Husqvarna®

Workshop manual

DM 400, DM 430

English

1202 - 002 - 12.02.2020

Contents

1 Introduction

1.1 Document description

This manual gives a full description of how to do maintenance and repair on the product. It also gives safety instructions that the personnel must obey.

1.2 Target group

This manual is for personnel with a general knowledge of how to do repair and do servicing. All personnel that do repair or do servicing on the product must read and understand the manual.

1.3 Revisions

Changes to the product can cause changes to the maintenance work and spare parts. Separate information is sent out for each change.

Read the manual together with all received information about changes to maintenance and spare parts for the product.

1.4 Safety

WARNING: All personnel that repair or do servicing on the product must read and understand the safety instructions in this workshop manual.

1.5 Servicing tools

The manual gives information about necessary servicing tools. Always use original tools from Husqvarna.

2 Safety

2.1 Safety definitions

Warnings, cautions and notes are used to point out specially important parts of the manual.

WARNING: Used if there is a risk of injury or death for the operator or bystanders if the instructions in the manual are not obeyed.

CAUTION: Used if there is a risk of damage to the product, other materials or the adjacent area if the instructions in the manual are not obeyed.

Note: Used to give more information that is necessary in a given situation.

2.2 General safety instructions

- You must not repair the product unless you have read and understood this workshop manual.
- The service center where the product is repaired must have safety equipment approved by local bylaws.
- The product is examined and approved only with the equipment given or recommended by the manufacturer.
- Service personnel must make sure that the service and repairs in this manual are done following legal requirements. This in order to avoid health and safety risks of the personnel doing the work.
- When possible, disconnect the power cable and make sure it cannot be connected until the service is completed.
- If you keep the product running during service, do not touch the wires. Electrical shock can cause injury.
- Follow the local waste regulations.
- Always make sure all nuts and bolts are correctly tightened.
- Do not lift the machine by holding the cable and do not pull the plug by pulling the cable.
- Check that the cables are not damaged and in good condition.
- Do not use the product if a cable is damaged.
- Use protective gloves and eye protection. Goggles must follow the ANSI Z87.1 for US or EN166 for EU countries.
- When using compressed air, do not point it to your body. Air can go in to the blood stream.
- Wear ear protection when test running.
- The product can make sparks and cause ignition of flammable materials.
- If a warning symbol decal on the product is damaged or missing, replace the warning symbol decal.

2.3 Symbols on the product

WARNING! This product can be dangerous and cause serious injury or death to the operator or others. Be careful and use the product correctly.

Read the operator's manual carefully and make sure that you understand the instructions before you use this product.

Always use approved personal protective equipment.

This product complies with applicable EC directives. (EU only).

Environmental mark. The product or package of the product is not domestic waste. Recycle it at an approved disposal location for electrical and electronic equipment.

Make sure that water cannot leak into the product when you drill in the ceiling. Use an applicable water collector.

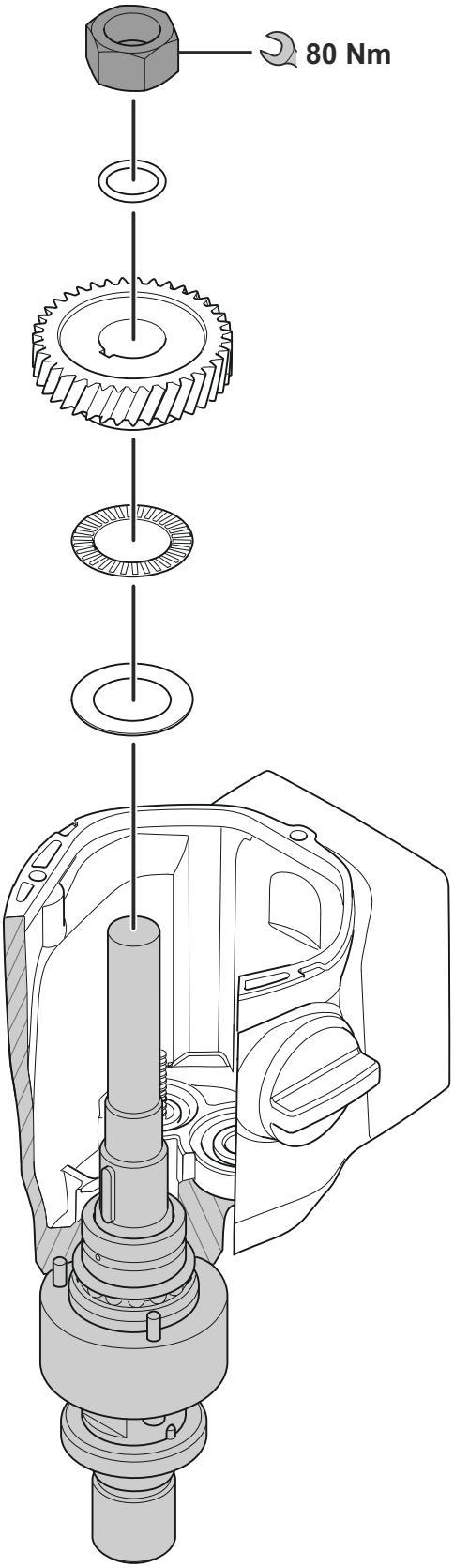
Note: Other symbols/decals on the product refer to special certification requirements for some markets.

3 Servicing data

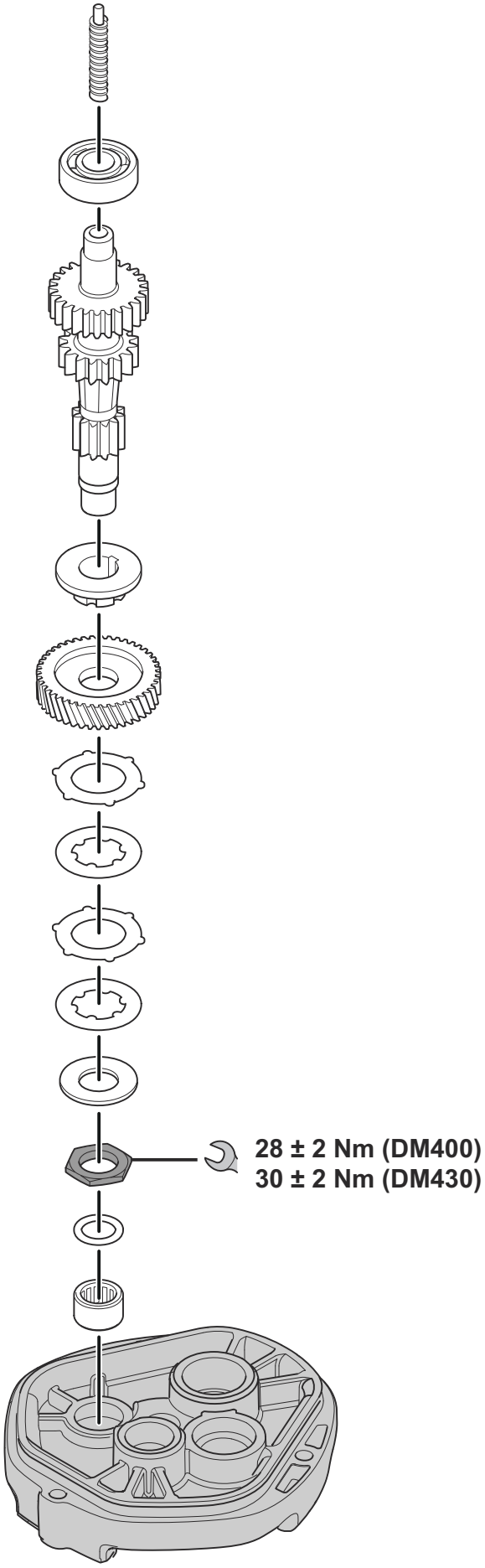
3.1 Symbols in the diagrams

Tightening torque, Nm

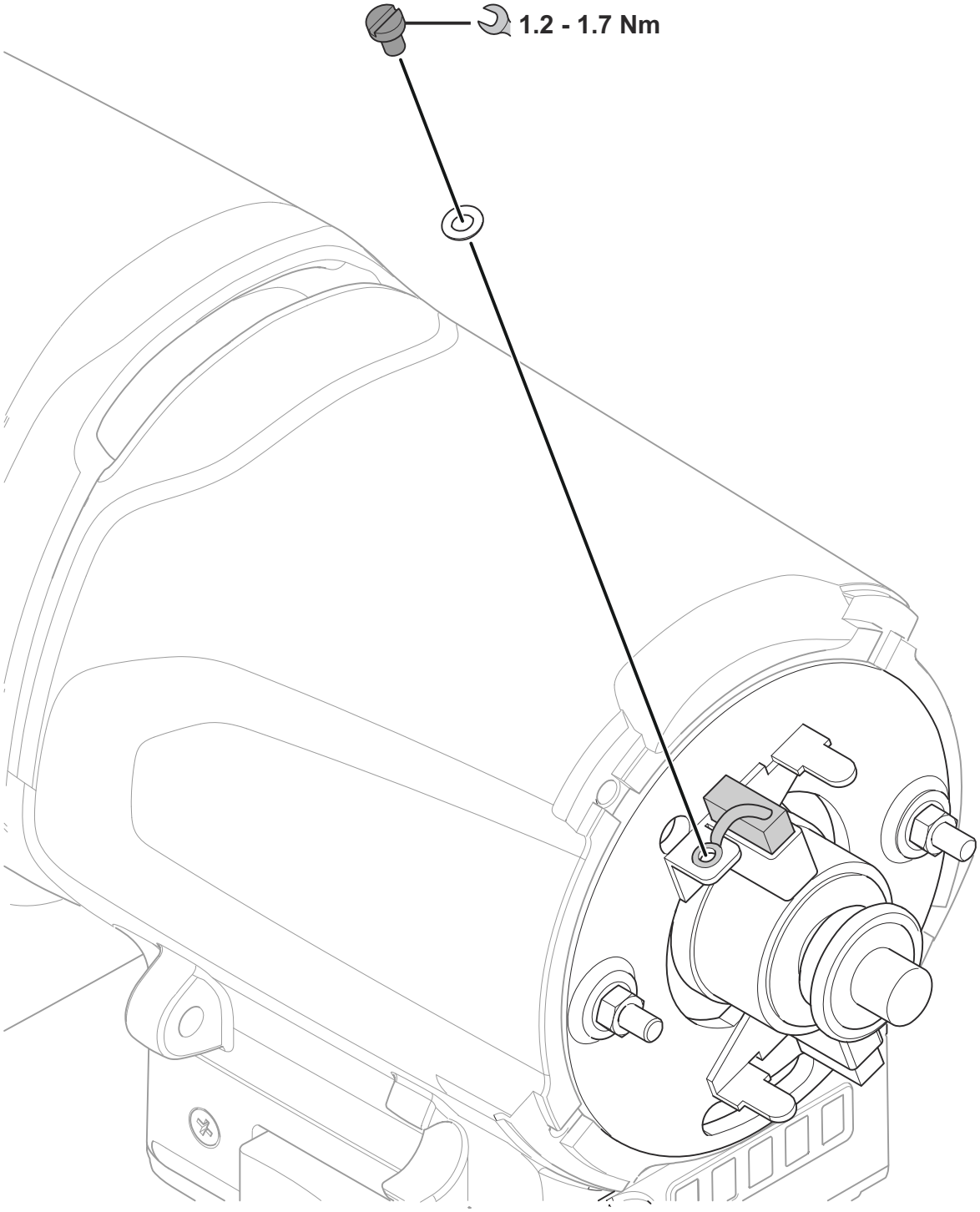
3.2 Hex nut for the drill spindle



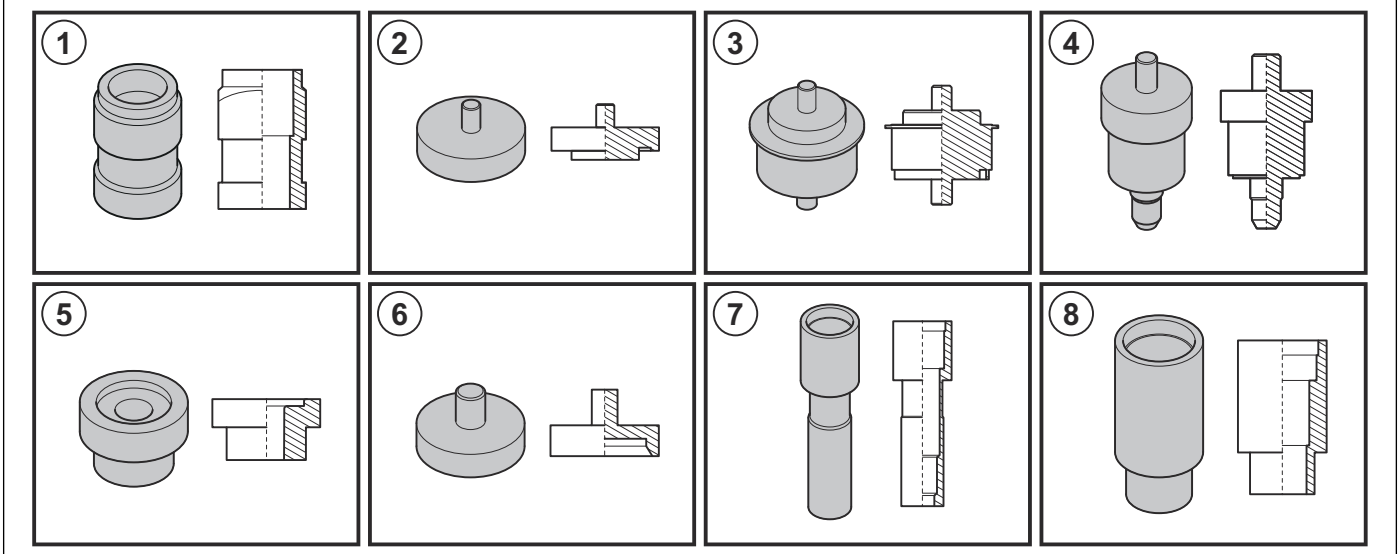
3.3 Hex nut for the gear shaft



3.4 Screws for the connection wires of the carbon brushes

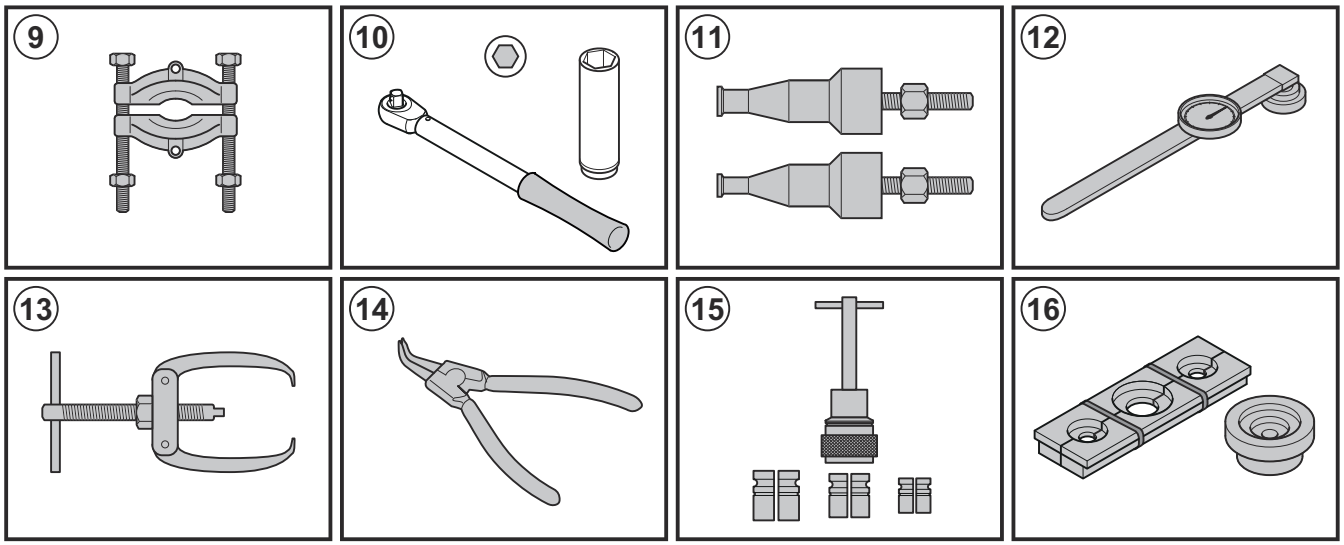


4.1 Servicing tools overview 1



Pos.	Designation	Used for	Order No./ Source
1	Machine holder tool	To attach the product to a vise. Refer to *To disassemble the product on page 14* and *To replace the gear oil on page 17*.	598 94 68-01
2	Shaft seal press tool	To install the gear housing bearings. Refer to *To install the gear housing bearings on page 26*.	598 94 71-01
3	Shaft seal press tool	To replace the shaft seals for the drill spindle. Refer to *To replace the shaft seals for the drill spindle on page 19*.	598 94 72-01
4	Shaft seal press tool	To replace the gear oil seal. Refer to *To replace the gear oil seal on page 18*.	598 94 73-01
5	Bearing press tool	To assemble the rotor. Refer to *To assemble the rotor on page 37*.	598 94 75-01
6	Bearing press tool	To assemble the rotor. Refer to *To assemble the rotor on page 37*.	598 94 74-01
7	Sleeve press tool	To replace the shaft sleeves for the drill spindle. Refer to *To replace the shaft sleeves for the drill spindle on page 23*.	598 94 76-01
8	Sleeve press tool	To replace the shaft sleeves for the drill spindle. Refer to *To replace the shaft sleeves for the drill spindle on page 23*.	598 94 77-01

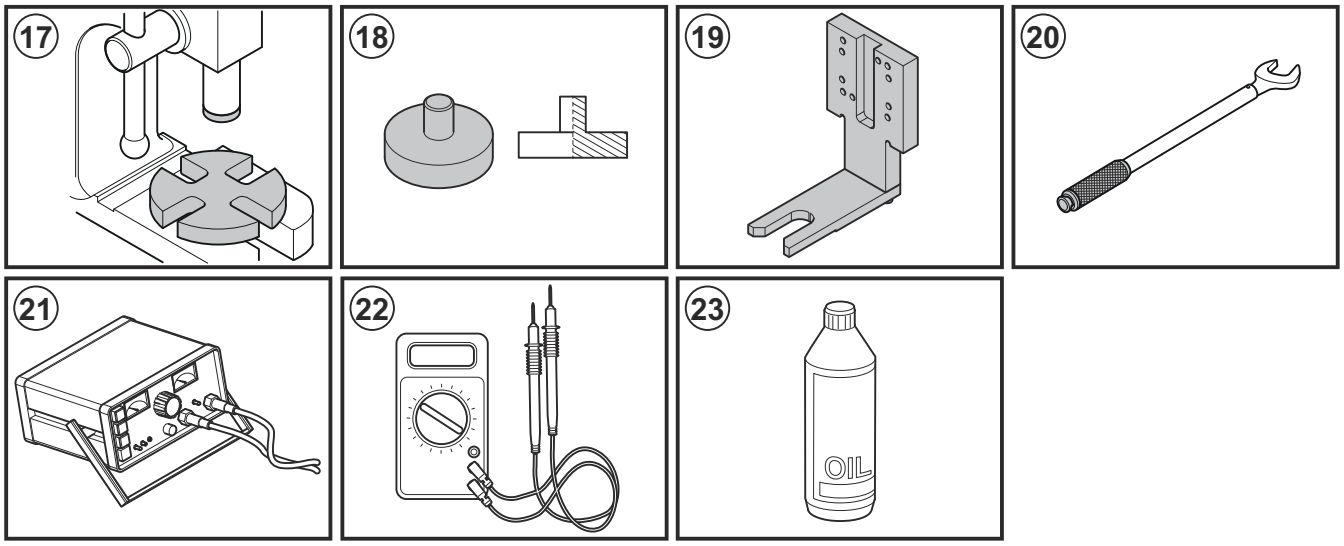
4.2 Servicing tools overview 2



Pos.	Designation	Used for	Order No./ Source
9	Separator puller tool	To replace the shaft sleeves for the drill spindle. Refer to *To replace the shaft sleeves for the drill spindle on page 23*. To disassemble the rotor. Refer to *To disassemble the rotor on page 37*.	598 94 78-01
10	Socket wrench with 32 mm socket	To remove the drill spindle. Refer to *To remove the drill spindle on page 22*. To install the drill spindle. Refer to *To install the drill spindle on page 24*.	598 95 37-01
11	Inner bearing puller tool	To remove the middle cover bearings. Refer to *To remove the middle cover bearings on page 27*.	598 95 39-01
			598 95 40-01
12	Torque wrench 10-100 Nm	To assemble the gear shaft. Refer to *To assemble the gear shaft on page 30*.	598 95 41-01
13	Small puller tool	To remove the gear shaft and the pinion shaft. Refer to *To remove the gear shaft and the pinion shaft on page 20*.	598 95 42-01
14	Circlip pliers	To remove the gear selector. Refer to *To remove the gear selector on page 28*. To install the gear selector. Refer to *To install the gear selector on page 28*. To disassemble the pinion shaft. Refer to *To disassemble the pinion shaft on page 28*.	598 95 43-01
15	Bearing puller tool		598 95 44-01
	Insert for roller bearing	To disassemble the rotor. Refer to *To disassemble the rotor on page 37*.	598 95 45-01
			598 95 47-01
	Insert for gear wheel	To disassemble the middle gear housing. Refer to *To disassemble the middle gear housing on page 31*.	598 95 48-01

Pos.	Designation	Used for	Order No./ Source
16	Gear shaft holder with insert	To disassemble the gear shaft. Refer to *To disassemble the gear shaft on page 30*.	598 95 49-01
	Insert for gear shaft		598 95 50-01
	Gear shaft holder without insert		598 95 51-01

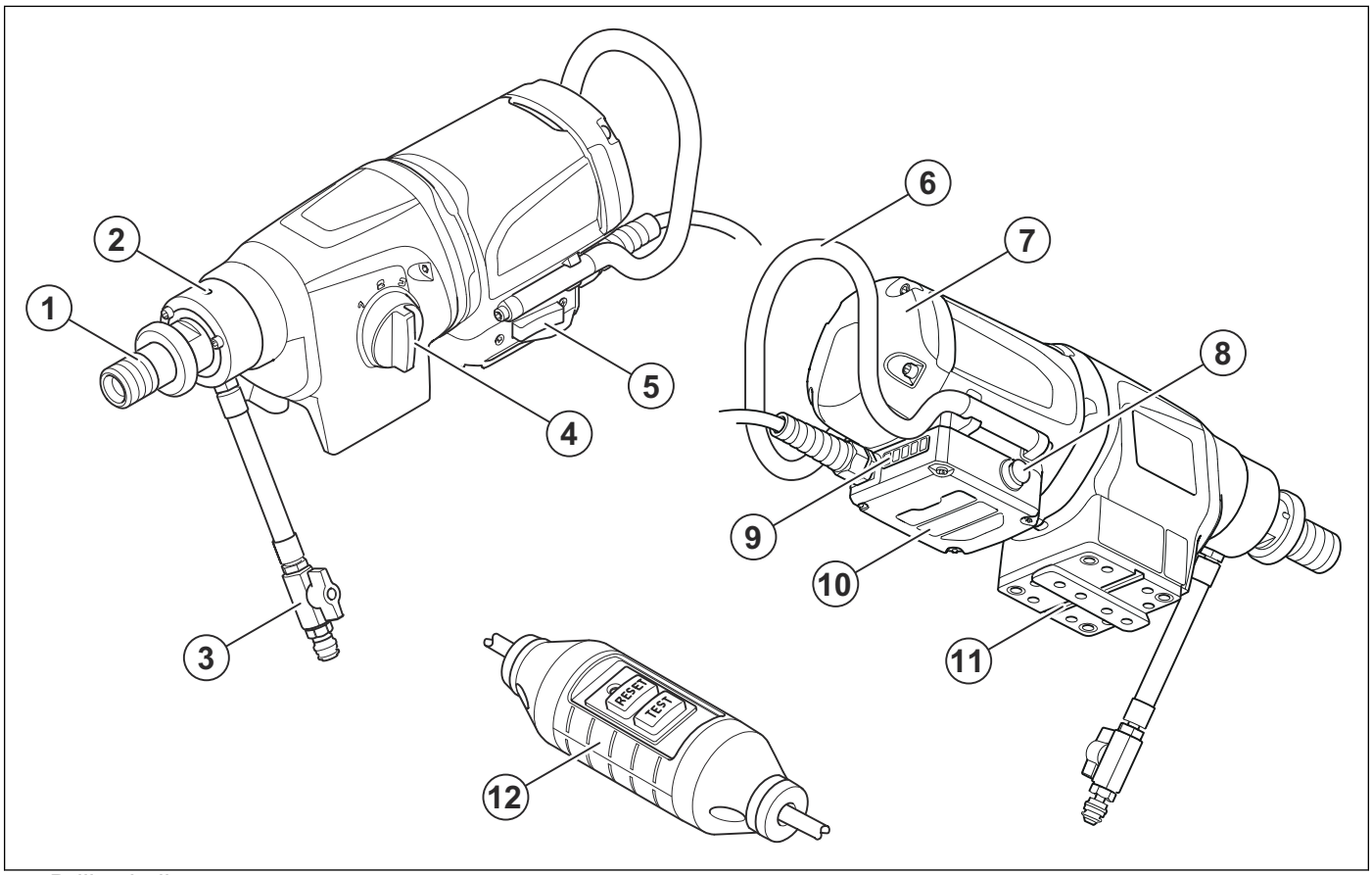
4.3 Servicing tools overview 3



Pos.	Designation	Used for	Order No./Source
17	Mandrel press	To install and remove product parts.	598 95 53-01
18	Protective tool for mandrel press	To install the middle cover bearings. Refer to *To install the middle cover bearings on page 27*. To install the bearings for the middle gear housing. Refer to *To install the bearings for the middle gear housing on page 36*.	598 95 55-01
19	Machine holder tool	To attach the product to a vise. Refer to *To disassemble the middle gear housing on page 31* and *To assemble the middle gear housing on page 34*.	598 95 56-01
20	Click type torque wrench 10-100 Nm	To install the drill spindle. Refer to *To install the drill spindle on page 24*.	There are many manufacturers.
21	High voltage tester	To control the functions of the electrical system.	There are many manufacturers.
22	Multimeter	To control the functions of the electrical system.	There are many manufacturers.
23	Gear oil	Use 300 ml for DM 400. Use 400 ml for DM 430.	Castrol ALPHA SP150 or equivalent.

5 Product overview for repair and servicing

5.1 Product overview



1. Drill spindle
2. Leakage hole
3. Water connector with valve
4. Gear selector
5. Power switch
6. Handle
7. Carbon brush cover
8. Button for the Smartstart™ function
9. Power output LEDs
10. Electronics box
11. Assembly plate for Husqvarna drill stand
12. PRCD (Portable Residual Current Device)

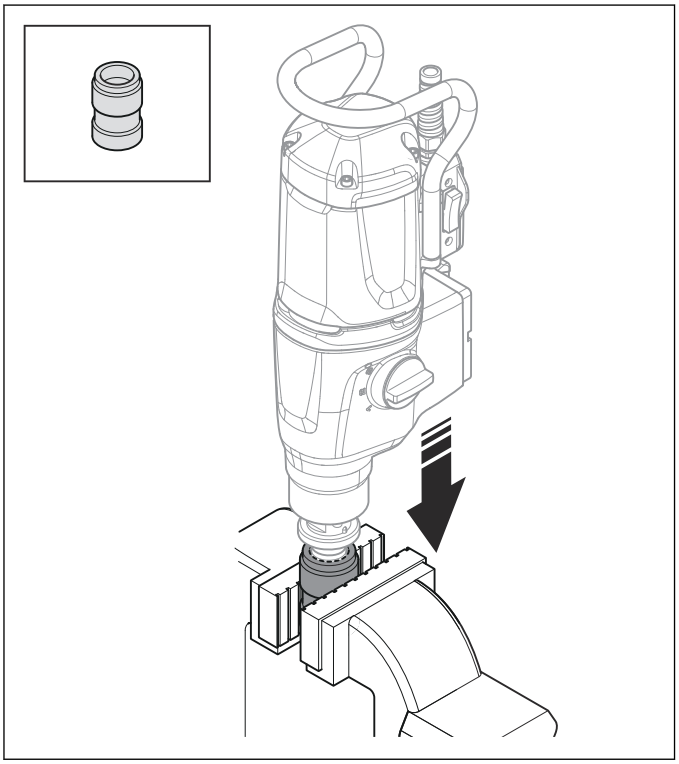
6 Repair and servicing

6.1 To clean and examine the product parts

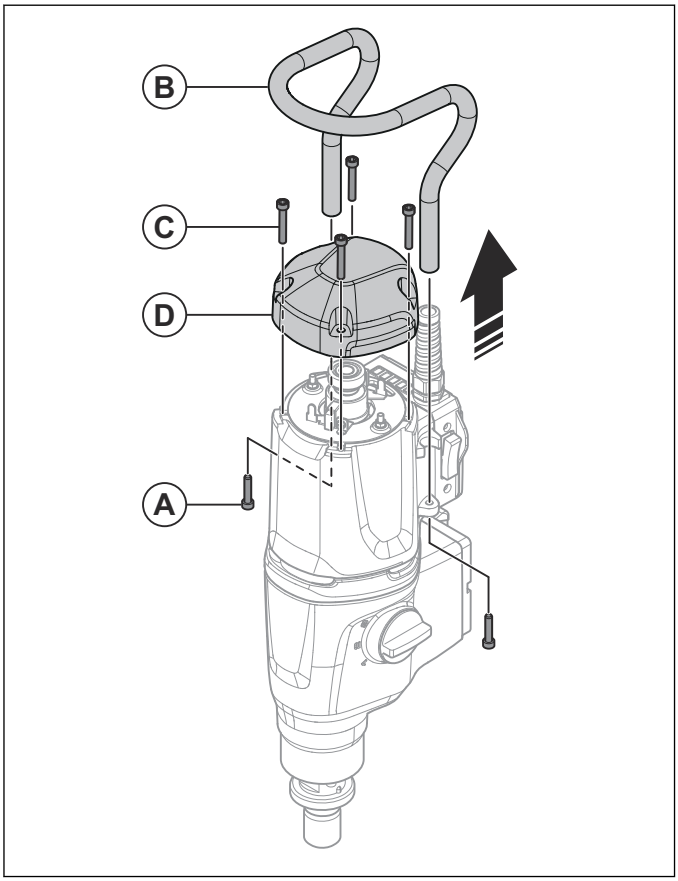
- Clean and examine all parts fully. You find more instructions in the chapter for each part if special tools or procedures are necessary.
- Replace damaged or defective parts.
- Always use original spare parts.

6.2 To disassemble the product

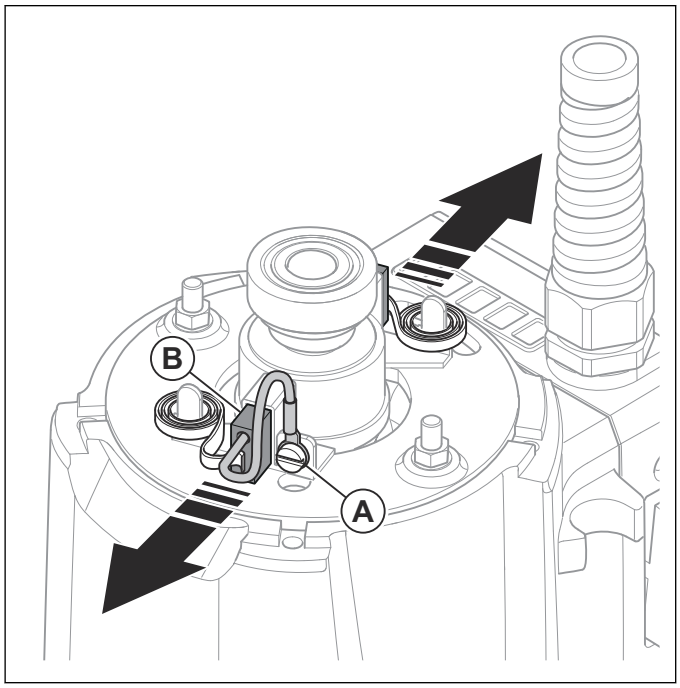
1. Attach the machine holder tool to a vise. Refer to *Servicing tools overview 1 on page 9*. Put the product in a vertical position with the drill spindle in the machine holder tool.



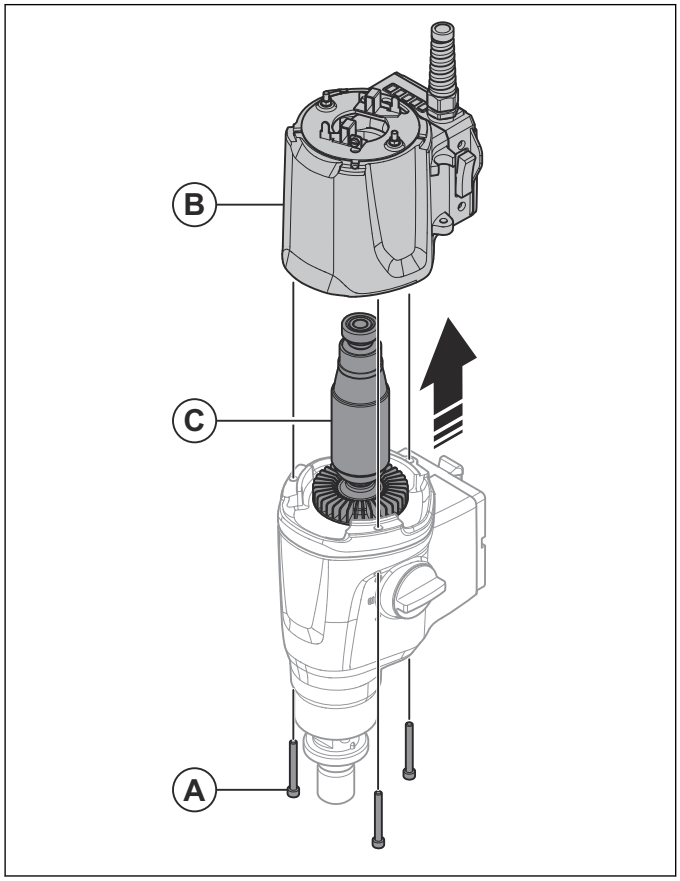
2. Remove the 2 Allen screws (A) that hold the handle (B). Remove the handle. Remove the 4 Allen screws (C) that hold the top cover (D). Remove the top cover.



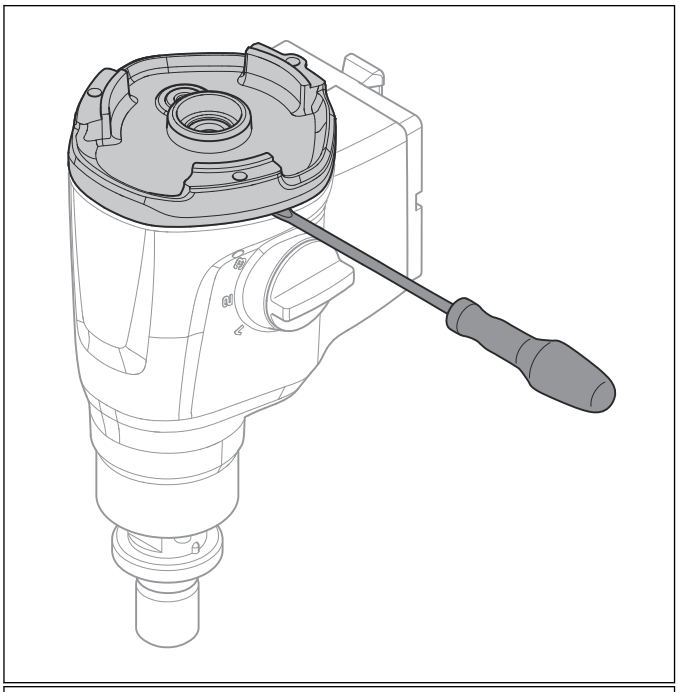
3. Remove the 2 screws (A) and the 2 washers for the connection wires of the carbon brushes (B). Pull the carbon brushes out from the holders.

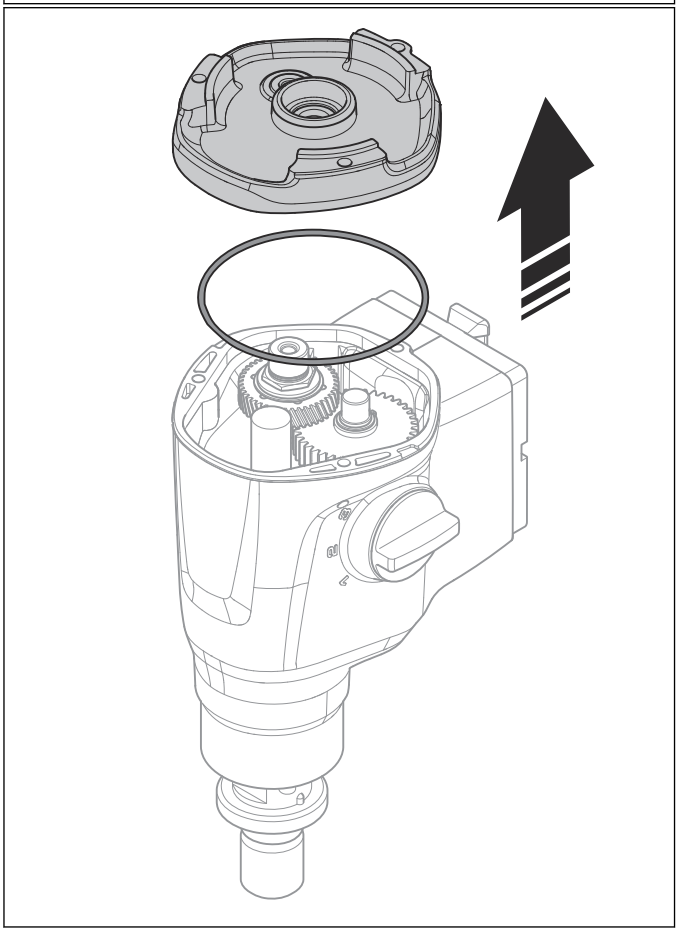


4. Remove the 3 Allen screws (A) that hold the motor housing (B). Remove the motor housing. Remove the rotor (C) from the bearing seat.



5. Put a flat screwdriver in the recess on the gear housing. Carefully loosen the middle cover. Remove the middle cover.





CAUTION: Make sure that the O-ring is not damaged.

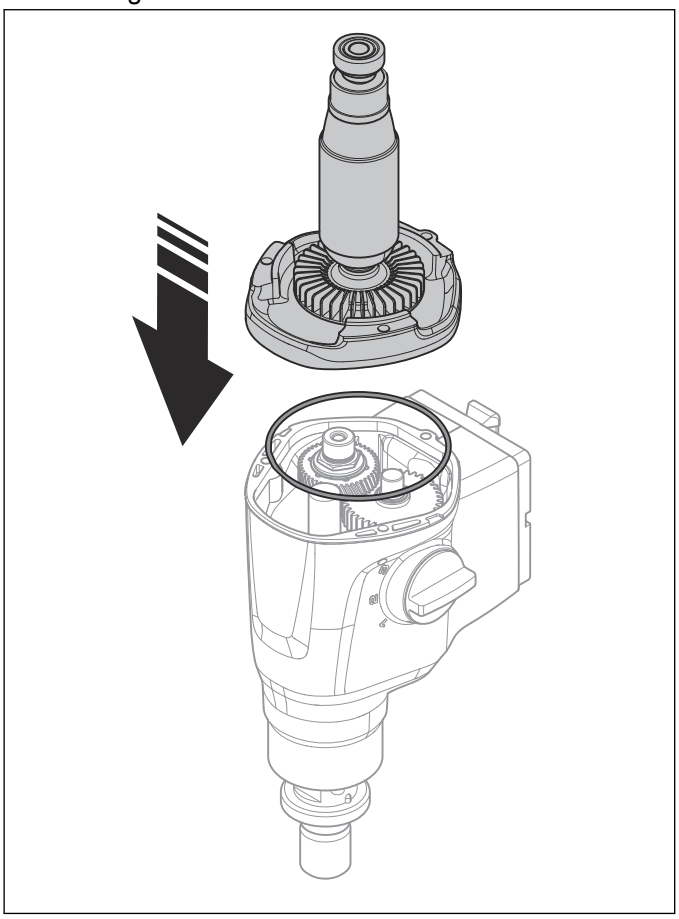
6.3 To assemble the product

Refer to *To assemble the rotor on page 37* to assemble the rotor.

Refer to *To assemble the stator on page 39* to assemble the stator.

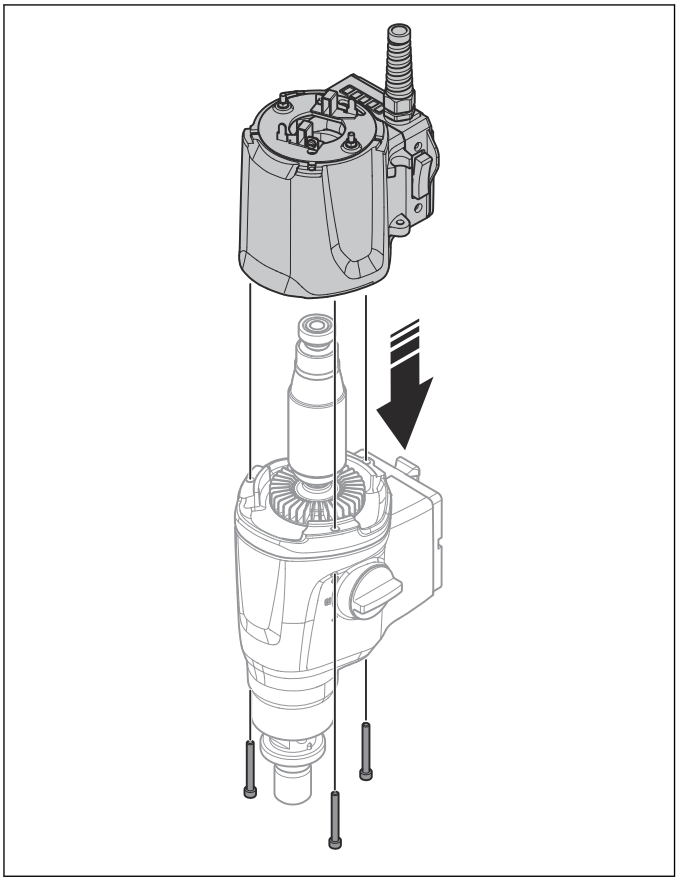
Refer to *To replace the gear oil on page 17* to replace the gear oil.

1. Put the middle cover with the rotor on the gear housing.

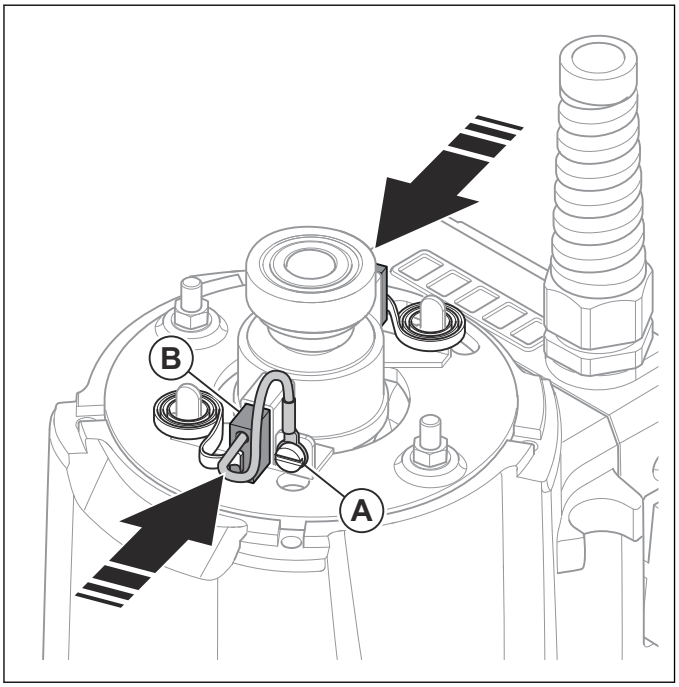


CAUTION: Make sure that the O-ring is not damaged.

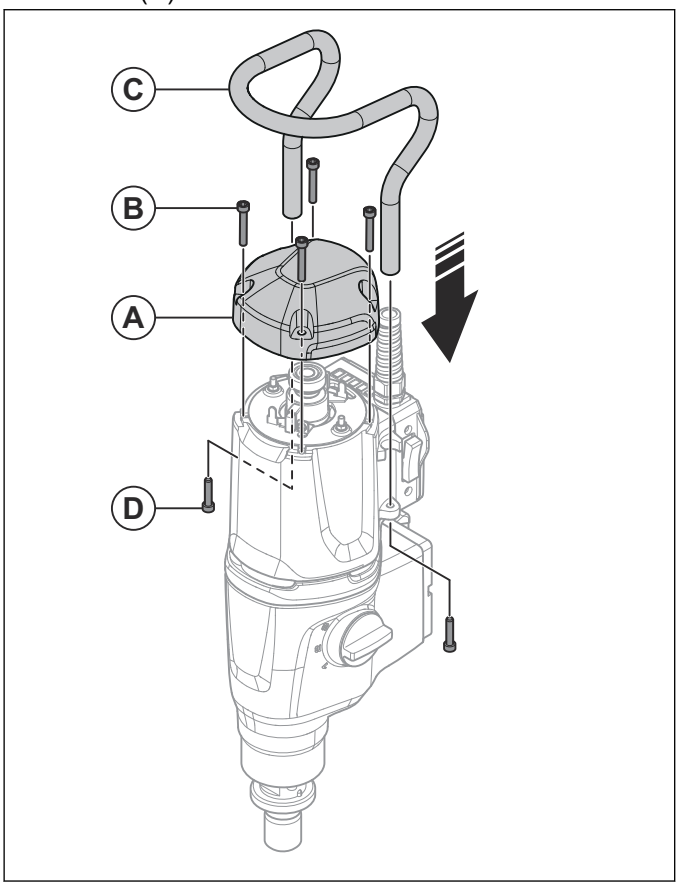
2. Put the motor housing on the middle cover. Attach the motor housing with the 3 Allen screws.



3. Install the carbon brushes and brush connection wires with the 2 screws (A) and the 2 washers. Put the carbon brushes (B) in the holders.



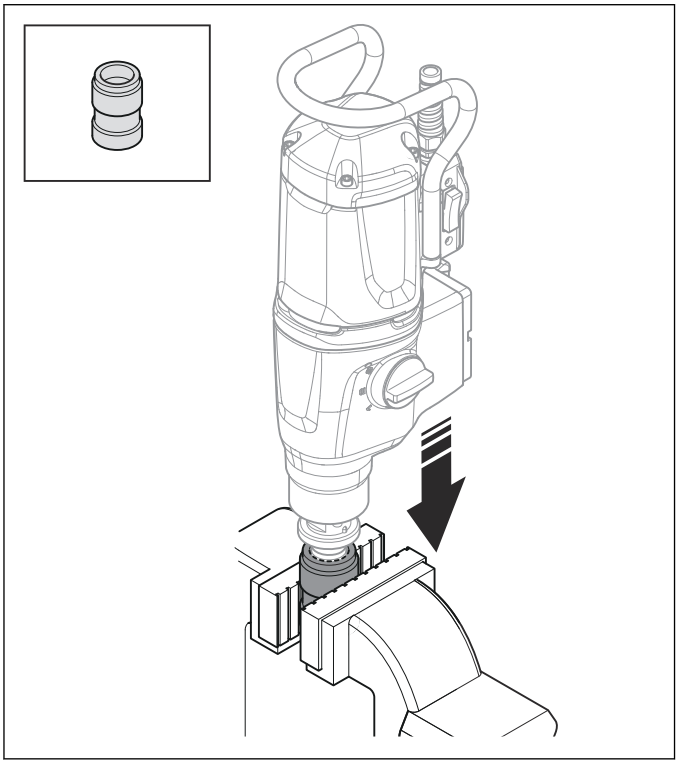
4. Put the top cover (A) on the motor housing. Align the screw holes in the top cover with the holes in the motor housing. Put the 4 Allen screws (B) in the screw holes. Make sure that the rotor bearing is attached to the bearing seat. Tighten the 4 Allen screws. Attach the handle (C) with the 2 Allen screws (D).



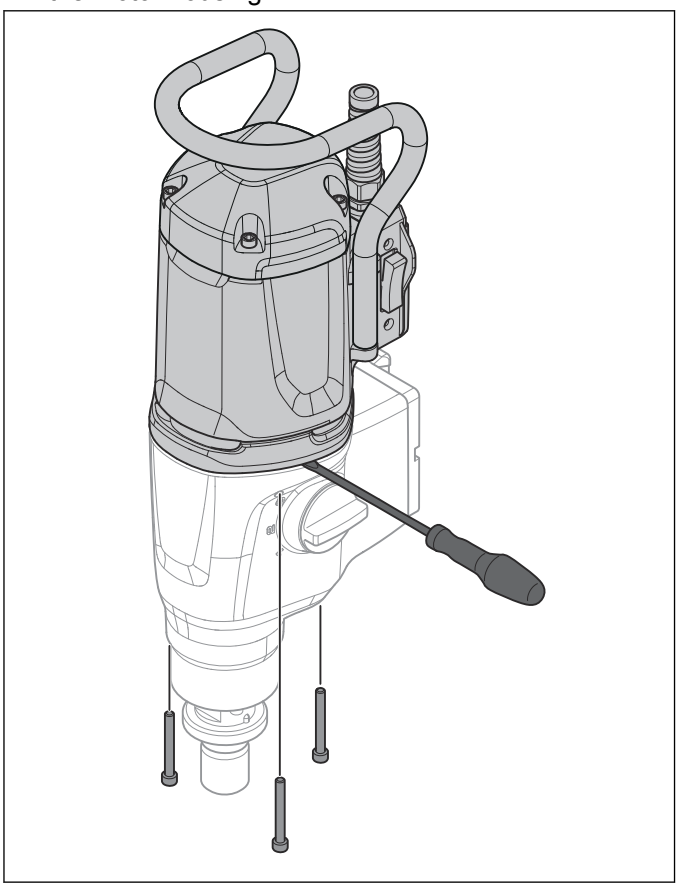
6.4 To replace the gear oil

Replace the gear oil for the first time after 100 hours of operation. After that, the interval is approximately each 300 hours of operation.

1. Attach the machine holder tool to a vise. Refer to *Servicing tools overview 1 on page 9*. Put the product in a vertical position with the drill spindle in the machine holder tool.

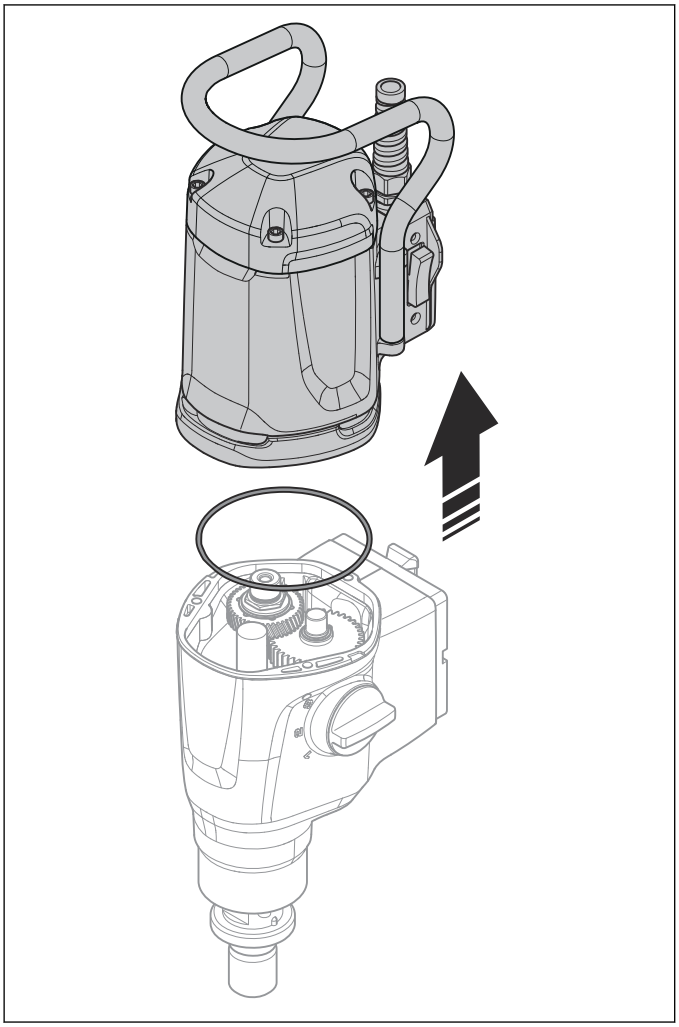


2. Remove the 3 Allen screws that hold the motor housing. Put a flat screwdriver in the recess on the gear housing. Carefully loosen the middle cover and the motor housing.



CAUTION: Make sure that the O-ring is not damaged.

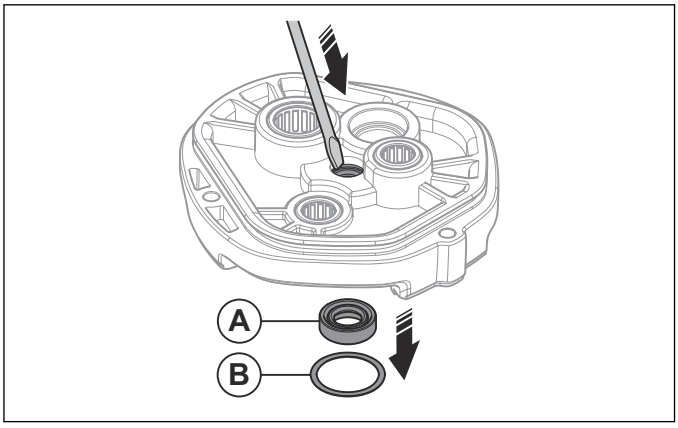
3. Remove the middle cover and the motor housing.



4. Put a container below the product. Remove the product from the machine holder tool. Tilt the product to drain the gear oil. Fill the gear housing with new gear oil. Refer to *Servicing tools overview 1 on page 9*.
5. Assemble the product in opposite sequence.

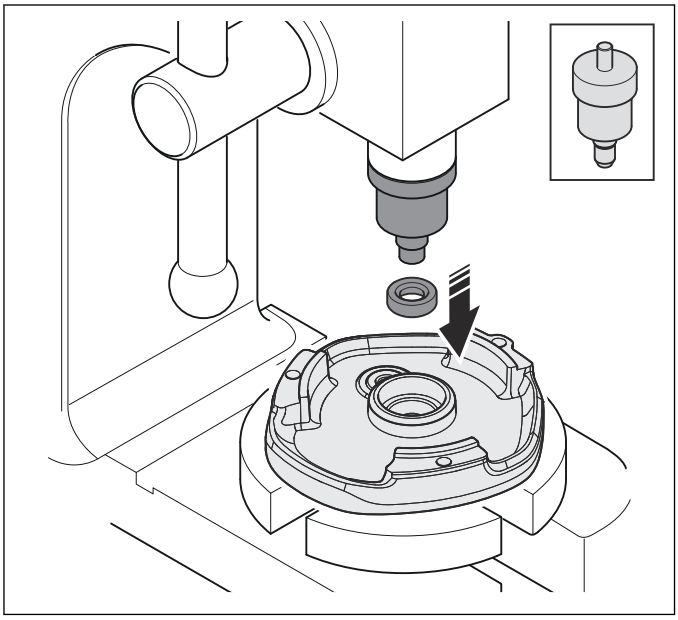
6.4.1 To replace the gear oil seal

1. Remove the middle cover. Refer to *To disassemble the product on page 14*.
2. Put the point of a screwdriver on the shaft seal (A). Carefully put pressure on the shaft seal and push it with the washer (B) in front of it. Remove the shaft seal and the washer.

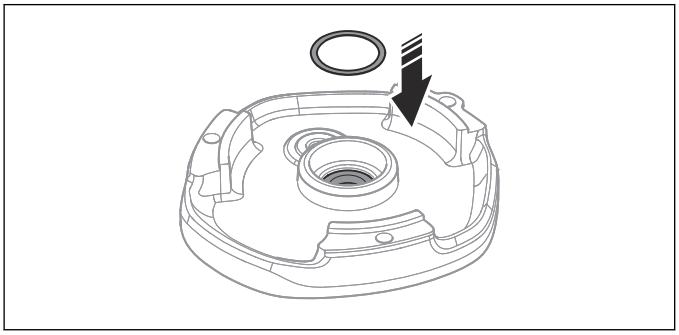


CAUTION: Make sure that the metal surface does not become damaged.

3. Put gear oil on the surface of the bearing seat in the middle cover. Put a new shaft seal in the bearing seat. Push the shaft seal into the bearing seat with the shaft seal press tool attached to a mandrel press. Refer to *Servicing tools overview 1 on page 9*.



4. Put gear oil on the shaft seal. Install the washer.



6.5 Carbon brushes

The carbon brushes transmit electric current to the rotor. The carbon brushes are wear parts and must be examined regularly.

6.5.1 To replace the carbon brushes

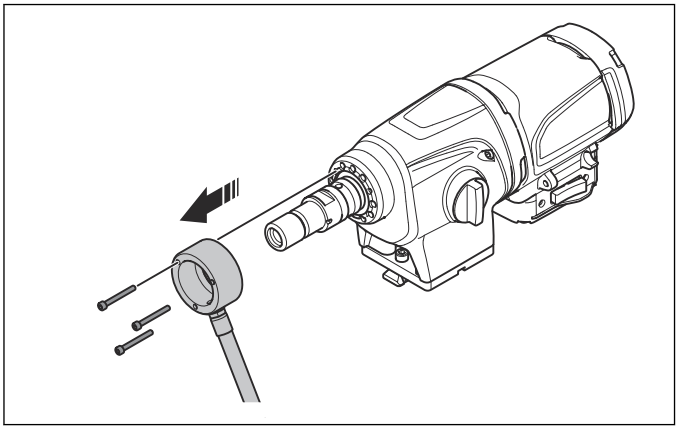
Replace the carbon brushes if less than 6 mm remain on the carbon brushes.

1. Remove the top cover. Refer to *To disassemble the product on page 14*.
2. Carefully remove the carbon brushes.
3. Install new carbon brushes.
4. Install the top cover. Refer to *To assemble the product on page 15*.

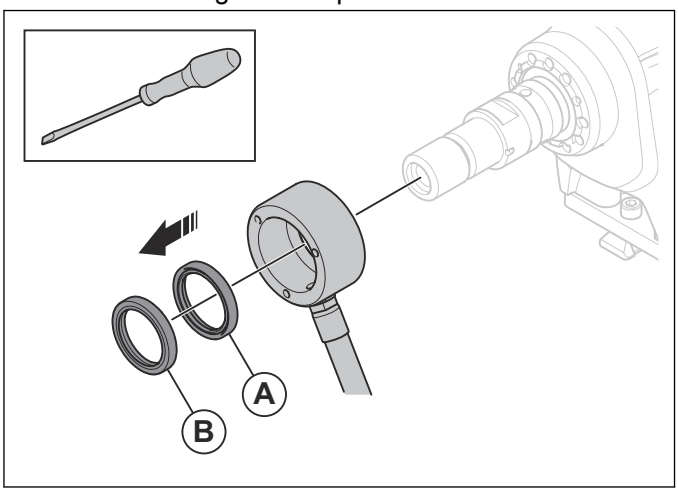
6.6 Gear housing DM 400

6.6.1 To replace the shaft seals for the drill spindle

1. Remove the 3 Allen screws that hold the water connection ring. Remove the water connection ring.



2. Carefully push the shaft seals out of the water connection ring with the point of a screwdriver.

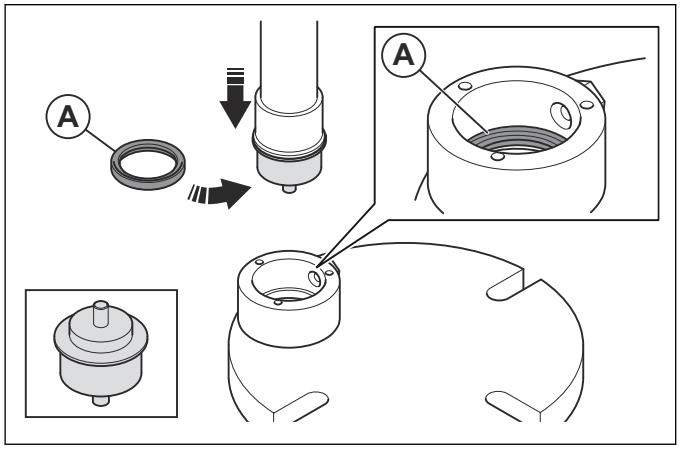


CAUTION: Make sure that the metal surface does not become damaged.

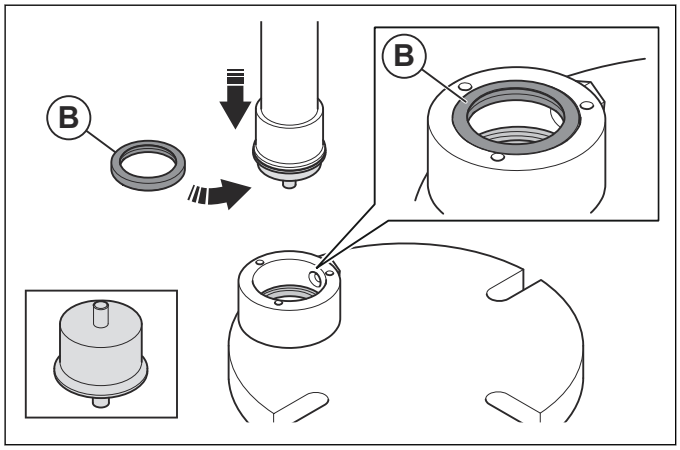
Note: Make a note of the positions of the 2 shaft seals. The shaft seal with 2 edges (B) is in front of the shaft seal with 1 edge (A).

3. Clean and dry the seal seat.

4. Put a new shaft seal with 1 edge (A) on the shaft seal press tool attached to a mandrel press. Refer to *Servicing tools overview 1 on page 9*. Put oil on the inner surface of the water connection ring. Push the shaft seal into the water connection ring.

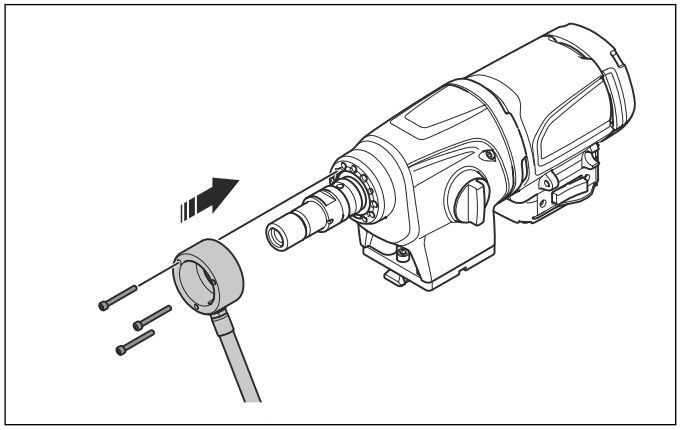


5. Turn the shaft seal press tool around. Put a new shaft seal with 2 edges (B) on the other side of the shaft seal press tool. Push the shaft seal into the water connection ring.



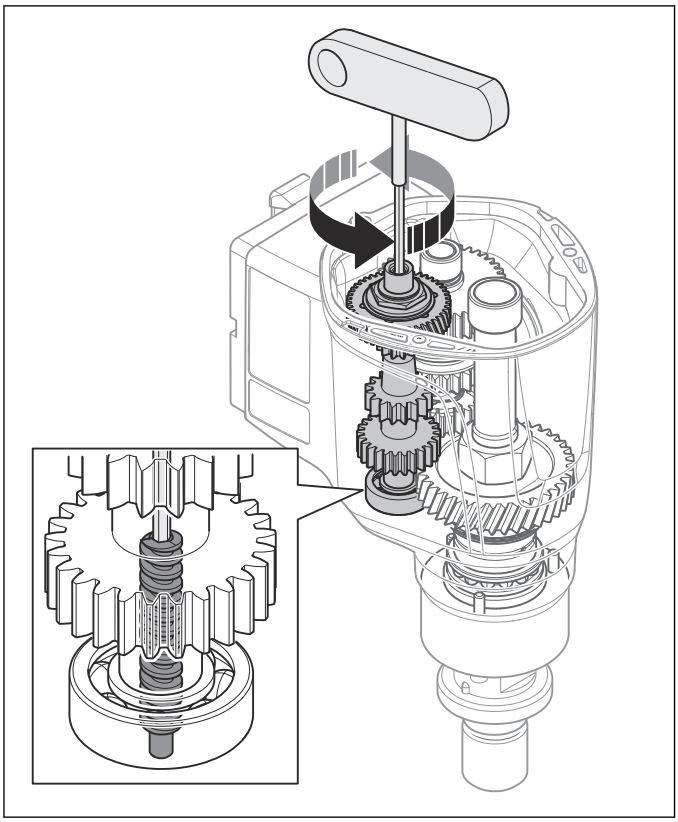
6. Put grease on the seals.

7. Install the water connection ring. Install the 3 Allen screws that hold the water connection ring.

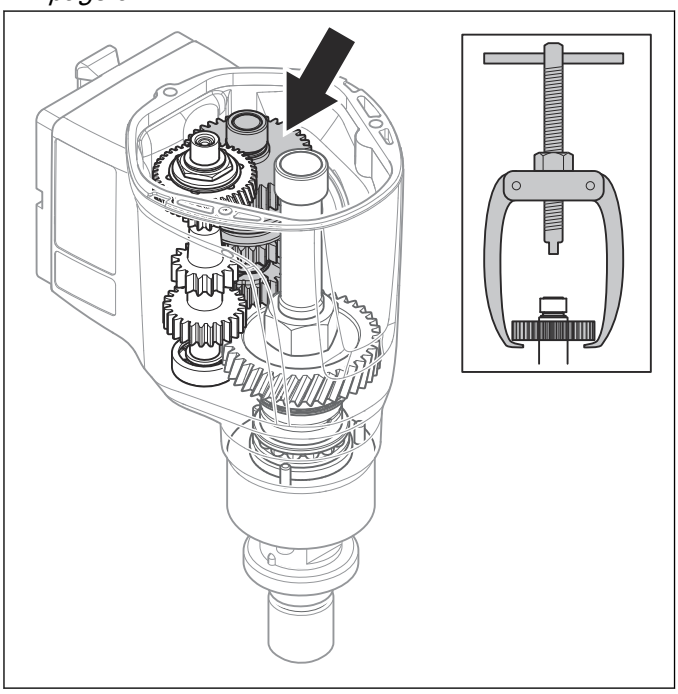


6.6.2 To remove the gear shaft and the pinion shaft

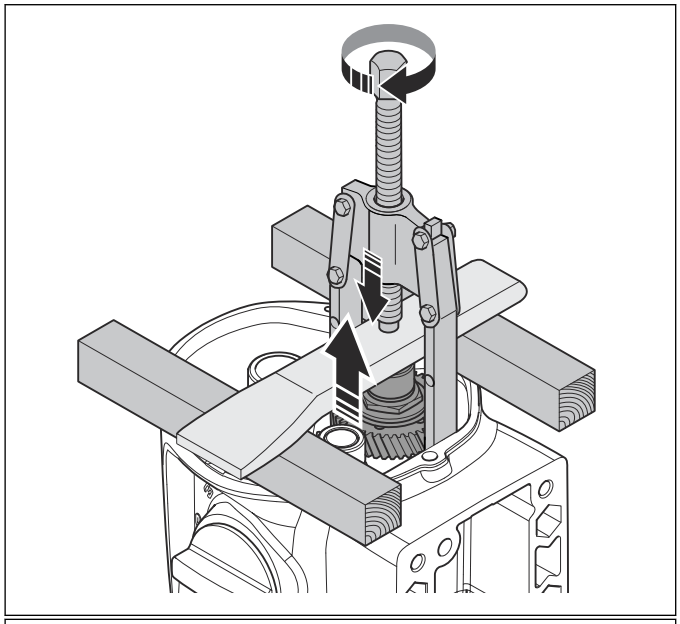
1. Put a hex key into the hole in the pinion shaft and into the socket of the feed screw. Turn the hex key counterclockwise to loosen the feed screw.

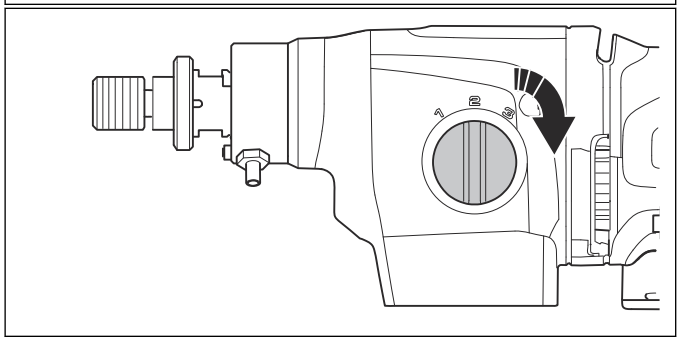


2. Put a small puller tool on the top gear wheel on the gear shaft. Refer to *Servicing tools overview 1 on page 9*.



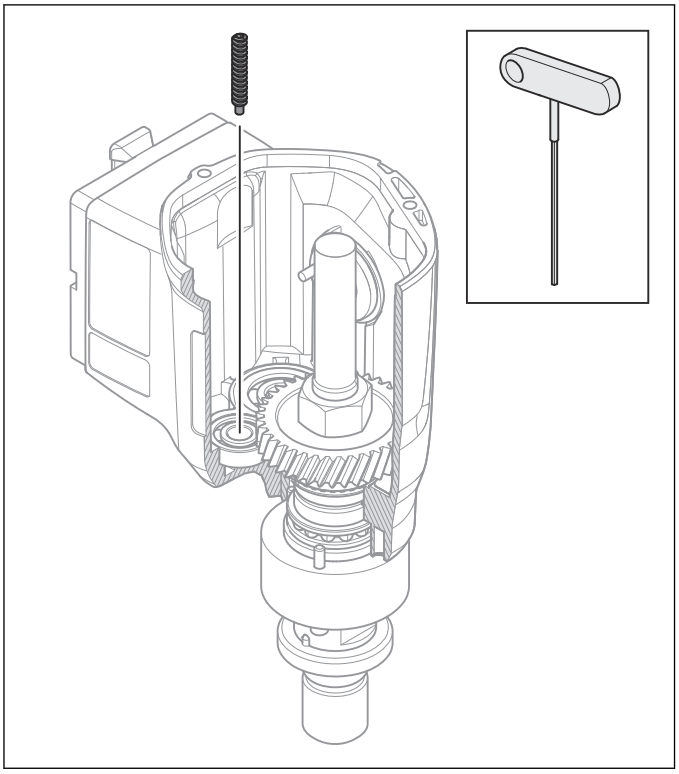
3. Use 2 spacers and put a piece of metal between them as support for the puller tool. Loosen the gear shaft and the pinion shaft. Pull out the gear shaft together with the pinion shaft. Turn the gear selector clockwise when you pull out the gear shaft and the pinion shaft from the gear housing.



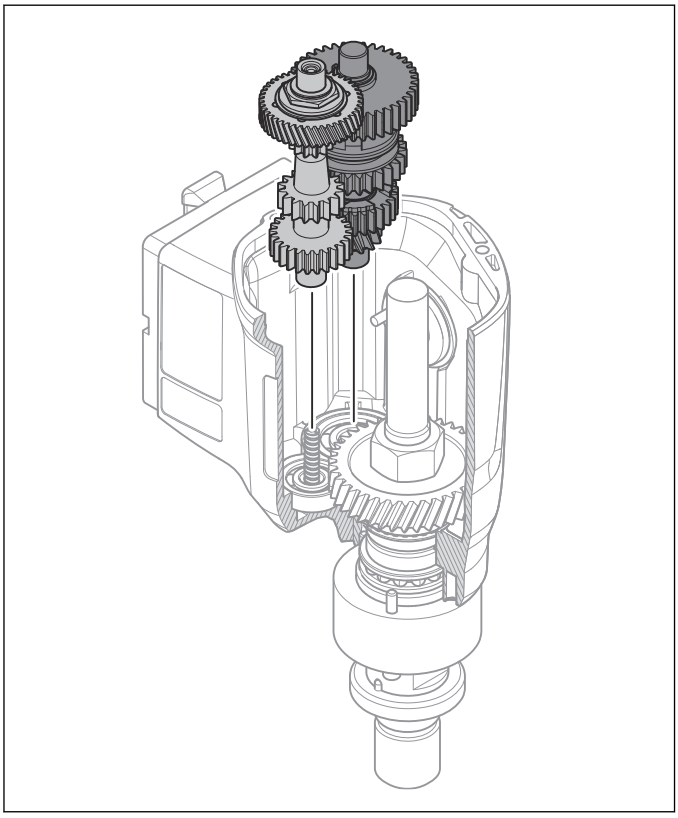


6.6.3 To install the gear shaft and the pinion shaft

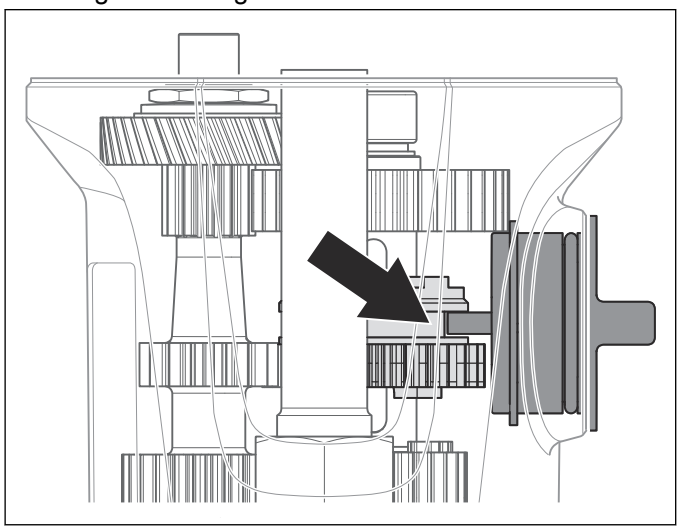
1. Put grease on the feed screw and put it into the gear housing bearing of the pinion shaft. Tighten the screw with a hex key.



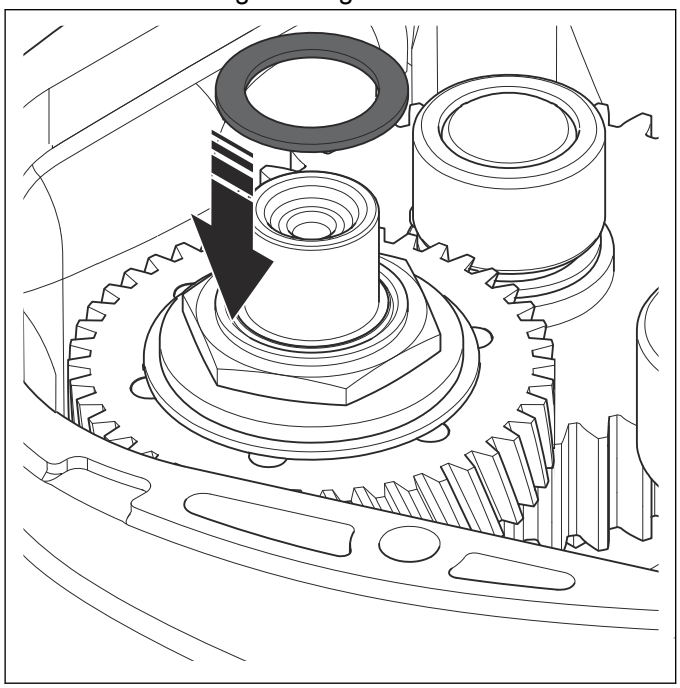
2. Put the gear shaft and pinion shaft together into the gear housing.



3. Put the pin of the gear selector into the groove of the gear wheel. Attach the shafts to the bearing seats in the gear housing.



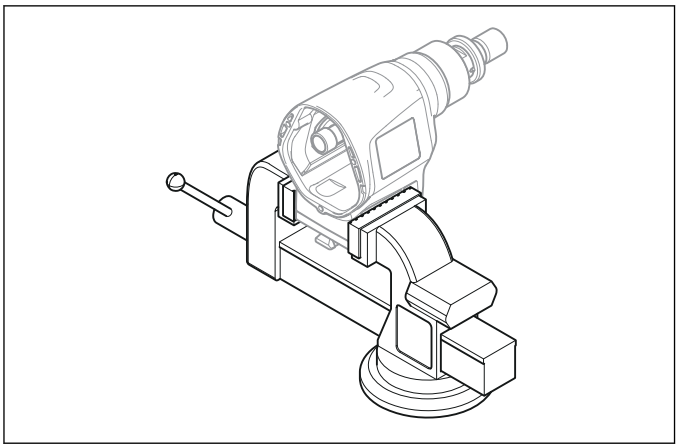
4. Put the shim ring on the gear shaft.



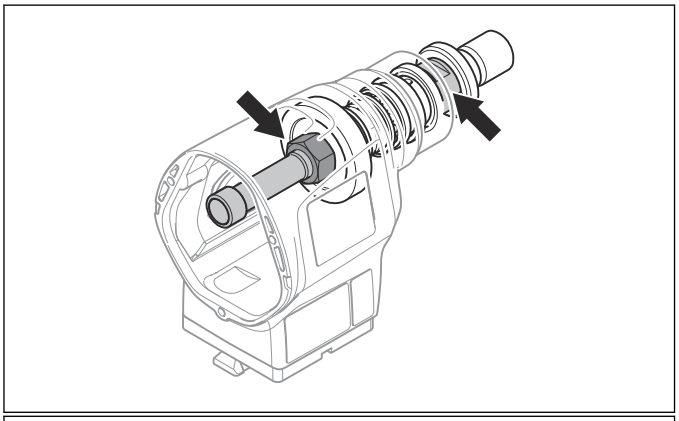
5. Fill the gear housing with gear oil and assemble the product. Refer to *To replace the gear oil on page 17*.

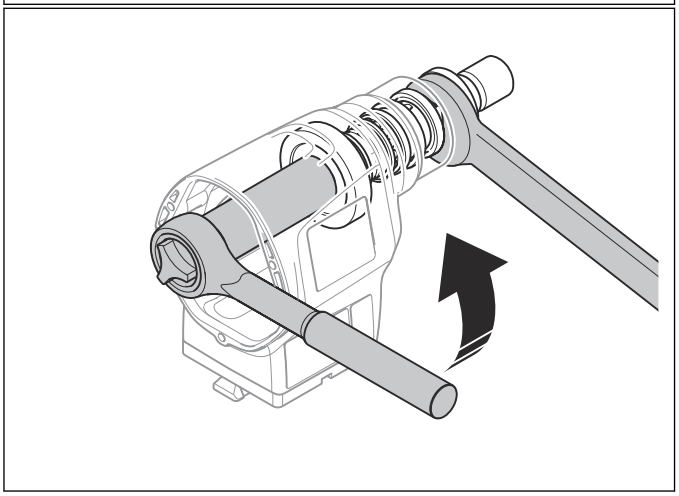
6.6.4 To remove the drill spindle

1. Attach the assembly plate for the Husqvarna drill stand to a vise.

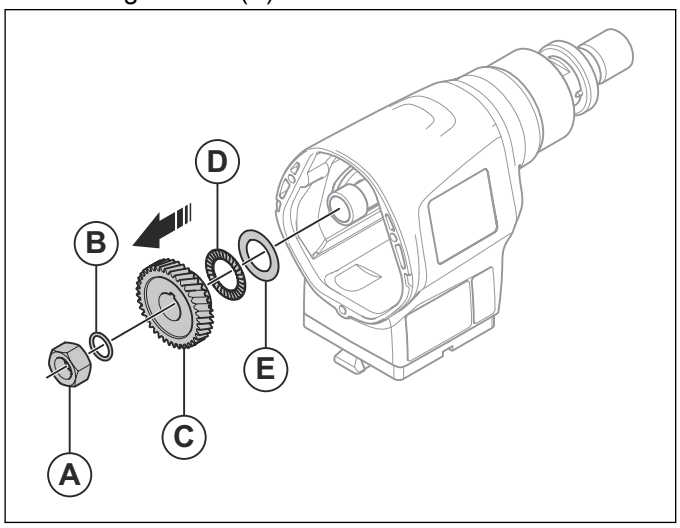


2. Hold the drill spindle with a wrench. Loosen the hex nut with a 32 mm deep socket wrench.

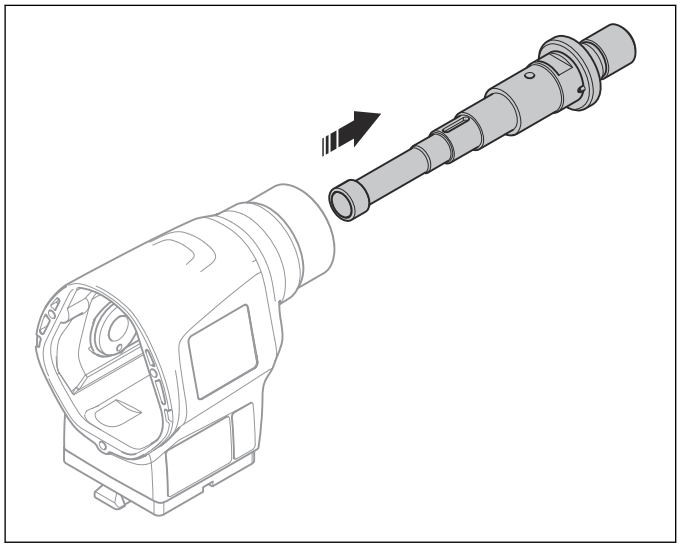




3. Remove the hex nut (A), the O-ring (B), the gear wheel (C), the axial needle bearing (D), and the axial bearing washer (E).



4. Tap the drill spindle carefully with a soft head mallet to loosen it. Remove the drill spindle.

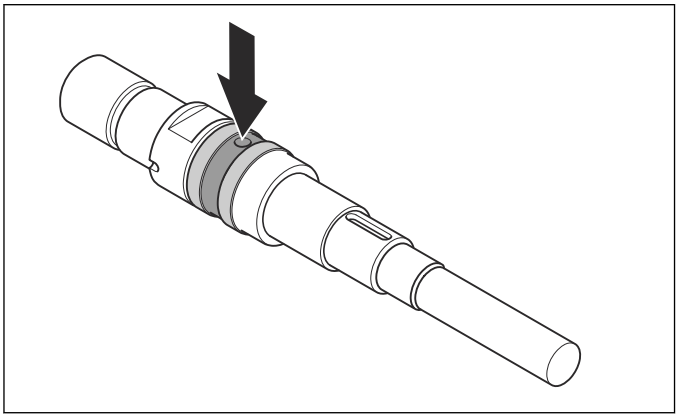


CAUTION: Make sure that the metal surface does not become damaged.

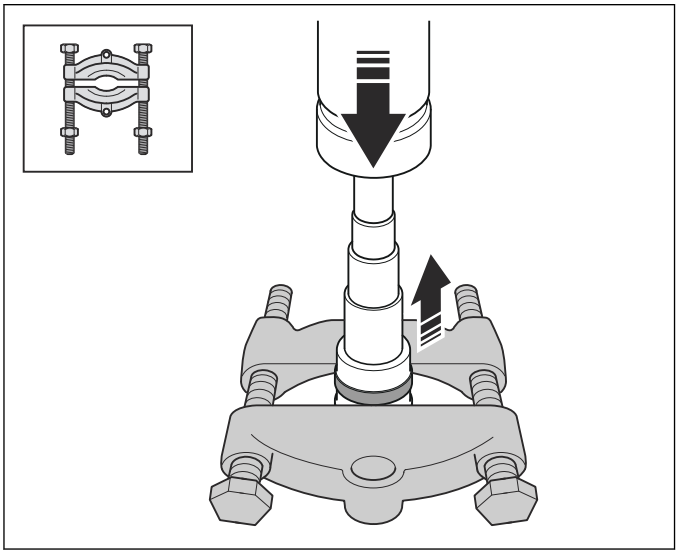
6.6.5 To replace the shaft sleeves for the drill spindle

Examine the shaft sleeves for the drill spindle for damage or wear. If the diameter is less than 39.85 mm, the shaft sleeves must be replaced.

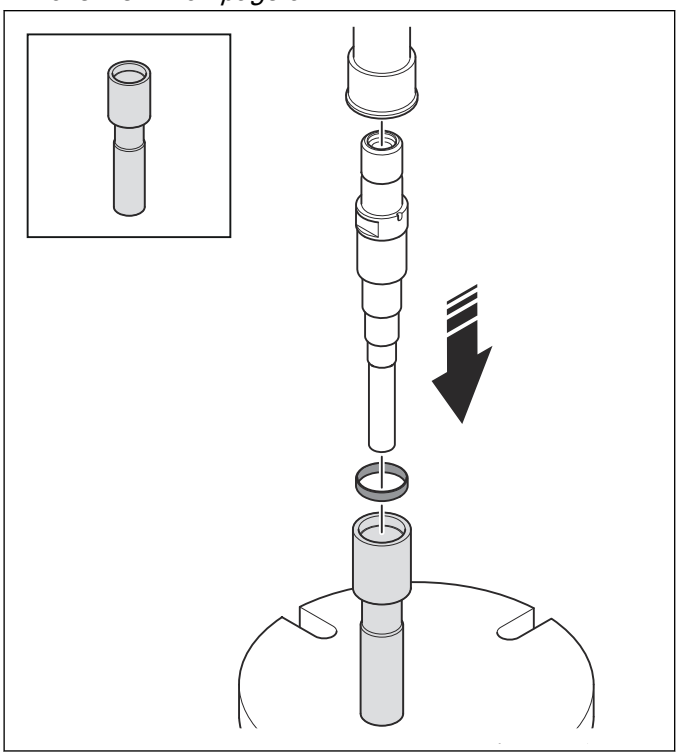
1. Clean the drill spindle shaft between the shaft sleeves with a cloth.



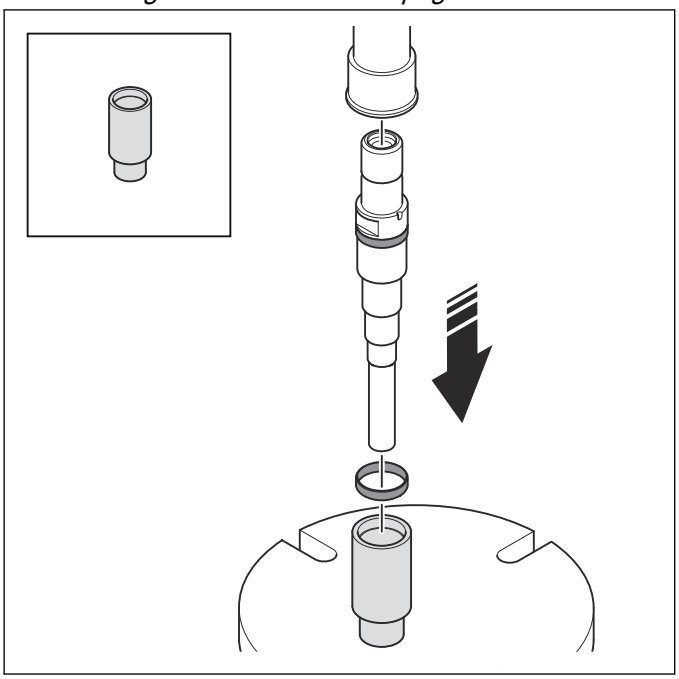
2. Push the 2 shaft sleeves off the drill spindle shaft with the separator puller tool and a mandrel press. Refer to *Servicing tools overview 1 on page 9*.



3. Put the first shaft sleeve into the first sleeve press tool. Push the first shaft sleeve onto the drill spindle shaft with a mandrel press. Refer to *Servicing tools overview 1 on page 9*.

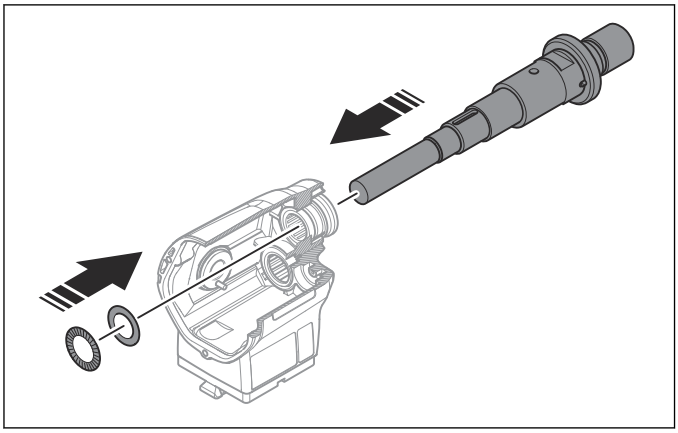


4. Put the second shaft sleeve into the second sleeve press tool. Push the second shaft sleeve onto the drill spindle shaft with a mandrel press. Refer to *Servicing tools overview 1 on page 9*.

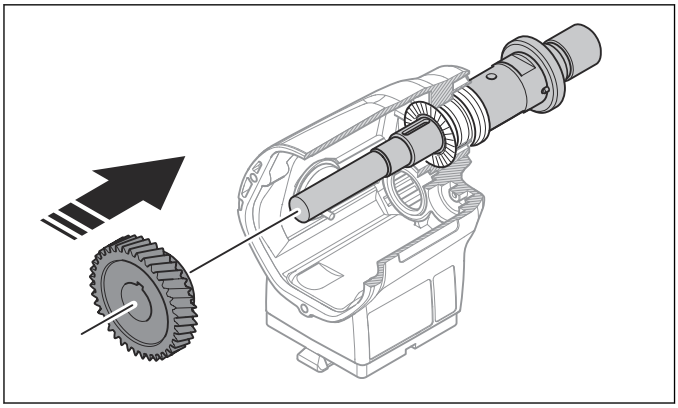


6.6.6 To install the drill spindle

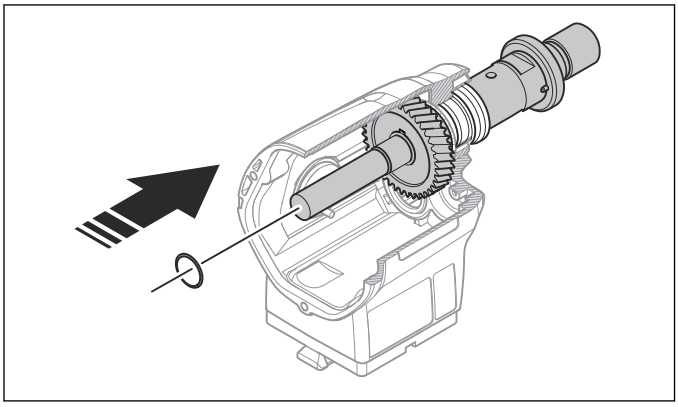
1. Put the drill spindle into the gear housing. Put the thrust washer and the axial needle bearing on the drill spindle shaft.



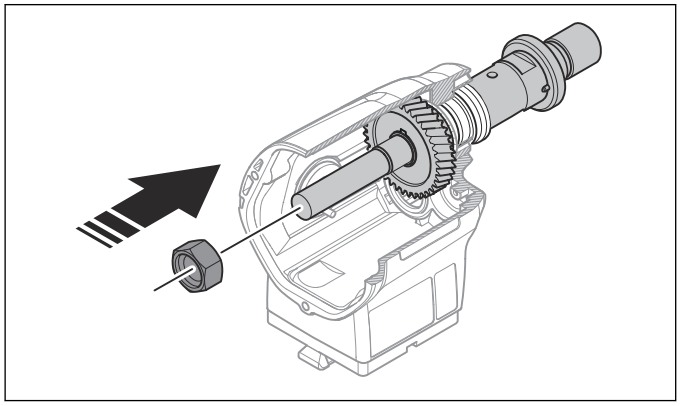
2. Put the gear wheel on the drill spindle shaft. Make sure that the key on the spindle shaft goes into the groove in the gear wheel.



3. Put the O-ring on the drill spindle shaft. Push the O-ring by hand against the gear wheel.

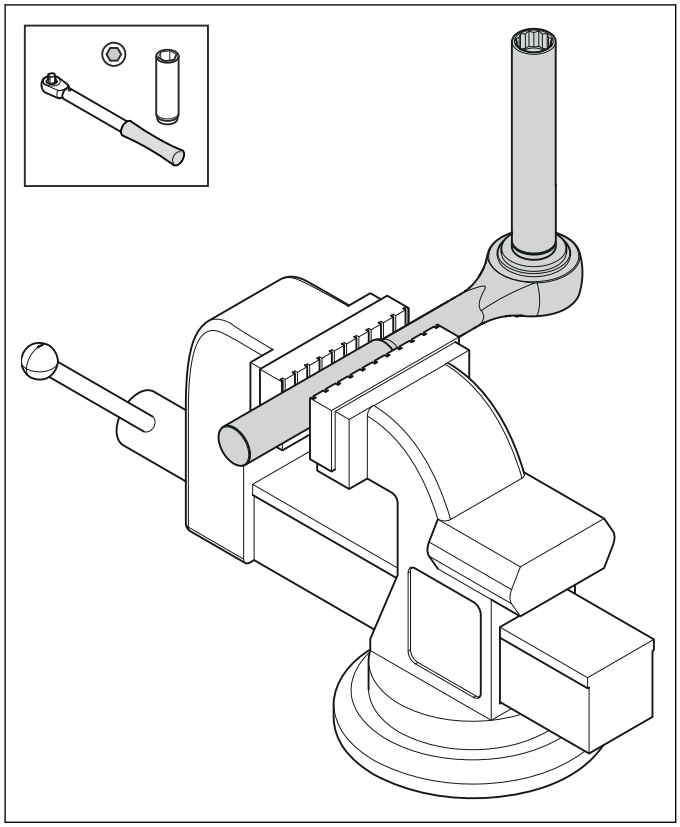


4. Put the hex nut on the drill spindle shaft and tighten it by hand.

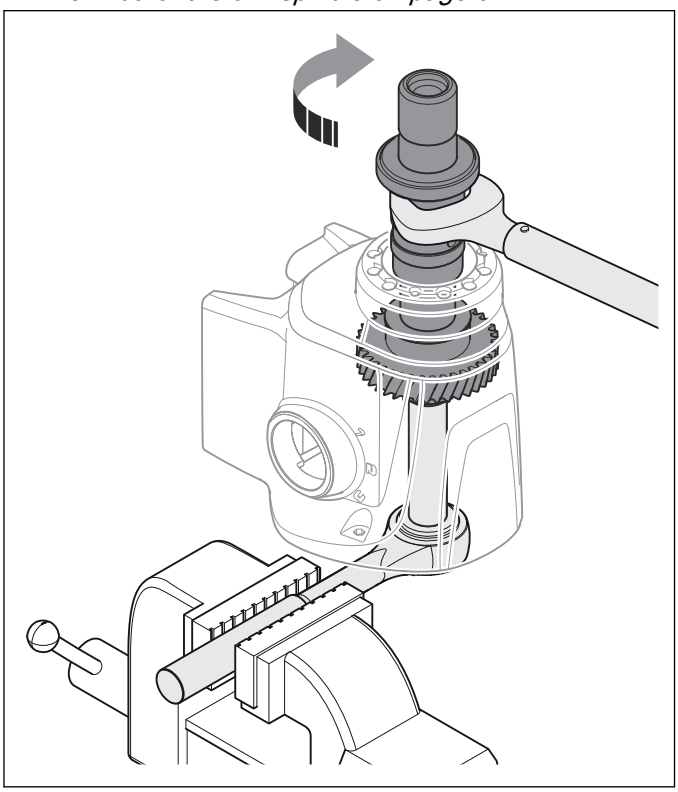


CAUTION: Make sure that the O-ring is not damaged.

5. Attach a deep socket wrench to a vise. Refer to *Servicing tools overview 1 on page 9*.

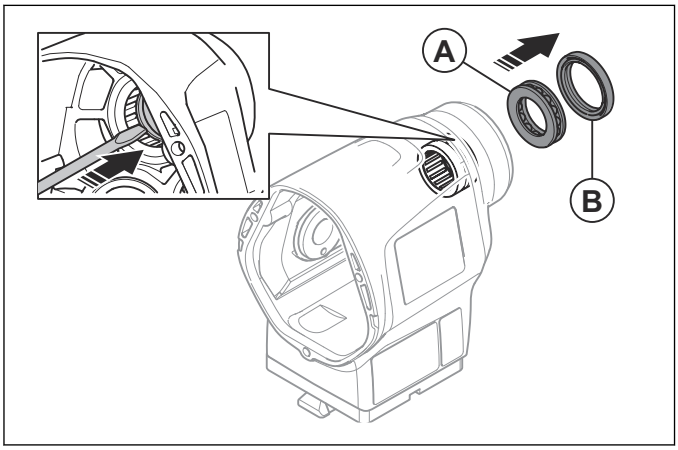


6. Put the drill spindle with the hex nut on the socket wrench. Turn the drill spindle with a torque wrench. Tighten the hex nut to the specified torque. Refer to *Hex nut for the drill spindle on page 6*.



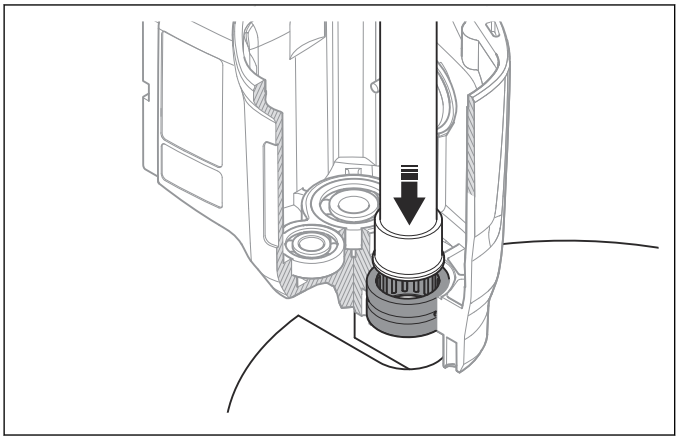
6.6.7 To remove the gear housing bearings

1. Put the point of a screwdriver on the surface of the outer disc of the axial ball bearing. Put pressure on the ball bearing and push the ball bearing with the shaft seal in front of it. Remove the axial ball bearing (A) and the shaft seal (B).

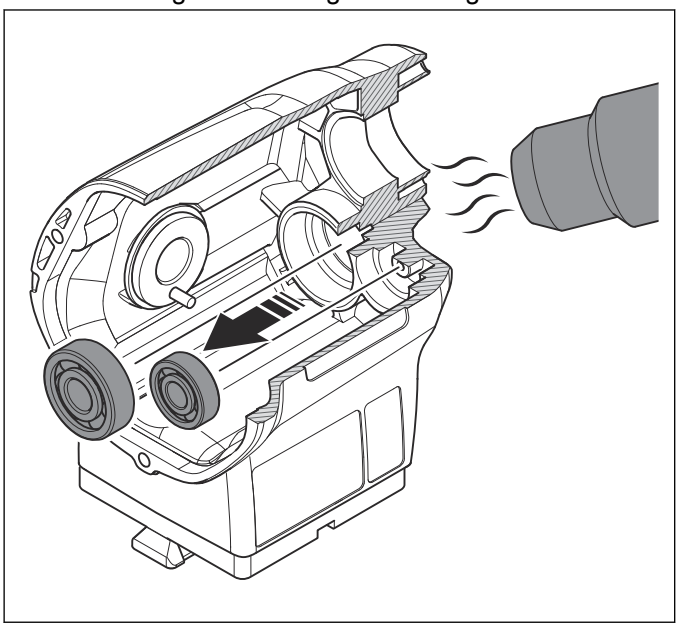


CAUTION: Make sure that the metal surface does not become damaged.

2. Push the needle bearing out of the gear housing with a mandrel press. Refer to *Servicing tools overview 1 on page 9*.

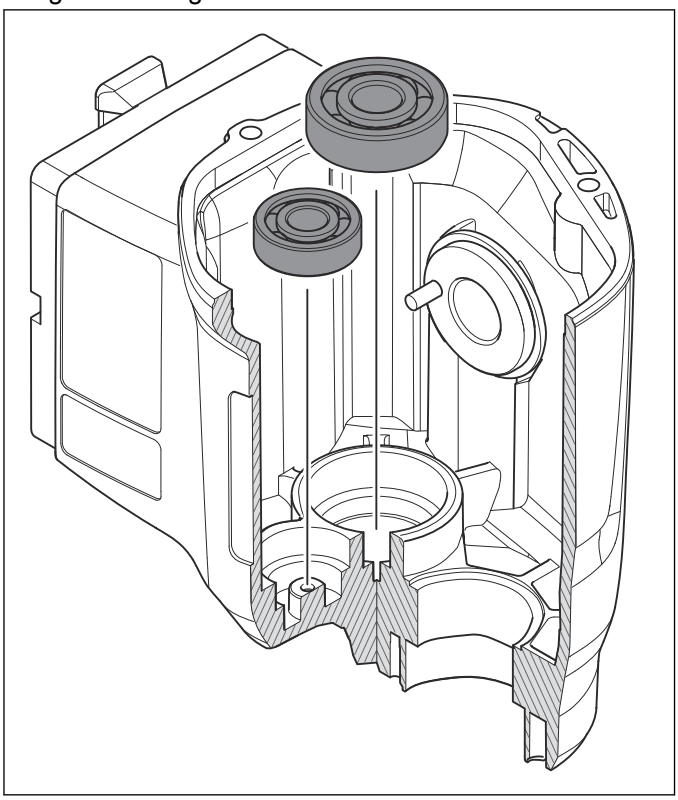


3. Apply heat to the ball bearing seats for the pinion shaft and the gear shaft with a hot air gun. Push the ball bearings out of the gear housing.

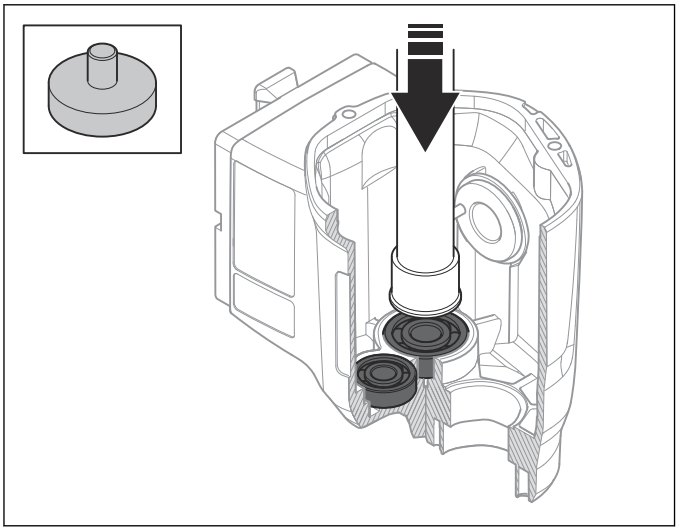


6.6.8 To install the gear housing bearings

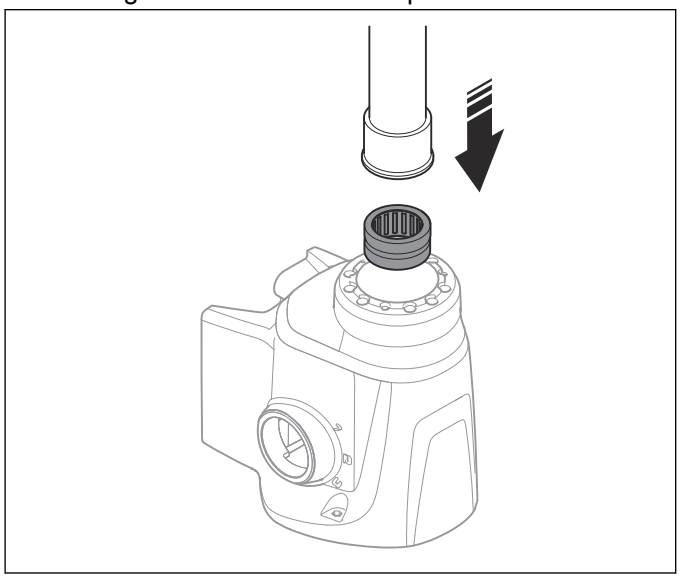
1. Put the 2 ball bearings into the bearing seats in the gear housing.



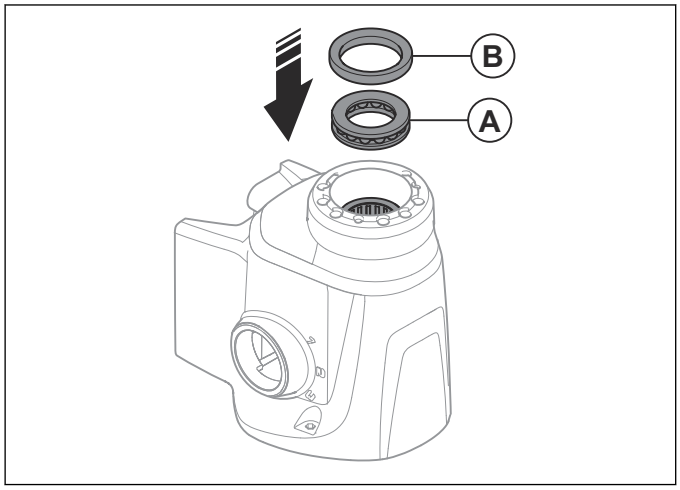
2. Attach the protective tool to a mandrel press. Refer to *Servicing tools overview 1 on page 9*. Push the 2 ball bearings into the bearing seats with the mandrel press.



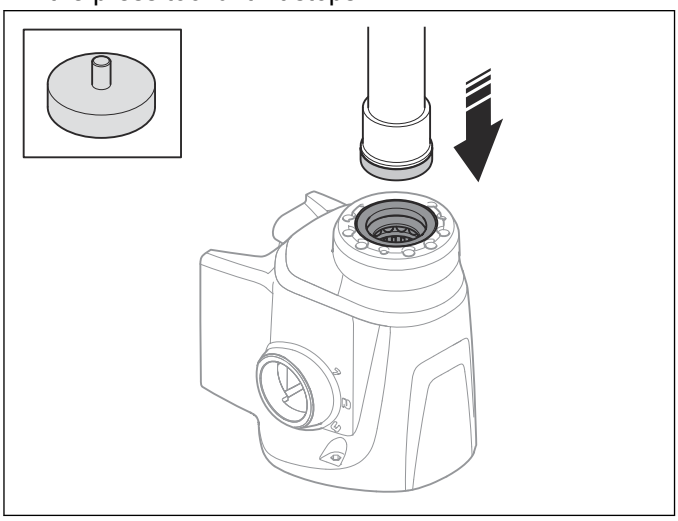
3. Put the needle bearing into the bearing seat in the gear housing. Push the needle bearing into the bearing seat with the mandrel press.



4. Put the axial ball bearing (A) with the 2 washers into the bearing seat in the gear housing. Make sure that the washer with the small inner diameter is at the top. Make sure that the washer with the large inner diameter is at the bottom. Put the radial shaft seal (B) on top of the axial ball bearing.



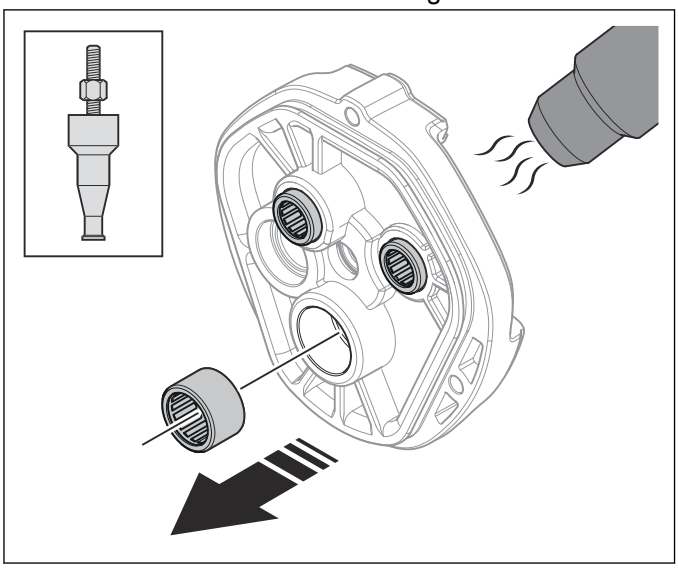
5. Attach the shaft seal press tool to the mandrel press. Refer to *Servicing tools overview 1 on page 9*. Push the radial shaft seal onto the axial ball bearing with the press tool until it stops.



6. Put grease on the radial shaft seal.

6.6.9 To remove the middle cover bearings

1. Put an inner bearing puller into one of the 3 needle bearings in the middle cover. Refer to *Servicing tools overview 1 on page 9*. Attach the puller to a vise. Apply heat to the bearing seat with a hot air gun. Tap the middle cover carefully with a soft head mallet to loosen the needle bearing from the bearing seat. Remove the needle bearing.

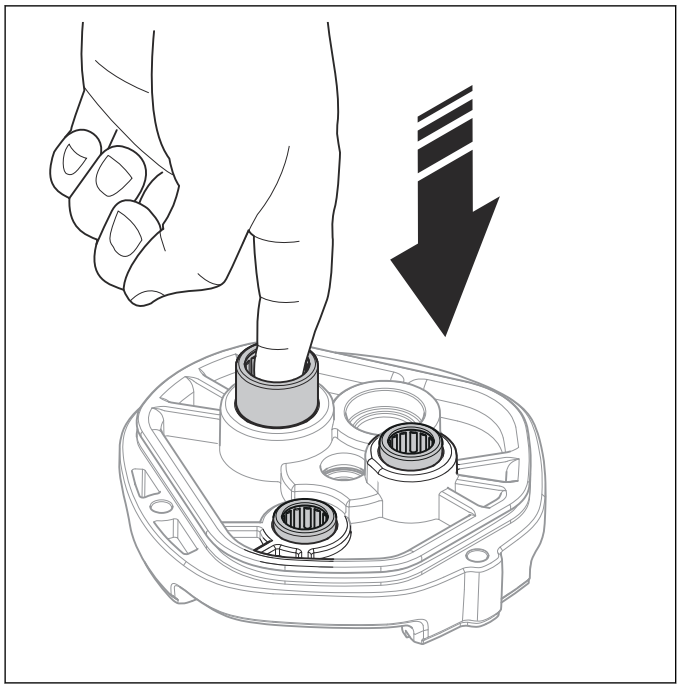


CAUTION: Make sure that the metal surface does not become damaged.

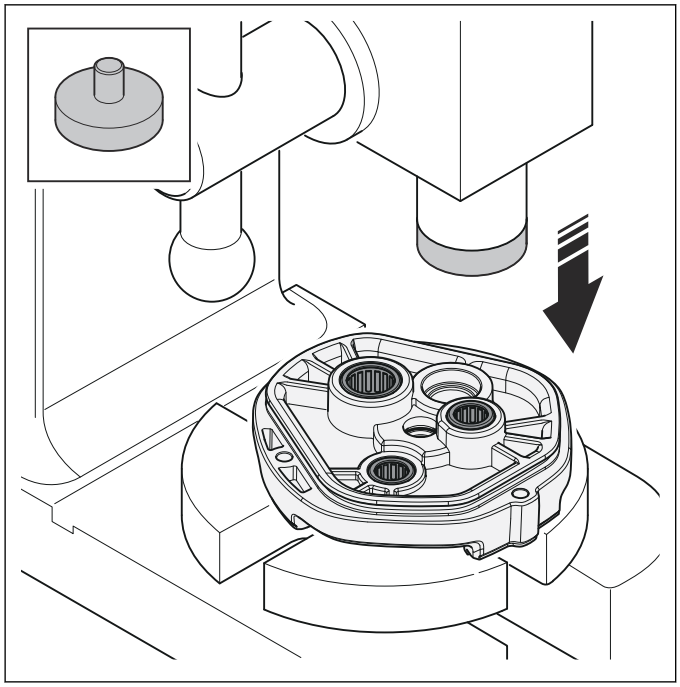
2. Do the same procedure as in the step before to remove all 3 needle bearings from the middle cover.

6.6.10 To install the middle cover bearings

1. Put the 3 needle bearings into the bearing seats in the middle cover.

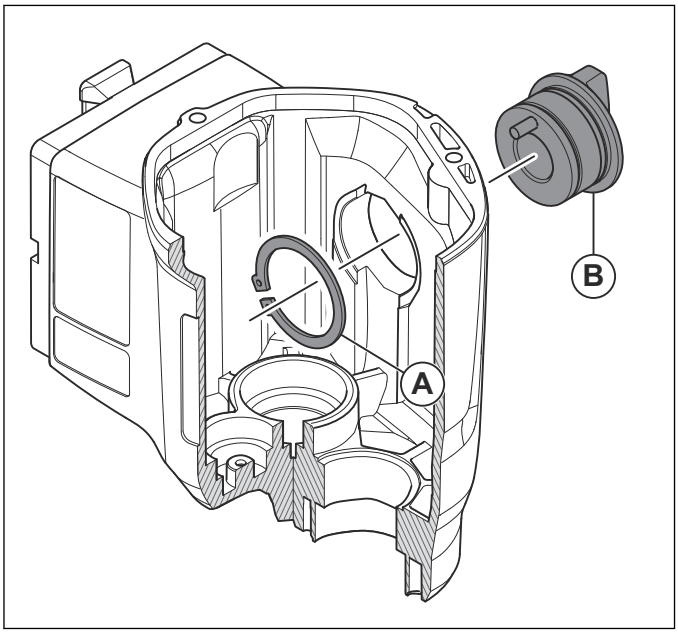


2. Attach the protective tool to a mandrel press. Refer to *Servicing tools overview 1 on page 9*. Push the 3 needle bearings into the bearing seats.



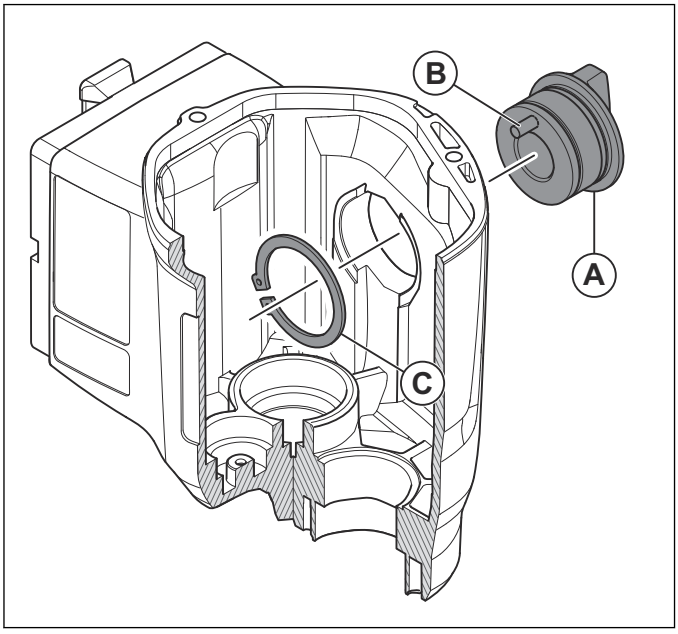
6.6.11 To remove the gear selector

- Remove the snap ring (A) with circlip pliers. Remove the gear selector (B).



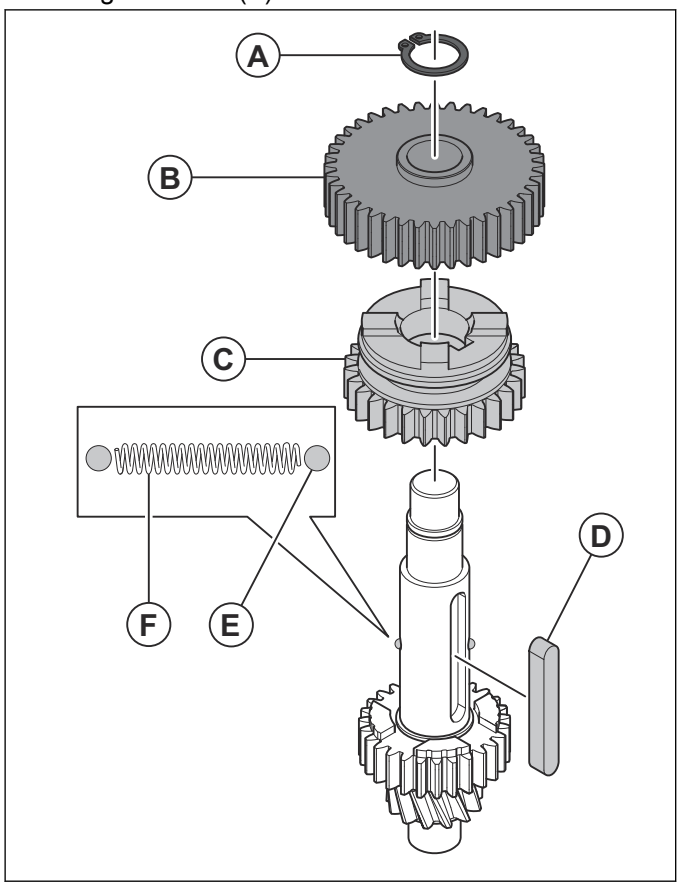
6.6.12 To install the gear selector

- Put grease on the gear selector (A). Put the gear selector in the hole in the gear housing with the pin (B) up. Put the snap ring (C) on the gear selector and tighten it with circlip pliers.

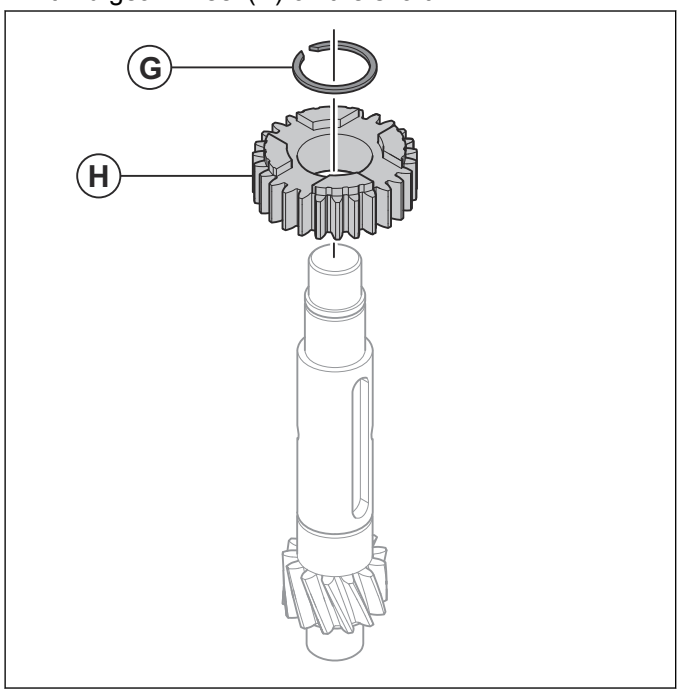


6.6.13 To disassemble the pinion shaft

1. Remove the snap ring (A) with circlip pliers. Pull the first gear wheel (B) off the shaft.



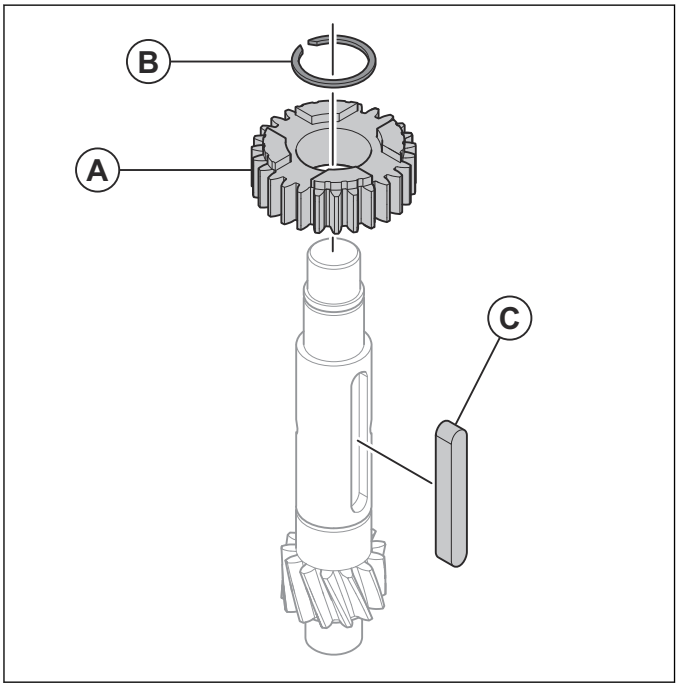
2. Carefully pull the second gear wheel (C) off the shaft. Hold the compression spring (F) and the 2 steel balls (E) in position with your fingers.
3. Remove the compression spring and the 2 steel balls. Remove the parallel key (D).
4. Remove the snap ring (G) with circlip pliers. Pull the third gear wheel (H) off the shaft.



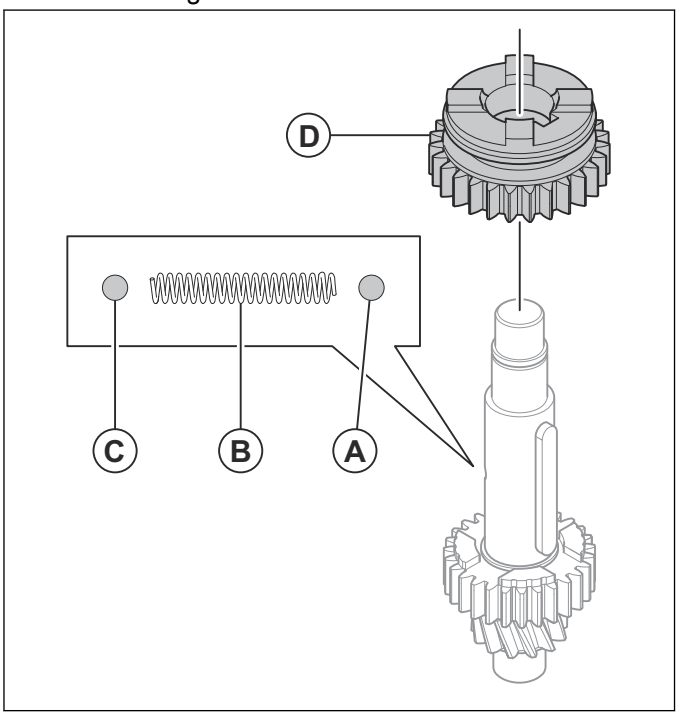
5. Clean and dry all parts. Examine all parts for wear. Replace damaged parts.

6.6.14 To assemble the pinion shaft

1. Put the third gear wheel (A) onto the pinion shaft. Install the snap ring (B). Install the parallel key (C).

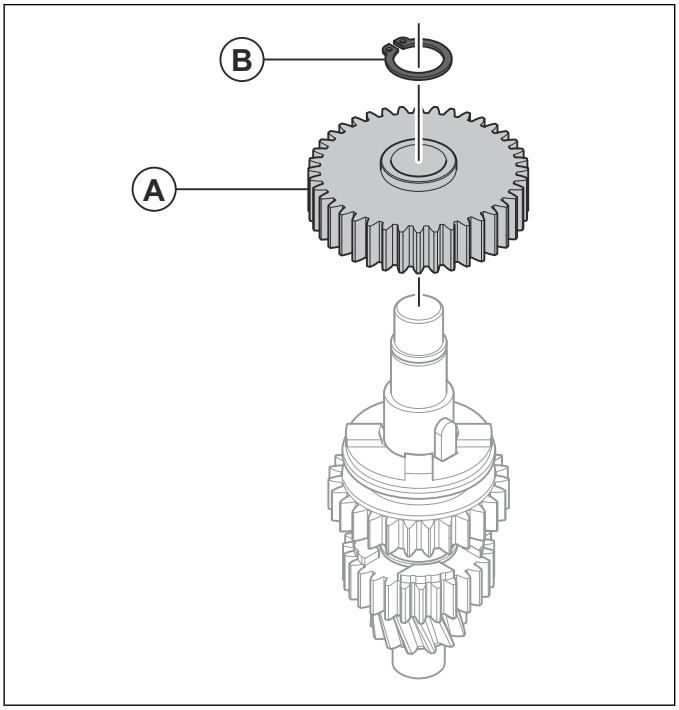


2. Install the compression spring, the 2 steel balls and the second gear wheel.



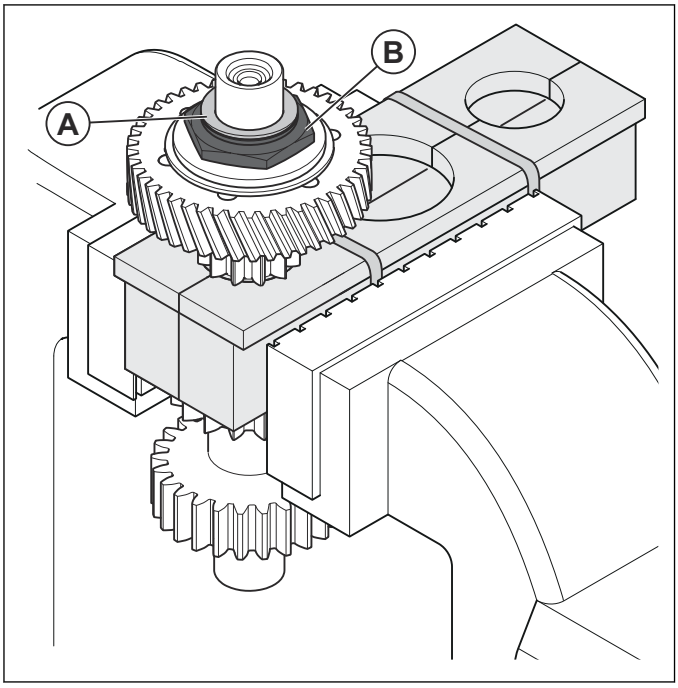
a) Put the first steel ball (A) into the hole in the pinion shaft. Put the compression spring (B) into the hole in the pinion shaft. Put the second steel ball (C) into the hole in the pinion shaft.
b) Hold the compression spring and the 2 steel balls in position with your fingers.
c) Put the second gear wheel (D) onto the pinion shaft. Push it onto the compression spring and the 2 steel balls.

3. Put the first gear wheel (A) onto the pinion shaft. Install the snap ring (B).

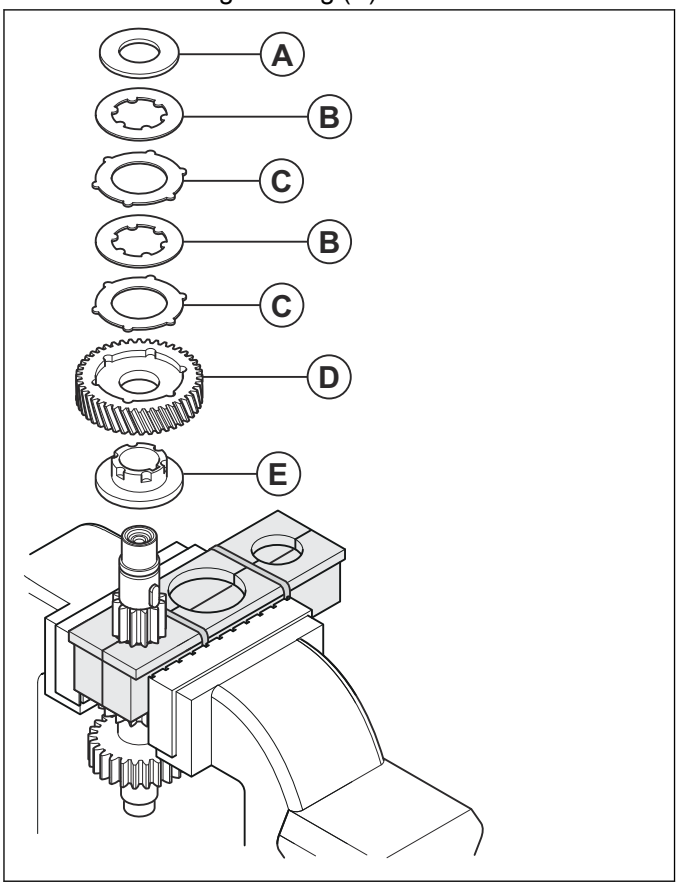


6.6.15 To disassemble the gear shaft

1. Attach the gear shaft holder to a vise. Refer to *Servicing tools overview 1 on page 9*. Put the gear shaft in the holder. Make sure that the tension is on the shaft. Loosen the hex nut (B). Remove the shim ring (A) and the hex nut.



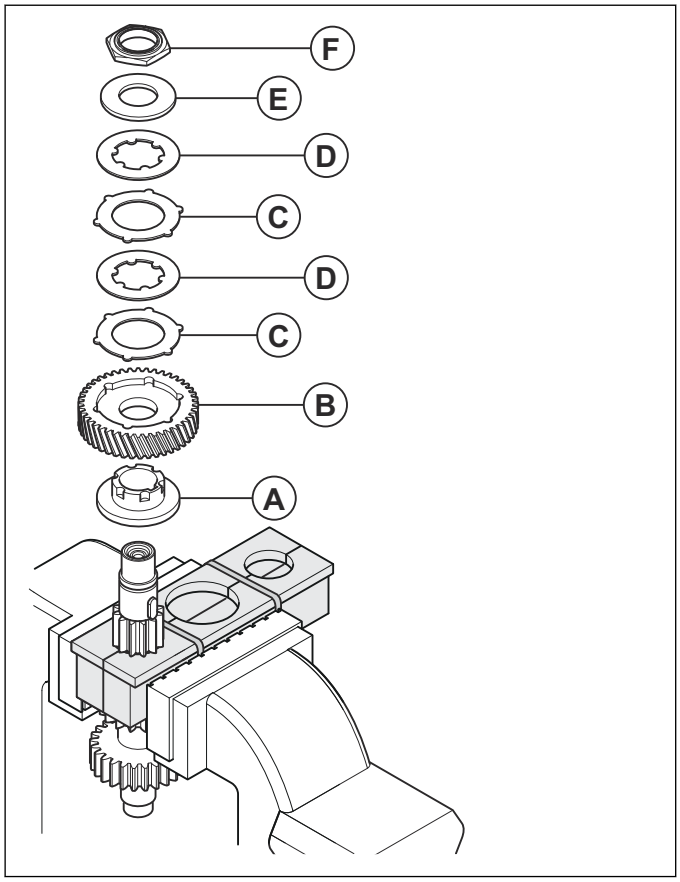
2. Remove the plate spring (A), the pressure discs (B), and the brake discs (C). Remove the gear wheel (D) and the bearing bushing (E).



3. Clean and dry all parts. Examine all parts for wear. Refer to *To do a check of the gear housing and gears on page 41*. Replace damaged parts.

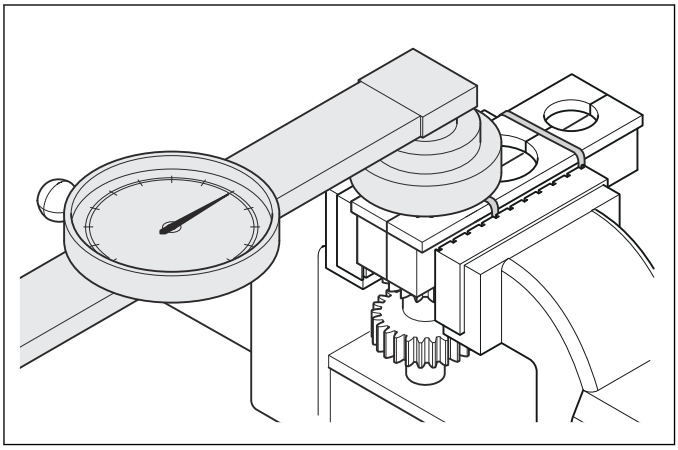
6.6.16 To assemble the gear shaft

1. Attach the gear shaft holder to a vise. Refer to *Servicing tools overview 1 on page 9*. Put the gear shaft in the gear shaft holder. Put gear oil on all parts before assembly. Install the bearing bushing (A), the gear wheel (B), the brake discs (C), and the pressure discs (D). Install the plate spring (E) and the hex nut (F).



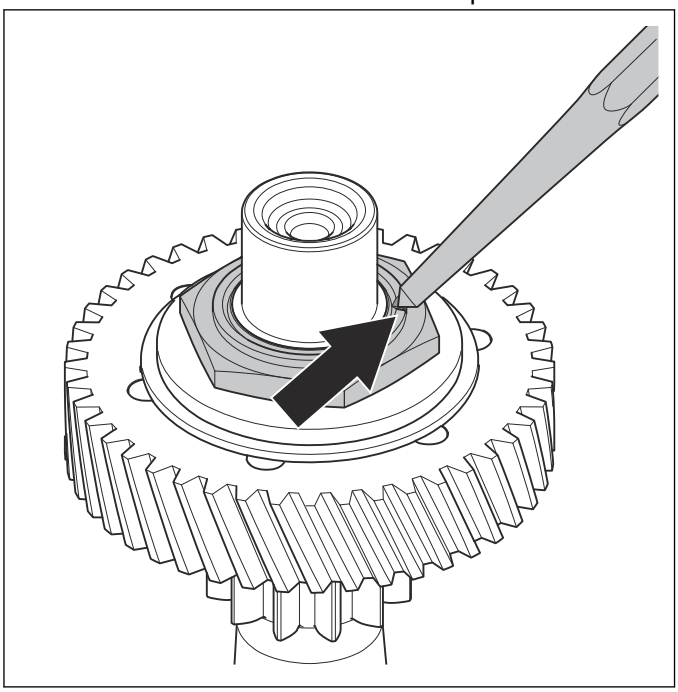
Note: Replace the used hex nut with a new hex nut.

2. Do a check of the hex nut torque with a torque wrench. Turn the torque wrench counterclockwise while you read the value. Tighten the hex nut to the specified torque. Refer to *Hex nut for the gear shaft on page 7*. If the value is too high, remove the hex nut. Remove the plate spring, the pressure discs, and the brake discs and install them again. Do the procedure until you read the correct value.



Note: When the friction clutch rotates, it becomes warm. It increases the torque. Let the friction clutch become cool before you read the torque again.

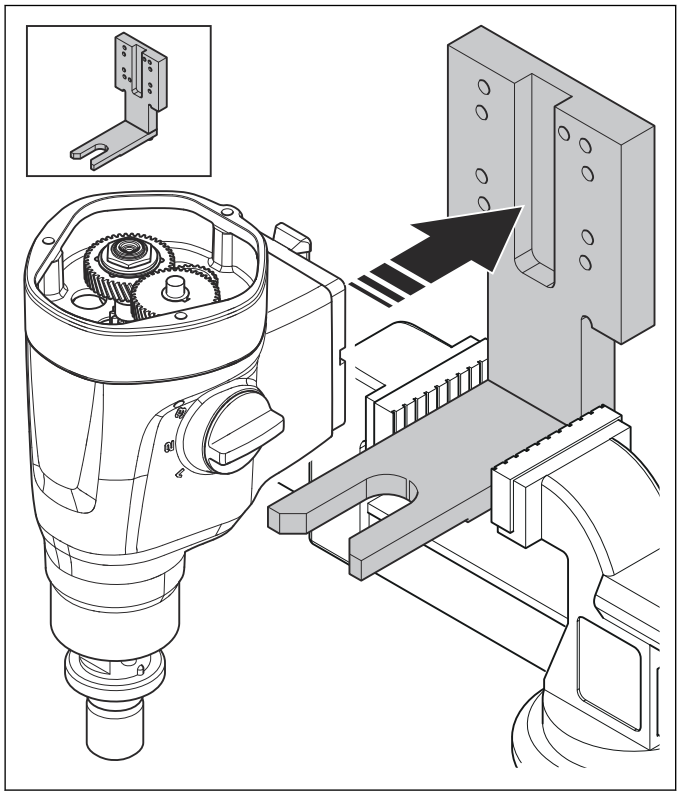
3. Make a notch on the hex nut with a punch.



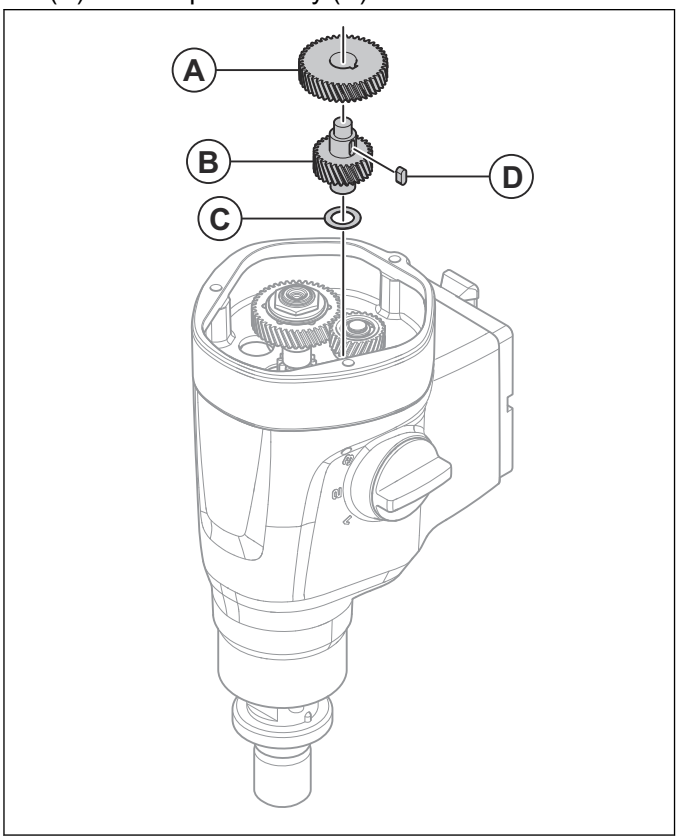
6.7 Gear housing DM 430

6.7.1 To disassemble the middle gear housing

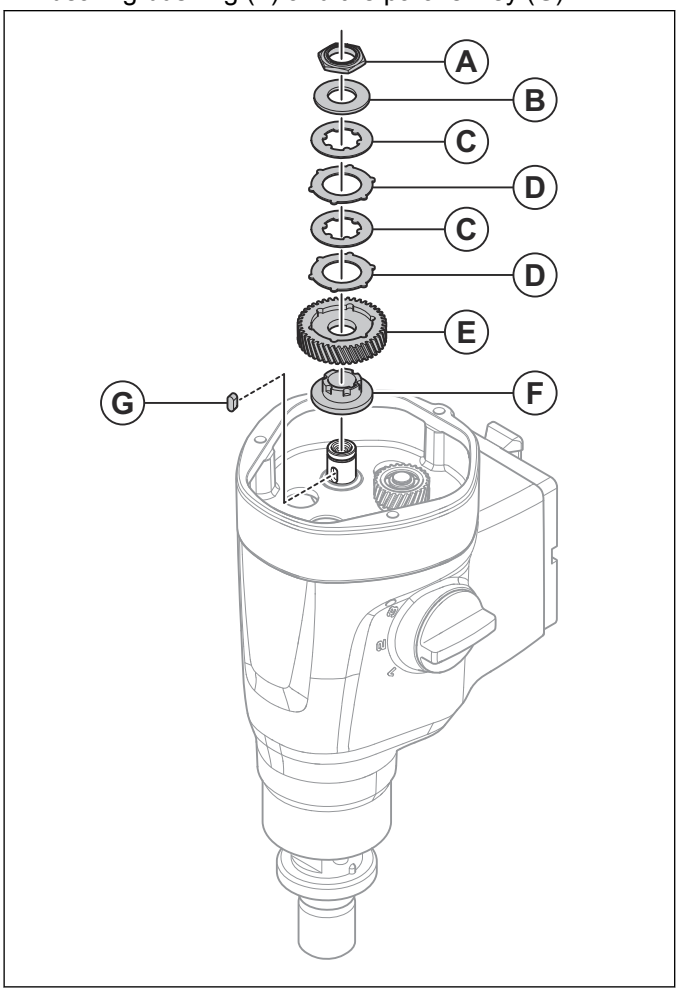
1. Disassemble the product. Refer to *To disassemble the product on page 14*.
2. Attach the machine holder tool to a vise. Refer to *Servicing tools overview 1 on page 9*. Put the product in a vertical position in the machine holder tool.



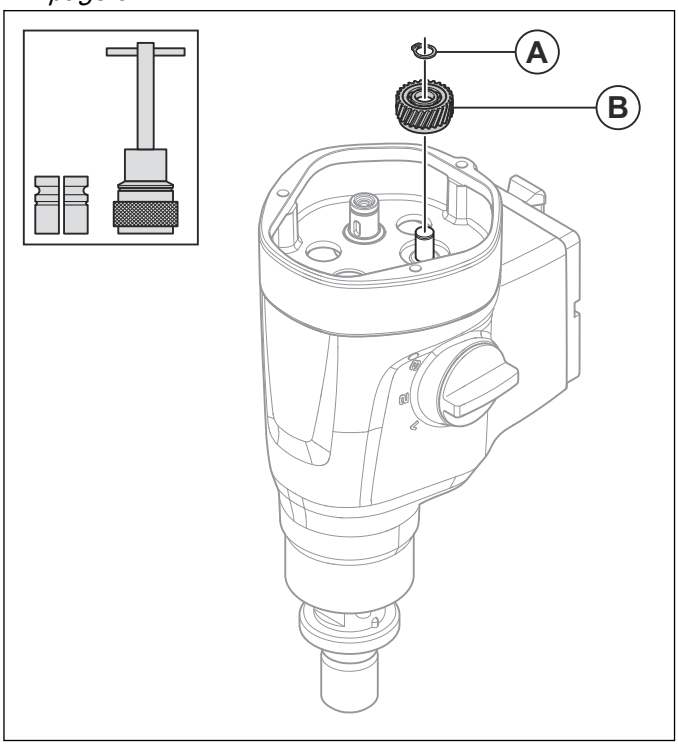
3. Pull the gear wheel (A) off the middle gear shaft. Pull out the middle gear shaft (B). Remove the shim ring (C) and the parallel key (D).



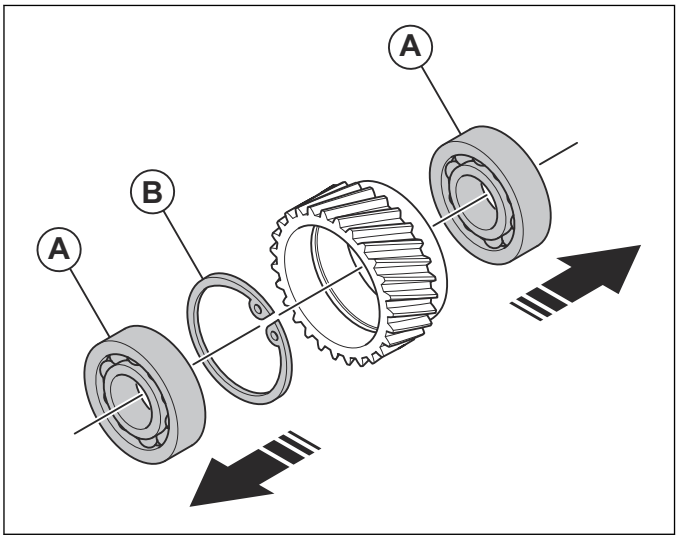
4. Loosen the hex nut (A) and remove it. Remove the plate spring (B), the pressure discs (C), the brake discs (D), and the gear wheel (E). Remove the bearing bushing (F) and the parallel key (G).



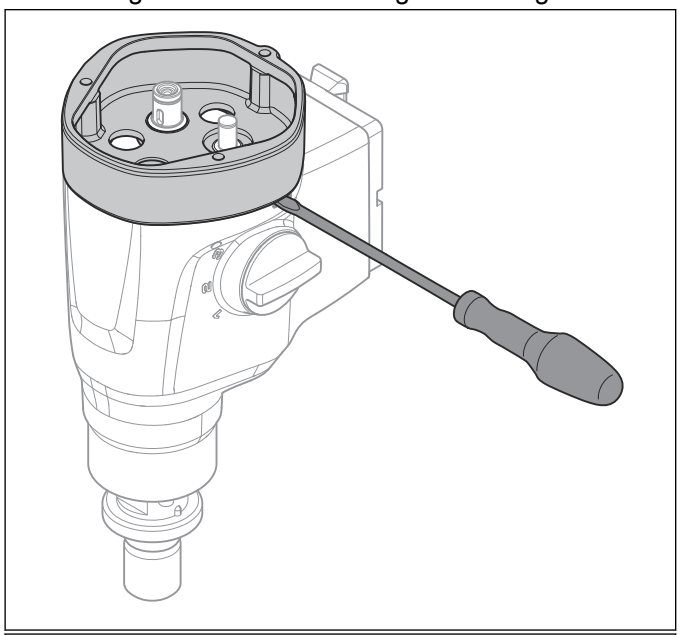
5. Remove the snap ring (A) with circlip pliers. Pull the gear wheel (B) off the gear shaft with the bearing puller tool. Refer to *Servicing tools overview 1 on page 9*.

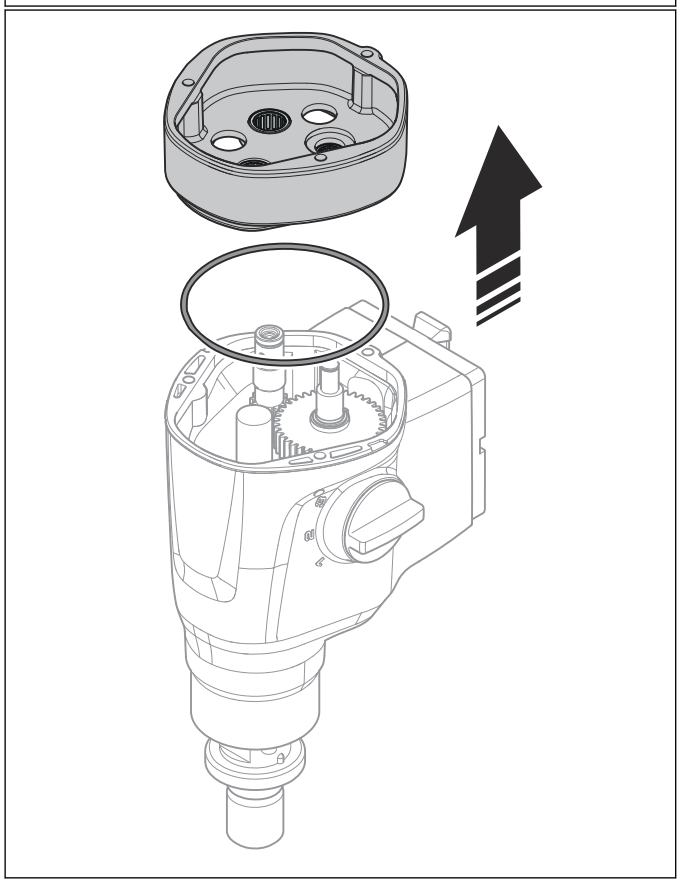


6. Pull out the 2 ball bearings (A) from the gear wheel of the gear shaft. Pull out the snap ring (B) from the gear wheel of the gear shaft.



7. Put a flat screwdriver in the recess on the primary gear housing. Carefully loosen the middle gear housing. Remove the middle gear housing.

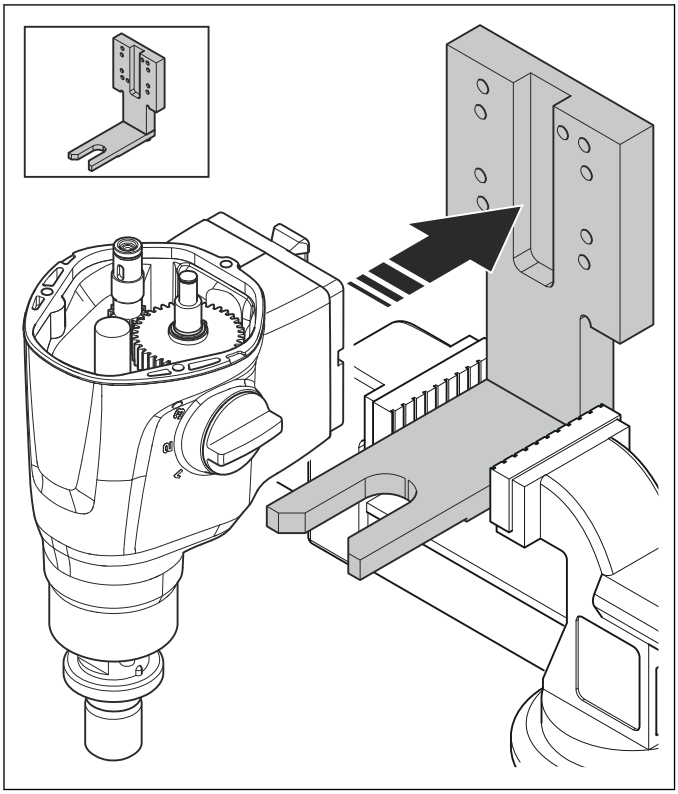




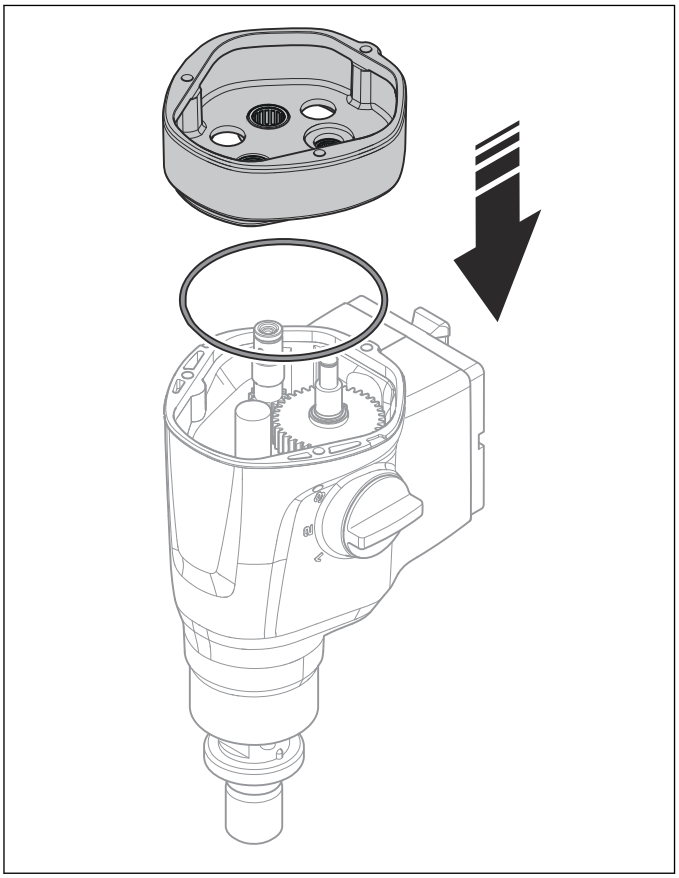
CAUTION: Make sure that the O-ring is not damaged.

6.7.2 To assemble the middle gear housing

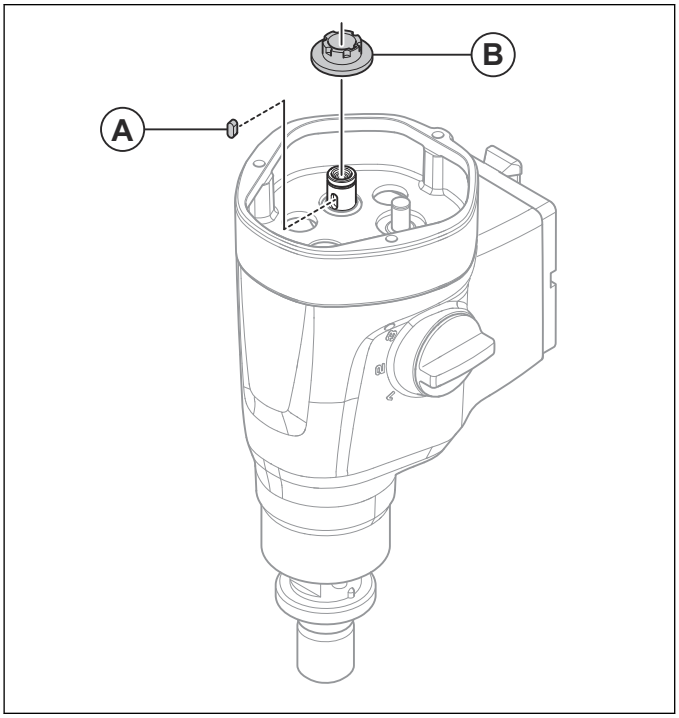
1. Attach the machine holder tool to a vise. Refer to *Servicing tools overview 1 on page 9*. Put the product in a vertical position in the machine holder tool.



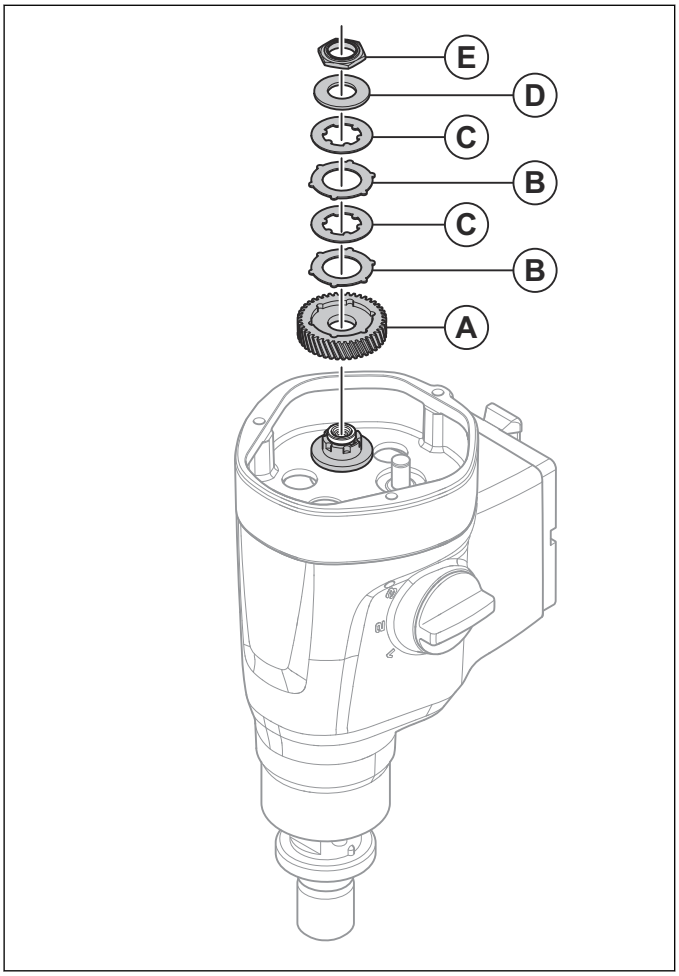
2. Put oil on the O-ring and the O-ring seat of the middle gear housing. Put the middle gear housing on the primary gear housing.



3. Install the parallel key (A) on the pinion shaft. Put the bearing bushing (B) onto the pinion shaft and push it onto the parallel key.

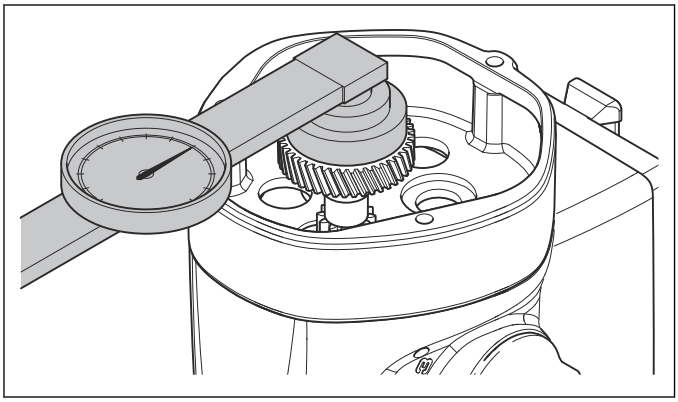


4. Put gear oil on all parts before assembly. Install the gear wheel (A), the brake discs (B), and the pressure discs (C). Install the plate spring (D) and the hex nut (E).



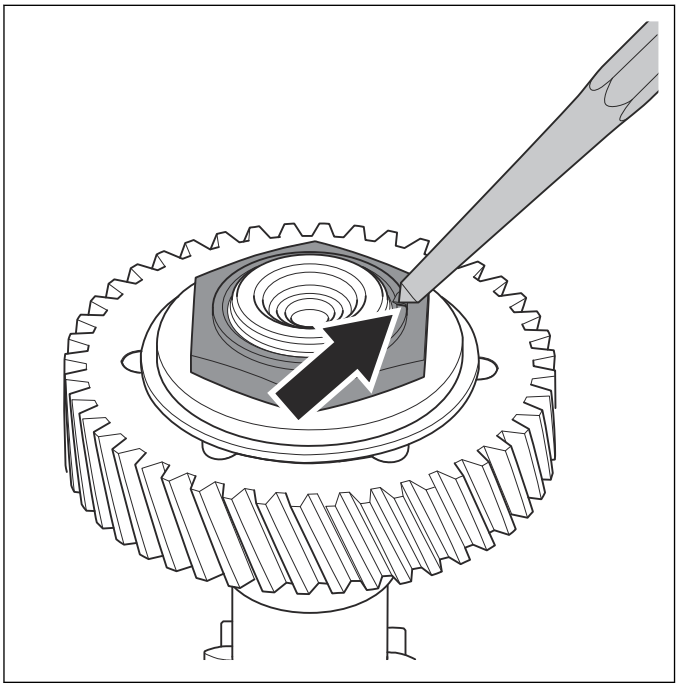
Note: Replace the used hex nut with a new hex nut.

5. Do a check of the hex nut torque with a torque wrench. Turn the torque wrench counterclockwise while you read the value. Tighten the hex nut to the specified torque. Refer to *Hex nut for the gear shaft on page 7*. If the value is too high, remove the hex nut. Remove the plate spring, the pressure discs, and the brake discs and install them again. Do the procedure until you read the correct value.

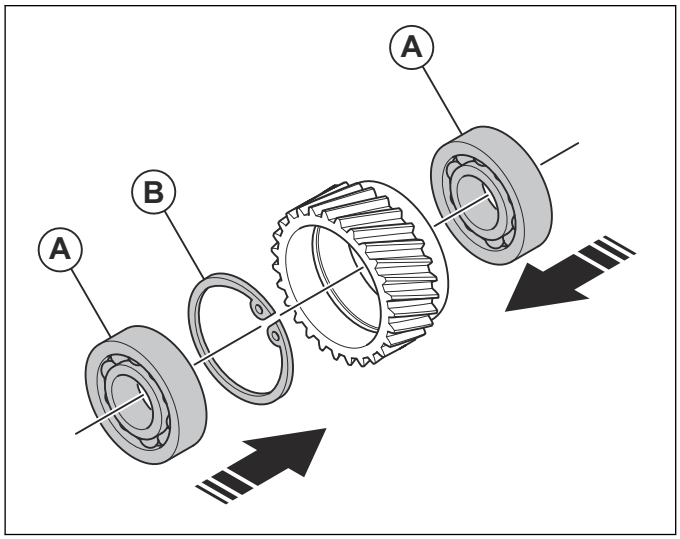


Note: When the friction clutch rotates, it becomes warm. It increases the torque. Let the friction clutch become cool before you read the torque again.

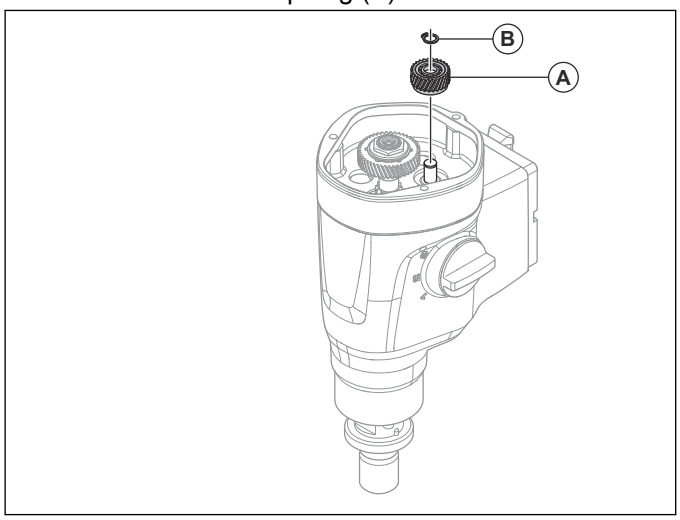
6. Make a notch on the hex nut with a punch.



7. Put the snap ring (B) into the gear wheel of the gear shaft. Put the 2 steel ball bearings (A) into the gear wheel.

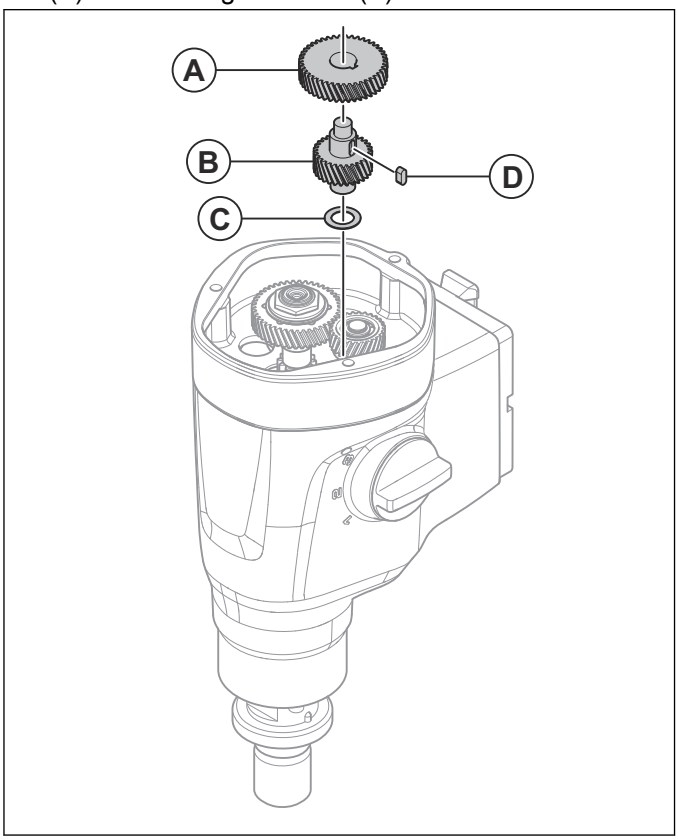


8. Carefully push the gear wheel (A) onto the gear shaft. Install the snap ring (B).



CAUTION: Make sure not to do damage to the gear teeth.

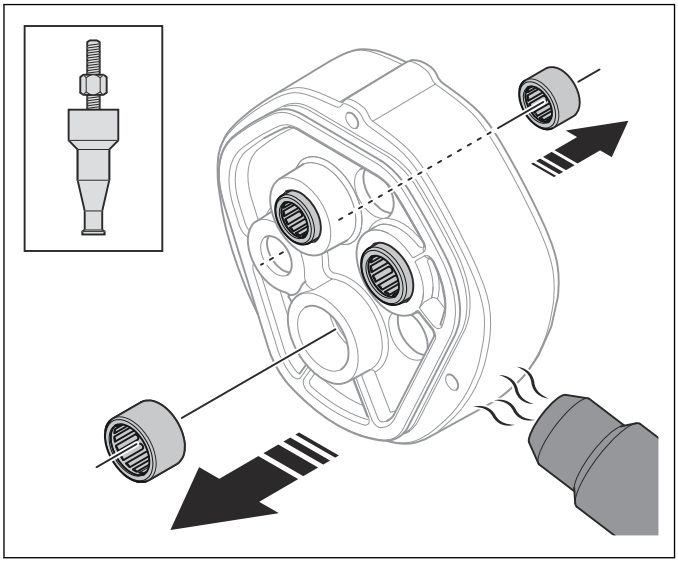
9. Install the shim ring (C) and the parallel key (D) of the middle gear shaft. Install the middle gear shaft (B). Install the gear wheel (A).



10. Assemble the product. Refer to *To assemble the product on page 15*.

6.7.3 To remove the middle gear housing bearings

1. Put an inner bearing puller into 1 of the 4 needle bearings in the middle gear housing. Refer to *Servicing tools overview 1 on page 9*. Attach the puller to a vise. Apply heat to the bearing seat with a hot air gun. Tap the middle gear housing carefully with a soft head mallet to loosen the needle bearing from the bearing seat. Remove the needle bearing.

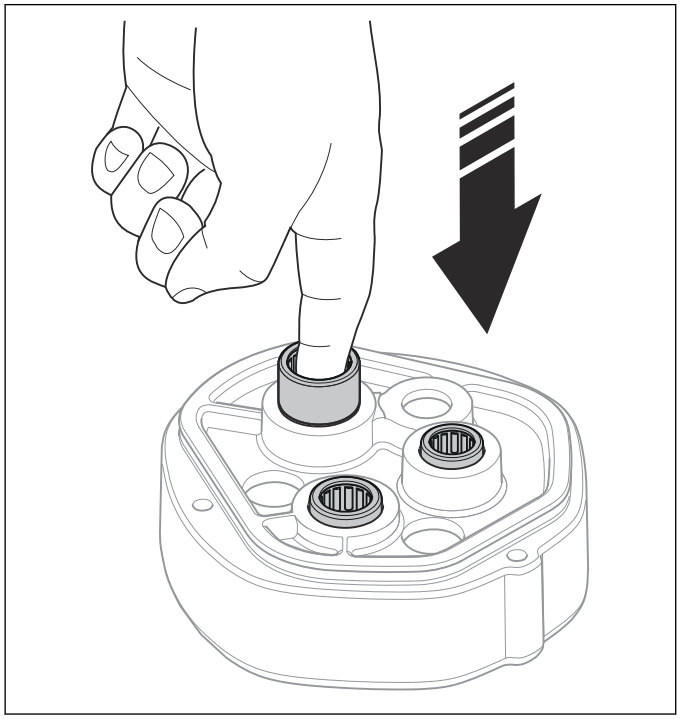


CAUTION: Make sure that the metal surface does not become damaged.

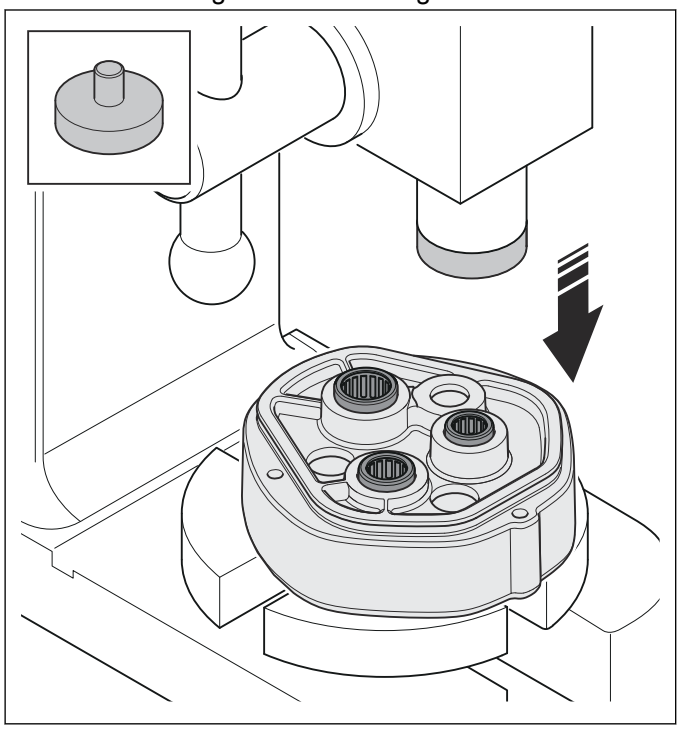
2. Do the same procedure as in the step before to remove all 4 needle bearings from the middle cover.

6.7.4 To install the bearings for the middle gear housing

1. Put 3 needle bearings into the bearing seats in the middle gear housing.

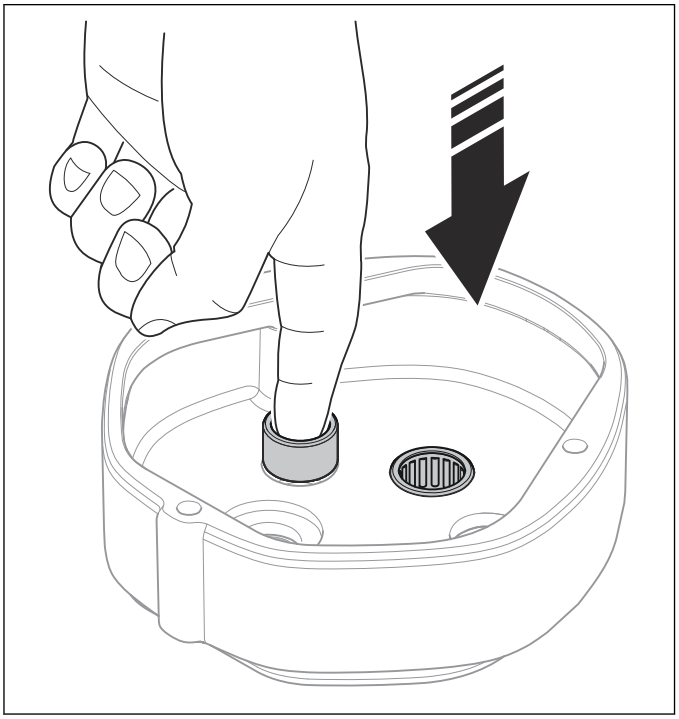


2. Attach the protective tool to a mandrel press. Refer to *Servicing tools overview 1 on page 9*. Push the 3 needle bearings into the bearing seats.

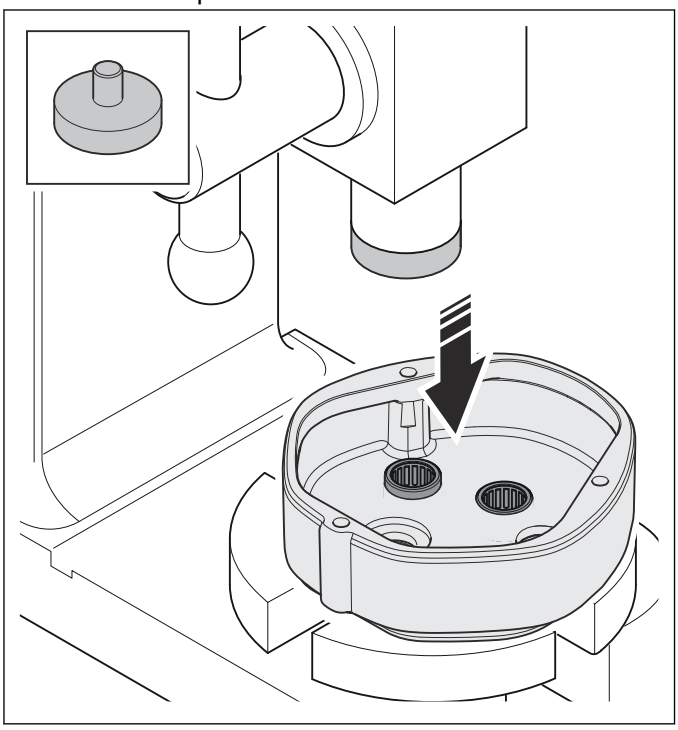


3. Turn the middle gear housing to the other side.

4. Put 1 needle bearing into the bearing seat in the middle gear housing.



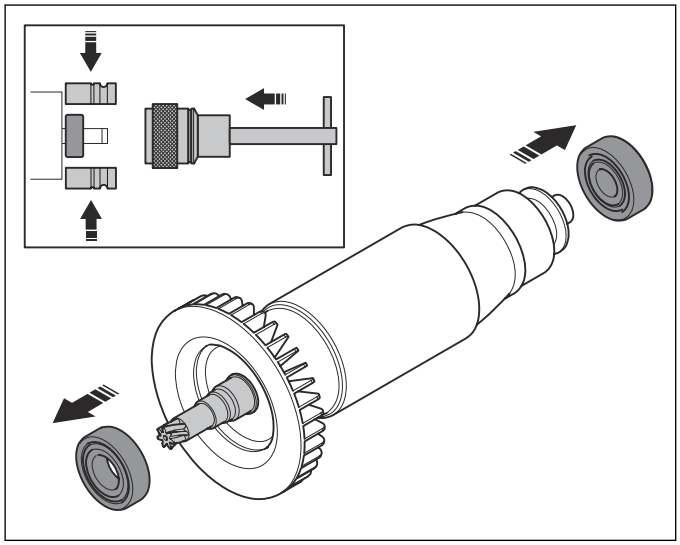
5. Push the needle bearing into the bearing seat with the mandrel press.



6.8 Rotor

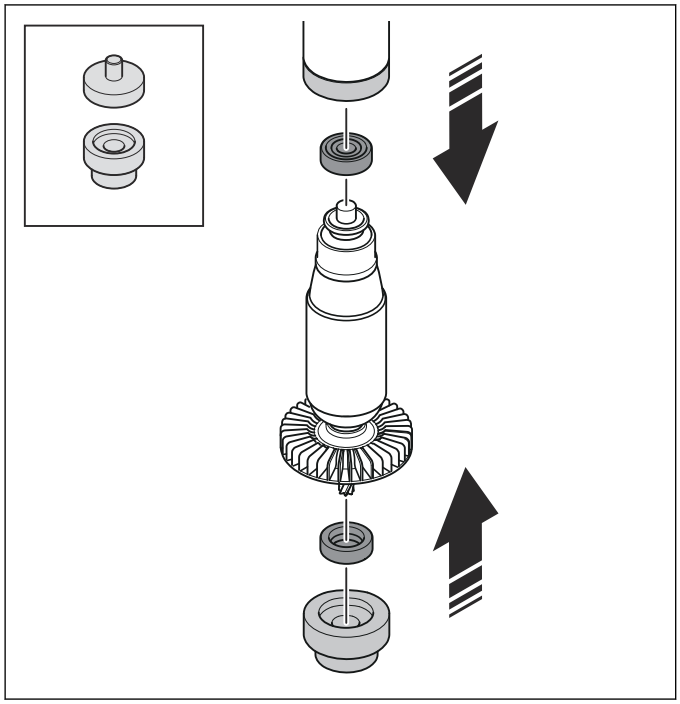
6.8.1 To disassemble the rotor

- Pull off the rotor bearings with the bearing puller tool. Refer to *Servicing tools overview 1 on page 9*.



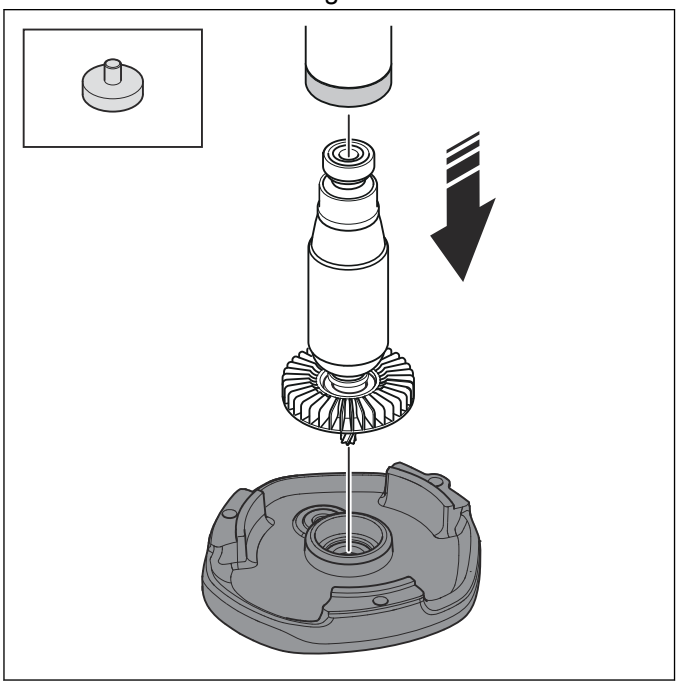
6.8.2 To assemble the rotor

1. Put the first ball bearing in the first bearing press tool. Refer to *Servicing tools overview 1 on page 9*. Put the rotor shaft into the first ball bearing. Put the second ball bearing onto the rotor shaft. Attach the the second bearing press tool to a mandrel press. Push the ball bearings onto the rotor shaft.



2. Install the oil seal for the motor transmission. Refer to *To replace the gear oil seal on page 18*.

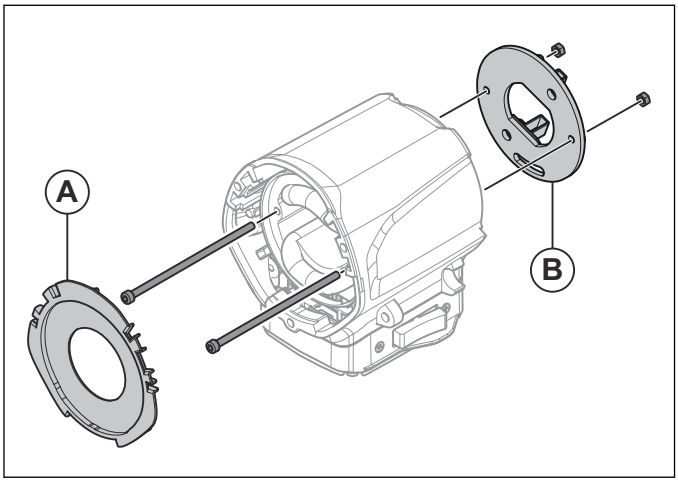
3. Put the rotor into the bearing seat in the middle cover. Use the second bearing press tool to push the rotor into the bearing seat in the middle cover.



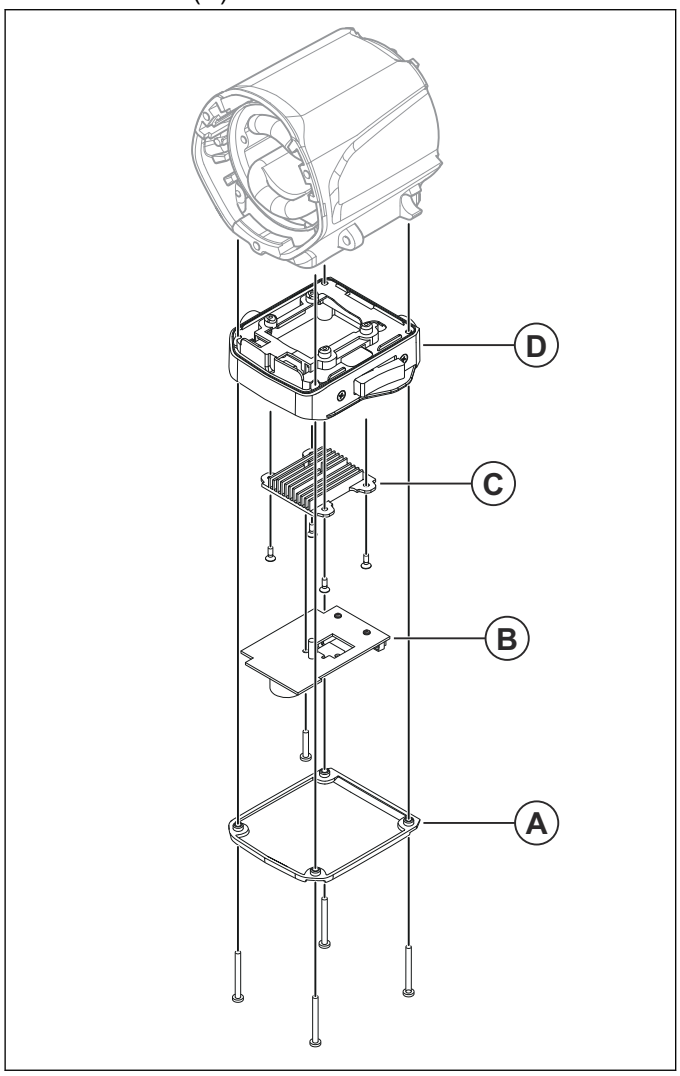
6.9 Stator

6.9.1 To disassemble the stator

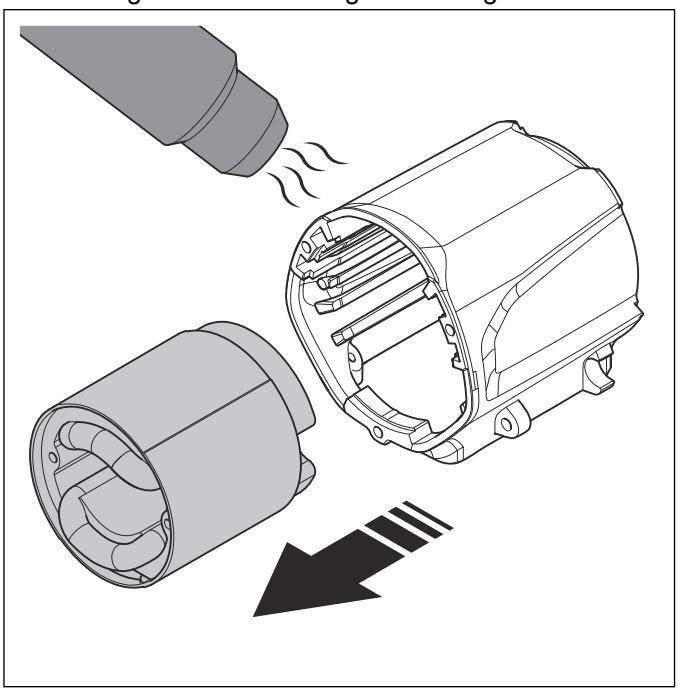
1. Remove the 2 screws and the 2 washers for the connection wires for the carbon brushes. Pull the carbon brushes out from the holders. Refer to *To disassemble the product on page 14*.
2. Remove the air disc (A). Remove the 2 screws, the 2 washers and the 2 nuts and remove the brush holder disc (B).



3. Remove the 4 screws and remove the electronic module cover (A). Loosen the pan head screw to disassemble the electronic module (B). Loosen the 4 screws to disassemble the cool element (C). Disconnect the motor connection wires from the terminal of the electronic module and remove the electric box (D).

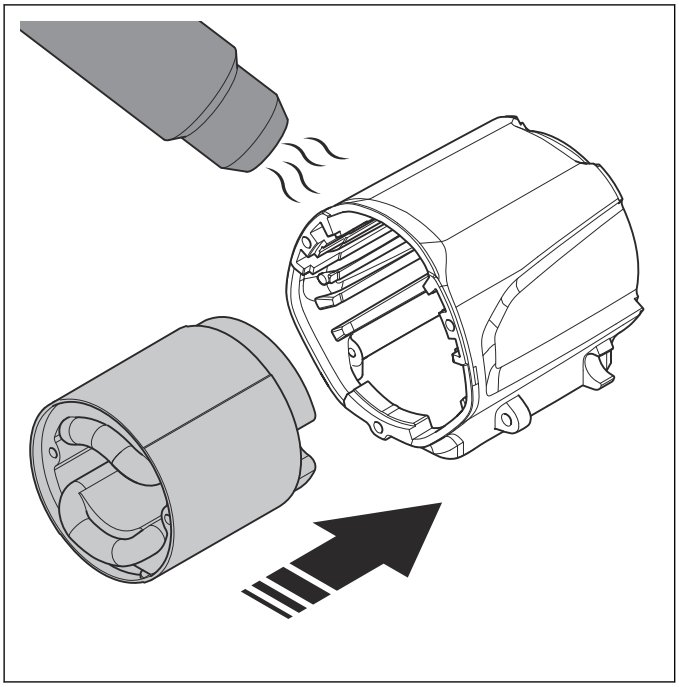


4. Apply heat to the motor housing to approximately 70°C with a hot air gun to loosen the magnet housing. Remove the magnet housing.

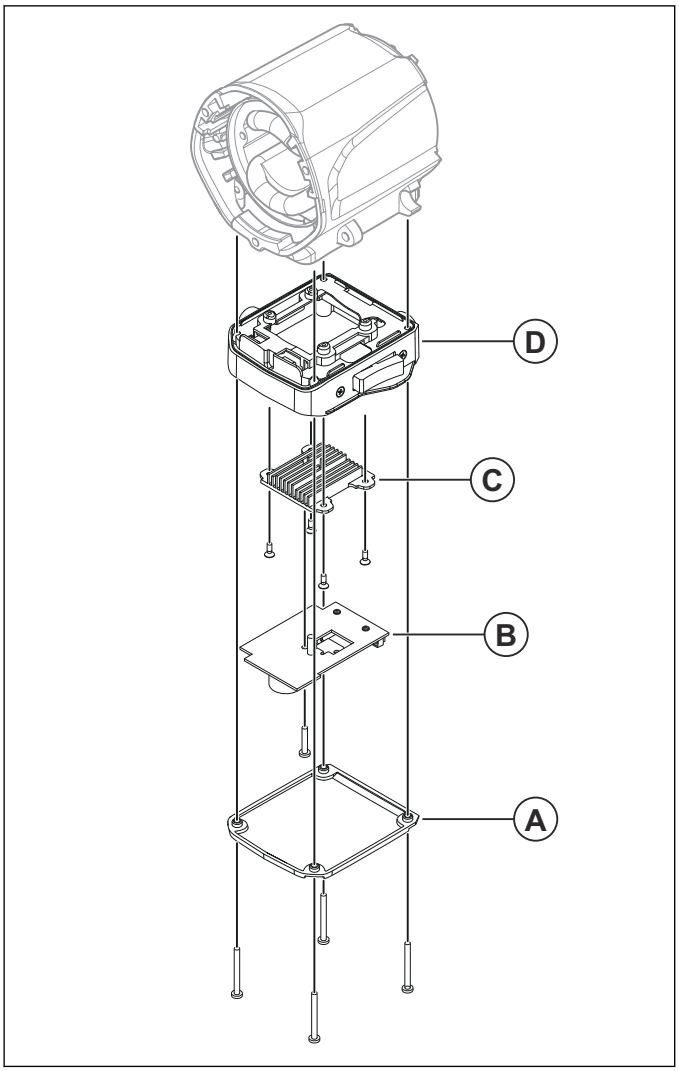


6.9.2 To assemble the stator

1. Apply heat to the motor housing to approximately 70°C with a hot air gun. Put the magnet housing into the warm motor housing.

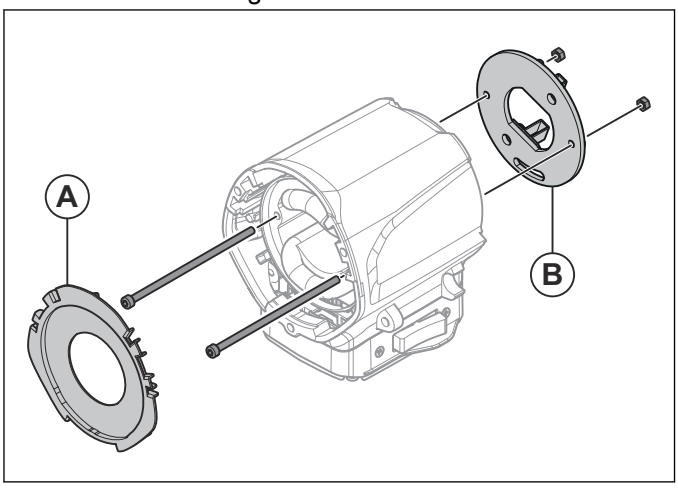


2. Put the motor connection wires through the recess in the insulation tube into the terminal box. Connect the motor connection wires to the terminal of the electronic module (D). Refer to *Diagrams on page 45*.



CAUTION: Make sure that the wires cannot touch the rotor.

3. Tighten the 4 screws to install the cool element (C). Tighten the pan head screw to install the electronic module (B). Tighten the 4 screws to install the electronic module cover (A).
4. Put the connection wires for the carbon brushes through the hole in the brush holder disc (B). Put the brush holder disc on the motor housing. Install the brush holder disc with the 2 screws, the 2 washers and the 2 nuts. Put the air disc (A) in the groove in the motor housing.

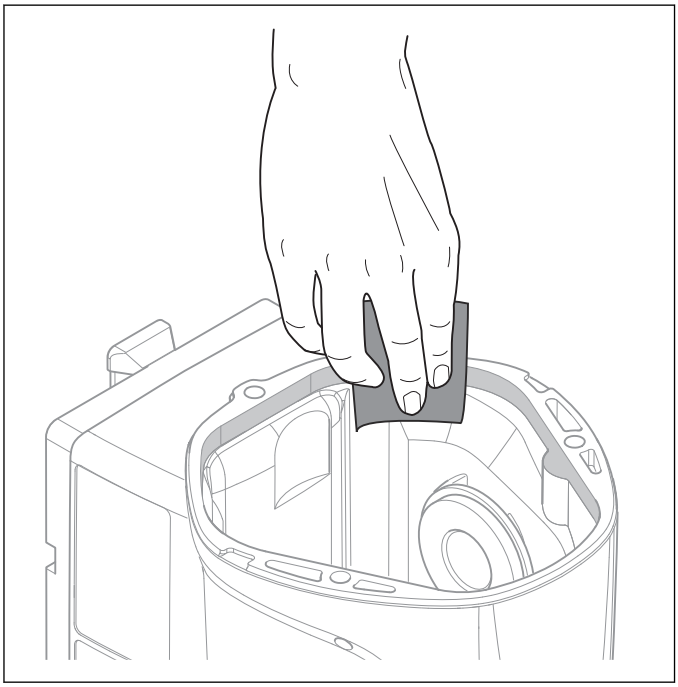


5. Install the carbon brushes and the connection wires for the carbon brushes with the 2 screws and the 2 washers. Put the carbon brushes in the holders. Refer to *To replace the carbon brushes on page 18*.

7.1 Gear housing

7.1.1 To do a check of the gear housing and gears

- Do a check of the gear housing for cracks and other damage. Use abrasive paper to remove sharp edges and scratches from the O-ring seat.



- Do a check of the pinion shaft, the gear shaft and the drill spindle shaft for damage and deformation. Do a check for blue color from too high temperatures. The drill spindle shaft must be replaced if the diameter is smaller than 37.80 mm at the wear area.
- Do a check of the bearing seats for the pinion shaft and the gear shaft for damage and deformation. Do a check of the bearing seats for the drill spindle shaft for damage and deformation.
- Do a check of the shaft sleeves for damage. Use abrasive paper to remove scratches. The shaft sleeves must be replaced if the diameter is smaller than 39.85 mm.
- Do a check of the gear wheels for broken teeth, surface damage and deformation.
- Do a check of the brake discs for surface damage and deformation.
- Do a check of the ball bearings in the gear housing for damage. Do a check for water in the gear oil caused by damaged ball bearings.
- Replace damaged parts.

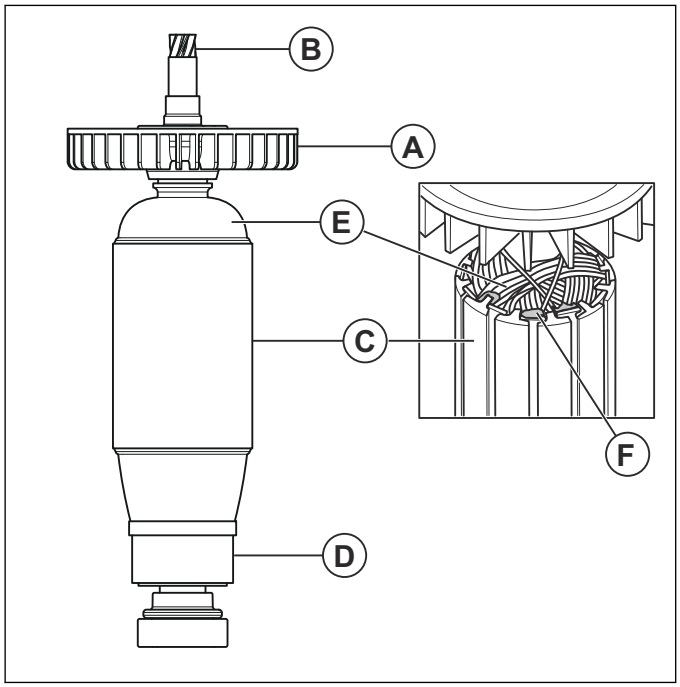
7.1.2 To do a check of the covers and the motor housing

1. Examine the top cover for damage. The inner diameter of the top cover must be 114 ± 0.1 mm. The depth of the top cover must be 45 ± 0.05 mm. If the values are too high or too low, the top cover must be replaced.
2. Examine the middle cover and the motor housing for damage. Measure and make sure that the bearing seats are circular. If deviations are more than ± 0.1 mm, replace the parts.

7.2 Rotor

7.2.1 To do a check of the rotor

1. Examine the rotor fan (A) for damage. Replace the rotor fan if it is damaged.



2. Examine the rotor shaft (B) for damage. Too low level of gear oil can cause a loss of surface hardness. Heat overload can cause a blue color on the rotor shaft. Replace the rotor if the rotor shaft is damaged.

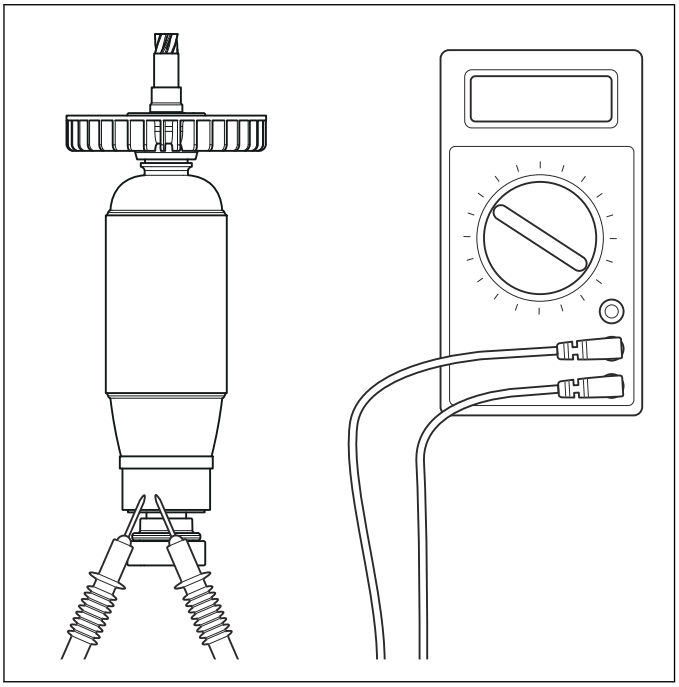
CAUTION: Replace the first gear wheel if the rotor is replaced as a result of a damaged rotor shaft.

3. Examine the rotor surface (C) for damage. If the rotor is not in the center of the motor housing, the rotor surface can be damaged. Replace the rotor if the rotor surface is damaged
4. Examine the commutator (D) for damage. The commutator surface must be repaired if the wear is more than 0.07 mm. The nominal dimension is 36 mm.

5. Examine the coils (E) for damage. A short circuit between the segments on the commutator can cause burned coils. Unbalance or strong vibrations can cause a wire break in the coil. The rotor must be replaced if the coils or the wires are damaged.
6. Examine the insulation (F) for damage. Heat overload can cause a damaged insulation. Overload of the product, defective electronics or blocked air slots can cause heat overload. The rotor must be replaced if the insulation is damaged.

7.2.2 To do an electrical check of the rotor

- Do a check of the rotor windings with a multimeter. Examine 2 adjacent commutator plates. Refer to *Servicing tools overview 1 on page 9*.



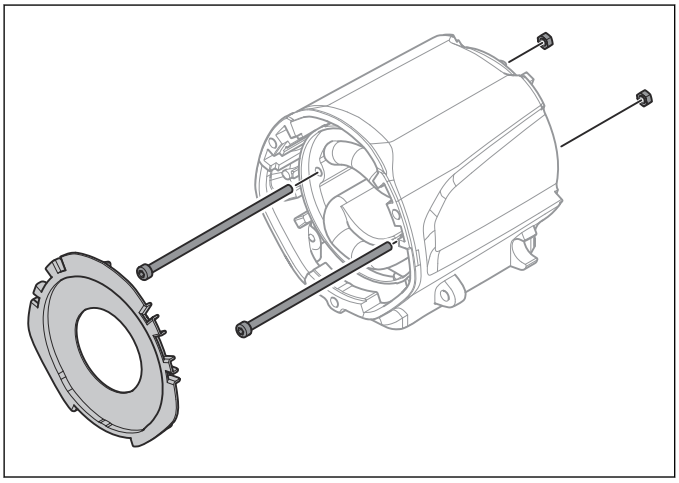
230V: Typical measured value for a correct rotor is R = 80 mΩ ± 5%.

120V: Typical measured value for a correct rotor is R = 28 mΩ ± 5%.

7.3 Stator

7.3.1 To do a check of the stator

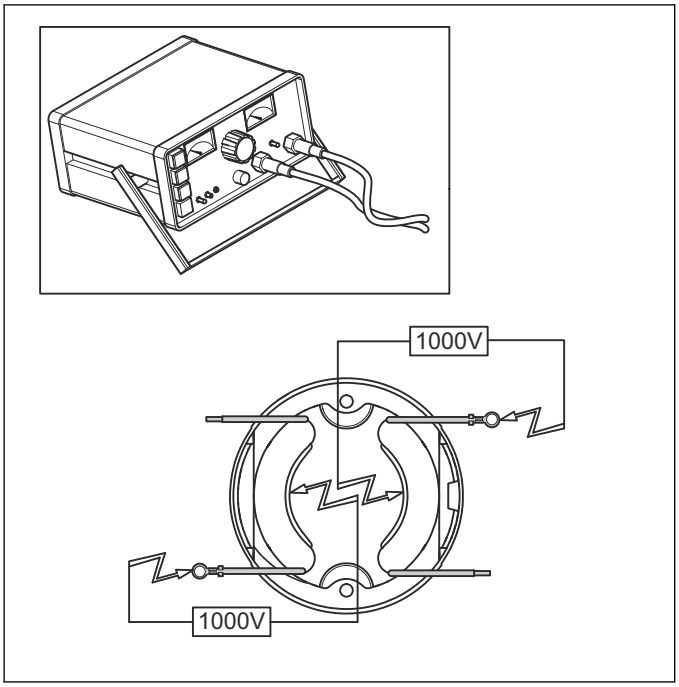
- Remove the air disc.



- Clean the motor housing.
- Examine the windings for damage.
- Examine the screws and nuts for damage. Tighten if it is necessary.

7.3.2 To do an electrical check of the stator

- Do a high voltage check with the high voltage tester.
  a) Set the high voltage tester to 1000V. Refer to *Servicing tools overview 1 on page 9*.
  b) The 2 coils must be examined. Put the test probes as the illustration shows.



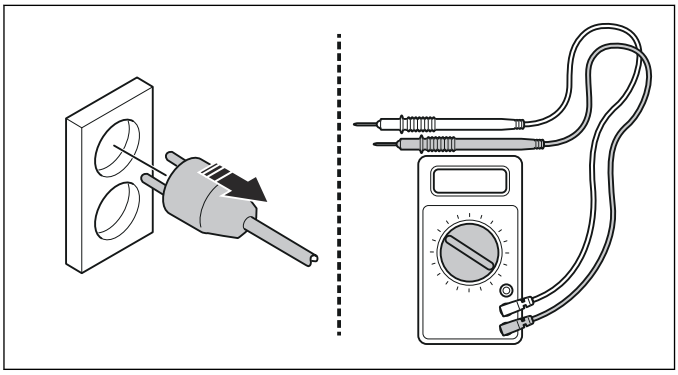
No fault signal must show on the high voltage tester.

7.4 Cables

7.4.1 To do a check of the power switch and power cord

WARNING: Disconnect the power cord from the power outlet.

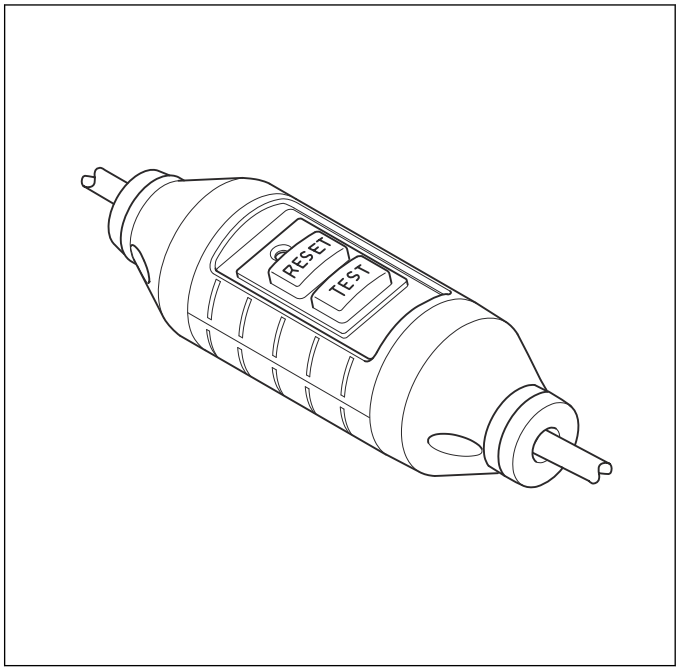
- Do a check of the power cord, the cable gland and the strain relief for damage.



- Do a check of the power plug and the power switch. If the power plug is burned, replace it.
- Do a check of the electrical function with a multimeter.

7.4.2 To do a check of the PRCD

The product has a PRCD installed on the power cord. The PRCD is for protection and engages if an electrical fault occurs.

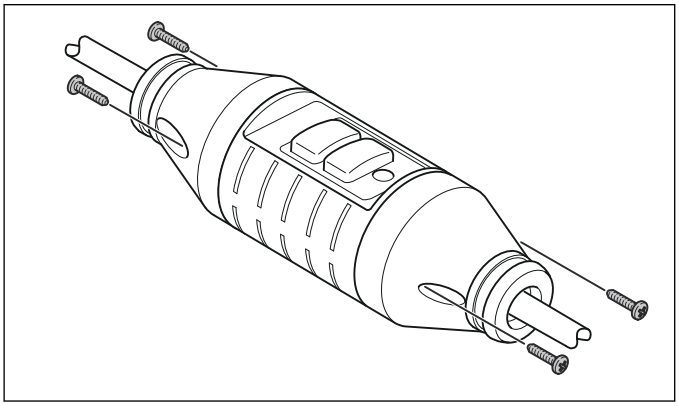


1. Connect the power plug to the power outlet.
2. Push the "RESET" button. The red indicator shows that the current is connected.
3. Pull the power plug out of the power outlet. The red indicator goes off.
4. Do step 1 and 2 again.
5. Push the "TEST" button. The red indicator goes off.
6. Push the "RESET" button again. The red indicator shows that the current is connected.

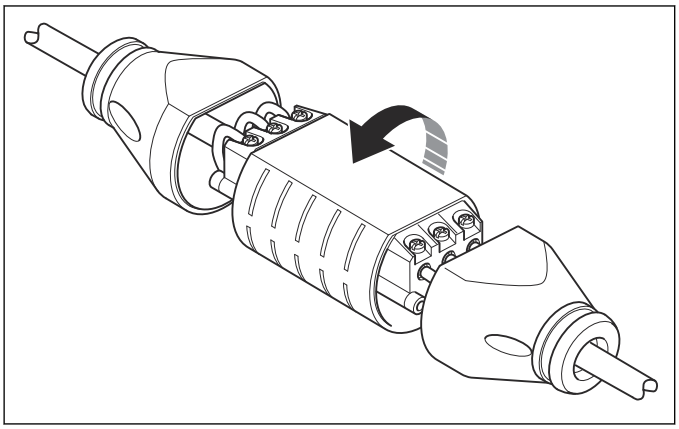
7.4.3 To examine the electrical cables of the PRCD

The PRCD only lets through current when it is connected to the power outlet. Examine the connection points with a multimeter.

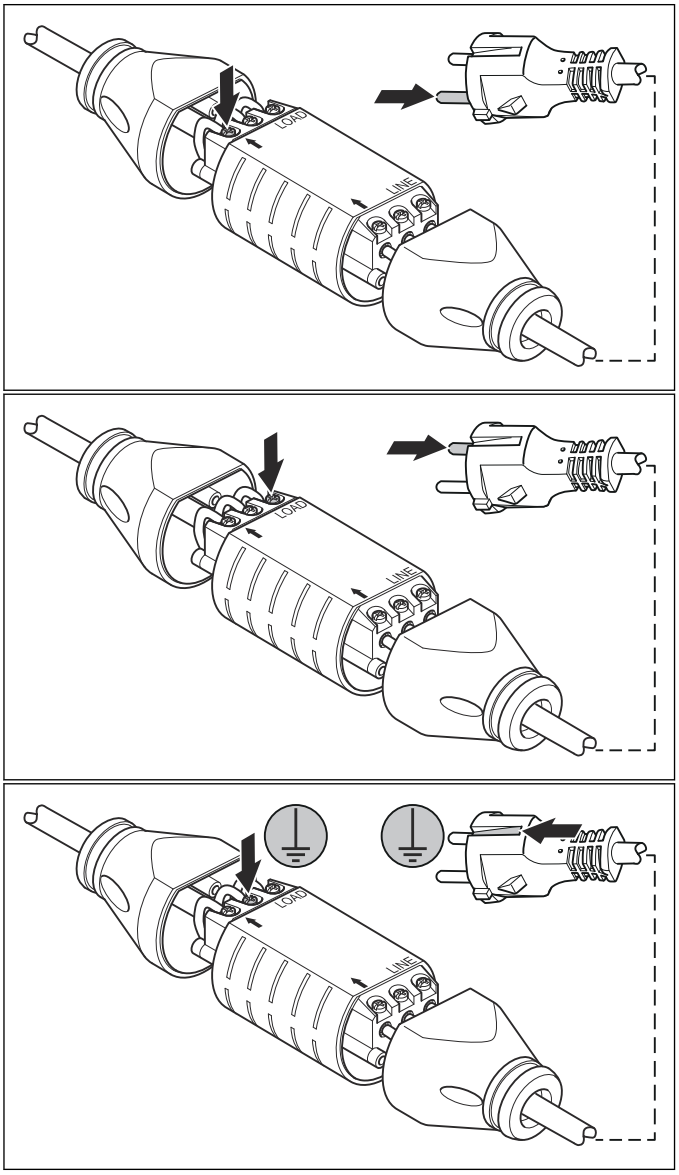
1. Remove the 4 screws and pull apart the ends of the PRCD.



2. Turn the PRCD to the other side.



3. Put the test probes at the connection points as the illustrations show.



7.5 To do a check of the electronics

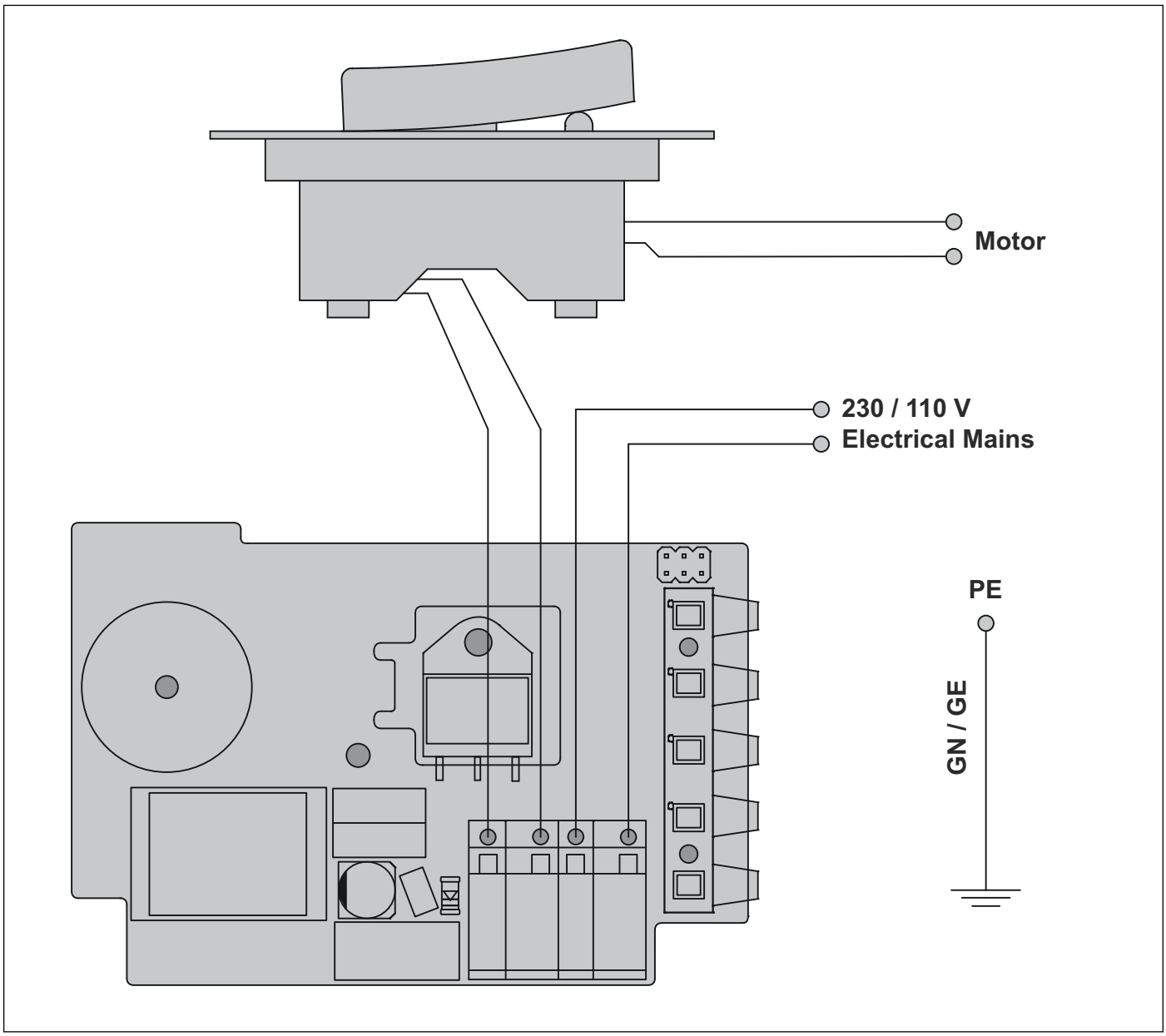
1. Do a visual check for damaged components.
2. Do a soft start of the motor. Refer to the operator's manual. The product must operate correctly.

7.6 To do a function test

- Let the motor operate for 10-15 minutes and measure the no load current.
  230V: Typical measured value is I = 4-5 A.

  120V: Typical measured value is I = 8-9 A.

8.1 Wiring diagram



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