

REMOVAL / INSTALLATION INSTRUCTIONS

ZF-TRONIC[®]

**10 AS 2000 B, 10 AS 2010 B, 10 AS 2300 B,
10 AS 2310 B, 12 AS 2000 B, 12 AS 2300 B
Transmission and clutch removal and installation**

1327 754 104

Subject to alterations in the design

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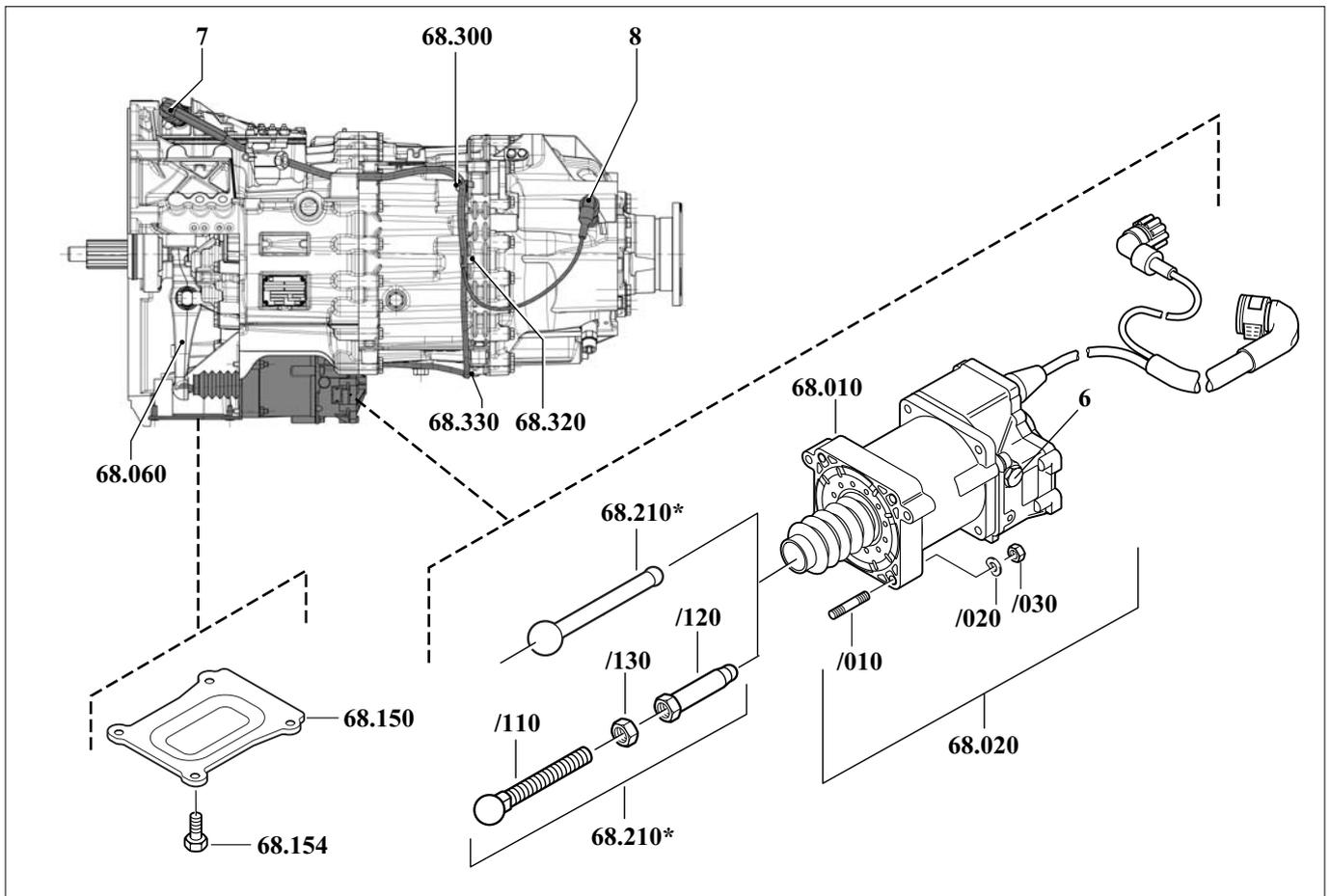
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0018 484

⚠ DANGER

If the transmission is not suspended unsupported, the engine must be supported (place supports under engine).

CAUTION

The transmission must not be supported on the clutch actuator. Such action could result in the clutch actuator or transmission being damaged.

Park vehicle on flat ground.
 Shift transmission into neutral.
 Switch off engine.

⚠ DANGER

Secure vehicle to prevent it from rolling away.

Interrogate transmission error memory.

NOTE

If the error memory is interrogated later, another error will occur for each interrupt to the transmission connection (unplug the connector).

Note down content of error memory.

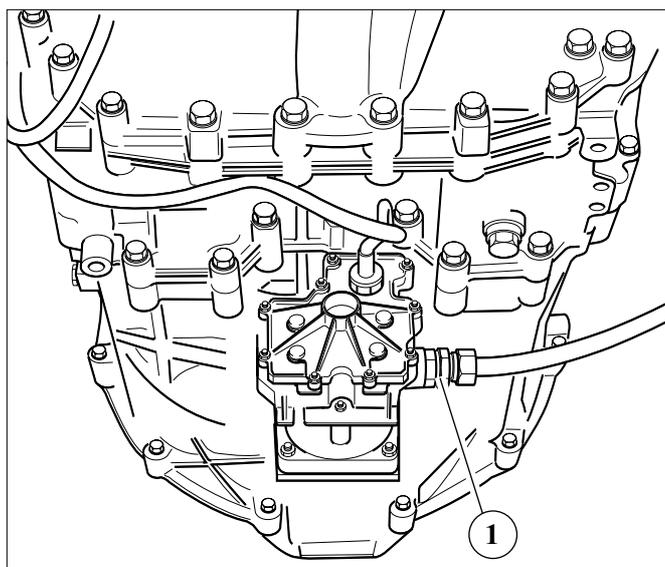
Switch off ignition.

Dismantling the clutch actuator

⚠ DANGER

Wear protective glasses when dismantling and fitting air and oil connections. Compressed air may escape. Risk of injury from particles of dirt.

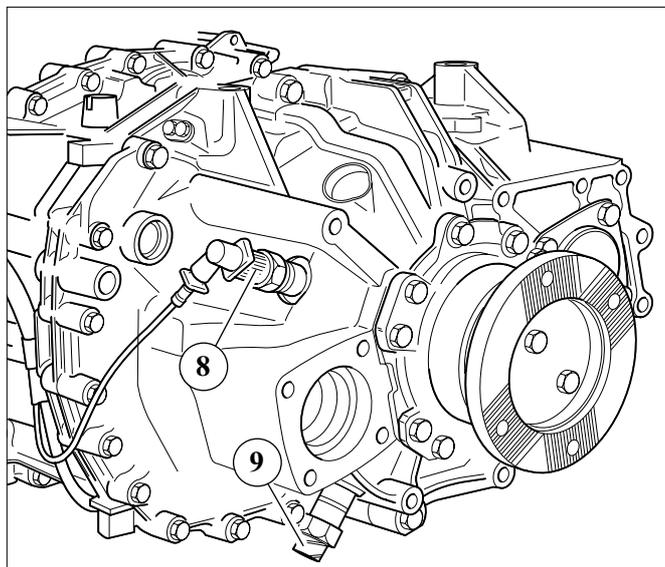
Remove compressed air line from clutch actuator (1).



018 466

Pull connector off transmission end output speed sensor ((8), also see next diagram) .

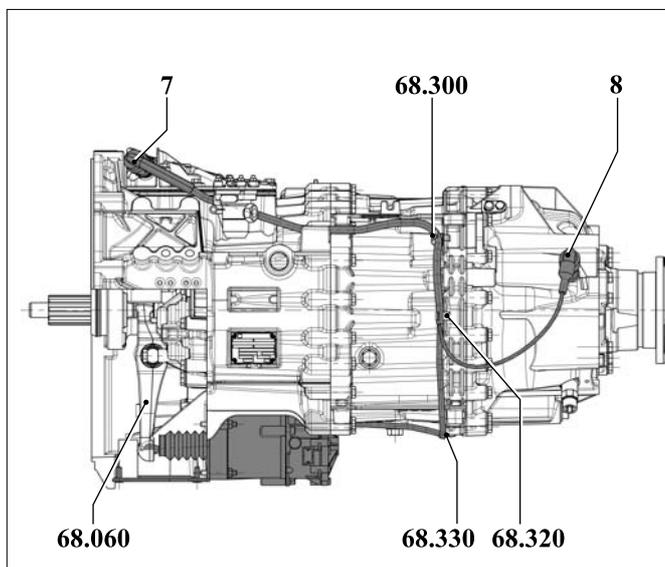
Pull connector off vehicle end output speed sensor (9).



018 463

Pull plug connection (“Transmission” end) (7) off transmission actuator.

Remove wiring harness from cable clips (68.300, 68.320 and 68.330).



018 483

Bleed clutch actuator.

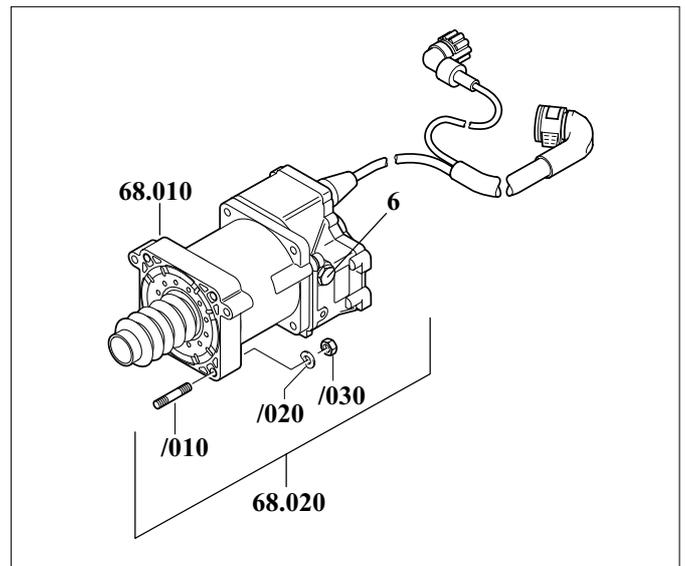
To do this, loosen M12x1.5 hex bolt (6).

Once the clutch actuator has been bled, tighten hex bolt (6) to 22 Nm.

Remove 4 M8 hex nuts and washers (/030).

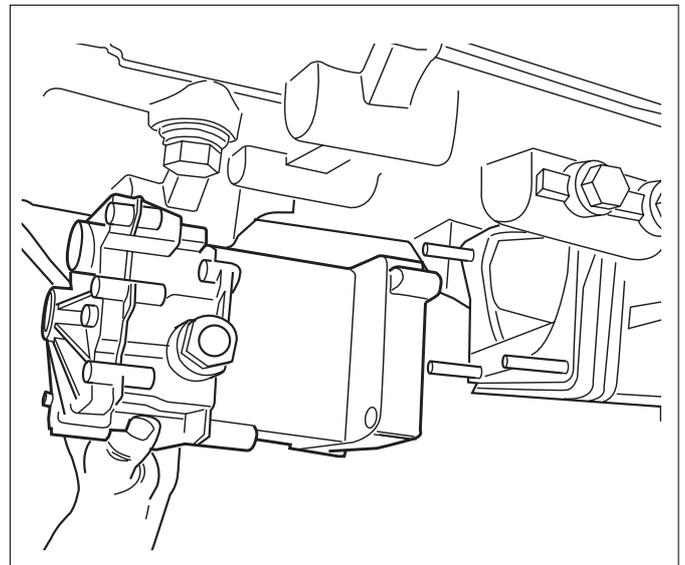
NOTE

While the clutch actuator is being dismantled, the ignition must be switched off and must not be switched on under any circumstances.



018 491

Take off clutch actuator (68.010).



018 402

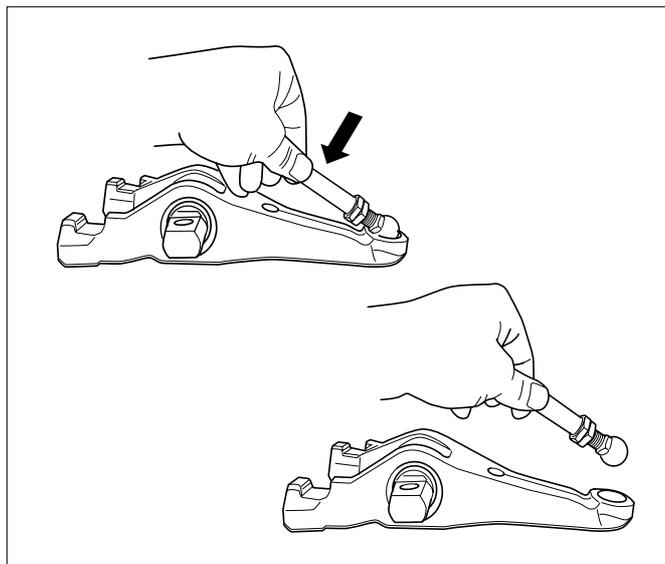
Transmission removal

Unfasten push rod from release fork by pressing push rod towards fork.

Take out push rod.

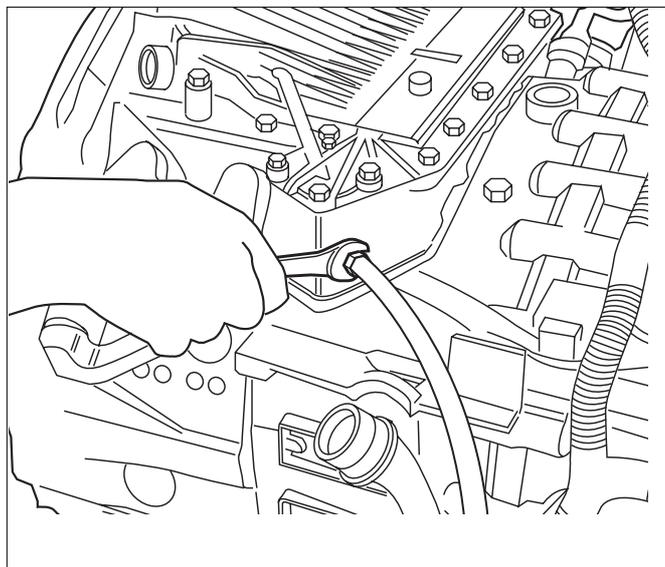
NOTE

If push rod is not removed, this may wedge in transmission housing and block movement of release fork when transmission is pulled off engine flywheel disc.



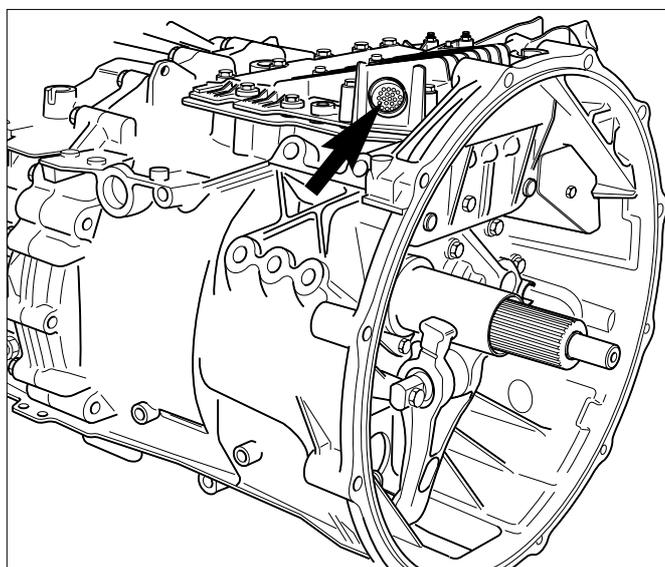
018 473

Remove air supply hose from transmission actuator.



018 403

Pull connector off transmission actuator at vehicle end of vehicle wiring.

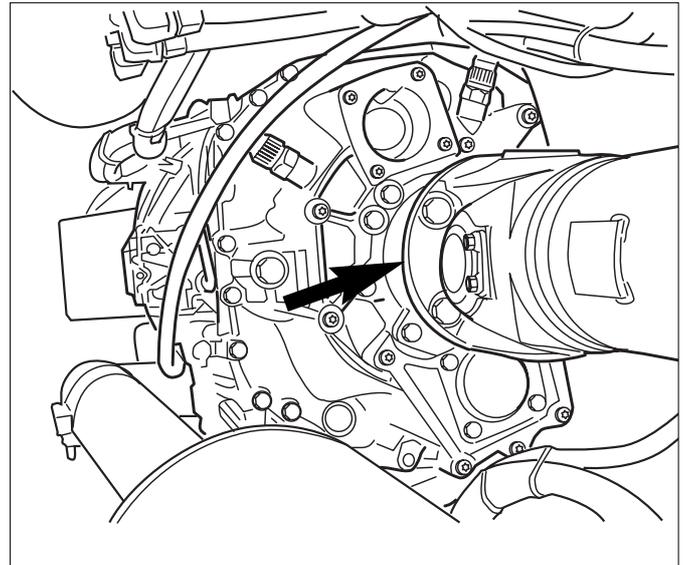


018 464

CAUTION

When disconnecting driveline flange, note the guidelines provided by the vehicle manufacturer and manufacturer of the driveline.

Remove flanges from driveline (cardan shaft).

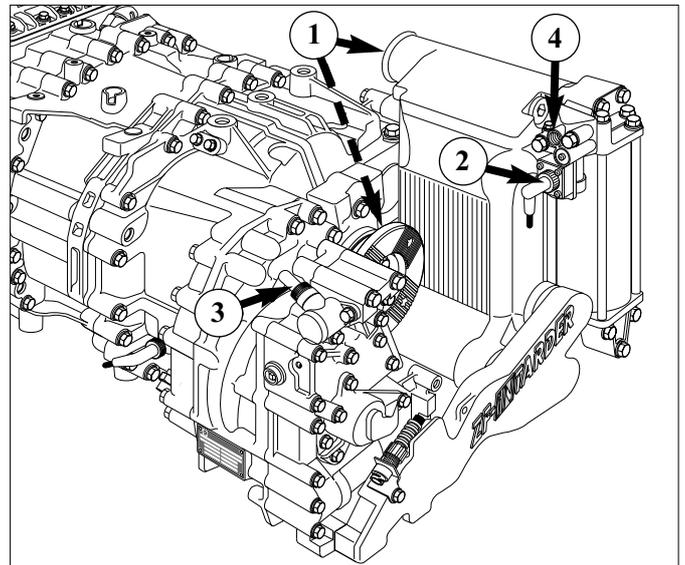


018 410

NOTE

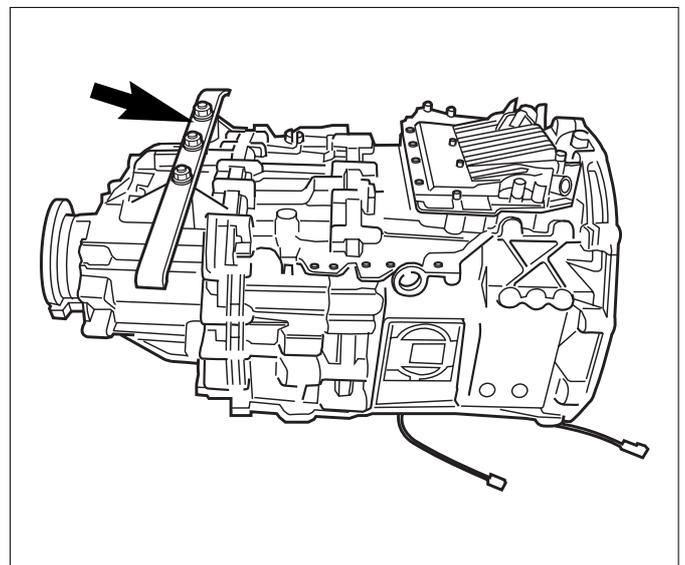
When working on bus applications with ZF Intarders, the following tasks also have to be carried out:

- Drain off coolant.
- Remove water piping (top and bottom) (1).
- Remove electric connection plug: accumulator charge valve (2) proportional solenoid valve (3)
- Remove air connection (4) from accumulator.



018 730

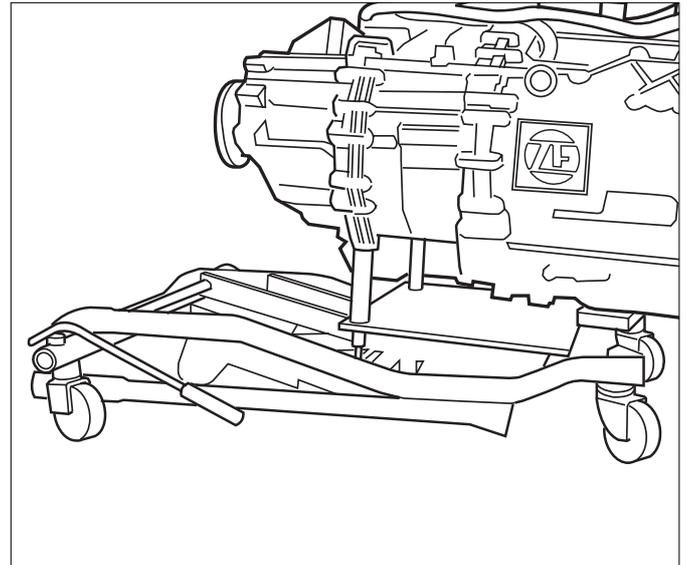
If fitted, remove rear transmission mounting.



018 411

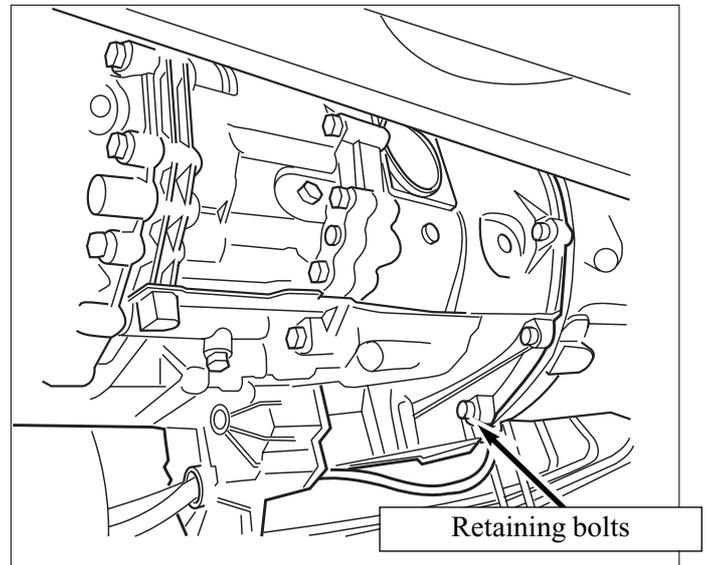
⚠ DANGER

Securely fasten the transmission (still fitted to the vehicle) onto a trolley. Otherwise, the transmission may fall out and cause injury to bystanders or damage to transmission components.



018 412

Remove 12 bolts with which transmission is secured to flywheel housing.



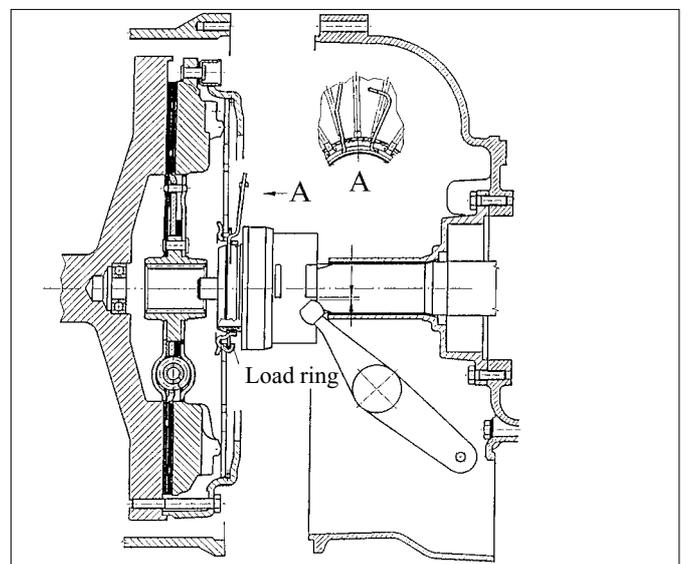
018 413

Carefully pull transmission (secured to the trolley) off flywheel housing from behind.

In so doing, the release fork ends slide over the release bearing cams.

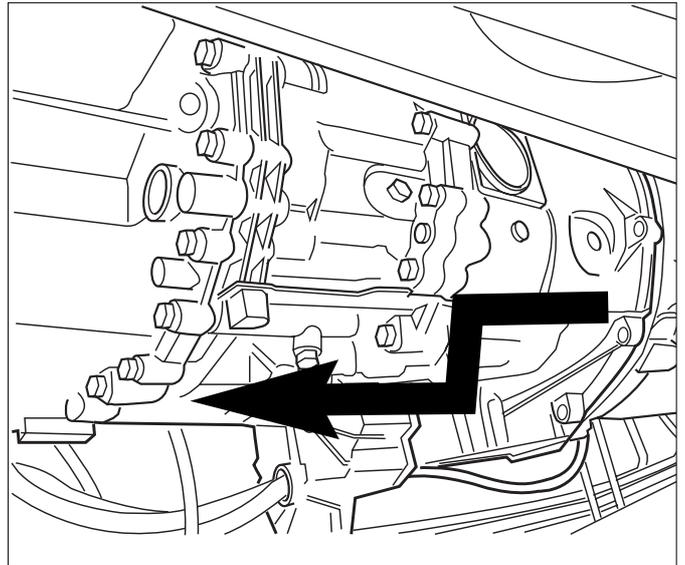
NOTE

The push rod should have been removed previously. (See p. 3-1, top diagram)
Otherwise the free end may drop down and prevent the release fork from sliding out.



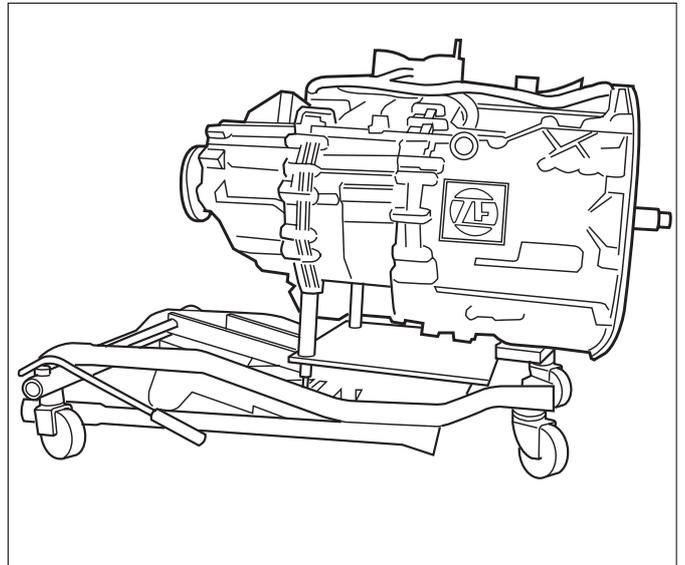
018 497

Lower transmission.



018 414

Remove transmission on trolley from vehicle.



018 412

Clutch removal

⚠ DANGER associated with the handling of fibres not containing asbestos.

Some clutch parts may contain fibres not containing asbestos and their long-term effects on health are not known.

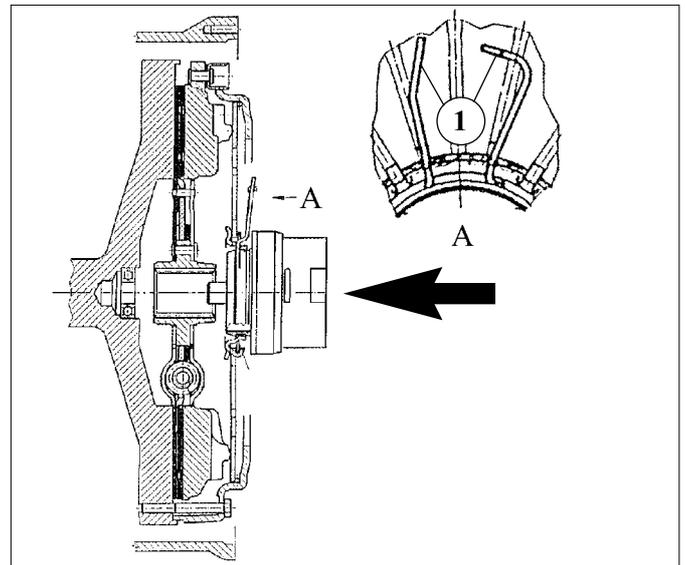
Take care when working with fibrous materials not containing asbestos.

A summary of the possible health risks and recommended methods for work can be found in Annex A of these instructions.

Open load ring ends (1).

Forcefully push release bearing against pressure plate of clutch (in direction indicated by arrow). The load ring will thereby widen.

Take out release bearing.



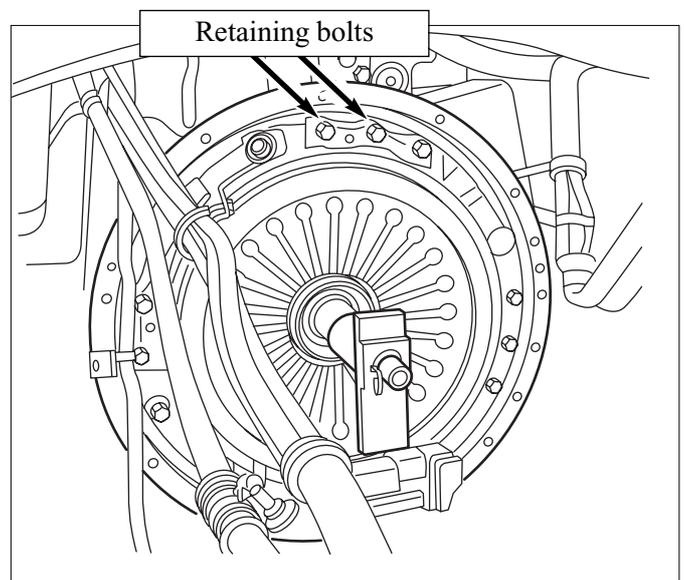
018 493.tif

⚠ DANGER

During removal, the input shaft must not be used to hold or support the clutch. Such action could result in the pilot bearing being damaged or the clutch falling resulting in injury to bystanders or damage to clutch components.

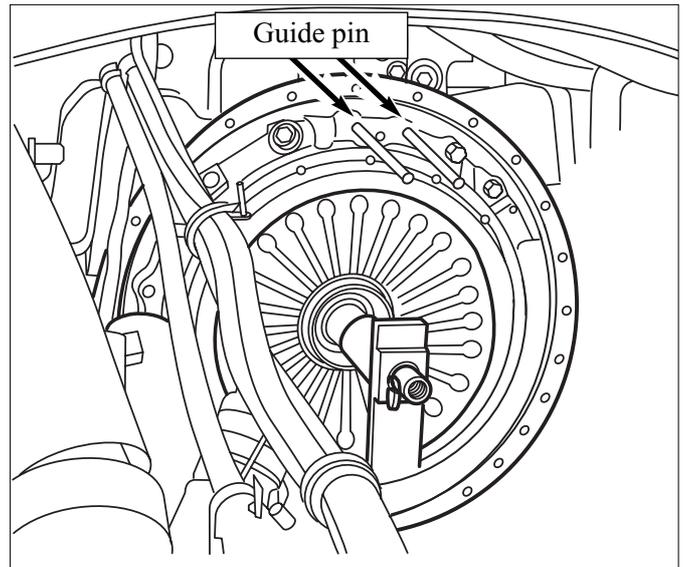
Securely fasten clutch to a clutch trolley or an appropriate support.

Remove both bolts from upper side of clutch bell housing.



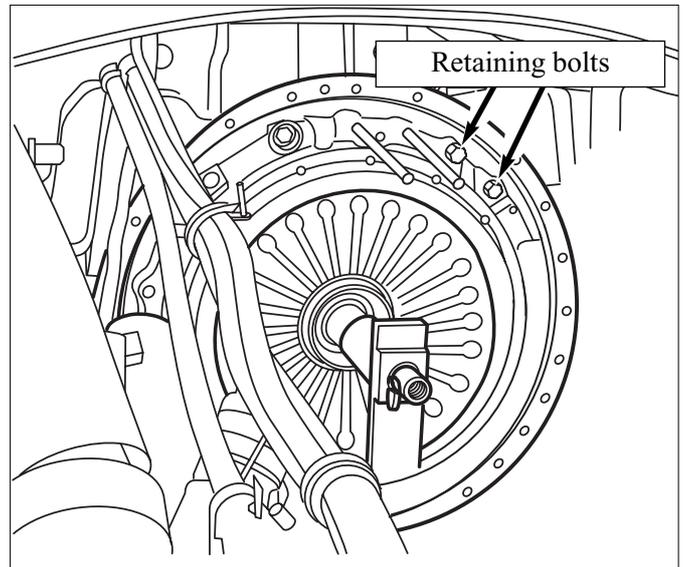
018 415

Screw guide pins into threaded holes.



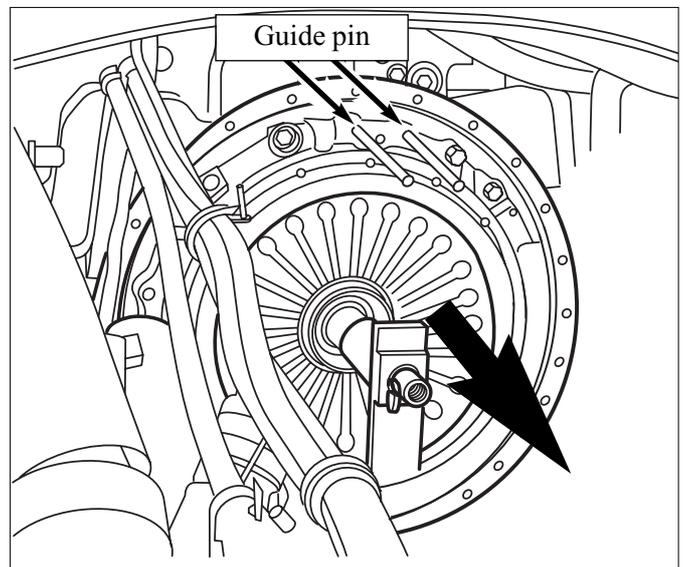
018 416

Remove all other retaining bolts from clutch bell housing.



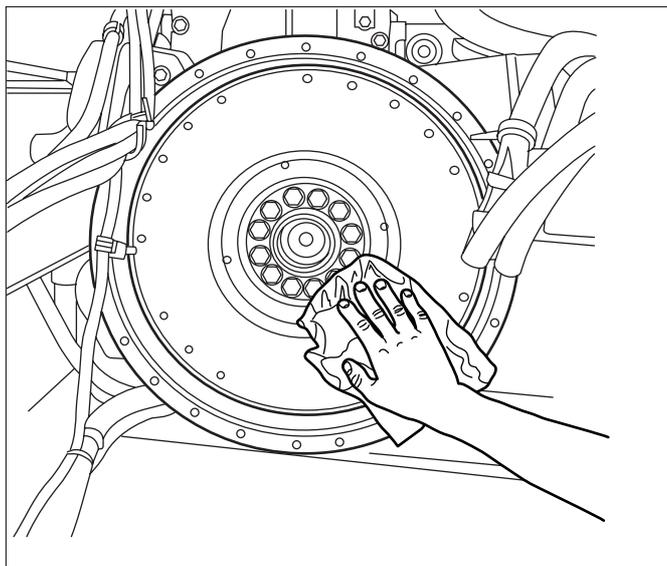
018 416

Carefully draw back clutch and pull out of flywheel housing using the guide pins.



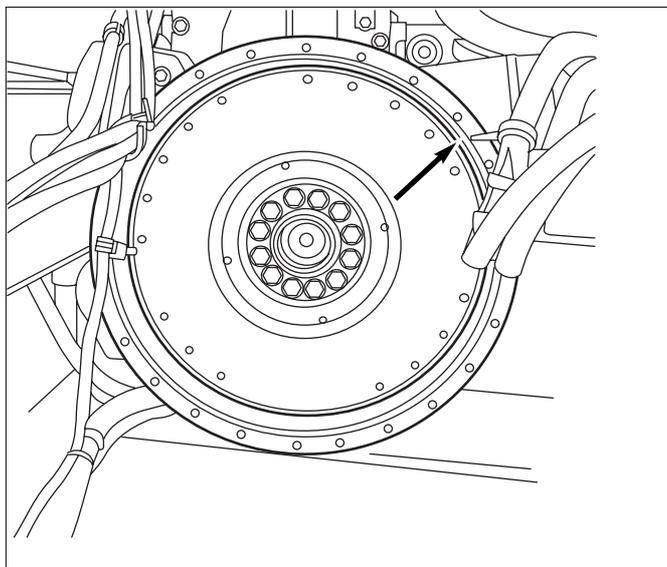
018 416

Use a lint-free cloth to clean surfaces of flywheel and flywheel housing.



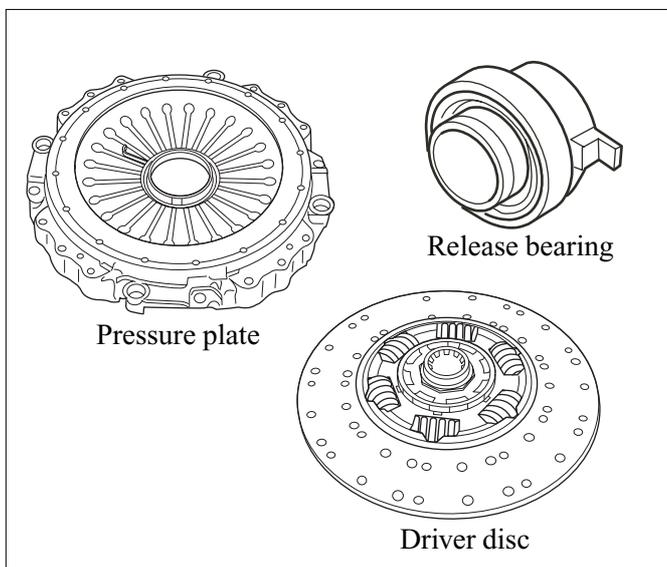
018 417

Check flywheel and centring edge of clutch housing for damage.
If necessary, note service instructions of engine manufacturer.



018 418

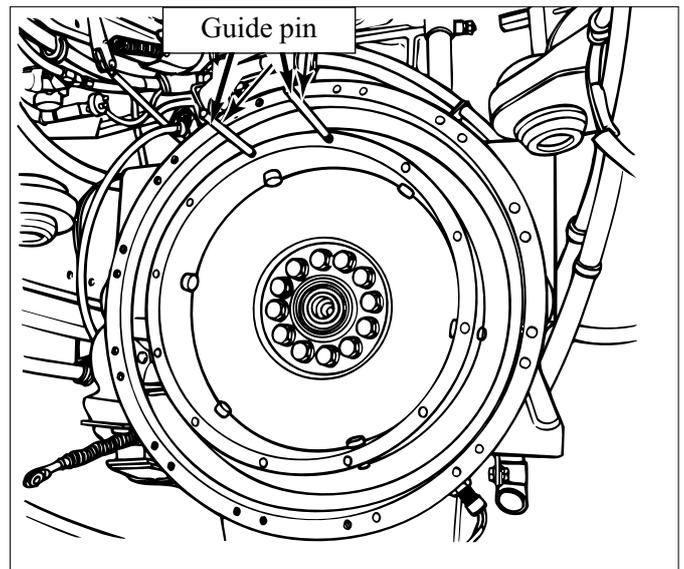
Check pressure plate, clutch disc (driver disc) and release bearing for damage.



018 420

Clutch installation

Screw guide pins into **upper** bolt holes of flywheel.



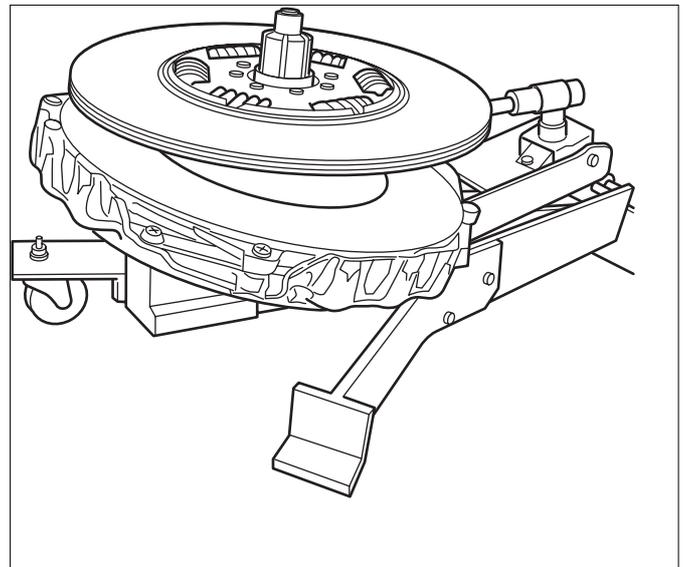
018 421

Fit driver disc and pressure plate without grease.
If necessary use brake cleaner to first degrease parts.
If necessary, remove any old corrosion inhibitor.

⚠ DANGER

During removal, the input shaft must not be used to hold or support the clutch. Such action could result in the pilot bearing being damaged or the clutch falling resulting in injury to bystanders or damage to clutch components.

Slide the clutch (secured to a clutch trolley or an appropriate support) into the vehicle.

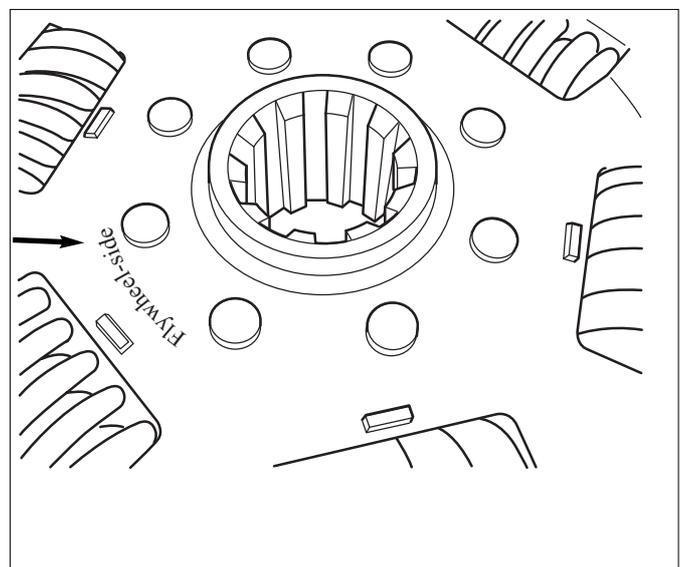


018 422

CAUTION

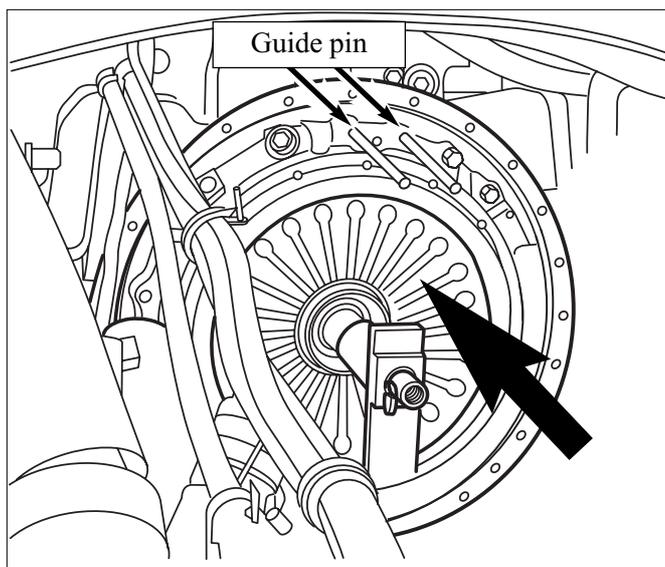
The flywheel end of clutch is marked with "flywheel end".

This end must face the engine connection.



018 423

Slide pressure plate and driver disc over guide pins.
In so doing, ensure that the entire pressure plate is on
the flywheel.

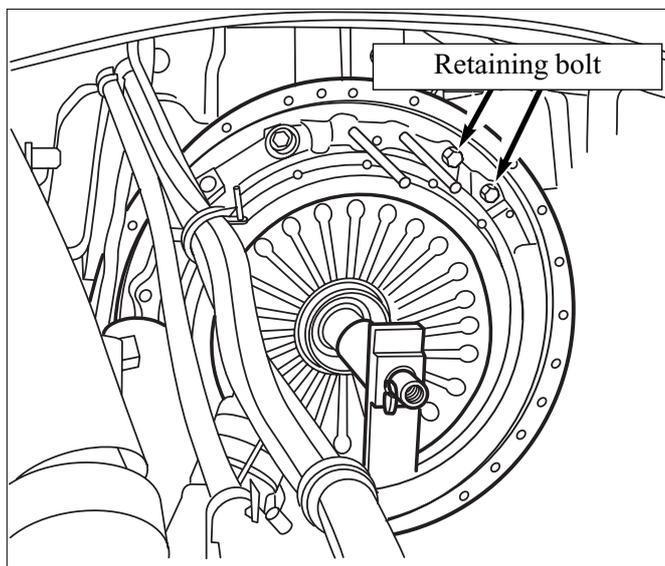


018 416

⚠ DANGER
when using Loctite.
Note the manufacturer specifications to avoid eye
and skin irritations.

Coat threads on 12 retaining bolts of pressure plate
with bolt securing Loctite 222.

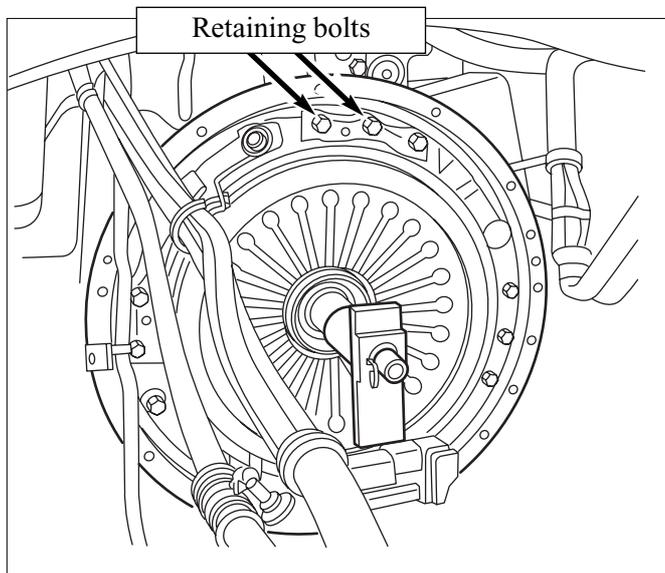
Insert bolts and gently tighten by hand.



018 416

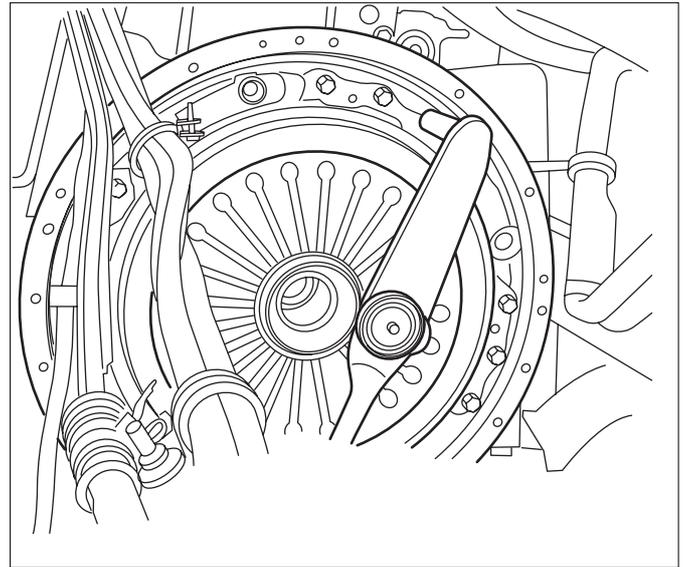
Remove guide pins.

Insert remaining 2 bolts.



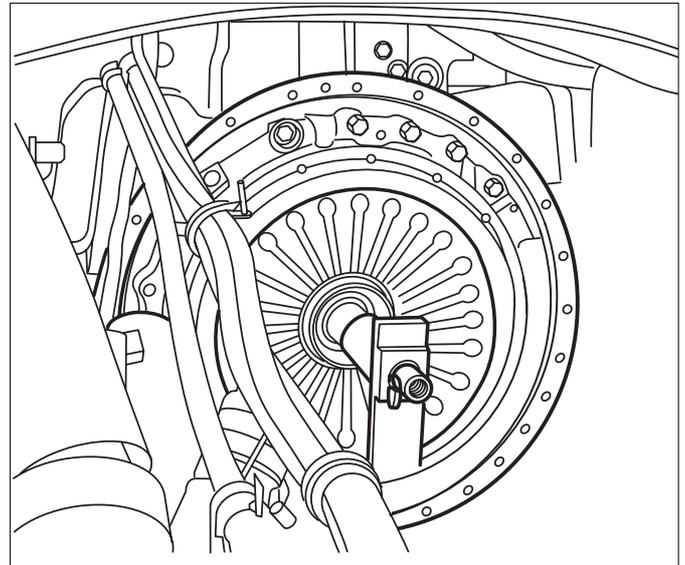
018 415

Retighten bolts crosswise in several cycles, each of approx. 1 revolution. Continue until all bolts are tightened.
Use torque wrench to tighten bolts to specified level of torque.
Tightening torque: refer to specification of engine or vehicle manufacturer



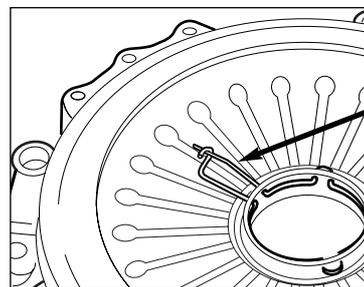
018 424

CAUTION
The alignment shaft should slide out easily.



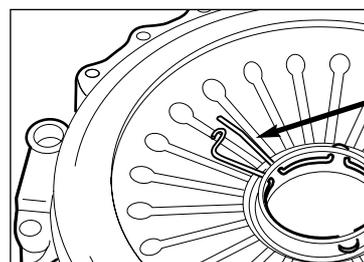
018 425

Before installing the transmission, check that the load ring ends are properly attached.



Load ring closed
(hooked together)

018 426



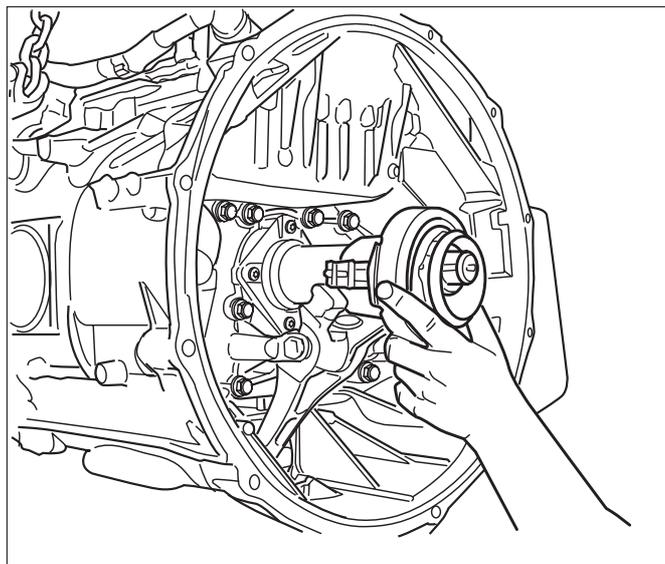
Load ring opened
(disconnected)

018 451

NOTE

Do not grease release bearing (Teflon bush).
If using new or replacement transmissions,
preservation agent must be cleaned off the guide pipe
(degreased).

Slide release bearing onto guide pipe.



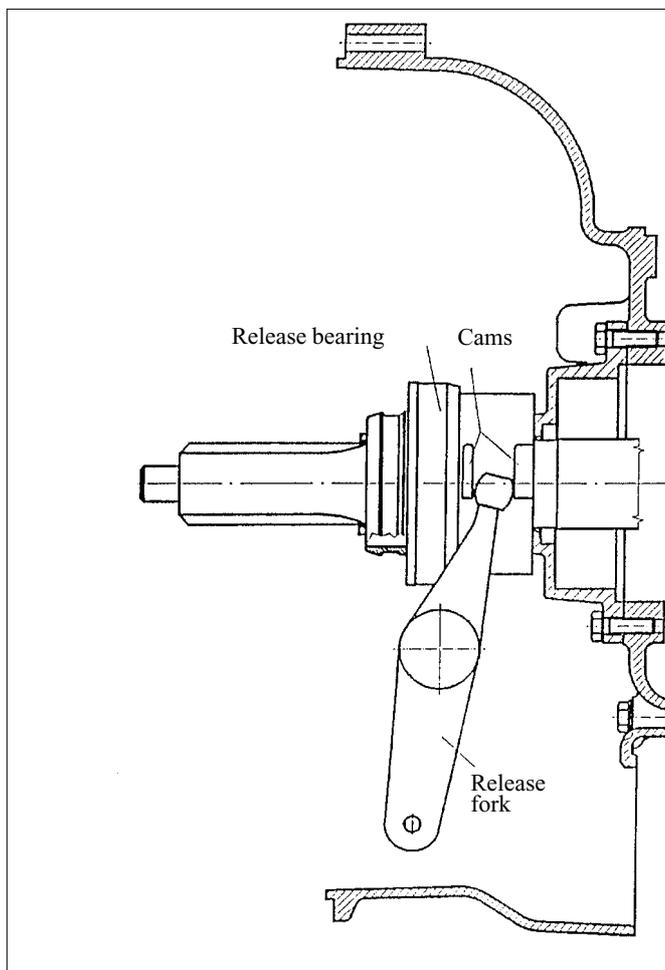
018 427

Insert ends of release fork between release fork cams.

Slide back release bearing until it reaches the stop.

NOTE

The clutch is automatically adjusted from the
transmission input shaft. Further adjustments are not
required.

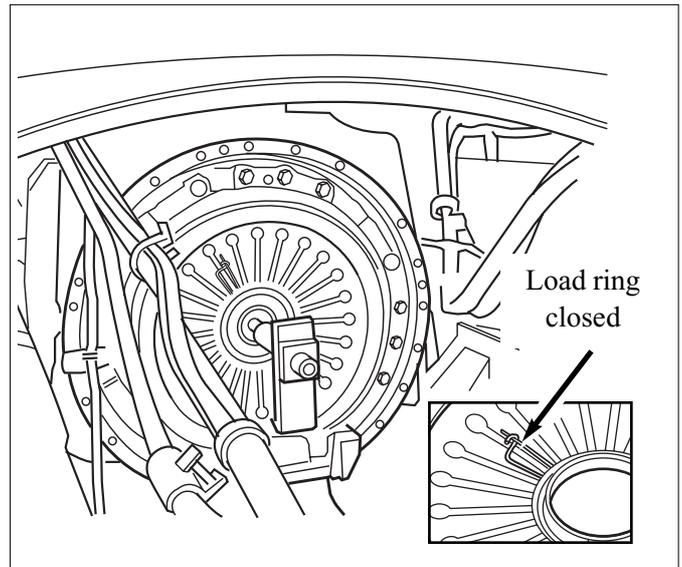


018 663

Transmission installation

Install clutch. (See Clutch installation)

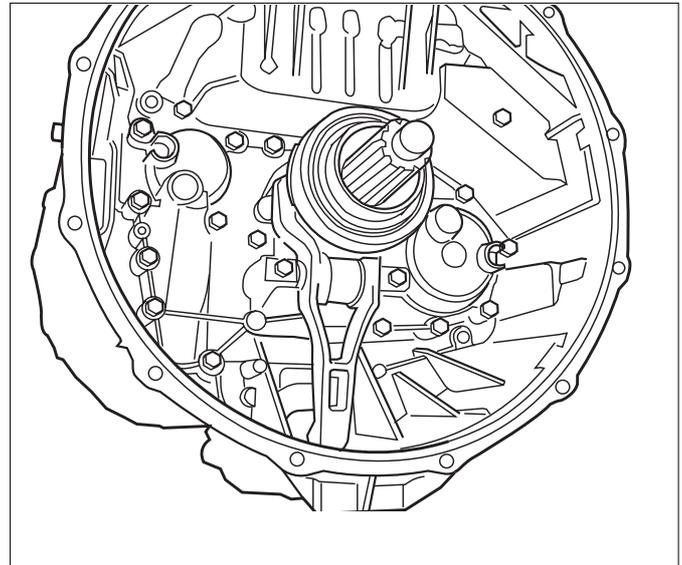
Ensure that the load ring is closed, i.e. the load ring ends are hooked together.



018 428

Check release bearing and components of release fork for damage. Replace damaged parts.

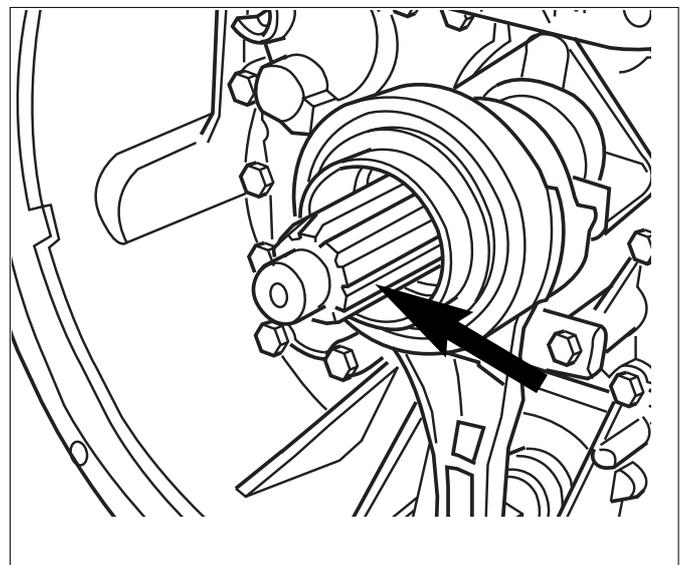
- a) The shift fork components must be able to rotate freely and easily around their mounting point. The lateral clearance of the rotary axis must not be too great.
- b) The release bearing must slide easily over the input shaft.



018 429

Check spline profile on input shaft for wear and damage.

Smoothen out any slight scratches on the input shaft with emery boards or carborundum blocks.

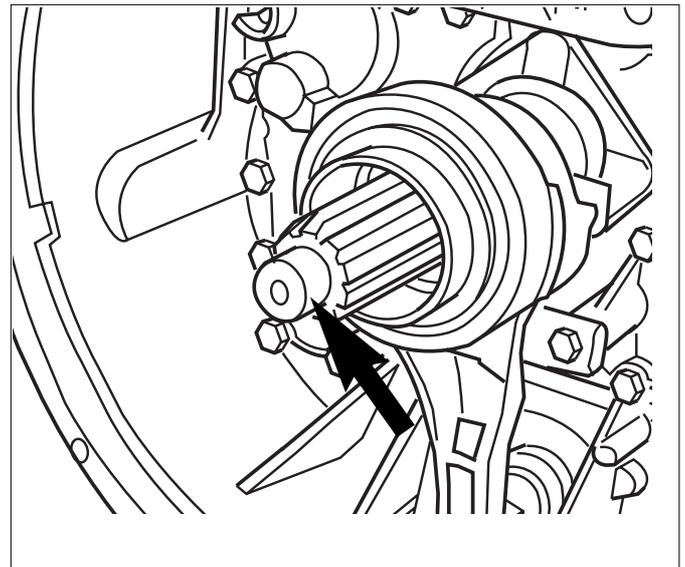


018 431

Check the end of the input shaft at which the pilot bearing is located.

Smoothen out slight scratches with emery boards.

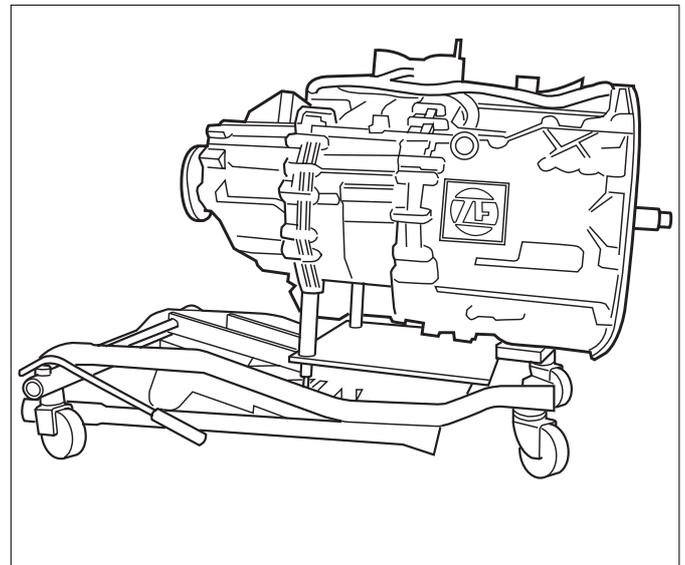
If necessary, replace pilot bearing



018 431

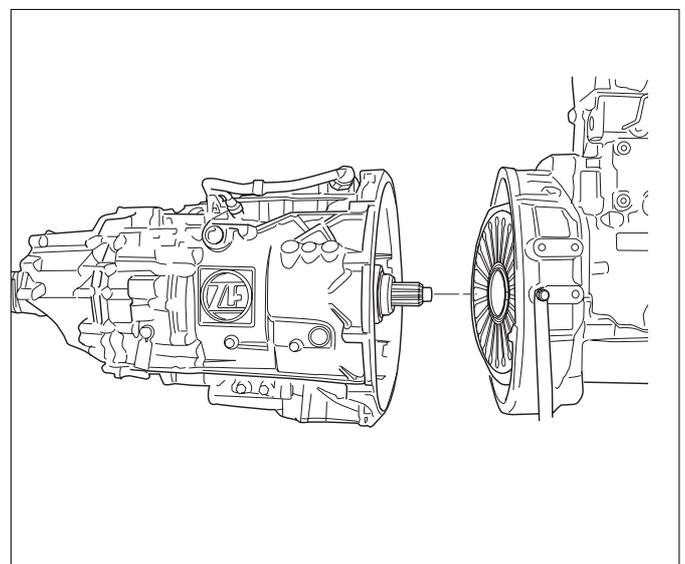
⚠ DANGER

Securely fasten transmission onto a trolley.
Otherwise the transmission may fall and cause
injury to bystanders or damage to transmission
components.



018 412

Align transmission so that the input shaft is in a line
with the pilot bearing.



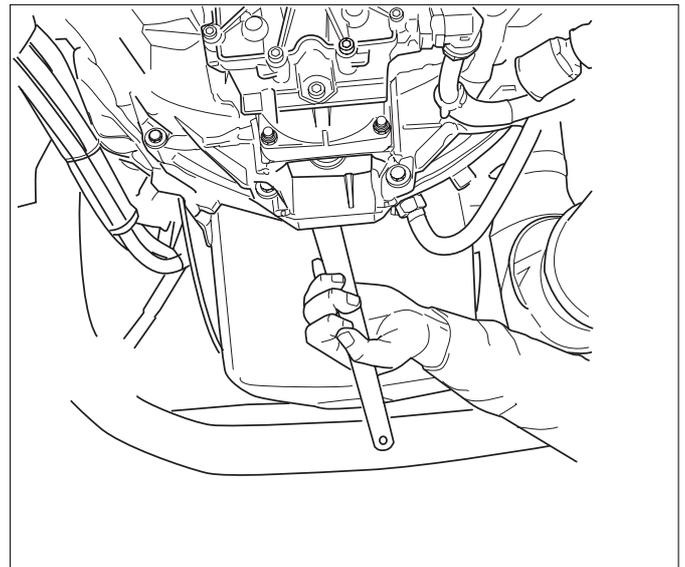
018 432

CAUTION

Carefully insert transmission input shaft into clutch disc hub. Do not use force to push or knock input shaft into hub. Otherwise clutch disc or clutch bell housing could be damaged.

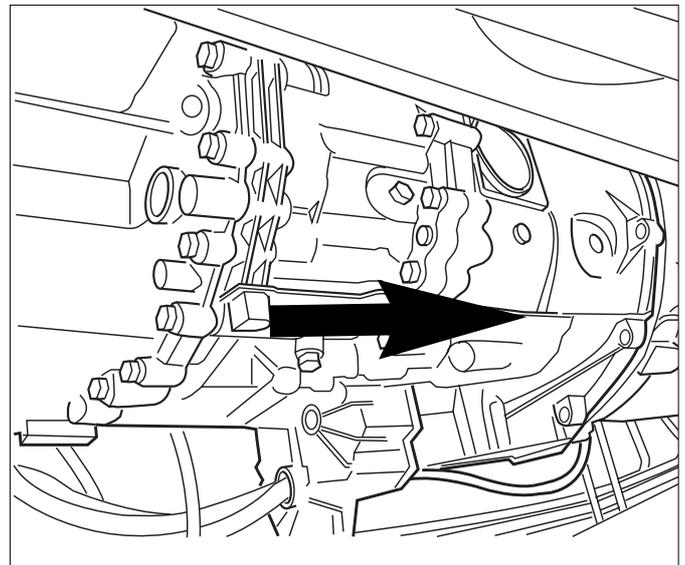
NOTE

The transmission is in neutral.
If necessary, long tongs etc. must be used to gently rotate the input shaft and gently slide the spline profile of the input shaft and clutch disc hub into one another.



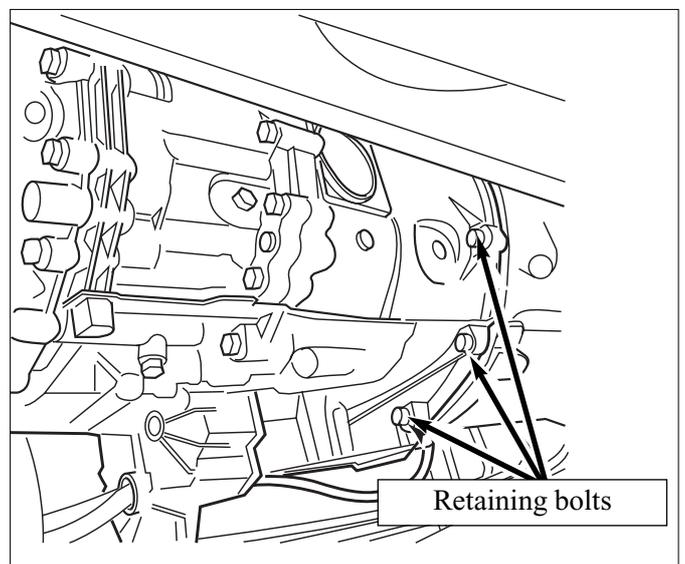
018 433

Slide transmission towards engine flywheel housing.



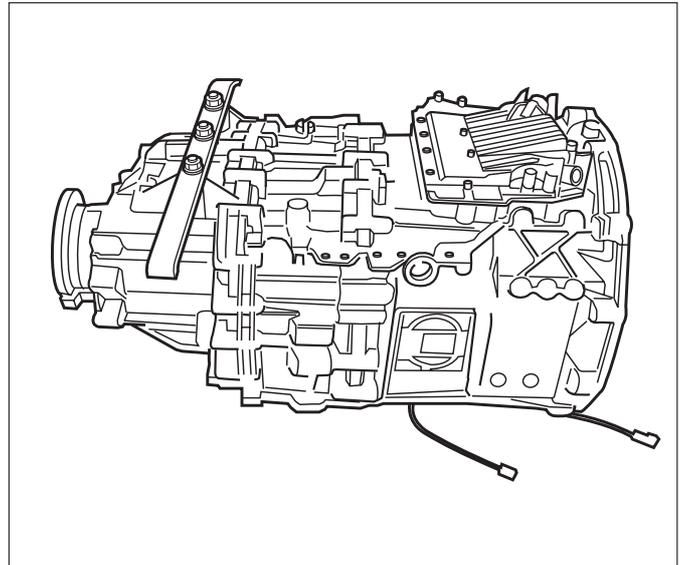
018 414

Use 12 bolts to secure transmission to flywheel housing.
Tighten bolts crosswise in accordance with specifications provided by vehicle manufacturer.



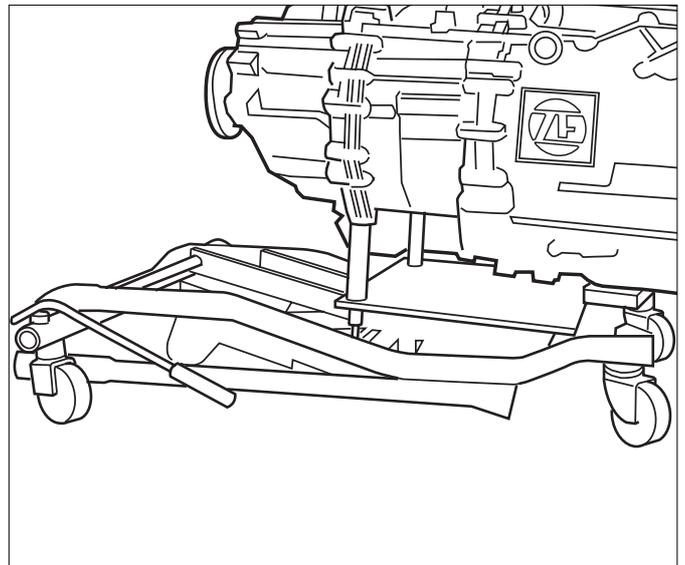
018 413

If necessary, secure rear transmission mounting.



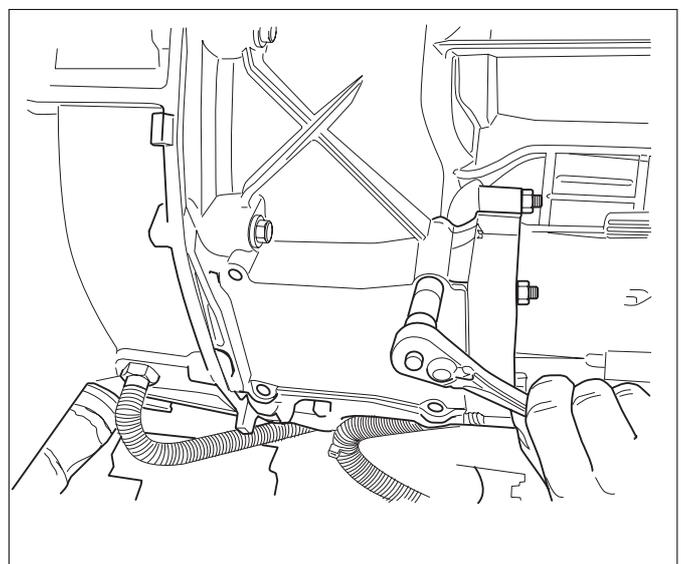
018 411

Remove trolley from transmission.



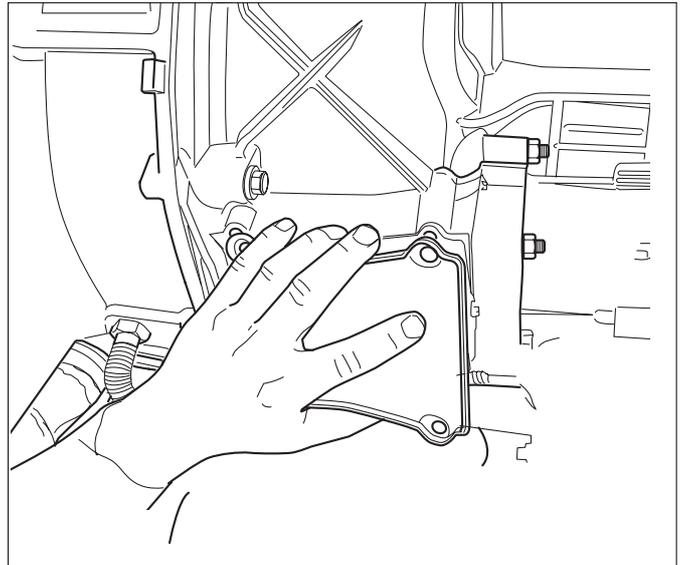
018 412

Remove 4 bolts from clutch inspection cover.



018 405

Remove clutch inspection cover.



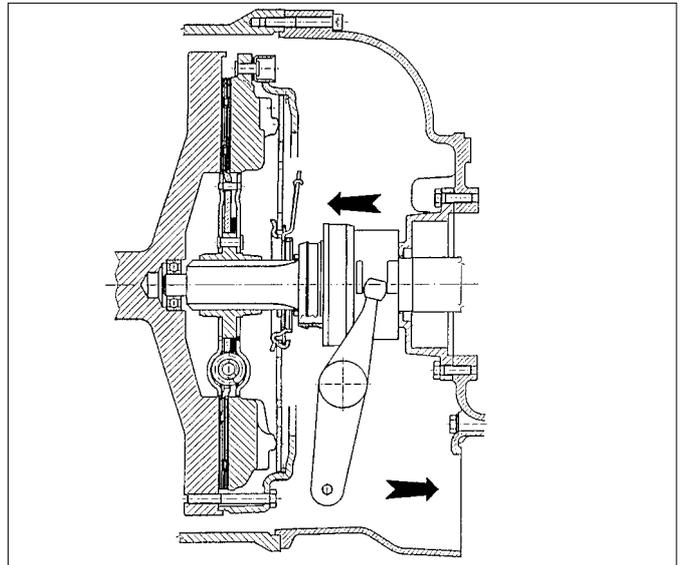
018 406

Secure release bearing in load ring by using a levering tool (pry bar) to press lower end of release fork towards transmission output. The upper end of the release fork thereby presses the release bearing towards the engine until it snaps into the load ring.

NOTE

You must be able to feel and hear it snapping in.

By pressing the fork towards the engine, check that the connection has snapped in correctly.

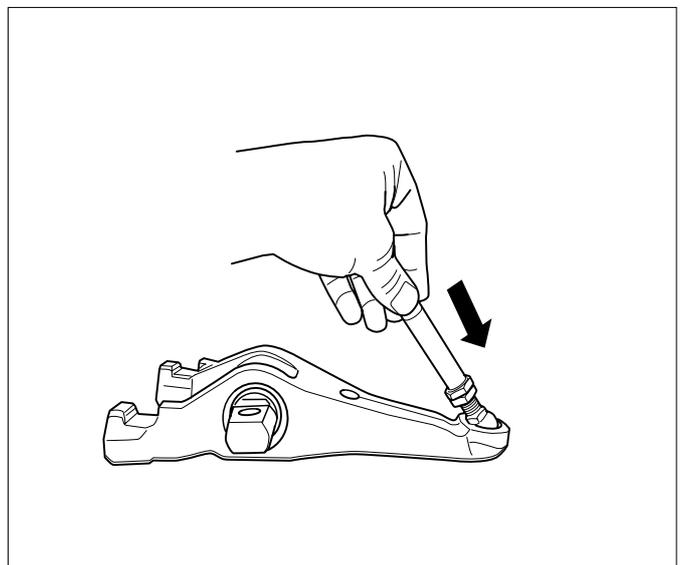


018 495

Insert push rod in release fork.

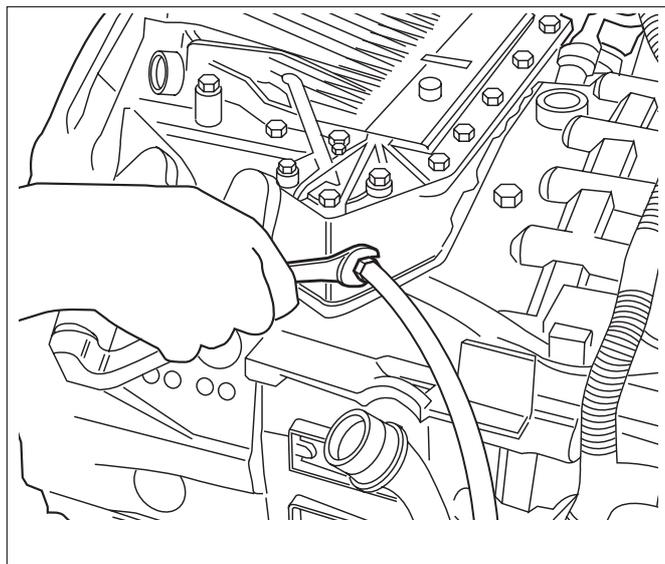
NOTE

The push rod length should always match the relevant engine/clutch/transmission assignment and content of the transmission parts list precisely.



018 498

Connect air supply hose to transmission actuator.



018 403

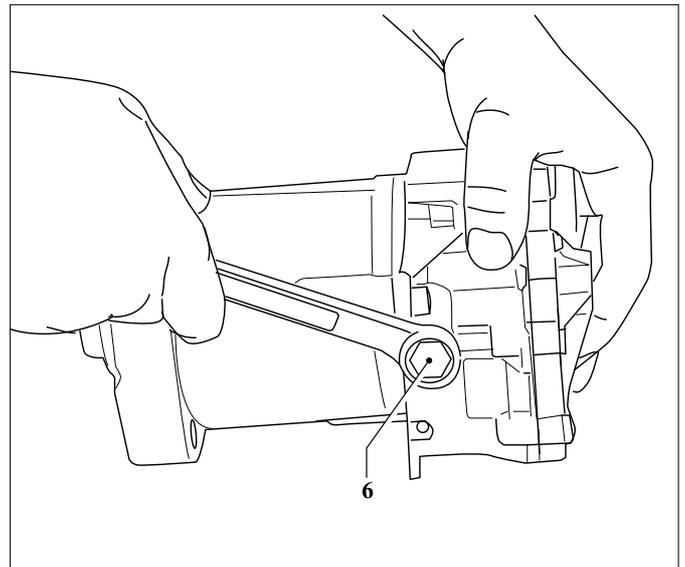
Fit clutch actuator.
SEE FOLLOWING PAGES

Fitting the clutch actuator

Bleed clutch actuator.

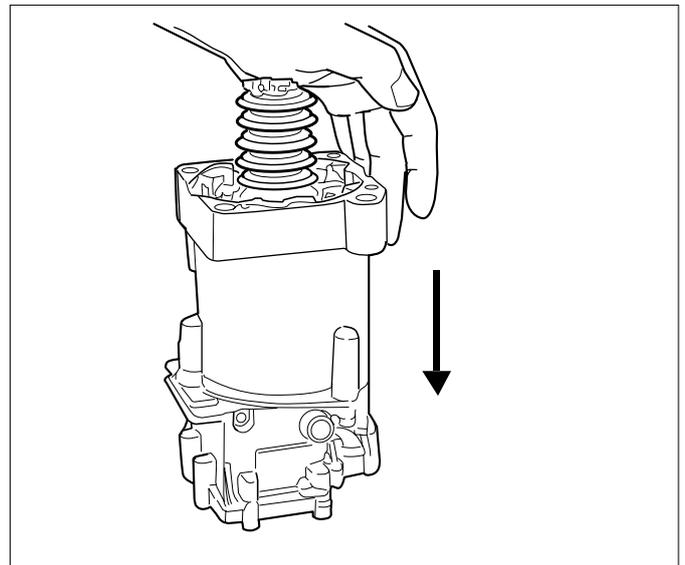
Loosen M12x1.5 bolt (6).

Check seal on bolt for wear and if necessary replace.



018 475

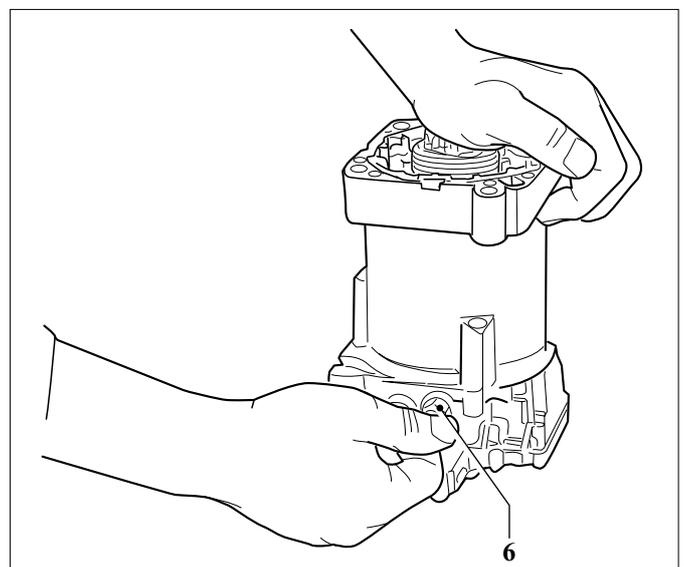
Press back piston.



018 476

Hold down piston and tighten bolt (6).

Tightening torque: 22 Nm



018 477

If not yet done, insert push rod (68.210) in release fork (68.060). (See diagram, p. 6-6 top)

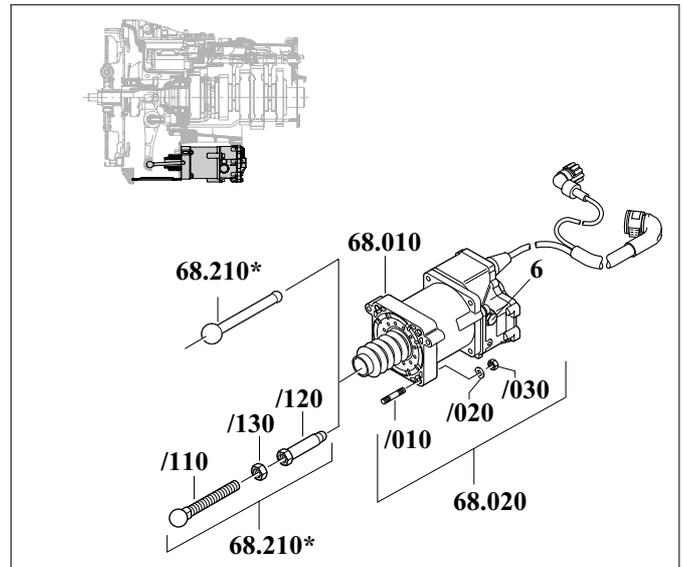
Use 4 M8 hex nuts (/030) to secure clutch actuator (68.010) and 4 washers (/020).

In so doing, check connections are in correct position and that push rod (68.210) is seated correctly in release fork and clutch actuator.

Tightening torques:

M8 hex nut (/030) 23 Nm

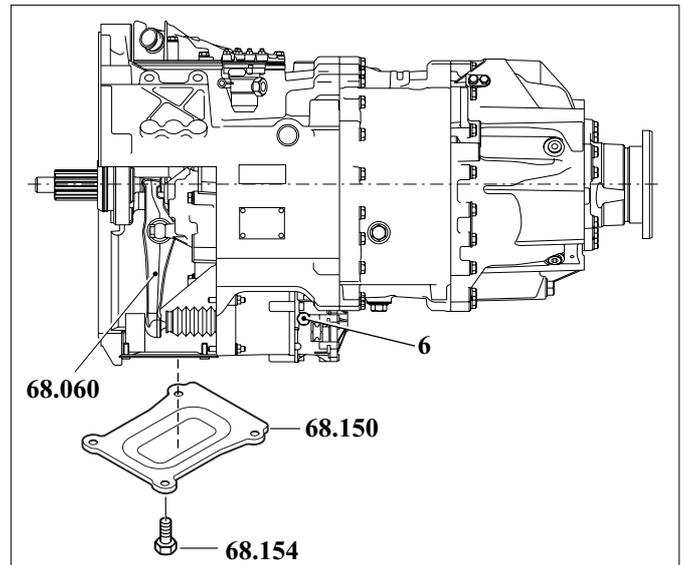
M8 stud bolt (/010) 10 Nm



018 481

Loosen bolt (6) and wait until piston is extended. In so doing check that push rod (68.210) is seated correctly in release fork (68.060) and clutch actuator. Retighten bolt (6) to 23 Nm.

Use 4 M8 hex bolts (68.154) to secure cover (68.150). Tightening torque 23 Nm



018 482

CAUTION

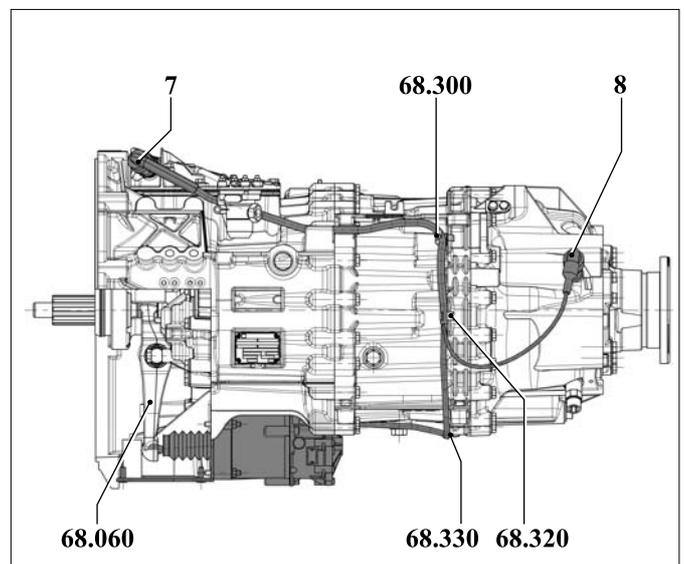
- Do not bend cable or tighten hard.
- Avoid chafing points.
- Fit connector with traction relief and check detent.

Check cable clips (68.300, 68.320 and 68.330) for damage and replace if necessary.

Press wiring harness into cable clips.

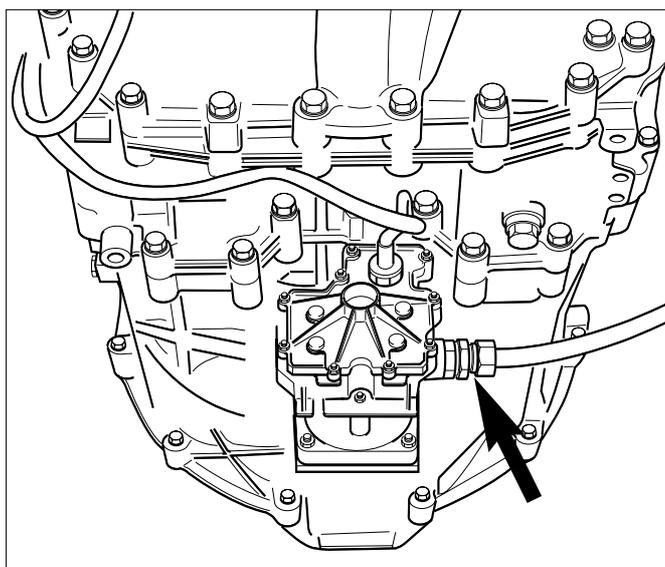
Connect 18 or 20-pin connector (7) to transmission actuator and connector connector (8) to transmission end of output speed sensor.

Connect compressed air line (9) to clutch actuator.

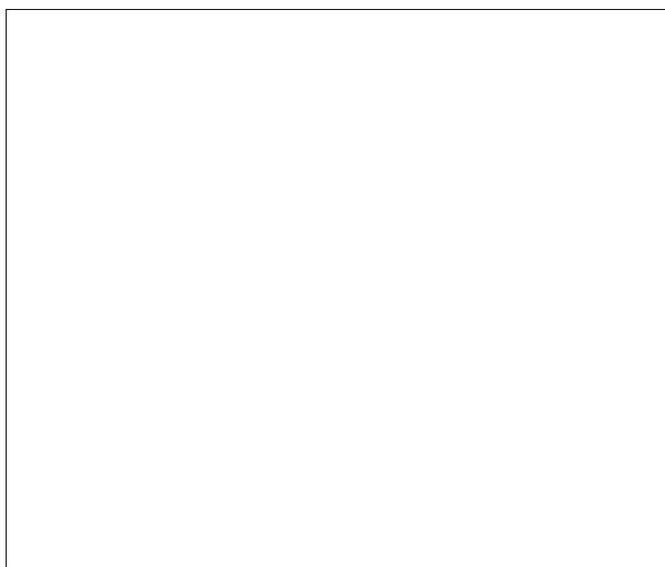
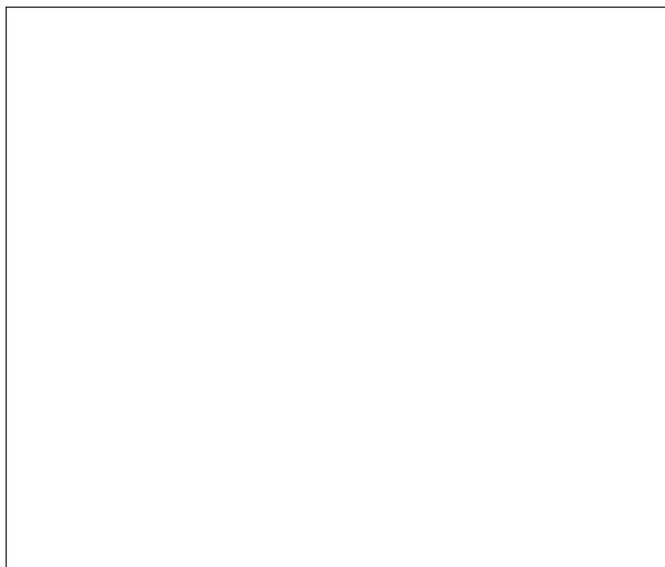


018 483

Connect air supply lines to clutch actuator.



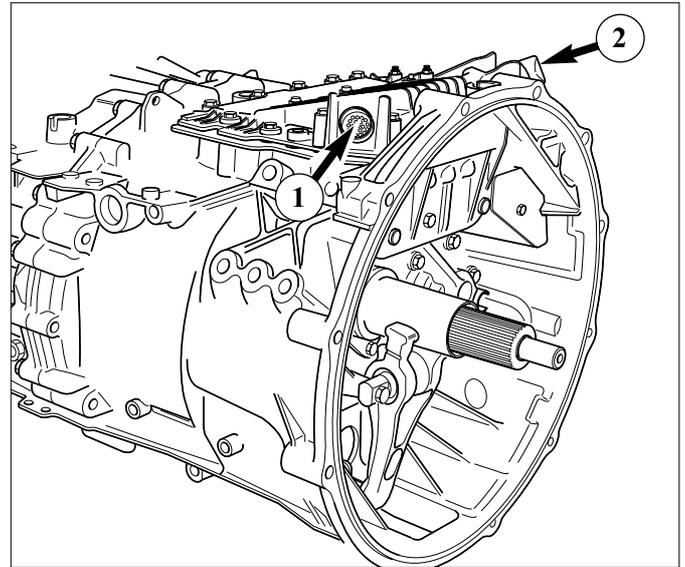
018 466



Vehicle connections, oil level check

Connect connector at vehicle end („vehicle“ side) (1) to vehicle wiring, until locking is audible.

Connect connector at transmission end („transmission“ side) (2) of central wiring harness to the clutch actuator to vehicle wiring, until locking is audible.



018 464

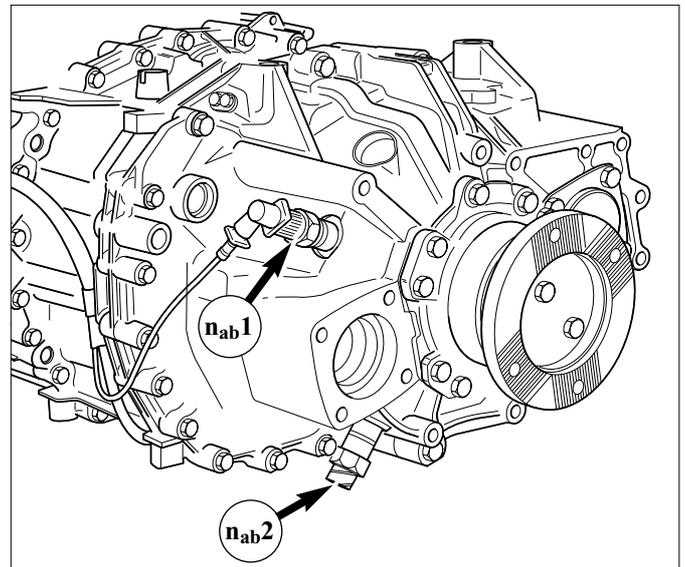
Connect output speed sensor connector at transmission end ((n_{ab1}), also see p. 7-2, bottom diagram, item (8)).

Connect output speed sensor connector at vehicle end (n_{ab2}).

CAUTION

Some vehicle manufacturers use speedo-specific output sensors with different operating voltages (e.g. Kitas sensor with 9 - 12 V; this sensor is approx. 10 mm longer than the ZF output sensor operated at 24 V).

You must ensure that this sensor is only used at the (n_{ab2}) point.

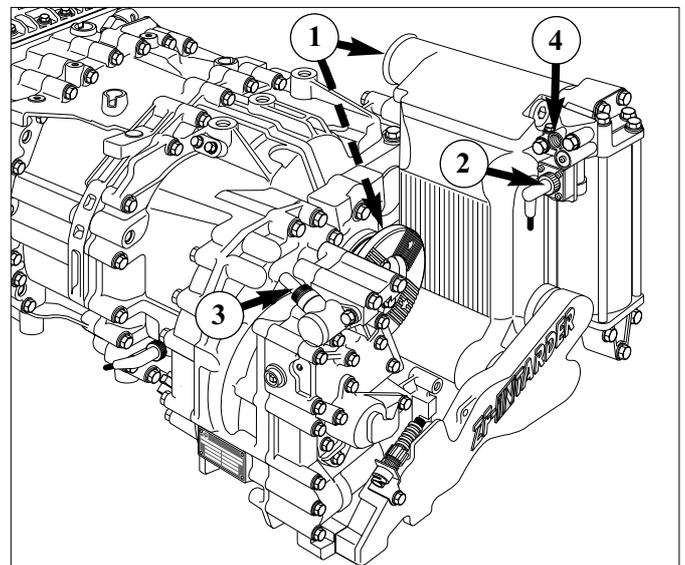


018 463

NOTE

When working on bus applications with ZF Intarders, the following tasks also have to be carried out:

- Fit water pipe (top and bottom) (1).
- Fill up with coolant.
- Fit electric plug connection:
 accumulator charge valve (2)
 proportional solenoid valve (3)
- Connect air connection (4) to accumulator.

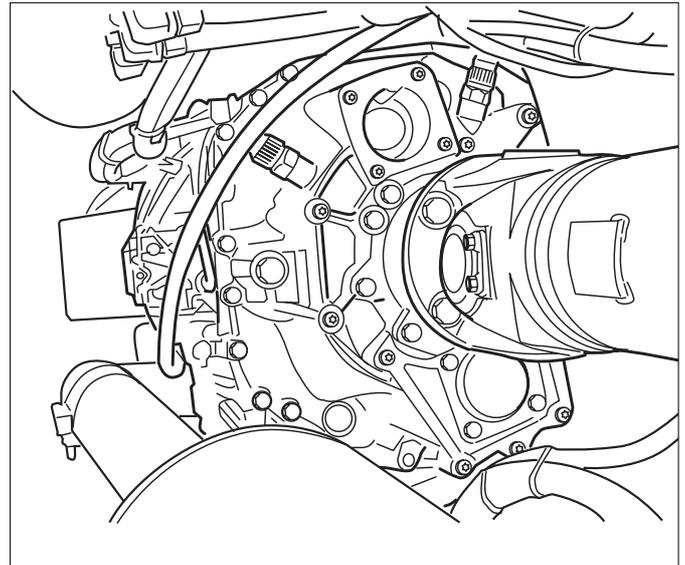


018 730

Connect cardan shaft to output flange of transmission.

NOTE

Note connection specifications of vehicle manufacturer.



018 410

Oil level check for transmission version without Intarder

Use a lint-free cloth to clean area around oil fill plug.
Remove oil fill plug from transmission.

Check oil level. The oil must reach up to the lower edge of the oil fill aperture.

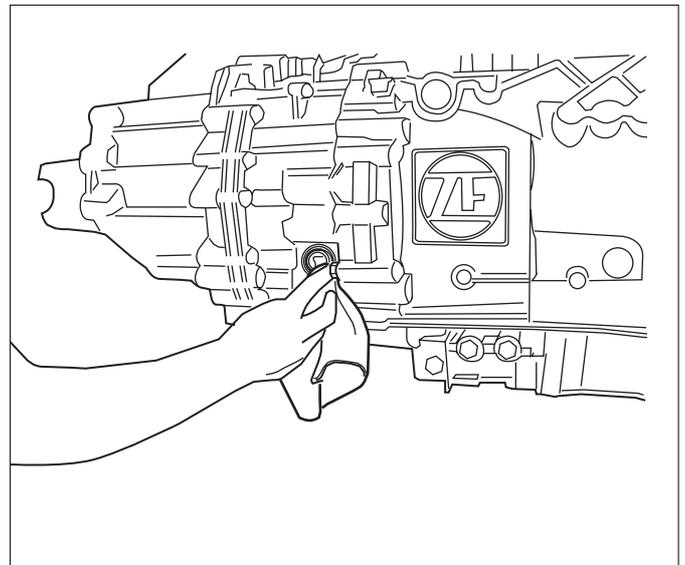
If necessary top up oil in accordance with ZF List of Lubricants.

Screw oil fill plug back in.

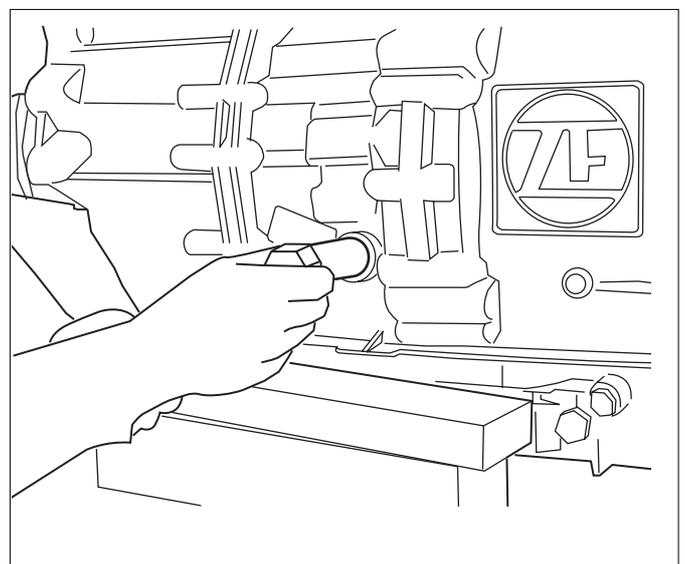
Start engine and leave to run for approx. 30 seconds.

Remove oil fill plug and again check oil level.
If necessary, again top up oil until the oil reaches up to lower edge of the oil fill aperture.

Insert oil fill plug and tighten.
Tightening torque: 44 lb-ft (60 Nm)



018 436



018 437

**Oil level check and oil filling for transmission
version with Intarder**

NOTE

When working on bus applications with ZF Intarders, the oil level check and oil filling must be carried out as follows:

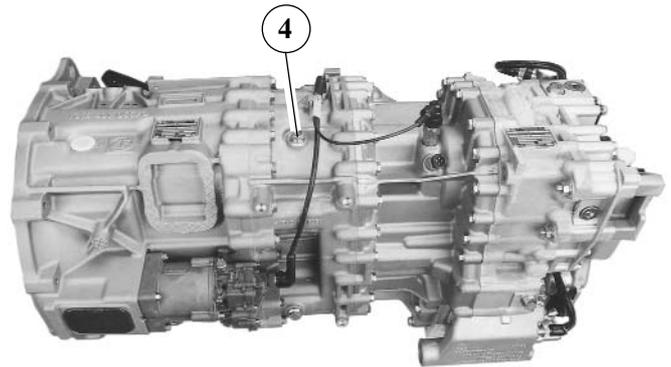
- Vehicle horizontal
- Engine switched off
- Continue with a) or b)

a) Oil filling after oil change

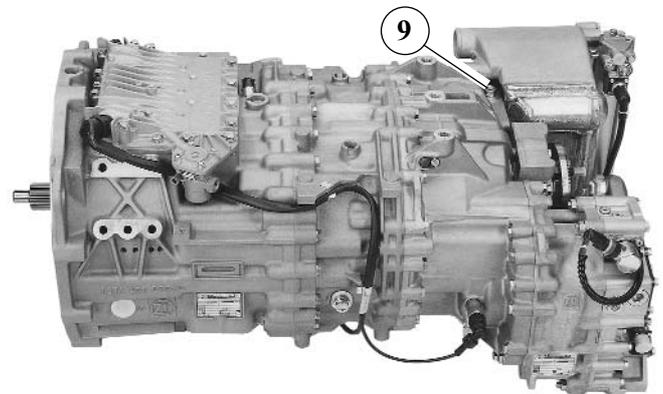
- Open oil overflow screw (4).
- Fill transmission until oil overflows.
- Screw in oil fill screw (4) with new seal.
Tightening torque 60 Nm
- Externally fill pneumatic system.
- Start engine.
- Carry out test run: distance 2 - 5 km
Do **NOT** actuate Intarder.
- Continue with: c) **At the end of the test run**

b) Oil filling after repairs

- Open oil fill screw (9).
- Fill oil at item 9.
- Screw in oil fill screw (9) with new seal.
Tightening torque 60 Nm
- Externally fill pneumatic system.
- Start engine.
- Carry out test run: distance 2 - 5 km
BRIEFLY ONCE (braking level 6) actuate Intarder at start of test run.
- Continue with: c) **At the end of the test run**



013 609



013 610

c) At the end of the test run

- Vehicle at standstill
- Do **NOT** actuate Intarder.

CAUTION

For the oil level check, the Intarder must not be actuated directly before the vehicle is stopped. This ensures that the correct volume of oil is set in the transmission.

- Open oil overflow screw (4).
Do not remove information plate.

CAUTION

Again check oil level and if necessary, top up oil until it overflows.

- Screw oil overflow screw (4) back in with new seal.
Tightening torque 60 Nm

⚠ CAUTION

NON-ASBESTOS FIBERS WARNING

Some clutch parts or assemblies can contain non-asbestos fibers whose long-term effects to the health are unknown.

The following procedures for servicing clutch parts or assemblies are recommended to reduce exposure to non-asbestos fiber dust, a cancer and lung disease hazard. Material Safety Data Sheets are available from ArvinMeritor.

Hazard Summary

Most recently manufactured clutch parts or assemblies do not contain asbestos fibers. These clutch parts or assemblies may contain one or more of a variety of ingredients that can present health risks if inhaled. Scientists disagree on the extent of the risks from exposure to these substances. Nonetheless, exposure to silica dust can cause silicosis, a non-cancerous lung disease. Silicosis gradually reduces lung capacity and efficiency and can result in serious breathing difficulty.

Some scientists believe other types of non-asbestos fibers, when inhaled, can cause similar diseases of the lung. In addition, silica dust and ceramic fiber dust are known to the State of California to cause lung cancer. U.S. and international agencies have also determined that dust from mineral wool, ceramic fibers and silica are potential causes of cancer.

Accordingly, workers must use caution to avoid creating and breathing dust when servicing clutch parts or assemblies. Specific recommended work practices for reducing exposure to non-asbestos dust follow. Consult your employer for more details.

Recommended Work Practices

1. Separate Work Areas

Whenever feasible, service clutch parts or assemblies in a separate area away from other operations to reduce risks to unprotected persons.

2. Respiratory Protection

OSHA has set a maximum allowable level of exposure for silica of 0.1 mg/m³ as an 8-hour time-weighted average. Some manufacturers of non-asbestos clutch parts or assemblies recommend that exposures to other ingredients found in non-asbestos clutch parts or assem-

blies be kept below 1.0 f/cc as an 8-hour time-weighted average. Scientists disagree, however, to what extent adherence to these maximum allowable exposure levels will eliminate the risk of disease that can result from inhaling non-asbestos dust.

Therefore, wear respiratory protection at all times when servicing clutch parts or assemblies, including removal and installation. Wear a respirator equipped with a high-efficiency (HEPA) filter approved by NIOSH or MSHA, if the exposure levels may exceed OSHA or manufacturers' recommended maximum levels. Even when exposures are expected to be within the maximum allowable levels, wearing such a respirator at all times when servicing clutch parts or assemblies will help minimize exposure.

3. Procedures for Servicing Clutch Parts or Assemblies

- A. Enclose clutch parts or assemblies within a negative pressure enclosure. The enclosure should be equipped with a HEPA vacuum and worker arm sleeves. With the enclosure in place, use the HEPA vacuum to loosen and vacuum residue from clutch parts or assemblies.
- B. As an alternative procedure, use a catch basin with water and a biodegradable, non-phosphate, water-based detergent to wash the clutch parts or assemblies. The solution should be applied with low pressure to prevent dust from becoming airborne. Use a cloth to wipe the clutch parts or assemblies clean.
- C. If an enclosed vacuum system or clutch parts or assemblies washing equipment is not available, carefully clean the clutch parts or assemblies in the open air. Wet the parts thoroughly with a solution applied with a pump-spray bottle that creates a fine mist. Use a solution containing water, and, if available, a biodegradable, non-phosphate, water-based detergent. Use a cloth to wipe the clutch parts or assemblies clean.
- D. NEVER use compressed air by itself, dry brushing, or a vacuum not equipped with a HEPA filter when cleaning clutch parts or assemblies. NEVER use carcinogenic solvents, flammable solvents, or solvents that can damage clutch parts or assemblies as wetting agents.

4. Cleaning Work Areas

Clean work areas with a vacuum equipped with a HEPA filter or by wet wiping. NEVER use compressed air or dry sweeping to clean work areas. When you empty vacuum cleaners and handle used rags, wear a respirator equipped with a HEPA filter approved by NIOSH or MSHA, to minimize exposure. When you replace a HEPA filter, wet the filter with a fine mist of water and dispose of the used filter with care.

5. Worker Clean-Up

After servicing clutch parts or assemblies, wash your hands before you eat, drink or smoke. Shower after work. Do not wear work clothes home. Use a vacuum equipped with a HEPA filter to vacuum work clothes after they are worn. Launder them separately. Do not shake or use compressed air to remove dust from work clothes.

6. Waste Disposal

Dispose of discarded linings, used rags, cloths and HEPA filters with care, such as in sealed plastic bags. Consult applicable EPA, state and local regulations on waste disposal.

Regulatory Guidance

References to OSHA, NIOSH, MSHA, and EPA, which are regulatory agencies in the United States, are made to provide further guidance to employers and workers employed within the United States. Employers and workers employed outside of the United States should consult the regulations that apply to them for further guidance.