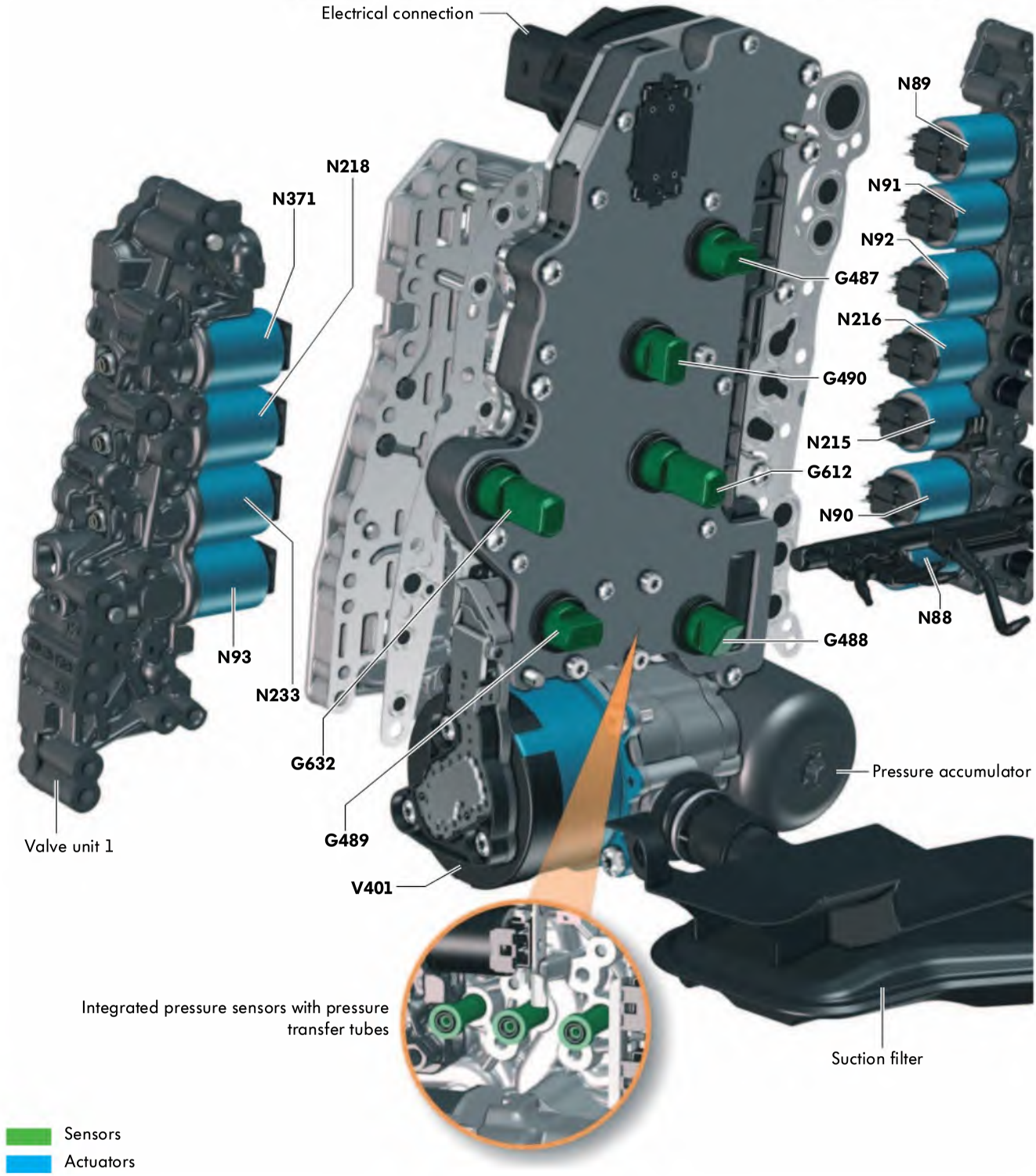
- The mechatronic unit electrically activates the pressure regulating valve for the corresponding gear train half.
- The gear oil passes through the open pressure regulating valve for the gear train half to the gear actuator valves and the clutch valve.
- The electrically activated gear actuator valve opens and the gear oil flows through the oil supply passage.
- The gear oil presses against a hydraulic cylinder on the selector shaft.
- The selector shaft is moved along its axis.
- The selector fork pushes the locking collar onto the selector gear.

The gear is engaged.



Sensors and actuators

The mechatronic unit contains numerous sensors and electrical valves that control and monitor the selection processes.



Sensors (shown in green)

G487 Gear selector movement sensor 1

G488 Gear selector movement sensor 2

G489 Gear selector movement sensor 3

G490 Gear selector movement sensor 4

G612 Gearbox input speed sender 2 (input shaft 2)

G632 Gearbox input speed sender 1 (input shaft 1)

The following three senders have been integrated into the mechatronic unit and are not visible from the outside:

G270 Gearbox hydraulic pressure sender, (measures the pressure in the high-pressure accumulator)

G617 Clutch travel sender 1 (pressure sensor; measures the pressure acting on the piston for clutch K1)

G618 Clutch travel sender 2 (pressure sensor; measures the pressure acting on the piston for clutch K2)

Actuators (shown in blue)

N88 Solenoid valve 1, (operates the gear actuator for 1st gear and N)

N89 Solenoid valve 2, (operates the gear actuator for 6th and 2nd gear)

N90 Solenoid valve 3, (operates the gear actuator for 5th and 3rd gear)

N91 Solenoid valve 4, (operates the gear actuator for 4th and R gear)

N92 Solenoid valve 5 (regulates the cooling oil flow rate for drive clutches K1 and K2)

N93 Solenoid valve 6 (allows the pressure accumulator to be filled and drained as necessary)

N215 Automatic gearbox pressure regulating valve 1, (operates drive clutch K1)

N216 Automatic gearbox pressure regulating valve 2, (operates drive clutch K2)

N218 Automatic gearbox pressure regulating valve 4, (operates disengagement clutch K0)

N233 Automatic gearbox pressure regulating valve 5, (safety valve 1 for gear train half 1)

N371 Automatic gearbox pressure regulating valve 6, (safety valve 1 for gear train half 2)

V401 Hydraulic pump motor

Oil circuit

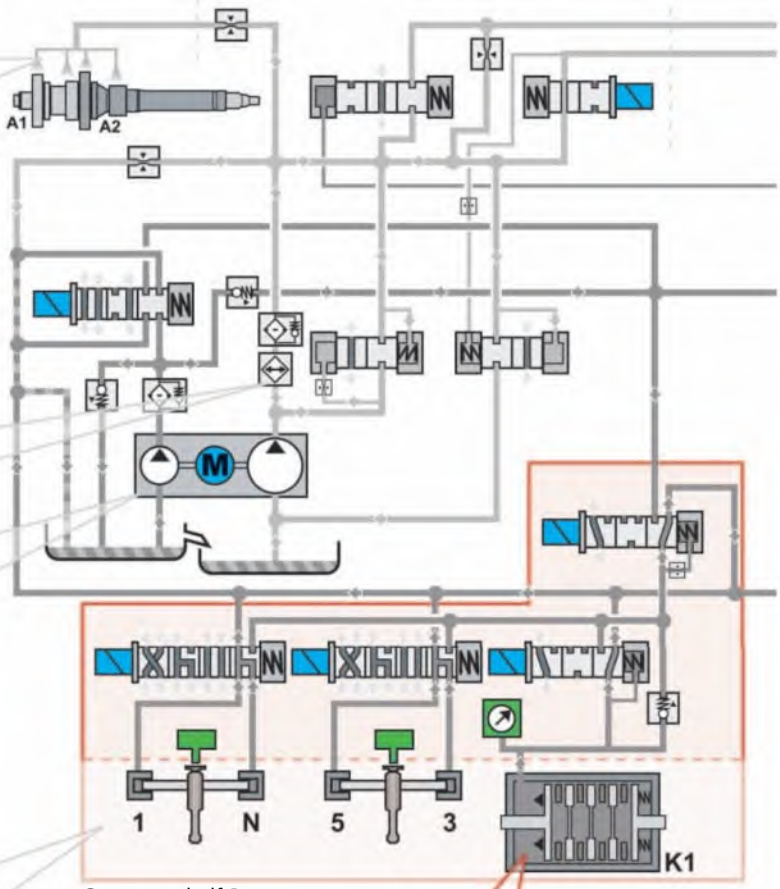
In this chapter, we will look at the mechatronic unit oil circuit in detail. On this double page, the highlighted components have been assigned to the hydraulic diagram elements to simplify the schematic hydraulic diagram.

Gear case lubrication

Oil cooler

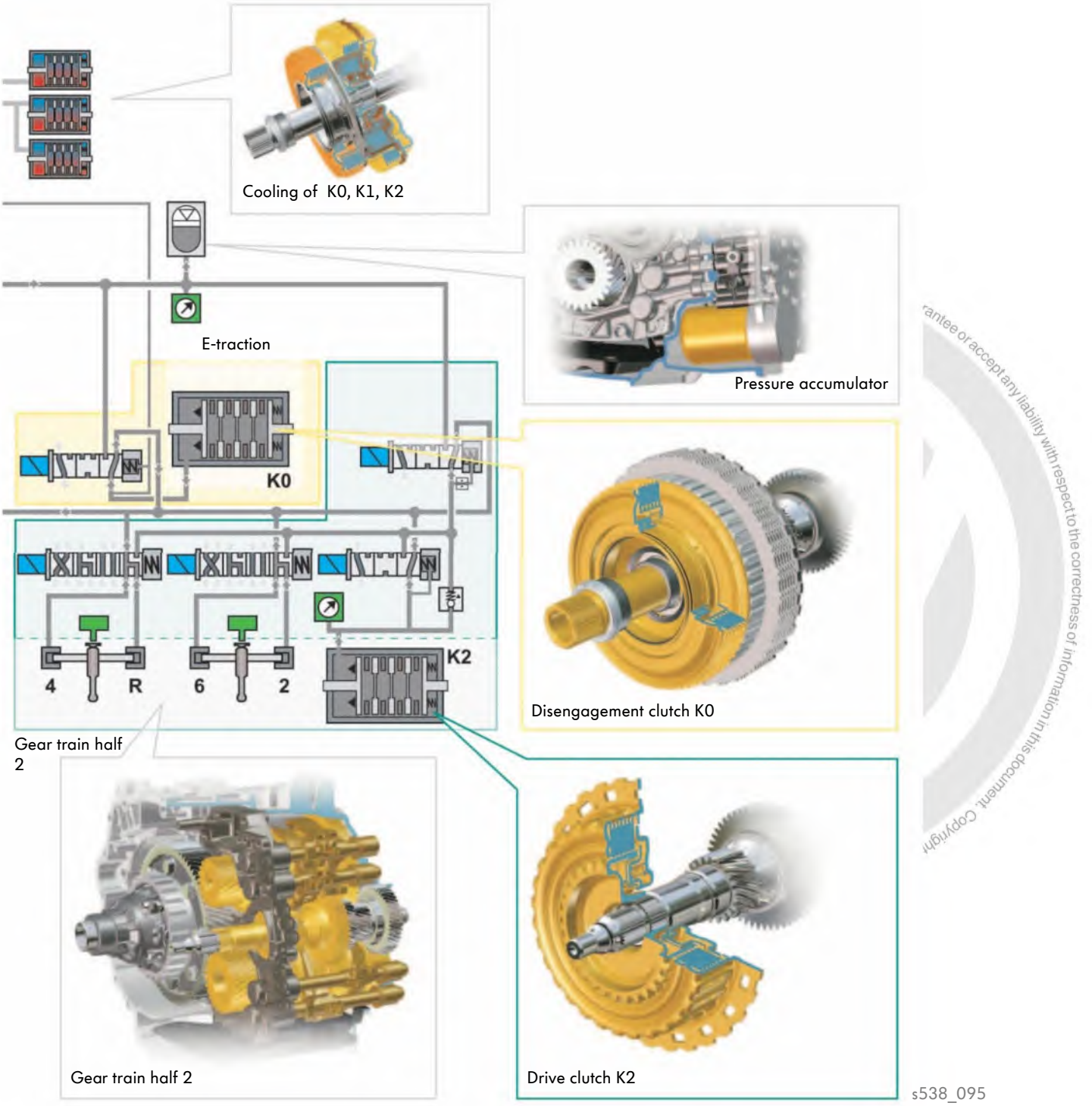
Double gear pump with oil filter

Gear train half 1



Gear train half 1

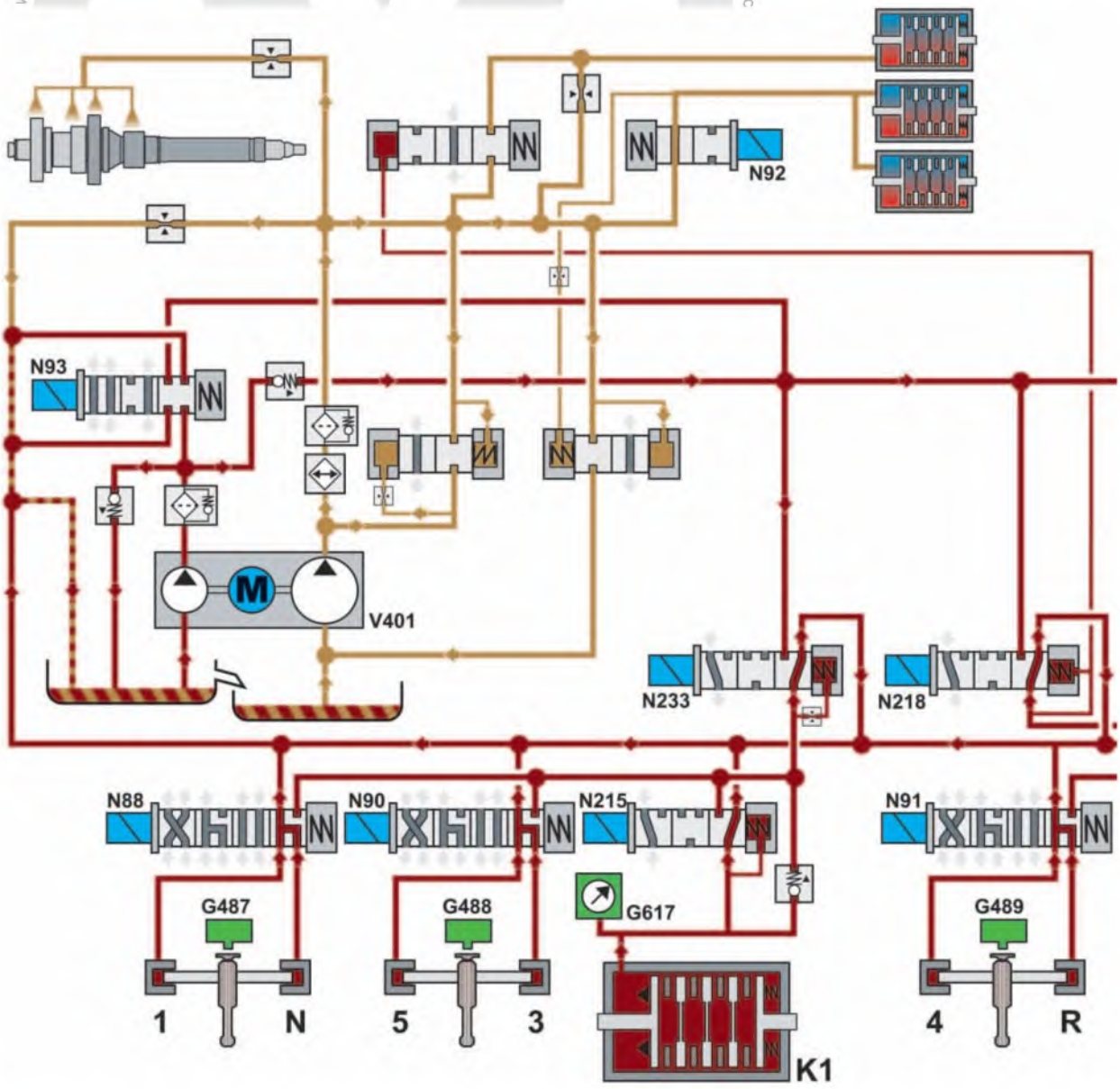
Drive clutch K1



Overview of oil circuit

There are two oil circuits inside the mechatronic unit:

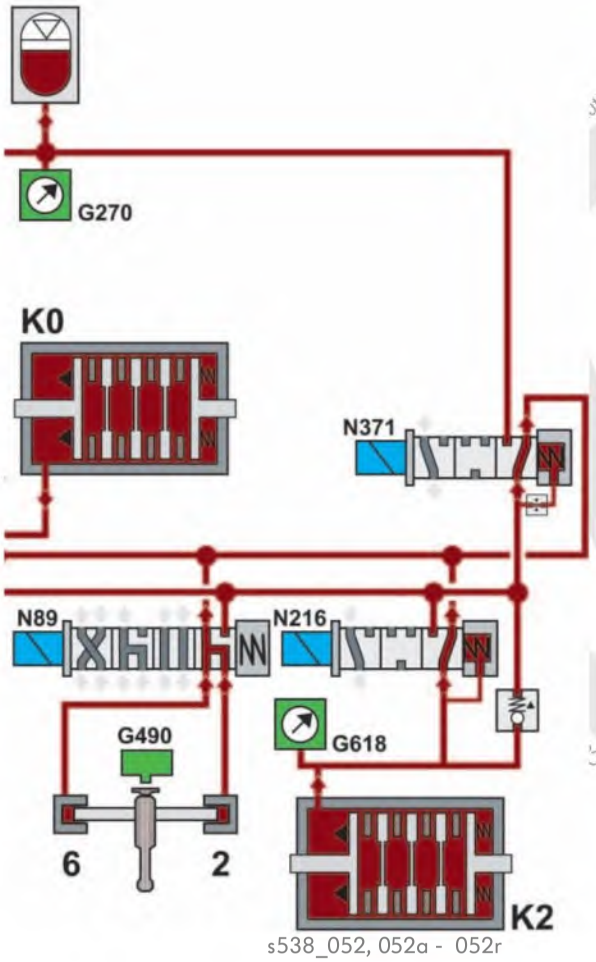
- Low-pressure oil circuit regulated to 1.5 bar
- High-pressure oil circuit with a system pressure of 43–53 bar



Key

- Sensor
- Actuator
- Low-pressure oil circuit
- High-pressure oil circuit

The low-pressure oil circuit is supplied from the oil sump in the gear case.
The high-pressure oil circuit is supplied from the oil sump in the mechatronic unit.
All of the oil is continuously cooled and filtered as it is exchanged between the mechatronic unit and gear case.



s538_052, 052a - 052r

2/2-way valve, electrically operated

4/3-way valve, electrically operated

3/3-way valve, electrically operated

4/4-way valve, electrically operated

2/2-way valve, hydraulically operated

2/3-way valve, hydraulically operated

Filter with overload protection

Cooler

Non-return valve, spring-loaded

Restrictor

Pressure sensor

Position sensor with permanent magnet

Hydraulic double pump, electrically operated

Pressure accumulator

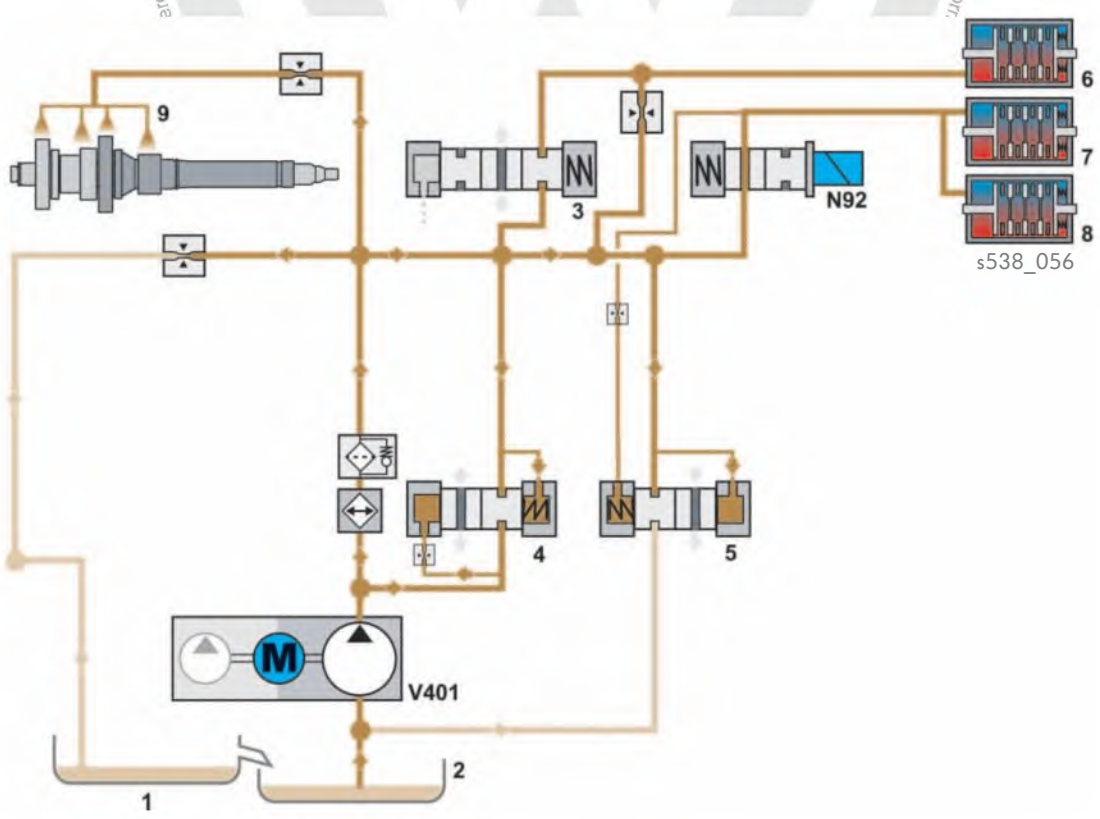
Selector shaft with selector fork

Clutch, disengaged

Clutch, engaged

Low-pressure oil circuit

The low-pressure oil circuit lubricates the gear case and cools the clutches K0, K1 and K2.
The solenoid valve N92 and the three hydraulically operated valves regulate the oil circulation. The gear oil drawn in flows through an oil cooler and an oil filter before it reaches the gear case and the clutches.



Key

N92 Solenoid valve 5

V401 Hydraulic pump motor

1 Mechatronic unit oil sump

2 Gearbox housing oil sump

3 2/3-way valve, hydraulically operated, (opens and closes the cooling oil supply passage for K0)

4 2/2-way valve, hydraulically operated, (enables emergency running when the cooling and filter route is blocked)

5 2/2-way valve, hydraulically operated, (regulates the lubricating pressure to 1.5 bar)

6 Cooling of disengagement clutch K0

7 Cooling of drive clutch K1

8 Cooling of drive clutch K2

9 Gear case lubrication

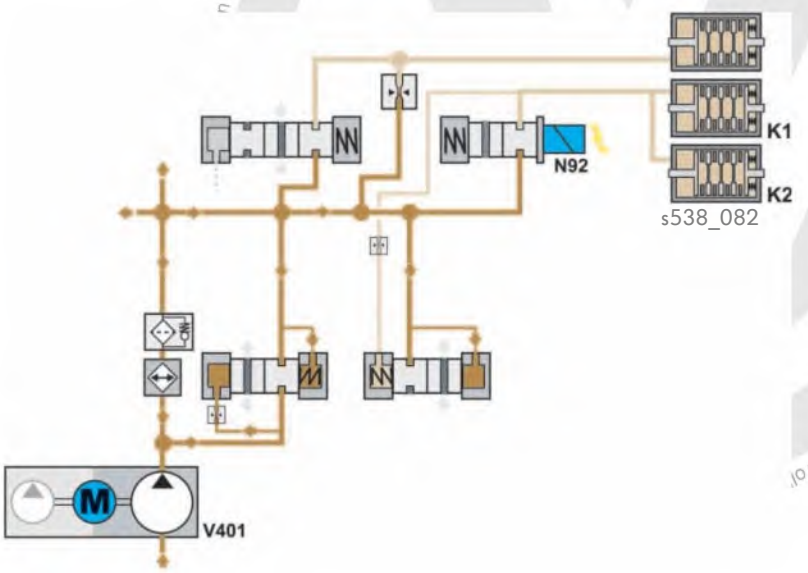
Low-pressure oil circuit supply

Low-pressure oil circuit return

Cooling of drive clutches

The drive clutches K1 and K2 are cooled via the solenoid valve N92 when it is not powered.

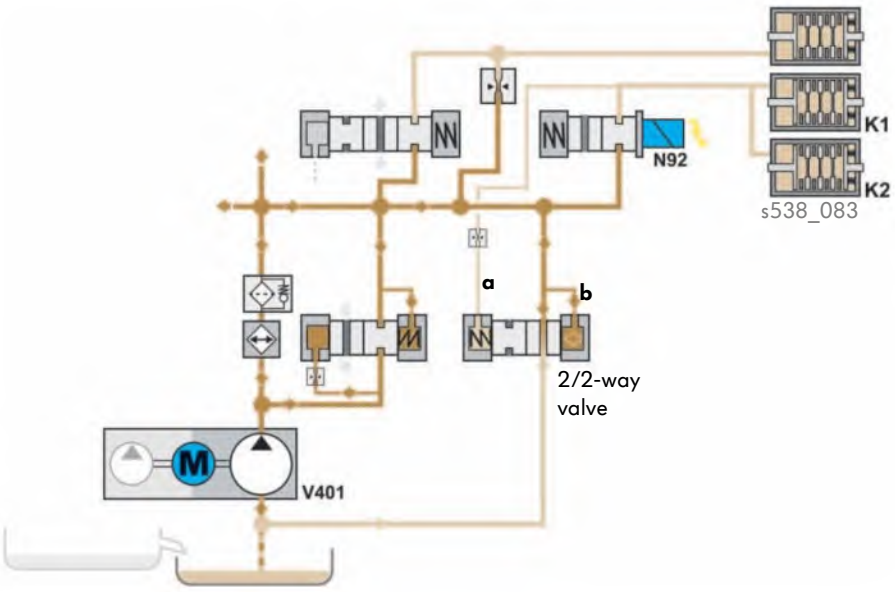
If there is a low requirement or no requirement for cooling oil, solenoid valve N92 is electrically activated. The valve closes and the oil volume supplied to the clutches is reduced.



Regulation of low pressure

The oil volume in the control line (a) from the drive clutches to the pressure-operated 2/2-way valve is also reduced.

The oil volume and the spring force are no longer sufficient to keep the valve closed. It is opened by the oil pressure (b) that is applied in a second control line to the supply. The oil flows back into the sump. The low-pressure oil circuit is regulated by the interaction of both valves.

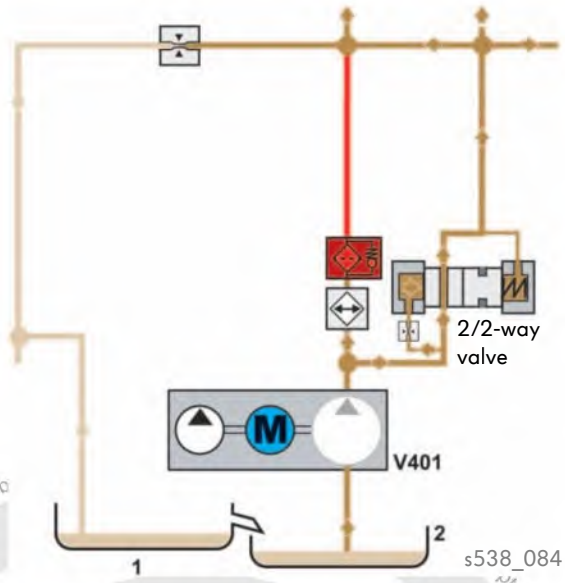


Mechatronic unit

Cooling and filter route blocked

If gear oil cannot pass through the filter, the oil pressure will increase in the supply between the pump and the filter.

The increased oil pressure builds up in front of the pressure-operated 2/2-way valve and the control line. The valve is opened against the spring force. The components are still cooled and lubricated.



Activation of cooling system for disengagement clutch K0

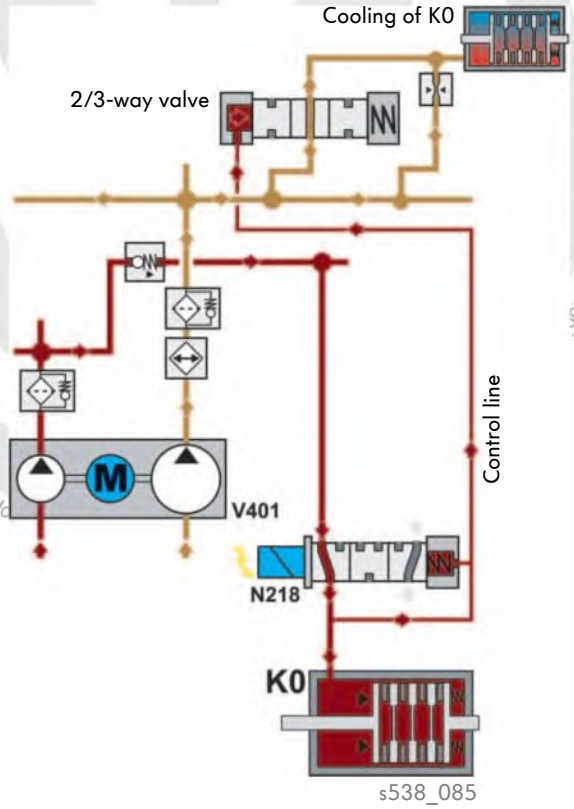
The pressure regulating valve N218 is electrically activated and opened to engage the disengagement clutch K0.

The oil volume reaches the disengagement clutch and starts to engage it.

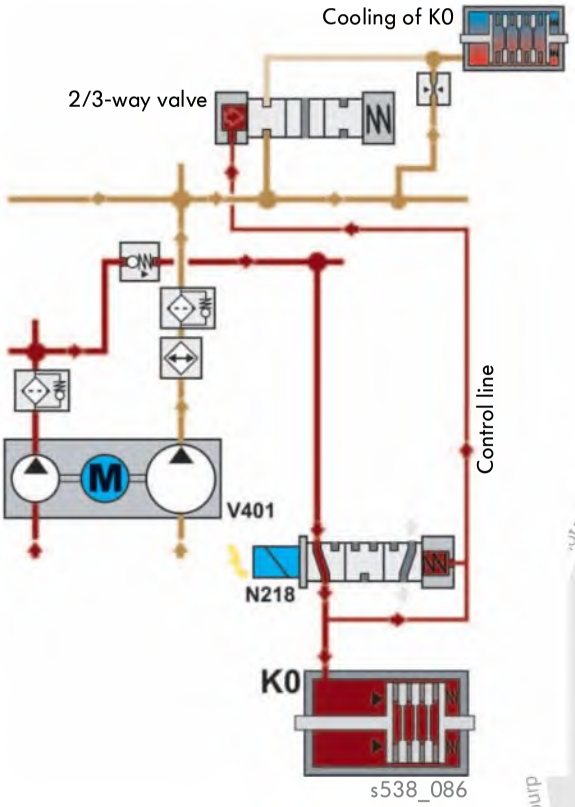
The clutch plates rub against each other and heat is produced.

At the same time, gear oil flows through the control line to the pressure-operated 2/3-way valve.

The valve opens and additional gear oil cools the clutch K0.



The oil from the high-pressure oil circuit actuates the 2/3-way valve when K0 engages.

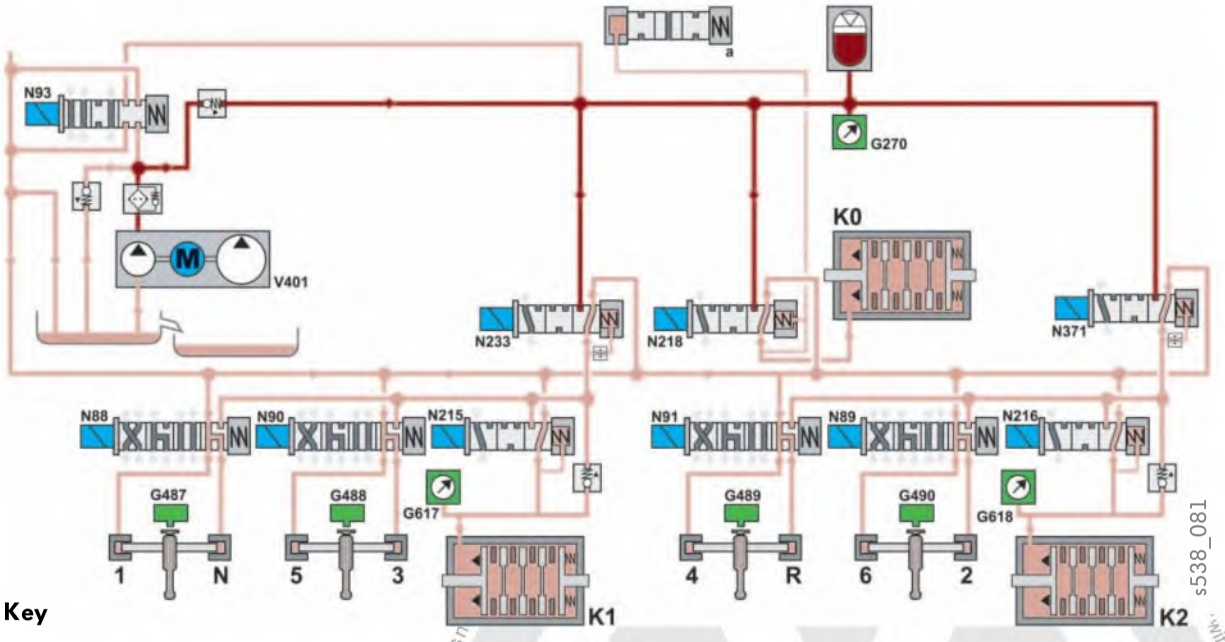


The rising pressure in the control line closes the 2/3-way valve when K0 is fully engaged.

If the oil volume continues to rise, the clutch K0 is fully engaged. The clutch plates no longer rub against each other.
The 2/3-way valve is closed again by the rising pressure.

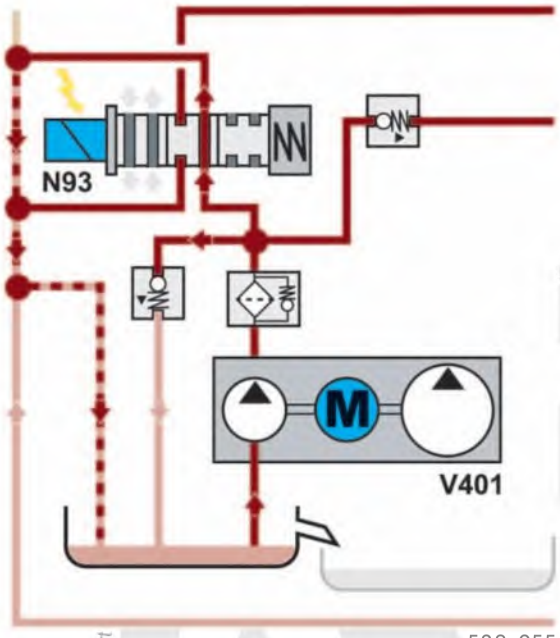
High-pressure oil circuit

Various solenoid valves are located in the high-pressure oil circuit. The valves are electrically activated by the mechatronic unit allowing gear oil to flow to the selector shafts and the clutches. A pressure accumulator ensures a constant supply of oil. The gearbox hydraulic pressure sender G270 on the pressure accumulator informs the mechatronic unit about the oil pressure in the high-pressure oil circuit. The mechatronic unit sets the position of the solenoid valve N93 on the basis of the oil pressure level. The two pressure sensors (clutch travel senders 1 G617 and 2 G618) inform the mechatronic unit about the oil pressure acting on the drive clutches. These measured values are required to ensure a smooth switch-over between the clutches.



Key

G270	Gearbox hydraulic pressure sender
G487	Gear selector movement sensor 1
G488	Gear selector movement sensor 2
G489	Gear selector movement sensor 3
G490	Gear selector movement sensor 4
G617	Clutch travel sender 1
G618	Clutch travel sender 2
N88	Solenoid valve 1
N89	Solenoid valve 2
N90	Solenoid valve 3
N91	Solenoid valve 4
N93	Solenoid valve 6
N215	Automatic gearbox pressure regulating valve 1
N216	Automatic gearbox pressure regulating valve 2
N218	Automatic gearbox pressure regulating valve 4
N233	Automatic gearbox pressure regulating valve 5
N371	Automatic gearbox pressure regulating valve 6
V401	Hydraulic pump motor
	High-pressure oil circuit supply
	High-pressure oil circuit return

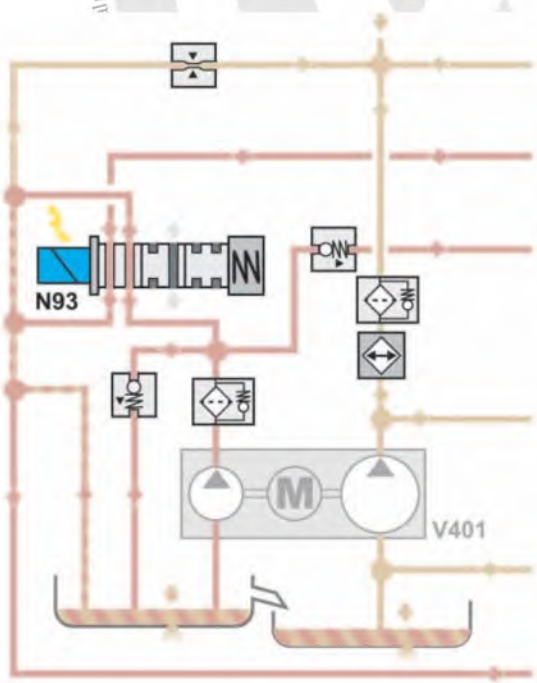


s538_055

Term for “pump in circuit”

The mechatronic unit activates the solenoid valve N93 to regulate the pressure in the high-pressure oil circuit.

The valve moves to the centre position. The oil drawn from the mechatronic unit oil sump is pumped and filtered within the circuit.



s538_054

Draining the gear oil

The gear oil can only be fully drained with the vehicle diagnostic tester.

The vehicle diagnostic tester activates the solenoid valve N93.

The valve is moved to the “drain” position. The oil flows in the circuit again and the high-pressure oil circuit is drained.

Please observe the information on this in ELSA.

Summary

Procedures during gear selection

Pulling away

The selection processes that take place when the vehicle pulls away are described first in the following section to help explain the procedures in the mechatronic unit. The steps from opening the driver's door to driving are explained.
Starting requirements in the vehicle:
the vehicle is always parked with 1st and R gear engaged in selector lever position "P".

The following steps are run through:

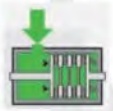
1. The hydraulic pump motor V401 is activated when the driver's door is opened.
   Both gear pumps start to build up pressure and enable the vehicle to be quickly set to driving mode. The pressure sensor G270 transmits the system pressure to the mechatronic unit.

2. The driver starts the vehicle and selects position "D".

3. The mechatronic unit detects the position of the selector lever.

4. The driver request is detected by the engine control unit via the accelerator pedal position.

5. The valves N233 and N215 are electrically activated to engage the drive clutch K1.

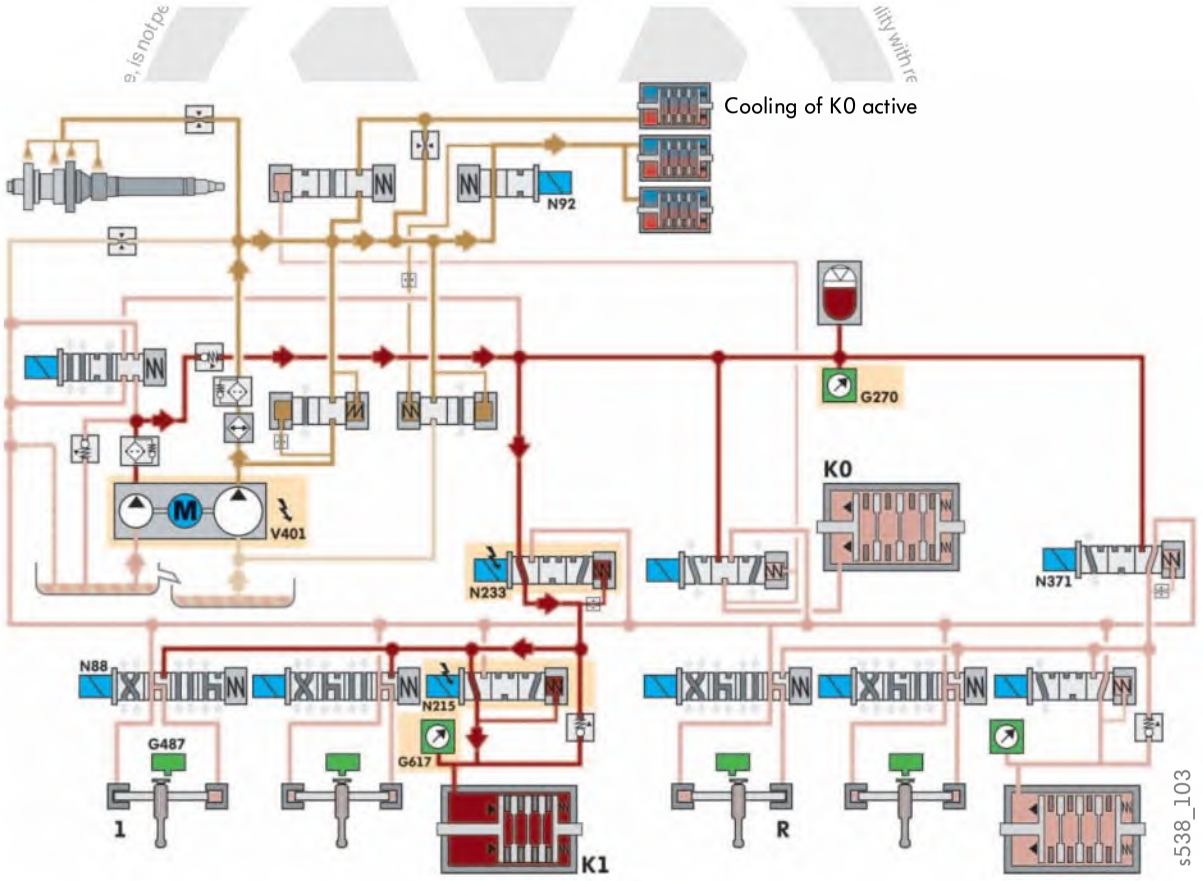


6. The gear train half is filled with oil and the clutch is pushed together.

7. The pressure sensor G617 transmits the level of the oil pressure applied to the clutch.

8. The vehicle starts moving as the drive clutch K1 is engaged and 1st gear is selected.

The valve N233 will no longer be powered if there is a fault in gear train half 1 or if there is a fault in gear train half 2, then valve N371 will no longer be powered.
This shuts down the corresponding gear train half.
The vehicle can still be driven with the other gear train half.



Key

G270	Gearbox hydraulic pressure sender
G487	Gear selector movement sensor 1
G617	Clutch travel sender 1
N88	Solenoid valve 1
N92	Solenoid valve 5
N215	Automatic gearbox pressure regulating valve 1
N233	Automatic gearbox pressure regulating valve 5
N371	Automatic gearbox pressure regulating valve 4
V401	Hydraulic pump motor

Low-pressure oil circuit supply

Low-pressure oil circuit return

High-pressure oil circuit supply

High-pressure oil circuit return

Sensors

Actuators

Summary

Vehicle operation with the combustion engine and engaged disengagement clutch K0

The following procedures are initiated by the mechatronic unit to engage the disengagement clutch K0:

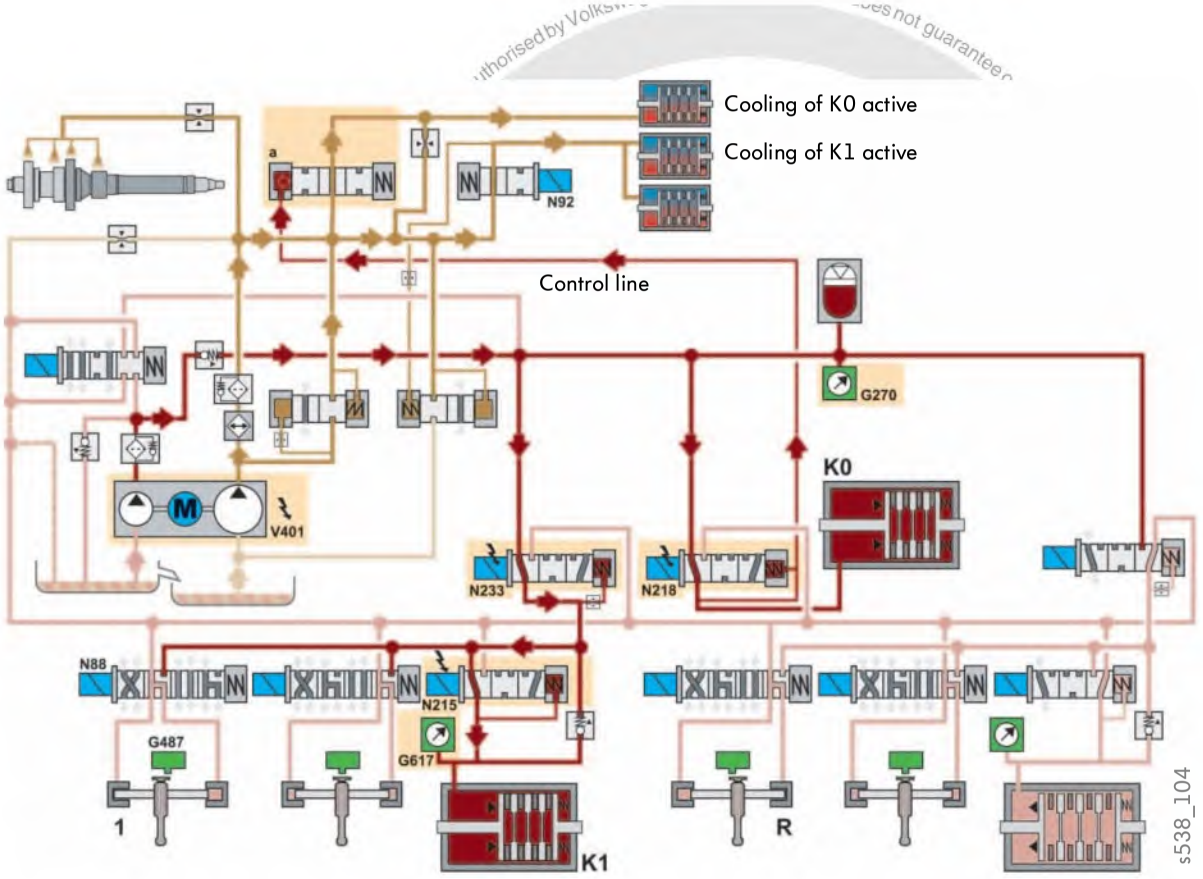
1. The valve N218 is electrically activated.
   It opens allowing oil to flow to the disengagement clutch K0.

2. The disengagement clutch K0 starts to engage and the clutch plates rub against each other.
   This produces heat.

3. At the same time, the oil pressure passes from disengagement clutch K0 via the control line to the 2/3-way valve (a).

4. The valve opens and allows additional cooling oil to flow to the disengagement clutch K0.

5. If the oil pressure at the disengagement clutch is increased, the clutch will fully engage.
   There is no longer an increased oil cooling requirement.
   The 2/3-way valve (a) is closed again by the higher oil pressure.



Key

G270	Gearbox hydraulic pressure sender
G487	Gear selector movement sensor 1
G617	Clutch travel sender 1
N88	Solenoid valve 1
N92	Solenoid valve 5
N215	Automatic gearbox pressure regulating valve 1
N218	Automatic gearbox pressure regulating valve 4
N233	Automatic gearbox pressure regulating valve 5
V401	Hydraulic pump motor
a	2/3-way valve, pressure-operated

Low-pressure oil circuit supply

Low-pressure oil circuit return

High-pressure oil circuit supply

High-pressure oil circuit return

Sensors

Actuators

Basic setting

The basic setting is performed with the vehicle diagnostic tester in five steps.

Step 1
The necessary oil pressure is built up. The combustion engine is started and all gears are moved to the neutral position.

Step 2
The gear actuator travel required to synchronise the individual gears and the bite point of the drive clutches K1 and K2 are adapted.

Step 3
The gear actuator travel for the neutral positions of the individual gears is adapted.

Step 4
The gear actuator travel for the end positions of the individual gears is adapted.

Step 5
The combustion engine is switched off and the bite point of the disengagement clutch K0 is adapted.

The basic setting procedure is merely an initial calibration of the transmission components, and serves as a starting point for the adaption during driving.
The driving characteristics may be affected after the basic setting procedure.
Therefore the vehicle should be taken on a road test afterwards.

After a basic setting, a K0 adaption is performed approximately once per minute in “Hybrid” operating mode until the K0 bite point has been successfully adapted fifteen times. The adaption interval is then extended to eight minutes.

Changing the oil

The vehicle diagnostic tester is required to change the oil in the dual clutch gearbox 0DD.

The vehicle diagnostic tester is used to activate the solenoid valve N93 (accumulator filling valve) and drain the high-pressure oil circuit. The hydraulic pump motor V401 is also deactivated.
This is done to protect the high-pressure pump from running dry once the gear oil has been drained.

Once the gearbox has been filled with gear oil, the motor V401 is activated again.
When the oil level is checked, the double gear pump runs for several minutes and circulates the gear oil. This ensures that the oil levels in the gear case and in the mechatronic unit are correct.

The oil level can be checked at the check plug with the overflow pipe.
The high-pressure accumulator is filled again after the oil level check.

The oil level will fall due to the described procedure.
Please observe the information in ELSA on this.

Test your knowledge

Which answers are correct?

One or several of the given answers may be correct.

1. What should you observe when draining the gear oil?

❒ a) All of the oil can, as usual, be drained by opening the drain plug.

❒ b) When draining all of the gear oil, the solenoid valve N93 needs to be activated with the vehicle diagnostic tester.

❒ c) The automatic gearbox pressure regulating valve 1 N215 is set to “open” and the oil can be drained.

2. How are the six forward gears and the reverse gear synchronised?

❒ a) All of them have a single synchromesh.

❒ b) Only reverse gear has a single synchromesh.

❒ c) 1st to 3rd gear have a double synchromesh, all other gears have a single synchromesh.

3. Which statement about the clutches is correct?

❒ a) All clutches run in gear oil.

❒ b) The drive clutches run in gear oil while the disengagement clutch K0 is a dry clutch.

❒ c) All clutches are located in the hybrid module.

4. Which statement about the disengagement clutch K0 is correct?

❒ a) It connects the combustion engine to the electric drive motor.

❒ b) The vehicle is driven by the combustion engine when disengagement clutch K0 is disengaged.

❒ c) When disengagement clutch K0 is engaged, the vehicle can only be driven by the electric drive motor.

5. What should be observed after a basic setting procedure?

❒ a) The vehicle can be handed back to the customer immediately after the basic setting as all selection and clutch processes will be perfectly configured.

❒ b) The vehicle should be taken on a road test after the basic setting.

❒ c) A basic setting is not necessary.

Answers:
1. b); 2. a); 3. a), c); 4. a); 5. b)

538

000.2812.95.20 Technical status 03/2015

Volkswagen AG
After Sales Qualification
Service Training VSQ-2
Brieffach 1995
D-38436 Wolfsburg