

4. Transmission

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4.1. Troubleshooting

Transmission slips

- Slack belt
- Broken strap teeth
- Oil contaminated belt

Oil leakage

- Rear wheel axle seal damaged
- Crown axle seal damaged

Rear wheel sway

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

Rear crown axle warpage

- Damaged rear crown axle bearing
- Rear crown axle bearing support screws loose

Transmission noise

- Worn gearbox bearings
- Broken teeth on gearbox gears

Rear wheel locked

- Seized reduction gearbox gears
- Oil level too low or no oil in gear box

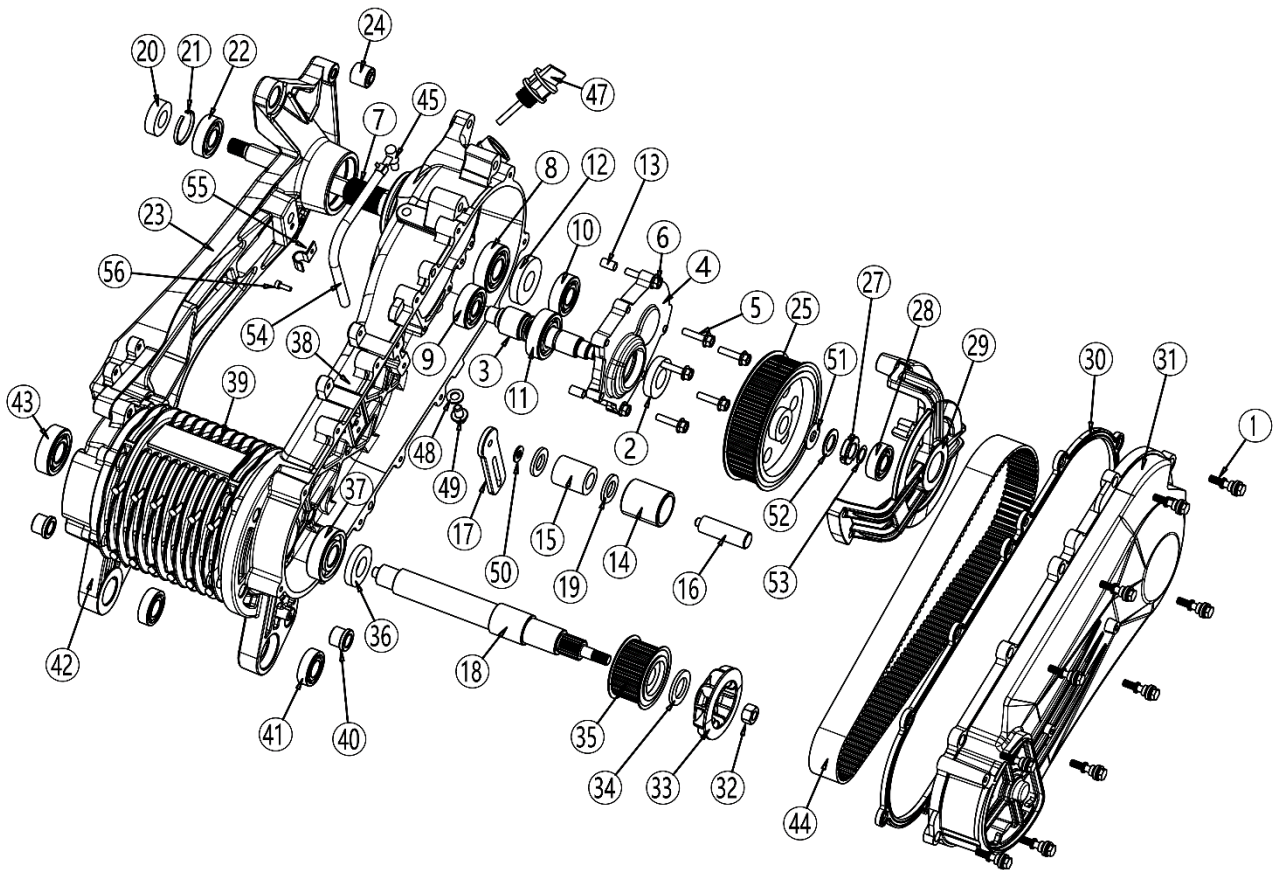
4.2. Transmission characteristics

Transmission gear oil type	SAE 80W-90
Quantity gearbox transmission oil	120 cc
Primary reduction ratio	48/22
Secondary gear ratio	47/17
No. of teeth belt drive sprocket	22 teeth
No. of teeth crown gear belt drive	48 teeth

4.3. Tightening torques

Component	Thread	Tightening torque
Outer plastic cover screw	M6	10-12 Nm
Inner metal cover screw	M6	12-15 Nm
Tensioner fixing screw	M6	15 Nm
Crenellated crown nut	M16	30-35 Nm
switch housing nut	M10	28-32 Nm
Crown axle bearing support screw	M6	12-15 Nm
Gearbox cover screw	M6	15 Nm
Drain plug / screw for the reduction gearbox	M10	20-22 Nm
Engine-to-transmission crankcase fixing screws	M6	15 Nm

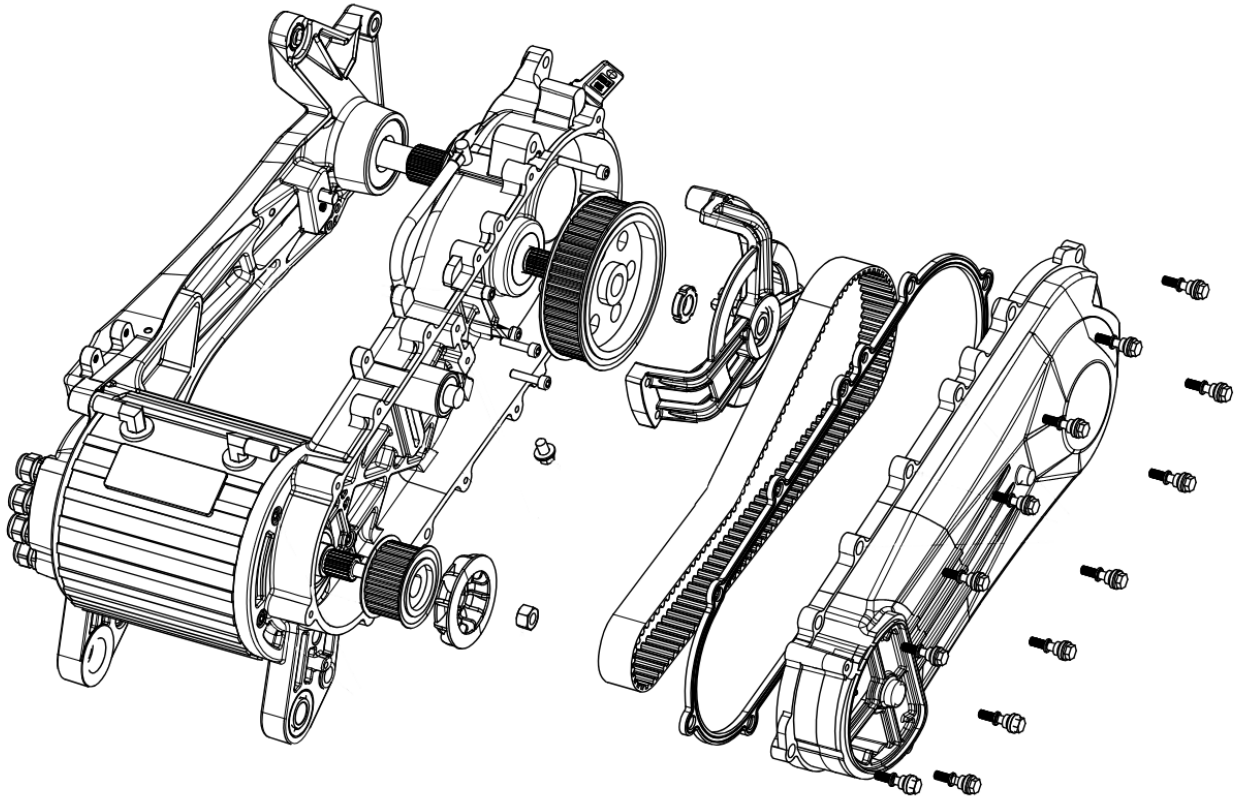
4.4. Transmission diagram



Code	NAME	Code	NAME	Code	NAME
1	Left-hand side cover fixing screws	19	Tensioner bearing	39	Engine
2	Primary axle seal	20	Wheel axle dust cover	40	Centring bushing
3	Primary axle	21	Wheel axle circlip	41	Engine assembly support bearing
4	Gearbox cover	22	Swingarm bearing	42	Right-hand side engine cover
5	M6x25 hexagon-head screw	23	Swingarm	43	Right engine bearing
6	M6x32 hexagon-head screw	24	Silent-Block	44	Transmission belt
7	Wheel axle	25	Rear pulley	45	Reduction gearbox breather pipe connector
8	Wheel axle bearing	27	Castellated nut M16	47	Oil dipstick
9	Primary axle support bearing	28	Rear pulley support bearing	48	Aluminium washer
10	Wheel axle support bearing	29	Rear pulley support	49	Oil drain screw
11	Primary axle bearing	30	Rubber gasket	50	Flat washer $\phi 8 \times 16 \times 1.5$
12	Rear wheel axle seal	31	Left-hand side cover	51	Curved washer
13	Centring bushing	32	Locknut	52	Flat washer
14	Tensioner bushing	33	Front pulley fan nut	53	Warped washer
15	Tensioner inner bearing	35	Front pulley	54	Breather pipe
16	Tensioner screw	36	Engine axle seal	55	Breather pipe clamp
17	Tensioner positioning slider	37	Engine axle bearing	56	M4x12 screw
18	Engine axle	38	Transmission crankcase		

4.5. Disassembly of the transmission covers

Diagram



Necessary tools



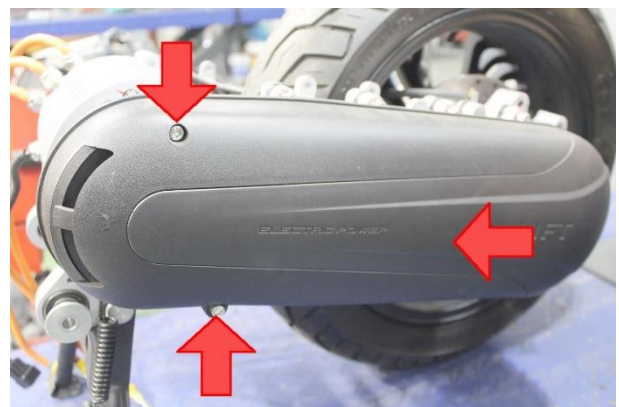
8 mm Allen key



10 mm socket
spanner

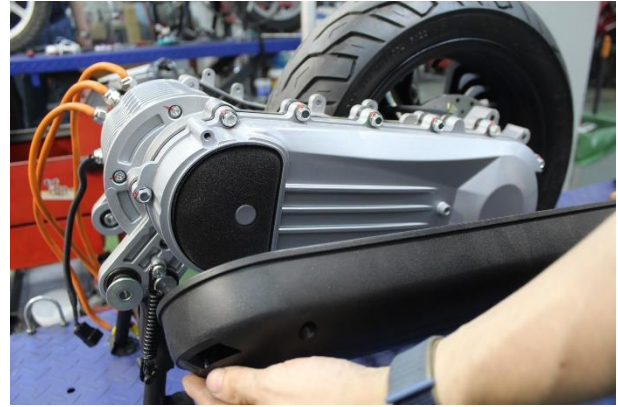
Remove the three screws securing the outer plastic cover to the inner metal cover with a 5 mm Allen key.

When mounting, remember that the longest screw is at the rear, the medium screw at the upper and the short screw at the bottom.

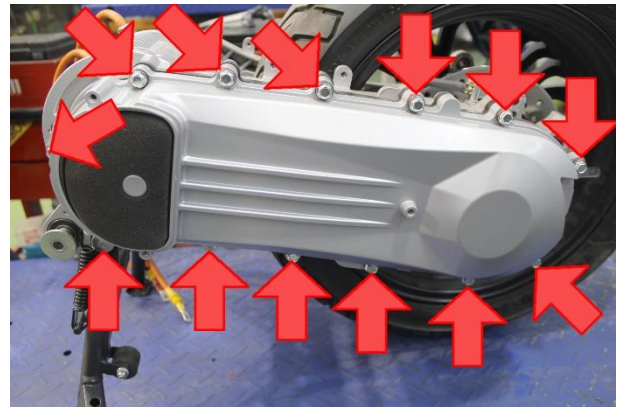


4. TRANSMISSION

Remove the outer plastic cover.



Remove the thirteen screws securing the inner metal cover to the transmission housing with a 10 mm socket spanner.



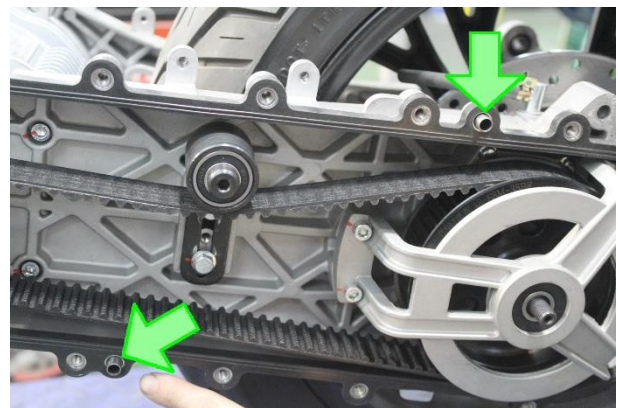
Remove the inner metal cover.



To fit the transmission covers, follow the reverse order of disassembly by placing the two centring bushings in their housings in the inner metal cover.

Tightening torques:

External plastic cover screw 10-12 Nm
Inner metal cover screw 12-15 Nm



4.6. Checking the timing belt

Required prior operations:

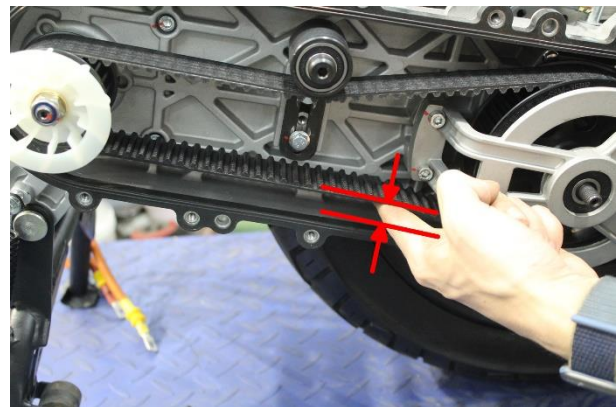
- Remove the transmission covers (Refer to → 4.5. Disassembly of the transmission covers)

Visually check the belt for cracks, damage or wear. If there is evidence of any such faults, replace the belt with a new one.

Rotate the rear wheel while feeling the belt teeth with one finger. If you find any teeth missing or about to come loose, replace the belt with a new one.

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

If this slack is exceeded, tighten the belt.



4.7. Toothed belt tensioning

Required prior operations:

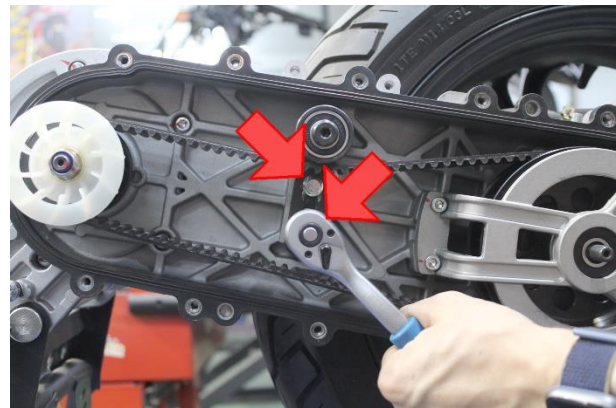
- Remove the transmission covers (Refer to → 4.5. Disassembly of the transmission covers)

Necessary tools



10 mm socket spanner

Loosen (but do not remove) the two screws securing the tensioner support to the transmission housing with a 10 mm socket spanner.

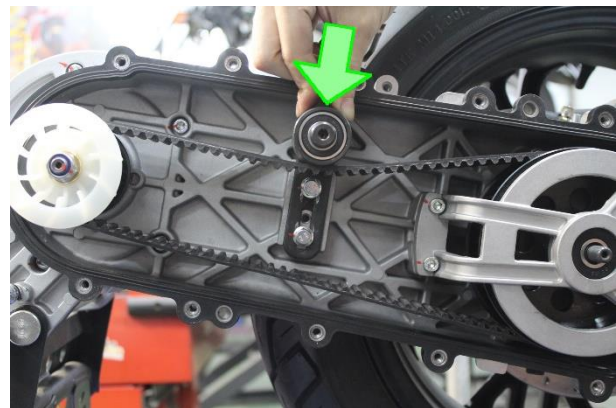


Push the tensioner down until the slack in the lower half of the belt is less than 2 cm from its rest position.

Tighten the two tensioner support fixing screws to the specified torque.

Tightening torque:

12-15 Nm tensioner screws



4.8. Removal of the belt

Required prior operations:

- Remove the transmission covers (Refer to → 4.5. Removal of the transmission covers)

Necessary tools



5 mm Allen key



22 mm hexagon socket spanner



17 mm socket spanner

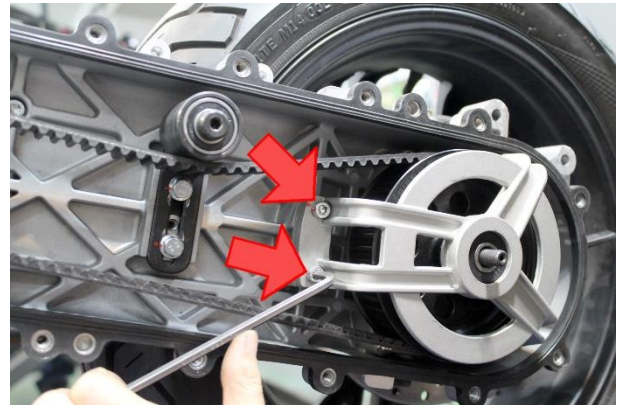


Two-jaw puller

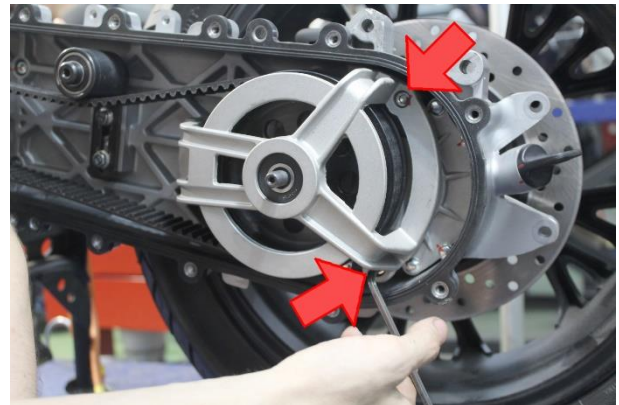


Pneumatic gun

Remove the two front screws securing the rear ring gear axle bearing support with a 5 mm Allen key.



Remove the two rear screws securing the rear ring gear axle bearing support with a 5 mm Allen key.



Remove the bearing support from the rear ring gear axle.

Check whether the bearing turns freely and smoothly by rotating its inner race with your finger. Check that the outer race is firmly attached to the support.

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



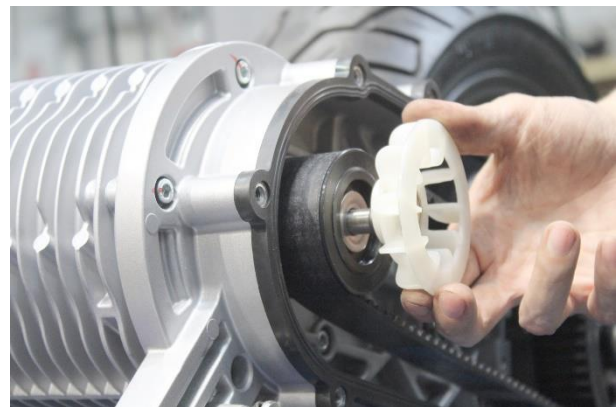
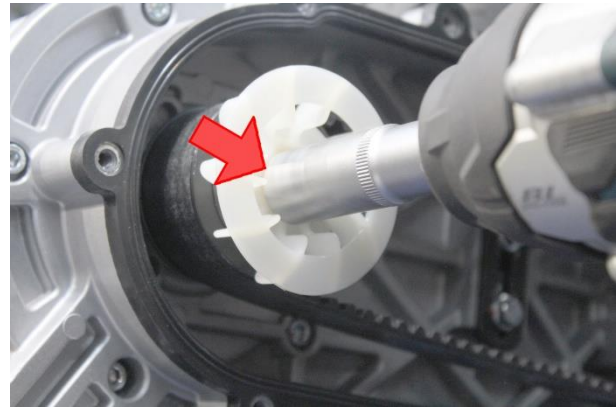
Use a pneumatic pistol with a 17 mm socket spanner to remove the nut from the belt sprocket axle.

WARNING: The nut on the switch housing axle is left-hand.

Tightening torque:

switch housing nut (left) 28-32 Nm

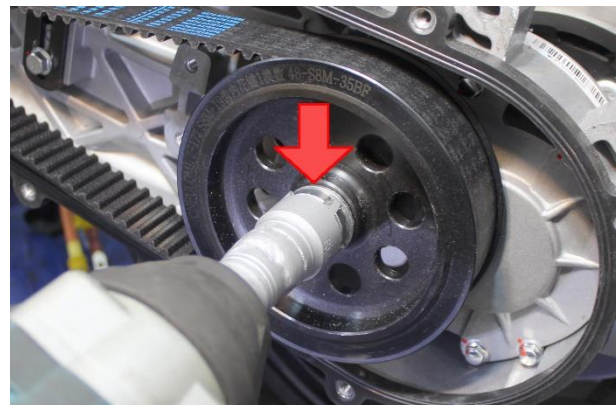
Remove the fan attached to the crown gear by hand.



Use a pneumatic gun to remove the nut from the ring gear axle with a 22 mm socket spanner.

Pull out the sprocket, crown and belt assembly, discard the belt.

Reassemble the entire new switch housing, sprocket and belt assembly and continue the disassembly steps in reverse order.



WARNING: The nut on the crown gear axle is left-hand.

Remove the castellated nut.



Remove the washer.



Use a suitable puller to remove the belt crown from its axle.

Tightening torques:

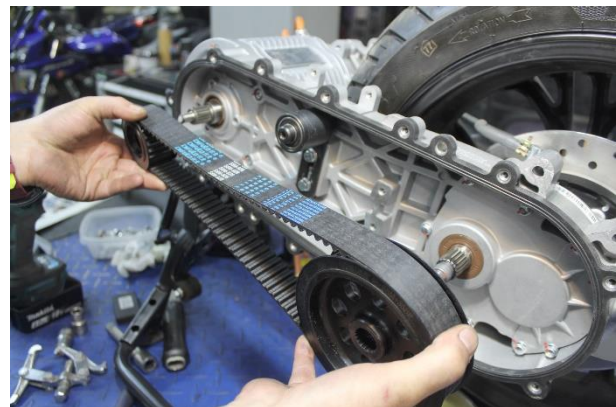
Crown castellated nut (left) 30-35 Nm

switch housing nut 28-32 Nm

Sprocket axle bearing support screws
12-15 Nm



Remove the belt by gradually pulling the switch housing and the crown wheel off their respective axles.



4.9. Checking the oil level of the final drive reduction gearbox

WARNINGS

- Raise the scooter on its centre kickstand on a level surface.
- Avoid spilling transmission oil on the rear brake disc as this will contaminate its surface and those of the brake pads, resulting in an accident due to loss of braking power.
- Dispose of used transmission oil at an appropriate official waste disposal facility.
- It is dangerous for the transmission to run with the oil level below the minimum or above the maximum level. Always keep the level between the two marks on the dipstick, and if necessary upper up with the recommended transmission oil (SAE 80W-90) or upper up above the maximum level.

Unscrew the final drive oil dipstick at the rear end of the transmission housing by hand to remove it.



Wipe the dipstick with a rag.



Re-insert the dipstick by screwing it back in as far as it will go.



Remove the dipstick again and check that the oil-stained part of the dipstick is between the maximum and minimum level marks.

If the dipstick has not been stained with oil, it means that the oil level is below the minimum level and may irreversibly damage the final drive. Immediately upper up a certain amount of SAE 80W-90 oil until the level is between the two marks on the dipstick.

If the level exceeds the maximum level mark on the dipstick, the oil pressure in the gearbox is high and can damage the oil seals. Remove a certain amount by loosening the drain screw and recheck that the oil level is between the two marks.

Once the check has been completed, screw the dipstick back into its hole and tighten it securely.

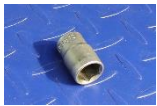


4.10. Changing the oil in the final drive reduction gearbox

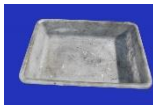
WARNINGS

- Raise the scooter on its centre kickstand on a level surface.
- Avoid spilling transmission oil on the rear brake disc as this will contaminate its surface and those of the brake pads, resulting in an accident due to loss of braking power.
- Dispose of used transmission oil at an appropriate official waste disposal facility.
- Check the final drive oil level (→ Refer to 4.9. Check the oil level of the final drive reduction gearbox).

Necessary tools



10 mm socket spanner (or angled wrench)

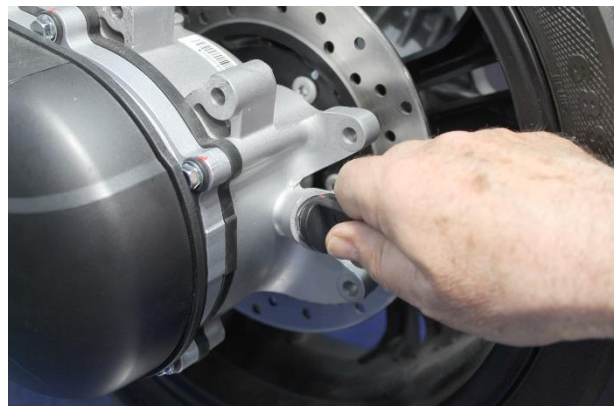


Angular



Syringe

Unscrew the final drive oil dipstick at the rear end of the transmission housing by hand to remove it.



Place a suitable container for collecting the used oil under the drain screw of the reduction gear and loosen this screw with a 10 mm socket spanner.



Continue loosening the drain screw with your fingers and remove it to drain the oil content from the reduction gear case into the oil container.

Turn the rear wheel by hand to completely drain the oil from the reduction gearbox.

Refit the drain screw with a new washer to ensure that it is sealed using a 10 mm socket spanner.



Tightening torque:

Drain screw 20-22 Nm

Use a syringe to draw **120 cc of SAE 80W-90 oil** into the dipstick hole.

Following procedure 4.9. Checking the oil level of the final drive reduction gearbox, check that the oil level of the reduction gearbox is between the two dipsticks on the dipstick. If the level is not between the above mentioned marks, proceed as explained in paragraph 4.9.

Once the level has been checked, tighten the dipstick in its hole and check for oil leakage.



4.11. Disassembly of the gearbox

WARNINGS

- This operation can be performed without disassembly of the engine-transmission assembly from the vehicle. The photos show the operation with the engine out of the frame for ease of viewing.
- Raise the scooter on its centre kickstand on a level surface.
- Dispose of used transmission oil at an appropriate official waste disposal facility.

Required prior operations:

- Remove the transmission covers (Refer to → 4.5. Removal of the transmission covers)
- Remove the drive belt together with the sprocket and the crown wheel (See → 4.8. Removal of the belt)
- Remove the right shock absorber (See → 8.7. Removal of the right shock absorber)
- Remove the right-hand swingarm (See → 8.8. Removal of the right swingarm)
- Remove the rear caliper (See → 8.9. Rear brake caliper removal)
- Remove the rear wheel (See → 8.14. Rear wheel removal)
- Drain the transmission oil from the reduction gearbox (See → 4.10. Change the final drive gearbox oil WITHOUT FILLING IT)

Necessary tools



8 mm socket spanner



Flat screwdriver

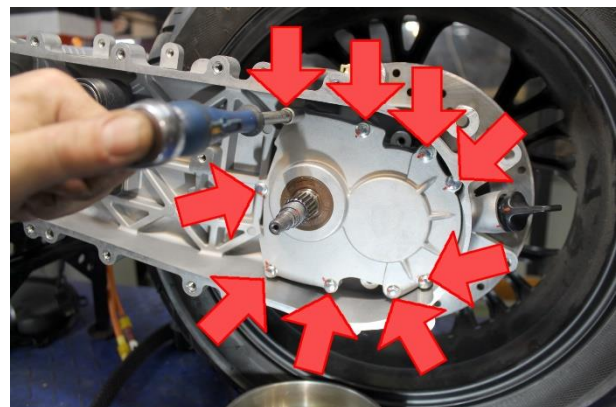


Nylon hammer

Remove the nine screws securing the gearbox cover with an 8 mm socket spanner.

Tightening torque:

Gearbox cover screws 15 Nm



4. TRANSMISSION

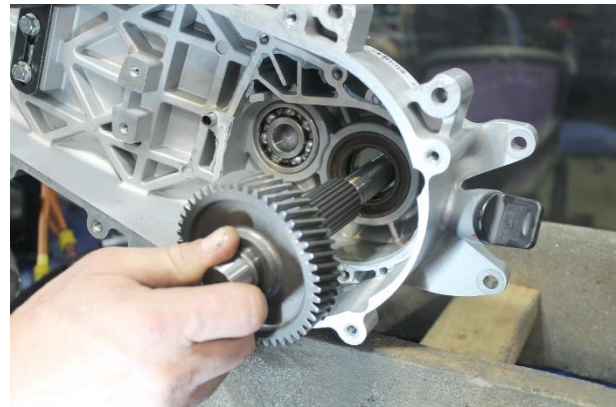
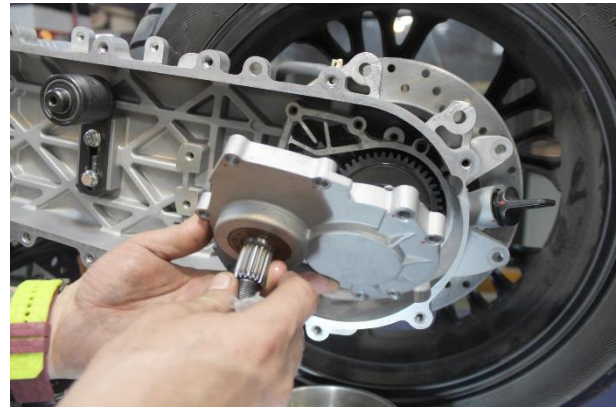
Remove the gearbox cover together with the worm wheel axle and its gear.

Clean any remaining gasket paste from the transmission crankcase and gearbox cover.

Gently tap with a nylon hammer on the ring gear axle from the outside of the cover to remove it from its housing.

Remove the wheel axle with the corresponding gear.

Visually check whether the rear wheel and crown wheel axles with their respective worm gears are in good condition. If you notice any damage to the teeth, or a bluish colour, replace the entire assembly with a new one.



4.12. Replacement of gearbox bearings and seals

WARNINGS

- This operation can be performed without disassembly of the engine-transmission assembly from the vehicle. The photos show the operation with the engine out of the frame for ease of viewing.
- Raise the scooter on its centre kickstand on a level surface.
- Dispose of used transmission oil at an appropriate official waste disposal facility.
- Once you have opened the gearbox, you should at least replace the oil seals with new ones.
- Check the condition of the bearings by rotating the inner race with your finger and checking that they rotate smoothly. Check that the outer race of the bearing is securely fixed to the bearing bore. If any anomaly is detected, replace the bearings.
- Always replace a bearing with a new one.
- Before mounting, store the new bearings that you intend to replace in the freezer compartment of a refrigerator – this allows them to shrink and facilitate mounting.

Required prior operations:

- Remove the transmission covers (Refer to → 4.5. Removal of the transmission covers)
- Remove the drive belt together with the sprocket and the crown wheel (See → 4.8. Removal of the belt)
- Remove the right shock absorber (See → 8.7. Removal of the right shock absorber)
- Remove the right-hand swingarm (See → 8.8. Removal of the right swingarm)
- Remove the rear caliper (See → 8.9. Rear brake caliper removal)
- Remove the rear wheel (See → 8.14. Rear wheel removal)
- Drain the transmission oil from the reduction gearbox (See → 4.10. Change the final drive gearbox oil WITHOUT FILLING IT)
- Dismantle the gearbox (See → 4.11. Disassembly of the gearbox)

Necessary tools



Bearing puller



Heat gun

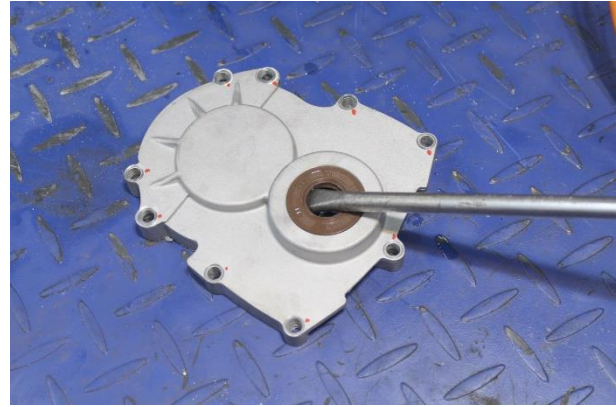


Nylon hammer

Flat-blade
screwdriver
with fine tipSocket
spanners in
different sizes
for use as a
bearing
assembler or
puller8 mm socket
spanner

Jointing paste

Remove the seal from the gearbox cover by levering it out with a flat-blade screwdriver.



Use a socket of the appropriate size to remove the bearing from the ring gear axle in the gearbox cover.

NOTE: A 25 mm socket has been used to remove the bearing and seal, although this size may vary depending on the manufacturer.



Remove the rear wheel axle seal from inside the gearbox by levering it out with a flat-blade screwdriver or a screwdriver.

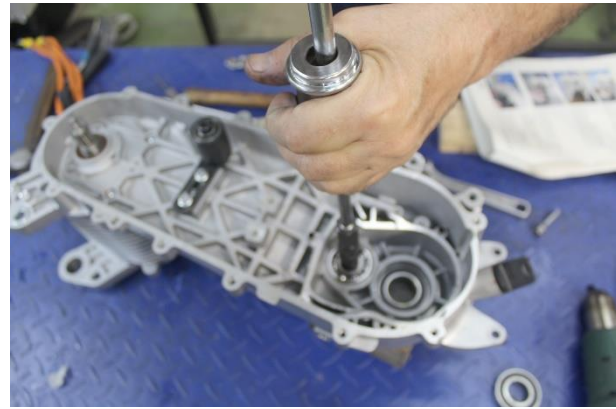


Use a suitable socket spanner that fits into the output hole of the wheel axle to tap on the bearing and remove it.



4. TRANSMISSION

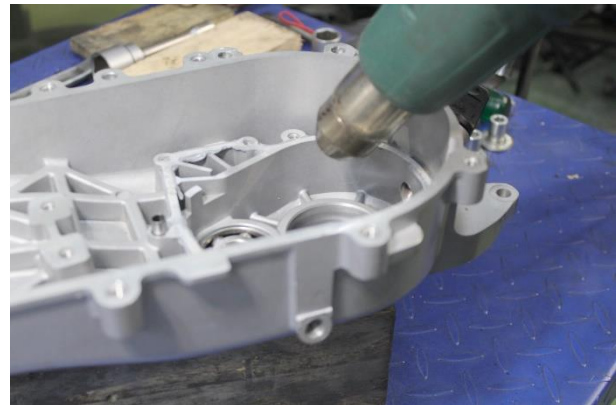
Use a suitable bearing puller to remove the crown wheel axle support bearing from its recess in the gearbox.



Use a suitable bearing puller to remove the rear wheel axle support bearing from its housing in the gearbox cover.



Using the heat gun, heat the area where the bearing to be replaced is located. This will expand the bearing bore, making it easier to fit the bearing.



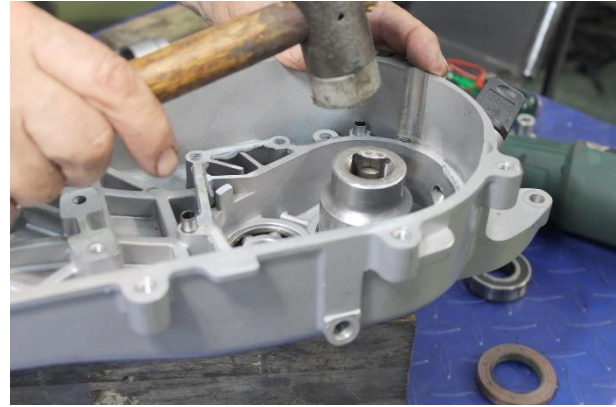
Remove the bearing to be replaced from the freezer and mount it in the appropriate recess.



4. TRANSMISSION

Use a socket spanner whose outer dimension matches the outer race of the bearing. NEVER rest the socket spanner on the inner race of the bearing – this will irreversibly damage the bearing.

Repeat this process for the rest of the bearings.



Fit new seals on the rear wheel axle and crown wheel axle.

Close the gearbox cover and upper up the transmission oil.

Tightening torque:

Gearbox cover screws 15 Nm



4.13. Disassembly of the centre kickstand

WARNINGS

- Take care when removing the springs from the centre kickstand – they are very tense and can cause serious injury to operators.

Required prior operations:

- Disconnect the power supply to the batteries (See → 5.6. Disconnection of the BDU)
- Disconnect the engine power wires from the controller (See → 5.7. Disconnection of the engine cables from the Controller)
- Remove the engine from the chassis (See → 3.4. Engine removal)

Necessary tools



Needle-nose
pliers



Spring extractor

Locate the centre kickstand axle pin on the right-hand side of the engine.



Straighten the legs of the pin with needle-nose pliers.



4. TRANSMISSION

Remove the pin with needle-nose pliers from the right-hand end of the centre kickstand axle.

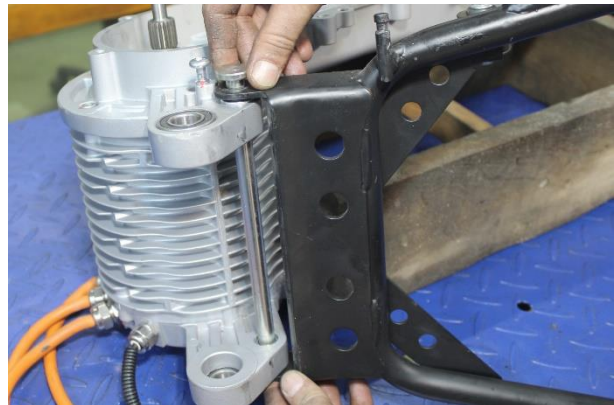


Remove the springs from the centre kickstand with a spring puller, or by pulling the spring with a steel cable and a screwdriver as a handle.

WARNING: Take care when removing the springs from the centre kickstand – they are very tense and can cause serious injury.



Pull the axle from the centre kickstand.



4.14.Engine rotor replacement

WARNINGS

- Check the condition of the bearings by rotating the inner race with your finger and checking that they rotate smoothly. Check that the outer race of the bearing is securely fixed to the bearing bore. If any anomaly is detected, replace the bearings.
- Always replace a removed bearing with a new one.
- Before mounting, store the new bearings that you intend to replace in the freezer compartment of a refrigerator – this allows them to shrink and facilitate mounting.
- During assembly, apply gasket sealant between the transmission housing and the engine
- Do not forget to perform the engine-controller calibration after installation. The procedure is explained in Section 4.16.

Required prior operations:

- Disconnect the power supply to the batteries (See → 5.6. Disconnection of the BDU)
- Disconnect the engine power wires from the controller (See → 5.7. Disconnection of the engine cables from the Controller)
- Remove the engine from the chassis (See → 3.4. Engine removal)
- Remove the centre kickstand (See → 4.13. Disassembly of the centre kickstand)
- Remove the transmission covers (Refer to → 4.5. Removal of the transmission covers)
- Removal of the engine sprocket (See → 4.8. Removal of the belt)

Necessary tools



5 mm Allen key



Vise



Nylon hammer



External bearing puller

4. TRANSMISSION

Use a 5 mm Allen key to remove the five screws securing the engine to the transmission housing.

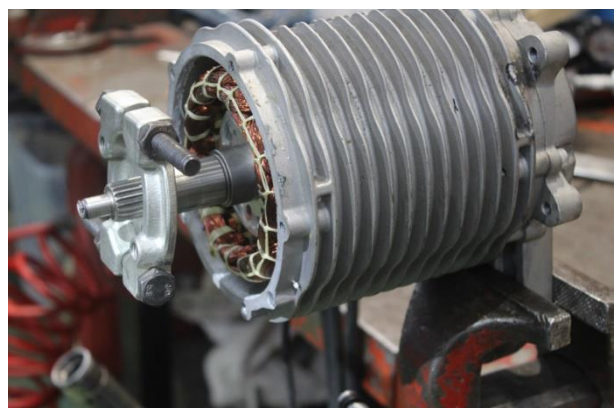
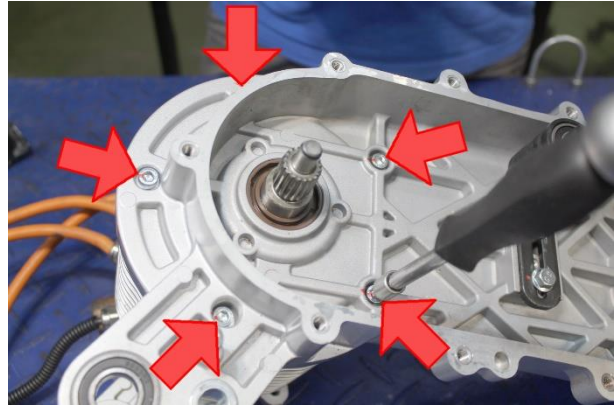
Tightening torque:

Screws connecting the crankcase to the engine: 15 Nm

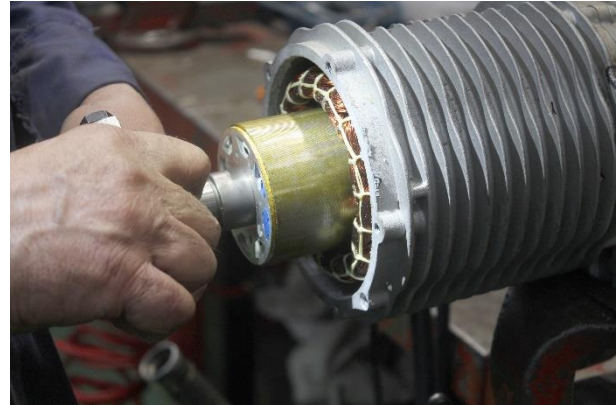
Place the engine with the axle facing downwards on a piece of wood and tap the transmission housing with a nylon hammer to separate it from the engine.

Separate the engine from the transmission housing.

Fix the engine in a vise and use a suitable outboard bearing puller to fix it to the collar under the axle spline.



Pull the puller to remove the rotor from the winding by overcoming the attractive force of the magnets.



4.15.Engine-controller calibration

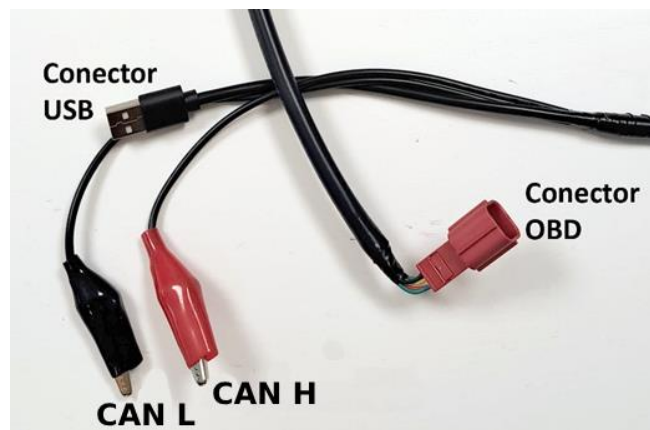
Required prior operations:

- Raise the scooter on its centre kickstand on a level surface.

Connect the activated vehicle to a computer with a Windows operating system.

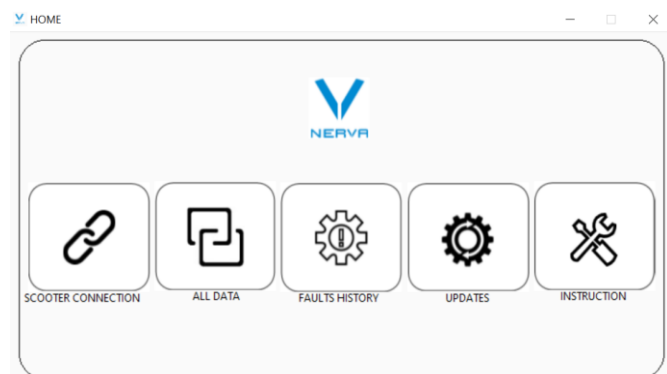
An OBD-USB connection cable is required for this purpose.

Locate the OBD connector next to the fuse box of the 12V circuit (See → 6.20.1. Fuses – fuse box).



Do not allow the alligator clips to make contact with each other, as this may cause a short circuit.

Switch on the vehicle and open the "Nerva" programme which can be downloaded from B2B.



4. TRANSMISSION

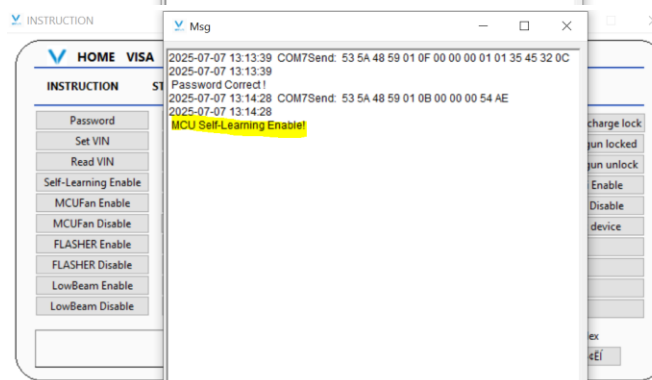
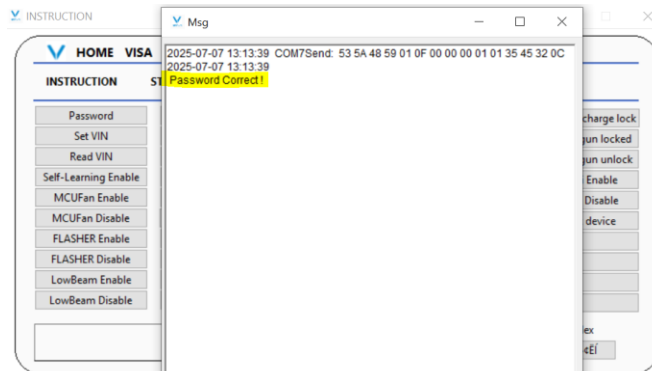
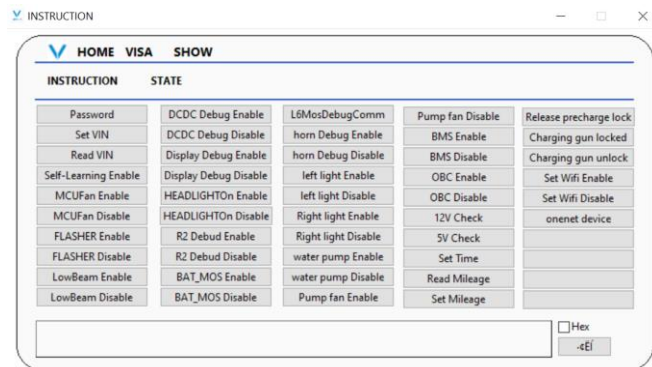
Select the "INSTRUCTION" option
by entering the access password:
32453503

Open the "SHOW" communication
window to verify that the commands
are sent correctly.

Send the command "PASSWORD"
to initiate communication.

Press the "SELF-LEARNING
ENABLE" button in the first column to
enable calibration.

With the calibration command
enabled, hold the throttle in the full
throttle position and the reverse button,
"R", depressed.



4. TRANSMISSION

Keep this setting until the rear wheel starts to rotate forward. The wheel will change direction by itself and turn backwards immediately.

Once it has been turned backwards, the calibration process is finished.

