Failure Diagnosis

LuK's guide to troubleshooting clutch-system failures and malfunctions

passenger cars

Contents

This manual is for the use of all of our employees, business associates, and friends who sell, install, or report on LuK-clutches. It is primarily intended to be a source of information that will simplify diagnosing the causes of failures and malfunctions of commercial vehicle clutch systems. Its content is confined to typical clutch-system defects and is not aimed at being complete.

August 2008, 3rd edition

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, however 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. Also take this opportunity 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 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 are 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 also must be fitted.

Notes: The following is 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 accomodate 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 a damage on their way to the garage.
Every driven plate should be checked for lateral runout (the maximum tolerance is 0.5 mm) prior to installation. Excessive lateral runout 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 bearing 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 mechanism 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 judder, clutch slip, heavy or difficult clutch operation. Damaged or worn guide tubes should always be replaced as part of a professional clutch replacement.
LuK-AS has a range liste within our passenger car catalogue, identified against specific vehicle applications.
Note: Audi and VW models still found to be fitted with a plastic sleeve should have them replaced with the metal version
LuK-AS No. 414 0002 10.
Note: 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. Re-lubricate the bearings before replacing the shaft.
The LuK-AS part 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.
LuK-AS'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.
LuK-AS has the correct high-melting-point grease for clutch replacements available under Part No. 414 0014 10. Once grease has been applied to the spines 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.

• Hotline number for problem cases:
+49 (0) 1801-753-333 or in the U.K.
+44 (0) 8457 001100

Failure diagnosis/causes of failures

Certain criteria should be kept in mind and certain procedures observed when assessing the malfunction of clutch systems. 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 provide basic information in 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 and it can be readily and clearly described.

The five possible reasons for complaints about clutches:

- Clutch fails to disengaged
- Clutch slip
- Clutch judder
- 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 undertaken.
Where as searching for the cause of the failure / or 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.
The cause of clutch failures or faults is not always attributable to a clutch malfunctioning. A closer look would show that there are a variety of external influences that can affect clutch operation.

Here are a few examples:

Incorrectly adjusted carburettors 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.

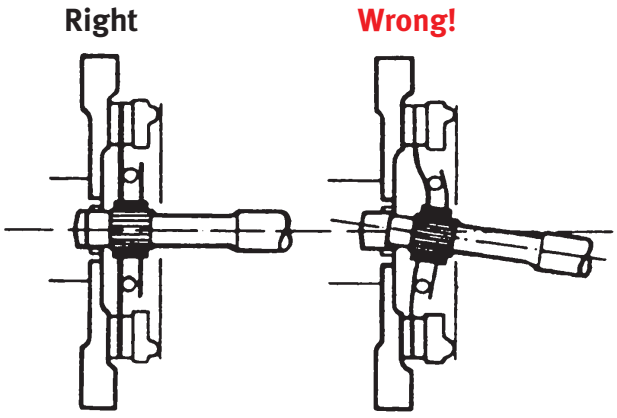
Damaged or weak engine mountings will cause the engine to move from it’s position and then ‘bounce’ back when the clutch is engaged, which causes a transition between static and dynamic coefficients of friction at the contact surface of clutch facings and results in judder.

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 judder.

Distorted transmission mountings or missing spigot (pilot) bearings cause angular misalignment between the crankshaft and transmission input shaft which results in judder or disengagement problems.
The subsequent ‘Wobbling’ motion of the driven plate during engagement and disengagement because 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.RepXpert.com or **www.Schaeffler-Aftermarket.com**!

Clutch fails to disengage

1. Worn diaphragm spring fingers

Cause

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

2. Broken clutch levers

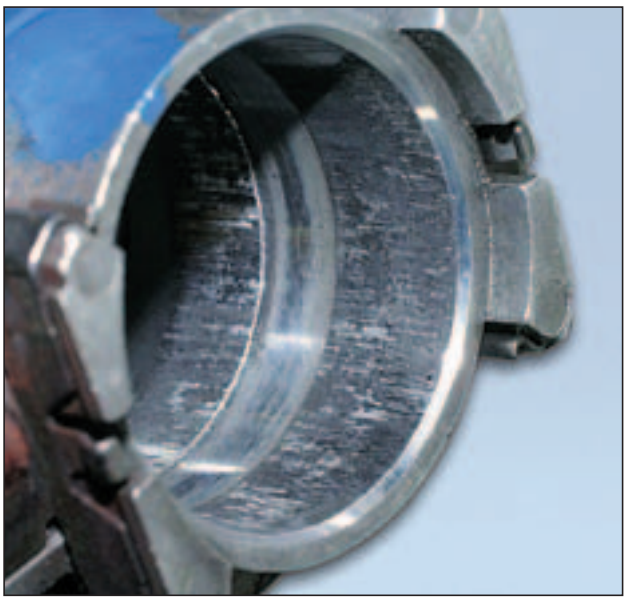
Cause

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

3. Damaged inner bore on release bearing

Cause

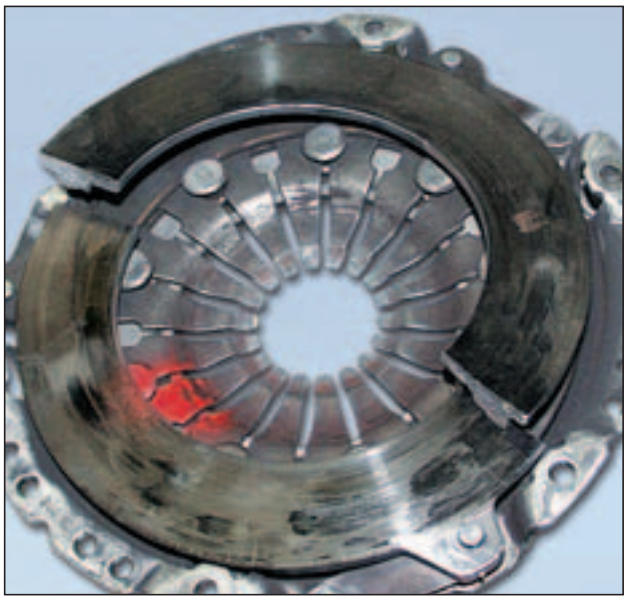
- Incorrect grade of grease or no grease used
- Damaged gearbox snout



4. Damaged bearing lugs

Cause

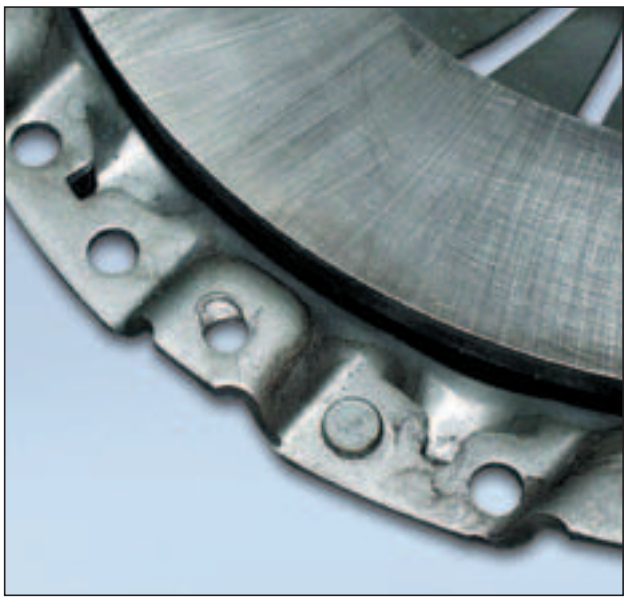
- Damaged release system



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

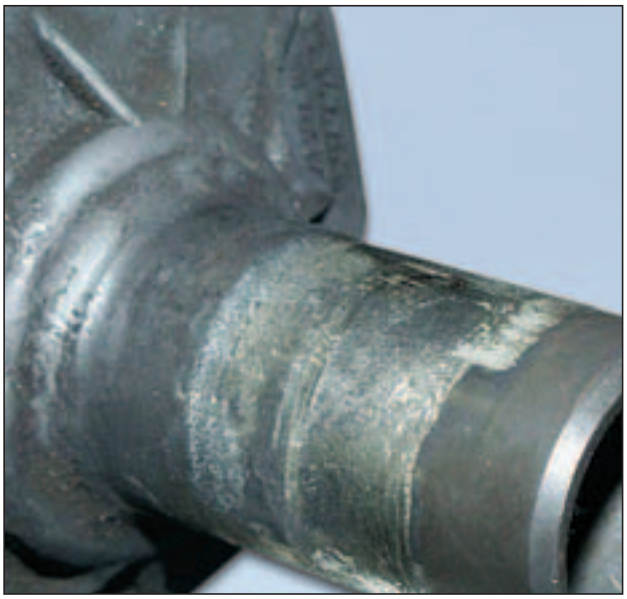
- Incorrect fitting

→ 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

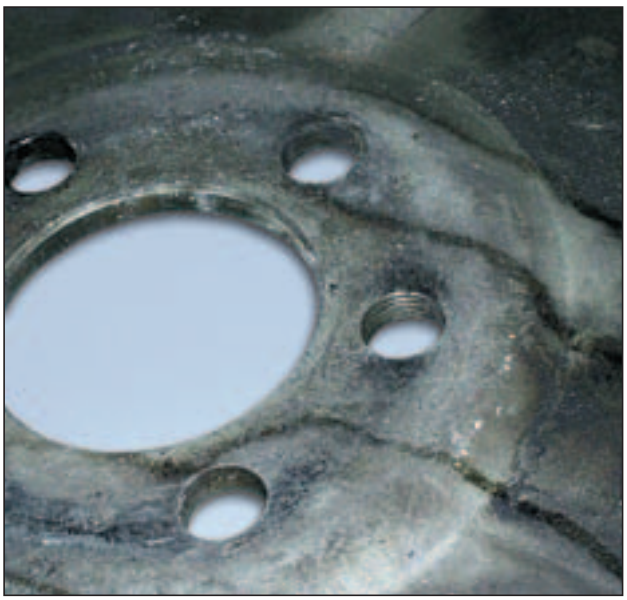
- Incorrect fitting
- Not aligned to flywheel correctly

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

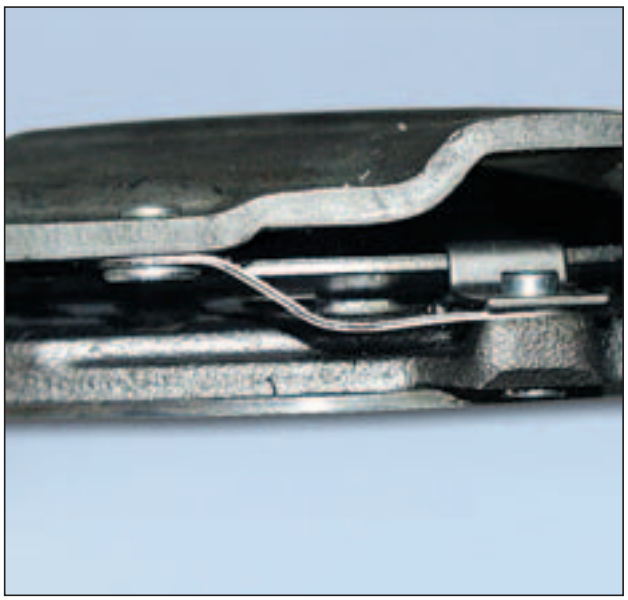
→ Worn drive line coupling (BMW)

- Incorrect driven practice

→ 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 driven practice

→ 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

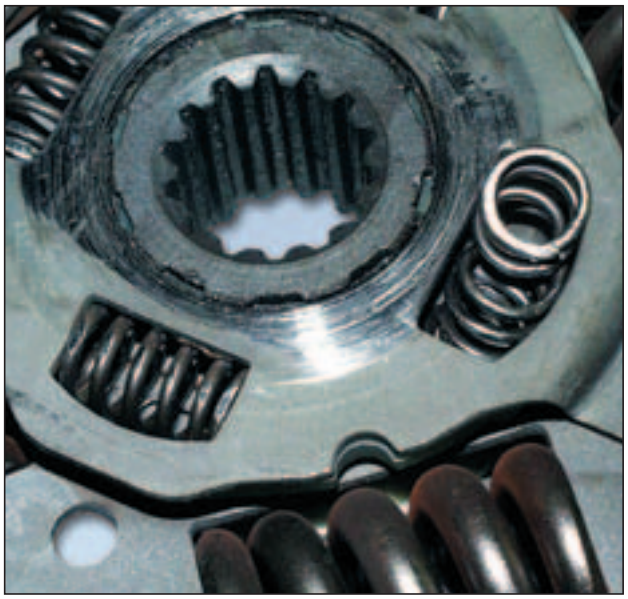
Cause

- 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

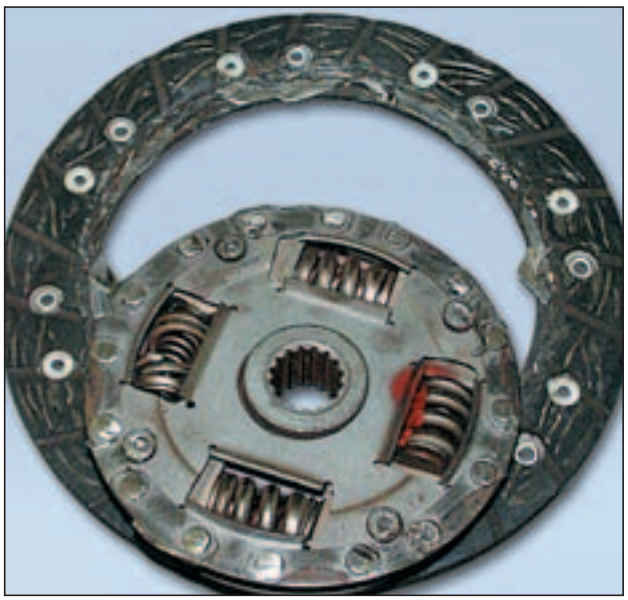
- Incorrect fitting
- Incorrect driven plate

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 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 engine speed, the critical factor is the speed of the gearbox input shaft.

20. Facing burnt

Cause

- Oil contaminated facings

→ Faulty oil seals

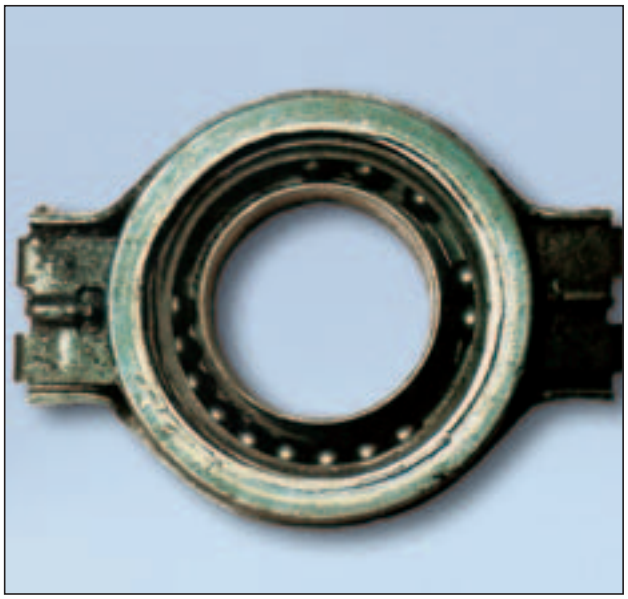
- Release system seized or faulty
- If the flywheel has been refaced the pot depth was not considered or the bolting surface not machined by the same amount

21. Excessive driven plate runout (distorted driven plate)

Cause

- Driven plate not checked befor fitting

→ Driven plate bent during fitting (maximum permissible runout 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)

1. Overheating of pressure plate

Cause

- Oil on the facings
  (reduced coefficient of friction)

→ Faulty oil seals

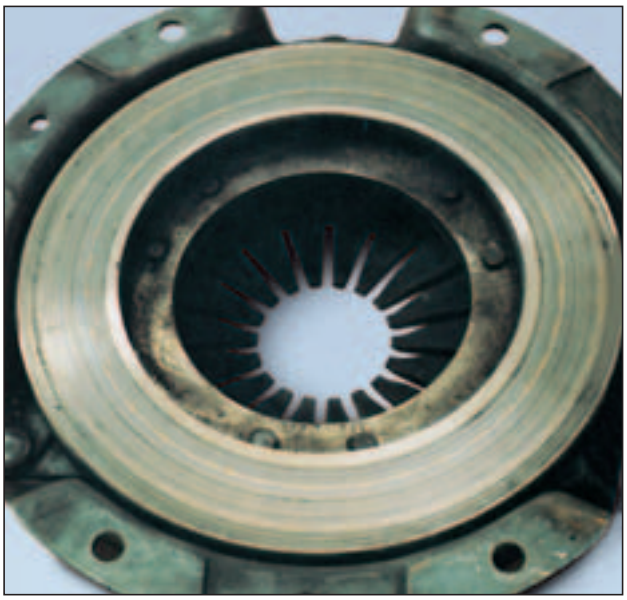
- Insufficient release bearing clearance
- Damaged release system (cable or hydraulic)
- Incorrect driven practice

→ Allowing the clutch to slip for too long

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

Cause

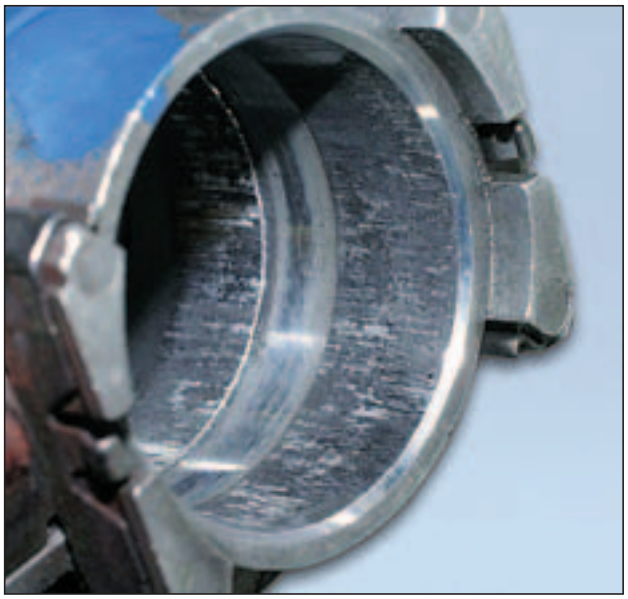
- Facings badly worn
- Incorrect release bearing clearance
- Faulty release system
- Clutch operating in a partially disengaged condition



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 carbonised

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

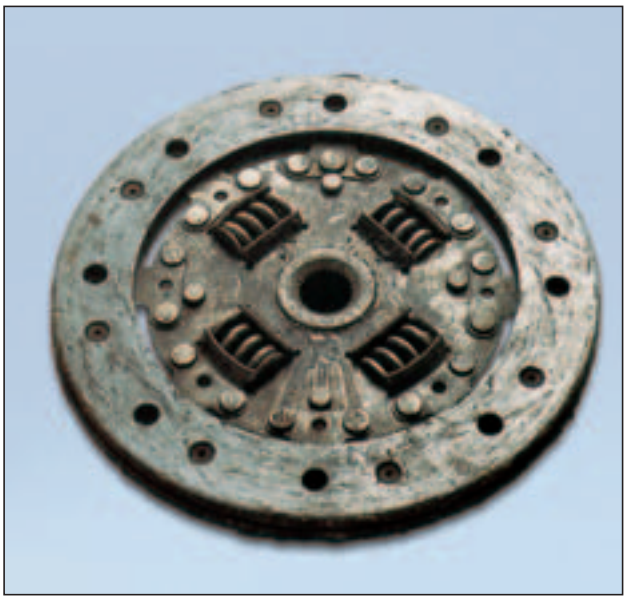
8. Facing contaminated by grease

Cause

- Splines over greased

→ Surplus grease was not removed

→ Grease has been thrown out on to the facing material



9. Facing material worn down to rivets

Cause

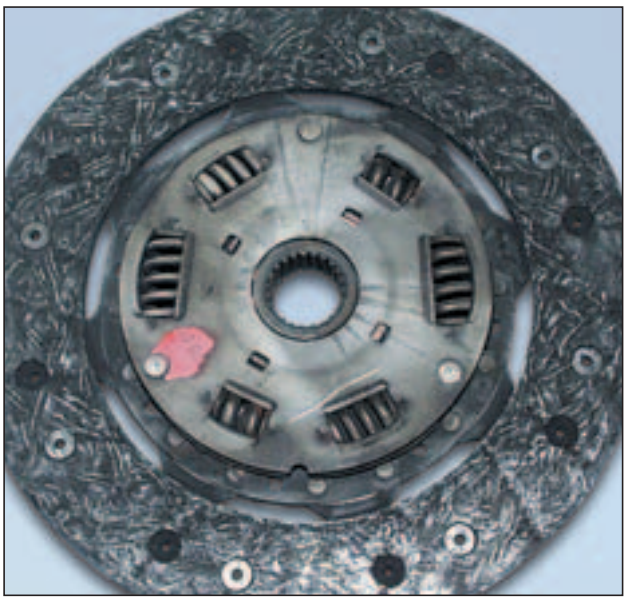
- Facing worn

→ Vehicle being driven despite slipping clutch

- Incorrect driven practice

→ Allowing the clutch to slip for too long

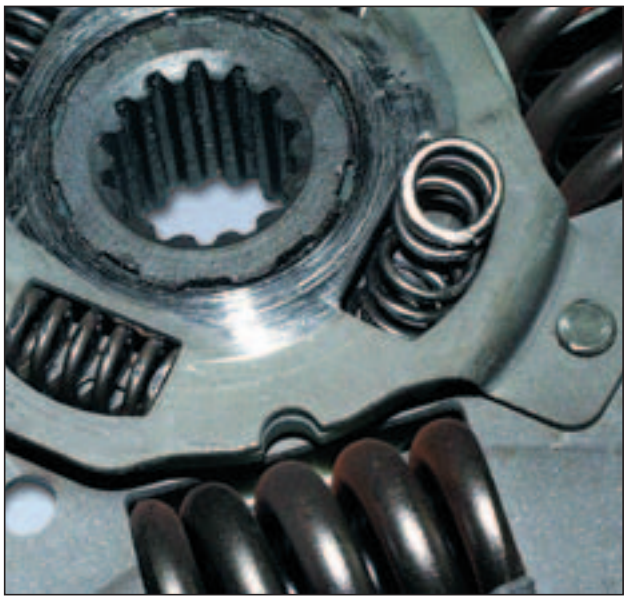
- Incorrect clutch assembly
- Faulty release mechanism



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

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 driven practice

→ 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

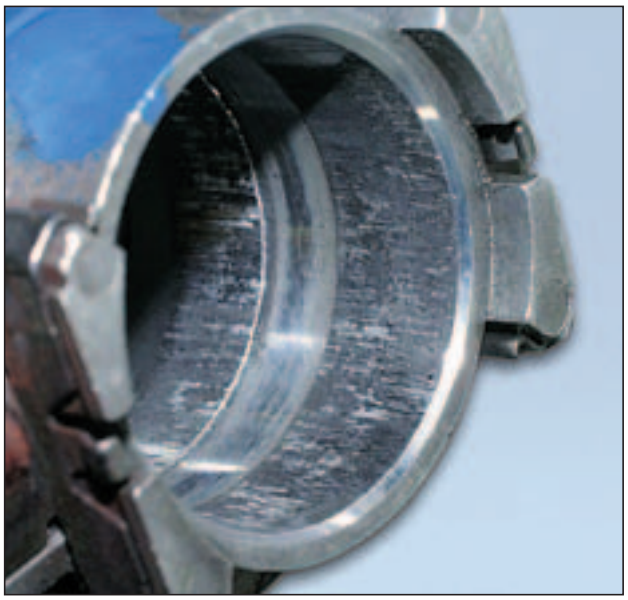
→ Diaphragm fingers bent during fitting

4. Facing contaminated with grease

Cause

- Surplus grease not removed

→ Grease has been thrown out on to 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

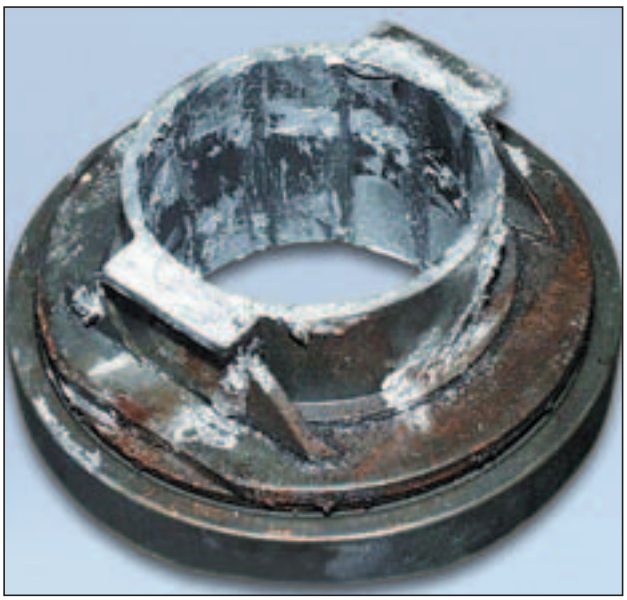
Cause

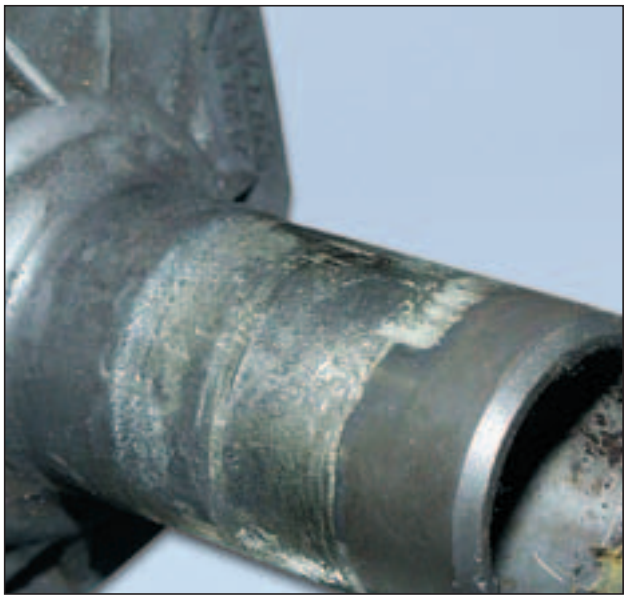
- Release fork worn
- Release system damaged

9. Release bearing incorrectly lubricated

Cause

- Use of a solids based lubricant

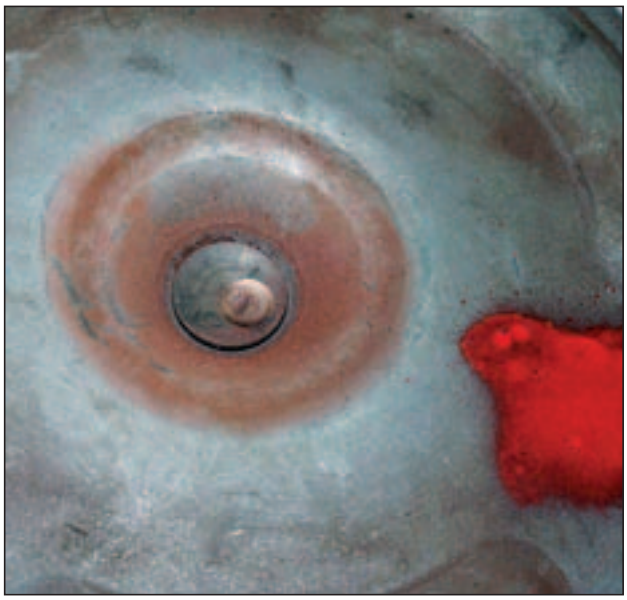




10. Worn gearbox snout

Cause

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



11. Push rod wear mark off centre

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

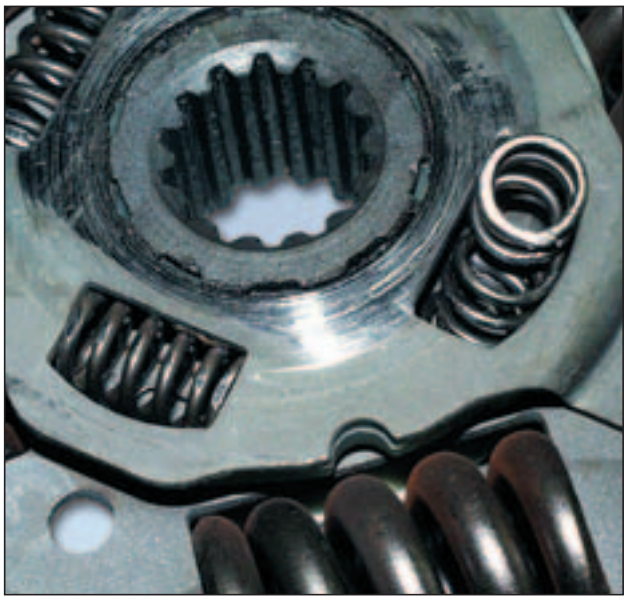
Cause

- Damaged oil seal
- Excessive grease used on the splines

1. Worn diaphragm spring fingers

Cause

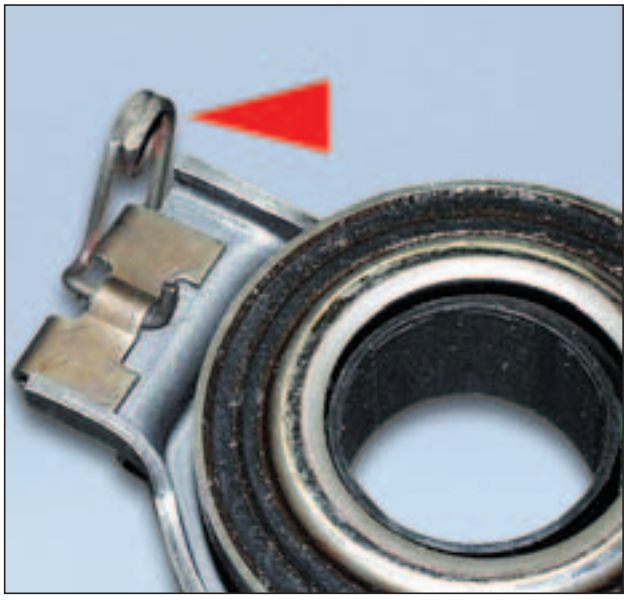
- Release bearing seized
- Faulty release system
- Incorrectly adjusted release system



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 driven practice

→ 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 driven practice

→ 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

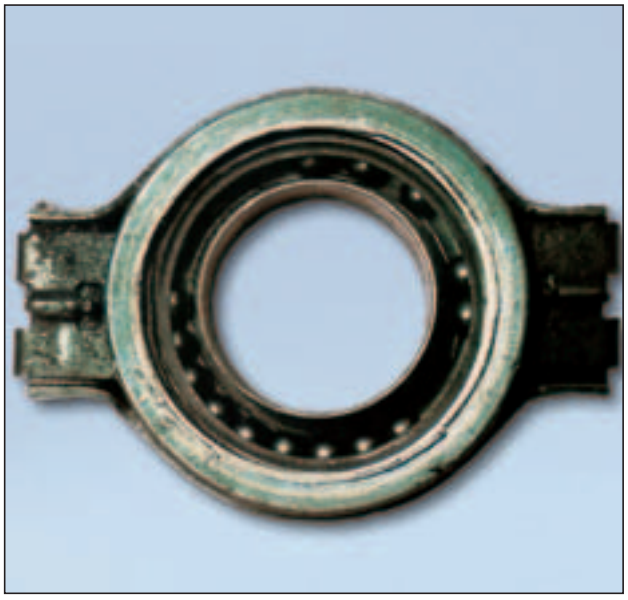
Cause

- 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

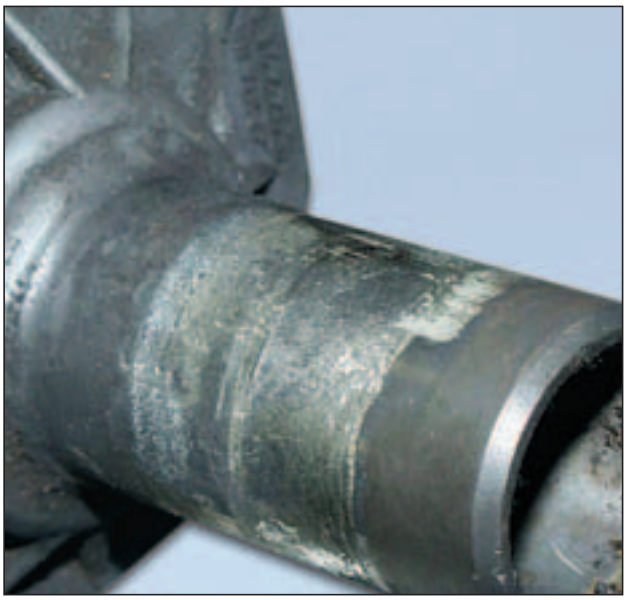
Cause

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

11. Gearbox snout worn

Cause

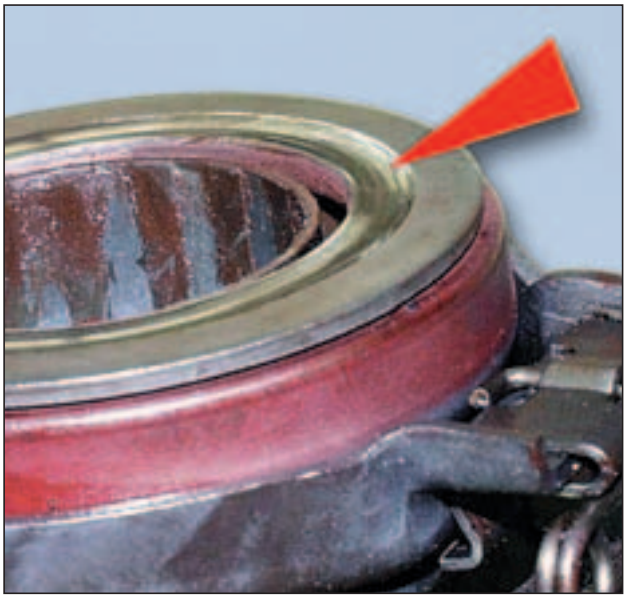
- Incorrect grade of grease or no grease used
- Damaged release bearing



12. Running surface on release bearing worn

Cause

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



13. Worn release lever

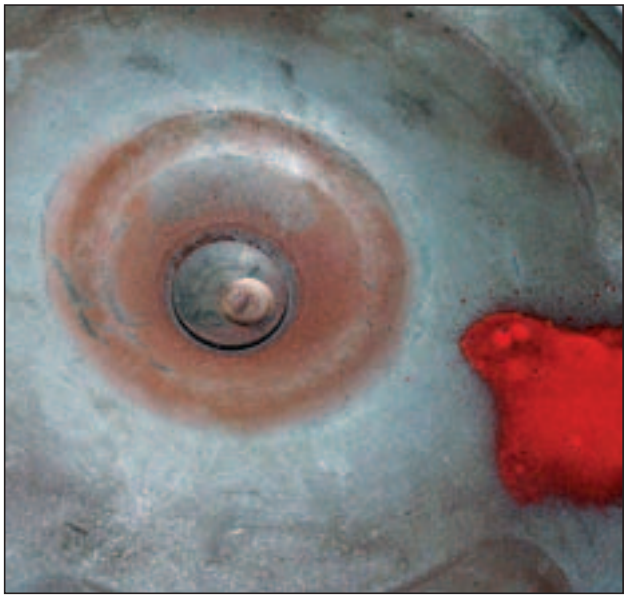
Cause

- None or incorrect grease used

14. Release bearing tappet points worn

Cause

- Tappet points not lubricated
- Release system worn



15. Push rod wear mark off centre

Cause

- Damaged release system

→ Bearing worn

→ Guide bush worn

16. Damaged bearing lugs

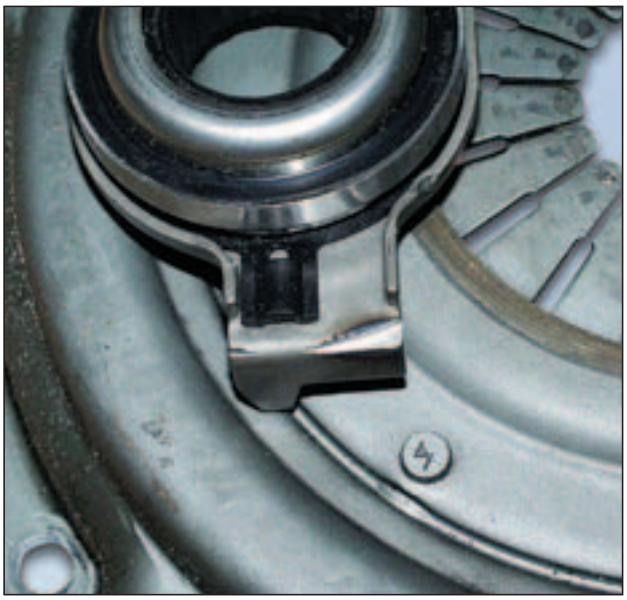
Cause

- Damaged release system

17. Bearing fouling clutch cover

Cause

- Clutch cover and release bearing mismatch



18. Torsion damper broken

Cause

- Incorrect driven practice

→ Driving the vehicle in too high a gear at low revs

→ Grease / oil contaminated facing

19. Hub assembly broken

Cause

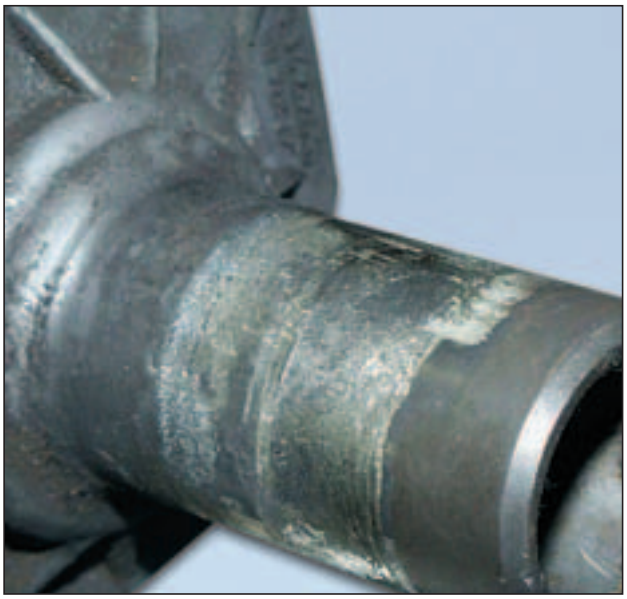
- Incorrect fitting

→ Driven plate fitted the wrong way round

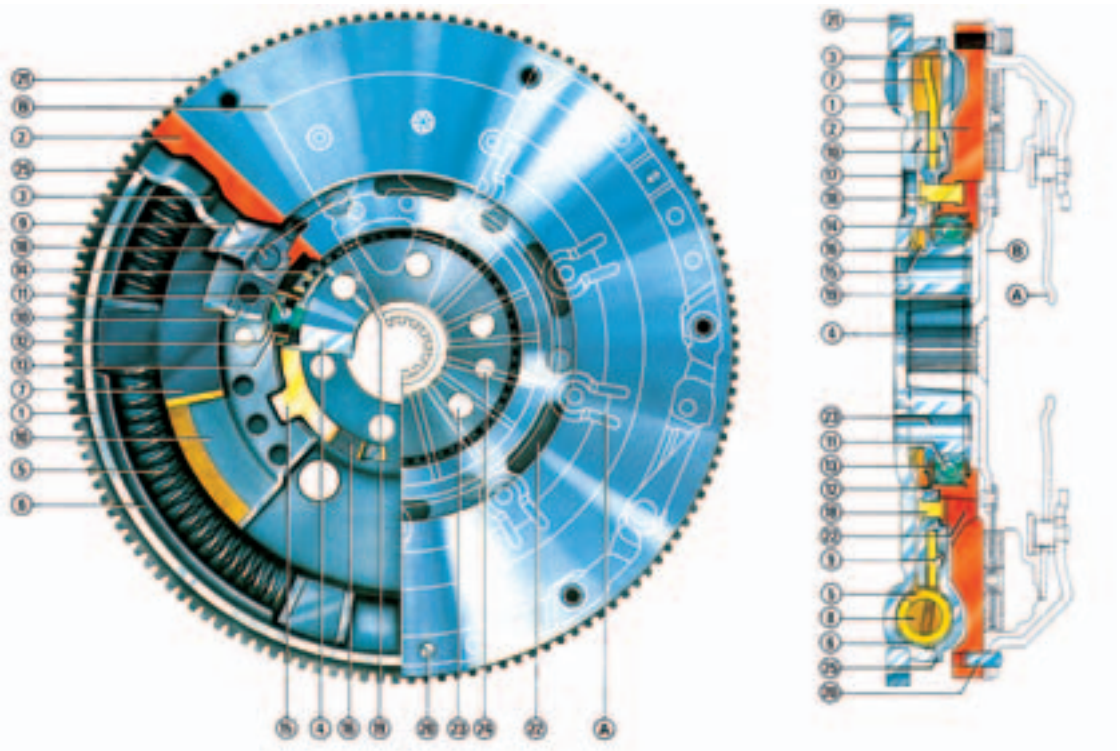
1. Damaged gearbox snout

Cause

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

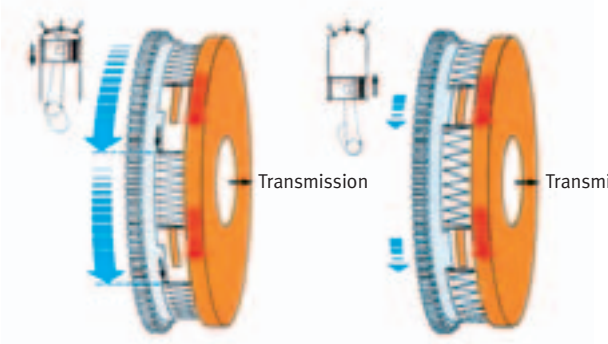


Dual-mass Flywheels: their design and operation



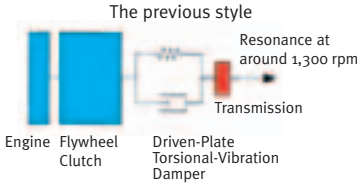
① Primary rotating mass and damper housing
② Secondary rotating mass and friction surface
③ Cover for primary rotating mass
④ Hub
⑤ Arced compression spring
⑥ Tubular spring guide
⑦ Flange and diaphragm spring
⑧ Grease reservoir
⑨ Membrane seal
⑩ Friction and supporting ring
⑪ Caged ball bearings
⑫ O-ring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

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.

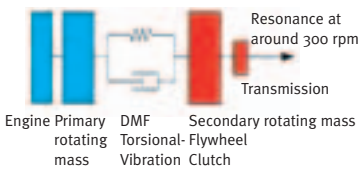


Schematic

The previous style

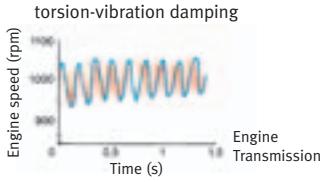


Dual-mass flywheel

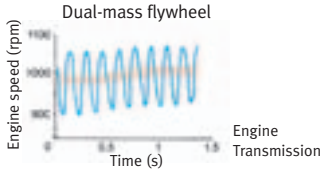


How it works
(Transmission of torsional vibrations)

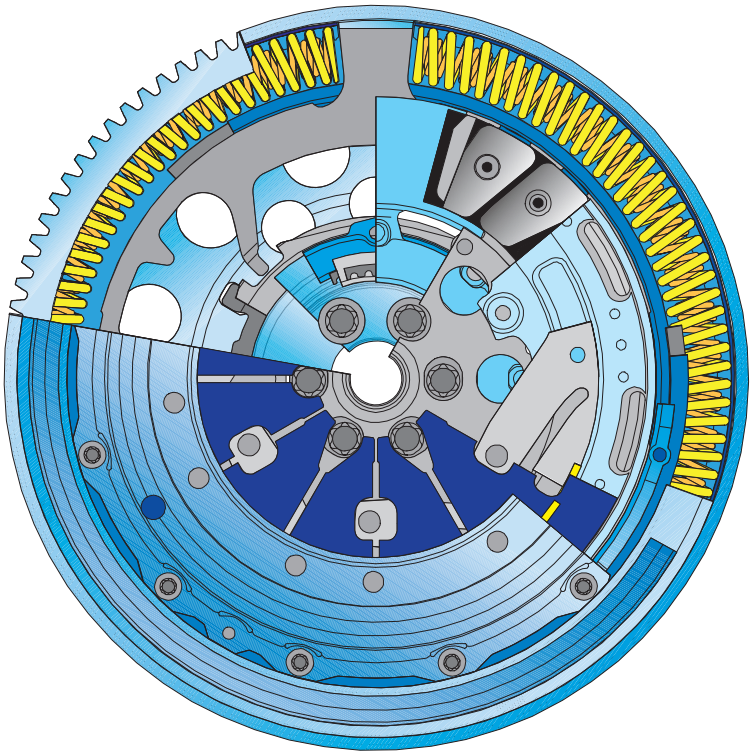
Conventional flywheel and driven plate with torsion-vibration damping

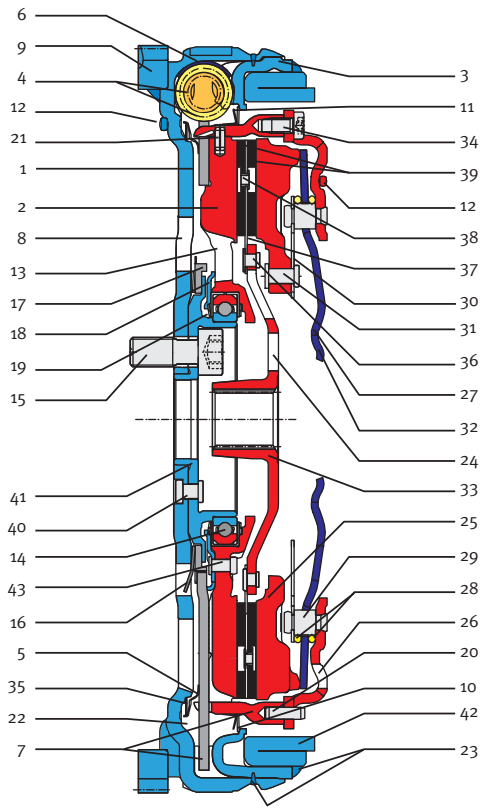


Dual-mass flywheel

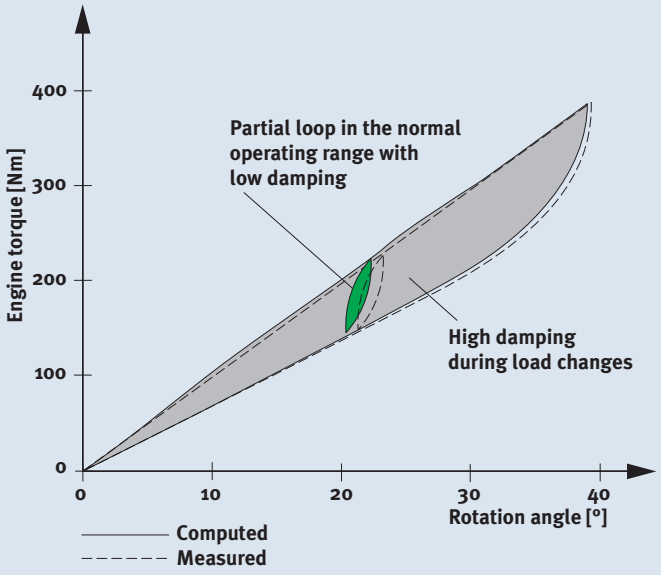


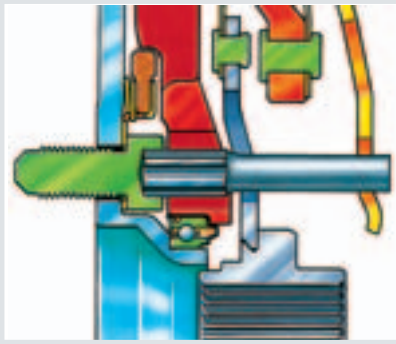
Damped Flywheel Clutch – their design and operation



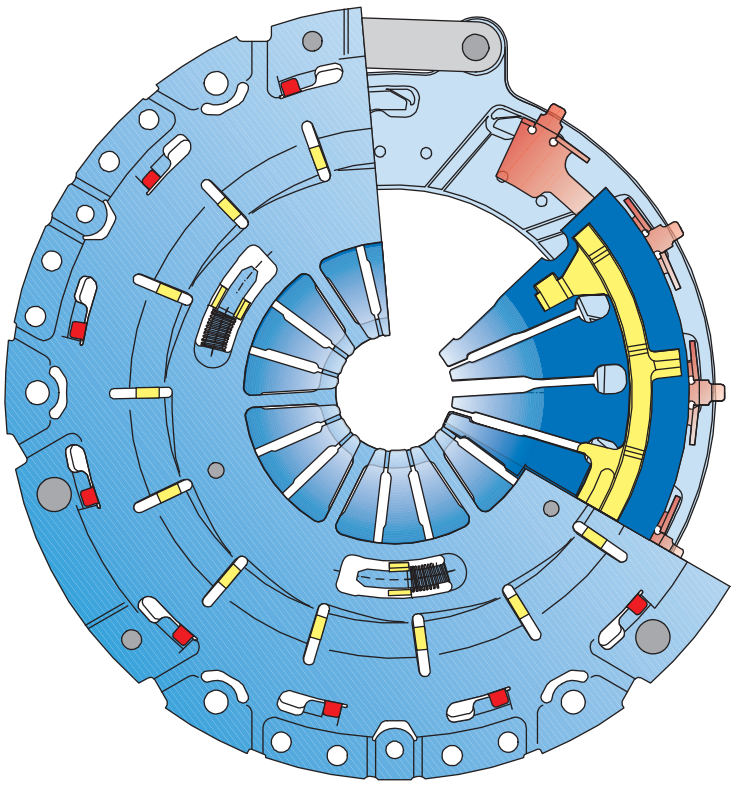


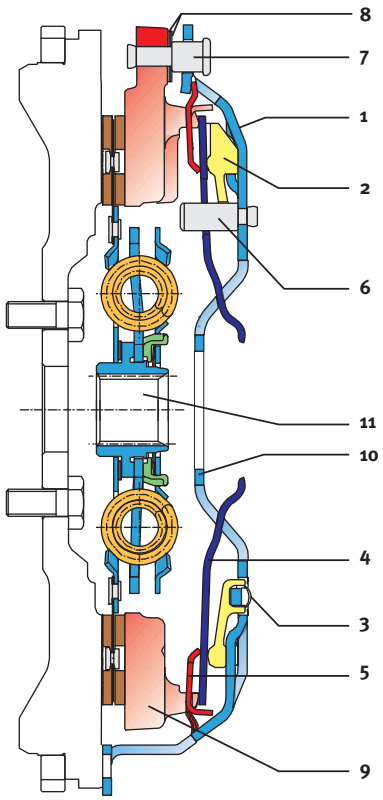
① Primary rotating mass and damper housing
② Secondary rotating mass and friction surface
③ Cover for primary rotating mass
④ Arced compression spring
⑤ Membrane seal
⑥ Tubular spring guide
⑦ Cover retaining ring and flange
⑧ Ventilation slots
⑨ Starter ring gear
⑩ Membrane seal
⑪ Sheet-metal support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



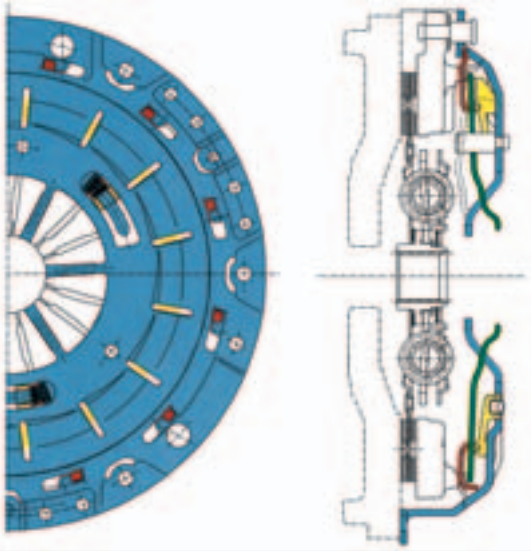


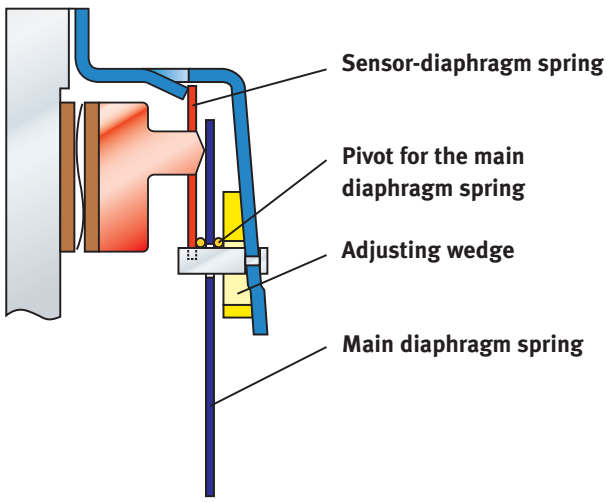
Self Adjusting Clutches – their design and operation

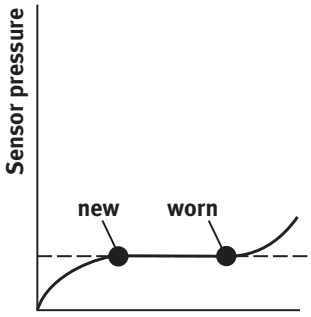


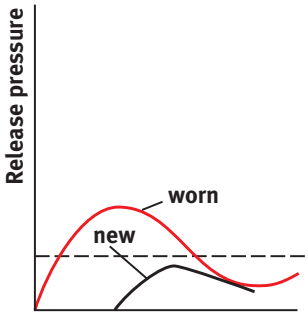


① Cover
② Adjusting ring (chamfered ring)
③ Compression spring
④ Diaphragm spring
⑤ Sensor diaphragm spring
⑥ Stud
⑦ Stud
⑧ Leaf spring
⑨ Pressure plate
⑩ Stop
⑪ Driven plate

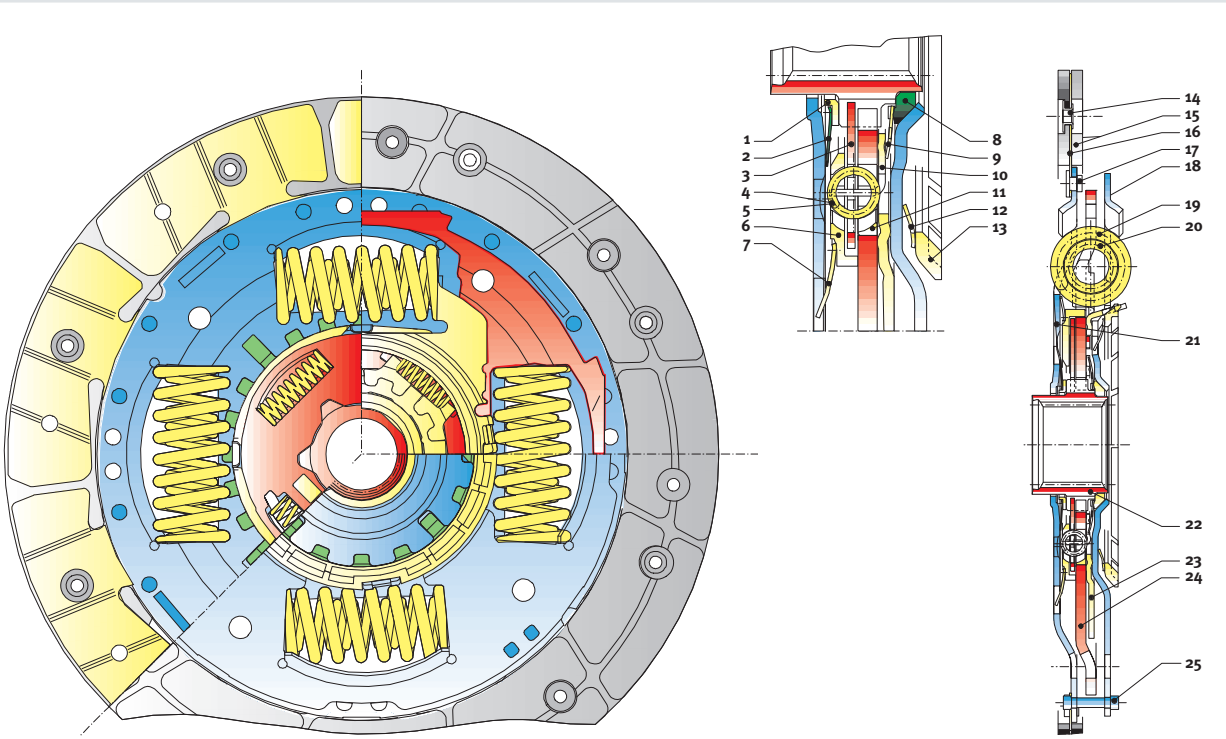




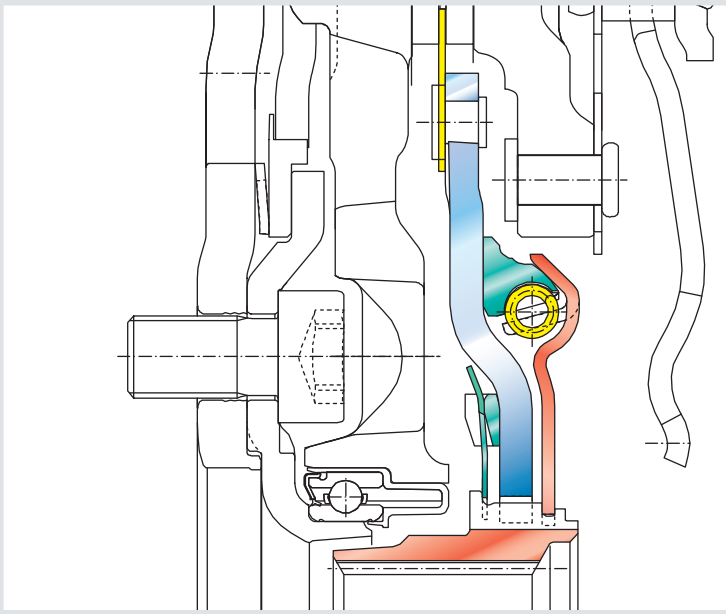


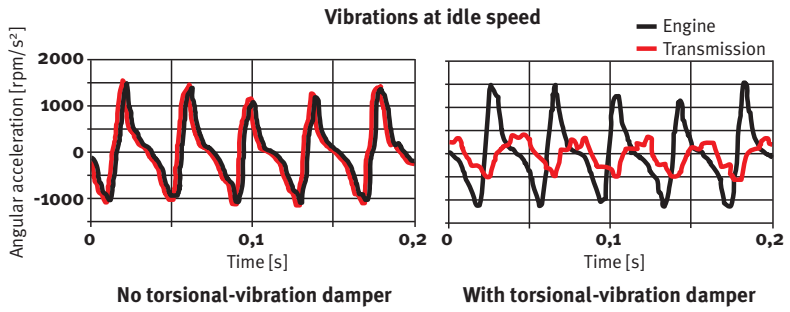


Driven Plates – design and operation

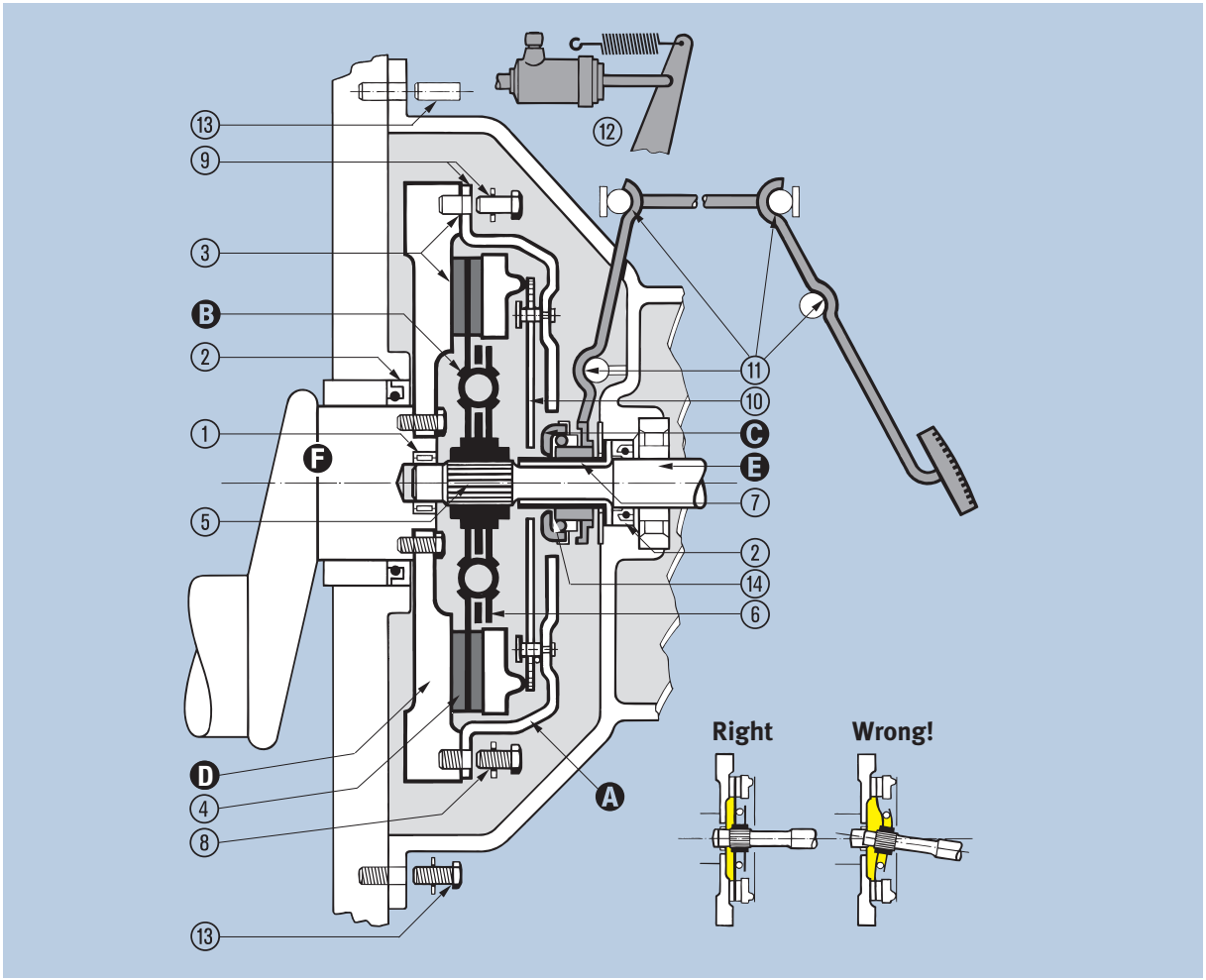


① Predamper friction washer
② Predamper diaphragm spring (1st stage)
③ Predamper hub flange
④ Predamper compression springs
⑤ Predamper compression springs
⑥ Predamper cage
⑦ Main-damper diaphragm spring (1st stage)
⑧ Centering cone
⑨ Predamper diaphragm spring (2nd stage)
⑩ Predamper load-transmitting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





...cost-effective, efficient clutch replacements



- **A Clutch pressure plate**
- **B Clutch driven plate**
- **C Release bearing**
- **D Flywheel**
- **E Transmission input shaft**
- **F Crankshaft**

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:

1. Check wear of the pilot bearing; renew if necessary.
2. Check shaft sealing rings on engine and transmission side for leakages and replace if necessary.
3. **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 may **not** be reworked!
4. Check the clutch disc for lateral runout prior to assembly **(max. 0.5 mm)**.
5. Check the clutch shaft for damage, lubricate spline profile or shaft. Remove excess grease. Manufacturer's recommendation:
   LuK high-performance grease (LuK-AS item no. **414 0014 10**). Grease containing suspended solids is not suitable.
   Note! Chemical nickel-plated splines are not to be lubricated!
6. Note the correct installation position of the clutch disc! Use centering pins for assembly.
7. Check the guiding sleeve of the release bearing for wear and replace if necessary; use suitable lubrication.
8. Tighten the clutch assembly crosswise with the prescribed torque. Always remove and install the SAC clutch with the special tool approved by LuK-AS (LuK-AS item no. **400 0072 10**).
9. 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.
10. Inconsistencies in diaphragm spring tabs or release levers, caused by thick ness 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!**
11. Check clutch operation for function and wear! Replace the clutch cable - check the bearings.
12. Check clutch operation for function and wear! Replace the clutch cable - check the bearings. 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).
13. Check the alignment of the engine to the gearbox. Replace dislodged gearbox dowels!
14. Set release bearing clearance at 2-3 mm. Constant running bearings are o perated with a pre-load of 80–100 N. Only combine bearings which have plastic sleeves with metal guiding sleeves.

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

Clutch fails to disengage A

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 runout (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 Check parts are correct to application
Facing too thick	Incorrect driven plate	Check parts is correct to application
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 slip B

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

Clutch judder C

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	Carburettor, fuel injection ignition timing	Check engine for correct running

Clutch makes a noise D

Problem	Cause	Remedy
Bearing running eccentrically to diaphragm fingers	Bearing not centreing	Renew bearing
No drive		Renew pressure plate or driven plate
Incorrect driven plate	Torsion damper incorrect for vehicles 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
Damaged damper spring breakout	Incorrect driving habits Wrong gear selection	Renew driven plate

Clutch pedal is heavy in operation E

Problem	Cause	Remedy
Incorrect pressure plate	Release load too great	Fit correct pressure plate
Damaged gearbox snout	Release bearing damaged Incorrect combination No grease used Incorrect grease used	Renew release bearing Check combination Grease bearing and snout 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 Incorrect cable fitted	Renew cable Check for suitability

Start off by asking the customer these questions:

Regarding malfunctions:
What is malfunctioning? How was the problem noticed? How long has it existed?

Regarding wear:
Clutch mileage? Is it the original clutch? Has the clutch been abused?

Regarding usage:
Is the vehicle new? Who drives it?

Regarding past repairs:
Have the clutch and/or transmission been repaired?

Clutch fails to disengage

1. What are the particular symptoms?

The vehicle moves despite a depressed clutch, crashing noises when changing gear.

2. Which components might be defective?

Contact force is no longer relieved, clutch disc is not released due to too little or no lift-off of the clutch assembly.

3. What should be checked before clutch removal?

QUICK TEST – Start engine, select reverse gear, shift through all gears → gear noises when changing gear → clutch defective.

ACTUATION – Pedal mechanism, clutch play, clutch cable, release lever, release shaft, travel from master/slave cylinder, master/slave cylinder and hose lines, fluid levels, air in clutch system.

4. What can be determined after removal?

CLUTCH DISC – Spline profile rusted in, lining on companion friction surfaces seized up, lining broken/loose, lining retainer plate shaped, lining retainer broken, clutch disc incorrectly mounted, lateral runout of the clutch disc, torsion damper spring broken.

CLUTCH ASSEMBLY – Contact plate, leaf spring compressed, leaf spring broken, diaphragm spring tabs heavily worn, cover bent.

RELEASE SYSTEM – Release bearing sluggish, release shaft bearing fixed, guiding sleeve corroded.

SPECIAL CASE – Clutch shaft is seized in the pilot bearing → Torque is transferred.

5. What might be causing the problem(s)?

Clutch disc is 'dented', angular displacement.

Clutch slip

1. What are the particular symptoms?

The engine revs at startup/acceleration – but the speed increases only slowly or not at all.

2. Which components might be defective?

Friction values of the mating friction surfaces too low, dimensions of the mating friction surfaces not OK, contact force of the clutch assembly too low.

3. What should be checked before clutch removal?

QUICK TEST – Put on the handbrake, start the engine, engage 3rd gear, press down on the accelerator and slowly engage the clutch → engine does not cut out → clutch defective.

TEST RUN – Upon Acceleration at maximum engine torque → the engine suddenly revs faster but the speed does not increase further → clutch defective.

ACTUATION – Pedal mechanism, clutch play, clutch cable, master/slave cylinder and hose lines.

SPECIAL CASE (BMW / MERCEDES-BENZ) – Lining thickness may also be checked with a special tool prior to removal!

4. What can be determined after removal?

CLUTCH DISC – Lining oily, lining greasy, lining carbonised, reduced lining thickness.

CLUTCH ASSEMBLY – Overheating of the driven plate, heavy scoring on the contact plate, diaphragm springs broken.

FLYWHEEL – Scoring/cracks in the friction surface, flywheel depth.

RELEASE SYSTEM – Release bearing/guiding sleeve sluggish

5. What might be causing the problem(s)?

Normal wear, frequent driving with slipping clutch, shaft sealing ring of the crankshaft or the gearbox leaking, engine tuning.

Clutch judder

1. What are the particular symptoms?

The engine shakes on take up of drive.

2. Which components might be defective?

Uneven rotary motion of the crankshaft or the clutch shaft, friction values of the mating friction surfaces uneven, driven plate misaligned, contact force increases unevenly.

3. What should be checked before clutch removal?

TEST RUN – Judders in certain driving situations, e.g. also reverse start-up on a hill.

ACTUATION – Pedal mechanism, clutch cable, release shaft, master/slave cylinder and hose lines.

DRIVE TRAIN – ENGINE – Engine management, engine suspension/engine mount.

GEARBOX – Gearbox suspension/gearbox mount.

DRIVE – Drive shafts, Hardy disc.

4. What can be determined after removal?

CLUTCH DISC – Lining oily, lining vitrified, wear pattern not OK.

CLUTCH ASSEMBLY – Leaf spring compressed, diaphragm spring tabs bent, cover shifted.

FLYWHEEL – friction surface not OK.

RELEASE SYSTEM – release bearing/release shaft bearing damaged, guiding sleeve corroded.

5. What might be causing the problem(s)?

- Clutch shaft over lubricated
- Incorrect lubricant used
- Guiding sleeve corroded
- Assembly error

Clutch makes a noise

1. What are the particular symptoms?

Noises when clutch actuated, noises when changing gear, noises during the journey.

2. Which components might be defective?

Insufficient or no lubrication of moving parts, friction of rotating parts, loose parts.

3. What should be checked before clutch removal?

QUICK TEST – Engage/disengage clutch, noise from the clutch area?

TEST RUN – Slipping noise? Clutch defective.

ACTUATION – Pedal mechanism, clutch cable, release shaft, master/slave cylinder and hose lines.

4. What can be determined after removal?

CLUTCH DISC – Scoring on the spline, scoring on the torsion damper, grease hole cap of the torsion damper, torsion spring broken, spline profile knocked out.

CLUTCH ASSEMBLY – Diaphragm spring tabs worn.

RELEASE SYSTEM – Ball bearing of the release bearing defective, release shaft bearing defective.

5. What might be causing the problem(s)?

TECHNICAL CAUSES – Defective parts: Clutch cable, release leaver, release bearing sluggish.

EXTERNAL CAUSES – Normal wear, torsion damper defective, assembly errors.

Clutch pedal is heavy in operation

1. What are the particular symptoms?

Clutch pedal can only be depressed by exerting increased force.

2. Which components might be defective?

Friction in area of actuation, friction in area of the release system.

3. What should be checked before clutch removal?

ACTUATION – Pedal mechanism, clutch cable, release shaft, master/slave cylinder and hose lines.

4. What can be determined after removal?

RELEASE SYSTEM – Release bearing, release shaft, release shaft bearing knocked out.

5. What might be causing the problem(s)?

TECHNICAL CAUSES – Defective parts: Clutch cable, release leaver, release bearing sluggish.

EXTERNAL CAUSES – Normal wear, assembly errors

 LuK	✓	✓	✓	✓	✓
	✓	✓			
	✓	✓	✓	✓	
	✓	✓	✓	✓	
	✓	✓			
 LuK	✓	✓	✓	✓	
 LuK	✓	✓			
 FAG	✓	✓	✓	✓	

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