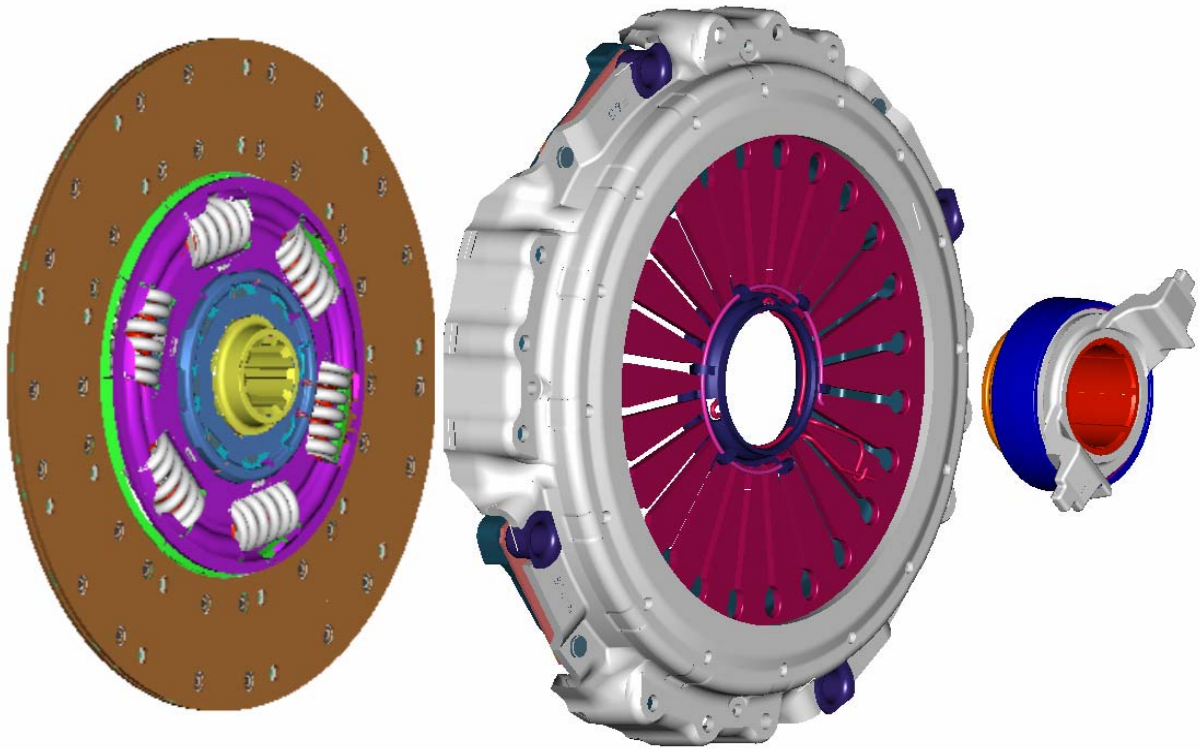
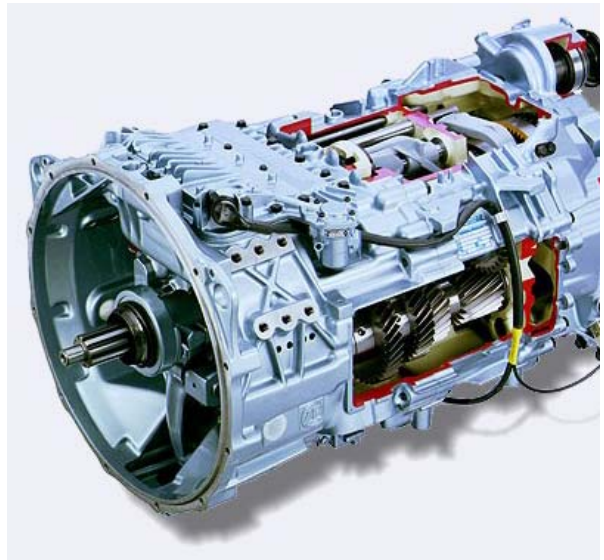
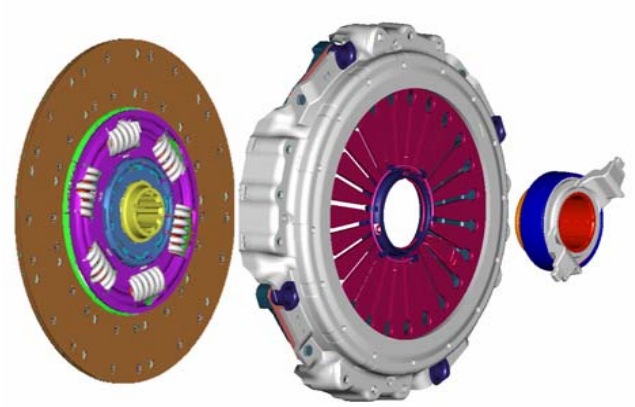
SACHS 430 mm Clutch for ZF AS Tronic Transmission



Content

1. **Introduction**
   - description, identification
2. **Clutch Components**
   - function, features
3. **Installation, Maintenance**
   - mounting, lubrication
4. **Troubleshooting**
   - operation conditions
5. **Inspection**





1. Introduction

1.1 Description

The **clutch** for the Astronic Transmission is a pull-type, single plate, 430 mm clutch with a stamped housing. The plate load is provided by a diaphragm spring.

The release bearing has a **“snap-in“-connection** to the diaphragm spring, which acts also as a lever to disengage the clutch.

The disc **facing material** is organic and is “cushioned“, i.e. between the driven plate and the facing material are axially flexible components to ensure a smooth clutch engagement.

The disc also incorporates two **torsional dampers**:

- one “main“ damper to reduce the transmission of engine oscillation in drive and coast operation and
- one “pre“-damper to reduce transmission gear rattle at engine idling.

1. Introduction
1.2 Identification

Cover assembly:

Bsp.: MFZ430 – 32 3482 1235 12

inscribed on housing

Release Bearing:

Bsp.:KZISZ-5 – 34 3151 225 303

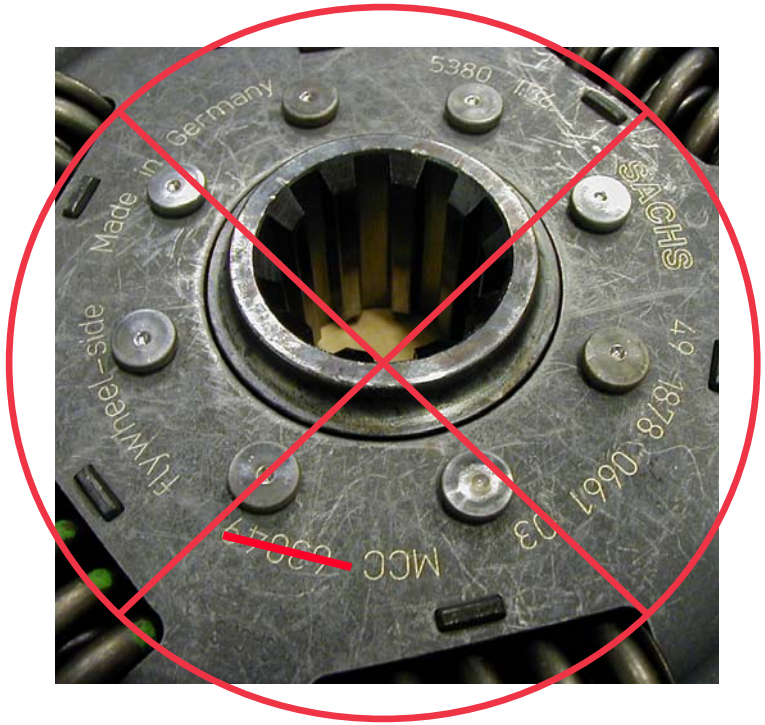
inscribed on bearing housing

Disc assemblies:

Bsp.:430WGTZ – 49 1878 0661 03

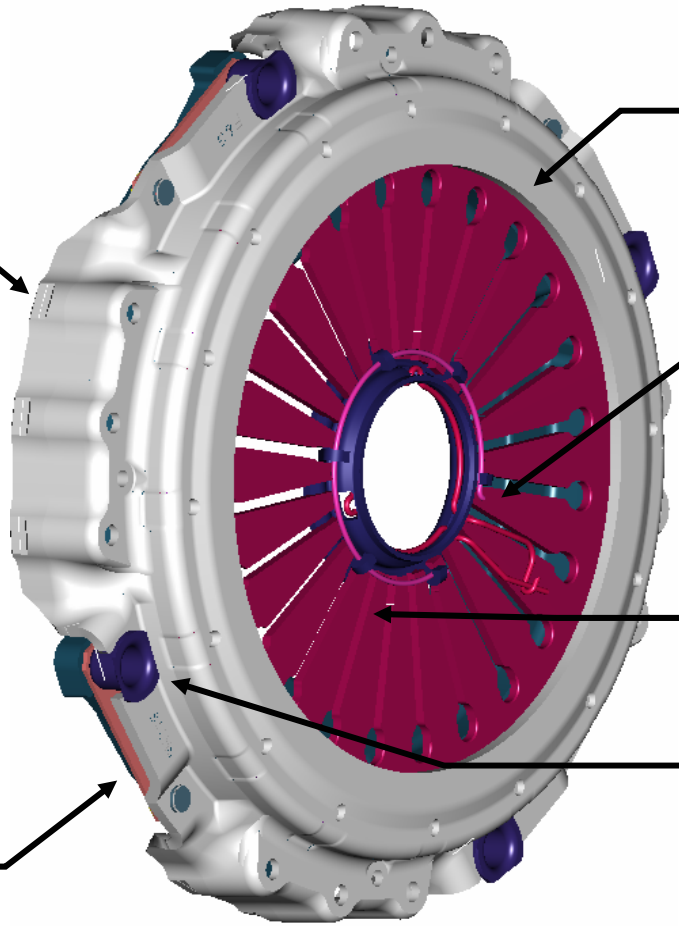
lasered on the retainer plate (flywheel side)

New Pictures with latest Nomenclature to be added



2. Clutch Components

2.1 Pull-type, single plate, 430 mm Cover Assembly



Stamped housing with 4x3 bolts and pilot diameter machined on O.D.

Balance milling/drilling (only by clutch manufactor)

Connection ring and release wire of ‘snap-in’ bearing connection

Diaphragm spring

shipment cups (remain attached throughout clutch life)

4x two straps

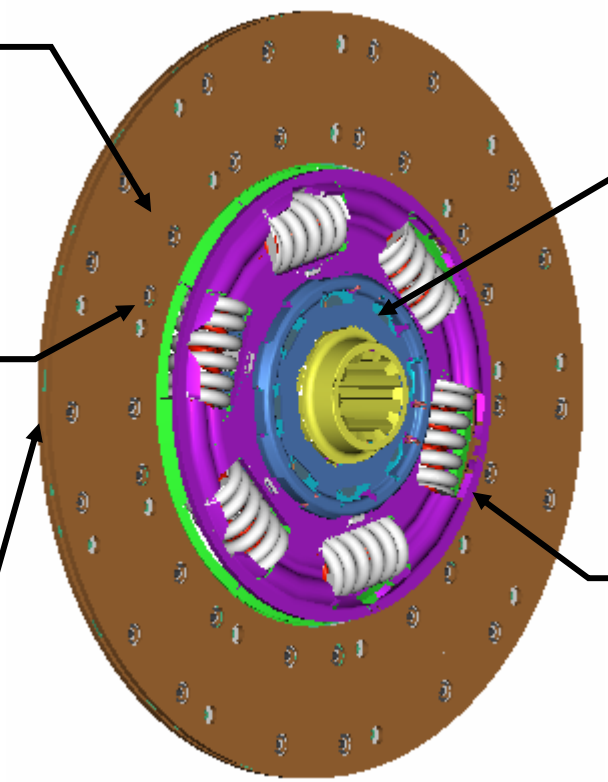
2. Clutch Components

2.2 430 mm Disc Assembly with torsional damper and organic facing

Surface:
keep free of
grease and oil

Riveted Organic
Facing with
cushion

Stamp on
Retainer Plate of
Damper:
“Flywheel side”



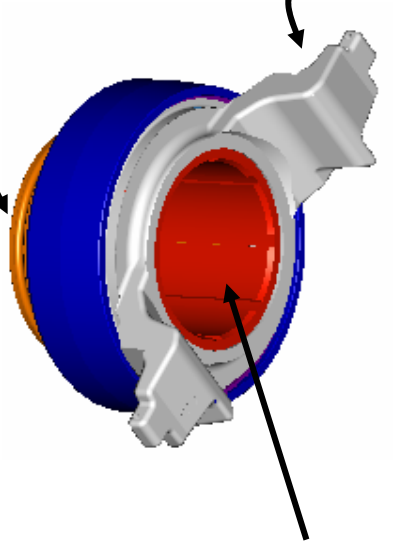
Pre-lubricated SAE
2”-10 teeth spline

6 spring torsional damper
- Main- and Idle-Damper

2. Clutch Components

2.3 Release Bearing with ‘Snap-in‘ interface

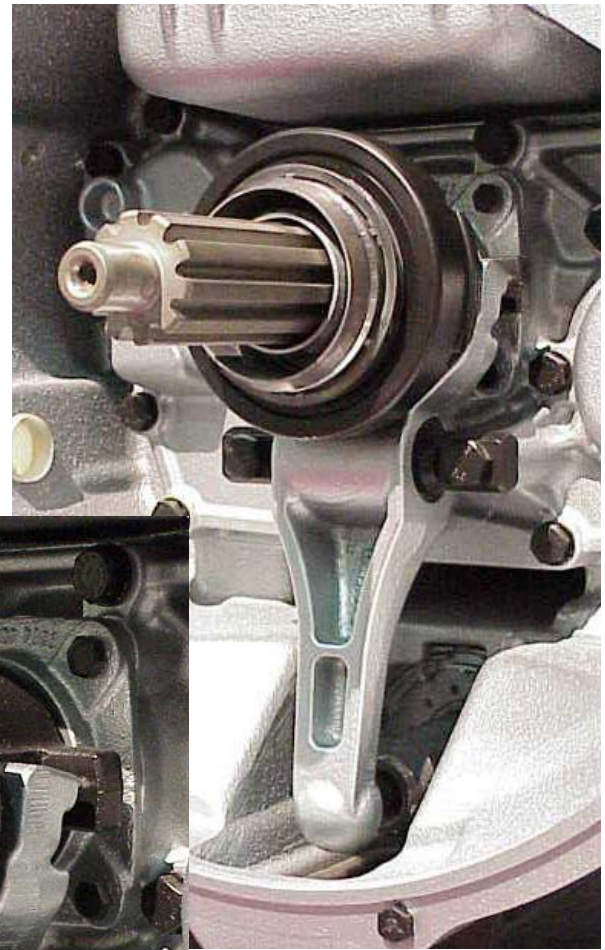
Sealed, self-centering bearing

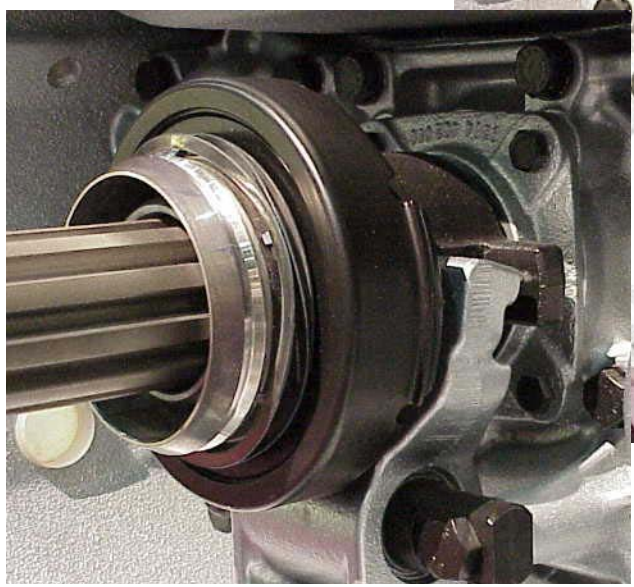


Interface to release fork* of AS Tronic transmission

- Induction hardened

* Fork pre-greased by ZF





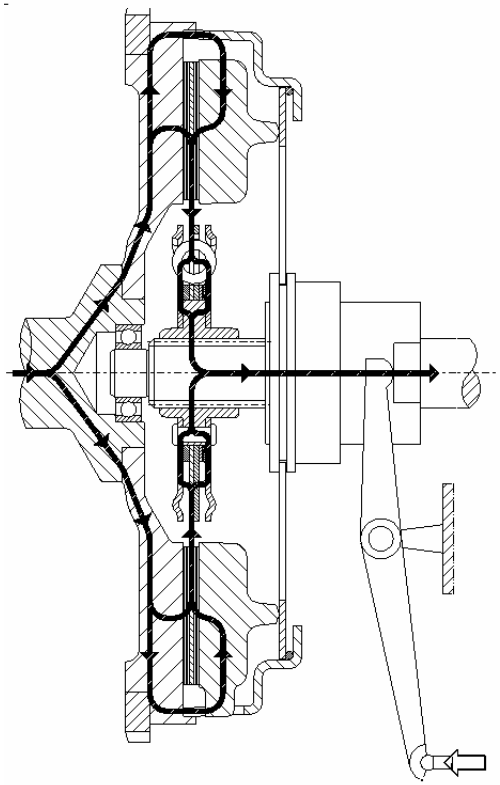
Polymer Sleeve (interface to quill)

DO NOT grease sleeve or quill

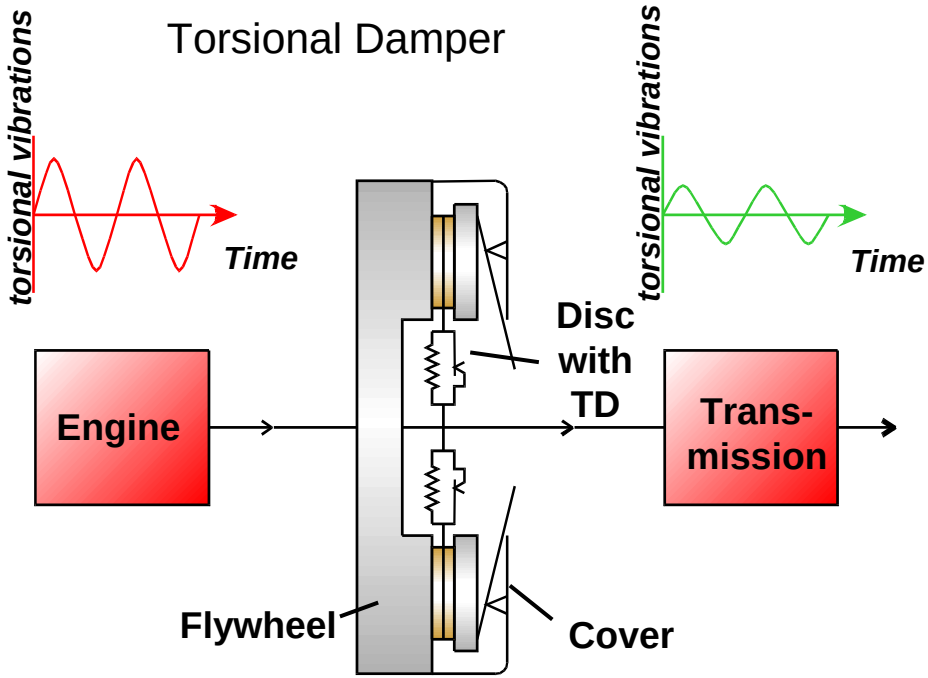
2. Clutch Components

2.4 Function

Torque Transfer



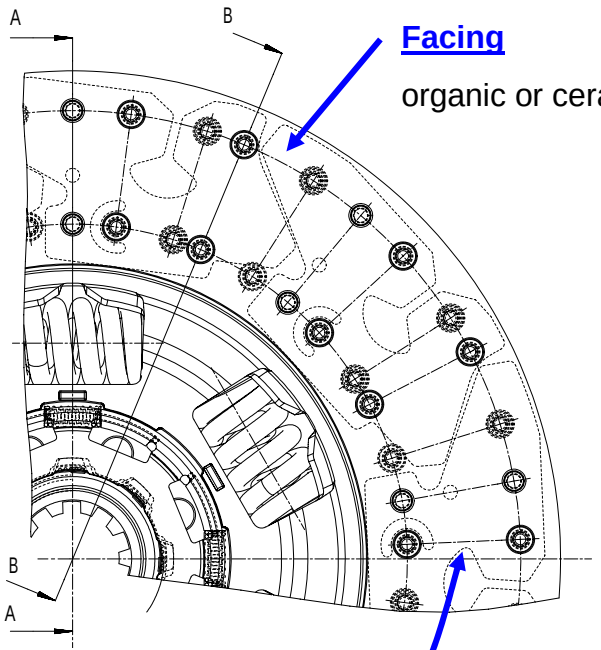
Torsional Damper



Rotational irregularities of the engine cause torsional vibrations in the powertrain.
These torsional vibrations lead to durability and noise issues in the drive line.

2. Clutch Components

2.5 Features of SACHS disc



Facing

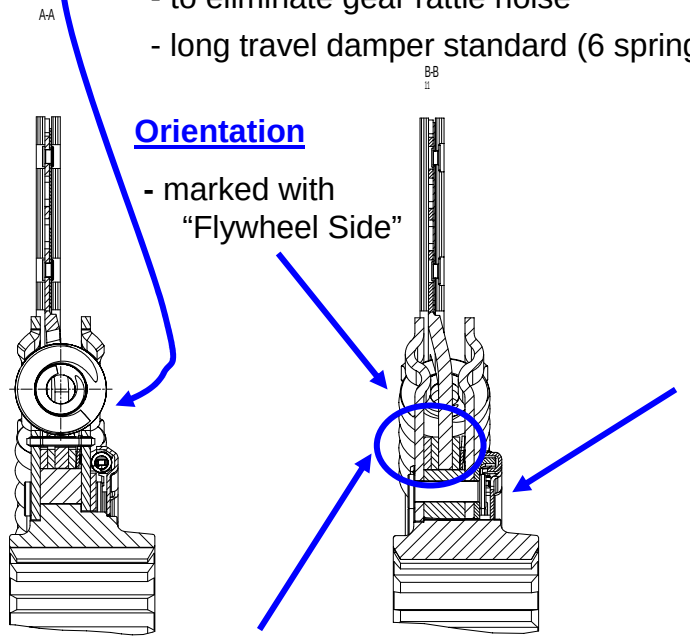
organic or ceramic

Cushion Springs

- available for ceramic and organic facing
- promotes smooth engagement
- helps to reduce the release load peak

Maindamper

- to protect driveline components
- to eliminate gear rattle noise
- long travel damper standard (6 spring)



Orientation

- marked with "Flywheel Side"

Predamper

- to eliminate idle rattle

Friction Device

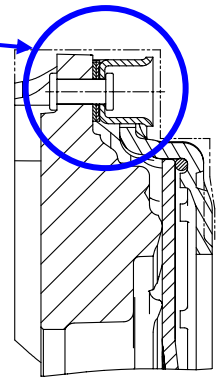
- generates hysterisis
- to eliminate gear rattle noise
- to protect the powertrain (durability)
- friction stable over life

2. Clutch Components

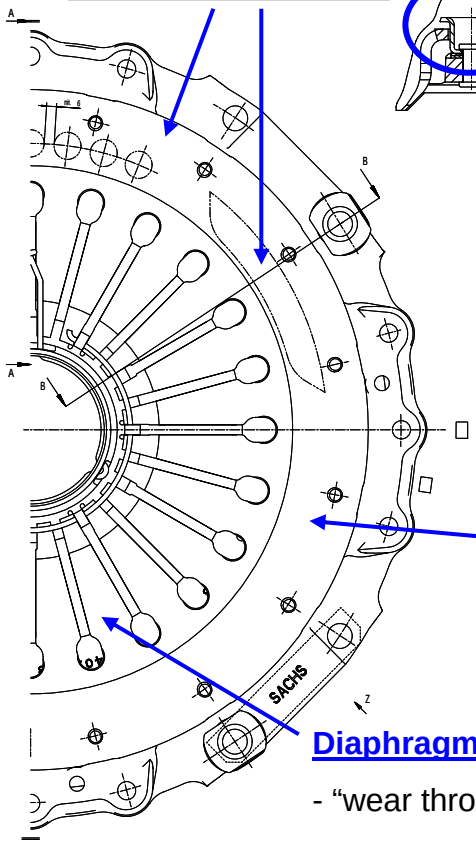
2.6 Features of SACHS cover

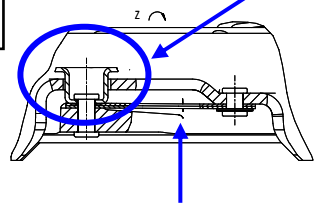
Shipment Cups

- protect straps of damage during shipment
- remain attached through out clutch life
- keep pressure plate in retracted position to enable bolts to be started by hand



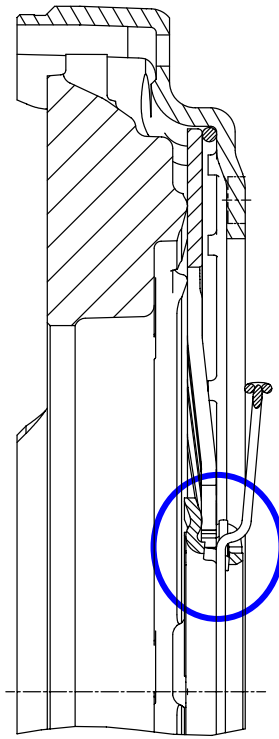
Balance drilling / milling





Straps

- positive lift of pressure plate --> no clutch drag



Snap-In Interface for Release Bearing

- allows mating of transmission + engine
- spring loaded, durable connection
- quick-release mechanism

Stamped Housing

- lightweight, but durable housing

Diaphragm Spring

- “wear through” clutch requires NO adjustment

2. Clutch Components

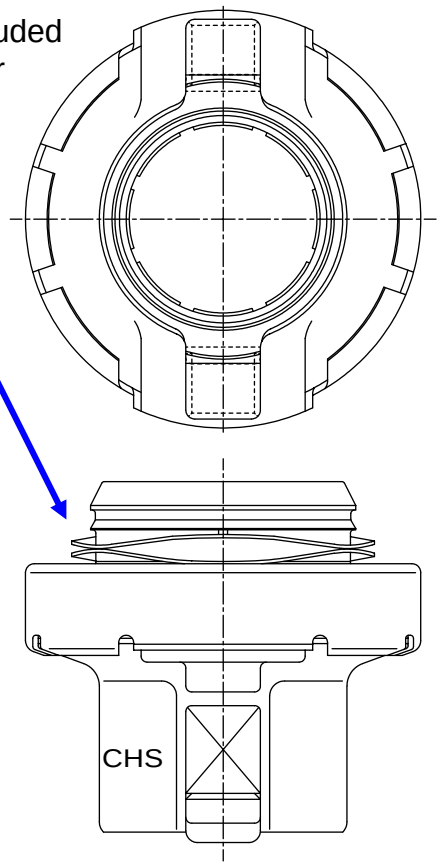
2.7 Features of SACHS release bearing

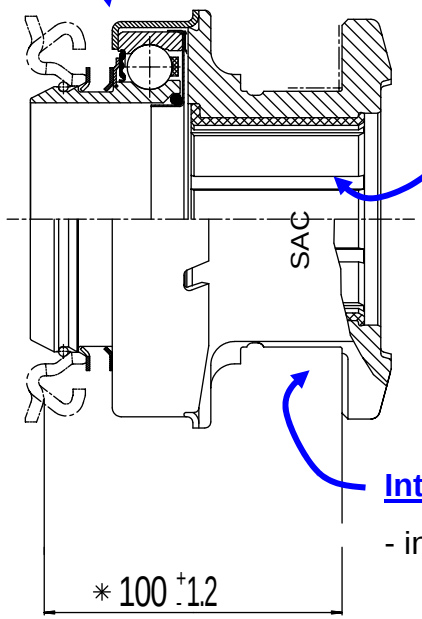
Sealed Bearing

- NO lubrication required
- self-centering
  1.5 to 2.5 mm axial displ. possible

Interface to Cover Assembly

- spring washers included to provide load for connection to diaphragm spring
- ensures snap-in connection during mating of transmission and engine
- disassembly via wire (part of cover assembly)





Bearing Sleeve

- DO NOT grease at I.D. polymer Material as Interface to steel transmission quill

Interface to release fork

- induction hardened
  Lubrication:
  ONLY INITIALLY BY ZF
  (with 5g Olista Longtime)

Preload of 100...200 N REQUIRED !

- required load on bearing by actuation system to avoid noise, wear and to guarantee constant turning of bearing
- preload established by pneumatic actuator

3. Installation and Maintenance

3.1 Component Inspection (before Installation)

Clutch:

- inspect disc and cover for damage due to dropping, e.g. facing damaged at O.D. or shipping cups of cover and/or straps damaged, O.D. of cover housing damaged
- release bearing is pre-installed at the Astronic transmission - make sure it can move freely on quill
- keep dirt, oil, grease away from clutch
- for cleaning of the surface from the pressure plate and the the flywheel, the recomendation is to use brake cleaner or simular liquid
- in case of oil or grease on the refriction surface, the clutch disc must be exchanged because of possible malefunction and comfort problems

Flywheel and Transmission Components:

- flywheel opening > Torsional Damper size:
  O.D. of 254 mm for application truck, rail and crane
  O.D. of 232 for application crane
- inspect flywheel for flatness, damaged threads and damaged centering shoulder
- inspect pilot bearing for free, easy rotation
- inspect interface of flywheel-housing to bell-housing for any damage or dirt that would lead to misalignment; the bearing is self-centering, but can compensate only a limited amount of misalignment
- check transmission input shaft spline for any damage and make sure that the disc can move easily forward and backwards on the spline

3. Installation and Maintenance

3.2 Installation

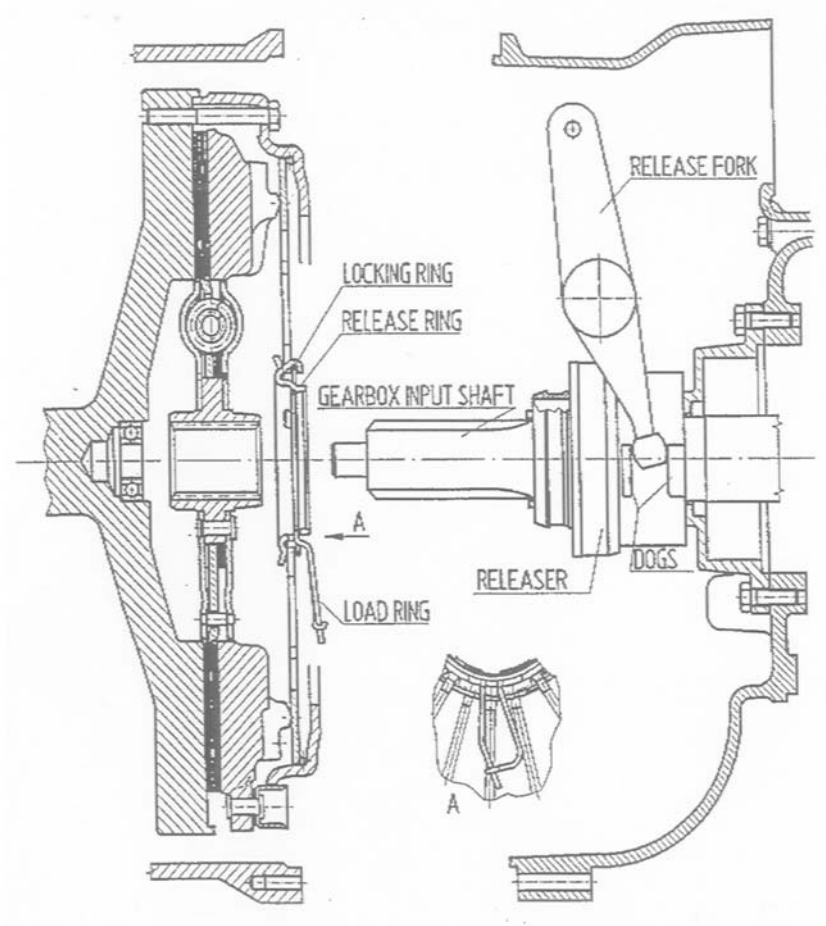
- orientation of disc (look out for ‘Flywheel side’ mark on torsional damper)
- use pilot shaft for location of disc
- customer dependend, has to be defined:
  tightening tourque for the 12 bolts
- criss-cross bolting method required (assembly and disassembly) -
  first round bolt down, second round adjust with correct torque
- centering of clutch on flywheel via O.D. of cover
- make sure the clutch positioning and the positioning of the transmission to engine/flywheel housing is correct
- engine to transmission needs to be aligned - the bearing is self-centering but can compensate only a limited amount of misalignment
- do not hang transmission with its input shaft into the clutch
- positively snap in bearing into diaphragm spring during mating of transmission to engine
  --> see next page for detailed description
- use of 2 dowel pins during mounting of cover on flywheel

3. Installation and Maintenance

3.3 Snap-in Connection

Preparation

- make sure that the end of the load ring is hooked in as shown in detail “A”
- slide fit releaser on guide shaft
- insert fork between ‘dogs’ of releaser
- push releaser towards transmission

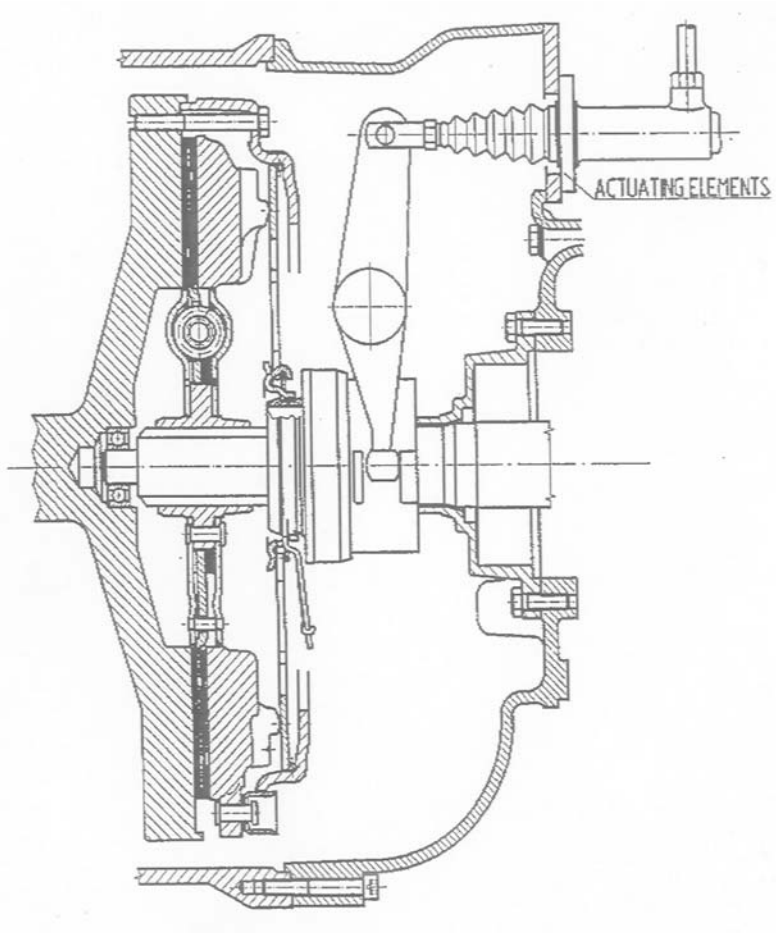


3. Installation and Maintenance

3.3 Snap-in Connection

Completion/Check

- check whether the connection is completely snapped in by pushing the fork in the opposite direction
- install the actuating elements

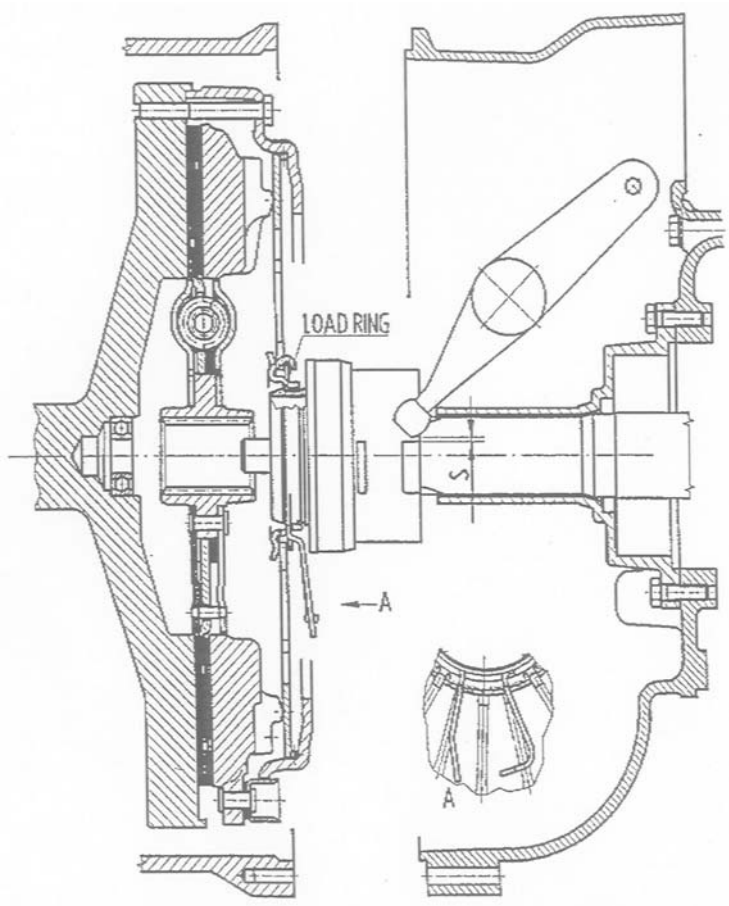


3. Installation and Maintenance

3.3 Snap-in Connection

Disassembly

- Separate the actuator from the fork so that it can move freely
- unbolt the transmission housing from the flywheel housing and start moving the transmission away from the engine; allow the fork to have the clearance “S” between fork and ‘dogs’ of the releaser
- open the hook at the end of the load ring as shown in detail “A”
- push releaser towards engine to unload the load ring - with this the load rings widens
- pull the releaser out of the release ring



3. Installation and Maintenance

3.4 Lubrication

- input shaft: **DO NOT lubricate** --> the disc spline is pre-lubricated by SACHS
- interface bearing to quill:
  DO NOT lubricate, this would attract dirt, clutch dust etc. and would cause excessive wear of the inner polymer bearing sleeve
- interface bearing to pickle fork: Lubrication recommended to minimize wear, increase life;
  ZF **lubricate**s **using 5g Olista Longtime**
  (ZF part no. 0671 190 050 for the 1kg can) on bearing sides and 'ears'
- release bearing: maintenance-free, sealed, **NO lubrication** required

3.5 Maintenance

- this **clutch requires no adjustment**, it is a so called "wear-through" clutch
- the **bearing is maintenance free** due to being sealed

4. Troubleshooting

4.1 Failure Analysis List

Clutch is slipping

- wrong clutch cover installed
- completely worn facings
- contaminated facings due to seal leakage of engine/transmission or due to excess use of grease
- overheated clutch, burned facing, deformations in pressure plate etc., heat cracks in flywheel/pressure plate
- disc is ‘frozen’ on input shaft spline due to dirt/rust
- release system causes to much pre-load, i.e plate load insufficient
- depth of pot-type flywheel is too big (resurface at clutch facing contact and bolt-on area !)

4. Troubleshooting

4.1 Failure Analysis List

Clutch does not disengage

- wrong clutch disc with wrong thickness installed
- run out of disc is too high
  (max. 0,6mm in regards to the clutch drawing, in any case, please contact the clutch supplier and manufactor)
- orientation of disc is wrong (Note marking ‘flywheel side’ on retainer plate of the disc assembly!)
- disc is sticking on input shaft due to rust, dirt, wear or improper slip fit to input shaft
- release travel of actuation system is too short
- wear at pickle fork
- pilot bearing is defective and does not move freely
- due to rust or contamination the disc is sticking to the flywheel

4. Troubleshooting

4.1 Failure Analysis List

Clutch chutter

- deformation of cover/disc before/during installation or due to overheating of clutch
- wrong disc with chutter sensitive facing material
- contaminated facing
- disc is sticking on input shaft spline
- release fork is out of center and rotates release bearing
- air in hydraulic actuation system or actuation system is ‘sticky’
- engine/transmission mounts damaged (pseudo-chutter)
- release bearing “sticky” on the cover plate pipe
- wrong grease on the cover plate pipe

4. Troubleshooting

4.1 Failure Analysis List

Clutch noise

- unbalanced clutch
  (pressure plate balanced individually - holes drilled + cover assembly, disc is not balanced)
- preload of release bearing too low, release bearing runs not centric
- release fork is worn or bearing pre-load is too low (noise goes away when clutch is actuated)
- torsional damper defect or hysteresis reduced due to contamination with grease/oil
- grease filling of bearing gone due to overheating of clutch

4. Troubleshooting

4.1 Failure Analysis List

Others

- burst facing material
  --> DO NOT drive downhill in low gear with clutch disengaged
  (should be no concern with automized manual transmission)
- input shaft/disc hub splines damaged due to misalignment of engine to transmission
- interface transmission housing to flywheel housing is contaminated, damaged, loose and leads to misalignment
- destroyed pilot bearing which leads to misalignment or disengagement problems
- wear of synchronizer rings in transmission due to clutch drag

5. Inspection

Clutch is slipping

Facing Worn

(worn down to the rivet heads)

- Normal wear - end of clutch life
- Actuation System not correctly functioning (excessive slip time during engagement
- excessive pre-load causing slipping

Facing s burned/disintegrated

- clutch was permitted to slip continuously
- excessively high gear used for drive off
- defective release system
- oil or grease contamination

Facings contaminated with oil or grease

- Transmission or engine seals leaking
- excessive grease on input shaft and/or pilot bearing

DO NOT GREASE INPUT SHAFT DURING INSTALLATION
- spline of disc hub is pre-greased !

Facing does not contact entire surface

- flywheel not re-machined (grooved or concave due to excessive heat)

⇒ new cover assembly:
facing contacts only at outer diameter
NOT A FAULT !

⇒ new disc assembly:
facing contacts only at some points due to cushion springs underneath the facings
NOT A FAULT !

Not always is the clutch the reason for the slippage, also responsible can be the actuation system or wrongly resurfaced flywheel or the wrong clutch was installed.

5. Inspection

Clutch is slipping

Clutch Cover overheated/ damaged

- clutch permitted to slip continuously
- defective release system, e.g. pre-load too high
- oil or grease contamination
- clamp load insufficient

Diaphragm Spring fractured

- overpressure / release travel exceeded
- AS Tronic software does not fit towards the clutch layout application (reference: customer specification document)

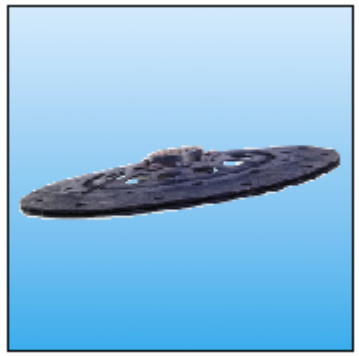
5. Inspection

Clutch does not disengage

Max. runout: approx. 0.5-0.6mm by using the correct meassurement tool (order no. Sachs: 4200 080 580)

Disc has excessive run-out

- disc bent during transportation or installation



Clutch disc warped **(cone shaped)**

- major overheating (steel components are discolored blue)

⇒ the specified pressure plate lift is not sufficient enough to release clutch disc

Hub / input shaft spline damaged

- transmission input shaft and clutch hub misaligned / forced together during installation

⇒ clutch disc does not slide freely on input shaft, causing release problems

Tangential leaf springs bent or deformed

- transportation or installation damage
- excessive play in drive train
- extreme deceleration loading resulting from
  - improper shifting
  - improper towing technique
  - operator error during rolling test bed

⇒ pressure plate does not disengage correctly

If the customer says that the clutch does not disengage, the clutch is not necessarily at fault. Frequently the release system is faulty or the pilot bearing worn out.

5. Inspection
Clutch chatter

Facings slightly oil or grease contaminated

- Transmission or engine seals leaking
- excessive grease on input shaft / pilot bearing

DO NOT GREASE INPUT SHAFT DURING INSTALLATION
- spline of disc hub is pre-greased !

Hub / input shaft spline damaged

- transmission input shaft and clutch hub misaligned / forced together during installation

⇒ clutch disc moves jerkily on the transmission input shaft

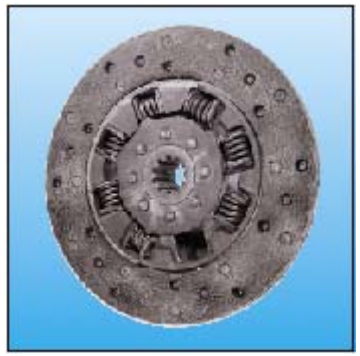
If the clutch chatters the clutch is not necessarily at fault. Frequently worn engine mounts or poor engine adjustments interfere with a smooth clutch engagement.

5. Inspection
Clutch noise

the hub can be rotated manually

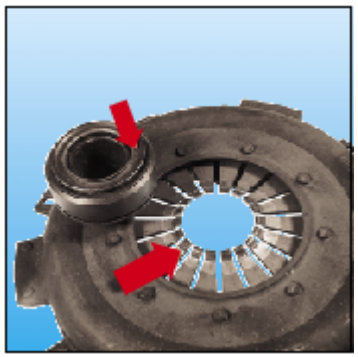
- the idle damper has small coil springs to prevent idle rattle noise

NOT A FAULT !



Retainer plates/ springs damaged

- misalignment of clutch housing to flywheel housing
- pilot bearing missing or damaged (input shaft not guided)
- excessive shock loads in drivetrain caused by
  - misshifts
  - docking operations
  - incorrect towing operations



Interface Bearing-Diaphragm / Bearing-Actuation fork worn out

- out of center setup of the release bearing caused by parallel offset
- guide quill worn
- excessive pre-load from actuator

The clutch is often defective. Some noises, e.g. clonk during shifting and engine shut off, are simply result from normal operation. The wrong part might be installed or the wrong way around.

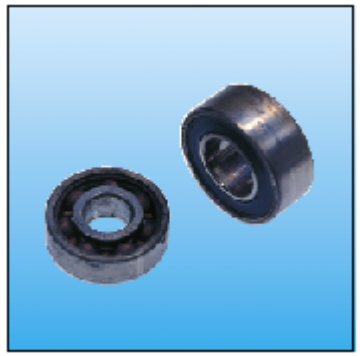
5. Inspection

Other failure modes

Shipment cups damaged

- transportation damage which leads to deformed tangential leaf springs

⇒ disengagement problems



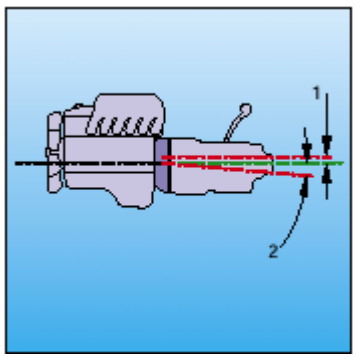
Pilot bearing

- jammed

⇒ input shaft drag leads to clutch not disengaging

- damaged

⇒ noisy operation (only with clutch disengaged)



1 Parallel Offset
2 Angular Offset

- incorrect centering between engine and transmission
- dirt/particles at interface of flywheel and transmission housing
- housing bolts loose

Guide quill

- worn

⇒ release mechanism reverses jerkily and clutch chutter might result

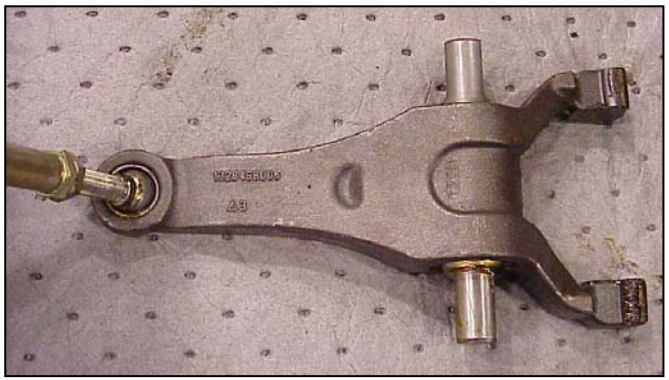
- burrs

⇒ releaser jammed = clutch is continuously disengaged

Many failures can be caused by peripheral components like pilot bearing, quill, release fork, actuator.

5. Inspection

Other failure modes



Release Fork

- excessive wear, deformation
- ball joint w/o grease, shaft w/o grease

⇒ disengagement problems, chatter

6 Lubrication specifications

Disc Spline/Transmission Input Shaft-Interface

→ **DO NOT** grease; the clutch disc spline is pre-greased by SACHS

Bearing sleeve/quill-Interface

→ **DO NOT** grease; grease would attract dirt/facing particles and would form an abrasive paste

Release fork/Bearing-Interface

→ ZF initially lubricates sides and ‘dogs’ of releaser fork with 5g of Optimol Olista Longtime (ZF order no. For the 1kg can: 0671 190 050)

Release Bearing

→ NO lubrication required; sealed bearing that is greased for life by SACHS