Failure Diagnosis

LuK’s guide to troubleshooting clutch-system failures and malfunctions
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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 aimed at being complete.

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August 2008, 3rd edition
Major causes of problems:

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

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

Notes:

- The following is allowed on some vehicle makes and models and have no effect on the operation of clutch components:
  - A small amount of axial movement is allowed between the primary and have no effect on the operation of clutch components:
  - Tolerance is 0.5 mm) prior to installation. Excessive lateral runout is not covered under warranty.

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

- **Centrally actuated release mechanism**
Like the clutch, the centrally actuated release mechanism is subject to wear, which may not always be visible during normal operation. If only the clutch is replaced, it might be that the centrally actuated release mechanism could fail soon after clutch replacement, necessitating a second, unnecessary visit to the garage, since the worn centrally actuated release mechanism was not identified the first time around. Professional clutch replacement should always involve replacing the clutch pressure plate, driven plate, and centrally actuated release mechanism.

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

LuK-AS has a range list within our passenger car catalogue, identified against specific vehicle applications.

**Note:** Audi and VW models still found to be fitted with a plastic sleeve should have them replaced with the metal version. LuK-AS No. 414 0002 10.

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

- **Release shaft**
The release shaft will have to be removed before it can be inspected for wear or damage, since the bearing surfaces and bearings cannot be inspected while in place. Damaged or worn shaft bearings will cause the shaft to tilt, which will create binding and/or a juddering clutch. Re-lubricate the bearings before replacing the shaft. The LuK-AS part number for the correct high-melting-point grease is 414 0014 10.

- **Clutch cable**
Clutch cables cannot be accurately checked for proper operation at garage level. Since clutch cables are subject to wear, they should be replaced whenever clutches are replaced. Make certain that clutch cables are correctly routed when installing them. They should never be routed around sharp corners or kinked. LuK-AS's line of clutch cables is covered in the associated sales literature.

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

- **Lubricants**
Grease that contains no suspended particulates should be used for lubricating splines and release bearings/guide tubes. LuK-AS has the correct high-melting-point grease for clutch replacements available under Part No. 414 0014 10. Once grease has been applied to the 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.

- **Hotline number for problem cases:**
  +49 (0) 1801-753-333 or in the U.K. +44 (0) 8457 001100
LuK tips on avoiding clutch system failures and malfunctions

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:

<table>
<thead>
<tr>
<th>Clutch fails to disengaged</th>
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<tbody>
<tr>
<td>Clutch slip</td>
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<td>Clutch judder</td>
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<td>Clutch pedal is heavy in operation</td>
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Troubleshooting

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

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

The cause of clutch failures or faults is not always attributable to a clutch malfunctioning. A closer look would show that there are a variety of external influences that can affect clutch operation.

Here are a few examples:

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

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

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

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

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

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

Distorted transmission mountings or missing spigot (pilot) bearings cause angular misalignment between the crankshaft and transmission input shaft which results in judder or disengagement problems. The subsequent ‘Wobbling’ motion of the driven plate during engagement and disengagement because this angular misalignment causes fractures around the rivets that hold the segments in place.

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

More technical information:

Clutch fails to disengage

1. Worn diaphragm spring fingers

Cause

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

2. Broken clutch levers

Cause

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

3. Damaged inner bore on release bearing

Cause

- Incorrect grade of grease or no grease used
- Damaged gearbox snout
<table>
<thead>
<tr>
<th>Issue</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Damaged bearing lugs</td>
<td>• Damaged release system</td>
</tr>
<tr>
<td>5. Broken pressure plate</td>
<td>• Overheated pressure plate as a result of prolonged clutch slip</td>
</tr>
<tr>
<td></td>
<td>• Clutch slips due to worn facings</td>
</tr>
<tr>
<td></td>
<td>• Damage or seized release system</td>
</tr>
<tr>
<td></td>
<td>• Faulty slave cylinder</td>
</tr>
<tr>
<td></td>
<td>• Facings oil contaminated (replace faulty seals)</td>
</tr>
<tr>
<td>6. Clutch cover damaged</td>
<td>• Incorrect fitting</td>
</tr>
<tr>
<td></td>
<td>→ Not aligned to flywheel correctly</td>
</tr>
</tbody>
</table>
7. Gearbox snout worn

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

8. Clutch cover damaged (VW)

**Cause**
- Incorrect fitting
- Not aligned to flywheel correctly

9. Damaged bolt holes

**Cause**
- Incorrect fitting
  → Reinforcing plate not fitted
10. Fouling marks on driven plate segment rivets (VW, Rover)

**Cause**
- Incorrect fitting
  → Release clip incorrectly fitted
- Incorrect circlip

11. Tangential strap broken

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

12. Tangential strap bent

**Cause**
- Play in the drive train
  → Worn drive line coupling (BMW)
- Incorrect driven practice
  → Tow starting in 1st or 2nd gear
  → Incorrect gear selection
- Improper storage
  → Dropping the clutch prior to fitting
- Clutch not bolted up evenly and sequentially
13. Damaged spline profile

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

14. Rust and corrosion on the hub splines

Cause
- Gearbox input shaft not greased

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

Cause
- Spigot (pilot) bearing defective
- Misalignment between engine and gearbox
16. Damaged idle damper

**Cause**
- Incorrect fitting
- Incorrect driven plate

17. Backing plate distorted

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

18. Driven plate segments sheared

**Cause**
- Worn or missing spigot (pilot) bearing
- Misalignment condition between engine and gearbox
- Gearbox hung while fitting the clutch
19. Burst facing

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

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

20. Facing burnt

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

21. Excessive driven plate runout (distorted driven plate)

Cause
- Driven plate not checked before fitting
  → Driven plate bent during fitting
    (maximum permissible runout 0.5 mm)
22. Bearing and casing damaged

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

23. Bearing carrier damaged

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

24. Release bearing worn and damaged

Cause
- Incorrect adjustment of release arm
- Insufficient preload on bearing (specification 80 – 100 N)
1. Overheating of pressure plate

Cause

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

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

Cause

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

3. Damaged diaphragm spring fingers

Cause

- Excessive bearing preload
- Damaged or seized release system
- Damaged release bearing
4. Wear marks on release bearing inner bore

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

5. Facing contaminated on the inner portion

Cause
- Defective oil seal
- Excessive grease used on the splines

6. Facing carbonised

Cause
- Facing oil contaminated
  - Defective oil seal
- Clutch allowed to slip for too long (Overheating)
7. Facing oil contaminated

Cause
- Engine or gearbox oil seals defective

8. Facing contaminated by grease

Cause
- Splines over greased
  → Surplus grease was not removed
  → Grease has been thrown out on to the facing material

9. Facing material worn down to rivets

Cause
- Facing worn
  → Vehicle being driven despite slipping clutch
- Incorrect driven practice
  → Allowing the clutch to slip for too long
- Incorrect clutch assembly
- Faulty release mechanism
10. Facing scored on the flywheel side

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

11. Damaged idle damper

**Cause**
- Incorrect fitting
- Incorrect driven plate

12. Gearbox snout worn

**Cause**
- Incorrect grade of grease or no grease used
- Damaged release bearing
**1. Incorrect grease on splines**

**Cause**
- Grease containing solids has been used

**2. Tangential strap bent**

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

**3. Diaphragm spring fingers bent**

**Cause**
- Incorrect fitting
  - Diaphragm fingers bent during fitting
4. Facing contaminated with grease

**Cause**
- Surplus grease not removed
- Grease has been thrown out on to the facing material

5. Wear marks on release bearing inner bore

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

6. Facing worn on flywheel side

**Cause**
- Flywheel not replaced
- Contact surface on the flywheel not re-machined
7. Damaged hub splines

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

8. Release bearing worn

**Cause**
- Release fork worn
- Release system damaged

9. Release bearing incorrectly lubricated

**Cause**
- Use of a solids based lubricant
10. Worn gearbox snout

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

11. Push rod wear mark off centre

Cause
- Damaged release system
  → Bearing worn
  → Guide bush worn

12. Flywheel scored

Cause
- Flywheel not re-machined/renewed
13. Tangential strap damaged

Cause
- Excessive free play in the drive joints

14. Damaged bearing lugs

Cause
- Damaged release system

15. Facing contaminated on the inner portion

Cause
- Damaged oil seal
- Excessive grease used on the splines
1. Worn diaphragm spring fingers

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

2. Damaged idle damper

**Cause**
- Incorrect fitting
- Incorrect driven plate

3. Retainer spring damaged

**Cause**
- Incorrect fitting
  → Incorrect diaphragm spring in clutch assembly
4. Spring window damaged

**Cause**

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

5. Torsion damper spring broken out

**Cause**

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

6. Torsion damper stop rivet worn

**Cause**

- Incorrect driven practice
  - Driving the vehicle in too high a gear at low revs
- Incorrect clutch driven plate
7. Spline damaged on one side forming a taper, torsion damper damaged

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

8. Worn splines

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

9. Casing and ball bearing damage

Cause
- Overheating of release bearing due to incorrect clearance causing loss of grease and break up of bearing
10. Release bearing worn

Cause

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

11. Gearbox snout worn

Cause

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

12. Running surface on release bearing worn

Cause

- Release system worn
- Incorrect bearing preload (specification 80 – 100 N)
13. Worn release lever

**Cause**
- None or incorrect grease used

14. Release bearing tappet points worn

**Cause**
- Tappet points not lubricated
- Release system worn

15. Push rod wear mark off centre

**Cause**
- Damaged release system
  → Bearing worn
  → Guide bush worn
16. Damaged bearing lugs

Cause
- Damaged release system

17. Bearing fouling clutch cover

Cause
- Clutch cover and release bearing mismatch

18. Torsion damper broken

Cause
- Incorrect driven practice
  → Driving the vehicle in too high a gear at low revs
  → Grease/oil contaminated facing
Clutch makes a noise

19. Hub assembly broken

Cause

- Incorrect fitting
  → Driven plate fitted the wrong way round
1. Damaged gearbox snout

Cause

- Incorrect grade of grease or no grease used
- Damaged release bearing
Dual-mass Flywheels: their design and operation

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.

**Diagram:**
- Primary rotating mass and damper housing
- Secondary rotating mass and friction surface
- Cover for primary rotating mass
- Hub
- Arced compression spring
- Tubular spring guide
- Flange and diaphragm spring
- Grease reservoir
- Membrane seal
- Friction and supporting ring
- Caged ball bearings
- O-ring
- Sealing and insulating cap
- Diaphragm springs providing basic friction control
- Load-transmitting friction washer
- Diaphragm spring
- Sheet-metal cover plate
- Rivet
- Washer
- Centering pin
- Starter ring gear
- Ventilation slots
- Mounting hole
- Positioning hole
- Laser weld
- Diaphragm-spring clutch
- Rigid driven plate

**Schematic:**
- The previous style
  - Resonance at around 1,300 rpm
- Conventional flywheel and driven plate with torsion-vibration damping

**How it works:**
- Transmission of torsional vibrations
  - Dual-mass flywheel and driven plate with torsion-vibration damping
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

Partial loop in the normal operating range with low damping

High damping during load changes

Computed
Measured
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

Sensor-diaphragm spring
Pivot for the main diaphragm spring
Adjusting wedge
Main diaphragm spring

Sensor pressure
Release pressure

new worn
new worn
Driven Plates – design and operation

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

Vibrations at idle speed

No torsional-vibration damper

With torsional-vibration damper
The LuK way to...

...cost-effective, efficient clutch replacements

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

In particular, the following should be noted:
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.
13. 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).
14. Check the alignment of the engine to the gearbox.
15. Replace dislodged gearbox dowels!
16. 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.
The following easy to use charts are provided to enable clutch problems to be easily identified and make diagnosis simpler.

### Clutch fails to disengage

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

### Clutch slip

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

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### Clutch judder

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

### Clutch makes a noise

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearing running eccentrically to diaphragm fingers</td>
<td>Bearing not centreing</td>
<td>Renew bearing</td>
</tr>
<tr>
<td>No drive</td>
<td></td>
<td>Renew pressure plate or driven plate</td>
</tr>
<tr>
<td>Incorrect driven plate</td>
<td>Torsion damper incorrect for vehicles application</td>
<td>Fit correct driven plate</td>
</tr>
<tr>
<td>Torsion damper broken</td>
<td>Incorrect damper</td>
<td>Fit correct driven plate</td>
</tr>
<tr>
<td>Release bearing defective</td>
<td>Not rotating smoothly</td>
<td>Renew bearing</td>
</tr>
<tr>
<td>Spigot (pilot) bearing defective</td>
<td>Bearing seized</td>
<td>Renew bearing</td>
</tr>
<tr>
<td>Damaged damper spring breakout</td>
<td>Incorrect driving habits&lt;br&gt;Wrong gear selection</td>
<td>Renew driven plate</td>
</tr>
</tbody>
</table>

### Clutch pedal is heavy in operation

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incorrect pressure plate</td>
<td>Release load too great</td>
<td>Fit correct pressure plate</td>
</tr>
<tr>
<td>Damaged gearbox snout</td>
<td>Release bearing damaged&lt;br&gt;Incorrect combination&lt;br&gt;No grease used&lt;br&gt;Incorrect grease used</td>
<td>Renew release bearing&lt;br&gt;Check combination&lt;br&gt;Grease bearing and snout&lt;br&gt;Use correct grade of grease</td>
</tr>
<tr>
<td>Release system bearings or bushes worn</td>
<td>Bushes worn or not lubricated</td>
<td>Renew bearings and bushes&lt;br&gt;Lubricate where required</td>
</tr>
<tr>
<td>Clutch cable damaged</td>
<td>Normal wear and tear&lt;br&gt;Incorrect cable fitted</td>
<td>Renew cable&lt;br&gt;Check for suitability</td>
</tr>
</tbody>
</table>
Start off by asking the customer these questions:

<table>
<thead>
<tr>
<th>Regarding malfunctions:</th>
<th>Regarding wear:</th>
<th>Regarding usage:</th>
<th>Regarding past repairs:</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is malfunctioning?</td>
<td>Clutch mileage?</td>
<td>Is the vehicle new?</td>
<td>Have the clutch and/or transmission been repaired?</td>
</tr>
<tr>
<td>How was the problem noticed? How long has it existed?</td>
<td>Is it the original clutch?</td>
<td>Who drives it?</td>
<td></td>
</tr>
</tbody>
</table>

### Clutch fails to disengage

<table>
<thead>
<tr>
<th>1. What are the particular symptoms?</th>
</tr>
</thead>
<tbody>
<tr>
<td>The vehicle moves despite a depressed clutch, crashing noises when changing gear.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Which components might be defective?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact force is no longer relieved, clutch disc is not released due to too little or no lift-off of the clutch assembly.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. What should be checked before clutch removal?</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUICK TEST – Start engine, select reverse gear, shift through all gears ➔ gear noises when changing gear ➔ clutch defective.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. What can be determined after removal?</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLUTCH DISC – Spline profile rusted in, lining on companion friction surfaces seized up, lining broken/loose, lining retainer plate shaped, lining retainer broken, clutch disc incorrectly mounted, lateral runout of the clutch disc, torsion damper spring broken.</td>
</tr>
<tr>
<td>CLUTCH ASSEMBLY – Contact plate, leaf spring compressed, leaf spring broken, diaphragm spring tabs heavily worn, cover bent.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5. What might be causing the problem(s)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clutch disc is ‘dented’, angular displacement.</td>
</tr>
</tbody>
</table>

### Clutch slip

<table>
<thead>
<tr>
<th>1. What are the particular symptoms?</th>
</tr>
</thead>
<tbody>
<tr>
<td>The engine revs at startup/acceleration – but the speed increases only slowly or not at all.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Which components might be defective?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friction values of the mating friction surfaces too low, dimensions of the mating friction surfaces not OK, contact force of the clutch assembly too low.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. What should be checked before clutch removal?</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUICK TEST – Put on the hand-brake, start the engine, engage 3rd gear, press down on the accelerator and slowly engage the clutch ➔ engine does not cut out ➔ clutch defective.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. What can be determined after removal?</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLUTCH DISC – Lining oily, lining greasy, lining carbonised, reduced lining thickness.</td>
</tr>
<tr>
<td>FLYWHEEL – Scoring/cracks in the friction surface, flywheel depth.</td>
</tr>
<tr>
<td>CLUTCH ASSEMBLY – Over-heating of the driven plate, heavy scoring on the contact plate, diaphragm springs broken.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5. What might be causing the problem(s)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal wear, frequent driving with slipping clutch, shaft sealing ring of the crankshaft or the gearbox leaking, engine tuning.</td>
</tr>
</tbody>
</table>
Clutch judder

1. What are the particular symptoms?
The engine shakes on take up of drive.

2. Which components might be defective?
Uneven rotary motion of the crankshaft or the clutch shaft, friction values of the mating friction surfaces uneven, driven plate misaligned, contact force increases unevenly.

3. What should be checked before clutch removal?
TEST RUN – Judders in certain driving situations, e.g. also reverse start-up on a hill.
ACTUATION – Pedal mechanism, clutch cable, release shaft, master/slave cylinder and hose lines.
DRIVE TRAIN – Engine management, engine suspension/engine mount.
GEARBOX – Gearbox suspension/gearbox mount.
DRIVE – Drive shafts, Hardy disc.

4. What can be determined after removal?
CLUTCH DISC – Lining oily, lining vitrified, wear pattern not OK.
CLUTCH ASSEMBLY – Leaf spring compressed, diaphragm spring tabs bent, cover shifted.
FLYWHEEL – friction surface not OK.
RELEASE SYSTEM – release bearing/release shaft bearing damaged, guiding sleeve corroded.

5. What might be causing the problem(s)?
• Clutch shaft over lubricated
• Incorrect lubricant used
• Guiding sleeve corroded
• Assembly error

Clutch makes a noise

1. What are the particular symptoms?
Noises when clutch actuated, noises when changing gear, noises during the journey.

2. Which components might be defective?
Insufficient or no lubrication of moving parts, friction of rotating parts, loose parts.

3. What should be checked before clutch removal?
QUICK TEST – Engage/disengage clutch, noise from the clutch area?

4. What can be determined after removal?
CLUTCH DISC – Scoring on the spline, scoring on the torsion damper, grease hole cap of the torsion damper, torsion spring broken, spline profile knocked out.
CLUTCH ASSEMBLY – Diaphragm spring tabs worn.
RELEASE SYSTEM – Ball bearing of the release bearing defective, release shaft bearing defective.

5. What might be causing the problem(s)?
TECHNICAL CAUSES – Defective parts: Clutch cable, release lever, release bearing sluggish.
EXTERNAL CAUSES – Normal wear, torsion damper defective, assembly errors.

Clutch pedal is heavy in operation

1. What are the particular symptoms?
Clutch pedal can only be depressed by exerting increased force.

2. Which components might be defective?
Friction in area of actuation, friction in area of the release system.

3. What should be checked before clutch removal?
ACTUATION – Pedal mechanism, clutch cable, release shaft, master/slave cylinder and hose lines.

4. What can be determined after removal?
RELEASE SYSTEM – Release bearing, release shaft, release shaft bearing knocked out.

5. What might be causing the problem(s)?
TECHNICAL CAUSES – Defective parts: Clutch cable, release lever, release bearing sluggish.
EXTERNAL CAUSES – Normal wear, assembly errors.