

BOP 6 (A); BOP 10 (A); BOP 10-2 (A); BOP 13-2 (A)

Repair instructions





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1. Models described

These repair instructions describe how to repair the following models:

Model	Order number
BOP 6 (A)	7 205 52
BOP 10 (A)	7 205 53
BOP 10-2 (A)	7 205 54
BOP 13-2 (A)	7 205 55



2. Technical data

Technical data

All the technical data can be found in the operating instructions for the model.

Test data

Up-to-date test data for all models can be found on the FEIN Extranet (Customer Service → Repair Guides).

Lubricants

The lubricants and container sizes available from FEIN can be found on the FEIN Extranet (Customer Service → Repair Guides).

Lists of spare parts

Lists of spare parts and exploded views are available online at www.fein.com



3. Notes and requirements

Please note

These instructions are only intended for persons with suitable technical training. It is assumed that the reader has mechanical and electrical training.

Only use original FEIN spare parts.

Provisions

Please note that power tools may only be repaired, maintained and checked by a trained electrician, as improper repair can result in serious risks to the user.

The provisions set out in **DIN VDE 0701-0702** should be observed after repairs.

The relevant accident prevention regulations of the employer's liability insurance associations are to be observed when commissioning.

The German Equipment and Product Safety Act [ProdSG] applies for correct use.

Outside Germany, the regulations applicable in the relevant country must be observed.



4. Tools required

Standard tools

Open-ended spanner (width = 4 mm)	17 mm
Socket head wrench	10 mm
Arbor press	
Punch	7 mm diameter
Plastic hammer	
Circlip pliers	
Torx	T20
Slotted screwdriver	
Slotted screwdriver (small)	
Combination pliers	
Inner puller	
Cross-tip screwdriver	PH1; PH2
Forceps	
Sleeve	33 mm inner diameter 43 mm inner diameter 13 mm inner diameter 17 mm inner diameter

Special tools

Drawing-off socket cap	6 41 04 150 00 8
Chuck cone, 15 mm diameter	6 41 07 015 00 0
Chuck cone, 19 mm diameter	6 41 07 019 00 7
Assembly aid	6 41 22 121 01 0
Assembly aid	6 41 31 017 00 0



4. Tools required

Standard tools

Sleeve	30 mm inner diameter
	40 mm inner diameter
	12 mm inner diameter
	30 mm inner diameter
	20 mm inner diameter
	28 mm inner diameter
	55 mm inner diameter
	65 mm inner diameter
	7 mm inner diameter
	17 mm inner diameter
	8 mm inner diameter
	19 mm inner diameter
	20 mm inner diameter
	27 mm inner diameter
	6 mm inner diameter
	20 mm inner diameter
	12 mm inner diameter
	15 mm inner diameter



5. Lubricants and auxiliary substances required

Lubricants

BOP 6 (A)

Grease	0 40 101 0100 4	12 g	Gearbox housing
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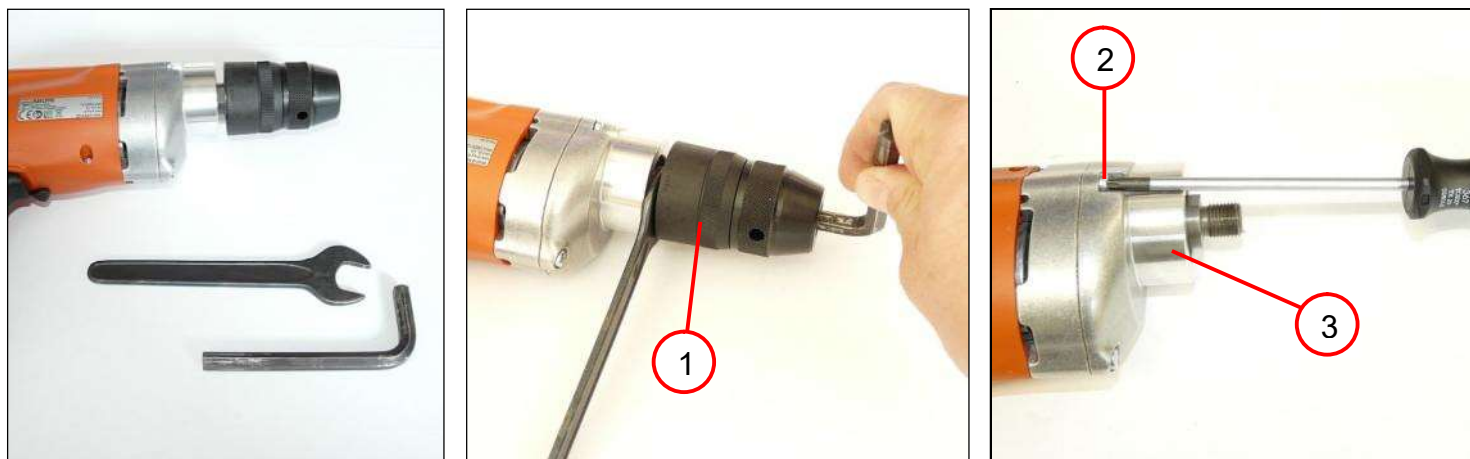
BOP 10 (A); BOP 10-2 (A); BOP 13-2 (A)

Grease	0 40 101 0100 4	25 g	Gearbox housing
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6. Removal

Removing the gearbox housing



1. Insert the socket head wrench into the quick-action chuck.
2. Turn the quick-action chuck (1) downwards.
3. Unscrew the three screws (2).
4. Remove the gearbox housing (3).

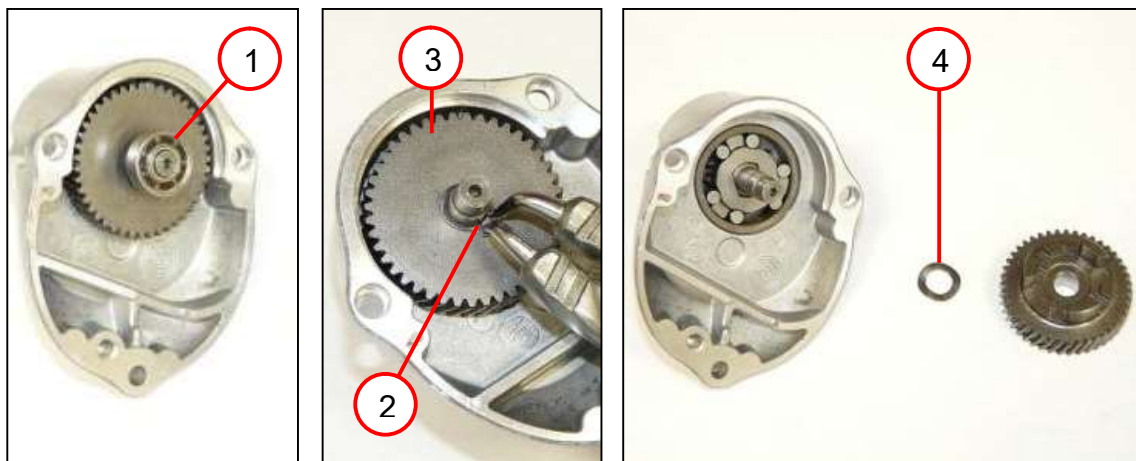
Tools:

- Socket head wrench
- Open-ended spanner, 17 mm (width = 4 mm)
- Torx T20



6. Removal

Removing the gearbox housing [applies to: BOP 6 (A)]



1. Pull off the grooved ball bearing (1).
2. Remove the circlip (2).
3. Remove the gear-wheel (3).
4. Remove the spring washer (4).

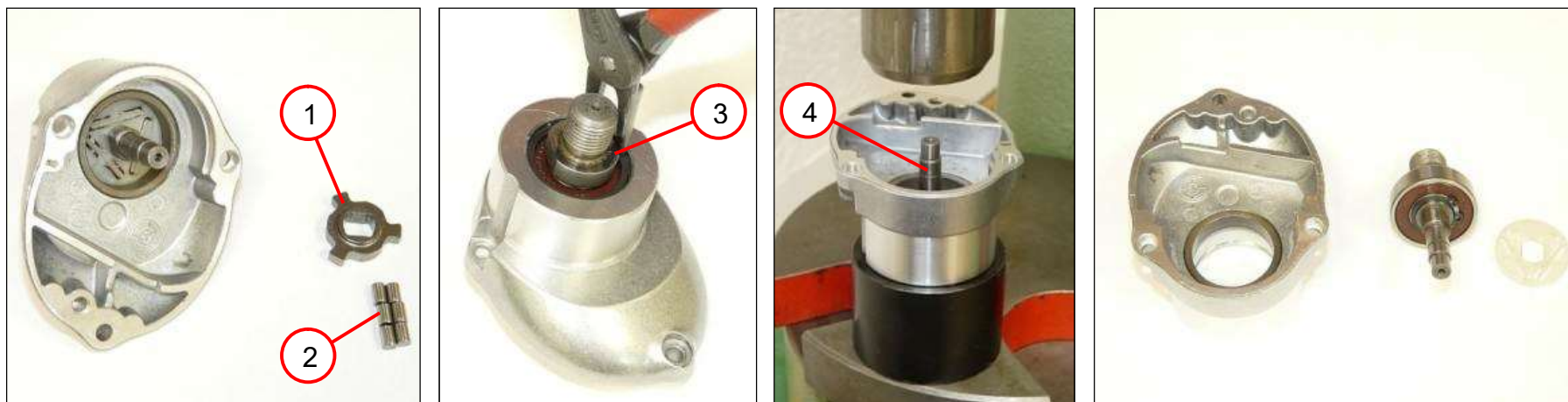
Tools:

- Drawing-off socket cap
- Chuck cone, 15 mm
- Circlip pliers



6. Removal

Removing the gearbox housing [applies to: BOP 6 (A)]



1. Remove the clutch ring (1).
2. Remove the six rollers (2).
3. Remove the circlip (3).
4. Press out the shaft (4).

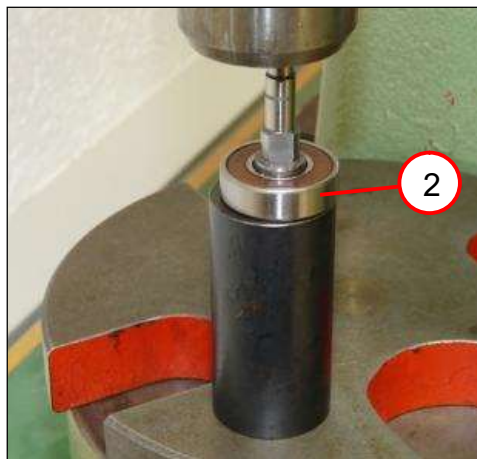
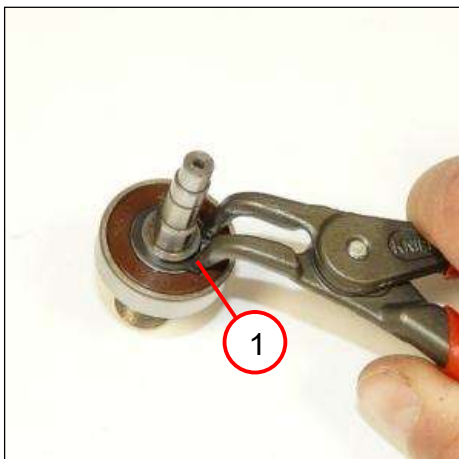
Tools:

- Arbor press
- Sleeve
33 mm inner diameter
43 mm outer diameter



6. Removal

Removing the gearbox housing [applies to: BOP 6 (A)]



1. Remove the circlip (1).
2. Press down on the grooved ball bearing (2).

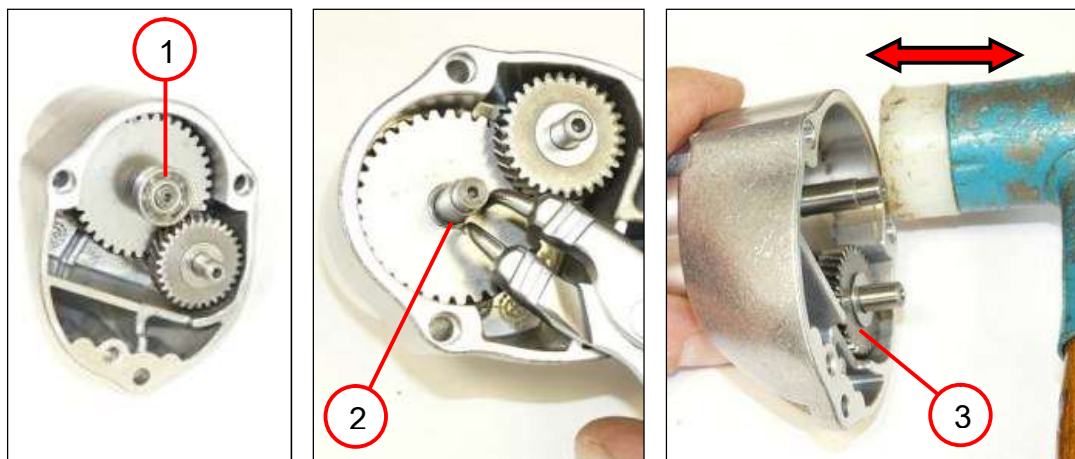
Tools:

- Circlip pliers
- Arbor press
- Sleeve
13 mm inner diameter
17 mm outer diameter



6. Removal

Removing the gearbox housing [applies to: BOP 10 (A)]



1. Pull off the grooved ball bearing (1).
2. Remove the circlip (2).
3. Remove the gear-wheel (3).

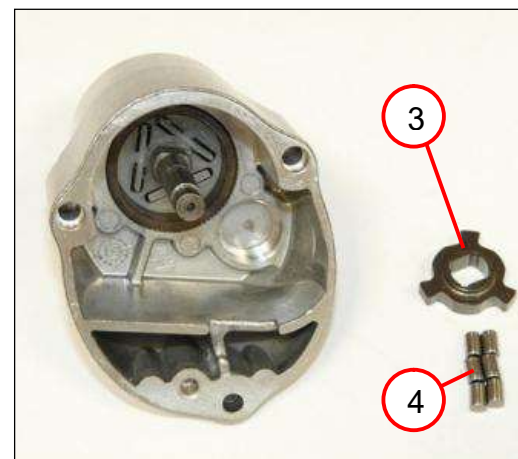
Tools:

- Drawing-off socket cap
- Chuck cone, 15 mm
- Circlip pliers
- Plastic hammer



6. Removal

Removing the gearbox housing [applies to: BOP 10 (A)]



1. Remove the gear-wheel (1).
2. Remove spring washer (2).
3. Pull off the clutch ring (3).
4. Remove the six rollers (4).
5. Remove the circlip (5).

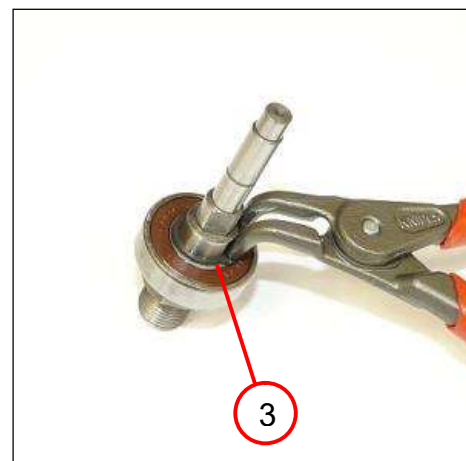
Tools:

- Circlip pliers



6. Removal

Removing the gearbox housing [applies to: BOP 10 (A)]



1. Press out the shaft (1).
2. Remove the disc (2).
3. Remove the circlip (3).

Tools:

- Arbor press
- Sleeve
30 mm inner diameter
40 mm outer diameter
- Circlip pliers



6. Removal

Removing the gearbox housing [applies to: BOP 10 (A)]



1. Press down on the grooved ball bearing (1).
2. Press the gear-wheel [z = 30 mm] (2) down.

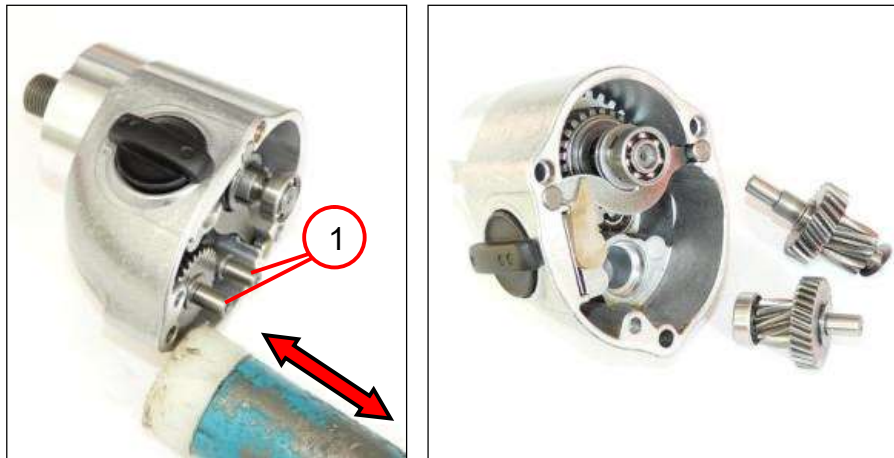
Tools:

- Arbor press
- Sleeve
12 mm inner diameter
30 mm outer diameter



6. Removal

Removing the gearbox housing [applies to: BOP 13-2 (A)]



1. Remove the two shafts (1) with gear-wheels.

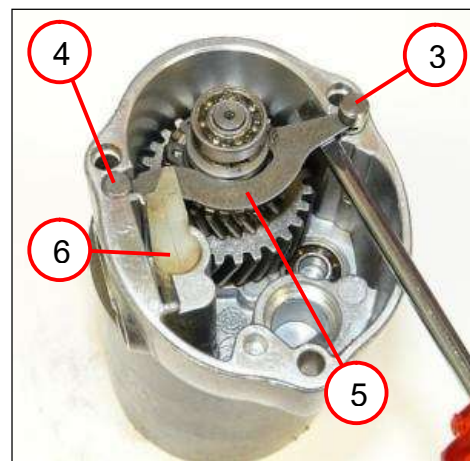
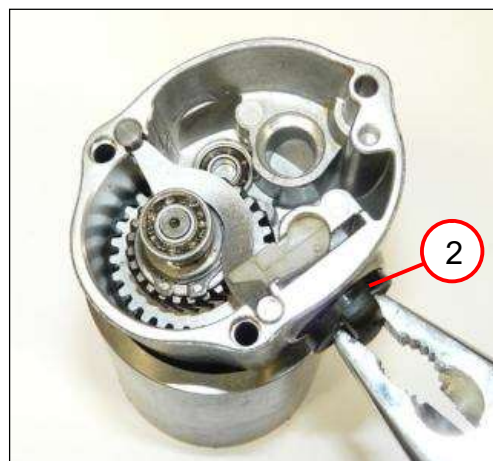
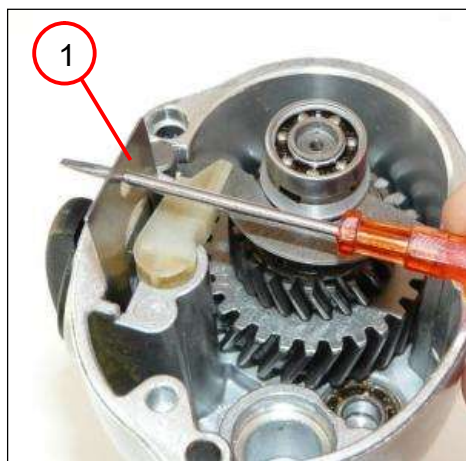
Tools:

- Plastic hammer



6. Removal

Removing the gearbox housing [applies to: BOP 13-2 (A)]



1. Remove the plate (1).
2. Remove the switch pushbutton (2).

NOTE:

The two leaf springs (5) are tensioned and could jump out.

3. Lever out the bolt (3) to halfway.
4. Lever out the bolt (4).
5. Remove the two leaf springs (5), the two bolts (3/4) and the bolt (6).

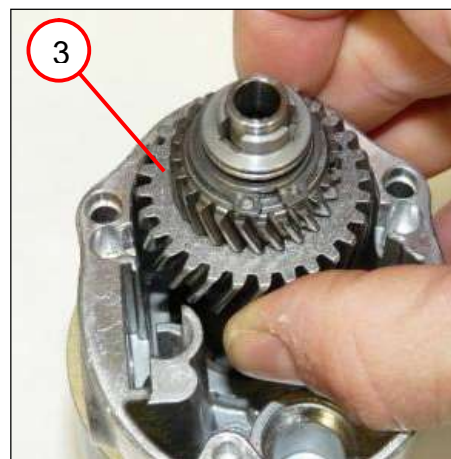
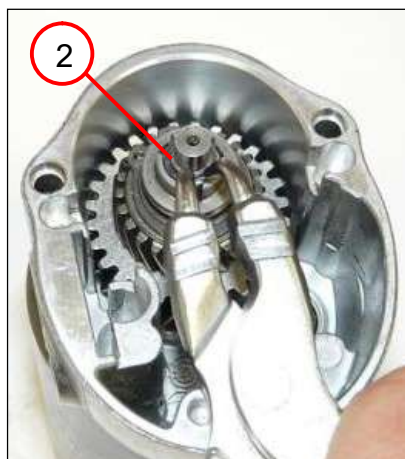
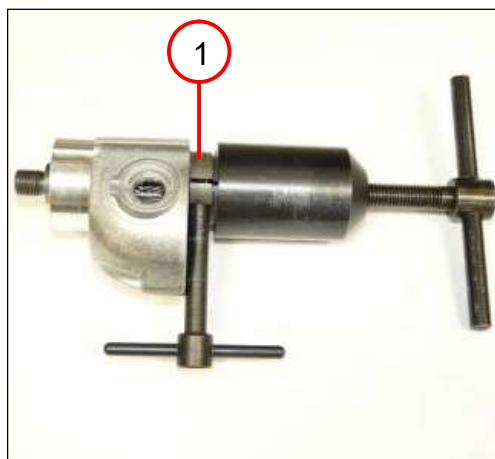
Tools:

- Slotted screwdriver
- Combination pliers



6. Removal

Removing the gearbox housing [applies to: BOP 13-2 (A)]



1. Pull off the ball bearing (1).
2. Remove the circlip (2).
3. Remove the gear-wheel (3) with the spring washer.

Tools:

- Drawing-off socket cap
- Chuck cone, 15 mm
- Circlip pliers



6. Removal

Removing the gearbox housing [applies to: BOP 13-2 (A)]



1. Remove the clutch ring (1) and the rollers (2).
2. Remove the grooved ball bearing (3).
1. Remove the circlip (4).

Tools:

- Inner puller
- Circlip pliers



6. Removal

Removing the gearbox housing [applies to: BOP 13-2 (A)]



1. Press out the shaft (1).
2. Remove the disc (2).

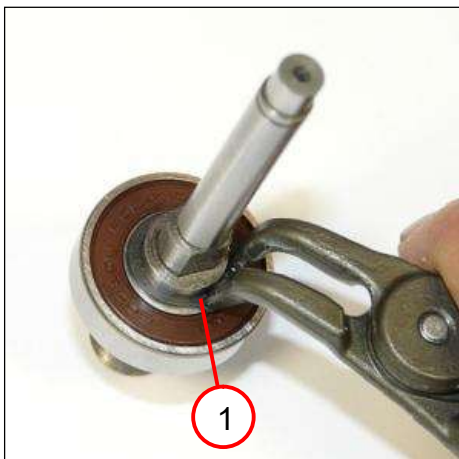
Tools:

- Arbor press
- Sleeve:
30 mm inner diameter
40 mm outer diameter



6. Removal

Removing the gearbox housing [applies to: BOP 13-2 (A)]



1. Remove the circlip (1).
2. Press down on the grooved ball bearing (2).

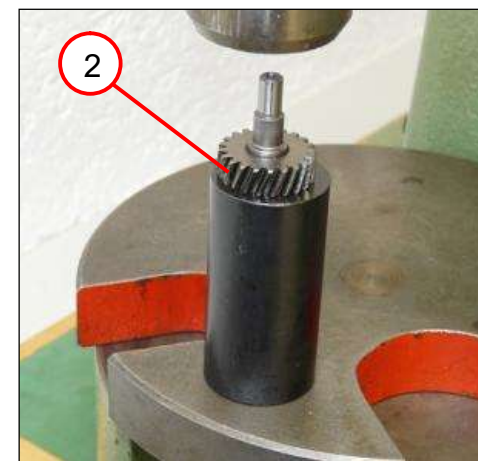
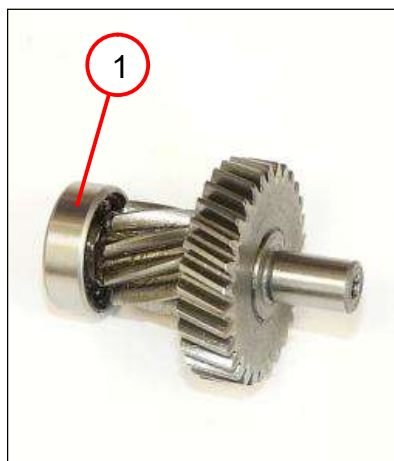
Tools:

- Circlip pliers
- Arbor press
- Sleeve:
20 mm inner diameter
28 mm outer diameter



6. Removal

Removing the gearbox housing [applies to: BOP 13-2 (A)]



1. Pull off the grooved ball bearing (1).
2. Press down on the gear-wheel (2).

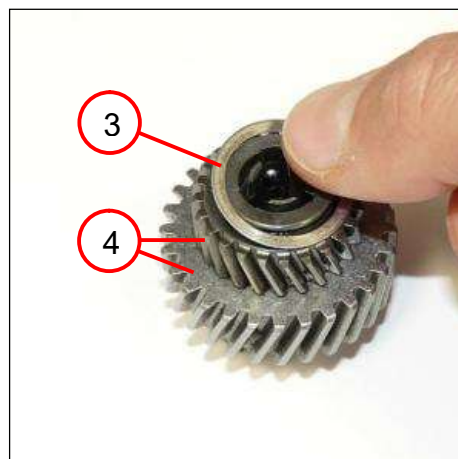
Tools:

- Drawing-off socket cap
- Chuck cone, 15 mm
- Arbor press
- Sleeve:
12 mm inner diameter
26 mm outer diameter



6. Removal

Removing the gearbox housing [applies to: BOP 13-2 (A)]



1. Remove the circlip (1).
2. Remove the three draw keys (2).
3. Remove the disc (3).
4. Remove the two gear wheels (4).

Tools:

- Circlip pliers



6. Removal

Removing the gearbox housing [applies to: BOP 13-2 (A)]

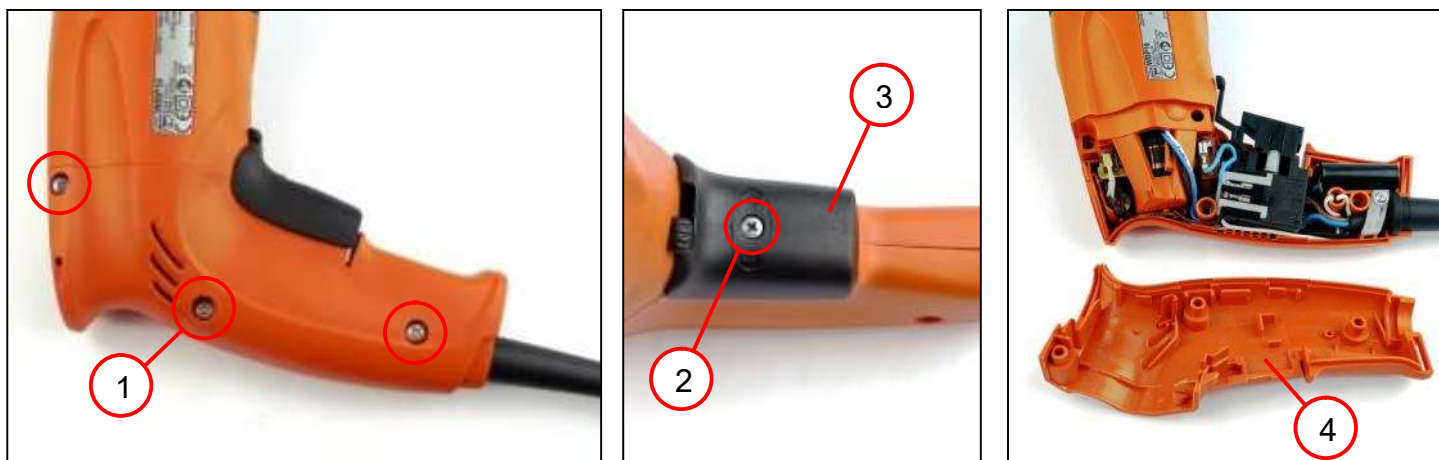


1. Remove the six balls (1).



6. Removal

Removing the handle half shell



1. Unscrew the three screws (1).
2. Unscrew the countersunk screw (2).
3. Remove the switch pushbutton (3).
4. Remove the handle half shell (4).

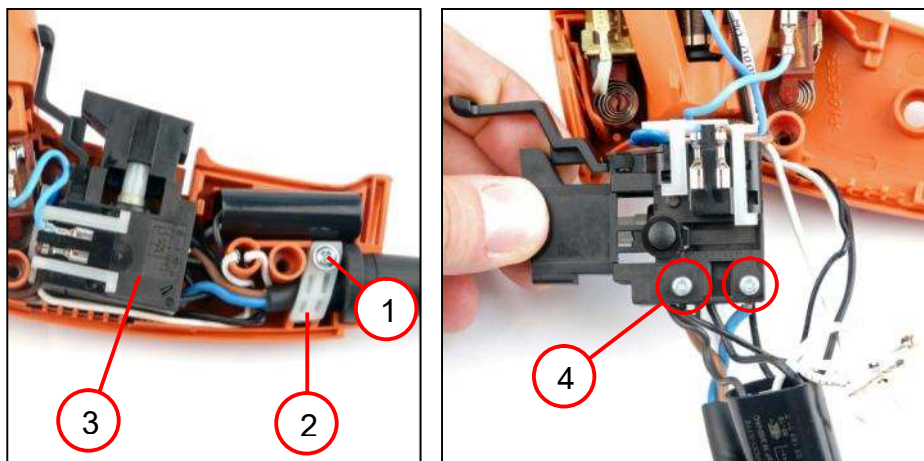
Tools:

- PH1/PH2 cross-head screwdriver



6. Removal

Removing the cable with plug



1. Unscrew the screw (1).
2. Remove the cable clamping piece (2).
3. Remove the speed setting switch (3).
4. Undo the two screws (4) and remove the cable with plug.

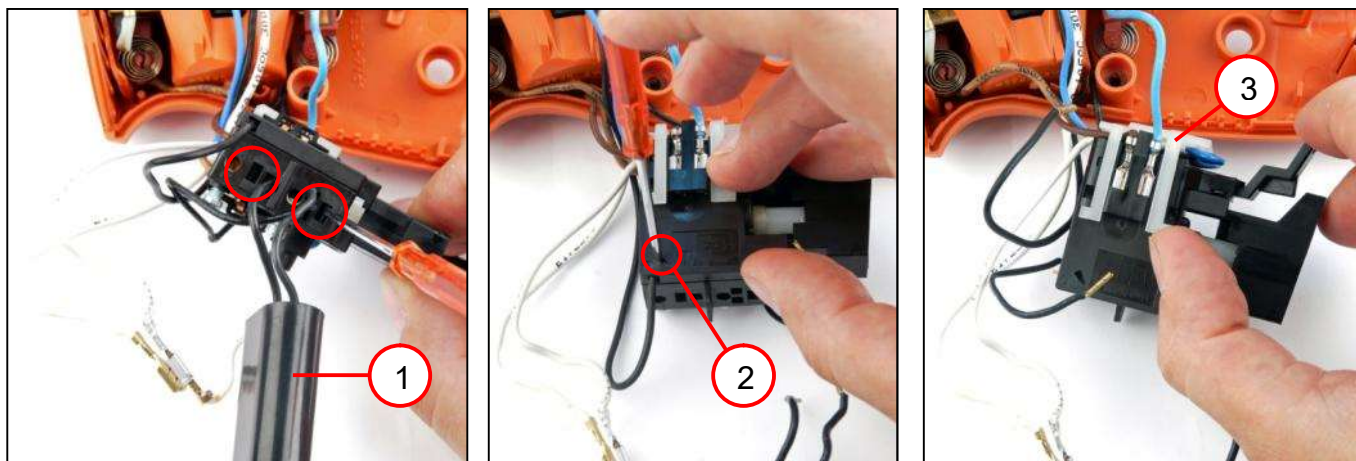
Tools:

- PH1/PH2 cross-head screwdriver



6. Removal

Removing the speed setting switch



1. Remove the capacitor (1).
2. Remove the cable (2).
3. Remove the holder (3).

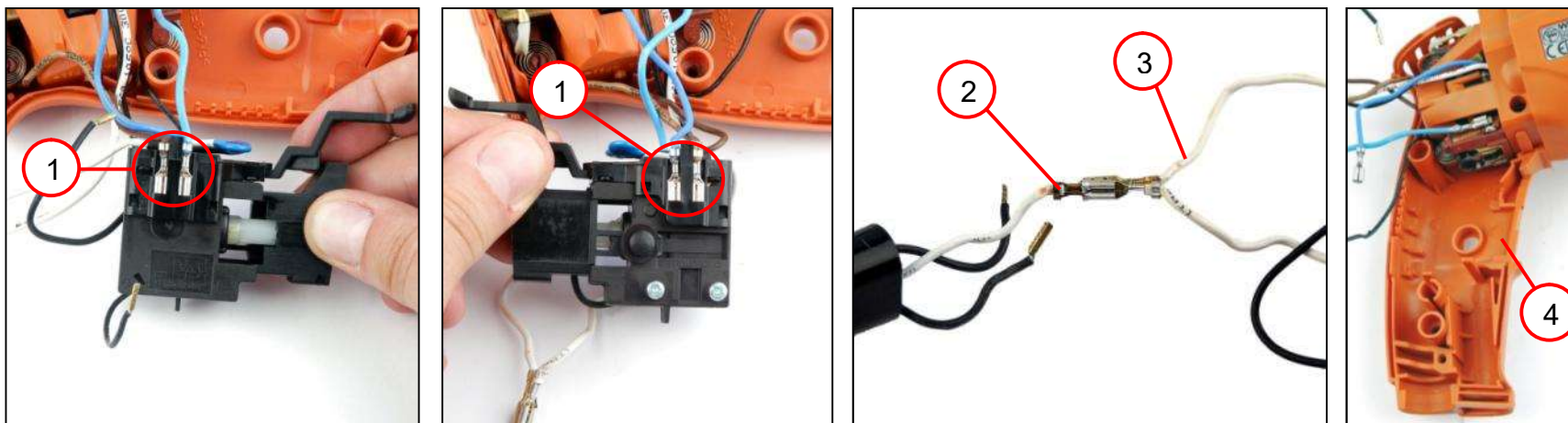
Tools:

- Slotted screwdriver (small)



6. Removal

Removing the speed setting switch

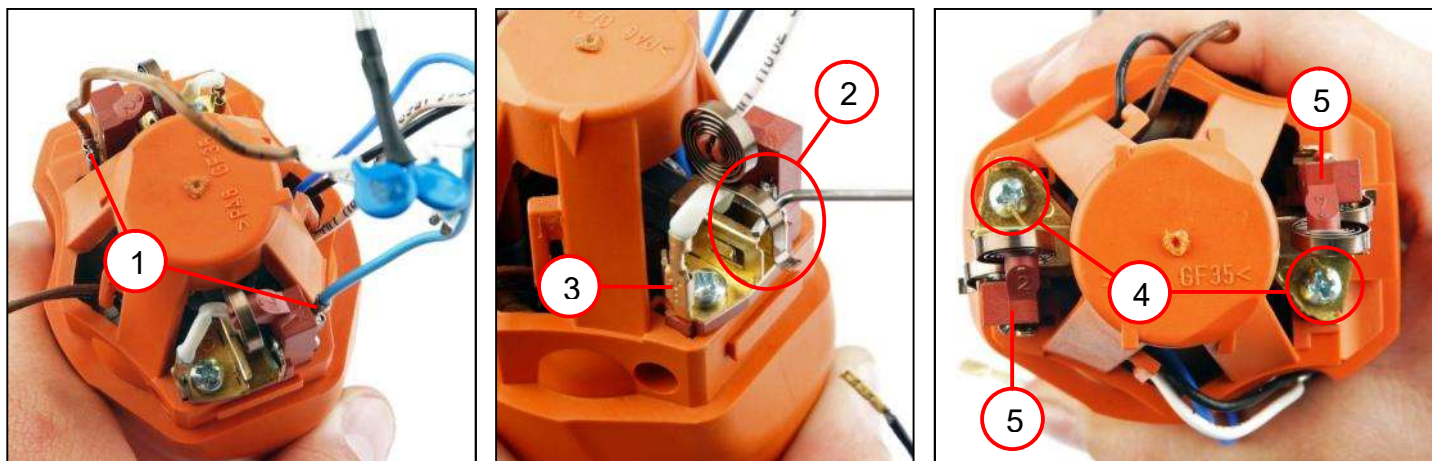


1. Disconnect all cables (1).
2. Disconnect the cable (2).
3. Disconnect the cable (3).
4. Remove the handle half shell (4).



6. Removal

Removing the carbon brushes and carbon brush holders



1. Remove the two cables (1).
2. Lift the spring (2) to one side [on both sides].
3. Disconnect the connection cable (3) on both sides.
4. Remove the carbon brush on both sides.
5. Unscrew the screws (4).
6. Remove the carbon brush holders (5).

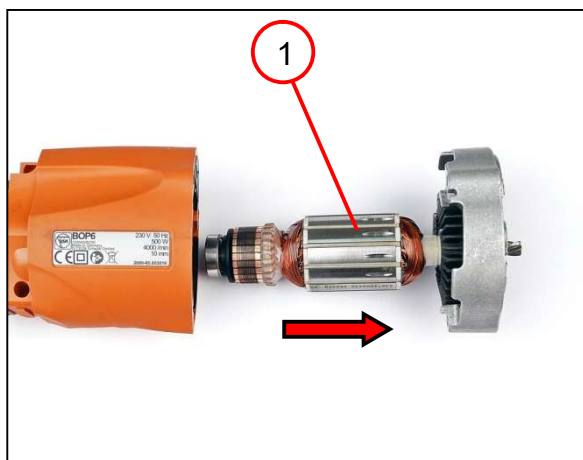
Tools:

- PH2 cross-tip screwdriver
- Assembly aid



6. Removal

Removing the motor housing

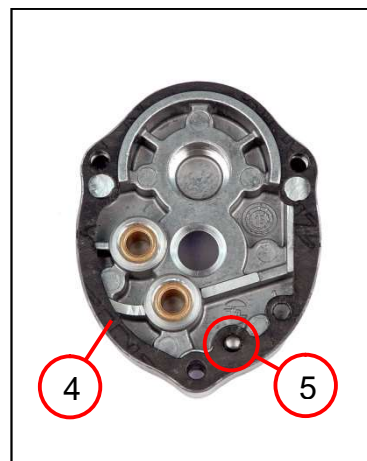
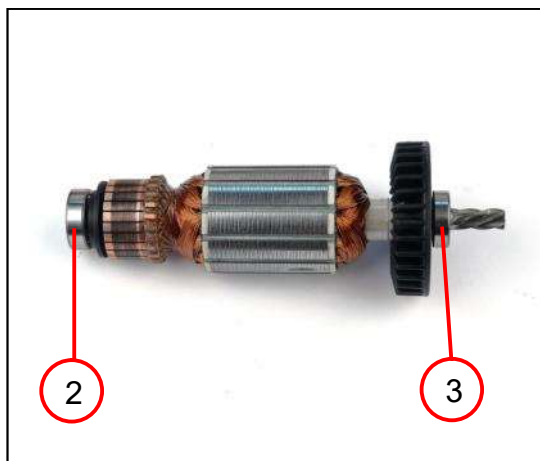


1. Remove the armature (1) together with the intermediate gearbox.



6. Removal

Removing the armature



1. Press out the armature (1).
2. Pull off the grooved ball bearing (2).
3. Pull off the grooved ball bearing (3).
4. Remove the seal (4).
5. Remove pin (5).

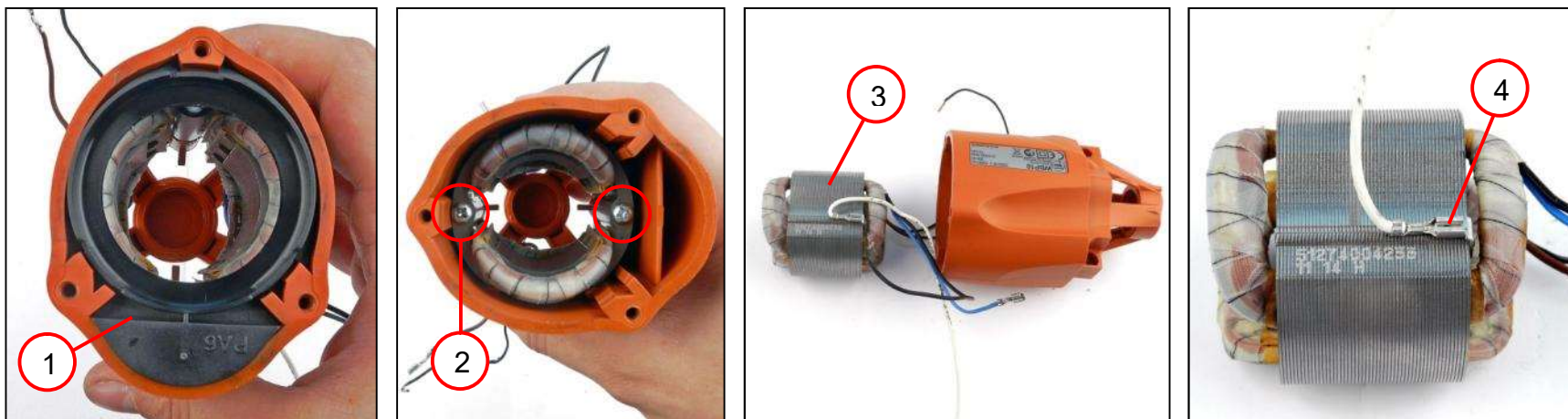
Tools:

- Drawing-off socket cap
- Chuck cone, 17 mm diameter
- Chuck cone, 19 mm diameter
- Punch, 7 mm diameter
- Sleeve
55 mm inner diameter
65 mm outer diameter



6. Removal

Removing the motor housing



1. Remove the air guide ring (1).
2. Unscrew the two screws (2).
3. Remove the stator (3) from the motor housing.
4. Pull out the connecting cable (4).

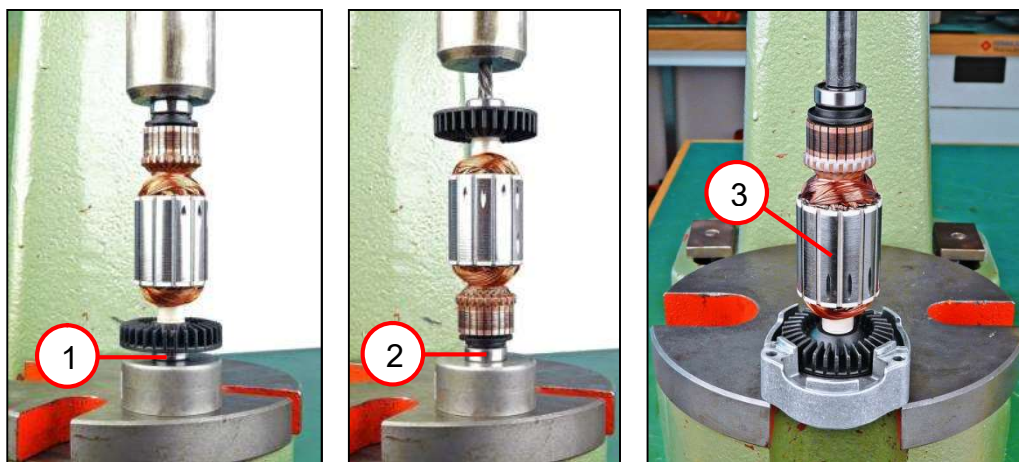
Tools:

- PH2 cross-tip screwdriver



7. Fitting

Fitting the armature



1. Press on the grooved ball bearing (1).
2. Press on the grooved ball bearing (2).
3. Press in the armature (3).

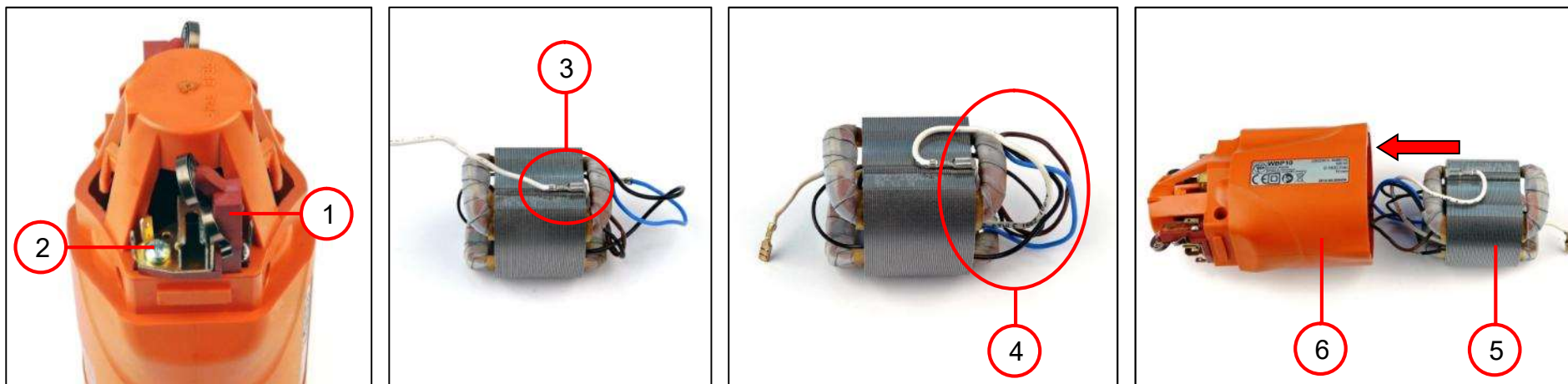
Tools:

- Arbor press
- Sleeve
7 mm inner diameter
~17 mm outer diameter
- Sleeve
8 mm inner diameter
~19 mm outer diameter
- Pressure piece, 7 mm
diameter



7. Fitting

Fitting the motor housing



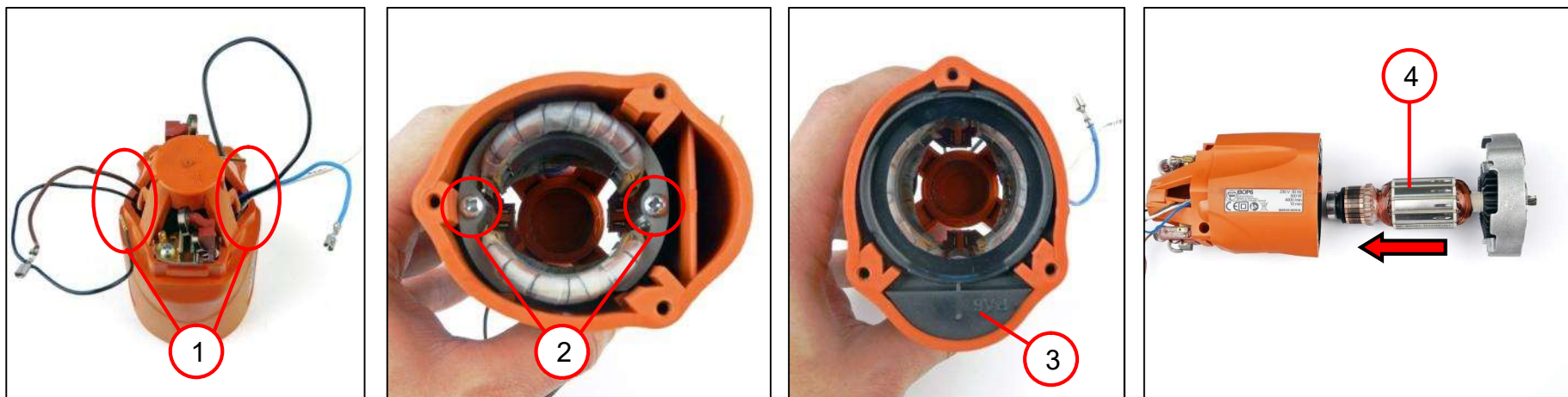
1. Put the carbon bush holder (1) in place and use the screw (2) to fasten it [0.6 Nm +0.1 Nm].
2. Connect the cable (3) to the stator.
3. Insert the cables (4) into the stator.
4. Slide the stator (5) into the correct position in the motor housing (6).

Tools:

- PH2 cross-head screwdriver

7. Fitting

Fitting the motor housing



1. Remove the cables (1) from the stator.
2. Use the two screws (2) to fasten the stator [1 Nm +0.4 Nm].
3. Insert the air guide ring (3).
4. Push the armature (4) into the housing.

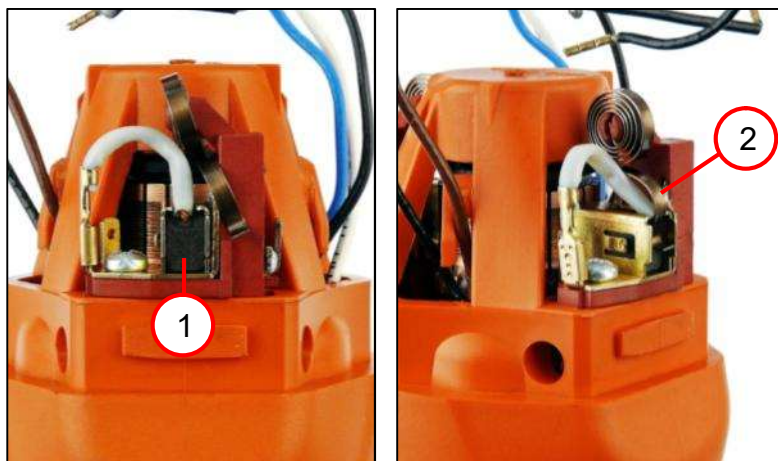
Tools:

- Assembly aid
- PH2 cross-head screwdriver



7. Fitting

Fitting the carbon brush [on both sides]



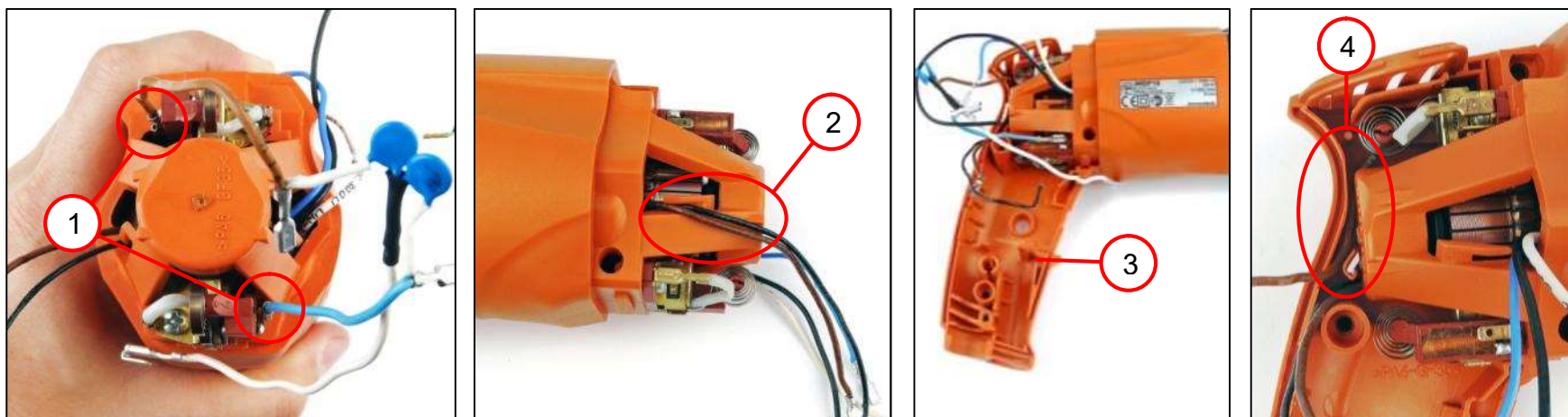
1. Insert the carbon brush (1) in the correct position and connect it.
2. Place the spring (2) on the carbon brush.

Tools:

- Assembly aid

7. Fitting

Fitting the electronics

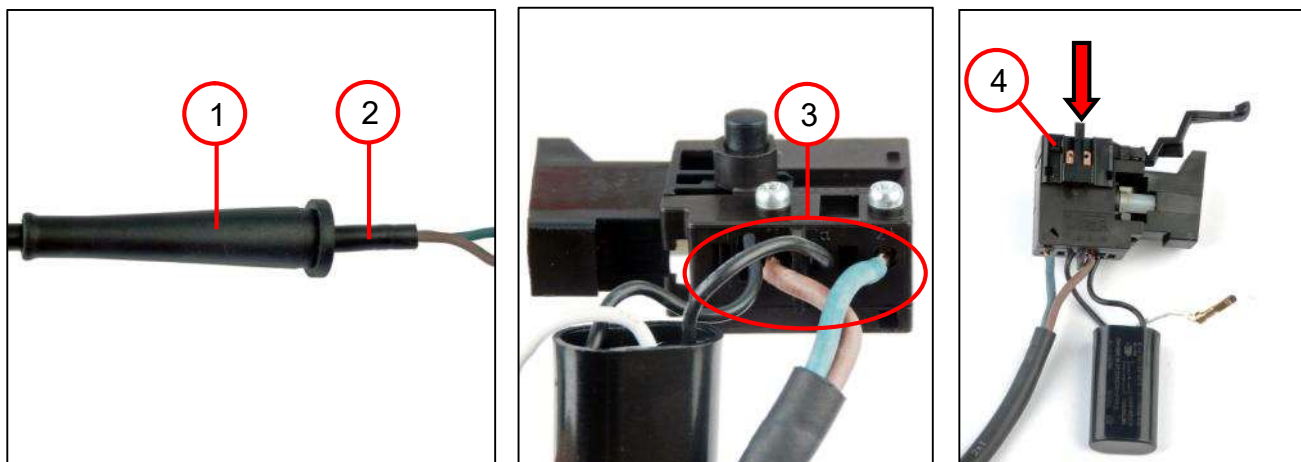


1. Connect the long radio shielding cables (1) to the brush holders.
☞ See “Connection diagram”.
2. Route the cables (2) as shown in the photograph.
3. Fit the handle half shell (3).
4. Route the brown radio shielding cable (4) as shown in the photograph.



7. Fitting

Fitting the electronics



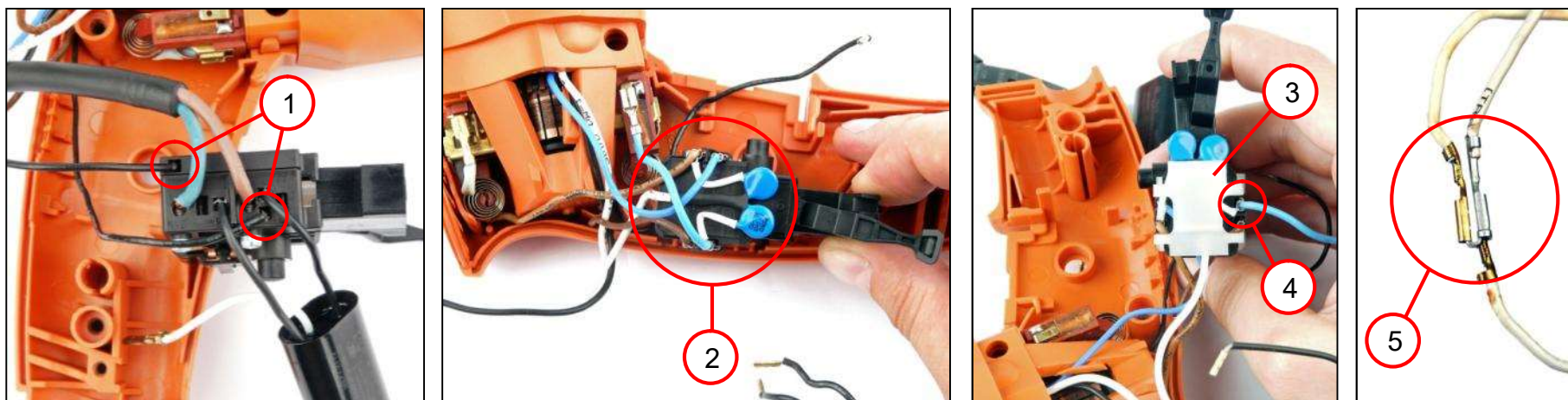
1. Slide the cable grommet (1) onto the cable (2).
2. Connect the cable and the capacitor to the speed setting switch (3).
☞ See “Connection diagram”.
3. Fit the toggle switch (4) to the speed setting switch.

Tools:

- PH1 cross-tip screwdriver

7. Fitting

Fitting the switch



1. Connect the two black connection cables (1) from the stator to the speed setting switch.
2. Connect all cables to the toggle switch (2).
 - ☞ Start with the radio shielding.
 - ☞ See "Connection diagram".
3. Fit the cover (3) on the speed setting switch.
 - ☞ The blue cable (4) is outside of the cover.
4. Connect the three cables (5) to one another.
 - ☞ See "Connection diagram".



7. Fitting

Fitting the motor housing



1. Put all the electronic components in place in the housing half as shown in the first photograph.
2. Route all the cables as shown in the first photograph.
3. Fit the cable clamping piece (1) and use the screw (2) to screw it in place [0.7 Nm +0.1 Nm].
4. Fit the second housing half (3).
5. Screw in the two screws 9x22 (4) [1.2 Nm +0.2 Nm].
6. Screw in the screw 4x30 (5) [1.2 Nm +0.2 Nm].
7. Put the switch pushbutton (6) in place and use the countersunk screw (7) to fasten it [0.6 Nm +0.2 Nm].

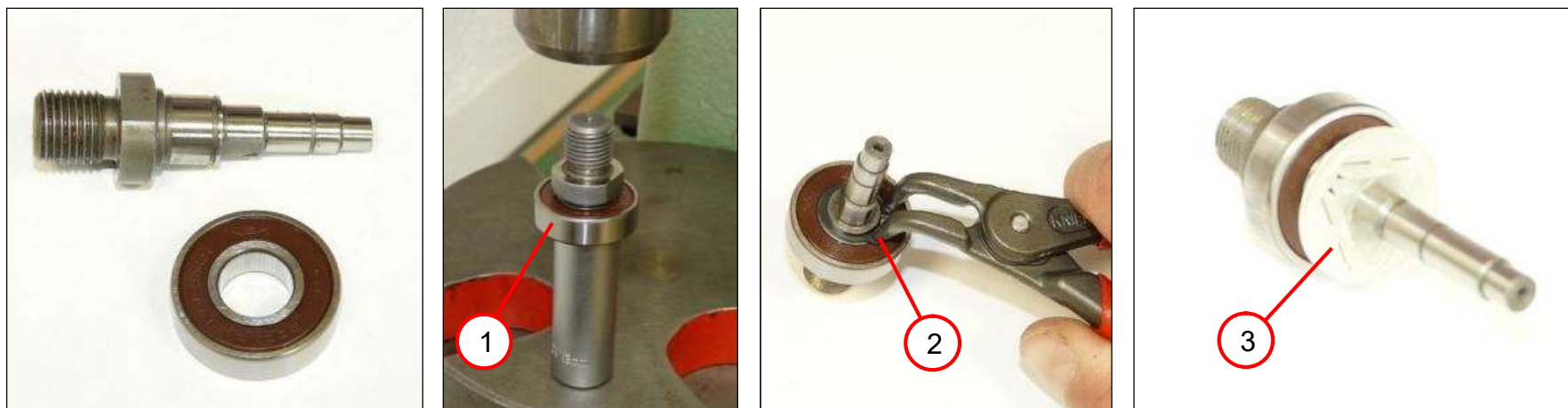
Tools:

- PH1/PH2 cross-head screwdriver



7. Fitting

Fitting the gearbox housing [applies to: BOP 6 (A)]



1. Press on the grooved ball bearing (1).
2. Fit the circlip (2).
 - ☞ Replace the circlip during each fitting.
3. Place the disc (3) in the correct position.
 - ☞ Its flat side should be facing the grooved ball bearing.

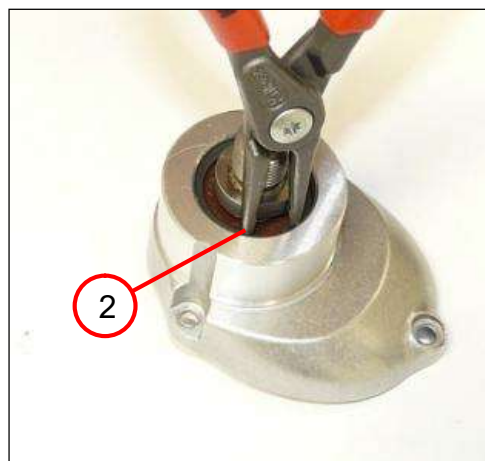
Tools:

- Arbor press
- Circlip pliers



7. Fitting

Fitting the gearbox housing [applies to: BOP 6 (A)]



1. Press in the shaft (1).
2. Fit the circlip (2).

Tools:

- Arbor press
- Sleeve
20 mm inner diameter
27 mm outer diameter
- Circlip pliers



7. Fitting

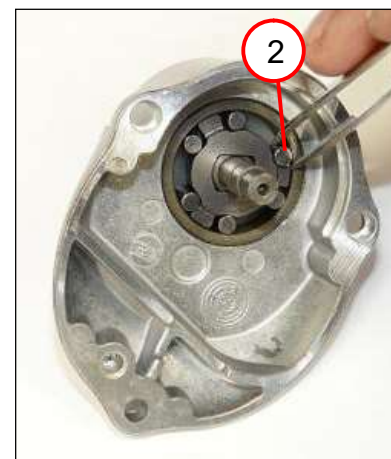
Fitting the gearbox housing [applies to: BOP 6 (A)]



Wrong



Right



1. Place the clutch ring (1) in the correct position.
2. Fit the six rollers (2).

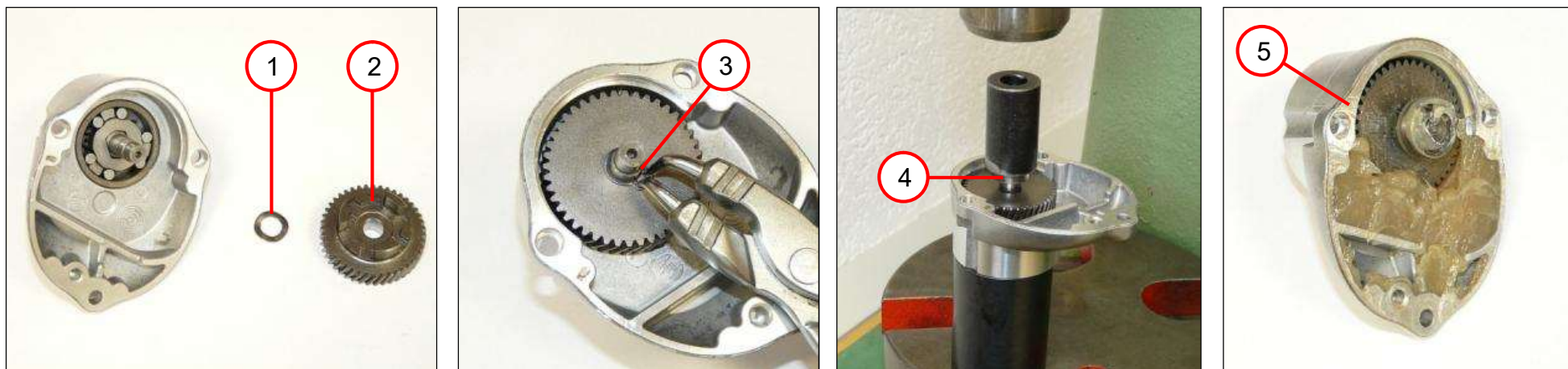
Tools:

- Forceps



7. Fitting

Fitting the gearbox housing [applies to: BOP 6 (A)]



1. Position the spring washer (1).
2. Place the gear-wheel [z = 43] (2) in the correct position.
3. Fit the circlip (3).
☞ Replace the circlip during each fitting.
4. Press on the grooved ball bearing (4).
5. Fill the gearbox housing (5) with 12 g of grease.

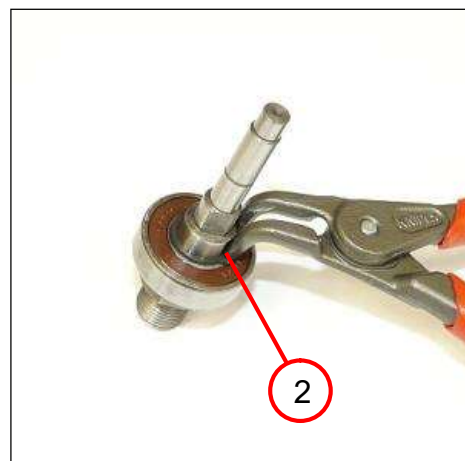
Tools:

- Arbor press
- Sleeve
6 mm inner diameter
20 mm outer diameter
- Grease



7. Fitting

Fitting the gearbox housing [applies to: BOP 10 (A)]



1. Press on the grooved ball bearing (1).
2. Fit the circlip (2).
 - ☞ Replace the circlip during each fitting.
3. Place the disc (3) in the correct position.
 - ☞ Its flat side should be facing the grooved ball bearing.

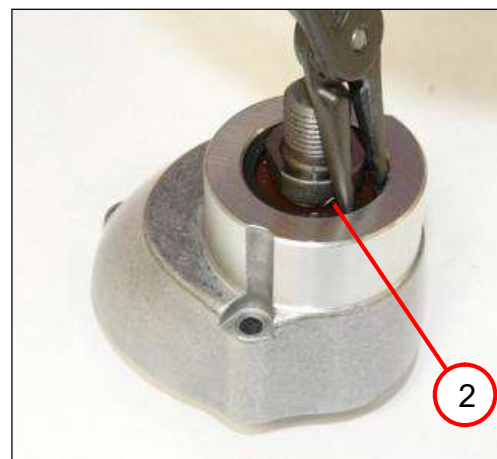
Tools:

- Arbor press
- Sleeve
12 mm inner diameter
15 mm outer diameter



7. Fitting

Fitting the gearbox housing [applies to: BOP 10 (A)]



1. Press in the shaft (1).
2. Fit the circlip (2).

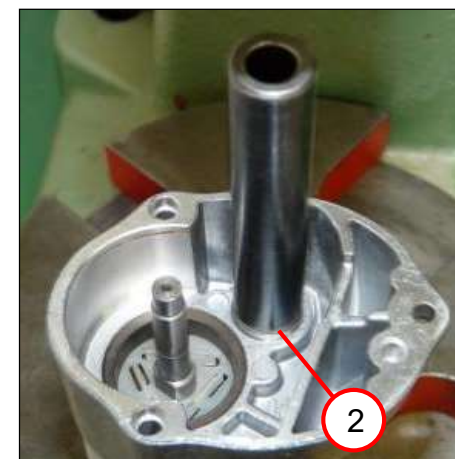
Tools:

- Arbor press
- Sleeve
20 mm inner diameter
27 mm outer diameter
- Circlip pliers



7. Fitting

Fitting the gearbox housing [applies to: BOP 10 (A)]



1. Press on the gear wheel (1).
2. Press in the grooved ball bearing (2).

Tools:

- Arbor press
- Sleeve
6 mm inner diameter
20 mm outer diameter



7. Fitting

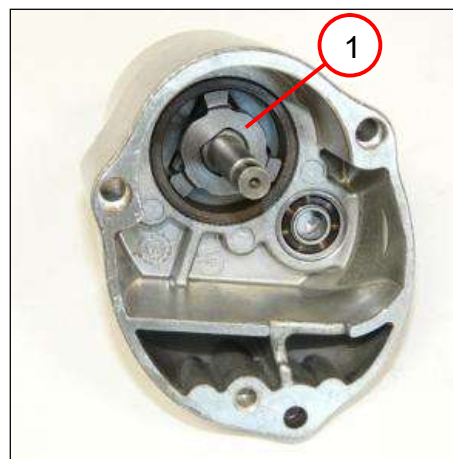
Fitting the gearbox housing [applies to: BOP 10 (A)]



Wrong



Right



1. Place the clutch ring (1) in the correct position.
2. Fit the six rollers (2).

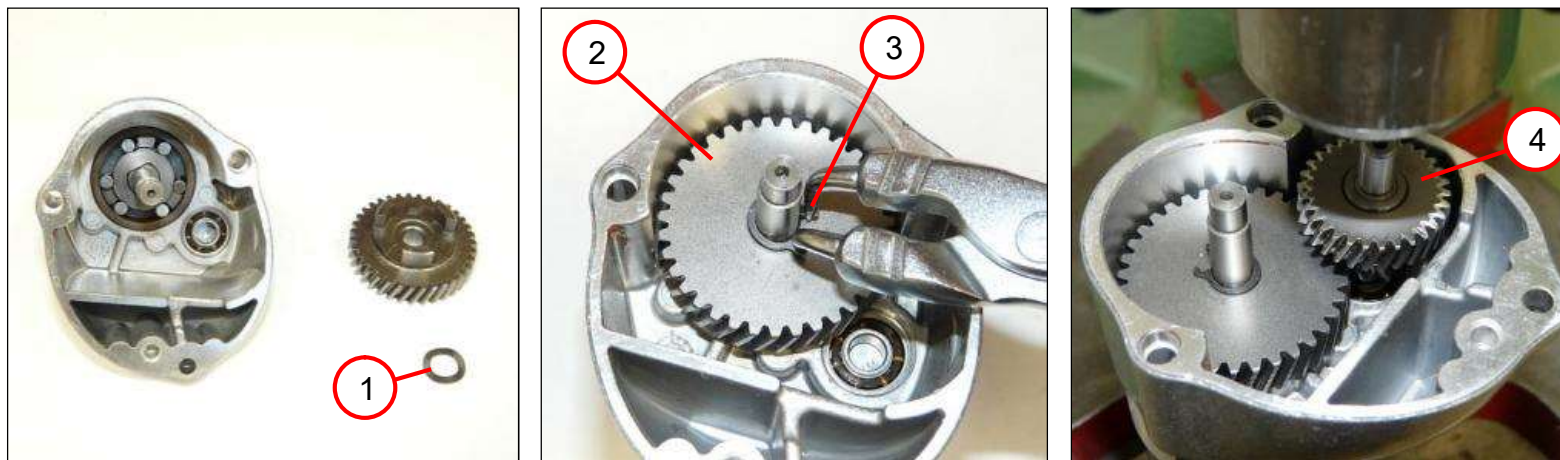
Tools:

- Forceps



7. Fitting

Fitting the gearbox housing [applies to: BOP 10 (A)]



1. Place the spring washer (1) on the shaft.
2. Position the gear wheel (2).
3. Fit the circlip (3).
 - ☞ Replace the circlip during each fitting.
4. Press in the shaft (4).

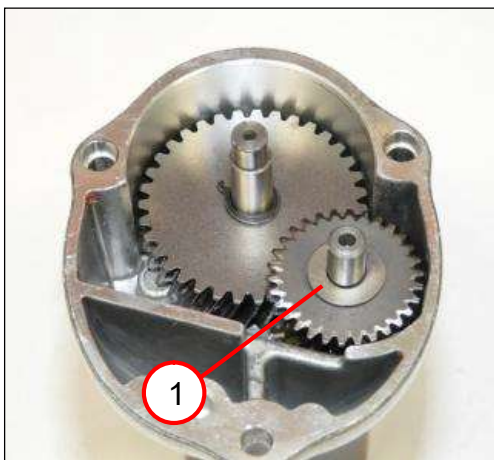
Tools:

- Circlip pliers
- Arbor press
- Sleeve
6 mm inner diameter
20 mm outer diameter



7. Fitting

Fitting the gearbox housing [applies to: BOP 10 (A)]



1. Position the disc (1).
2. Press on the grooved ball bearing (2).
3. Fill the gearbox housing (3) with 25 g of grease.

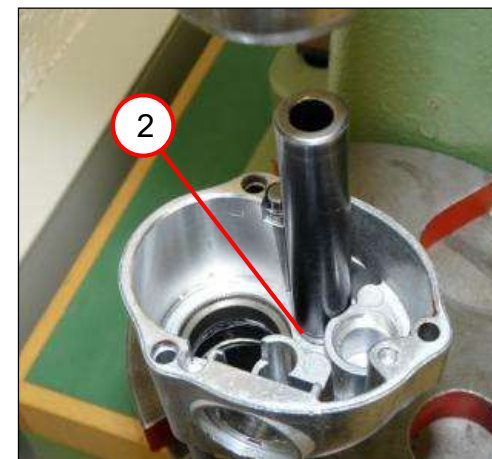
Tools:

- Arbor press
- Sleeve
6 mm inner diameter
20 mm outer diameter
- Grease



7. Fitting

Fitting the gearbox housing [applies to: BOP 13-2 (A)]



1. Press on the gear wheel (1).
2. Press in the grooved ball bearing (2).

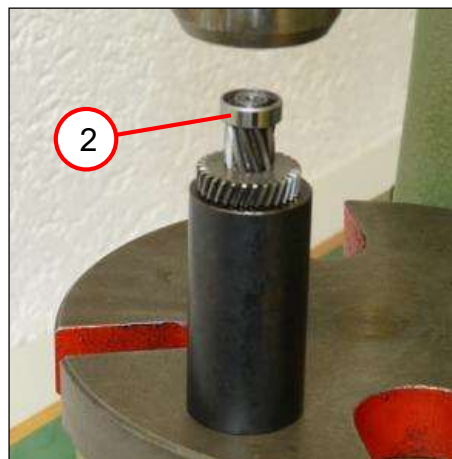
Tools:

- Arbor press
- Sleeve
12 mm inner diameter
30 mm outer diameter



7. Fitting

Fitting the gearbox housing [applies to: BOP 13-2 (A)]



3. Press on the gear wheel (1).
4. Press in the grooved ball bearing (2).

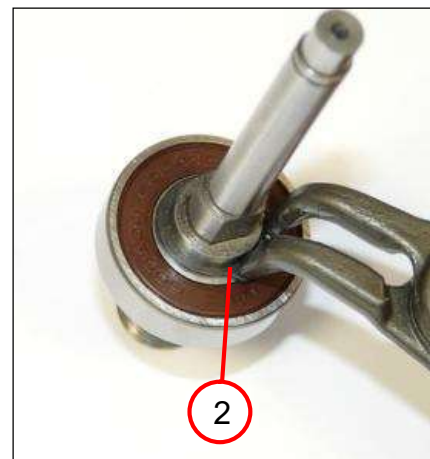
Tools:

- Arbor press
- Sleeve
12 mm inner diameter
30 mm outer diameter



7. Fitting

Fitting the gearbox housing [applies to: BOP 13-2 (A)]



1. Press on the grooved ball bearing (1).
2. Fit the circlip (2).
 - ☞ Replace the circlip during each fitting.
3. Place the disc (3) in the correct position.
 - ☞ Its flat side should be facing the grooved ball bearing.

Tools:

- Circlip pliers
- Arbor press
- Sleeve
12 mm inner diameter
15 mm outer diameter



7. Fitting

Fitting the gearbox housing [applies to: BOP 13-2 (A)]



1. Press in the shaft (1).
2. Fit the circlip (2).
 - ☞ Replace the circlip during each fitting.

Tools:

- Circlip pliers
- Arbor press
- Sleeve
20 mm inner diameter
27 mm outer diameter

7. Fitting

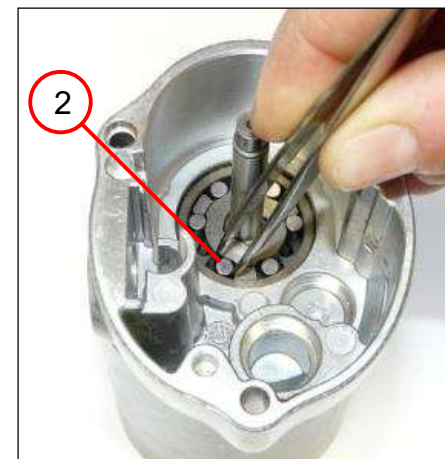
Fitting the gearbox housing [applies to: BOP 13-2 (A)]



Wrong



Right



1. Position the clutch ring (1).
2. Fit the six rollers (2).

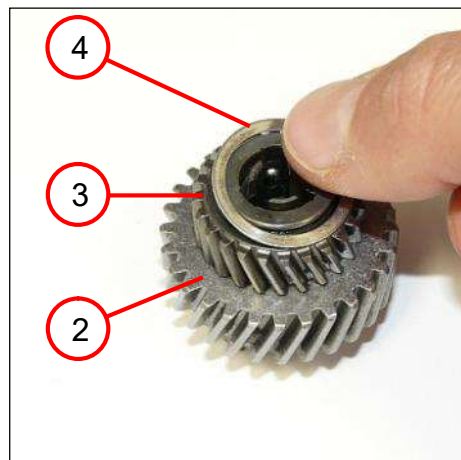
Tools:

- Forceps



7. Fitting

Fitting the gearbox housing [applies to: BOP 13-2 (A)]



1. Apply a layer of grease to the six balls (1).
2. Insert the six balls (1).
3. Position the gear-wheel [z=28] (2).
4. Position the gear-wheel [z=24] (3).
5. Position the disc (4).

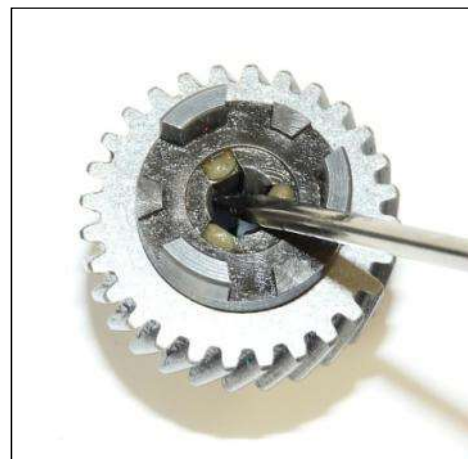
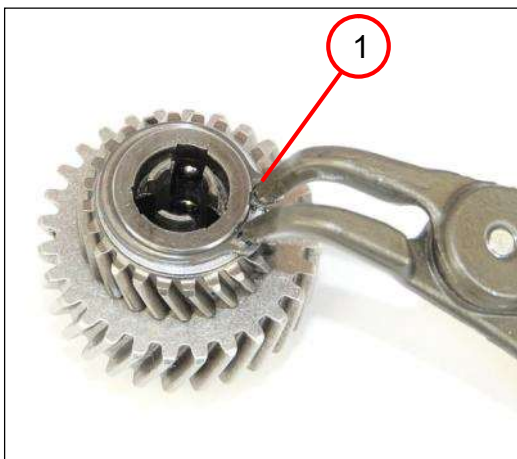
Tools:

- Forceps



7. Fitting

Fitting the gearbox housing [applies to: BOP 13-2 (A)]



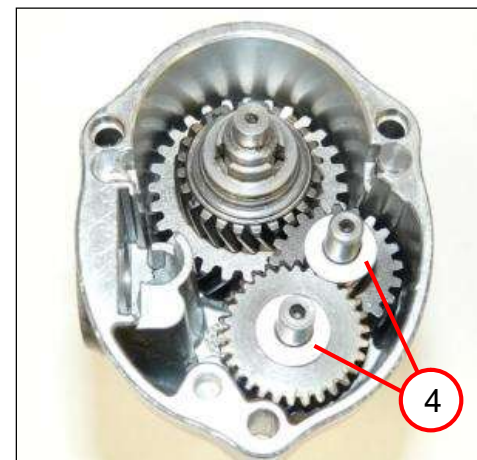
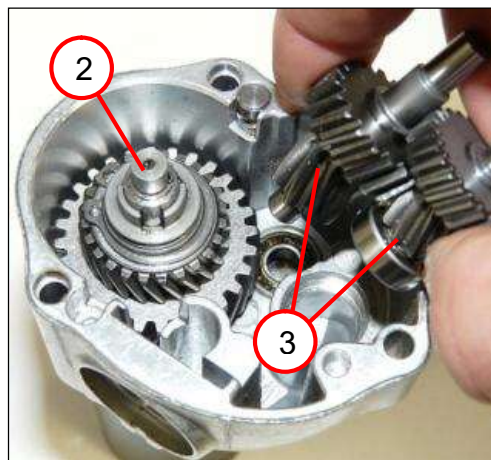
1. Fit the circlip (1).
2. Insert the draw keys (2).
3. Press draw keys outwards.

Tools:

- Slotted screwdriver (small)
- Circlip pliers

7. Fitting

Fitting the gearbox housing [applies to: BOP 13-2 (A)]

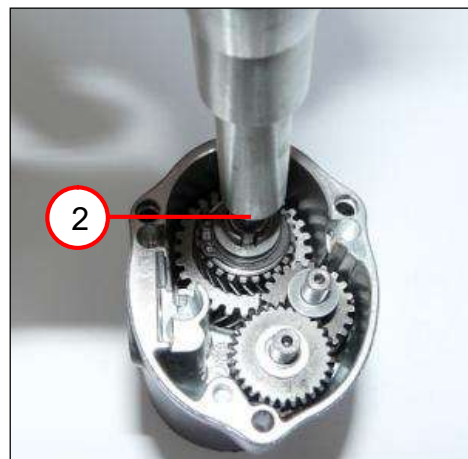
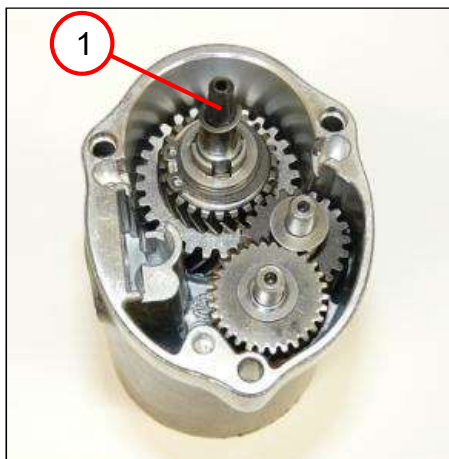


1. Position the spring washer (1).
2. Insert the gear-wheel (2) in the correct position.
3. Insert the two shafts (3).
4. Position the two discs (4).



7. Fitting

Fitting the gearbox housing [applies to: BOP 13-2 (A)]



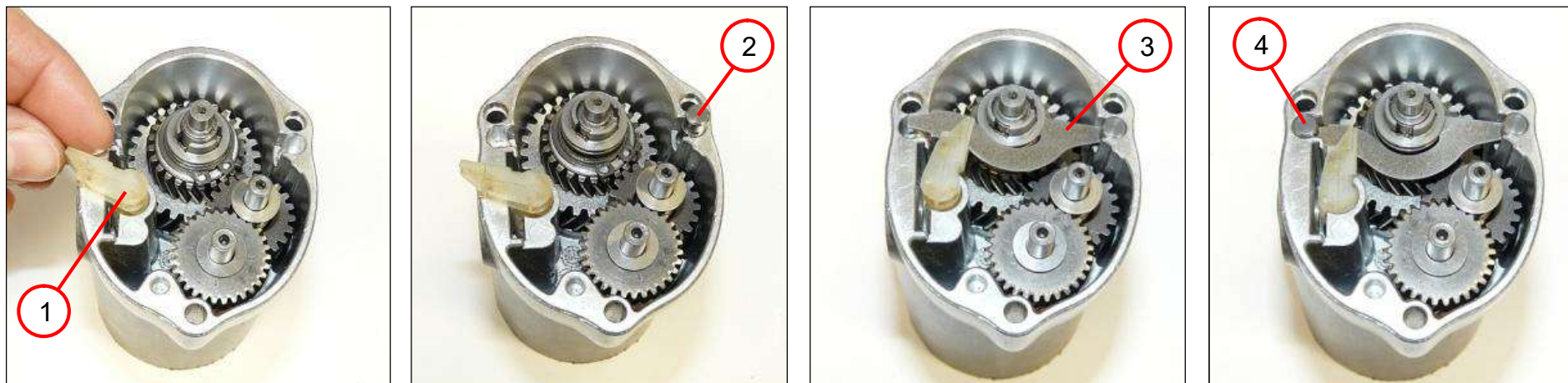
1. Fit the sleeve (1) in the correct position.
2. Fit the circlip (2).

Tools:

- Assembly aid

7. Fitting

Fitting the gearbox housing [applies to: BOP 13-2 (A)]

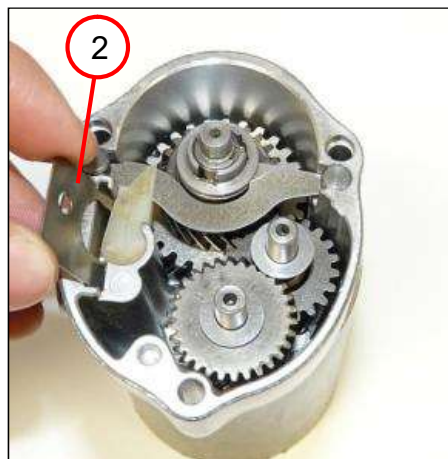


1. Insert the bolt (1) in the correct position.
2. Insert the bolt (2).
3. Insert the two leaf springs (3).
4. Insert the bolt (4).



7. Fitting

Fitting the gearbox housing [applies to: BOP 13-2 (A)]



1. Insert the switch pushbutton (1).
2. Insert the plate (2).
3. Press on the grooved ball bearing (3).
4. Fill the gearbox housing (4) with 25 g of grease.

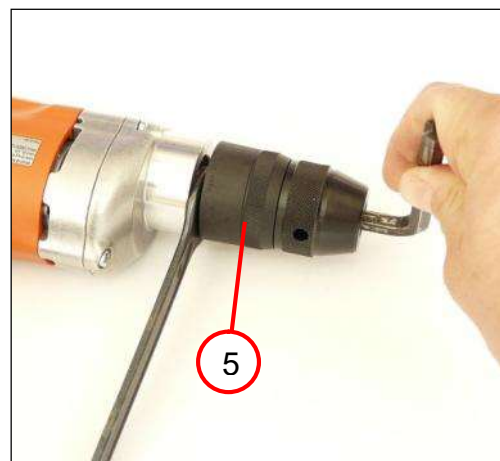
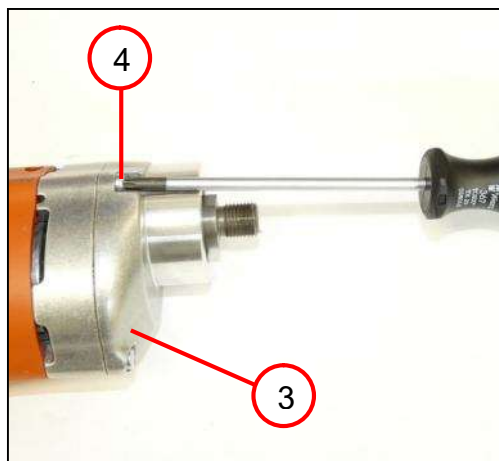
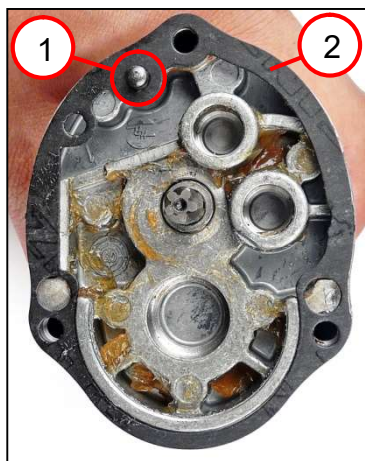
Tools:

- Arbor press
- Sleeve
6 mm inner diameter
20 mm outer diameter
- Grease



7. Fitting

Fitting the gearbox housing



1. Fit the pin (1).
2. Position the seal (2).
3. Fit the gearbox housing (3) on the motor housing.
4. Screw in the three screws (4).
5. Fit the quick-action chuck (5) [35 Nm].

Tools:

- Torx T20
- Socket head wrench
- Open-ended spanner, 17 mm (width = 4 mm)



8. Troubleshooting

Currently unavailable.



9. Connection diagram

