LuK Repair Solution for Dry Double Clutches

Technology / Failure Diagnosis
Special Tool / Removal and Installation Guidelines

7-Speed Transmission OAM in Audi, Seat, Skoda and Volkswagen

SCHAEFFLER
AUTOMOTIVE AFTERMARKET

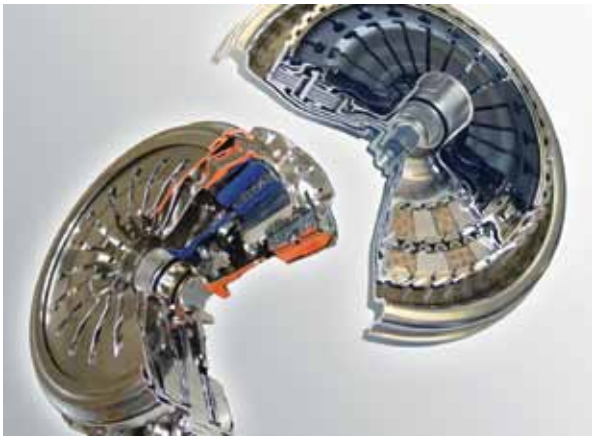
LuK INA FAG

Contents

1 What is a double clutch transmission?

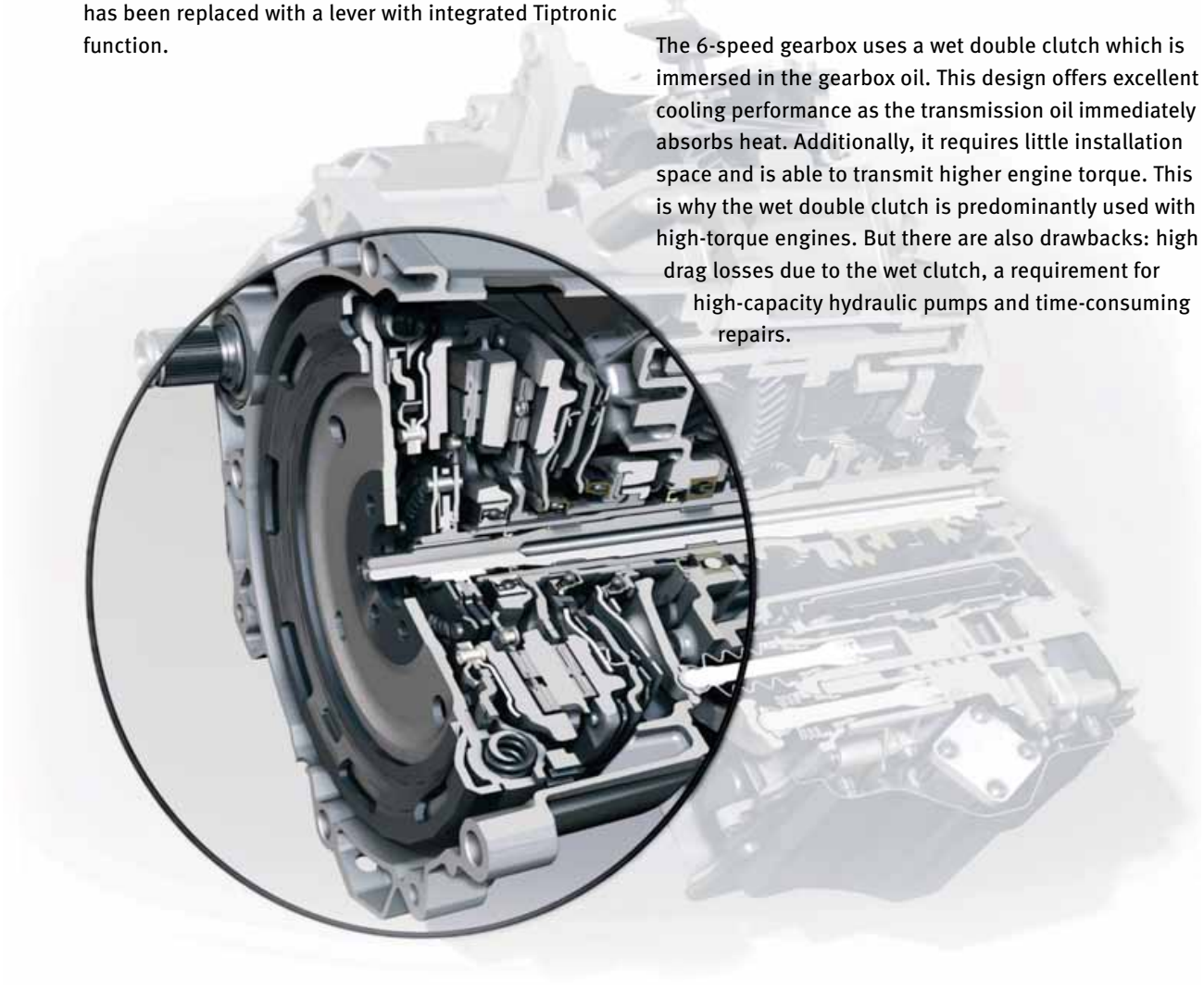
For several years the double clutch transmission (DCT) has been used in volume production at the Volkswagen Group. Since 2003 a number of successive models have been equipped with the 6-speed version which features a wet double clutch. Since 2008, models with engine torque of up to 250 Nm have been equipped with the new 7-speed DCT with dry double clutch.

State-of-the-art transmission concepts are designed to incorporate the advantages of automatic manual gearboxes. Automatic transmissions offer superb driving comfort thanks to automated gear shift and uninterrupted traction while manual transmissions are sporty, fun and economical. Both the 6-speed and 7-speed versions of the DCT offer these benefits. The DCT is an automated shift gearbox featuring two gear sets which operate independently of each other, thereby enabling fully-automatic gear shift without traction interruption. There is no clutch pedal, and the conventional gear lever has been replaced with a lever with integrated Tiptronic function.



And this is how it works:
Both the dry and wet versions have two gear sets and two clutches. Each of the clutches is assigned a gear set. They are operated alternately when changing gears, making traction interruption a thing of the past.

The 6-speed gearbox uses a wet double clutch which is immersed in the gearbox oil. This design offers excellent cooling performance as the transmission oil immediately absorbs heat. Additionally, it requires little installation space and is able to transmit higher engine torque. This is why the wet double clutch is predominantly used with high-torque engines. But there are also drawbacks: high drag losses due to the wet clutch, a requirement for high-capacity hydraulic pumps and time-consuming repairs.



Like conventional single-disc clutches the dry double clutch of the 7-speed DCT is also located in the gearbox housing. There are no drag losses as it is not oil-immersed, which increases engine and fuel efficiency compared to wet double clutches. It also makes repairs less complex.

This brochure deals only with the dry LuK double clutch as used in the transmission 0AM by Audi, Seat, Skoda and Volkswagen.

The benefits of the double clutch system at a glance

- Combines the ease of an automatic transmission with the responsiveness of a manual gearbox
- Similar to automatic transmissions except for excellent efficiency
- No power interruption during torque transfer
- Improved fuel efficiency
- Reduction in CO_2 emissions

2 Design and operating principle of the dry double clutch system

Three core components make up the double clutch system: dual mass flywheel (DMF), double clutch and engagement system. These components are controlled by the gearbox mechatronics which comprise the electronic control unit and the electro-hydraulic control unit. The mechatronic system is housed in the gearbox, which consists of two gear sets operating independently of each other.

During operation the mechatronic system processes the following information:

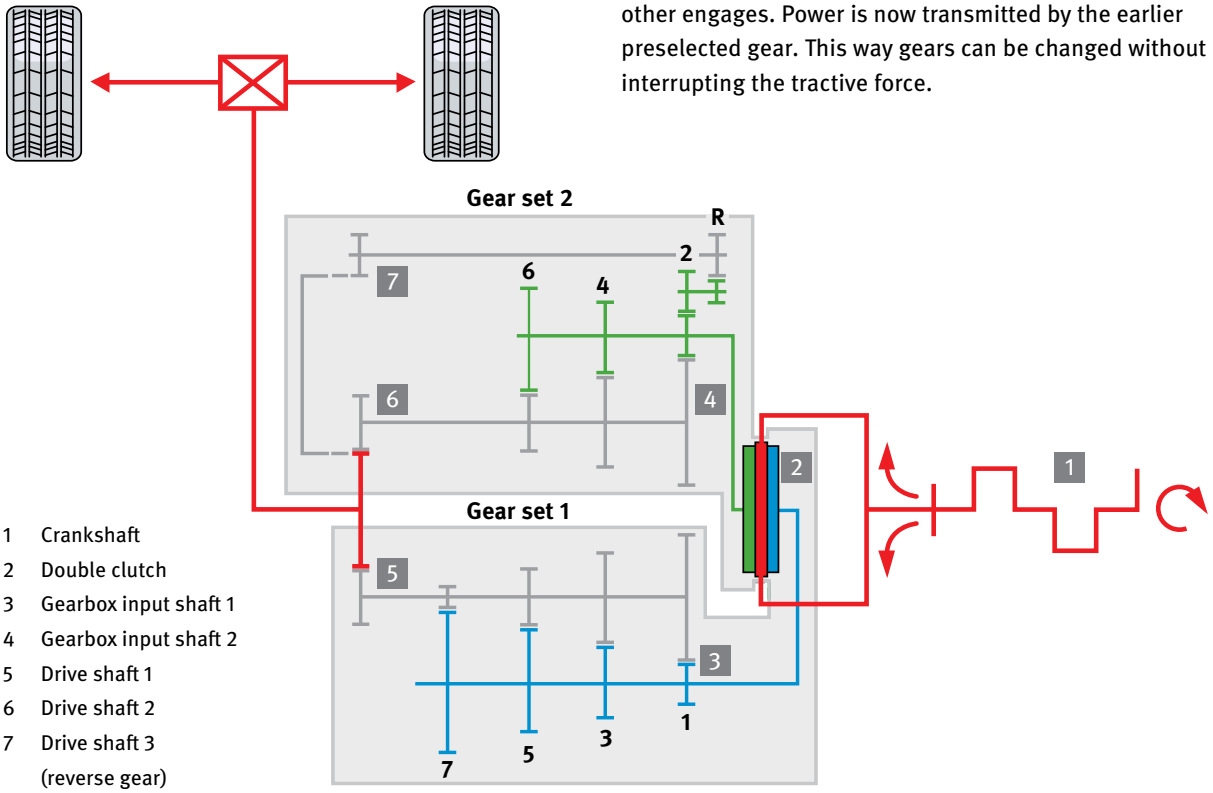
- Transmission input rotational speed
- Input shaft speed of both transmissions
- Wheel speed and road speed
- Gear lever position
- Accelerator pedal position (acceleration or deceleration)

1 Dual mass flywheel
2 Double clutch
3 Engagement system

Using this data, the vehicle mechatronics anticipate the next gear to be selected and engage it by means of gear actuators and shift forks. Two positioning cylinders, one each to actuate the engagement levers, open and close both clutches.

The system is configured such that both clutches are disengaged during engine downtime and idling. They are engaged only when the engagement levers are actuated. During operation one clutch is always engaged, thereby ensuring continuous power transmission by one gear set. The next gear is already preselected by the other gear set whose clutch is still disengaged. To change gear one clutch disengages while simultaneously the other engages. Power is now transmitted by the earlier preselected gear. This way gears can be changed without interrupting the tractive force.

Gearbox schematic



1 Crankshaft
2 Double clutch
3 Gearbox input shaft 1
4 Gearbox input shaft 2
5 Drive shaft 1
6 Drive shaft 2
7 Drive shaft 3 (reverse gear)

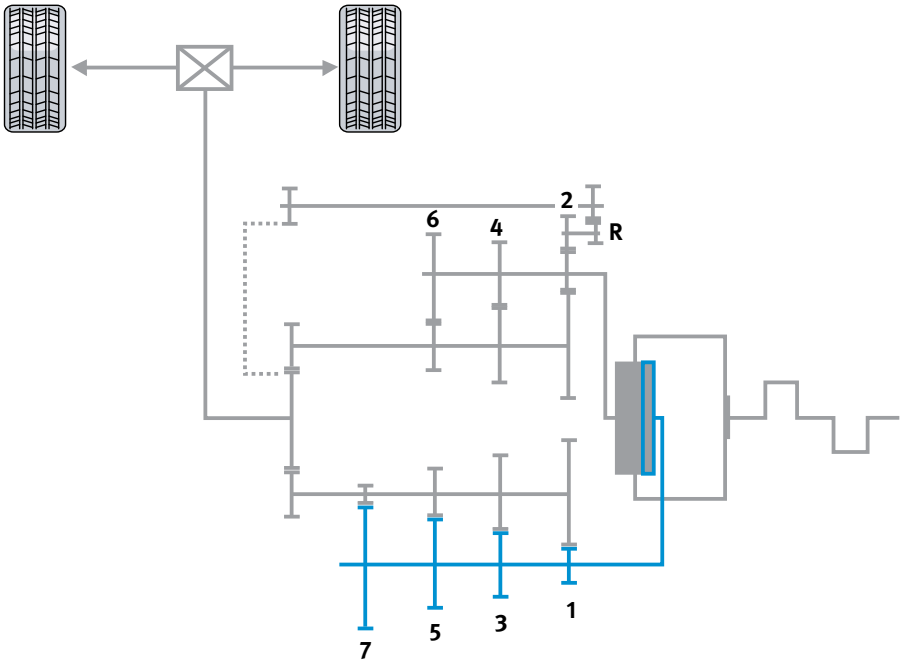
2.1 Double clutch

Operating principle

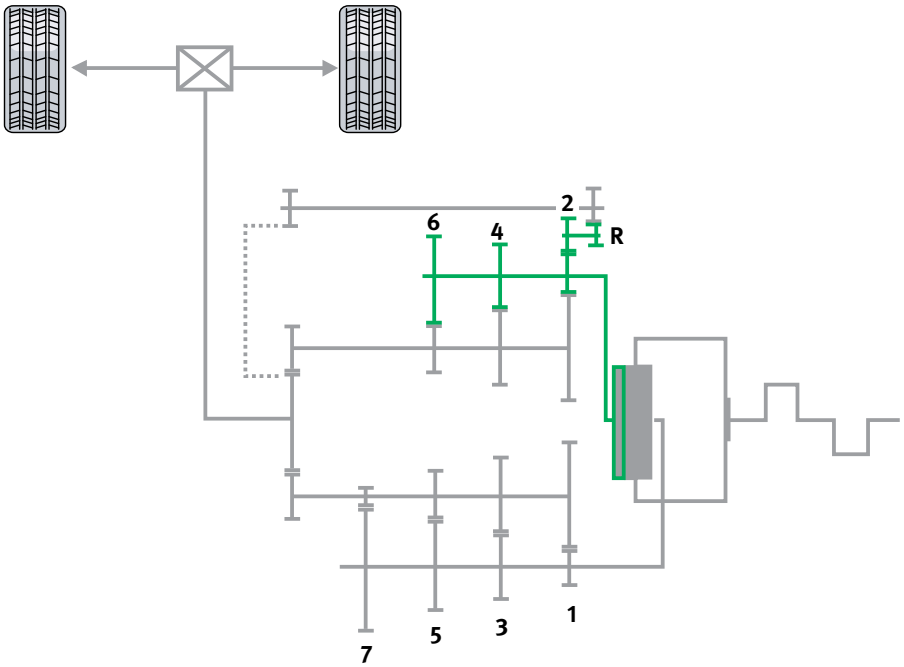
Each gear set of the 7-speed double clutch gearbox functions similarly to a manual gearbox. Each gear set is assigned one clutch. Both clutches are positioned on two nested gearbox input shafts, the outer hollow shaft and the inner solid shaft.

The first, third, fifth and seventh gears are engaged using Clutch K1; torque is transmitted to the gearbox by the solid shaft. The second, fourth, sixth and reverse gears are engaged using Clutch K2; torque is transmitted to the gearbox by the hollow shaft.

Clutch K1
The K1 clutch operates gears 1, 3, 5 and 7.



Clutch K2
The K2 clutch operates gears 2, 4, and 6 and reverse gear.



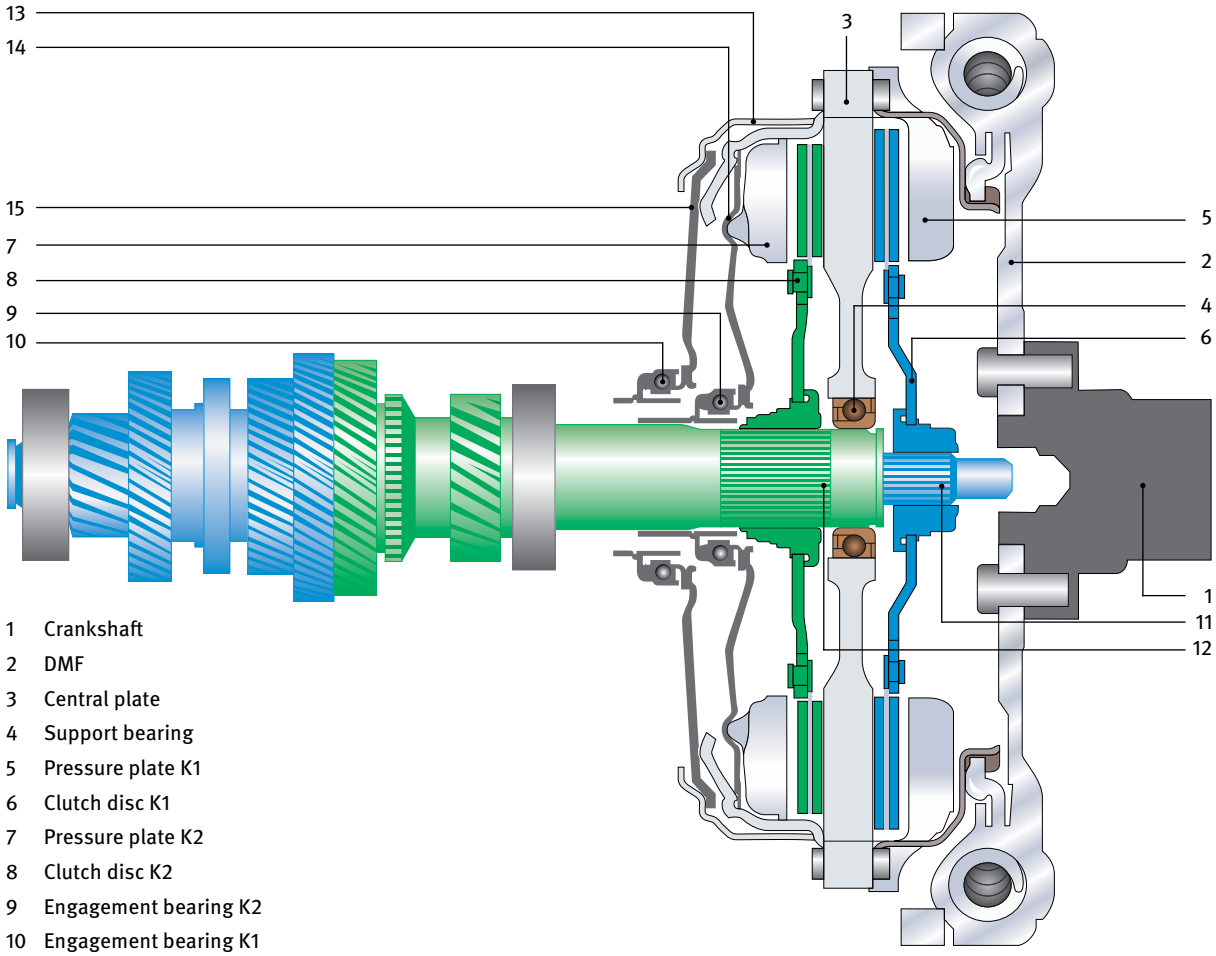
2.1 Double clutch

Design

1 Drive ring with pressure plate for K1
2 Clutch disc K1
3 Central plate
4 Clutch disc K2
5 Pressure plate K2
6 Lever spring with self-adjusting device for K2
7 Clutch cover with self-adjusting device for K1
8 Lever spring K1
9 Retaining ring
10 Stop ring

The central plate is the core component of the clutch. It is mounted on the hollow shaft by means of a support bearing. It is connected to the DMF, and consequently to the engine by means of the drive cover and spline.

With one of the clutches engaged, torque is transferred via the clutch disc to the corresponding gearbox input shaft.

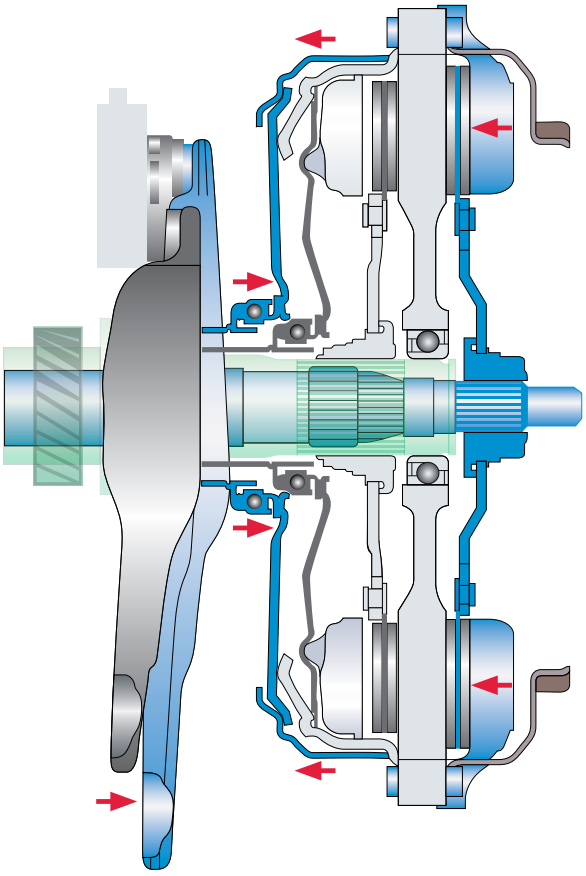


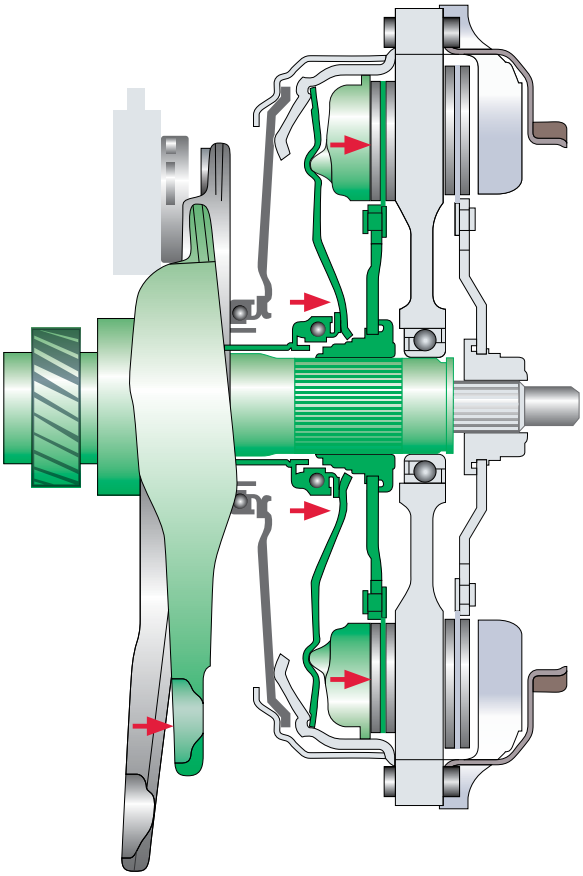
1 Crankshaft
2 DMF
3 Central plate
4 Support bearing
5 Pressure plate K1
6 Clutch disc K1
7 Pressure plate K2
8 Clutch disc K2
9 Engagement bearing K2
10 Engagement bearing K1
11 Gearbox input shaft 1 (solid shaft)
12 Gearbox input shaft 2 (hollow shaft)
13 Retaining ring
14 Diaphragm spring K2
15 Diaphragm spring K1

Function

To drive in first, third, fifth or seventh gear, the mechatronic system actuates the large engagement lever. Clutch K1 is engaged and power is transmitted to the solid shaft. When driving in an “odd” gear, the mechatronic unit selects the next higher or lower gear and waits for clutch K2 to engage.

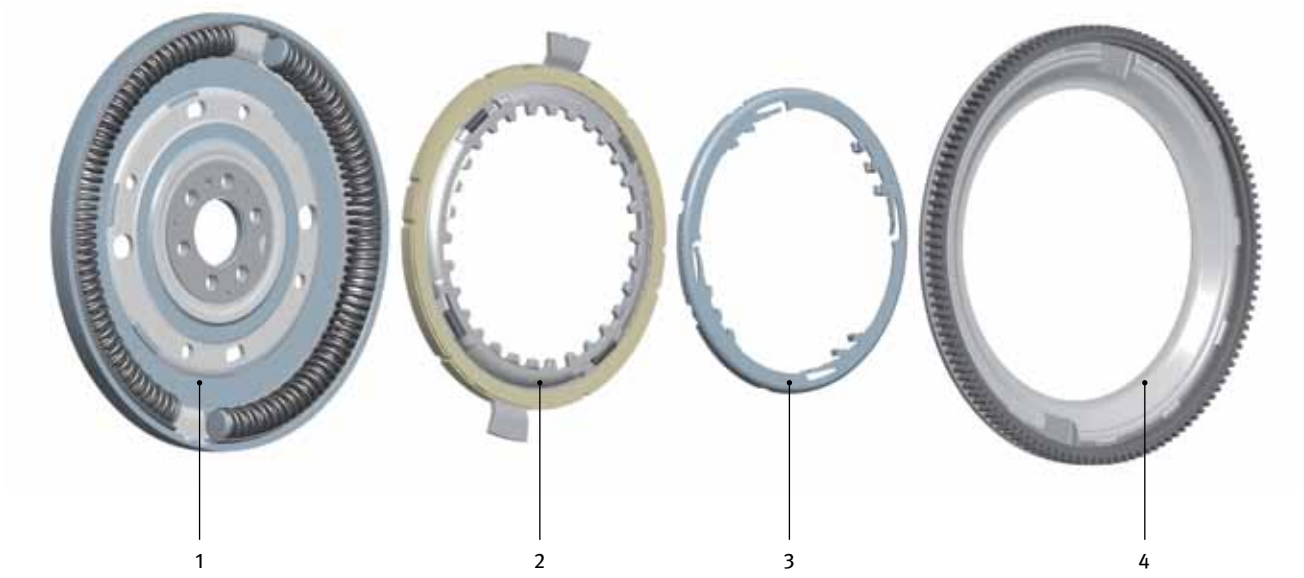
To drive in second, fourth, sixth or reverse gear the large engagement lever is pulled back, which disengages clutch K1. Simultaneously the mechatronic system actuates the small engagement lever. Clutch K2 engages and allows torque to be transferred to the hollow shaft.





- The pushing motion of the large engagement lever is transformed into pulling motion by means of pivot points.
- Pressure plate 1 is pulled towards the central plate to engage clutch K1.
- To engage clutch K2 the small engagement lever pushes pressure plate 2 against clutch K2.

2.2 Dual mass flywheel



1 Primary mass with arc springs
2 Flange with internal toothing to engage with DC drive ring gear
3 Clamp ring
4 Primary mass closing plate with starter ring gear

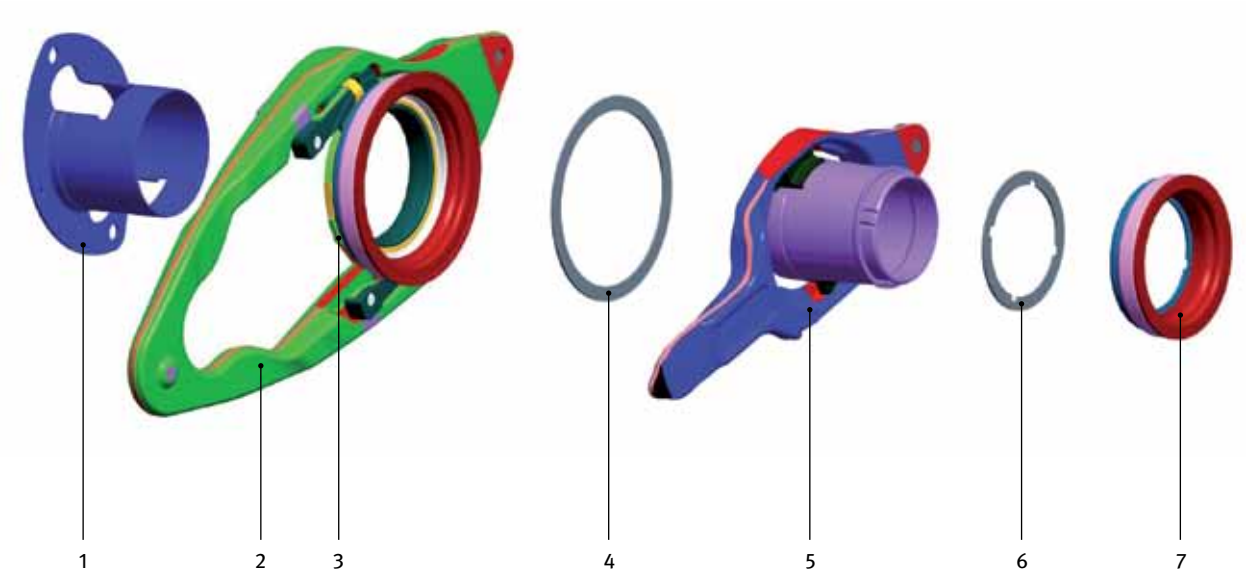
The flywheel used on the DCT is a special version of the LuK dual mass flywheel. Similarly to the DMF used in conventional manual transmissions its mass is split into a primary and secondary mass. Contrary to a conventional DMF, however, the secondary mass of the special version is not designed as an integral flywheel mass but as a flange. Its only purpose is to connect the primary mass to the double clutch. The function normally performed by the secondary mass is taken on by the double clutch mounted on the hollow shaft. This eliminates the need for direct support of both masses, which is usually realised by means of ball bearings or plain bearings on conventional DMF designs.

Unlike a conventional DMF the secondary mass of the special version lacks a friction surface which is also integrated in the double clutch. The central plate provides the friction surfaces for both clutches. The DMF friction surface was substituted with a flange with inner teeth which engages with the drive ring gear of the double clutch. To prevent noise from tooth backlash between the toothed rings a clamp ring is used which generates sufficient preload of the toothed rings to prevent flank clearance.

Functioning principle of the DMF
Engine torque is applied to the DMF's primary mass. The internal damping system absorbs rotational irregularities and torque is passed onto the clutch via the secondary mass.

Note:
More detailed information on the DMF and its operating principle can be found in the LuK "Dual Mass Flywheel" brochure.

2.3 Engagement system



1 Guide sleeve for K1 engagement bearing
2 Large engagement lever
3 Engagement bearing for K1
4 Adjusting shim clutch K1
5 Small engagement lever with guide sleeve for K2
6 Adjusting shim clutch K2
7 Engagement bearing for clutch K2

On a manual transmission with single-disc clutch, the clutch is engaged in the idle state. Pressing the clutch pedal disengages the clutch and interrupts power transmission. This is the function of the release system.

In contrast, the clutches of a DCT are disengaged in the idle state. Actuating the engagement levers engages the clutches. This is why the system is called the engagement system.

The engagement system comprises two engagement levers (2) and (5) operating independently of each other and two engagement bearings (3) and (7) one to actuate each of the clutches. The engagement levers are locked in position by two guide sleeves. The adjusting shims (4) and (6) are positioned above or beneath the engagement bearing; their task is to compensate for axial tolerances of adjacent components.

Functioning principle of the engagement system
By means of two pushrods the mechatronic system alternately actuates the engagement levers and corresponding engagement bearings. During operation the engagement levers are supported by the counter bearing, thereby pushing each engagement bearing towards the corresponding diaphragm spring. The respective clutch is engaged. An integrated self-adjusting mechanism compensates for clutch disc wear. This way, pushrod travel is kept constant throughout their entire service lives.

3 Troubleshooting double clutch failure

3.1 General repair guidelines

Before proceeding to any repair work on the double clutch, ask your customer some basic questions to pinpoint possible causes of damage.

If the car is roadworthy, carry out a test drive together with your customer. The customer should be behind the wheel and pointing out problems occurring during operation.

Ask your customer some targeted questions:

- What exactly does not work, what exactly is the customer's complaint?
- When did the problem first occur?
- Did the problem manifest itself suddenly or gradually?
- When does the problem occur?
  → from time to time, often, always?
- Under which operating conditions does the problem occur?
  → e.g. while driving off, accelerating, decelerating, when the vehicle is cold or at operating temperature?
- What is the mileage of the car?
- Are there extraordinary load conditions under which the vehicle operates?
  → e.g. towing, overloading, taxi, frequent uphill driving, fleet vehicle, rental car, driving school?
- What is the driving profile?
  → city traffic, short distance/overland, long-distance?
- Have there been previous transmission/clutch repairs?
  → if yes, at what mileage, for what reason, what repairs were carried out?

General vehicle inspection

Check the following prior to starting repair:

- Fault codes stored in the control unit (engine, gearbox, clutch, comfort, CAN BUS).
- Battery power.

Professional handling of the DMF and double clutch

The following instructions provide important information on the correct handling of the DMF and double clutch:

- Do not install a DMF and/or double clutch which has been dropped.
- Do not clean the components in a parts washing machine.
- Do not disassemble the components.

Double clutch, engine side

Double clutch, gearbox side

3.2 Wear test

A wear test can be performed in addition to a general function test of the double clutch. To do so, adhere to the following procedure:

1. Ensure engine is at operating temperature
2. Test drive car in manual shift mode
3. When in sixth gear maintain engine speed between 1,000 and 1,500 rpm
4. Then give full acceleration (CAUTION: do not activate kickdown)
5. Observe tachometer
6. If speed varies by up to 200 rpm under acceleration, double clutch wear limit has been exceeded
7. If speed remains constant, double clutch has not yet reached wear limit
8. Repeat test steps 3-7 while in seventh gear

3.3 Visual inspection

As a rule, always check the clutch system environment for leakage and defects before carrying out clutch repair work.

Before replacing the clutch merely on suspicion of malfunction, remedy any damage caused by broken off parts or oil leakage due to defective seals or seal rings.

Replace clutch if contaminated with oil.

3.4 Noise

To investigate complaints of noise coming from the double clutch environment it is essential to determine during the test drive whether noise is caused by adjacent components, e.g. the exhaust system, heat shields, engine mounts, front-end accessories etc.

To pinpoint the noise source turn off the radio, air conditioning and ventilation systems. You may also use a stethoscope at the garage.

3.5 Disengagement problems and clutch slip

Before removing the gearbox and clutch, perform a system check using an appropriate diagnostic tester. If no defect can be identified and other causes can definitely be ruled out, disengagement problems and clutch slip may result among other things from incorrect end float at clutches K1 and K2. If the problems manifest themselves immediately after the clutch was replaced, the engagement system may have been set incorrectly (refer to page 26 onward) and the procedure must be repeated.

3.6 Diagnosis

The gearbox and clutch electronics (mechatronics) are diagnosable. The system can be read using suitable diagnostic equipment.

System adjustments, which are required after every clutch repair, can also be configured this way.

3.7 Symptoms

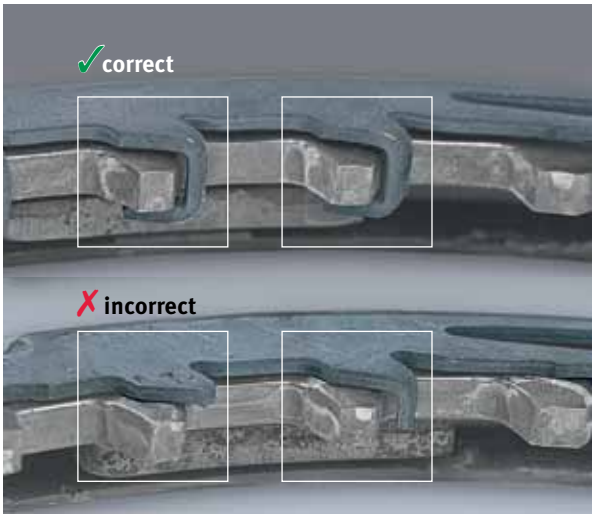
DMF clamp ring

Problem
- Rattling

Cause
- Clamp ring retaining lug broken off

Remedy
- Replace DMF

Caution:
Broken parts of the clamp ring may have entered the double clutch. Therefore it is highly recommended that the double clutch be replaced as well!

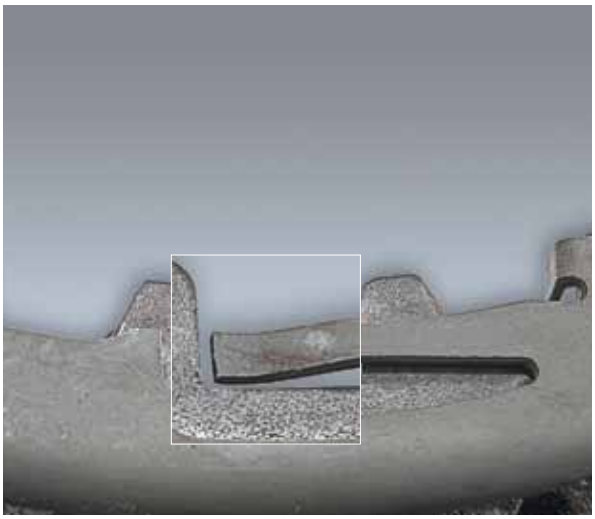


DMF clamp ring

Problem
- Rattling

Cause
- Clamp ring preload insufficient. There must be no visible distance between clamp ring and drive ring tooth. Force exerted by internal spring must be high enough to push clamp ring back into basic position

Remedy
- Replace DMF



4 LuK RepSet® 2CT – description and contents

The LuK RepSet® 2CT (Twin Clutch Technology) contains all components required for the replacement of the double-clutch system. As a rule, all parts of the system must be replaced.

Mixing used parts with new components from the LuK RepSet® 2CT is not permissible. Non-observance can lead to system malfunction and damage.

1 Double clutch
2 Large engagement lever for K1 including engagement bearing and guide sleeve
3 Small engagement lever for K2 including guide sleeve
4 Engagement bearing for K2
5 Pilot bearing
6 Counter bearing
7 Snap ring
8 Bracket
9 Fastening screws
10 Adjusting shims for K1
11 Adjusting shims for K2
12 Closing plug

5 LuK special tool – description and contents

Using special tools is an absolute must to ensure correct removal and installation of the double clutch. To uninstall the double clutch remove it from the gearbox shaft; to re-install the clutch press it on the shaft. In addition, the clutches K1 and K2 must be set correctly using special shims. To ensure correct system set-up the use of a special tool is mandatory.

Part # 400 0240 10

Note:
For any questions concerning ordering the special tool case (Part # 400 0240 10) please call our Service Center on: +49 (0) 1801 753-333.

1 Cross beam with spindle and pressure piece
2 3 knurled-head screws
3 3 threaded bolts M10, 101 mm long
4 3 threaded bolts M10, 161 mm long
5 Support bush for removal
6 Pressure sleeve for assembly
7 Reference gauge 32.92 mm
8 Reference gauge 48.63 mm
9 Weight 3.5 kg
10 Setting gauge for reference gauge
11 3 puller legs
12 3 spring loaded clamps
13 Circlip pliers, angled
14 Blanking plugs
15 Dial gauge with stand
16 Magnet
17 Pulling hooks
18 DVD with removal/installation instructions and training video

6 Double clutch assembly and disassembly

LuK RepSet® 2CT training DVD

The training video “LuK RepSet® 2CT 7-Speed Transmission 0AM in Audi, Seat, Skoda and Volkswagen” gives step-by-step instructions on the removal and assembly procedures of the double clutch using the LuK Special Tool.

The video film is included as a DVD in the LuK Special Tool Case. This DVD can also be ordered using order number 999 6003 500.

In addition, the training video is available for download at www.RepXpert.com as well as at www.schaeffler-aftermarket.com.

6.1 Repair guidelines

These guidelines apply to:
7-speed double clutch gearbox 0AM used on models from Audi, Seat, Skoda and Volkswagen

Pre-fitted with:
LuK RepSet® 2CT, ref.: 602 0001 00, 602 0002 00

Using:
LuK special tool, ref.: 400 0240 10

Important notes:

- Only assign trained and skilled personnel and use appropriate garage equipment to perform DCT repairs.
- Due to the vehicle manufacturer's continuous efforts to refine volume production components, repair procedures (e.g. set values) and special tools to be used are subject to change.
- Ensure to use the most current repair instructions and appropriate special tools prior to repair.

Up-to-date information and instructions can be found at:
www.schaeffler-aftermarket.com or
WWW.REPXPERT.COM

- If transmission oil leaks during repair, drain the oil completely. Refill transmission with 1.7 l of oil specified by vehicle manufacturer. If oil leaks from the mechatronic unit, it must not be refilled or replaced. In this case the entire mechatronic unit must be replaced according to the specifications of the manufacturer.
- When replacing the clutch, it is strongly recommended to perform a functional check of the dual mass flywheel and replace it if necessary. Pay particular attention to the teeth and clamp ring. Refer to chapter 2.2 to find further information on DMF technology.
- Similar to the repair of a conventional clutch, also check the pilot bearing's condition when replacing the double clutch and change it, if necessary.
- After assembly of the clutch and transmission, use an appropriate diagnostic system to configure the system's basic settings.
- As a rule, the complete LuK RepSet® 2CT assembly must be installed. Do not mix used and new parts.
- Clean oily and/or dirty transmission components prior to installing new parts. Pay attention to cleanliness throughout the entire repair process.
- Do not grease or oil any components of the engagement and clutch systems.

Caution:
Under no circumstances drop the clutch. Always avoid heavy impacts and shocks, which can damage the self-adjusting function!

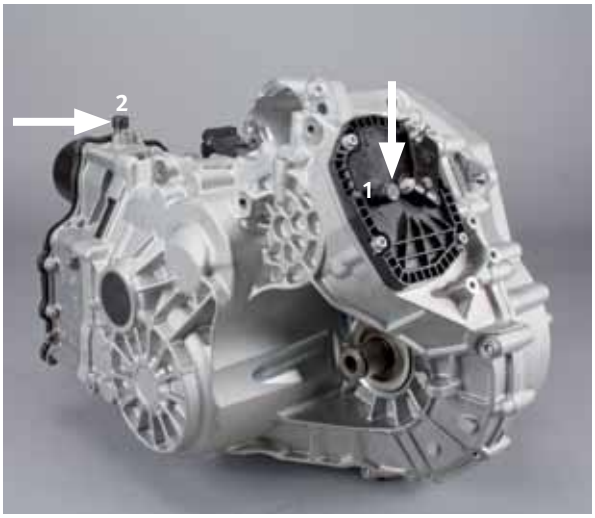
6.2 Repair procedure summary

- Remove gearbox
- Remove clutch from transmission input shaft (hollow shaft)
- Remove used engagement system components
- Install new engagement system components
- Determine correct engagement bearing position by means of adjusting shims
- Press new clutch on hollow shaft
- Measure freeplay of clutch discs
- Install gearbox
- Configure basic system settings using appropriate diagnostic equipment

6.3 Double clutch removal

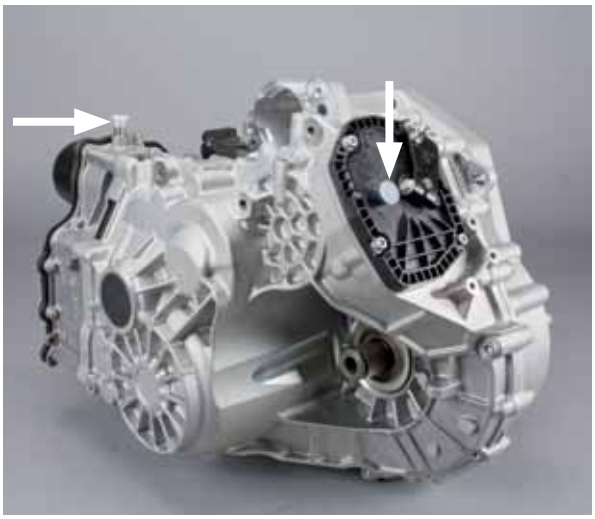
Caution:
Remove the gearbox according to manufacturer's instructions!

- Remove the vent caps from transmission (1) and mechatronic system (2) and plug with blanking plug (KL-0500-607).



Caution:
If transmission oil leaks from gearbox during repair, drain oil completely. Refill transmission with 1.7 l of oil as specified by vehicle manufacturer!

If oil leaks from mechatronic unit, it must not be refilled. In this case the entire mechatronic assembly must be replaced according to manufacturer's specifications!



- Mount transmission assembly on mounting stand or place it on workbench so that clutch housing is safely and horizontally positioned.

- Use screwdriver to remove snap ring of upper clutch disc hub (K1).

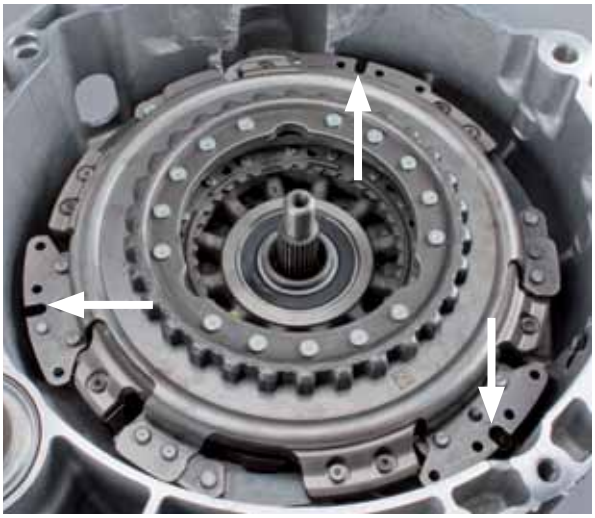
- Disassemble snap ring and clutch disc hub (K1).

- Remove snap ring from hollow shaft by means of circlip pliers (KL-0192-12). Normally, ring gets damaged and needs to be replaced.

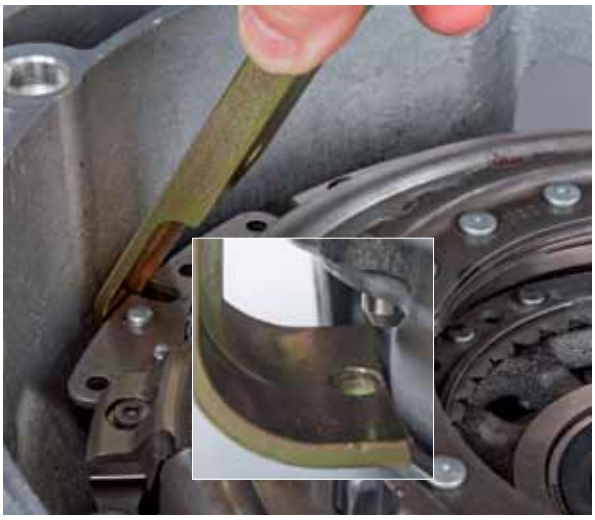
Caution:
If snap ring gets caught in hollow shaft groove, use special tool set to press snap ring gently downward and release ring (see page 37).

6.3 Double clutch removal

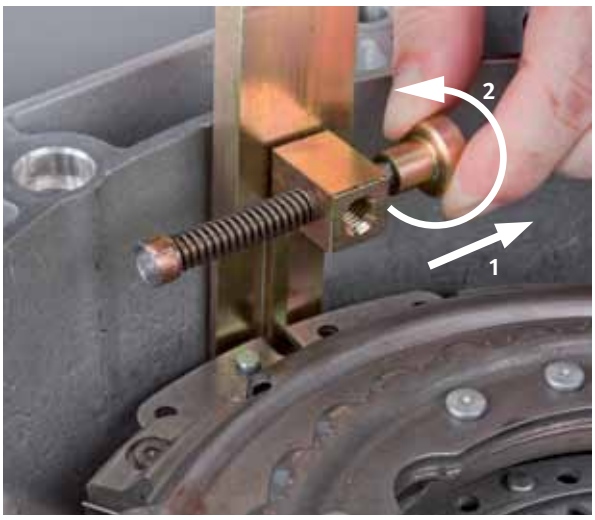
- Rotate clutch in gearbox housing such that sufficient space remains between clutch and gearbox housing to apply pullers.
- Insert three puller legs (KL-0500-6041) into clutch assembly.



- Apply first puller leg between clutch housing and clutch and pull upward, simultaneously inserting the dowel on the underside into the hole in the puller leg.



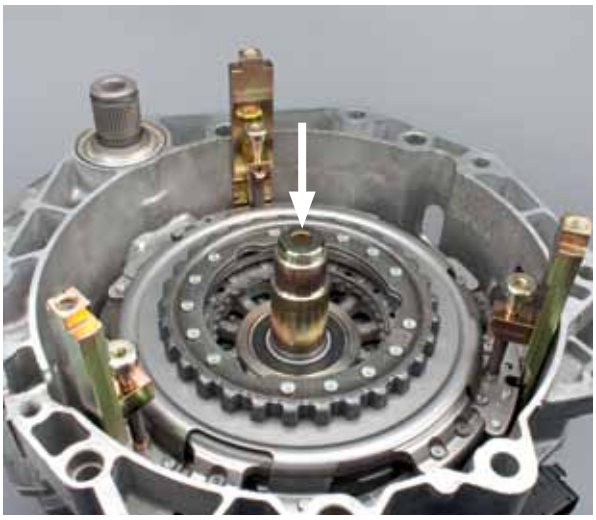
- Insert spring-loaded clamps horizontally into puller leg.
- Retract plunger against spring load, rotate by 90° and position on clutch.



- Puller leg is now in correct mounting position.
- Repeat above procedure for remaining puller legs.

- Position support bush (KL-0500-6030) on hollow shaft.

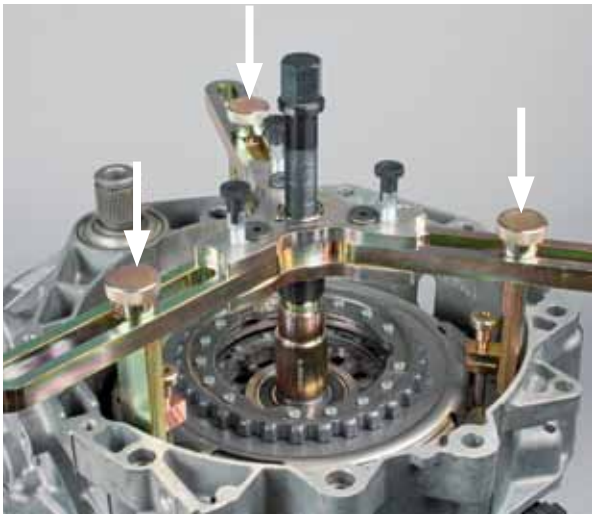
Note:
When disassembling the clutch unit, this bush supports the cross beam.



- Apply cross beam (KL-0500-60) on support bush and puller legs.
- Unscrew spindle so that puller legs can be attached to cross beam without force by means of knurled-head screws.

6.3 Double clutch removal

- Finger-tighten knurled-head screws into puller legs.



- Tighten three hexagon socket screws on the cross beam.

- Rotate spindle to remove clutch assembly from hollow shaft.

- Use cross beam to lift clutch assembly out of gearbox unit.

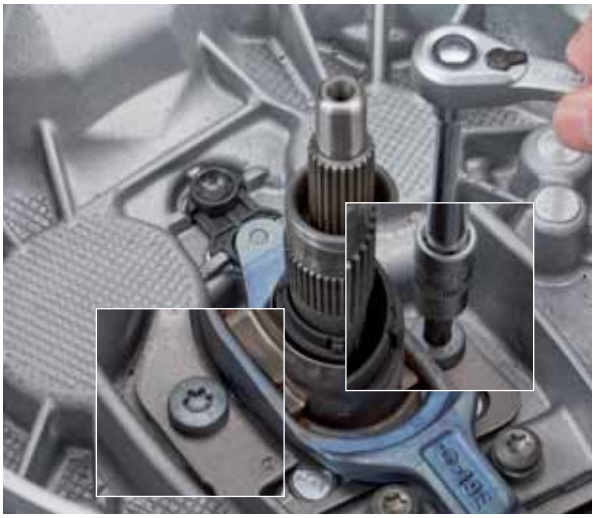
6.4 Engagement system removal

- Remove small engagement bearing (for K2) and adjusting shim. Depending on vehicle model year the adjusting shim is positioned below or above engagement bearing.

- Remove big engagement bearing (for K1), adjusting shim and engagement lever.

6.4 Engagement system removal

- Unscrew both bracket bolts (Torx T30).



- Remove bracket, engagement lever and guide sleeve; bracket is missing on previous transmission designs.

- Remove counter bearing of engagement levers.

- Clean the transmission input shaft with solvent-free cleaner, a residual amount of grease should remain in the shaft splines.

- Check the radial shaft seal of the transmission input shaft for leaks.

Caution:
The bearing seat on the hollow shaft must be clean and in good condition! With an oxidized or damaged bearing seat the force required to press the clutch on will damage the bearing of the hollow shaft in the gearbox!

6.5 Engagement system installation and adjustment

- Install new counter bearing for engagement lever. It fits only in one direction and should be inserted loosely.

- Mount new small engagement lever (for K2) including guide sleeve and new bracket. Bracket is positioned above guide sleeve flange.

- Torque down new bolts to 8 Nm + 90°.

- Ensure engagement lever fits properly on counter bearing (1).

Caution:
Do not oil or grease components!

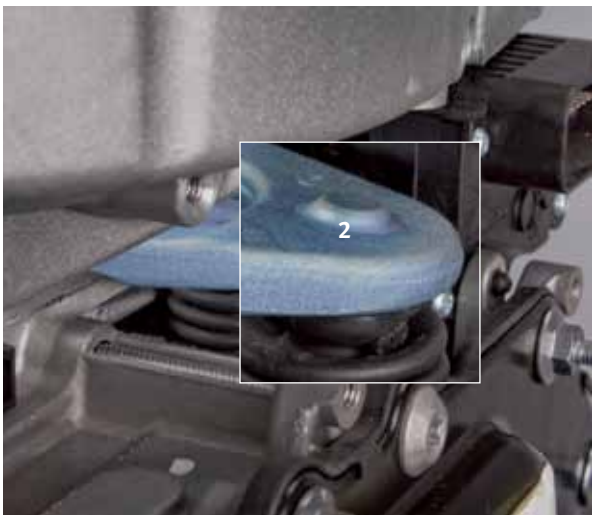
6.5 Engagement system installation and adjustment

- Ensure engagement lever fits properly on piston (2).

- Install new big engagement lever and engagement bearing (for K1).
- Ensure engagement lever fits properly on counter bearing (1).

Caution:
Do not oil or grease components!

- Ensure engagement lever fits properly on piston (2).



- Assemble thickest adjusting shim (2.8 mm) on big engagement bearing.

- Position reference gauge 48.63 mm (KL-0500-6033) on big engagement lever (for K1).

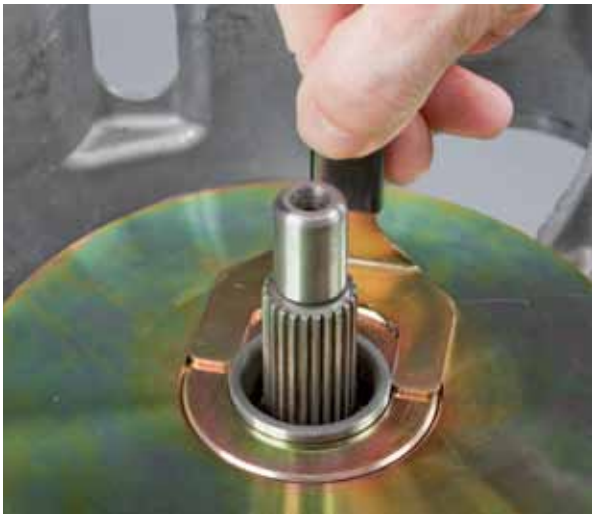
- Position 3.5 kg weight (KL-0500-6034) on reference gauge to generate specified preload.

6.5 Engagement system installation and adjustment

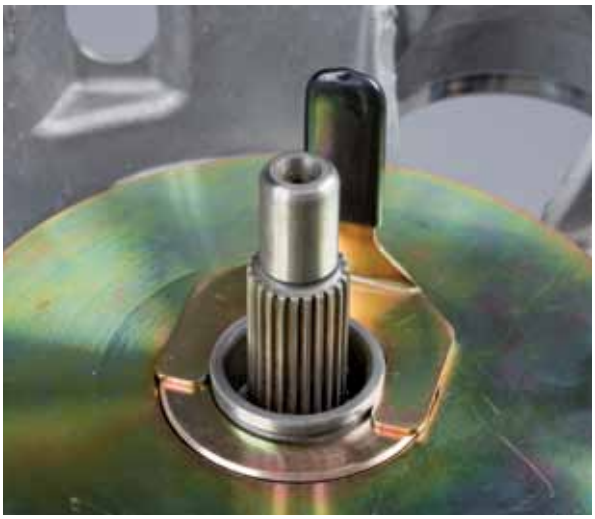
- Try to fit setting gauge (KL-0500-6035) into snap ring groove of hollow shaft.

Caution:
Do not press down reference gauge. Setting gauge must slide smoothly into groove!

- If impossible, replace installed adjusting shim with next thinner shim and try again to insert setting gauge into snap ring groove.

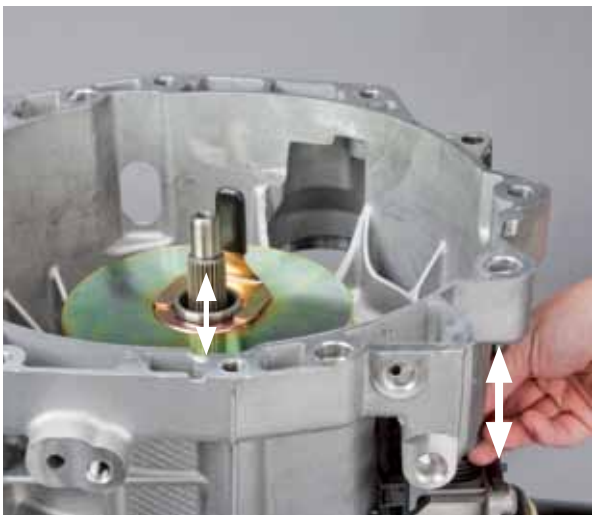


- Repeat until the adjustment gauge can be pushed into the retaining ring groove without force – the adjusting shim for the standard size of clutch 1 has been identified.



- To check whether or not correct adjusting shim is fitted, try to move engagement bearing reference gauge axially against setting gauge in position using corresponding engagement lever.

Caution:
If correct, adjusting gauge should move very little (max. 0.1 mm) or not at all!



- Fine-tune adjusting shim corresponding to clutch nominal setting to individual tolerance values of clutch K1.

Caution:
Individual tolerance values specified on clutch, engine side. Value is marked K1 and ranges between –0.40 mm and +0.40 mm.

- Depending on its algebraic sign, add the tolerance value to or subtract it from the identified adjusting shim thickness.

Example 1
Identified thickness of adjusting shim according to nominal setting of clutch K1: 1.8 mm.
Individual tolerance value of clutch K1: -0.2 mm.
• 1.8 mm - 0.2 mm = 1.6 mm.
Correct thickness of adjusting shim to be mounted on clutch K1: 1.6 mm.

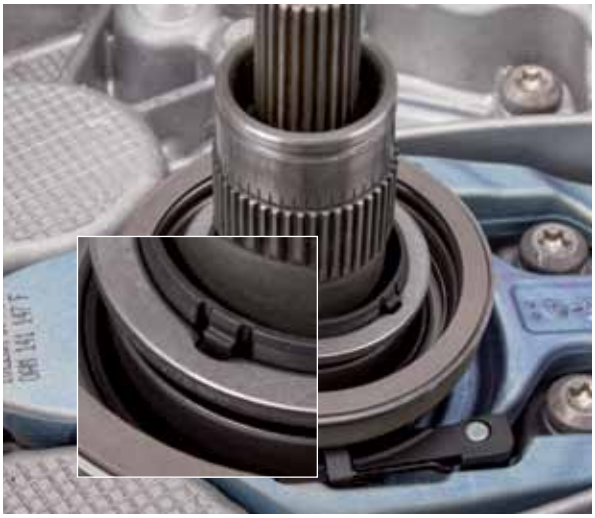
Example 2
Identified thickness of adjusting shim according to nominal setting of clutch K1: 2.0 mm.
Individual tolerance value of clutch K1: + 0.4 mm.
• 2.0 mm + 0.4 mm = 2.4 mm.
Correct thickness of adjusting shim to be mounted on clutch K1: 2.4 mm.

- Install calculated adjusting shim into big engagement bearing (for K1) and ensure it fits snugly in corresponding recess.

Note:
Apply three drops of superfast adhesive to adjusting shim to fix it in place during double clutch assembly.

6.5 Engagement system installation and adjustment

- Insert thickest adjusting shim (2.8 mm) for small engagement bearing (for K2). Ensure flanges fit properly in adjusting shim grooves.



- Insert small engagement bearing (for K2) and ensure flanges fit properly in engagement bearing grooves.

- Position reference gauge 32.92 mm (KL-0500-6032) on small engagement bearing (for K2).

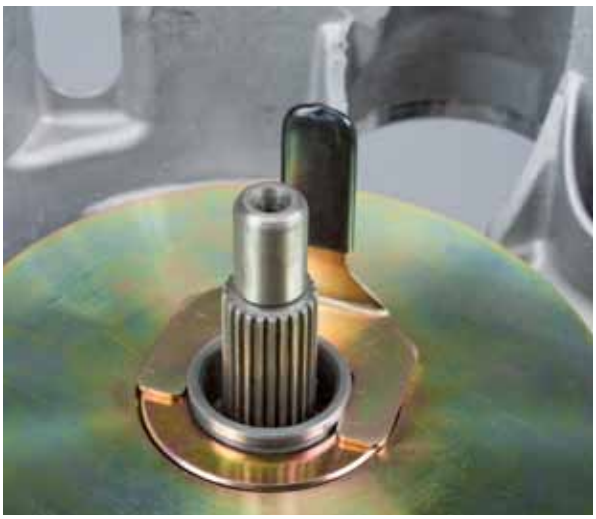
- Position 3.5 kg weight (KL-0500-6034) on reference gauge to generate specified preload.

- Try to slide setting gauge (KL-0500-6035) into snap ring groove on hollow shaft.

Caution:
Do not press down reference gauge. Setting gauge must slide smoothly into groove!

- If impossible, replace installed adjusting shim with next thinner shim and try again to insert setting gauge into snap ring groove.

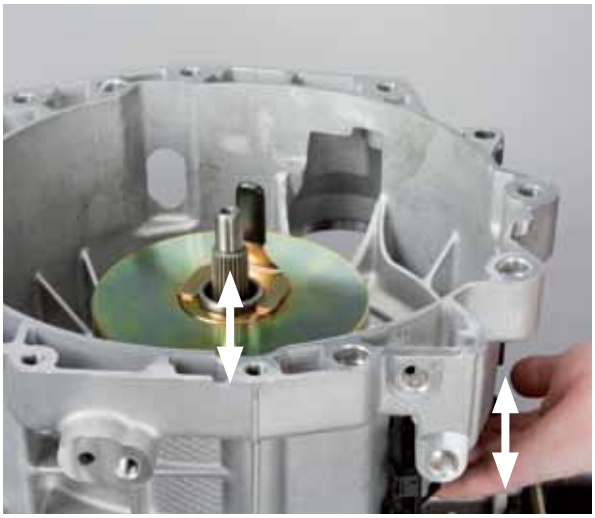
- Repeat until the adjustment gauge can be pushed into the retaining ring groove without force – the adjusting shim for the standard size of clutch 2 has been identified.



6.5 Engagement system installation and adjustment

- To check whether or not correct adjusting shim is mounted, try to move engagement bearing with fitted reference gauge in position axially against setting gauge using corresponding engagement lever.

Caution:
If correct, adjusting gauge should move very little (max. 0.1 mm) or not at all!



- Fine-tune adjusting shim corresponding to clutch nominal setting to individual tolerance values of clutch K2.

Note:
Individual tolerance values marked on clutch engine side. Value is marked K2 and ranges between –0.40 mm and +0.40 mm.

- Depending on its algebraic sign, add the tolerance value to or subtract it from the identified adjusting shim thickness.

Example 1
Identified thickness of adjusting shim corresponding to nominal setting of clutch K2: 1.8 mm.
Individual tolerance value of clutch K2: –0.2 mm.
- 1.8 mm - 0.2 mm = 1.6 mm.

Correct thickness of adjusting shim to be mounted on clutch K2: 1.6 mm.

Example 2
Identified thickness of adjusting shim corresponding to nominal setting of clutch K2: 2.0 mm.
Individual tolerance value of clutch K2: +0.4 mm.
- 2.0 mm + 0.4 mm = 2.4 mm.

Correct thickness of adjusting shim to be mounted on clutch K2: 2.4 mm.

- Install calculated adjusting shim, mount engagement bearing (K2) and ensure flanges fit snugly in adjusting shim and engagement bearing grooves.

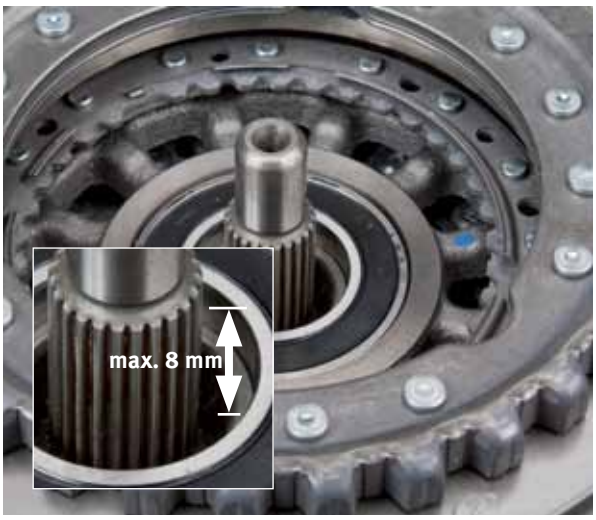
6.6 Double clutch installation

Note:
Clean hollow shaft using solvent-free agents and check for corrosion spots to avoid difficulties when pressing on new clutch. Ensure spline is still greased.

- Install new clutch assembly on hollow shaft. Gently rotate clutch to ensure spline of clutch disc 2 engages firmly with hollow shaft spline.

Caution:
Do not oil or grease components!

- Measure distance between top edge of bearing inner ring and frontal area of hollow shaft to ensure clutch fits properly on shaft. Distance must not exceed 8 mm.



6.6 Double clutch installation

- Apply pressure sleeve (KL-0500-6031) to bearing inner ring of clutch assembly.

- Mount three threaded bolts (KL-0500-6021 / KL-0500-6022) on gearbox housing using collar nuts.

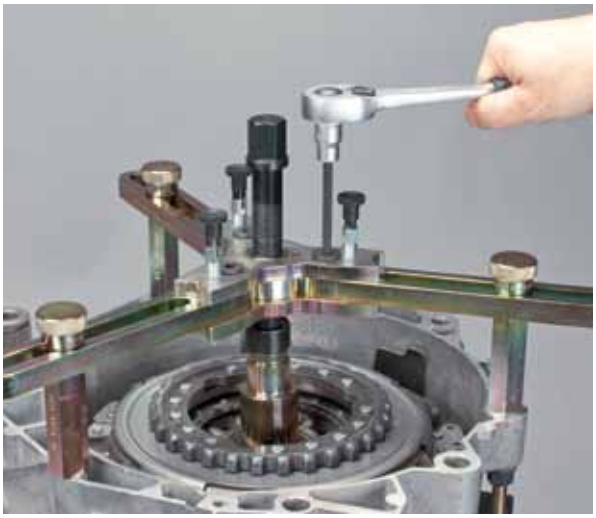
Note:
Depending on the available space, use either long-threaded or short-threaded bolts.

- Position threaded bolts at approximately 120° from each other.

- Unscrew three hexagon socket screws on the cross beam.
- Use knurled-head nuts (KL-0500-60) to mount cross beam (KL-0500-6020) on threaded bolts; ensure strain-free connection.

Note:
Ensure spindle is positioned centrally on clutch and fits in pressure sleeve. Check for smooth spindle motion.

- Tighten three hexagon socket screws on the cross beam.



- Press the clutch on using the fitment tool onto the hollow shaft by tightening the spindle; The clutch is correctly fitted when the circlip groove is completely visible in the window of the fitment tool and the effort required to turn the spindle increases noticeably.

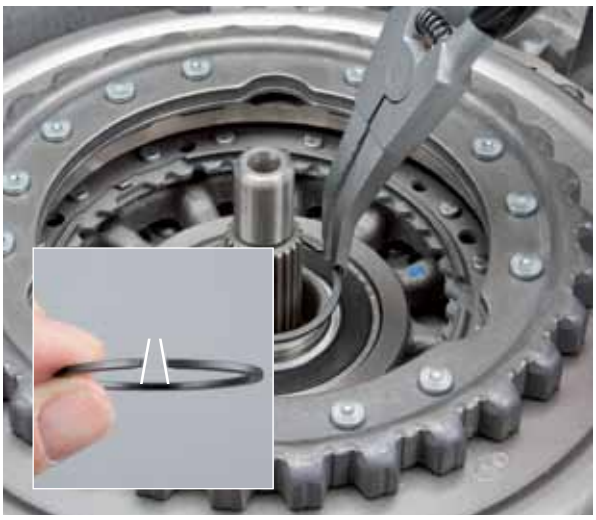
Caution:
Turning the spindle further will damage the bearing of the hollow shaft. The result is transmission damage!

Note:
The spindle should tightened using a torque wrench set to the maximum permissible torque of 12 Nm. The force necessary to turn the spindle should not exceed 12 Nm. If 12 Nm has been reached before the clutch is fully seated then something is wrong.

- Apply snap ring on hollow shaft using circlip pliers (KL-0192-12).

Note:
Mount with narrow side of opening facing upward.

- As a rule, always use new snap ring.



6.6 Double clutch installation

- Check end float on bottom clutch disc (K2).
- Attach dial gauge and stand (KL-0500-606) to clutch housing by means of collar nut.
- Position preloaded measuring tip on bottom clutch disc and zero dial gauge.

- Grab bottom clutch disc with two pull hooks, lift disc with both hands simultaneously until it contacts end stop and read off measurement.

Note:
Measurements must be taken at three points at 120° from each other.

Note:
The clearance (actual play of the clutch plate) must be between 0.3 and 1.0 mm at all measuring points. The measured values must not deviate more than 0.3 mm. If the measured clearance is outside of the tolerance value, the bearing shimming process must be repeated. It is possible that the adjusting shim has not been positioned correctly.

- After measurement re-position the dial gauge to one side, but do not remove it. The dial gauge is required again for the clearance measurement of the upper clutch plate.

- Insert clutch disc hub into top clutch (K1).

Note:
The hub only fits in one position due to one large tooth.

- Apply snap ring with the gap equally spaced around the large tooth.

Note:
The gap in the circlip should be centered around the white line in the middle of the large tooth.

- Measure end float of top clutch disc (K1). Position preloaded measuring tip on top clutch disc hub and zero the dial gauge.

Note:
Measurements must be taken at three points at 120° from each other.

6.6 Double clutch installation

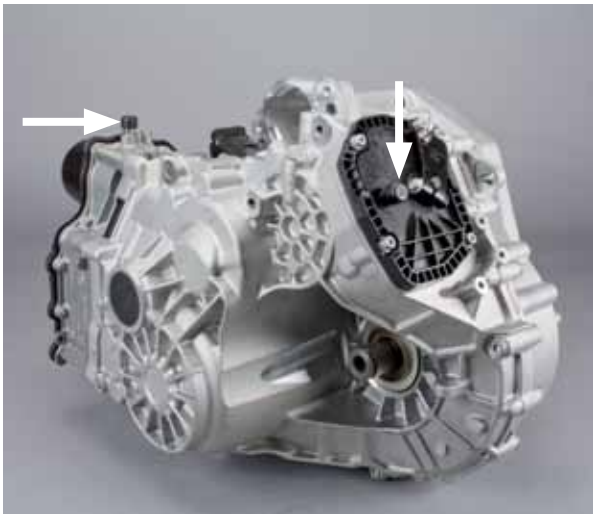
- Grab top disc with two pull hooks and lift disc simultaneously until it contacts end stop.

Note:
The clearance (actual play of the clutch plate) must be between 0.3 and 1.0 mm at all measuring points. The measured values must not deviate more than 0.3 mm. If the measured clearance is outside of the tolerance value, the bearing shimming process must be repeated. It is possible that the adjusting shim has not been positioned correctly.

- Rotate transmission to installation position.

- Remove both blanking plugs and apply vent caps.
- Reinstall transmission according to manufacturer's specifications.

Caution:
Assemble engine and gearbox manually until both flanges fully contact one another. Then bolt components together. Failure to observe this procedure can damage the double clutch!



Caution:
If transmission oil leaks during repair, drain oil completely. Refill transmission with 1.7 l of oil as specified by vehicle manufacturer. Do not top up remaining oil!

If oil leaks from mechatronic unit, it must not be refilled. In this case the entire mechatronic unit must be replaced according to manufacturer's specifications!

After assembly of clutch and transmission, use the appropriate diagnostic system to configure basic system settings.

7 Vehicle applications

Symbols and shortcuts

	LuK RepSet® for vehicles with a dry double clutch
	Dual mass flywheel
	Screws
	Vehicle manufacturer
	Model year

	Instructions for the engine
	Chassis number
	Gearbox number
START/STOP	Vehicles with start/stop
START/STOP	Vehicles without start/stop
	Number of teeth

					
AUDI					
A1 (8X1)					
1.6 TDI CAYB; (66kW)	03.11 -		→ 04.11 incl.	**415 0545 09**	
A3 (8P1, 8PA)					
1.4 TFSI CAXC; CMSA; (92kW)	09.07 -	2CT	03.08 → 04.11	**602 0001 00**	
			CAXC; 03.08 → 05.10; START/STOP; 132 excl.	**415 0497 09**	
			CAXC; 05.09 → 05.10; START/STOP; 129	**415 0500 09**	
			CAXC; 06.10 → 04.11; 129 excl.		
			CAXC; 03.08 → 04.11	**411 0133 10**	
1.6 TDI CAYB; (66kW)	05.09 -		→ 04.11 excl.	**415 0509 09**	
			→ 04.11	**411 0133 10**	
1.6 TDI CAYC; (77kW)	05.09 -	2CT	→ 04.11	**602 0002 00**	
			→ 04.11 excl.	**415 0509 09**	
			→ 04.11	**411 0133 10**	
1.8 TFSI BYT; BZB; CDAA; (118kW)	11.06 -	2CT	CDAA; 07.08 → 04.11	**602 0001 00**	
			CDAA; 07.08 → 04.11 excl.	**415 0503 09**	
			CDAA; 07.08 → 04.11	**411 0133 11**	
A3 Cabriolet					
1.8 TFSI BZB; CDAA; (118kW)	04.08 -	2CT	CDAA; → 04.11	**602 0001 00**	
			CDAA; → 04.11 excl.	**415 0503 09**	
			CDAA; → 04.11	**411 0133 11**	
SEAT					
ALTEA (5P1, 5P5, 5P8)					
1.6 BGU; BSE; BSF; CCSA; CMXA; (75kW)	03.04 -	2CT	BSF; 12.09 → 04.11	**602 0001 00**	
			BSF; 12.09 → 05.10; 132 excl.	**415 0497 09**	
			BSF; 06.10 → 04.11; 129 excl.	**415 0500 09**	
			BSF; 12.09 → 04.11	**411 0133 10**	
1.6 TDI CAYC; (77kW)	10.09 -	2CT	11.09 → 04.11	**602 0002 00**	
			11.09 → 07.10; START/STOP; 129 excl.	**415 0509 09**	
			08.10 → 04.11; START/STOP; 129 incl.	**415 0545 09**	
			11.09 → 04.11; START/STOP; 132 incl.	**415 0531 09**	
			+ 415 0509 09	**411 0133 10**	
1.8 TFSI BYT; BZB; CDAA; (118kW)	01.07 -	2CT	CDAA; 03.09 → 04.11	**602 0001 00**	
			CDAA; 03.09 → 05.10; 132 excl.	**415 0503 09**	
			CDAA; 06.10 → 04.11; 129 incl.	**415 0542 09**	
IBIZA V (6J1, 6J5)					
1.4 TSI CAVE; CAVF; (110-132kW)	06.09 -	2CT	→ 04.11	**602 0001 00**	
			→ 05.10; 132 excl.	**415 0506 09**	
			06.10 → 04.11; 129 excl.	**415 0515 09**	
			→ 04.11	**411 0133 10**	

	2001... 2002... 2003...				
SEAT					
IBIZA V (6J1, 6J5)					
1.6 BTS; (77kW)	05.08 -	2CT	→ 04.11	**602 0001 00**	
			→ 05.10; 132 excl.	**415 0497 09**	
			06.10 → 04.11; 129 excl.	**415 0500 09**	
LEON (1P1)					
1.6 BFQ; BSE; BSF; CCSA; CMXA; (75kW)	07.05 -	2CT	BSF; 12.09 → 04.11	**602 0001 00**	
			BSF; 12.09 → 05.10; 132 excl.	**415 0497 09**	
			BSF; 06.10 → 04.11; 129 excl.	**415 0500 09**	
			BSF; 12.09 → 04.11	**411 0133 10**	
1.6 TDI CAYC; (77kW)	02.10 -	2CT	→ 04.11	**602 0002 00**	
			→ 04.11; START/STOP; 132 incl.	**415 0531 09**	
			→ 08.10; START/STOP; 129 excl.	**415 0509 09**	
			09.10 → 04.11; START/STOP; 129 incl.	**415 0545 09**	
			+ 415 0509 09	**411 0133 10**	
1.8 TSI BZB; CDAA; (118kW)	06.07 -	2CT	CDAA; 03.09 → 04.11	**602 0001 00**	
			CDAA; 03.09 → 05.10; 132 excl.	**415 0503 09**	
			CDAA; 06.10 → 04.11; 129 incl.	**415 0542 09**	
TOLEDO III (5P2)					
1.8 TFSI BYT; BZB; CDAA; (118kW)	01.07 - 05.09	2CT	CDAA; 03.09 →	**602 0001 00**	
			CDAA; 03.09 → excl.	**415 0503 09**	
SKODA					
OCTAVIA (1Z3, 1Z5)					
1.4 TSI CAXA; (90kW)	11.08 -	2CT	→ 04.11	**602 0001 00**	
			→ 04.11 excl.	**415 0497 09**	
			→ 04.11	**411 0133 10**	
1.6 TDI CAYC; (77kW)	06.09 -	2CT	→ 04.11	**602 0002 00**	
			→ 03.10; 132 incl.	**415 0531 09**	
			04.10 → 08.10; 129 excl.	**415 0509 09**	
			09.10 → 04.11; 129 incl.	**415 0545 09**	
1.8 TSI CDAB; (112kW)	03.09 -	2CT	→ 04.11	**602 0001 00**	
			→ 05.10; 132 excl.	**415 0503 09**	
			06.10 → 04.11; 129 incl.	**415 0542 09**	
			+ 415 0503 09	**411 0133 11**	
1.8 TSI BZB; CDAA; (118kW)	06.07 -	2CT	CDAA; 11.08 → 04.11	**602 0001 00**	
			CDAA; 11.08 → 05.10; 132 excl.	**415 0503 09**	
			CDAA; 06.10 → 04.11; 129 incl.	**415 0542 09**	
			+ 415 0503 09	**411 0133 11**	

SKODA

SUPERB II (3T4, 3T5)

1.8 TSI CDAB; (112kW)	03.09 -	2CT	→ 04.11	**602 0001 00**	
			→ 05.10; 132 excl.	**415 0503 09**	
			06.10 → 04.11; 129 incl.	**415 0542 09**	
			+ 415 0503 09	**411 0133 10**	
1.8 TSI BZB; CDAA; (118kW)	03.08 -	2CT	CDAA; → 04.11	**602 0001 00**	
			CDAA; → 05.10; 132 excl.	**415 0503 09**	
			CDAA; 06.10 → 04.11; 129 incl.	**415 0542 09**	
			+ 415 0503 09	**411 0133 11**	
1.8 TSI CDAA; (118kW)	10.09 -	2CT	→ 04.11	**602 0001 00**	
			→ 05.10; 132 excl.	**415 0503 09**	
			06.10 → 04.11; 129 incl.	**415 0542 09**	
			+ 415 0503 09	**411 0133 11**	

VW

GOLF V (1K1)

1.4 TSI CAXA; (90kW)	05.07 -	2CT	11.07 → № 26.05.8 →	**602 0001 00**	
			11.07 → excl.	**415 0497 09**	
			11.07 →	**411 0133 10**	
1.9 TDI BKC; BLS; BXE; (77kW)	10.03 -	2CT	BLS; 11.07 → 11.08; **G7**; № 26.05.8 →	**602 0002 00**	
			BLS; 11.07 → 11.08; **G7** incl.	**415 0531 09**	

GOLF V Variant (1K5)

1.4 TSI CAXA; (90kW)	06.07 -	2CT	02.08 → 06.09	**602 0001 00**	
			02.08 → 06.09 excl.	**415 0497 09**	
			02.08 → 06.09	**411 0133 10**	
1.4 TSI CAVD; (118kW)	07.08 -	2CT		**602 0001 00**	
			excl.	**415 0506 09**	
				411 0133 10	
1.9 TDI BKC; BLS; BXE; (77kW)	06.07 -	2CT	BLS; 02.08 → 06.09; **G7**	**602 0002 00**	
			BLS; 02.08 → 06.09; **G7** incl.	**415 0531 09**	

GOLF VI (5K1)

1.4 TSI CAXA; (90kW)	10.08 -	2CT	→ 04.11; № 26.05.8 →	**602 0001 00**	
			→ 05.10; 132 excl.	**415 0497 09**	
			06.10 → 04.11; 129 excl.	**415 0500 09**	
			→ 04.11	**411 0133 10**	
1.4 TSI CAVD; (118kW)	10.08 -	2CT	→ 04.11	**602 0001 00**	
			→ 05.10; 132 excl.	**415 0506 09**	
			06.10 → 04.11; 129 excl.	**415 0515 09**	
			→ 04.11	**411 0133 10**	
1.6 BSE; BSF; CCSA; CMXA; (75kW)	10.08 -	2CT	BSE; BSF; → 04.11	**602 0001 00**	
			BSE; BSF; → 05.10; 132 excl.	**415 0497 09**	
			BSE; BSF; 06.10 → 04.11; 129 excl.	**415 0500 09**	
			BSE; BSF; → 04.11	**411 0133 10**	

	2001... 2002... 2003...			LUK	
VW					
GOLF VI (5K1)					
1.6 TDI CAYC; (77kW)	02.09 -	2CT	→ 04.11	**602 0002 00**	
			→ 04.10; START/STOP; 132 incl.	**415 0531 09**	
			05.10 → 08.10; START/STOP; 129 → 08.10; START/STOP; 129 excl.	**415 0509 09**	
			09.10 → 04.11; 129 incl.	**415 0545 09**	
			+ 415 0509 09	**411 0133 10**	
1.8 TSI CDAA; (118kW)	06.09 -	2CT		**602 0001 00**	
			→ 05.10; 132 excl.	**415 0503 09**	
			06.10 → ; 129 incl.	**415 0542 09**	
			+ 415 0503 09	**411 0133 11**	
GOLF VI Variant (AJ5)					
1.4 TSI CAXA; (90kW)	07.09 -	2CT	→ 04.11	**602 0001 00**	
			→ 05.10; 132 excl.	**415 0497 09**	
			06.10 → 04.11; 129 excl.	**415 0500 09**	
			→ 04.11	**411 0133 10**	
1.4 TSI CAVD; (118kW)	07.09 -	2CT	→ 04.11	**602 0001 00**	
			→ 04.11 excl.	**415 0506 09**	
			→ 04.11	**411 0133 10**	
1.6 TDI CAYC; (77kW)	07.09 -	2CT	→ 04.11	**602 0002 00**	
			→ 04.11; START/STOP incl.	**415 0531 09**	
			→ 04.11; START/STOP excl.	**415 0509 09**	
			+ 415 0509 09	**411 0133 10**	
GOLF PLUS (5M1, 521)					
1.4 TSI CAXA; (90kW)	06.07 -	2CT	11.07 → 04.11; № 26.05.8 →	**602 0001 00**	
			11.07 → 05.10; 132 excl.	**415 0497 09**	
			06.10 → 04.11; 129 excl.	**415 0500 09**	
			11.07 → 04.11	**411 0133 10**	
1.4 TSI CAVD; CNWA; (118kW)	06.08 -	2CT	→ 04.11	**602 0001 00**	
			→ 05.10; 132 excl.	**415 0506 09**	
			06.10 → 04.11; 129 excl.	**415 0515 09**	
			→ 04.11	**411 0133 10**	
1.6 BSE; BSF; CCSA; CMXA; (75kW)	05.05 -	2CT	BSE; BSF; 01.09 → 04.11	**602 0001 00**	
			BSE; BSF; 01.09 → 05.10; 132 excl.	**415 0497 09**	
			BSE; BSF; 06.10 → 04.11; 129 excl.	**415 0500 09**	
			BSE; BSF; 01.09 → 04.11	**411 0133 10**	
1.6 TDI CAYC; (77kW)	03.09 -	2CT	→ 04.11	**602 0002 00**	
			→ 04.10; START/STOP; 132 incl.	**415 0531 09**	
			05.10 → 08.10; START/STOP; 129 → 08.10; START/STOP; 129 excl.	**415 0509 09**	

VW

GOLF PLUS (5M1, 521)

1.6 TDI CAYC; (77kW)	03.09 -		09.10 → 04.11; 129 incl.	**415 0545 09**	
			+ 415 0509 09	**411 0133 10**	
1.9 TDI BKC; BLS; BXE; (77kW)	01.05 - 01.09	2CT	BLS; 11.07 → 12.08; **G7**; № 26.05.8 →	**602 0002 00**	
			BLS; 11.07 → 12.08; **G7** incl.	**415 0531 09**	

JETTA III (1K2)

1.4 TSI CAXA; (90kW)	05.07 - 10.10	2CT	10.07 →	**602 0001 00**	
			10.07 → 05.10; 132 excl.	**415 0497 09**	
			06.10 → ; 129 excl.	**415 0500 09**	
			10.07 →	**411 0133 10**	
1.4 TSI CAVD; (118kW)	07.08 - 10.10	2CT		**602 0001 00**	
			excl.	**415 0506 09**	
				411 0133 10	
1.6 TDI CAYC; (77kW)	06.09 - 10.10	2CT	→ 09.10	**602 0002 00**	
			→ 09.10; **START/STOP** excl.	**415 0509 09**	
			→ 09.10; ~~START/STOP~~ incl.	**415 0531 09**	
			+ 415 0509 09	**411 0133 10**	
1.9 TDI BKC; BLS; BXE; (77kW)	08.05 - 10.10	2CT	BLS; 07.08 → 09.10; **G7**	**602 0002 00**	
			BLS; 02.08 → 09.10; **G7** incl.	**415 0531 09**	

PASSAT (3C2, 3C5)

1.4 TSI CAXA; (90kW)	05.07 -	2CT	05.08 →	**602 0001 00**	
			05.08 → 05.10; ~~START/STOP~~; 132 excl.	**415 0497 09**	
			06.10 →; **START/STOP**; 129 excl.	**415 0500 09**	
			05.08 →	**411 0133 10**	
1.4 TSI EcoFuel CDGA; (110kW)	01.09 -	2CT		**602 0001 00**	
			→ 05.10; 132 excl.	**415 0506 09**	
			06.10 →; 129 excl.	**415 0515 09**	
				411 0133 10	
1.8 TSI CDAB; CGYA; (112kW)	11.09 -	2CT		**602 0001 00**	
			→ 05.10; 132 excl.	**415 0503 09**	
			06.10 →; 129 incl.	**415 0542 09**	
			+ 415 0503 09	**411 0133 11**	
1.8 TSI BZB; CDAA; (118kW)	05.07 -	2CT	05.08 →	**602 0001 00**	
			05.08 → 05.10; 132 excl.	**415 0503 09**	
			06.10 →; 129 incl.	**415 0542 09**	
			+ 415 0503 09	**411 0133 11**	

PASSAT (362, 365)

1.4 TSI CAXA; (90kW)	08.10 -	2CT	09.10 → 04.11	**602 0001 00**	
			09.10 → 04.11 excl.	**415 0500 09**	
			09.10 → 04.11	**411 0133 10**	

					
VW					
PASSAT (362, 365)					
1.4 TSI EcoFuel CDGA; (110kW)	08.10 -	2CT	09.10 → 04.11	**602 0001 00**	
			09.10 → 04.11; 129 excl.	**415 0515 09**	
			09.10 → 04.11	**411 0133 10**	
1.8 TSI CDAA; (118kW)	08.10 -	2CT	→ 04.11	**602 0001 00**	
			→ 04.11 incl.	**415 0542 09**	
PASSAT CC					
1.8 TSI BZB; CDAA; (118kW)	06.08 - 11.10	2CT		**602 0001 00**	
			→ 05.10; 132 excl.	**415 0503 09**	
			06.10 → ; 129 incl.	**415 0542 09**	
			+ 415 0503 09	**411 0133 11**	
POLO VIII (6R_)					
1.4 CDDA; CGGB; CLPA; (63kW)	06.09 -	2CT	→ 04.11	**602 0001 00**	
			→ 05.10; 132 excl.	**415 0497 09**	
			06.10 → 04.11; 129 excl.	**415 0500 09**	
			→ 04.11	**411 0133 10**	
1.6 TDI CAYB; (66kW)	06.09 -	2CT	→ 04.11	**602 0002 00**	
			→ 04.10; 132 incl.	**415 0531 09**	
			05.10 → 08.10; 129 excl.	**415 0509 09**	
			09.10 → 04.11; 129 incl.	**415 0545 09**	
			+ 415 0509 09	**411 0133 10**	
SCIROCCO (137)					
1.4 TSI CAVD; CNWA; (118kW)	05.08 -	2CT	→ 04.11	**602 0001 00**	
			→ 05.10; 132 excl.	**415 0506 09**	
			06.10 → 04.11; 129 excl.	**415 0515 09**	
			→ 04.11	**411 0133 10**	
TOURAN (1T1, 1T2, 1T3)					
1.4 TSI BMY; CAVC; (103kW)	02.06 -	2CT	CAVC; 05.08 → 04.11	**602 0001 00**	
			CAVC; 9#000001 → A#150000; 132 excl.	**415 0506 09**	
			CAVC; B#000001 → B#150000; 129 excl.	**415 0515 09**	
			CAVC; 9#000001 → B#150000	**411 0133 10**	
1.4 TSI EcoFuel CDGA; (110kW)	05.09 -	2CT	→ 04.11	**602 0001 00**	
			9#000001 → A#150000; 132 excl.	**415 0506 09**	
			B#000001 → B#150000; 129 excl.	**415 0515 09**	
			9#000001 → B#150000	**411 0133 10**	
1.4 FSI BLG; CAVB; (125kW)	11.06 -	2CT	CAVB; 05.08 → 04.11	**602 0001 00**	
			CAVB; 9#000001 → A#150000; 132 excl.	**415 0506 09**	
			CAVB; B#000001 → B#150000; 129 excl.	**415 0515 09**	
			CAVB; 9#000001 → B#150000	**411 0133 10**	

				LUK	
VW					
TOURAN (1T1, 1T2, 1T3)					
1.6 TDI CAYC; (77kW)	05.10 -	2CT	→ 04.11	**602 0002 00**	
			→ 08.10; 129 excl.	**415 0509 09**	
			09.10 → 04.11; 129 incl.	**415 0545 09**	
			+ 415 0509 09	**411 0133 10**	
1.9 TDI BKC; BLS; BXE; (77kW)	08.03 - 05.10	2CT	BLS; 05.08 →; **G7**	**602 0002 00**	
			BLS; 05.08 → 04.10; **G7**; 132 incl.	**415 0531 09**	
			BLS; 05.10 →; **G7**; 129 excl.	**415 0509 09**	
			+ 415 0509 09	**411 0133 10**	

	LuK	●	●	●	●	●
	LuK	●	●			
	LuK	●	●	●	●	
	INA	●	●	●	●	
	INA	●	●	●	●	
	INA	●	●			
	FAG	●	●	●	●	

Phone: +49 (0) 1801 753-333
Fax: +49 (0) 6103 753-297
automotive-aftermarket@schaeffler.com
www.schaeffler-aftermarket.com