Failure Diagnosis

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

commercial vehicles

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 designed to be a comprehensive list.

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 before mentioned problems.
- Check the engine timing sensor for damage.

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.

• 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.

• 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.

• 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.

• 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.

• 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 (only LHD).

• 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.

• 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 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.

• The Service life of clutch facings

Since friction clutches are dry clutches, and wear during the slipping phase, i.e., while the rotational speed of the driven plate is being brought up to that of the flywheel, is normal.
The basic pre-requisite for a long clutch life is ensure that the clutch release mechanism is in perfect working order and that the clutch is not abused while driving. Clutch life may be adversely affected by the following:

- revving up the engine when starting off or starting off in the wrong gear,
- stop-and-go driving in heavy traffic,
- manouvering in close confines,
- slipping the clutch for extended periods,
- preventing the vehicle from rolling back on inclines by slipping the clutch, and failing to use the accelerator pedal to match speeds when downshifting.

• 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 disengage

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.

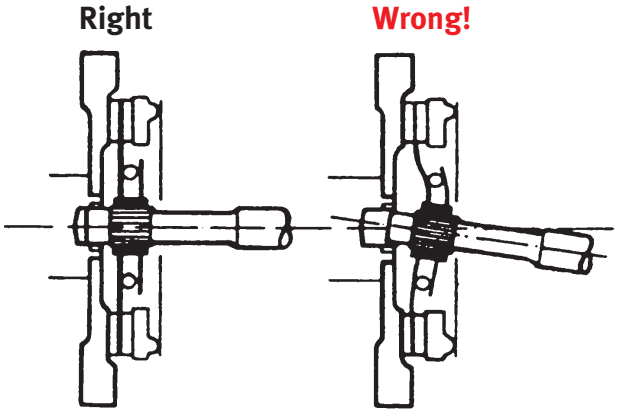
Damaged or weak engine mountings will cause the engine to move from it’s position and then ‘bounce’ back when the clutch is engaged, which causes a transition between static and dynamic coefficients of friction at the contact surface of clutch facings and results in judder.

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.

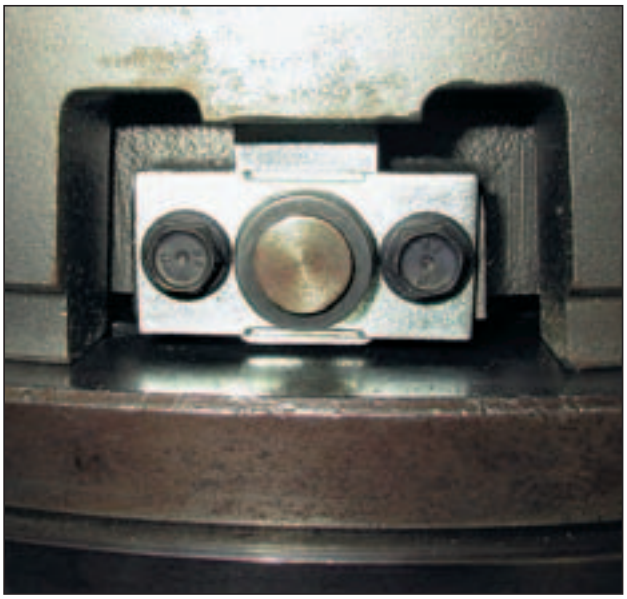
More technical information:
www.RepXpert.com or **www.Schaeffler-Aftermarket.com**!

1. Twin plate coil spring clutches with cast housings

Cause

- Incorrect fitting

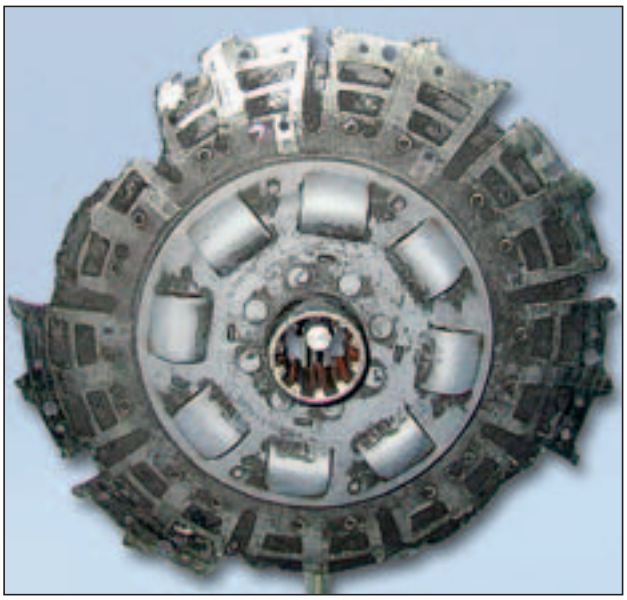
→ Slide not brought up to the stop on fitment



2. Linings torn off

Cause

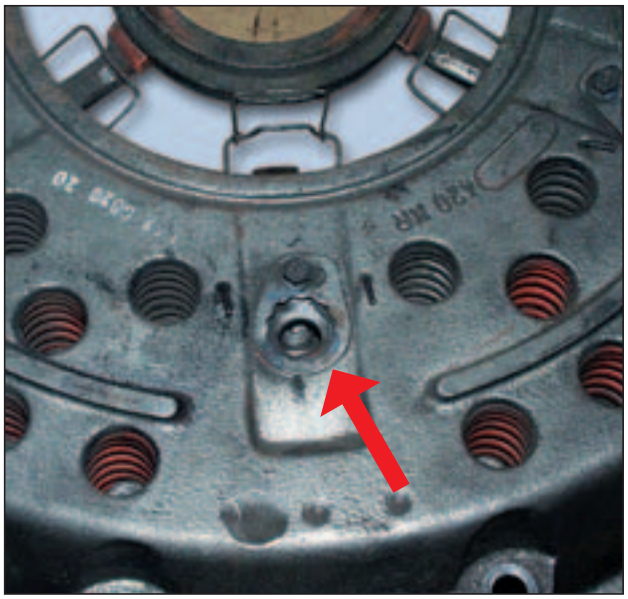
- The rotational speed of the driven plate has exceeded the burst speed of the lining material, this condition occurs when the vehicle is allowed to coast with the clutch pedal depressed and the vehicle speed exceeds the maximum speed of the gear selected.
  This sort of damage is independent of engine rpm. The determining factor is transmission input-shaft rpm.



3. Pressure plate lugs broken

Cause

- Lack of release bearing clearance
- Engine vibration damper defective
- Fuel injection system incorrectly adjusted



4. Release-lever mount broken

Cause

- Lack of release bearing free play
- Engine vibration damper defective
- Fuel-injection system incorrectly adjusted

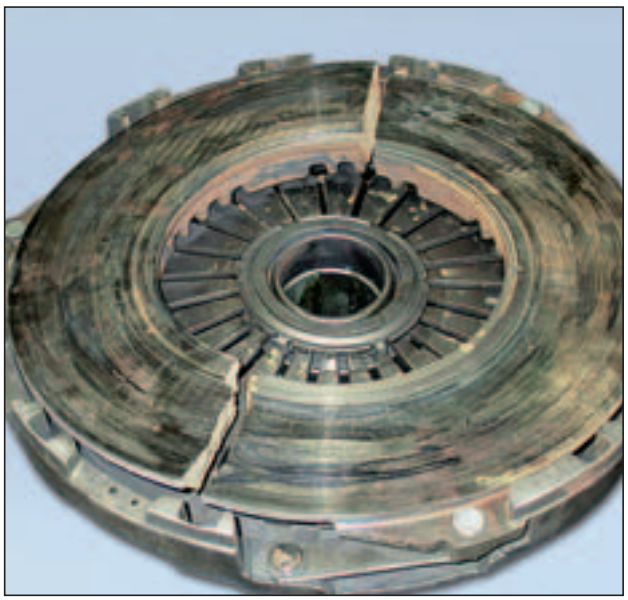
5. A release-lever pivot pin has drifted out

Cause

- Engine vibration damper defective

→ Engine torsional vibrations have caused the circlip securing the pivot pin to pop off

- Fuel-injection system incorrectly adjusted



6. Pressure plate broken

Cause

- Pressure-plate overheating due to slipping the clutch for excessively long periods
- Clutch was slipping due to worn linings
- Binding in the release system
- Slave cylinder defective
- Oil on linings due to a leaking shaft seal or seals

7. Centering ridge on flywheel broken off

Cause

- Incorrect fitting

→ Clutch not aligned to the flywheel ridge

→ Bolts not torqued down evenly

8. Tangential leaf spring broken

Cause

- Play in the drive train
- Driver error

→ Poor gear-shifting habits

9. Tangential leaf spring bent

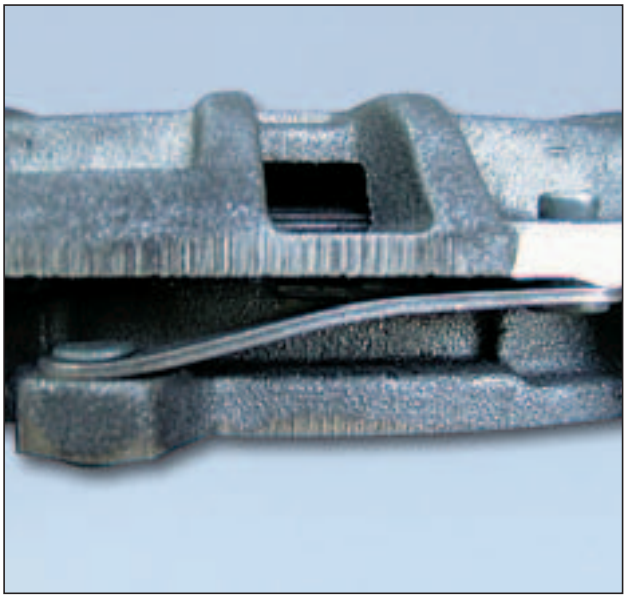
Cause

- Play in the drive train
- Driver error

→ Poor gear-shifting habits

- Improper storage

→ Clutch fell or was dropped during installation



10. Hub splines damaged

Cause

- Incorrect fitting

→ Pressure plate not aligned to flywheel step

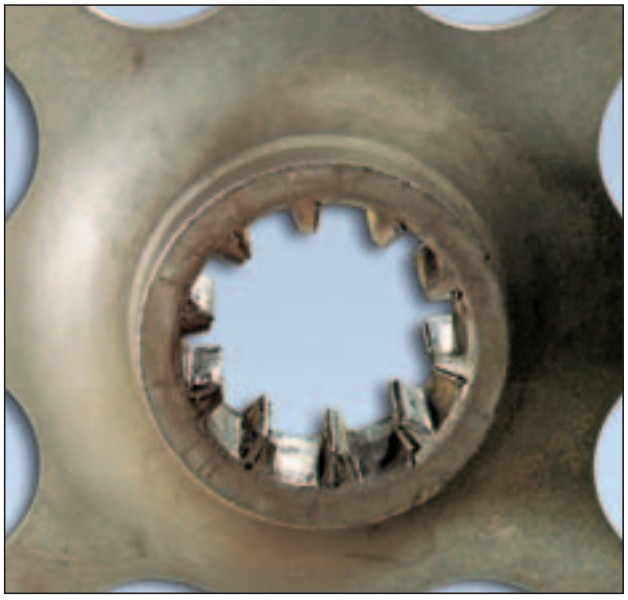
→ Pressure plate not torqued down correctly

- Wrong driven plate installed

11. Rust on the hub

Cause

- Hub splines were not lubricated



12. Hub splines chewed out on one side, tapered wear on splines

Cause

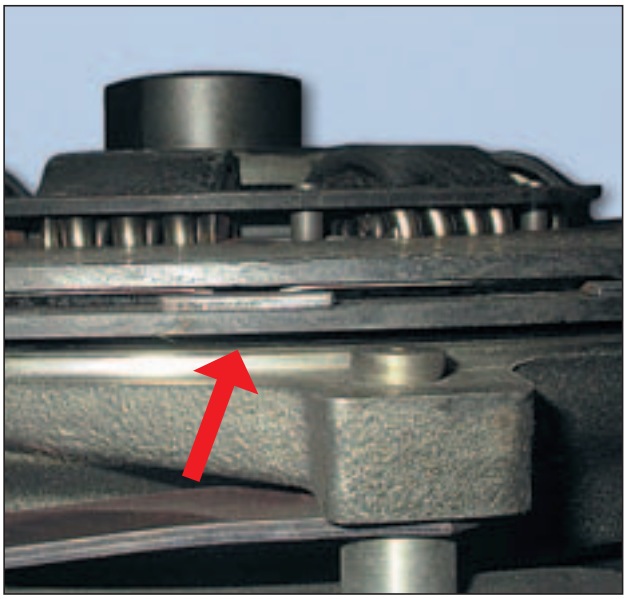
- Spigot (pilot) bearing worn
- Angular misalignment of engine and transmission

13. Segment cushion distorted

Cause

- Incorrect fitting

→ The sheet-metal carrier was bent by the transmission's input shaft when the transmission was reinstalled on the engine



14. Segment cushion broken

Cause

- Incorrect fitting

→ The transmission was allowed to drop down during installation.

- Engine-transmission angularly misaligned

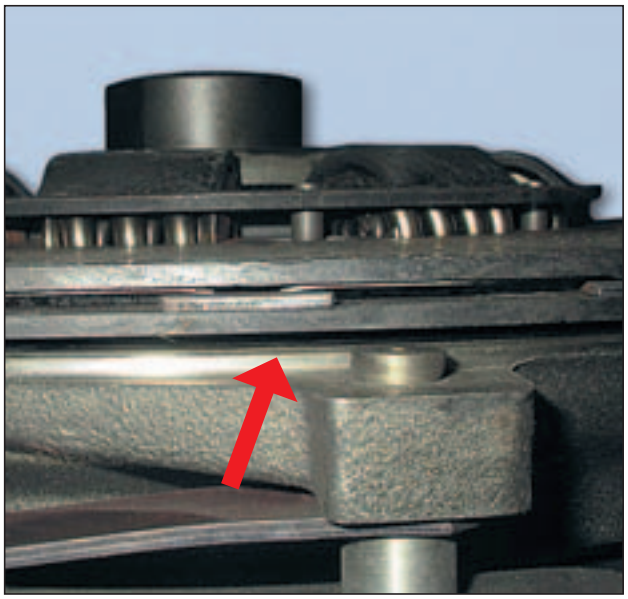
15. Linings glazed

Cause

- Overheating
- Oil on linings

→ Leaking shaft seal(s)

- Release system binding or defective



16. Clutch driven plate warped (excessive lateral runout)

Cause

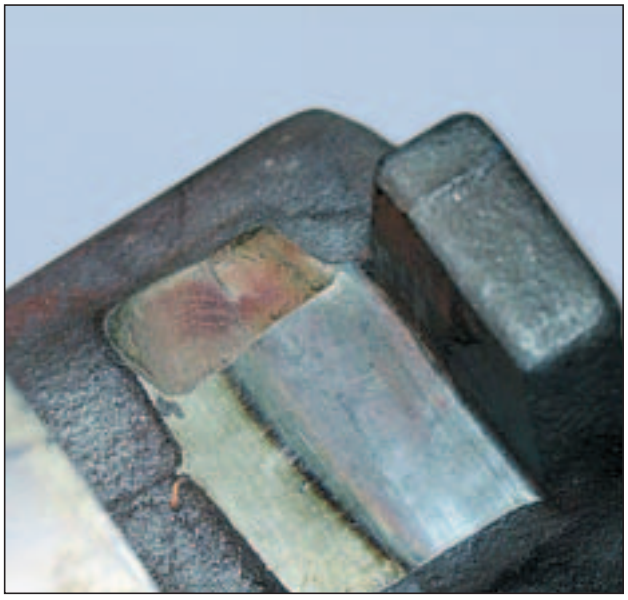
- Lateral run-out (distortion) not checked prior to installation
  (runout should not exceed 0.5 mm)

17. Retractor plate clamping ring worn

Cause

- Defective release system

→ Insufficient preload



18. Release-bearing surface mating to release fork damaged

Cause

- Worn release fork
- Worn guide tube
- Worn release shaft bearings

19. Release-bearing clamping ring worn

Cause

- Defective release system

→ Insufficient preload

20. Broken clutch levers

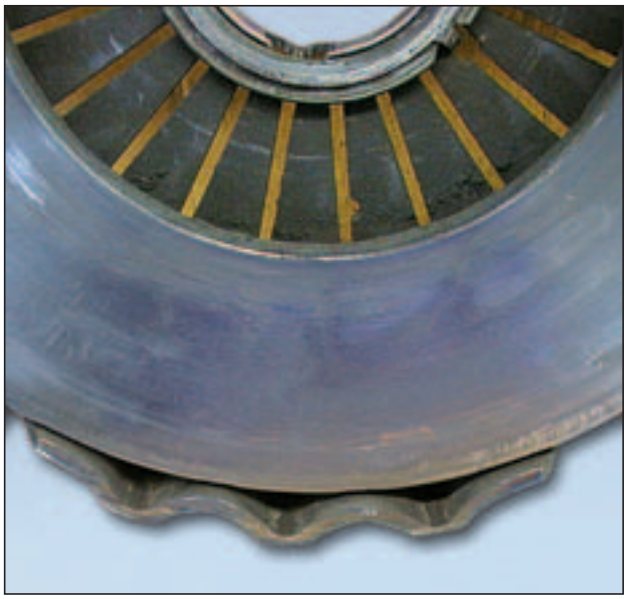
Cause

- Release bearing running off centre
- Incorrectly adjusted release bearing
- Release fork pivot bushes worn

21. Worn clutch levers

Cause

- Incorrectly adjusted release bearing
- Faulty release mechanism



1. Severe scoring and glazing on the pressure plate

Cause

- Overheating
- Lining worn beyond permissible limits

2. Diaphragm-spring fingers worn

Cause

- Incorrect preload

3. Lining surfaces glazed

Cause

- Oil on linings

→ Leaking shaft seal(s)

- Lining coefficient of friction decreased due to allowing the clutch to slip for too long (overheated linings)

4. Grease/oil on linings

Cause

- Too much grease used on hub

→ Excess grease on the hub splines was not removed and grease spread

- Leaking engine or transmission shaft seal spread onto the linings

5. Linings worn down to the rivet heads

Cause

- Excessive lining wear

→ Vehicle was still being driven, even though the clutch was slipping

- Incorrect driven plate

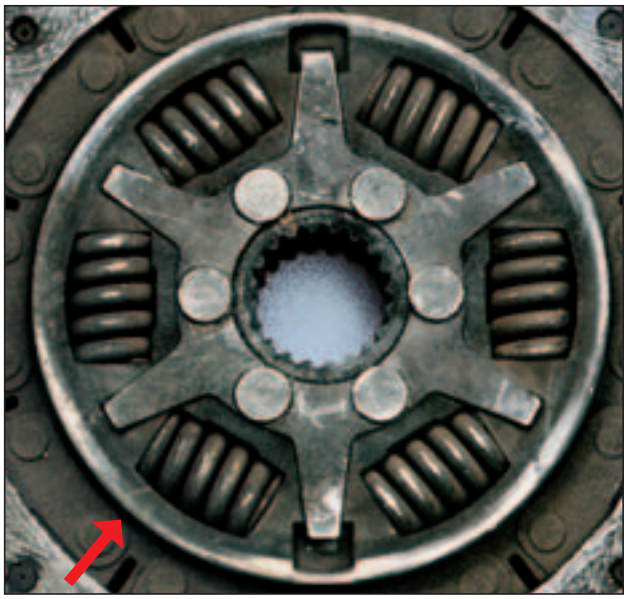
→ Allowing the clutch to slip for too long

- Improper use of the clutch
- Defective release system

6. Lining on flywheel side scored

Cause

- Worn flywheel was not replaced
- Worn flywheel mating surface was not turned down



7. Signs of wear on the torsional-vibration damper

Cause

- Incorrect fitting

→ Driven plate installed backwards

- Wrong driven plate or clutch installed

8. Release shaft binding

Cause

- Release-shaft bearings not lubricated
- Release shaft and/or its bearings worn

9. Worn clutch levers

Cause

- Incorrectly adjusted release bearing
- Faulty release mechanism

1. Section of the flywheel`s rim has broken off

Cause

- Incorrect fitting

→ Pressure plate not aligned to flywheel step
→ Pressure plate not torqued down correctly

2. Tangential leaf spring bent

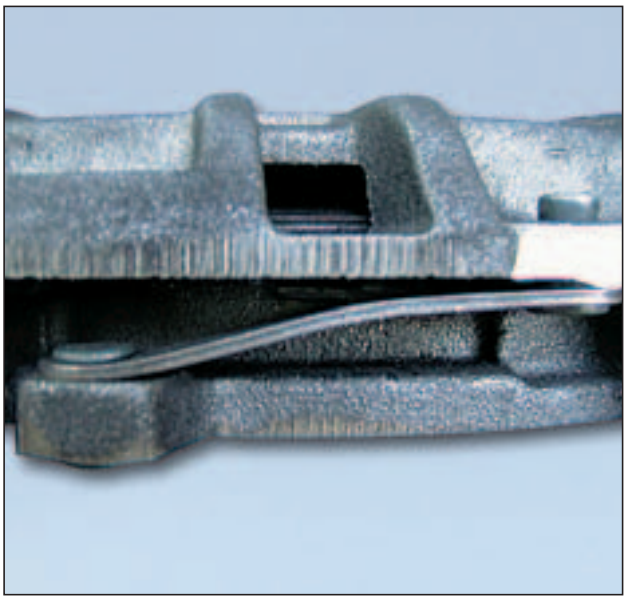
Cause

- Excessive play in the drive train
- Driver error

→ Poor gear-shifting habits

- Improper storage

→ Clutch was dropped during installation



3. Release-fork bearing surface worn

Cause

- Release fork worn

→ Release-bearing mountings worn

4. Grease/oil on linings

Cause

- Too much grease used on hub splines

→ Excess grease was not removed during installation and grease spread out onto the linings

5. Lining on flywheel side scored

Cause

- Worn flywheel was not replaced
- Worn flywheel mating surface was not turned down

6. Hub splines damaged

Cause

- Incorrect fitting

→ The transmission input shaft has been forced into the driven plate spines (the driven plate was not aligned when the pressure plate was installed)

- Incorrect driven plate fitted

7. Release fork worn

Cause

- Worn release fork mountings

→ Worn guide sleeve

8. Retractor-plate clamping ring worn

Cause

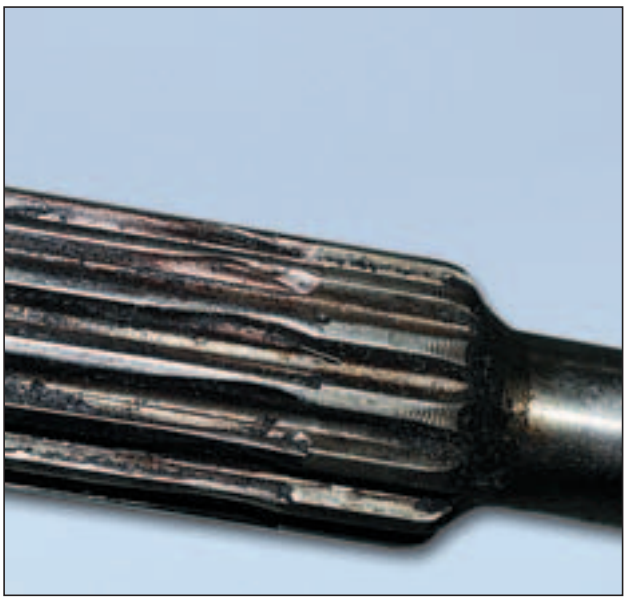
- Defective release system

→ Insufficient preload

9. Transmission input shaft worn out

Cause

- Worn input shaft was not replaced



10. Release shaft binding

Cause

- Worn release shaft and/or bearings

11. Flywheel glazed and scored

Cause

- Flywheel not refaced/replaced

12. Release-bearing clamping ring worn

Cause

- Defective release system

→ Insufficient preload

1. Diaphragm-spring fingers worn

Cause

- Insufficient preload

2. Release-fork bearing surface worn

Cause

- Defective release system

→ Worn release-shaft bearings

→ Worn guide tube

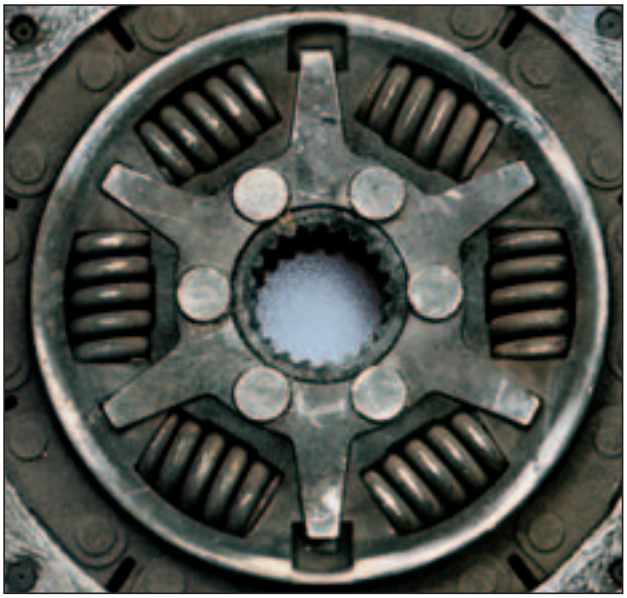
3. Signs of wear on the torsional-vibration damper

Cause

- Incorrect fitting

→ Driven plate installed backward

- Wrong driven plate or clutch installed



4. Torsion damper retainer plate broken

Cause

- Incorrect driven practice

→ Driving too long at excessively low engine speeds has caused the damper's efficiency limits to be exceeded

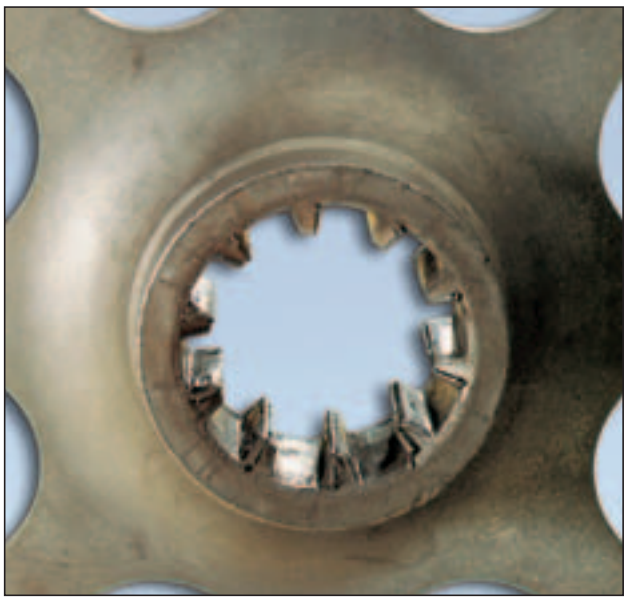
- Wrong driven plate installed

5. A torsion spring has broken out

Cause

- Oil on clutch linings
- Improperly tuned engine
- Defective release system
- Wrong driven plate installed
- Incorrect driven practice

Juddering damages the torsonal-vibration damper.



6. Hub spline chewed out on one side, tapered wear on hub splines, torsional-vibration damper destroyed

Cause

- Worn spigot (pilot) bearing
- Angular misalignment of engine and transmission

7. Hub splines galled

Cause

- Missing or worn spigot (pilot) bearing
- Excessive vibration
- Transmission input-shaft bearing worn
- Parallel or angular misalignment of engine and transmission defective

8. Retractor-plate clamping ring worn

Cause

- Defective release system

→ Insufficient preload

9. Release-bearing clamping ring worn

Cause

- Defective release system

→ Insufficient preload

10. Release fork worn

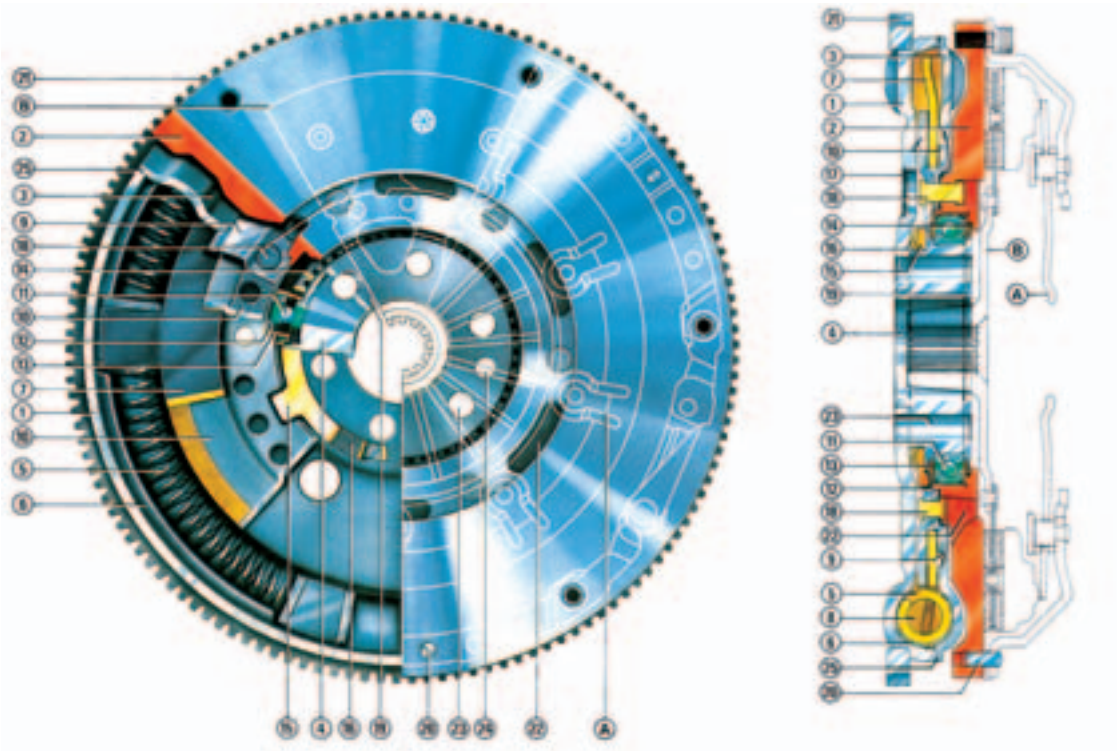
Cause

- Defective release system

→ Worn guide tube

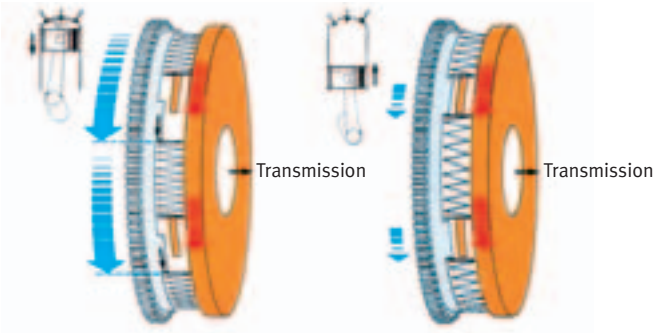
→ Worn release-shaft bearings

Dual-mass flywheels: their design and operation

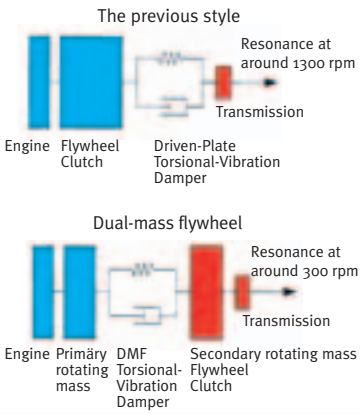


① Primary rotating mass and damper housing
② Secondary rotating mass and friction surface
③ Cover for primary rotating mass
④ Hub
⑤ Arced compression spring
⑥ Tubular spring guide
⑦ Flange and diaphragm spring
⑧ Grease reservoir
⑨ Membrane seal
⑩ Friction and supporting ring
⑪ Caged ball bearings
⑫ O-ring
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.

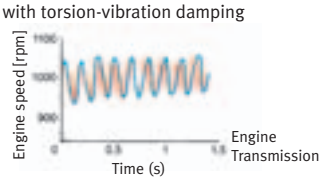


Schematic

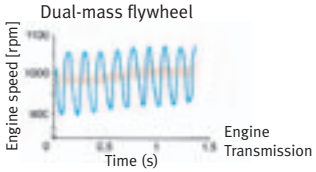


How it works (Transmission of torsional vibrations)

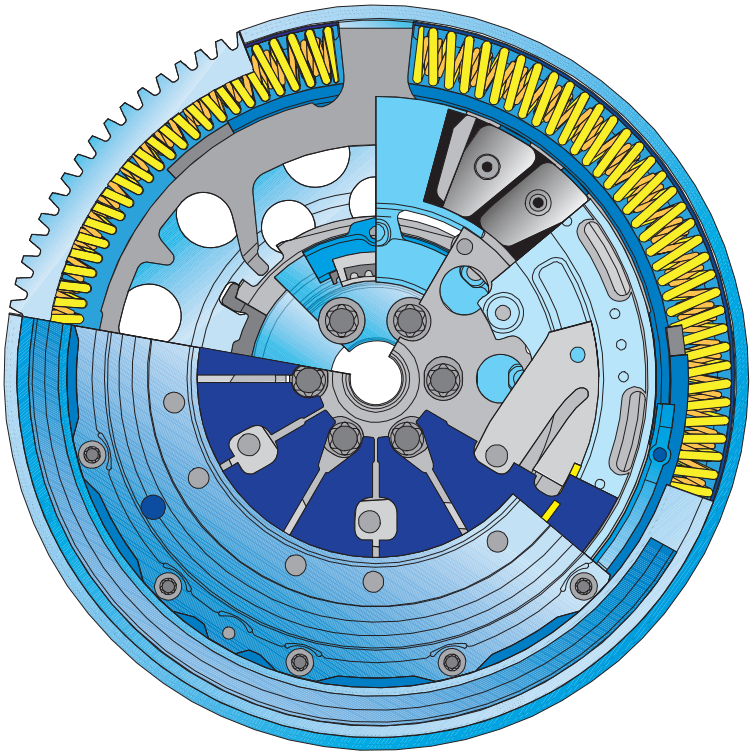
Conventional flywheel and driven plate with torsion-vibration damping

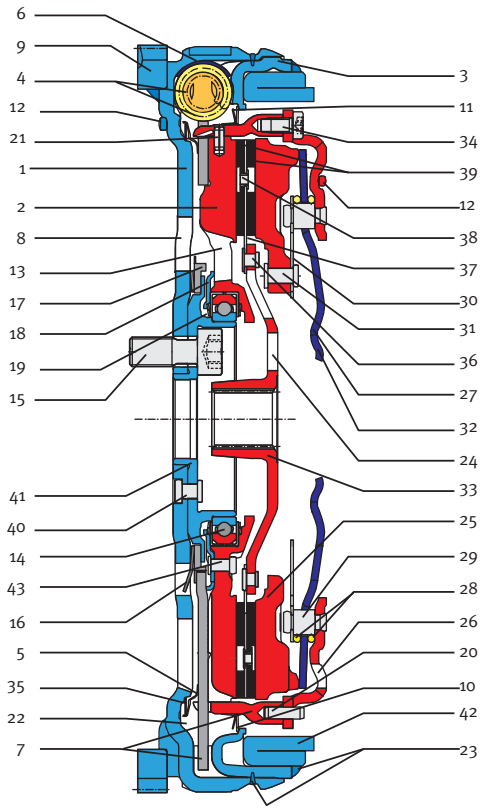


Dual-mass flywheel

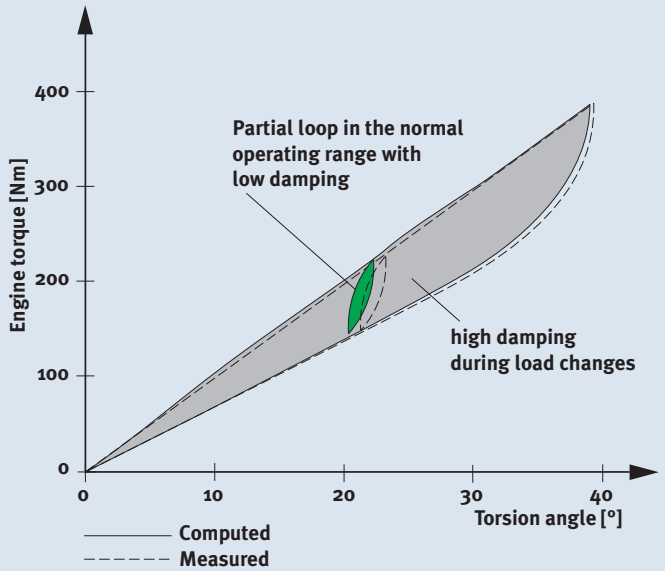


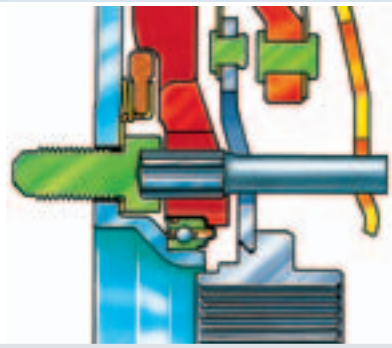
Damped Flywheel Clutch – their design and operation



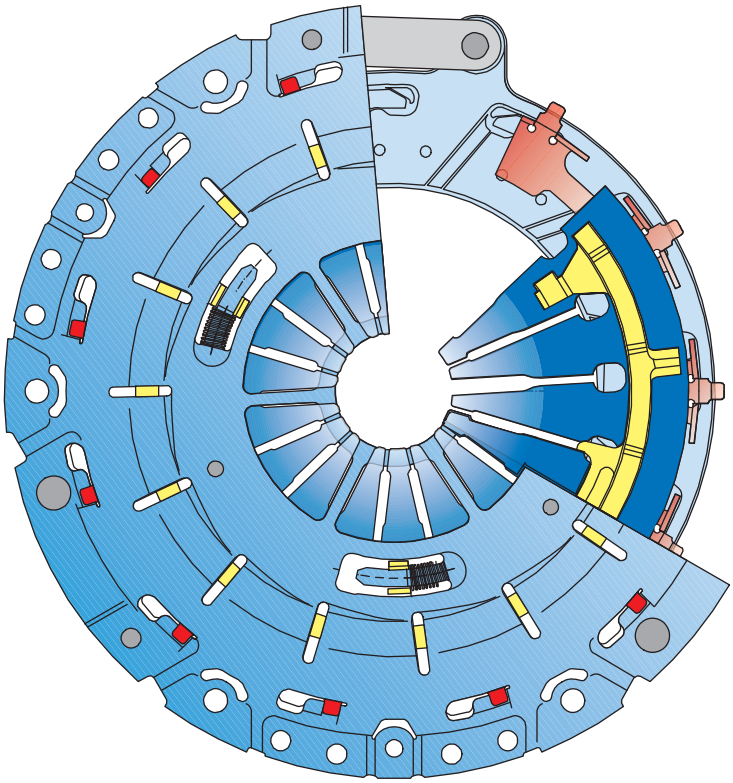


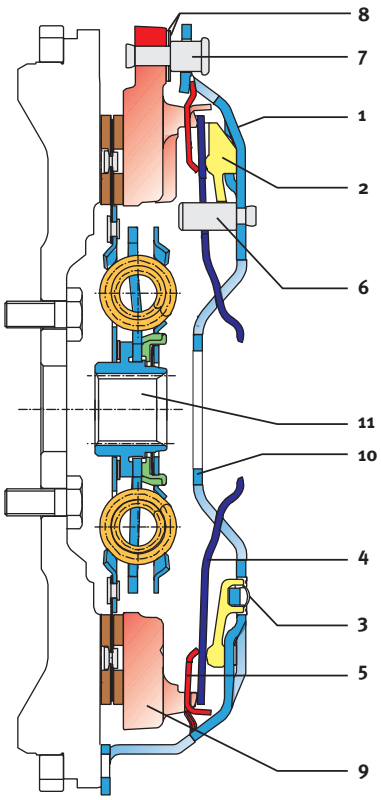
① Primary rotating mass and damper housing
② Secondary rotating mass and friction surface
③ Cover for primary rotating mass
④ Arced compression spring
⑤ Membrane seal
⑥ Tubular spring guide
⑦ Cover retaining ring and flange
⑧ Ventilation slots
⑨ Starter ring gear
⑩ Membrane seal
⑪ Sheet-metal support
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



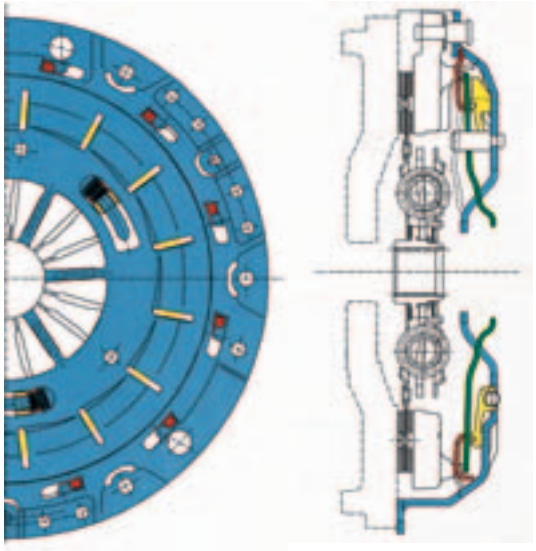


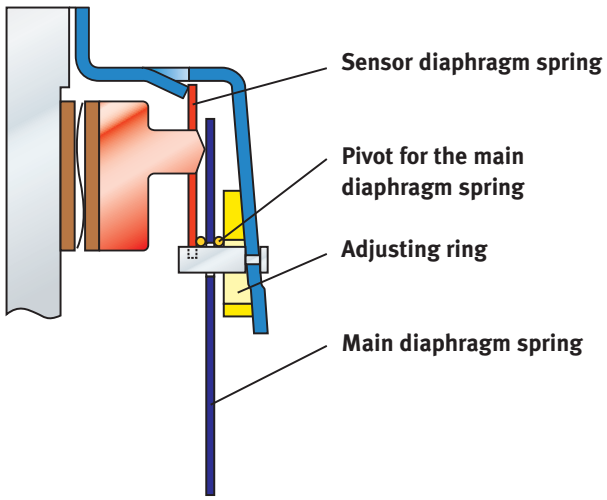
Self Adjusting Clutches – their design and operation

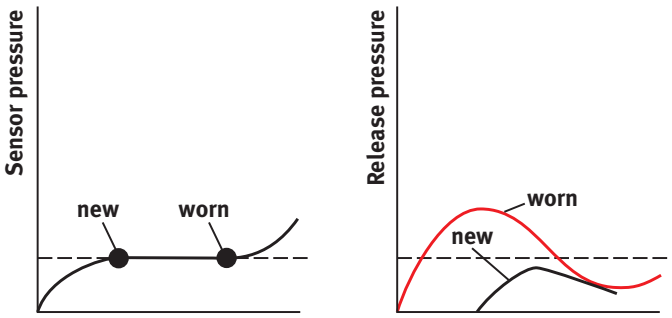




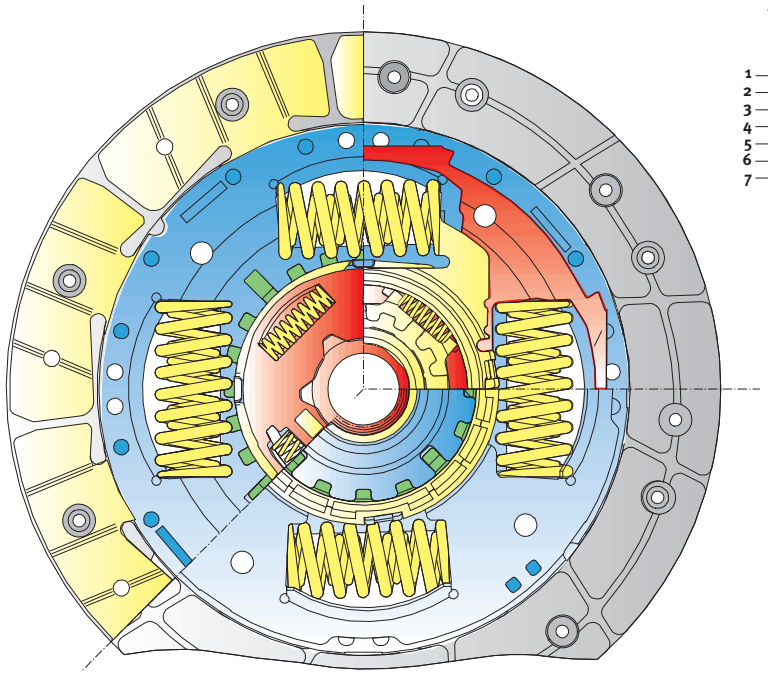
① Cover
② Adjusting ring (chamfered ring)
③ Compression spring
④ Diaphragm spring
⑤ Sensor diaphragm spring
⑥ Stud
⑦ Stud
⑧ Leaf spring
⑨ Pressure plate
⑩ Stop
⑪ Driven plate

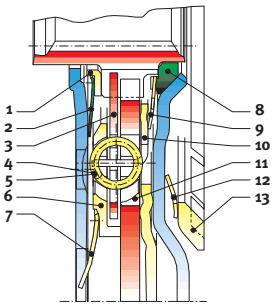


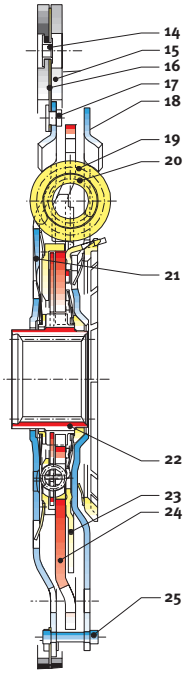




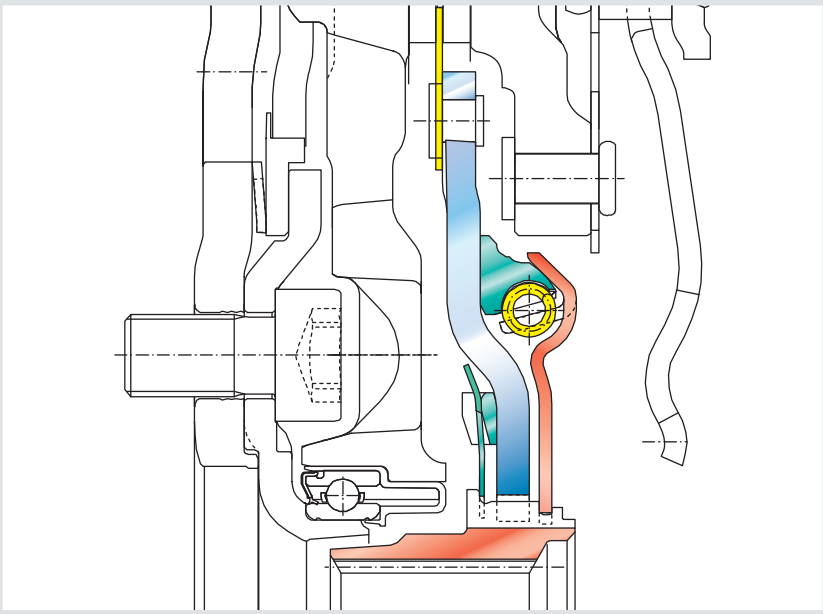
Driven plates for light trucks – design and operation

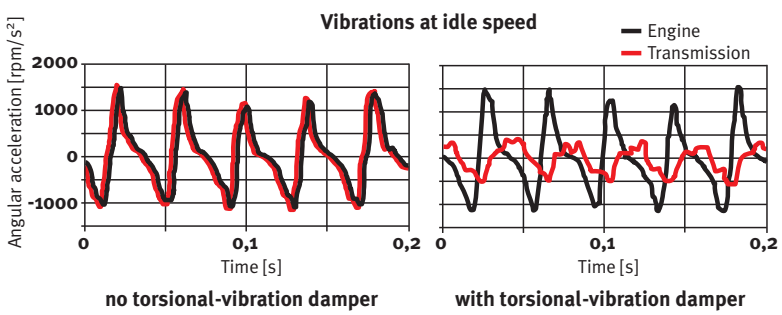




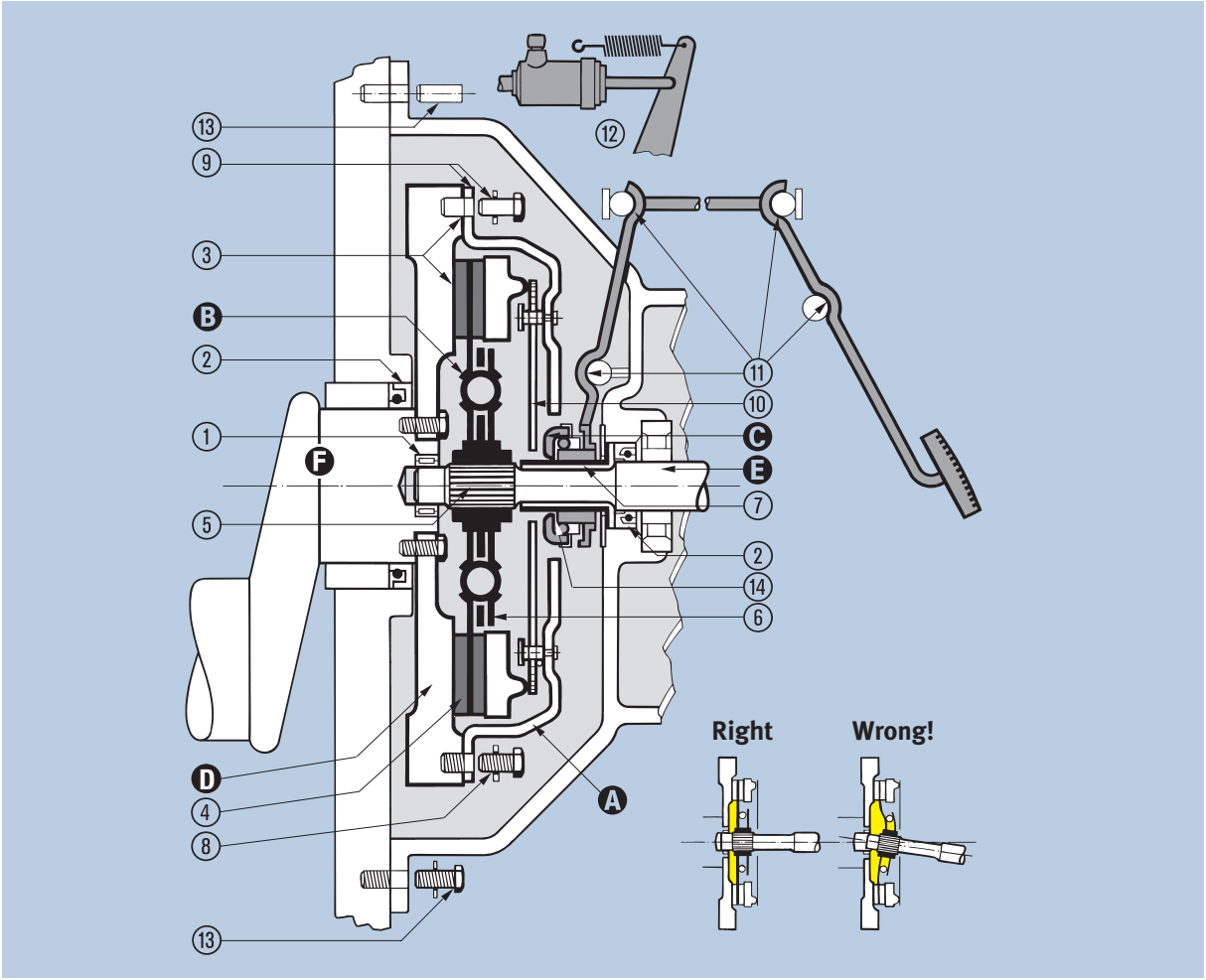


① Predamper friction washer
② Predamper diaphragm spring (1st stage)
③ Predamper hub flange
④ Predamper compression springs
⑤ Predamper compression springs
⑥ Predamper cage
⑦ Main-damper diaphragm spring (1st stage)
⑧ Centering cone
⑨ Predamper diaphragm spring (2nd stage)
⑩ Predamper load-transmitting 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



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

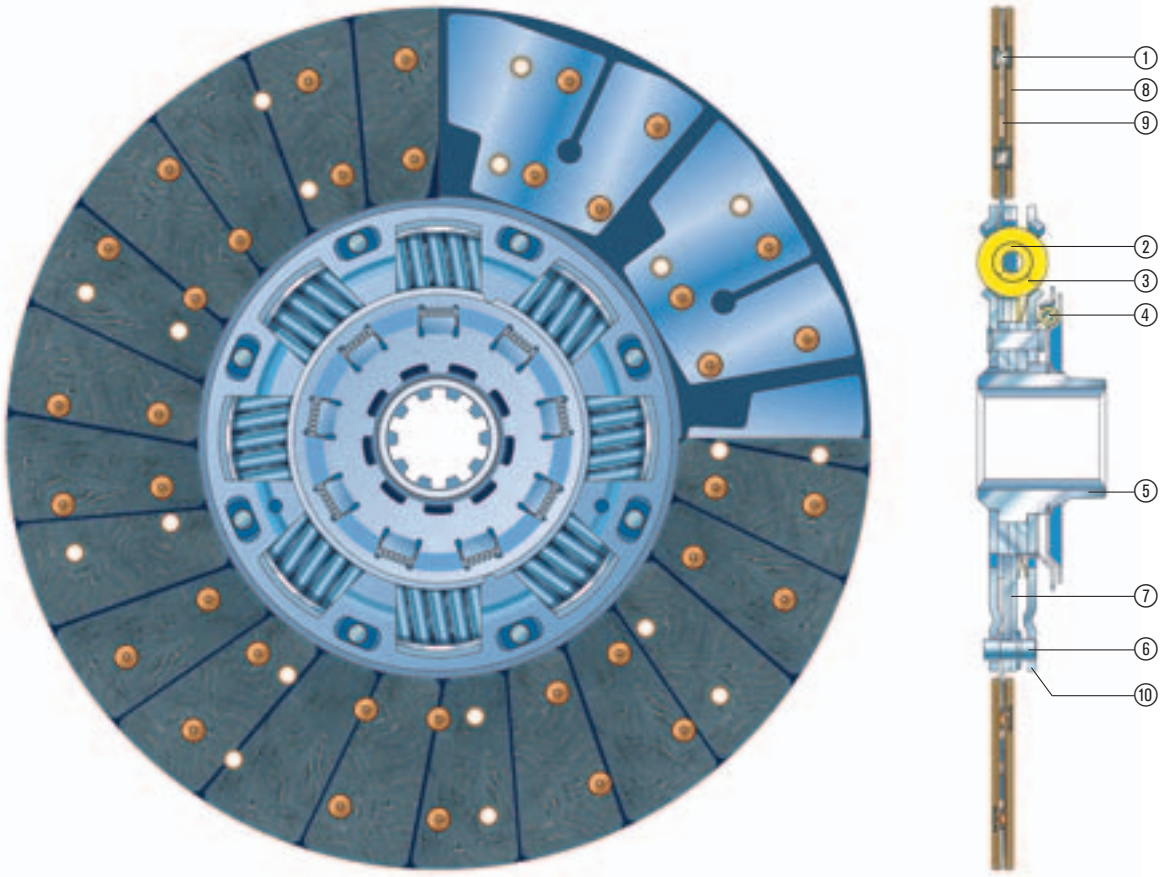
First things first:

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

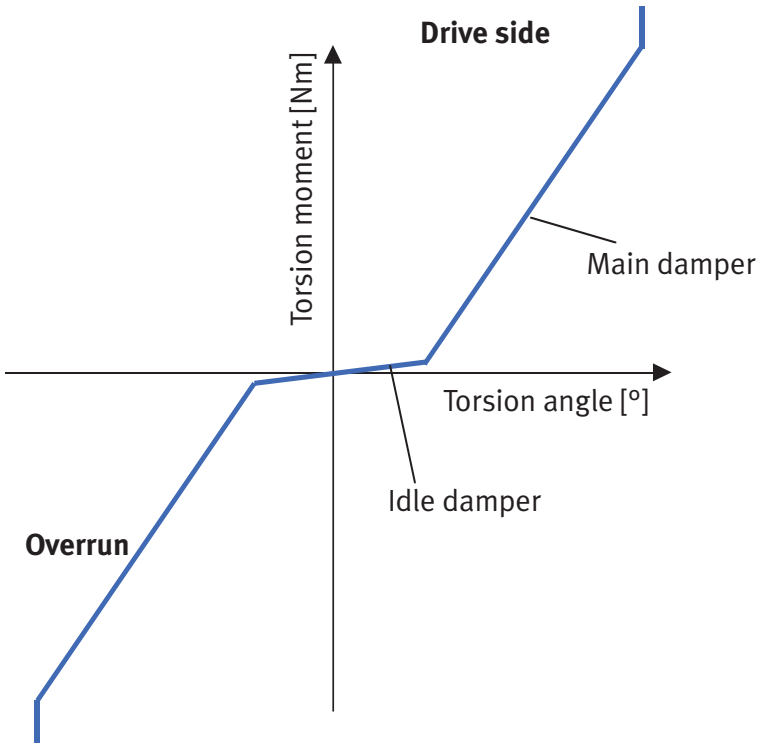
In particular, the following should be noted:

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.

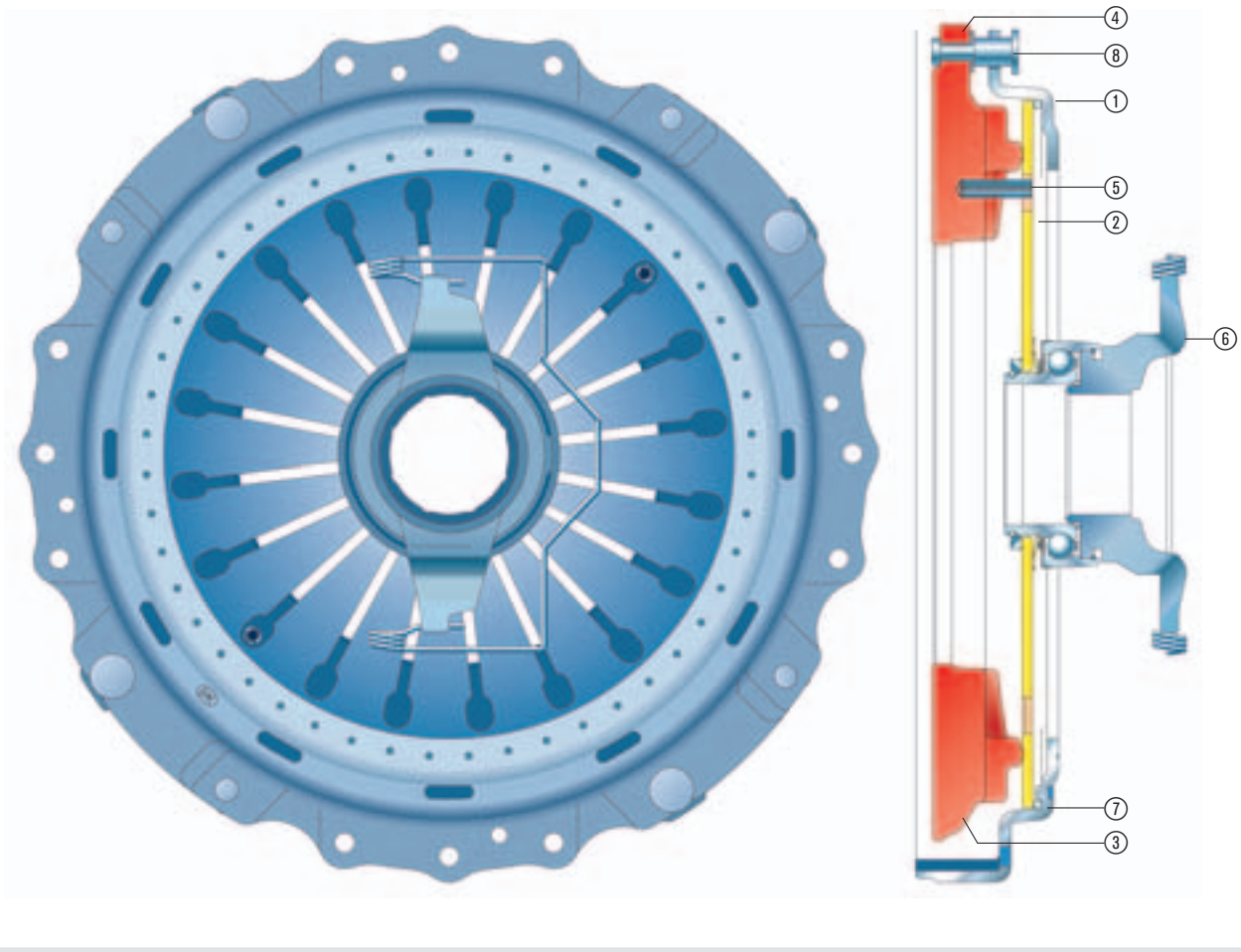
Driven plates for heavy vehicles – their design and operation



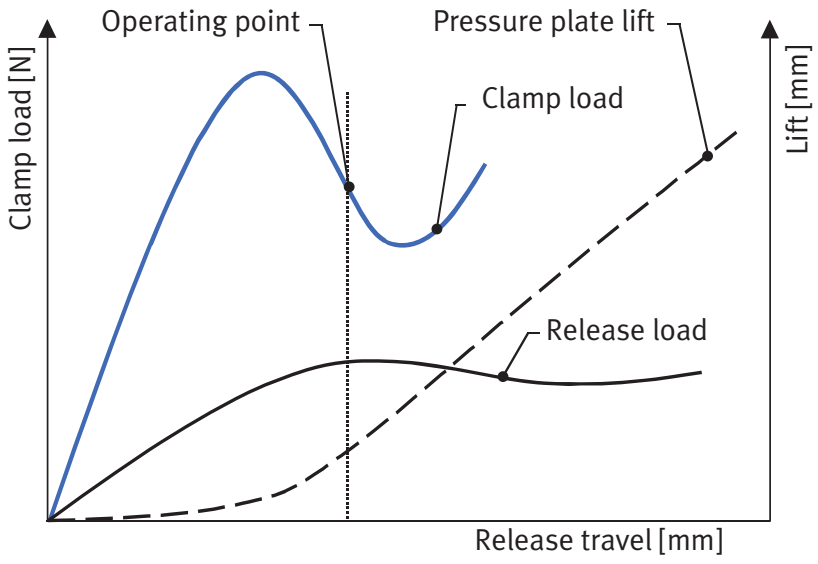
① Lining rivet
② Inner compression spring on primary damper
③ Outer compression spring on primary damper
④ Compression spring on secondary idle damper
⑤ Splined hub
⑥ Segment rivet
⑦ Hub flange
⑧ Lining
⑨ Spring segment
⑩ Retainer plate



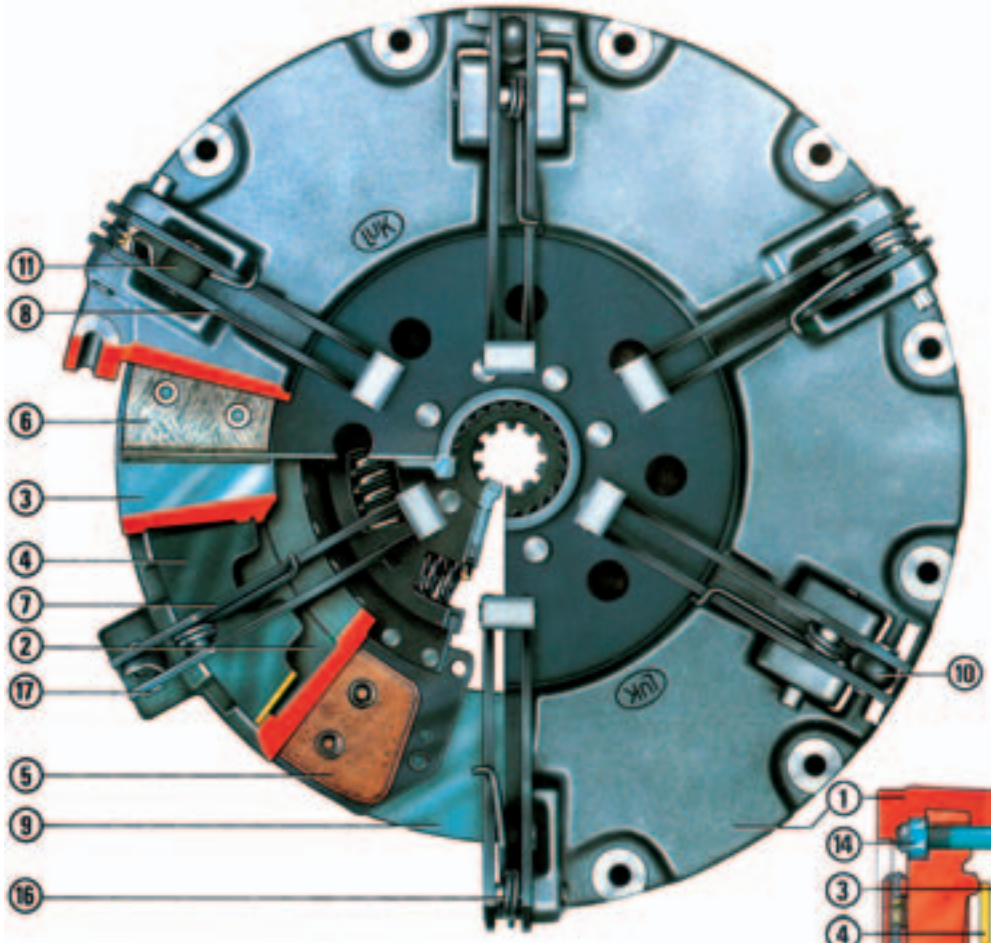
Pull type diaphragm spring clutch

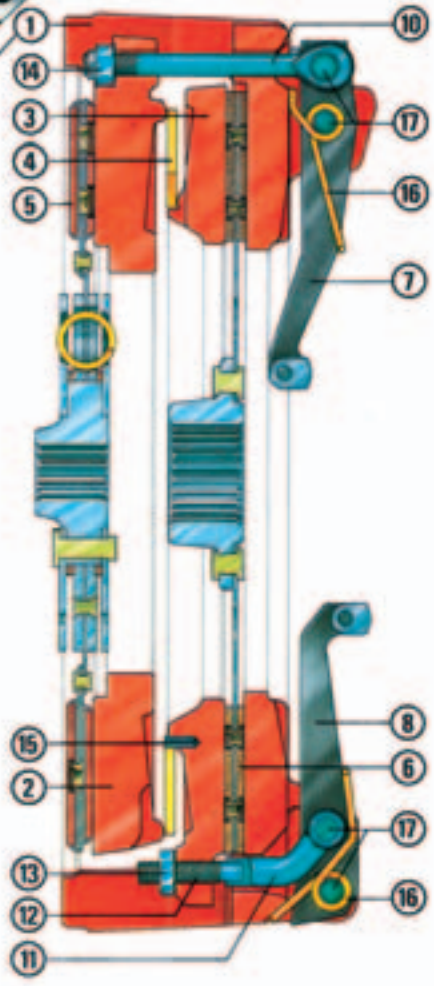


① Clutch cover
② Diaphragm spring
③ Pressure plate
④ Leaf spring
⑤ Roll pin
⑥ Release bearing, complete with installation kit
⑦ Steel-wire hoop
⑧ Stud



Tractor clutch with independent PTO





① Housing
② Main drive pressure plate
③ P.T.O. pressure plate
④ Diaphragm spring
⑤ Main drive plate
(with sintered metal pads and torsion damper)
⑥ P.T.O. plate
(with organic facing and rigid centre)
⑦ Main drive release arm
⑧ P.T.O. release arm
⑨ Flywheel
⑩ Eye bolt
⑪ Release arm conrod
⑫ Adjusting screw
⑬ Lock nut
⑭ Adjusting nut
⑮ Roll pin
⑯ Anti-rattle spring
⑰ Pivot pin

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
Gear box 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 flyheel or to pressure plate		Clean rust and corrosion from facing material

Clutch slip B

Problem	Cause	Remedy
Pressure plate overheating	Thermal overload Incorrect assembly Broken diaphragm spring Oil or grease 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 Driver error	Renew clutch assembly
Clutch facing contaminated	Oil seals leaking Gearbox splines overgreased Release bearing overlubricated	Renew oil seals Renew clutch assembly Clean Flywheel
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 Damaged release arm or shaft	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?

QUICK TEST – Start the engine, shift into reverse;
Does the transmission make a noise when shifting gears?

2. Which components might be defective?

The pressure plate is not retracting or is dragging. The driven plate is not free to rotate. Input shaft is seized in the spigot bearing.

3. What should be checked before clutch removal?

ACTUATION – Pedal mechanism, adjustment, clutch cable, release fork rotating on its shaft or broken, travel of master/slave cylinders, master/slave cylinders leaking, hydraulic lines, fluid levels, air in the system, clutch servo stroke too short

DRIVE TRAIN – Hardy spicer joints, drive shaft universal joints/splines

4. What can be determined after removal?

DRIVEN PLATE – Hub splines rusted, linings rusted onto flywheel/pressure plate, linings fractured/torn off, excessive lateral runout, lining backings bowed, driven plate installed backwards, torsional-vibration damper springs have broken loose, hub splines damaged, incorrectly machined, or unlubricated

PRESSURE PLATE – Pressure plate broken, leaf springs bent or broken, diaphragm-spring fingers severely worn, cover distorted, diaphragm spring bent or broken, inner surface of diaphragm spring scored due to excessively long travel

FLYWHEEL – Has no effect!

RELEASE SYSTEM – Release bearing, release shaft seized in its bearings, guide tube, release fork broken or bent

SPECIAL CASE – Driven plate continues to rotate when the clutch is disengaged because the transmission input shaft is seized in the spigot (pilot) bearing

TWIN-PLATE CLUTCHES – Are the adjuster slides contacting the flywheel?

COIL-SPRING CLUTCHES – Cam(s) or release-lever mountings broken

PULL TYPE TWIN-PLATE CLUTCHES – Spacers have slipped out of position

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

COMPONENT FAILURES – Defective parts in the clutch itself? In the release system?

ADVERSE EFFECTS CAUSED BY THE DRIVE TRAIN? – Engine, transmission, other drive-train components

EXTERNAL CAUSES – Normal wear / Improper use / Incorrect repair procedures

Clutch slip

1. What are the particular symptoms?

QUICK TEST – Set the handbrake, disengage the clutch and start the engine, select fourth gear, press the accelerator and slowly engage the clutch
The engine should stall?

TEST DRIVE – Disengage the clutch while in 4th/5th gear, press the acce-lerator and engage the clutch
Does the engine speed up?

2. Which components might be defective?

Insufficient friction between driven plate and flywheel/pressure plate
Excessive wear on driven plate/flywheel/pressure plate
Insufficient clamp load

3. What should be checked before clutch removal?

ACTUATION – Pedal mechanism, Adjustment Clutch cable, Master/slave cylinders, Hydraulic lines

DRIVE TRAIN – Has no effect!

4. What can be determined after removal?

DRIVEN PLATE – Oil/grease on linings, Linings glazed or worn thin

PRESSURE PLATE – Pressure plate overheated, Pressure plate severely scored, worn thin, diaphragm spring weak

FLYWHEEL – Flywheel mating surface scored, flywheel worn thin

RELEASE SYSTEM – Release bearing, guide tube, release fork, bearings

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

COMPONENT FAILURES – Defective parts in the clutch itself? In the release system?

ADVERSE EFFECTS CAUSED BY THE DRIVE TRAIN? – Engine, transmission, other drive-train components

EXTERNAL CAUSES – Normal wear / Improper use / Incorrect repair procedures

Clutch judder

1. What are the particular symptoms?

TEST DRIVE – Does the clutch judder (particularly under certain circumstances, e.g., when reversing uphill)?

2. Which components might be defective?

Erratic rotational motion of the crankshaft or transmission input shaft, Erratic friction between driven plate/flywheel/pressure plate, Pressure plate engages off-axis, Clamp load increases erratically, driven plate binding on transmission input shaft

3. What should be checked before clutch removal?

ACTUATION – Pedal mechanism, Clutch cable, Adjustment, Release shaft, Master/slave cylinders, Hydraulic lines

DRIVE TRAIN – Engine management, Engine mountings, Transmission mountings, Prop shaft, Drive coupling

4. What can be determined after removal?

DRIVEN PLATE – Facing oily, facing greasy, contact pattern incorrect

COVER ASSEMBLY – Chatter marks, leaf spring deformed, diaphragm spring bent, cover warped

FLYWHEEL – Surface incorrect

RELEASE SYSTEM – Release bearing, release shaft bearing, guide sleeve

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

COMPONENT FAILURES – Defective parts in the clutch itself? In the release system?

ADVERSE EFFECTS CAUSED BY THE DRIVE TRAIN? – Engine, transmission, other drive-train components

EXTERNAL CAUSES – Normal wear / Improper use / Incorrect repair procedures

Clutch makes a noise

1. What are the particular symptoms?

QUICK TEST – Locate the source of the noise, Engage/disengage the clutch, Is the noise coming from the vicinity of the clutch?

TEST DRIVE – Is the noise still there?

2. Which components might be defective?

Rotating components are rubbing against one another

Loose components

3. What should be checked before clutch removal?

ACTUATION – Pedal mechanism, clutch cable, release shaft, master/slave cylinders, hydraulic lines

DRIVE TRAIN – Has no effect!

ENGINE – Engine tuning

4. What can be determined after removal?

DRIVEN PLATE – Hub glazed, torsional-vibration damper glazed, cover plate on the torsional-vibration damper, torsion springs have broken loose, hub splines worn

PRESSURE PLATE – Diaphragm-spring fingers worn, inner surface of diaphragm spring scored due to excessively long travel

COIL SPRING CLUTCHES – Cam(s) or release-lever mountings broken

SPIGOT BEARING – Noisy

FLYWHEEL – Mating surface

RELEASE SYSTEM – Release-bearing ball bearings, release-shaft bearings, guide tube, release fork

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

COMPONENT FAILURES – Defective parts in the clutch itself? In the release system?

ADVERSE EFFECTS CAUSED BY THE DRIVE TRAIN? – Engine, transmission, other drive-train components

EXTERNAL CAUSES – Normal wear / Improper use / Incorrect repair procedures

Clutch pedal is heavy in operation

1. What are the particular symptoms?

QUICK TEST – Press the clutch pedal Does it feel heavy?

2. Which components might be defective?

Friction in the actuating mechanism, Friction in the release system

3. What should be checked before clutch removal?

ACTUATION – Pedal mechanism, clutch cable, release shaft, master/slave cylinders, hydraulic lines, compressed-air booster

DRIVE TRAIN – Has no effect!

4. What can be determined after removal?

DRIVEN PLATE – Has no effect!

PRESSURE PLATE – Has no effect!

FLYWHEEL – Has no effect!

RELEASE SYSTEM – Wrong release bearing, wrong/no grease used, release shaft, release-shaft bearings worn, damaged guide tubes, release fork broken or bent

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

COMPONENT FAILURES – Defective parts in the clutch itself? In the release system?

ADVERSE EFFECTS CAUSED BY THE DRIVE TRAIN? – Engine, transmission, other drive-train components

EXTERNAL CAUSES – Normal wear / Improper use / Incorrect repair procedures

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

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