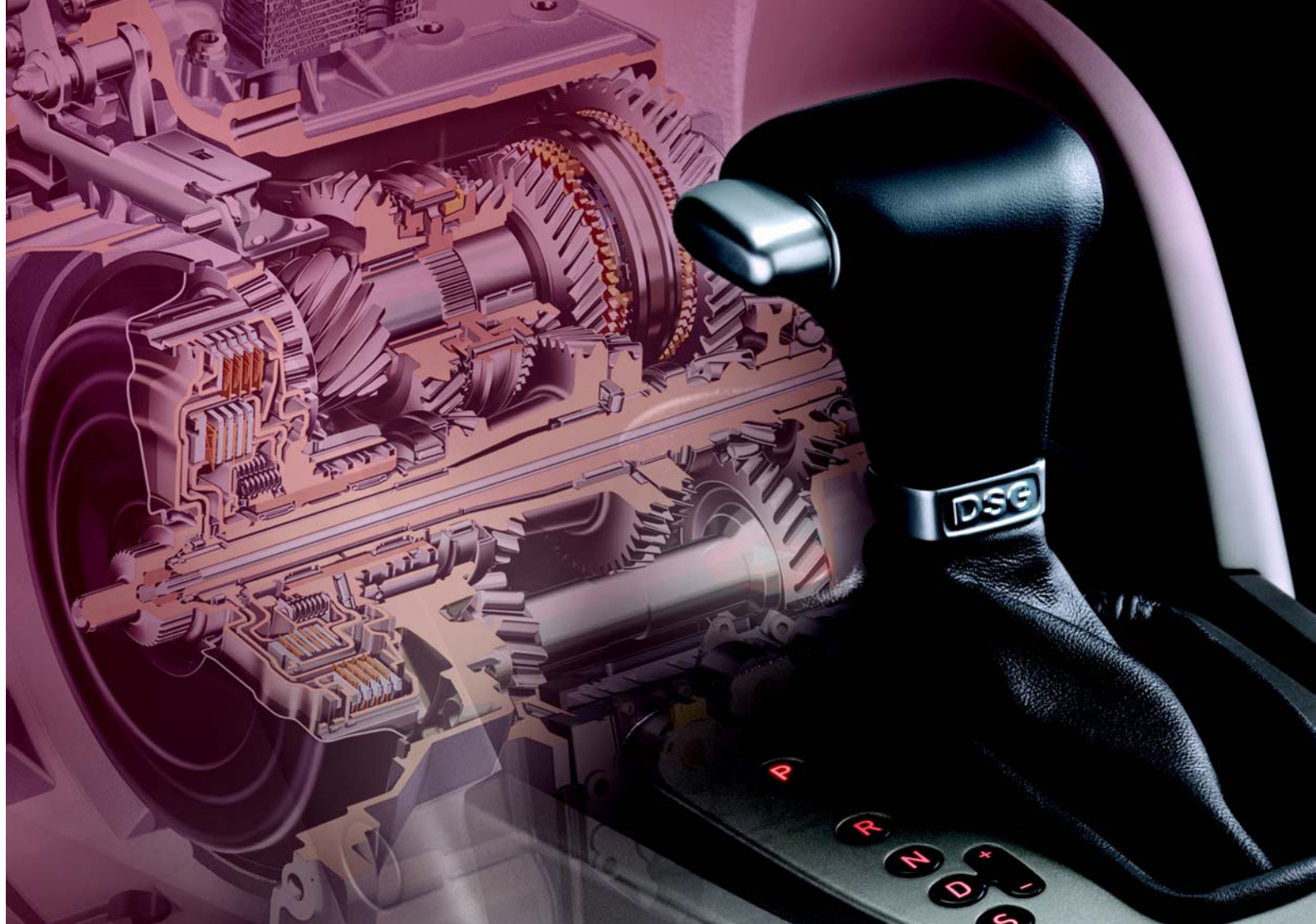




Direct Shift Gearbox 02E

Self Study Program No. 105

2530-122
Edic.: 1 (05-04)



Technical Status: 05.04. Due to constant product development and improvements, the data which appears in this document is subject to possible modifications.

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DSG 2E automatic gearbox

The DSG automatic gearbox due to its novel concept introduces a new form of driving pleasure in SEAT vehicles.

It is a gearbox which uses two **multi-disk clutches** immersed in oil, and is equipped with several automatic **gear change programs**. Both characteristics provide the DSG gearbox with comfortable performance and ease of driving, aspects highly sought after by drivers of automatic gearbox equipped vehicles.

The DSG automatic gearbox also offers the **driver** the possibility to intervene directly in the **gear change** process, providing a rapid response with no jerky reactions, features which are normal on manual gearboxes.

The DSG gearbox has a complete electronic package to manage the hydraulic circuit used to change all the **6** synchronised **gears**.

The management also offers a complete **diagnosis**, an aspect of vital importance for service since it greatly reduces and facilitates the system testing and control.

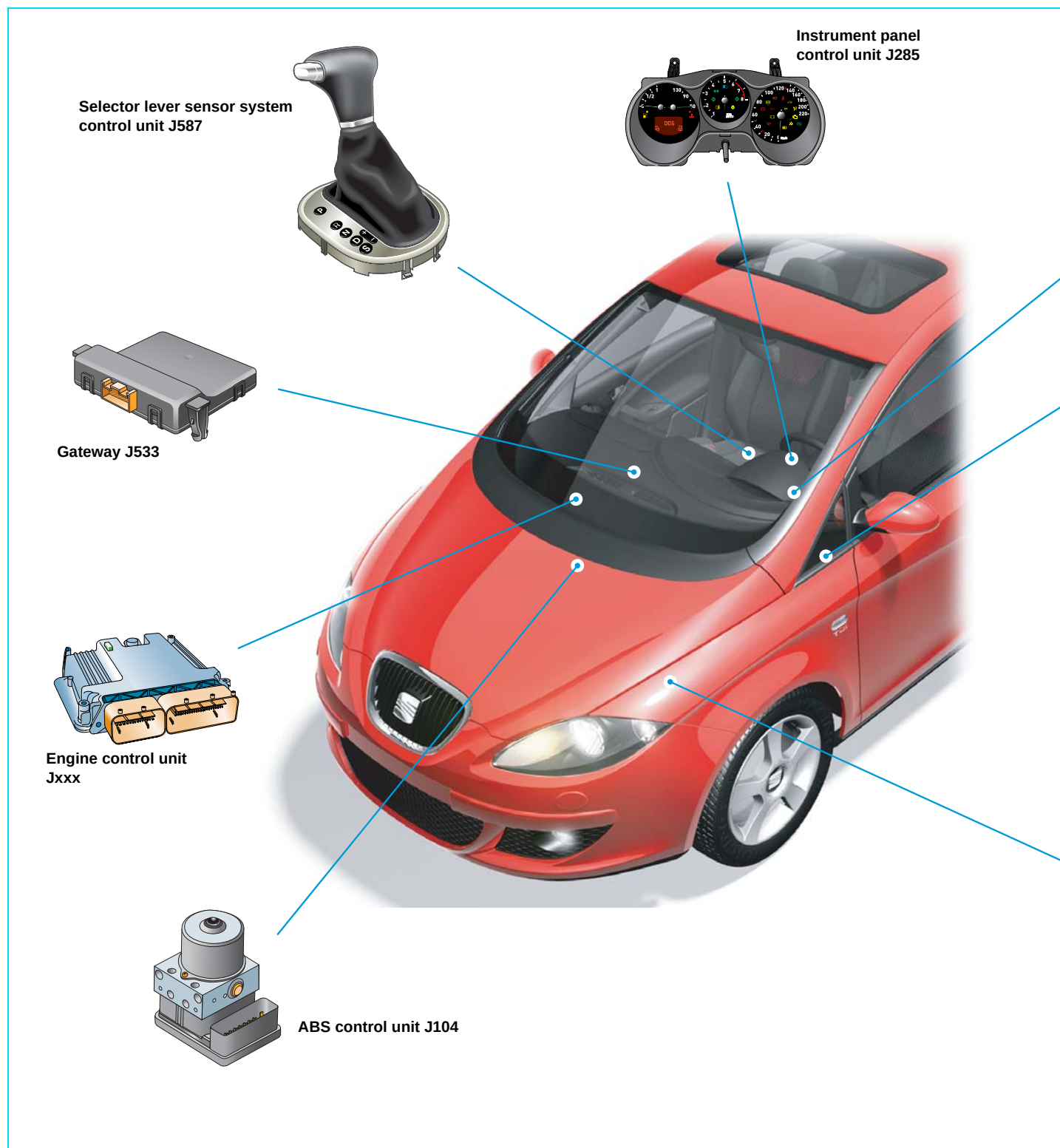
In short, as with the SEAT Altea, the DSG automatic gearbox meets the expectations of all drivers, due to its comfort, sporty features, robustness and reliability. All this is achieved with minimum fuel consumption.

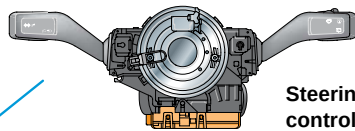
Note: The precise checking, adjustment and repair information is contained in the relevant Repair Manuals and in the guided fault finding or guided functions of the VAS 5051.

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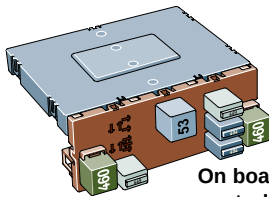
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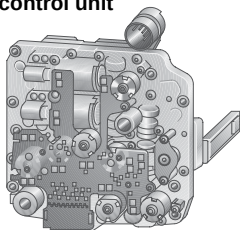


Steering column
control unit J527

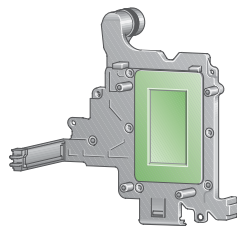


On board network
control unit J519

Hydraulic control unit



Automatic gearbox
control unit dsg J743



Automatic gearbox DSG

D105-01

This new family of automatic gearboxes will be launched with the name DSG which is the German abbreviation for (**D**irekt **S**chaltgetriebe).

The DSG automatic gearbox is notable for the fact that it offers in one single unit the advantages of both the manual and automatic gearboxes.

In a **similar** manner to **manual gearboxes**, this gearbox has high mechanical efficiency, is robust and sporty.

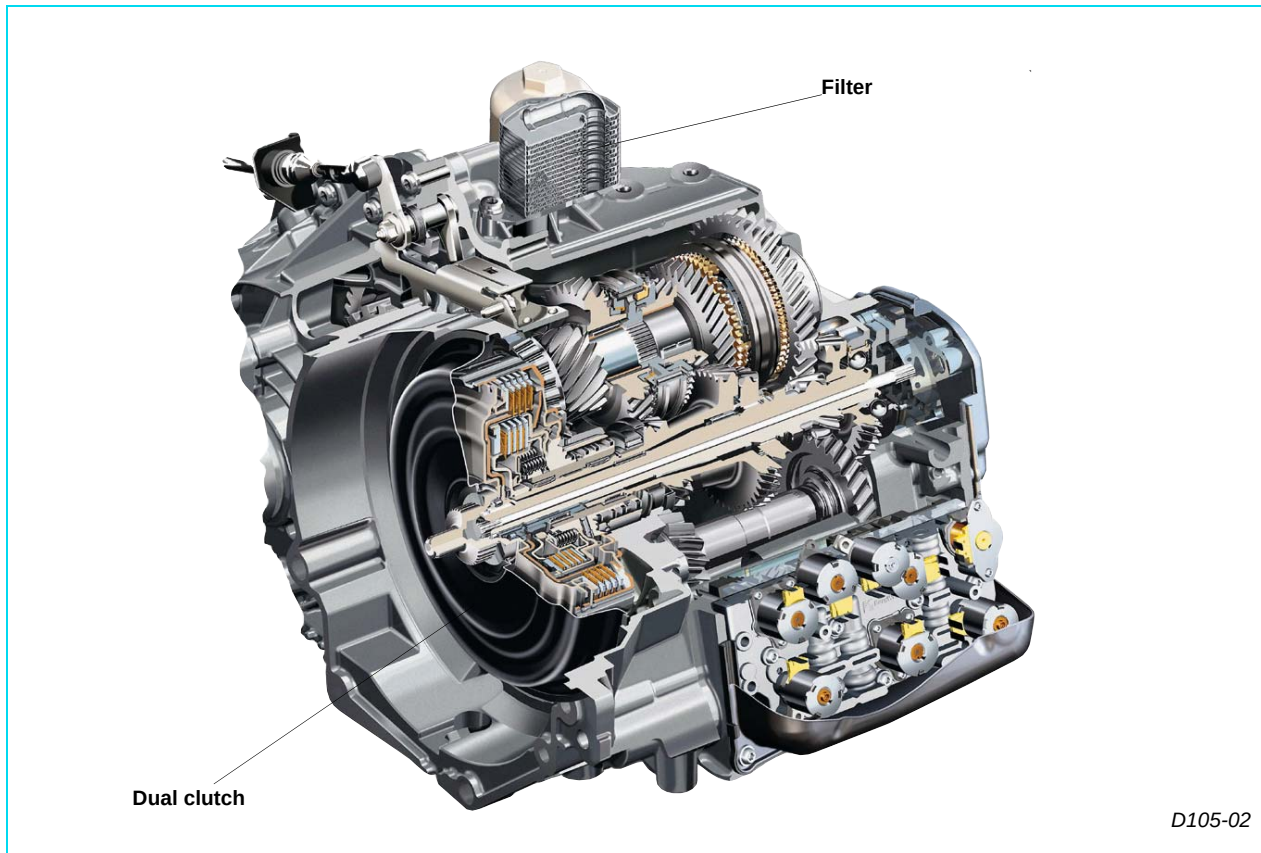
It also has characteristics similar to those of **automatic gearboxes** due to the driving comfort especially during gear changes.

The operating principle is based on the use of a hydraulically operated dual clutch but with an electronic control. This layout provides the performance of an automatic gearbox and offers the comfort expected from an automatic gearbox.

At the same time, the electronic management offers the **driver** the possibility to **intervene** in a manual direct manner during **gear changes**, as with a normal manual gearbox.

The DSG automatic gearbox offers in essence a combination of the advantages of the different types of gearboxes in one single unit. At the same time it should not be forgotten that the fuel consumption levels obtained are equal to the most economical manual gearbox versions.

SYSTEM LAYOUT



The main characteristics of the DSG automatic gearbox are:

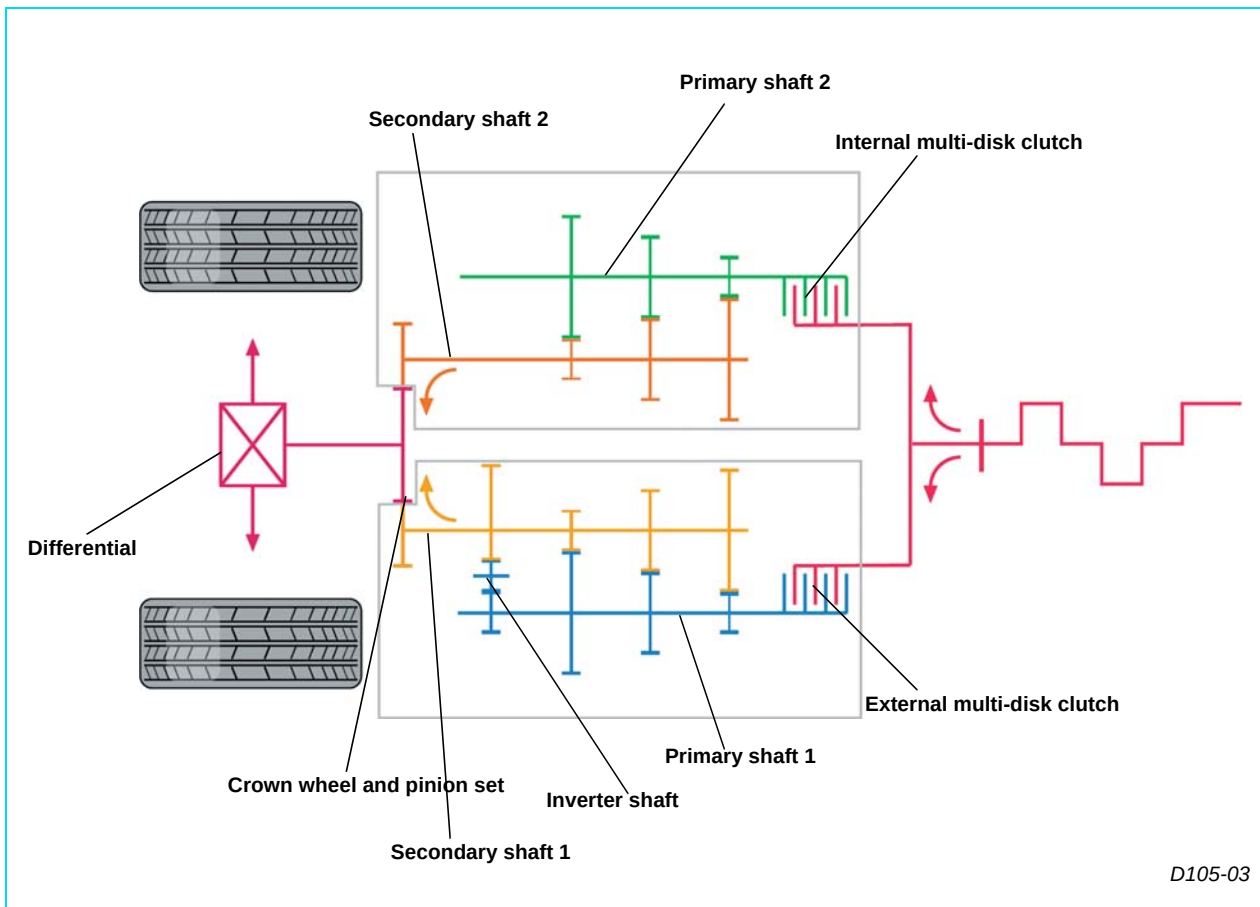
- Designation letters **02E**.
- Presently offered with 2.0L FSI engines.
- Has a **dual clutch**, composed of two wet multi-disk clutches.
- It has **6** forward and one reverse **gear, all synchronised**.
- It offers **3 driving modes**, normal “D”, sporty “S” or Tiptronic “+” or “-”.

- The mechatronic unit contains in one single assembly the electronic and electro-hydraulic control units, increasing reliability and reducing the wiring.

- It uses special oil for automatic transmissions. (7.2 litres).

- It is capable of transmitting a torque value as high as 350 Nm.

- The gearbox weight is approximately 80kg.



BASIC CONCEPT

The DSG automatic gearbox is **essentially** of **two partial transmissions**, built as if they were independent gearboxes, from a functional standpoint.

Each transmission or partial **circuit** has an assigned multi-disk clutch in the interior of the dual clutch, a primary shaft and a secondary shaft.

The electronic management controls a hydraulic circuit, which engages and disengages the clutches and the gear engagement or disengagement, depending on the driving conditions.

Basically there is always a power flow through one of the transmissions while the other pre-selects the next gear, while at the same keeping the clutch disengaged for this particular gear.

Each gear has an assigned **synchro** and its **own control** similar to a manual gearbox.

DUAL CLUTCH

The dual clutch is composed of independent clutch assemblies, known as the **external multi-disk clutch K1** and the **internal multi-disk clutch K2**.

Both clutches are hydraulically operated and each one is associated with a primary shaft.

The torque flow is passed from the crankshaft to the dual mass flywheel and from there to the dual clutch. Depending on the multi-disk clutch, which is engaged, the torque will be transmitted to one or other primary shaft.

The following dual clutch components are integrated on the flywheel and rotate together as a unit (coloured in red on the diagram):

- The input casing and the driving disk.
- The external disk carrier both for the external clutch K1 and internal clutch K2, which in turn drive the corresponding metallic disks.
- The main casing which houses the oil distribution channels to the clutches.

EXTERNAL MULTI-DISK CLUTCH, K1

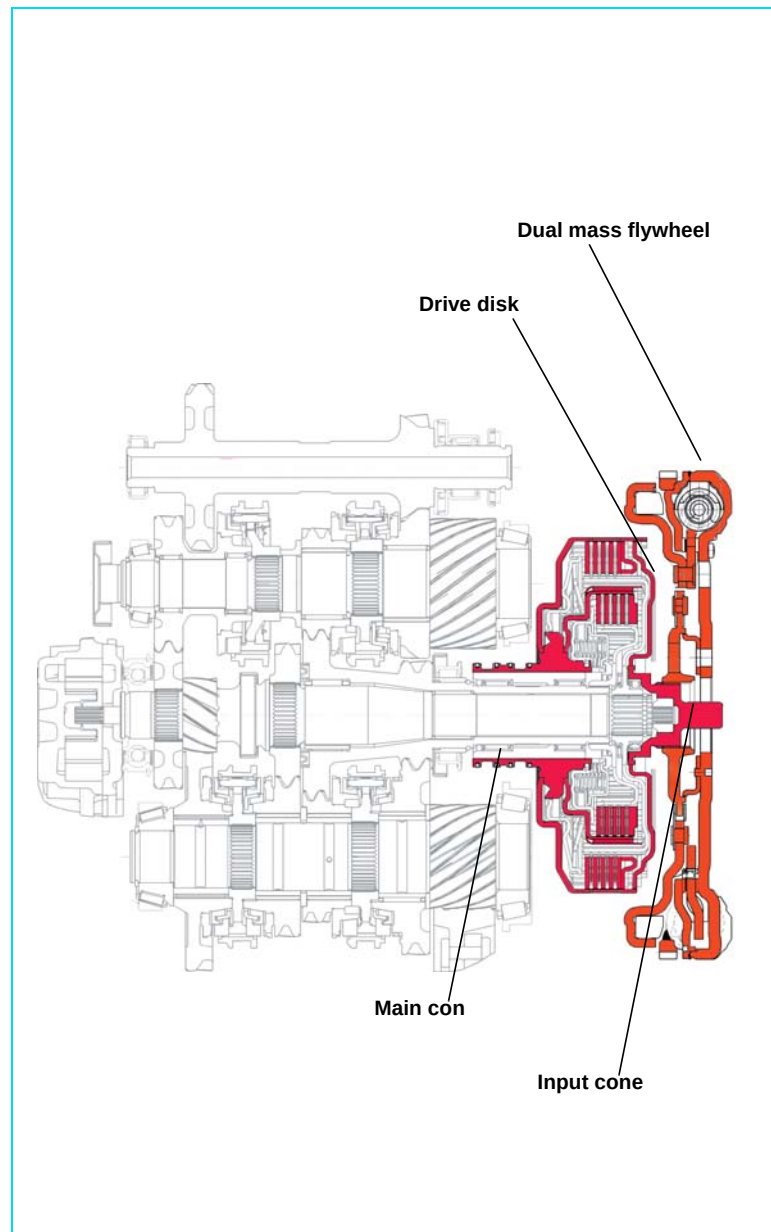
This is composed of an external multi-disk support and metallic disks, which are an integral part of the flywheel. It also contains the friction disks and internal disk carrier of the clutch K1 that are joined to the primary shaft 1.

To engage the clutch, oil pressure should pass through the input casing to the pressure chamber K1. The result is that the piston K1 will move and compress the K1 multi-disk clutch assembly.

The torque is transmitted through the internal multi-disk clutch assembly support to the primary shaft 1.

When the hydraulic pressure is released, the diaphragm spring will press the piston 1 back to its initial position.

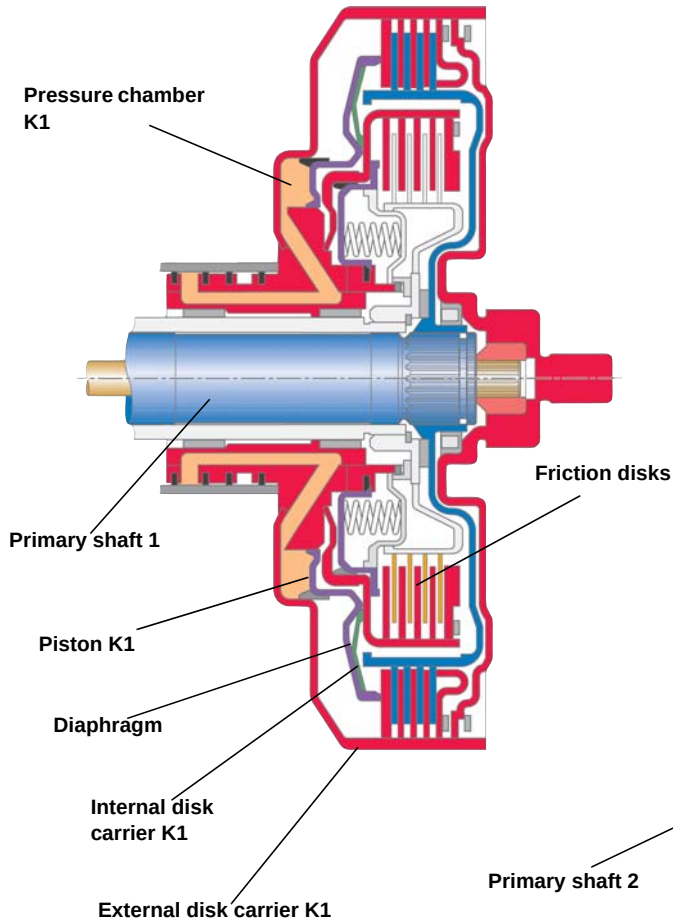
When this clutch is operated hydraulically, the engine torque is transmitted to the primary shaft 1 which contains the 1st, 3rd, 5th and reverse gears and also reverse gear.



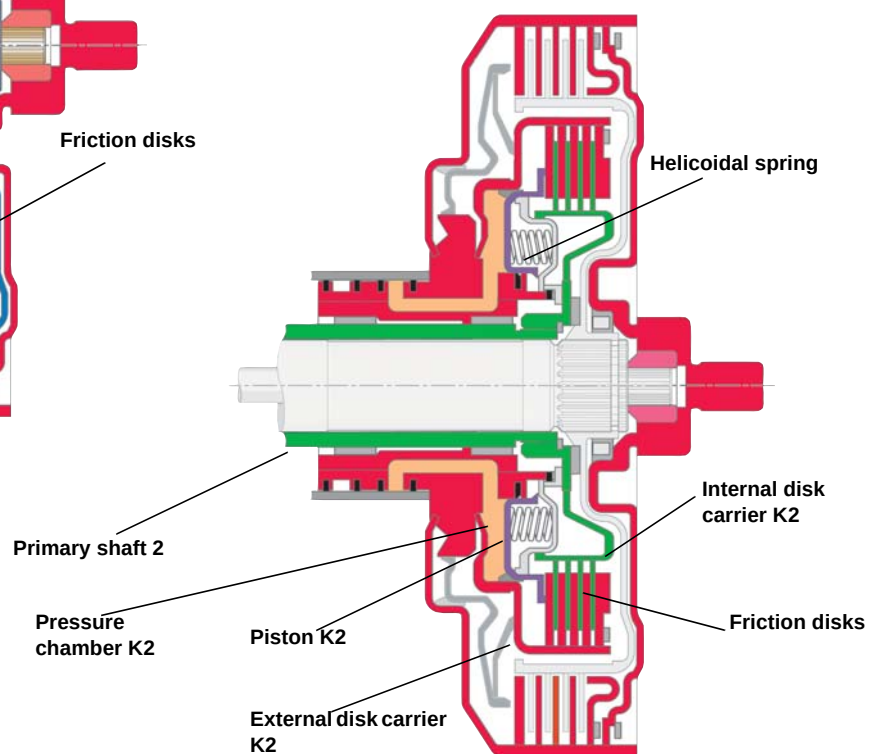
INTERNAL MULTI-DISK CLUTCH, K2

This unit is composed of the external disk carrier K2 and the metallic disks which are attached to the flywheel. It also contains the friction disks and internal disk carrier of the clutch K2 which are joined to the primary shaft 2.

External multi-disk clutch K1



Internal multi-disk clutch K2



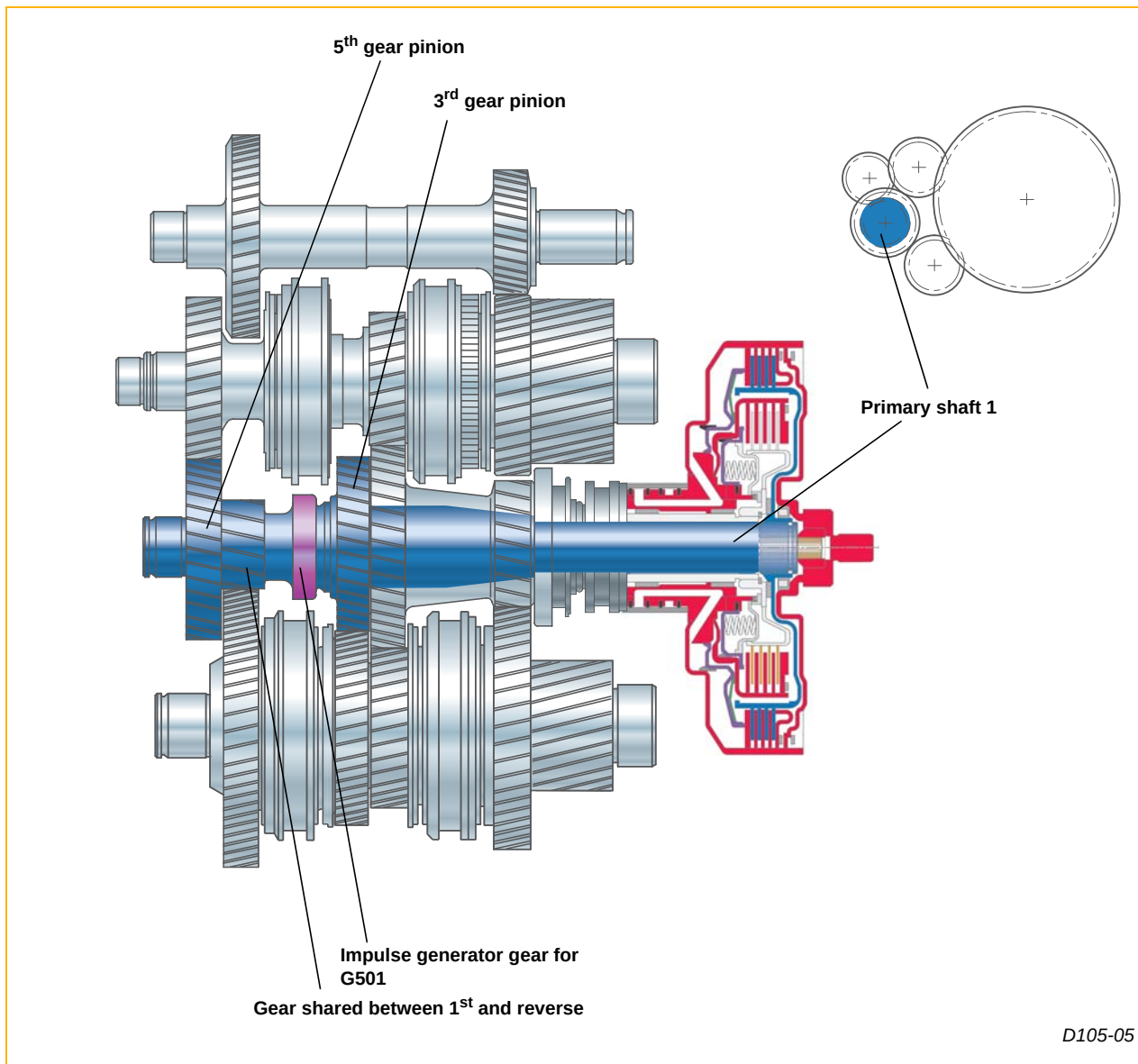
D105-04

The hydraulic pressure also reaches the pressure chamber K2 through the main casing but through another channel, and it moves and compresses the multi-disk clutch K2.

The torque is transmitted through the interior disk carrier to the primary shaft 2.

As the hydraulic pressure is reduced, the helicoidal springs will press the piston 2 back to its original position. When this multi-disk clutch is compressed, the torque is transmitted to the primary shaft 2 which contains the 2nd, 4th and 6th gear pinions.

INTERNAL COMPONENTS



D105-05

PRIMARY SHAFTS

The engine torque enters the gearbox through the multi-disk clutches and passes to the primary shafts.

Both shafts are concentric, the primary shaft 1 is internal and the primary shaft 2 is external.

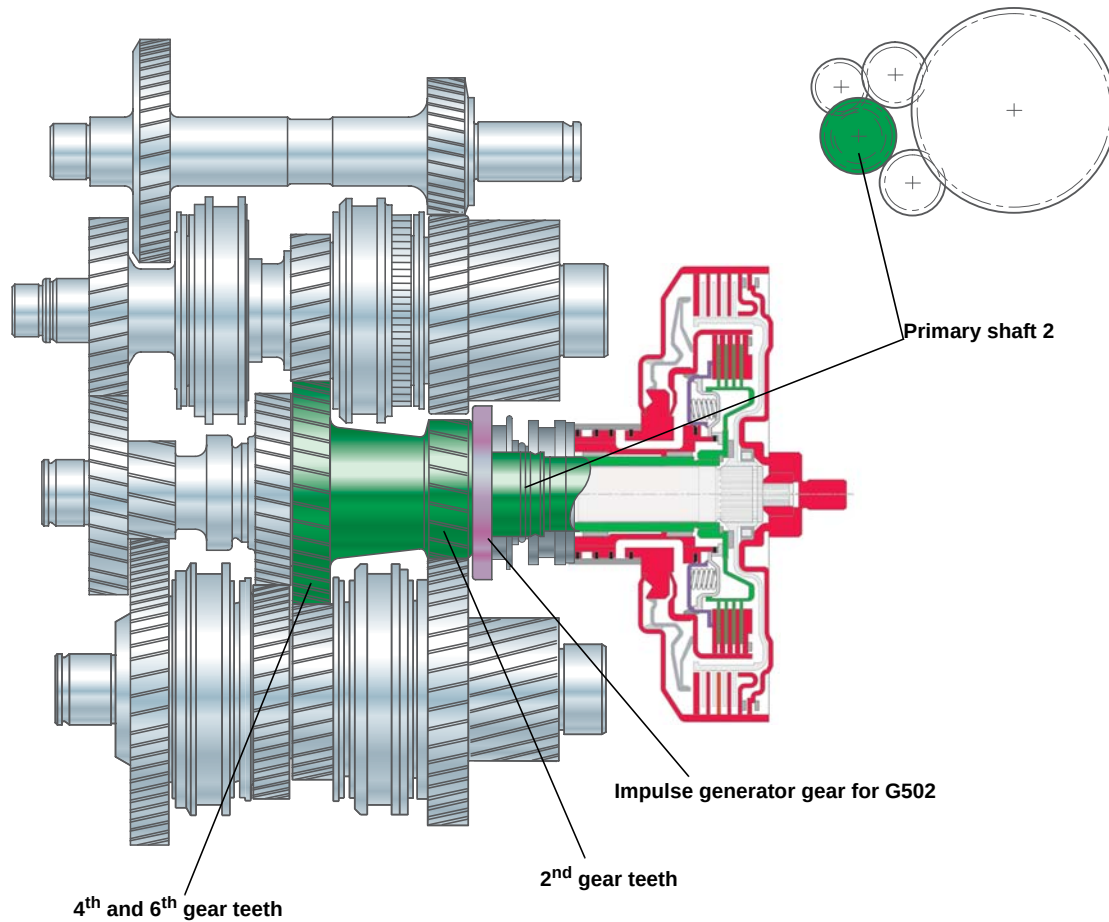
The primary shaft 1 is supported by ball bearings in the gearbox casing and by roller bearings in the clutch.

The primary shaft 2 rotates freely on the primary shaft 1 on three needle roller bearings (2 axial and one radial).

PRIMARY SHAFT 1

The primary shaft 1 is joined directly by splines to the multi-disk clutch.

This shaft contains the 3rd, 5th and a shared gear for 1st and reverse gear.



D105-06

It also drives an impulse generator gear to energise the rpm sensor on the primary shaft 1 G501. This gear is mounted between the 3rd and the shared gear for 1st and reverse gear.

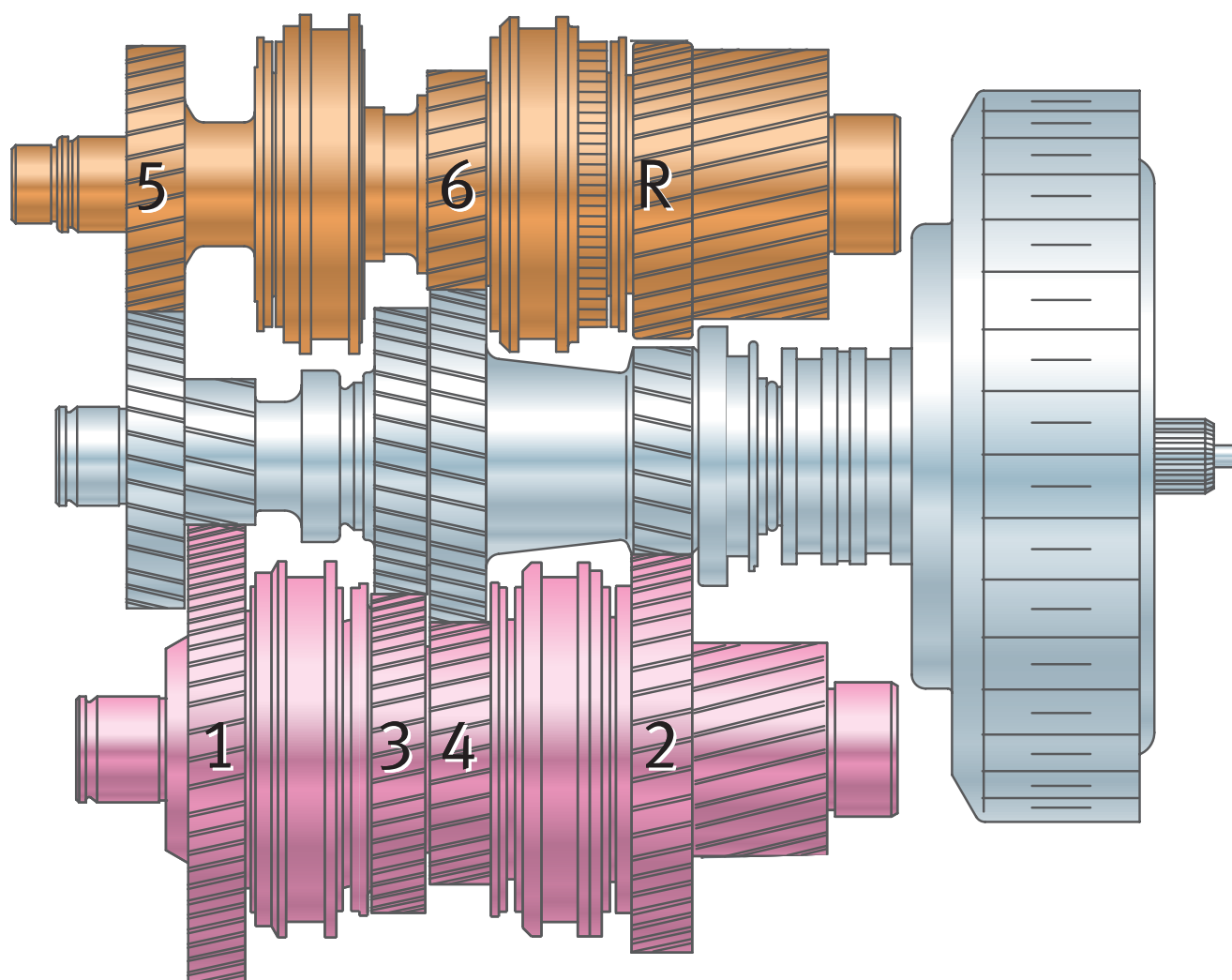
PRIMARY SHAFT 2

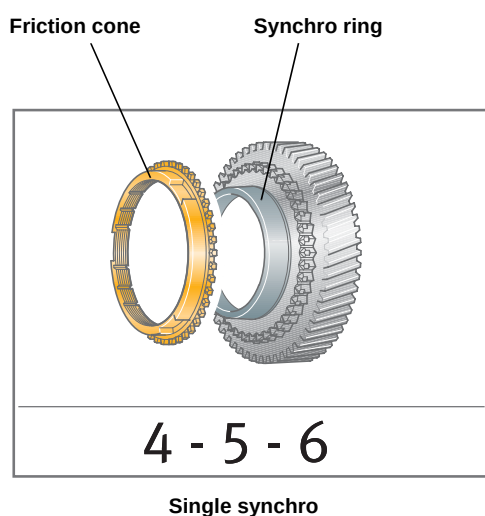
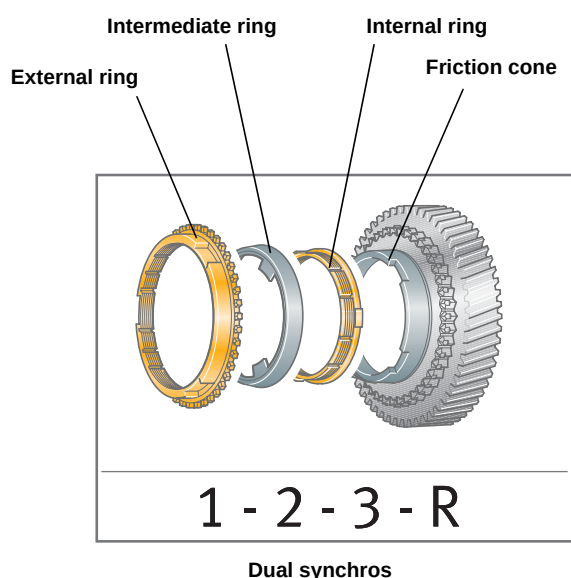
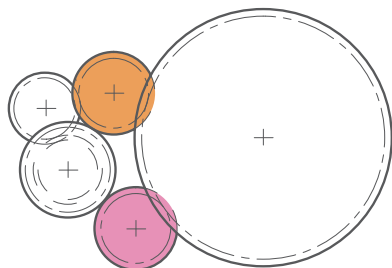
The primary shaft 2 is splined to the multi-disk clutch 2.

The primary shaft 2 has mechanised teeth for the 2nd gear and a common gear for 4th and 6th gears.

One end of the shaft next to the 2nd gear teeth is fitted with an impulse generator gear to energise the primary shaft 2 rpm sensor G502.

INTERNAL COMPONENTS





D105-07

When the torque reaches one of the primary shafts, it will be transmitted to the secondary shaft

1 or 2 depending on the gear engaged.

Both secondary shafts run on conical roller bearings, one in the clutch casing and the other in the gearbox casing.

SECONDARY SHAFT 1

This is a hollow shaft, on which the pinions for 1st, 2nd, 3rd, and 4th gears are fitted and rotate freely on needle roller bearings. The corresponding synchros are also fitted to this shaft.

There are two different types of synchros:

- The **single synchro** for the 4th gear made from one single synchro ring and one friction cone.

- The **dual synchro** for the 1st, 2nd and 3rd gears made from an external ring an intermediate ring, an interior ring and a friction cone. Both the external and internal ring have a molybdenum surface covering.

The secondary shaft 1 has axial drillings in the areas occupied by 2nd, 3rd and 4th gears to facilitate proper lubrication of the needle bearings for the different pinions.

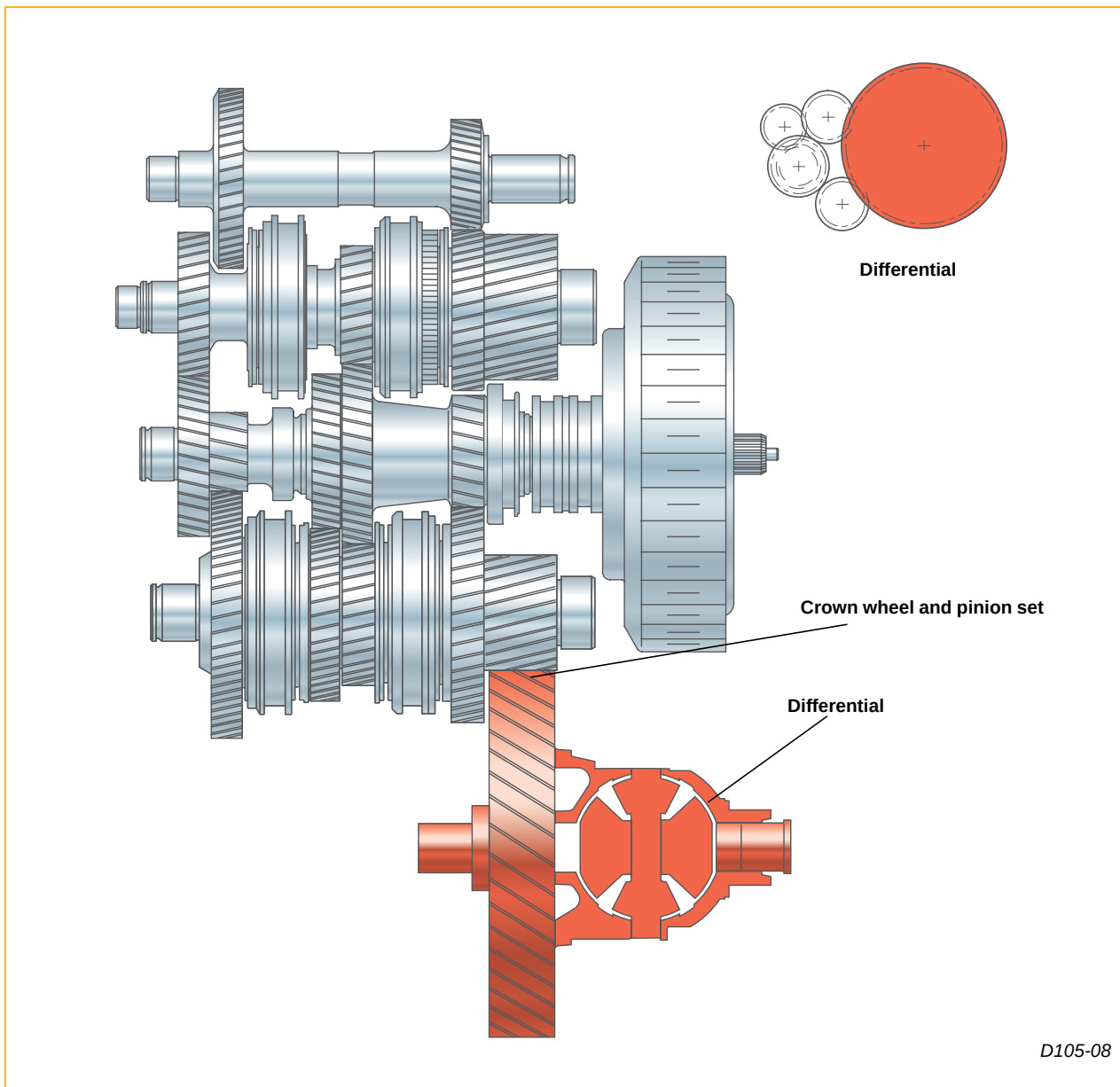
SECONDARY SHAFT 2

This is a hollow shaft on which the 5th and 6th gears are fitted and these rotate freely on needle roller bearings.

The reverse gear has a **dual synchro** while the 5th and 6th gears have **single synchro** units.

Finally the drive pinions of both secondary shafts engage the differential crown wheel forming the crown wheel and pinion assembly.

INTERNAL COMPONENTS



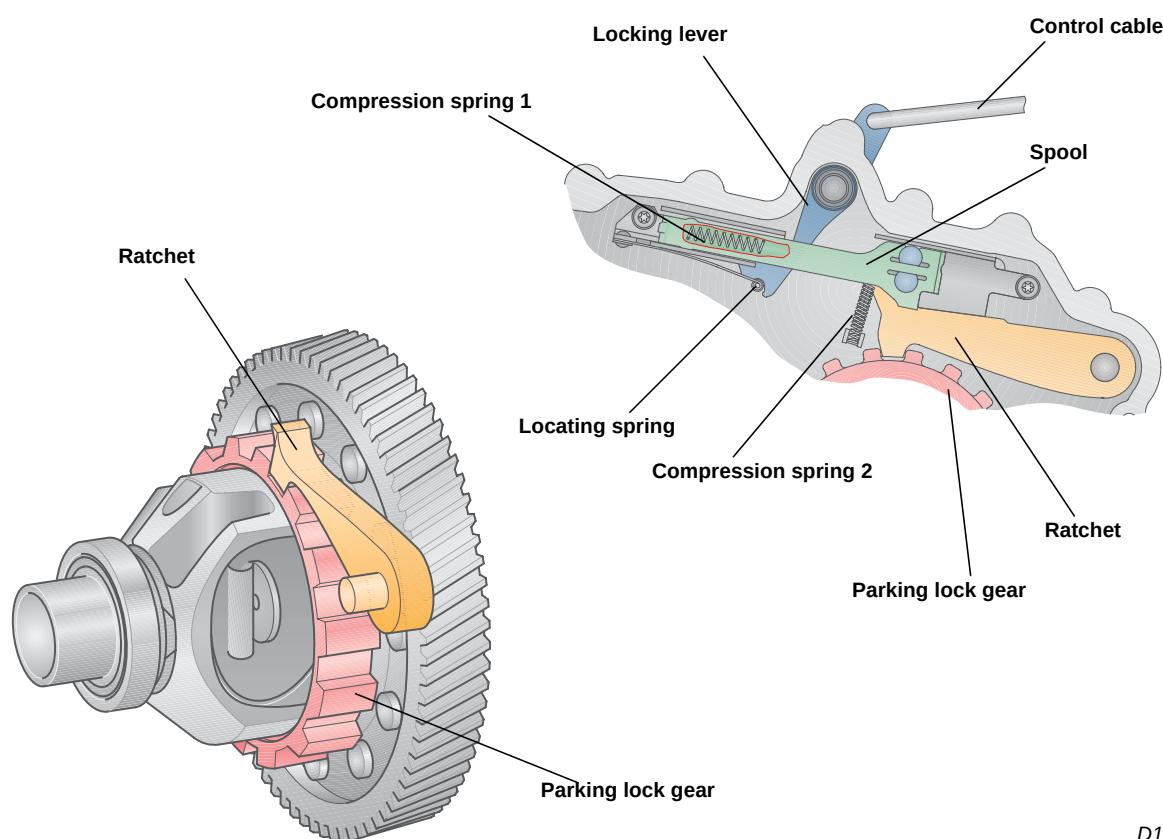
DIFFERENTIAL

The differential runs on **conical roller bearings**, one in the clutch casing and the other in the gearbox casing.

It has the same components and functions as a conventional differential.

The only unique characteristics are:

- The drive gear of both **secondary** shafts transmit **torque to** the differential **crown wheel**.
- The **parking lock gear** is integrated in the differential.



D105-09

PARKING LOCK

This is used to park the vehicle and prevent it from moving involuntarily when the handbrake is not applied. The parking lock is required because when the engine is stopped there is no hydraulic pressure and the multi-disk clutches are open.

The mechanism consists of a **parking lock gear** into which a **ratchet** is engaged. A **cable moves** this **ratchet** when the selector lever is placed in the parking position "P".

The **operation** of the ratchet is completely mechanical. It is used exclusively for the parking lock device which is installed between the selector lever and parking lock lever in the gearbox.

When the selector lever is placed in position "P", the **ratchet** engages the teeth of the parking **lock gear**.

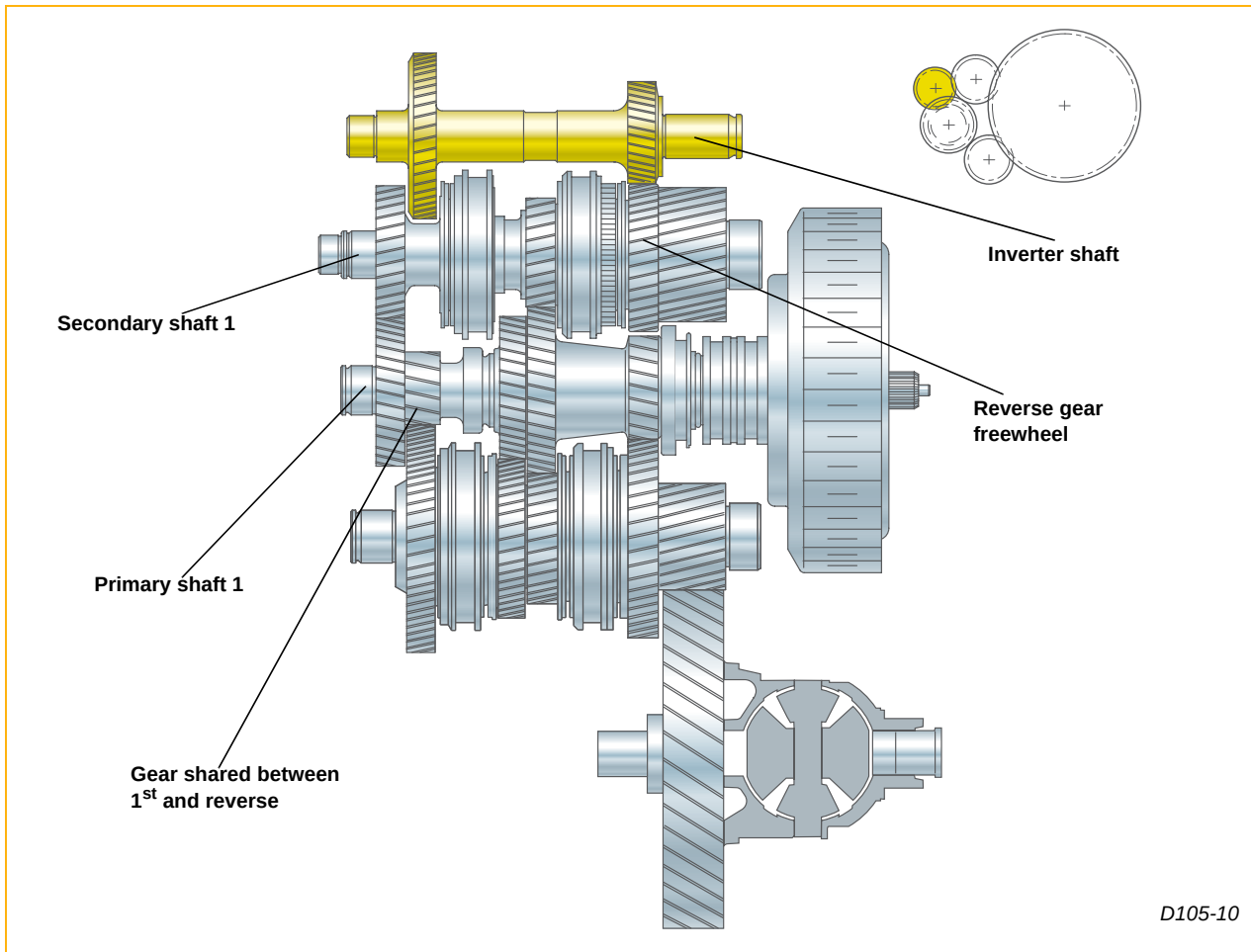
A locating spring holds the ratchet lever in this position.

If the ratchet teeth coincide with a tooth crown on the locking gear, the spring 1 is compressed. When the vehicle moves a little, the ratchet will fall into a tooth recess and the spring 1 will decompress, the spool will move and the system will lock.

The brake is **released** when the **selector lever** is **moved out** of the "**P**" **position**.

The spool will return to its original position and the spring 2 will move the ratchet out of the tooth recess in the locking gear.

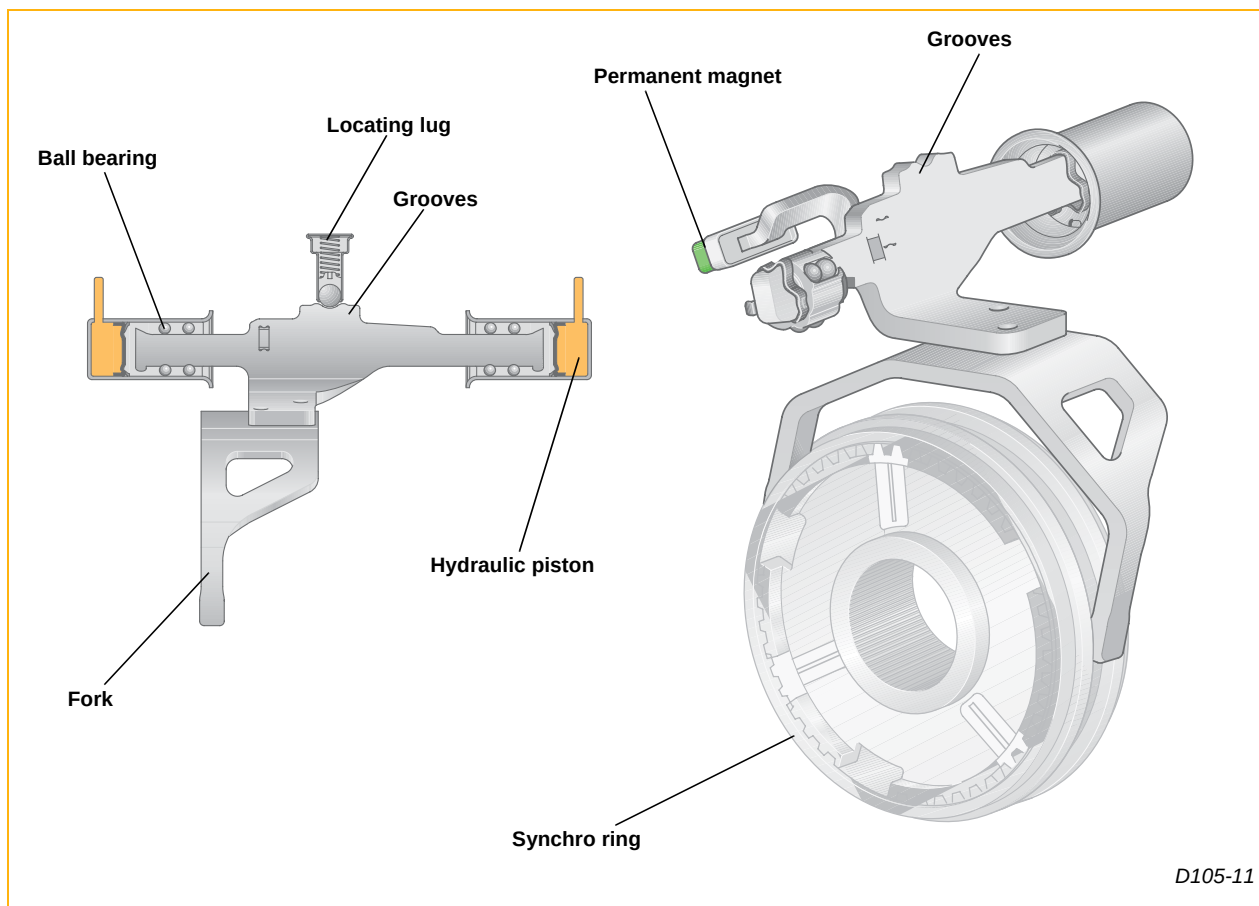
INTERNAL COMPONENTS



INVERTER SHAFT

The inverter gear is responsible for changing the direction of rotation of the secondary shaft 2 and therefore the direction of rotation of the output gear to the differential assembly.

It engages with the gear shared between the 1st and reverse gear on the primary shaft 1 and with the freewheel gear for reverse on the secondary shaft 2.



D105-11

GEAR ENGAGEMENT

The gears are engaged by the action of **four hydraulically operated forks**. These are located in the gearbox casing and each one operates a synchro ring.

The forks are guided by ball bearings to ensure smooth movement. A hydraulic piston is fitted at the end of each fork.

The oil pressure supplied to each of the **8 pistons** is governed by the mechatronic unit and delivered to a hydraulic circuit where the pressure varies between 0 and 20 bars.

The selector fork movement will depend on which piston receives oil pressure.

In other words, if the left piston is pressurised, the fork will move to the left, since the right piston will have no pressure. This action will move the

synchro ring and engage the corresponding gear.

The speed of gear change can vary depending on the energising signal to the solenoid.

When the gear has been engaged, the hydraulic pressure is released and the gear is held in place due to retention pressure exercised by the teeth machining pattern.

The fork is held in the neutral position by the **locating lug** which fits into each fork.

A **permanent magnet** located in front of a movement sensor enables the mechatronic unit to have precise information on the position of each fork.

POWER FLOW

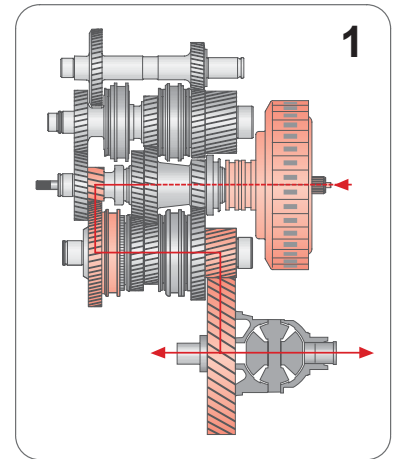
POWER FLOW

The power transmission inside the gearbox begins through the dual clutch, either through the external multi-disk clutch K1 or through the internal multi-disk clutch K2.

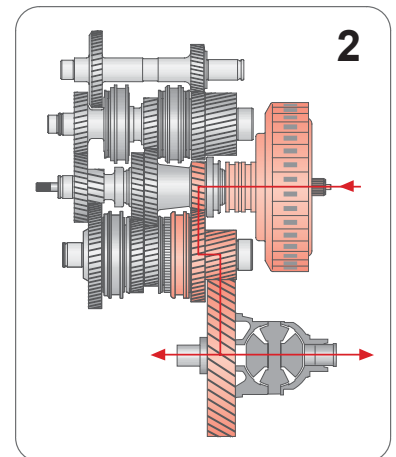
Each clutch drives a primary shaft. The primary shaft 1 (internal) is driven by the multi-disk clutch K1 and the primary shaft 2 (external) is driven by the multi-disk clutch K2.

From here the power passes to one of the secondary shafts and finally to the differential assembly.

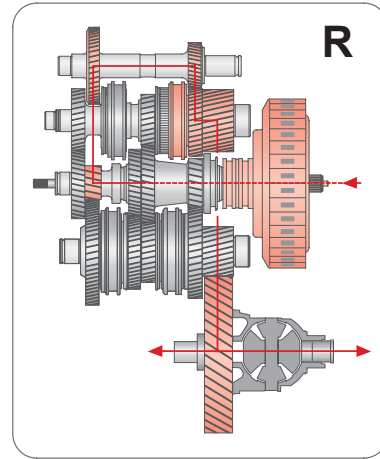
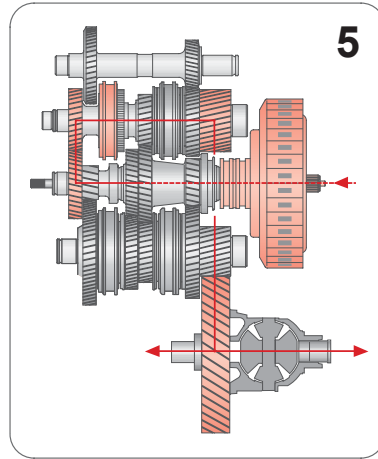
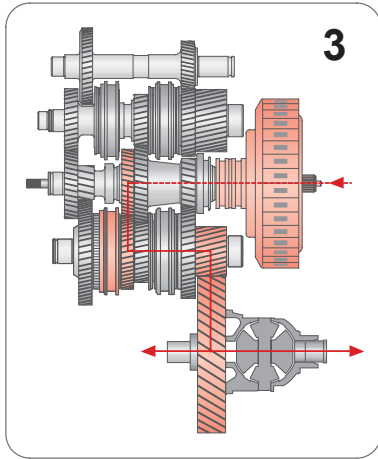
It should be borne in mind that the secondary shaft 1 includes the 2nd, 3rd, and 4th gears and the secondary shaft 2 includes the 5th, 6th and reverse gears.



1st gear:
Clutch K1
Primary shaft 1
Secondary shaft 1
Differential



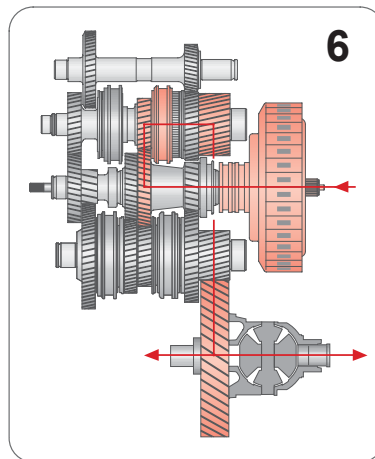
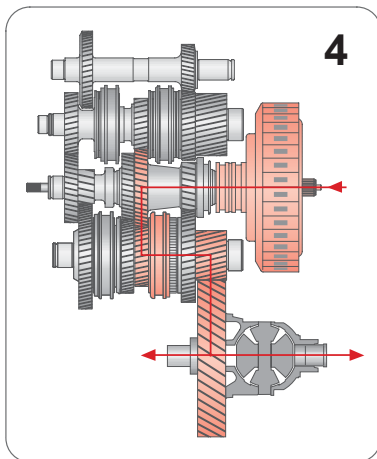
2nd gear:
Clutch K2
Primary shaft 2
Secondary shaft 1
Differential



3rd gear:
Clutch K1
Primary shaft 1
Secondary shaft 1
Differential

5th gear:
Clutch K1
Primary shaft 1
Secondary shaft 2
Differential

Reverse gear:
Clutch K1
Primary shaft 1
Inverter shaft
Secondary shaft 2
Differential

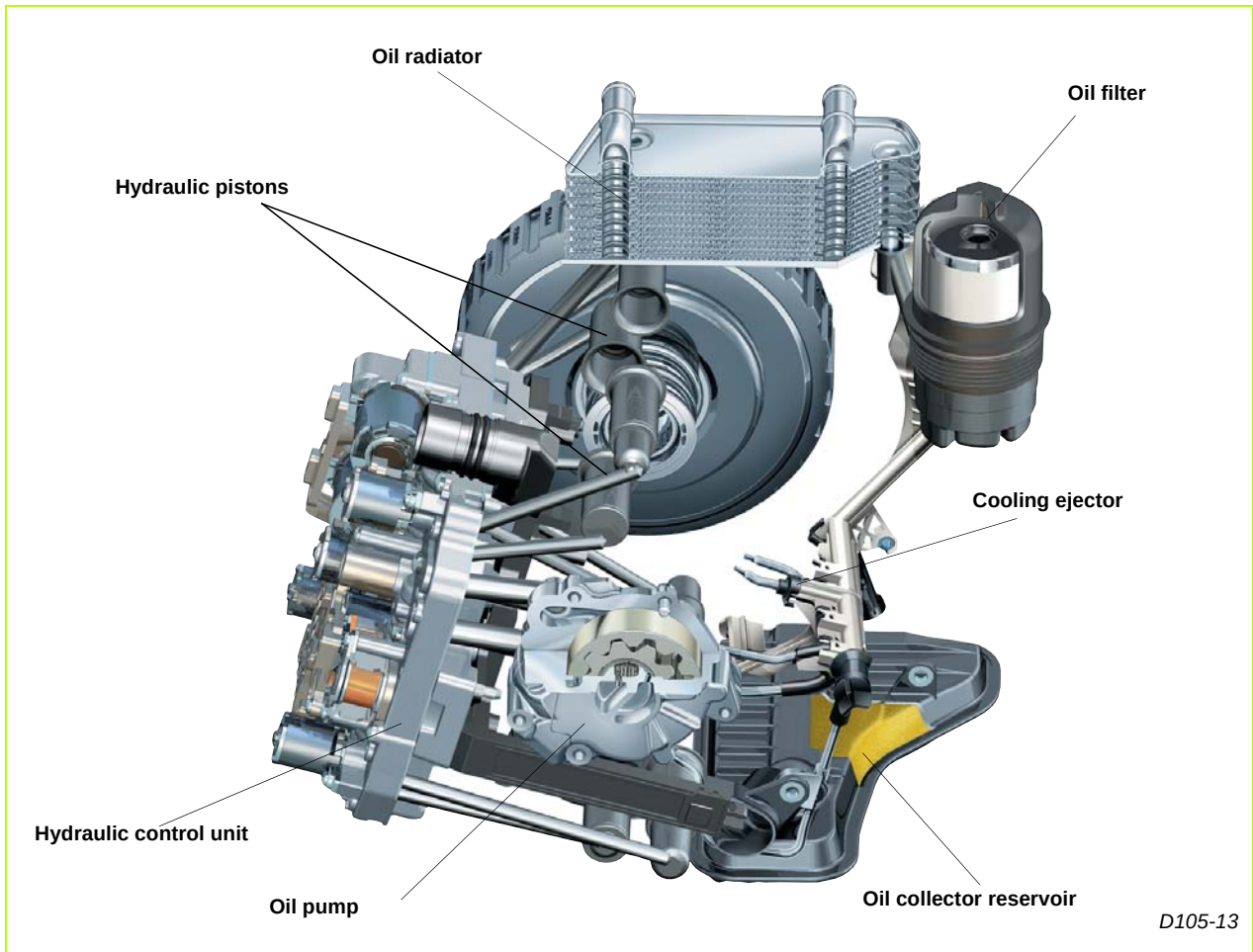


4th gear:
Clutch K2
Primary shaft 2
Secondary shaft 1
Differential

6th gear:
Clutch K2
Primary shaft 2
Secondary shaft 2
Differential

D105-12

HYDRAULIC CIRCUIT



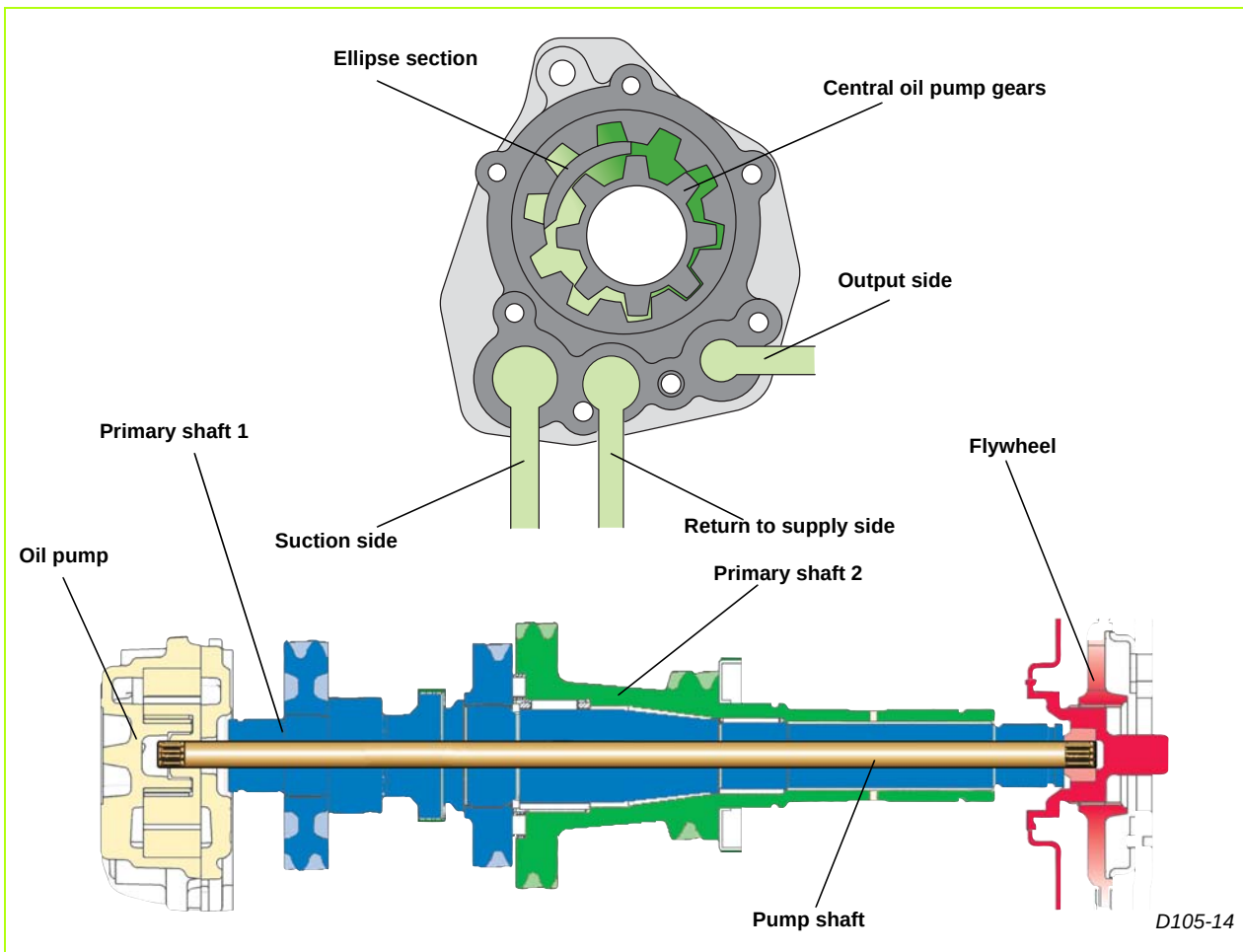
The circuit of the DSG automatic gearbox is common for all gearbox hydraulic functions.

The hydraulic circuit is basically made up of:

- A oil collector unit.
- An oil pump.
- A hydraulic control unit.
- An oil radiator.
- Two multi-disk clutches.
- Eight hydraulic pistons.
- An oil ejector to cool the pistons.
- Oil volume of 7.2 litres for the first filling and 6 litres for any successive replacement.

The oil has the characteristics that it holds its viscosity over the entire working range, it resists high level mechanical loads and does not produce foam.

The functions assigned to this oil are those of operating lubricating and cooling all the internal mechanical components (dual clutch, gears, shafts, bearings, synchros and hydraulic pistons).



OIL PUMP

The oil pump is driven by a shaft connected at one end to the flywheel and at the other end to the central gear of the oil pump. This means that the pump axis will always rotate at engine speed.

This axis is located as a third shaft within the two primary shafts.

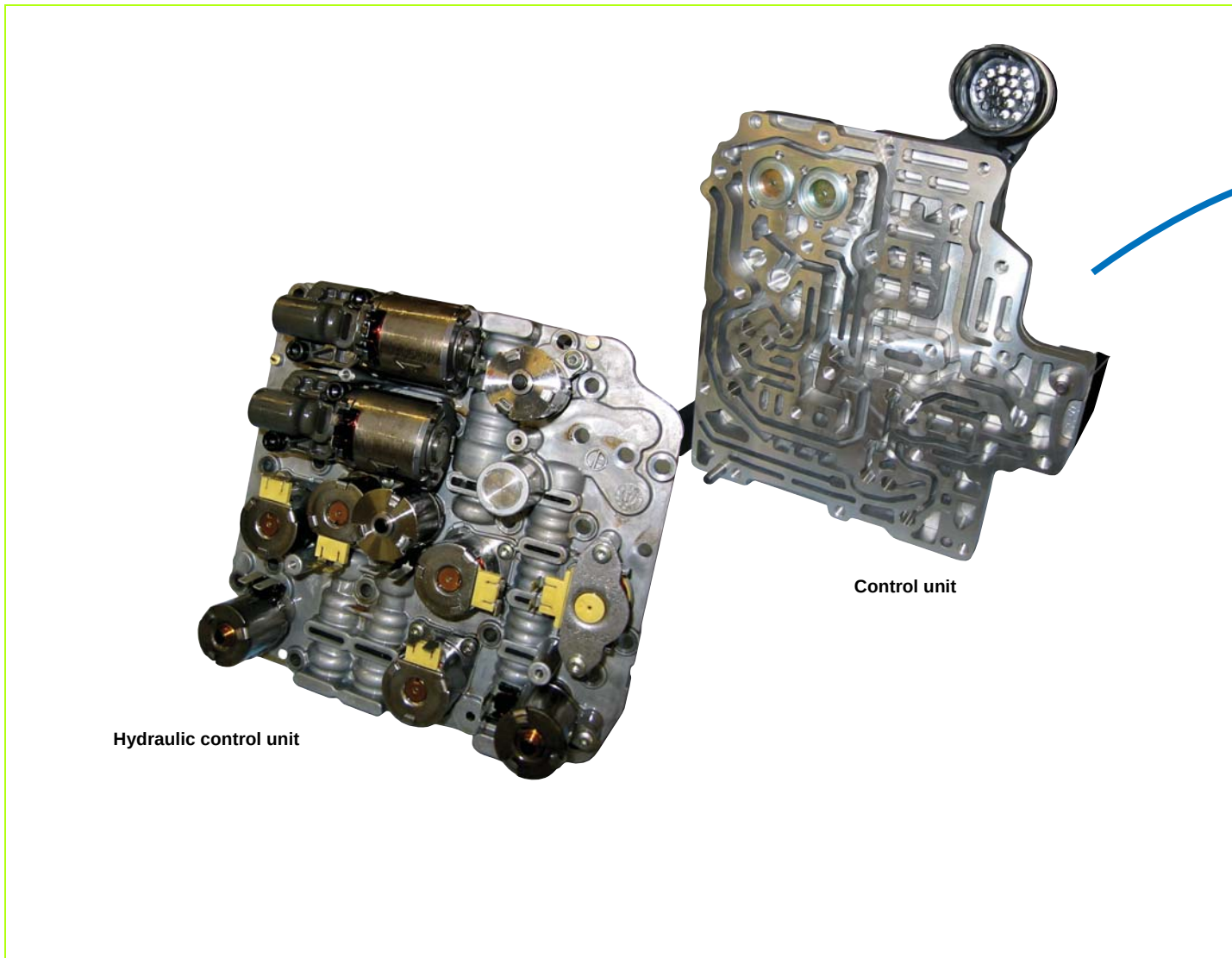
The pump has an annular type layout and it draws in oil and generates the necessary pressure to operate the hydraulic components

even when it is running at idle speed. The pump has a maximum flow of 100 litres per minute at a pressure of 20 bars.

The hydraulic pressure generated by the pump is used to:

- Operate the multi-disk clutches.
- Cool the clutches.
- Operate the hydraulic control unit.
- Lubricate the gears.
- Engage the gears.

HYDRAULIC CIRCUIT



MECHATRONIC UNIT

This unit is composed of three different functional parts which work together, these are:

- Automatic gearbox control unit.
- Hydraulic control unit.
- Printed circuit.

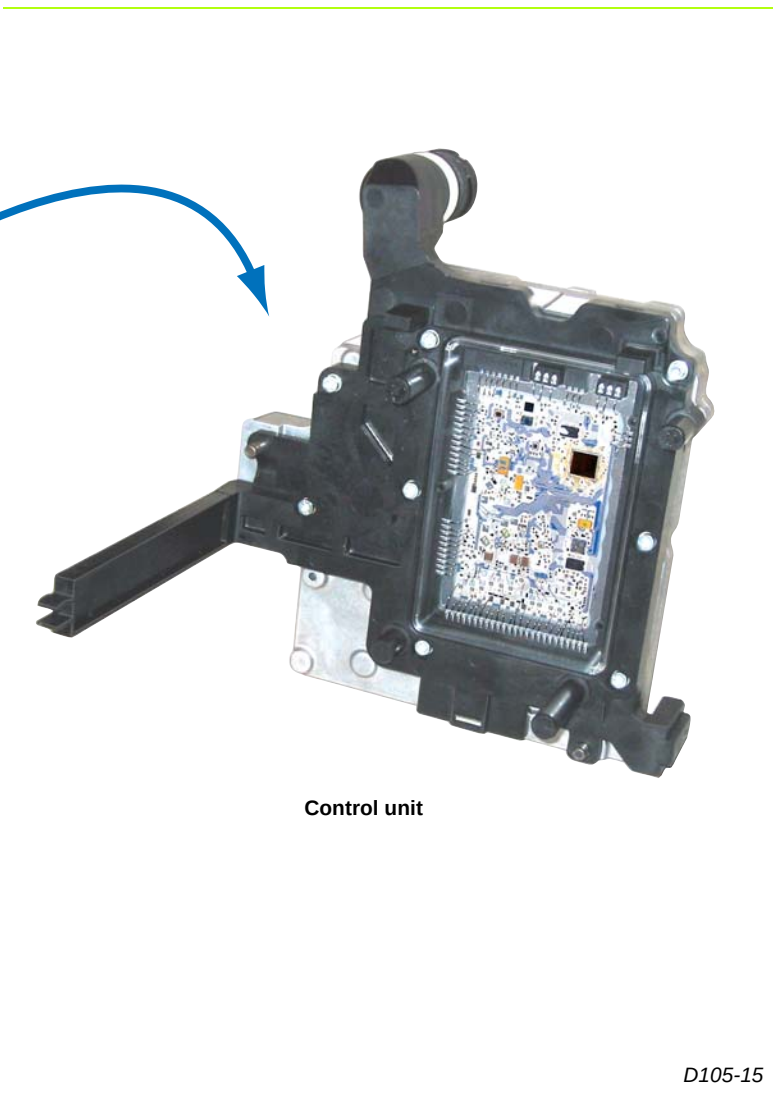
The fact that the mechatronic unit is a compact assembly has many advantages:

- The majority of the sensors are contained in the unit.
- The electrical actuators are contained in the hydraulic control unit.

- The wiring is reduced.
- The connectors required to join the gearbox to the vehicle can be grouped in one central connector.

All these factors offer improved electrical reliability and less weight.

However this also means that the mechatronic unit has to support high thermal (between -40°C and 150°C) and mechanical loads (mechanical oscillations up to 33 times the force of gravity without affecting the ability of the system to operate when driving).



Control unit

D105-15

HYDRAULIC CONTROL UNIT

The objective of this unit is to govern the hydraulic pressure required by the gearbox control unit to perform its functions.

The hydraulic control unit contains both the following electromechanical and hydraulic components required for its operation:

Five electrically energised, 'on/off' switching type solenoid valves known as, 1, 2, 3, 4 and 5 (N88, N89, N90, N91 and N92).

Six electrically energised, modulating type solenoid valves 1, 2, 3, 4, 5, and 6 (N215, N216, N217, N218, N233 and N371).

It also contains a hydraulically operated **discharge valve** to prevent pressure peaks to levels that could damage the system, and **five spool valves** operated by the pressure controlling the electrical valves.

- Main pressure spool valve (controlled by N217)

- Oil operating valve for clutch cooling (controlled by N218).

- Safety valve for harness 1 (controlled by N233).

- Safety valve for harness 2 (controlled by N371).

- Multiplex (controlled by N92).

The spool valves control the pressure in the clutches, the clutch cooling and the gear changes.

The hydraulic control unit also incorporates other essential components in a hydraulic circuit such as: pressure accumulators, retention valves or hydraulic dampers.

AUTOMATIC GEARBOX CONTROL UNIT

The control unit incorporates the electronic management and 12 sensors detailed as follows:

- 8 hall sensors.
- 2 pressure sensors.
- 2 temperature sensors.

The control unit decides on the functions it needs to apply at any point in time based on the signals coming from the internal sensors, the external sensors and other data from other systems. The functions are selected by energising the corresponding actuators.

PRINTED CIRCUIT PLATE

This has the task of grouping the entire gearbox control and electrical activation conductors in one single unit.

HYDRAULIC CIRCUIT

DESCRIPTION OF THE HYDRAULIC CIRCUIT

The pump draws oil from the pump through the suction filter and delivers it to the **main pressure port valve**, which regulates the working pressure in the hydraulic circuit of the automatic gearbox and is operated by the pressure regulator valve 3.

A discharge valve ensures that the circuit pressure does not exceed the operating threshold.

The circuit pressure depends on the position of the main pressure port valve.

Maximum system pressure is developed when the valve is closed. When the valve is opened, part of the pump output returns through a channel on the pump suction side or through a second channel which divides into two.

- One passage feeds the **ejectors used to cool** the gears, passing previously through the **external oil filter** and the **oil radiator** which is a part of the engine cooling circuit.

- The other passes to the **main pressure port valve** which is operated by the pressure regulator 4 and is used **to cool the clutches**.

The following valves are fitted to the working pressure circuit:

- Multiplexer.
- Circuit 1 safety valve.
- Circuit 2 safety valve.

The **discharge valve** limits the maximum circuit pressure and will always open when this pressure exceeds 32 bars.

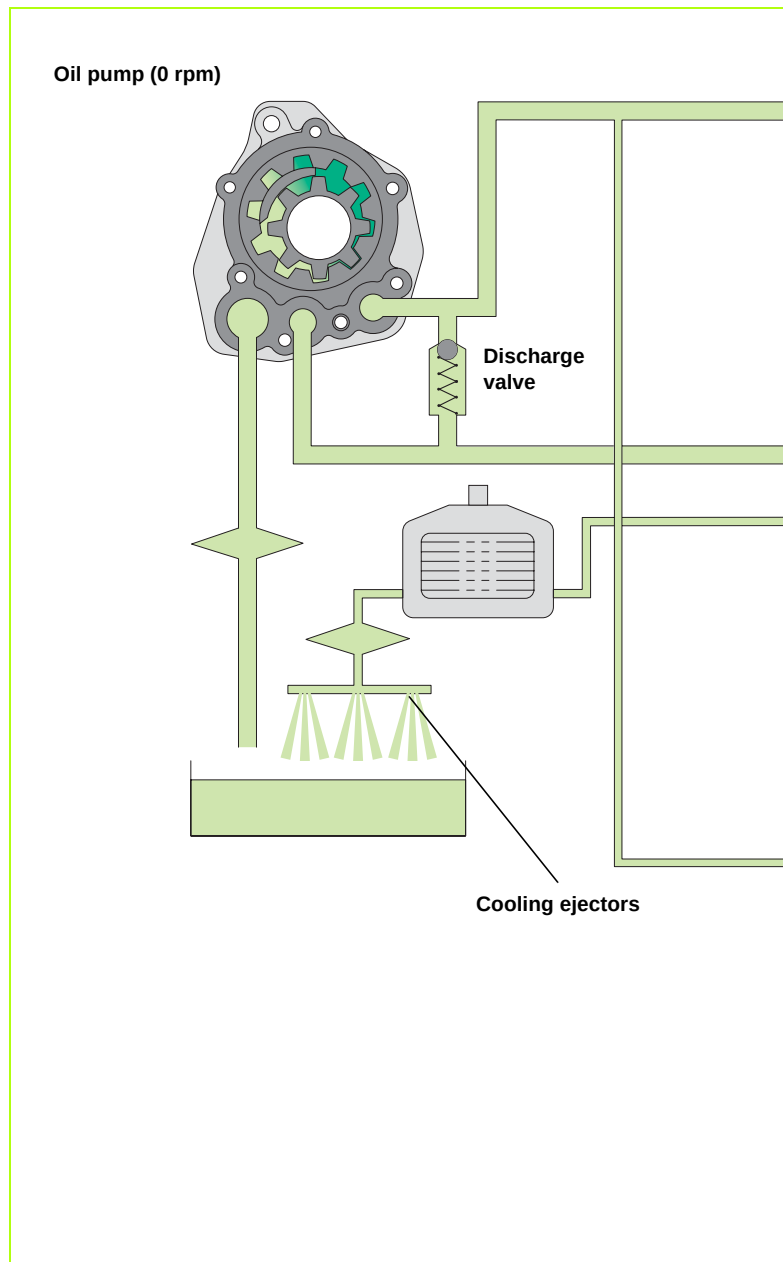
The **multiplexer** consists of a dual position spool valve, which provides a duplication of the gear change functions assumed by the valves 1 and 4. The multiplexer position is determined by the valve 5, N92.

In the at-rest position, the multiplexer is pressed into its **base position** by a spring and the gears **1, 3, 6** and **R** can be selected.

If the valve 5 is energised, the oil pressure passes to the operating channel of the multiplexer and this is forced against the spring pressure into its **working position**.

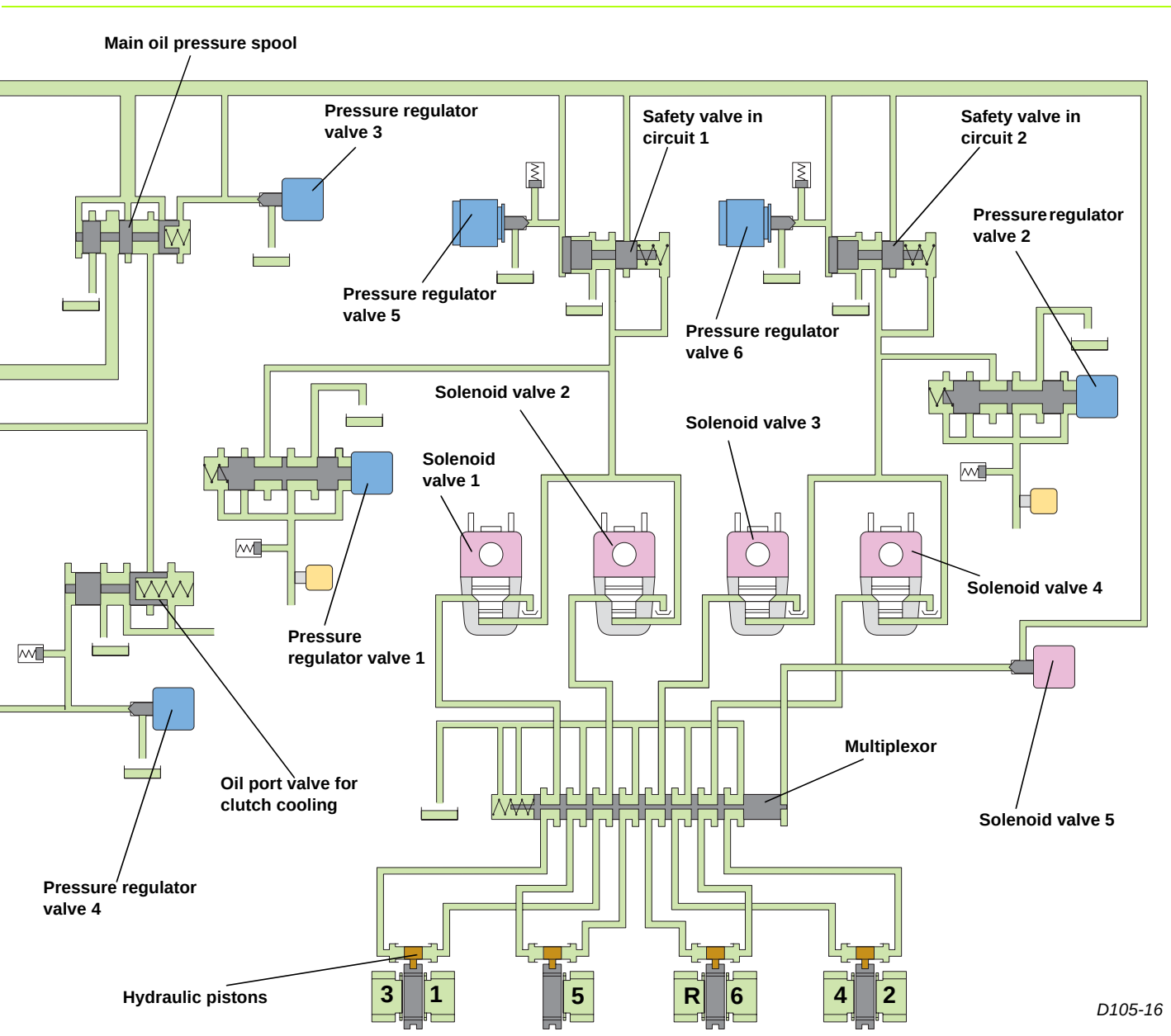
This position allows the gears **2, 4** and **5** to be selected.

The **safety valve** retinas the pressure in each of the hydraulic circuits.



The **circuit 1 safety valve** is operated by the pressure regulator valve and adjusts the hydraulic pressure reaching:

- The solenoid 1, for the 1st and 5th gear.
- The solenoid 2 which also participates in the 3rd gear operation.
- The pressure regulator valve 1 for the automatic gearbox regulates the external multi-disk clutch K1.



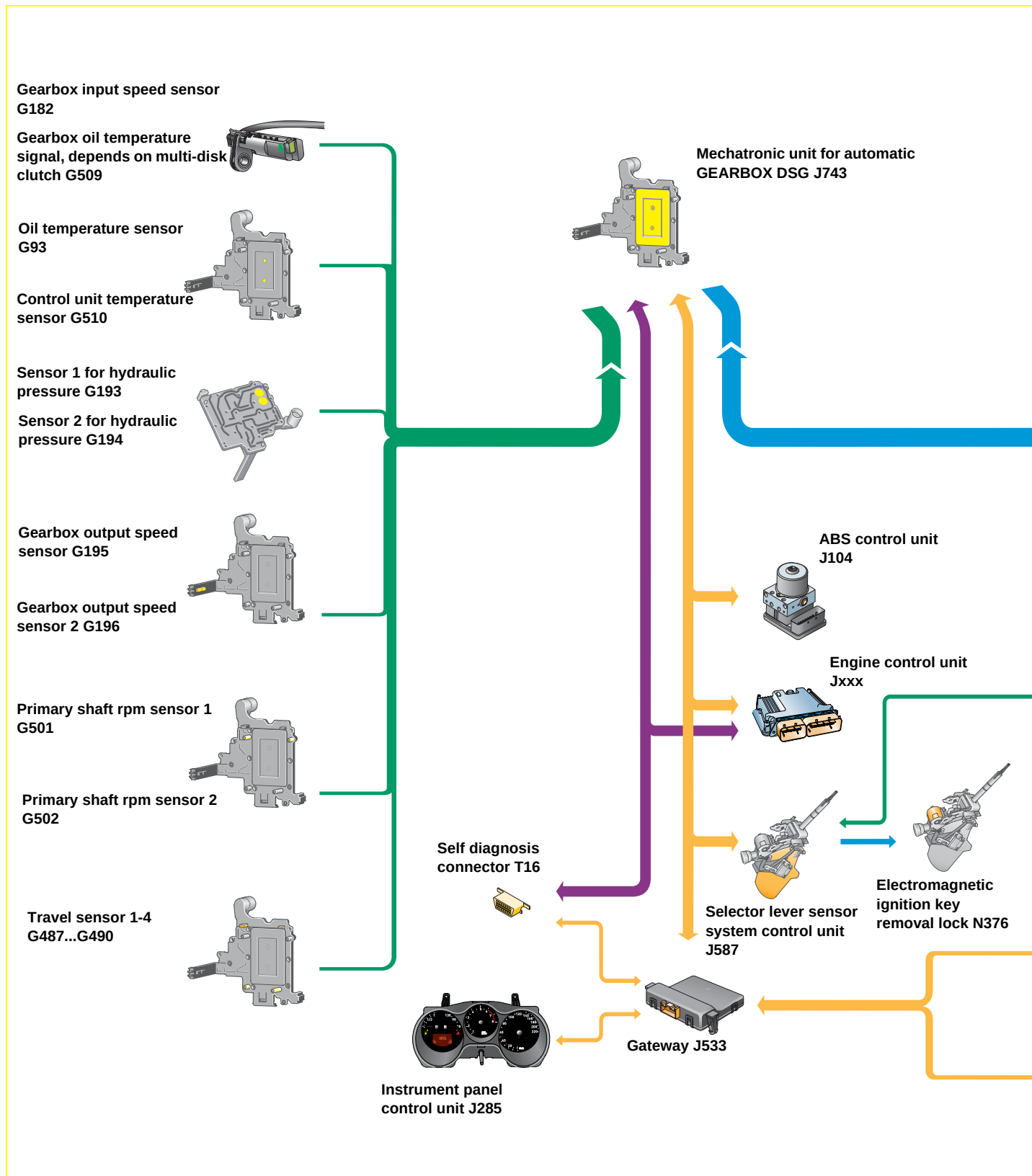
The **safety valve of circuit 2** is operated by pressure regulator valve 6, and thus the hydraulic pressure reaching the following components can be controlled:

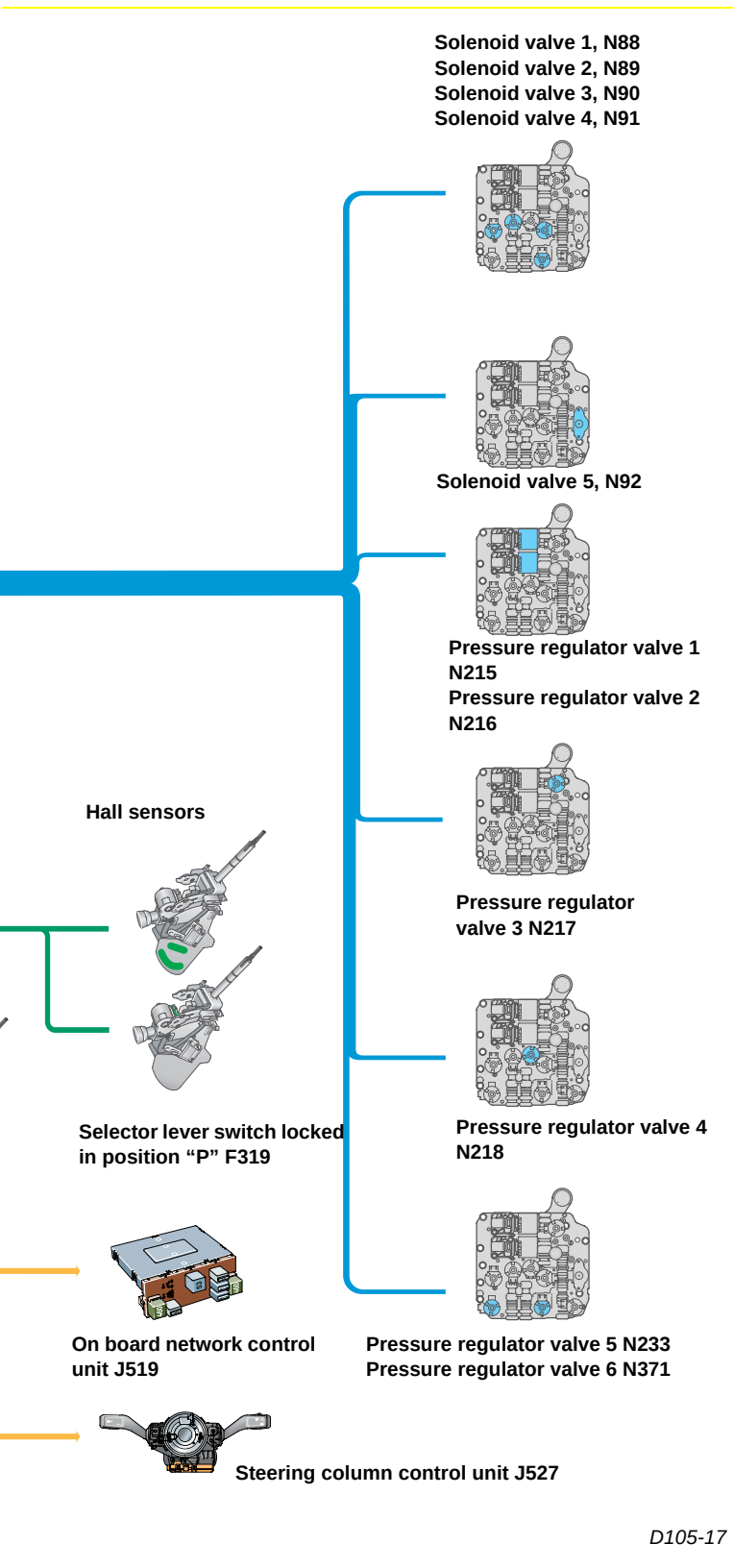
- The solenoid 3 which takes part in the 2nd and 6th gear.
- The solenoid 4 which takes part in the 4th and reverse gear.

– The pressure regulator valve 2 for the automatic gearbox which regulates the external multi-disk clutch K2.

The gear selector forks are activated when pressure reaches any of the hydraulic pistons. This pressure will be controlled by the solenoids 1 and 5.

SYNOPTIC CHART





FUNCTIONS ASSUMED BY THE MECHATRONIC UNIT

The electronic control of the DSG automatic gearbox assumes the functions related to:

HYDRAULIC PRESSURE MANAGEMENT

This function is used to regulate the pressure in the circuit and adapt it to the instantaneous needs of the gearbox.

CLUTCH MANAGEMENT

This group covers those functions related to the control of the clutches:

- Hydraulic operation of the multi-disk clutches.
- Auto-adaptation of the dual clutch.
- Adjustment of the micro slippage.
- Cooling of the dual clutch.
- Downhill retention.
- Safety disconnection of the dual clutch.
- Protection against overloads.

CHANGE PROGRAMS

The control unit has several change programs based on the pre-selection chosen by the driver.

GEAR CHANGE AND ENGAGEMENT

The selection, engagement and gear disengagement is performed by a combination of complex electronic and hydraulic circuit operations.

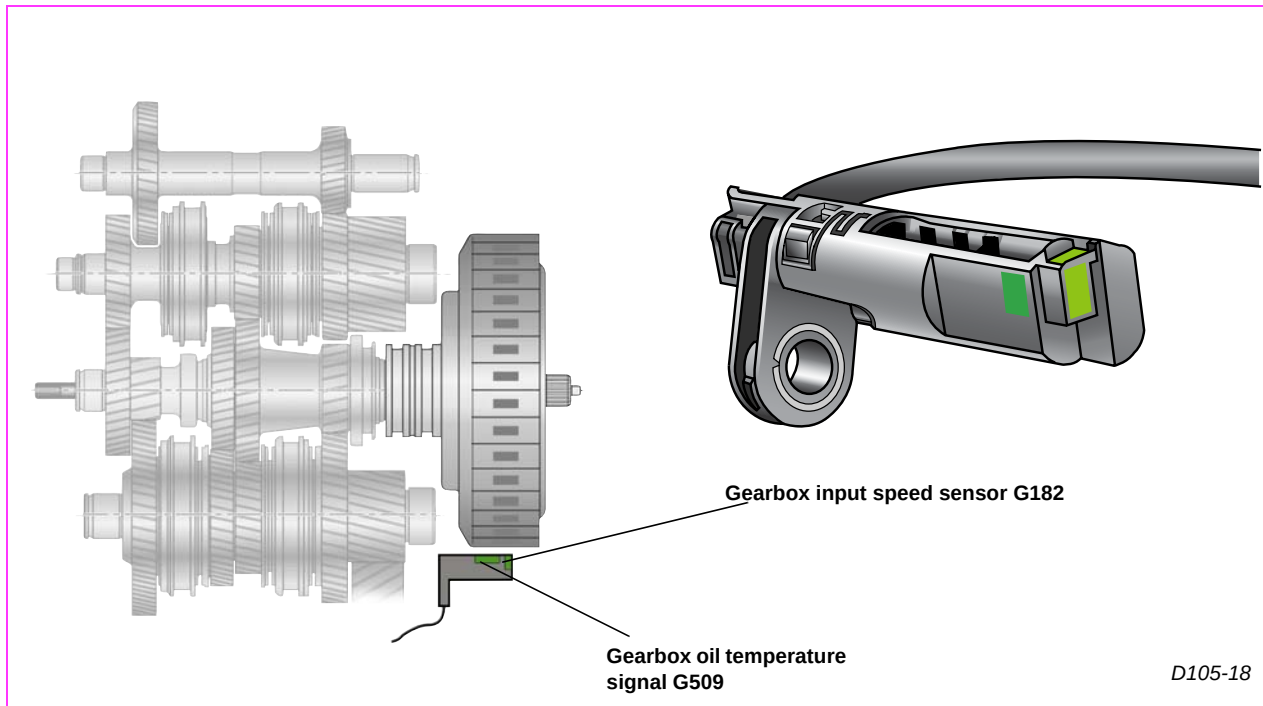
EMERGENCY MODE

The control unit will activate this function as a result of certain gearbox failures to prevent the immobilisation of the vehicle.

DIAGNOSIS

A complete diagnosis program allows verification and diagnosis of all the components which take part in the DSG automatic gearbox operation.

SENSORS



GEARBOX INPUT SPEED SENSOR G182

This is an integral part of the gearbox oil temperature sensor G509

It is a sensor which works according to the **hall principle** taking its signal from the hollows in the external part of the dual clutch casing.

SIGNAL APPLICATION

The gearbox control unit uses this information to determine the gearbox **input speed**, which is equal to that of the engine and thus enable it to calculate the multi-disk clutch slippage.

REPLACEMENT FUNCTION

If this signal is missing, the mechatronic unit will use the **engine rpm** signal which it obtains from the drive CAN-Bus.

DUAL CLUTCH TEMPERATURE SENSOR G509

The sensor G509 is located in the same casing as the input speed sensor G182.

It measures the **oil temperature** at the exit of the multi-disk clutches. A high oil clutch temperature indicates that the clutches were submitted to high thermal loads.

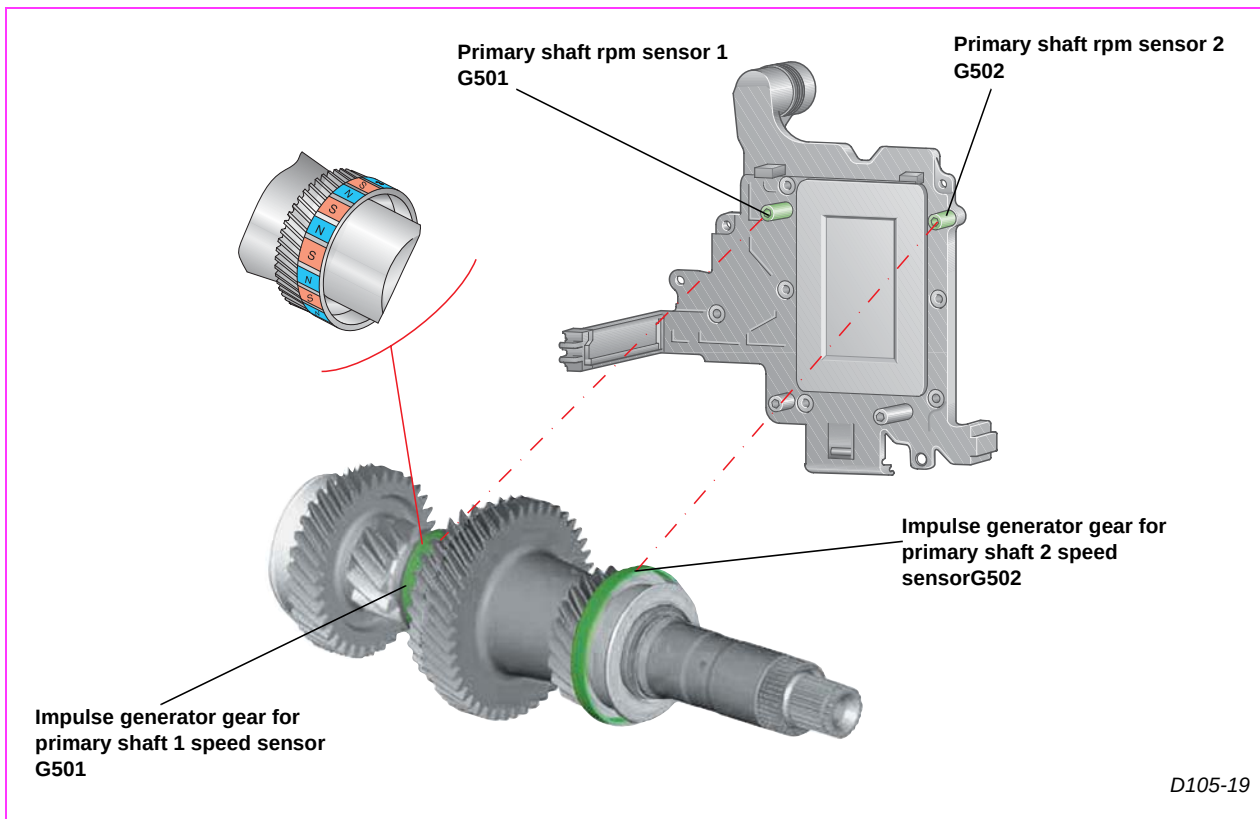
The sensor has been designed to enable it rapidly and precisely measure temperatures between -55°C and $+180^{\circ}\text{C}$.

SIGNAL APPLICATION

The gearbox control unit uses the oil temperature signal to adjust the oil flow needed to **cool** the **clutch** disks.

REPLACEMENT FUNCTION

If this signal is missing, the control unit will rely on the signal from the gearbox oil sensor G93 and the oil temperature sensor G510, using these as supplementary signals.



D105-19

PRIMARY SHAFTS 1 AND 2 SPEED SENSORS, G501 AND G502

Both sensors are located in the interior of the mechatronic unit.

The speed sensor **G501** detects the speed of the **primary shaft 1** and the speed sensor **G502** detects the speed of the **primary shaft 2**.

Their operation is based on the **hall principle**, and each sensor takes its reading from an impulse generator gear located on the corresponding shaft.

Each generator gear is composed of a metal plate and a section containing a metal rubber layer which contains small magnets inserted in its external perimeter, each with their corresponding north south poles.

There is a small space between each magnet.

SIGNAL APPLICATION

Each signal is used to determine the **speed** of each **primary shaft** and thus calculate the slippage of the multi-disk clutch on the corresponding primary shaft.

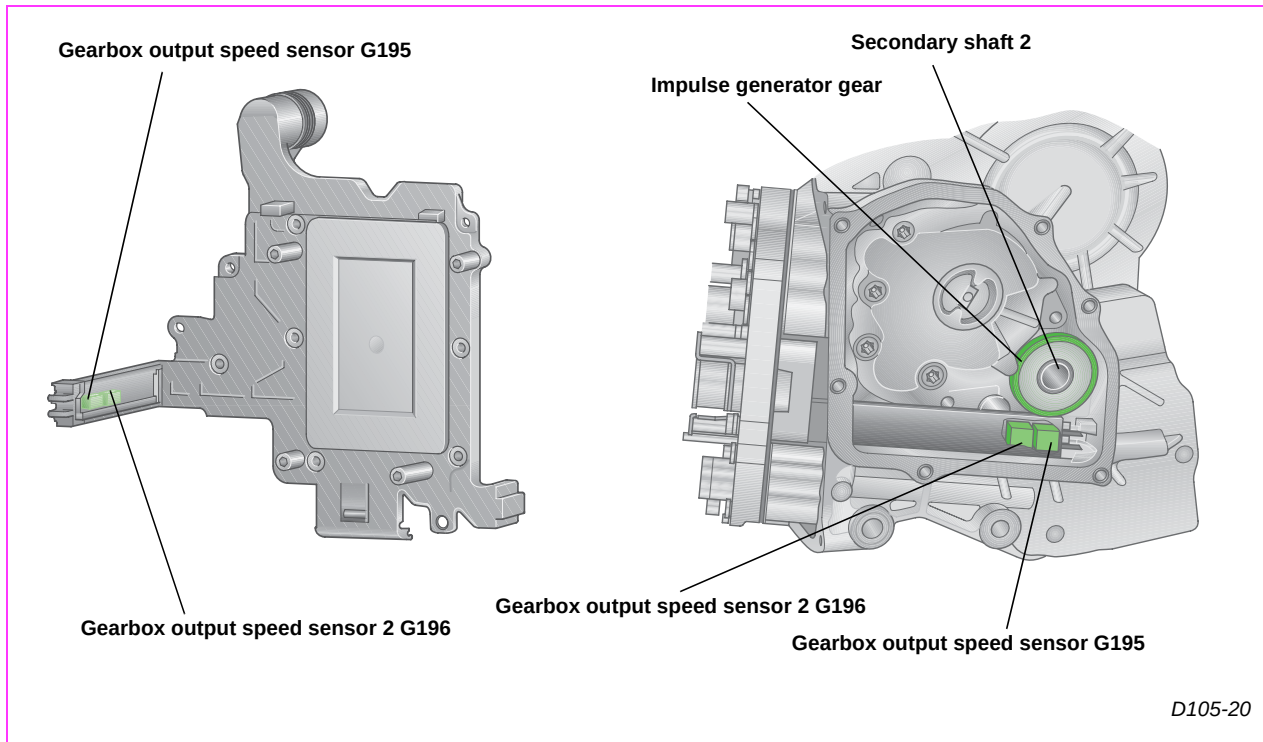
The signal from the sensor **G501** is used to determine the slippage of the external multi-disk clutch **K1** and the sensor **G502** for the internal multi-disk clutch **K2**.

REPLACEMENT FUNCTION

The lack of any of these signals implies the deactivation of the corresponding circuit.

Also if the sensor **G501** is faulty, it will only be possible to select the **2nd gear**. If the fault is in the sensor **G502**, it will only be possible to use the **1st** and **3rd** gears.

SENSORS



GEARBOX OUTPUT SPEED SENSOR 1 AND 2, G195 AND G196

These operate according to the **hall principle** and are located inside the control unit close to each other.

Both sensors pick up their signal from the same impulse gear on the secondary shaft 2.

The signal picked up by both sensors are similar except for a slight delay between both. When the signal from the sensor G195 adopts a dominant "high" value, the signal from the sensor G196 will still have a recessive "low" value.

SIGNAL APPLICATION

The control unit uses these signals to determine the vehicle **speed** and **direction of travel**.

The direction of travel of the vehicle is determined due to the delay between both signals. If the direction of travel is changed, the signals will be received in the reverse order by the control unit.

REPLACEMENT FUNCTION

If these signals are missing, the control unit will use the signals for **vehicle speed** and direction of travel from the **ABS** control unit.

SENSOR 1 AND 2 FOR HYDRAULIC PRESSURE G193 AND G194

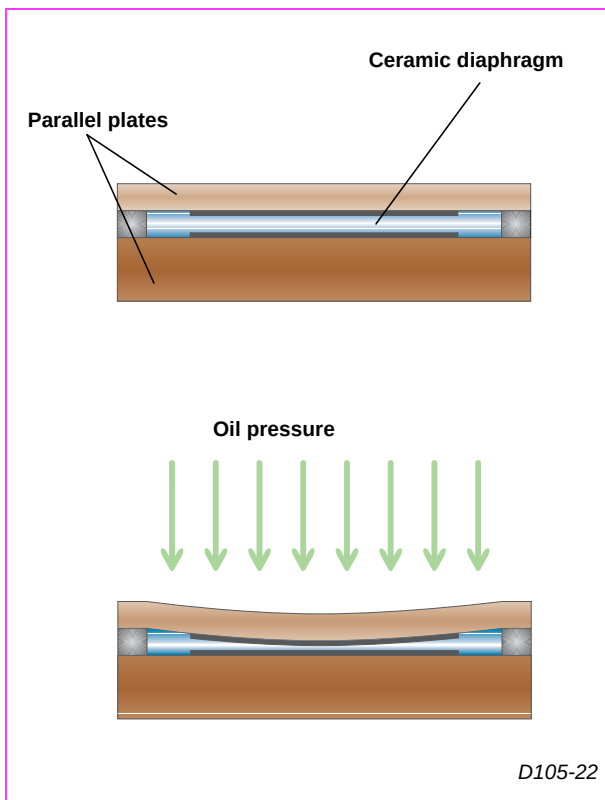
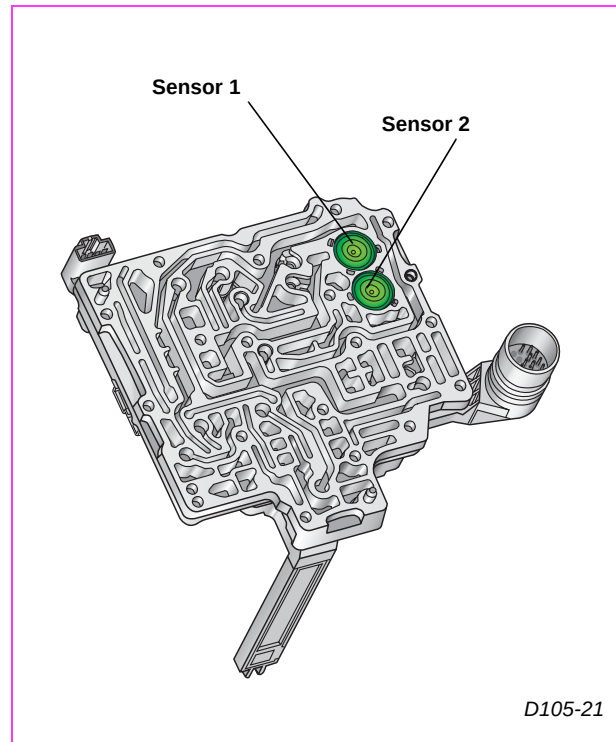
Both pressure sensors are located inside the gearbox control unit and operate in the same manner.

The **sensor 1** G193 measures the pressure acting on the **external multi-disk** clutch K1 and the **sensor 2** G194 measures the pressure in the **internal multi-disk** clutch K2.

The pressure sensor is composed of two parallel plates which conduct electrical current.

A **ceramic diaphragm** is attached to one of the plates and this is in contact with the pressure in the circuit and bends according to the pressure level applied to the diaphragm.

When the pressure increases the movement of the diaphragm varies the distance between the plates generating a reliable signal based on a precise relation to the pressure level.



SIGNAL APPLICATION

The signal from these sensors is used by the control unit to precisely determine the level of hydraulic **pressure** acting on the multi-disk **clutches**.

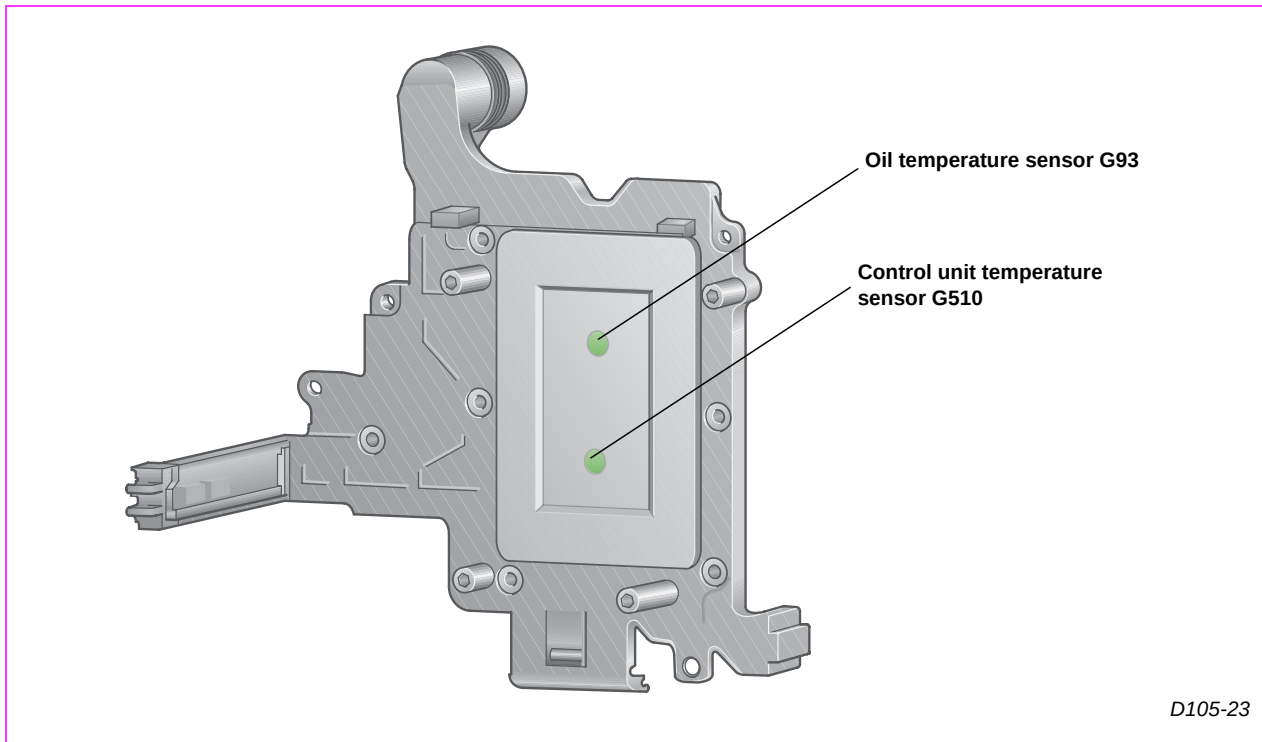
This method allows a precise control of the contact pressure between the multi-disk clutch plates.

REPLACEMENT FUNCTION

If this pressure signal is missing or no pressure is generated, the control unit will deactivate the corresponding gearbox hydraulic circuit.

The gearbox can only be used in **1st** and **3rd** gear or **2nd** gear depending on the circuit which has been affected.

SENSORS



GEARBOX OIL TEMPERATURE SENSOR G93 AND CONTROL UNIT TEMPERATURE SENSOR G510

These are located in the control unit and are permanently immersed in oil. They constantly **measure** the oil **temperature**.

This allows the different measures for oil temperature reduction to be applied at the required time and thus avoid overheating of the mechatronic unit.

A considerable increase in temperature could damage the control unit electronics.

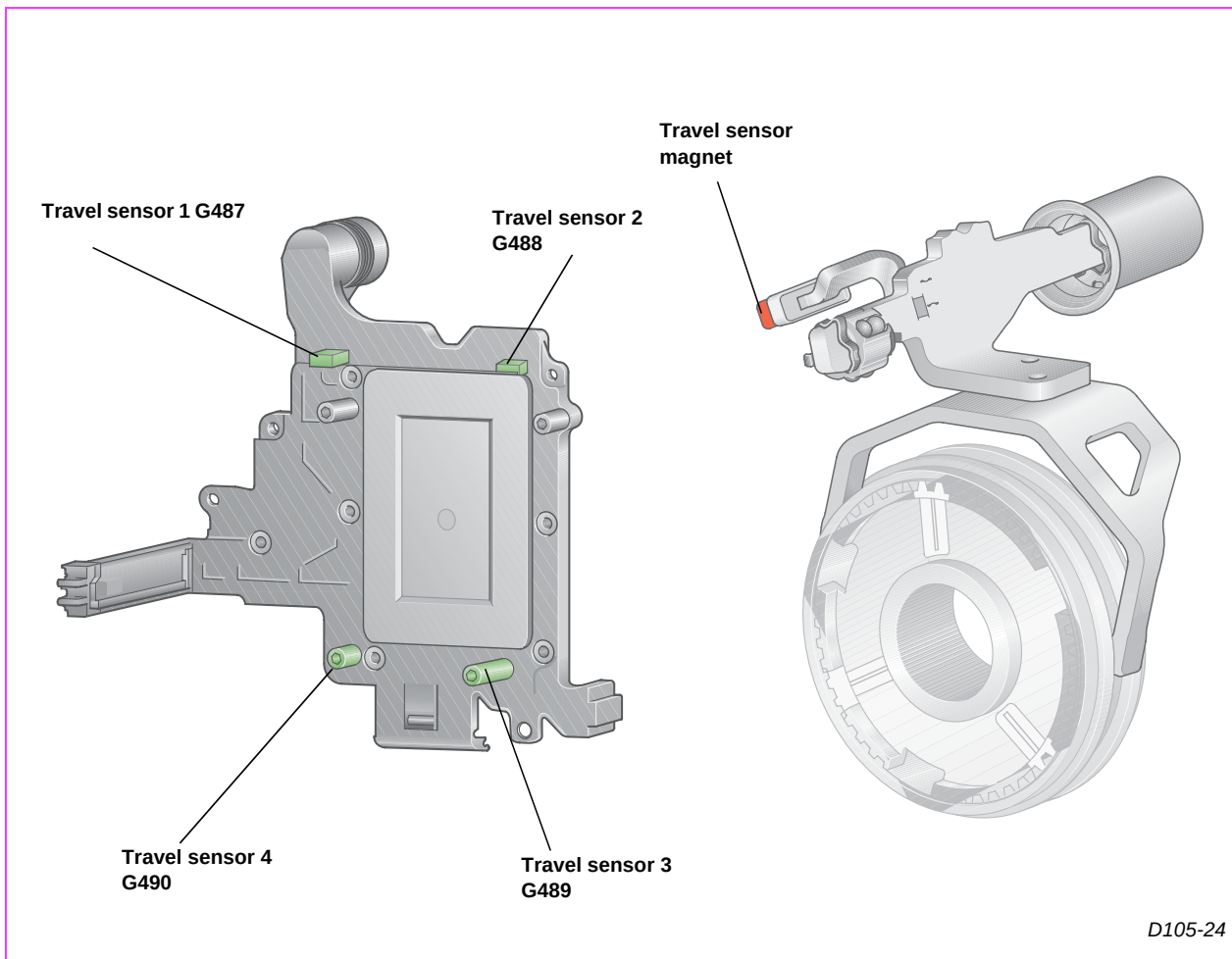
SIGNAL APPLICATION

The signals from both sensors are used to check the mechatronic unit temperature.

REPLACEMENT FUNCTION

If the gearbox oil temperature reaches values between 138°C and 145°C, the control unit will reduce the torque supplied by the engine.

If this increases to more than 145 °C, the hydraulic pressure will be released to allow the clutches to open.



TRAVEL SENSOR 1, 2, 3 AND 4; G487, G488, G489 AND G490

There are four of these **hall type sensors** located in the control unit.

Each sensor is located in front of one of the magnets on each selector fork.

Concretely:

- G487 for 1st and 3rd gears,
- G488 for 2nd and 4th gears,
- G489 for 5th gear,
- G490 for 6th and reverse gears.

SIGNAL APPLICATION

The result is a combination of signals which the control unit to detect the **position of each**

fork, thus determining the position of each gearbox actuator and also the gear selection speed.

This information also allows the control unit to apply oil pressure to the actuators for the selection of the corresponding gear.

REPLACEMENT FUNCTION

If a travel sensor signal is lost, the control unit will deactivate the affected gearbox circuit. In this case it will not be possible to select the corresponding gears.

SENSORS

SELECTOR LEVER SENSOR SYSTEM CONTROL UNIT J587

These are located within the selector lever assembly mechanism and are composed of **16 hall sensors, 3 magnets** and **electronic controls**.

The hall sensors are aligned in three rows, with 6, 7 and 3 sensors respectively. Each magnet moves together with the selector lever over each row.

The rows six and seven generate a cross check signal to determine selector lever position with precision and thus offer maximum reliability.

The row with three hall sensors is used to detect the position of the selector lever in tiptronic mode.

The selector lever can occupy the following positions:

“P” (Parking): The vehicle remains mechanically immobilised; to move the lever, the ignition needs to be on and the brake pedal pressed. Also the release button has to be pressed.

“R” (Reverse gear): To select the reverse gear, the release button has to be pressed.

“N” (Neutral): The transmission will be in the neutral position. If the lever is left in this position for more than 2 seconds, the brake pedal will need to be pressed again to move it.

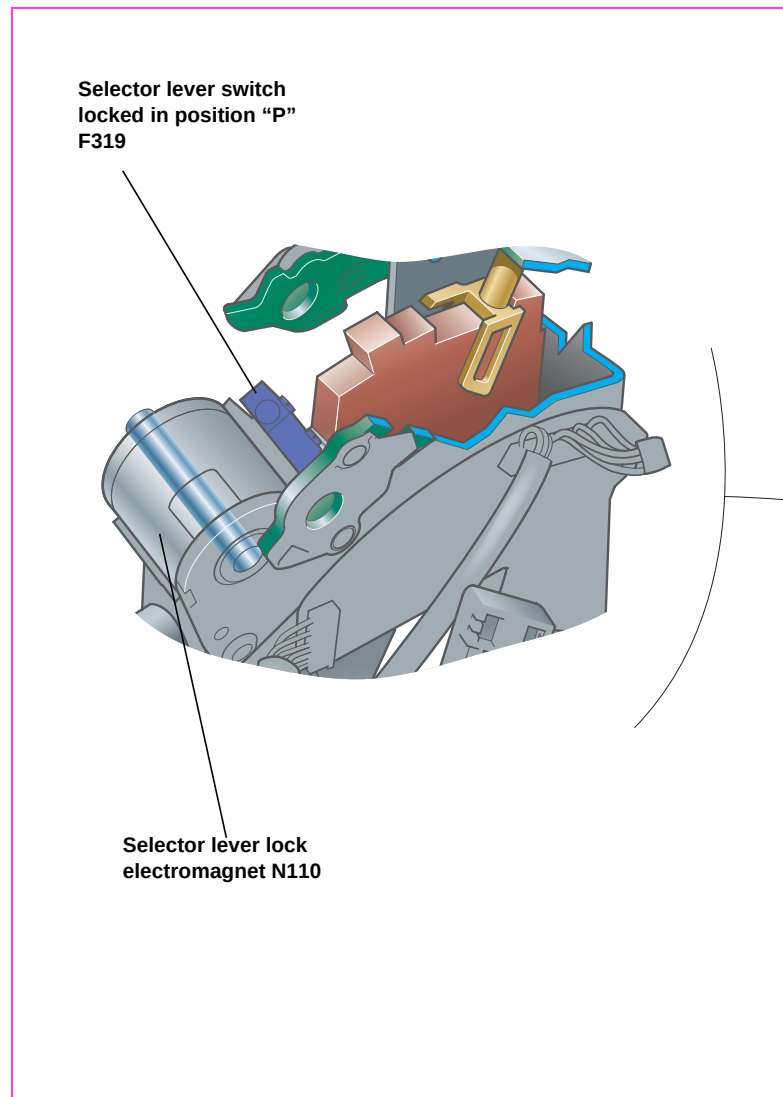
“D” (Drive position): The forward gears will change automatically.

“S” (Sporty driving): The automatic gear change will take place according to a characteristic map for sporty driving programmed into the control unit.

“+ / -” (Tiptronic): To select the Tiptronic gate, the lever needs to be moved to the right from the “D” position. The driver will then need to move the lever to change gears.

SIGNAL APPLICATION

The electronics will **recognise** the signal from each hall sensor and thus be able to determine the **lever position**. This control unit will convert



this information into **CAN-Bus** messages and pass them to the **drive CAN-Bus**.

This information is used by the:

- Mechatronic unit for the automatic gearbox J743.

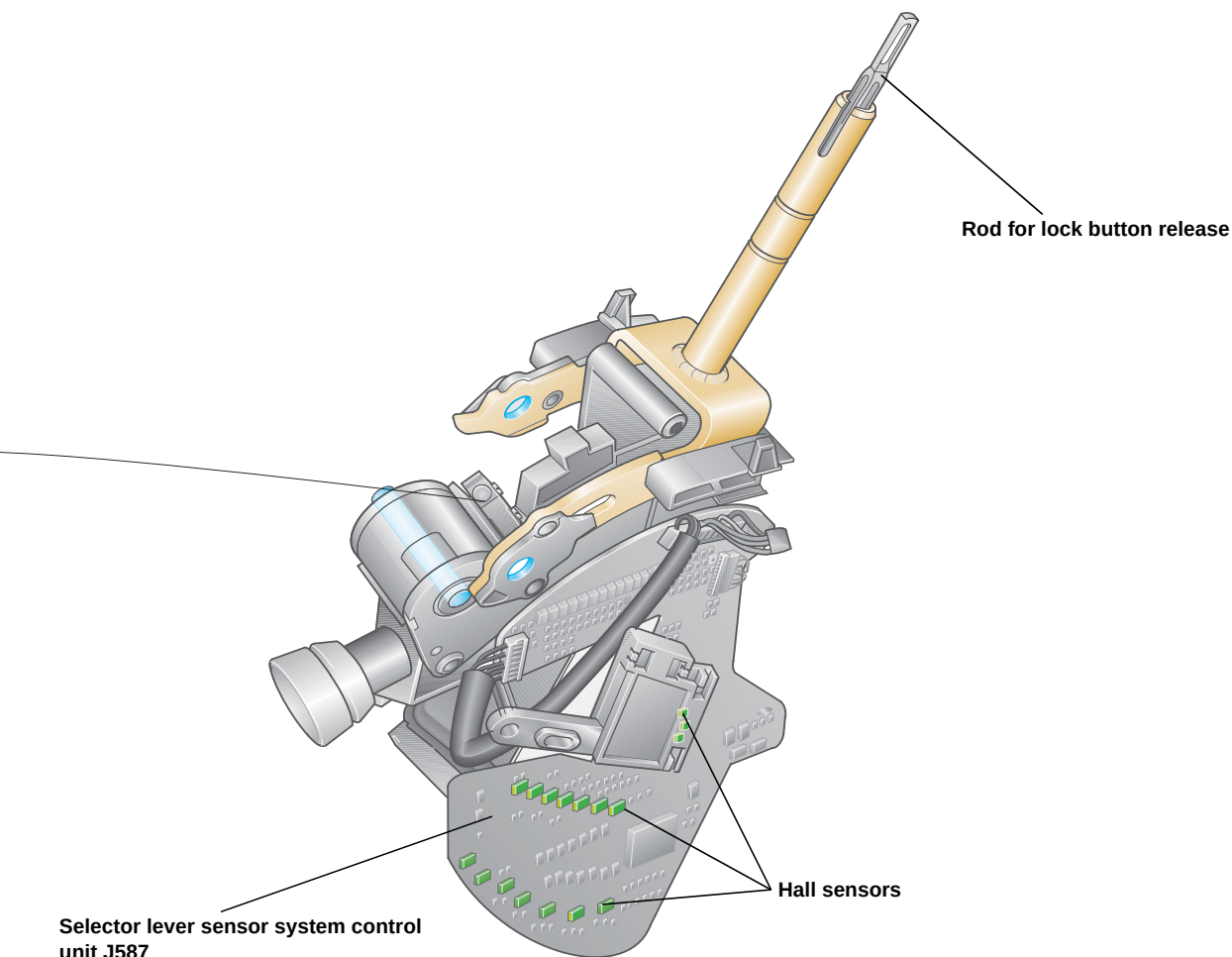
- Instrument panel J285.

- Engine control unit Jxxx.

The control unit will manage the **illumination of the selector lever gate**.

REPLACEMENT FUNCTION

In case of failure of the sensor control unit, the gearbox control unit will not recognise the



D105-25

position of the selector lever and will therefore not be able to change gears.

SELECTOR LEVER SWITCH LOCKED IN POSITION "P" F319

This switch is located in the lever assembly and is normally open when the lever is in position "P".

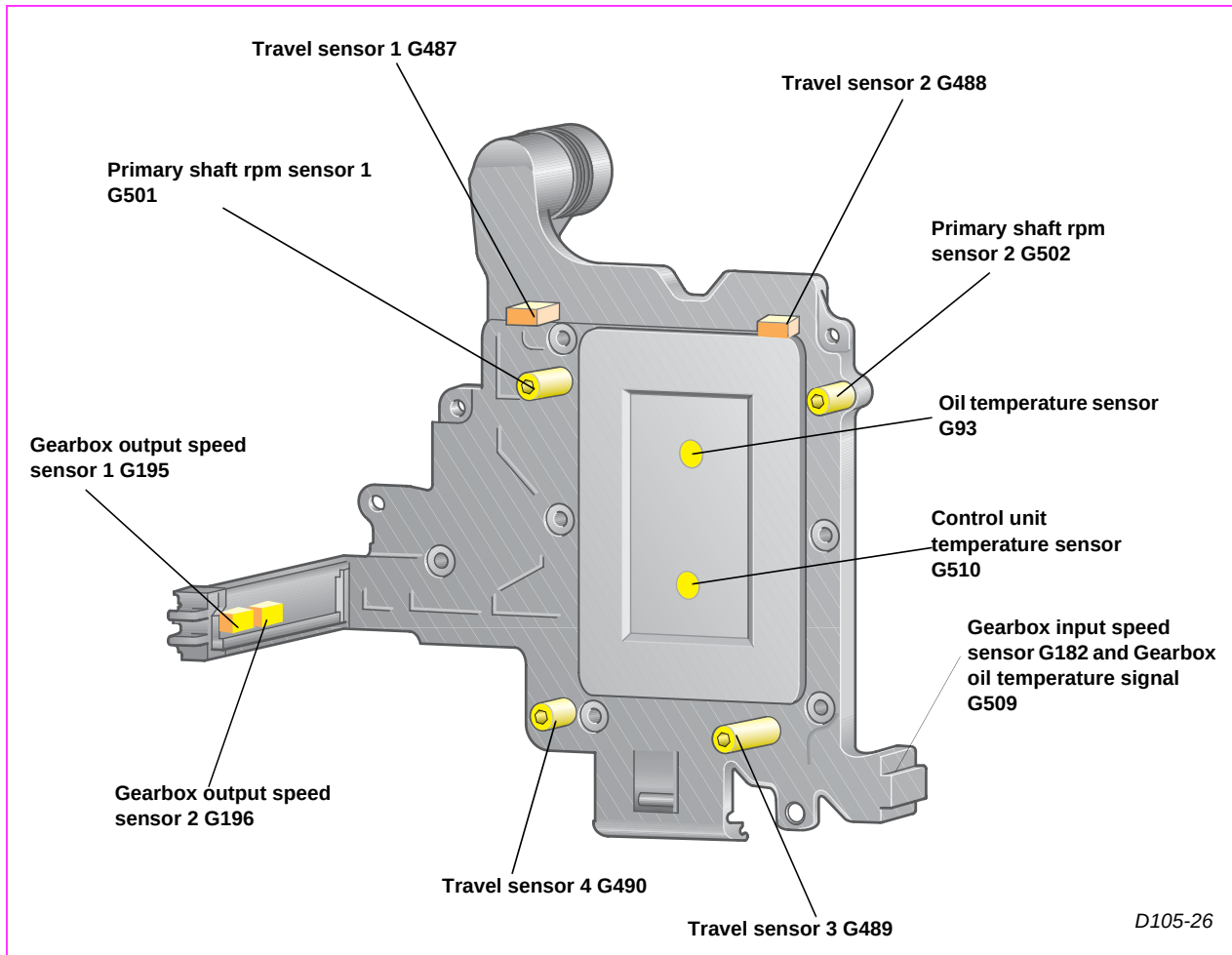
SIGNAL APPLICATION

The control unit signal is used by the steering column control unit J527 to allow the **removal of the key** whenever the lever is in position "P".

REPLACEMENT FUNCTION

If the switch remains permanently closed, the key can be removed if it is rotated slowly.

SENSORS



DSG MECHATRONIC UNIT J743

It is composed of the automatic gearbox control unit and the hydraulic control unit making up the **mechatronic** unit.

The integration of the control unit in the gearbox means higher thermal and mechanical loads with temperature oscillating between -40°C and 145°C and mechanical oscillations up to 33 times greater than gravity; all this has to take place without affecting the normal operation of the gearbox. The electronic unit is shielded from the surrounding oil by plastic casing and a protective gel.

The control unit is **fitted** with **12** internal **sensors**:

- Eight hall type sensors.
- Two hydraulic pressure measurement sensors.

- Two temperature sensors.

The control unit analyses the signals from the sensors and from other control units related to the gearbox to energise the actuators and correctly manage the **functions** related to:

- Hydraulic circuit pressure.
- Multi-disk clutches.
- Gear change programmes.
- Emergency mode.
- Diagnosis.

ACTUATORS

PRESSURE REGULATOR VALVE 3 N217

This is located in the mechatronic electro-hydraulic control unit.

It is designed as a **modulating valve**, closed in the at-rest position without current; meaning that it can adopt intermediate positions between totally opened and totally closed.

This is energised directly by the gearbox control unit.

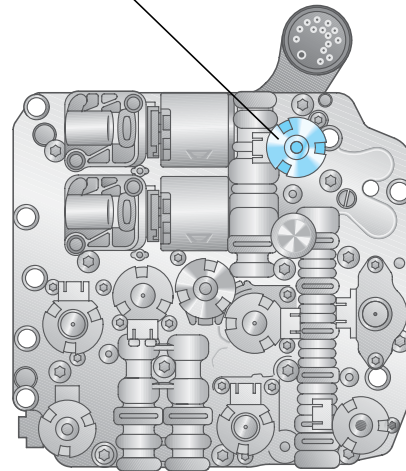
This valve regulates the **operating** pressure of the **main pressure regulator valve** and thus controls the working pressure in the gearbox hydraulic circuit.

REPLACEMENT FUNCTION

If there is a fault in the valve N217, it will remain closed when the oil pump generates pressure and as a result the main spool valve also, therefore the **working pressure** in the hydraulic circuit will reach its **maximum value**.

This could lead to an increase in fuel consumption and also to gearbox noises when changing gears.

Pressure regulator
valve 3 N217



D105-27

PRESSURE REGULATOR VALVE 4 N218

This is located in the electro-hydraulic control unit.

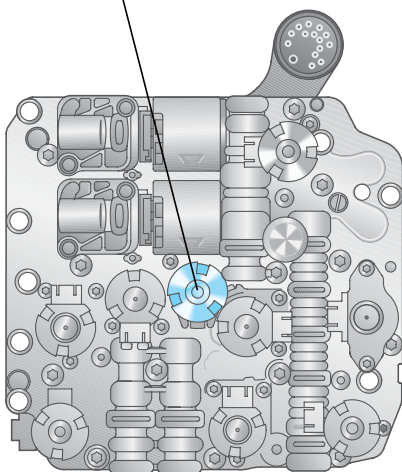
It is a **modulating valve** which remains closed when there is no electrical current, **controlling** the hydraulic pressure which activates the **main oil port valve to cool the clutches**.

REPLACEMENT FUNCTION

A fault in the pressure regulator valve 4 means that it will remain completely closed as will the main port valve, and in this position the **maximum** amount of **cooling** oil will flow through the multi-disk clutches.

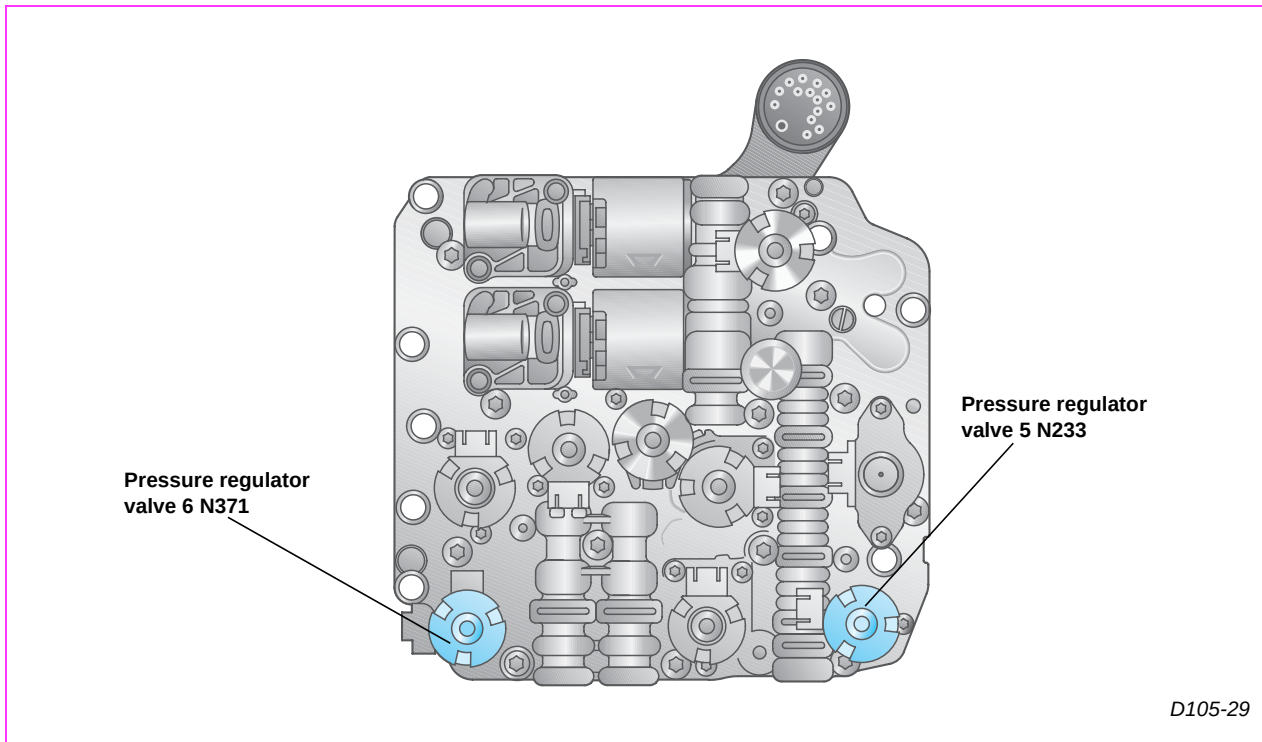
Note: At low ambient temperatures, this could lead to gear change problems and an increase in fuel consumption.

Pressure regulator
valve 4 N218



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ACTUATORS



D105-29

PRESSURE REGULATOR VALVE 5 AND 6, N233 AND N371

This is located inside the hydraulic control unit of the mechatronic unit. They are energised directly by the control unit and act as **modulating valves**.

Their function is to cut off the hydraulic pressure in that part of the hydraulic circuit with a significant failure.

The **pressure regulator valve 5, N233 acts** on the **safety valve of the circuit 1** in the gearbox.

The **pressure regulator valve 6, N371 acts** on the **safety valve of circuit 2** in the gearbox.

REPLACEMENT FUNCTION

The consequence of a failure is similar in both valves.

The faulty valve will close completely and the safety valve will open, retaining the **pressure** in the **affected circuit**.

If the circuit 1 is faulty, the electronic control will only allow 2nd gear to be engaged.

If circuit 2 is faulty, it will only be possible to 1st or 3rd gear.

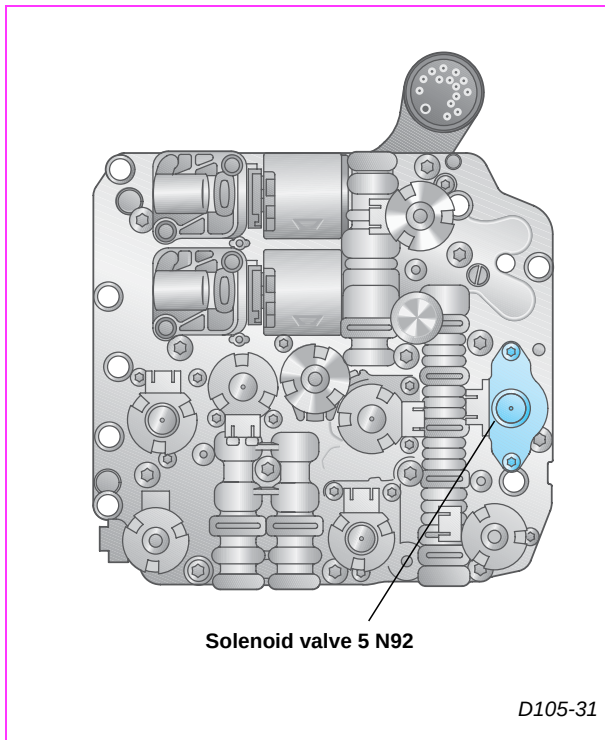
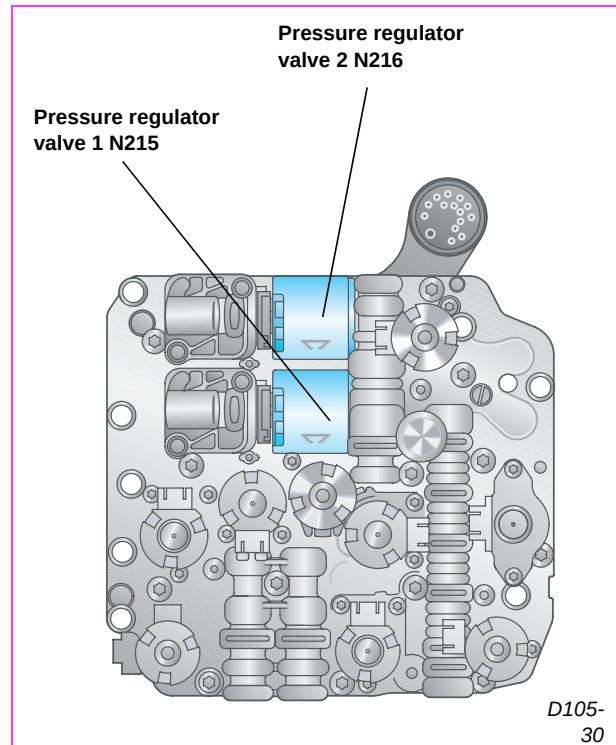
PRESSURE REGULATOR VALVE 1 AND 2, N215 AND N216

These are located inside the hydraulic control unit of mechatronic unit.

Their design corresponds to a **modulation valves**, in other words, they are closed when there is no circuit pressure. They regulate the pressure on the **multi-disk clutches**. Precisely, the pressure regulator valve 1, N215, controls the pressure in the external multi-disk clutch K1 and the pressure regulator valve 2, N216 controls the pressure in the internal multi-disk clutch K2.

REPLACEMENT FUNCTION

A fault in either of these valves implies a **deactivation of the affected circuit**.



SOLENOID VALVE 5, N92

Located in the hydraulic control unit.

This is a **switching valve** energized by the control unit which **governs** the position of the **multiplexer**. In the at rest position, it prevents oil from reaching the multiplexer.

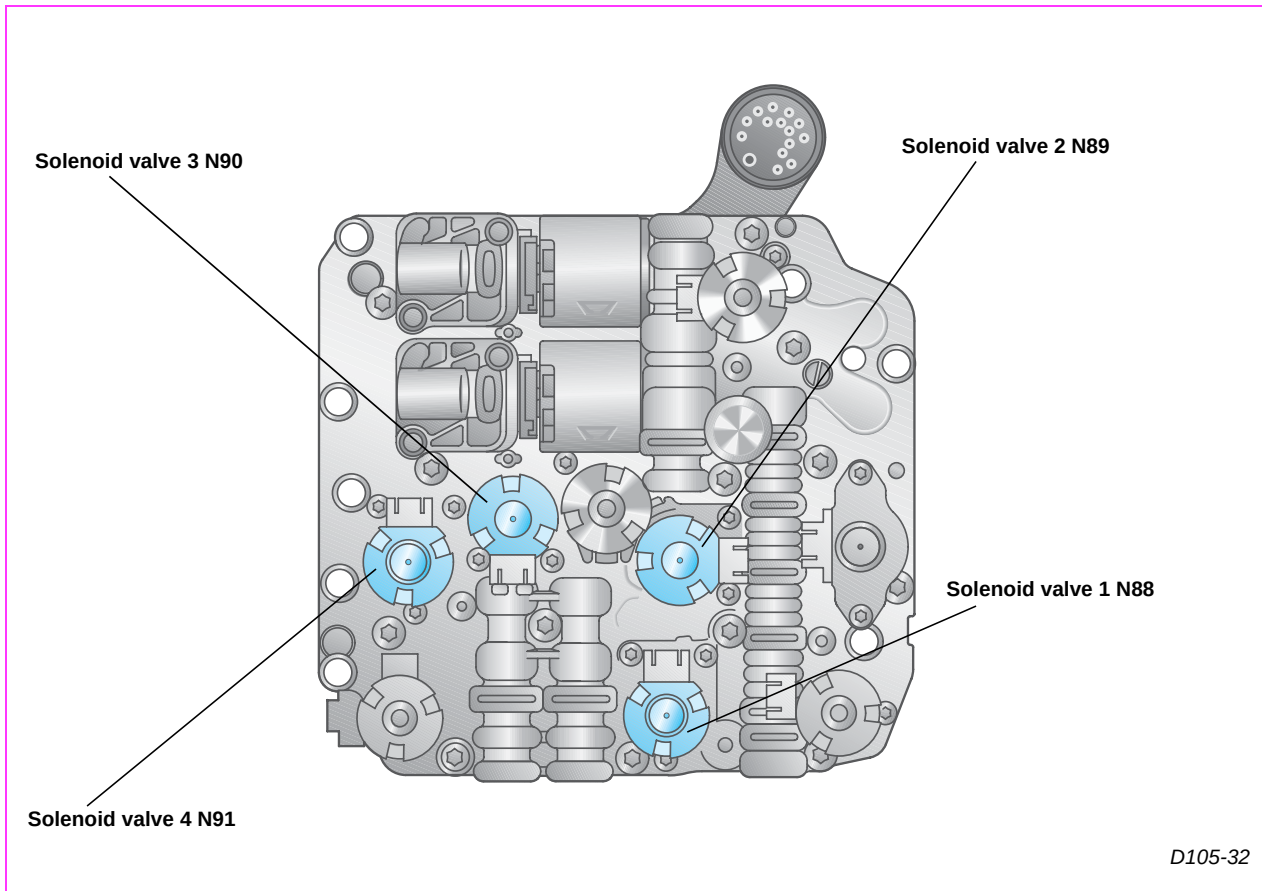
This implies that the 1st, 3rd, 6th and reverse gear can be selected.

When energized, it will be possible to select 2nd, 4th, and 5th gears.

REPLACEMENT FUNCTION

A fault in the solenoid valve 5 will prevent the proper engagement of some gears since it will not be possible correctly control the hydraulic pressure. It may even occur that some gears will be incorrectly selected. Also, in extreme cases the vehicle could be immobilized.

ACTUATORS



SOLENOID VALVES 1, 2, 3 AND 4; N88, N89, N90 AND N91

The four solenoids are located in the electro-hydraulic control unit of the mechatronic unit. They are “on/off” **switching valves**.

When they are activated they open the oil passage through the multiplexer to **activate** the **gearbox actuators**.

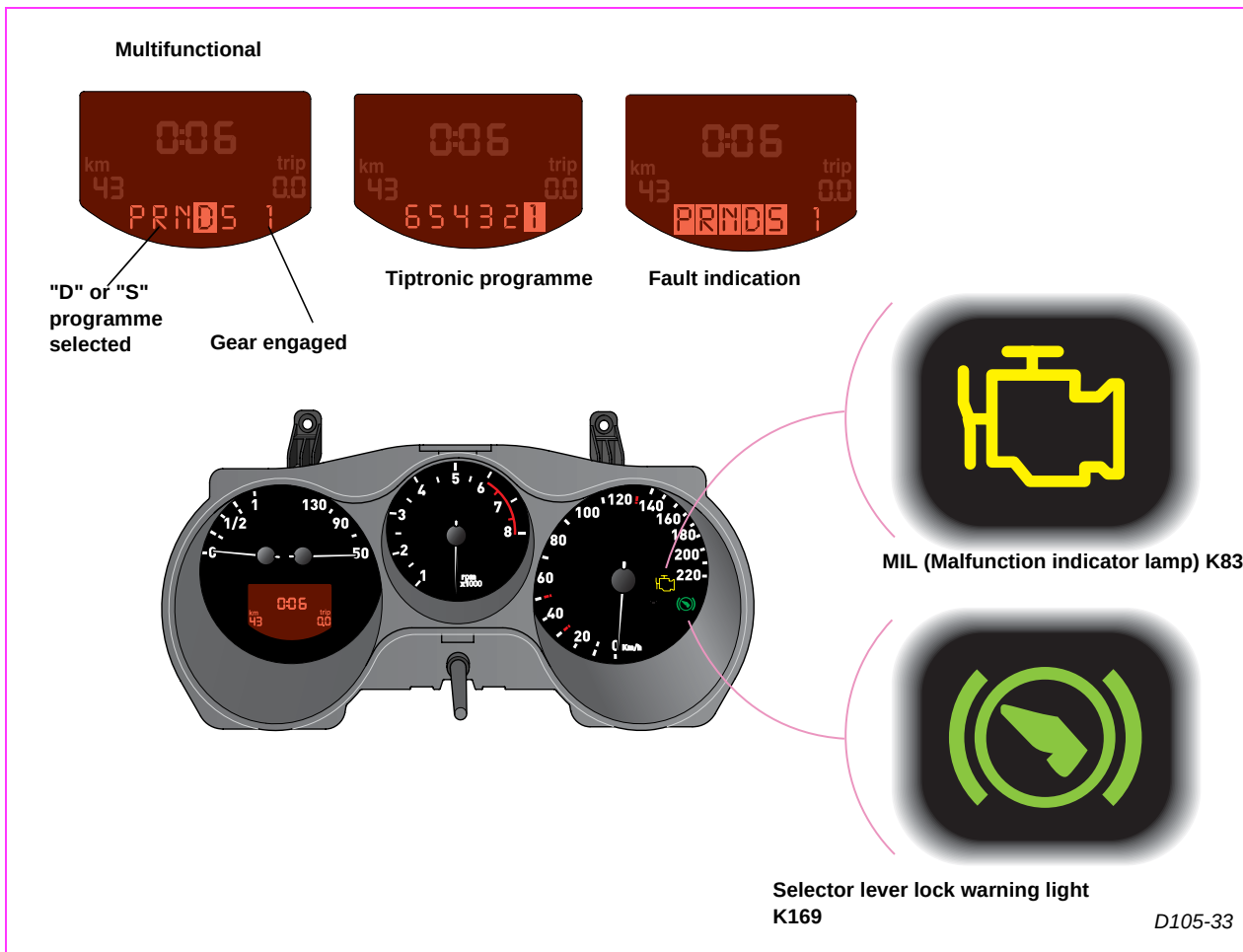
The solenoids 1 and 2, N88 and N89, control the oil pressure for the engagement of the 1st, 3rd and 5th gear.

The solenoids 3 and 4, N90 and N91 control the oil pressure for the engagement of the 2nd, 4th, 6th and reverse gears.

REPLACEMENT FUNCTION

If there is fault in one of the solenoids, the affected circuit actuator will be deactivated.

The vehicle can only be driven in 1st or 3rd or in 2nd gear respectively.



INSTRUMENT PANEL CONTROL UNIT J285

The instrument panel will inform the driver using the **selector lever lock warning light** K169 when the brake pedal should be pressed. A multifunction indicator J119 will indicate the driving mode and gear selected.

The instrument panel will **activate** the warning light based on the analysis of the messages it receives through the CAN-Bus line from the gearbox control unit, the control unit for the selector lever sensors and the ABS control unit.

The multifunction indicator unit informs the driver of possible faults in the automatic gearbox, with two priority levels.

If the multifunction indicator unit indicates the fault with a shading of all the gears except the

gear selected (opposite of the normal indication), a visit should be made to a SEAT dealer as soon as possible.

If the multifunction indicator unit indicates the fault with a shading and blinking of all the gears except the gear selected, the fault is serious and a visit should be made to a SEAT dealer immediately.

There are some gearbox faults which could result in vehicle operating problems and cause the EOBD light to come on.

In all cases, the fault will be stored in the memory.

ACTUATORS



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SELECTOR LEVER POSITION ILLUMINATION L101

This illumination is provided by a series of **seven leds**, which illuminate the different **positions** of the selector **lever**.

The selector lever control unit J587 supplies each led individually.

The warning light have **three** different **illumination patterns**.

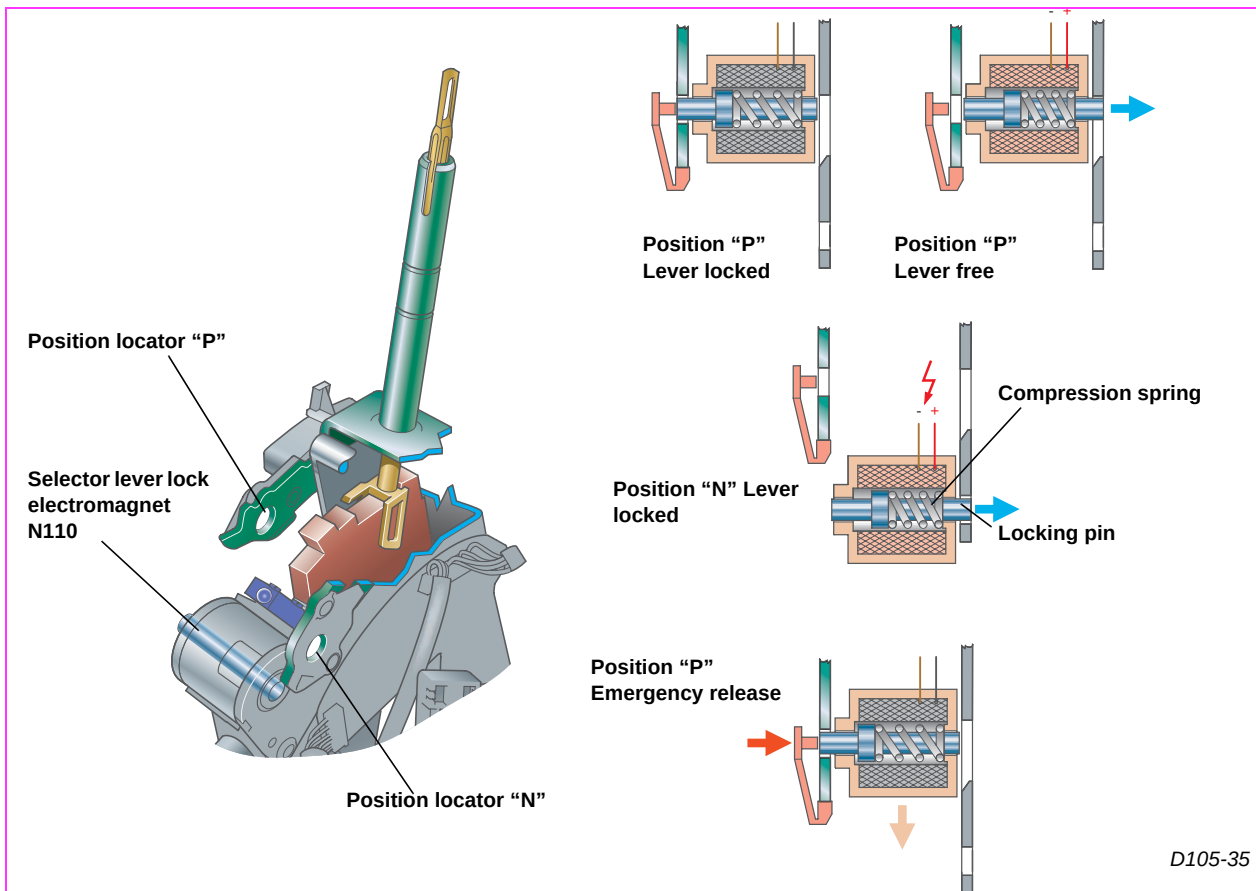
- Low illumination, when the position is not selected.

- Strong illumination, when the position is selected.

- Intense flashing illumination when the position is selected but there is no communication with the gearbox control unit.

REPLACEMENT FUNCTION

In case of failure, there will no illumination of the selector lever position.



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SELECTOR LEVER LOCK ELECTROMAGNET N110

This is an integral part of the selector lever assembly.

It is composed of an electromagnet which is **energised by the selector lever sensor control unit J587**.

The electromagnet has lock pin and a compression spring.

When the selector lever is in position "P", the compression spring pushes the locking pin and this engages in the corresponding position locator.

When the selector lever is in position "N" for more than 2 seconds, the selector lever sensor control unit energises the electromagnet and causes the locking pin to move to the opposite

side and engage the other position locator, immobilising the selector lever.

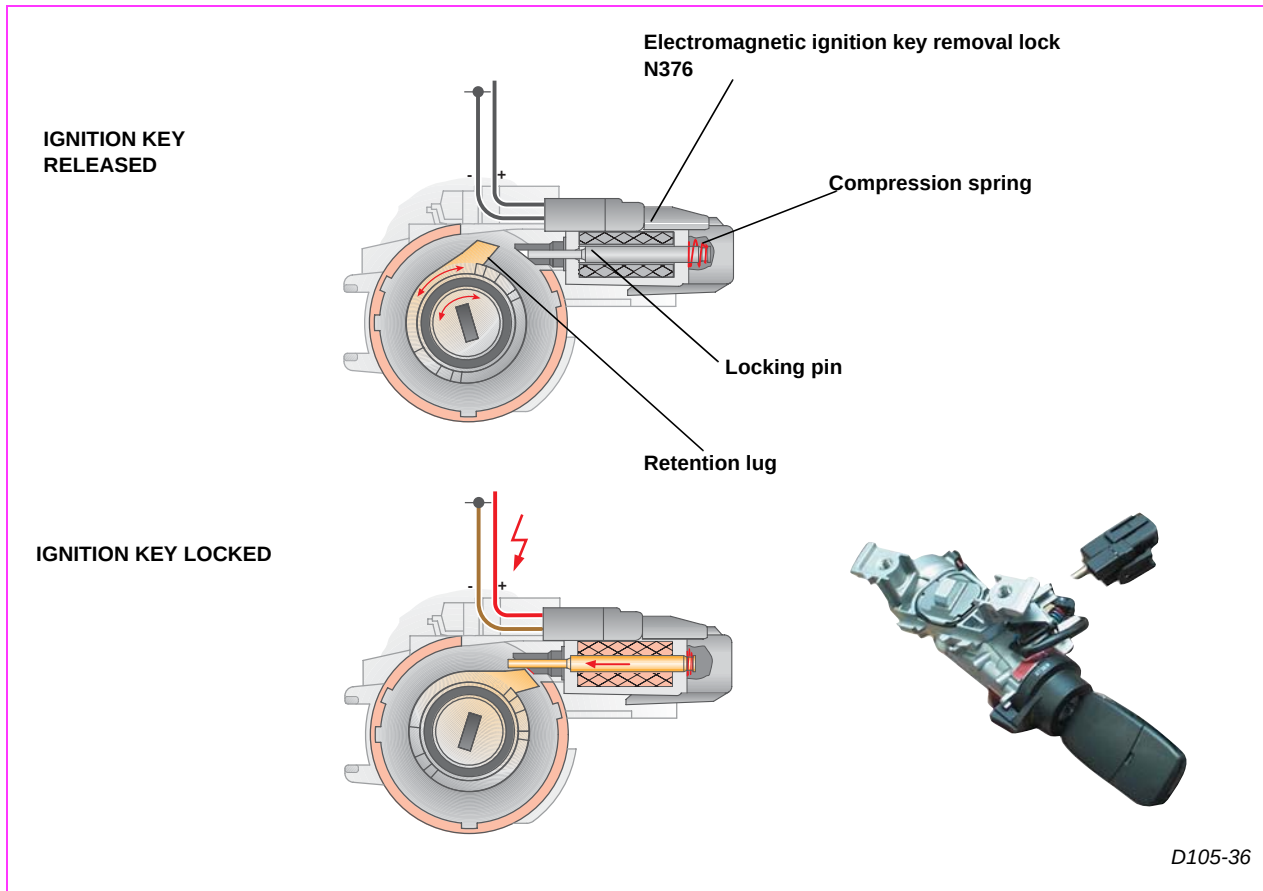
The brake pedal has to be pressed to release the electromagnet and allow the selector lever to move.

REPLACEMENT FUNCTION

The selector lever sensor control unit has no replacement function to operate the electromagnet however it is possible to release it manually.

Note: The releasing of the selector lever is explained in page 58.

ACTUATORS



ELECTROMAGNETIC IGNITION KEY REMOVAL LOCK N376

It is located next to the ignition switch and is connected to the steering column control unit J527.

This removal lock prevents the key from returning to the removal position if the selector lever is not in position "P".

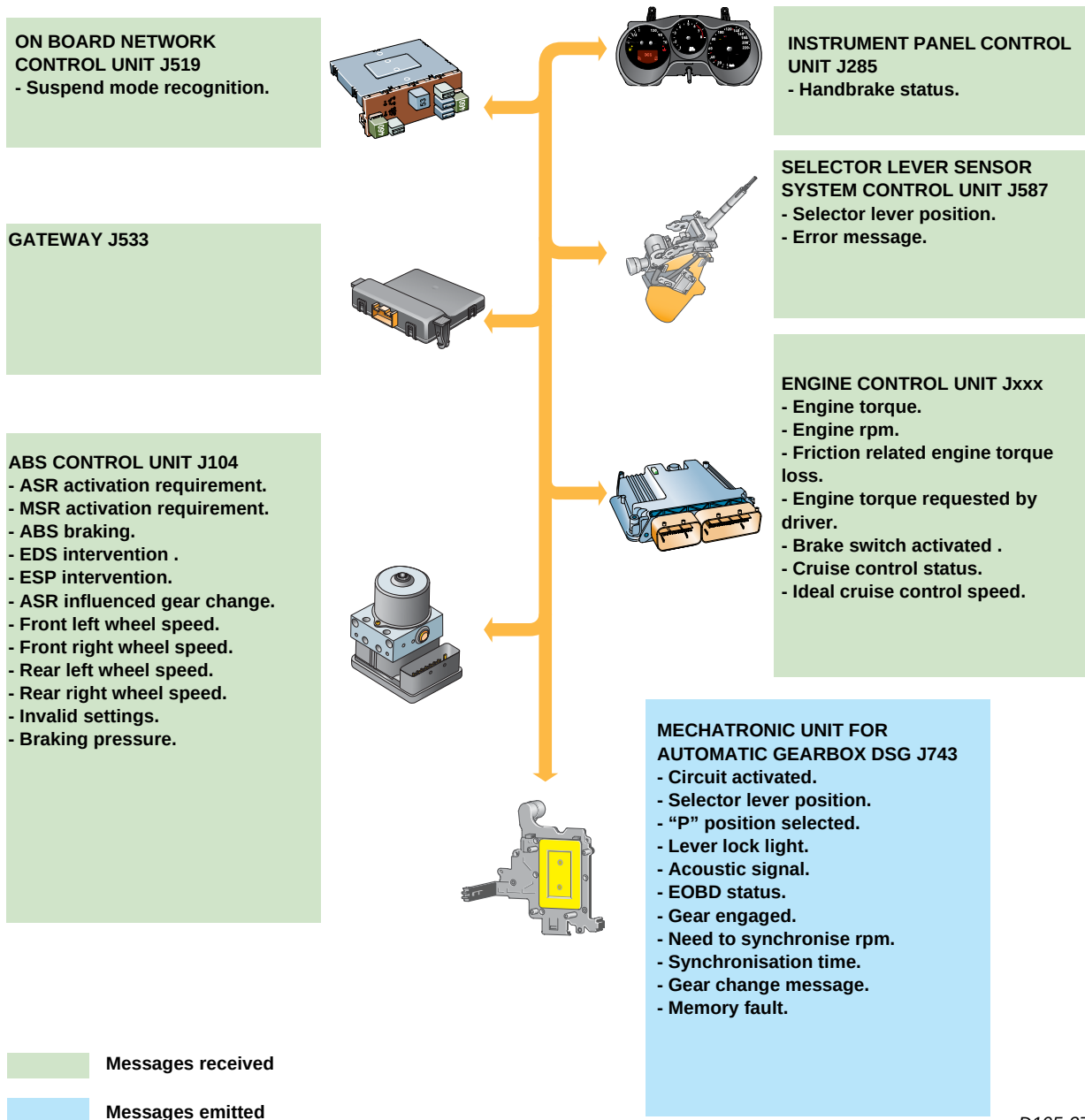
Its operating concept is similar to that of a **coil**, energised by the steering column control unit J527, and when a magnetic field is created the **locking pin** is moved.

When the coil is not energised, the **compression spring** is extended and the

locking pin is moved to the outside, so that the **retention lug** rotates together with the key barrel and prevents extraction of the key.

REPLACEMENT FUNCTION

In the event of failure, the key removal lock will not operate.



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CAN-BUS MESSAGES

The information exchange between the control units is through the drive CAN Bus line.

The diagnosis above shows the control units affected and the most important information exchanged.

The inner part of the green squares describes the information analysed by the automatic gearbox control unit.

The information in blue represents the information emitted for analysis by other control units.

ASSUMED FUNCTIONS

HYDRAULIC PRESSURE MANAGEMENT

When the engine is started, the oil pump will develop system circuit pressure.

The control unit will determine the maximum circuit pressure required based on:

- The pressure required for the multi-disk clutches.
- The engine torque supplied.

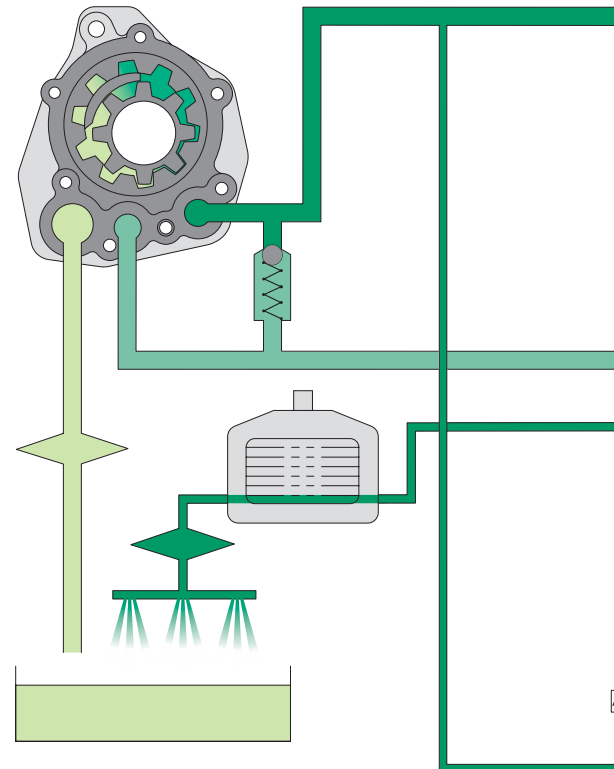
The control unit will also use the oil temperature signals to adapt the pressure to the instantaneous operating conditions.

The control unit energises the **pressure regulator valve 3** to enable this valve to monitor the **main pressure port valve**; this method permits precise pressure control in the gearbox circuit.

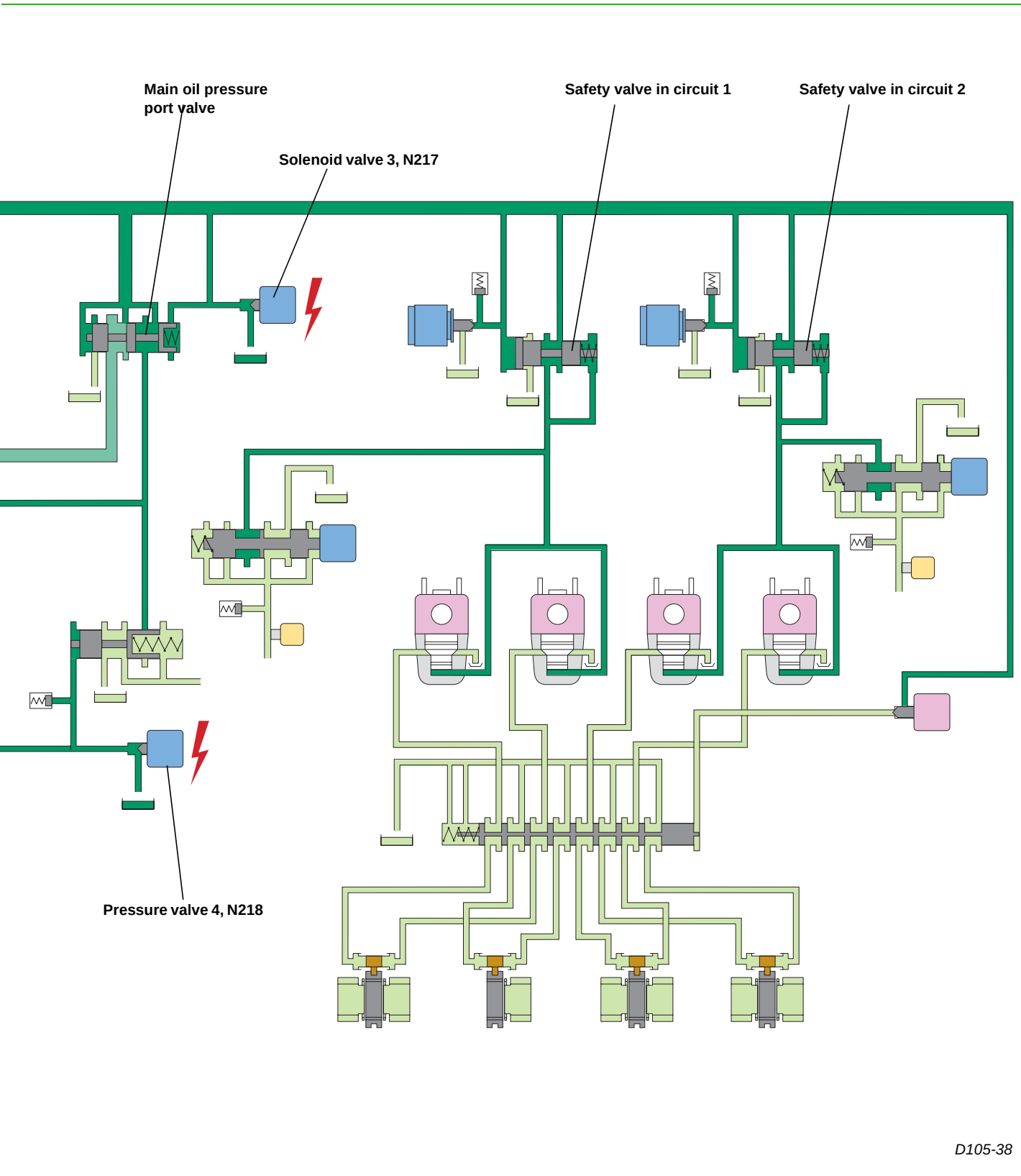
The main pressure port valve controls the oil flow for:

- The return oil flow through the radiator, filter and oil ejectors.
- The return from the oil pump.

The main pressure is available to adjust the multi-disk clutches (pressure regulator valves 2 and 3, N215 and N216 respectively) to engage the gears (valves 1 to 5, N88, N89, N90, N91 and N92).



- Working pressure
- Cooling pressure
- Out of control pressure



ASSUMED FUNCTIONS

HYDRAULIC CONTROL OF THE CLUTCHES

The gearbox control unit governs the operation of the dual clutch, its cooling and adjustment.

To determine which multi-disk clutch needs to be engaged, it **uses** the following **signals** from:

- The engine rpm, Jxxx,
- The vehicle speed, J104,
- Brake application, J104,
- Position of the selector lever, J587,
- Gearbox input speed, G182,
- Primary shaft 1 rpm, G501,
- Primary shaft 2 rpm, G502,
- Hydraulic pressure in circuit 1, G193,
- Hydraulic pressure in circuit 2, G194,
- Secondary shaft 1 rpm, G195,
- Secondary shaft 2 rpm, G196,
- Oil temperature (G93, G509, G510)

With the above signals, the control unit can calculate the following functions.

HYDRAULIC OPERATION OF THE MULTI-DISK CLUTCHES

When the data has been analysed, the control unit determines the **energising level** of:

- The pressure regulator valve 1 N215 to adjust the external multi-disk clutch K1.
- The pressure regulator valve 2 to adjust the external multi-disk clutch K2.

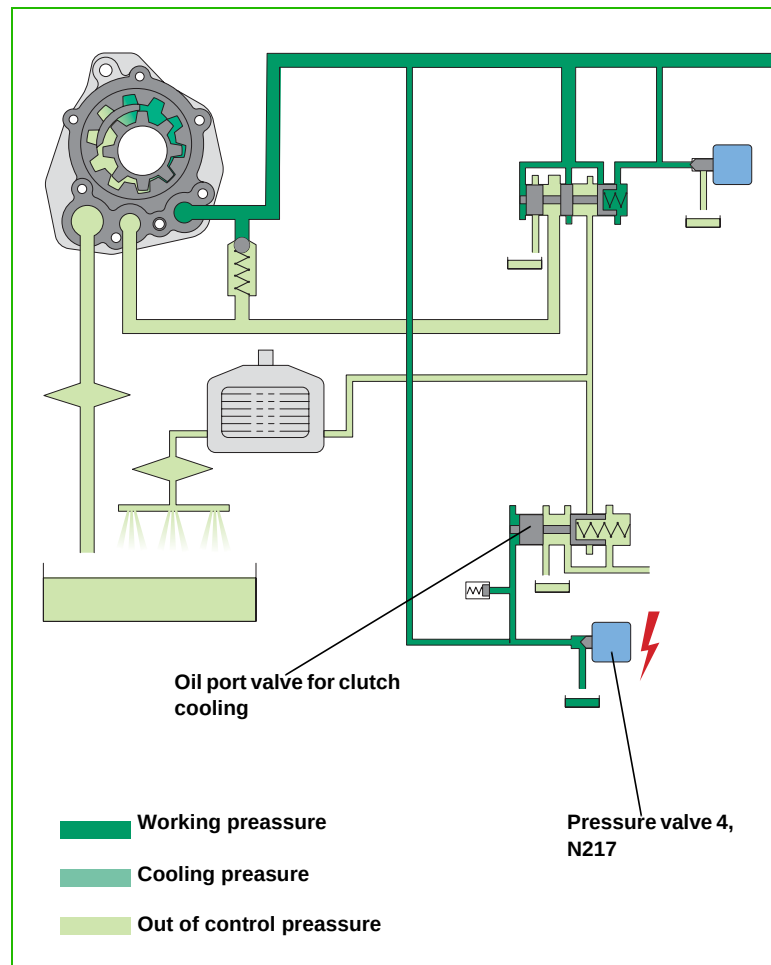
In position “P” or “N” both pressure regulator valves are open and no clutch will transmit torque.

MANOEUVRING ADJUSTMENTS

This function controls the operation of the multi-disk clutch during manoeuvres at low speeds with no pressure on the brake pedal. An example could be when parking or beginning to move from a stationary position on moderate slopes.

The control unit will activate this function when the following **conditions** have been met:

- Engine at idling.
- Gear engaged.
- Accelerator in the at rest position.



The result to that on vehicles with automatic gearboxes and torque converters, in other words smooth and precise.

The control unit activates this function by **energising** the pressure regulator valve 1, N215 and the valve 2, N216.

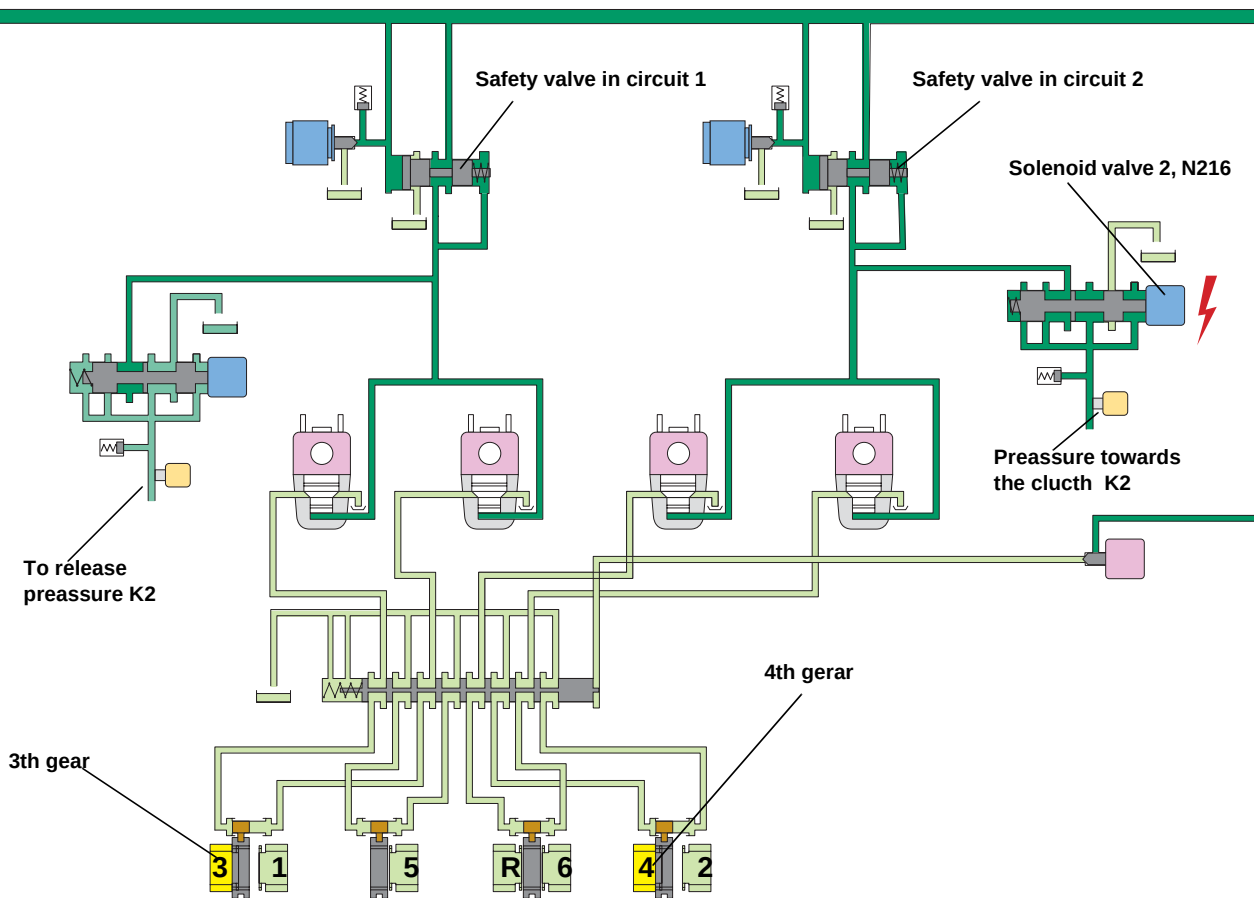
At the same time, it **will send** a message to the **drive CAN-Bus** regarding the most appropriate torque at each point.

This leads to a smooth vehicle movement.

AUTO-ADAPTATION OF THE DUAL CLUTCH

The control unit continuously **updates** the clutch adjustment to maintain gearbox operating comfort.

To ensure comfortable operation, while driving the continuous auto adaptation adjusts



the control current for the pressure regulator valves 5 and 6 (N233 and N371), the clutch torque and the main circuit pressure level.

This process ensures uniform comfortable operation of the clutch during its entire service life.

It should be borne in mind that the friction torque of the clutch depends among other factors on:

- The oil (quality, ageing, deterioration...).
- Oil temperature.
- Clutch temperature.

MICROSLIPPAGE CONTROL

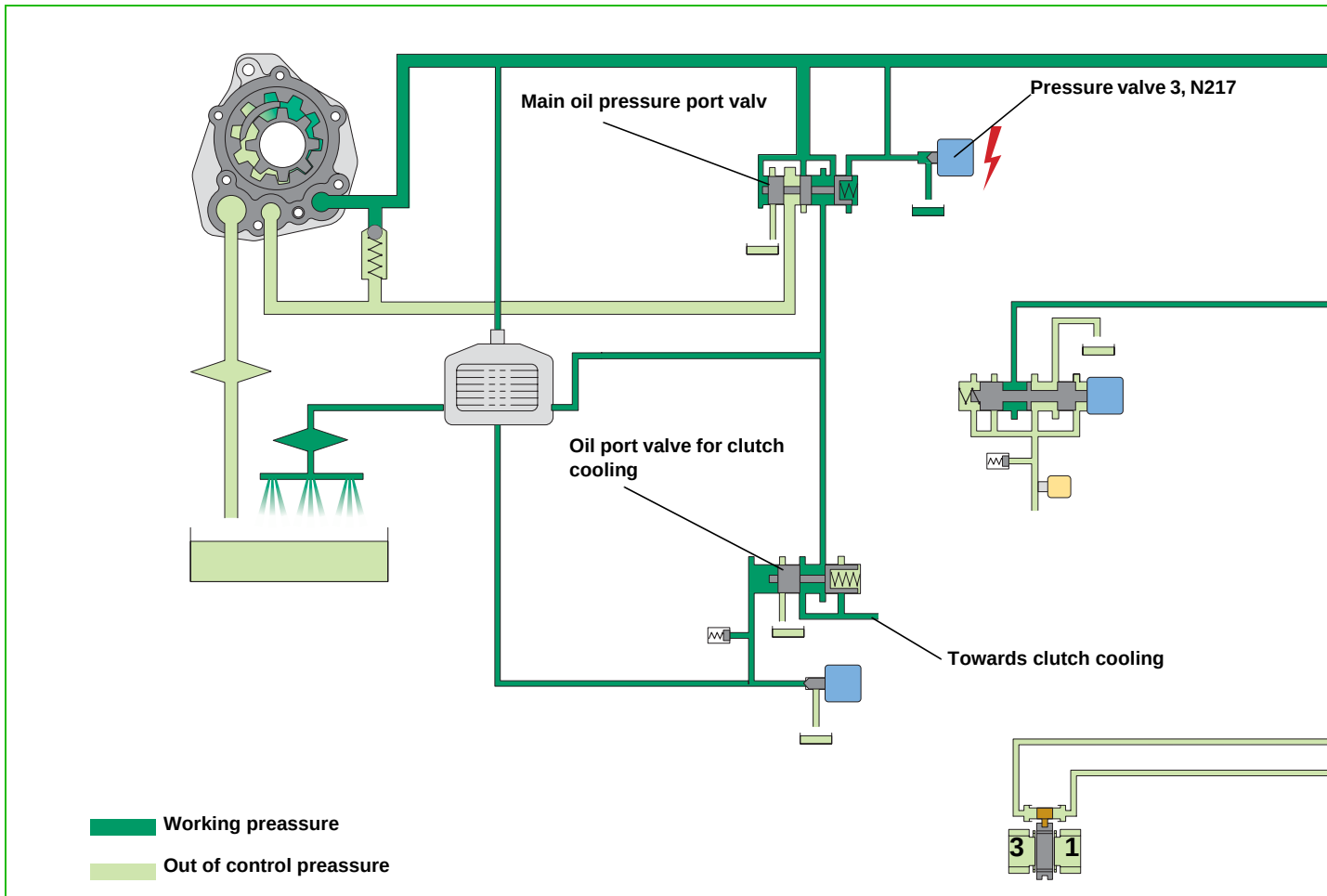
The clutches are continuously controlled with a minimum microslippage of approximately 10 rpm. The term microslippage is used due to the low percentage of slippage in the unit.

This improves the performance of clutch control and can be used for the auto-adaptation of the clutch adjustment.

DOWNHILL RETENTION

If the brake is slightly applied, and the vehicle slows down, the system will increase the pressure in the multi-disc clutch and depending on the gear selected at that instant, the vehicle will be slowed.

ASSUMED FUNCTIONS



The control unit, as well as assuming functions for the operation of the multi-disk clutches, will also perform functions related to the protection of the components.

This task is performed using the same signals as those for operation.

DUAL CLUTCH COOLING

The DSG automatic gearbox has an independent cooling circuit to protect the multi-disk clutches from overheating due to excessive friction.

The cooling level is managed by the control unit based on the need to avoid unnecessary power loss.

When the degree of cooling for the dual clutch has been determined, the control unit will de-

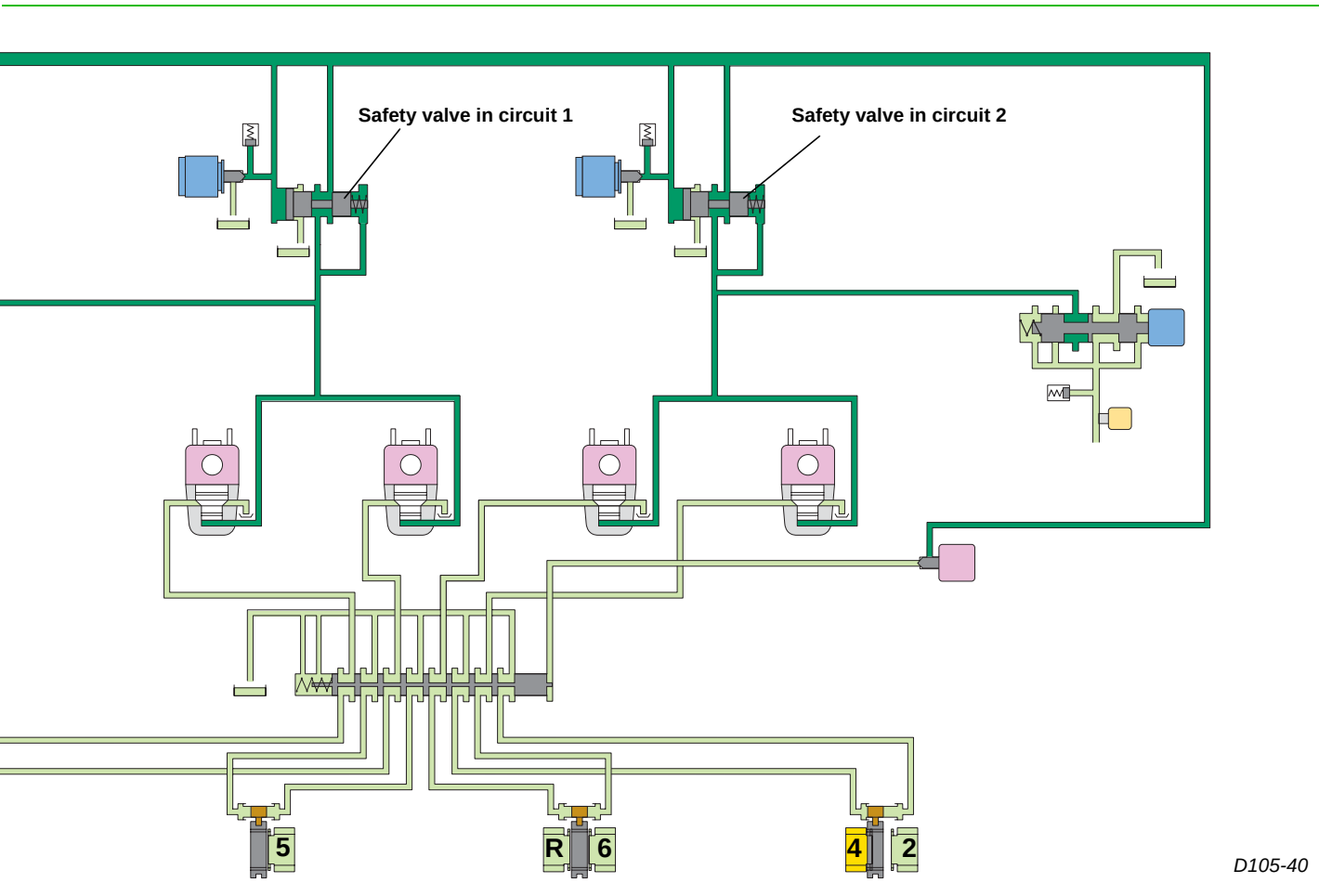
energise the **pressure regulator valve 4, N218**, based on the requirements established. The greater the cooling required, the lower the energising level of the pressure regulator valve.

The maximum cooling oil volume is 20 l/min.

SAFETY DISENGAGEMENT OF THE DUAL CLUTCH

The gearbox control unit recognises this situation based on the pressure signals from the sensors G193 and G194.

The **pressure regulator valves 5 or 6, N233 or N371 are energised**. To allow the **safety valves** in circuit 1 or 2 to **close** and prevent pressure from reaching the clutch in the faulty circuit.



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The clutches will be disengaged when no pressure is applied, this ensures that the vehicle will not accelerate on its own when no pressure is applied.

The vehicle can operate, however it will be in the emergency mode, and only in 1st or 3rd gear or 2nd and with no reverse gear available.

OVERLOAD PROTECTION

The gearbox control unit will calculate the clutch temperature based on a mathematical model. For this purpose it will use the signal from the sensor previously mentioned.

If overload values above a certain threshold are exceeded, the gearbox control unit will request a **torque reduction** from the engine control unit over the CAN Bus line. This

reduction could be as low as that corresponding to no load driving, implying that the engine will not respond to the accelerator pedal action by the driver.

The clutch cooling initiates a short cooling cycle and the engine torque returns to normal. The risk of dual clutch overloading will be almost completely eliminated.

ASSUMED FUNCTIONS

DRIVING MODES

The driver defines the driving mode using the selector lever, selecting one of the following options:

- “D”, normal driving.
- “S”, sporty driving.
- “+ / -” Tiptronic.

During **normal driving**, the gear change point is determined by the control unit based on the calculations completed, without any intervention by the driver, endeavouring to constantly achieve the most comfortable driving and lowest fuel consumption possible.

In the **sporty driving** mode the gears are changed automatically, with the exception that the gears are changed maintaining a high power output level.

In the tiptronic mode, the gears are changed by slight pressure on the selector lever although the control unit could also make gear changes under certain conditions.

The **tiptronic** driving mode will be terminated when the lever is moved out of the tiptronic selector gate.

In all cases the control unit uses the **signals from:**

- Gearbox input speed, G182,
- Primary shaft 1 rpm, G501,
- Primary shaft 2 rpm, G502,
- Secondary shaft 1 rpm, G195,
- Secondary shaft 2 rpm, G196,
- Gear lever position J587,
- Travel sensors 1-4, G487... 490

The analysis of these signals determines the gear engagement and disengagement process. This operation is performed by actions on the solenoid and pressure regulator valves in the hydraulic control unit.

Gearbox input speed sensor
G182

Gearbox oil temperature
signal, depends on multi-disk
clutch G509

Oil temperature sensor
G93

Control unit temperature
sensor G510

Sensor 1 for hydraulic
pressure G193

Sensor 2 for hydraulic
pressure G194

Gearbox output speed
sensor G195

Gearbox output speed
sensor 2 G196

Primary shaft rpm sensor 1
G501

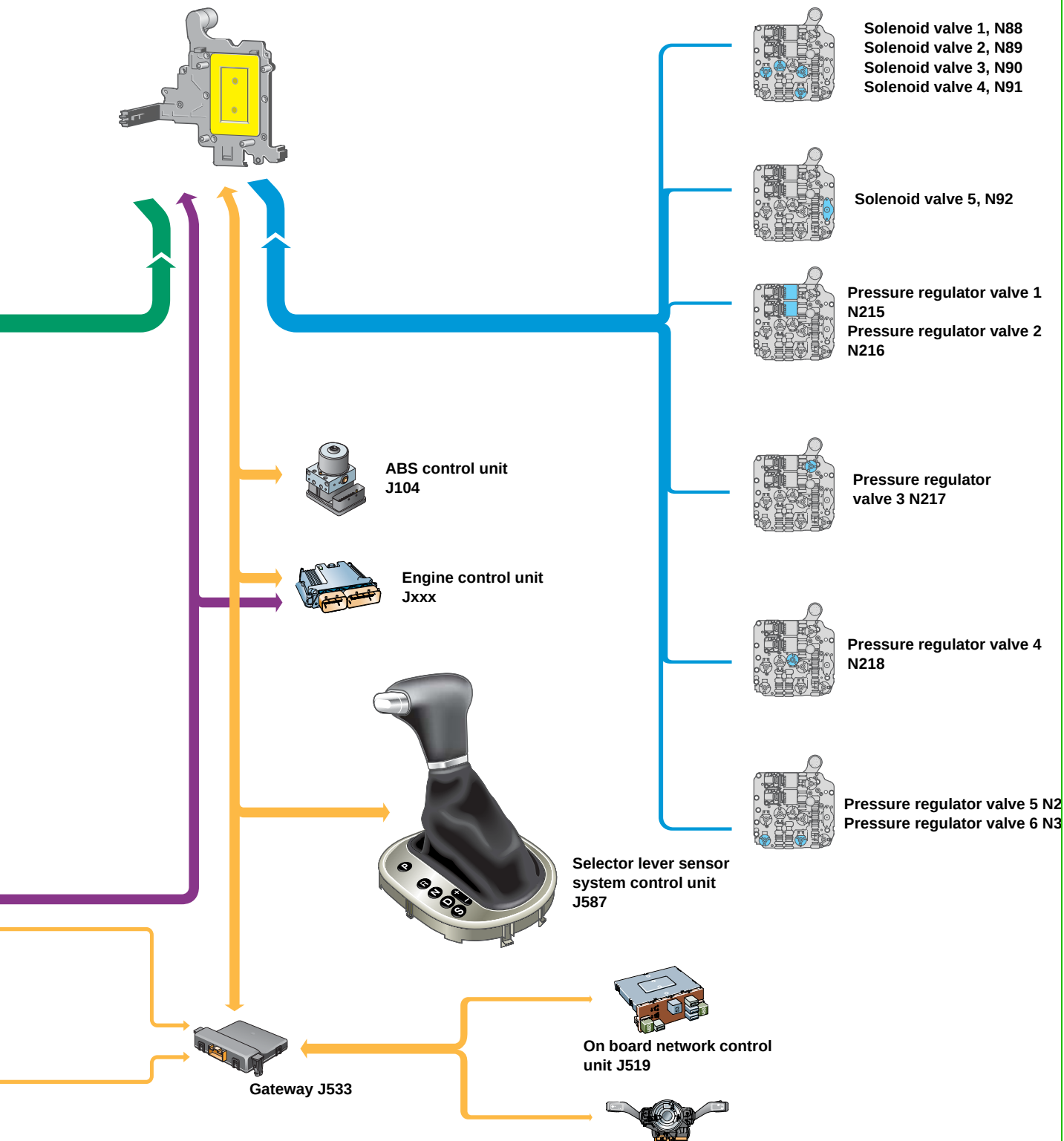
Primary shaft rpm sensor 2
G502

Travel sensor 1-4
G487...G490

Self diagnosis
connector T16

Instrument panel
control unit J285

**Mechatronic unit for automatic
GEARBOX DSG J743**



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ASSUMED FUNCTIONS

GEAR ENGAGEMENT AND DISENGAGEMENT

An explanation of the gearbox operation in different situations will be given here below.

SELECTOR LEVER IN POSITION “N” OR “P”

When the selector lever is in position “N” or “P”, the control unit uses the **pressure regulator valve 3, N217**, to maintain the correct working pressure in circuit 1 and 2.

In circuit 1, the reverse gear is engaged and in circuit 2 the 2nd gear is engaged. This ensures faster response times, since the final travel direction to be selected by the driver is not yet confirmed.

When the **pressure regulator valves 1 and 2, N215 and N217** are closed, the multi-disk clutch K1 and K2 are opened and no torque is transmitted.

DRIVE POSITION “D”

If the “D” drive position is selected, the subtle difference is that **valves** and **multiplexer** are now activated to engage the 1st gear and the 2nd gear which was already engaged.

The control unit also governs the **pressure regulator valve 1 and 2, N215 and N217** so that the vehicle begins to move based on the torque level requested by the driver.

To determine which of the two gears should be used to initiate movement, the gearbox control unit will analyse the following signals:

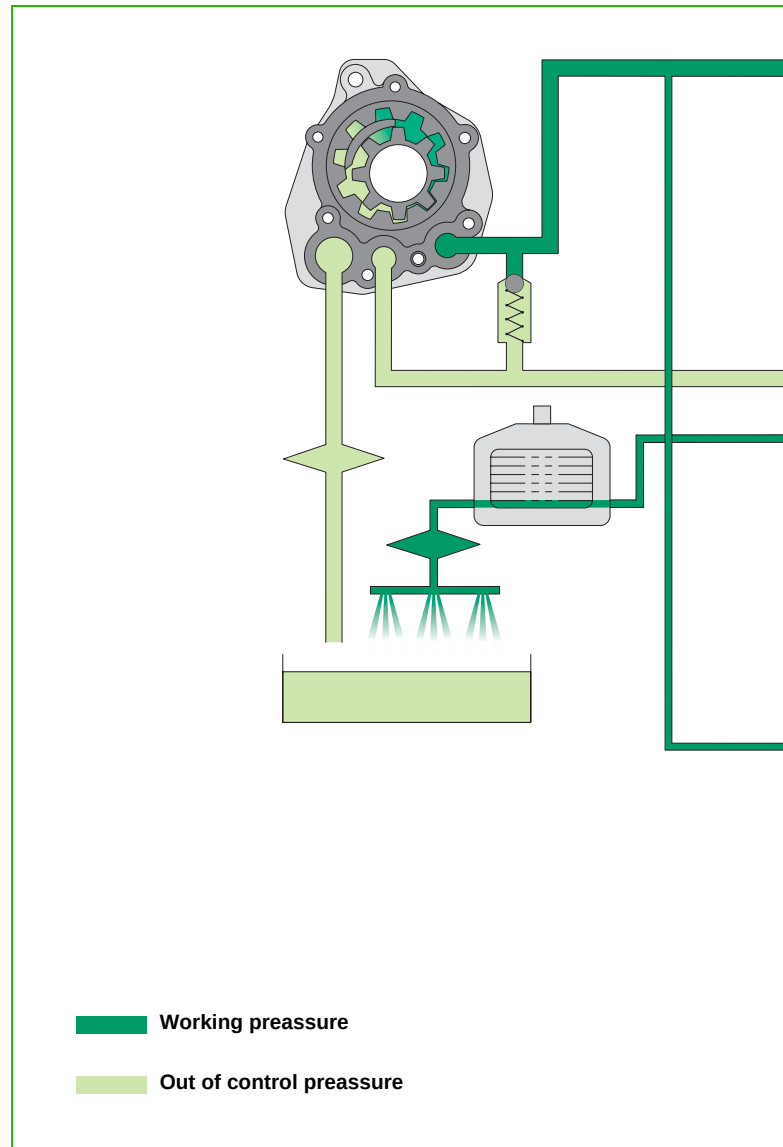
- Vehicle speed.
- Engine rpm.
- Accelerator pedal position.

If the driver requests a high level of torque when starting, the control unit will close the external multi-disk clutch K1 and the vehicle will start in 1st gear.

PROGRESSION, POSITION “D” OR “S”

The gear engagement means that the gearbox control unit:

- Will deliver the oil pressure to the corresponding hydraulic piston until the gear is engaged.

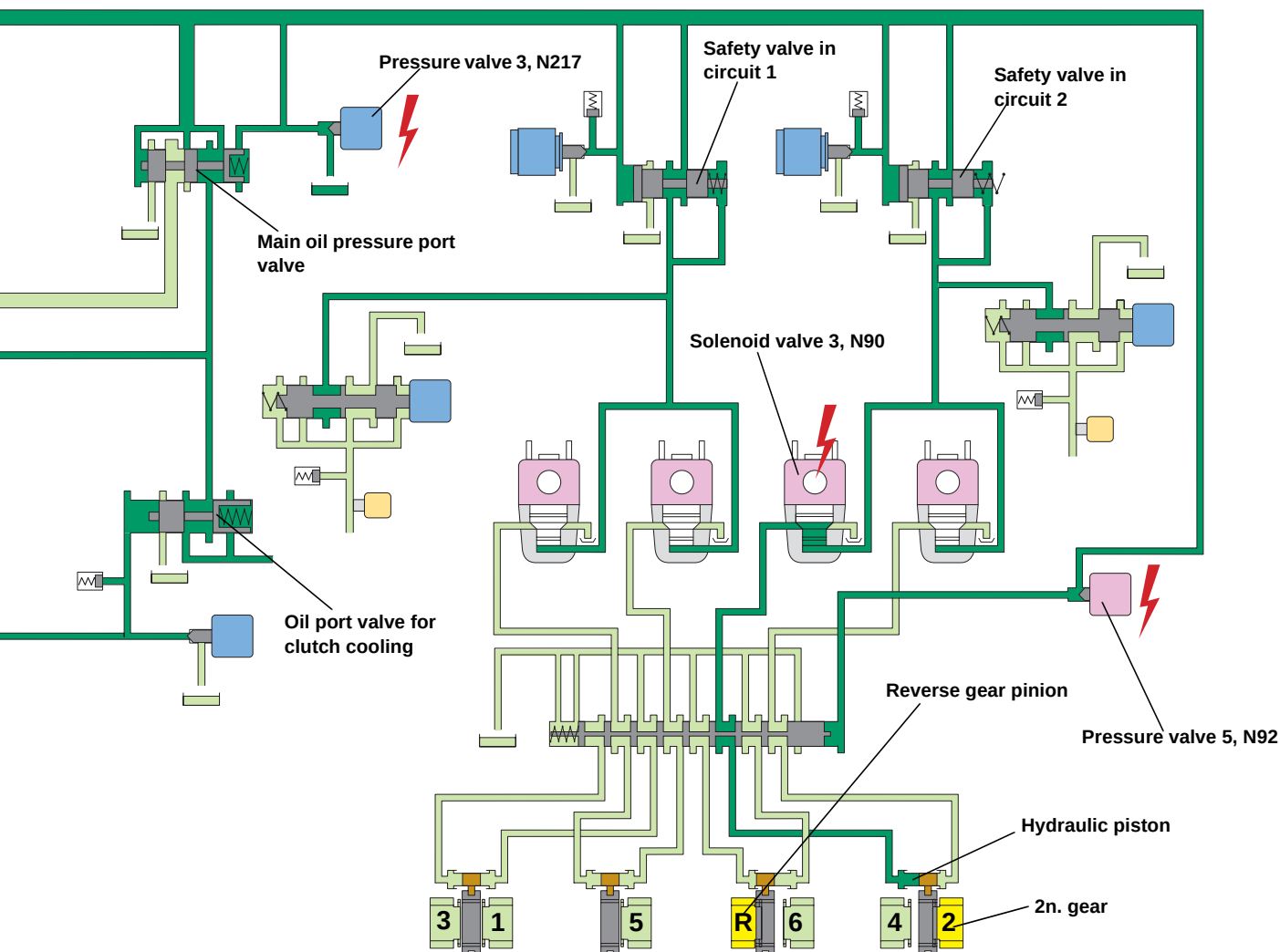


- Reduce the pressure in the working multi-disk clutch while increasing it in the other multi-disk clutch.

- Deliver oil pressure to the corresponding piston to disengage the previous gear.

When the gear is engaged, the hydraulic pressure on the fork piston will be neutralised.

The result is a rapid comfortable gear change (in approx. 100 ms). This period could vary depending on the condition of the oil, for example, with very low temperature.



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RAPID START

The gearbox control unit has an incorporated rapid start (Launch control) program which serves to apply the maximum torque and acceleration during initial vehicle movement.

This program checks:

- The accelerator pedal position.
- Connection of ESP or ASR.

MAXIMUM POWER DEMAND

When the driver pushes the pedal fully down, the engine control unit passes the Kick-down message to the drive CAN Bus line. When this message is received, the control unit selects the most adequate gear at this point to deliver the maximum engine power.

EMERGENCY MODE

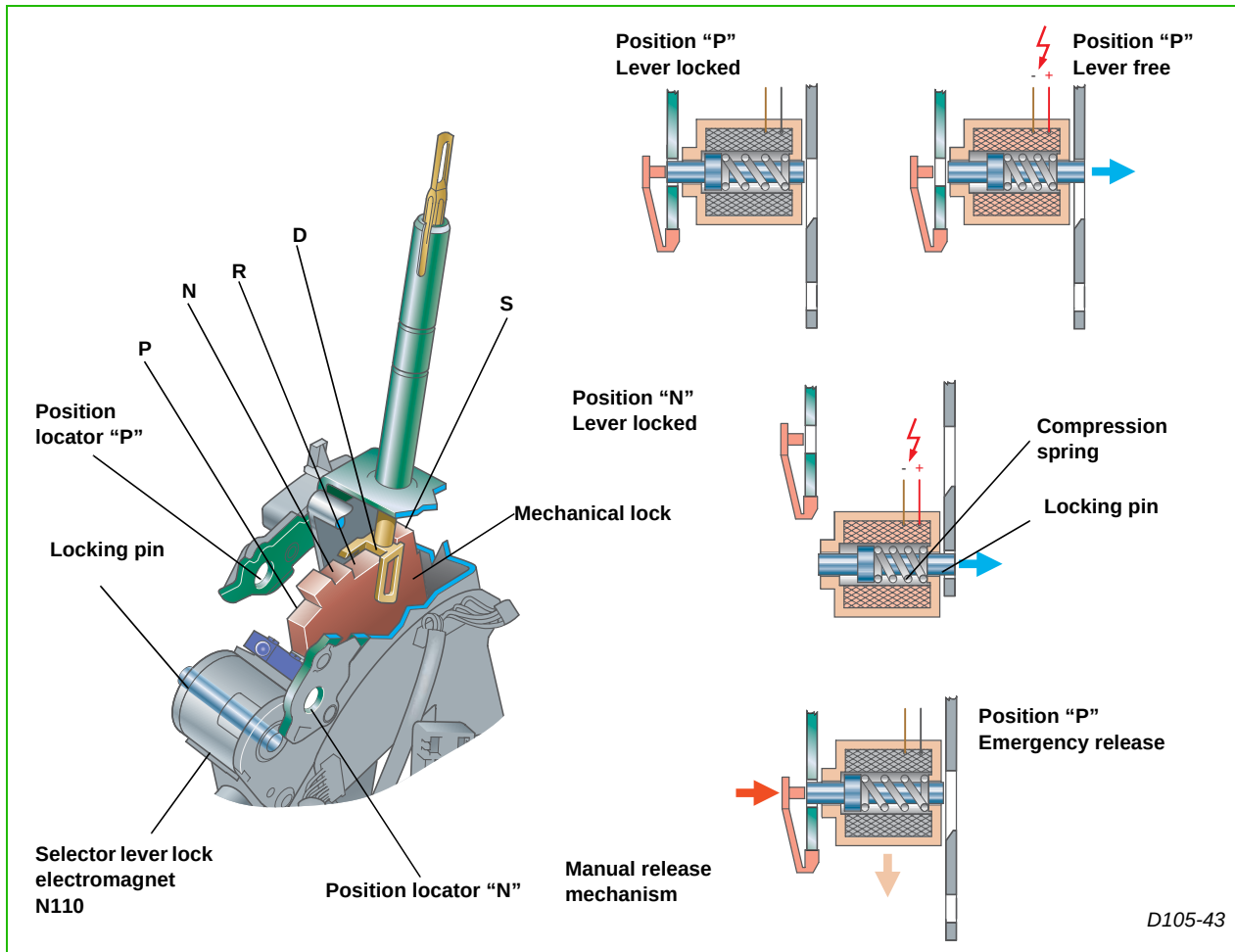
Engine the case of certain failures, the gearbox circuit affected will be have the affected circuit disconnected.

This mode allows the vehicle to be driven with certain limitations.

With circuit 1 intact, the 1st and 3rd gear can be selected.

With circuit 1 intact, the 2nd gear can be selected.

GEARLEVER OPERATION SELECTOR



There are three functions which are not controlled by the gearbox control unit but where it has a partial role.

SELECTOR LEVER LOCKING

This is locked in different positions:

Lock in position "P": the locking pin enters the locator and the mechanical lock action occurs. The lever can be released by pressing the brake pedal.

Lock in position "R": The lever can move freely to position "N" but is locked in direction of position "P".

Lock in position "N": After 2 seconds have elapsed, the lever is locked by the pin. The lever cannot be moved to "R" but can be moved to position "D".

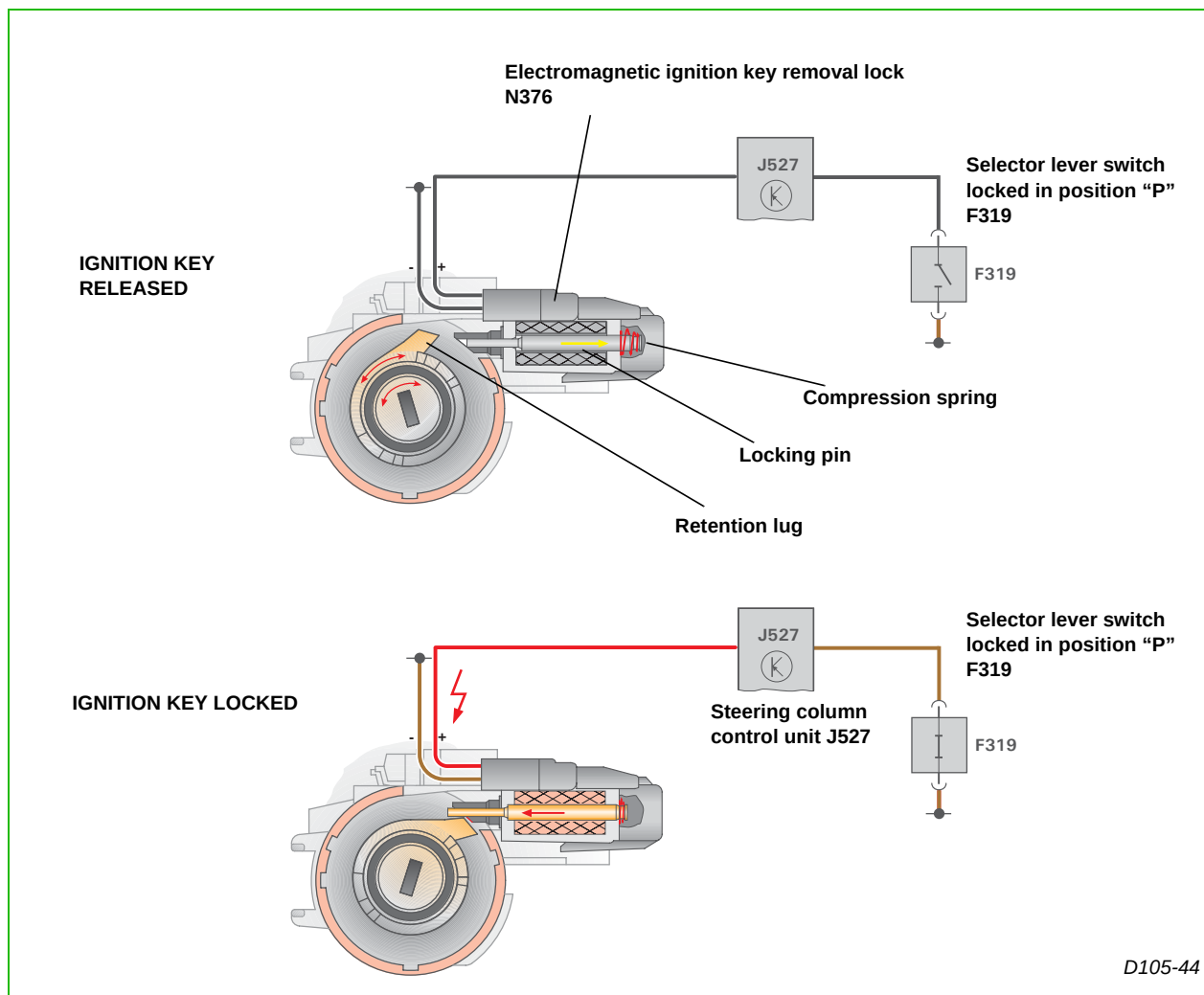
Lock in position "D": The lever can be moved to position "N" or to the tiptronic position, but the lock prevents movement to position "S".

Position "S": The selector lever is not locked.

EMERGENCY RELEASING

This can be done by simply **moving the pin of the manual** release mechanism to the inside of the electromagnet, thus allowing the selector lever to be shifted to position "N" and the vehicle to be moved.

GEARLEVER OPERATION SELECTOR



IGNITION KEY REMOVAL LOCK

The **selector lever lock F319** is closed when the selector lever is moved from position "P", allowing an earth signal to reach the steering column control unit J527.

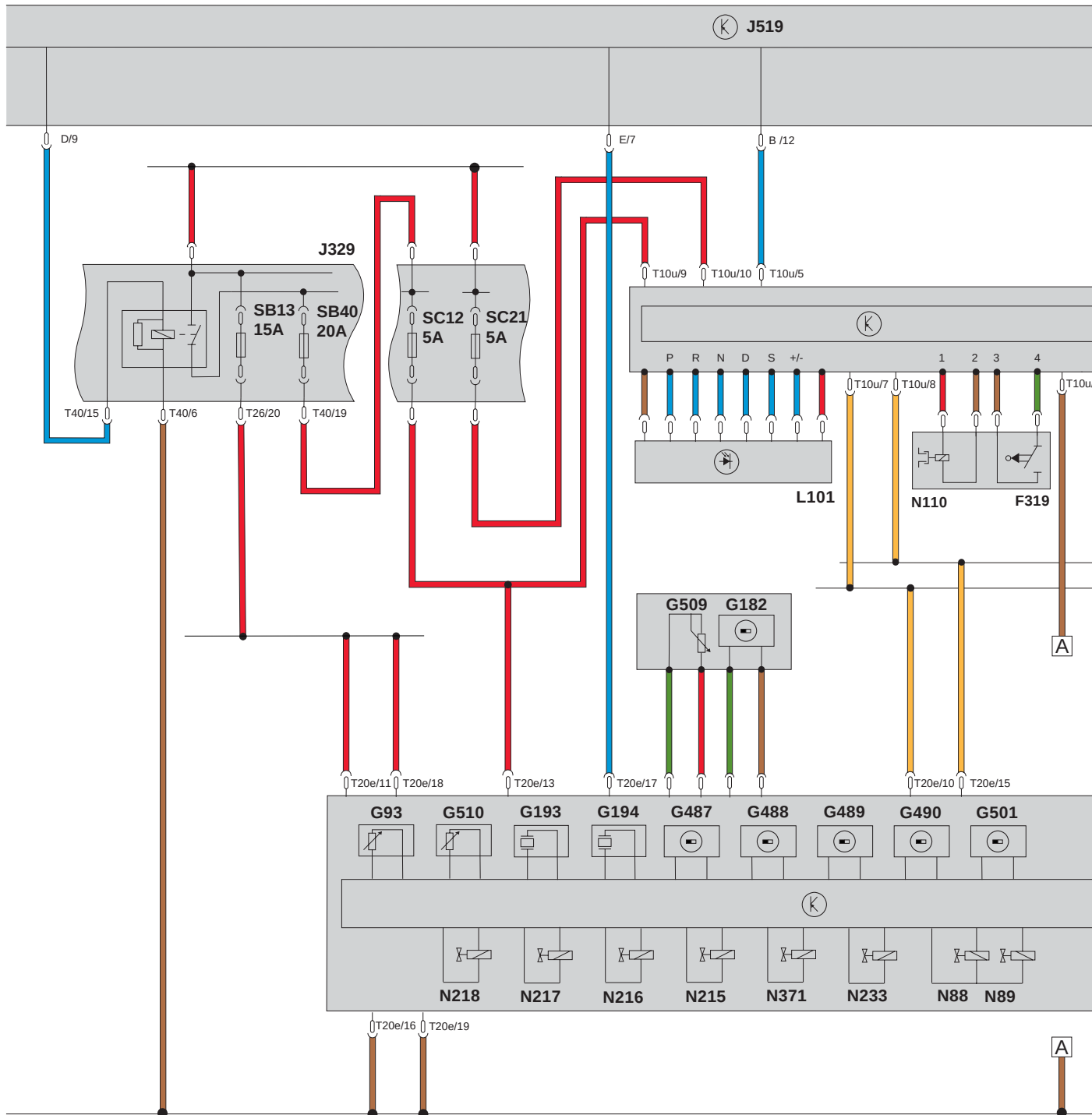
This situation allows the control unit to energise the electromagnetic ignition key removal lock N376, making it impossible to remove the ignition key.

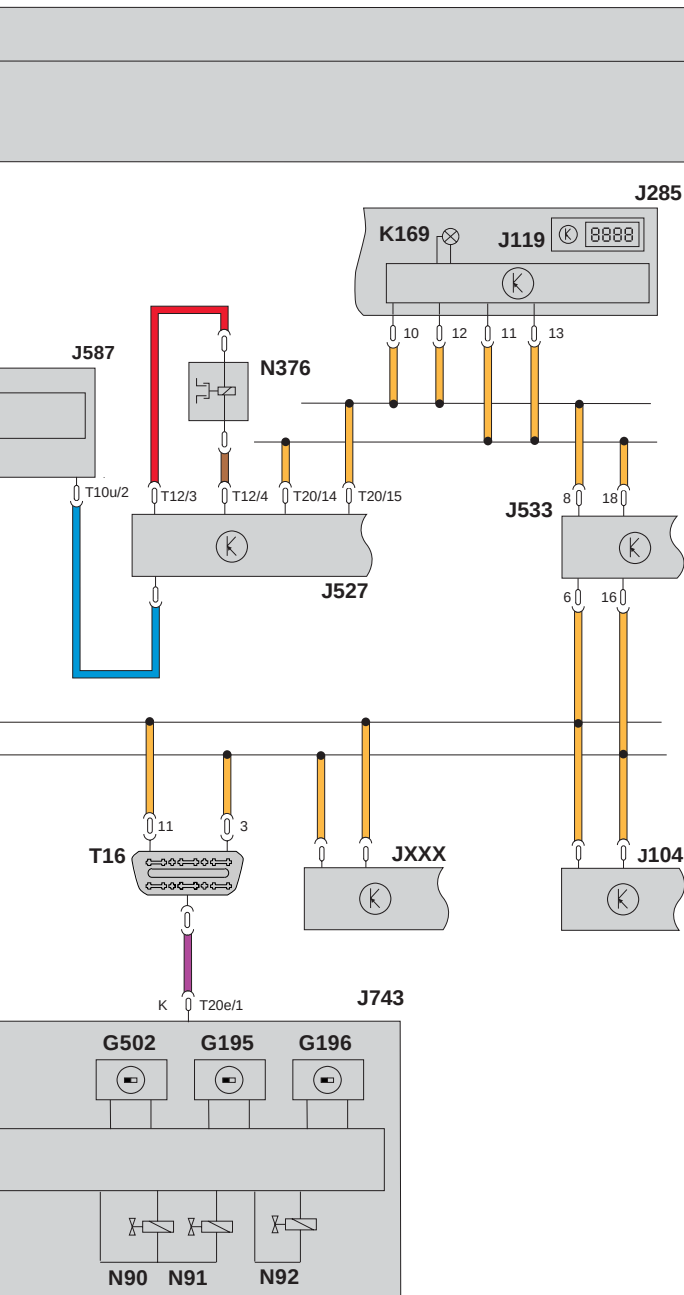
It will only be possible to remove the key when the lever is placed in position "P", the switch opens and the control unit cuts off the energising signal.

REVERSE LIGHT

The selector lever sensors control unit J587 and the on board network control unit J519 are joined by a cable, to detect the reverse gear selection action.

WIRING DIAGRAM





COLOUR CODES

- Input signal
- Output signal
- Positive supply
- Earth
- Bi-directional signal
- CAN-Bus

LEGEND

- F319** Selector lever switch locked in position "P".
- G93** Oil temperature sensor.
- G182** Gearbox input speed sensor.
- G193-G194** Sensor 1 and 2 for hydraulic pressure.
- G195-G196** Gearbox output speed sensor 1 and 2.
- G487-G488-G489- G490** Travel sensor 1, 2, 3 and 4.
- G501-G502** Primary shaft rpm sensor 1 and 2.
- G509** Gearbox oil temperature signal, depends on multi-disk clutch.
- G510** Control unit temperature sensor.
- Jxxx** Engine control unit.
- J104** ABS control unit.
- J119** Multifunction indicator
- J285** Instrument panel control unit.
- J329** Terminal 15 voltage supply relay.
- J519** On board network control unit.
- J527** Steering column control unit.
- J533** Gateway
- J587** Selector lever sensor system control unit.
- J743** Automatic gearbox control unit.
- K169** Selector lever lock warning light.
- L101** Selector lever display illumination.
- N88-N89-N90-N91** Solenoid valve 1, 2, 3 and 4.
- N110** Selector lever lock electromagnet.
- N215-N216** Pressure regulator valve 1 and 2.
- N217** Pressure regulator valve 3.
- N218** Pressure regulator valve 4.
- N233-N371** Pressure regulator valve 5 and 6.

SELF-DIAGNOSIS

The diagnosis of the DSG automatic gearbox control unit can be performed using the **guided fault finding** or **guided functions** options. These functions combine self-diagnosis, test instruments and Repair manuals (ELSA).

GUIDED FAULT FINDING

This option can only begin after consulting the fault memory of all the control units.

The precise access to the interrogation of the automatic gearbox control unit diagnosis is initiated with: Function/component selection, Powertrain, DSG Gearbox 02E, 01 - Systems capable of self-diagnosis.

The following two options are available:

- Electrical components
- Functions.

Each of these options is described here below.

Guided fault finding	Seat V06. 20 20/05/2004
Function / component selection	Altea 2004> 2005 (5)
Function or component selection	Saloon BKD 2,0L TDI / 103 kW
+ Powertrain. + 02. DSG gearbox 02E. + 01 - System capable of self diagnosis. + Electrical components. + Functions.	

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Guided fault finding	Seat V06. 20 20/05/2004
Function / component selection	Altea 2004> 2005 (5)
Function or component selection	Saloon BKD 2,0L TDI / 103 kW
+ Powertrain. + 02. DSG gearbox 02E. + 01 - System capable of self diagnosis. + Electrical components. DSG mechatronic unit. Sensors. J 587 Selector lever sensors control unit	

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SELECTOR LEVER CONTROL UNIT

The option “J587, selector lever control unit” can be used to check the correct operation of the following sensors and actuators included in this assembly as follows:

- E313, selector lever.
- F319, selector lever lock assembly.
- L101, selector lever quadrant illumination.
- N110, selector lever electromagnetic lock.

Guided fault finding	Seat V06. 20 20/05/2004
Function / component selection	Altea 2004> 2005 (5)
Function or component selection	Saloon BKD 2,0L TDI / 103 kW
+ Powertrain. + 02. DSG gearbox 02E. + 01 - System capable of self diagnosis. + Electrical components. DSG mechatronic unit. J 587 Selector lever sensors control unit - E313, Selector lever. - F319, Selector lever lock switch. - L101, Selector lever quadrant illumination. - N110, Selector lever electromagnetic lock.	

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MECHATRONIC UNIT: "SENSORS"

This option contains a list of components related to the gearbox, which can be checked adjusted or calibrated according to a specific test plan for each component as follows:

- G93, Gearbox oil temperature sensor.
- G182, Gearbox input speed sensor.
- G193, Pressure sensor clutch 1.
- G194, Pressure sensor clutch 2.
- G195, Gearbox output speed sensor 1.
- G196, Gearbox output speed sensor 2.
- G487, Travel sensor 1 for selector mechanism.
- G488, Travel sensor 2 for selector mechanism.
- G489, Travel sensor 3 for selector mechanism.
- G490, Travel sensor 3 for selector mechanism.
- G501, Primary shaft 1 speed sensor.
- G502, Primary shaft 2 speed sensor.
- G510, Oil temperature sensor.
- G501, Control unit temperature sensor.
- N88, Solenoid valve 1.
- N89, Solenoid valve 2.
- N90, Solenoid valve 3.
- N91, Solenoid valve 4.
- N92, Solenoid valve 5.

Guided fault finding	Seat	V06. 20	20/05/2004
Function / component selection	Altea 2004>		
Function or component selection	2005 (5)		
	Saloon		
	BKD 2,0L TDI / 103 kW		
+ Powertrain. + 02. DSG gearbox 02E. + 01 - System capable of self diagnosis. + Electrical components. DSG mechatronic unit.			
Sensors.			
G93, Gearbox oil temperature sensor. G182, Gearbox input speed sensor. G193, Pressure sensor clutch 1. G194, Pressure sensor clutch 2. G195, Gearbox output speed sensor 1. G196, Gearbox output speed sensor 2. G487, Travel sensor 1 for selector mechanism. G488, Travel sensor 2 for selector mechanism.			
Test instruments Go to Print Help			

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- N215, Pressure regulator valve 1.
- N216, Pressure regulator valve 2.
- N217, Pressure regulator valve 3.
- N218, Pressure regulator valve 4.
- N233, Pressure regulator valve 5.
- N371, Pressure regulator valve 6.

Guided fault finding	Seat	V06. 20	20/05/2004
Function / component selection	Altea 2004>		
Function or component selection	2005 (5)		
	Saloon		
	BKD 2,0L TDI / 103 kW		
+ Powertrain. + 02. DSG gearbox 02E. + 01 - System capable of self diagnosis. + Electrical components. +Unidad mecánica electrónica del cambio directo.			
+ Functions.			
Check oil level/temperature sensor. Code the automatic gearbox control unit. Operational check of DSG automatic gearbox control unit. Monitoring of the DSG gears. Supply voltage.			
Test instruments Go to Print Help			

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MECHATRONIC UNIT: "FUNCTIONS"

When "Functions" is selected, six options are available, and all of these are related to the DSG gearbox control unit as follows:

- Check correct operation of the oil level and temperature sensor.
- Code the automatic gearbox control unit.
- Operational check of DSG automatic gearbox control unit.
- Checking and monitoring of the operation and adjustment of the DSG gears.
- Basic setting of DSG gearbox.
- Supply voltage.

MAINTENANCE AND REPAIR

TOWING

When the vehicle is towed, the following precautions should be observed:

- The selector **lever** should be in position “**N**”.
- It is not allowed to drive at speeds above

50km/h.

- The maximum travel distance should not exceed **50 km**.

These precautions should be adhered to since the oil pump will not operate when the engine is stopped and this lead to lack of component lubrication.

If as a result of a fault, the vehicle is moved with a gear engaged, the rotation of the wheels will provoke the movement of one of the secondary shafts. This will in turn move the corresponding primary shaft, which will drive one of the multi-disk clutch at speeds much higher than the designed limit value.

MAINTENANCE SERVICE

The DSG automatic gearbox maintenance is limited to the change of the ATF and filter every 60,000 km. (identical to other automatic gearbox models).

This also includes the system check using the VAS 5051asmentioned in the Service Technical Manual.

