4. Transmission

4.1. Troubleshooting

Transmission slip

- Loose belt
- Broken belt teeth
- Belt contaminated with oil

Oil leaks

- Damaged rear wheel axle retaining joint
- Worn sprocket pin retaining gasket

Swinging in the rear wheel

- Rear wheel axle bearing damaged
- Unbalanced or incorrectly mounted tyre
- Warped rear brake disc

Deformation of the rear sprocket pin

- Rear sprocket axle bearing damaged
- Rear sprocket axle bearing support screws loose

Noises in transmission

- Worn gearbox bearings
- Broken teeth in gearbox gears

Rear wheel blocked

- Seized gearbox gears
- Extremely low oil level or no oil in gearbox

4.2. Transmission characteristics

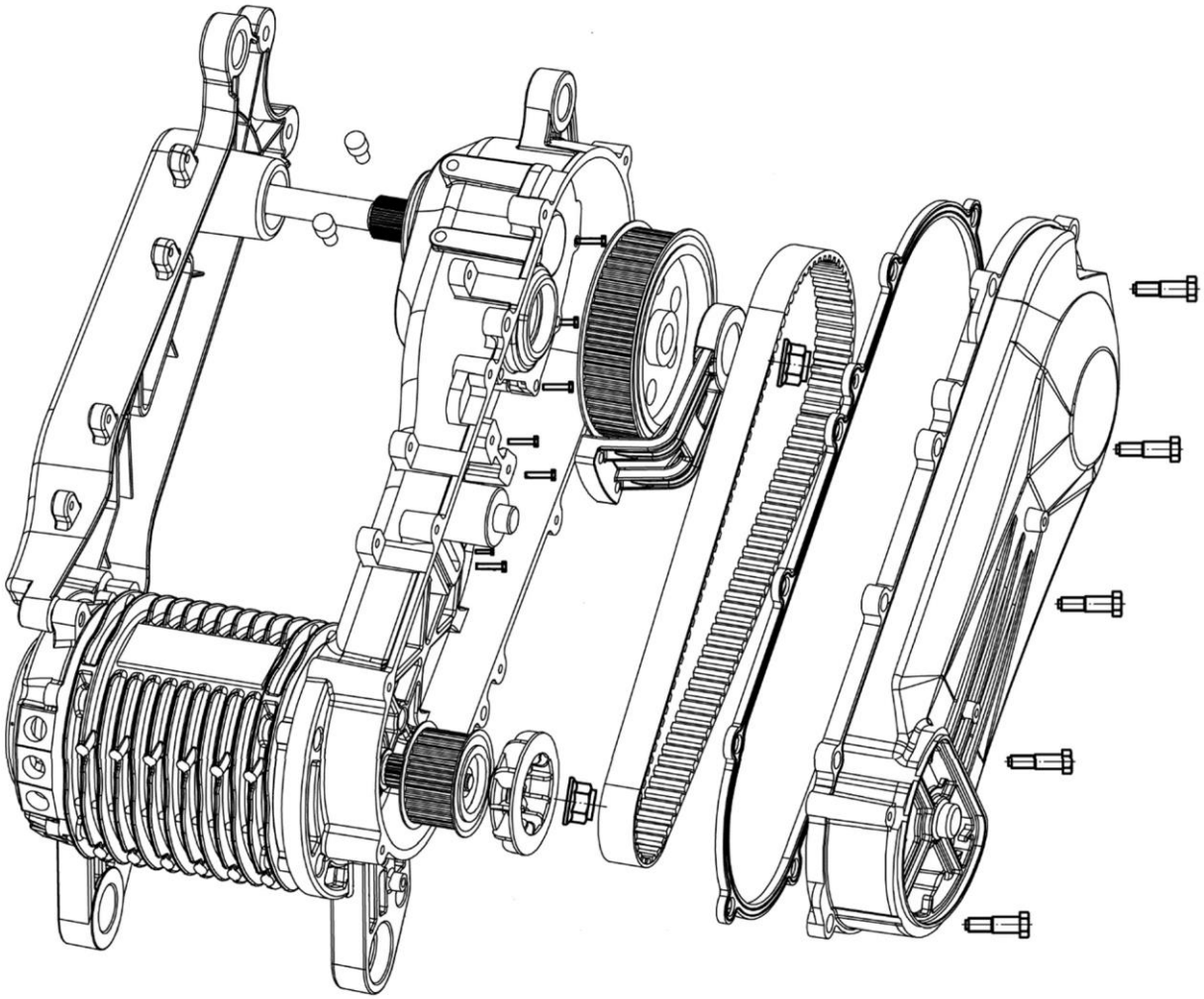
Gearbox transmission oil type	SAE 80W-90
Quantity of gearbox transmission oil	130 cc
Primary gearbox ratio	22/48
Secondary gearbox ratio	13/40
Number of belt transmission pin teeth	22 teeth
Number of belt transmission sprocket teeth	48 teeth

4.3. Tightening torques

Element	Net	Tightening torque
External plastic cover screw	M6x25	10-12 Nm
Internal plastic cover screw	M6	12-15 Nm
Tensioner fixing screw	M6	12-15 Nm
Crown castle nut	M16	30-35 Nm
Pin nut	M10	28-32 Nm
Crown axle bearing support screw	M6	12-15 Nm
Gearbox cover screw	M6	15 Nm
Gearbox drainage screw	M8	20-22 Nm
Gearbox filling screw	M8	20- 22 m

4.4. Belt transmission and transmission covers diagram

4.5. Removing the transmission covers



Necessary tools

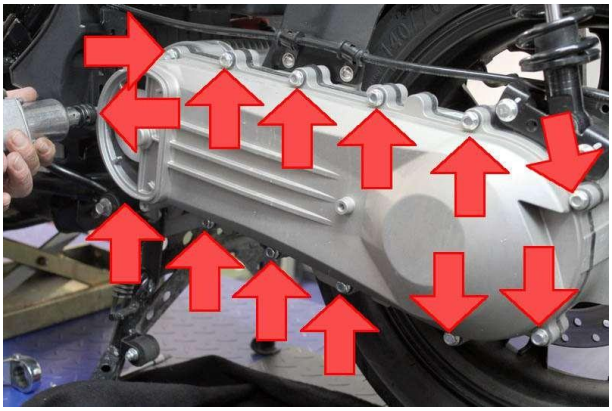
8mm Allen key

10mm socket wrench

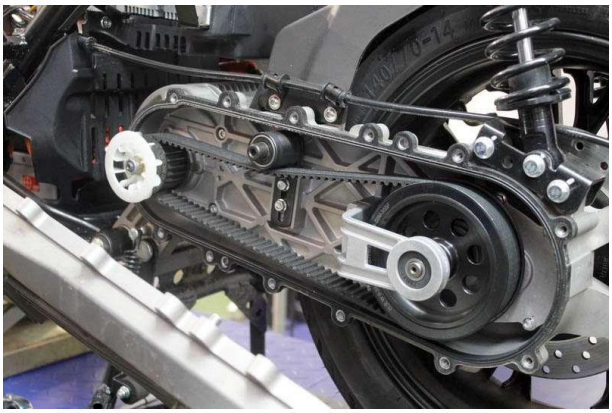
Remove the three screws holding the outer plastic cover to the inner metal cover using a 5mm Allen wrench.

Remove the outer plastic cover.

Remove the thirteen screws holding the metal cover to the transmission housing using a 10mm socket wrench.



Remove the inner metal cover.



To assemble the transmission covers, follow the reverse procedure to that of disassembly by placing the two centring bushes in their housings in the interior metal cover.

Tightening torques:

External plastic cover screw 10-12 Nm.

Internal metal cover screw 12-15 Nm.

4.6. Checking the toothed belt

Preliminary operations:

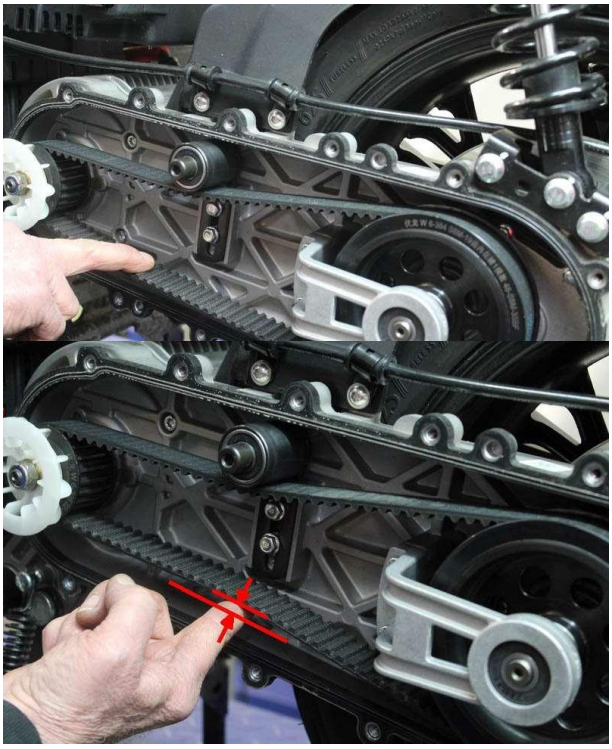
- Remove the transmission covers (See → 4.5. Removing the transmission covers)

Visually check the belt for cracks, damage or wear. If so, replace the belt with a new one.

Spin the rear wheel while feeling the teeth of the belt with a finger. If you detect that a tooth is missing or one is about to fall out, replace the belt with a new one.

Check the belt tension by checking with a finger that the play from its rest position to the upper point of maximum tension does not exceed 2 cm.

Otherwise, retighten the belt.



4.7. Adjusting the toothed belt tension

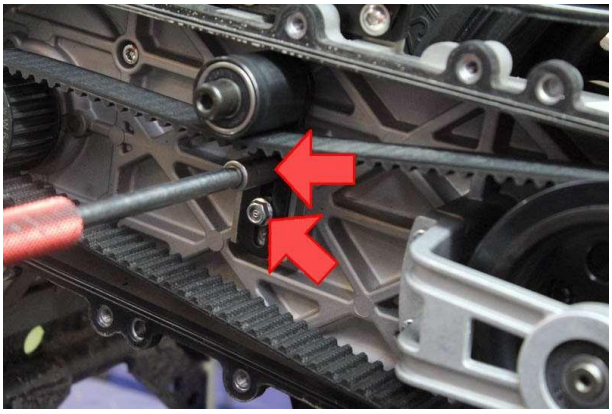
Preliminary operations:

- Remove the transmission covers (See → 4.5. Removing the transmission covers)

Necessary tools

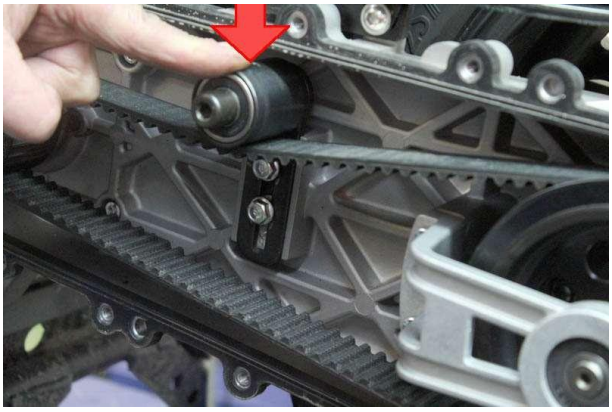
10 mm socket wrench

Loosen (do not remove) the two screws holding the tensioner bracket to the transmission case using a 10mm socket wrench.



Push the tensioner down until there is belt play in its lower half of less than 2 cm from its resting position.

Tighten the two tensioner bracket mounting screws to the specified torque.



Tightening torque:

Tensioner screw 12-15 Nm.

4.8. Belt removal

Preliminary operations:

- Remove the transmission covers (See → 4.5. Removing the transmission covers)

Necessary tools


Universal immobiliser


5mm Allen key

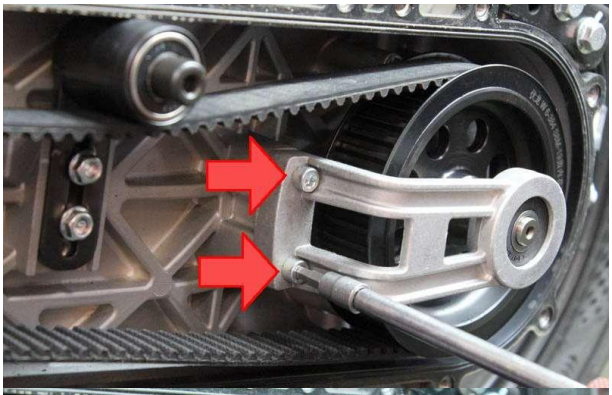

22mm serrated socket wrench


17 mm socket wrench


Two-jaw puller


Pneumatic gun (optional)

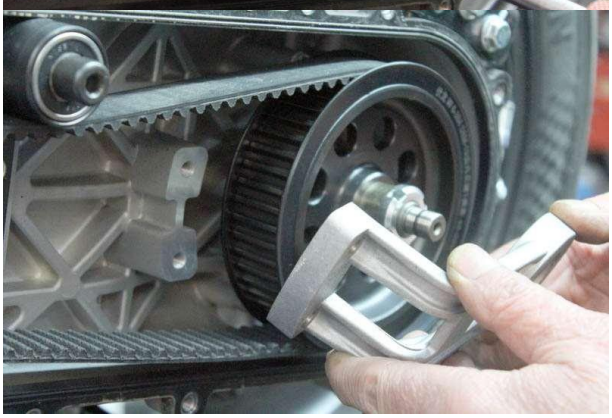
Remove the two screws holding the rear sprocket axle bearing bracket using a 5mm Allen wrench.



Remove the rear sprocket axle bearing bracket.

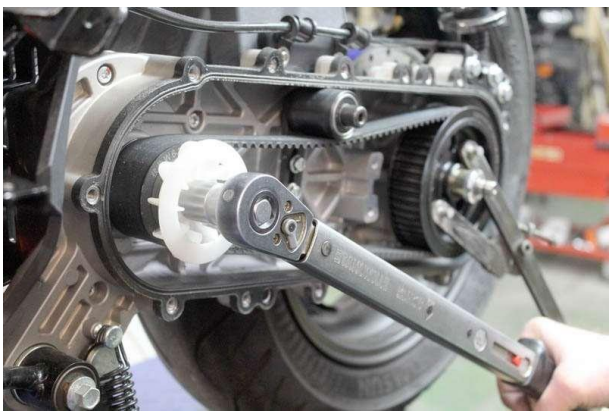
Check if the bearing rotates freely and smoothly by moving its inner track with your finger. Check that the outer track is firmly attached to the bracket.

If the bearing is not in good condition, replace it with a new one.



Hold the rear sprocket using a universal lock while you remove the sprocket nut using a 17mm socket wrench.

NOTE: The pin axle nut is left-hand rotation.



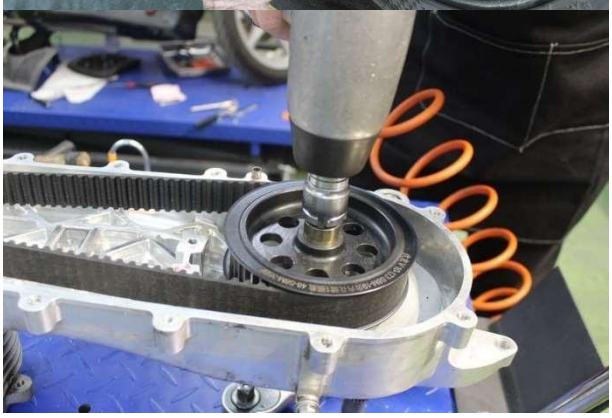
This is what the castle nut that holds the rear sprocket axle looks like.

Hold the rear sprocket using a universal lock and remove the sprocket axle nut using a 22mm castellated socket wrench.

Pull the pin, sprocket and belt assembly outwards, remove the belt.

Reassemble the pin, sprocket and new belt assembly, and continue the disassembly steps in reverse order.

NOTE 1: The sprocket axle nut is left-hand rotation.



Tightening torques:

Sprocket castellated nut 30-35 Nm.

Pin nut 28-32 Nm.

Sprocket axle bearing support screw 12-15 Nm.

NOTE 2: The use of a pneumatic gun is recommended.

Remove the belt by gradually removing the pin and sprocket from the axles. If necessary, use a two-jaw puller to remove the sprocket.

4.9. Draining the transmission final gearbox

WARNINGS
• Mount the scooter on its centre stand on a flat surface. • Avoid spilling transmission oil on the rear brake rotor, as this will contaminate its surface and that of the pads, causing an accident due to loss of braking power. • Dispose of used transmission oil at a collection point.

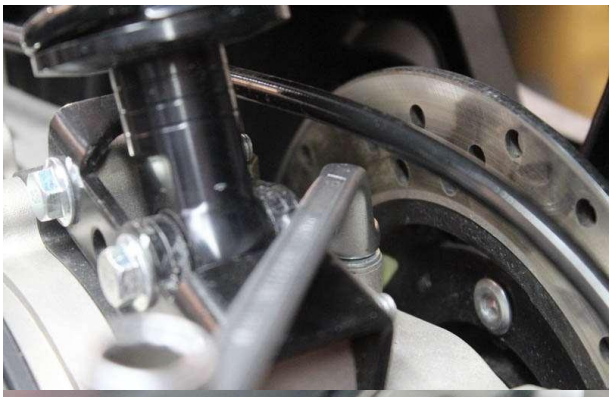
Necessary tools

10 mm socket (or offset) wrench

Tray

Syringe

Remove the final gear filler screw using a 10mm socket (or offset) wrench.



Place a waste oil collection tray under the transmission gear box drain screw and loosen this screw using a 10mm socket (or offset) wrench.

Continue to loosen the drain screw with your fingers and remove it to allow the transmission box to drain into the pan.

Manually turn the rear wheel to completely empty the gearbox of the oil it contains.

Once empty, replace the drainage screw with its washer using the 10 mm wrench.

Tightening torque:

Drain screw 20-22 Nm.

Use a syringe with a sheath long and narrow enough to fit into the fill screw port.

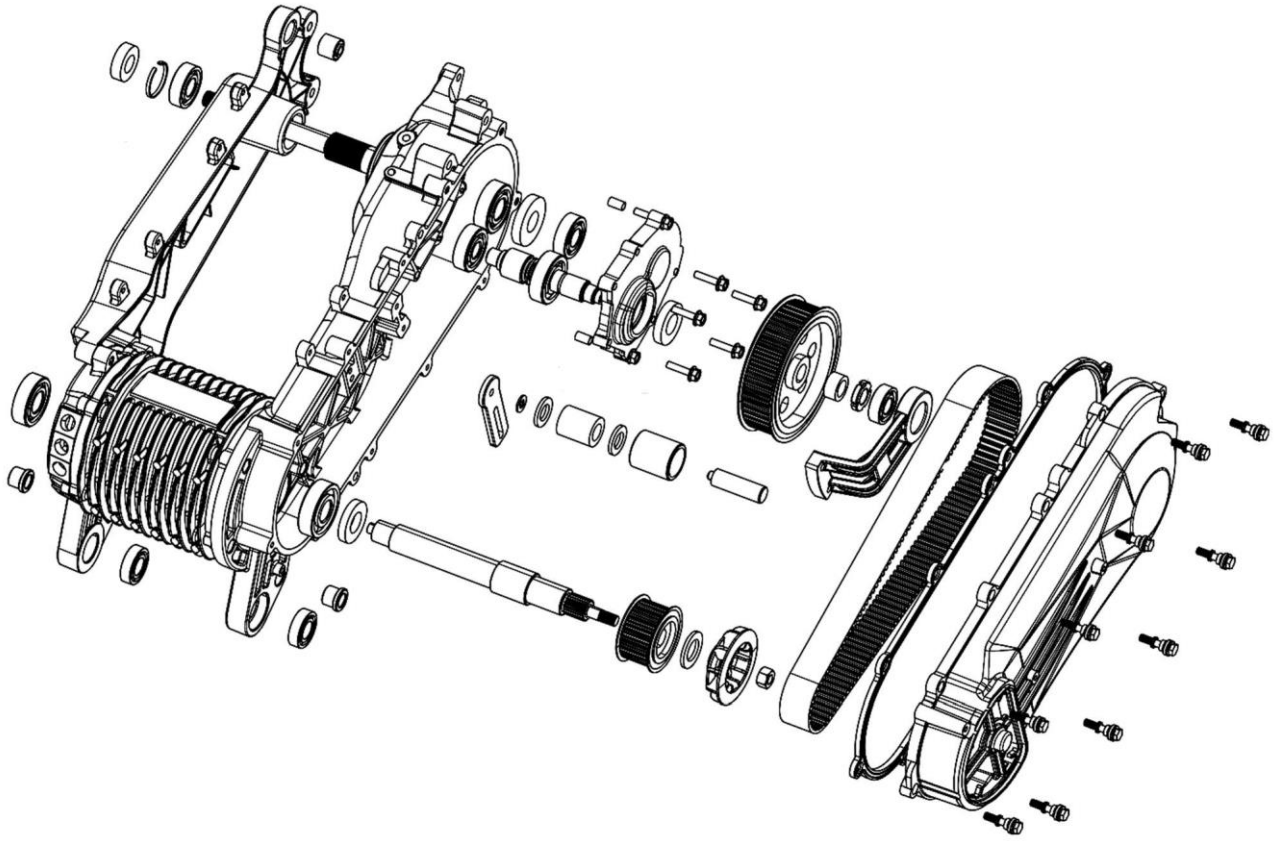
Fill the syringe with **130 cc of SAE 80W-90 oil** and pour its contents into the filler screw.

Replace the filler screw with its washer using the 10 mm wrench.

Tightening torque:

Filler screw 20-22 Nm.

4.10. Gearbox diagram



4.11. Gearbox disassembly

WARNINGS
• This operation can be carried out without extracting the engine-transmission assembly from the vehicle. The photos show the operation with the engine out of the frame for better visualisation. • Mount the scooter on its centre stand on a flat surface. • Dispose of used transmission oil at a collection point.

Preliminary operations:

- Remove the transmission covers (See → 4.5. Removing the transmission covers)
- Remove the drive belt along with the sprocket and pin (see→ 4.8. Belt removal)
- Remove the right shock absorber (see→ 8.6. Removal of the right shock absorber)
- Remove the right swingarm (see→ 8.8. Removal of the right swingarm)
- Remove the rear caliper (see→ 8.7. Removal of the rear caliper)
- Remove the rear wheel (see→ 8.14. Removal of the rear wheel)
- Drain the gearbox (see→ 4.9. Draining the transmission final gearbox WITHOUT FILLING)

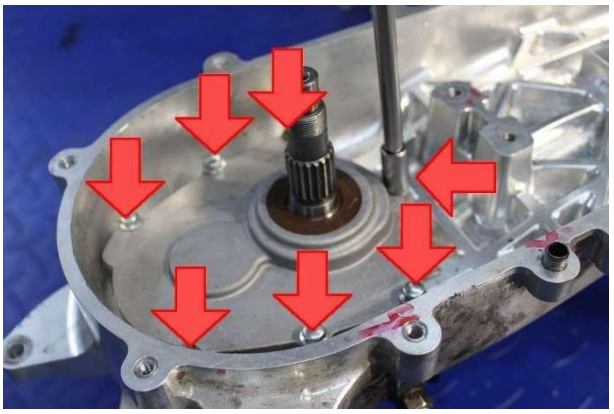
Necessary tools

8 mm socket wrench

Flat screwdriver

Nylon Hammer

Remove the seven screws holding the cover of the gearbox using an 8 mm socket wrench.

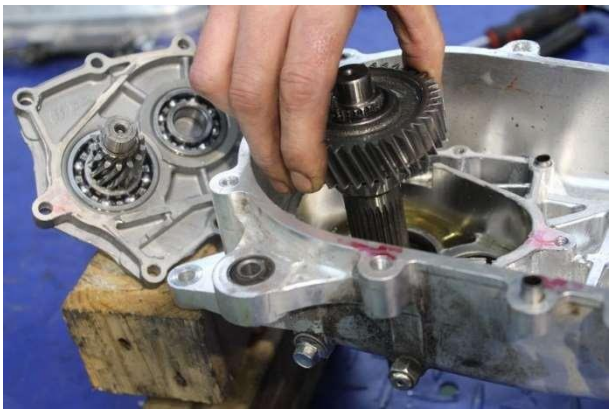


Gently pry the cover off using a flathead screwdriver. Use a cloth to support the flathead screwdriver to avoid damaging the transmission housing.

Remove the gearbox cover upwards. The sprocket axle and its corresponding gear will likely be removed at once.

Clean any remaining joint compound from the transmission housing and gearbox cover.

Extract the wheel axle and its corresponding gear.



Gently tap with a nylon hammer from the outside of the cover on the sprocket pin to remove it from its housing with its corresponding gear.

Visually check whether the rear wheel and ring gear axles, as well as their respective gears, are in good condition. If you observe any damage to the teeth or a bluish colour, replace the set with a new one.

4.12. Replacing gearbox bearings and retaining seals

WARNINGS
• Once the gearbox is opened, you will need to replace the retaining gaskets with new ones. • Check the condition of the bearings by rotating the inner track with your finger and checking that they rotate smoothly. Check that the outer track of the bearing is secured to its bore. If an anomaly is detected, replace the bearings. • Always replace an extracted bearing with a new one. • Before assembly, keep the new bearings to be replaced in the freezer of a refrigerator to allow them to shrink and make assembly easier.

Preliminary operations:

- Remove the transmission covers (See → 4.5. Removing the transmission covers)
- Remove the drive belt along with the sprocket and pin (see→ 4.8. Belt removal)
- Remove the right shock absorber (see→ 8.6. Removal of the right shock absorber)

- Remove the right swingarm (see→ 8.8. Removal of the right swingarm)
- Remove the rear caliper (see→ 8.7. Removal of the rear caliper)
- Remove the rear wheel (see→ 8.14. Removal of the rear wheel)
- Drain the gearbox (see→ 4.9. Draining the transmission final gearbox WITHOUT FILLING)
- Disassemble the gearbox (consult→ 4.11. Disassembly of the gearbox)

Necessary tools

Bearing extractor

Heat gun

Nylon Hammer

Fine point flat screwdriver

Socket wrenches of various sizes for use in mounting or removing bearings

8 mm socket wrench

Joint compound

Remove the sprocket axle backing bearing in the transmission housing using a bearing puller. The head used for the inside of the bearing is 15 mm.

Use a suitable socket wrench that fits into the wheel axle exit hole to tap the bearing and extract it along with the retaining seal.

NOTE: To extract the bearing and retaining seal, a 27mm socket wrench was used, although this dimension may vary depending on the manufacturer.

Use a fine-tipped flathead screwdriver to pry out the sprocket axle retaining gasket in the gearbox cover.

Use a properly sized socket wrench to extract the sprocket shaft bearing from the gearbox cover.

NOTE: To extract the bearing and retaining seal, a 25 mm socket wrench was used, although this dimension may vary depending on the manufacturer.

Remove the wheel axle backing bearing in the transmission cover using a bearing puller. The head used for the inside of the bearing is 17 mm.

Using the heat gun, heat the area of the transmission housing where the wheel axle bearing is housed. This will expand the bore of the bearing, making it easier to fit.

Remove the wheel axle bearing from the freezer and install it into the transmission housing using a socket wrench whose outer dimension matches the outer track of the bearing.

NOTE: To fit the bearing a 36mm socket wrench was used, although this dimension may vary depending on the manufacturer.

Install a new retaining gasket on the bearing. Moisten the inner lip of the retaining gasket with transmission oil.

Using the heat gun, heat the area of the transmission housing where the wheel axle bearing is housed. This will expand the bore of the bearing, making it easier to fit.

Remove the backing sprocket axle bearing from the freezer and install it into the transmission housing using a socket wrench whose outer dimension coincides with the outer track of the bearing.

NOTE: To fit the bearing a 26 mm socket wrench was used, although this dimension may vary depending on the manufacturer.

Using the heat gun, heat the area of the transmission cover where the wheel axle bearing is housed. This will expand the bore of the bearing, making it easier to fit.

Remove the backing wheel axle bearing from the freezer and install it into the transmission cover using a socket wrench whose outer dimension coincides with the outer track of the bearing.

NOTE: To fit the bearing a 30 mm socket wrench was used, although this dimension may vary depending on the manufacturer.

Using the heat gun, heat the area of the transmission cover where the wheel axle bearing is housed. This will expand the bore of the bearing, making it easier to fit.

Remove the sprocket axle bearing from the freezer and install it into the transmission cover using a socket wrench whose outer dimension matches the outer track of the bearing.

NOTE: To fit the bearing a 34 mm socket wrench was used, although this dimension may vary depending on the manufacturer.

Install a new retaining gasket onto the sprocket axle bearing from the outside of the transmission cover.
Moisten the inner lip of the retaining gasket with transmission oil

Insert the rear wheel axle into its housing.

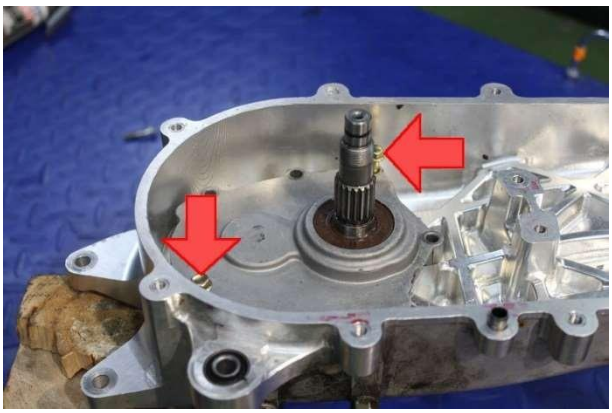
Insert the sprocket pin into its housing in the support bearing.

Apply joint compound to the ribs of the gearbox cover that rest on the transmission case. Clean excess paste from the ribs.

Place the gearbox cover by inserting it through the sprocket pin.

Fit the cover securely onto the crankcase by gently tapping around its perimeter using a nylon hammer.

Insert the two longest screws into the holes shown in the picture.



Tighten the seven screws using an 8 mm socket wrench.

Tightening torque: 15 Nm.

4.13. Replacing the sprocket pin guide bearing

WARNINGS
• Check the condition of the bearings by rotating the inner track with your finger and checking that they rotate smoothly. Check that the outer track of the bearing is secured to its bore. If an anomaly is detected, replace the bearings. • Always replace an extracted bearing with a new one. • Before assembly, keep the new bearings to be replaced in the freezer of a refrigerator to allow them to shrink and make assembly easier.

Preliminary operations:

- Remove the transmission covers (See → 4.5. Removing the transmission covers)

Necessary tools

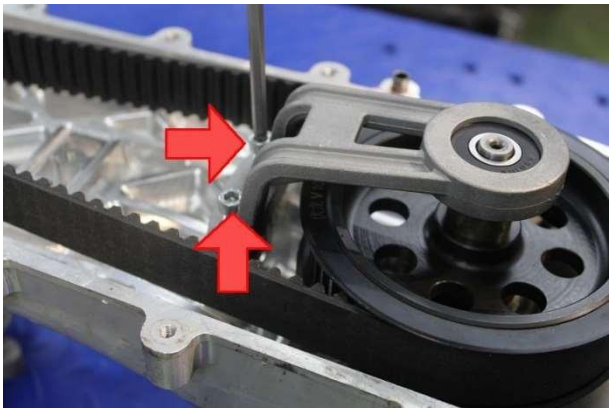
50 mm Allen key

Heat gun

Nylon Hammer

Socket wrenches of various sizes for use in mounting or removing bearings

Remove the two screws holding the rear sprocket axle guide bracket using a 5 mm Allen wrench.



Extract the guide bracket from the sprocket pin.

Use a properly sized socket wrench to support the sprocket axle guide bracket so that when removed the bearing can fit into the socket mouth with sufficient clearance.

NOTE: To support the sprocket pin guide bracket, a 36mm socket wrench was used, although this dimension may vary depending on the manufacturer.

Use a properly sized socket wrench to remove the bearing from the sprocket axle guide bracket.

NOTE: To extract the sprocket pin guide bearing, a 22 mm socket wrench was used, although this dimension may vary depending on the manufacturer.

Using the heat gun, heat the bearing bore area in the sprocket axle guide bracket. This will expand the bore of the bearing, making it easier to fit.

Take the sprocket pin bearing out of the freezer and place it into the bore in the sprocket pin guide bracket.

Install the bearing from the guide pin to the sprocket pin using a socket wrench whose outer dimension coincides with the outer track of the bearing.

Reassemble the sprocket pin guide bracket following the disassembly steps in reverse.

Tightening torque:

Guide bracket from the sprocket pin screw. 12-15 Nm.

4.14. Changing the motor rotor

NOTES
• Check the condition of the bearings by rotating the inner race with your finger and ensuring that it rotates smoothly. Check that the outer race of the bearing is well fixed in its recess. If any anomaly is detected, change the bearings. • Always change a removed bearing for a new one. • Before fitting, place the new replacement bearings in the refrigerator freezer so that they contract and facilitate installation. • During assembly, apply joint sealant between the transmission crankcase and the motor. • Don’t forget to calibrate the motor-controller after assembly. The procedure is explained in section 4.15.

Prior operations:

- Removing the motor from the frame (see ❼ 3.4. Removing the motor)
- Disconnecting the motor's power supply cables on the controller (See ❼ 5.7. Removing the controller)
- Dismantling the transmission covers (See ❼ 4.5. Removing the transmission covers)
- Removing the sprocket from the motor (See ❼ 4.8. Removing the belt)

Necessary tools

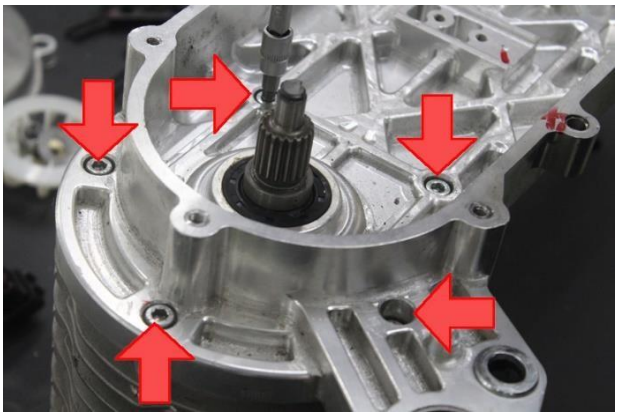

5 mm Allen key


Bench vice


Nylon hammer


Bearing outer puller

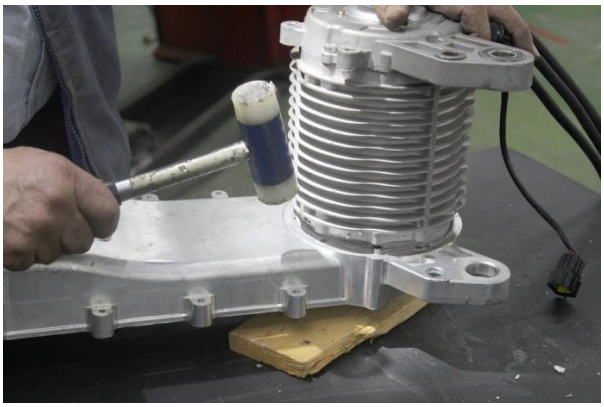
With a 5 mm Allen key, remove the five bolts that fix the motor to the transmission crankcase.



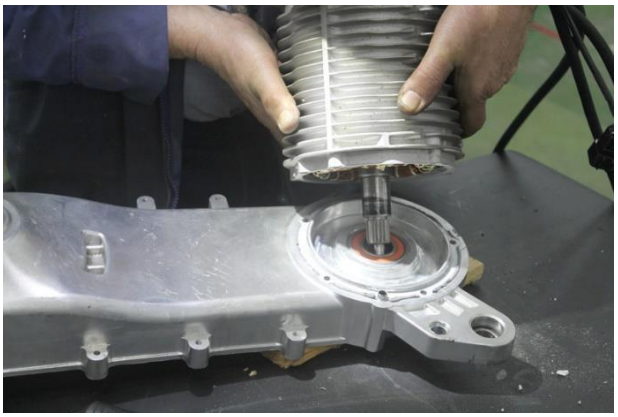
Tightening torque:

Motor - crankcase connecting bolts: 15 Nm

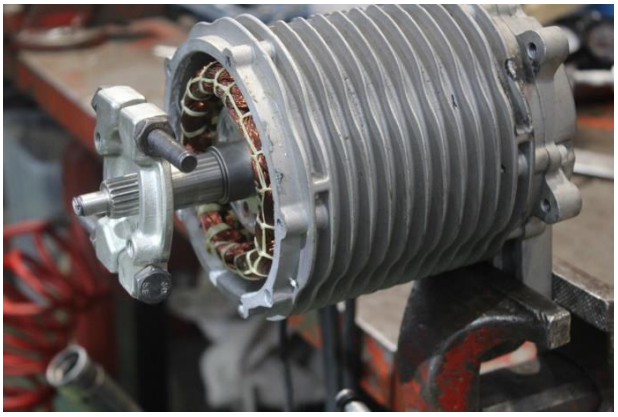
Position the motor with the shaft downwards supported on a piece of wood and hit the transmission crankcase with a nylon hammer to separate it from the motor.



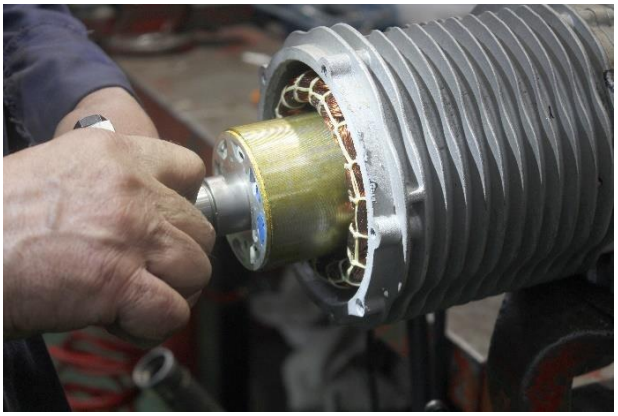
Separate the motor from the transmission crankcase.



Fix the motor in a bench vice and use the appropriate outer bearing puller for fixing it to the collar under the shaft spline.



Use the puller to remove the rotor from the winding by overcoming the attraction force of the magnets.



Assembly is the reverse of disassembly. Once the motor is connected, the controller and the motor must be calibrated. For this, contact the Nerva after-sales service.