

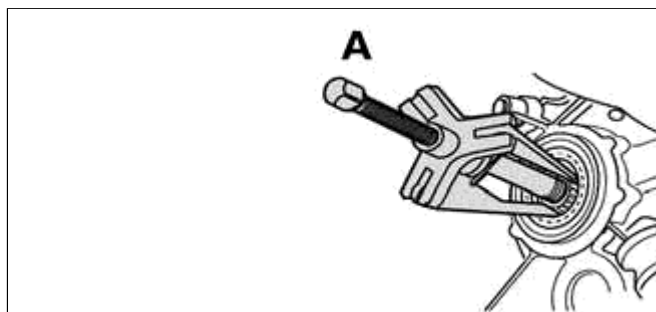
General

This repair group cover removal and repair information for the rear drive axle shafts, CV joints and CV joint boots. Also covered is rear differential (final drive) removal procedures and seal replacement information.

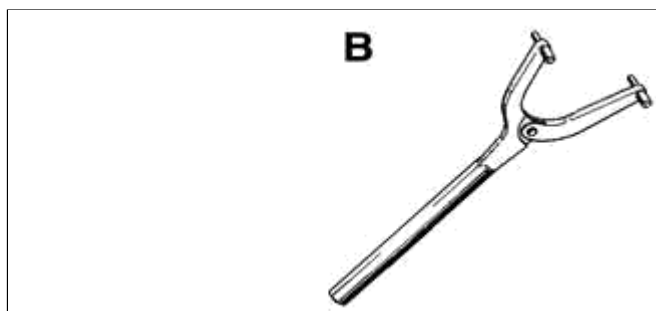
Internal repairs of the differential assembly are not covered in this manual.

Special tools

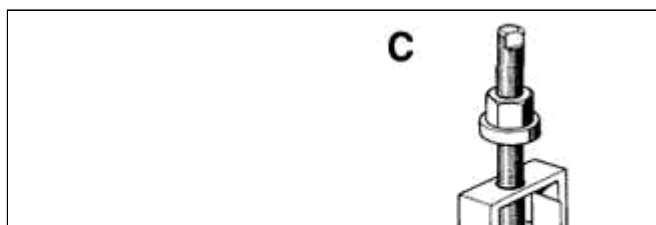
BMW recommends some special tools for the removal of the drive axles as well as the installation of rear differential input and output drive flange seals. Some common pullers and drifts can often be substituted for these tools.



- ◀ Radial seal puller BMW 00 5 010



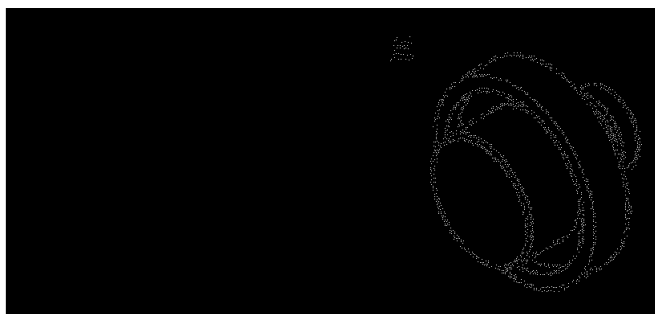
- ◀ Flange counterhold tool BMW 23 0 020



- ◀ Drive axle puller BMW 33 2 110

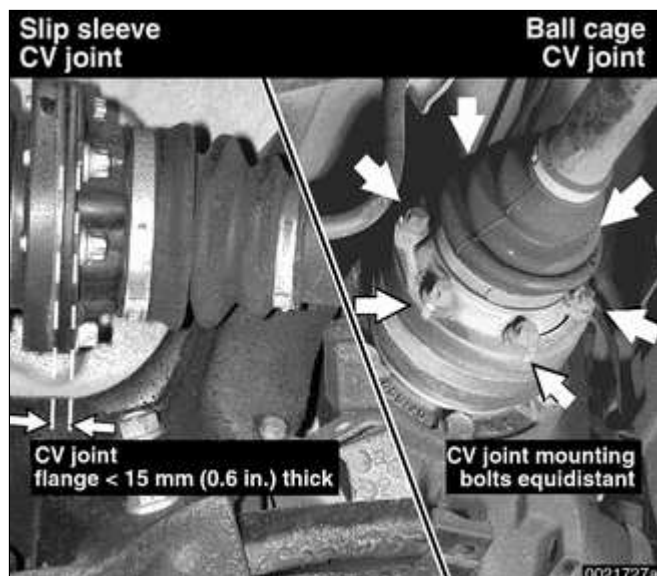


➤ Output flange seal drift BMW 33 3 400



➤ Input flange seal drift BMW 33 3 430

Drive Axles

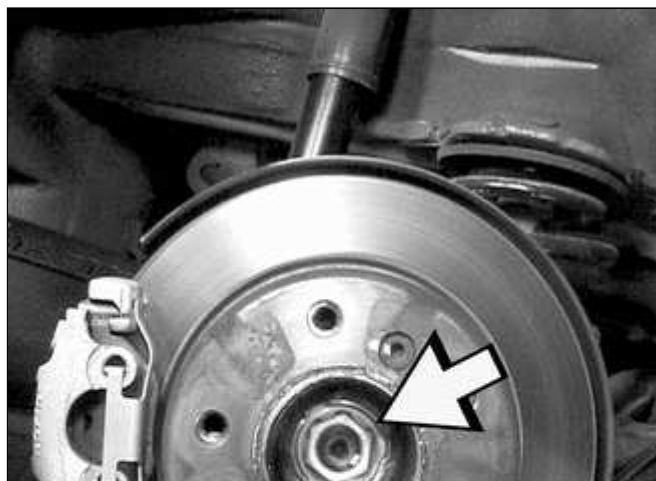


✦ The drive axles use constant-velocity (CV) joints on both ends. Two different styles of CV joints have been supplied with E46 vehicles. Refer to the accompanying illustration:

- ◆ Ball cage CV joint. Traditional design CV joint with thick metal housing (approx. 40 mm/1.6 in. thick). Balls slide in non-parallel grooves.
- ◆ Slip sleeve CV joint. Thin bolt-on flange (approx. 15 mm/0.6 in. thick). CV joint has splined shaft that slides into end of axle.

For replacement parts, only CV joints boots or complete axles are offered by BMW. To replace a CV joint boot, the drive axle must be removed from the car. The rear axle shafts are different in length. The shorter of the two shafts is located on the left side, the longer shaft on the right.

Rear drive axle, removing and installing



✦ With an assistant applying brakes, break free staked collar nut (**arrow**) at center of rear wheel hub. Do not remove completely.

Note:

The drive flange collar nut is tightened to a torque of over 250 Nm (184 ft-lb). Make sure the car is firmly on the ground.



- Raise rear of car. Remove rear wheel.

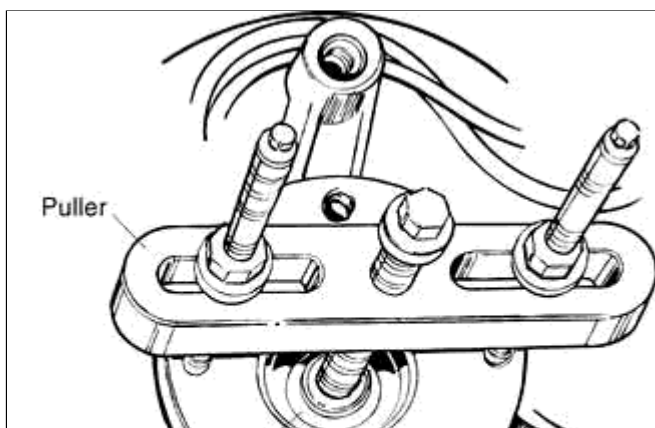
WARNING!

Make sure that the car is firmly supported on jack stands designed for the purpose. Place the jack stands beneath a structural chassis point. Do not place jack stands under suspension parts.

- Detach rear stabilizer bar anchor bolts from rear subframe and tilt stabilizer down.
- Working on left axle: Detach rear of exhaust system and tilt down. Support rear muffler securely.



- Remove drive axle to differential mounting bolts (**arrows**). Detach drive axle from drive flange. Suspend drive axle from chassis using stiff wire.



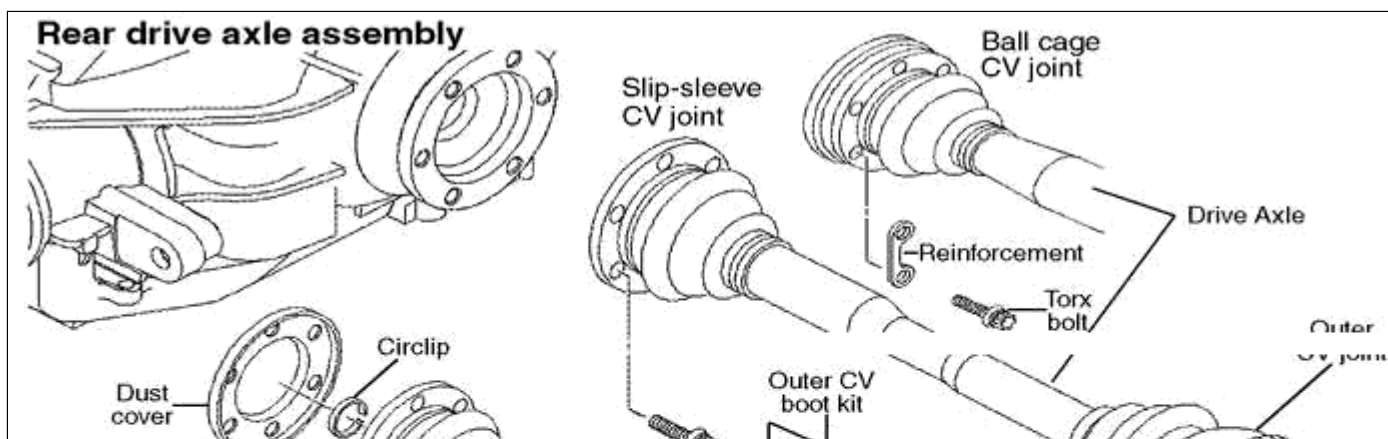
- Press drive axle from wheel bearing housing using an appropriate puller.
- Installation is reverse of removal.
- ◆ Apply a light coating of oil to contact face of collar nut and install it loosely.

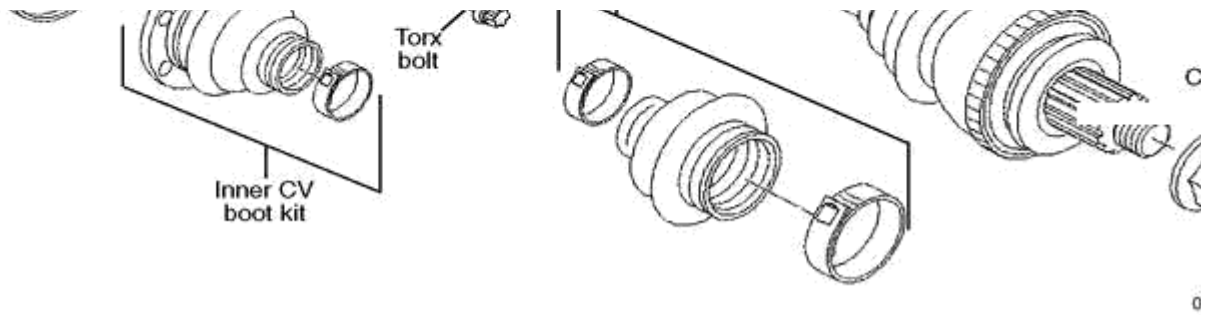


- ◆ Install road wheel and lower car to ground.
- ◆ With an assistant applying brakes, tighten drive axle collar nut to its final torque.
- ◆ Stake and caulk collar nut.

Tightening torques	
Drive axle collar nut to drive flange	
M24	250 Nm (184 ft-lb)
M27	300 Nm (221 ft-lb)
Drive axle to differential flange	
M10x20 mm Torx bolt	83 Nm (61 ft-lb)
M10x46 mm bolt (black)	100 Nm (74 ft-lb)
M10x46 mm bolt (silver) (always replace)	80 Nm (59 ft-lb)
Road wheel to hub	100 ± 10 Nm (74 ± 7 ft-lb)

Rear drive axle assembly





CV joint boots

Note:

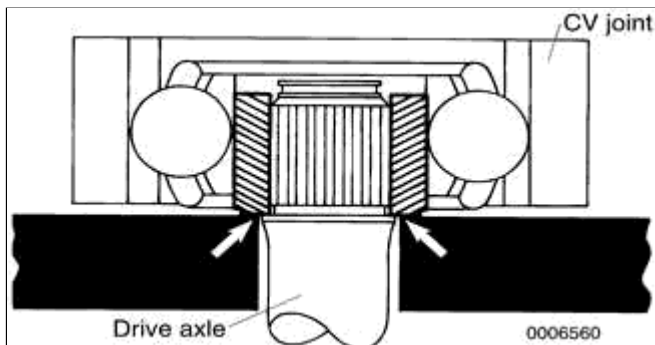
- ◆ *When replacing a CV joint boot, use a complete CV joint boot repair kit. The kit will include a new boot, clamping bands, special lubricant, and a new inner CV joint circlip. The kit is available from an authorized BMW dealer parts department.*
- ◆ *The outer CV joint cannot be removed from the axle shaft. In order to replace the outer CV boot, it is necessary to remove the inner joint and boot first.*
- ◆ *If the CV joints are worn or defective, a complete rebuilt axle shaft is available from an authorized BMW dealer parts department.*

Working with axle shaft at bench, cut off old boot clamps and remove boots. Clean old grease off joints and shafts. Use new grease from CV joint boot kit.

Ball cage CV joint boot



- ◀ Lift off dust cover from inner CV joint and remove circlip (**arrow**) retaining joint



inner hub to axle shaft.

Support inner hub at **arrows** when pressing axle shaft out of joint.

- Clean all old lubricant off shaft splines and inner joint's splines.

CAUTION!

If the CV joint must be disassembled for cleaning and inspection, be sure to matchmark inner and outer race and intermediate ball cage. This allows reassembly of parts in their original positions.

Note:

To inspect a CV joint, clean away the grease and look for galling, pitting and other signs of wear or physical damage. Polished surfaces or visible ball tracks alone are not necessarily cause for replacement. Discoloration due to overheating indicates lack of lubrication.

- Apply Loctite® 270 or an equivalent heavy-duty locking compound to drive axle splines. Position new CV joint on shaft so that raised or taller

side of hub is facing shaft.

WARNING!

Do not let the locking compound contact the balls in the joint. Apply only a thin coat to cover the splines.

- While supporting axle shaft, press inner hub of CV joint onto shaft. Install new circlip.

Note:

- ◆ *Do not let the ball hub pivot more than 20° in the outer ring of the joint. The balls will fall out if the hub is pivoted too far.*
- ◆ *Before installing each small boot clamp be sure to "burp" the boot by flexing the CV joint as far over as it will go. A small screwdriver inserted between the boot and the axle shaft will help the process.*
- ◆ *BMW recommends Bostik®1513 or Epple®4851 adhesive, and Epple®39 or Curil®T sealer.*

CV joint lubricant capacity	
Wheel hub end	80 gram (2.8 oz.)
Differential end	85 gram (3.0 oz.)

- Use sealing gel to seal dust cover to CV joint prior to reinstallation.

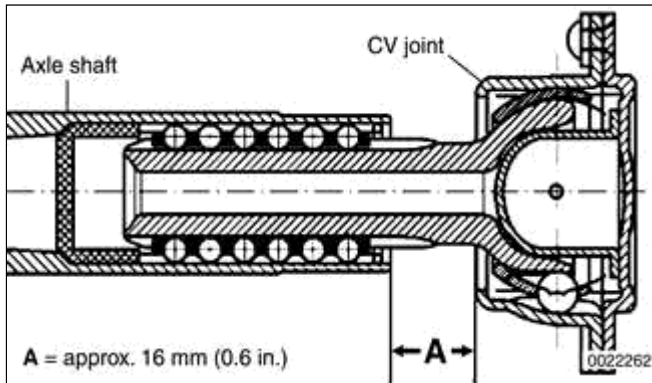
Slip sleeve CV joint boot

- Pull CV joint partially out of axle shaft. Matchmark relative position of

joint to shaft.

CAUTION!

If the joint and shaft are not reassembled in their original position the assembly may be out of balance and vibrate during operation.



- ◀ When reinstalling joint, push joint into shaft as far as it will go, then pull it out to measurement **A** (16 mm / 0.6 in.).

Note:

This step insures uniform lubrication of the CV joint.

- Keep joint in position while installing inner (small) boot clamp.
- Make sure sealing lip of joint and boot are free of grease. The boot could otherwise slide off when boot clamp is tightened.

Slip sleeve joint boot lengths

Inner boot	65 mm (2.6 in.)
Outer boot	55 mm (2.2 in.)

Note:

- ◆ *On the differential end CV joint, position large boot clamp so that crimp in clamp faces rivet on CV joint flange.*
- ◆ *Install large clamps of inner and outer CV joints so that the crimps are offset by 180°.*

Rear Differential

All rear differential work requires some method of raising the car and supporting it securely while the work is performed. Jack stands and a floor jack can easily be used, but use extreme caution when working beneath the car. See ⇒ [010 General](#).

Note:

Removal of rear subframe (differential carrier) is covered in ⇒ [330 Rear Suspension](#).

Rear differential oil, checking and filling

Note:

BMW supplies the E46 rear differential with lifetime lubricant.

⚡ To check rear differential oil level:

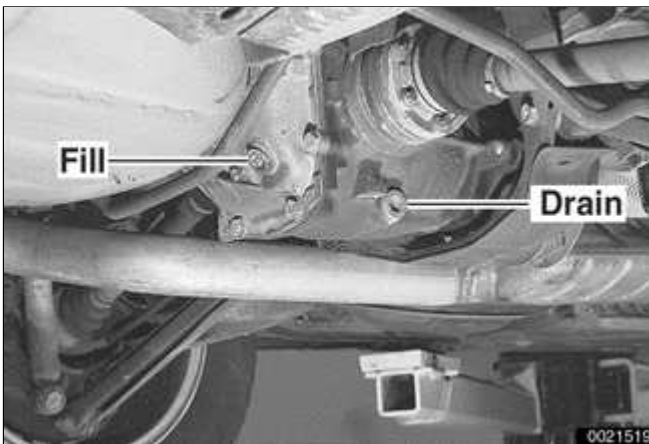
- ◆ Remove oil filler plug.
- ◆ Insert finger into fill hole. If finger is wetted from oil, level is correct.

Note:

Use a 14 mm Allen socket to remove the fill or drain plug. Alternatively, cut approximately 30 mm (1.2 in) from an Allen key and use a box end wrench on the key stub.

- If necessary, fill differential with appropriate type and quantity of lubricant.

Note:



The differential fluid level is correct when the fluid begins to spill from the fill plug.

- Install and tighten fill plug.

Differential oil	
Differential oil capacity	
Rear wheel drive	0.9 liter (0.95 US qt.)
All wheel drive	1.0 liter (1.06 US qt.)
Oil specification	BMW SAF-XO synthetic oil

Tightening torques	
Differential drain or fill plug	70 Nm (52 ft-lb)

Rear differential, removing and installing

- Raise rear end of car and support it securely on jack stands.

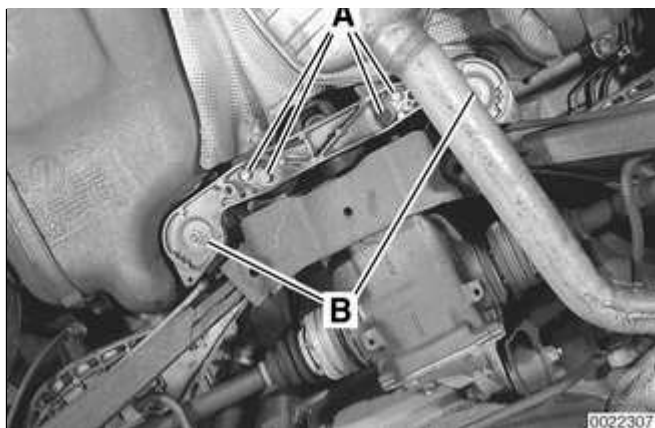
WARNING!

Make sure that the car is firmly supported on jack stands designed for the purpose. Place the jack stands beneath a structural chassis point. Do not place jack stands under suspension parts.

- Remove rear drive axles.
- If necessary, drain differential oil.



Remove rear suspension reinforcement brace:



- ◆ Remove heat shield between reinforcement brace and exhaust pipe.
- ◆ Remove bolts (A) mounting brace to undercarriage.
- ◆ Remove nuts (B) mounting brace and front of rear subframe to undercarriage.
- ◆ Lower and remove reinforcement.

Note:

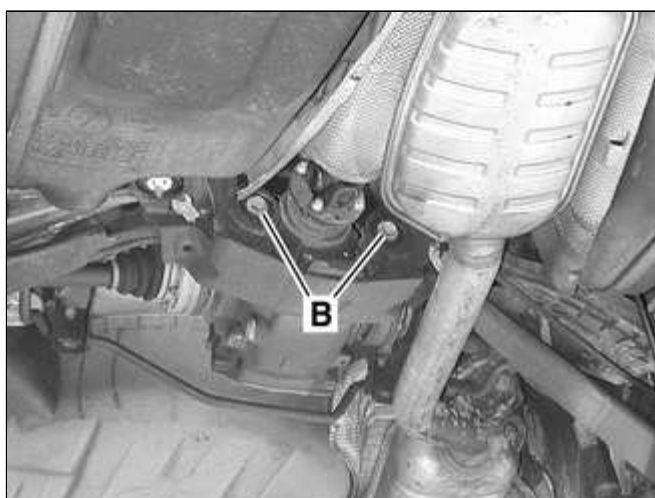
If necessary, tilt rear half of exhaust system down. Support exhaust system securely.

- Detach driveshaft from differential input shaft flange and suspend. See ⇒ [260 Driveshaft](#).

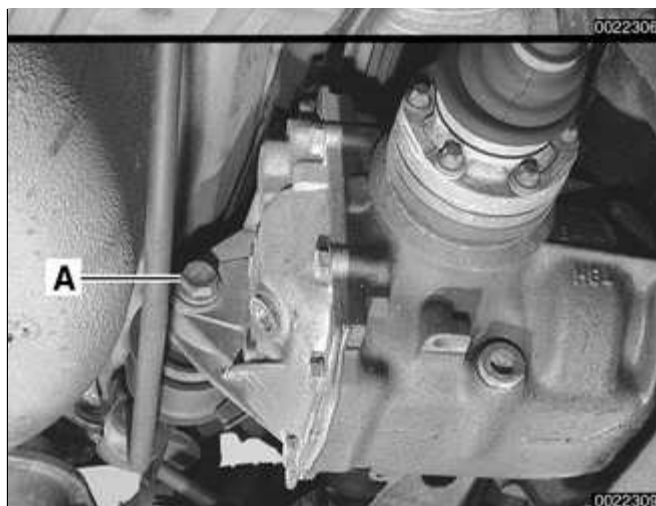
CAUTION!

Suspend the detached drive axle from the car body with a stiff wire hook to prevent damage to the outer CV joint.

- Remove rear stabilizer bar.



- ✦ Support differential with transmission jack. Remove rear (A) and front (B) mounting bolts at subframe.
 - Slowly lower differential unit and remove toward rear.
 - Installation is reverse of removal. In order to prevent excess vibration and noise, follow sequence for tightening



differential mounting bolts:

- ◆ Install bolts finger tight.
- ◆ Tighten front bolts (**B**).
- ◆ Tighten rear bolt (**A**).

Tightening torques	
Differential drain or fill plug	70 Nm (52 ft-lb)
Differential to rear subframe	
Front mount (M12 bolts)	95 Nm (70 ft-lb)
Rear mount (M14 bolt)	174 Nm (128 ft-lb)
Drive axle to differential flange	
M10x20 mm Torx bolt	83 Nm (61 ft-lb)
M10x46 mm bolt (black)	100 Nm (74 ft-lb)
M10x46 mm bolt (silver) (always replace)	80 Nm (59 ft-lb)
Driveshaft to differential flange	
M10 compression nut	64 Nm (47 ft-lb)
M10 Torx bolt	85 Nm (63 ft-lb)
Rear suspension reinforcement to undercarriage	
M12 self-locking nut	77 Nm (57 ft-lb)
M8 bolt 8.8 grade	21 Nm (15 ft-lb)
M8 bolt 10.9 grade	30 Nm (22 ft-lb)

- Be sure to refill differential.

Differential oil	
Differential oil capacity	
Rear wheel drive	0.9 liter (0.95 US qt)
All wheel drive	1.0 liter (1.06 US qt.)
Oil specification	BMW SAF-XO synthetic oil

Differential mounting bushings

- If rear differential mounting bushing are worn, damaged or oil soaked:
 - ◆ Remove differential from rear subframe.
 - ◆ Working at subframe, use bushing press tools to remove old bushings and install new ones.
 - ◆ Carefully note installation marks (arrows) on new bushings.

Note:

BMW uses bushings from different manufacturers in the course of production. Always check with an authorized BMW dealer for the latest information on suspension bushings.

Rear Differential Oil Seals

Low oil level caused by faulty oil seals may be the cause of noisy differential operation. The drive flange (side) and input shaft (front) oil seals can be replaced while the differential is installed.

Note:

Do not mistake leaking CV joints for flange seal leaks. It may be helpful to degrease the differential to pinpoint the source of the leak prior to replacing seals.

Output drive flange oil seal, replacing

- Raise car and support safely.

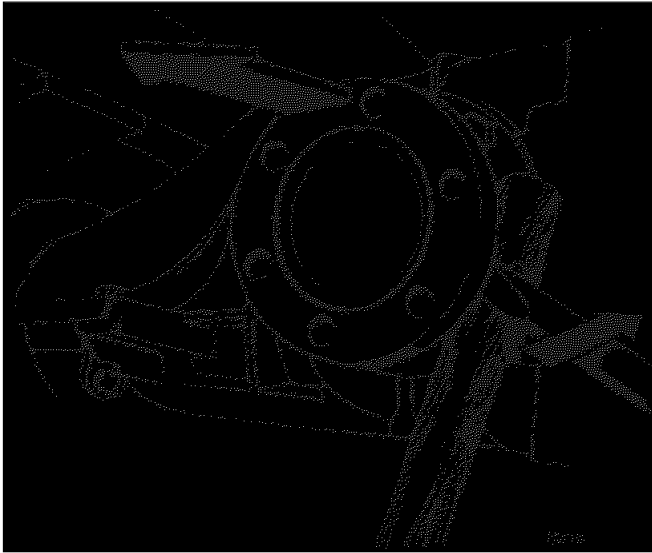
WARNING!

Make sure that the car is firmly supported on jack stands designed for the purpose. Place the jack stands beneath a structural chassis point. Do not place jack stands under suspension parts.

- If working on left side: Detach rear of exhaust system and tilt down. Support rear muffler securely.
- Detach stabilizer bar from rear subframe.
- Detach drive axle from differential as described earlier.

CAUTION!

Suspend the detached drive axle from the car body with a stiff wire hook to prevent damage to the outer CV joint.



- ✦ Pry output flange from differential. For leverage, use a wooden dowel as shown.

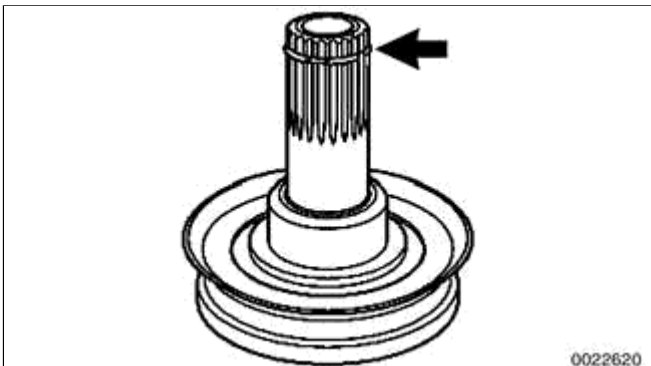
Note:

- ◆ Be prepared to catch dripping oil in a pan.
- ◆ Inspect flange at the point where the oil seal rides on the shaft. Replace the flange if there is a groove worn in the shaft.
- Pry old oil seal from its recess using BMW special tool 00 5 010 or equivalent seal puller.

CAUTION!

Be careful not to mar the differential housing when removing the seal.

- Dip new seal in differential lubricant and drive into place until fully seated.

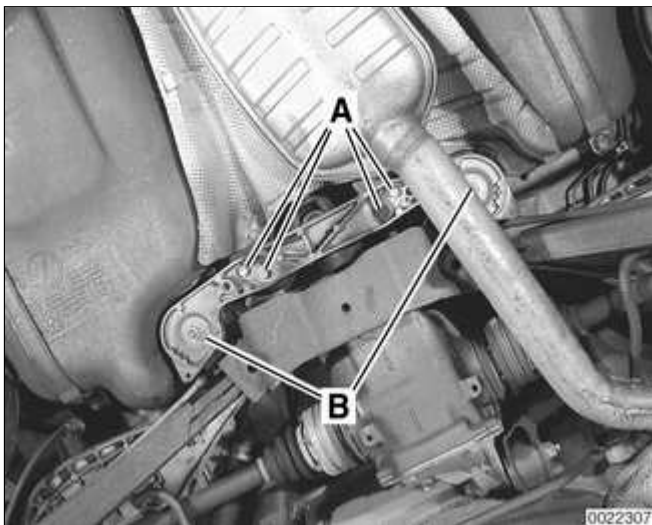


- ✦ Replace locking circlip (**arrow**) on output flange.
- Install flange by pressing it in by hand until snap ring engages. It may be necessary to turn flange slightly while pushing.
- Attach drive axle and tighten bolts.
- Top off differential with oil.

Tightening torque	
Drive axle to differential flange	
M10x20 mm Torx bolt	83 Nm (61 ft-lb)
M10x46 mm bolt (black)	100 Nm (74 ft-lb)
M10x46 mm bolt (silver) (always replace)	80 Nm (59 ft-lb)

Input drive flange oil seal, replacing

- Raise car and support safely.



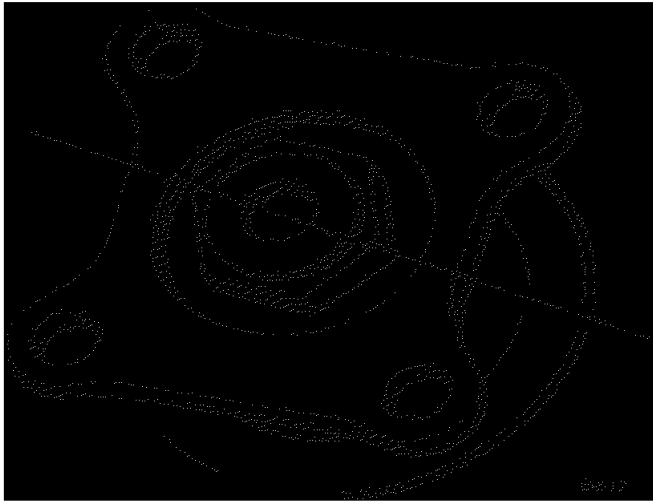
- Remove rear suspension reinforcement brace:

- ◆ Remove heat shield between reinforcement brace and exhaust pipe.
- ◆ Remove bolts (A) mounting brace to undercarriage.
- ◆ Remove nuts (B) mounting brace and front of rear subframe to undercarriage.
- ◆ Lower and remove reinforcement.

Note:

If necessary, tilt rear half of exhaust system down. Support exhaust system securely.

- Remove driveshaft from differential input shaft flange. See ⇒ [260 Driveshaft](#). Tie end of driveshaft to



side.



Make matching marks on differential input shaft, collar nut and driveshaft flange.

- Pry lock plate from nut. Counterhold input flange with BMW special tool 23 0 020 or equivalent and remove collar nut.
- If necessary, use puller to remove input flange.

Note:

Be prepared to catch dripping oil in a pan.

- Pry old oil seal from its recess using BMW special tool 00 5 010 or equivalent seal puller.

CAUTION!

Be careful not to mar the differential housing when removing the seal.

- Dip new seal in differential lubricant and drive it into position.
- Lightly lubricate input shaft and press input flange back on. Install collar nut and slowly tighten until matching marks line up.
- Install a new lock plate and refill differential with lubricant.

CAUTION!

If the flange collar nut is tightened past the marks, interior components of the differential will be damaged.

Differential oil	
Differential oil capacity	
Rear wheel drive	0.9 liter (0.95 US qt)
All wheel drive	1.0 liter (1.06 US qt.)
Oil specification	BMW SAF-XO synthetic oil

- Remainder of assembly is reverse of disassembly.

Tightening torques	
Driveshaft to differential flange	
M10 compression nut	64 Nm (47 ft-lb)
M10 Torx bolt	85 Nm (63 ft-lb)
Differential drain or fill plug	70 Nm (52 ft-lb)