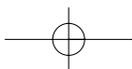


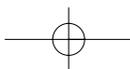
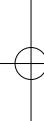
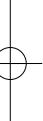
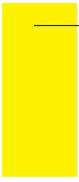
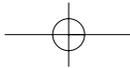
# Failure Diagnosis

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



## agricultural 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 aimed at being complete.

	Pages	
<b>LuK-tips on avoiding clutch system failures and malfunctions</b> .....	<b>4-5</b>	
<b>Clutch not clearing</b> .....	<b>6-14</b>	<b>A</b>
<b>Clutch slip</b> .....	<b>15-18</b>	<b>B</b>
<b>Clutch judder</b> .....	<b>19-22</b>	<b>C</b>
<b>Clutch noise</b> .....	<b>23-26</b>	<b>D</b>
<b>General tips on installing commercial vehicle clutches</b> .....	<b>24-31</b>	
<b>Diagnostic charts</b> .....	<b>32-35</b>	

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# LuK tips on avoiding

## 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 prerequisite 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.

# clutch-system problems

## 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:

Juddering

Slipping

Failure to disengage

Noise

A heavy clutch pedal

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

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

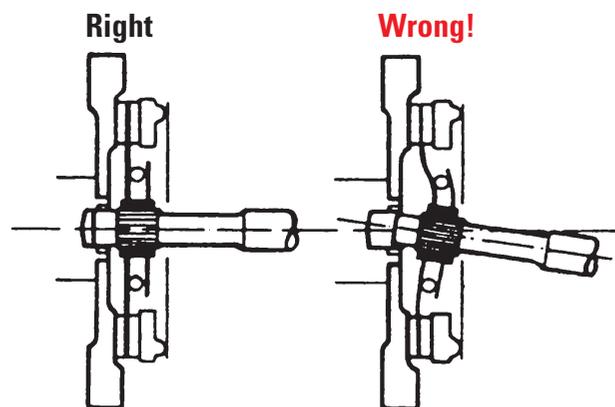
Damaged or weak engine mountings will cause the engine to move from its position and then 'bounce' back when the clutch is engaged, which causes a transition between static and dynamic coefficients of friction at the contact surface of clutch facings and results in judder.

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

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

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

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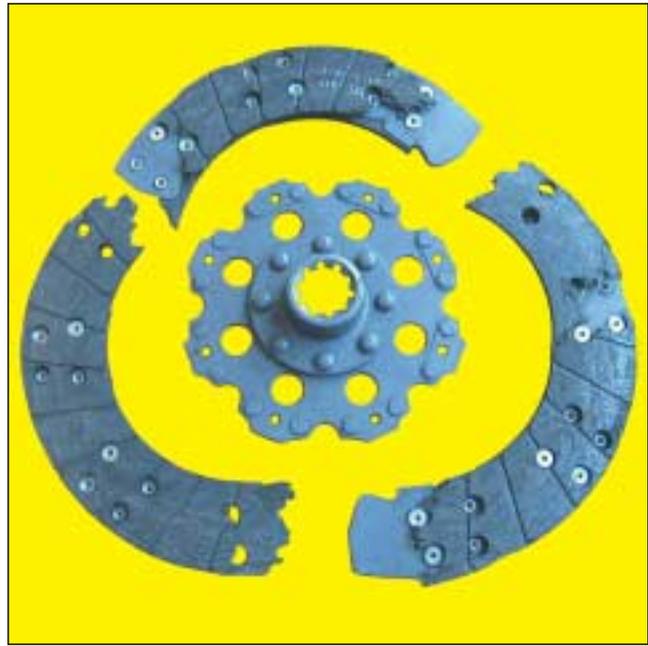
# Clutch not clearing

## 1. Linings torn off

### Causes:

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

### Causes:

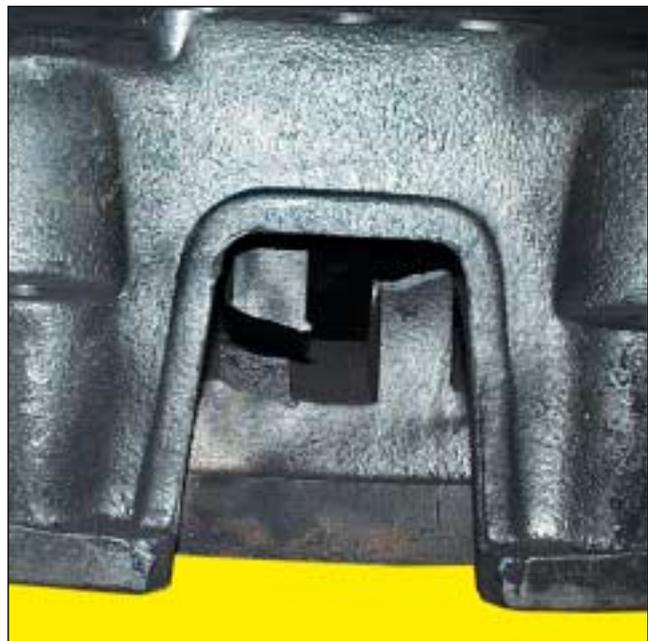
- Worn flywheel face not machined flat.



## 3. Pressure plate lugs broken

### Causes:

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



# Clutch not clearing

A



**A release-lever pivot pin has drifted out.**

4.

**Causes:**

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



**Broken pivot pin**

5.

**Causes:**

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



**Pressure plate broken**

6.

**Causes:**

- 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

### Causes:

- Play in the drive train
- Driver error
- Poor gear-shifting habits



## 9. Tangential leaf spring bent

### Causes:

- Play in the drive train
- Driver error
- Poor gear-shifting habits
- Improper storage
- Clutch fell or was dropped during installation



# Clutch not clearing

A

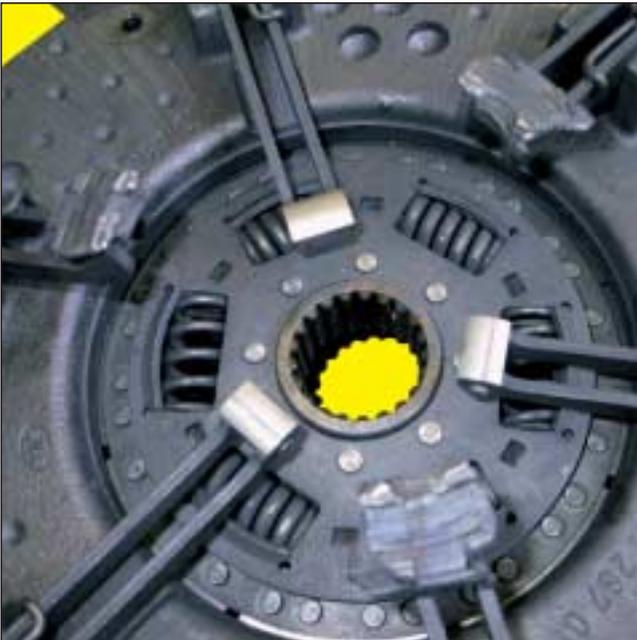


## Broken clutch levers

10.

### Causes:

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



## Worn clutch levers

11.

### Causes:

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



## Worn spring fingers

12.

### Causes:

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

## 13. Clutch cover pressing bent

### Causes:

- Fitting fault
- Mounting bolts not uniformly tightened
- Dowels in flywheel not correctly aligned



## 14. Pivot ring removed

### Causes:

- Fitting fault
  - Pivot ring removed following fitting
- Pivot ring is not an aid to fitment**



## 15. Hub splines damaged

### Causes:

- Clutch incorrectly installed
- 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



# Clutch not clearing

A



## Rust on the hub

16.

### Cause:

- Hub splines were not lubricated.



## Hub splines chewed out on one side, tapered wear on splines

17.

### Causes:

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



## Clutch disc distorted

18.

### Causes:

- Improper installation
- 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

### Causes:

- Improper installation
- 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

### Causes:

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



## 21. Fouling marks on the hub

### Causes:

- Fitting fault
- Driven plate fitted wrong way around
- Incorrect driven plate



# Clutch not clearing

A



## Facing stiction

22.

### Cause:

- Vehicle has been left standing for a long time



## Sintered friction material destroyed

23.

### Causes:

- 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.

### Causes:

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

## 25. Release bearing clearing

### Causes:

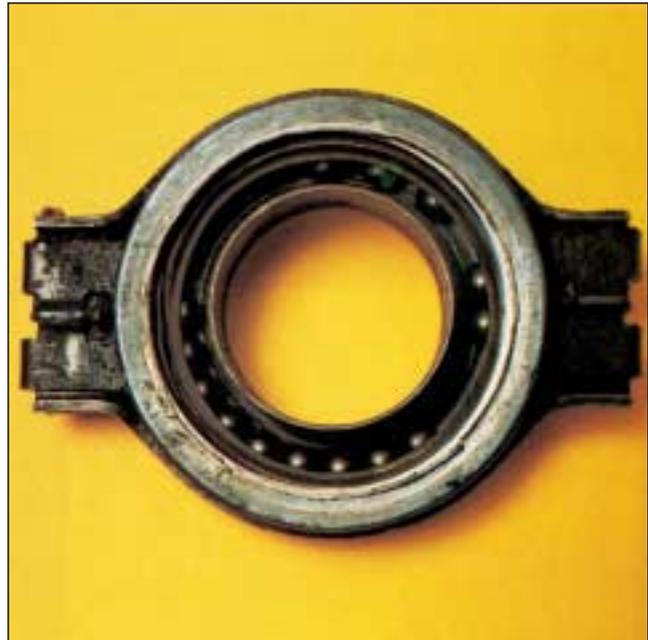
- Insufficient bearing preload (specification 80-100 N)
- Incorrect adjustment of the release fork



## 26. Casing and bearing damaged

### Causes:

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



## 27. Gearbox snout worn

### Causes:

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



# Clutch slip

B



## Severe scoring and glazing on the pressure plate

1.

### Cause:

- Overheating
- Lining worn beyond permissible limits



## Diaphragm-spring fingers worn

2.

### Cause:

- Incorrect preload



## Lining surfaces glazed

3.

### Causes:

- 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

### Causes:

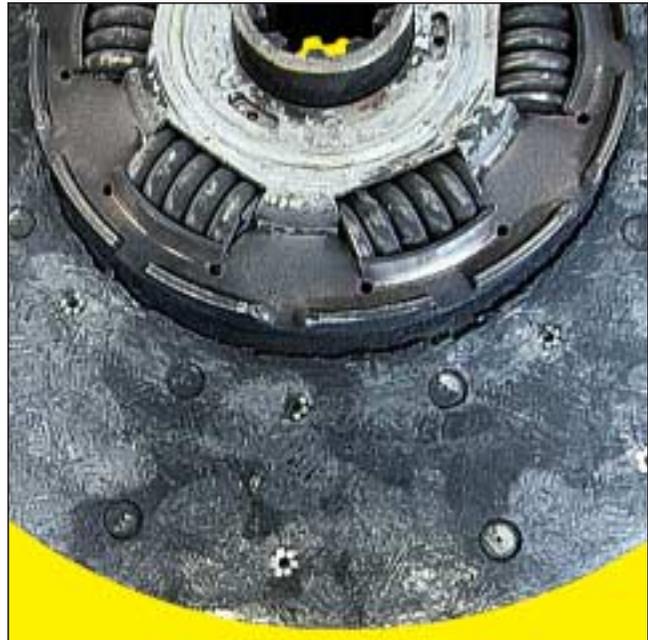
- Too much grease used on hub
- Excess grease on the hub splines was not removed and grease ran
- Leaking engine or transmission shaft seal out onto the linings.



## 5. Linings worn down to the rivet heads

### Causes:

- Excessive lining wear
- Vehicle was still being driven, even though the clutch was slipping.
- Driver error
- Allowing the clutch to slip for too long
- Improper use of the clutch
- Defective release system



## 6. Friction material worn to rivet head

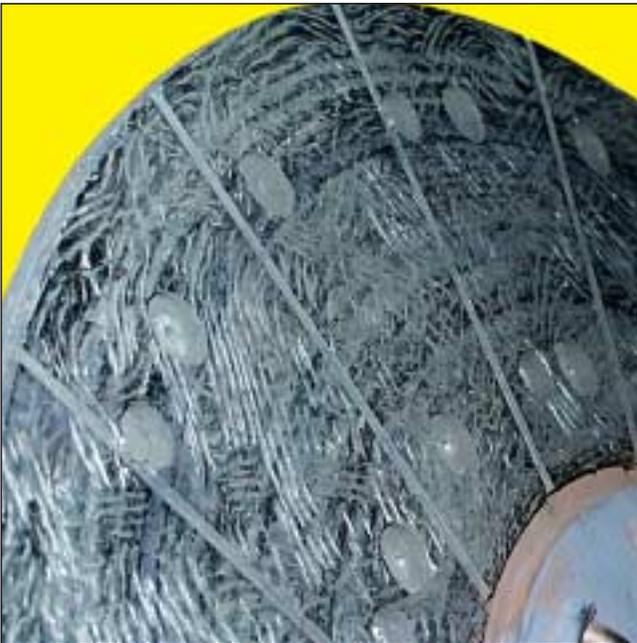
### Causes:

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



# Clutch slip

B



## Lining on flywheel side scored

7.

### Causes:

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



## Incorrect fitment

8.

### Causes:

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



## Release shaft binding

9.

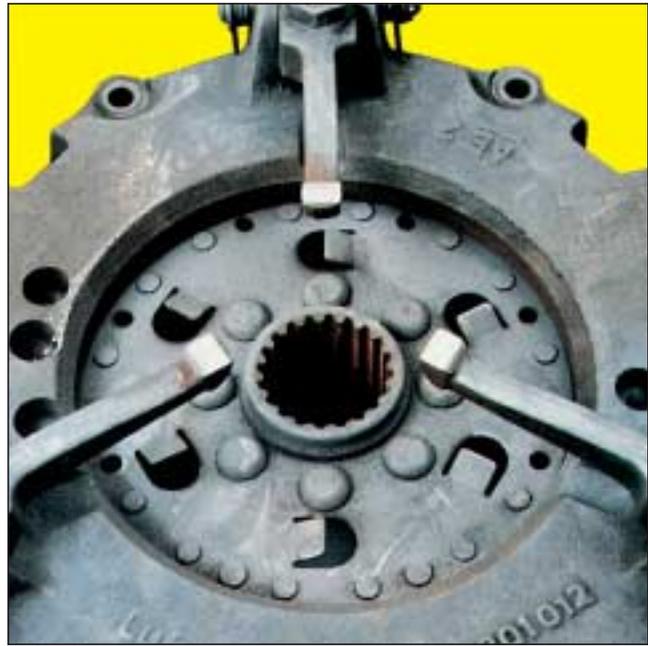
### Causes:

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

## 10. Worn clutch levers

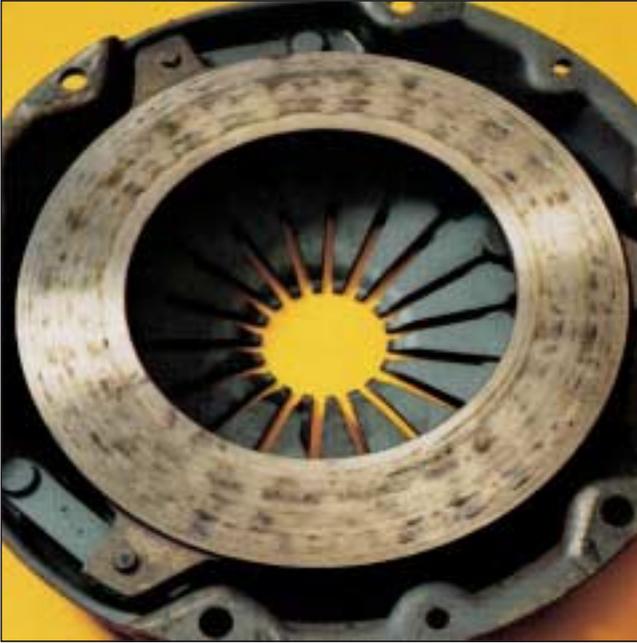
**Causes:**

- Incorrectly adjusted release bearing
- Faulty release mechanism



# Clutch judder

C



## Heavy chatter marks on the pressure plate

1.

### Causes:

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



## Tangential leaf spring bent

2.

### Causes:

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



## Release-fork bearing surface worn

3.

### Cause:

- Release fork worn
  - Release-bearing mountings worn

## 4. Grease/oil on linings

### Causes:

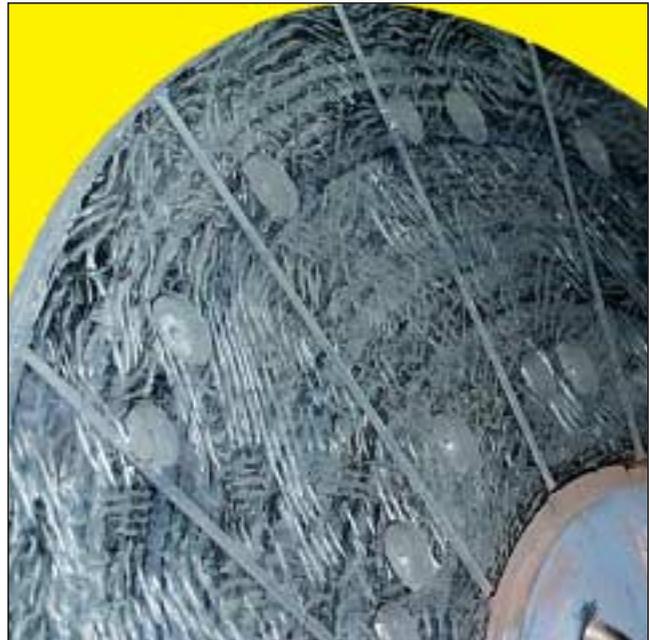
- Too much grease used on hub splines
- Excess grease was not removed during installation and grease ran out onto the linings.



## 5. Lining on flywheel side scored

### Causes:

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



## 6. Release-fork bearing surface worn

### Causes:

- Incorrect installation
- 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



# Clutch judder

C



## Release fork worn

7.

### Cause:

- Worn release fork mountings
- Worn guide sleeve



## Transmission input shaft worn out

8.

### Cause:

- Worn input shaft was not replaced



## Release shaft binding

9.

### Cause:

- Worn release shaft and/or bearings

## 10. Flywheel glazed and scored

**Cause:**

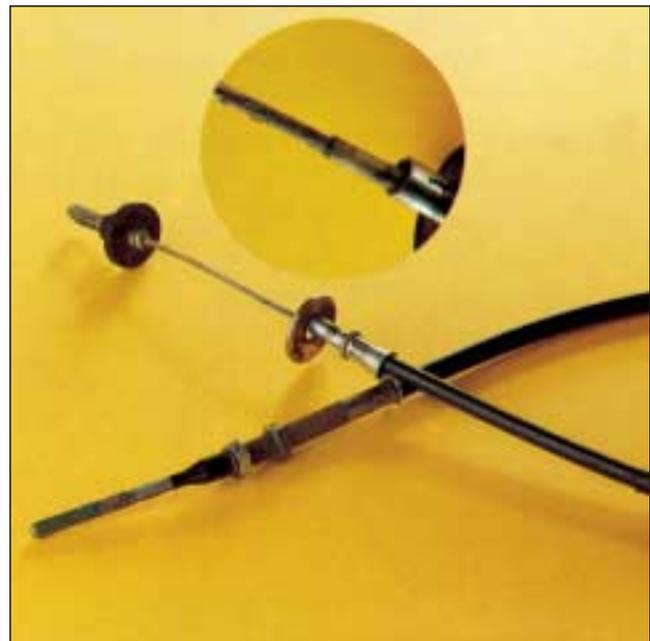
- Flywheel not refaced/replaced.



## 11. Faulty clutch mechanism

**Cause:**

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



# Clutch noise

D

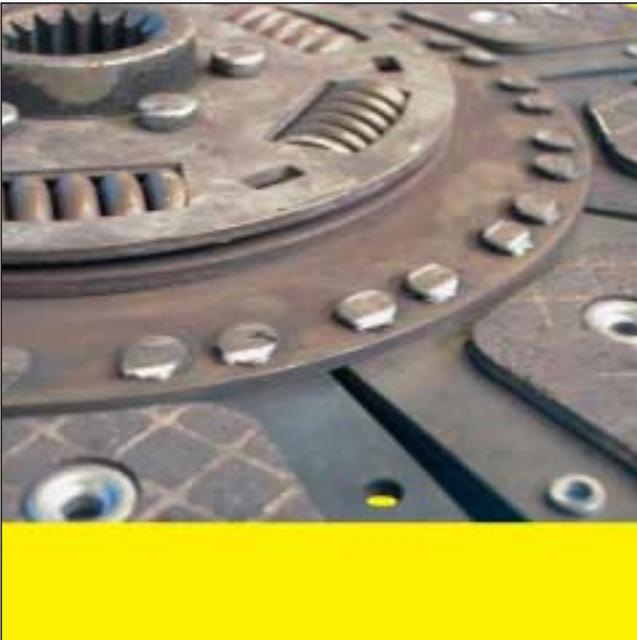


## Diaphragm-spring fingers worn

1.

### Causes:

- Insufficient preload
- Release bearing seized



## Signs of wear on torsional vibration damper

2.

### Causes:

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



## Fouling marks on the hub

3.

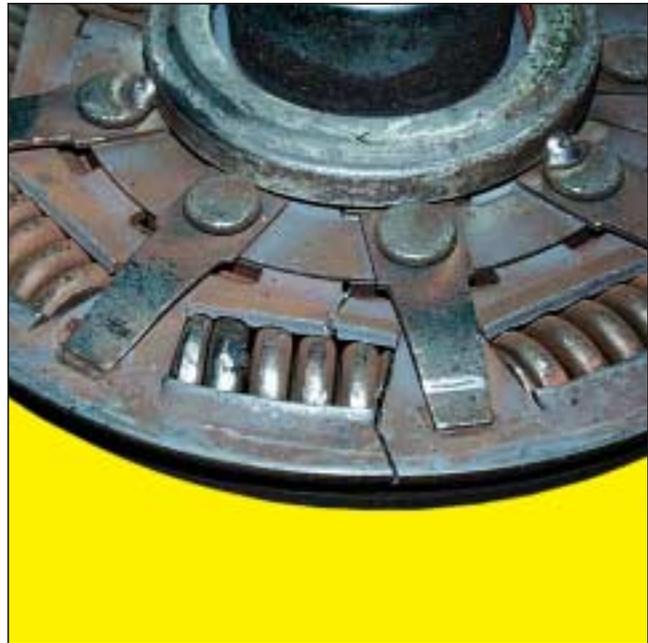
### Causes:

- Fitting fault
- Driven plate fitted wrong way around
- Incorrect driven plate

## 4. Torsion damper retainer plate broken

### Causes:

- Driver error
- Driving too long at excessively low engine speeds has caused the damper's efficiency limits to be exceeded.
- Wrong driven plate installed

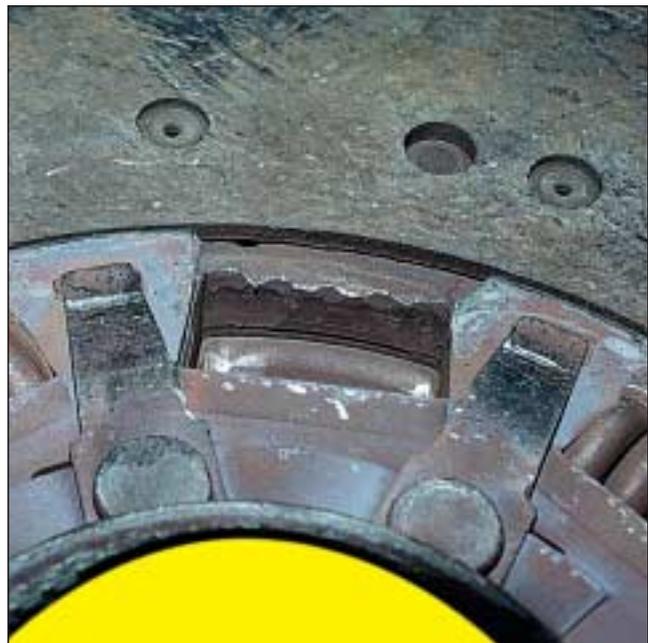


## 5. A torsion spring has broken out

### Causes:

- Oil on clutch linings
- Improperly tuned engine
- Defective release system
- Wrong driven plate installed
- Driver error

Juddering damages the torsional-vibration damper.



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

### Causes:

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



# Clutch noise

D

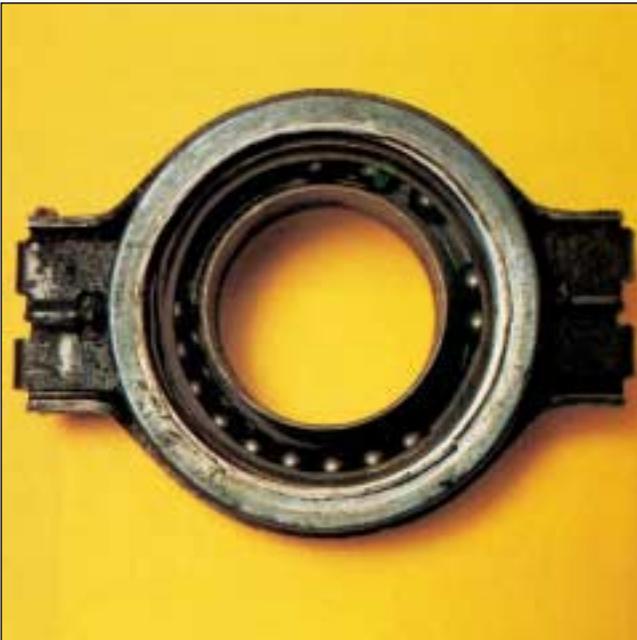


## Worn splines

7.

### Causes:

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



## Casing and bearing damaged

8.

### Causes:

- Oil on clutch linings
- Improperly tuned engine
- Defective release system
- Wrong driven plate installed
- Driver error

Juddering damages the torsional-vibration damper.



## Release bearing worn

9.

### Causes:

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

## 10. Gear box snout worn

**Causes:**

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



## 11. Release-fork bearing surface worn

**Cause:**

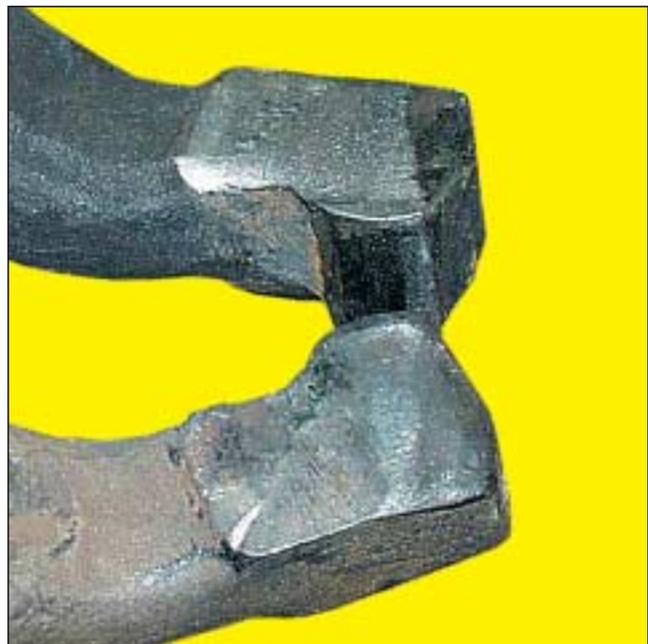
- Defective release system
  - Worn release-shaft bearings
  - Worn guide tube

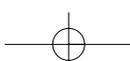
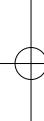
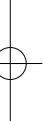
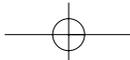


## 12. Release fork worn

**Cause:**

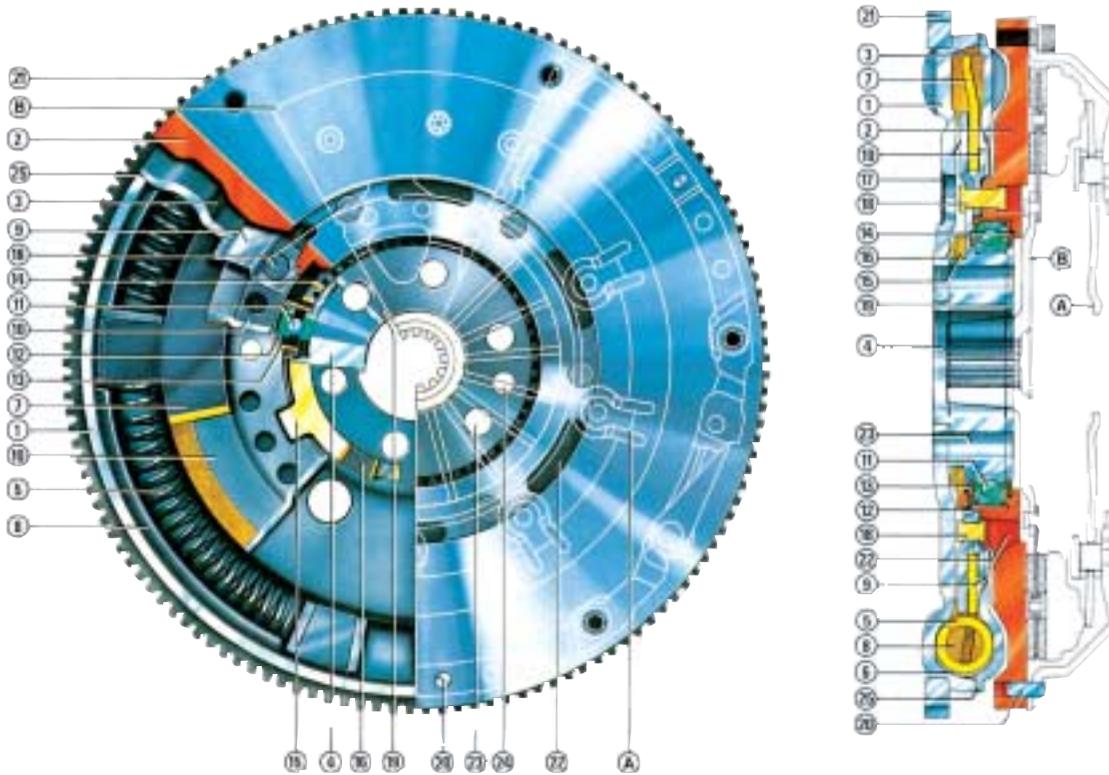
- Defective release system
  - Worn guide tube
  - Worn release-shaft bearings





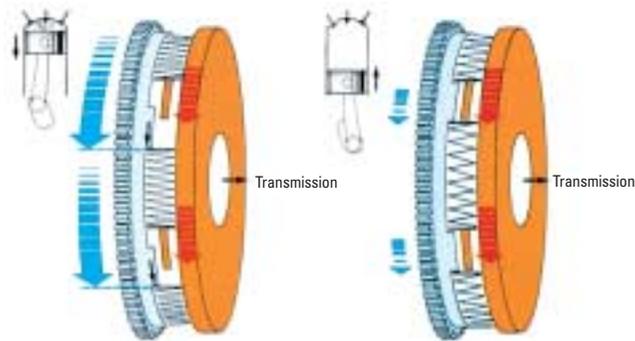
# The LuK Clutch Course

## Dual-mass flywheels: their design and operation

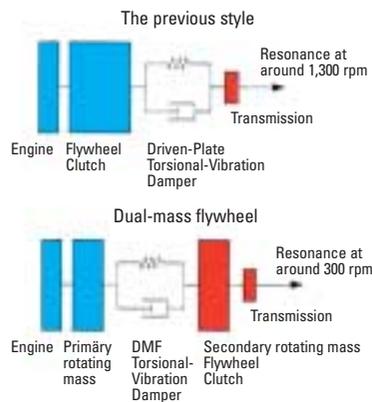


- ① Primary rotating mass and damper housing
- ② Secondary rotating mass and friction surface
- ③ Cover for primary rotating mass
- ④ Hub
- ⑤ Arced compression spring
- ⑥ Tubular spring guide
- ⑦ Flange and diaphragm spring
- ⑧ Grease reservoir
- ⑨ Membrane seal
- ⑩ Friction and supporting ring
- ⑪ Caged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

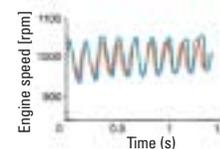


### Schematic

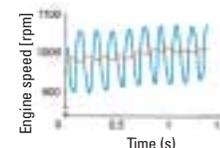


### How it works (Transmission of torsional vibrations)

Conventional flywheel and driven plate with torsion-vibration damping



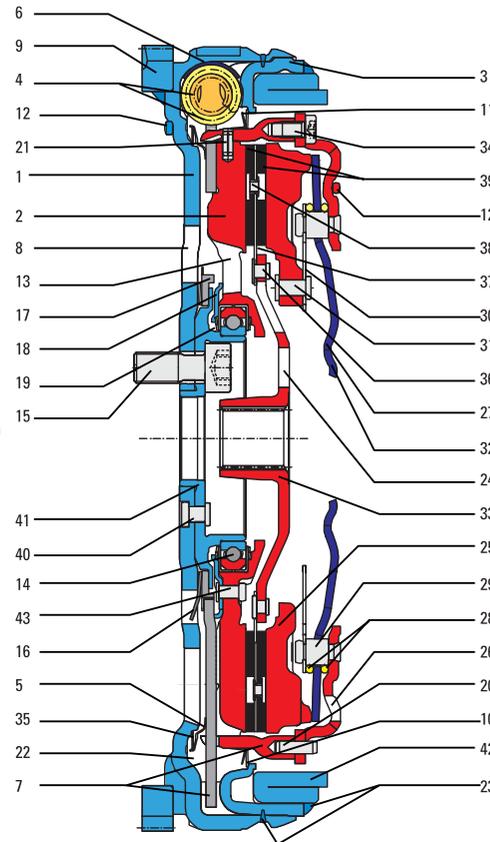
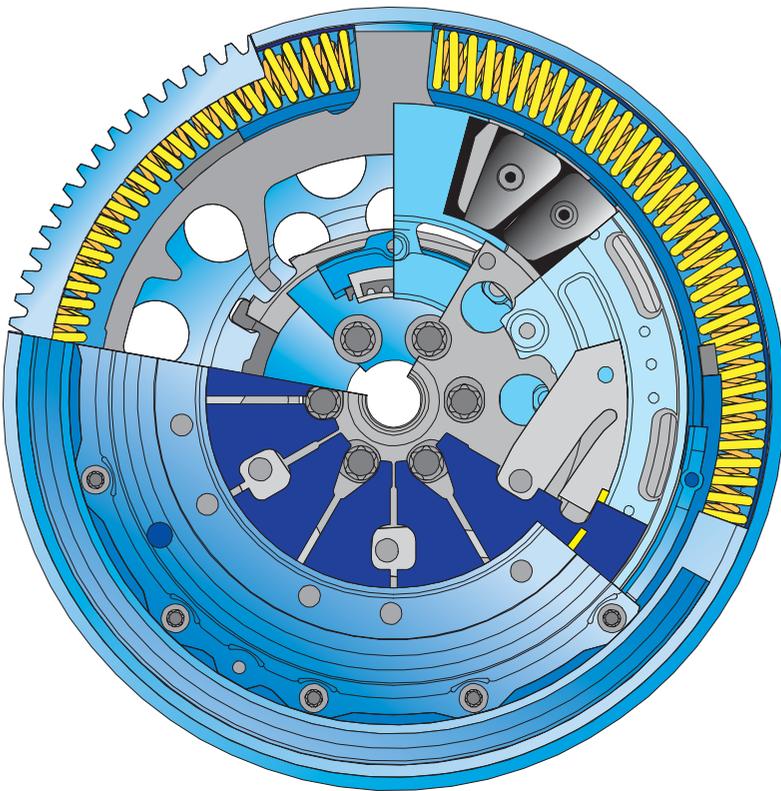
Dual-mass flywheel



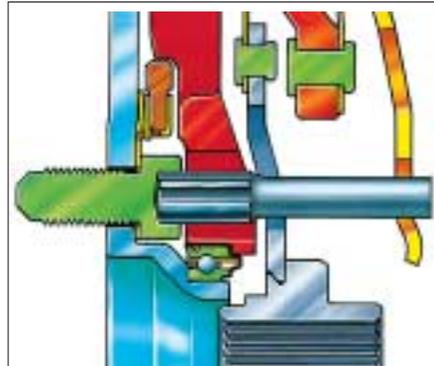
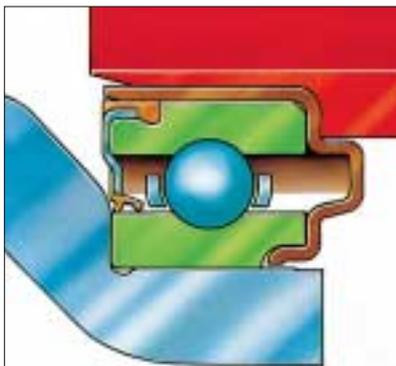
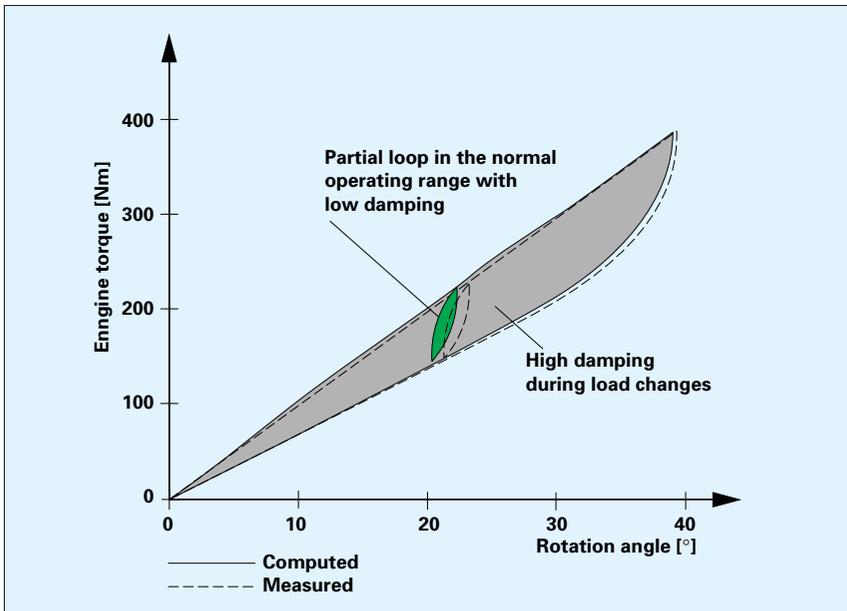
Engine  
Trans-  
mission

# The LuK Clutch Course

## Damped Flywheel Clutch – their design and operation

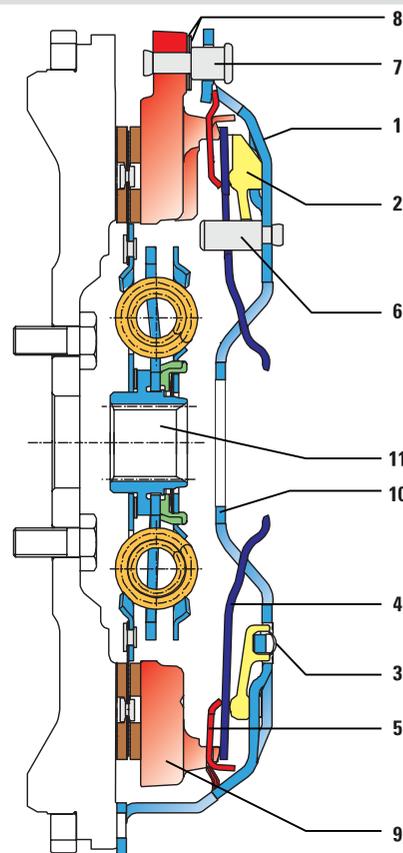
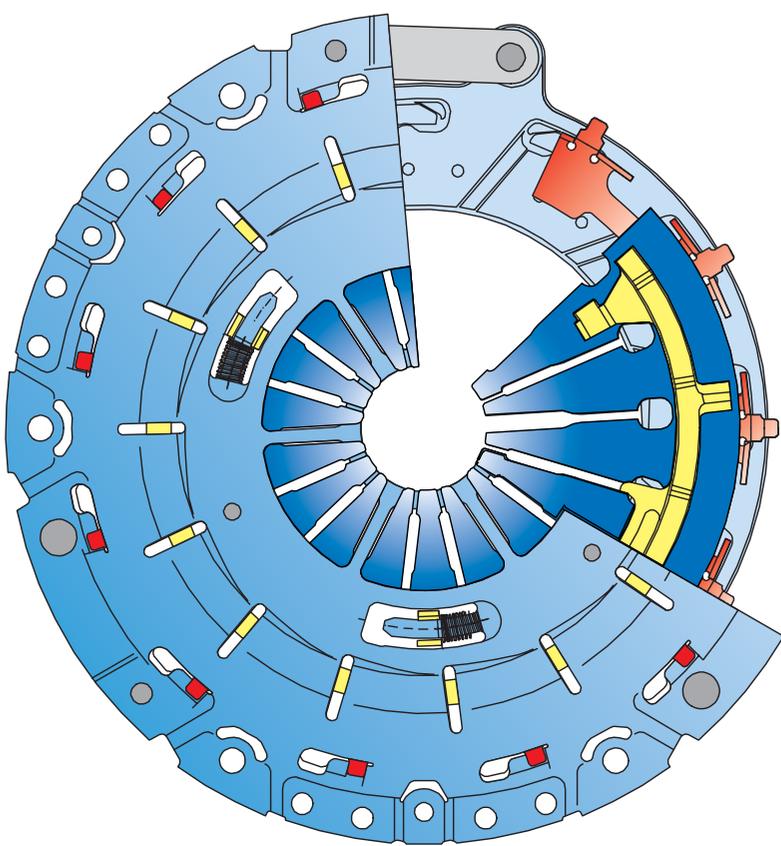


- ① Primary rotating mass and damper housing
- ② Secondary rotating mass and friction surface
- ③ Cover for primary rotating mass
- ④ Arced compression spring
- ⑤ Membrane seal
- ⑥ Tubular spring guide
- ⑦ Cover retaining ring and flange
- ⑧ Ventilation slots
- ⑨ Starter ring gear
- ⑩ Membrane seal
-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

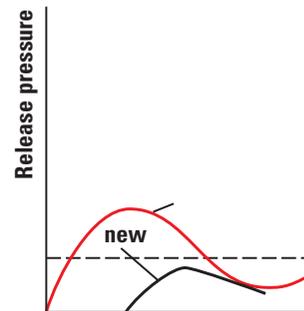
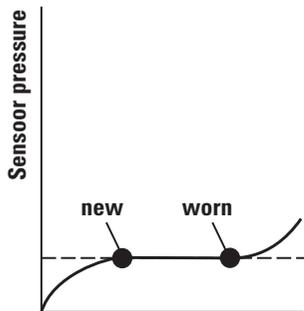
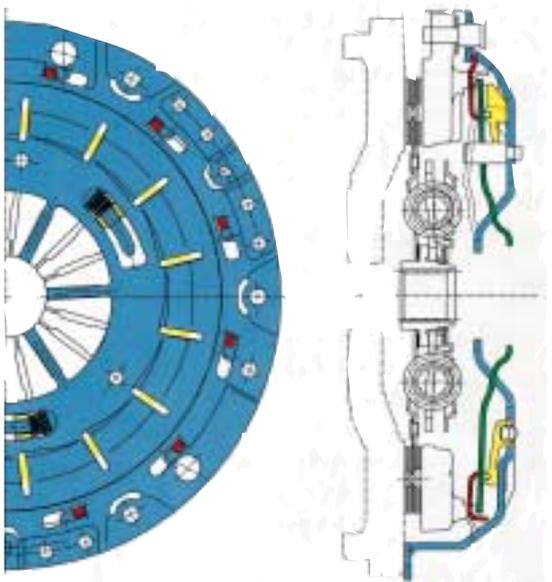
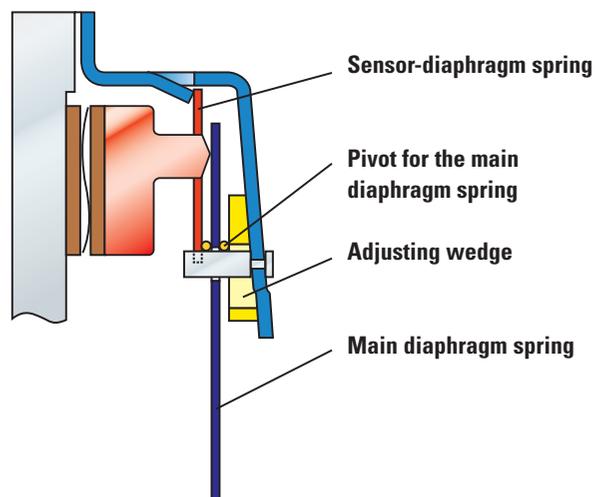


# The LuK Clutch Course

## Self Adjusting Clutches – their design and operation

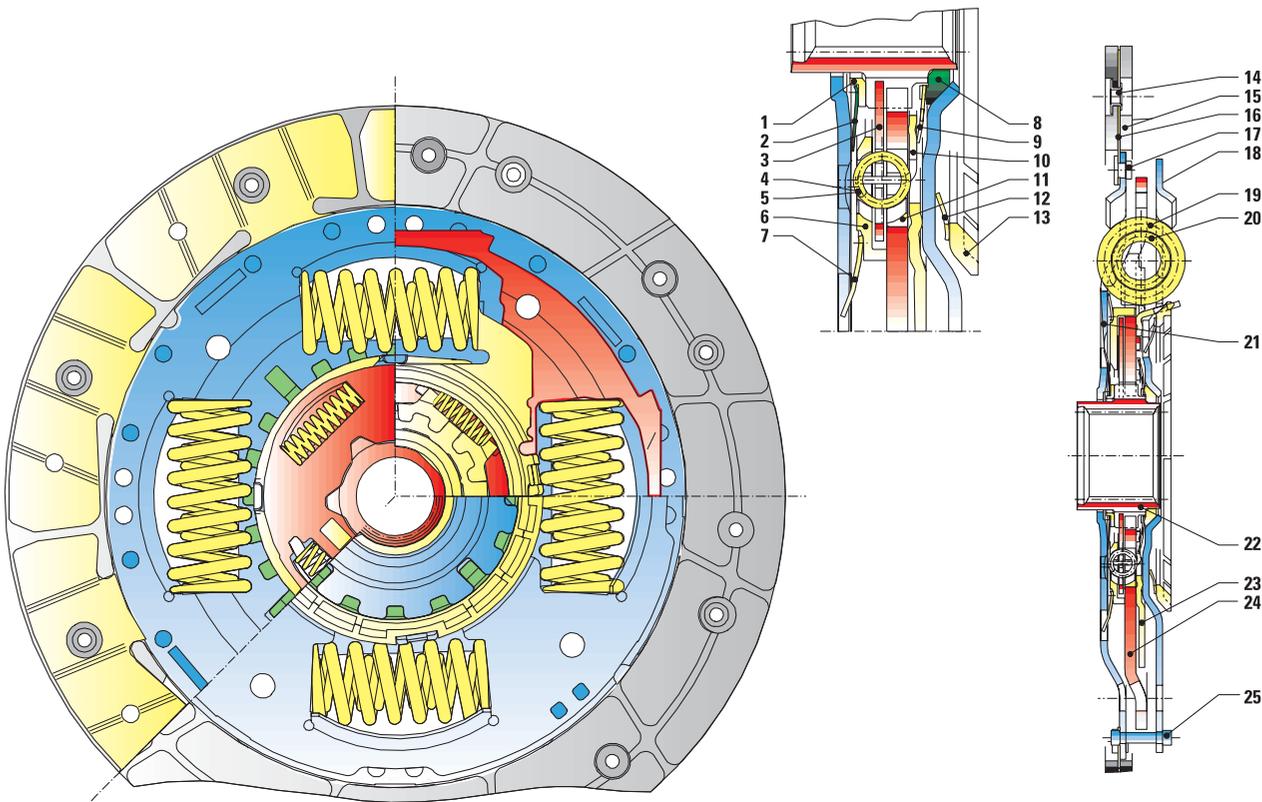


- ① Cover
- ② Adjusting ring (chamfered ring)
- ③ Compression spring
- ④ Diaphragm spring
- ⑤ Sensor diaphragm spring
- ⑥ Stud
- ⑦ Stud
- ⑧ Leaf spring
- ⑨ Pressure plate
- ⑩ Stop
- ⑪ Driven plate

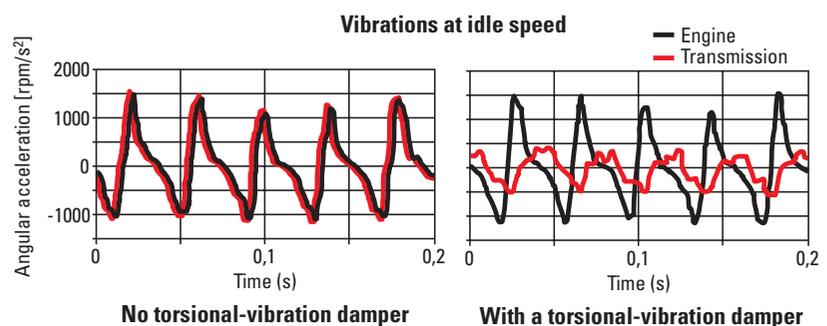
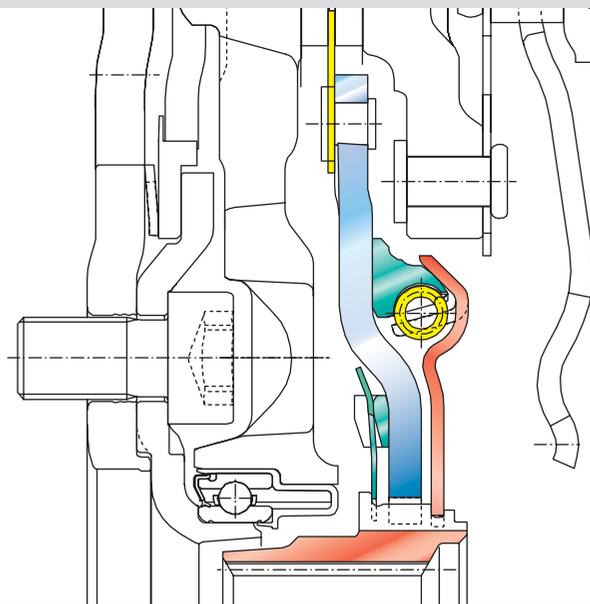


# The LuK Clutch Course

## Driven plates for light trucks – design and operation

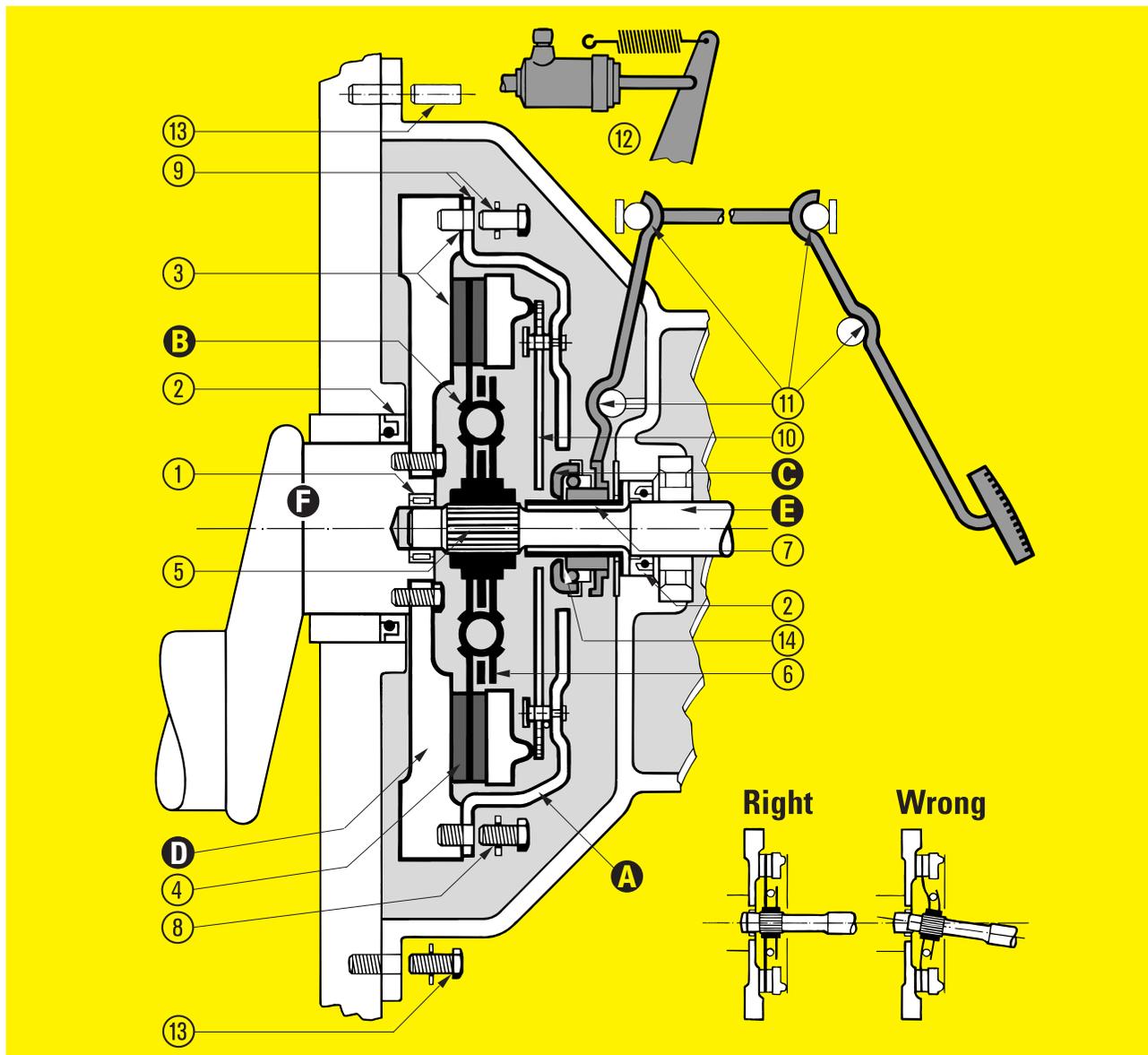


- ① Predamper friction washer
- ② Predamper diaphragm spring (1st stage)
- ③ Predamper hub flange
- ④ Predamper compression springs
- ⑤ Predamper compression springs
- ⑥ Predamper cage
- ⑦ Main-damper diaphragm spring (1st stage)
- ⑧ Centering cone
- ⑨ Predamper diaphragm spring (2nd stage)
- ⑩ Predamper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



# The LuK way to...

## ...cost-effective, efficient clutch replacements



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

### Top priority:

- Are the right clutch components for the vehicle in question being used?
- Are all of the special tools that might be needed for clutch replacement available?

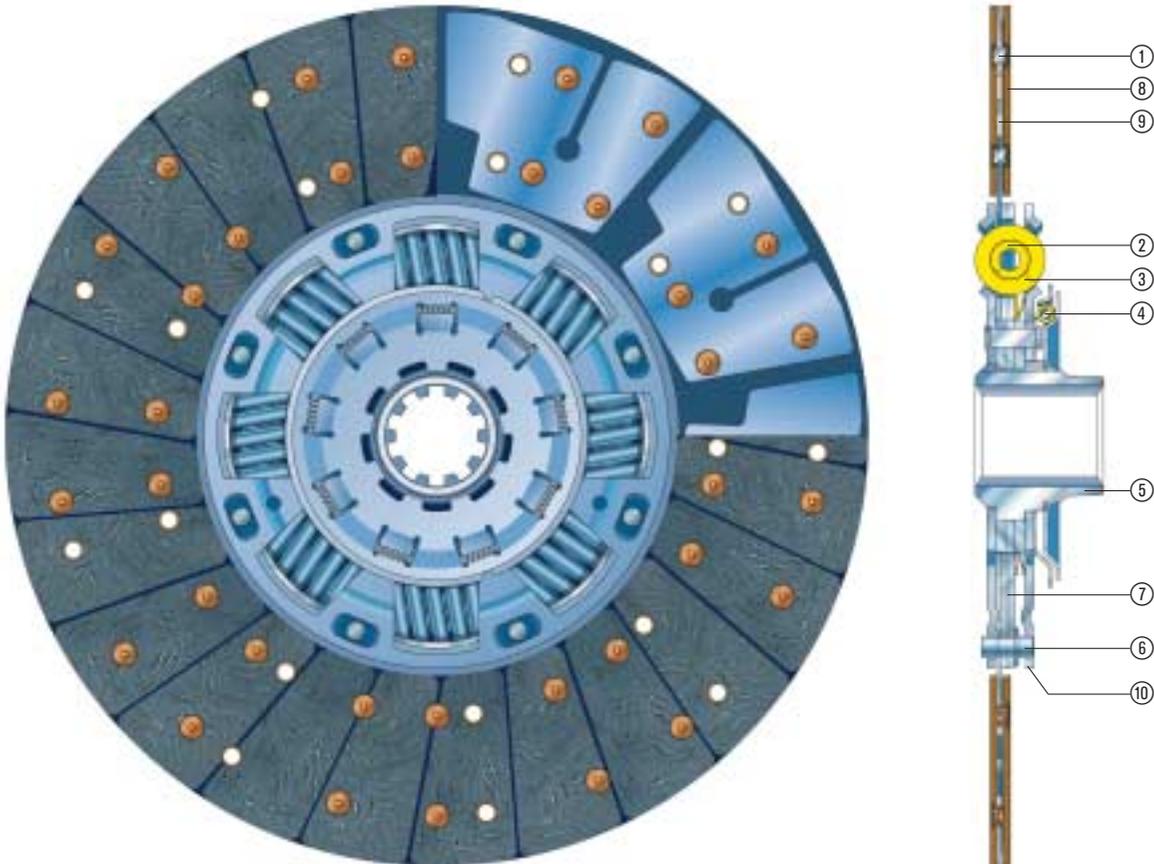
### Qualified LuK associates observe the following procedures, which are essential to professional clutch replacement:

- ① Check the spigot (pilot) bearing for security and replace it if necessary.
- ② Check the engine and transmission shaft seals for leakage and replace them, if necessary.
- ③ Check the mating surface of the flywheel for scoring and gouges. If its mating surface needs to be machined, make certain that the prescribed tolerances are maintained.  
**Note:** The area around the bolting surface should be machined by the same amount.
- ④ Check the driven plate for lateral runout using LuK-AS checking and straightening fixture (AS Part No.400 0006 10, which accommodates driven plates up to 295 mm in diameter). Center the driven plate using a LuK centering fixture.
- ⑤ Check the transmission input shaft for damage. Use only grease containing no suspended solid matter for lubricating its splines, the release bearing, and its guide tube. LuK-AS has the right high-melting-point grease in its product line under AS Part No. 414 0014 10. Once grease has been applied to the input shaft splines, slide the driven plate onto them and wipe off any excess grease. Grease containing suspended solid matter is unsuitable for this purpose.  
**Chemically nickel-plated splines should not be lubricated.**
- ⑥ Make certain that the driven plate is installed the right way around, with its engine side facing the engine and its transmission side facing the transmission.

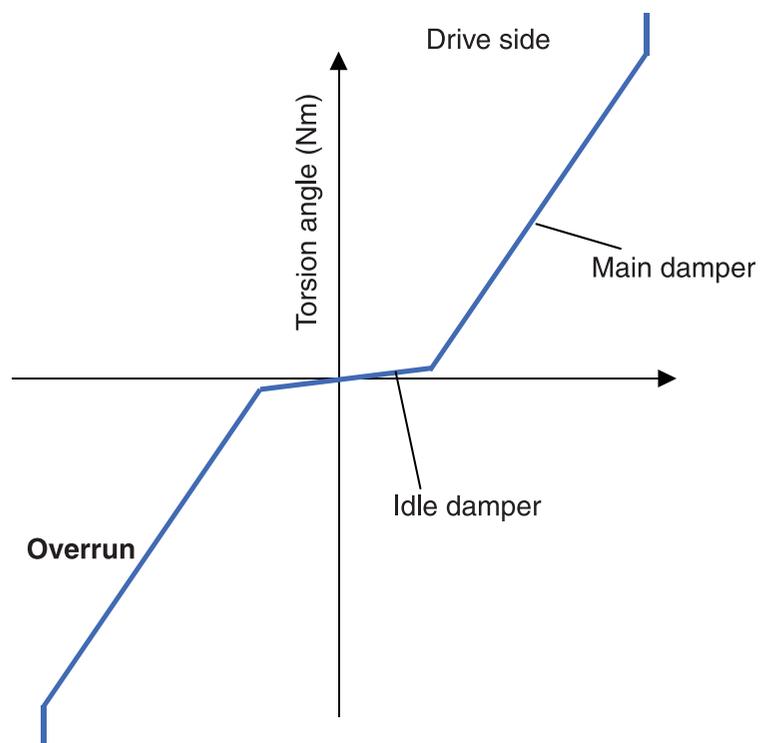
- ⑦ Check the release bearing guide tube for wear and replace it if necessary. Use grease when reinstalling the release bearing only if it has a metal inner bore against a metal guide tube and wipe off any excess grease once it has been installed.
- ⑧ Torque the pressure plate down in several stages, tightening the bolts diagonally opposite and in sequence, securing them with a dab of locking compound once they have been finally torqued down, if necessary.
- ⑨ Make certain that the clutch pressure plate is centered on the flywheel. If the pressure plate is centered by a step, check the condition of the step in the flywheel and the mating step in the pressure plate.
- ⑩ Check for any unevenness on release lever height. If found to be uneven do not adjust them but return the unit to LuK. Adjustments carried out by non LuK trained staff will void any warranty.
- ⑪ Check the clutch actuation mechanism for proper operation and wear. Replacing clutch cables is part of any properly performed clutch repair. On mechanically actuated clutches, check their mechanical linkage and all bearings for wear.
- ⑫ Bleed the hydraulic system, if necessary adjust the slave cylinder piston rod travel. Check whether the piston returns to its retracted position.
- ⑬ Check the alignment of the bell housing on the engine. Replace any worn dowel pins.
- ⑭ Release bearings that are designed to operate with a certain amount of free play, set the clearance between the release bearing and the release fingers/levers to 2 mm to 3 mm. Release bearings that are designed for constant contact should run with a pretension to 80 N to 100 N. Release bearings with a plastic sleeve should be used in combination with metallic guide tubes only.

# The LuK Clutch Course

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

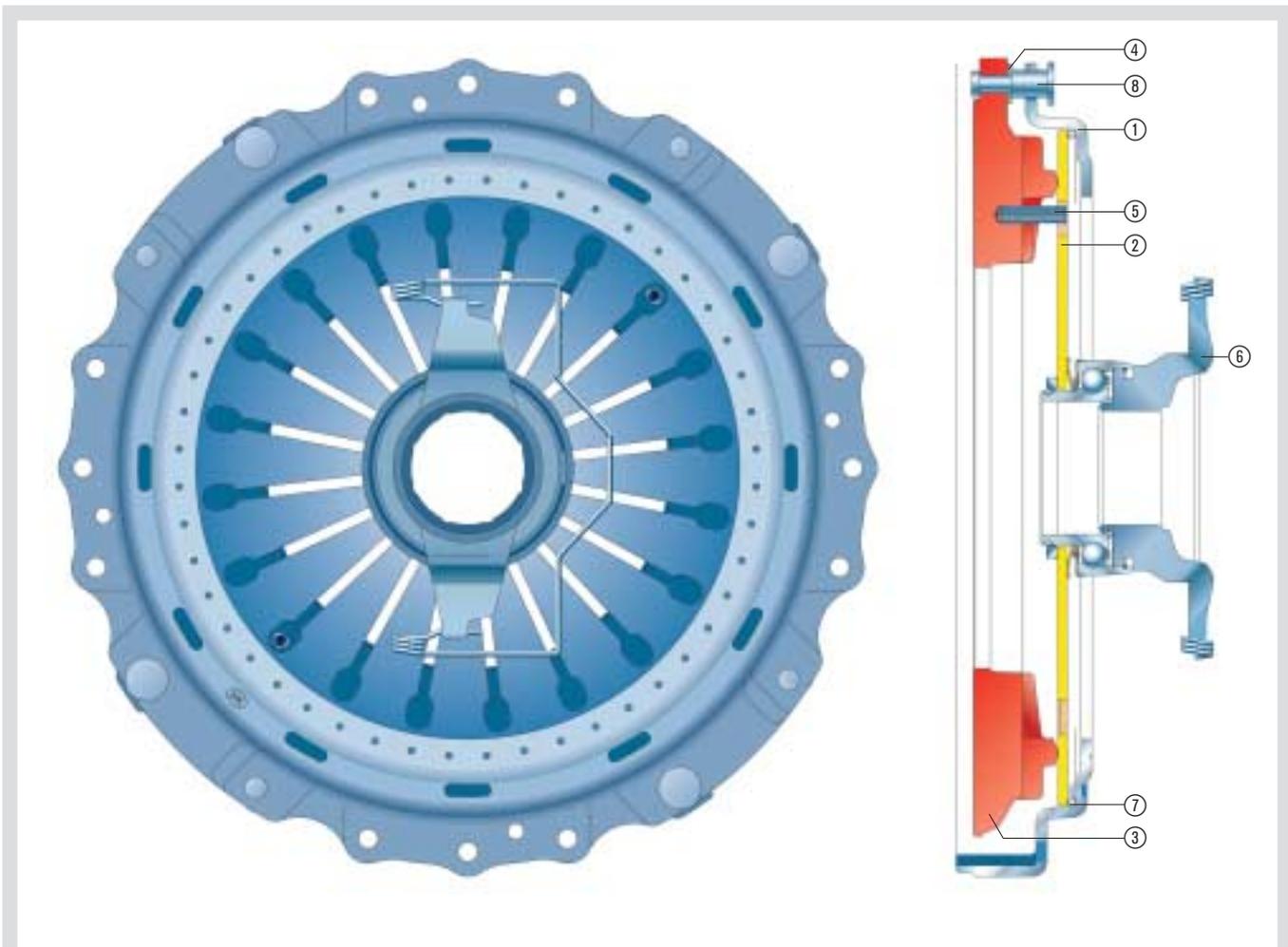


- ① Lining rivet
- ② Inner compression spring on primary damper
- ③ Outer compression spring on primary damper
- ④ Compression spring on secondary idle damper
- ⑤ Splined hub
- ⑥ Segment rivet
- ⑦ Hub flange
- ⑧ Lining
- ⑨ Spring segment
- ⑩ Retainer plate

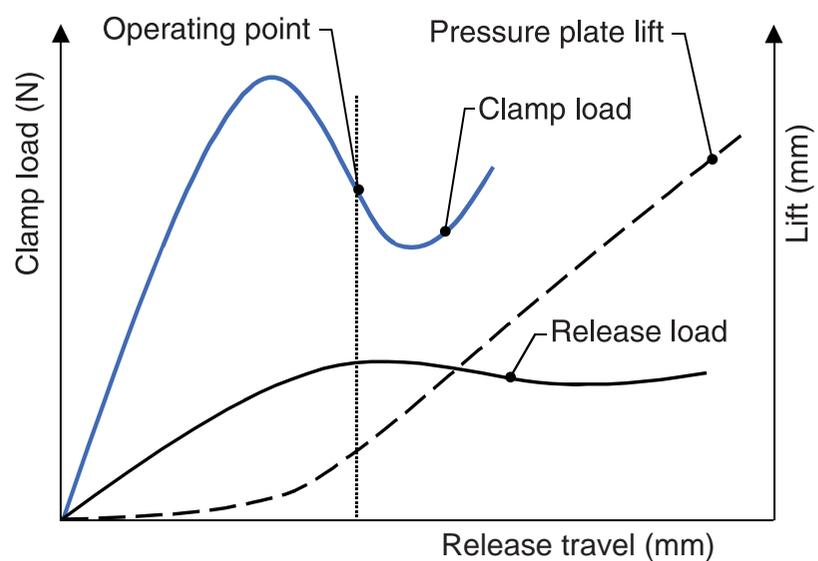


# The LuK Clutch Course

## Pull type diaphragm spring clutch

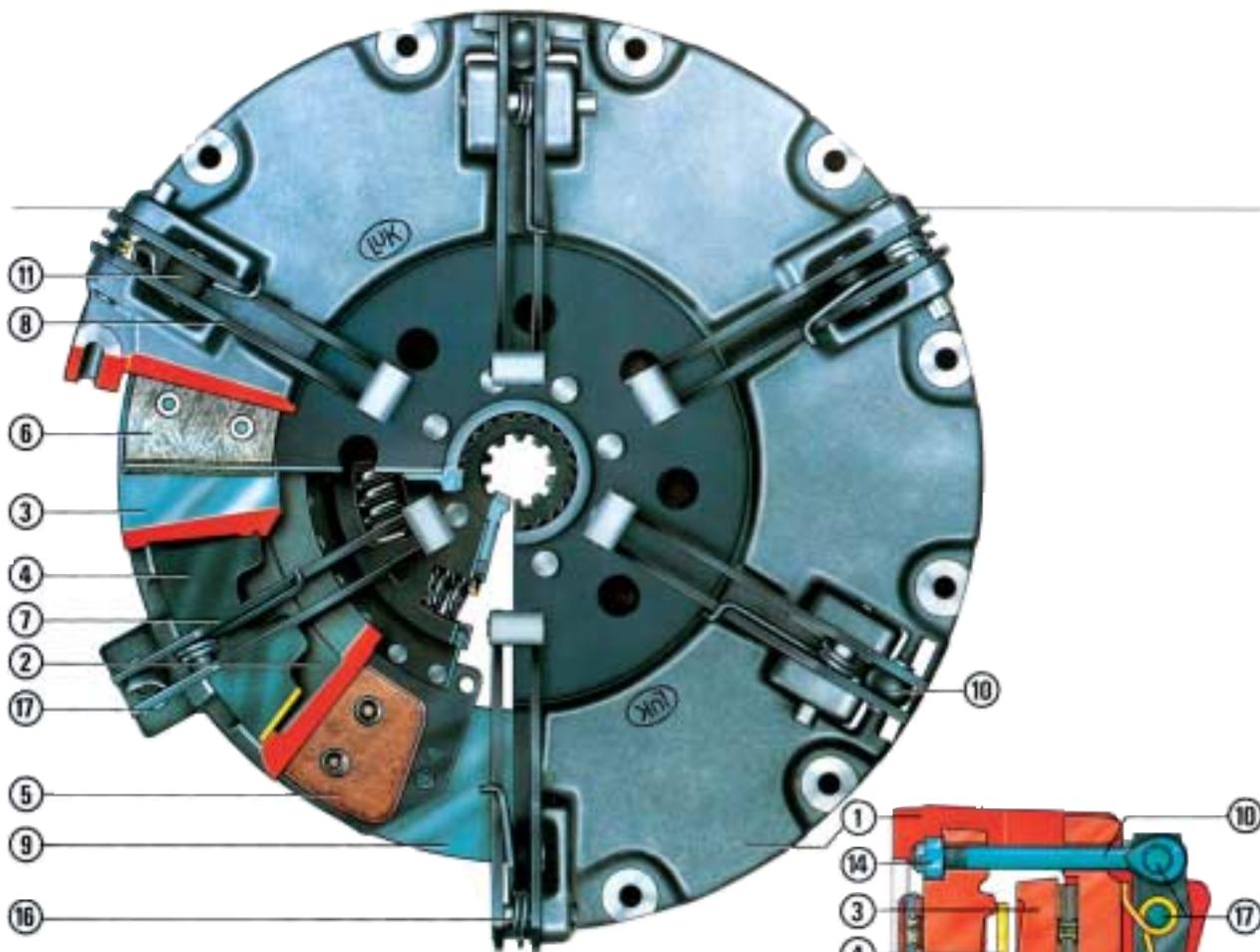


- ① Clutch cover
- ② Diaphragm spring
- ③ Pressure plate
- ④ Leaf spring
- ⑤ Roll pin
- ⑥ Release bearing, complete with installation kit
- ⑦ Steel-wire hoop
- ⑧ Stud

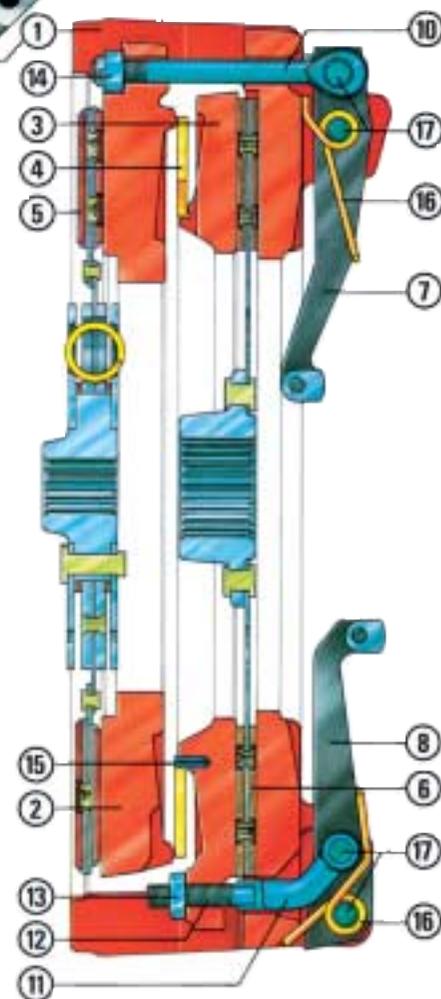


# The LuK Clutch Course

## 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



# LUK TROUBLESHOOTING AGRICULTURAL VEHICLES

START OFF THE CUSTOMER QUEST

## DIAGNOSTIC PROCEDURES

- 1** What are the particular symptoms?
- 2** Which components might be defective?
- 3** What should be checked before clutch removal?
- 4** What can be determined after removal?
- 5** What might be causing the problem(s)?

## THE CLUTCH SLIPS

- 1** **QUICK TEST:**  
Set the handbrake. Disengage the clutch and start the engine. Select fourth gear. Press the accelerator and slowly engage the clutch. Does the engine stall as it should?  
**TEST DRIVE:**  
Disengage the clutch while in 4th/5th gear. Press the accelerator and engage the clutch. Does the engine speed up?
- 2** Insufficient friction between driven plate and flywheel/pressure plate. Excessive wear on driven plate/flywheel/pressure plate. Insufficient clamp load.
- 3** **ACTUATION:**  
Pedal mechanism  
Adjustment  
Clutch cable  
Master/slave cylinders  
Hydraulic lines  
**DRIVE TRAIN:** Has no effect!
- 4** **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

## THE CLUTCH JUDDERS

- 1** **TEST DRIVE:**  
Does the clutch judder, particularly under certain circumstances, e.g., when reversing uphill?
- 2** 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** **ACTUATION:**  
Pedal mechanism  
Clutch cable  
Adjustment  
Release shaft  
Master/slave cylinders  
Hydraulic lines  
**DRIVE TRAIN:**  
Engine management, Engine suspension, Transmission suspension, Prop shaft, drive coupling
- 4** **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.



SERVICE IDEAS FOR THE WORLD OF CLUTCHES.

# AND SERVICE-TIPS FOR

**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 QUICK TEST:**  
Start the engine, shift into reverse.  
Does the transmission make a  
noise when shifting gears?

**2** 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 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 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, incor-  
rectly 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 sur-  
face 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 con-  
tinues to rotate when the clutch is  
disengaged because the transmis-  
sion 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.

## CLUTCH PEDAL IS HEAVY IN OPERATION

**1 QUICK TEST:**  
Press the clutch pedal.  
Does it feel heavy?

**2** Friction in the actuating  
mechanism  
Friction in the release  
system

**3 ACTUATION:**  
Pedal mechanism, clutch cable,  
release shaft, master/slave  
cylinders, hydraulic lines,  
compressed-air booster  
**DRIVE TRAIN:**  
Has no effect.

**4 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 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 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** Rotating components are rubbing  
against one another.  
Loose components

**3 ACTUATION:**  
Pedal mechanism, clutch cable,  
release shaft, master/slave  
cylinders, hydraulic lines  
**DRIVE TRAIN:** Has no effect.  
**ENGINE:** Engine tuning

**4 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

# LuK CLUTCH SERVICE

## CLUTCH NOT CLEARING

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		Renew bearing
Insufficient release travel	Incorrect clutch cable or adjustment incorrect. Air in the hydraulic system Release system damaged	Replace clutch cable  Bleed the system Renew the release system
Excessive release travel		Check release system operation
Driven plate seized to flywheel or to pressure plate		Clean rust and corrosion from facing material

## CLUTCH SLIP

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	Renew clutch assembly
Clutch facing contaminated	Oilseals leaking Gearbox splines overgreased Release bearing overlubricated	Renew oil seals Renew clutch assembly
Uneven wear pattern on flywheel side of facing material	Badly worn flywheel	Re-machine flywheel
Flywheel thickness incorrect	Incorrect machining of flywheel Bolting surface not machined to same dimension as running surface	Machine bolting surface Renew flywheel
Gearbox snout damaged	Non/incorrect lubricant Damaged release bearing Incorrect combination of bearing and snout	Renew gearbox snout Use correct lubricant Check parts for suitability
Clutch cable heavy in operation	Clutch cable damaged Incorrect cable	Renew clutch cable Check for correct cable assy
Release system heavy in operation	Damaged bushes on release arm or shaft Bushes or bearing not lubricated	Renew bushes  Lubricate bearings or bushes



**SERVICE IDEAS FOR THE WORLD OF CLUTCHES.**

# CE TIPS

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

## CLUTCH JUDDER

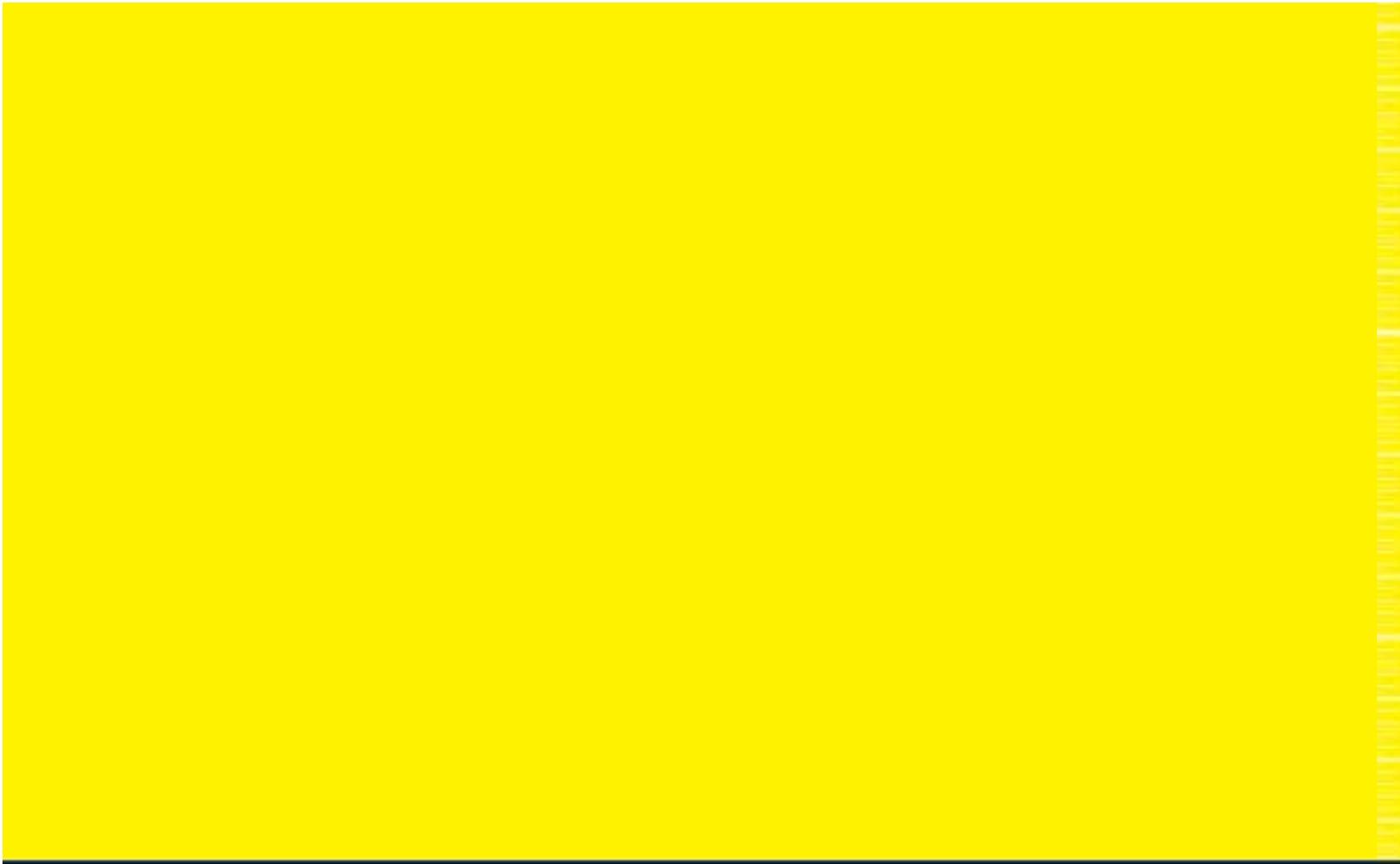
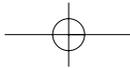
Problem	Cause	Remedy
Pressure plate uneven	Broken or bent tangential straps Distorted cover	Replace clutch cover Install correctly
Facing contaminated with oil	Oil seals defective	Renew oil seals Replace driven plate
Facings contaminated with grease	Excessive grease on splines and release bearing	Renew 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 NOISE

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 HEAVY IN OPERATION

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



					
	✓	✓			
		✓	✓	✓	
					✓
	✓	✓	✓	✓	
	✓	✓			
	✓	✓	✓	✓	
	✓	✓	✓	✓	

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