



Failure Diagnosis



The LuK guide to troubleshooting clutch system failures and malfunctions on agricultural vehicles



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LuK Tractor Clutches: No.1 in the field at all times!

The genuine LuK portfolio has the right parts for every possible use – OE quality and operational comfort included. LuK is the leading manufacturer of clutch technology, supplying all major tractor manufacturers worldwide. LuK damping systems provide a highly effective system to dampen vibrations. Rely on our cost effective products with prolonged operating life. Have the freedom to work your field 24/7.



We move the world – with quality.

Schaeffler Automotive Aftermarket is a specialist in components and services involving the complete drivetrain in passenger cars and commercial vehicles – from engines, to transmissions, to chassis. As a globally active company we move millions of people every day in cars, trucks, buses, and tractors. Our products are used in almost every new vehicle throughout the world – and for good reason: Schaeffler is the innovation-leader in original equipment manufacturing and aftermarket sales – and is a guarantee of the very highest quality.



1 The LuK guide to troubleshooting tractor clutch failures

This guide is for the use of anyone who sells, installs or reports on LuK agricultural clutches. It is intended to be a source of information that can help simplify the diagnosis of clutch failures and malfunctions. The content is confined to the most common cause of tractor clutch defects and is not designed to be a comprehensive list. Technical diagrams are generic examples of the type of product and for guidance only.

Major causes of problems

Flywheel

- The surface face of the flywheel may show signs of scoring, glazing, and/or gouges.
- This must be refaced to the tolerances laid down by the manufacturer.
- It is important that the same amount is refaced from the clutch mounting surface.
- Also take this opportunity to check the starter ring gear.

Spigot (pilot) bearing

- Binding or seized bearings will cause the clutch to not disengage.
- Collapsed bearings will cause noise and angular misalignment of the input shaft, and thus cause damage to the driven disc.

Oil seals

- Leaking oil seals are a major cause of clutch failure.

Driven disc

- Every driven disc should be checked for lateral run out (the maximum tolerance is 0.5 mm) prior to installation.

Release mechanism

- Release bearings should always be renewed whenever the clutch is replaced.
- The bearings should slide freely on their guide tube without tilting.
- Check the guide tube, for correct fitment. Guide tubes should be concentric to the transmission input shafts.
- All bearing carriers and release forks must be free of wear to their pivots.
- Excessive play in release shaft bushes reduces release bearing travel.
- Worn, bent, or broken release forks may prevent the clutch from disengaging.
- Lubricate all moving parts.

Clutch cable

- It is advisable to replace cables whenever clutches are replaced.
- Make certain that clutch cables are correctly routed when installing them.

Concentric Slave Cylinder (CSC)

- Always use the vehicle manufacturer's specification and recommendation of clutch fluid.

Alignment

- Always use the correct aligning tools when installing the clutch and disc to avoid spline or disc damage.

Lubricants

- Grease that contains no suspended metallic particulates should be used for lubricating splines and release bearings/guide tubes.
- LuK can supply the correct high-melting-point grease for clutch replacements.
Please order LuK Part No. **414 0014 10**.
- Once grease has been applied to the splines on the gearbox input shaft, slide the driven disc hub onto the shaft and remove any excess grease.

2 What is clutch drag?

One function of the clutch is to interrupt the drive from the engine to the transmission, which allows the operator to select and engage each gear smoothly. If clutch drag occurs the operator will experience difficulty in selecting or changing gear without grating.

Possible causes	Remedy
Excessive clutch pedal or hand clutch lever free play	Refer to operator's manual for correct settings
Air in hydraulic release system	Air in the system will reduce the thrust bearings release travel – Bleed air from the system and ensure that the correct fluid is used
Master & slave cylinder adjustment / fault	Check for external leaks, push rod adjustment and binding linkage
Concentric Slave Cylinder (CSC) fault	Check for external leaks, bleed air from the system and ensure that the correct fluid is used
Insufficient clutch pedal or hand lever release travel	Check the pedal and lever stop settings and for linkage fouling
PTO second stage setting bolts	Bolts are factory set and depending on flywheel and disc condition they may require additional adjustment during fitment to the tractor
Clutch cable stretched / collapsed	A faulty cable will reduce the movement of the release bearing – Replace the cable
Flywheel bearing seized / tight	Always replace the bearing
Clutch housing centre bearing seized / tight	Always replace the bearing
Incorrect disc centering on assembly	Use correct alignment tool when installing the clutch and disc to flywheel
Clutch release cross shaft and bushes worn	Excessive wear will not allow even or full clutch release travel – Replace worn parts
Clutch release fork worn or loose	Check release fork pivots for excessive or uneven wear
Clutch disc friction loose or damaged	Check that the friction riveting is secure and friction face is flat and even
Clutch disc friction contaminated	Contaminated discs must be replaced
Clutch disc distorted	Disc may be distorted during transport, during installation or by exposure to severe heat input in service – Replace the disc
Pressure plate tangential straps damaged	Straps must not be kinked or show gaps between the leaves – Any deformity will result in the pressure plate not lifting sufficient or evenly
Uneven clutch pressure plate lift	Caused by damaged tangential pressure drive straps or incorrectly set clutch levers
Fault within transmission	Worn or broken synchro rings – Lubrication level too low
Transmission input shaft splines	Ensure splines are free of all burrs, damage and rust – Lightly lubricate splines – use LuK spline grease ref. 414 0014 10

Disc splined hub damaged / tight
Splines damaged during assembly or by gearbox misalignment.



3 What is clutch slip?

Another function of the clutch is to transmit the drive from the engine through the clutch into the transmission without any loss of power. Clutch slip occurs when the speed of the engine differs to that going into the transmission. This is evident by the engine revs increasing but the wheel or PTO speed failing to increase accordingly.

Possible causes	Remedy
Clutch disc friction worn out	The clutch disc friction has worn below its limits and the rivets have contacted the pressure plate face. The clutch disc has achieved a full service life – Replace clutch disc
Clutch disc friction damaged	The clutch disc friction has been damaged or destroyed through excessive heat input from slip or contamination – Replace clutch disc
Clutch disc friction contaminated	The friction material is contaminated with oil or grease – Excessive spline lubrication applied during tractor assembly or the engine crankshaft / gearbox oil seal is leaking – Replace the clutch disc
Clutch clamp load reduced	The clutch assembly diaphragm spring provides the clamping force for the clutch – Excessive heat input into the clutch will destroy the diaphragm spring – Replace the clutch
Binding within the clutch	Pressure plate lugs binding in the clutch housing
Incorrect release system adjustment	Release system has no free play causing the clutch to run partially disengaged, resulting in increased heat input to the friction disc due to clutch slip – Check the free-play adjustments
Hydraulic release systems	Incorrect adjustment can result in excessive release bearing pre-load resulting in clutch slip – Check that the master and slave cylinder adjustments are correct
Release system binding or fouling	Check that the release system has sufficient movement and that there is no fouling – Lubricate all pivots and bushes – Check the cables for binding
Tractor being used for incorrect work load	The Tractor is being used for operations beyond its design capabilities – Including: Towing too heavy a load – Operating external machinery that requires a greater HP (Kw) rating – Excessive front end loader work
Operator driving error	The operator can be responsible for inducing clutch slip via a poor driving style – Do not rest anything on the clutch pedal!
Restricted pedal travel	Check for any obstructions that may prevent a full pedal stroke Check the pedal stop adjustment

Condition of the flywheel wear face

It is recommended that all flywheel wear faces must be refaced and any location step or pot depth must be re-established when the clutch is replaced – However, worn, uneven, grooved or highly polished wear surfaces must **always** be refaced.



4 What is clutch judder?

Clutch vibration (or clutch judder) is experienced by the operator during the engagement of the clutch. When this occurs it will be difficult for the operator to achieve a smooth take-up of drive and deliver precise tractor movements.

Possible causes	Remedy
Clutch disc has loose friction	Friction material retaining rivets are loose due to aggressive clutch engagement – Replace the clutch disc
Clutch disc cushioning damaged	Some clutch discs use cushioning segments between the riveted friction (to assist a smooth engagement of drive) which can be destroyed by high heat input – Replace the clutch disc
Clutch disc bent or distorted	Check that the disc is flat and has no sign of distortion – Damage can occur during transit or as a result of sub-standard installation
Clutch lever heights not even	Caused by incorrectly set clutch levers or by an uneven flywheel wear face or clutch mounting face – Ensure uneven or highly polished wear surfaces are refaced
Diaphragm spring fingers uneven	Caused by an uneven flywheel wear face, the clutch mounting face is not flat or the fulcrum ring has dislodged
Clutch pivots binding	The build-up of dust can cause excessive friction in the moving parts of the clutch – Additionally, the levers, pivots or diaphragm fulcrum points can also be affected by rust, causing heavy clutch operation
Flywheel wear face uneven	Reface the flywheel wear face to within 0.1mm and re-establish any pot or location step
Release system linkage / cable binding	Check all linkages are free and lubricated – Replace the cables
Damaged hub splines	Care must be taken during clutch installation to ensure that the cover and discs are correctly aligned using special tools – Discs must be free moving on the splines
Wear to release bearing, carrier and support snout	A loose or worn release bearing and carrier can vibrate during operation and may make contact with the fork or support snout
External influence – Cab mounts	Loose / worn cab mountings or wear in the tractor driveline
Clutch disc friction is contaminated	The friction material is either contaminated with oil or grease caused by excessive spline lubrication applied during tractor assembly or the engine crankshaft / gearbox oil seal is leaking – Replace clutch disc

Clutch disc torsion damper faulty

Damper springs can be damaged during installation due to poor gearbox alignment or coil spring breakage from excessive torque loadings – Replace the clutch disc.



5 What is clutch noise?

Clutch noise may be as a result of parts failure or system wear. Noise during clutch disengagement is normally related to the release system. However, noise during engagement and drive is usually related to disc cushioning or damping.

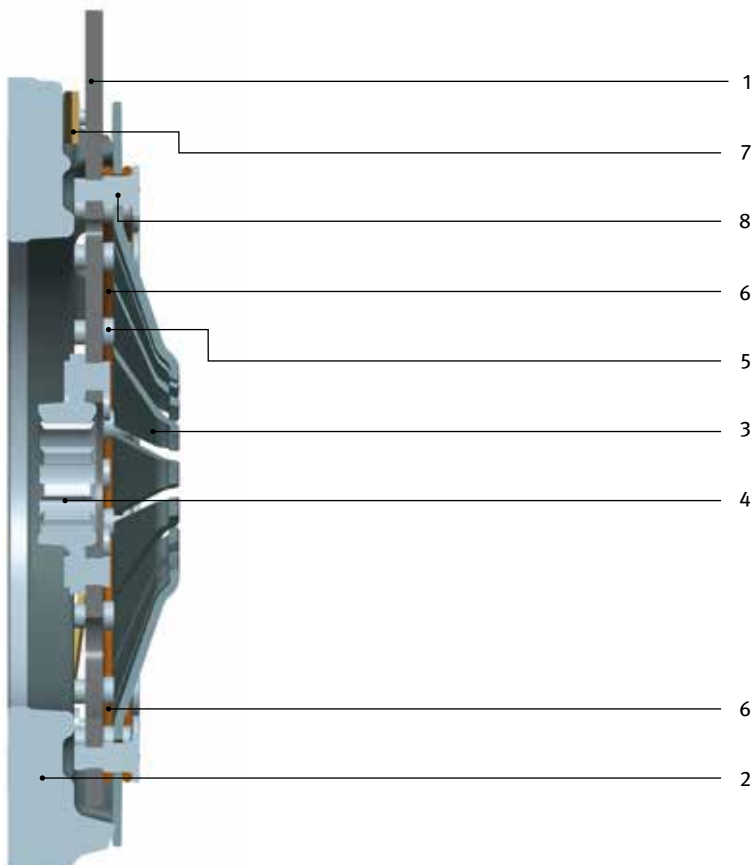
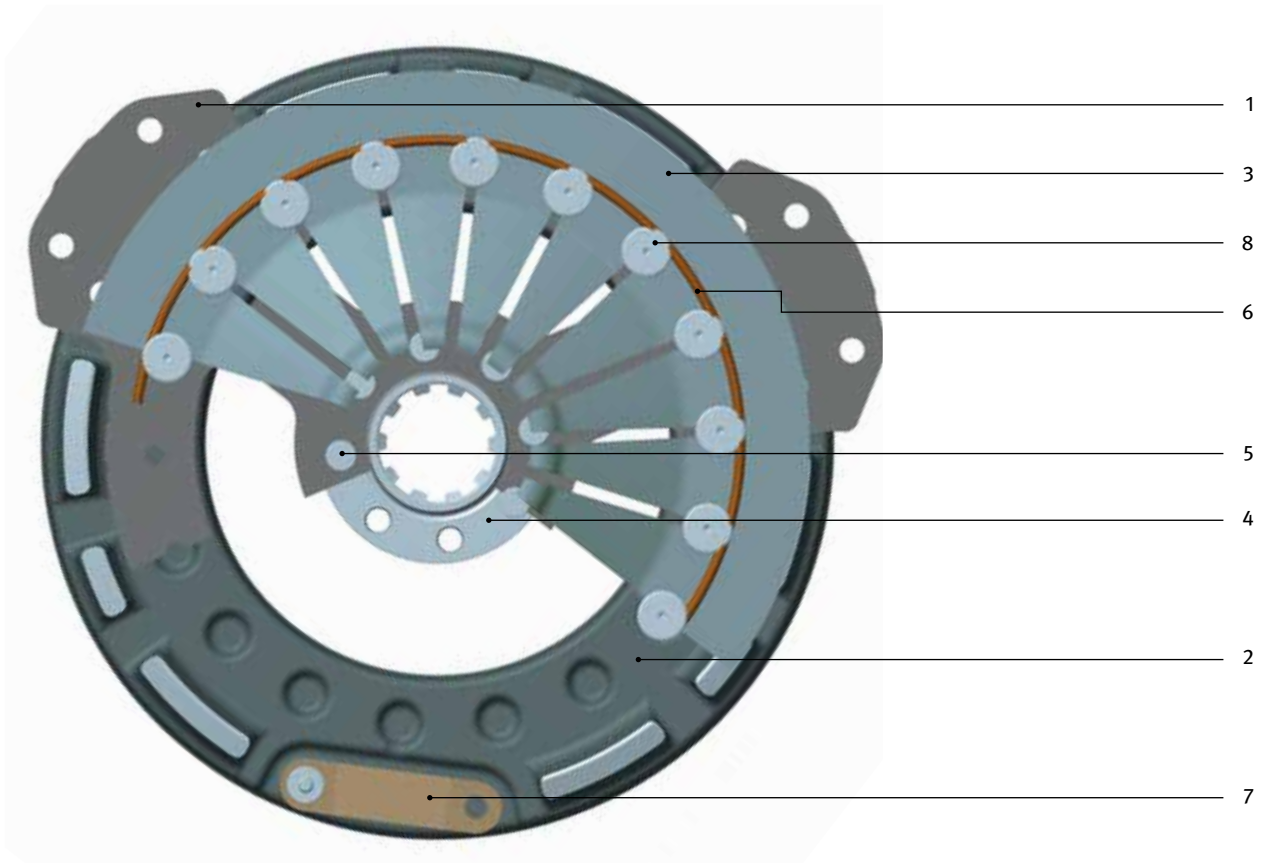
Possible causes	Remedy
Faulty release bearing	Replace the release bearing
Release bearing retainer clip or spring damaged	Replace the damaged components
Clutch disc idle torsion damper defective	The first stage damper which controls engine idle damping may have loose or broken coil springs as the result of an aggressive driving style or poorly tuned engine
Clutch disc secondary main torsion damper defective	The second stage damper controls and absorbs the vibration generated by the engine and prevents it from entering the transmission drivetrain – Failure can also be caused by the disc reaching the end of its service life, an aggressive driving style, excessive torque loadings or material failure
Badly worn splines	Excessive spline wear can cause the disc to ‘chatter’ or vibrate
Clutch disc cushioning defective	Cushioning between the clutch disc friction has collapsed due to high heat input, resulting in a high pitched engagement ‘squawk’
External influence	Wear or damage within the tractor drive line or transmission causing noise and vibrations, or loose cab mountings causing the cab to foul against the chassis
Flywheel / centre bearing collapsed or seized	Replace the affected bearings
Clutch disc incorrectly fitted	Ensure the clutch disc is fitted the correct way round in accordance with the product markings

Incorrectly installed release bearing

Release bearing fouled due to incorrect installation – Ensure the bearing is aligned correctly and fitted the right way round.

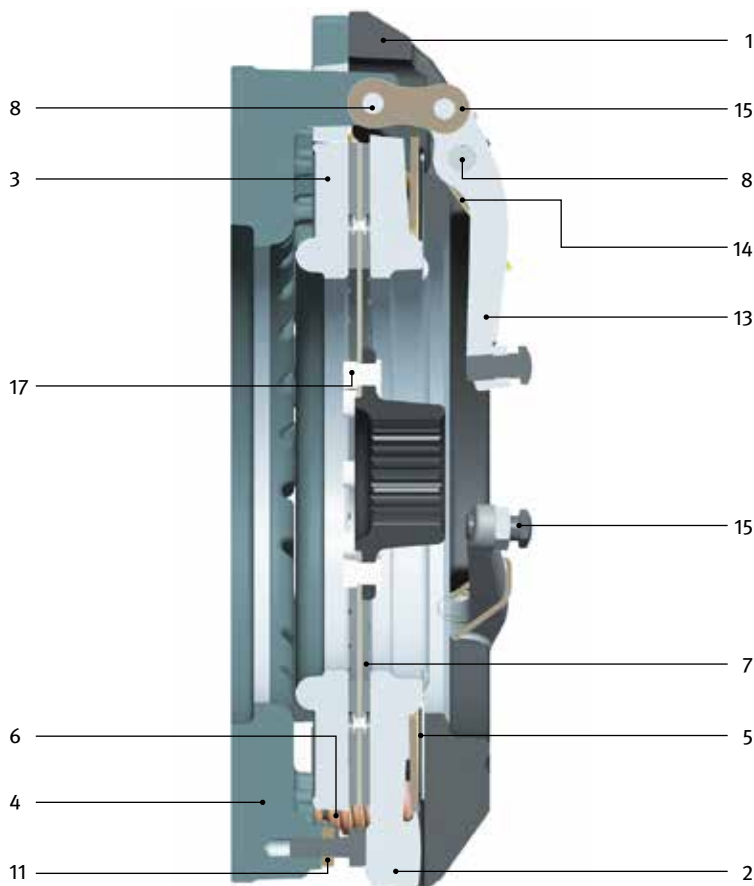
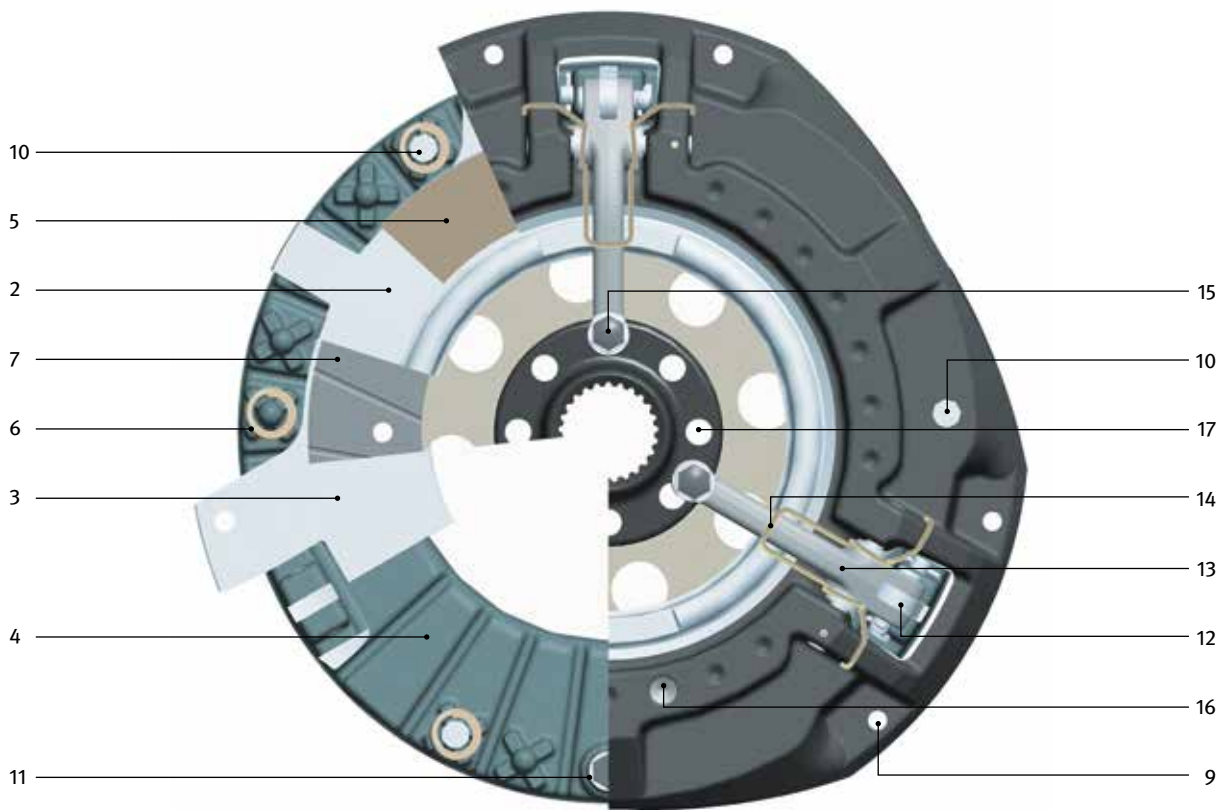


6 Single clutch with independent drive for P.T.O. (split torque)



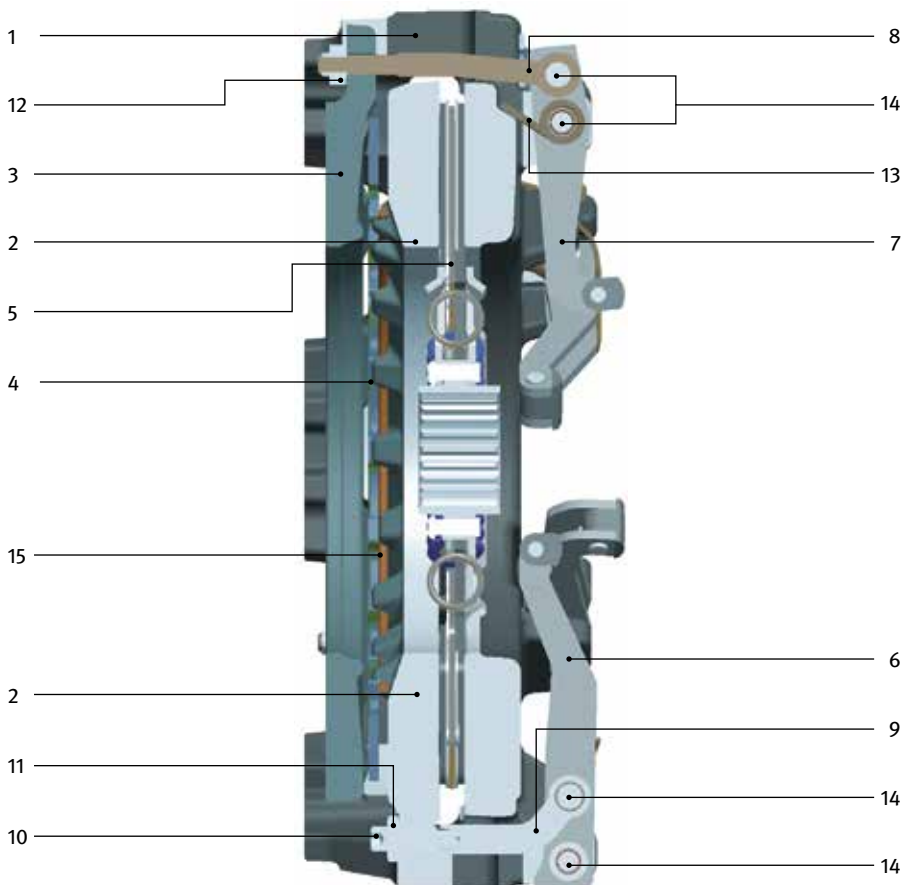
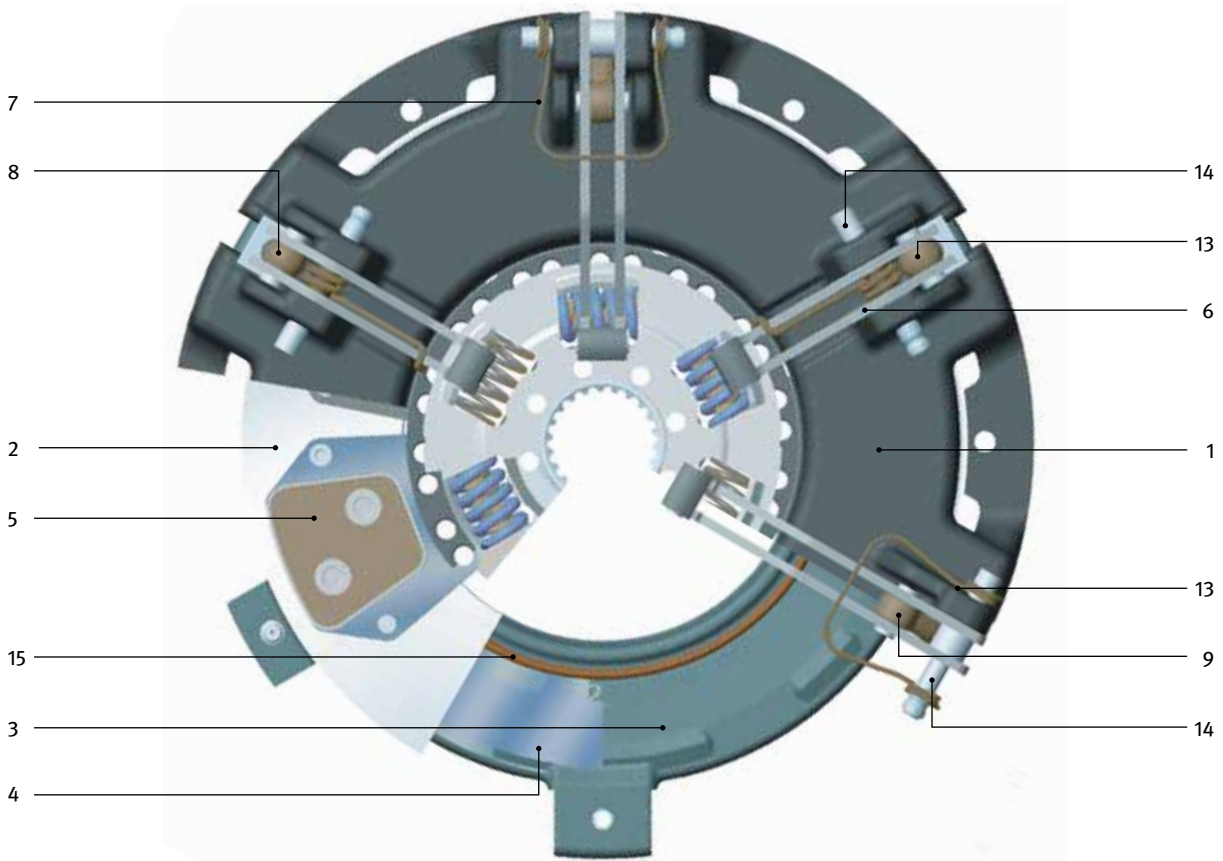
- 1 Cover housing
- 2 Pressure plate
- 3 Diaphragm spring
(with reinforced fingers)
- 4 Fixed P.T.O. hub
- 5 Rivet
- 6 Fulcrum ring
- 7 Tangential strap
- 8 Headed rivet

7 Combined clutch for tractors (special design)



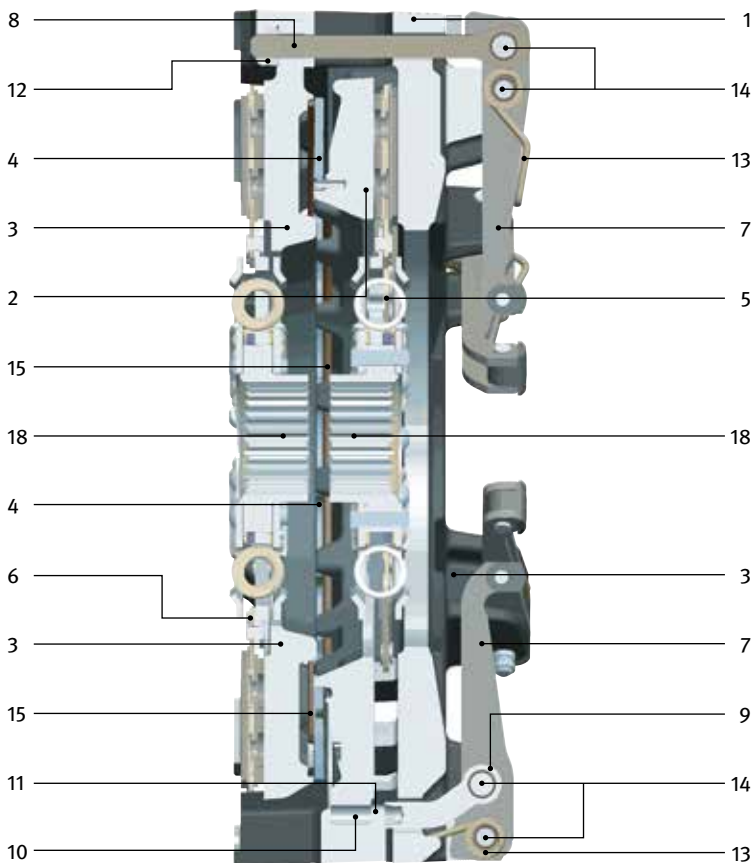
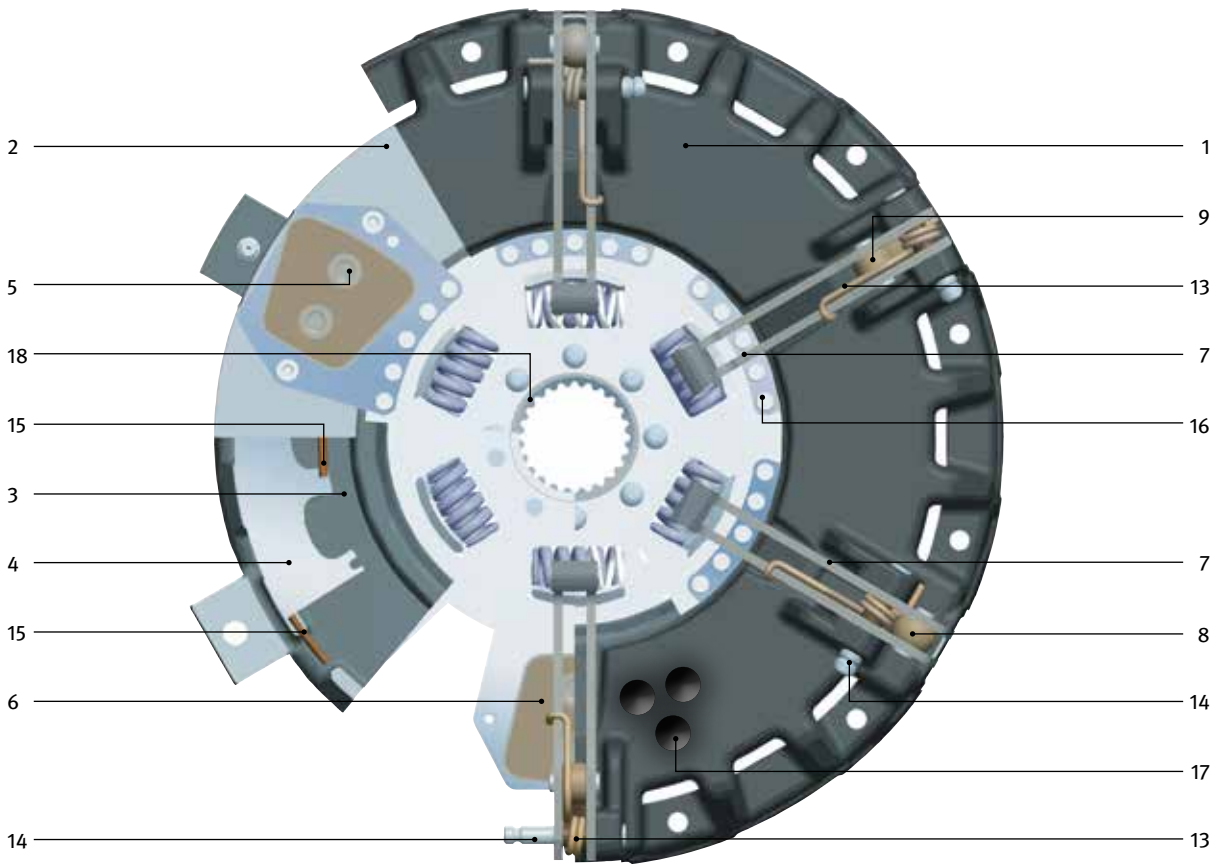
- 1 Cover housing
- 2 P.T.O. pressure plate
- 3 Flywheel plate
- 4 Pressure plate (transmission)
- 5 Diaphragm spring
- 6 Coil spring
- 7 P.T.O. disc (with organic friction)
- 8 Pivot pin
- 9 Fixing hole
- 10 Shipping bolt
- 11 P.T.O. adjusting screw
- 12 Link
- 13 Clutch lever
- 14 Anti-rattle spring
- 15 Lever adjustment screw
- 16 Balance hole
- 17 Rivet

8 Double clutch with independent P.T.O.



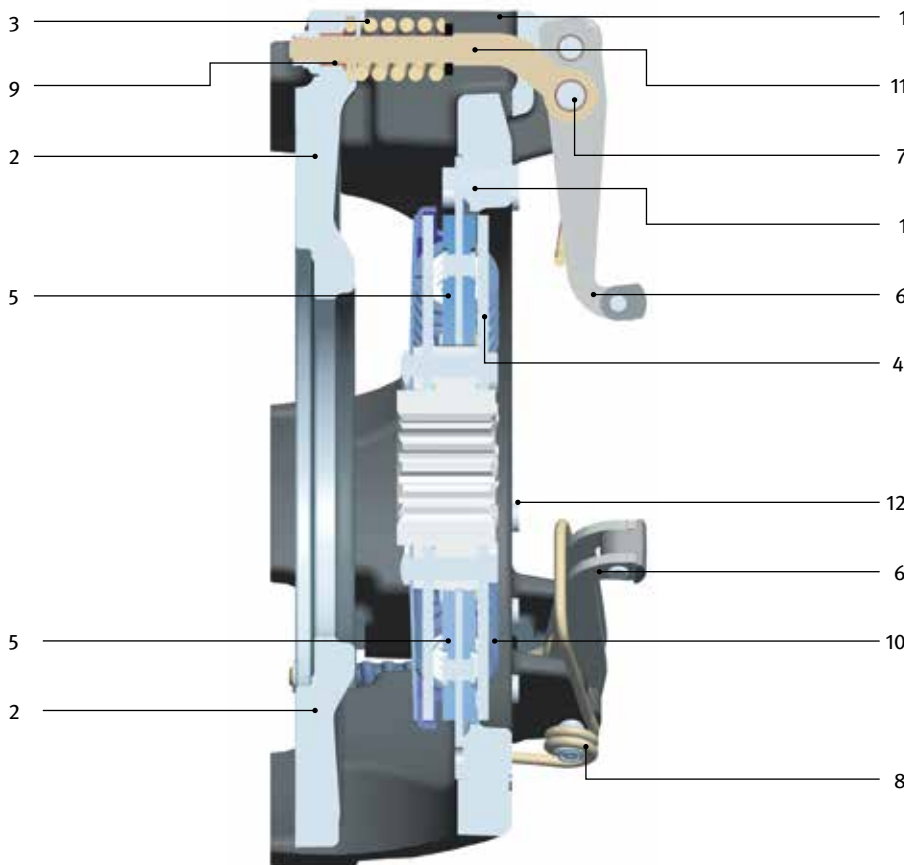
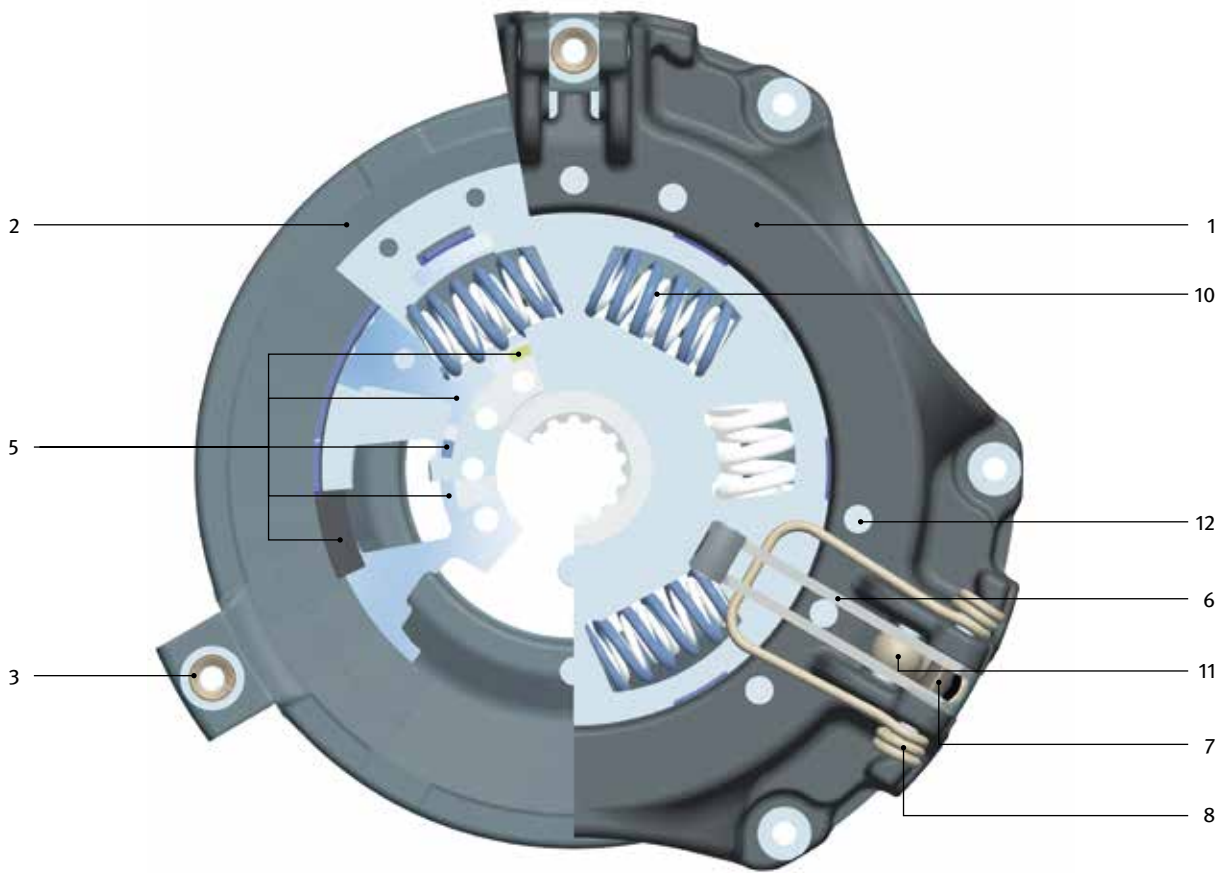
- 1 Cover housing
- 2 Main drive pressure plate
- 3 P.T.O. pressure plate
- 4 Diaphragm spring
- 5 Main drive clutch disc (with sintered pads and torsion damper)
- 6 Main drive lever
- 7 P.T.O. lever
- 8 P.T.O. lever eyebolt
- 9 Transmission lever elbow
- 10 Adjusting screw
- 11 Lock nut
- 12 Adjusting nut
- 13 Anti-rattle spring
- 14 Pivot pin
- 15 Fulcrum ring

9 Twin plate clutch for transmission drive



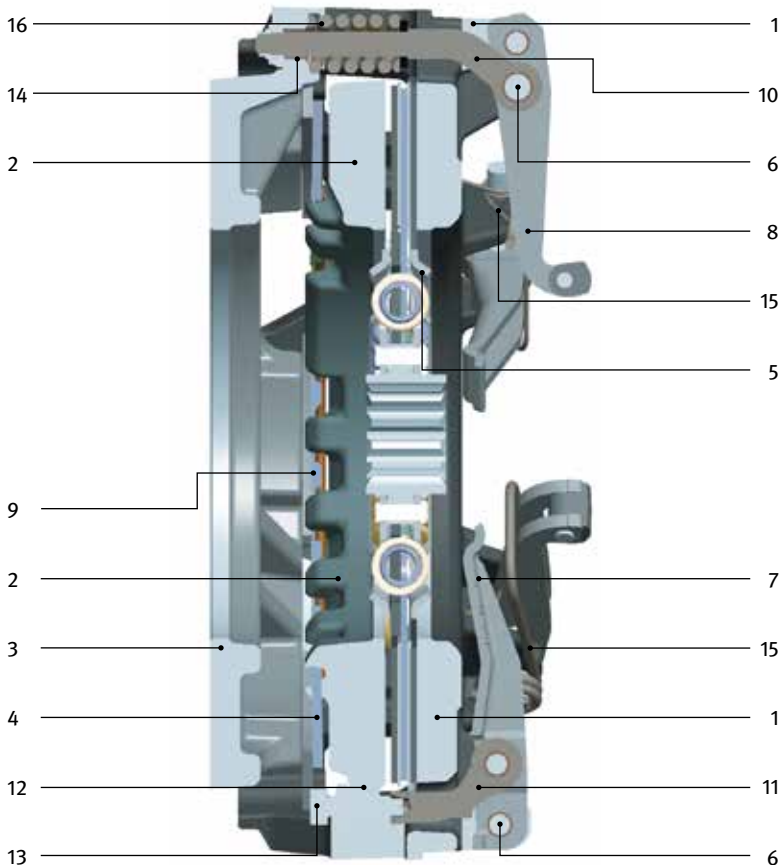
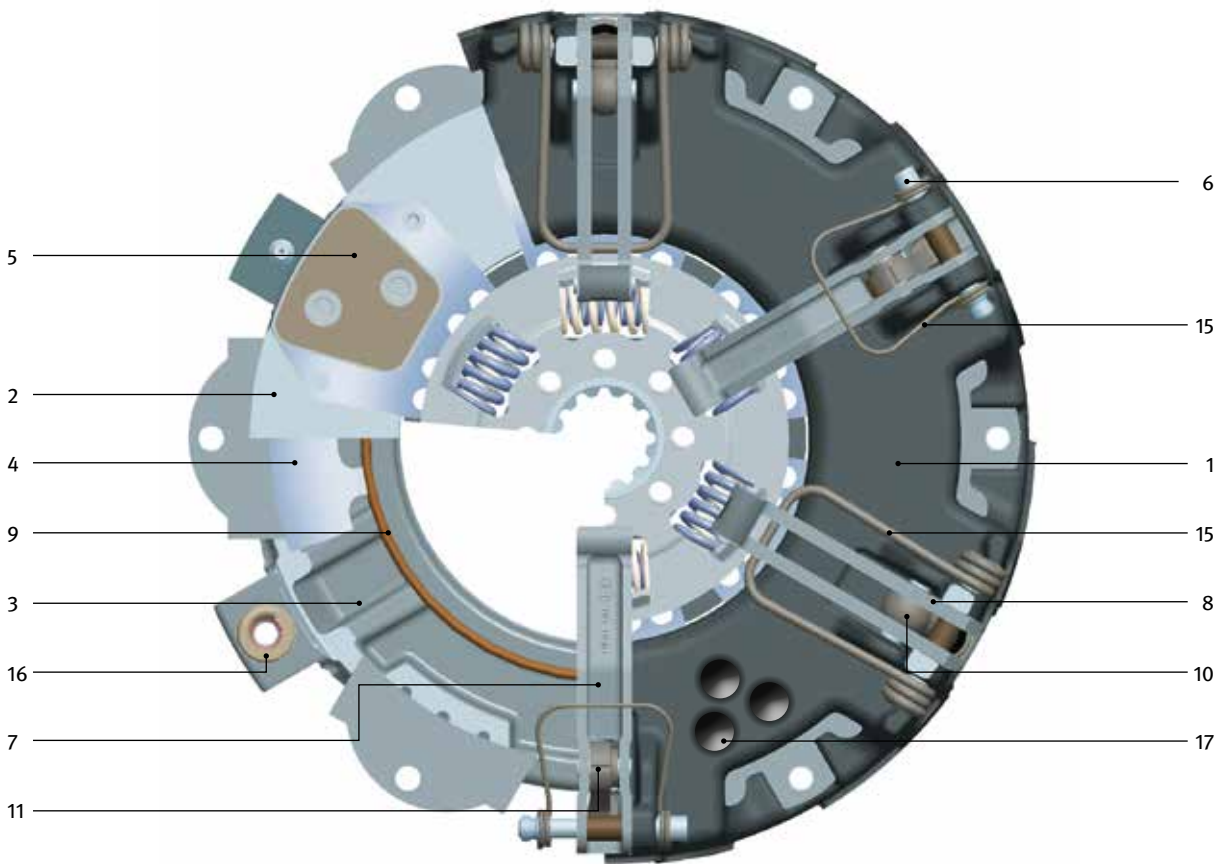
- 1 Cover housing
- 2 Main drive pressure plate (transmission side)
- 3 Main drive pressure plate (flywheel side)
- 4 Diaphragm spring
- 5 Main drive clutch disc with sintered pads and torsion damper (transmission side)
- 6 Main drive clutch disc with sintered pads and torsion damper (flywheel side)
- 7 Main drive lever
- 8 Transmission lever eyebolt
- 9 Transmission lever elbow
- 10 Adjusting screw
- 11 Lock nut
- 12 Adjusting nut
- 13 Anti-rattle spring
- 14 Pivot pin
- 15 Fulcrum ring
- 16 Rivet
- 17 Balance hole
- 18 Disc spline

10 Single safety P.T.O. clutch with fixed transmission damper



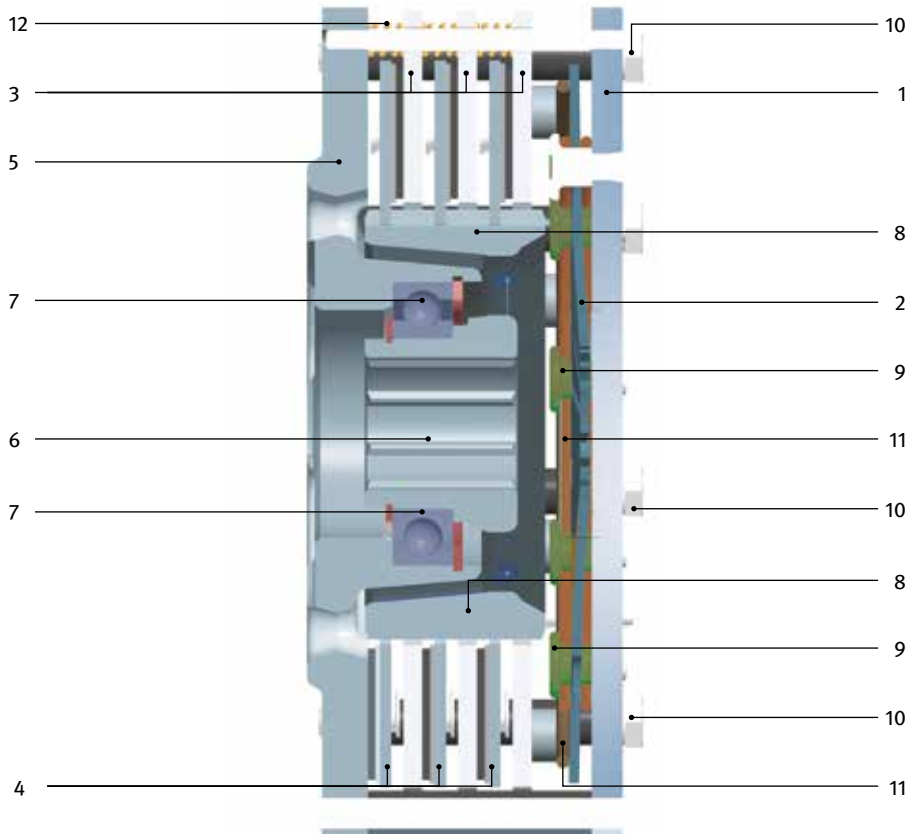
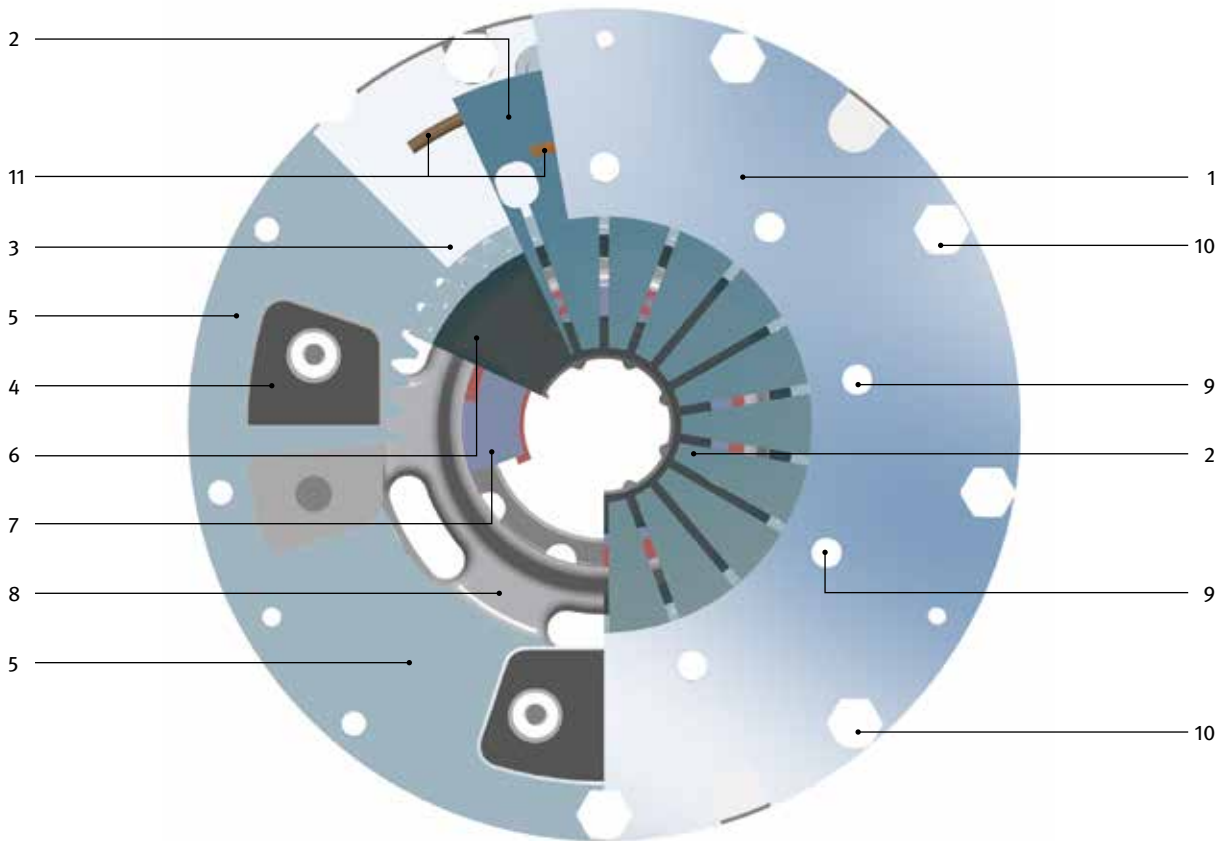
- 1 Cover housing
- 2 P.T.O. pressure plate
- 3 P.T.O. coil spring
- 4 Fixed transmission damper
- 5 Friction device
- 6 P.T.O. lever
- 7 Pivot pin
- 8 Anti-rattle spring
- 9 Adjusting nut
- 10 Transmission damper spring
- 11 P.T.O. lever eyebolt
- 12 Rivet

11 Double clutch with safety P.T.O.



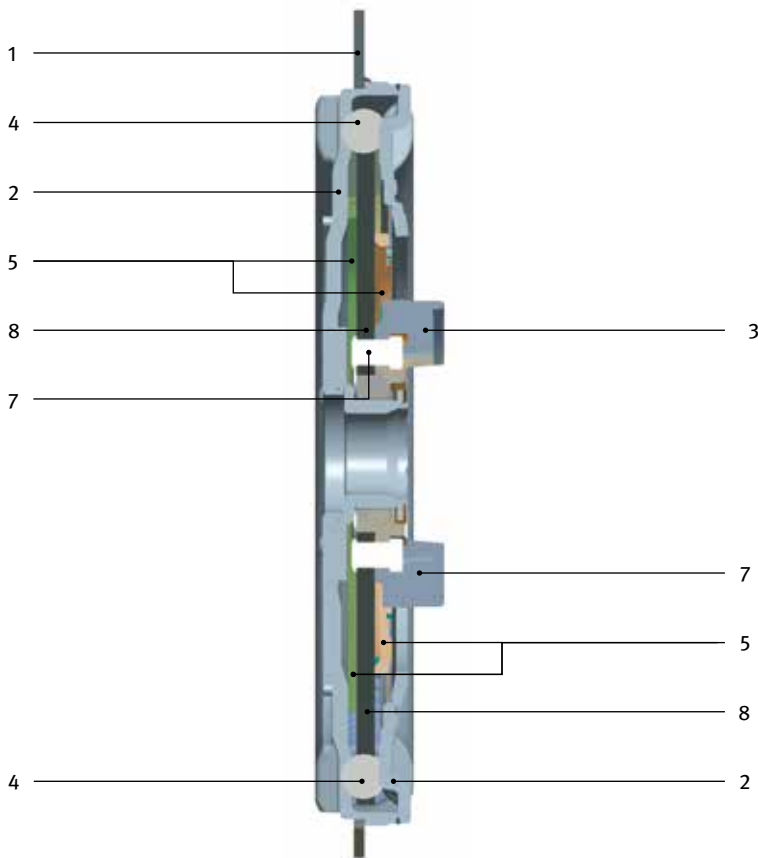
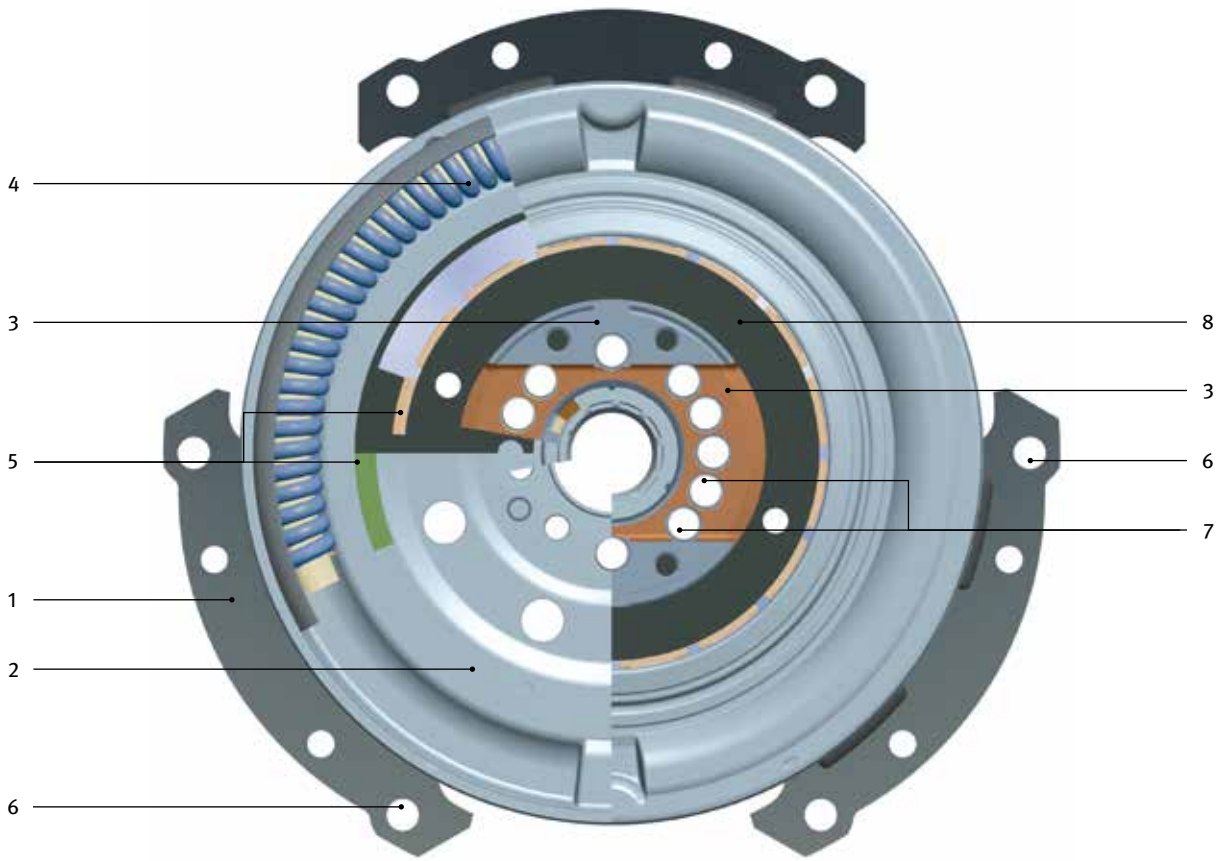
- 1 Cover housing
- 2 Main drive pressure plate
- 3 P.T.O. pressure plate
- 4 Diaphragm spring
- 5 Main drive disc (with sintered pads and torsion damper)
- 6 Pivot pin
- 7 Main drive lever
- 8 P.T.O. lever
- 9 Fulcrum ring
- 10 P.T.O. lever eyebolt
- 11 Transmission lever elbow
- 12 Adjusting screw
- 13 Lock nut
- 14 Adjusting nut
- 15 Anti-rattle spring
- 16 Coil spring
- 17 Balance hole

12 Front P.T.O. clutch



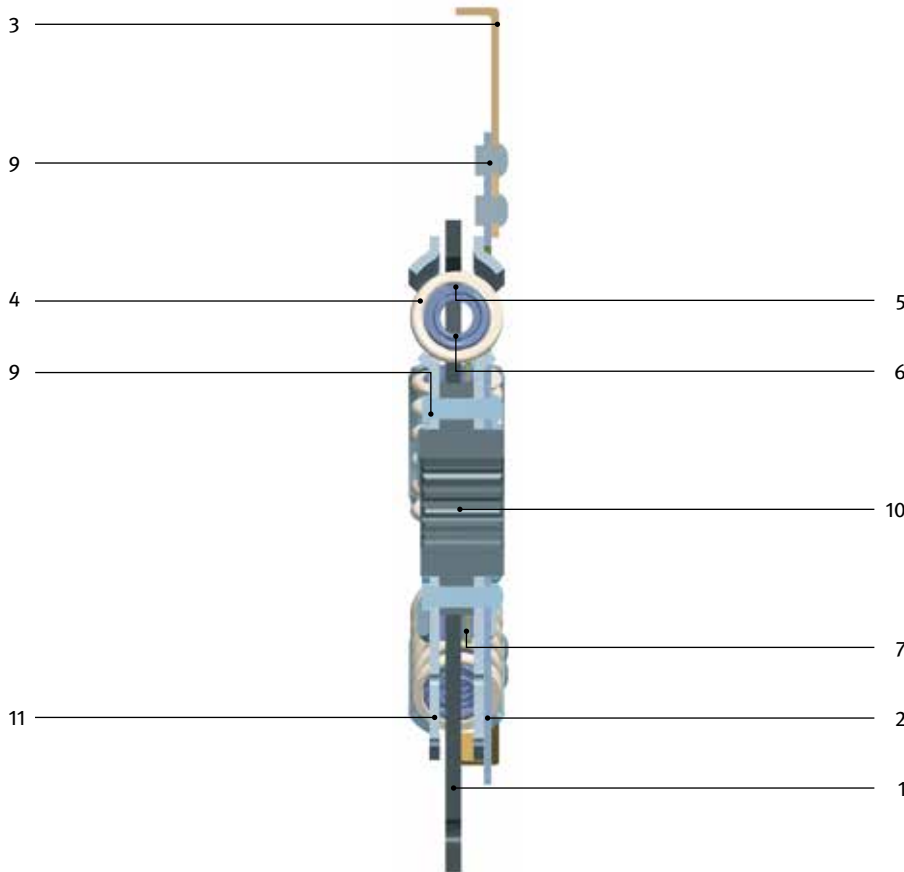
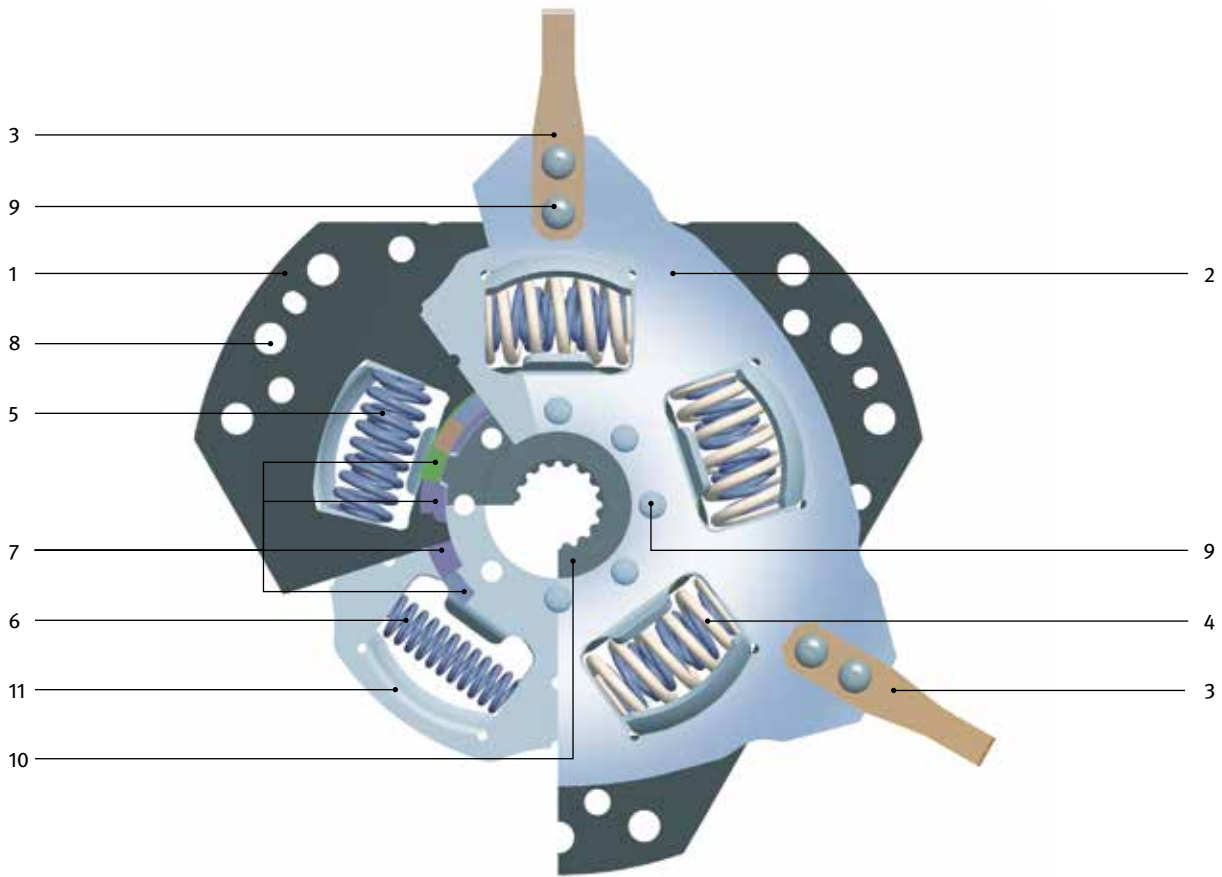
- 1 Housing cover plate
- 2 Diaphragm spring
- 3 Separator discs
- 4 Drive discs
(with sintered pads)
- 5 Lower pressure plate
- 6 Secondary drive hub
- 7 Support bearing
- 8 Primary drive hub
- 9 Rivet
- 10 Housing bolt
- 11 Fulcrum ring
- 12 Coil spring

13 Long travel torsion damper



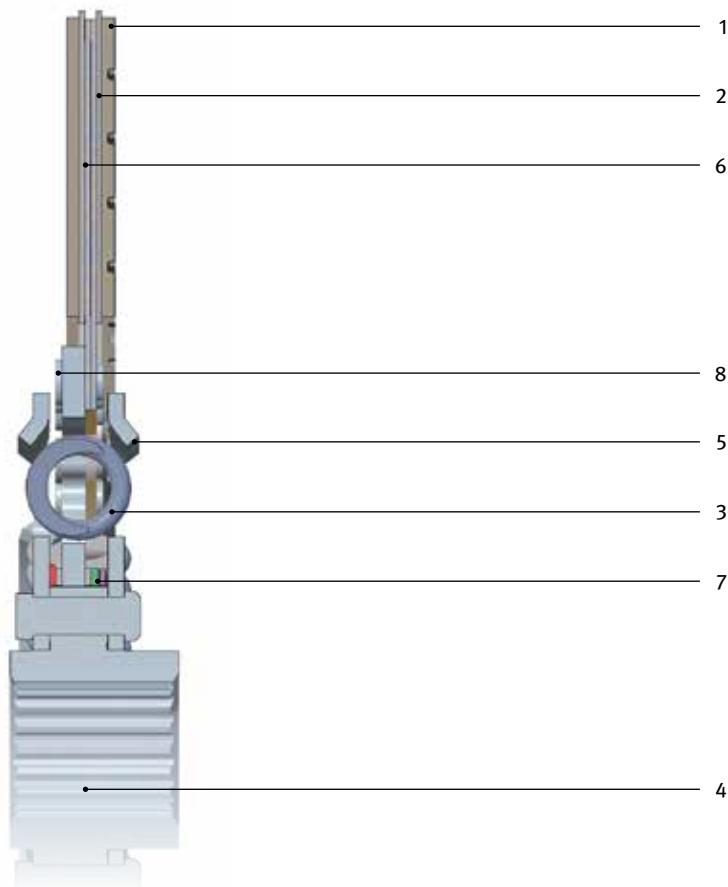
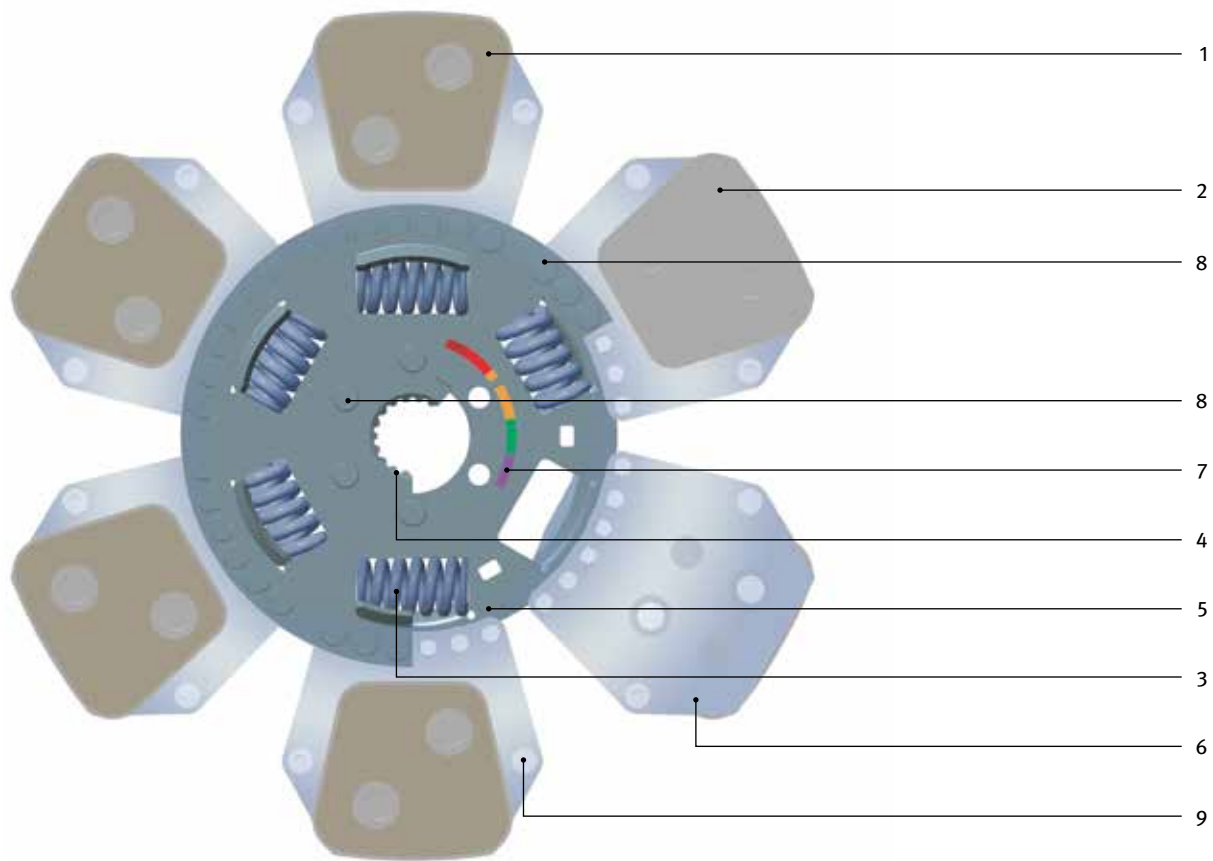
- 1. Location plate (primary)
- 2. Damper housing
- 3. Drive shaft location flange (secondary)
- 4. Arc spring
- 5. Friction device
- 6. Location holes
- 7. Rivet
- 8. Central carrier plate (secondary)

14 Axial spring torsion damper



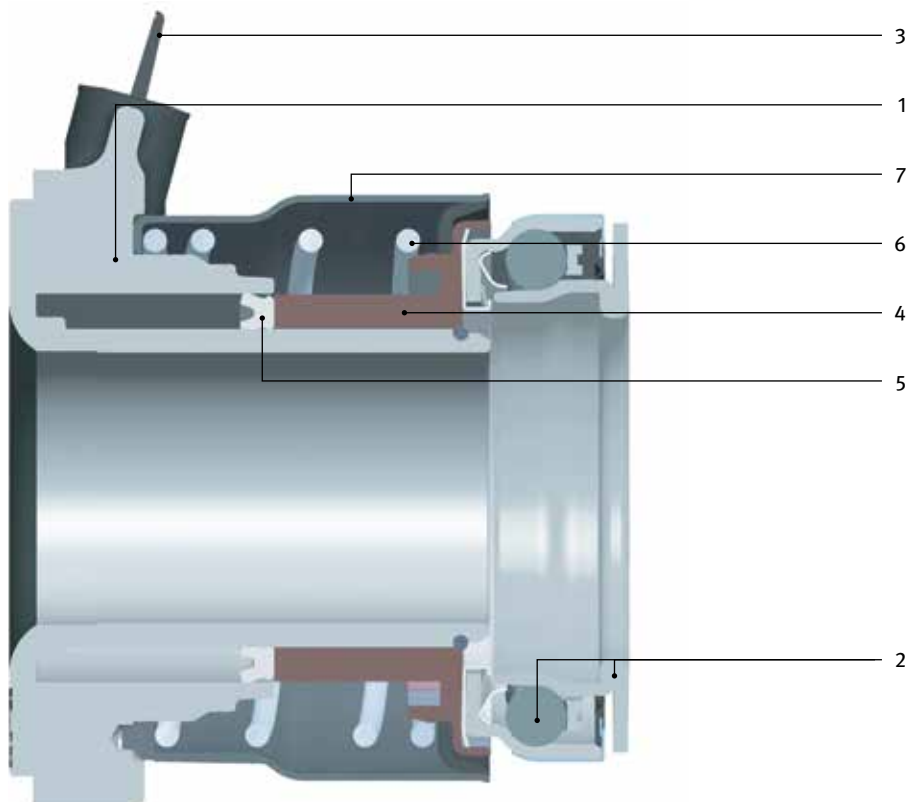
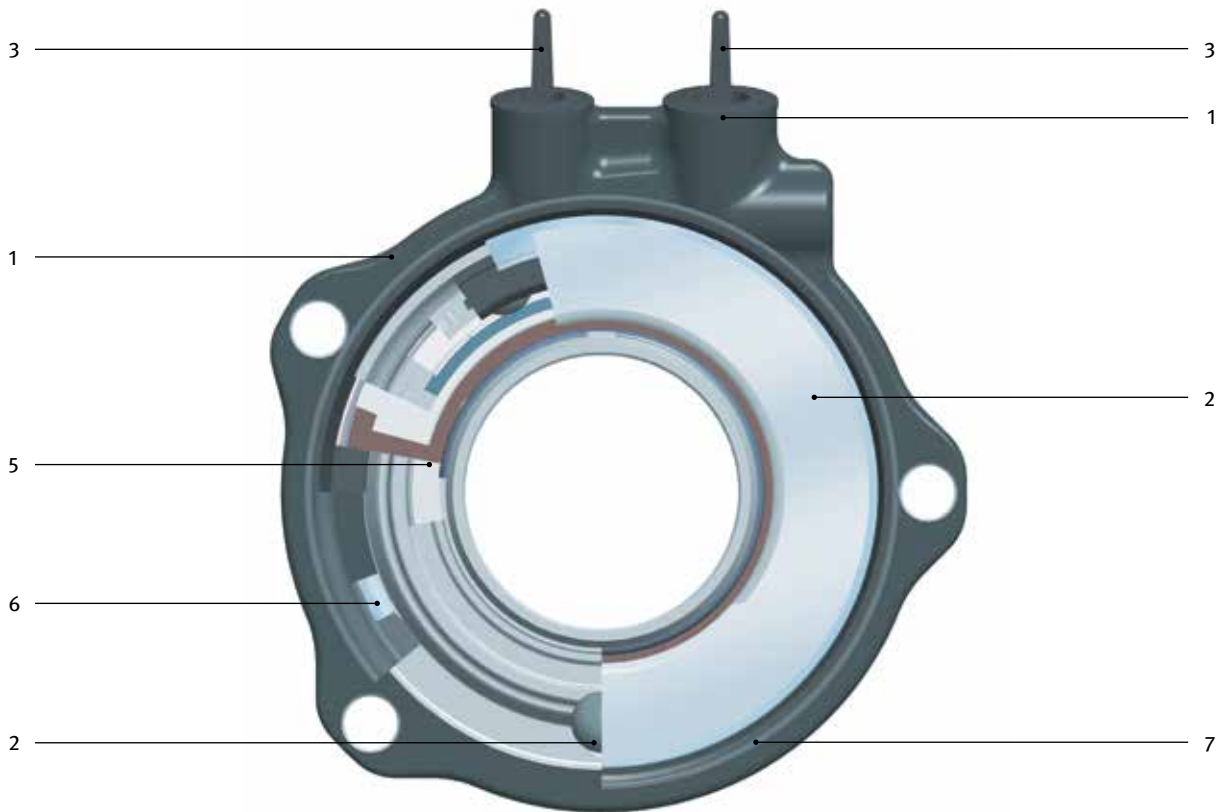
- 1. Location plate (primary)
- 2. Carrier plate (secondary)
- 3. Sensor wings
- 4. Torsion springs (idle)
- 5. Torsion springs (second stage)
- 6. Torsion springs (third stage)
- 7. Friction device
- 8. Location hole
- 9. Rivet
- 10. Splined drive hub
- 11. Backplate

15 Drive disc (with sintered or organic friction)



- 1 Friction pad
- 2 Friction backplate
- 3 Torsion damper spring
- 4 Splined drive hub
- 5 Carrier plate
- 6 Cushioned friction carrier plate
- 7 Friction device
- 8 Rivet
- 9 Cushion rivet

16 Concentric Slave Cylinder (CSC)



- 1 Housing
- 2 Release bearing
- 3 Hydraulic port
- 4 Piston
- 5 Piston seal
- 6 Pre-load spring
- 7 Plastic dust shield

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