



## Failure Diagnosis

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



### 1st Troubleshooting and Service-Tips for Passenger Cars

al vehicle

# agricultural vehicles





|   |                |          |
|---|----------------|----------|
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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.

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## 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.

### • 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.

Please take care to use the correct fluid for refills. In some cases you must use brake fluid (black seal), in others mineral oil (grey seal).

### • 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,
- manoeuvring 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.

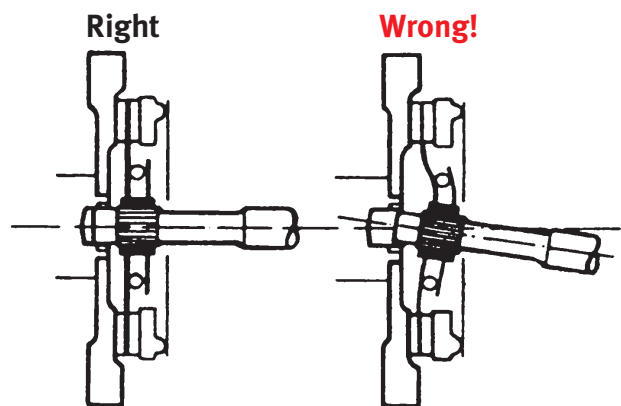
Damaged or weak engine mountings will cause the engine to move from its position and then 'bounce' back when the clutch is engaged, which causes a transition between static and dynamic coefficients of friction at the contact surface of clutch facings and results in judder.

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

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

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



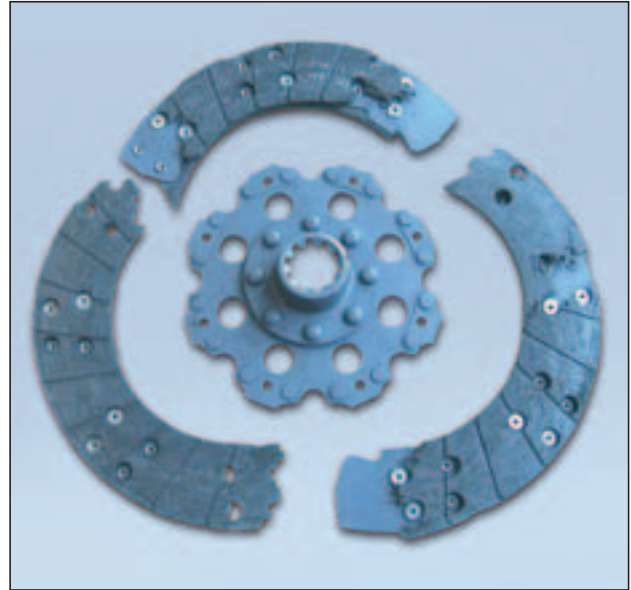
Worn splines on the transmission input shaft will cause erratic movement during load changes, which can bend tangential leaf springs and cause disengagement problems or juddering.

More technical information:  
[www.RepXpert.com](http://www.RepXpert.com) or [www.Schaeffler-Aftermarket.com!](http://www.Schaeffler-Aftermarket.com!)

## 1. 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.**



## 2. Linings torn off

### Cause

- Worn flywheel face not machined flat



## 3. Pressure plate lugs broken

### Cause

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



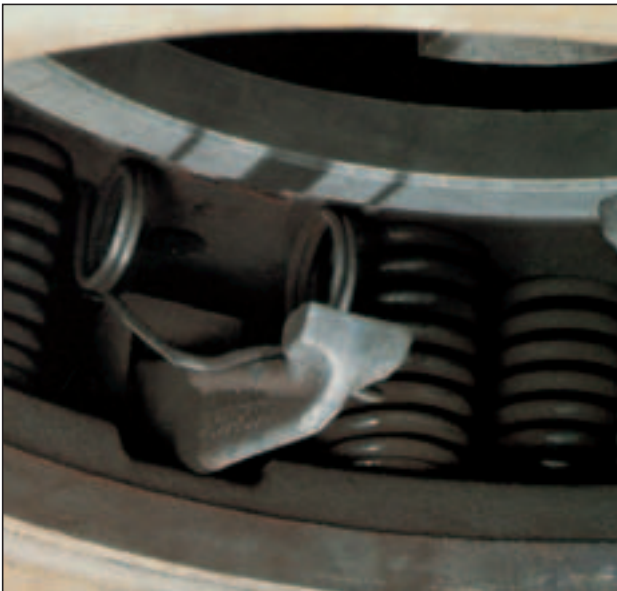




## 4. A release-lever pivot pin has drifted out

### Cause

- Engine vibration damper defective  
→ Engine torsional vibrations have caused the circlip securing the pivot pin to pop off
- Fuel-injection system incorrectly adjusted



## 5. Broken pivot pin

### Cause

- Incorrectly adjusted release bearing
- Worn out torsion damper on the crankshaft
- Incorrect setting of injectors



## 6. Pressure plate broken

### Cause

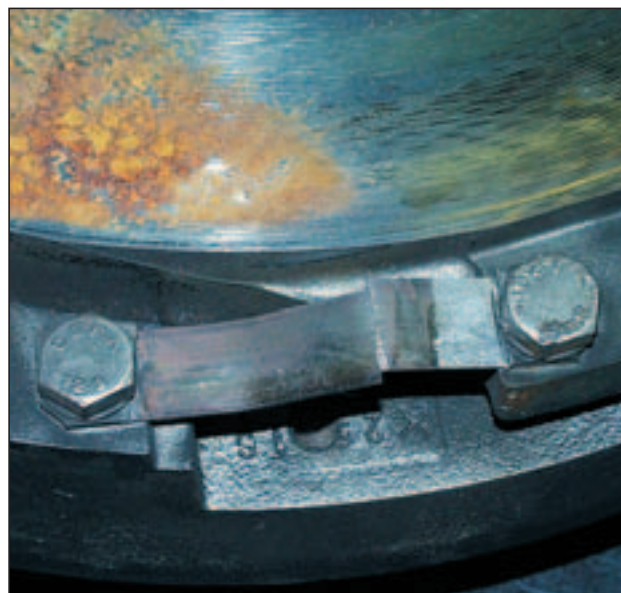
- Pressure-plate overheating due to slipping the clutch for excessively long periods
- Clutch was slipping due to worn friction
- Binding in the release system
- Defective slave cylinder
- Oil on linings due to a leaking shaft seal

**7. Centering ridge on flywheel broken off****Cause**

- Clutch incorrectly installed
- 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. Broken clutch levers

### Cause

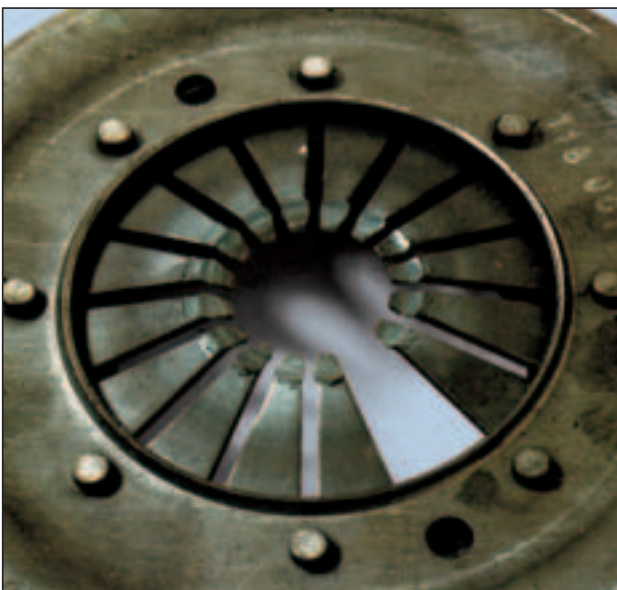
- Incorrectly adjusted release bearing
- Faulty release mechanism
- Release bearing failure



## 11. Worn clutch levers

### Cause

- Incorrectly adjusted release bearing
- Faulty release mechanism
- Release bearing failure



## 12. Worn spring fingers

### Cause

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

### 13. Clutch cover pressing bent

#### Cause

- Incorrect fitting
  - Mounting bolts not uniformly tightened
  - Dowels in flywheel not correctly aligned



### 14. Pivot ring removed

#### Cause

- Incorrect fitting
  - Pivot ring removed following fitting

**Pivot ring is not an aid to fitment!**



### 15. Hub splines damaged

#### Cause

- Incorrect fitting
  - Captive disc shaft incorrectly aligned
  - PTO hub shaft incorrectly aligned
  - Pressure plate not aligned to flywheel step
  - Pressure plate not torqued down correctly
  - Wrong drive plate installed





## 16. Rust on the hub

### Cause

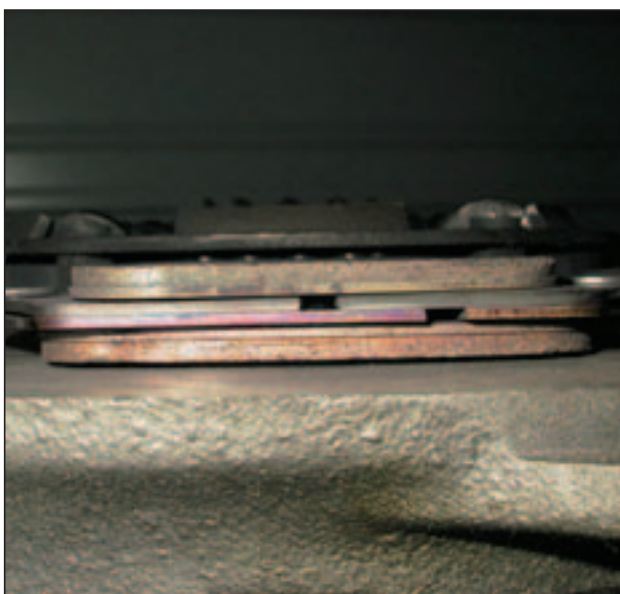
- Hub splines were not lubricated



## 17. splines chewed out on one side, tapered wear on splines

### Cause

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



## 18. Clutch disc distorted

### Cause

- Incorrect fitting
- The clutch disc carrier was damaged by the transmission/PTO input shaft due to misalignment when the transmission was reinstalled on the engine



**19. Clutch disc distorted****Cause**

- Incorrect fitting
- The clutch disc carrier was damaged by the transmission/PTO input shaft due to misalignment when the transmission was reinstalled on the engine

**20. Segment cushion broken****Cause**

- Incorrect fitting
- The transmission was allowed to drop down during installation.
- Engine-transmission angularly misaligned

**21. Fouling marks on the hub****Cause**

- Incorrect fitting
- Driven plate fitted wrong way around
- Incorrect driven plate





## 22. Facing stiction

### Cause

- Vehicle has been left standing for a long time



## 23. Sintered friction material destroyed

### Cause

- Sintered friction material not bedded in  
Tractor was put under heavy load immediately following fitting.
- Excessive slip due to fitment of clutch disc against worn and grooved flywheel

## Release-fork-bearing surface worn



## 24. Release-fork-bearing surface worn

### Cause

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



**25. Release bearing clattering****Cause**

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

**26. Casing and bearing damaged****Cause**

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

**27. Gearbox snout worn****Cause**

- Incorrect adjustment of the release fork
- Offset wear by the release fork





## 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

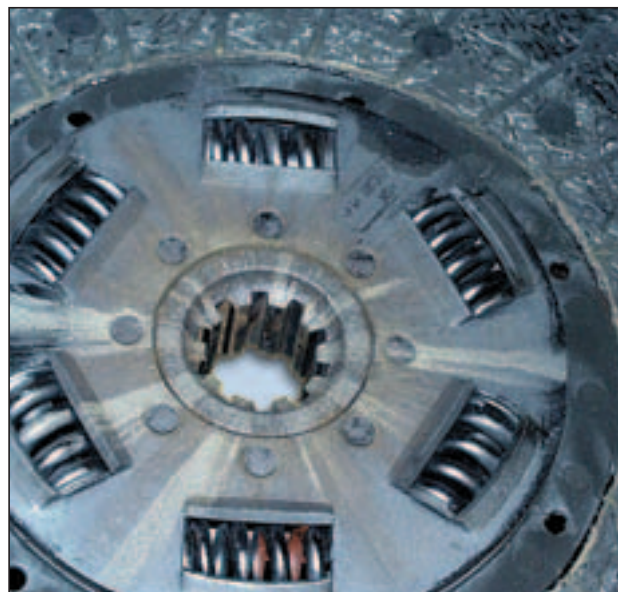
### Cause

- 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 ran
- Leaking engine or transmission shaft seal out 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 practice
- Allowing the clutch to slip for too long
- Improper use of the clutch
- Defective release system



#### 6. Friction material worn to rivet head

##### Cause

- Excessive friction material wear. Vehicle was still being driven, even though the clutch was slipping
- Clutch slipped for long periods?
- Incorrect driven practice
- Defective release system







## 7. Lining on flywheel side scored

### Cause

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



## 8. Incorrect fitment

### Cause

- Clutch disc installed backwards
- Incorrect clutch disc installed
- Flywheel modifications not made



## 9. Release shaft binding

### Cause

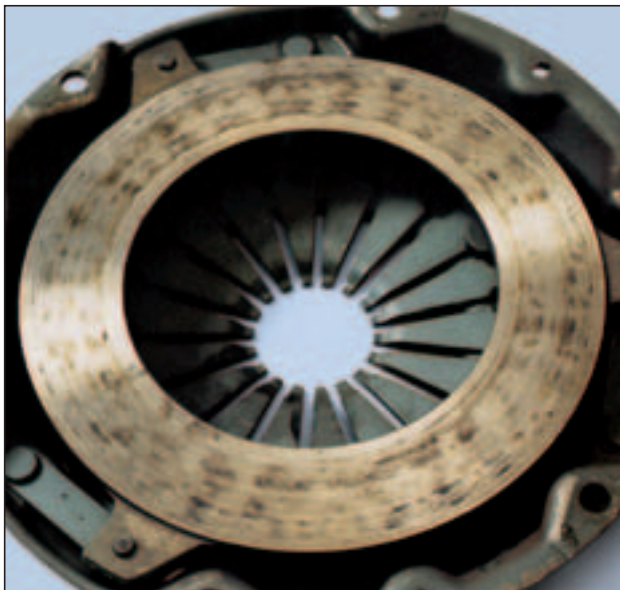
- Release-shaft bearings not lubricated
- Release shaft and/or its bearings worn

**10. Worn clutch levers****Cause**

- Incorrectly adjusted release bearing
- Faulty release mechanism







## 1. Heavy chatter marks on the pressure plate

### Cause

- Oil or grease on the facing
- Stiff clutch linkage
- Worn engine mountings
- Worn transmission linkages
- Engine badly tuned



## 2. Tangential leaf spring bent

### Cause

- Excessive clearance in the drive train
- Incorrect driven practice
  - Poor gear-shifting habits
- Improper storage
  - Clutch fell or was dropped during installation



## 3. Release-fork bearing surface worn

### Cause

- Release fork worn
  - Release-bearing mountings worn
  - Release shaft mounting worn out

#### 4. Grease/oil on linings

##### Cause

- Too much grease used on hub splines
- Excess grease was not removed during installation and grease ran 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. Spline size damaged

##### Cause

- Incorrect fitting
- The transmission input shaft has been forced into the driven plate splines (the driven plate was not aligned when the pressure plate was installed).
- Incorrect driven plate fitted

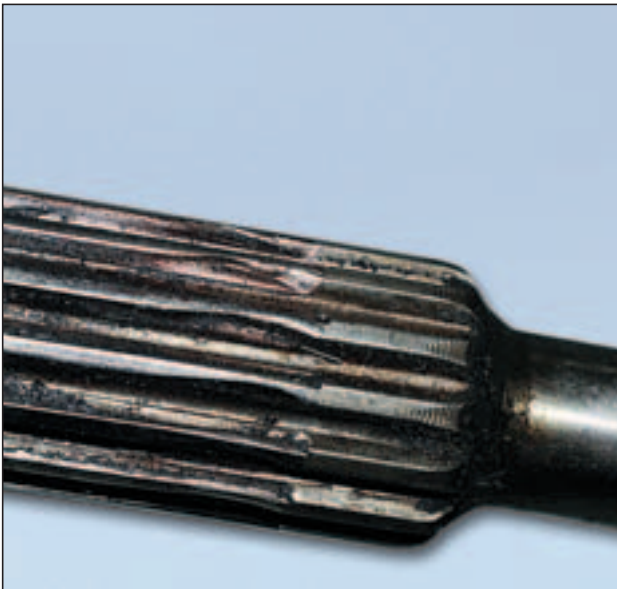




## 7. Release fork worn

### Cause

- Worn release fork mountings  
→ Worn guide sleeve



## 8. Transmission input shaft worn out

### Cause

- Worn input shaft was not replaced



## 9. Release shaft binding

### Cause

- Worn release shaft and/or bearings

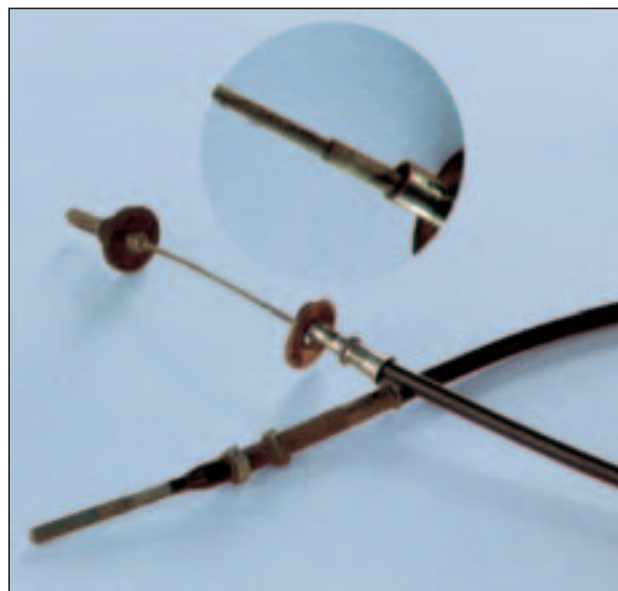


**10. Flywheel glazed and scored****Cause**

- Flywheel not refaced/replaced

**11. Faulty clutch mechanism****Cause**

- Worn cable
- Inner cable worn and unable to move freely
- Old cables whilst they may look sound are worn





## 1. Diaphragm-spring fingers worn

### Cause

- Insufficient preload
- Release bearing seized



## 2. Signs of wear on torsional vibration damper

### Cause

- Clutch disc installed backwards
- Incorrect clutch disc installed
- Flywheel modifications not made



## 3. Fouling marks on the hub

### Cause

- Incorrect fitting
- Driven plate fitted wrong way around
- Incorrect driven plate



#### 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 torsional-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. Worn splines

### Cause

- Badly tuned engine  
→ Faulty or incorrectly set injectors
- Induced torsional vibration in tractor PTO



## 8. Casing and bearing damaged

### Cause

- Defective release system



## 9. Release bearing worn

### Cause

- Insufficient bearing preload  
(Specification 80–100 N)
- Incorrect adjustment of the release fork

**10. Gear box snout worn****Cause**

- Offset wear by the release fork
- Incorrect adjustment of the release fork

**11. Release-fork bearing surface worn****Cause**

- Defective release system
  - Worn release-shaft bearings
  - Worn guide tube

**12. Release fork worn****Cause**

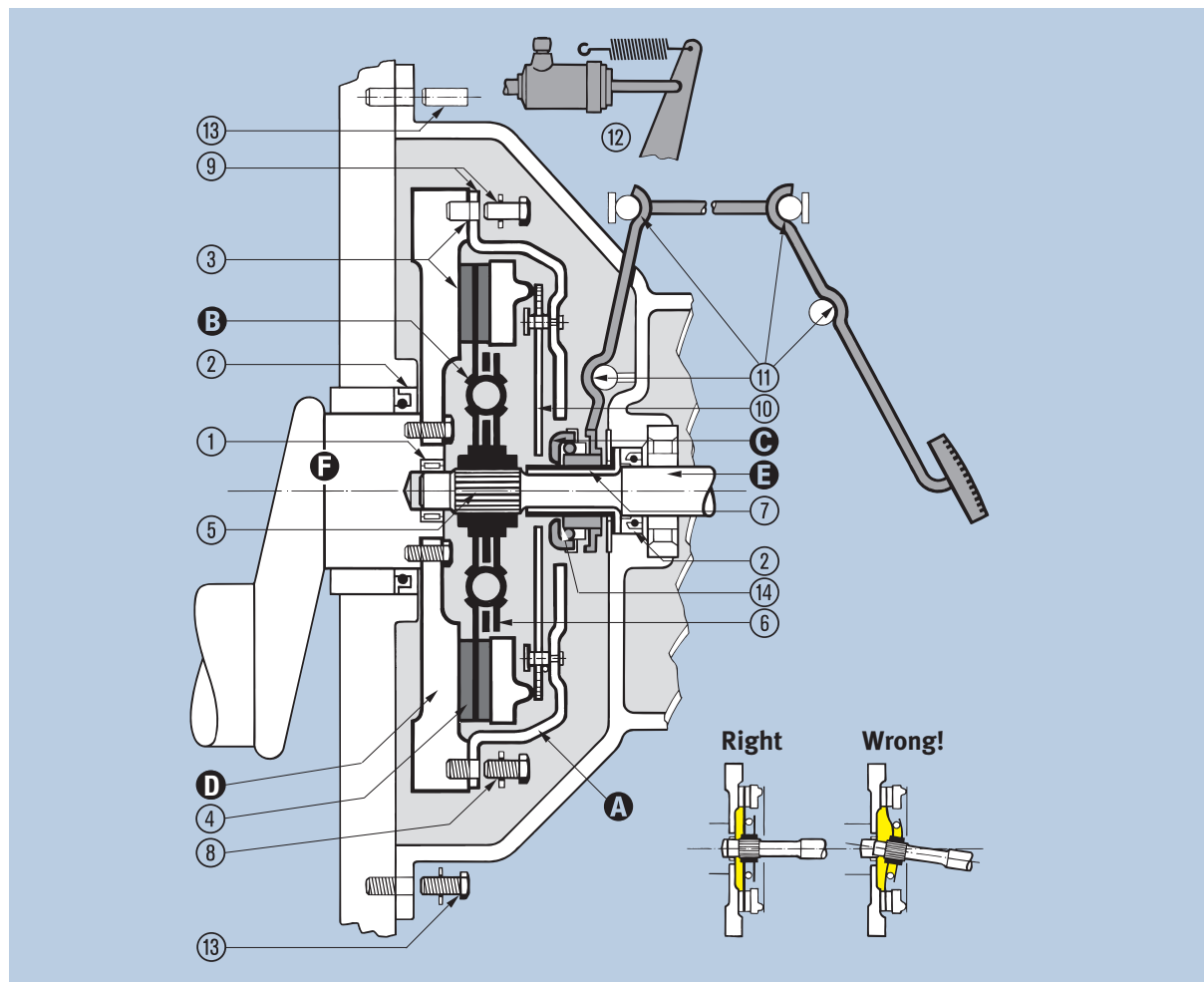
- Defective release system
  - Worn guide tube
  - Worn release-shaft bearings







## ...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.

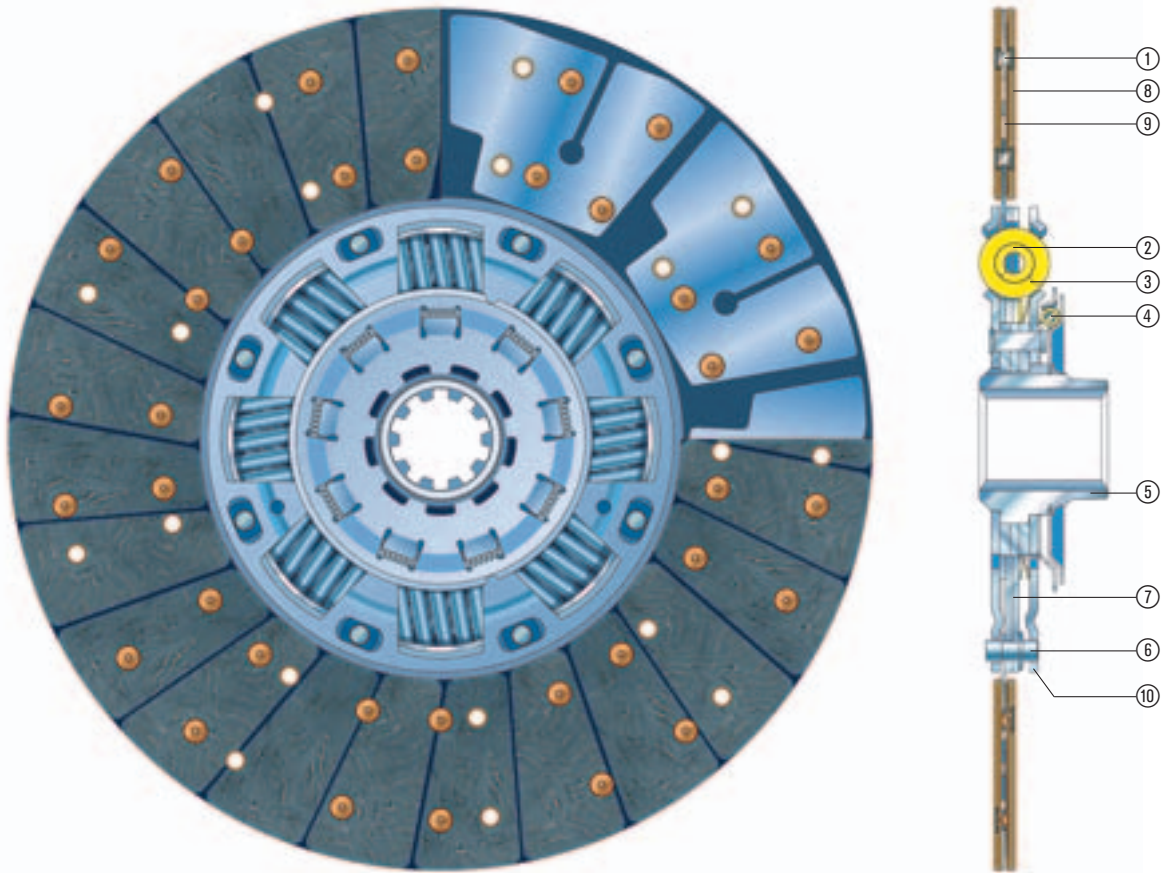
#### In particular, the following should be noted:

- 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.

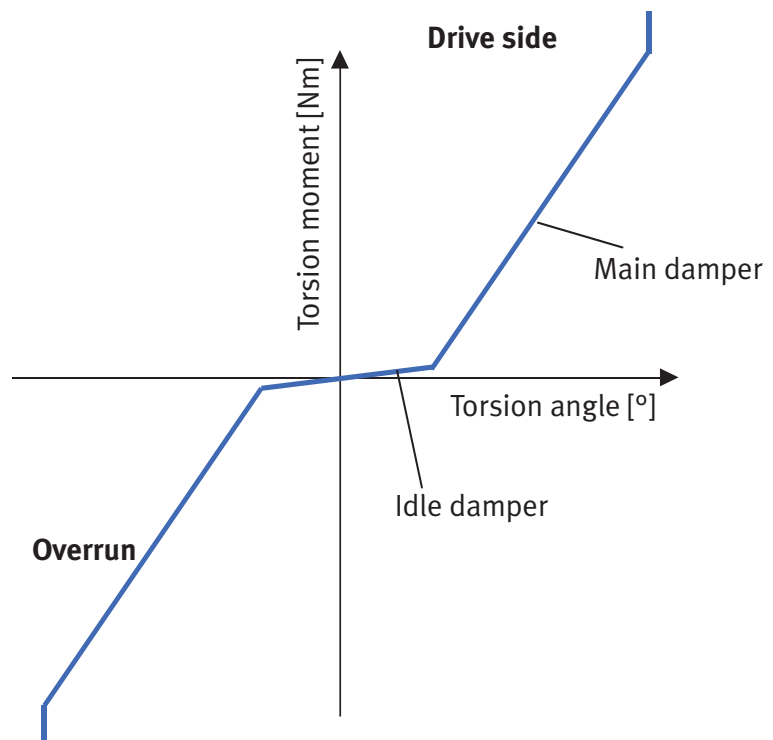
- 8 Tighten the clutch assembly crosswise with the prescribed torque. Always remove and install the SAC clutch with the special tool approved by LuK-AS (LuK-AS item no. **400 0072 10**).
- 9 Take into account the centering of the clutch assembly on the flywheel! With external centering, take into account 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 operated with a pre-load of 80-100 N. Only combine bearings which have plastic sleeves with metal guiding sleeves.



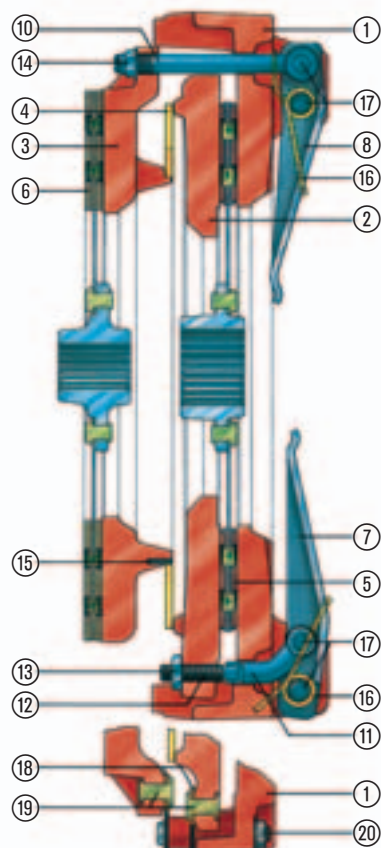
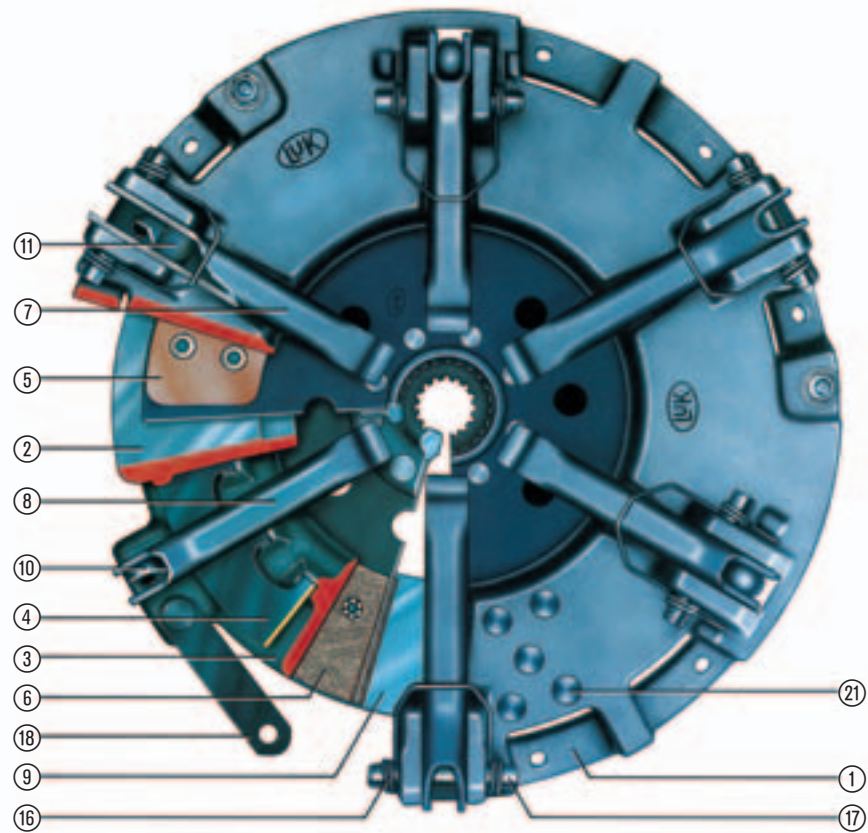
## Driven plates for heavy vehicles – their design and operation



- 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

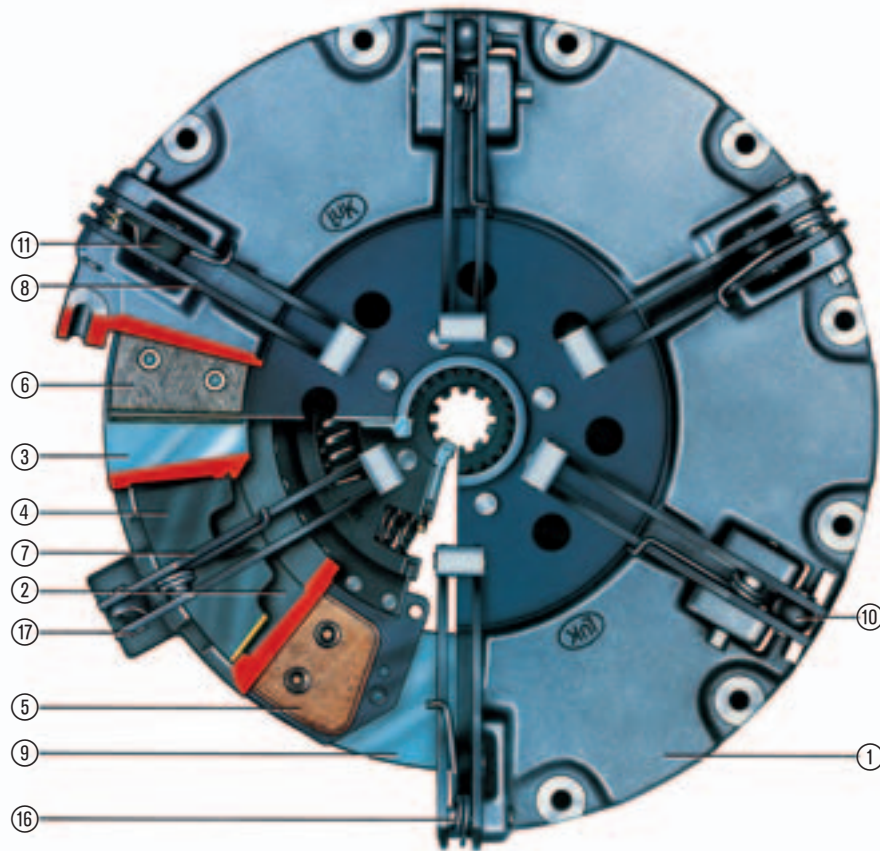


## Tractor clutch with sequential P.T.O.

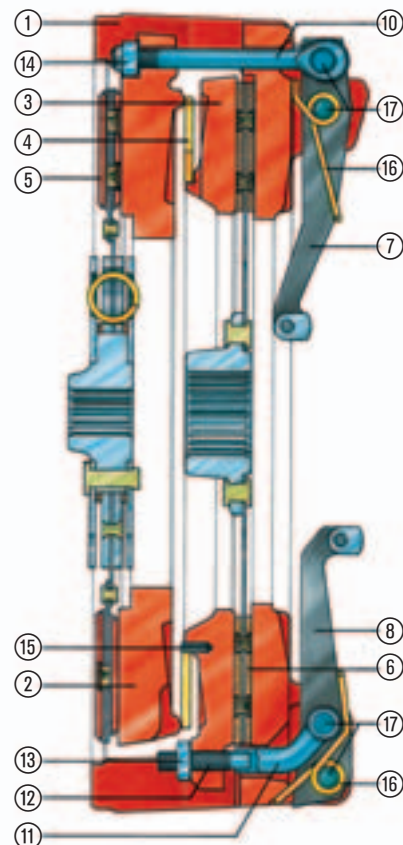


- ① Cover housing
- ② Main drive pressure plate
- ③ P.T.O. pressure plate
- ④ Diaphragm spring
- ⑤ Main drive clutch plate (with cera-metallic pads)
- ⑥ P.T.O. plate (with organic facing)
- ⑦ Main drive lever
- ⑧ P.T.O. lever
- ⑨ Flywheel
- ⑩ Connecting rod (pulling)
- ⑪ Connecting rod (pushing)
- ⑫ Adjusting screw
- ⑬ Lock nut
- ⑭ Adjusting nut
- ⑮ Location pin
- ⑯ Anti rattle spring
- ⑰ Pivot pin
- ⑱ Tangential strap
- ⑲ Rivet
- ⑳ Strap securing bolt
- ㉑ Balance hole

## Tractor clutch with independent P.T.O.

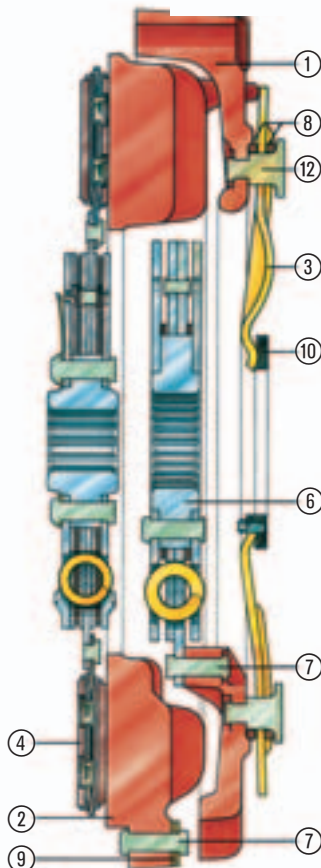
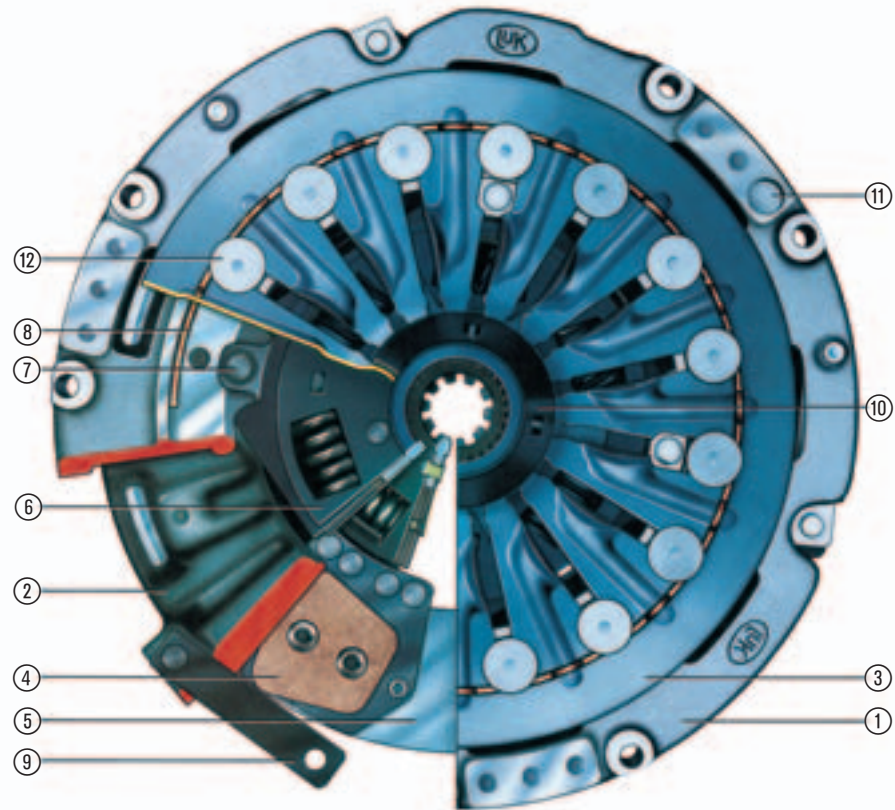


- ① Cover bracket
- ② Main drive pressure plate
- ③ P.T.O. pressure plate
- ④ Diaphragm spring
- ⑤ Main drive plate  
(with cera-metallic pads and torsion damped)
- ⑥ P.T.O. plate  
(with organic facing and solid center)
- ⑦ Main drive lever
- ⑧ P.T.O. lever
- ⑨ Flywheel
- ⑩ Connecting rod (pulling)
- ⑪ Connecting rod (pushing)
- ⑫ Adjusting screw
- ⑬ Lock nut
- ⑭ Adjusting nut
- ⑮ Split wheel
- ⑯ Hairpin spring
- ⑰ Pivot pin





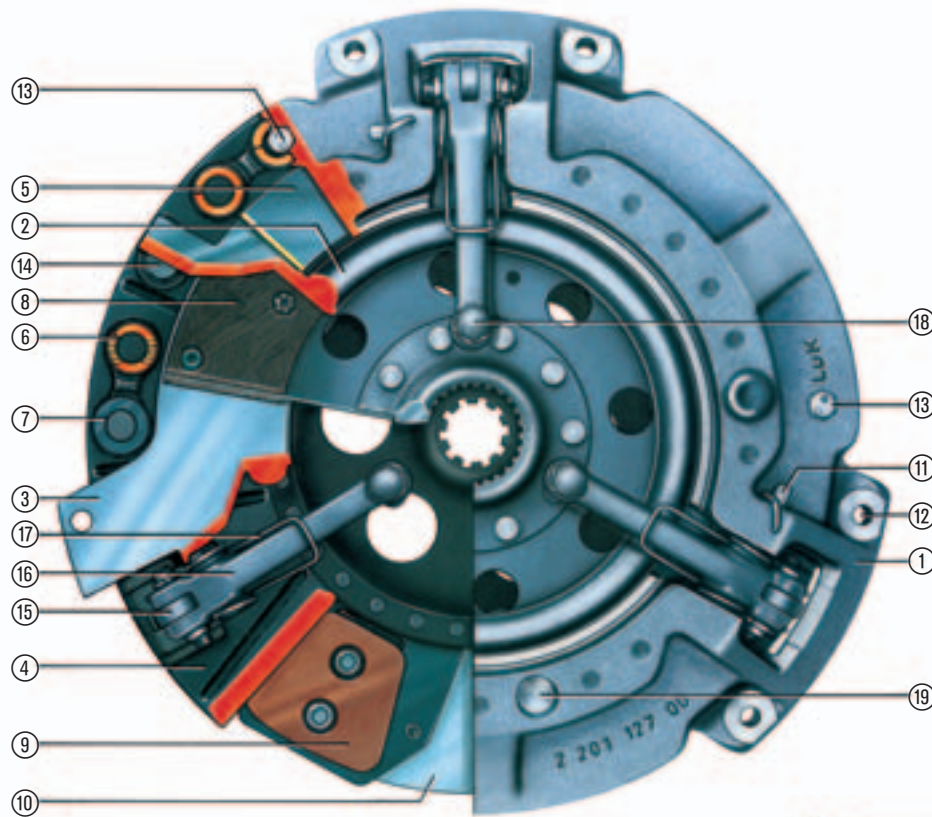
## Fixed P.T.O. tractor clutch



- ① Cover bracket
- ② Pressure plate
- ③ Diaphragm spring  
(with reinforced fingers and built-in cooling effect)
- ④ Main drive plate  
(with cera-metallic pads and torsion damper)
- ⑤ Flywheel
- ⑥ Fixed P.T.O. (with torsion damper)
- ⑦ Rivet
- ⑧ Fulcrum ring
- ⑨ Tangential strap
- ⑩ Release bearing
- ⑪ Balance hole
- ⑫ Headed rivet



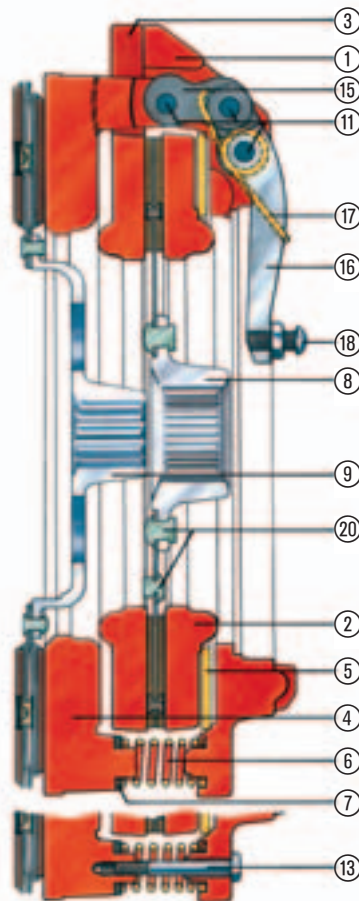
## Combined clutch for tractors (special design)



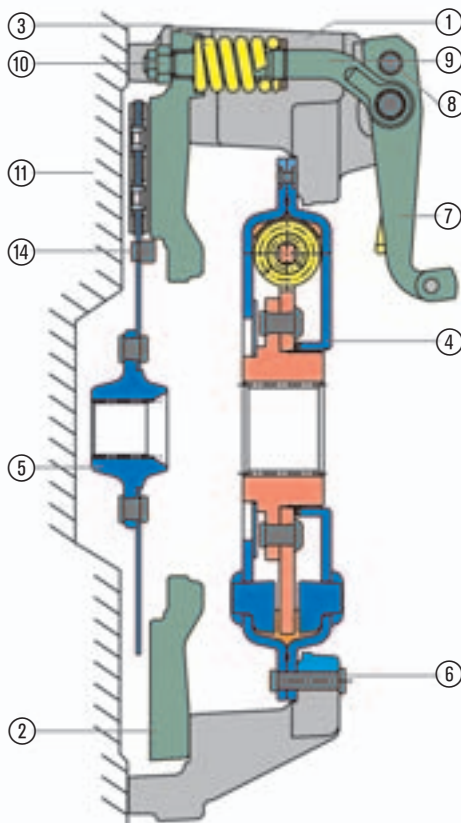
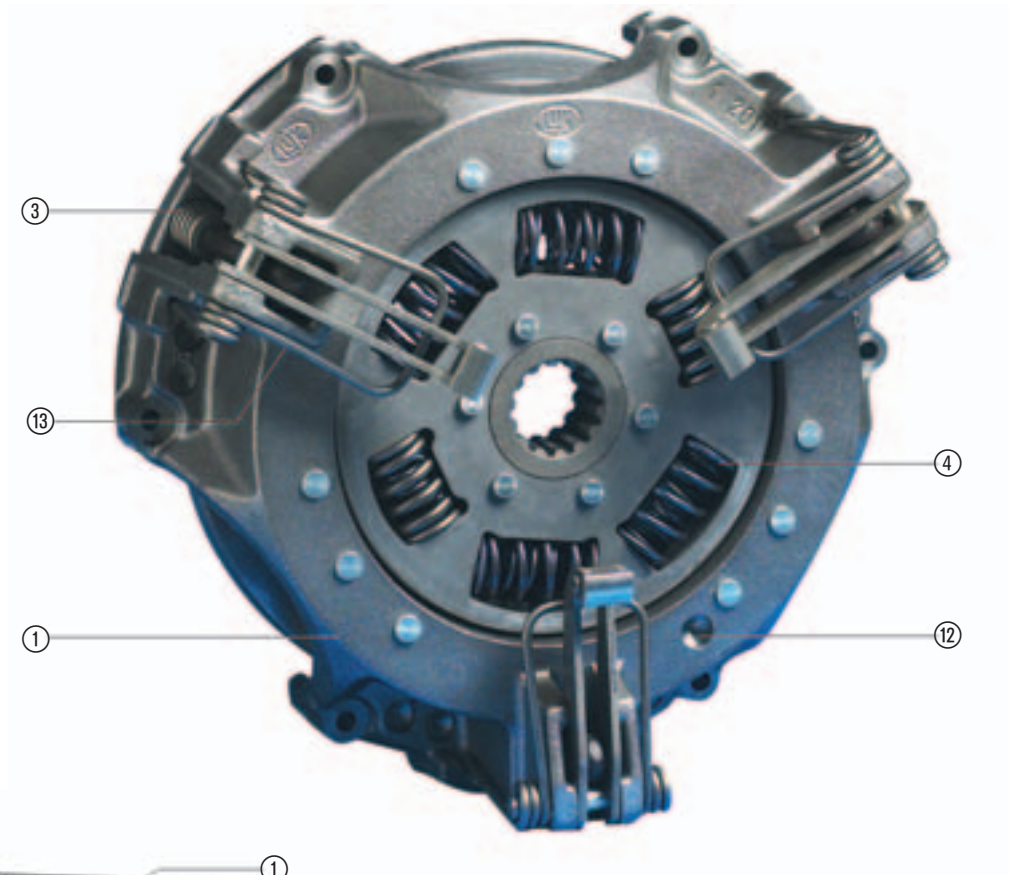
### Achtung!

Shipping bolts ⑬ must be removed after fitting clutch to vehicle.

- ① Cover bracket
- ② P.T.O. pressure plate
- ③ Flywheel plate
- ④ Pressure plate
- ⑤ Diaphragm spring
- ⑥ Coil spring
- ⑦ Insulating washer
- ⑧ P.T.O. plate  
(with organic facing)
- ⑨ Main drive plate  
(with cera-metallic facing)
- ⑩ Flywheel
- ⑪ Pivot pin
- ⑫ Fixing hole
- ⑬ Shipping bolt
- ⑭ P.T.O. adjusting screw
- ⑮ Link
- ⑯ Lever
- ⑰ Annti-rattle spring
- ⑱ Setting screw
- ⑲ Balance hole
- ⑳ Rivet

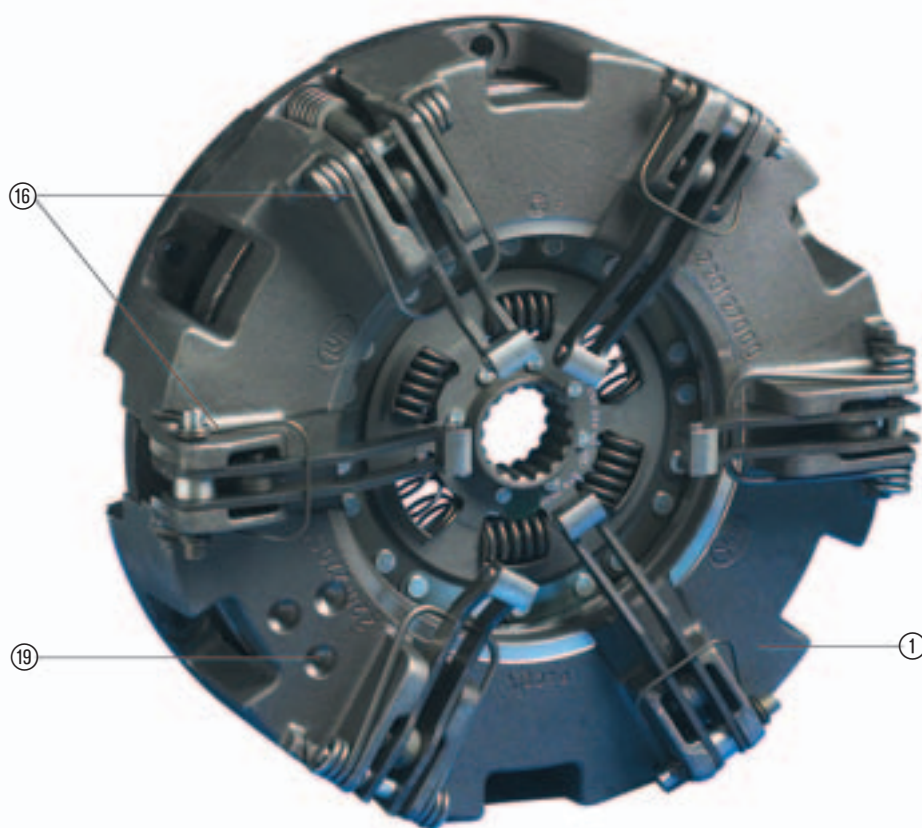


## Single safety P.T.O. clutch with fixed

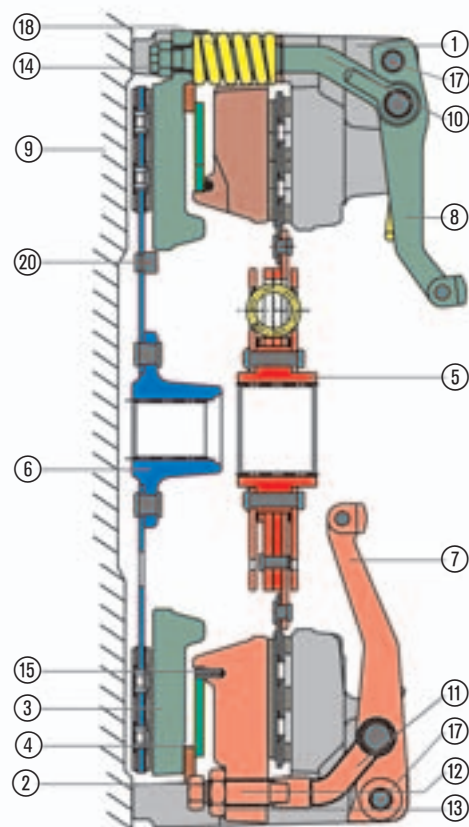


- ① Cover bracket
- ② Pressure plate
- ③ Coil spring
- ④ Fixed transmission damper
- ⑤ P.T.O. plate
- ⑥ Rivet
- ⑦ P.T.O. lever
- ⑧ Pivot pin
- ⑨ Connecting rod (pulling)
- ⑩ Adjusting nut
- ⑪ Flywheel
- ⑫ Balance hole
- ⑬ Hairpin spring
- ⑭ Rivet

## Dual Safety P.T.O. clutch



- ① Cover bracket
- ② Main drive pressure plate
- ③ P.T.O. pressure plate
- ④ Diaphragm spring
- ⑤ Main drive plate  
(with cera-metallic pads and torsion damped)
- ⑥ P.T.O. plate  
(with organic facing and solid center)
- ⑦ Main drive lever
- ⑧ P.T.O. lever
- ⑨ Flywheel
- ⑩ Connecting rod (pulling)
- ⑪ Connecting rod (pushing)
- ⑫ Adjusting screw
- ⑬ Lock nut
- ⑭ Adjusting nut
- ⑮ Split wheel
- ⑯ Hairpin spring
- ⑰ Pivot pin
- ⑱ Coil spring
- ⑲ Balance hole
- ⑳ Rivet



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<br>Damaged on replacement  | Renew the clutch pressure plate<br>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<br>Rust on input shaft<br>Incorrect grease used<br>Incorrect spline profile      | Remove burrs or renew plate<br>Remove all corrosion<br>Use correct grade of grease<br>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<br>Incorrectly matched parts<br>No grease used                                  | Renew bearing<br>Check suitability<br>Lubricate snout  |
| Damaged spigot (pilot) bearing                         | Worn  | Renew bearing  |
| Insufficient release travel                            | Incorrect clutch cable or adjustment incorrect<br>Air in the hydraulic system<br>Release system damaged | Replace clutch cable<br><br>Bleed the system<br>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<br>Incorrect assembly<br>Broken diaphragm spring<br>Oil or grease contaminated   | Renew clutch assembly<br><br>Renew oil seal                                 |
| Clutch housing, levers or diaphragm spring broken       | Incorrect installation  | Follow correct installation procedures                                      |
| Diaphragm fingers worn                                  | Excessive release bearing pre-load<br><br>No free play  | Adjust pre-load<br>Renew clutch assembly<br>Adjust free play                |
| Clutch facing worn out                                  | Normal wear and tear<br>Incorrect pressure plate<br>Driver error                                  | Renew clutch assembly   |
| Clutch facing contaminated                              | Oil seals leaking<br>Gearbox splines overgreased<br>Release bearing overlubricated                | Renew oil seals<br>Renew clutch assembly<br>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<br>Renew flywheel                                   |
| Gearbox snout damaged                                   | Non/incorrect lubricant<br>Damaged release bearing<br>Incorrect combination of bearing and snout  | Renew gearbox snout<br>Use correct lubricant<br>Check parts for suitability |
| Clutch cable heavy in operation                         | Clutch cable damaged<br>Incorrect cable   | Renew clutch cable<br>Check for correct cable assy                          |
| Release system heavy in operation                       | Damaged bushes on release arm or shaft<br>Bushes or bearing not lubricated                        | Renew bushes<br>Lubricate bearings or bushes                                |



## Clutch judder

C

| Problem                          | Cause   | Remedy   |
|----------------------------------|---|--|
| Pressure plate uneven            | Broken or bent tangential straps<br>Distorted cover                                 | Replace clutch cover<br>Install correctly  |
| Facing contaminated with oil     | Oil seals defective   | Renew oil seals<br>Replace driven plate  |
| Facings contaminated with grease | Excessive grease on splines and release bearing                                     | Renew driven plate<br>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<br>Release lever bearings<br>Gearbox snout<br>Master or slave cylinder | Fully inspect the release system<br>Check bearing/snout combination<br>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<br>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<br>Incorrect combination<br>No grease used<br>Incorrect grease used | Renew release bearing<br>Check combination<br>Grease bearing and snout<br>Use correct grade of grease |
| Release system bearings or bushes worn | Bushes worn or not lubricated<br>Damaged release arm or shaft                               | Renew bearings and bushes<br>Lubricate where required   |
| Clutch cable damaged                   | Normal wear and tear<br>Incorrect cable fitted  | Renew cable<br>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 accelerator 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

|   |  |  |  |  |  |
|---|---|---|---|---|---|
|   | ✓   | ✓   | ✓   | ✓   | ✓   |
|   | ✓   | ✓   |   |   |   |
|   | ✓   | ✓   | ✓   | ✓   |   |
|   | ✓   | ✓   | ✓   | ✓   |   |
|   | ✓   | ✓   |   |   |   |
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|   | ✓   | ✓   |   |   |   |
|   | ✓   | ✓   | ✓   | ✓   |   |

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