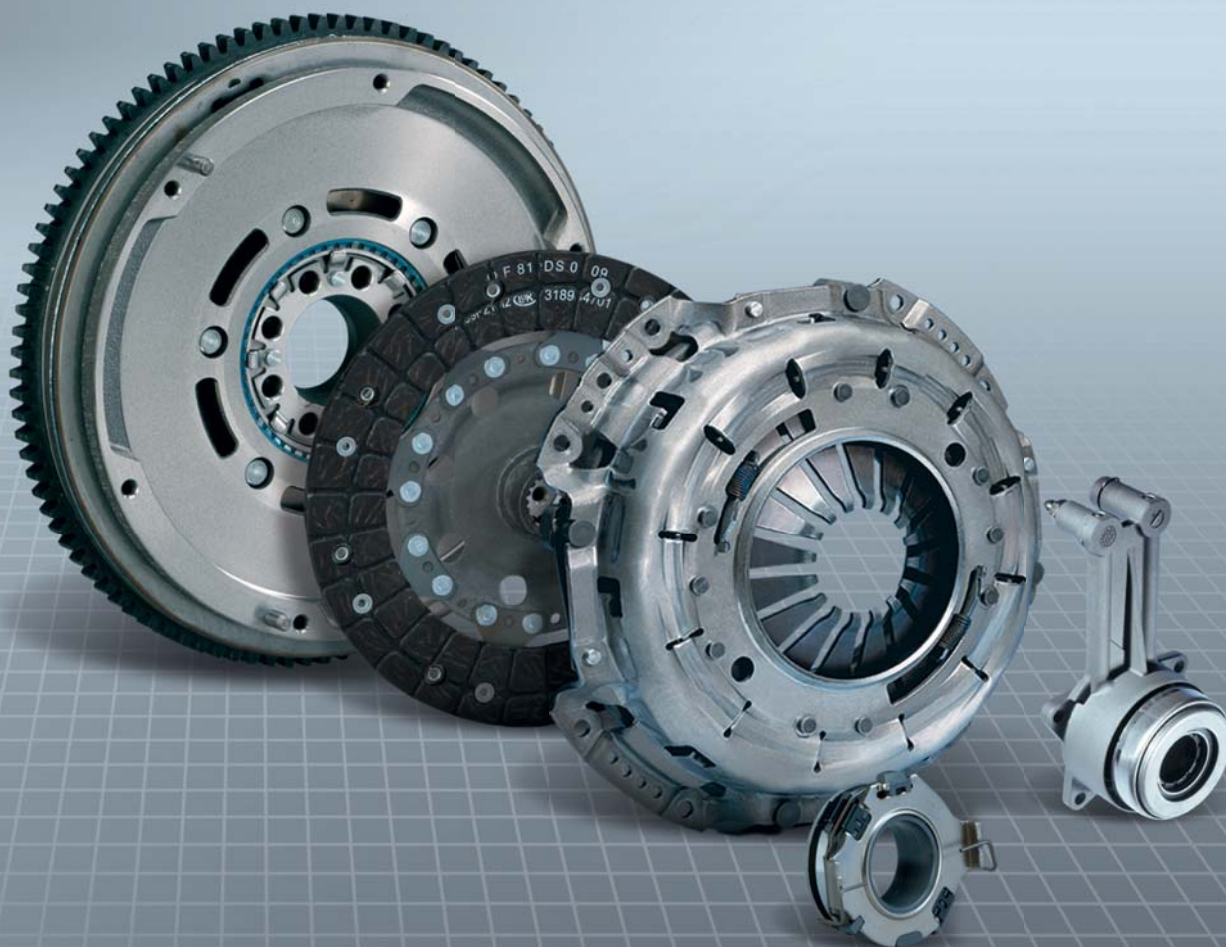




Failure Diagnosis

LuK's guide to troubleshooting clutch system failures and malfunctions



SCHAEFFLER
AUTOMOTIVE AFTERMARKET



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1 LuK tips on avoiding clutch system failures and malfunctions

Major causes of problems:

Flywheel

The running surface of the flywheel, which mates to the driven plate, may show signs of wear after extensive mileage. Scoring, glazing, and/or gouges indicate that the flywheel has been overheated, and these must be removed, but they should never be refaced beyond the tolerances laid down by the manufacturer. It is important, however, that the same amount is taken from the bolting surface. This opportunity should also be taken to check the starter ring gear.

Dual-Mass Flywheels (DMF/DFC)

- New retaining bolts should always be used when installing DMF/DFC, since they are stretch bolts.
- Worn parts should not be reused, since the bearing race may be damaged by wear on the mating parts.
- Clean the mating surface of the clutch pressure plates with a degreasing agent prior to installation.
- Make certain that the clearance between the speed sensors and the DMF's sensing pins is correctly set.
- Machining of the facing surface of a DMF is not recommended.
- Using the incorrect bolts for securing the clutch pressure plate will cause noisy operation or failure of the pressure plate (scoring on the primary mass). Also ensure that the locating dowels have not been forced inward, since this could also cause the aforementioned problems.
- Check the engine timing sensor for damage.
- When the DMF is fitted to BMW models it is essential that the sensor sleeve is fitted to the crank connection, otherwise the engine will not run correctly.
- On Mercedes-Benz vehicles fitted with a DMF a dowel is used which must also be fitted.

Notes

The following are allowed on some vehicle makes and models and have no effect on the operation of clutch components:

- A small amount of axial movement is allowed between the primary and secondary assemblies.
- The secondary assembly may be free to rotate about its axis when not under load and may not automatically return to its original position.
- There may be traces of grease on the rear (engine side) of the DMF, extending outward from the sealing caps.
- DFC Volkswagen: It is important to note the correct alignment of the clutch cover to the DMF, the 2 marks on the clutch cover align with the tab on the DMF.

Spigot (Pilot) bearing

They may be no larger than a thimble, but they can cause serious problems. If they bind, the clutch may fail to disengage. They can also cause noise and angular misalignment, and thus damage to the driven plate. A missing spigot (pilot) bearing may cause the transmission input shaft to wobble and destroy the torsional-vibration damper and the input shaft bearing.

A range of spigot (pilot) bearings are available under part number 400 1000 10!

Oil seals

Leaking oil seals can severely damage the clutch. Even slight traces of grease or oil can adversely affect clutch operation. Traces of oil in the bell housing or on the clutch driven plate indicate that seals will need to be replaced.

Seals on older vehicles with high mileage should always be replaced as a precaution. The major cause of clutch failures and malfunctions is still leaking oil seals.

On VW models, one small oil seal that is often overlooked is the input shaft seal. The input shaft is hollow to accommodate the push rod for the clutch release system.

Driven plate

Although each and every driven plate is checked for correct operation before it leaves the LuK factory, it cannot be ruled out that they might suffer damage on their way to the garage.

Every driven plate should be checked for lateral run-out (the maximum tolerance is 0.5 mm) prior to installation. Excessive lateral run-out is not covered under warranty.

Release bearing

Release bearings cannot be checked for correct operation at garage level. They should always be replaced whenever the clutch is replaced. The bearings should slide freely on their guide tube without tilting. A worn running surface will invariably cause noisy operation.

Centrally actuated release mechanism

Like the clutch, the centrally actuated release mechanism is subject to wear, which may not always be visible during normal operation.

If only the clutch is replaced, it might be that the centrally actuated release mechanism could fail soon after clutch replacement, necessitating a second, unnecessary visit to the garage, since the worn centrally actuated release mech-

anism was not identified the first time around. Professional clutch replacement should always involve replacing the clutch pressure plate, driven plate, and centrally actuated release mechanism.

Release-bearing guide tubes

Check the guide tube for correct fitment. Guide tubes should be centered and parallel to the transmission input shafts. Damaged or worn areas on guide tubes may prevent the release bearing from sliding freely. This can lead to juddering, clutch slipping and heavy or difficult clutch operation. Damaged or worn guide tubes should always be replaced as part of a professional clutch replacement.

Schaeffler Automotive Aftermarket supplies a wide range of parts which are listed in the passenger car catalogue, identified against specific vehicle applications.

Note

Audi and VW models still found with a plastic sleeve should be fitted with the metal version Schaeffler Automotive Aftermarket no. 414 0002 10.

The contact surface on the diaphragm spring fingers will indicate whether alignment is correct.

Release fork

Check the release fork for ease of operation. Excessive play in release-shaft bushes reduces release bearing travel. Uneven wear on the contact points will cause the release bearing to tilt and prevent the release bearing from sliding smoothly on its guide tube. Worn, bent, or broken release forks may prevent the clutch from disengaging.

Release shaft

The release shaft will have to be removed before it can be inspected for wear or damage, since the bearing surfaces and bearings cannot be inspected while in place. Damaged or worn shaft bearings will cause the shaft to tilt, which will create binding and/or a juddering clutch. Relubricate the bearings before replacing the shaft.

Schaeffler Automotive Aftermarket item number for the correct high melting point grease is 414 0014 10.

Clutch cable

Clutch cables cannot be accurately checked for proper operation at garage level.

Since clutch cables are subject to wear, they should be replaced whenever clutches are replaced.

Make certain that clutch cables are correctly routed when installing them. They should never be routed

around sharp corners or kinked. Schaeffler Automotive Aftermarket's line of clutch cables is covered in the associated sales literature.

Alignment

Correct alignment of the clutch is frequently ignored. If clutches have not been correctly aligned, they will start juddering or fail to disengage immediately afterwards. The clutch should thus always be checked for correct alignment on the flywheel.

Lubricants

Grease that contains no suspended particulates should be used for lubricating splines and release bearings/guide tubes.

Schaeffler Automotive Aftermarket supplies the correct high melting point grease for clutch replacements under item no. 414 0014 10. Once grease has been applied to the splines on the gearbox input shaft, slide the driven plate's hub onto the shaft and remove any excess grease.

Chemically nickel-plated hubs should not be lubricated.

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Failure diagnosis/causes of failure:

Certain criteria should be kept in mind and certain procedures observed when assessing the malfunction of clutch systems and diagnosing failures or problems in order that they may be efficiently and permanently eliminated.

The following should be observed:

1. Determine the reason(s) for the complaint
2. Troubleshooting
3. Diagnose the failure or problem
4. Eliminate the cause of the failure or problem

The reason(s) for the complaint provides basic information on the subsequent troubleshooting, which may identify one or more causes for complaint. The clutch should be visually inspected and subjected to dimensional checks if necessary, either while it is still installed or after it has been removed. This will provide an indication that will help in the correct diagnosis and will lead to the repair or replacement of the affected parts.

Determining the reason(s) for the complaint

Accurate information regarding the complaint is indispensable if the causes are to be eliminated.

Since the reasons may be counted on the fingers of one hand, they can be readily and clearly described.

The five possible reasons for complaints about clutches:

- Clutch fails to disengage
- Clutch slips
- Clutch judders
- Clutch makes a noise
- Clutch pedal is heavy in operation

Troubleshooting

Troubleshooting confined to a specific area can start once a clear-cut statement of the reason(s) for the complaint has been identified. However, the error of immediately starting to remove the clutch, which, in most cases, represents the bulk of the work to be carried out, is frequently made.

On the other hand, searching for the cause of the failure/fault in areas where it might be eliminated using relatively simple means, namely in areas of the clutch system other than the clutch itself, is frequently neglected.

Here are a few examples:

Incorrectly adjusted carburetors or fuel-injection systems may cause rough idling that will be reflected in a juddering clutch while driving.

An incorrectly adjusted ignition system may also cause phenomena such as a judder when the clutch is engaged. In addition, 'running on' after the engine is switched off transmits sudden jolts to the tangential leaf springs. Bent tangential leaf springs will cause disengagement problems.

Damaged or weak engine mountings will cause the engine to move from its position and then 'bounce' back when the clutch is engaged, which causes a transition between static and dynamic coefficients of friction at the contact surface of clutch facings, and results in judder.

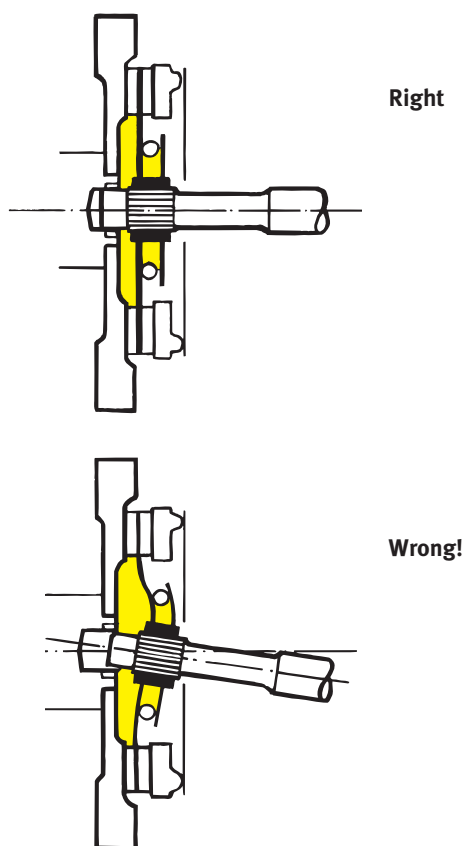
Heavy accelerator pedal actuation also causes juddering. A combination of a binding accelerator linkage and very weak engine mounts causes the drive train to rock.

A worn-out clutch cable causes disengagement problems or juddering. Failure to correctly adjust clutch cables will cause anything from slipping and disengagement problems to the total destruction of clutch components.

A malfunctioning hydraulic clutch actuation system will cause disengagement problems or juddering.

Distorted transmission mountings or missing spigot (pilot) bearings cause angular misalignment between the crankshaft and transmission input shaft, which results in juddering or disengagement problems.

The subsequent 'wobbling' motion of the driven plate during engagement and disengagement due to this angular misalignment causes fractures around the rivets that hold the segments in place.



Worn splines on the transmission input shaft will cause erratic movement during load changes, which can bend tangential leaf springs and cause disengagement problems or juddering.

More technical information:

WWW.REPERT.COM

or www.Schaeffler-Aftermarket.com

2 Clutch fails to disengage

1. Worn diaphragm spring fingers

Cause

- Release bearing seized
- Faulty release bearing
- Incorrectly adjusted release system



2. Broken clutch levers

Cause

- Release bearing running off-center
- Incorrectly adjusted release bearing
- Release lever bushes worn



3. Damaged inner bore on release bearing

Cause

- Incorrect grade of grease or no grease used
- Damaged gearbox snout



4. Damaged bearing lugs

Cause

- Damaged release system



5. Broken pressure plate

Cause

- Overheated pressure plate as a result of prolonged clutch slip
- Clutch slips due to worn facings
- Damage or seized release system
- Faulty slave cylinder
- Facings oil contaminated (replace faulty seals)



6. Clutch cover damaged

Cause

- Incorrect fitting
 - Not aligned to flywheel correctly



7. Gearbox snout worn

Cause

- Incorrect grade of grease or no grease used
- Damaged release bearing



8. Clutch cover damaged (VW)

Cause

- Incorrect fitting
- Not aligned to flywheel correctly



9. Damaged bolt holes

Cause

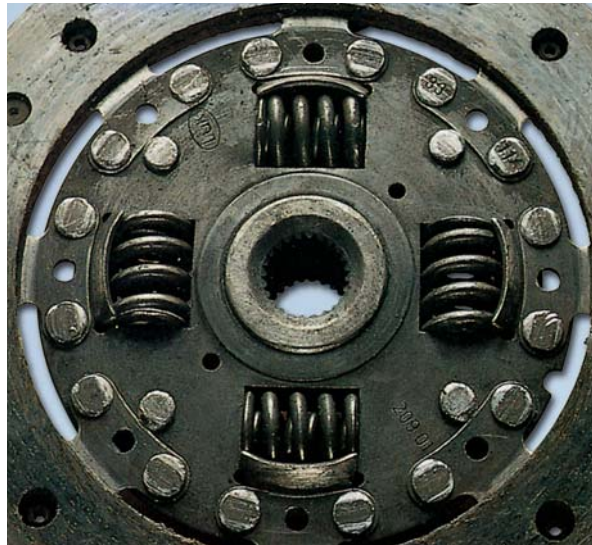
- Incorrect fitting
 - Reinforcing plate not fitted



10. Fouling marks on driven plate segment rivets (VW, Rover)

Cause

- Incorrect fitting
 - Release clip incorrectly fitted
- Incorrect circlip



11. Tangential strap broken

Cause

- Play in the drive train
 - Worn drive line coupling (BMW)
- Incorrect driving
 - Tow-starting in 1st or 2nd gear
- Wrong clutch fitted
 - Engine rotation incorrect (Renault)



12. Tangential strap bent

Cause

- Play in the drive train
 - Worn drive line coupling (BMW)
- Incorrect driving
 - Tow-starting in 1st or 2nd gear
 - Incorrect gear selection
- Improper storage
 - Dropping the clutch prior to fitting
- Clutch not bolted up evenly and sequentially



13. Damaged spline profile

Cause

- Incorrect fitting
 - Gearbox input shaft and hub splines not correctly aligned prior to fitting
 - Driven plate not centered
- Incorrect driven plate



14. Rust and corrosion on the hub splines

Cause

- Gearbox input shaft not greased



15. Splines are damaged on one side and worn to a taper, torsion damper damaged

Cause

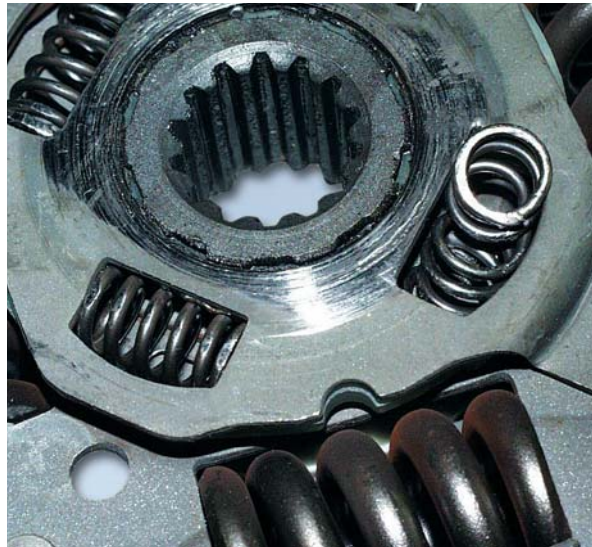
- Spigot (pilot) bearing defective
- Misalignment between engine and gearbox



16. Damaged idle damper

Cause

- Incorrect fitting
- Incorrect driven plate



17. Backing plate distorted

Cause

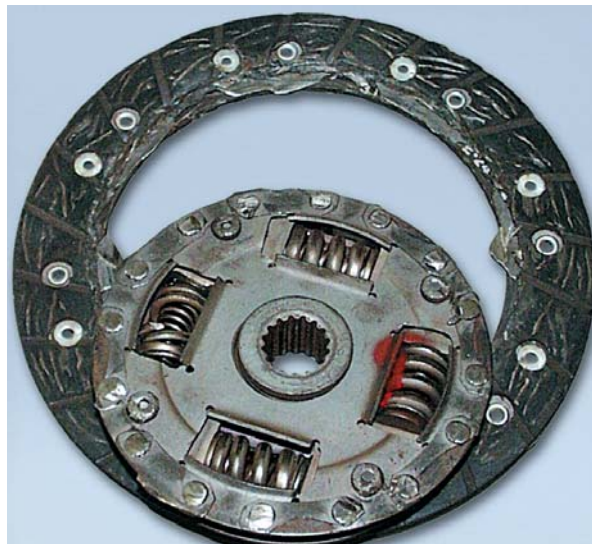
- Incorrect fitting
 - Gearbox input shaft and hub splines were not correctly aligned



18. Driven plate segments sheared

Cause

- Worn or missing spigot (pilot) bearing
- Misalignment condition between engine and gearbox
- Gearbox hung while fitting the clutch



19. Burst facing

Cause

- Driven plate speed exceeded the burst speed of the facing material. The clutch has been disengaged while travelling at a speed above the maximum speed for the gear selected

The damage is caused independently of the engine speed, the critical factor is the speed of the gearbox input shaft.



20. Facing burnt

Cause

- Oil-contaminated facings
 - Faulty oil seals
- Release system seized or faulty
- If the flywheel has been refaced, the pot depth was not considered or the bolting surface not machined by the same amount



21. Excessive driven plate run-out (distorted driven plate)

Cause

- Driven plate not checked before fitting
 - Driven plate bent during fitting (maximum permissible run-out 0.5 mm)



22. Bearing and casing damaged

Cause

- Overheating of the release bearing due to incorrect clearance, causing loss of grease and resulting in the bearing breaking up



23. Bearing carrier damaged

Cause

- Release bearing seized on gearbox snout
- Damaged gearbox snout
- Worn or damaged release arm bushes



24. Release bearing worn and damaged

Cause

- Incorrect adjustment of release arm
- Insufficient preload on bearing (specification 80–100 N)



3 Clutch slips

1. Overheating of pressure plate

Cause

- Oil on the facings
(reduced coefficient of friction)
 - Faulty oil seals
- Insufficient release bearing clearance
- Damaged release system (cable or hydraulic)
- Incorrect driving
 - Allowing the clutch to slip for too long



2. Deep grooves and traces of overheating on the pressure plate

Cause

- Facings badly worn
- Incorrect release bearing clearance
- Faulty release system
- Clutch operating in a partially disengaged condition



3. Damaged diaphragm spring fingers

Cause

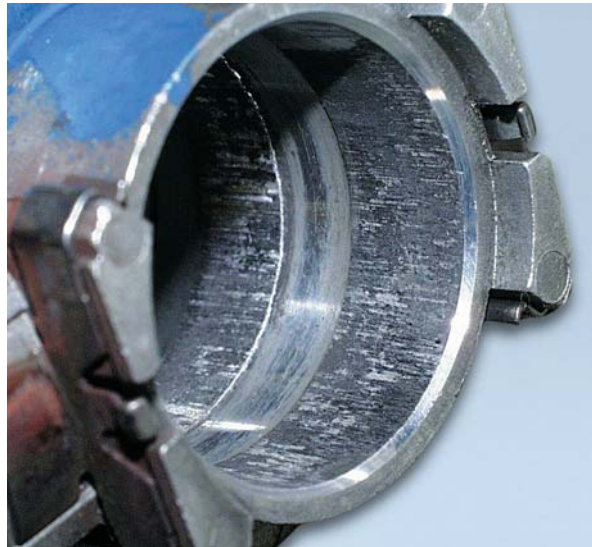
- Excessive bearing preload
- Damaged or seized release system
- Damaged release bearing



4. Wear marks on release bearing inner bore

Cause

- Incorrect grade of grease or no grease used
- Damaged gearbox snout



5. Facing contaminated on the inner portion

Cause

- Defective oil seal
- Excessive grease used on the splines



6. Facing carbonized

Cause

- Facing oil contaminated
 - Defective oil seal
- Clutch allowed to slip for too long (overheating)



7. Facing oil contaminated

Cause

- Engine or gearbox oil seals defective



8. Facing contaminated by grease

Cause

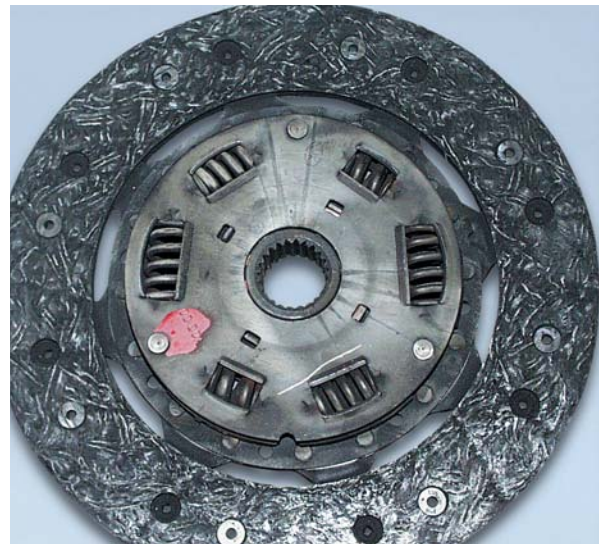
- Splines overgreased
 - Surplus grease was not removed
 - Grease has been thrown out onto the facing material



9. Facing material worn down to rivets

Cause

- Facing worn
 - Vehicle being driven despite slipping clutch
- Incorrect driving
 - Allowing the clutch to slip for too long
- Incorrect clutch assembly
- Faulty release mechanism



10. Facing scored on the flywheel side

Cause

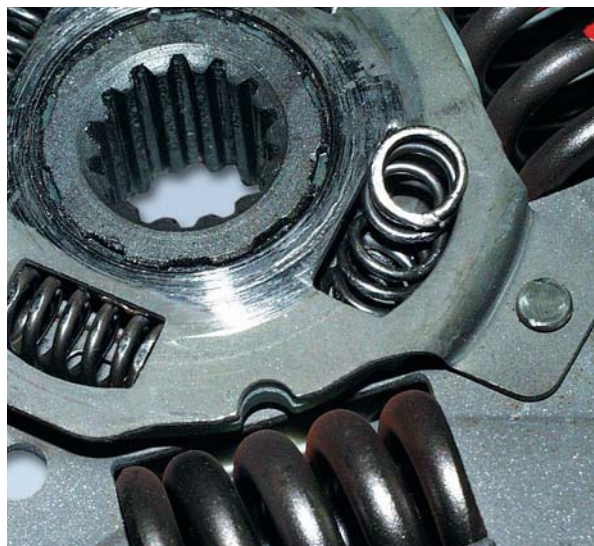
- Flywheel not replaced
- Contact surface on the flywheel not re-machined



11. Damaged idle damper

Cause

- Incorrect fitting
- Incorrect driven plate



12. Gearbox snout worn

Cause

- Incorrect grade of grease or no grease used
- Damaged release bearing



4 Clutch judders

1. Incorrect grease on splines

Cause

- Grease containing solids has been used



2. Tangential strap bent

Cause

- Play in the drive train
 - Worn drive line coupling (BMW)
- Incorrect driving
 - Tow-starting in 1st or 2nd gear
- Incorrect storage
 - Dropping the clutch prior to fitting
- Clutch not bolted up evenly and sequentially



3. Diaphragm spring fingers bent

Cause

- Incorrect fitting
 - Diaphragm fingers bent during fitting



4. Facing contaminated with grease

Cause

- Surplus grease not removed
 - Grease has been thrown out onto the facing material



5. Wear marks on release bearing inner bore

Cause

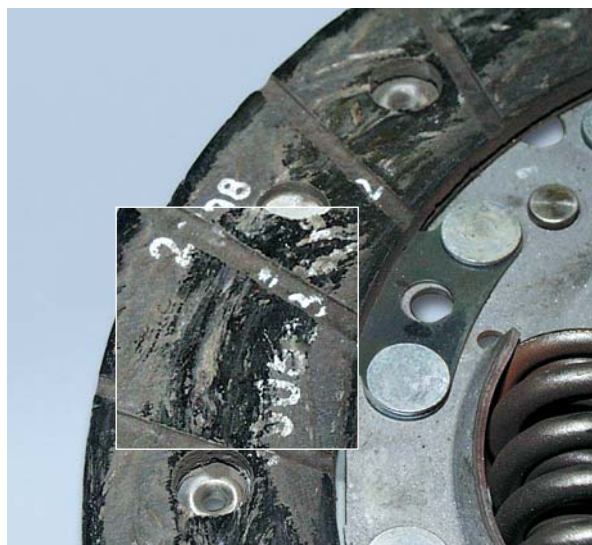
- Incorrect grade of grease or no grease used
- Damaged or worn gearbox snout



6. Facing worn on flywheel side

Cause

- Flywheel not replaced
- Contact surface on the flywheel not re-machined



7. Damaged hub splines

Cause

- Incorrect fitting
 - Gearbox input shaft and hub splines not correctly aligned prior to fitting
 - Driven plate not centered
- Incorrect driven plate



8. Release bearing worn

Cause

- Release fork worn
- Release system damaged



9. Release bearing incorrectly lubricated

Cause

- Use of a solids-based lubricant



10. Worn gearbox snout

Cause

- Incorrect grade of grease or no grease used
- Release bearing worn



11. Push rod wear mark off-center

Cause

- Damaged release system
 - Bearing worn
 - Guide bush worn



12. Flywheel scored

Cause

- Flywheel not re-machined/renewed



13. Tangential strap damaged

Cause

- Excessive free play in the drive joints



14. Damaged bearing lugs

Cause

- Damaged release system



15. Facing contaminated on the inner portion

Cause

- Damaged oil seal
- Excessive grease used on the splines



5 Clutch makes a noise

1. Worn diaphragm spring fingers

Cause

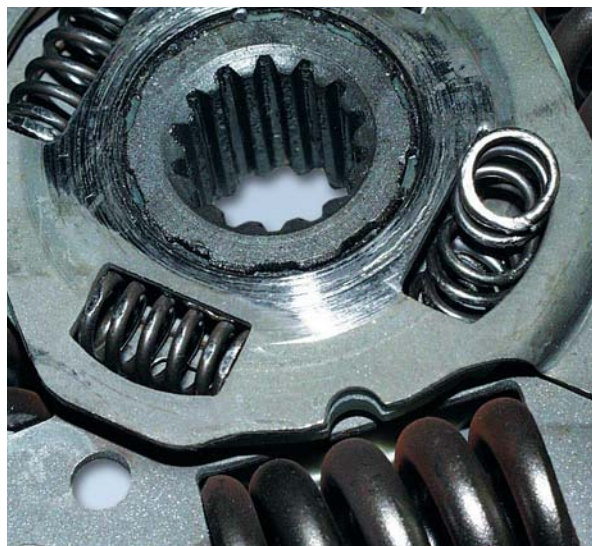
- Release bearing seized
- Faulty release system
- Incorrectly adjusted release system



2. Damaged idle damper

Cause

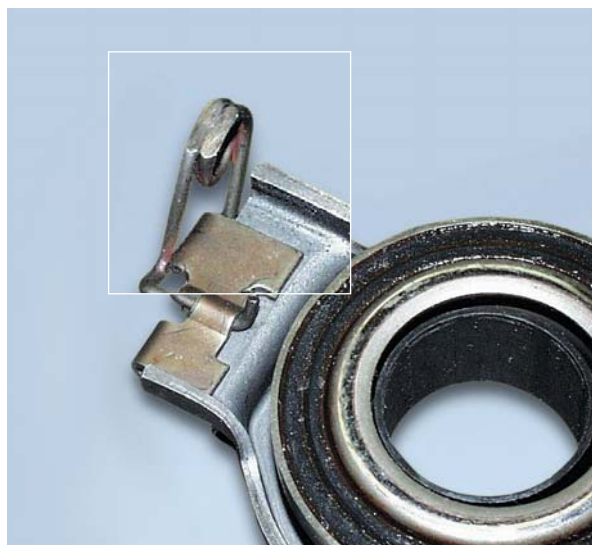
- Incorrect fitting
- Incorrect driven plate



3. Retainer spring damaged

Cause

- Incorrect fitting
 - Incorrect diaphragm spring in clutch assembly



4. Spring window damaged

Cause

- Incorrect driving
 - Driving the vehicle in too high a gear at low revs
- Incorrect clutch driven plate



5. Torsion damper spring broken out

Cause

- Facings contaminated with oil
- Out of tune engine
- Faulty release mechanism
 - Chatter vibration damages the torsion damper



6. Torsion damper stop rivet worn

Cause

- Incorrect driving
 - Driving the vehicle in too high a gear at low revs
- Incorrect clutch driven plate



7. Spline damaged on one side forming a taper, torsion damper damaged

Cause

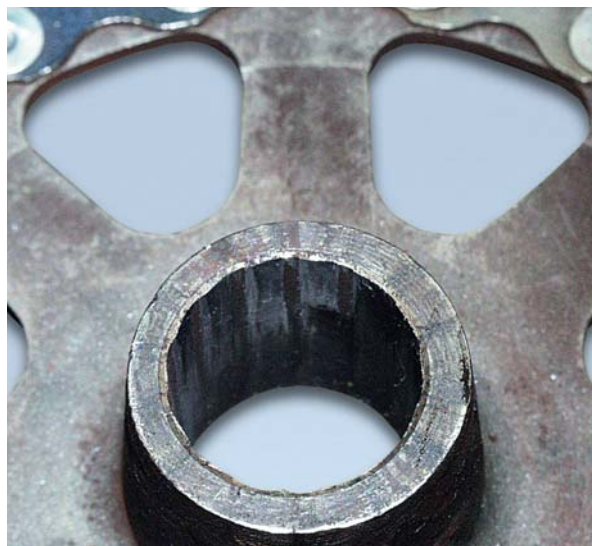
- Faulty spigot (pilot)
- Misalignment condition between engine and gearbox



8. Worn splines

Cause

- Worn or missing spigot (pilot) bearing
- Misalignment condition between engine and gearbox
- Damaged gearbox input shaft
- Induced torsional vibration



9. Casing and ball bearing damage

Cause

- Overheating of release bearing due to incorrect clearance, causing loss of grease and break up of bearing



10. Release bearing worn

Cause

- Incorrect adjustment of release arm
- Insufficient bearing preload (specification 80–100 N)



11. Gearbox snout worn

Cause

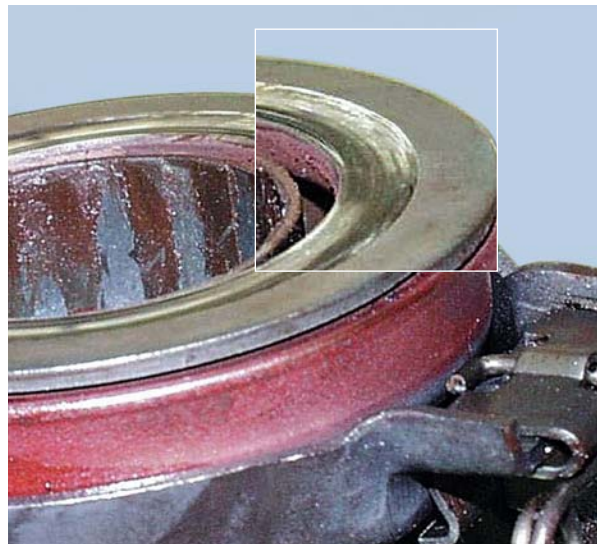
- Incorrect grade of grease or no grease used
- Damaged release bearing



12. Running surface on release bearing worn

Cause

- Release system worn
- Incorrect bearing preload (specification 80–100 N)



13. Worn release lever

Cause

- Incorrect or no grease



14. Release bearing tappet points worn

Cause

- Tappet points not lubricated
- Release system worn



15. Push rod wear mark off-center

Cause

- Damaged release system
 - Bearing worn
 - Guide bush worn



16. Damaged bearing lugs

Cause

- Damaged release system



17. Bearing fouling on clutch cover

Cause

- Clutch cover and release bearing mismatch



18. Torsion damper broken

Cause

- Incorrect driving
 - Driving the vehicle in too high a gear at low revs
 - Grease/oil-contaminated facing



19. Hub assembly broken

Cause

- Incorrect fitting
 - Driven plate fitted the wrong way round



6 Clutch pedal is heavy in operation

1. Damaged gearbox snout

Cause

- Incorrect grade of grease or no grease used
- Damaged release bearing

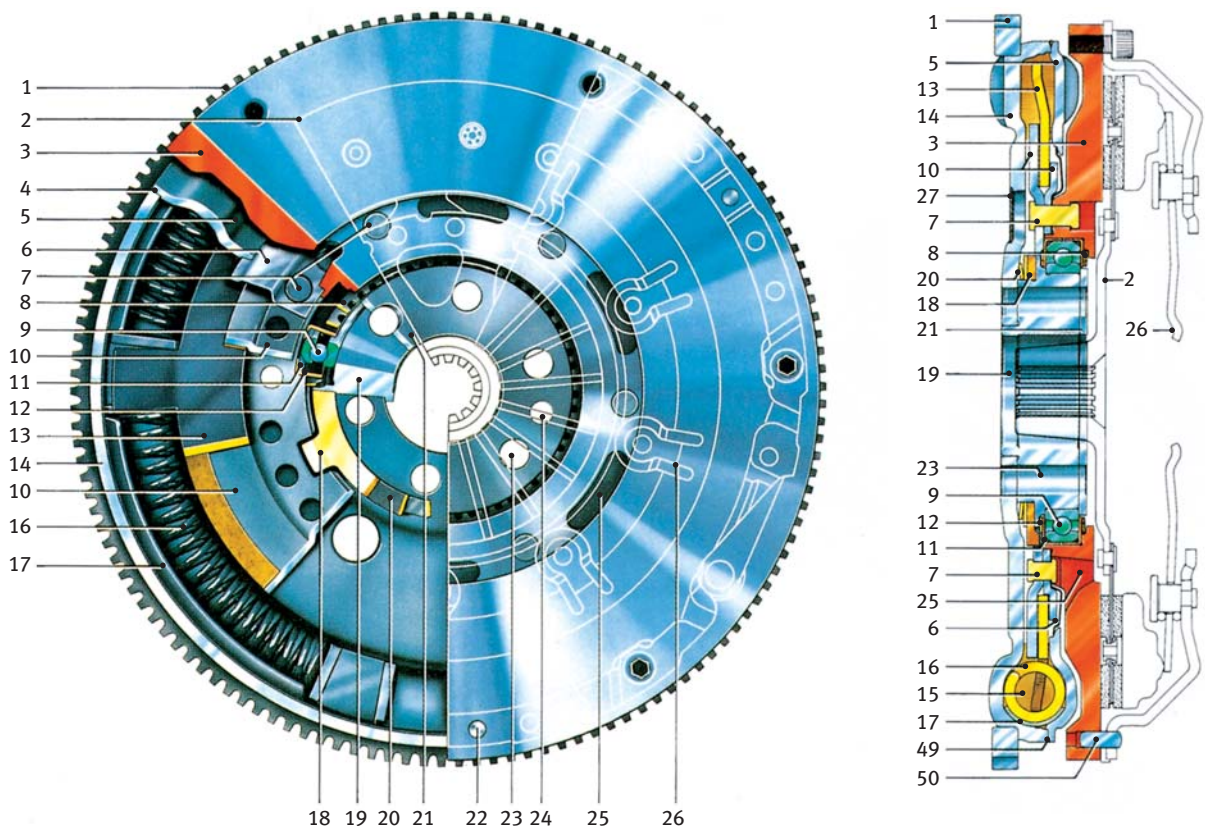


7 General tips on installing passenger vehicle and light transporter clutches

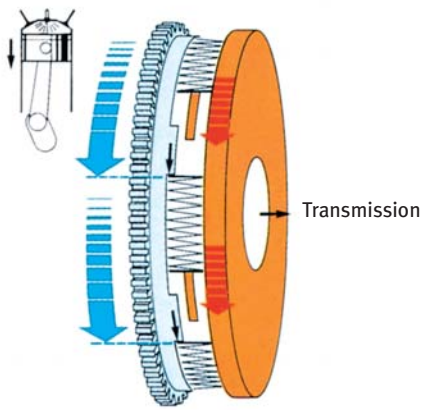
Dual-Mass Flywheels: design and operation

Dual-Mass Flywheels redistribute the mass moment of inertia and thus shift resonance frequencies to a range well below the normal operating range. The periodically occurring combustion cycles inevitably cause fluctuations in rotation rates. The spring/damping system of a Dual-Mass Flywheel virtually isolates the rest of the drive train

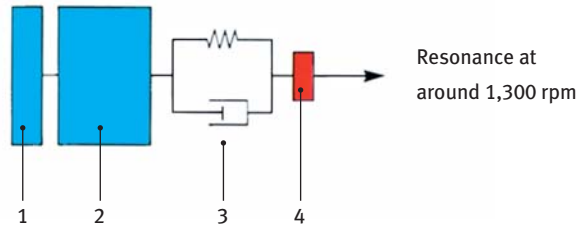
from these fluctuations and provides the smooth running of all components of the secondary mass (clutch, driven plate, transmission, and drive shafts) that follow in the drive train.



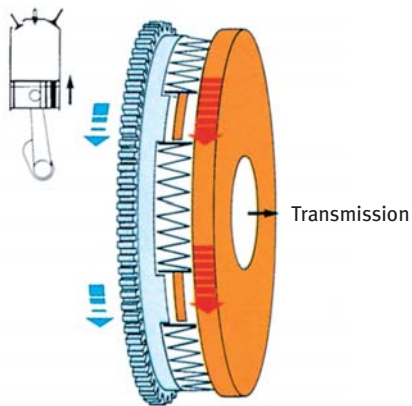
- | | |
|--|--------------------------------------|
| 1 Starter ring gear | 17 Tubular spring guide |
| 2 Rigid driven plate | 18 Load-transmitting friction washer |
| 3 Secondary rotating mass and friction surface | 19 Hub |
| 4 Laser weld | 20 Diaphragm spring |
| 5 Cover for primary rotating mass | 21 Washer |
| 6 Membrane seal | 22 Centering pin |
| 7 Rivet | 23 Mounting hole |
| 8 Diaphragm springs providing basic friction control | 24 Positioning hole |
| 9 Caged ball bearings | 25 Ventilation slots |
| 10 Friction and supporting ring | 26 Diaphragm-spring clutch |
| 11 O-ring | 27 Sheet-metal cover plate |
| 12 Sealing and insulating cap | |
| 13 Flange and diaphragm spring | |
| 14 Primary rotating mass and damper housing | |
| 15 Grease reservoir | |
| 16 Arced compression spring | |



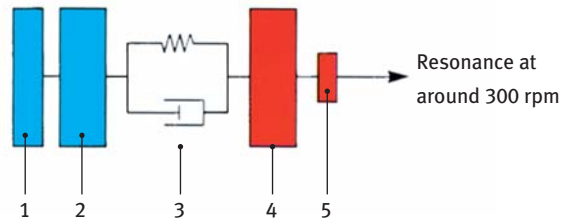
Schematic – the previous style



- 1 Engine
- 2 Flywheel clutch
- 3 Driven plate, torsional-vibration damper
- 4 Transmission



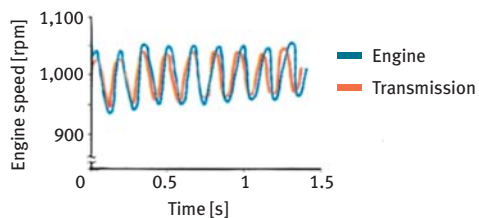
Schematic – Dual Mass Flywheel



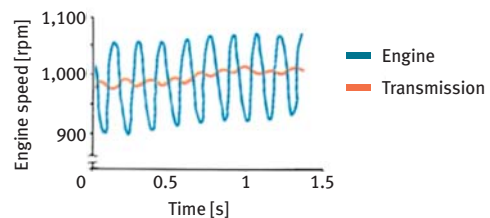
- 1 Engine
- 2 Primary rotating mass
- 3 DMF torsional-vibration damper
- 4 Secondary rotating mass, flywheel clutch
- 5 Transmission

How it works (transmission of torsional vibrations)

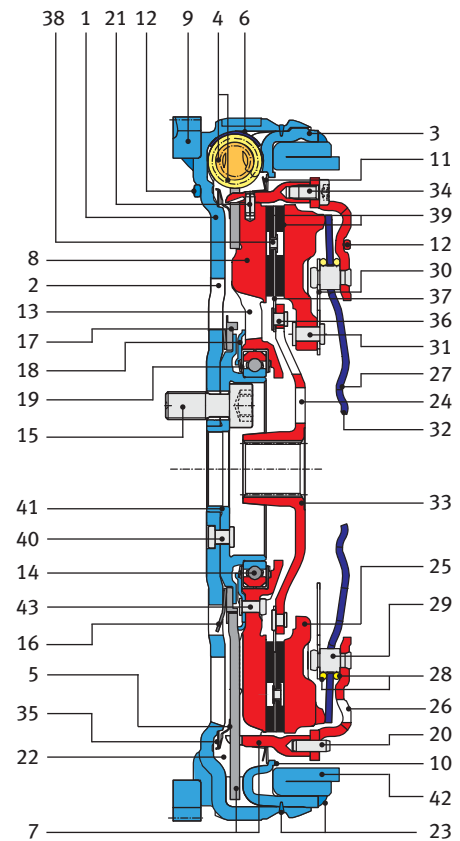
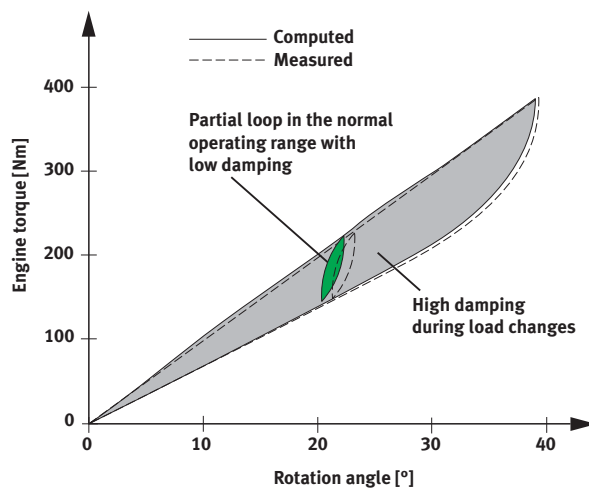
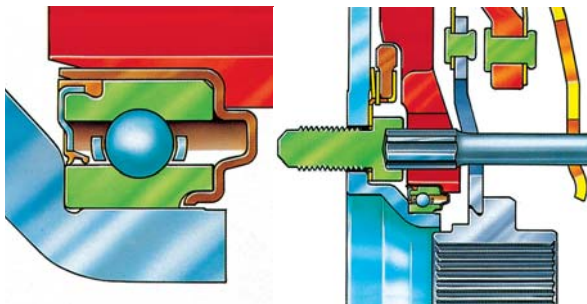
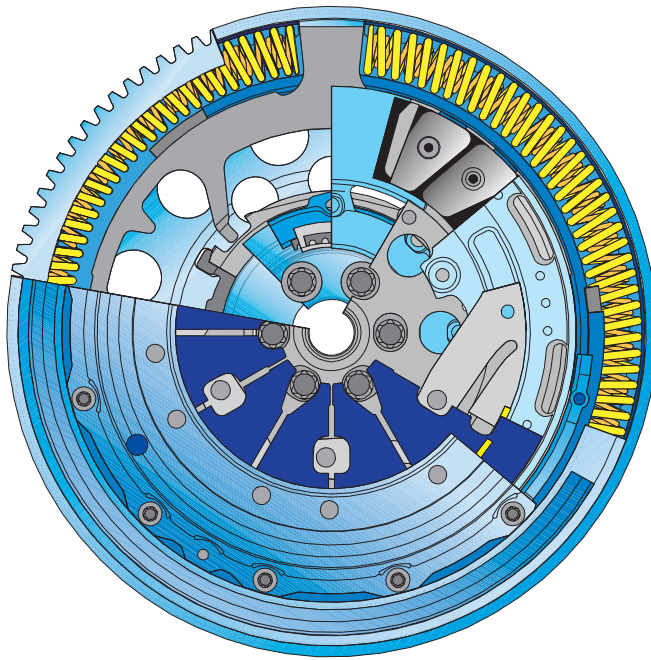
Conventional flywheel and driven plate with torsional-vibration damping



Dual-Mass Flywheel

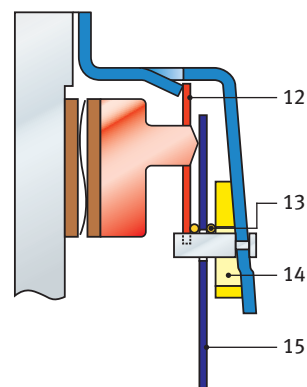
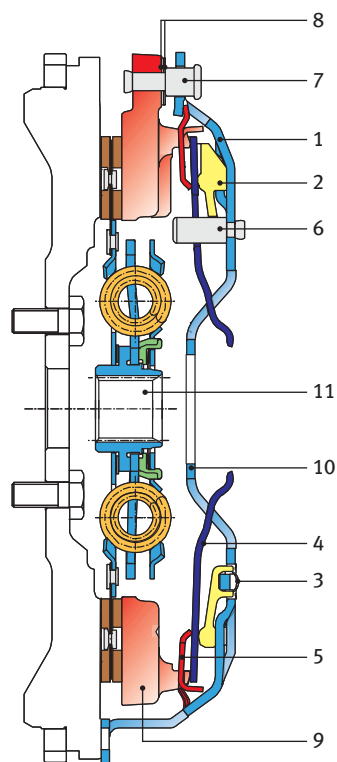
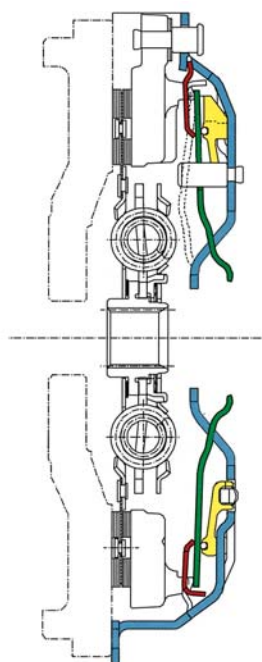
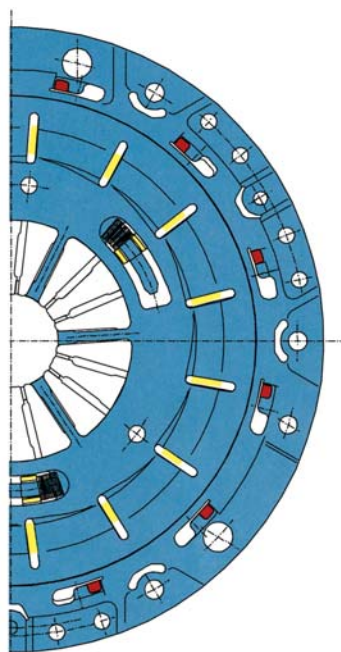
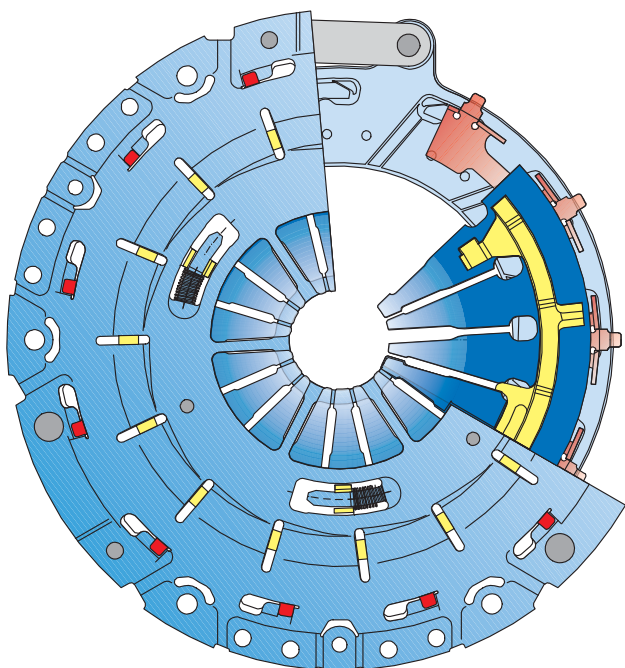


Damped Flywheel Clutch – design and operation

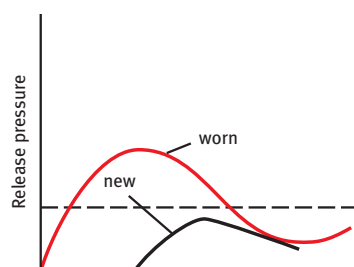
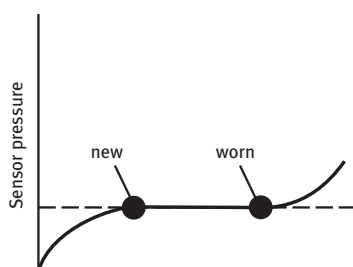


- | | |
|--|---|
| 1 Primary rotating mass and damper housing | 21 Tensioning pin |
| 2 Secondary rotating mass and friction surface | 22 Grease reservoir |
| 3 Cover for primary rotating mass | 23 Laser weld |
| 4 Arced compression spring | 24 Aperture for accessing retaining bolts |
| 5 Membrane seal | 25 Pressure plate with friction surfaces |
| 6 Tubular spring guide | 26 Ventilation slots |
| 7 Cover retaining ring and flange | 27 Diaphragm spring |
| 8 Ventilation slots | 28 Tilt rings |
| 9 Starter ring gear | 29 Riveted stud |
| 10 Membrane seal | 30 Leaf spring |
| 11 Sheet-metal support | 31 Rivet |
| 12 Balance weight | 32 Aperture for accessing retaining bolts |
| 13 Ventilation slots | 33 Hub |
| 14 Caged ball bearings with sealing and insulating cap | 34 Allen-head screw |
| 15 Allen-head screw | 35 Diaphragm spring |
| 16 Diaphragm spring | 36 Segment rivet |
| 17 Load-transmitting friction washer | 37 Spring segment |
| 18 Sheet-metal retainer | 38 Lining rivet |
| 19 Diaphragm spring | 39 Clutch linings |
| 20 Dowel pin | 40 Rivet |
| | 41 Hub |
| | 42 Annular mass (primary rotational mass) |
| | 43 Rivet |

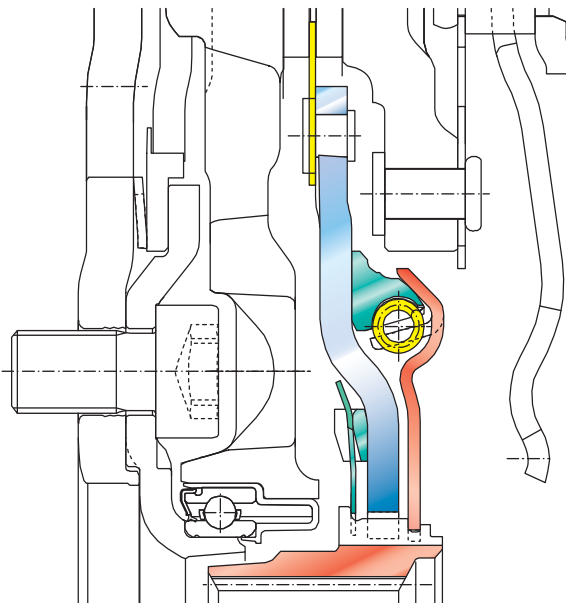
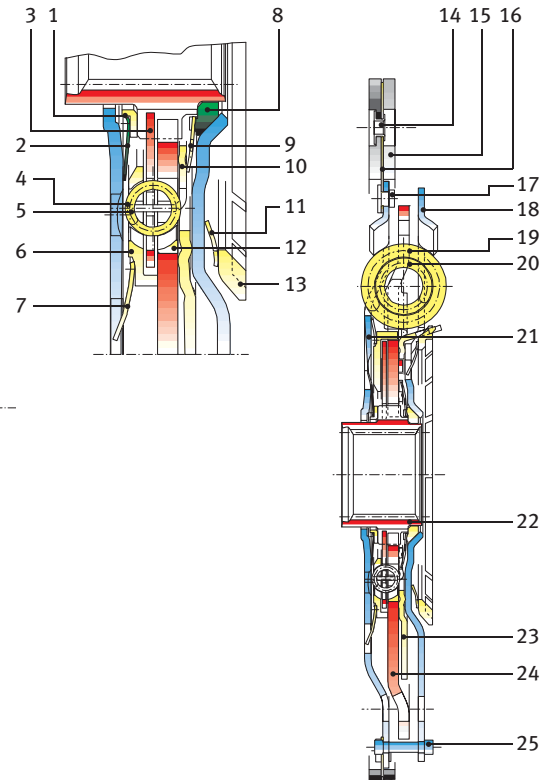
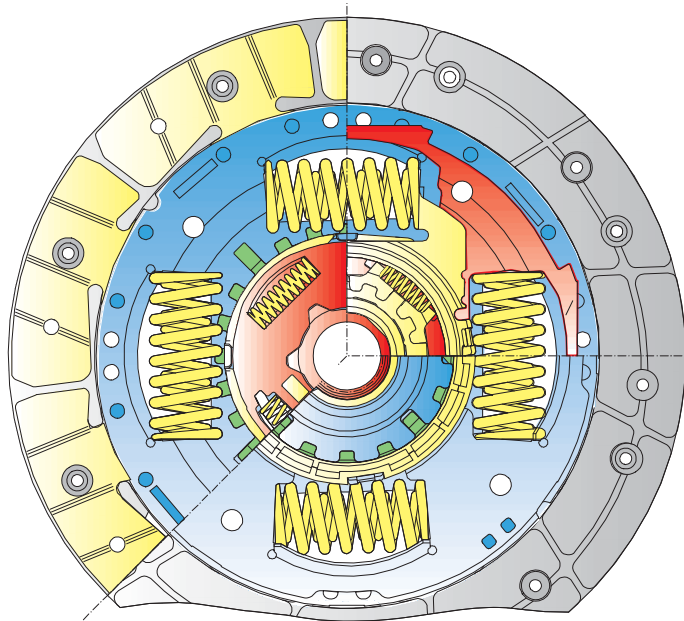
Self-Adjusting Clutches – design and operation



- 1 Cover
- 2 Adjusting ring (chamfered ring)
- 3 Compression spring
- 4 Diaphragm spring
- 5 Sensor diaphragm spring
- 6 Stud
- 7 Stud
- 8 Leaf spring
- 9 Pressure plate
- 10 Stop
- 11 Driven plate
- 12 Sensor-diaphragm spring
- 13 Pivot for the main diaphragm spring
- 14 Adjusting wedge
- 15 Main diaphragm spring

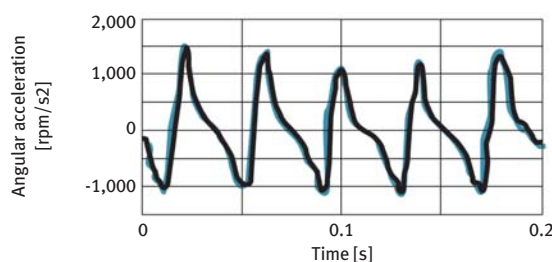


Driven Plates – design and operation

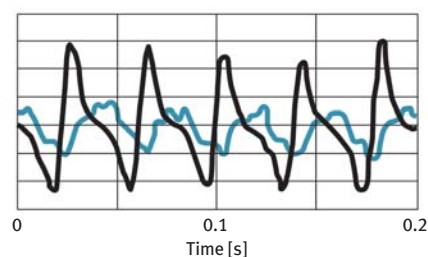


- | | |
|---|------------------------------------|
| 1 Predamper friction washer | 13 Main-damper friction washer |
| 2 Predamper diaphragm spring (1st stage) | 14 Lining rivet |
| 3 Predamper hub flange | 15 Friction linings |
| 4 Predamper compression springs | 16 Spring segment |
| 5 Predamper compression springs | 17 Segment rivet |
| 6 Predamper cage | 18 Counter plate |
| 7 Main-damper diaphragm spring (1st stage) | 19 Main-damper compression springs |
| 8 Centering cone | 20 Main-damper compression springs |
| 9 Predamper diaphragm spring (2nd stage) | 21 Driven plate |
| 10 Predamper load-transmitting washer | 22 Hub |
| 11 Predamper cage | 23 Main-damper friction washer |
| 12 Main-damper diaphragm spring (2nd stage) | 24 Main-damper auxiliary flange |
| | 25 Sheet-metal spacer |

Vibrations at idle speed



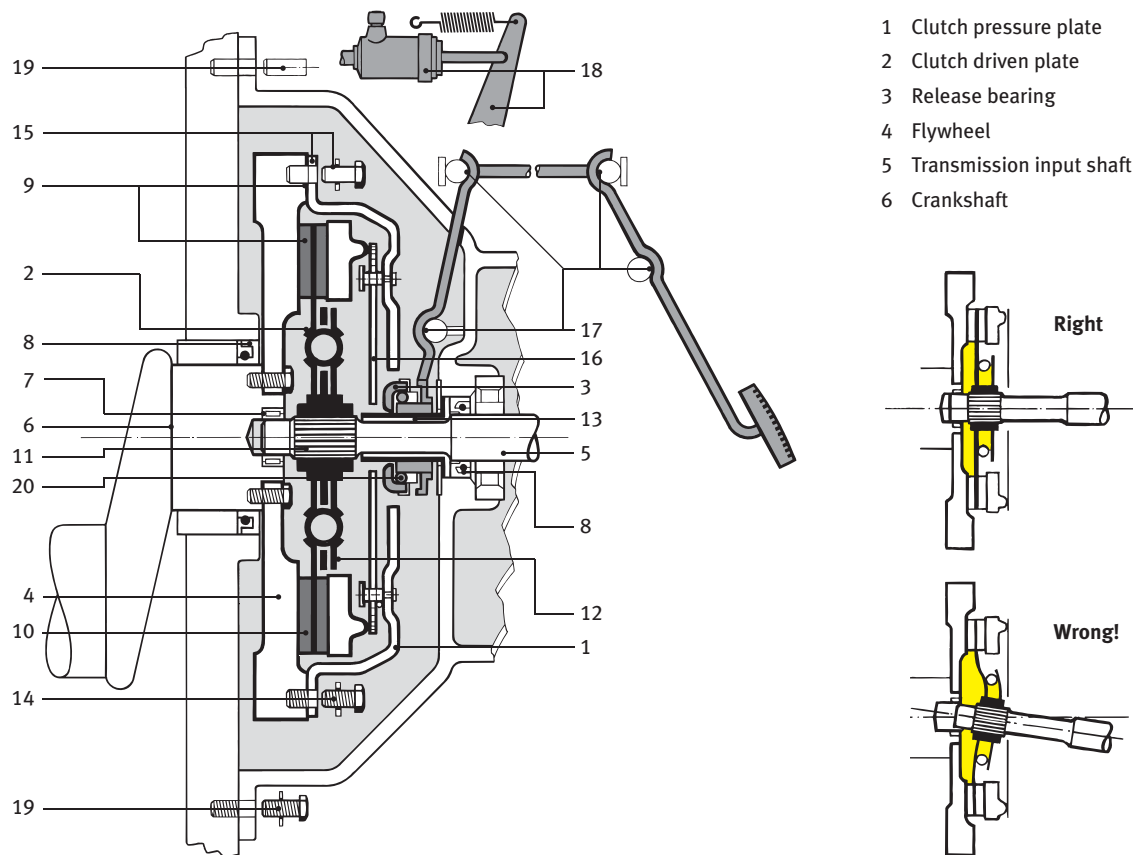
Without torsional-vibration damper



With torsional-vibration damper

— Engine
— Transmission

... cost-effective, efficient clutch replacements



First things first:

- Are the correct parts available?
- It is crucial to check before installation, compare with dismantled parts.

In particular, the following should be noted:

- 7 Check wear of the pilot bearing; renew if necessary.
- 8 Check shaft sealing rings on engine and transmission side for leakages and replace if necessary.
- 9 **Flywheel:** Check friction surface for scoring and cracks. Note the prescribed tolerances for reworking! Caution! Rework the screw fixing surface for the clutch to the same extent as the treated friction surface.
DMF: The friction surface must not be reworked!
- 10 Check the clutch disc for lateral run-out prior to assembly (**max. 0.5 mm**).
- 11 Check the clutch shaft for damage, lubricate spline profile or shaft. Remove excess grease. Manufacturer's recommendation: LuK high-performance grease (Schaeffler Automotive Aftermarket item no. **414 0014 10**). Grease containing suspended solids is not suitable. **NB: Chemical nickel-plated splines are not to be lubricated!**
- 12 Note the correct installation position of the clutch disc! Use centering pins for assembly.
- 13 Check the guiding sleeve of the release bearing for wear and replace if necessary; use suitable lubrication.

- 14 Tighten the clutch assembly crosswise with the prescribed torque. Always remove and install the SAC clutch with the special tool approved by Schaeffler Automotive Aftermarket (item no. **400 0072 10**).
- 15 Take into account the centering of the clutch assembly on the flywheel! With external centering, take into account the condition of the pilot diameter of the clutch assembly and the flywheel.
- 16 Inconsistencies in diaphragm spring tabs or release levers, caused by thickness tolerances in the friction lining, regulate themselves after a short run-in time. **If the fixed setting carried out by LuK in the factory is readjusted, the warranty is void!**
- 17 Check clutch operation for function and wear! Replace the clutch cable – check the bearings.
- 18 Check the hydraulic system for leaks and vent if necessary. Check the release stroke of the slave cylinder's piston rod. Check whether the initial position is reached. When changing the clutch, also replace the hydraulic concentric slave cylinder (CSC).
- 19 Check the alignment of the engine to the gearbox. Replace dislodged gearbox dowels!
- 20 Set release bearing clearance at 2-3 mm. Constant running bearings are operated with a pre-load of 80–100 N. Only combine bearings which have plastic sleeves with metal guiding sleeves.

8 LuK clutch service tips – diagnostic charts

The following easy-to-use charts are provided to enable clutch problems to be easily identified and make diagnosis simpler

Clutch fails to disengage

Problem	Cause	Remedy
Tangential straps damaged	The clutch was dropped Damaged on replacement	Renew the clutch pressure plate Check straps before fitting
Damaged levers/spring fingers	Incorrect assembly	Renew clutch pressure plate
Cover assembly distorted	Cover assembly not bolted down evenly and sequentially	Renew clutch pressure plate
Driven plate distorted	Check driven plate lateral run-out (max 0.5 mm)	Straighten driven plate
Corrosion on friction material	Vehicle not run for a long period	Clean the facing, remove all signs of corrosion
Driven plate seized or sticking on gearbox input shaft	Damaged spline profile Rust on input shaft Incorrect grease used Incorrect spline profile	Remove burrs or renew plate Remove all corrosion Use correct grade of grease Renew driven plate or gearbox input shaft or both
Facing too thick	Incorrect driven plate	Renew driven plate or gearbox input shaft or both
Facing material sticking	Grease or oil contaminated	Renew driven plate
Torsion damper broken	Driven plate incorrectly installed	Check driven plate for correct installation
Gearbox snout damaged	Damaged release bearing Incorrectly matched parts No grease used	Renew bearing Check suitability Lubricate snout
Damaged spigot (pilot) bearing	Worn	Renew bearing
Insufficient release travel	Incorrect clutch cable or adjustment incorrect Air in the hydraulic system Release system damaged	Replace clutch cable Bleed the system Renew the release system
Excessive release travel		Check release system operation
Driven plate seized to flywheel or to pressure plate		Clean rust and corrosion from facing material

Clutch slips

Problem	Cause	Remedy
Pressure plate overheating	Thermal overload	Renew clutch assembly
	Incorrect parts	
	Broken diaphragm spring	
	Oil contaminated	
Clutch housing, levers or diaphragm spring broken	Incorrect installation	Renew oil seal
Diaphragm fingers worn	Excessive release bearing pre-load	Follow correct installation procedures
		Adjust pre-load
		Renew clutch assembly
Clutch facing worn out	No free play	Adjust free play
	Normal wear and tear	Renew clutch assembly
	Incorrect pressure plate	
Clutch facing contaminated	Oil seals leaking	Renew oil seals
	Gearbox splines overgreased	Renew clutch assembly
	Release bearing overlubricated	
Uneven wear pattern on flywheel side of facing material	Badly worn flywheel	Re-machine flywheel
Flywheel thickness incorrect	Incorrect machining of flywheel bolting surface not machined to same dimension as running surface	Machine bolting surface
		Renew flywheel
Gearbox snout damaged	No/incorrect lubricant	Renew gearbox snout
	Damaged release bearing	Use correct lubricant
	Incorrect combination of bearing and snout	Check parts for suitability
Clutch cable heavy in operation	Clutch cable damaged	Renew clutch cable
	Incorrect cable	Check for correct cable assy
Release system heavy in operation	Damaged bushes on release arm or shaft	Renew bushes
	Bushes or bearing not lubricated	Lubricate bearings or bushes

Clutch judders

Problem	Cause	Remedy
Pressure plate uneven	Broken or bent tangential straps Distorted cover	Replace clutch cover Install correctly
Facing contaminated with oil	Oil seals defective	Renew oil seals Replace driven plate
Facings contaminated with grease	Excessive grease on splines and release bearing	Renew driven plate Renew release bearing
Incorrect facing material	Incorrect plate fitted	Check plate is suitable for application
Facing damp	Moisture penetrated facing	Operate clutch to remove moisture
Difficult or hard operation	Clutch cable Release lever bearings Gearbox snout Master or slave cylinder	Fully inspect the release system Check bearing/snout combination Renew all suspect parts
Air in the hydraulic system	Leaking or damaged master/slave cylinders or pipes	Renew any suspect or damaged parts
Damaged gearbox snout	Incorrect lubricant used	Renew the snout and use correct grade of lubricant
Engine/gearbox mountings	Incorrect or damaged mountings	Replace mountings
Engine not tuned/misfiring	carburetor, fuel injection, ignition timing	Check engine for correct running

Clutch makes a noise

Problem	Cause	Remedy
Bearing running eccentrically to diaphragm fingers	Bearing not centering	Renew bearing
No drive		Renew pressure plate or driven plate
Incorrect driven plate	Torsion damper incorrect for vehicle application	Fit correct driven plate
Torsion damper broken	Incorrect damper	Fit correct driven plate
Release bearing defective	Not rotating smoothly	Renew bearing
Spigot (pilot) bearing defective	Bearing seized	Renew bearing
Worn or broken torsion damper	Incorrect driving habits Wrong gear selection	Renew driven plate

Clutch pedal is heavy in operation

Problem	Cause	Remedy
Incorrect pressure plate	Release load too great	Fit correct pressure plate
Damaged gearbox snout	Release bearing damaged	Renew release bearing
	Incorrect combination	Check combination
	No grease used	Grease bearing and snout
	Incorrect grease used	Use correct grade of grease
Release system bearings or bushes worn	Bushes worn or not lubricated	Renew bearings and bushes Lubricate where required
Clutch cable damaged	Normal wear and tear	Renew cable
	Incorrect cable fitted	Check for suitability

9 LuK troubleshooting and service tips for passenger cars

Start by asking the customer some questions on:

Nature of the malfunction:

- What is the customer's complaint?
- Can the problem be reproduced?
- Does the problem occur in particular circumstances (e.g. after extended periods of downtime, after highway cruising or during cold running)?

Wear and tear:

- What is the car's total mileage?
- Has the total mileage been driven with one clutch assembly?
- Is the vehicle subject to exceptionally high operating loads (taxi or driving school car, chip tuning, frequent towing or commercial use)?

Operation:

Who's driving?

- Beginner
- Experienced driver

Previous repairs:

- Have clutch and transmission been previously repaired?

Diagnosing steps

1. How does the problem manifest itself?
2. Theoretical approach: Which part could have failed?
3. What to check prior to disassembly
4. What can be seen after disassembly?
5. What could be the root causes of the defect?

Clutch slips

1. How does the problem manifest itself?

High engine runs during drive-off/acceleration – no or slow increase in velocity.

2. Theoretical approach: Which part could have failed?

- Clutch driven plate
- Clutch pressure plate
- Release system
- Actuation system
- Flywheel/Dual Mass Flywheel (DMF)

3. What to check prior to disassembly

QUICK TEST

Apply hand brake, crank engine, put into 3rd gear, depress gas pedal and engage clutch slowly. → Engine not stalled → Clutch defective!

TEST DRIVE

Accelerating → On reaching max. torque, engine suddenly starts to rev up faster, but car will not accelerate further → Clutch defective!

ACTUATION SYSTEM

- Pedal mechanism
- Clutch play
- Clutch cable
- Master/slave cylinder and pipes/hoses

4. What can be seen after disassembly?

CLUTCH DRIVEN PLATE

- Oil-fouled linings
- Grease-fouled linings
- Lining burnt/carbonized
- Reduced lining thickness

CLUTCH PRESSURE PLATE

- Overheating of pressure plate
- Heavy scoring of pressure plate
- Diaphragm spring fractured

FLYWHEEL/DUAL MASS FLYWHEEL (DMF)

- Scoring/cracking of friction surface
- Flywheel depth beyond tolerance limits

RELEASE SYSTEM

- Heavy release bearing/guide sleeve
- Leaking/heavy CSC

5. What could be the root causes of the defect?

- Normal wear and tear
- Frequent driving with slipping clutch
- Shaft seal ring on crank shaft or gearbox leaking
- Engine tuning
- Oil-fouled clutch disc hub
- Clutch was driven beyond wear limits
- Thermal overload of clutch (until overheating can be smelled)

Clutch judders

1. How does the problem manifest itself?

Irregular engine torque transfer during drive-off.
Engine vibrations generate noise in the power train.

2. Theoretical approach: Which part could have failed?

- Clutch driven plate
- Clutch pressure plate
- Release system
- Engine suspension/mounting
- Gearbox suspension/mounting
- Propeller shafts
- Flexible disc
- Flywheel/DMF friction surface

3. What to check prior to disassembly

TEST DRIVE

➔ Clutch judders in certain operating conditions, e.g. when starting uphill in reverse!

ACTUATION SYSTEM

- Pedal mechanism
- Clutch cable
- Release shaft
- Master/slave cylinder and pipes/hoses

DRIVE TRAIN – ENGINE

- Engine management
- Engine suspension/mounting

GEARBOX

- Gearbox suspension/mounting

DRIVE

- Propeller shafts
- Flexible disc

4. What can be seen after disassembly?

CLUTCH DRIVEN PLATE

- Oil-fouled linings
- Lining glazed
- Incorrect contact pattern

CLUTCH PRESSURE PLATE

- Tangential leaf spring buckled or broken
- Diaphragm-spring fingers deformed
- Cover distorted (caused by installation without using SAC special tool, for example)

FLYWHEEL/DUAL MASS FLYWHEEL (DMF)

- Friction surface not in order

RELEASE SYSTEM

- Release bearing/release shaft bearing damaged
- Guide sleeve corroded
- Leaking, heavy CSC

5. What could be the root causes of the defect?

- Oil-fouled primary shaft
- Wrong lubricant
- Installation fault
- Centering sleeve missing on engine
- Thermal overload of clutch (up to odor accumulation)
- Tow-starting in 1st or 2nd gear; visit to car wash with conveyer belt with driving position engaged (resulting in buckled tangential leaf spring)

Clutch fails to disengage

1. How does the problem manifest itself?

Drive not interrupted despite depressed clutch, noisy gear shift.

2. Theoretical approach: Which part could have failed?

- Clutch pressure plate
- Clutch driven plate
- Release system
- Clutch actuation system

3. What to check prior to disassembly

QUICK TEST

Crank engine, put into reverse gear, shift through all gears ➔ Gearbox noise during shift ➔ Clutch defective!

ACTUATION SYSTEM

- Pedal mechanism
- Clutch play
- Clutch cable
- Release lever, release shaft
- Master/slave cylinder travel
- Master/slave cylinder pipes/hoses
- Clutch hydraulic fluid level
- Clutch hydraulics bleeding status

4. What can be seen after disassembly?**CLUTCH DRIVEN PLATE**

- Hub profile corroded
- Lining rusted to mating friction surface
- Lining broken/vanished
- Lining carrier dished
- Lining carrier broken
- Clutch disc installed back to front
- Lateral run-out of clutch disc
- Torsion spring broken off

CLUTCH PRESSURE PLATE

- Pressure plate broken
- Tangential leaf spring buckled
- Tangential leaf spring broken
- Diaphragm spring tips heavily worn
- Cover deformed (caused by installation without SAC special tool, for example)

RELEASE SYSTEM

- Heavy release bearing, CSC
- Release shaft bearing seized
- Release fork fractured
- Guide sleeve corroded

SPECIAL CASE

- Primary shaft jammed in pilot bearing → Torque is transferred

MULTI-PLATE CLUTCH

- Control slider not positioned on flywheel end stop

COIL SPRING CLUTCH

- Fractured lugs and cams

PULLED-TYPE MULTI-PLATE CLUTCH

- Spacers misaligned

5. What could be the root causes of the defect?

- Engine-transmission angular misalignment
- Clutch disc dished due to installation error
- Centering sleeve missing on engine
- Tow-starting in 1st or 2nd gear; visit to car wash with conveyer belt with driving position engaged (resulting in distorted/broken tangential leaf spring)
- Clutch disc speed exceeded maximum lining burst speed. This damage occurs when the vehicle is allowed to coast with the clutch pedal depressed and the vehicle speed exceeds the respective maximum speed of the gear selected.

Heavy clutch**1. How does the problem manifest itself?**

Greater force needed to depress clutch pedal.

2. Theoretical approach: Which part could have failed?

- Clutch pressure plate
- Clutch actuation system
- Release system

3. What to check prior to disassembly**ACTUATION SYSTEM**

- Pedal mechanism
- Clutch cable
- Release shaft
- Master/slave cylinder
- Pipes/hoses

4. What can be seen after disassembly?**RELEASE SYSTEM**

- Release bearing worn
- Guide sleeve worn, corroded, damaged
- Release shaft worn
- Release shaft bearing worn
- CSC defective

5. What could be the root causes of the defect?

- Incorrect or lack of lubricant
- Normal wear and tear
- Installation fault

Clutch makes a noise**1. How does the problem manifest itself?**

Noisy clutch actuation, noise emitted from the clutch environment during operation.

2. Theoretical approach: Which part could have failed?

- Clutch actuation system
- Clutch driven plate
- Clutch pressure plate
- Release system

3. What to check prior to disassembly**QUICK TEST**

Engage/disengage clutch while engine is shut off

- Noise coming from the clutch environment?
- Parts of actuation system defective!

TEST DRIVE

- Grinding noise? → Clutch defective!

ACTUATION SYSTEM

- Pedal mechanism
- Clutch cable
- Release shaft
- Master/slave cylinder
- Pipes/hoses

4. What can be seen after disassembly?

CLUTCH DRIVEN PLATE

Fouling marks on hub

- Fouling marks on torsion damper
- Fouling marks on torsion damper retainer plate
- Torsion springs broken out
- Hub profile worn

CLUTCH PRESSURE PLATE

- Diaphragm-spring fingers worn
- Grinding marks on diaphragm spring lower side

RELEASE SYSTEM

- Bearing of release bearing/CSC defective
- Release shaft bearing defective
- Guide sleeve worn, corroded

CLUTCH ACTUATION SYSTEM

- Lack of lubricant on moving parts

PILOT BEARING

- Lack of lubricant/wear and tear

FLYWHEEL/DUAL MASS FLYWHEEL (DMF)

- Seized/worn

COIL SPRING CLUTCH

- Fractured lugs and cams

5. What could be the root causes of the defect?

- Incorrect or lack of lubricant
- Normal wear and tear
- Installation fault
- DMF seized due to exceedingly long clutch cover tightening bolts, resulting in hub profile damage.
- Installation of incorrect parts.

You can find up-to-date Service Infos on mounting and dismounting clutches, as well as our online catalog at:

www.Schaeffler-Aftermarket.com or

PERT.COM">WWW.REPPERT.COM

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