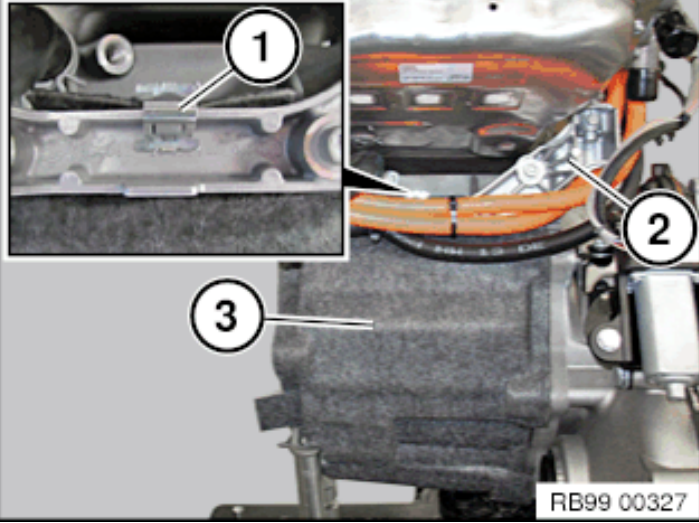
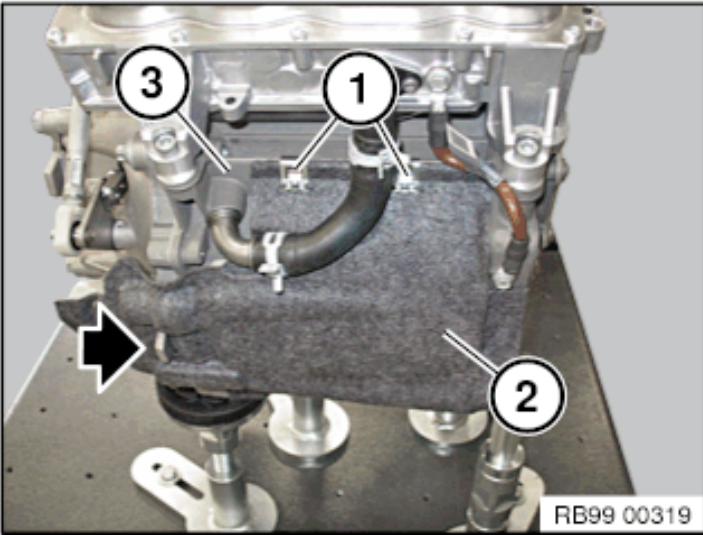


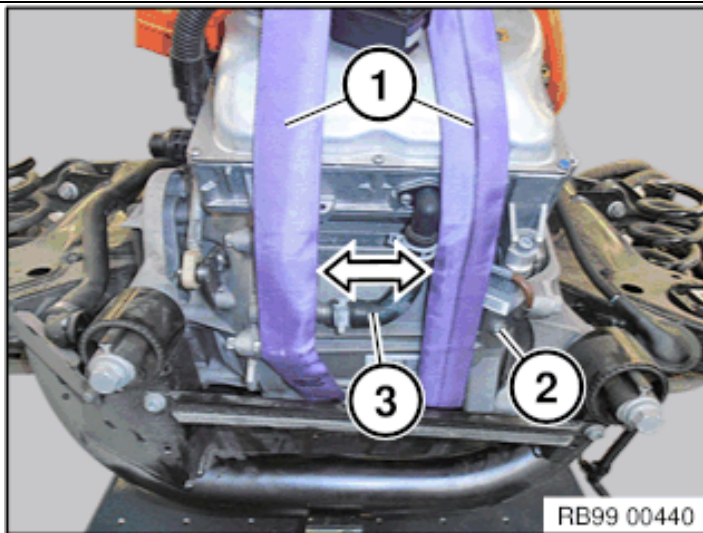
## 2011 ActiveE Drivetrain: Transmission Input Shaft Sealing

### Important Notes:

- Only technicians who have successfully completed High-voltage (HV) and hybrid technology training classes may perform repairs or maintenance on the ActiveE.
- Use only the E82E laptop tool loaded with ISTA ActiveE software for all diagnosis and repair operations. Connect this laptop to the vehicle with the E82E-specific Active Gateway special tool, and with the ICOM. 3G workshop equipment does not support the ActiveE.
- Do not repair or open HV components. It is only permitted to replace the component.
- Submit a PuMA case titled “ActiveE – Trans Shaft Service” in order provide documentation feedback for the Service Hub.
- The following procedure for inspection and lubrication of the transmission shaft, using the updated kit (P/N 27 21 8 604 187), must only be performed to each vehicle one time. Subsequent service visits will not require this procedure. Once it has been performed, this procedure is no longer necessary. Before attempting this procedure, check the vehicle’s warranty history to determine if it has already had the updated sealing procedure performed.

### REMOVING THE EME/E-MACHINE ASSEMBLY

|   |   |
|---|---|
|   | <ol style="list-style-type: none"> <li>1. Remove the rear axle assembly following RA 33 31 000, “R&amp;I Complete Rear Axle Support,” found in the ISTA ActiveE.</li> <li>2. Keep the EME/E-Motor assembly positioned on the MHT 1200 Mobile Lifting Table.</li> <li>3. Detach the HV cables from the EME/E-Motor bracket (2).</li> <li>4. Remove the transmission cover retaining clip (1) from the EME bracket (2).</li> <li>5. Pull the transmission cover (3) downwards.</li> </ol> <p><u>Installation notes:</u><br/>Make sure to position the cover snugly around the transmission. Secure the HV cables with wire ties to the EME bracket (2).</p> |
|  | <ol style="list-style-type: none"> <li>6. Remove the transmission cover retaining clips (1) on the E-Motor (3).</li> <li>7. Pull the transmission cover (2) downwards and remove it from the E-Motor.</li> </ol>  |

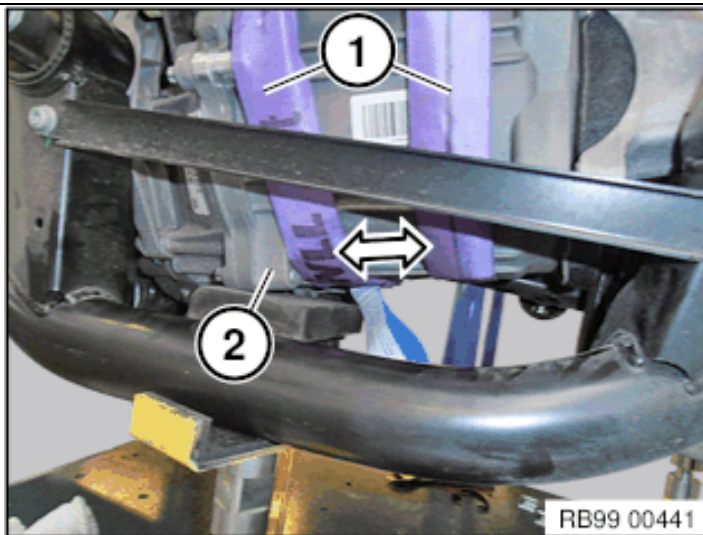


8. Use suitable woven lifting straps (1) for removing the EME/E-Motor assembly (2) from the rear axle sub frame.

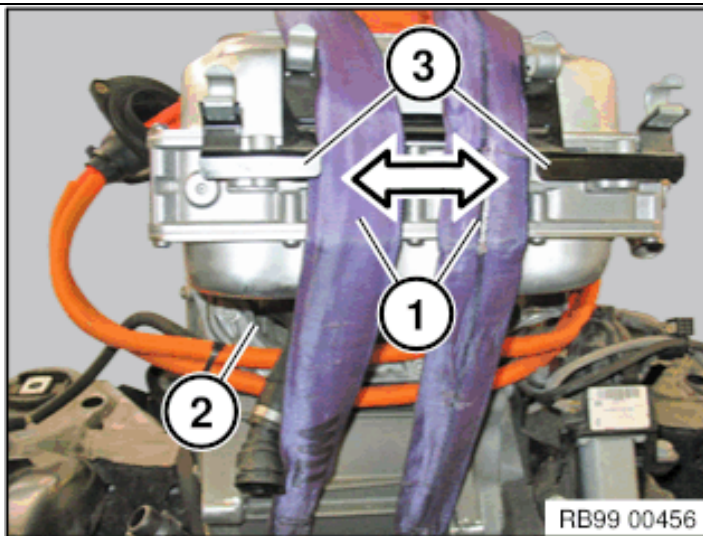
Important notes: Do not use chains or unshielded steel cables, which may damage surfaces of the EME/E-Motor.

Make sure your lifting straps are not damaged (cut), and are rated in excess of 300 lbs.

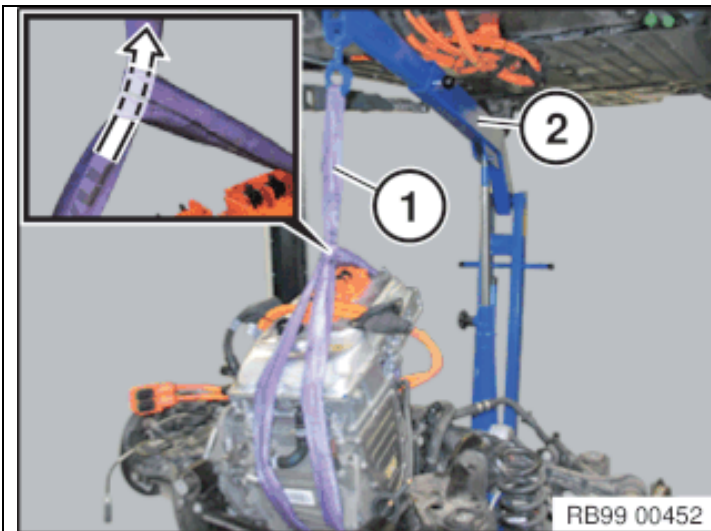
9. Place the lifting straps under the EME/E-Motor assembly, making sure that they are spread apart sufficiently. Rear view: lifting straps should be positioned outboard of the cooling hose (3).



10. Position the lifting straps (rear view, bottom) so that both straps (1) are placed separately on the E-Motor housing (2).



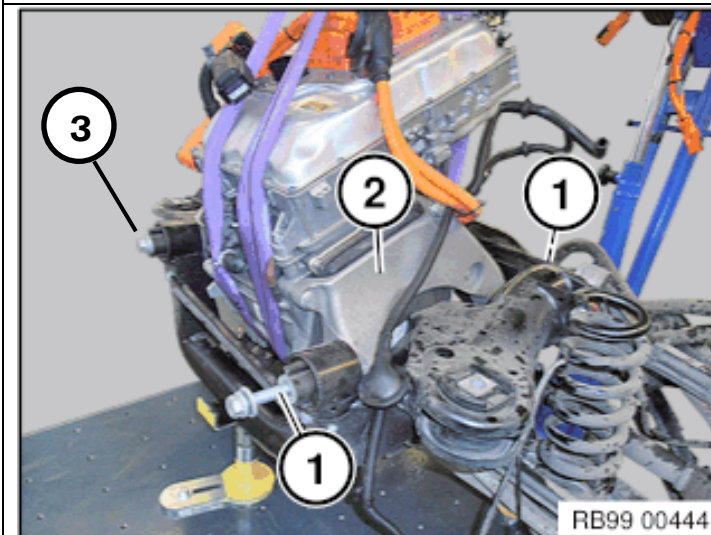
11. Position the lifting straps (front view, top) so that both straps are placed separately between the cable brackets on the EME.



12. Attach the lifting straps (1) to the BMW approved engine crane (2). Place a slight tension on the straps

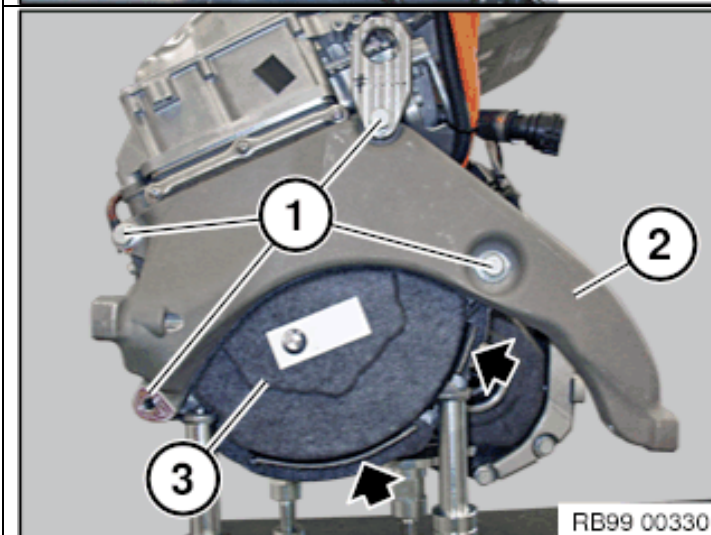
Hint:

Make sure the lifting strap loop is placed above the EME connector to prevent tilting of the unit when lifted.



13. Remove the bolts (1) from the right side of the Drive Unit. When reinstalling, torque them to 165 Nm.

14. Loosen the bolts (3) from the left side of the Drive Unit. When reinstalling, torque them to 165 Nm.



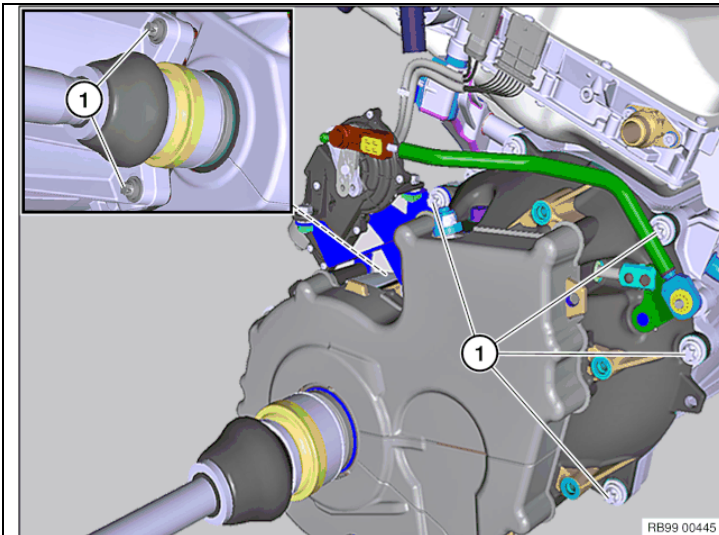
15. Remove the 4 bolts (1), support bracket (2) and the motor cover (3) from the right side of the E-Motor.

When reinstalling, torque the bolts to 56 Nm.

Note:

For clarity reasons, the picture shows the EME/E-Motor assembly, which has already been removed from the rear sub-frame.

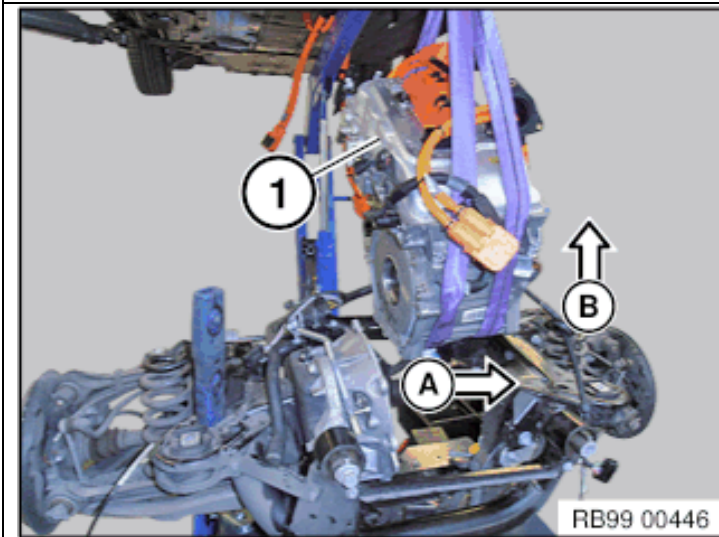
16. Remove the EME mounting bolts.



17. Detach the gear selector rod (green) from the transmission.

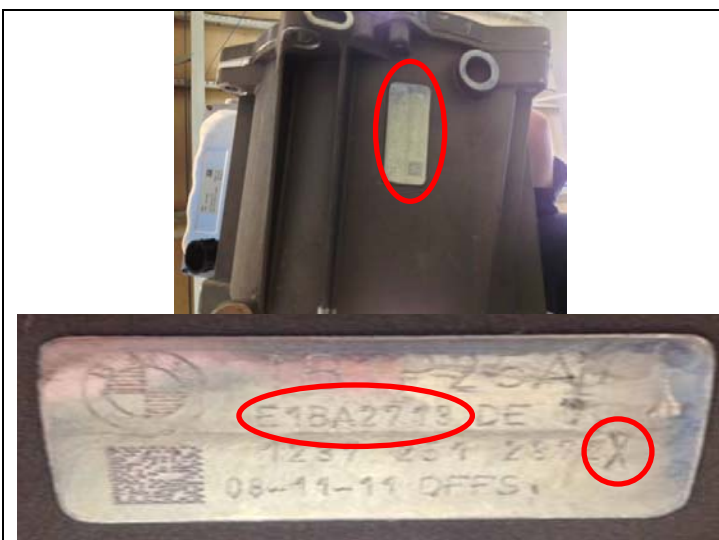
18. Detach and remove all 7 Torx bolts (1) between the transmission and the E-Motor.

19. Disconnect the park lock actuator harness connectors from the EME.



20. Carefully push the EME/E-Motor assembly (1) away from the transmission (direction A) and then upwards (direction B) from the sub-frame assembly.

## INSPECTION OF THE HUB/INPUT SHAFT



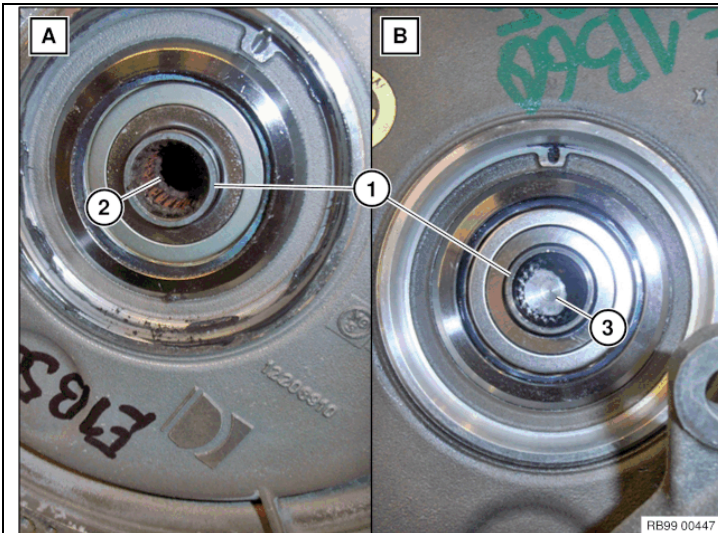
21. **Important:**

In every case, the E-Motor serial numbers have to be recorded.

22. The E-Motor serial number of the new and the old unit is found underneath the E-Machine on the type plate.

23. Write down both E-Motor numbers (old and new) with the additional stamped "X" and include them in the PuMA case, e.g.: "New#: E1BA2713X".

24. Remove the old sticker from the sub-frame.



25. Check and record the E-Motor version by inspecting the E-Motor output hub (1):

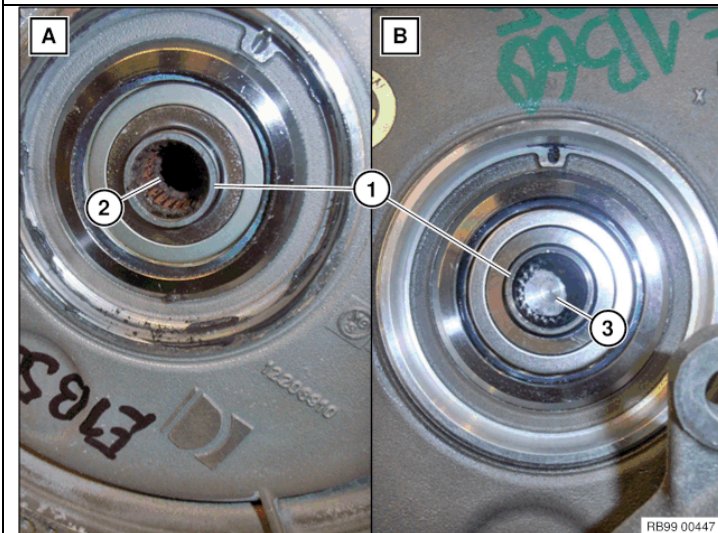
**Version A** – the motor output hub (hollow shaft) is **OPEN** in the back (without a grease pocket) – detail (2) on picture **A**.

The EME/E-Motor assembly must be replaced using the updated part P/N 05 74 2 512 372. The updated part has a closed end in the hub, which serves as a grease pocket.

Important:

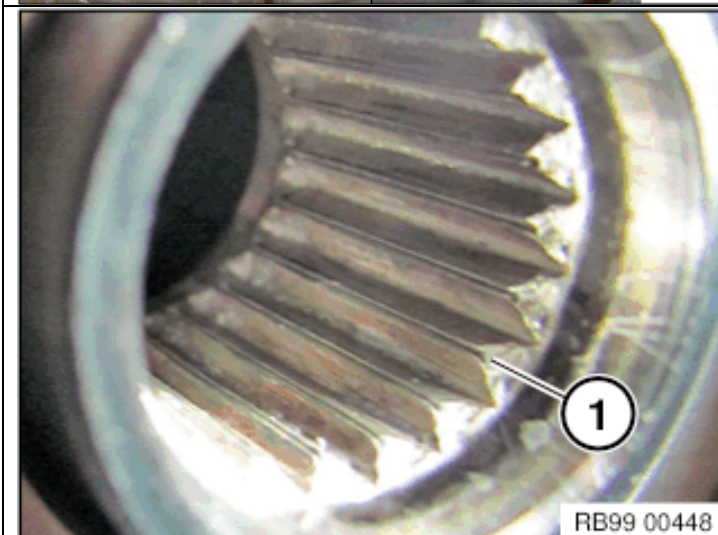
Update the PuMA case and attach a picture of the E-Motor output hub (open back), in order to receive an authorization for the EME/E-Motor replacement.

If the EME/E-Motor is replaced, skip to step 35 for the greasing procedure to be performed on the new part.



26. Check and record the E-Motor version by inspecting the E-Motor output hub (1):

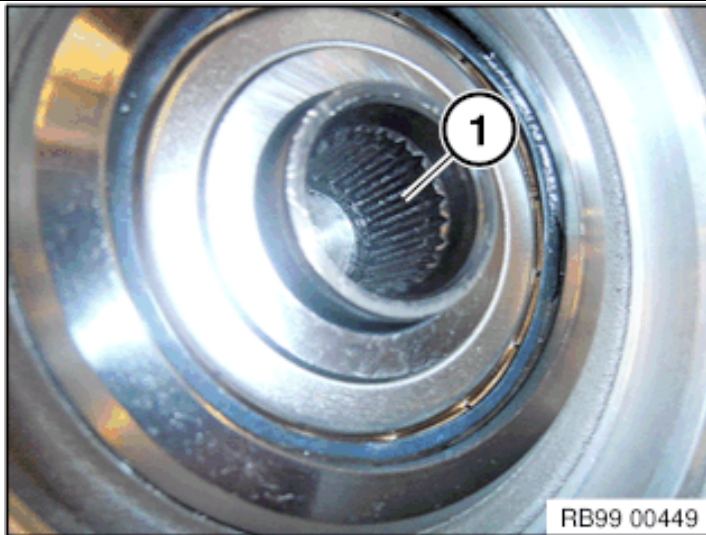
**Version B** – the motor output hub (hollow shaft) is **CLOSED** in the back (with a grease pocket) – detail (3) on picture **B**.



27. Before cleaning the splines of the E-Motor output hub (1), document their condition with a clear photo. In addition, also document the condition of the transmission input shaft with a photo.

Important:

Update the already submitted PuMA case with your findings, and attach pictures of the E-Motor output hub and the transmission input shaft (in their original condition, prior to cleaning).

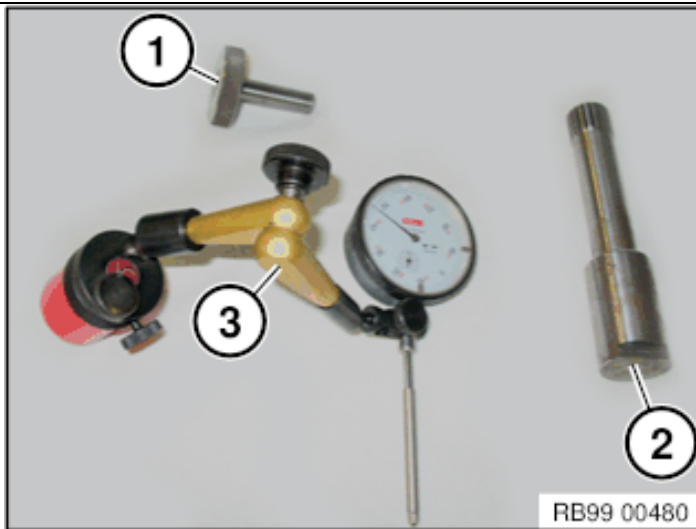


28. Using an appropriate wire brush, thoroughly clean the hub splines to remove all corrosion and rust/debris particles.

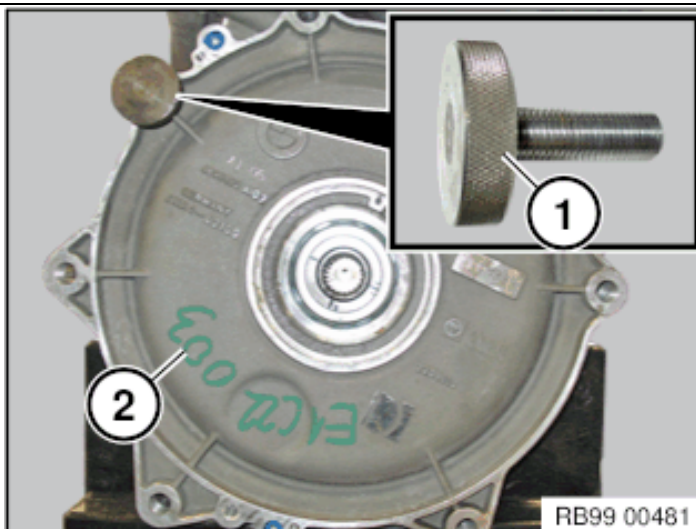
Clean the hub using a cloth moistened with "Reiniger R1 Autobody Repair Primer" (P/N 83 19 2 211 217).

Important:

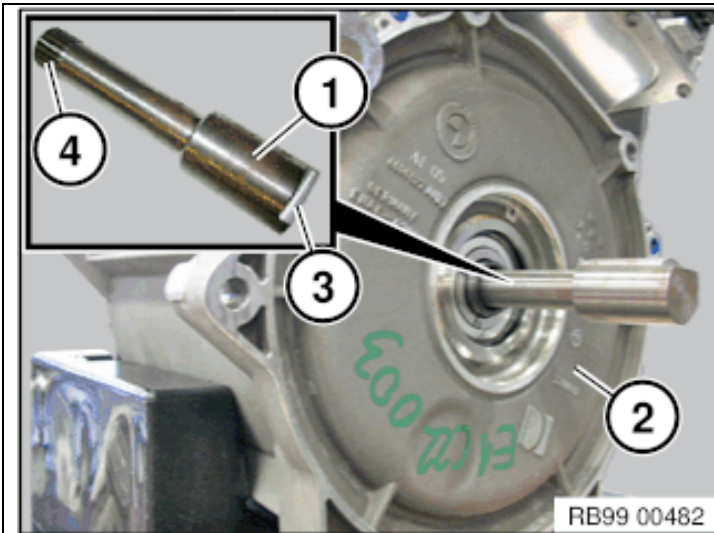
Update the already submitted PuMA case with your findings, and attach pictures of the E-motor output hub after cleaning.



29. Obtain the tools from the special tool kit to measure the wear of the hub splines. This consists of a Dial Gauge Mount (1), Measuring Shaft (2), and a Dial Gauge (3).

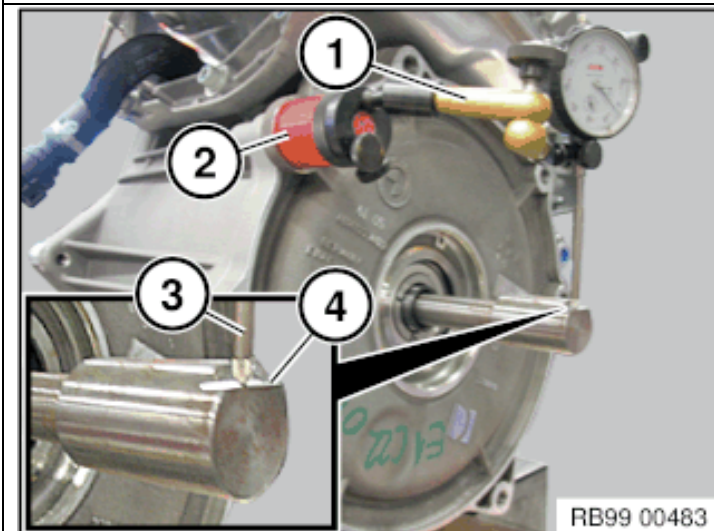


30. Thread the dial gauge mount (1) into the upper left E-Machine (2) mounting hole as shown.



31. Clean the measuring surface for the Measuring Shaft (3) and the splines for the Measurement Shaft (4).

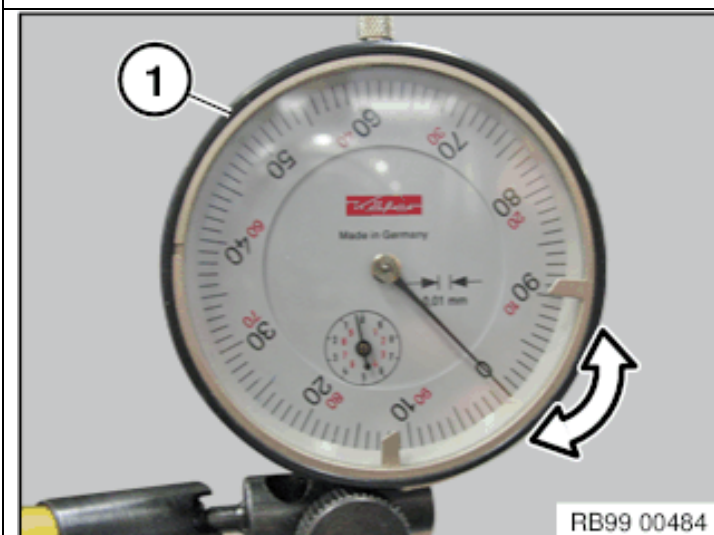
Insert the Measuring Shaft (1) fully into the E-Machine's hub (2). The measuring surface (3) should be approximately horizontal once installed.



32. Secure the dial gauge (1) to the dial gauge mount (2).

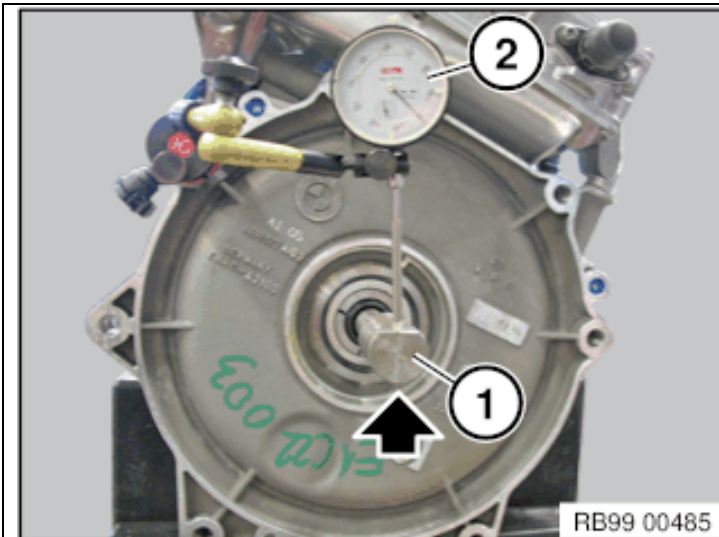
Position the tip of the gauge onto the center of the measuring surface of the measuring shaft.

Position the gauge (3) so that slight pressure exists on the measuring shaft (4).



33. Adjust the needle on the gauge (1) so that it reads 0.

NOTE: When reading the gauge, the small inner gauge displays the number of full mm, while the large outer gauge displays hundredths of a mm. For example, a difference of 1 on the inner gauge and 30 on the outer gauge would be a reading of 1.30 mm.



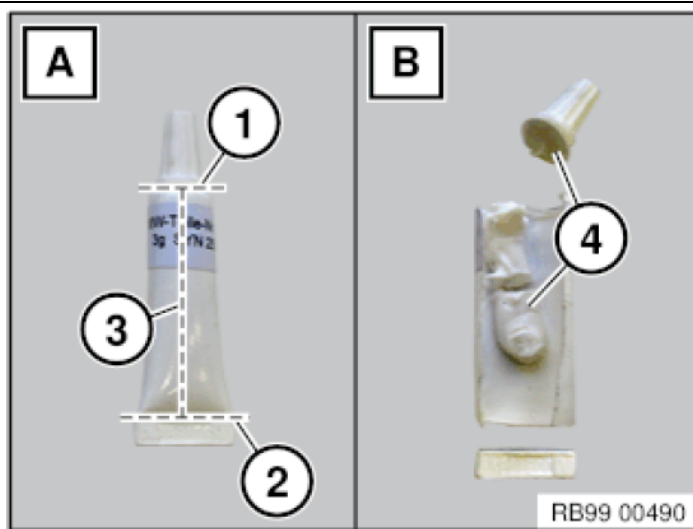
34. Measure the free play of the Measuring Shaft (1) inside the hub by pressing upward on the shaft until it tops out. Only minimal force is required. Record the measurement.

After the first measurement, remove the gauge (2), grasp the measuring shaft, and rotate the E-Machine approximately 60 degrees. Then set up the gauge and shaft, and repeat the measurement. The measurement should be performed 5 times in a row following this procedure.

NOTE: Refer to Step 33 for information on proper reading of the gauge measurement.

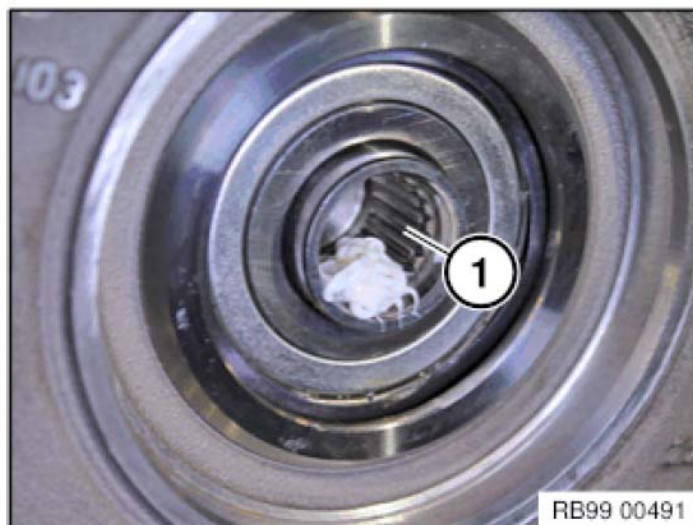
Important: Update the PuMA case with the measurement results and photos for replacement authorization if necessary. Transfer and record the E-Machine serial numbers (as per steps 21-24) in all cases.

## GREASE/SEALING PROCEDURE



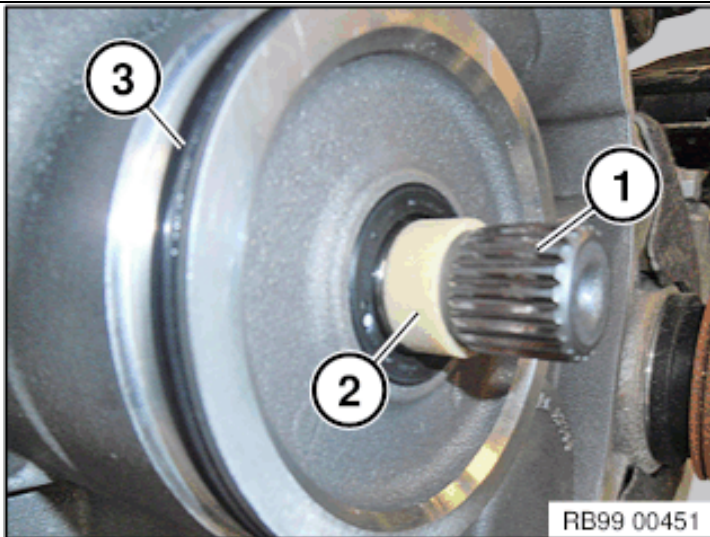
35. Cut off both ends of the tube (1 and 2). Then cut the tube lengthwise (3) and apply the complete contents of the grease to the splines of the E-Machine with your finger.

Note: Use P/N 27 21 8 604 187.



36. Using your finger, spread the grease evenly over all the splines in the output hub (1). Make sure to use all the grease from the tube.

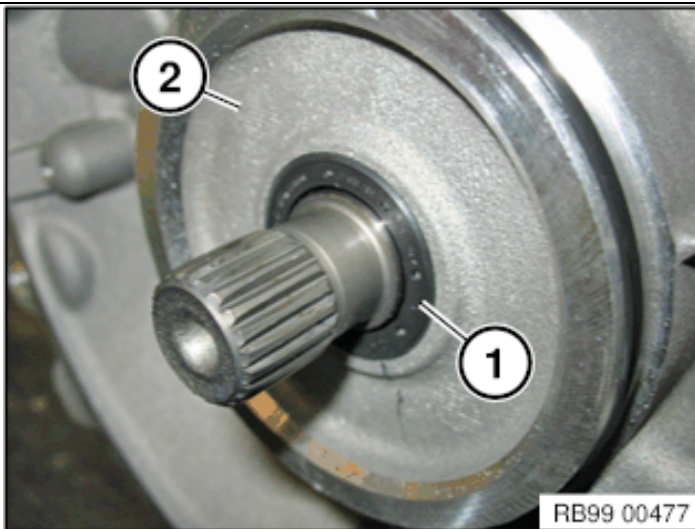
Note: If all the grease is not used, future damage to the hub can occur. Use the residual grease from your finger on the O-ring in step 41 and the half shells in step 50.



37. Remove the plastic bushing (2) from the transmission input shaft (1) and discard it.
38. Using an appropriate wire brush, thoroughly clean the splines, removing all corrosion.
39. Inspect the condition of the input shaft splines. If the splines are damaged (excessive wear), the gearbox will need to be replaced.
40. Inspect the O-ring seal (3) for signs of damage or cuts. Replace it if required.
41. Lightly moisten the O-ring (3) with the leftover grease from the repair kit.  
**Important:**  
Take clear digital pictures of the transmission input shaft after the cleaning has been performed. Attach these photos and those of the E-Motor output hub to the applicable PuMA case in order to receive necessary replacement authorizations.



42. In case the transmission needs to be replaced, the gearbox serial numbers have to be recorded.
43. The transmission serial number is found in the middle of the part identification sticker, attached to the gearbox housing (e.g., 1011101105050006).
44. Write down both transmission serial numbers (old and new) and include them in the PuMA case.
45. **Important:**  
Update the already submitted PuMA case with your findings, and attach pictures of the transmission input shaft after cleaning.



46. Examine the radial shaft seal (1) to determine if it's sitting flush against the transmission housing (2). If it protrudes at all, follow steps 51-53 to properly seat the seal.

In addition, inspect the seal to determine if it is damaged or leaking per the following images.

**IMPORTANT:**

In case of substantial oil leakage from the area of the transmission's radial seal, the EME has to be replaced.

**NOTE:** If it is necessary to seat or replace the radial seal, update the PuMA case with that detail.



47. This image shows an example of the seal leaking from the transmission side (the radial seal P/N 27 21 7 628 759 must be replaced).

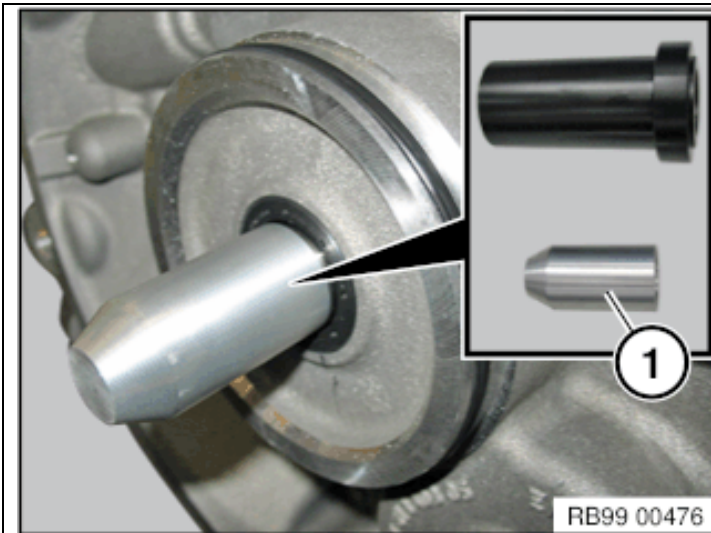


48. If the radial seal is to be replaced, it should be removed using a pick to pierce the seal and pull it out. The shaft or housing of the transmission must not be touched by the pick, as it is easily damaged.

Oil will leak out of the transmission when the seal is removed. Following the replacement, the oil level must be checked and filled as needed.



49. Remove the radial seal with the pick in place.



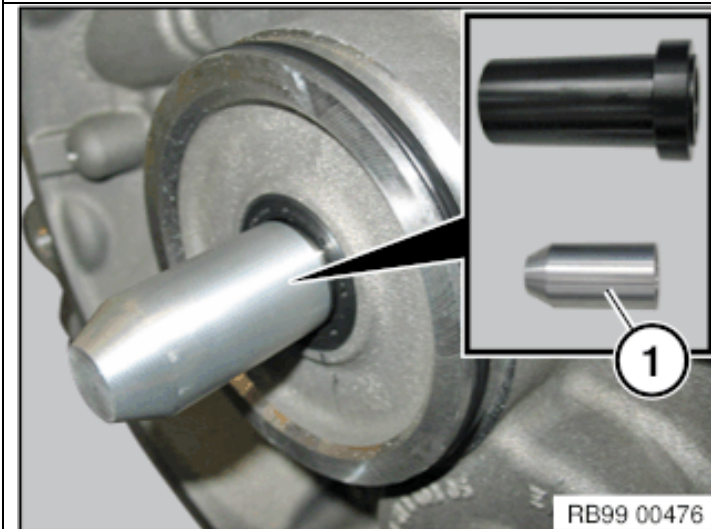
#### 50. Installing a new Radial Seal:

Place the guide sleeve (1) from the special tool kit over the input shaft of the transmission.

NOTE: Always use the guide sleeve. The sharp-edged trans shaft may damage the radial shaft seal.

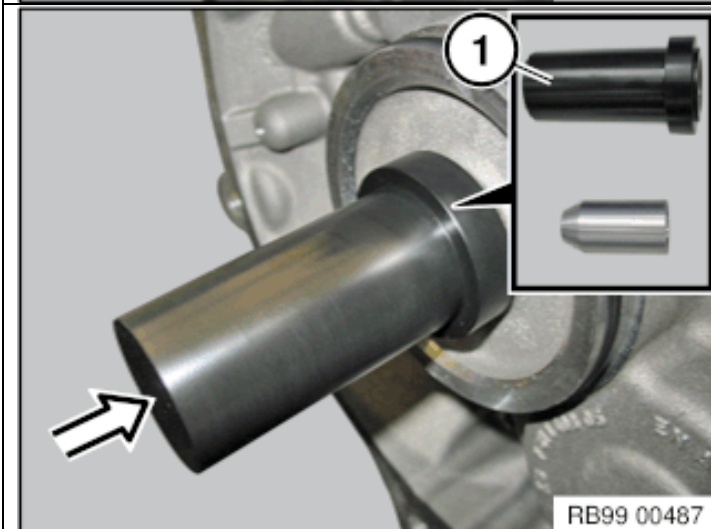
Apply a small amount of oil to the guide sleeve and the radial shaft seal. Carefully position the radial shaft seal over the guide sleeve. Follow steps 52-53 to properly seat the seal.

NOTE: If the transmission oil needs to be refilled, drain the complete transmission oil and refill with 500ml of BOT448 Gear Lubricant (P/N: 83 22 2 295 532). Do not fill it up to the bottom line of the fill hole. The oil level is approx. 30mm/1.2 inches under that line. Update the PUMA case with how much oil you were able to drain.



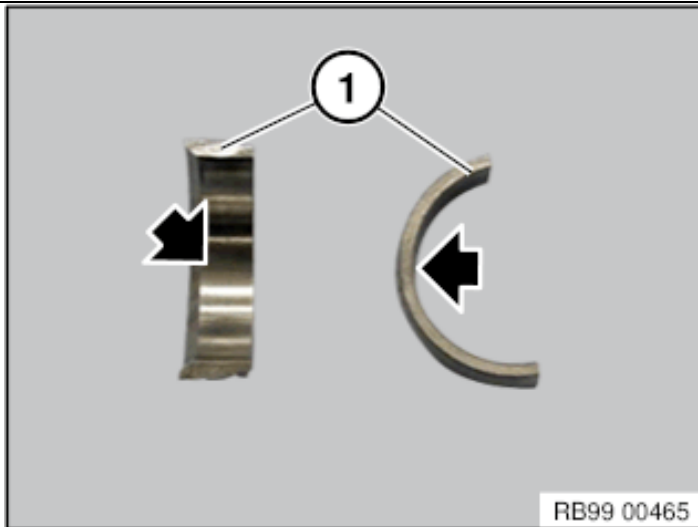
#### 51. Seating the existing Radial Seal:

Place the guide sleeve (1) from the special tool kit over the input shaft of the transmission.

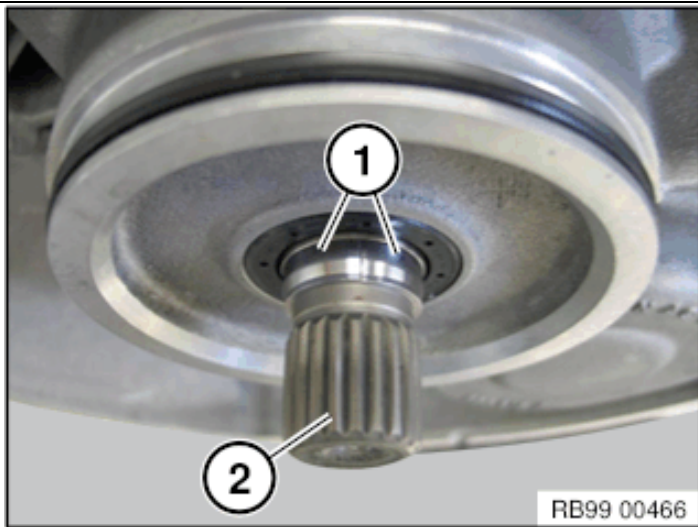


52. Install the seal tool (1) over the guide sleeve until it contacts the seal.

53. Rotate the seal tool while applying pressure to it (in the direction of the arrow), until the point where the seal is flush with the transmission housing.



54. Apply a small amount of leftover grease from step 35 to the inside of the bearing shells (1). This will ease the installation of the half shells around the input shaft.



55. Position the lightly lubricated half shells (1) over the transmission input shaft (2), as shown.

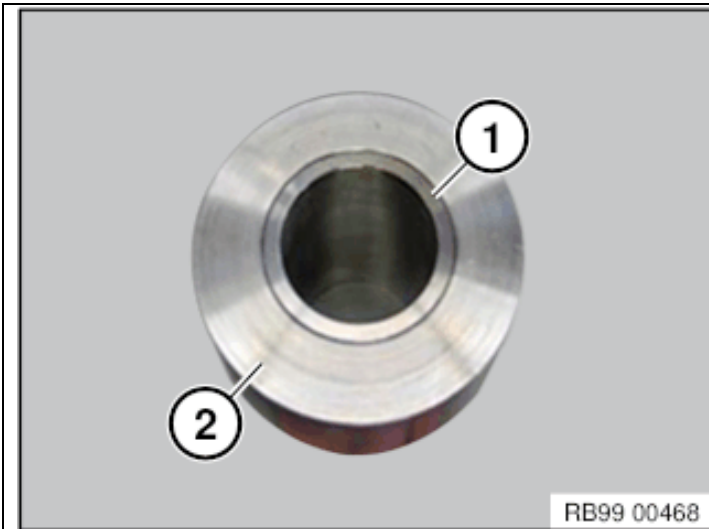
Slide the half shells toward the transmission until they bottom out on the input shaft collar. They should not contact the seal. The shells are tapered on the inside and outside. The taper on the inside of the shells should point toward the transmission.

NOTE: The taper on the inside of the shells MUST point inward, toward the inside of the transmission. As a result, the outside of the shells creates a ramp to ease installation of the metal ring.

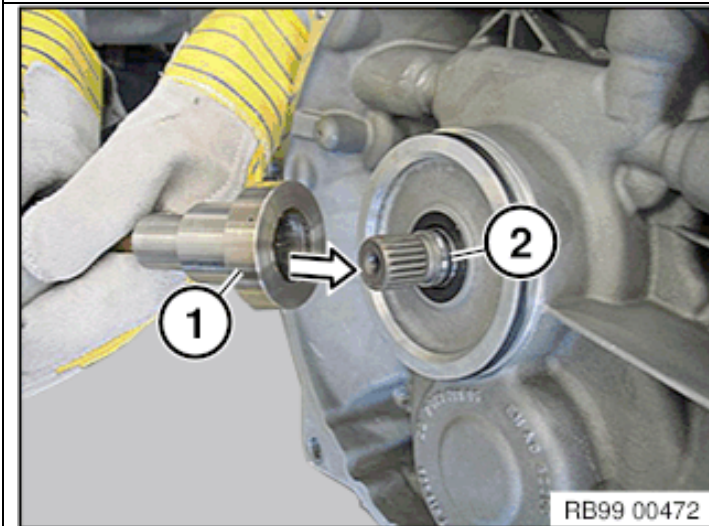


56. Lightly coat the surface on the tapered side of the metal ring (1) with non-metallic grease (2) (P/N 83 23 2 344 250). Only a few very small dots of grease are necessary.

NOTE: The taper on the ring is on the inside circumference. It is very small and can be difficult to see. Only a few dots of grease are necessary.

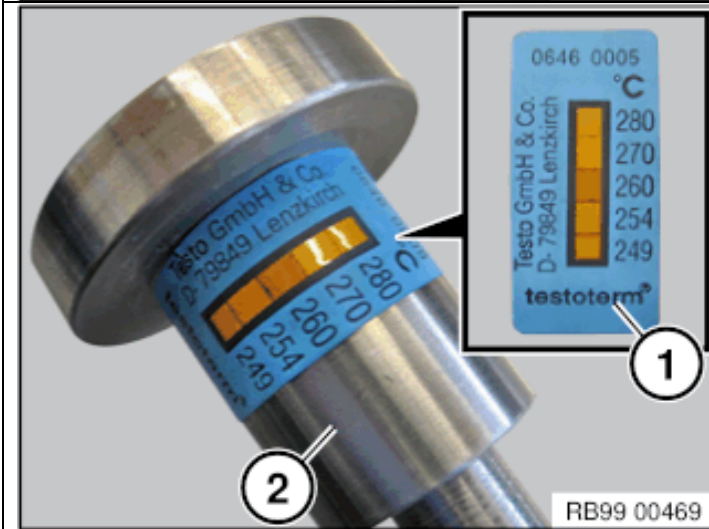


57. Place the greased metal ring (1) into the recess of the mounting tool (2), grease-side down. The intention of the grease is to hold the ring to the mounting tool when positioned for installation.



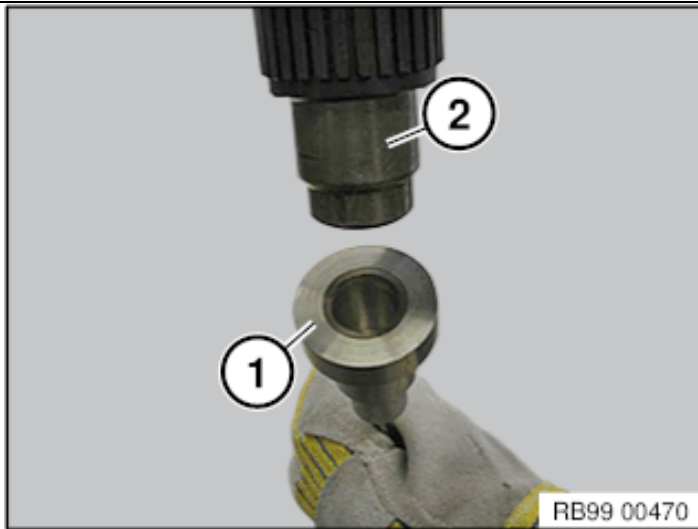
58. Position the mounting tool (1) over the input shaft and up to the half shells (2). With light effort, the metal ring should fit over the half shells and be fully seated. Do NOT use a mallet or excessive force to position the metal ring.

59. If the metal ring will not go over the half shells easily, follow steps 60-65 to properly heat the ring for installation. Otherwise, skip to step 66.



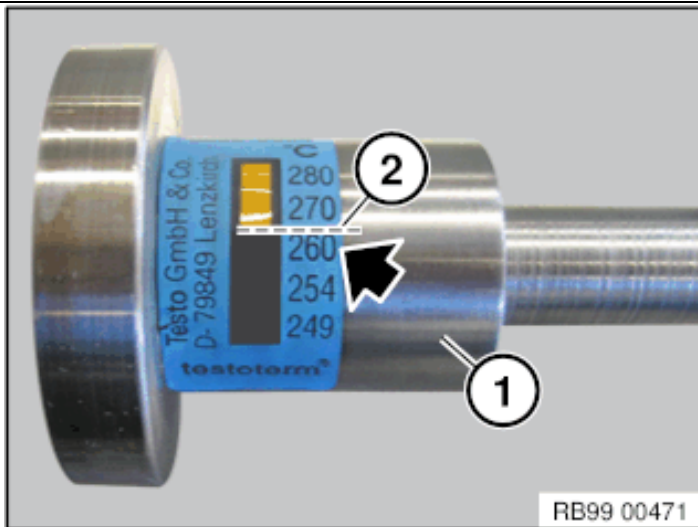
60. Clean the surface of the mounting tool (2) in the area where the temperature gauge is shown.

61. Position the adhesive-backed temperature gauge (1) to the mounting tool (2) as shown. All areas of the gauge must be flush with the mounting tool.

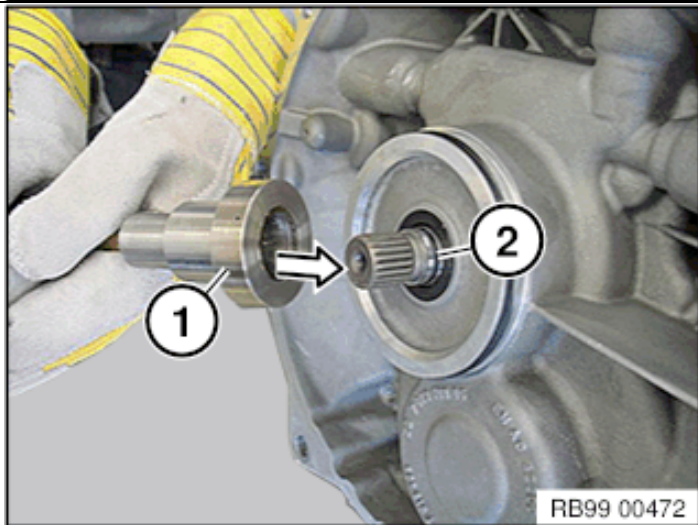


62. With heat-protective gloves on, hold the installation tool (1) with the metal ring facing up.

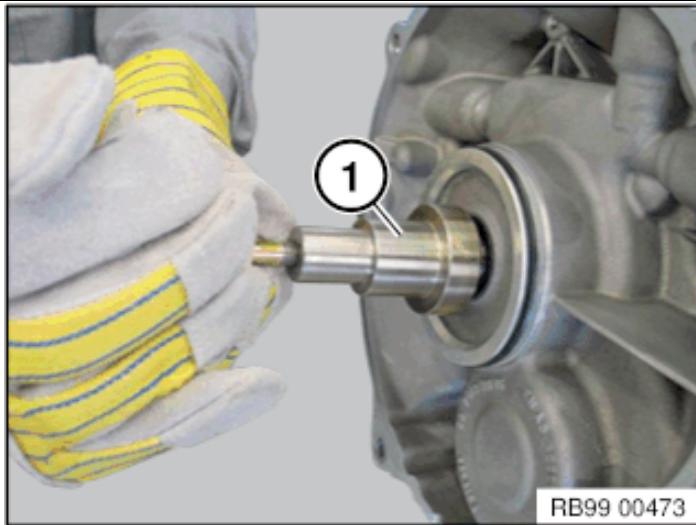
Use a heat gun (2) to warm the metal ring while keeping an eye on the temperature gauge.



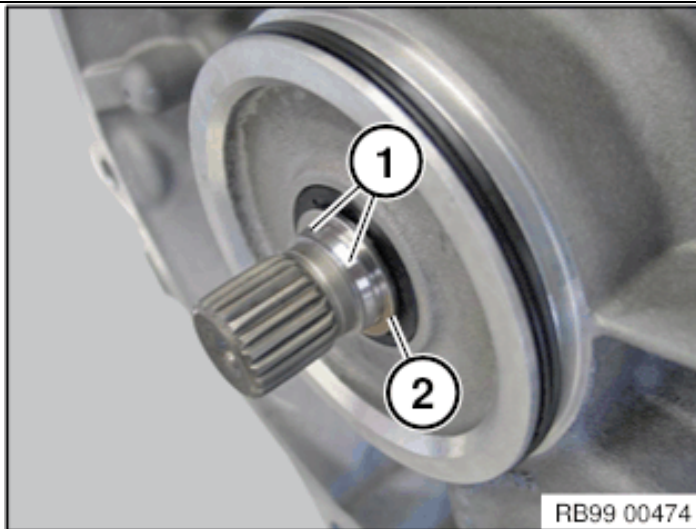
63. Continue heating the metal ring/mounting tool (1) until the temperature gauge (2) reads 260°C.



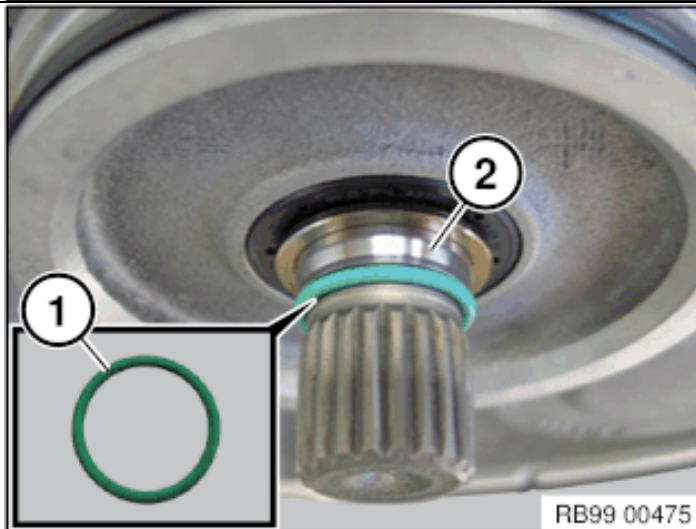
64. Place the warmed mounting tool with the metal ring (1) over the input shaft and half shells (2). Using light pressure, seat the metal ring over the half shells.



65. If the metal ring does not easily seat over the half shells, press and lightly tap on the end of the mounting tool (1) until seated.

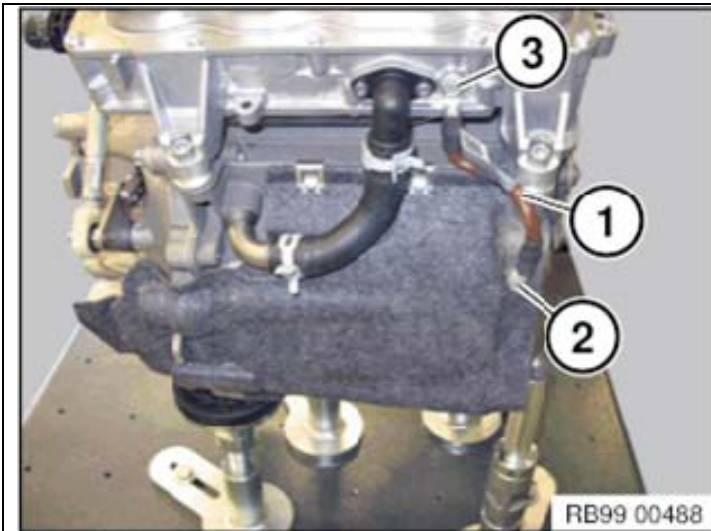


66. In the final seated location, the metal ring (2) may not be in contact with the radial shaft seal but will be over the half shells (1).



67. Install the O-ring (1) from the grease kit over the splines of the input shaft, to the point where it is flush against the half shells (2).

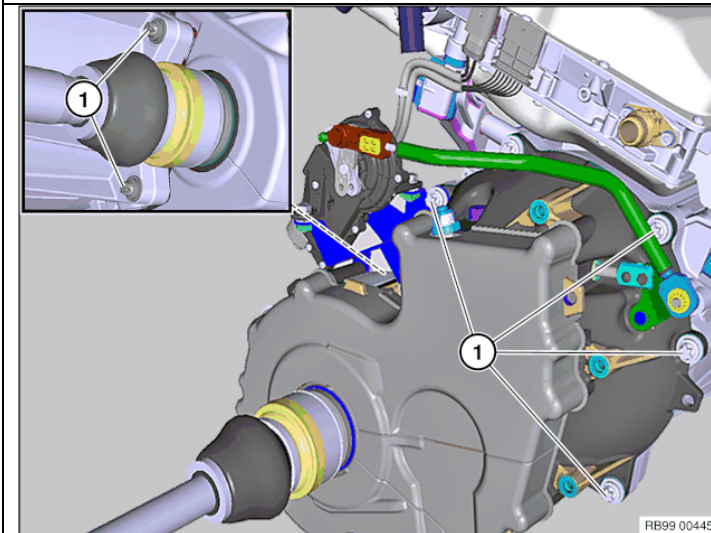
## REINSTALLATION OF TRANSMISSION AND DRIVETRAIN ASSEMBLY



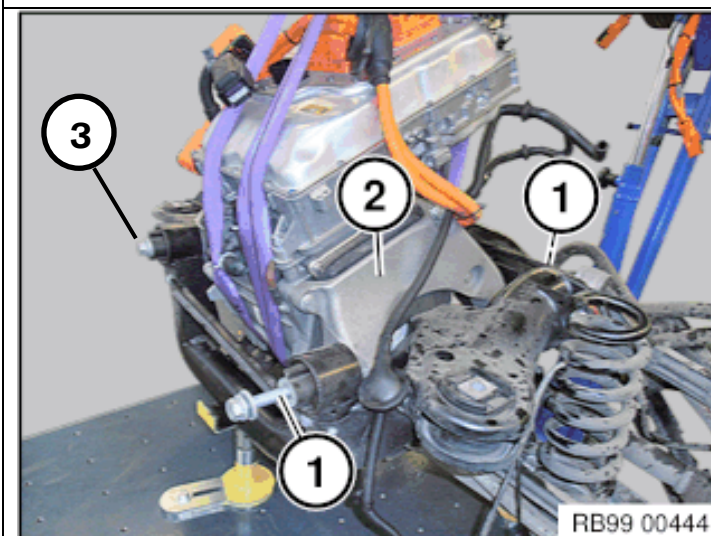
68. Prior to EME/E-Motor reinstallation, make sure the ground cable (1) between the electronic unit (3) and the motor (2) is installed. If the cable is installed, verify the correct torque of 8 Nm. Do not break the connection loose.
69. In case the ground cable is missing, transfer the ground cable (1) from the replaced EME unit and tighten the two hex bolts M5.5x10 to 8 Nm.
70. In sporadic situations when the ground cable is not found on either EME/E-Motor assemblies, order and install ground cable P/N 12 42 7 629 294 and two hex bolts M5.5x10 (torque to 8 Nm).

Important:

When installing the ground cable, have a second person on-site to verify the correct torque of the two hex bolts.



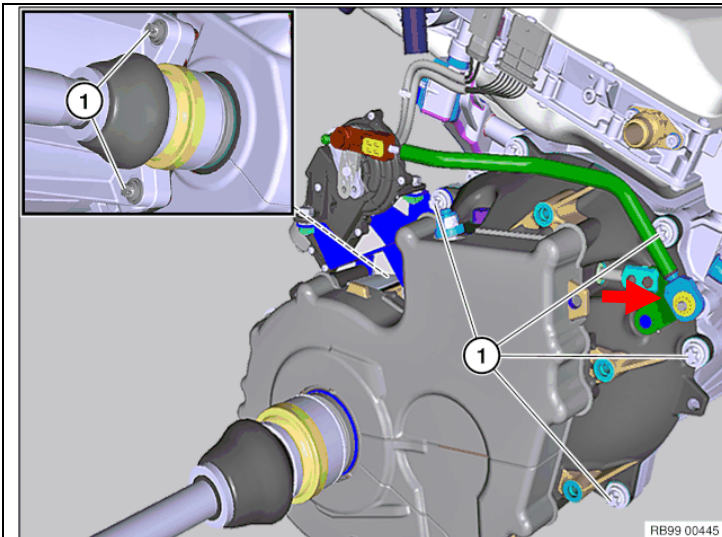
71. Carefully reconnect EME/E-Motor with the transmission.
72. Install and hand-tighten the 7 Torx bolts (1) between the transmission and the E-Motor.



73. Install the right-side transmission bracket (torque bolts to 56 Nm).
74. Reinstall the bolts (1) between the rear axle support and the transmission/motor brackets (2). Apply the final torque of 165 Nm.
75. Reinstall the bolts (3) and torque them to 165 Nm.

Hint:

When installing the screws and bolts, start them "by hand" to prevent any damage to the threads.



76. Apply the initial joining torque of 10 Nm to all 7 Torx bolts (1) in a diagonal pattern.
77. Loosen the bolts (1) again.
78. Hand-tighten the screws (1) again.
79. Push the gear selector lever (red arrow) all the way down.
80. Rotate the brake discs two complete revolutions, keeping the same direction and speed.
81. Push the gear selector lever up, into the previous position.
82. Apply the initial joining torque of 10 Nm to the bolts (1) in a diagonal pattern.
83. Apply the final tightening torque of 56 Nm in a diagonal pattern.
84. Reattach the gear select rod (green) to the selector lever.
85. Reconnect park actuator harness connectors at the EME.

86. Reinstall the rear axle support in the vehicle.

87. Fill the electric motor cooling circuit by following Repair Instruction "17 .. .... Bleeding and filling high-voltage cooling system with vacuum filling unit (eDrive 1)".  
The Repair Instruction can be found in ISTA ActiveE under: Activities > Information search > Text search > "Bleeding and filling" > Search in document title > Start search.

88. **IMPORTANT:**

Make sure to completely bleed the cooling system after refilling (do NOT switch ON the High Voltage prior to the bleeding being completed):

- Connect the approved battery charger.
- Open the expansion tank cap for the cooling circuit of the electric motor.
- Turn the ignition ON (KL15).
- Press and hold both the accelerator and brake pedals simultaneously to the floor for 10 seconds.

The cooling pumps will be activated for approximately 12 minutes.

- Check the coolant flow in the reservoir. If the level is rising and bubbles appear, the procedure is working.
- After the bleeding procedure stops, check the coolant level; adjust if needed; and close the reservoir cap.

89. Bleed the brake system.

90. Note: If E-Motor replacement was necessary during this procedure, update the EME (and all other control modules, if necessary) to the newest software level.  
Using the ISTA ActiveE test plan, initialize (code) the transmission parking lock. Follow the coding procedure from SI B07 01 12.

91. Perform the KDS wheel alignment check.

92. After completion of the repair, test-drive the vehicle.