


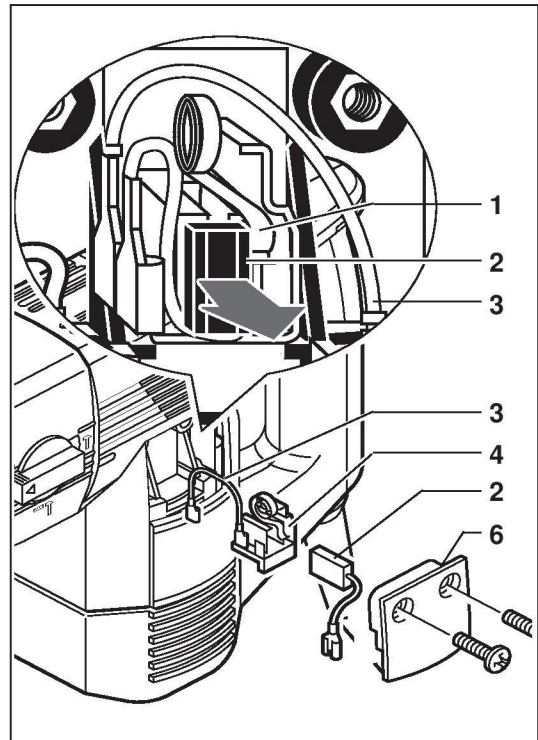
Important note  Due to constructional improvements several technical alterations were made at different times. As a result, some parts of the dismantling and assembly instructions were changed or new paragraphs were added. Therefore it is important to pay attention to the date of manufacture of the machine which is pointed out in the instructions where necessary.

- Service Tools needed**
- Torx screwdrivers sizes 15, 20, 25
 - Special pliers 4931 5990 57
 - Special pliers 4931 5990 56
 - Mounting device 4931 5990 39
 - Sleeve 4931 5990 38
 - (Dis-) Assembly tool 4931 5990 84

- Important**
- Before maintenance carry out an introduction examination with high voltage check according to VDE (see chapter Electrical and Mechanical Test Instruction).
 - Always disconnect the plug from the mains before maintenance.

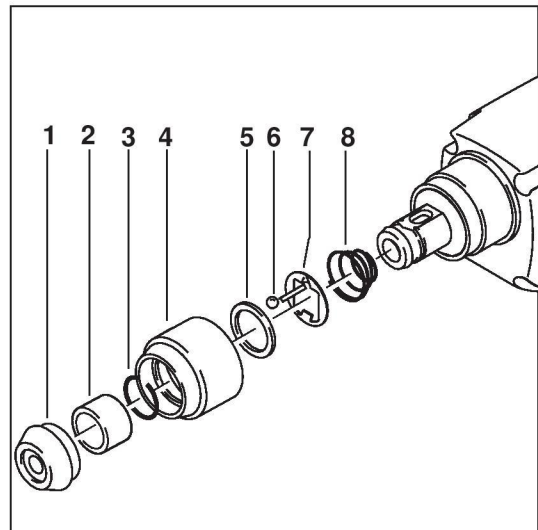
Dismantling

- Removing the carbon brushes**
- 1 Remove the service cover (6).
 - 2 Remove the cable (3) and pull the brush holder (4) from the housing.
 - 3 Put the spring (1) aside (see illustration) and pull out the carbon brushes (2). Remove the carbon brush cables.



1

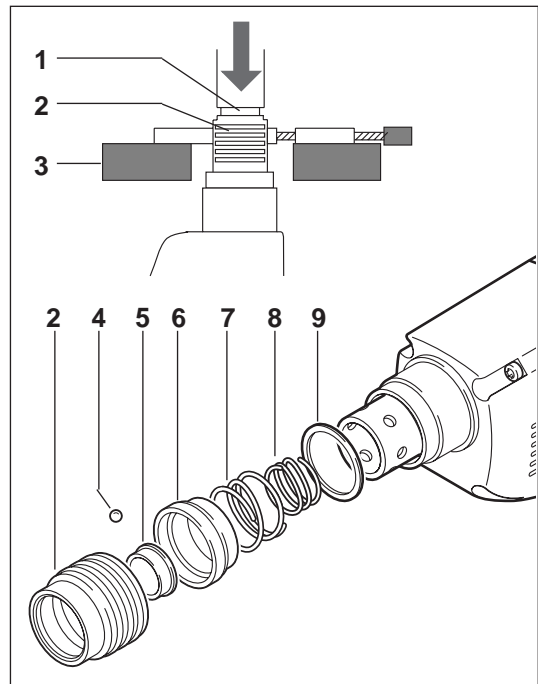
- Dismantling the SDS-Plus-Reception (applicable for PHE 3)**
- 1 Remove the rubber (1).
 - 2 Remove the spacer (2) (from date of manufacture 02/96).
 - 3 Depress the sliding sleeve (4) and lever off the seal ring (3) with a screwdriver.
 - 4 Remove the sliding sleeve (4) and the retaining ring (5).
 - 5 Depress the retaining disk (7) and press out the ball (6) with aid of a screwdriver or remove it with a magnet.
 - 6 Remove the retaining disk (7) and the spring (8).



2

**Dismantling the
FIXTEC-
Reception
(only applicable
for PHE 3 X)**

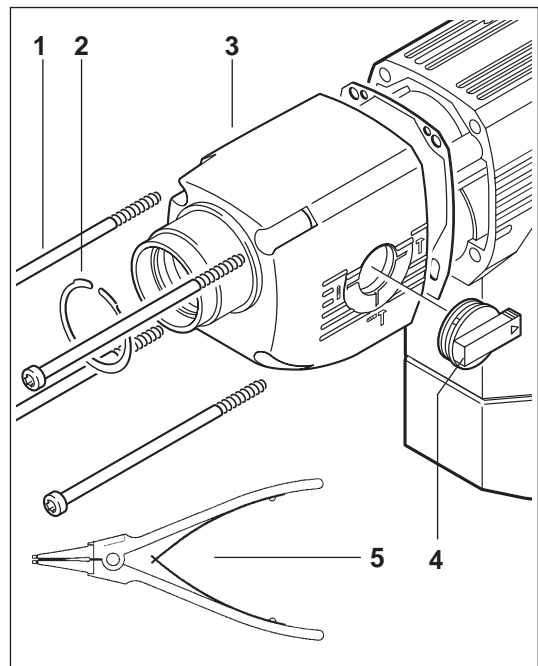
- 1 Removing the locking sleeve (2):
Fix the locking sleeve in a pulling off device (3) and press it out (by using a suitable sleeve (1)).
- 2 To remove the balls (4) (6 pieces):
depress the seal ring (6) and remove the balls with aid of a magnet.
- 3 Remove the remaining parts:
- seal ring (6)
- outer spring (7)
- ejector ring (5)
- inner spring (8)
- washer (9)



2

**Removing the
gear housing**

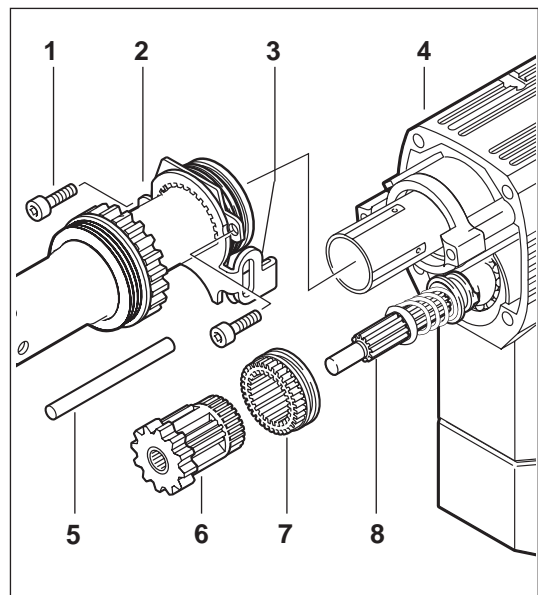
- 1 Removing the switch lever (4):
Switch the lever to „0“ and break it off with aid of pliers (the lever is being destroyed).
- ☞ Should this not be possible fix the switch in a vice and break it off by moving the machine to and fro. Remove any broken parts from the machine!
- 2 Remove the four housing screws (1).
- 3 To remove the locking ring (2) (only applicable for PHE 3 X): open the locking ring on the spindle with aid of special pliers (5) (4931 5990 57) and remove it together with the gear housing (3).



3

**Removing the
spindle**

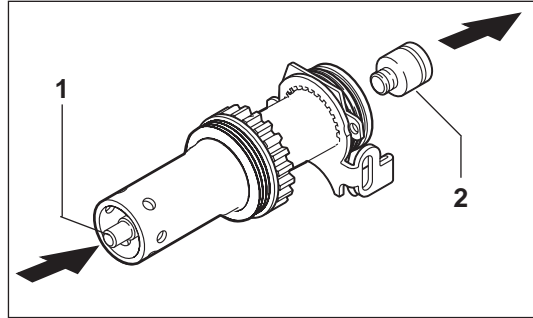
- 1 Remove the two screws (1).
- 2 Remove the straight pin (5).
- 3 Remove the planetary gear (6) and the ring gear (7).
- 4 Remove the complete spindle sleeve (2) from the cylinder.



4

Removing the striker

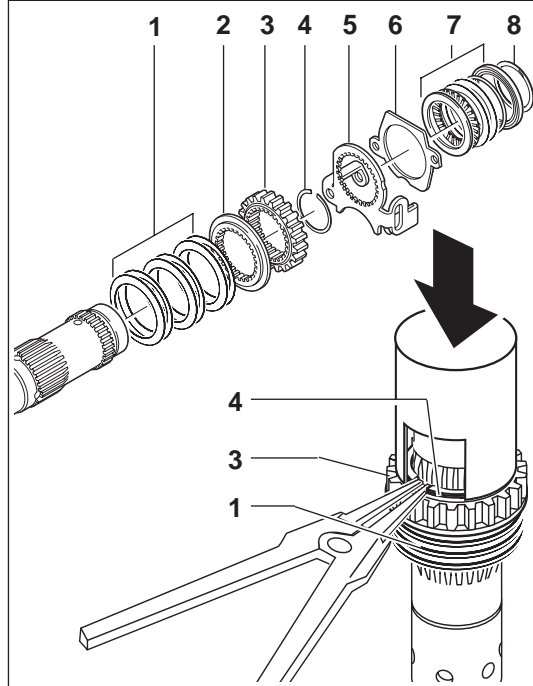
- 1 Place the spindle vertically and briefly hit the plunger (1) with a mandril - the striker (2) comes free.



5

Dismantling the spindle (removing the outer parts)

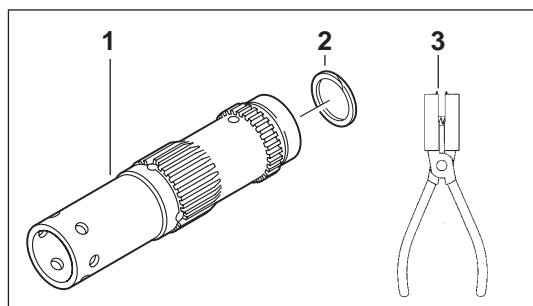
- 1 Removing the rear thrust bearing (7):
Lever off the special locking ring (8) with a screwdriver and remove it (peel it off like a key ring). The thrust bearing can be removed in the following component parts:
 - washer
 - thrust bearing
 - two compensating washers
 - profile ring with damper-O-ring
- 2 Remove the retaining clip (6) and the locking slide (5).
- 3 Removing the spindle wheel (3):
Press the spindle wheel with a sleeve against the disk springs (1) – the locking ring (4) is released and can be removed with pliers. Remove the spindle wheel.
- 4 Remove the ratchet (2) and the disk springs (1).



6

Dismantling the spindle (removing the inner locking ring)

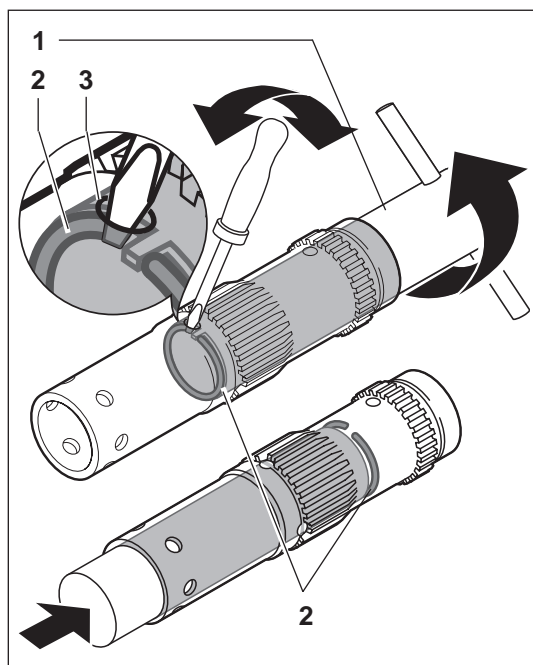
- ☞ Depending on the date of manufacture of the machine there are different ways to remove the locking ring:
- Date of manufacture up to 12/95:**
Remove the locking ring (2) inside the spindle (1) with aid of special pliers (3).



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Date of manufacture from 09/96:

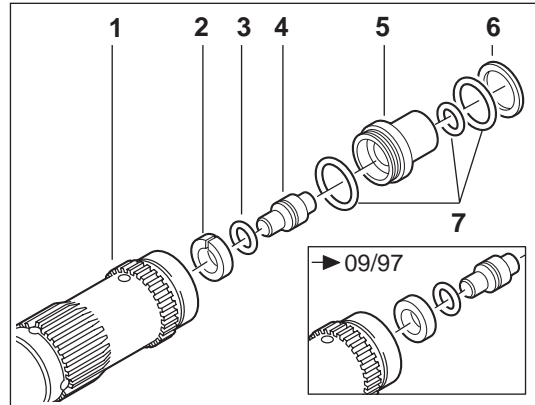
- ☞ In the middle of the spindle there are four deairing holes and one service boring. The diameter of the service boring is smaller.
- 1 Turn the locking ring (2) with aid of service tool 4931 5990 84, such that one end projects the service boring (3) by approx. 2 mm.
 - 2 Put a screwdriver through the service boring (3) and place it under the locking ring (2).
 - 3 Move the screwdriver to and fro and at the same time turn the locking ring with aid of the service tool in direction of arrow. Turn the locking ring until it is completely levered off.
 - 4 Press the locking ring from the spindle.



8

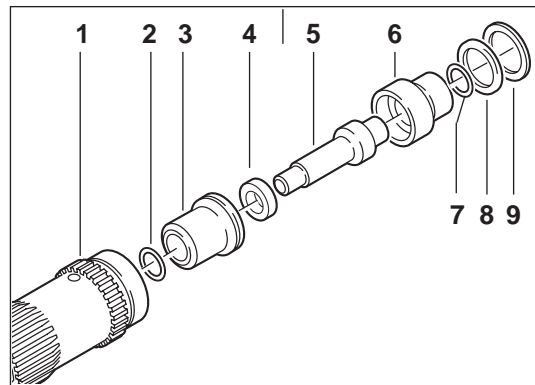
Dismantling the spindle (inner parts) only applicable for PHE 3

- 1 Press the following parts from the spindle:
 - washer (6)
 - pressure sleeve (5)
 - plunger (4)
 - brake disk (2) (is pressed in).
- 2 Remove the O-rings (3) and (7).



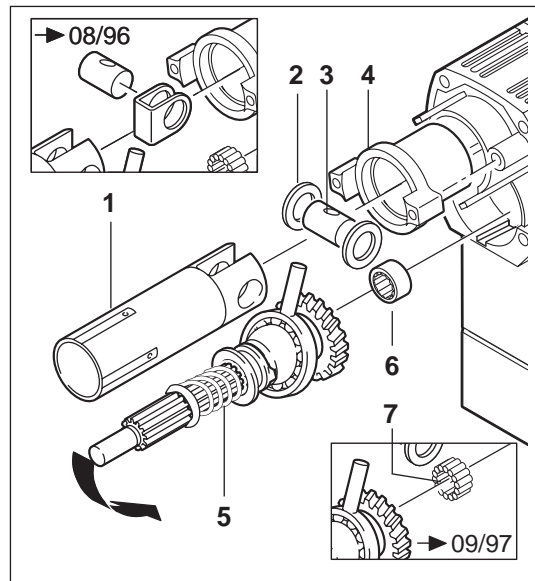
Dismantling the spindle (inner parts) only applicable for PHE 3 X

- 1 Press the following parts from the spindle:
 - washer (9)
 - pressure sleeve (6)
 - plunger (5)
 - brake disk (4)
 - pressure sleeve (3) (is pressed in).
- 2 Remove the O-rings (2), (7) and (8).



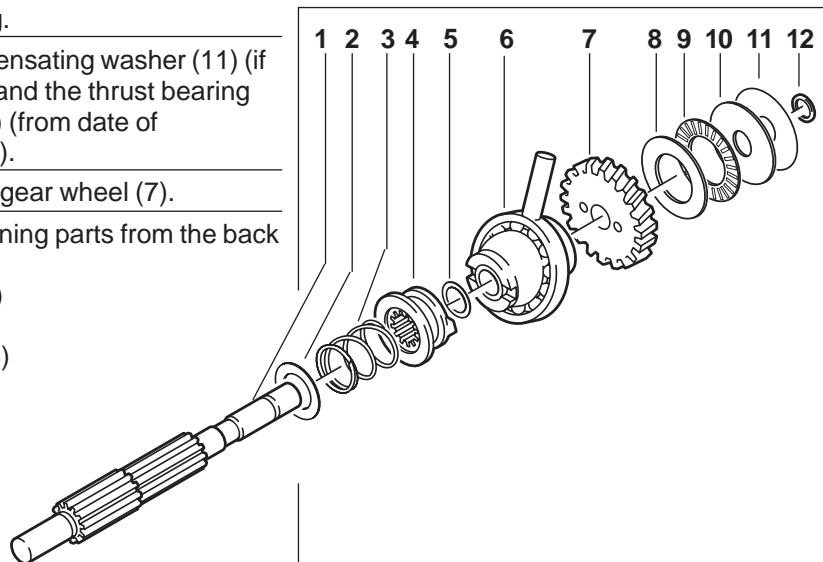
Removing the back gear shaft and the cylinder

- 1 Pull out the bearing housing (4) or loosen the bearing housing by hitting the gear housing lightly with a plastic hammer. (from date of manufacture 08/95).
- 2 Remove the tumble drive (5) and the cylinder (1).
- 3 Press out the bolt (2) by hand and remove the two disks (3) (older machines: guide ring (see box)).
- 4 Remove the needle bearing (6) with aid of an interior extractor. In case of older machines, remove the 13 rollers (7) from the back gear shaft.



Dismantling the back gear shaft

- 1 Remove the O-ring.
- 2 Remove the compensating washer (11) (if existing), the disk and the thrust bearing (9) and the disk (8) (from date of manufacture 12/95).
- 3 Press off the back gear wheel (7).
- 4 Remove the remaining parts from the back gear shaft (1):
 - tumble drive (6)
 - washer (5)
 - coupling box (4)
 - spring (3)
 - washer (2)



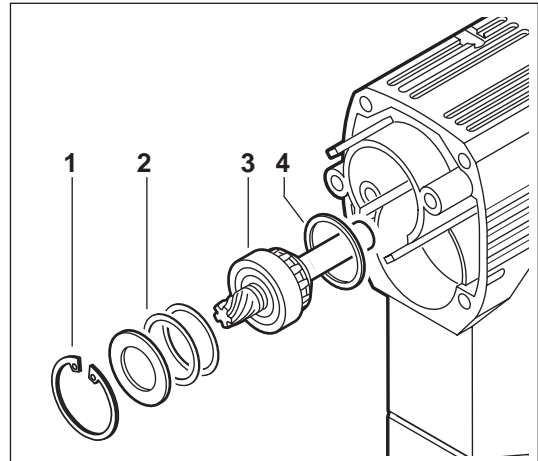
9

10

11

Removing the angle drive

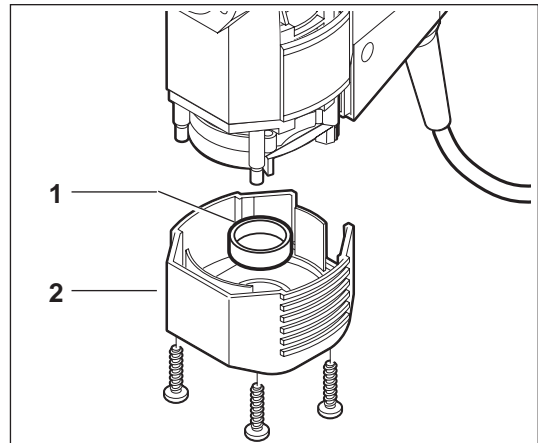
- 1 Remove the locking ring (1).
 - 2 Remove the angle drive (3) together with the washers (2) and the support ring (4). (If necessary by hitting the gear housing lightly with a plastic hammer.)
- ☞ Depending on the tolerance of the bearing the tool can be equipped with two or three washers (2). Note the numbers of the washers and mount the same number when re-assembling.



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Removing the motor cover

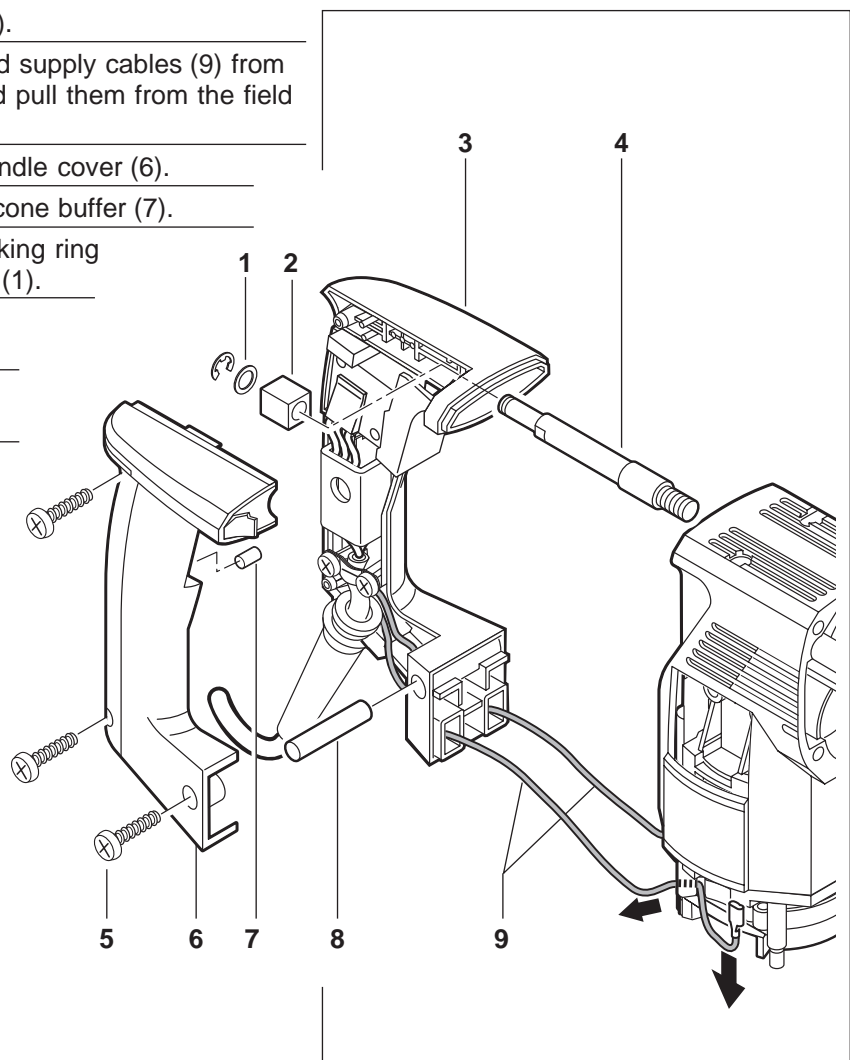
- 1 Loosen the four screws and remove the motor cover (2).
 - 2 Remove the rubber cap (1).
- ☞ The rubber cap (1) is glued in (from date of manufacture 01/97).



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Dismantling the handle

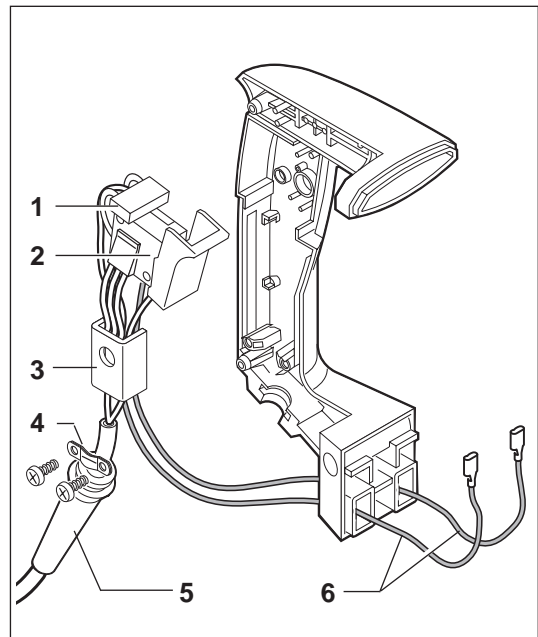
- 1 Expel the pin (8).
- 2 Remove the field supply cables (9) from the contacts and pull them from the field housing.
- 3 Unscrew the handle cover (6).
- 4 Remove the silicone buffer (7).
- 5 Remove the locking ring and the washer (1).
- 6 Remove the AVS-rubber (2).
- 7 Remove the handle (3).
- 8 Unscrew the handle bolt (4).



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Removing the electrical parts

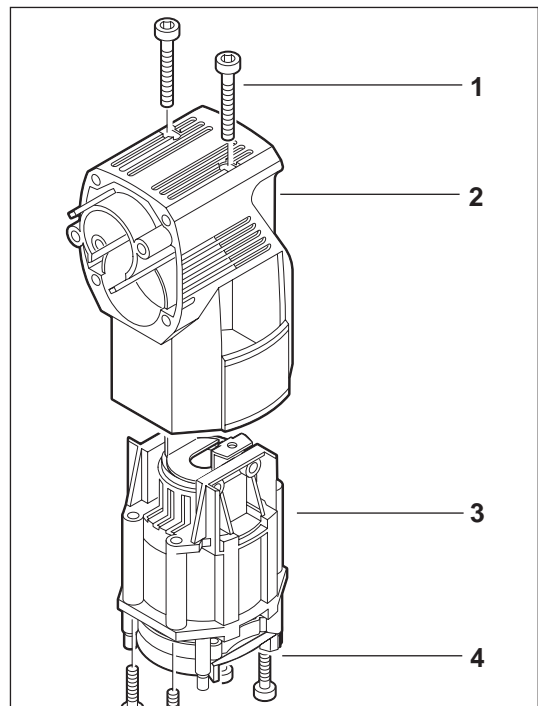
- 1 Unscrew the strain relief (4).
- 2 Remove the following parts:
 - switch (2)
 - capacitor (1)
 - triac (3)
 - mains cable (5)
 - field cable (6)



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Removing the motor

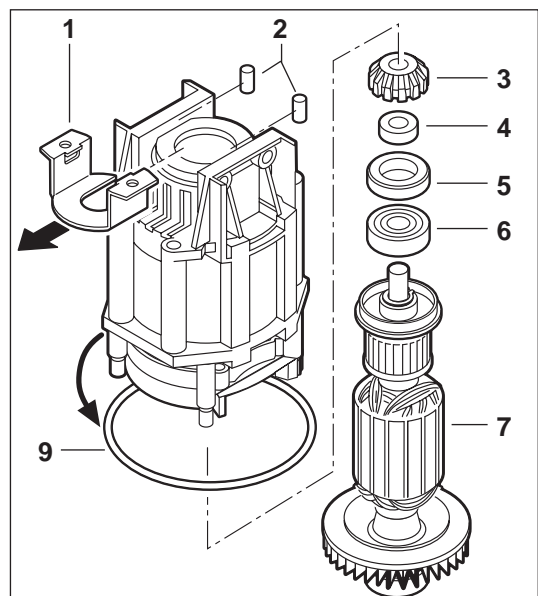
- 1 Loosen the screws (1) and (4) and pull out the motor (3) (if necessary, hit the motor housing (2) lightly with a plastic hammer).



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Removing and dismantling the armature

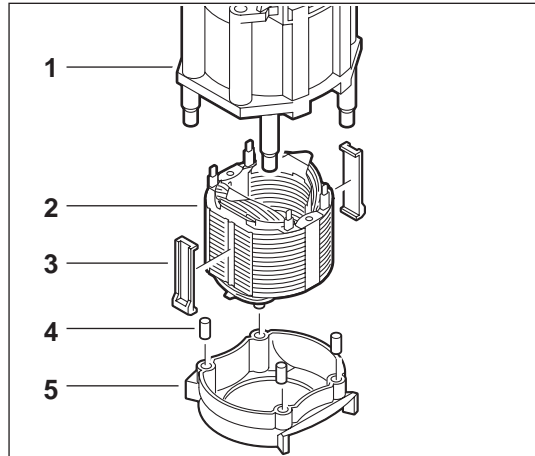
- 1 Remove the seal ring (9).
- 2 Push out the angle (1) as shown in illustration, and remove the silicone buffer (2).
- 3 Pull out the entire armature (7).
- 4 Press off the toothed wheel (3).
- 5 Remove the washer (4), the sealing ring (5) and the bearing (6).



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Removing the field

- 1 Remove the air deflector plate (5) and the silicone buffer (4).
- 2 Pull the field (2) from the field housing (1) and remove the centering ledges (3).



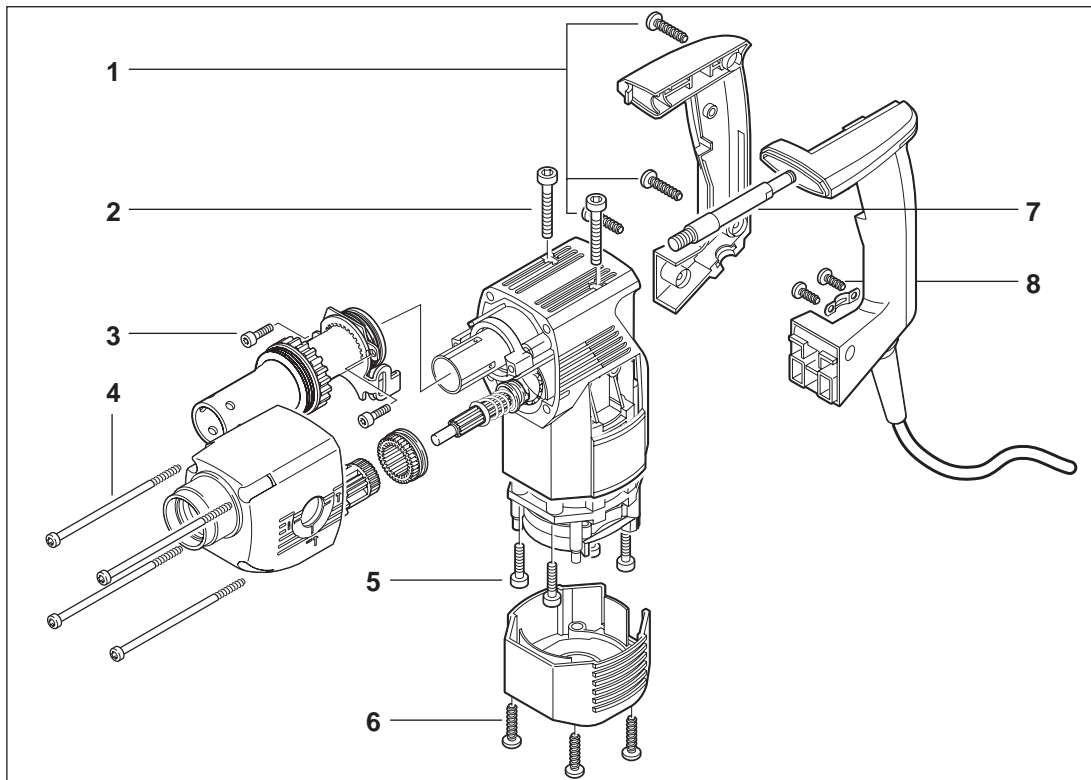
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Maintenance

General

It is recommended to regularly submit the tool to maintenance. Maintenance is also due if the carbon brushes cut off or if the hammer mechanism fails. When carrying out maintenance all parts of the maintenance set must be exchanged. Use the appropriate maintenance set for each machine: PHE 3: 4931 3568 29 (220-240 V), 4931 3568 37 (110 V)
PHE 3 X: 4931 3568 38 (220-240 V), 4931 3568 40 (110 V)

Torque



Position	Name	Torque
1	Handle cover screws	1,2 Nm
2	Motor screws	2,5 Nm
3	Spindle sleeve screws	6,0 Nm
4	Joining gear housing/motor housing	2,5+5 Nm
5	Motor screws	2,5 Nm
6	Motor cover screws	1,8 Nm
7	Handle bolt	10,0 Nm
8	Strain relief mains cable	1,0 Nm

Cleaning

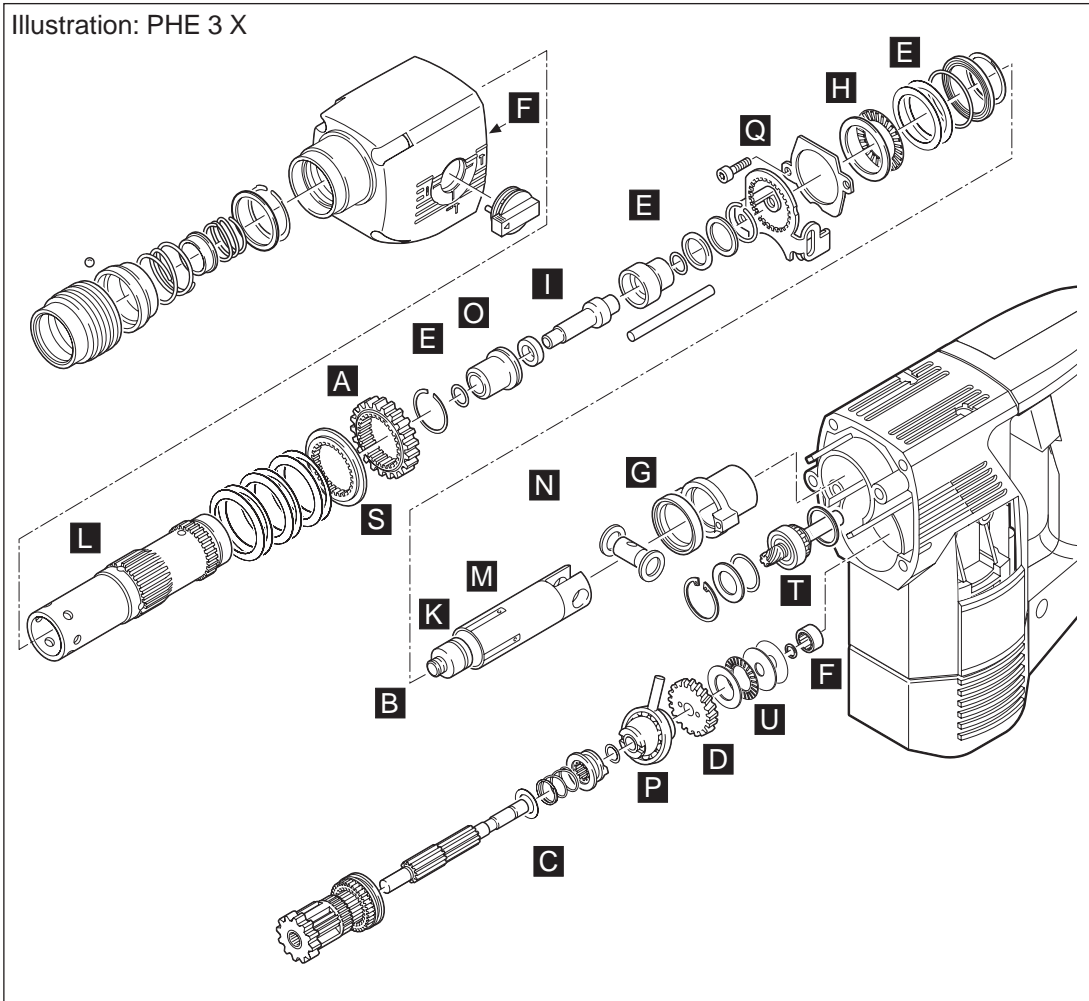
With the exception of the electrical parts all parts must be cleaned with cold cleaner. **Attention!** No cleaner must enter the encapsulated bearings. Clean the electrical parts with a dry brush.

Abrasion test

Check the dismantled parts for abrasion (visual check) and exchange if necessary.

Electrical test Before assembly submit all relevant parts to an electrical test (see chapter Electrical and Mechanical Test Instruction).


Lubrication At each maintenance the tool must be lubricated as shown in the lubrication chart. After having dismantled the entire tool remove the used grease completely and replace it by new grease. Please pay attention to the following lubrication chart:



Bauteil	Bezeichnung	Fettart	Menge
A	Spindle wheel tothing	Darina	5g
B	Hollow of back gear, spindle sleeve	Darina	14g
D	Tothing of back gear	Tivela	8g
E	O-rings	Darina	1g
F	Needle bearing	Darina	je 1g
G	Porous bearing boring	Darina	1g
H	Spindle sleeve thrust bearing	Tivela	1g
I	Plunger outside	Tivela	0,5g
K	Cylinder inside	Tivela	2g
L	Spindle sleeve outside	Tivela	2g
M	Cylinder outside	Darina	2g
N	Cylinder bolt	Darina	0,5g
O	Striker	Darina	0,5g
P	Tumble drive boring	Darina	0,5g
Q	Gear sleeve inside and outside	Darina	4g
S	Ratchet/spindle wheel	Darina	1g
T	Angular wheel	Darina	4g
U	Thrust bearing	Darina	2g

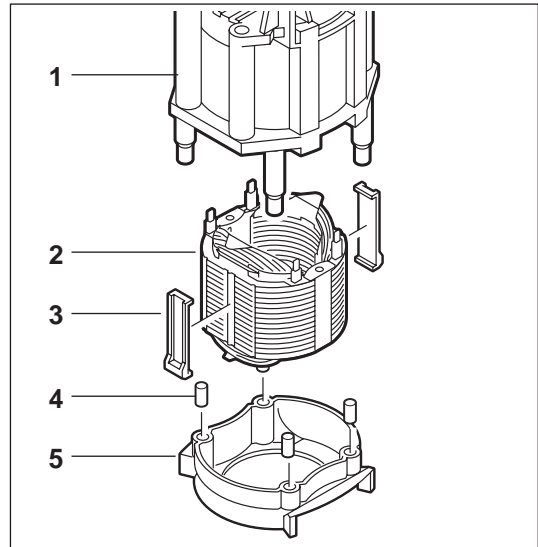
The service set contains tubes with grease (Darina, Tivela). All items listed above must be lubricated with the stated amount of grease. With the remainder of the Darina-tube evenly lubricate the gear box and the spindle sleeve.

Assembly

Note  Please additionally secure all screwed connections in metal with screw locking device.

Mounting the field

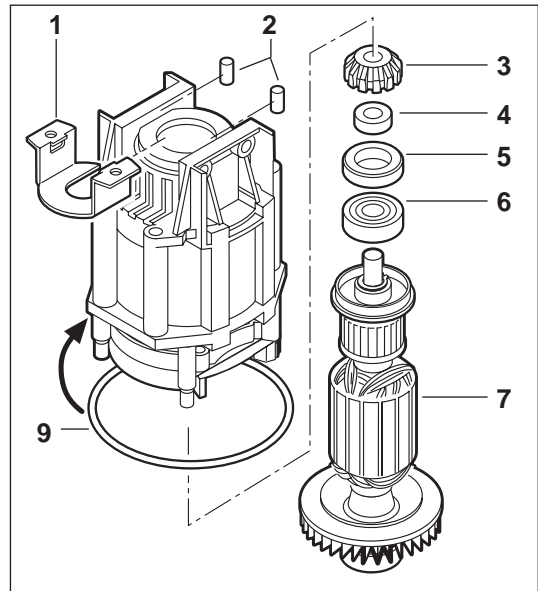
- 1 Fit the centering ledges (3) to the field (2) (take care of the right position, see illustration).
- 2 Insert the field (2) into the field housing (1) (lightly hit the field housing with a plastic hammer).
- 3 Insert the silicone buffer (4) into the air supply ring (5).
- 4 Insert the air deflector plate (5) (take care of the right position, see illustration).



1

Assembling and mounting the armature

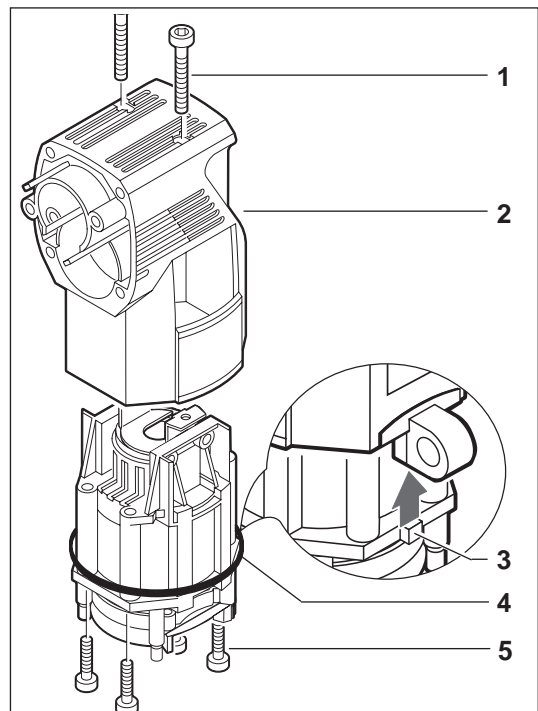
- 1 Push the bearing (6), the washer (4) and the seal ring (5) (take care of the right position: the small boring faces the toothed gear) onto the armature shaft and press on the toothed gear (3) as far as will go.
- 2 Insert the complete armature (7) into the field.
- 3 Push the silicone buffer (2) onto the field housing.
- 4 Fix the angle (1) in the field housing.
- 5 Push the seal ring (9) onto the field housing.



2

Mounting the motor

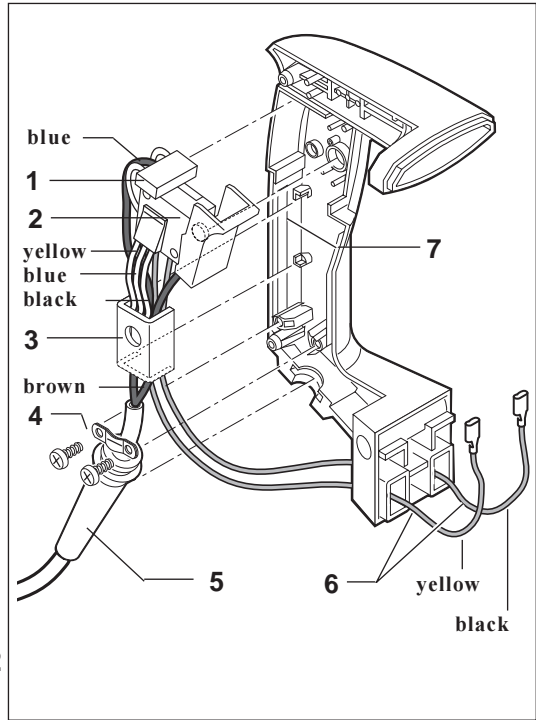
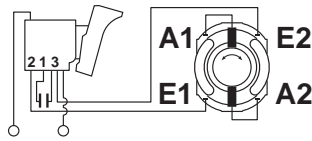
- 1 Insert the motor (4) into the motor housing (2) (take care of the right position: the lug (3) must fit into the relief of the motor housing).
- 2 Fasten the motor with screws (1) and (5) (2,5 Nm).



3

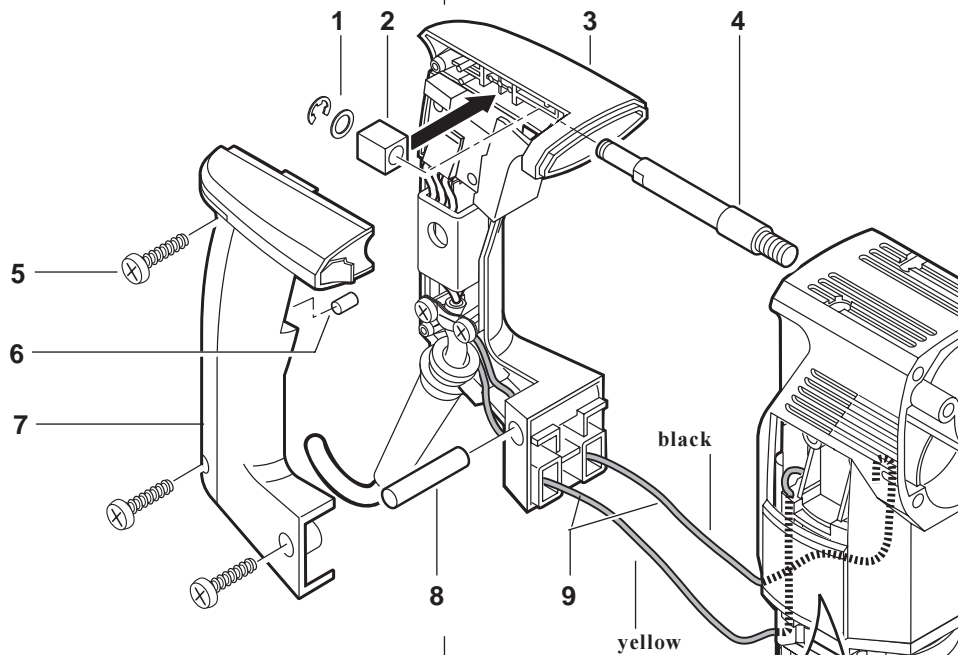
Assembling the electrical parts

- 1 Connect all cables with the switch as shown in illustration resp. wiring diagram.
- 2 Push the field cables (6) through the handle as shown in illustration.
- 3 Insert the switch (2), the capacitor (1), the cooling plate with triac (3) (from date of manufacture 03/96 into the provided relief (7)) and take care that the cables are fitted properly.
Lay the capacitor cable to the side of the switch, and lay the field supply cables (6) underneath the power supply cable in the area of the strain relief.
- 4 Fasten the strain relief (4) with screws (1 Nm).

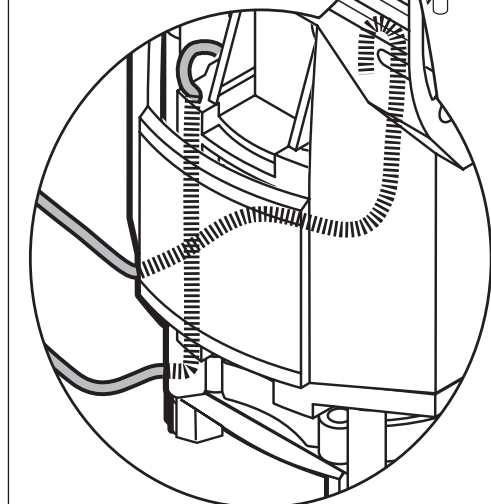


4

Mounting the handle



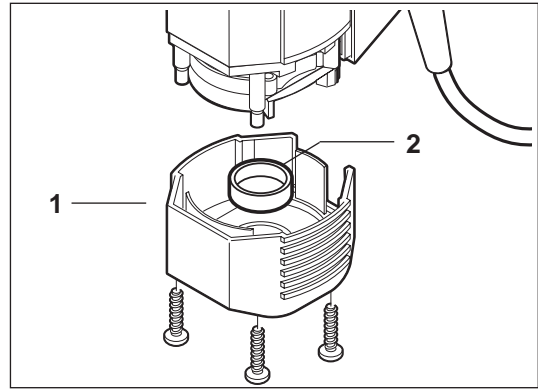
- 1 Screw the handle bolt (1) into the housing (10 Nm).
- 2 Push the handle (6) over the bolt and fix the AVS-rubber (4) with the washer and the locking ring (5).
- 3 Insert the silicone buffer (3) into the handle cover.
- 4 Fasten the handle cover (2) with the screws (1,2 Nm).
- 5 Lead the field supply cables (8) through the channels of the field housing (as shown in illustration) and connect them with the field (diagonally).
- 6 Fasten the handle with the bolt (7). Press in the bolt or knock it in with a rubber hammer.



5

Mounting the motor cover

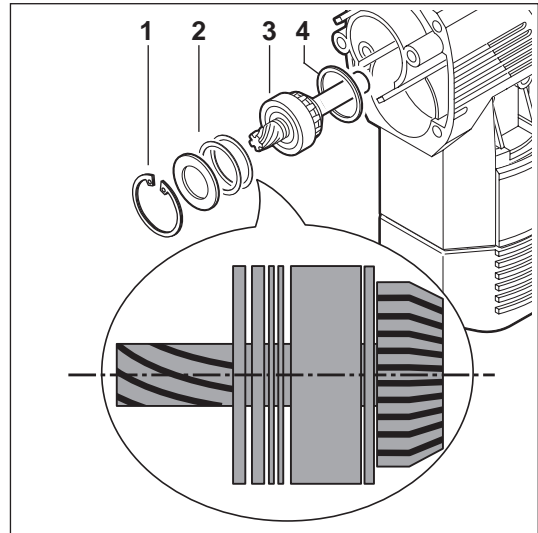
- 1 Fit the motor cover (1) (mind the right position) and fasten it with the screws (1,8 Nm).
- ☞ Take care that the rubber cap (2) is stuck in the motor cover. If necessary, apply glue to the back of the rubber cap and stick it in.



6

Assembling the angle drive

- 1 Insert the support ring (4).
- 2 Grease the angle drive (3) and insert it into the motor housing by turning it slightly.
- 3 Insert the washers (2).
- ☞ Depending on the tolerance of the bearing, two or three washers can be needed. For assembly, use the same amount of washers as have been removed when dismantling.
- 4 Insert the locking ring (1).

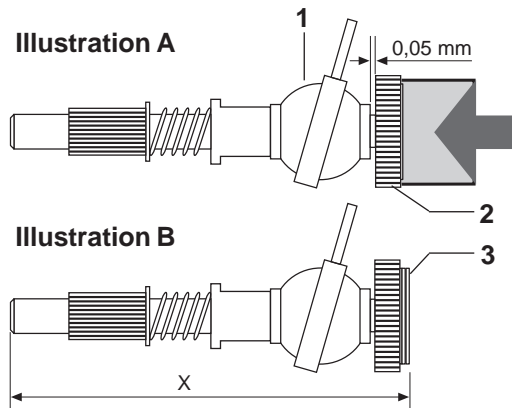


7

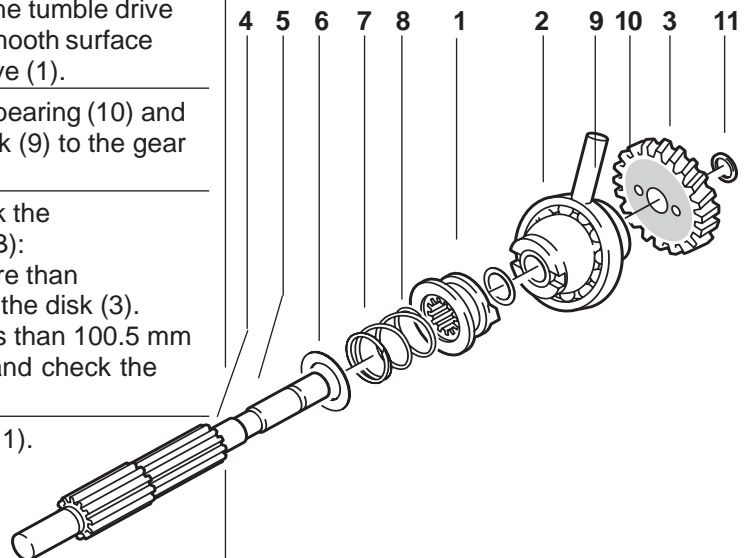
Assembling the back gear shaft

- ☞ From the date of manufacture 12/95 a thrust bearing is integrated in the gear wheel (2). All gear wheels manufactured before that date do not contain needle bearing (9) and disk (3).

- 1 Push the following parts onto the back gear shaft (4) in this order:
 - washer (5)
 - spring (6)
 - coupling box (7)
 - washer (8)
 - tumble drive (1)
- 2 Press on the gear wheel (2) with a distance of 0.05 mm to the tumble drive (1) (illustration A). The smooth surface must face the tumble drive (1).
- 3 Lightly grease the thrust bearing (10) and fit it together with the disk (9) to the gear wheel (2).
- 4 Fit the disk (3) and check the distance "X" (illustration B):
 - ☞ If the distance is more than 100.5 mm, do not fit the disk (3).
 - ☞ If the distance is less than 100.5 mm fit another disk (3) and check the distance again.
- 3 Insert the locking ring (11).



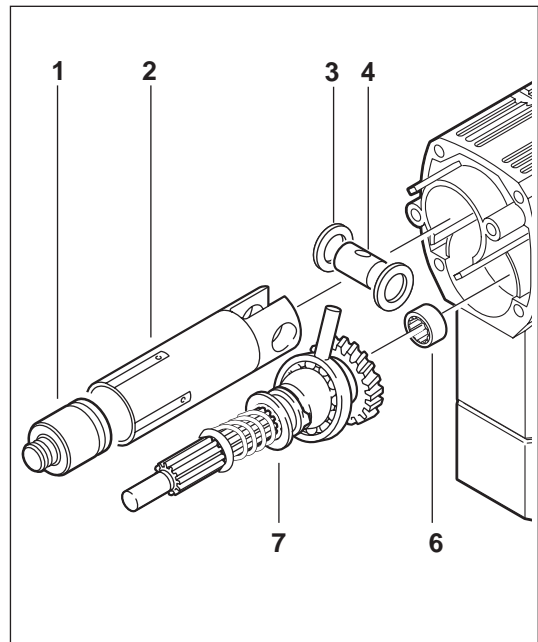
4 5 6 7 8 1 2 9 10 3 11



8

Mounting the back gear shaft and the cylinder

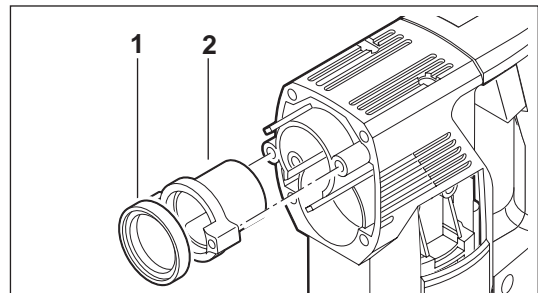
- 1 Insert the two disks (3) and the bolt (4) into the cylinder (2).
- 2 Insert the rolls (6) into the back gear shaft one after the other and fix it with grease.
☞ Mount the rolls (6) completely with the cage (from date of manufacture 09/97).
- 3 The back gear (7) can only be inserted as follows:
 - Put together the cylinder and the back gear for adjustment before mounting them.
 - Turn the tumble drive to the lowest position and leave it there
 - insert the cylinder into the end shield
 - Insert the tumble drive into the mounted cylinder.
- 4 Grease the striker (1) and insert it into the cylinder.



9

Mounting the spindle bearing

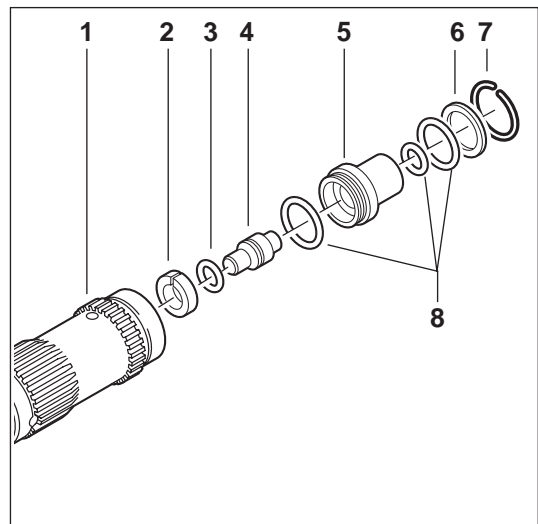
- 1 Press the bearing ring (1) into the bearing housing (2).
- 2 Insert the bearing housing (2) into the motor housing (do not yet insert it completely, mind the right position).
- 3 Press in the bearing housing (2) as far as it will go.



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Assembling the spindle (mounting the inner parts) only applicable for PHE 3

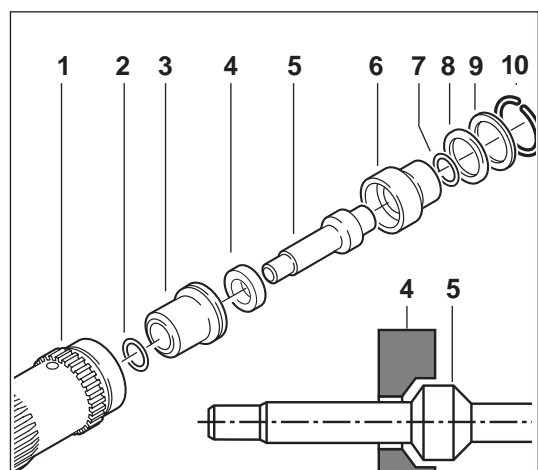
- ☞ From date of manufacture 01/96 the spindle is provided with service borings for easy removing of the locking ring (7). Older spindles must be exchanged for new ones.
- 1 Push the O-rings (8) onto resp. into the pressure sleeve (5).
 - 2 Fit the brake disk (2), the O-ring (3), and the pressure sleeve (5) to the plunger (4) and insert them into the spindle (1).
 - 3 Insert the washer (6) into the spindle until on top of the O-ring.
 - 4 Press the locking ring (7) with a used cylinder into the spindle until the locking ring engages. Visual check!



11

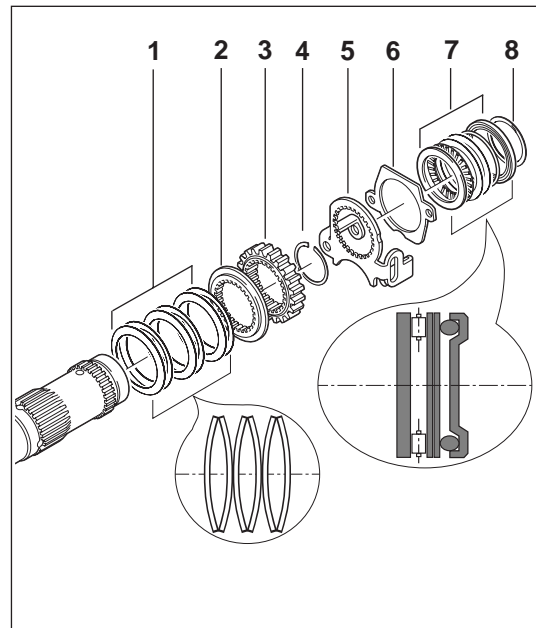
Assembling the spindle (mounting the inner parts) only applicable for PHE 3 X

- 1 Insert the O-rings (2) and (7) into the pressure sleeves (3) and (6). Fit the ring (8) to the pressure sleeve (6).
- 2 Press the pressure sleeve (3) into the spindle (1).
- 3 Push the brake ring (4) and the pressure sleeve (6) over the plunger and insert them into the spindle (1).
- 4 Insert the washer (9) into the spindle until on top of the O-ring (8).
- 5 Press the locking ring (10) with a used cylinder into the spindle until the locking ring engages. Sight control through the service



Assembling the spindle (mounting the outer parts)

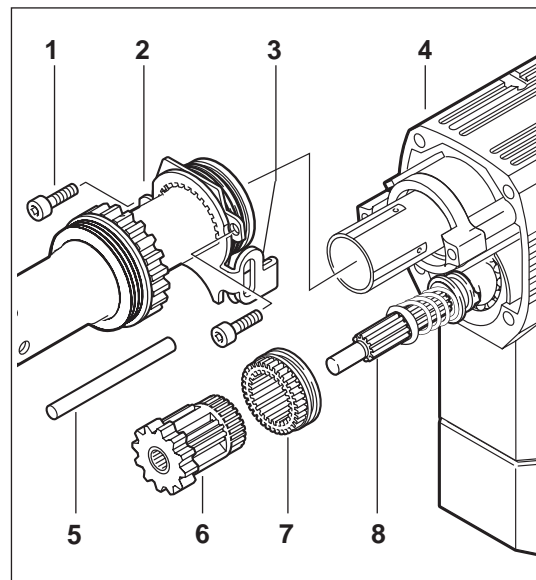
- 1 Mount the disk springs (1) with the bulgings head-on (see illustration).
- 2 Mount the clutch (the ratchet (2) with indentations against the tootthing of the spindle wheel (3)).
- 3 Fit the locking ring (4) and press it on against the pressure of the disk springs.
- 4 Mount the locking slide (5) and the retaining clip (6).
- 5 Mounting the rear thrust bearing (7):
- profile ring with damper-O-ring
- two compensating washers
- thrust bearing
- washer
- 6 Secure the rear thrust bearing (7) with the special locking ring (8).



12

Mounting the spindle

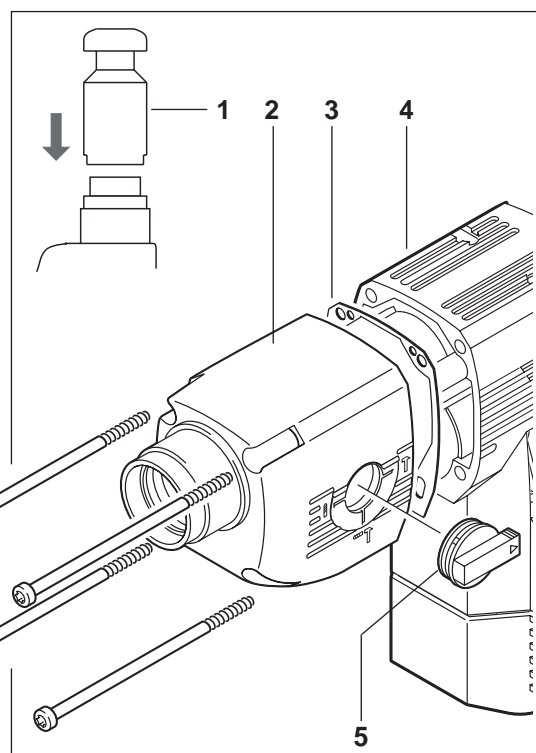
- 1 Fit the spindle (2) to the motor housing (4) and fasten it with two screws (1) (6 Nm, additionally secure it with screw locking device).
- 2 Push the ring gear (7) over the back gear shaft (8) and let it engage in the locking slide (3).
- 3 Push the planetary gear (6) onto the back gear shaft and fit them into the ring gear (7).
- 4 Push the straight pin (5) through the locking slide (3) and insert it into the motor housing (4).



13

Mounting the gear housing

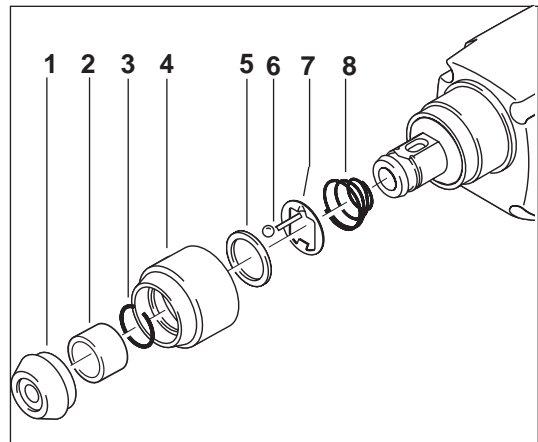
- 1 Insert the sleeve (1) (service tool No. 4931 5990 38) into the gear housing (2) (the sleeve protects the rotary shaft seal in the gear housing from damage during assembly).
- 2 Fit the gasket (3) to the motor housing (4).
- 3 Fasten the gear housing (2) to the motor housing (4) and fix it with screws (2,5+5 Nm).
- 4 Fit the switch lever (5) (mount it in the "hammer" position, the pin must grasp the elongated hole of the locking slide).



14

Mounting the SDS-plus Reception (applicable for PHE 3)

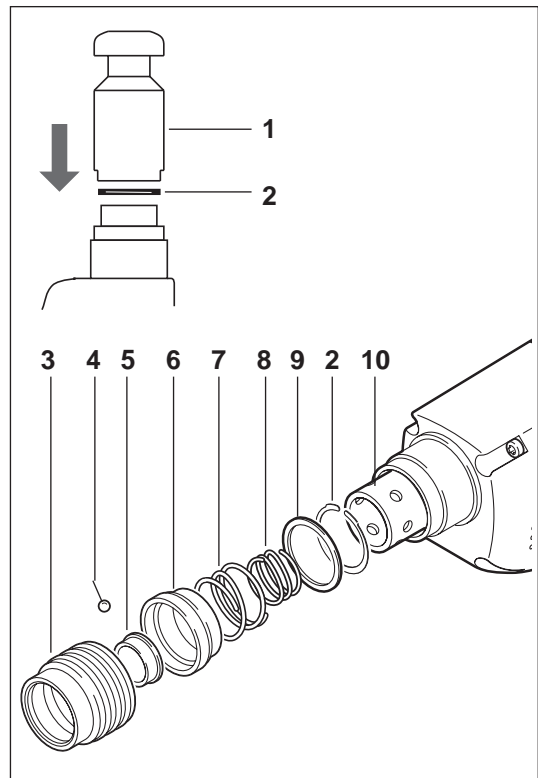
- 1 Insert the spring (8) and the retaining disk (7).
- 2 Depress the retaining disk (7) and insert the ball (6).
- 3 Fit the retaining ring (5) and the sliding sleeve (4).
- 4 Depress the sliding sleeve and insert the seal ring (3) into the pass.
- 5 Fit the spacer (2).
- 6 Push down the sliding sleeve and fit the rubber (1).



15

Mounting the FIXTEC-reception (applicable for PHE 3 X)

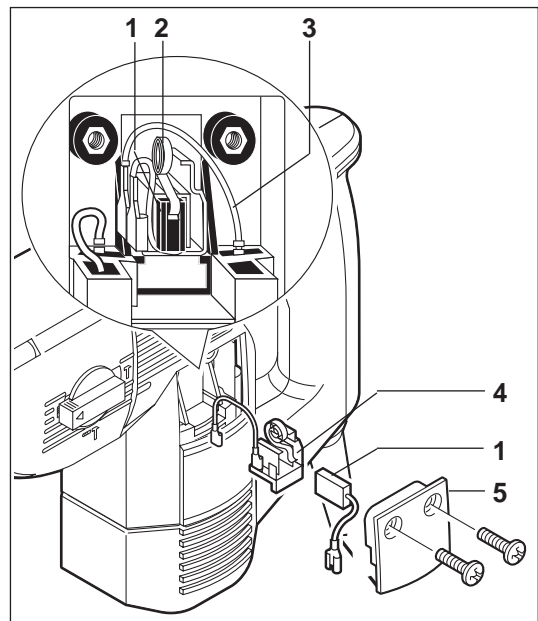
- 1 Press in the seal ring (2) with aid of a sleeve (1) (service tool No. 4931 5990 38) until it engages.
- 2 Fit the following parts in this order:
 - washer (9)
 - inner spring (8)
 - outer spring (7)
 - locking ring (6)
- 3 Depress the locking ring (6) and insert the balls (4).
- 4 Insert the ejector ring (5).
- 5 Depress the locking ring (6) (take care that the balls cannot fall out) and press in the ejector ring (5) with a used SDS-plus adapter.
- 6 Press a locking ring into the spindle in order to secure the ejector when mounting the locking sleeve (3).
- 7 Fix the locking sleeve (3).
- 8 Remove the locking ring fitted too secure the ejector.



16

Mounting the carbon brushes

- 1 Insert the brush holder (4) into the housing and connect the cable (3) with the field.
- 2 Insert the carbon brush (1) into the brush holder and put the spring (2) onto the carbon brush. Fit the flat plug.
- 3 Fasten the service cover (5) with screws.



17

Test run and electrical examination

Carry out a test run and check for strange noises.
Carry out an electrical examination. (See chapter Electrical and Mechanical Test Instruction).