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Eure!TechFLASH

THE UP-TO-DATE TECHNICAL INSIGHT IN AUTOMOTIVE TECHNOLOGY & INNOVATIONS

EDITION 15

Maintenance of automatic gear boxes

IN THIS ISSUE

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INTRODUCTION

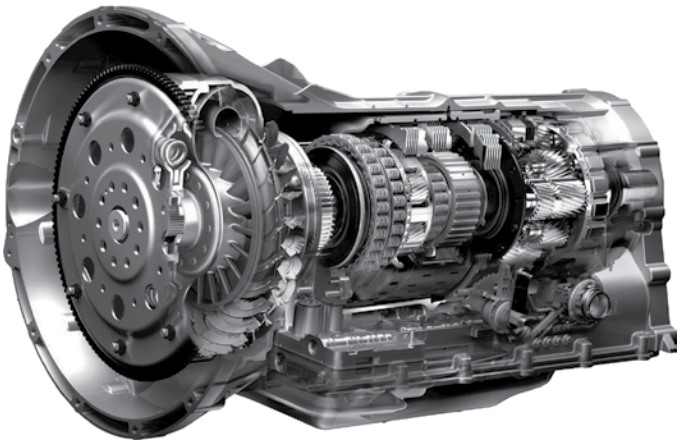
The concept of an automatic transmission or automatic gearbox is based on the ability to change gear or speed ratios automatically, without requiring the driver to do this manually using the selection lever. This means that vehicles equipped with automatic transmissions have only two pedals (brake and accelerator) and that they therefore lack both a clutch pedal and a conventional gear shift lever.

Automatic transmissions are being applied more and more commonly on the market. They were initially developed in high-end vehicles where user comfort is very important, and they are now starting to be used in the majority of models of each one of the car makes.

Today it is possible to find an endless array of vehicle models with different types of gearboxes and the respective variations of each type, thus achieving a particular use for each type of transmission. Different types of automatic transmissions currently coexist:

- Planetary gear transmission with torque converter.
- Continuously Variable Transmission (CVT).
- Robotised gearbox.
- Dual-clutch gearbox.

Each type of gearbox installed in today's vehicles is given a specific name depending on the manufacturer, such as: DSG, PDK, Multitronic, Tiptronic (VAG Group); Easytronic (GM); Steptronic (BMW); Hypertronic (NISSAN); Q-System, Selespeed (ALFA ROMEO-FIAT); Geartronic (VOLVO); PowerShift (FORD), among many other names.



Since there are many different types of transmissions on the market, each one requires periodic maintenance over the course of its operating lifetime. According to some manufacturers, maintenance is not required due to the fact that the oil is intended to last for the entire life of the transmission, while others do specify periods for replacing oil and filters.

In many cases, different adjustments or verifications need to be carried out during the period the gearbox is in use, always following the instructions of the transmission or vehicle manufacturer. The adjustments may be done mechanically or electronically, using a diagnostic machine.

Classification of automatic transmissions

The classification of automatic transmissions is complex, but they can basically be categorized as follows:

By control type:

- Analogue: the lever has a position for each one of the gear ratios.
- Sequential: may be alone or in addition to the analogue shift. Each touch of the lever or press of a button or cam on the steering wheel engages the next higher or lower gear.

By type of functions:

- Selection: the movement of the control engages the gear.
- Blocking: the control indicates which gears are blocked. For example, in a five-speed transmission, if the control is in third gear, the vehicle will not be able to change to fourth or fifth gear.

Based on the type of mechanism:

- Cylindrical gears: these are normally helical gears with synchronized gear changes.
- Planetary gear set: gear changes are made by means of brakes or clutches; the gears are always connected.
- Continuous variation: a belt moves between two opposing conical plates thanks to the inertia of the rotational speed. There is no gear change per se, but rather an infinite range of ratios between the longest ratio and the shortest.

In some cases, gearboxes may integrate several systems like the ones described above at the same time. For example, an automatic gearbox with a planetary gear set that has sequential control and a device to block access to other gears at certain times.

Traditionally, transmission multiplication or decrease is not obtained with gears in parallel, as in manual transmissions, but rather with sets of planetary gears. By means of hydraulic or electro-hydraulic control devices, one or more components of these gears is selectively immobilized, obtaining a suitable transmission ratio at all times while the vehicle is moving.

This type of transmission does not have a friction clutch, as in manual transmissions, but rather is equipped with a hydraulic clutch or even a torque converter, whose purpose is to constantly transmit the force generated by the engine to the transmission. In some cases, as in the case of dual-clutch gear gearboxes (DSG), they are equipped with multi-plate clutches in an oil bath or dry twin plate clutches.

Manufacturers of automatic transmissions

Car manufacturers use different types of gearboxes for their models. Many makes manufacture their own gearboxes based on the engines that they are going to produce. In many cases, there are specialized manufacturers of automatic transmissions who work with vehicle manufacturers. Some of the more well known include:

- Aisin Warner
- Getrag
- Jacto
- ZF

It is important to know which type of gearbox and model is installed in each vehicle. In some cases, different vehicle makes may use the same gearboxes. The table below shows a list with some of the automatic transmissions used by car manufacturers.

Manufacturer	Models of automatic transmissions
ALFA ROMEO	4HP18Q, 4HP20, 4HP22, AW50-40LE (AF14), AW55-50SN, TF-80SC - 81SC
AUDI	01J (CVT), 01M, 01N, 01V (ZF5HP19), 09E, 09G, 4HP18 FL , 4HP24A, 5HP19 (01V), 5HP19FLA (01V), 5HP24A, 6HP19A, 6HP26A (09E), 6HP28,6HP28AF (09E), 6HP32 (09E), 87, 89, 8HP55, 97, DQ250 (02E), TR-60SN (09D)
BMW	3HP22, 4HP22, 4HP24, 4L30E, 4L40E, 5HP18, 5HP19 (01V), 5HP24, 5HP30, 5L40E,6HP19, 6HP26 (09E), 6HP28, 6HP32 (09E), 6L45, 6L45R, 8HP45 \ 55 \ 70,8HP50 - 8HP75, 8HP70, RE5R01A
FIAT	4HP14, 4HP20, AL4, AW50-40LE (AF14), AW55-50SN, AW60-40LE (AF13),RE0F21A (CVT), TF-80SC - 81SC
KIA	4EAT-G (GF4A-EL), 6HP26 (09E), A4AF3, A4CF1, A4CF2, A5GF1, A5HF1, A6GF1, A6LF1/2/3, A6MF1/2/3, A750E, A8TR1, AL4, AW03-70 -72LE / LS (A40),AW03-71 -72LE \LS (A40), AW30-70LE, AW50-40LE (AF14), AW50-42LE (AF22),F4A-EL, F4A42, F4A51, F4A51- V5A51, F5A51, JF405E, RE4R01A\B, RE5R05A (JR507E)
MITSUBISHI	42RLE, 5-45RFE, A604 (40TE 41TE), AW03-70 -72LE / LS (A40), BTR4- M74LE, F1C1 (CVT), F3A22 , F4A22, F4A23 (175-177), F4A33, F4A42, F4A51, F4A51 - V5A51, F5A51, JF011E (CVT), JF506E, JF613E, KM175-177, R4A51 V4A51, R5A51 V5A51, RE4R03A, V4A51, V4AW3, V5A51, W4A32, W4A33, W4A42
NISSAN	AL4, JF011E (CVT), JF016E, JF017E, JF403E, JF404E, JF405E, JF506E, JF613E, JR403E, JR507E, JR710E (RE7R01A), JR711E (RE7R01B), RC4A-EL, RE0F06A (CVT), RE0F08A (CVT), RE0F09A (CVT JF010E), RE0F21A (CVT), RE4F03A, RE4F03A / B, RE4F04A, RE4F04A / B, RE4R01A \ B, RE4R03A, RE5R01A, RE5R05A (JR507E), RL4F03, RL4R01A
RENAULT	4HP20, AD4, AD8, AL4, AW50-40LE (AF14), AW55-50SN, JF011E (CVT), JF613E, MB1, MB3, TF-80SC - 81SC
TOYOTA	A132L / 131L, A140E / L, A240L \ E \ H, A241L, A242L, A243L, A244E, A245E , A246E, A247E, A340E / F / H, A343F / E, A40-A46DE, A42 -43 -44DE / DL, A440F, A442F, A540E \ H \ 541E, A541E, A650E, A750E, A750F, A761E / F, A960E, AB60F, TR-60SN (09D), U140E, U140F, U151E, U240E, U241E, U250E, U340E, U341E / F, U440E (AW80-40), U660E, U760E

MAINTENANCE OF AUTOMATIC GEARBOXES

There is an endless variety of automatic transmissions depending on their functioning and internal components, but in general, they all have very similar maintenance.

Maintenance must be done periodically because it is scheduled maintenance. This scheduling is determined by the manufacturer and must be done according to a certain number of kilometres travelled or a specific time. The table below shows an example of approximate maintenance periods:

Automatic gearbox with torque converter	Oil and filter replacement between 30,000 and 60,000 km
Continuously Variable Transmission (CVT)	Check the oil level every 15,000 km Oil and filter replacement every 90,000 km
Robotised gearbox	Oil and filter replacement every 60,000 km
Dual clutch gearbox (DSG)	Oil and filter replacement every 60,000 km or 8 years

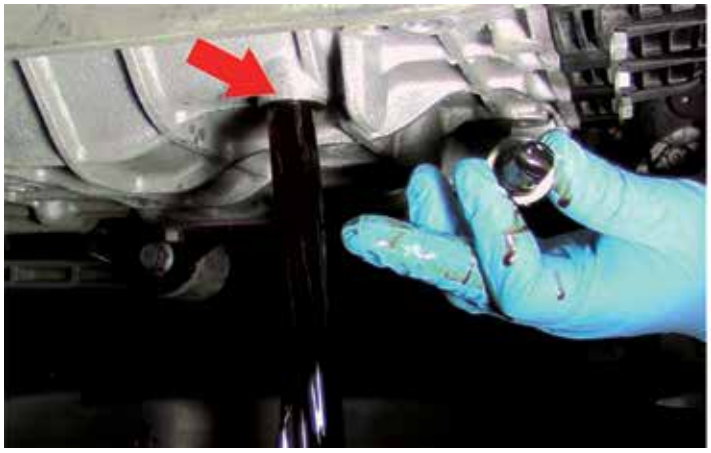
The oil in some transmissions does not need to be replaced (provided that it is in good condition), but it should be checked at the kilometre intervals specified by the manufacturer. When pulling trailers or driving in special conditions, the oil does need to be changed.

The most common maintenance is based on checking the oil level, replacing it, and replacing the filters that it uses.

Previously, when carrying out maintenance on the vehicle's gearbox, it is very important to take a road test in the vehicle in order to ensure that the gearbox is functioning correctly, and thus avoid problems or issues that could result in customer complaints later.

The technical information from the manufacturer is required to carry out any maintenance task, because this information specifies the oil capacities, the steps to be carried out, the location of replaceable elements and the tightening torque values.

Oil is drained with the engine turned off, removing a screw located in the gearbox crankcase. In some models, there is also a drain screw for the torque converter; in this case, you should look for openings in the bottom of the gearbox housing and turn the engine manually to locate the screw.



It is advisable to deposit the extracted oil in a graduated container so that you know how many litres were removed. It is also important to note the colour of the oil, because this may help detect possible anomalies in the gearbox.

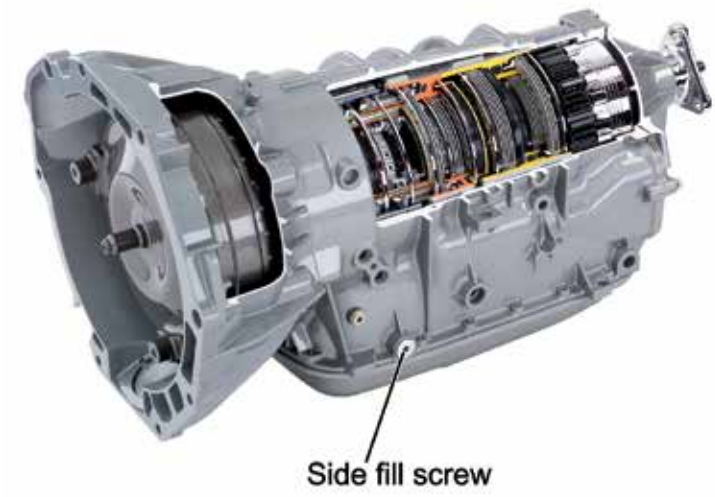
After the oil has been drained, disassemble the filter, which may be mounted externally on the housing or inside the gearbox. If it is located inside, you will need to disassemble the crankcase to access it. Some models even have the filter in the crankcase itself and the entire crankcase will need to be replaced.

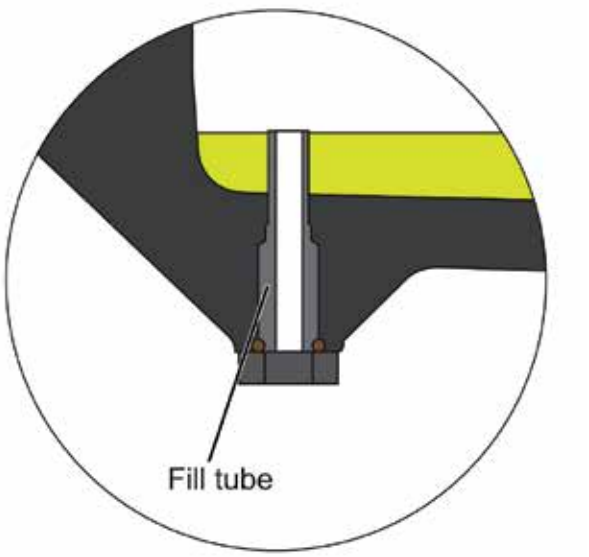
External filter

Internal filter

Filter in crankcase

Normally, oil can be refilled through the dipstick tube, a screw on the side of the gearbox, or the fill pipe located in the drain screw hole of the crankcase.





Manufacturers usually give two types of capacities:

- Total capacity:this is the total quantity of oil that the gearbox can hold; this capacity is usually filled when the gearbox is disassembled for repairs.
- Capacity of an oil change: this is the quantity of oil that must be filled in a maintenance oil change.

In the case of oil changes for maintenance, the manufacturer's specified capacity must be compared with the number of litres removed during the draining process. The amount drained should be approximately the same as the amount supplied by the manufacturer, but keep in mind that all of the oil in the circuit is never completely drained.
After the new oil has been added, check that the level is correct. To do this, start the engine and follow the manufacturer's instructions, which generally indicate that the different gear steps should be connected several times in succession.

The oil level should be checked after the oil change at the temperature specified by the manufacturer, so a diagnostic tool should be connected to determine the oil temperature.

This operation is usually done while the engine is running. If the level is checked with a dipstick, it should be between the minimum and maximum levels. If the level is checked with a side screw, the check will be done based on the overflow, until oil stops dripping. The engine should never be turned off, because the oil pump will stop working and oil will come out of the side fill hole.

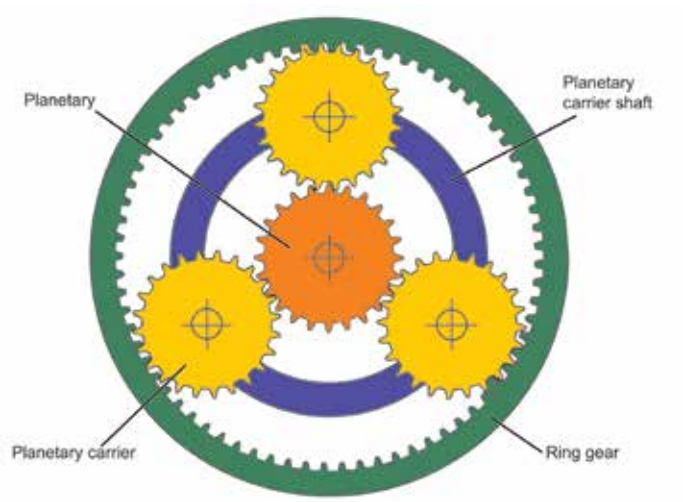
AUTOMATIC GEARBOX

Operating principle

The "classic" automatic transmission works by means of planetary gear sets. These sets are based on a series of groups of interconnected gears, with each one able to generate a different ratio. The gearbox receives the movement generated by the engine through a torque converter (upgraded hydraulic clutch).
The torque converter is basically made up of two turbines housed in a sealed oil-filled compartment. The oil is the force-transmitting element, so there is no type of friction.
Gears or speeds are managed through a hydraulic distributor, controlled by an electronic unit that distributes the control pressure to position the following elements:

- Planetary gear set
- Control element
- Overrunning
- Parking lock system
- Selector lever
- Torque converter
- Electro-hydraulic control
- Electronic transmission management

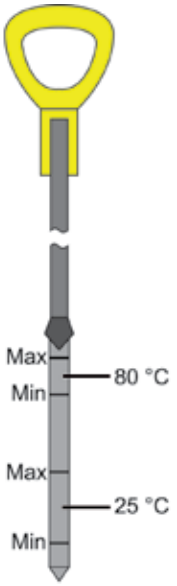
The operating principle of planetary gear sets is based on a group of intermeshed gears that rotate freely around each other. These elements are controlled by brakes or clutches that allow the total blocking of the element or the application of resistance against it. When the clutch is engaged to one of the elements to stop it, it means that the rest of the elements rotate freely around it or are even secured to it to form a block. If the the clutch is applied, it creates a difference in rotation between the incoming and outgoing force, obtaining greater multiplication or reduction in the transmission ratio.



Example of maintenance of the Mercedes 722.6 automatic gearbox

Conditions for checking the oil level

The oil level is checked with the lever in the **"P"** or **"N"** position and the engine running.
The dipstick is only available to the technical service and is not incorporated as part of the vehicle. It has two measurement ranges, the closest to the end would be the cold measurement **(25 ºC)** and the other would be the hot measurement **(80 ºC)**.



Changing the oil and filter

This is recommended every 60,000 kilometres. The prerequisites are the following:

- Engine turned off.
- Vehicle on a level surface.
- Move the shift lever to the "P" position.
- Remove the covering of the bottom of the engine compartment.

Carry out the following steps to correctly change the oil:
Raise the vehicle on a lift for visual inspection. During the inspection, look for signs of oil leaks or any other anomaly that may have occurred while driving the vehicle. Remove the drain plug located in the crankcase.

In early versions, there is an oil drain plug for the converter, so turn the engine over with a key (manually) until the cover is located, if the car is equipped with one. If so, remove all of the oil that cannot be drained through the crankcase.

When the oil is completely drained, disassemble the crankcase. It should be noted that drops of oil will continue to drip from the entire valve box during disassembly. If there are any metal shavings or excessive worn material from the disks in the lubricant, you will observe a dark grey paste on the bottom of the crankcase or even on the magnet.

To remove the filter element, proceed as follows:

1. Unscrew the crankcase screws and remove the metal wedges holding the crankcase.
2. Remove the magnet from the oil crankcase.
3. Clean the magnet by removing the abrasion waste.
4. Remove the oil filter.

To put it back in place:

1. Remount the filter element.
2. Put the magnet in its housing and change the crankcase seal.
3. Install the crankcase and then tighten all of the screws to **20 Nm**.

Oil for the change and capacities

The original oil from the manufacturer is shown below:

- **MB236.10.** Automatic Transmission Fluid (ATF).
- **Reference: A 001 989 2103.** This fluid is manufactured by the DaimlerChrysler AG brand (Mercedes Group).
- **Equivalence:** ATF Dexron III

The capacities for the oil change are the following:

- Total capacity or completely empty: **9.2 litres.**
- Capacity of an oil change: **7 litres.**

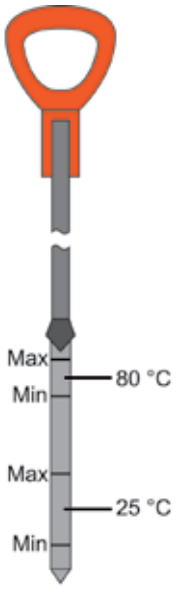
Oil level monitoring and filling

Fill the gearbox oil by carrying out the following steps indicated by the manufacturer:

1. Insert the crankcase plug/screw and tighten to **8 Nm**.
2. Add approximately **5 litres** of oil through the fill tube, removing the plug.
3. Add oil while the gearbox is **cold**.
4. Start the engine and allow it to idle briefly in the **"P" gear**.
5. Slowly add the remaining quantity of oil.
6. Apply the service brake and connect the gear steps briefly in succession, with the vehicle stopped and the engine idling, and then move the gear lever to **"P"**.

To correctly check the oil level after the oil change, carry out the following steps as indicated by the manufacturer:

1. An exact check can only be done when the gearbox oil is at a temperature of 80 °C.
2. Connect the **diagnostic tool** and **check the temperature of the gearbox oil** in the **"R"** or **"D"** gear position, pressing the service brake.
3. Insert the **oil level dipstick** all the way into the oil fill tube and pull it out to read the gearbox oil level.
4. The gearbox oil level should be between the **"min."** and **"max."** marks when the temperature reads **80 °C**.



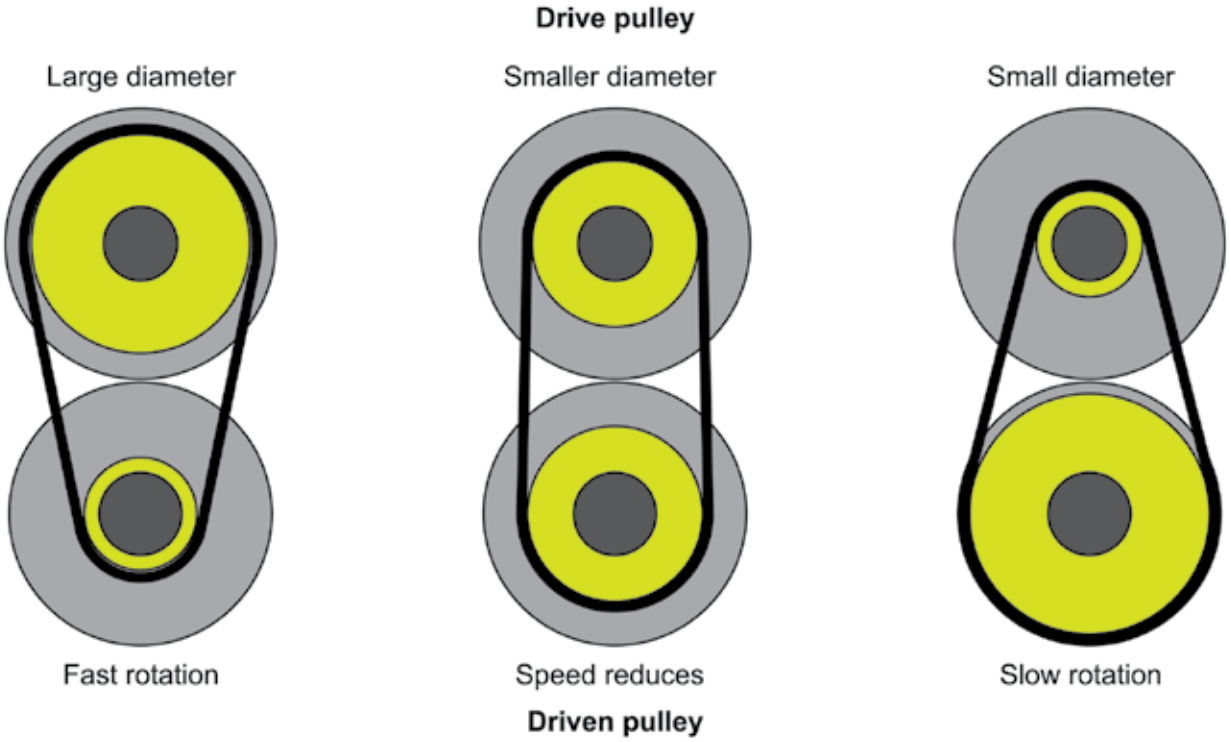
CONTINUOUSLY VARIABLE TRANSMISSION (CVT)

This is a type of gearbox that can change continuously through endless ratios within the values pre-established by the manufacturer without generating steps while the vehicle is moving. This means that there is no interruption of forward motion each time a gear is to be selected in the gearbox; this is the most similar option to a variable transmission in a motorcycle or scooter.

The CVT is based on the principle of transmission by pulleys. It consists of two pulleys connected by a belt or chain.

The first pulley is connected to the engine (drive) and the other pulley to the drive shaft (driven). The pulleys are made up of two moving cone-shaped plates that open and close, varying the distance between them. When the opening or closing of the plates is controlled, the effective interior diameter changes and different transmission ratios are obtained.

The transmission of force between the two pulleys is done by means of a belt, so that when the diameter of the pulleys changes, the transmission ratio also changes progressively, either multiplying or decreasing the torque output of the engine.Each one of the diameter ratios that the pulleys can adopt corresponds to a different transmission ratio, and for that reason, this type of transmission can develop infinite speeds.



Example of maintenance of the JATCO RE0F10A CVT

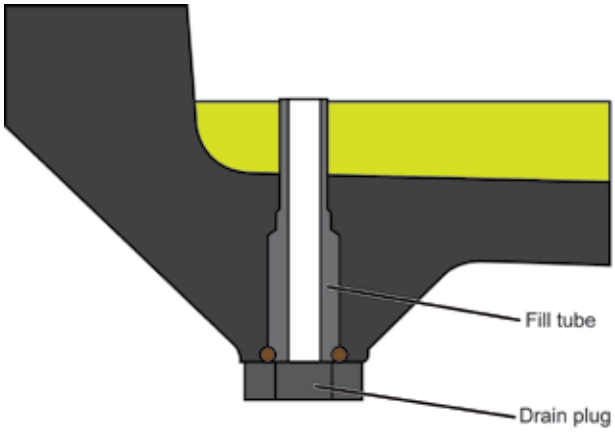
Changing the oil and filter

The oil in the gearboxes does not need to be replaced (provided that it is in good condition), but **it should be checked every 15,000 km**. When **pulling trailers or driving in special conditions, the oil is changed every 90,000 km**.

The oil filter does not need to be replaced unless the oil or gearbox have suffered some type of degradation. Even so, **changing it every 90,000 km** is recommended.

In order to drain the gearbox oil, the oil must be hot. Then carry out the following steps indicated by the manufacturer:

1. Remove the **drain plug** and then drain the oil from the CVT through the crankcase.
2. Install the fill tube.
3. Fill the gearbox with CVT fluid to the specified level.
4. Start up the engine and heat up the gearbox oil. It will take approximately 10 minutes for the CVT fluid to heat to a temperature of **50 °C - 80 °C**.
5. Check the CVT fluid level and its condition, removing the drain plug.



Oil for the change and capacities

The original oil of the make is **original NISSAN NS-2 CVT fluid** and the capacities will depend on the type of traction:

- For 2WD models: **8.5 litres**.
- For 4WD models: **9.5 litres**.

AUTOMATED GEARBOX

Operating principle

The automated (piloted or robotized) gearbox is based on a manual gearbox, but without the need to be controlled by the driver of the vehicle. When driving the vehicle, the driver does not have to change the speeds or press down the clutch pedal for it to operate correctly.

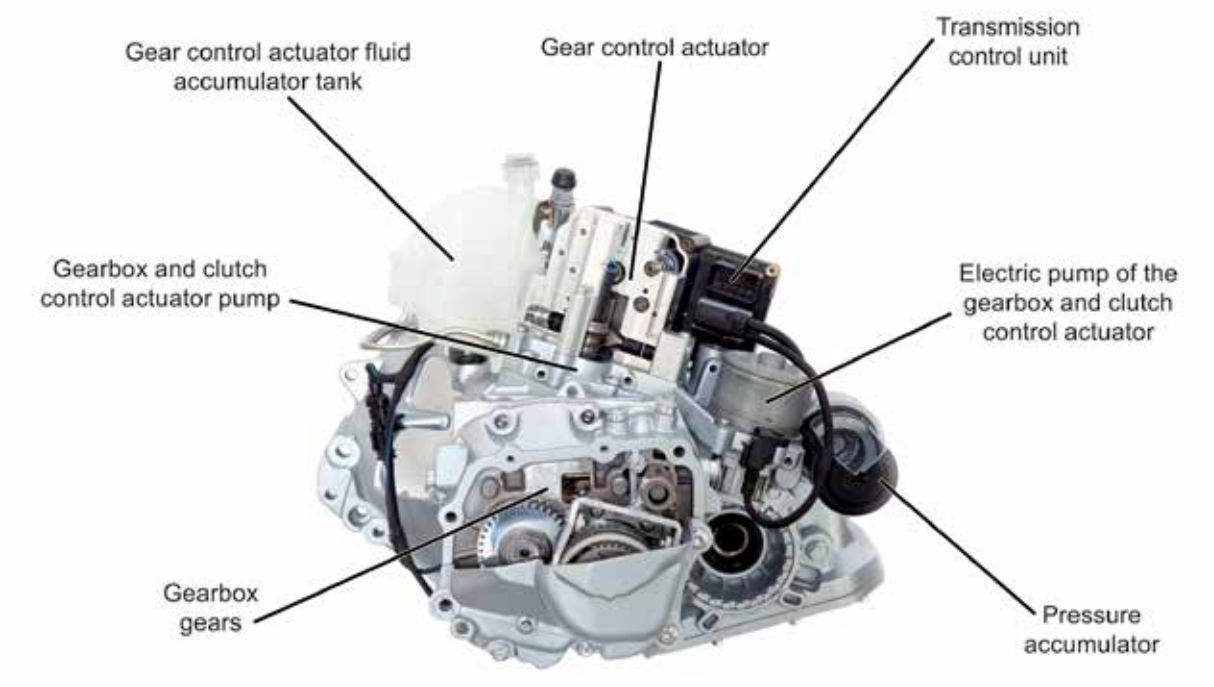
The gearbox functions like any automatic gearbox. The only difference is the operating principle of the internal mechanisms.

In terms of users, there is no clutch pedal and there is a lever with different operating modes. The user can select the operating mode depending on the driving situation or use.

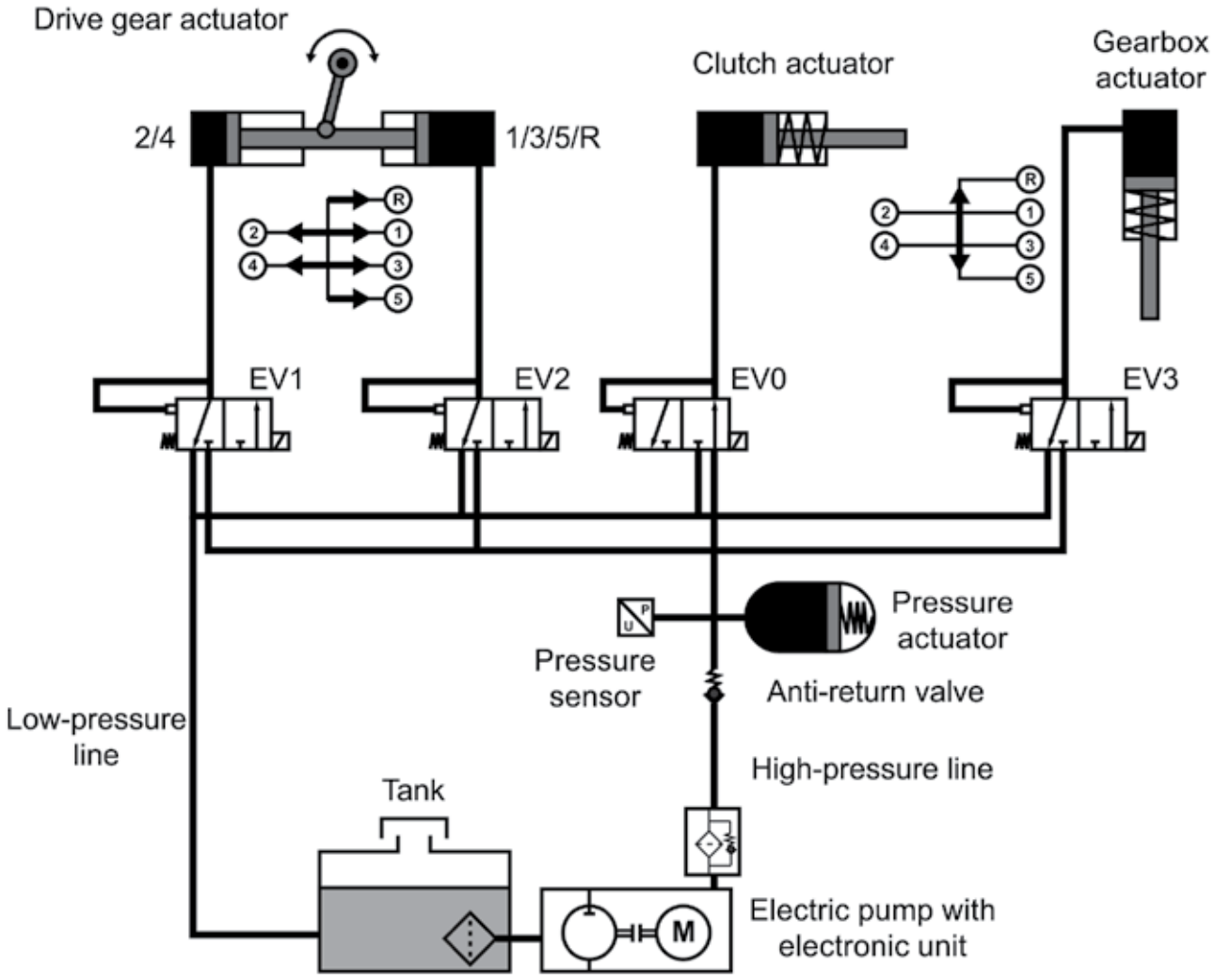
The gear lever can be used manually (sequential mode) or allowing the transmission to function completely automatically. The vehicle's instrument panel indicates the operating option at all times.

In order to select the gears and engage the clutch, a hydraulic system with solenoid valves and actuators can be used, or a system with electric motors and gears.

Regardless of the actuation system, the elements are managed by a control unit that is responsible for controlling the different command functions for the actuators based on the received signals, either from other units (engine, brakes, steering, etc.) or from the gearbox itself.



The figure below shows a hydraulic diagram of the operation of the gear management system of the **Easytronic MTA** (Manual Transmission Automatically Shifted) robotized transmission.

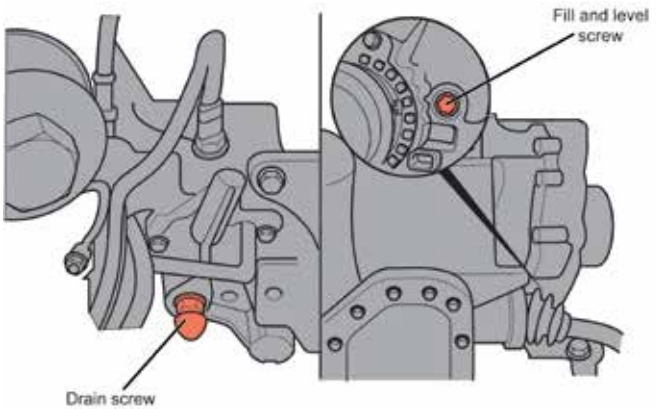


Example of maintenance of the Easytronic MTA automated transmission

For the maintenance of this type of gearbox, remember that they are manual transmissions with an automatic gear selection system, so they use the same lubricating oils for the gears as manual transmissions. Gearboxes with hydraulically driven movement of the clutch and gears use an exclusive oil that is totally independent from the oil that is used in the gears.

The Easytronic MTA robotized gearbox is used by OPEL and it is the F17-5 manual gearbox with an electronically-managed hydraulic system to select gears and engage the clutch.

In normal vehicle use, the lubricant in this gearbox does not need to be changed. If it is changed, the manufacturer recommends "Castrol BOT 303 Mod" or "SAE 70W" lubricant, with a total capacity of 1.6 litres. The oil is drained through a screw located on the bottom. Filling is done through a side screw close to the outlet to the half-shaft. The level is checked by overflow in the same fill opening.



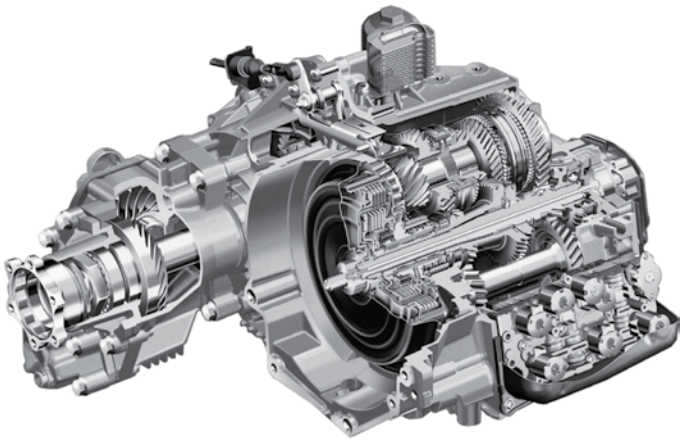
The fluid used to manage the gears that is recommended by the manufacturer is **NewGen F17MTA-System**, with a maximum capacity of **0.4 litres**. To change the oil and bleed the gear management circuit, use a proper diagnostic tool.

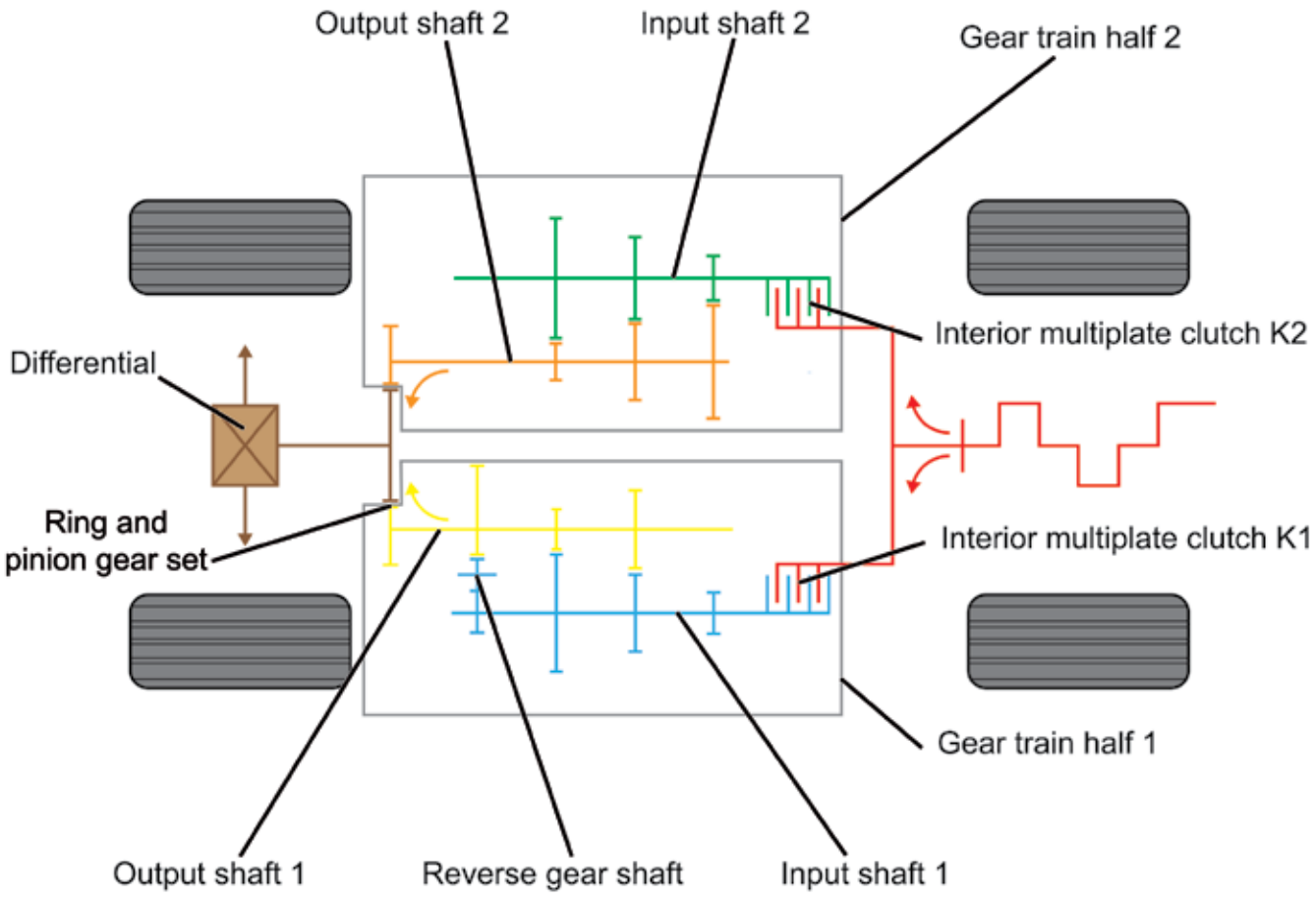
DUAL-CLUTCH GEARBOX

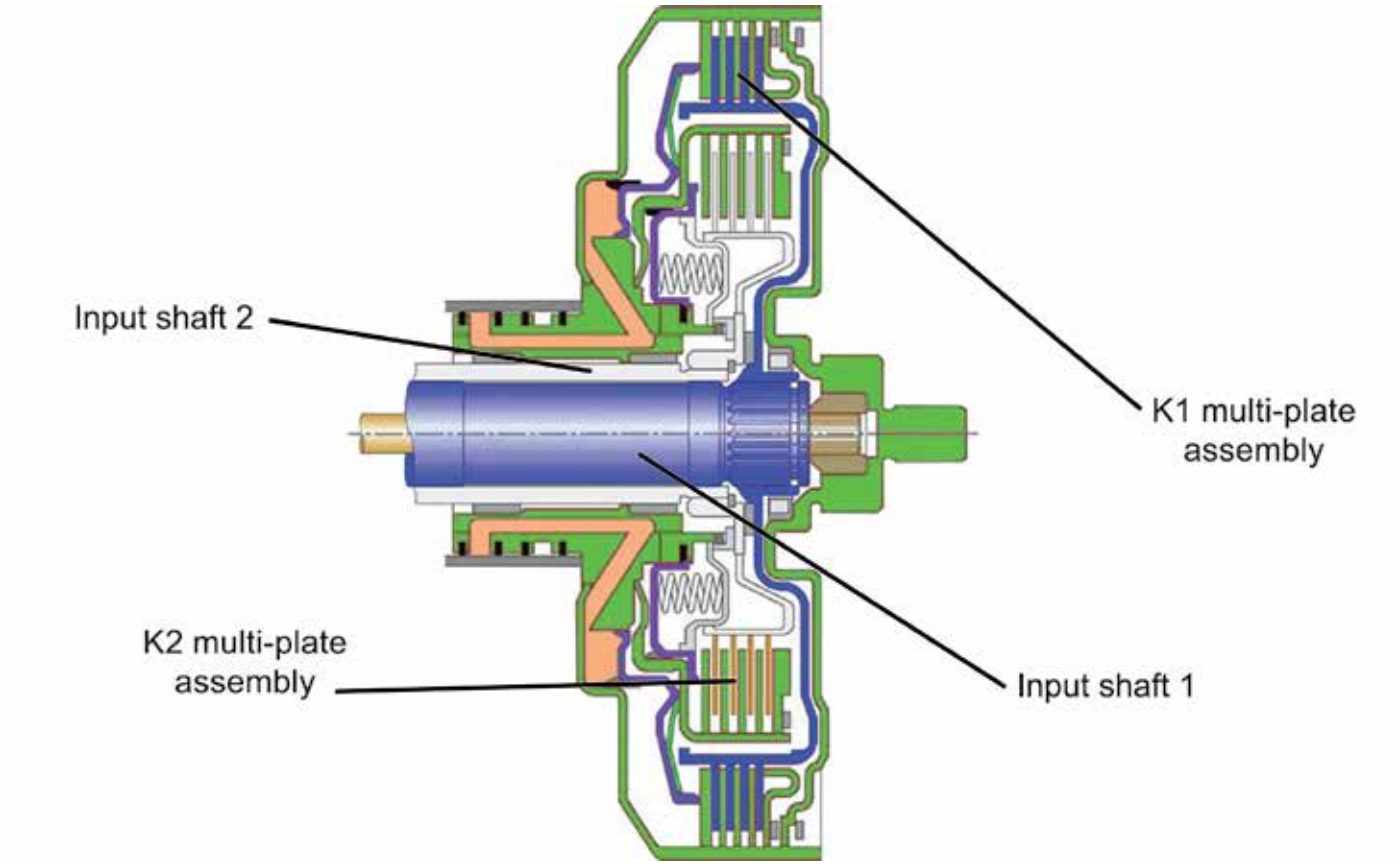
Operating principle

This transmission is used by the VAG group with the name DSG (Direkt-Schalt-Getriebe). There is also the PowerShift model manufactured by Getrag.

The dual-clutch transmission essentially consists of two intermediate transmissions operating in parallel, each with its own clutch. Thanks to the distribution of the intermediate shafts, one of which has the ratios of 1st, 3rd and 5th, and the other has the ratios of 2nd, 4th, 6th and reverse, the subsequent changes can be prepared by pre-selecting the next speed while in motion and at full power. The gear change takes place by changing from one clutch to the other, and is coordinated by the automatic gearbox control unit.





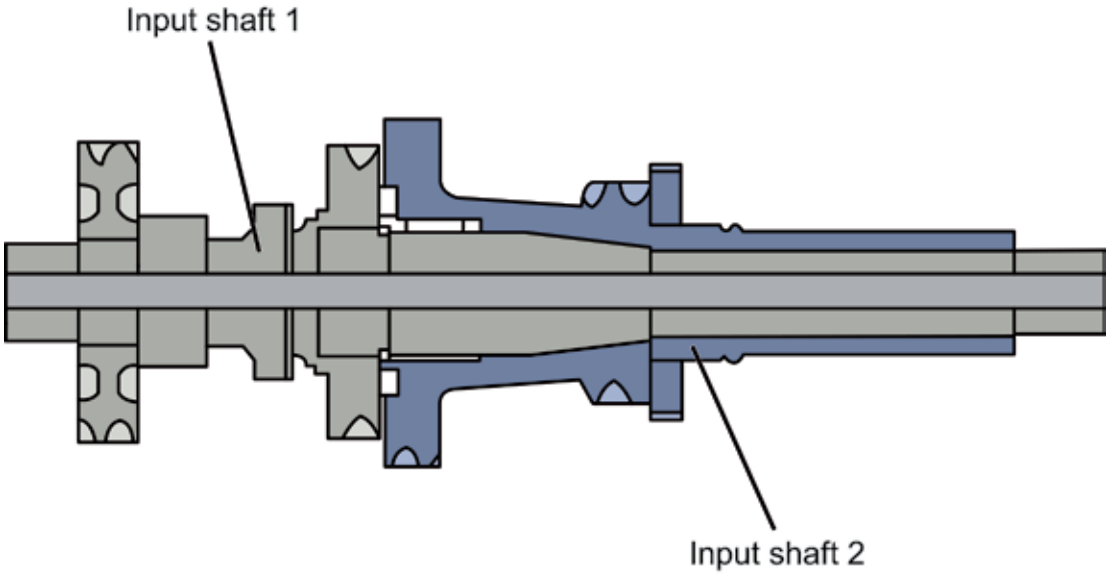


Each gear train half consists of an input shaft and another secondary tree, as well as its own multi-disk clutch.
The assembly is formed as follows:

- Gear train half 1 is made up of the input shaft 1, secondary tree 1 and the K1 multi-plate clutch. (Odd speeds).
- Gear train half 2 is made up of the input shaft 2, secondary tree 2 the intermediary shaft for the reverse inverter gear and the K2 multi-plate clutch. (Even speeds).

The K1 multi-plate clutch transmits the torque to input shaft 1 in order to be able to engage gears 1, 3, 5 and reverse from this shaft. Since the torque that is transferred in 1st gear and reverse is greater than the torque transferred in the other speeds, the K1 clutch has been arranged as the exterior clutch because this makes it possible to give it a larger diameter and thus better conditions for transferring torque and power.

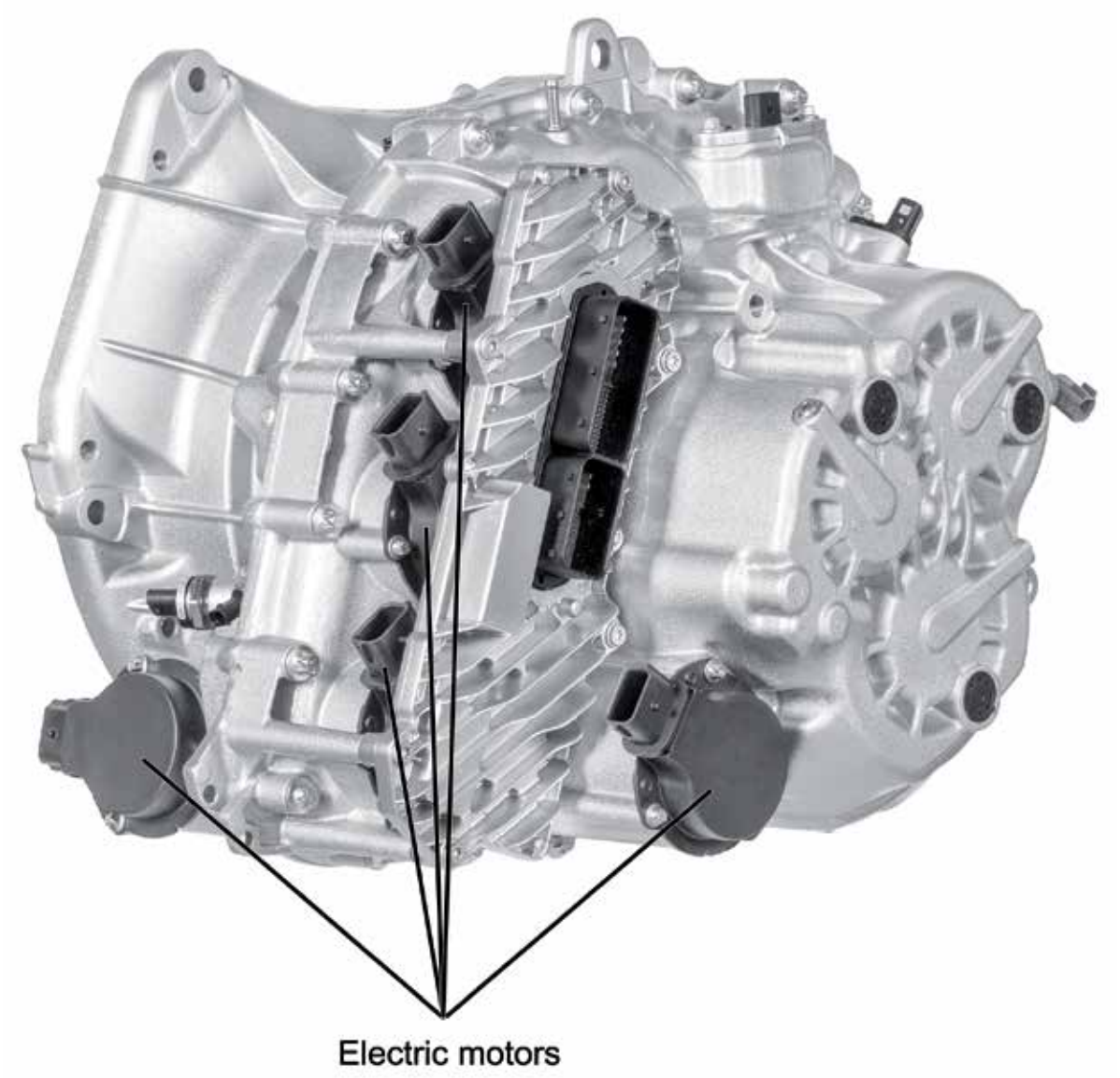
The K2 multi-plate clutch transmits the torque to input shaft 2. It receives the movement of the K2 multi-plate clutch (interior clutch) and is responsible for engaging 2nd, 4th and 6th gear.



Input shafts 1 and 2 are arranged concentrically (coaxial). Input shafts 1 and 2 distribute gear selection by odd and even gears, which allows for a much more robust, compact and lightweight construction of the transmission assembly.

In DSG transmissions, each one of the clutches is engaged by rods that move the thrust collars of the clutches. Speeds are changed by selector forks. All of this is driven by hydraulic fluid that is managed by a control unit and different solenoid valves.

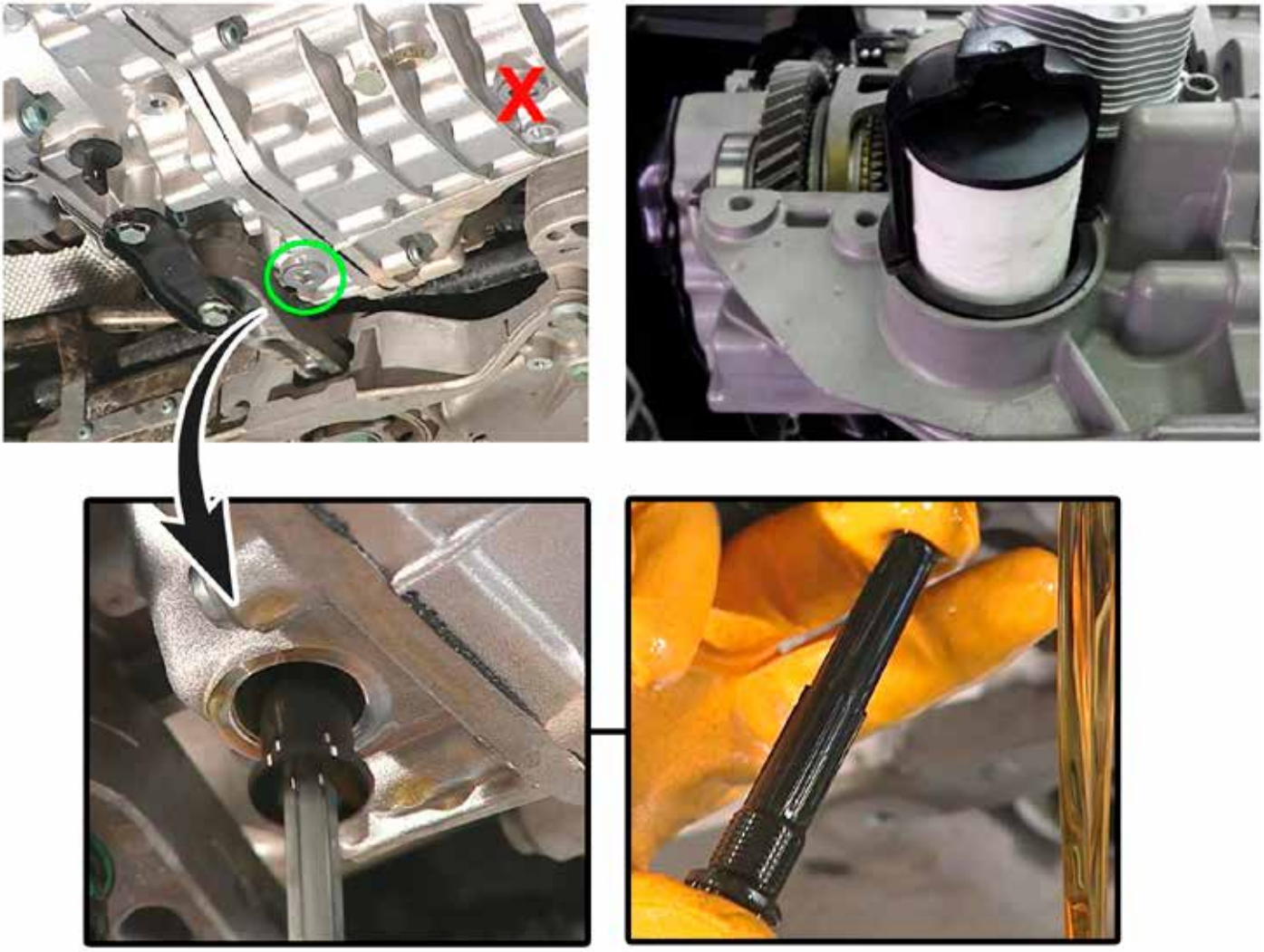
In the case of the PowerShift transmission, the clutches are moved and the speed changes are made by rods and forks, but the movement is provided by electric motors that are also managed by a control unit.



Example of maintenance of the DSG 02E 6-speed transmission

The oil and oil filter should be changed every 60,000 km. The total oil capacity is 7.2 litres, but for maintenance, the quantity of oil that is removed is 5.2 litres. The manufacturer recommends using VAG G 052 182 oil.

When changing the oil, first make sure that the temperature is less than 50°C by using a diagnostic tool. If it is lower, you can remove the drain screw and the level cannula to remove the oil. The filter is located at the top of the gearbox. Remove the filter housing which is screwed directly onto the gearbox housing.



After you have drained the oil and replaced the filter, reinstall the level cannula and then screw on the oil-fill tool and add 5.5 litres of oil. After filling, remove the tool, collect any oil that may have overflowed, and when it stops dripping, hand-tighten the screw.

To check the level, start the engine, press the brake, and move the gear selection lever through each position at 3-second intervals.

When you have moved the lever through all of the positions, put it in the “P” position and use a diagnostic tool to verify that the oil temperature is between 35 and 45 °C; if it is higher, allow the oil to cool. With the engine running, remove the drain screw only and allow the surplus oil to drip out. Once it stops coming out, replace the screw. If oil does not flow out, add 1 litre of oil through the breather tube and repeat the operation. The level is correct when the oil starts to overflow.

COMMON FAILURES

The most common malfunctions in automatic transmissions are normally due to insufficient maintenance. Failure to respect the oil change frequency may cause the oil to deteriorate or drop in level, leading to malfunctions in internal hydraulic components. The following are the most common malfunctions in the different types of automatic transmissions:

Malfunctions in the torque converter

The most common symptom of malfunctioning of a torque converter is vehicle vibration; this normally becomes more noticeable at maximum acceleration between 80 and 100 km/h, and disappears if acceleration continues.

To solve the problem, the torque converter should be repaired or replaced.

Malfunctions due to improper gearbox maintenance

If the fluid level is low, the oil pump draws air along with fluid, causing bubbles inside the hydraulic circuit. This in turn reduces the hydraulic pressure, causing slow speed changes and slipping of the clutches and brakes.
If the oil level is too high, the gears beat the fluid into foam, causing the same conditions that are produced when the fluid level is too low.

The use of incorrect fluid can cause not only poor quality in the execution of gear changes, but can also lead to damage and even rupturing of the transmission.
The oil recommended by the manufacturer should be used and the correct quantity should be added to the gearbox. If any of the internal components of the gearbox break, they should be replaced or repaired.

Slipping in clutch packages

The clutch packages become worn with use because their function is to engage and disengage. Over time, this wear causes excessive slippage of the clutches, and consequently poor engagement of the speeds.

It is important to respect the maintenance schedule and use the oil recommended by the manufacturer. If any of the internal components of the gearbox break, they should be replaced or repaired.

Malfunctions in electronic management

Any error in the measurement of the sensors or the electro-hydraulic module that controls the opening of the valves will cause the gearbox to go into emergency mode.

To solve the problem, check the malfunction log and repair or replace the elements affected inside the gearbox.

Solenoid valve failures

The most common symptoms are: emergency mode with malfunction codes related to the solenoid valves and knocking when changing gears. This knocking generally occurs when engaging and disengaging the gear.

In case of a malfunction, check the memory log with a diagnostic tool and repair or replace the damaged elements of the gearbox.

Oil pump failure

If the oil pump fails, it does not deliver hydraulic pressure and cannot transmit the different gears or reverse.
Check the electronic management system, verifying the internal pressure values and determine the condition of the pump in order to decide whether to repair or replace it.

Burning odour

If the transmission oil becomes overheated, it can generate this odour. Using oil other than the recommended oil can also cause these symptoms and effects. In all cases, the quantity and type of oil recommended by the manufacturer must be respected.

Overheating is normally caused by lack of maintenance and failure to change the oil before it degrades. When the oil is not changed on time, it loses its properties and friction increases on the metal parts of the gearbox causing an increase in temperature.

TECHNICAL NOTES

This section describes the most common malfunctions in relation to the mechanical components and electronics of automatic transmissions. Depending on the manufacturer and the different models, the number of faults occurring over the years may vary.

These faults are selected from the online platform: www.einavts.com This platform has a series of sections that specify: make, model, line, system affected, and subsystem, which can be selected independently depending on the desired search.

VOLKSWAGEN

VW CADDY III Station wagon (2KB, 2KJ) 1.6 TDI (CAYD)	
Symptoms	Transmission fault warning light on. Dashboard warning message: Gearbox malfunction. Fault codes recorded in the transmission control unit. The vehicle displays one or more of the aforementioned fault codes. The following symptom is observed in the workshop: - After starting the engine and selecting the ¨D¨, ¨R¨ or ¨TRIP¨ from the ¨P¨ position, the vehicle does not move and the aforementioned message is displayed or the transmission malfunction light turns on. NOTE: The code P72C may appear in combination with the P073A or the P072D or also in combination with P073B or P2711. NOTE: This technical note only affects those vehicles equipped with DSG gearboxes (DQ200, 0AM, 0EG) with 7 speeds and dry clutches. NOTE: This newsletter only affects those vehicles that are within a specific production date.
Cause	Software defect in the transmission control unit.
Solution	Repair procedure: • Read the fault codes reported by the transmission control unit with the diagnostic tool. • Confirm that one or more of the fault codes mentioned in the symptom field of this note are recorded. • Confirm that the symptoms indicated in the symptom field of this note occur. • Re-program the transmission control unit with updated software.

NISSAN

NISSAN QASHQAI (J10, JJ10) 2.0 dCi (M1D), NISSAN MURANO (Z50) 3.5 4x4 (VQ35DE), NISSAN QASHQAI (J10, JJ10) 1.5 dCi, NISSAN QASHQAI (J10, JJ10) 1.5 dCi, NISSAN QASHQAI (J10, JJ10) 1.6 (HR 16 DE), NISSAN QASHQAI (J10, JJ10) 2.0 dCi A las 4 ruedas (M1D), NISSAN X-TRAIL (T31) 2.0 (MR20DE),NISSAN X-TRAIL (T31) 2.0 (MR20DE), NISSAN X-TRAIL (T31) 2.0 FWD (MR20DE),NISSAN X-TRAIL (T31) 2.0 FWD (MR20DE), NISSAN X-TRAIL (T31) 2.0 dCi (M9R 760),NISSAN X-TRAIL (T31) 2.0 dCi (M9R), NISSAN X-TRAIL (T31) 2.0 dCi FWD (M9R),NISSAN X-TRAIL (T31) 2.5 (QR25DE), NISSAN MURANO (Z51) 3.5 (VQ35DE),NISSAN MURANO (Z51) 3.5 4x4 (VQ35DE), NISSAN MURANO (Z51) 3.5 4x4 (VQ35DE)	
Symptoms	Vibration in the vehicle. Loss of traction to the wheels. Malfunction indicator lamp (MIL) on. Vehicle in low power or emergency mode. NOTE: This technical note only affects those vehicles equipped with CVT automatic gearboxes. NOTE: The symptoms described in this note occur when driving on muddy roads or roads that are in poor condition.
Cause	Defect in the belt of the CVT automatic gearbox. When travelling on roads that are in poor condition, the wheels apply more force on the CVT, which could cause slight slippage of the belt. Continuing to drive in these conditions may cause dirt to be generated by the friction between the pulley and the belt, affecting the functioning of the CVT's control valves and reducing the oil pressure of the system.
Solution	Repair procedure: • Disassemble the CVT gearbox • Check the condition of the CVT pulley • Check the condition of the CVT belt • Replace the CVT automatic gearbox if these two components are found to be in poor condition.

MERCEDES-BENZ

All models	
Symptoms	2783 - Lock-up clutch of the torque converter, excessive wear. 0741 - Lock-up clutch of the torque converter, activation not possible. Fault codes recorded in the gearbox control unit. The vehicle displays one or more of the aforementioned fault codes. Poor acceleration. NOTE: This newsletter only affects those vehicles equipped with an automatic transmission.
Cause	Possible causes: • Excessive wear of the torque converter bearing bushing. • Internal leaks of the ring seal between the input shaft and the torque lock-up clutch.
Solution	Repair procedure (for 271 engines): • Read the fault codes reported by the gearbox control unit with the diagnostic tool. • Confirm that one or more of the fault codes mentioned in the symptoms field of this note are recorded. • Confirm that the symptoms indicated in the symptom field of this note occur. • Delete the fault codes reported by the transmission control unit with the diagnostic tool. • Reprogram the gearbox control unit with the updated software. • Carry out a basic adjustment of the torque converter with the diagnostic tool. Repair procedure (for other engines): • Read the fault codes reported by the gearbox control unit with the diagnostic tool. • Confirm that one or more of the fault codes mentioned in the symptoms field of this note are recorded. • Confirm that the symptoms indicated in the symptom field of this note occur. • Rectify the input shaft with sandpaper for micro-finishing. • Replace the torque converter. • Carry out a basic adjustment of the torque converter with the diagnostic tool. • Delete the fault codes reported by the transmission control unit with the diagnostic tool. • Carry out a second reading of the fault codes on the gearbox control unit with the diagnostic tool and confirm that the fault codes mentioned in the symptom field of this technical note are NOT displayed. • WARNING: The following should be taken into account when replacing the torque converter: • Eliminate possible metal shavings in the torque converter housing on the crankshaft. • Clean the torque converter housing on the crankshaft with brake-cleaning detergent. • Grease the torque converter support before installing it.

BMW

BMW X3 (E83) 3.0 i (M54 306 S3), BMW X3 (E83) 3.0 sd (M57 306 D5)	
Symptoms	Improper operation of the gearbox. There is a delay in the start of motion when the D speed range is selected. NOTE: This technical note only affects those vehicles equipped with an automatic gearbox A5S 390R (GM5). NOTE: This newsletter only affects those vehicles equipped with a specific type of engine.
Cause	Defective internal mechanism of the gearbox.
Solution	Replace the gearbox with a modified version.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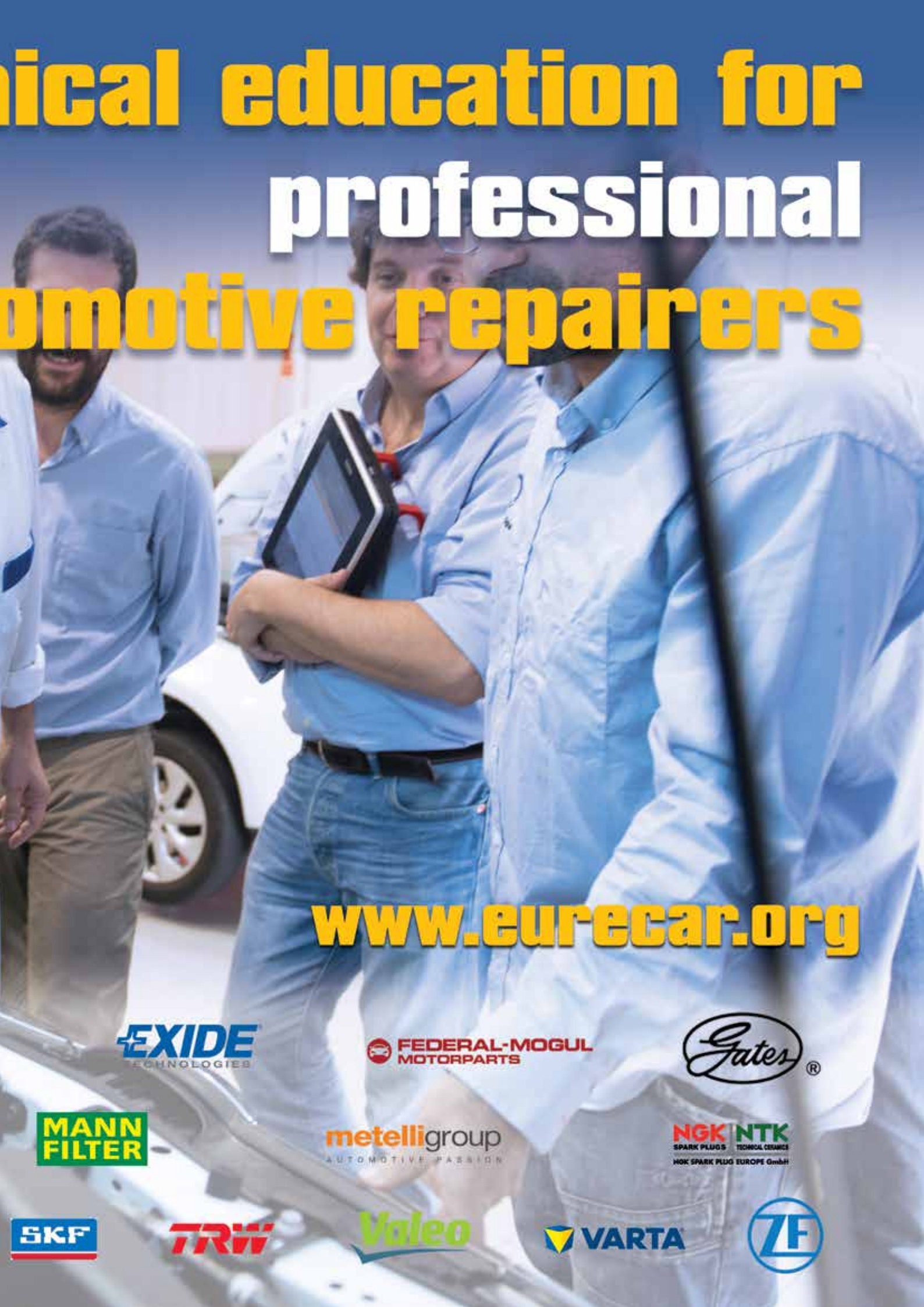
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