FLYGT

4410
4430

WORKSHOP MANUAL

Flygt

ITT Industries

890826/02

PRODUCTS INCLUDED

Standard versions	Specially approved versions (Ex)
4410.011 **4430.010**	**4410.090** **EEx d IIB T4** **4430.090**

CONTENTS

HOW TO USE THE WORKSHOP MANUAL

This workshop manual describes how mixers 4410.011 and 4430.010 are taken apart and put together in connection with service and reconditioning work. The manual is divided into four main parts: MOTOR, GERA CASING, OIL CASING and PROPELLER. This enables limited jobs to be performed in the mixer with a minimum numer of work operations.

This operative part of the manual have a description of the operations and numbered illustrations of different work operations.

In the end you will find exploded views.

Details are also provided of the special tools which do not only facilitate repair work but which are sometimes necessary in order to carry out a particular operation.

We would also like to point out that the practical work involved in compiling this manual has been performed under extremely favourable conditions. We have dismantled and assembled a brand new product. A product which has been in use for a longer period of time has acquired a “patina” and other working methods besides those recommended here will sometimes have to be used.

If the product is specially approved, please read the chapter “Specially approved machines”.

Flygt renounces all responsibility for work done by untrained, unauthorized personnel.

SAFETY PRECAUTIONS

Before starting work on the machine, make sure that the machine is disconnected from the power supply and cannot be energized.

Make sure that the machine can’t roll or fall over and injure people or damage property.

Make sure that the lifting equipment can handle the weight you want to lift and that it is in good condition.

Keep out from suspended loads.

In order to minimize the risk of accident in connection with service work, the following rules should be followed.

- **Carry out the work on a sturdy work bench.**
- **Bear in mind the danger of electrical accidents.**
- **Bear in mind health hazards. Observe strict cleanliness. When carrying out repair work take care to avoid injury by cutting or pinching.**
- **Make sure you have a first-aid box near at hand.**
- **Check that tools and other equipment are in good condition.**

Follow all other health and safety regulations, local codes and ordinances. See also the Installation, Care and Maintenance manual, chapter “Installation, safety precautions”.

General rules

Wash the outside of the machine thoroughly and blow it dry.

Clean all parts throughly – particularly O-ring grooves – before assembly.

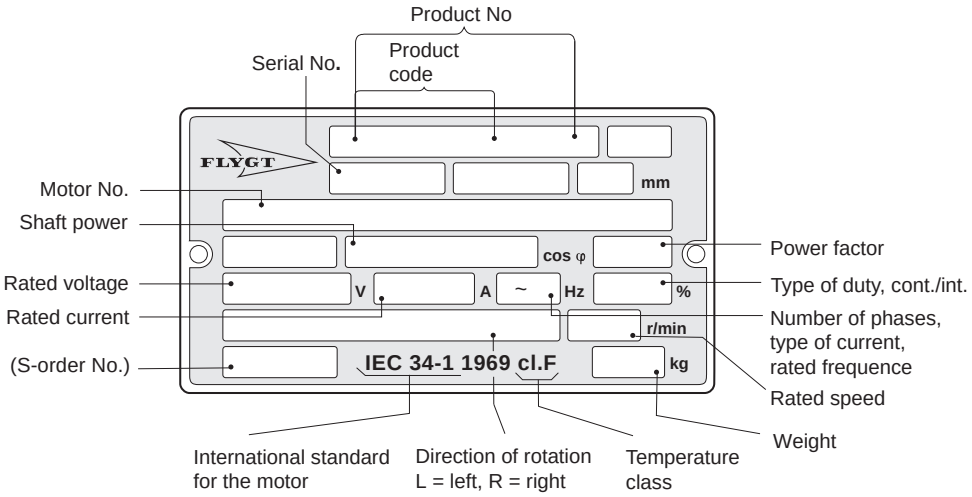
Always change all O-rings, other seals and gasket and lock washers.

Lubricate moving parts, O-rings and shaft seals.

Across-flats widths are given in brackets.

DATA PLATE INTERPRETATION

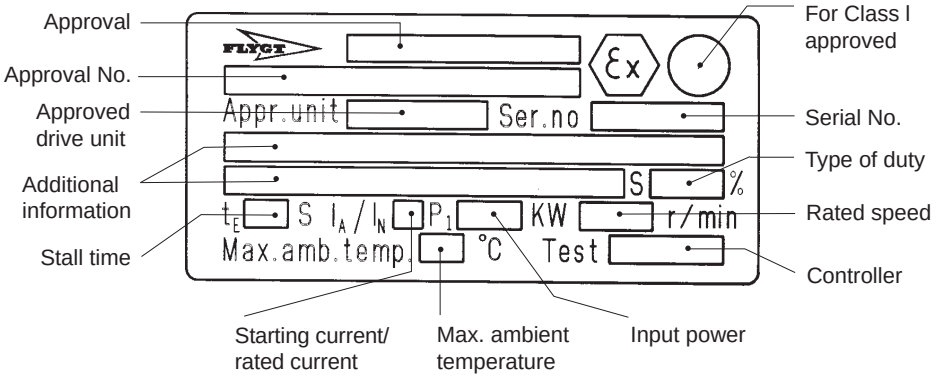
General data plate



Approval plates

Always together with the general data plate.

EN-data plate



TECHNICAL DATA

For weights, amperages, voltages, power ratings and propeller speed, see the mixer's data plate.

Tightening torques

Propeller unit	
Blade	80 Nm
Hub screw	140 Nm
Oil (inspection) screws	20 Nm

See also exploded views, page 42 and 46.

Winding resistances at 20°C (68°F)

4430.010				4410.011			
Stator	Resistance Ohms/phase	Stator	Resistance Ohms/phase	Stator	Resistance Ohms/phase	Stator	Resistance Ohms/phase
344 86 12	0.74 (½-phase)	310 11 12	0.87 (½-phase)	408 40 12	1.66 (½-phase)		
27	0.28	27	0.33	27	0.7	427 11 27	0.33
28	0.77	28	1.03	30	6.9		
29	0.87	29	1.23	32	2.7*	32	6.15
32	0.98	30	3.40	34	3.2	34	7.45
34	1.19	32	1.35	38	9.9	38	23.0
35	3.10	34	1.56	40	7.5	40	7.0
38	3.70	35	3.80	43	4.0	43	9.3
40	3.35	38	4.60	51	6.4	51	14.5
44	4.60	40	4.10				
50	5.95	44	5.70	1-phase		1-phase	
55	7.6	50	8.60				
58	11.5	52	8.80	397 86 14	1.9	408 40 12	1.66 (½-phase)
		55	9.30				
		58	14.2				

* For 60 Hz: 2.65

Lubricants

Order No	Description
90 17 52	Paraffin oil (Mobil oil Whiterex 309)
90 17 58	Gear oil (Mobil SHC 630)
90 20 58	Bearing grease (Mobilith SHC 460)

TECHNICAL DATA

Tools

Order No	Description	Use
84 08 02	Circlip pliers, SgA 19–60 mm	Motor shaft
84 08 09	Circlip pliers, SgH 19–60 mm	Intermediate shaft
84 08 11	Circlip pliers, SgH 85–165 mm	Gear casing
84 08 20	Circlip pliers, SgA 19–60 mm	Outer seal
84 10 16	Ratchet handle	Sockets
84 11 35	Combination wrench N8	Cable entry (OD min 20 mm)
84 11 56	Combination wrench N41	Cable entry (OD max 20 mm)
84 13 01	Hexagon bit socket n[1)] = 14 mm	Hub screw
84 13 03	Hexagon bit adapter N = 5	Earthing screw
84 13 04	Hexagon bit socket n = 6 mm	Stator casing
84 13 05	Hexagon bit socket n = 8 mm	Oil housing
84 13 06	Hexagon bit adapter n = 10	Stand
84 13 62	Puller compl.	Bearing
84 13 63	Puller compl.	Outer gear
84 13 91	Socket wrench N = 18	Outer gear
84 13 95	Socket wrench N = 16	Insp. plug
84 13 96	Socket wrench N = 24	Prop.blade screw
84 15 03	”C” hook wrench 45 mm	Intermediate shaft
84 15 14	”C” hook wrench 68–75 mm	Outer gear nut
84 15 64	Torque wrench 50–225 mm	Hub screw
84 16 89	Pin-punch set 3–8 mm	Outer seal unit
84 16 50	Screw driver (Tip = 1,2×8 mm)	Cable entry (OD min 20 mm)
394 69 00	Stator puller	Stator handling
398 60 00	Mounting socket L 85/95	Outer seal
403 90 00	Stator puller unit	Stator removel
464 68 00	Puller compl.	Intermediate shaft
477 60 00	Puller compl.	Motor bearing housing
477 78 00	Screw	4410 Oil housing
477 79 00	Mandrel	Lip seal prop. shaft
477 80 00	Mandrel	4430 Outer oil housing
486 14 00	Sleeve part	Intermediate shaft (prop. code 1, 4, 5)
486 14 01	Sleeve halves	Intermediate shaft (prop. code 2, 3, 6, 7)
486 15 00	Ring	Intermediate shaft
—	Open-end wrench n = 41 mm	

[1)] ”n” across flats width

ELECTRICAL CONNECTION

Note for Ex version

Specially approved mixers may only be repaired and adjusted by Flygt workshop and/or workshop personnel authorized by Flygt.

Monitoring equipment

Three thermal contacts are incorporated in the stator and are normally closed. The thermal contacts can be connected to maximum of 250 volts, breaking of 4 amps. current at maximum.

Connect the thermal contacts to the starter.

Thermal contacts must be used on Ex-approved machine due to approval conditions.

Capacitive leakage sensor CLS-30

A plate in the junction box shows that the machine is equipped with sensors.

The CLS-30 sensor is installed in the bearing holder and goes down into the oil casing. The CLS-sensor is not applicable to Ex-approved machines.

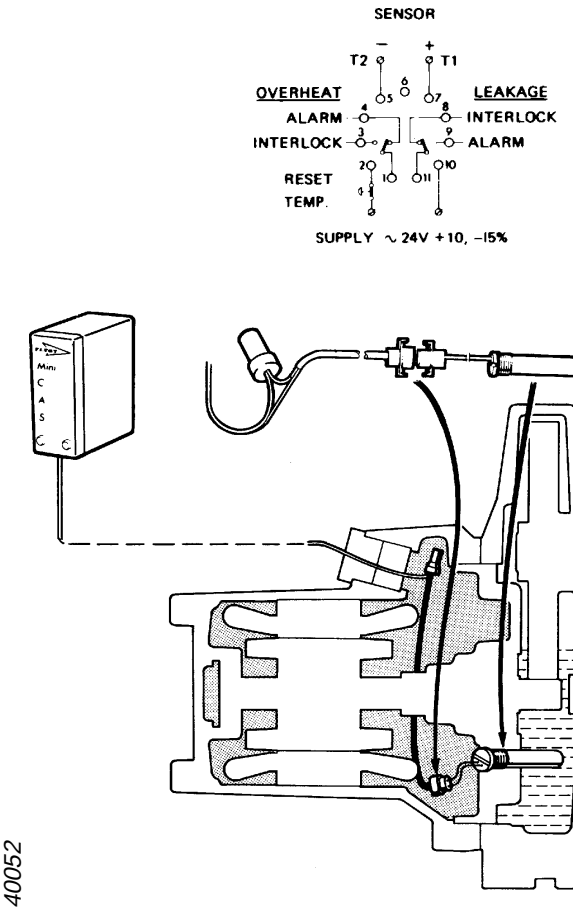
The sensor is connected in series with the stator's thermal contacts. They are connected on installation to an alarm relay, type MiniCAS, in accordance with the following diagram.

IMPORTANT! Be careful when removing the machine's motor unit not to damage the leads. Disconnect the leads before the rotor assembly and the stator casing are separated completely. Also be careful not to damage the sensors.

Make sure that the leads are not pinched during assembly.

Observe that the CLS cover is made of glass and can cause personal damage.

Capacitive leakage sensor CLS-30
(built in version).



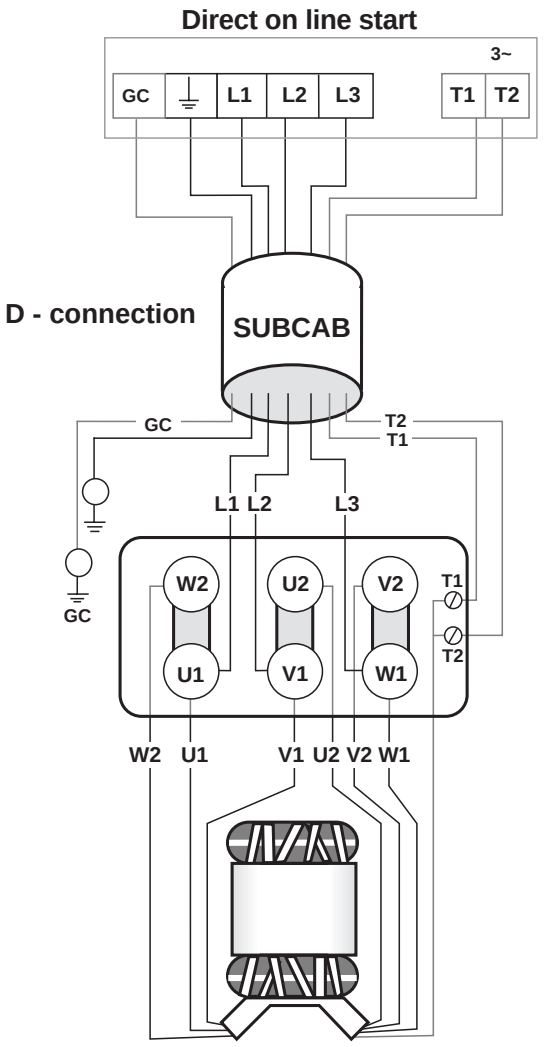
ELECTRICAL CONNECTION

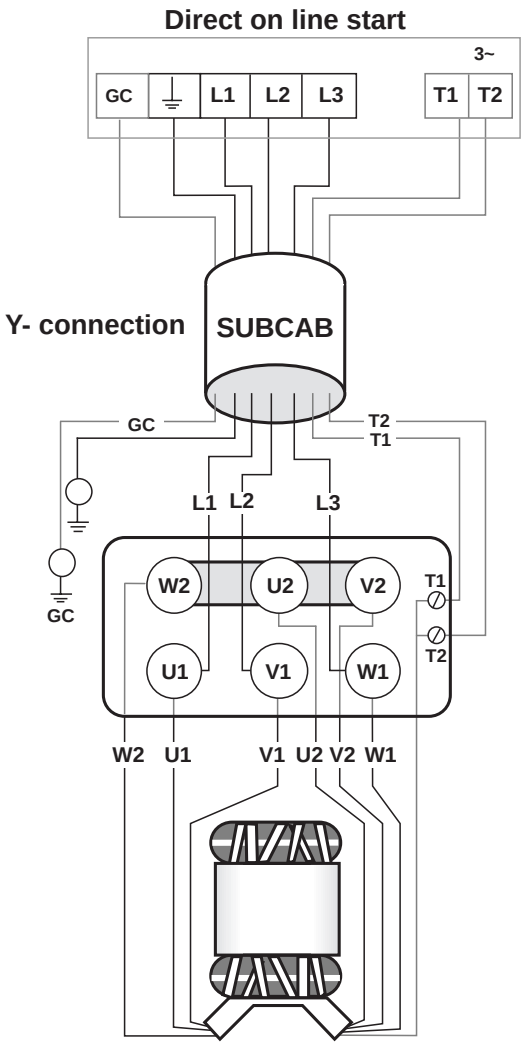
Connection of the stator leads and the motor cable

Connect the stator leads and the motor cable as shown in the wiring diagrams.

NOTE! For safety reasons, the earth lead should be longer than the phase leads. If the motor cable is jerked loose by mistake the earth lead should be the last to come loose from its terminal. This applies to both ends of the cable.

All electrical equipment must be earthed (grounded). This concerns the machine as well as any control or monitoring equipment. It is an extreme danger to life not to follow the above warning. Ensure that the ground connection is actually completed back to ground by testing the ground circuit.





Leads not in use must be isolated.

ELECTRICAL CONNECTION

Stator leads

Stator leads	Connection terminal board
red	U1, U5
brown	V1, V5
yellow	W1, W5
green	U2, U6
blue	V2, V2
black	W2, W6

Cable chart

Conductors	Connection starter	Connection terminal board
SUBCAB 4Gx+2×1.5 for direct on line start		
brown	L1	U1
blue	L2	W1
black	L3	V1
yellow/green	earth	earth
black T1	T1*	T1*
black T2	T2*	T2*

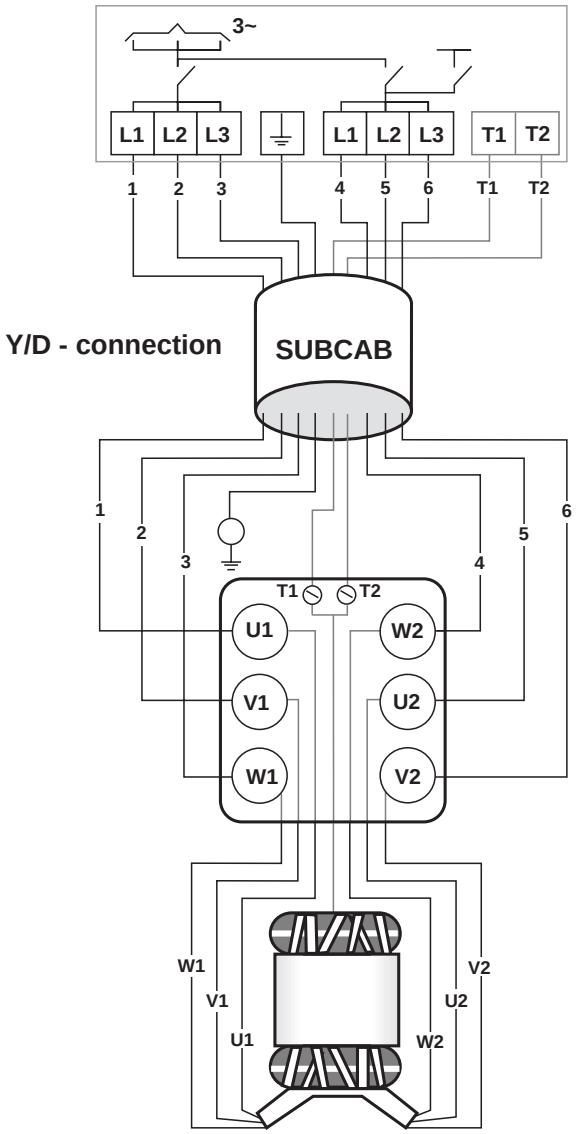
Conductors	Connection starter	Connection terminal board
SUBCAB® xAWG/7 for direct on line start		
red	L1	U1
white	L2	W1
black	L3	V1
yellow	GC**	GC**
yellow/green	earth	earth
orange	T1*	T1*
blue	T2*	T2*
SUBCAB® 7Gx+2×1.5 for Y/Δ start		
black 1	L1	U1
black 2	L2	W1
black 3	L3	V1
black 4	L1	W2
black 5	L2	U2
black 6	L3	V2
yellow/green	earth	earth
black T1	T1*	T1*
black T2	T2*	T2*

* Terminal for connection of thermal switches in motor and monitoring equipment.

** GC = Ground Check

Y/D start

Y/D - connection



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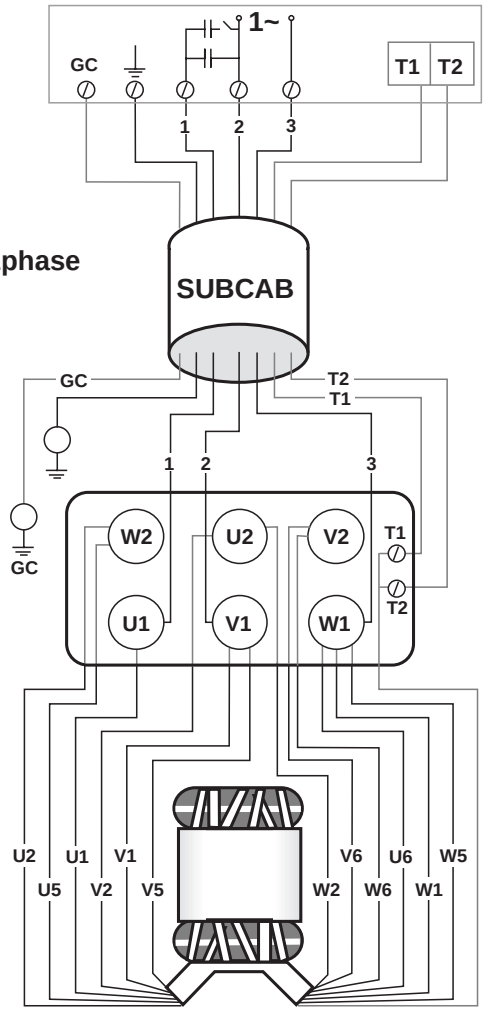

Leads not in use must be isolated.

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General rules

Wash the outside of the mixer thoroughly and blow dry.

Before starting the work on the machine, make sure that all tools are at hand and that O-rings and any other part that are to be replaced are set out. Clean all parts carefully, expecially the O-ring seats.

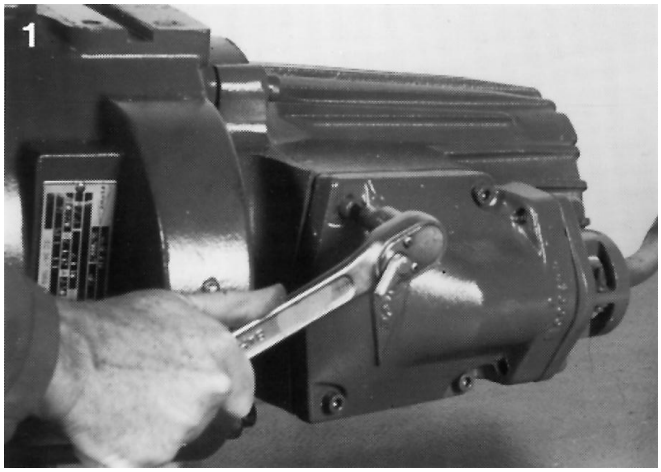
Lubricate all screws that have been removed before refitting them. Make sure that the product is isolated from the power supply before starting work. If the machine is specially approved, first read through the section “Specially approved machines”.

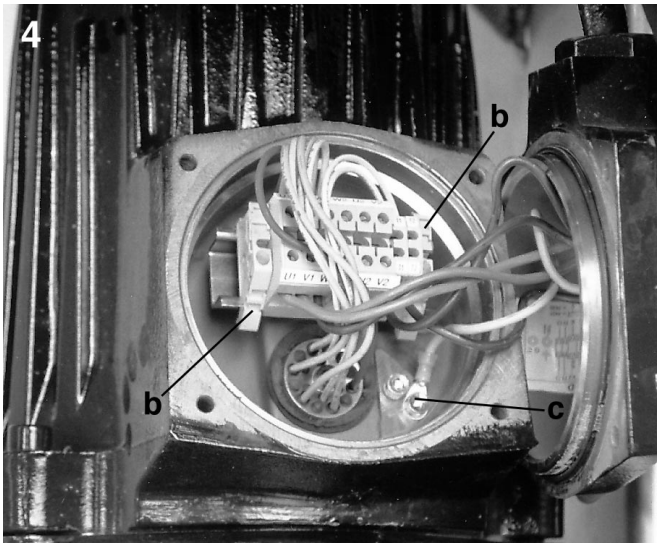
NOTE

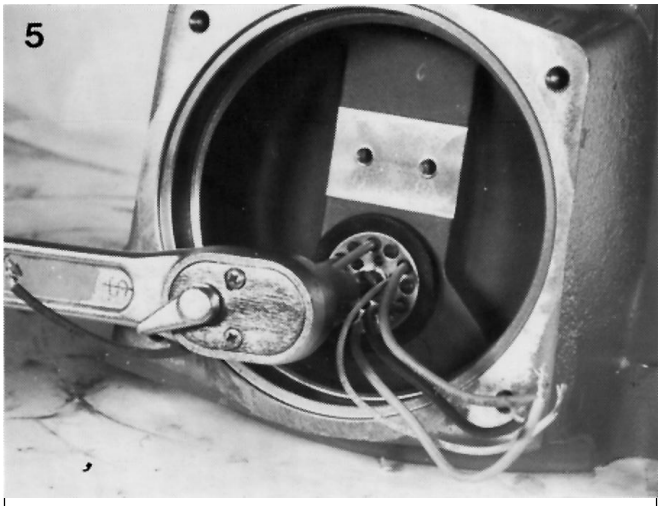
If only the motor is to be disassembled, the oil does not have to be drained.

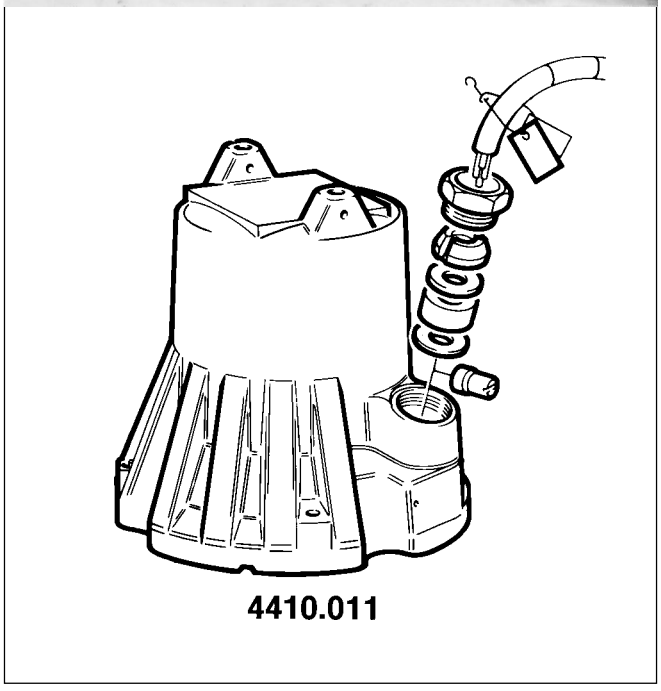
Touch up the anticorrosion coating during service.

4430.010









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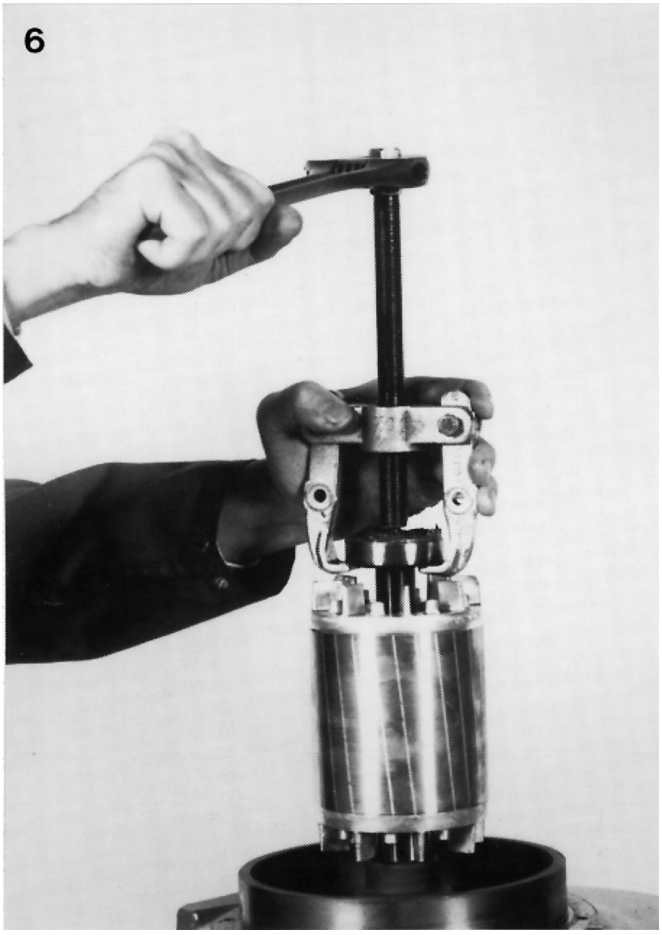
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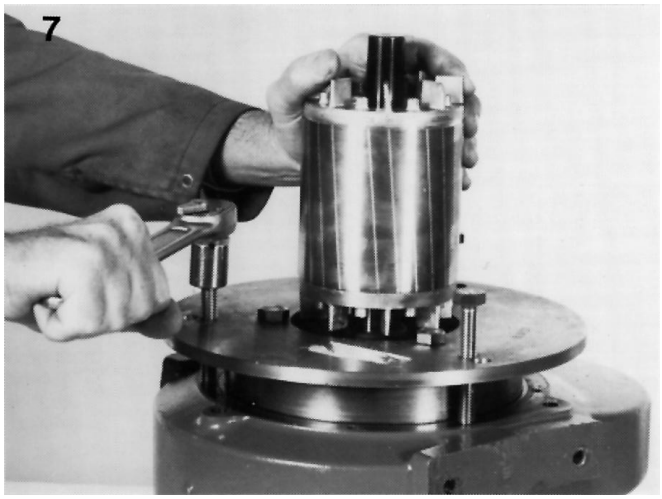
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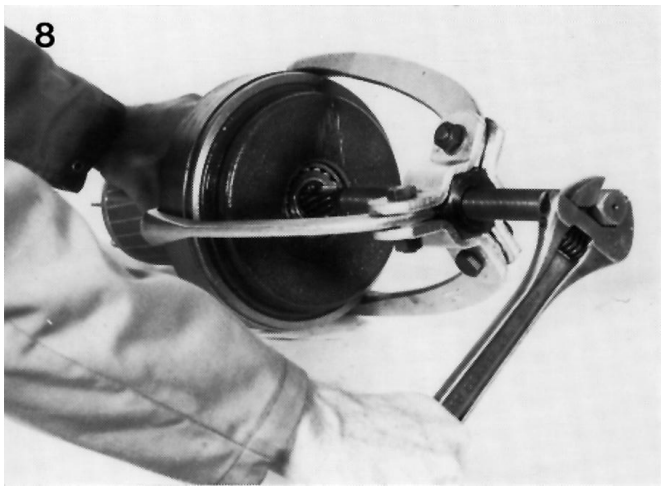
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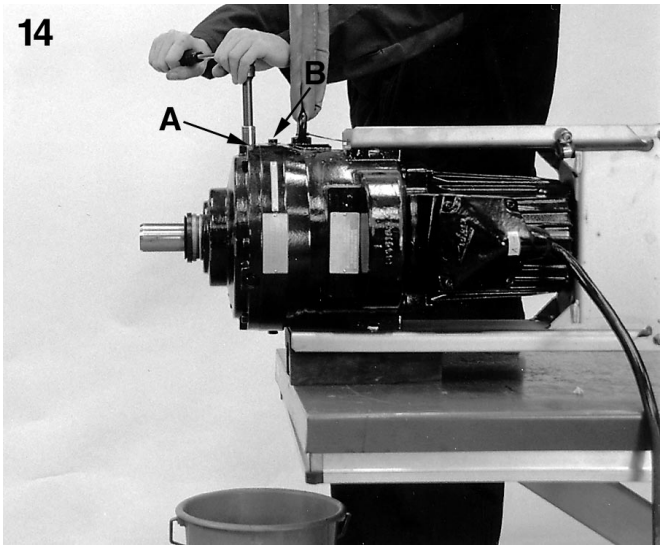

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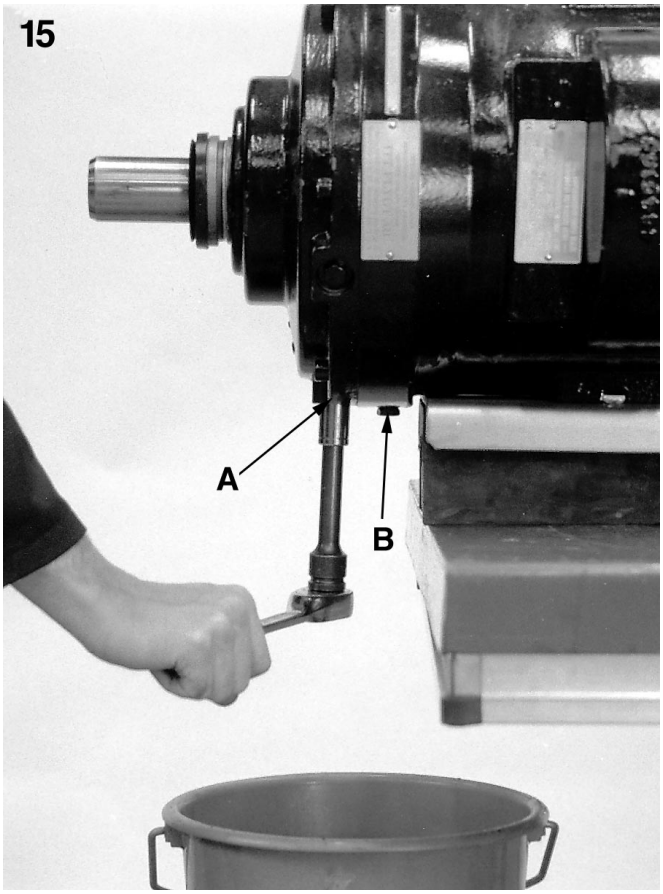

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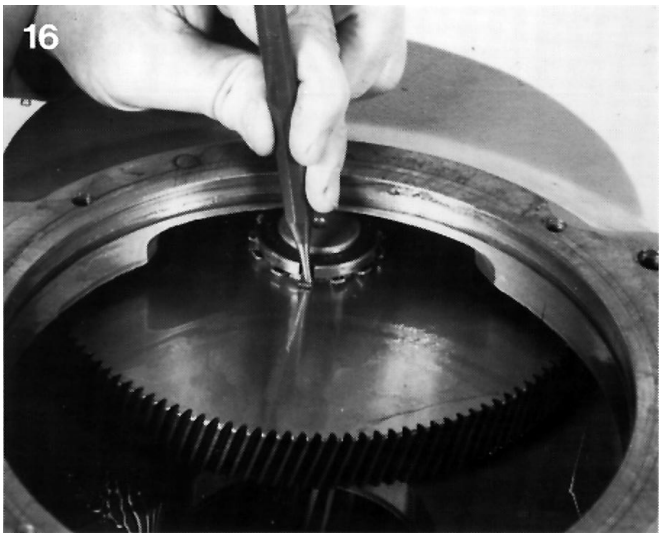

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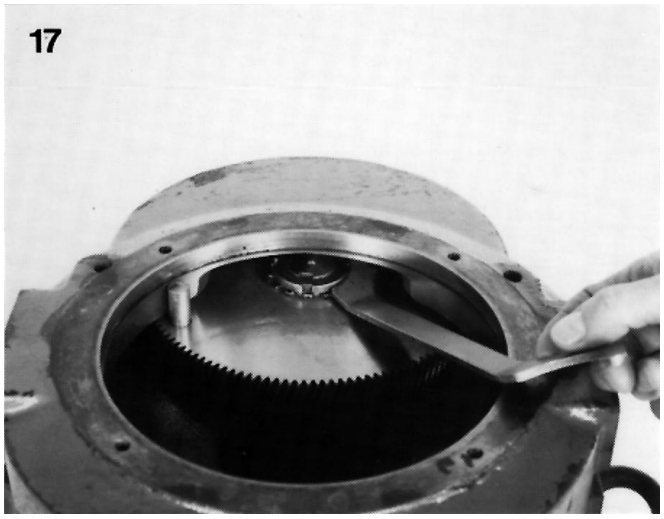

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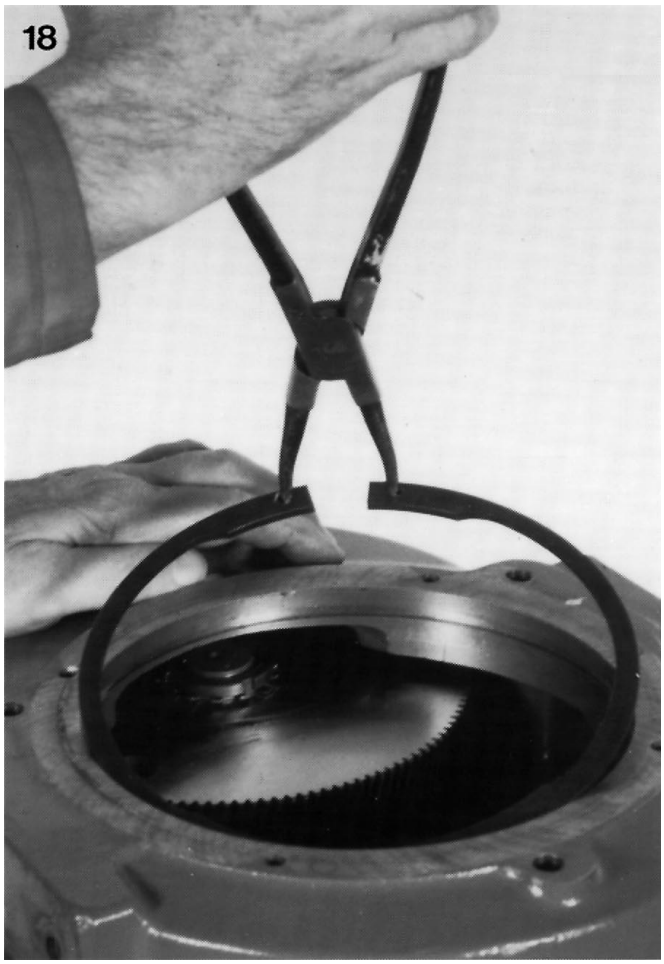

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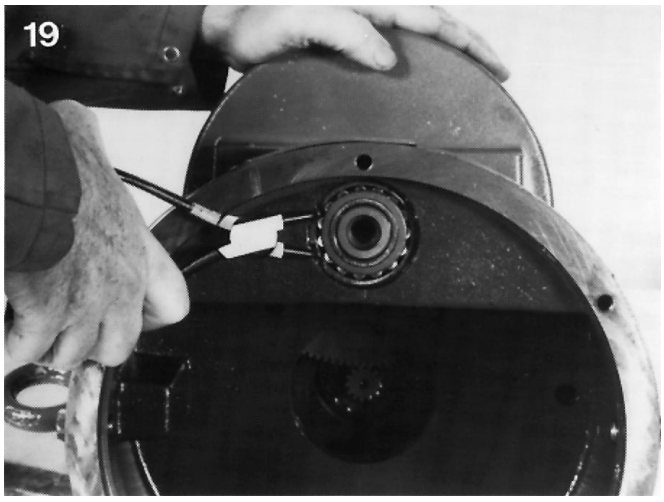

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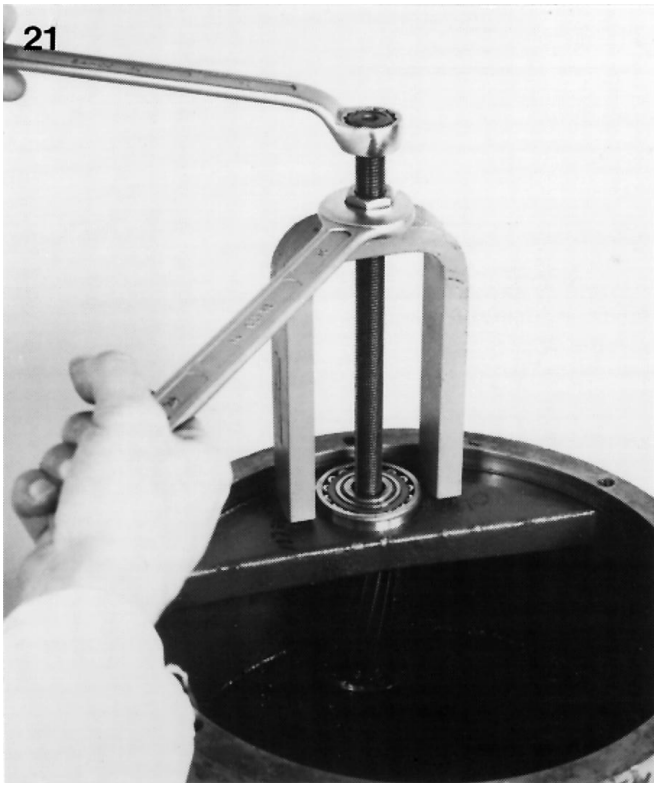

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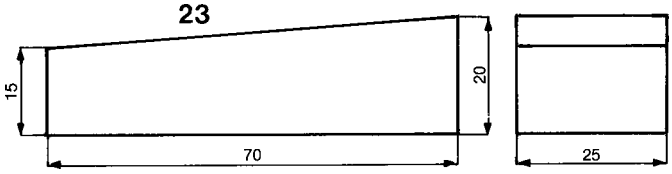

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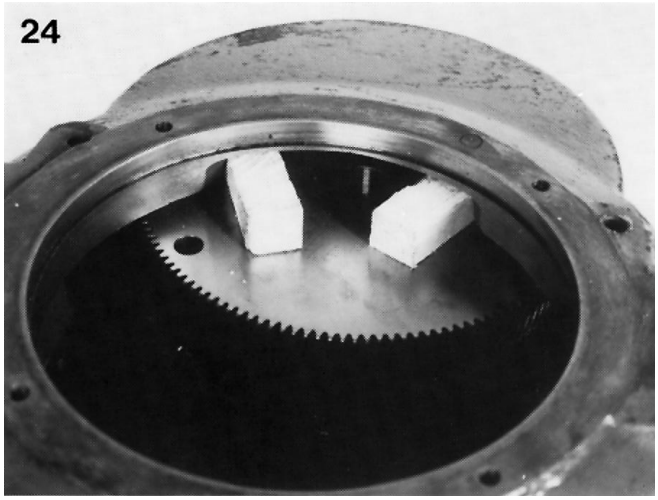

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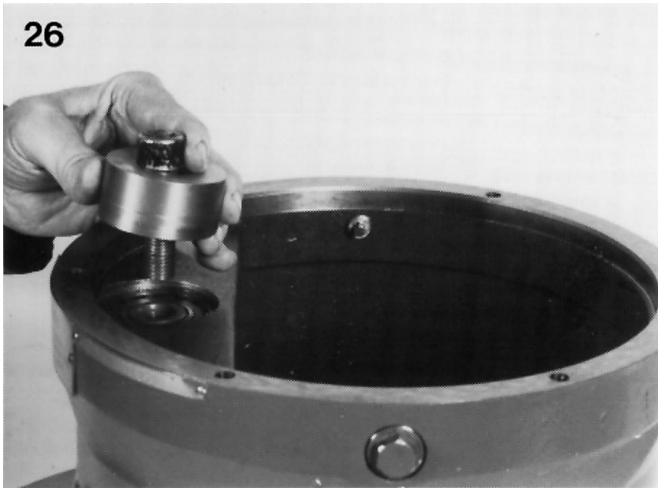

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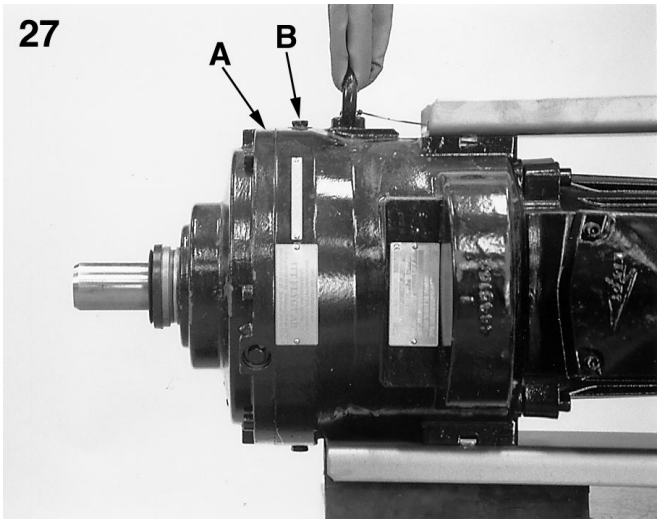

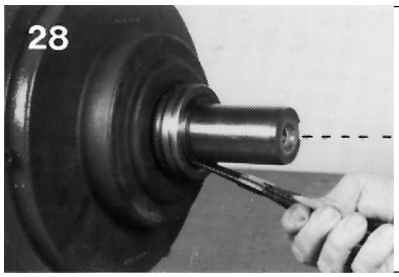
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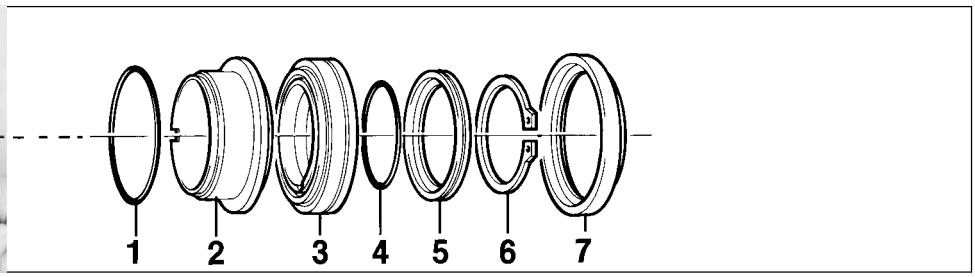
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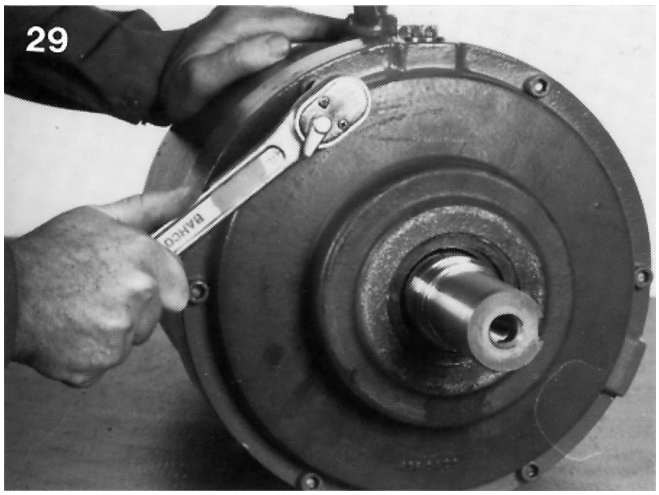
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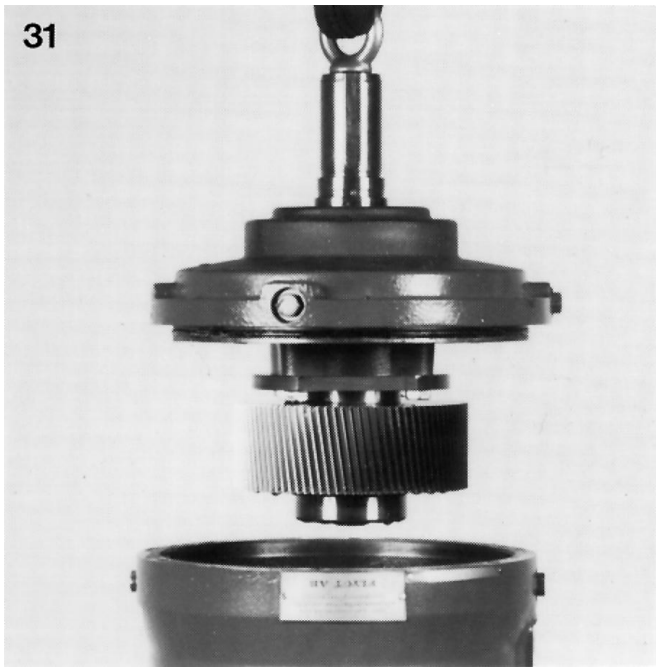
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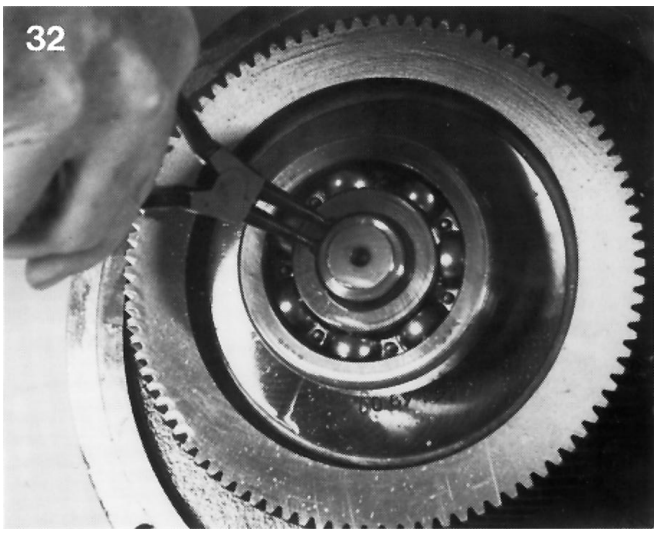
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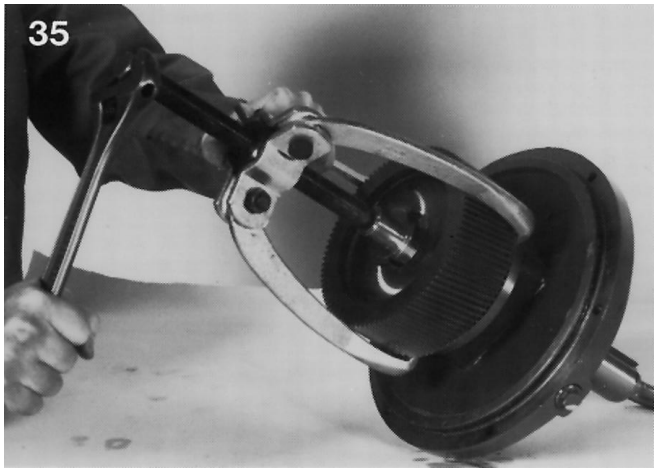
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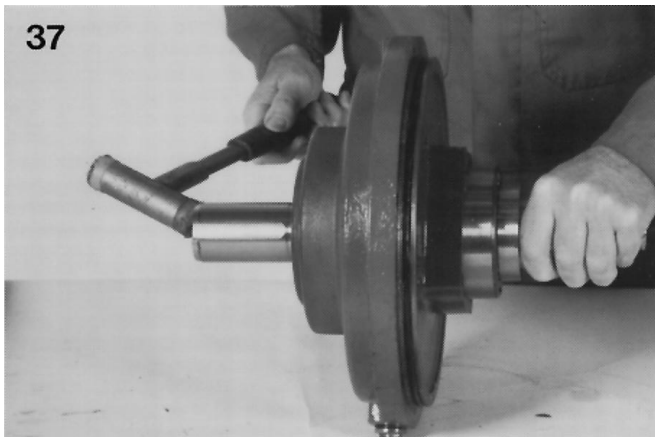
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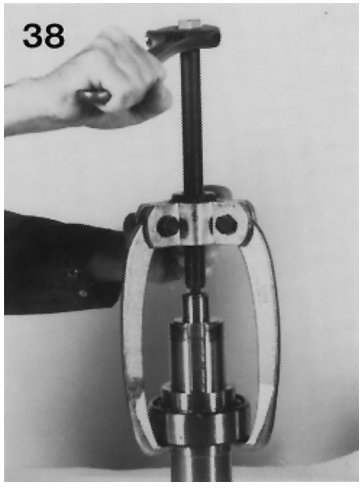
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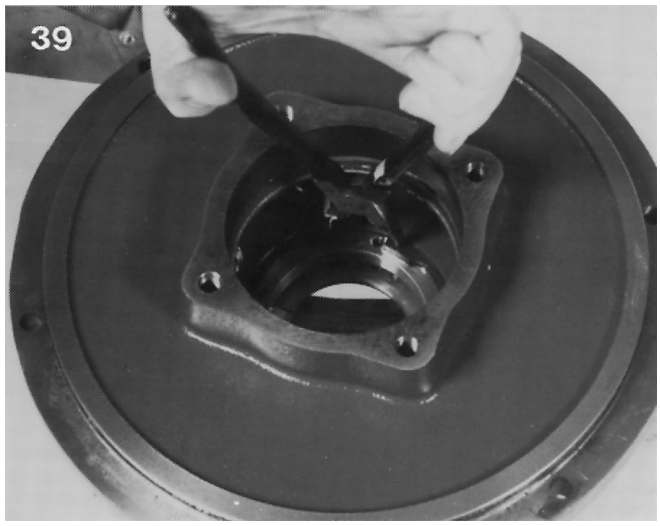
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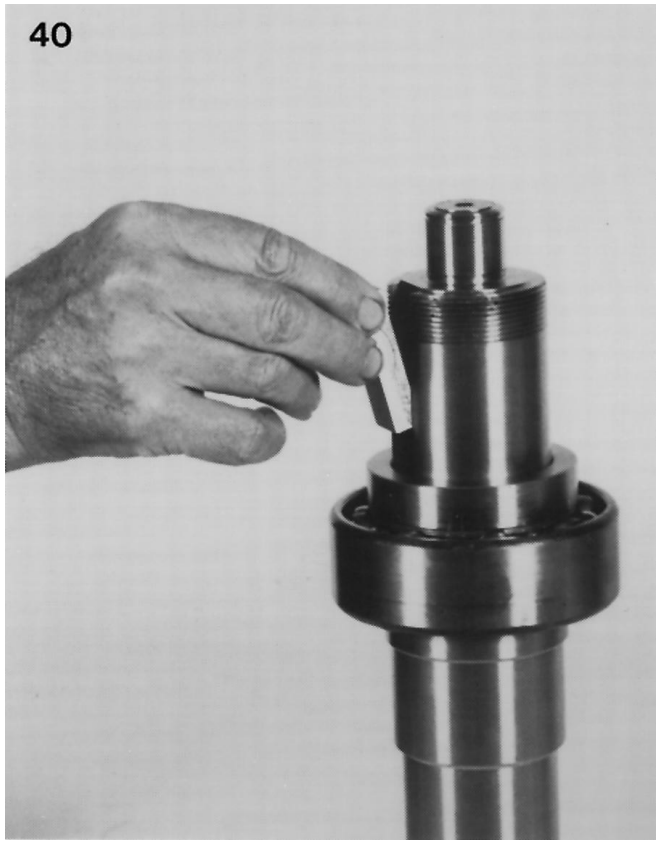
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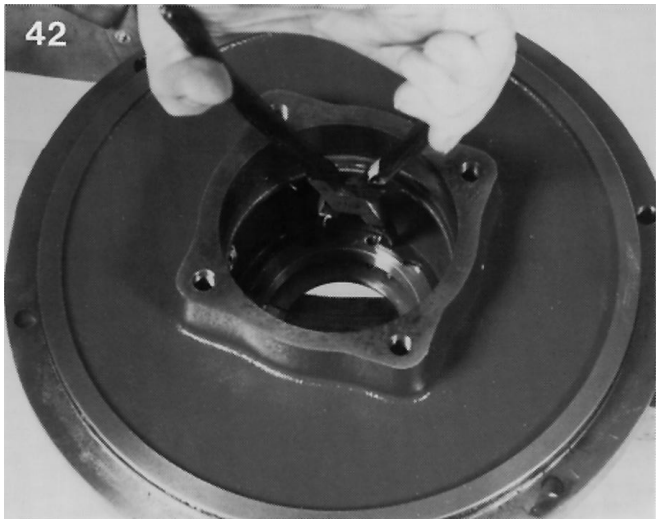
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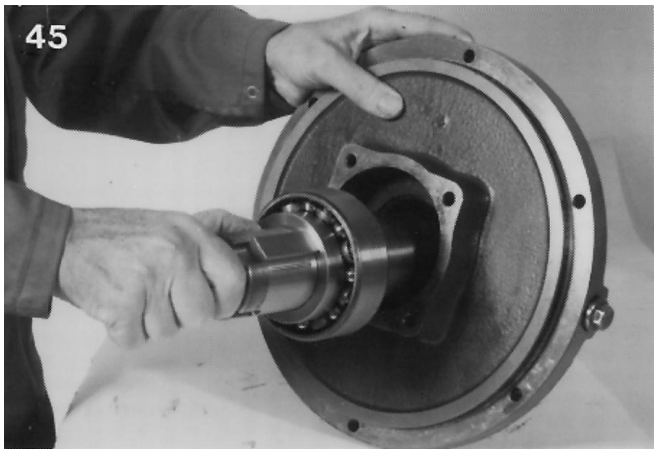
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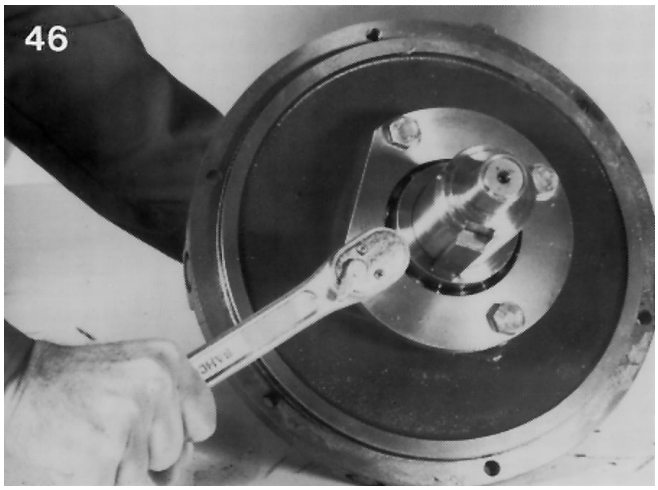
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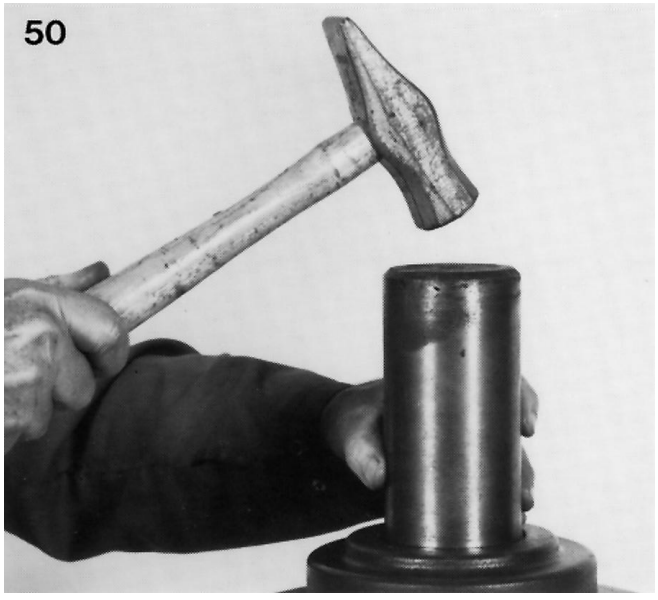
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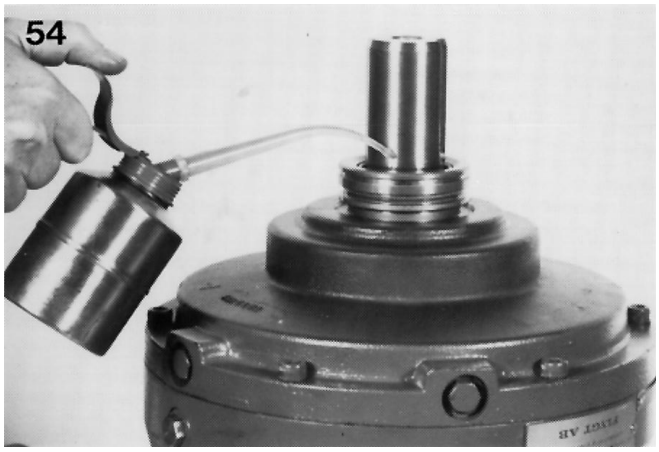
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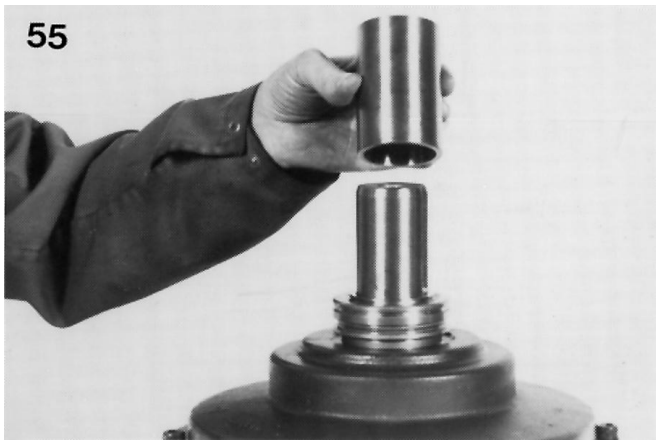
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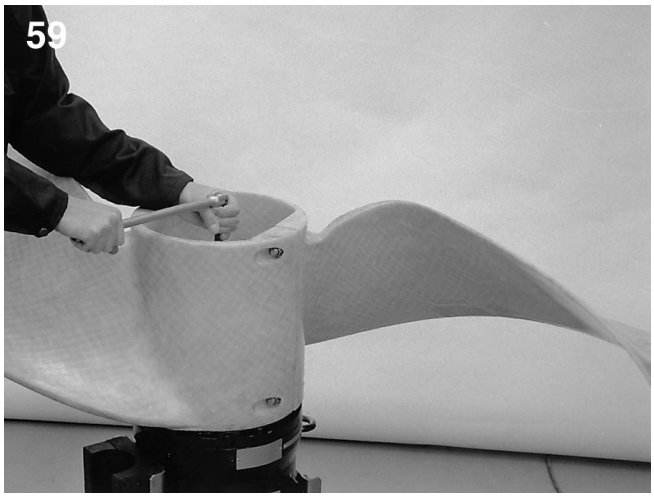
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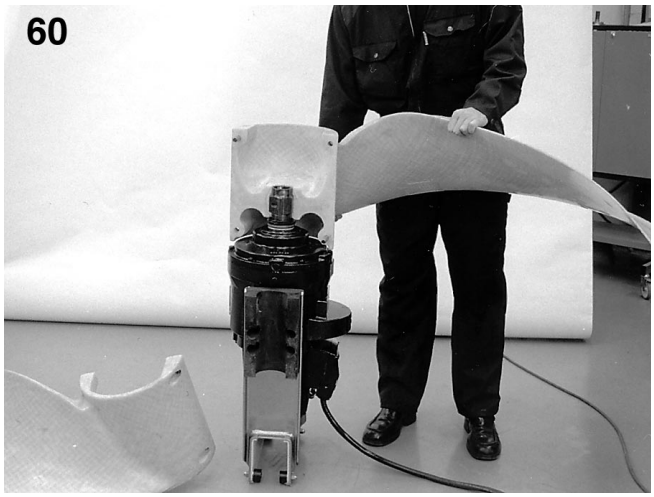
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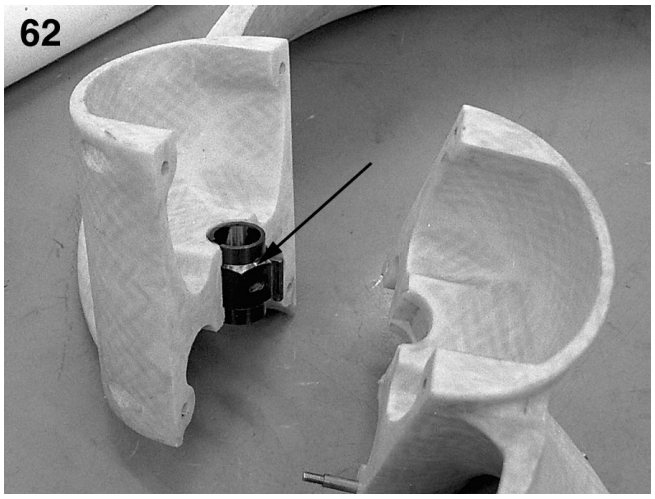
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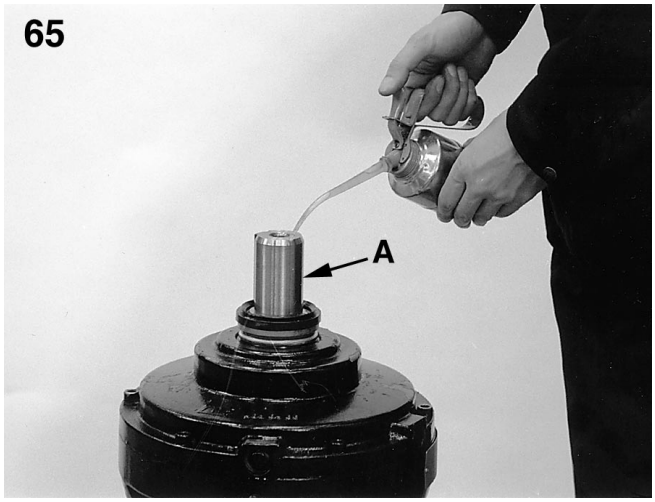
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MOTOR

Removal

- Place the mixer on the floor.
- Remove the screws (19 mm) that hold the stand and move it out sideways.

1 • Remove the retaining screws (hex socket 6 mm) on the junction box cover and remove the cover (not 4410).

- Undo the terminal screws and remove the motor cable.

2 • Remove the retaining screws (hex socket 10 mm) on the motor.

3 • Screv two M10 lifting eyes into the stator casing (not 4410) and livt it away. Note the O-ring.

Disassembly

Stator casing

- Place the stator casing on the workbench.

4 • Undo the terminal board by first removing the end stop (a).

- Pull out the clamps (b) – unscrew the earth clamp (c) (yellow/green).
- Remove the retaining screws on the rail (hex socket 5 mm).

5 • Remove the cable entry (hex socket 5 mm). On the 4410 – clip off the leads as close to the end sleeves as possible, undo the gland nut and pull out the motor cable.

- Apply tool 394 69 00 to the stator. Lift the stator (with casing) a couple of cm above the bench. Install LP gas torches (3 torches) distributed evenly around the stator casing. Heat rapidly (to about 150°C) until the stator lets go – lift out the stator.

Bearing holder

6 • Connect a puller to the upper rotor bearing and pull it off.

7 • Apply special tool 477 60 00 – tighten with 19 mm socket and ratchet handle. Pull off the bearing holder by tightening the screws alternatively a little at a time.

- Remove the large O-ring. Cover the gear casing so that no impurities enter the casing.
- Remove the circlip in the bearing holder.
- Remove the circlip on the shaft journal – then the spacer washer.

8 • Apply a puller to the bearing holder and press the shaft out of the bearing.

9 • Carefully tap the bearing out fron the bearing holder using a mandrel.

- Remove the lip seal – with washer.

Assembly

Wash all parts and casings internally with cleaning fluid and blow dry with compressed air. Oil all O-rings (new O-rings) and moving parts during assembly.

10 • Drive or press down the upper rotor bearing with a mandrel. The shaft has no shoulder – the bearing shall be aligned with the shaft end.

Alternatively, the bearing can be heated, and placed on the bench, after which the rotor shaft is pushed on from above.

> If the mixer is specially approved, the gap between the bearing holder and the distance sleeve should be measured as described in the section “Specially approved mixers”.

Bearing holder

11 • Put in the washer and push in the lip seal with a mandrel.

- Place the rotor on a clean surface with the long shaft end up.
- Push down the bearing holder over the shaft. On the 4410.011, the bearing holder cannot be pushed down far enough on the shaft. The bearing must therefore first be fitted in the bearing holder and the inner race heated prior to fitting on the shaft.
- Heat and put the large rotor bearing on the shaft journal.
- Pull off the bearing holder so that the large rotor bearing fits into its seat.
- Fit the bearing’s circlip.
- Put on the shaft journal’s spacer washer.
- Lock with the circlip.
- Place the bearing holder with rotor on the gear casing.

12 • Apply special tool 477 60 00 and press the bearing holder down into its seat. Tighten the screws alternatively – remove the tool.
• Heat the stator casing and fit the stator.
• Check that the O-ring in the stator casing's upper bearing seat is in place.
13 • Lower the stator casing and screw it to the gear casing.

> If the mixer is specially approved, the gap between the stator housing and the bearing cage should be measured as described in the section "Specially approved mixers".

Cable entry

• Thread the cable leads through the holes in the cable entry and press the cable entry into its seat.
• Fit the terminal board and connect the leads – see "Electrical connections".

GEAR CASING

Removal

Draining the oil

• Place the mixer on the workbench so that the draing plugs (3 plugs) on the gear and oil casings are accessible for drainage.
14 • Remove both filler plugs (17 mm). **Warning.** If there has been leakage into the oil casing, the oil may be under pressure. Hold a rag over the filler screw when undoing the screw in order to prevent oil splatter.
• Position a suitable vessel underneath the mixer (oil volume about 7 liters).
15 • Remove a drain plug (17 mm) below either casing and let all oil run out.
• Screw back both the filler plugs finger-tight.
• Tighten both drain plugs. NOTE the magnetic plug shall sit in the gear casing.

Remove the motor – see "MOTOR removal".

Remove the propeller – see "PROPELLER removal".

Remove the oil casing – see "OIL CASING removal".

Gear casing

Dissassembly

16 • Knock out the tab on the lock washer.
17 • Remove the ring nut with a hook wrench – remove the lock washer (the gear wheel can be locket with, for example, a screwdriver through the gear wheel hole and the oil hole in the intermediate wall).
18 • Remove the large circlip in the casing.
19 • Remove the circlip on the intermediate shaft bearing.
20 • Place the sleeve halves 486 14 01 (inside the casing) between the bearings on the intermediate shaft and tape the halves together. (Same principle as during assembly – see figure 25.)
21 • Apply the special tool to the shaft assembly – screw the spindle tightly into the shaft hole and pull out the shaft by screwing down the nut. NOTE, hold back the large gear while pulling.
• Remove the sleeve halves the key – and pull off the end bearing.
22 • Turn the shaft upside-down and pull off the journal bearing.
• Remove the circlip for the journal bearing in the gear casing.

Assembly

Intermediate shaft

• Heat one of the bearings and place it on the shaft journal – check that the bearing is flush upp against the shoulder.
• Repeat the procedure with the other bearing.
• Fit the key.

Casing

- Fit the rear circlip for the intermediate shaft bearing in the casing.

23 • Make two woode wedges as shown in figure 22.

24 • Put the large gear wheel in place and wedge it fast.

- Fit the assembly — apply the sleeve halves between the roller bearings — tape them together — see figure 20.

Position the shaft assembly — with the shaft journal down — above the seats. Make sure that the key fits into the keyway on the gear wheel and tap in the shaft until the lower bearing rests against the circlip.

25 Tap on an M16 screw threaded into the shaft.

26 For best results, use a special sleeve with screw.

- Remove the wooden wedges.
- Put on the lock washer — tighten the ring nut and knock in a suitable lock tab.

18 • Fit the large lock ring in the casing.

- Fit the circlip on the intermediate shaft bearing.

Fit the oil casing — see “OIL CASING fitting”.

Fit the motor — see “MOTOR fitting”.

Fit the propeller — see “PROPELLER fitting”.

27 • Fill with new oil: A, oil casing 1.5 litres paraffin oil type Mobil oil Whiterex 309.
B, gear casing 5 litres gear oil type Mobil SHC 630.

OIL CASING

Removal

- Drain the oil — see “GEAR CASING draining the oil”.

Seal

28 • Remove the rubber collar (7).

- Remove the circlip (6).
- Remove the outer ring (5).
- Remove the seal ring (3) with O-ring carefully.
- Remove the stationary ring (2).

29 • Remove the screws (hex socket 8 mm) that reatin the oil casing.

- Screw a lifting eye (M16) into the propeller shaft.
- Hoist up and place the mixer on the bench.

30 • Screw in the starting screws (19 mm) and tighten evenly until the casing comes loose.

31 • Lift off the oil casing with propeller shaft driver.

32 • Remove the circlip.

33 • Fit a puller on the propeller shaft bearing and pull off the bearing. Use a modified puller, 84 13 60.

NOTE! With certain pullers, it may be difficult to apply the jaws. Remove one jaw from the puller and then stick the jaw under the bearing. Then apply the other jaw under the bearing, screw the puller together and pull off the bearing.

- Knock out the tab on the lock washer.

34 • Pull off the ring nut.

- Remove the lock washer.

35 • Apply a puller to the output shaft driver and pull off the driver.

36 • Remove the screws (19 mm socket) on the washer and remove the washer. NOTE! The washer is milled flat on the periphery. Mark the location of the washer with a marking pen.
• Remove the shaft key.
37 • Tap out the output shaft using a plastic or rubber mallet.
38 • Apply the puller and pull off the bearing with spacer ring.
39 • Remove the upper lock ring in the casing.
• Remove the lip seal.
• Remove the lower lock ring in the casing.
• Lift off the ring with compression springs and the washer.

Assembly

Main shaft

• Heat the main bearing (NOTE position of filler groove) and place it on the shat journal — make sure that the bearing rests against the shoulder.
40 • Put on the spacer ring — and the key.

Oil casing

41 • Put in the washer (tabs down) and the ring with compression springs in the oil casing.
42 • Put in the lock ring (hold the screwdriver diametrically against the pliers and press down the lock ring).
43,44 • Push in the lip seal using tool 477 79 00.
• Put in the upper circlip.
45 • Push the main shaft into the casing so that the bearing rests on the circlip.
46 • Put on the washer. NOTE! Position of milled edge (marked).
• Tighten the screws (socket 19 mm). Tighten torque 57 Nm.
47 • Heat the large driver gear slightly and place it on the main shaft, making sure that the driver rests on the spacer ring.
• Put on the lock washer — tighten the ring nut (HN 12) and knock in a suitable tab on the lock washer.
48 • Heat the upper bearing and place it on the shaft journal — against the shoulder.
• Put on the upper circlip.
• Place the gear gasing on the workbench with the large gear wheel down.
49 • Screw an M16 lifting eye into the main shaft journal — lift the shaft assembly and lower it into the gear casing. Rotate the casing until it fits (the edge-milled washer only fits in one position). Screw on the casing.

Seal

• Remove the lifting eye in the shaft.
50 • Tap in the wear protector.
51 • Press in the stationary ring. Make sure that the grooves are aligned with the tabs in the compression spring washer. Rotate the ring and check tat it is in the right position.
52 • Put on the seal ring so that the groove fits together with the shaft's driving dog.
• Place the O-ring on the seal ring.
53 • Place the outer ring (with groove profile) on the shaft journal. The ring's smallest diameter shall face towards the shaft journal.
54 • Fill the space between the outer ring and the O-ring with oil.
55,56 Push the sleeve, 398 60 00, against the outer ring and press the ring down so that the O-ring comes into the right position (the circlip groove becomes accessible).

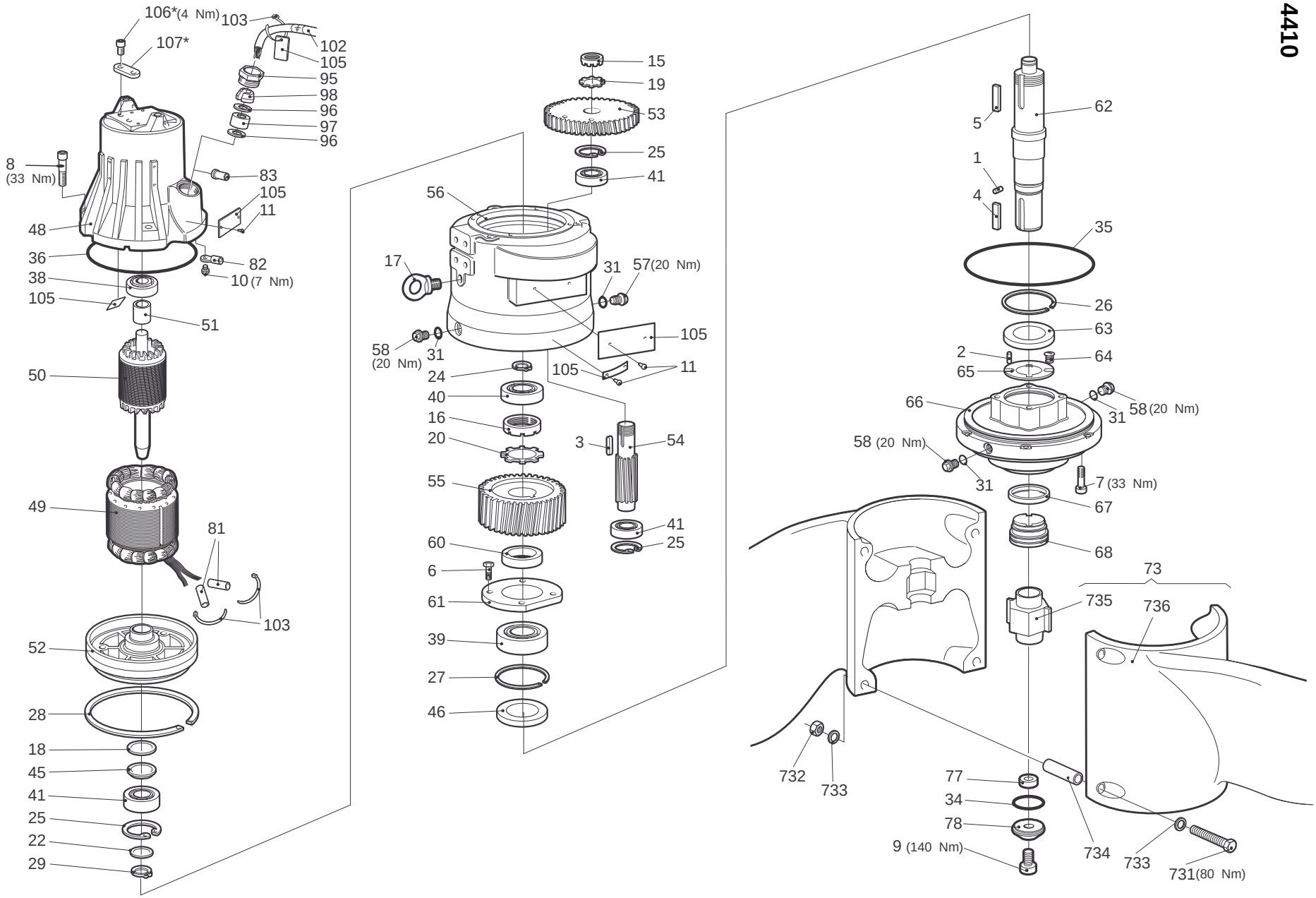
NOTE! Protect eyes and clothes against oil splatter during this operation.

57 Put on the circlip.

Fill with new oil — see "GEAR CASING figure 27".

EXPLODED VIEW

4410



The figures corresponding to the Part list
* only for Ex version

PROPELLER UNIT

Removal

Place the mixer on floor. Propeller pointing upwards.

58 Remove the four screws on the propellerhub.

59,60 Remove the centre hubscrew, be carefully secure the blade (consisting of two halves) not falling down.

61 Remove the hub.

Fitting

62 Place the blades on the floor and fit the hub into one of the blades.

63 Fit the blades together with the four screws, four sleeves, eight washers and four nuts.

64 Tighten the screws. Tighten torque 80 Nm.

NOTE! The scres must be follow-up draft within 6 mounth.

65 Fit the shaft key (A) and lubricate the shaft.

66 Lift on the propellerunit.

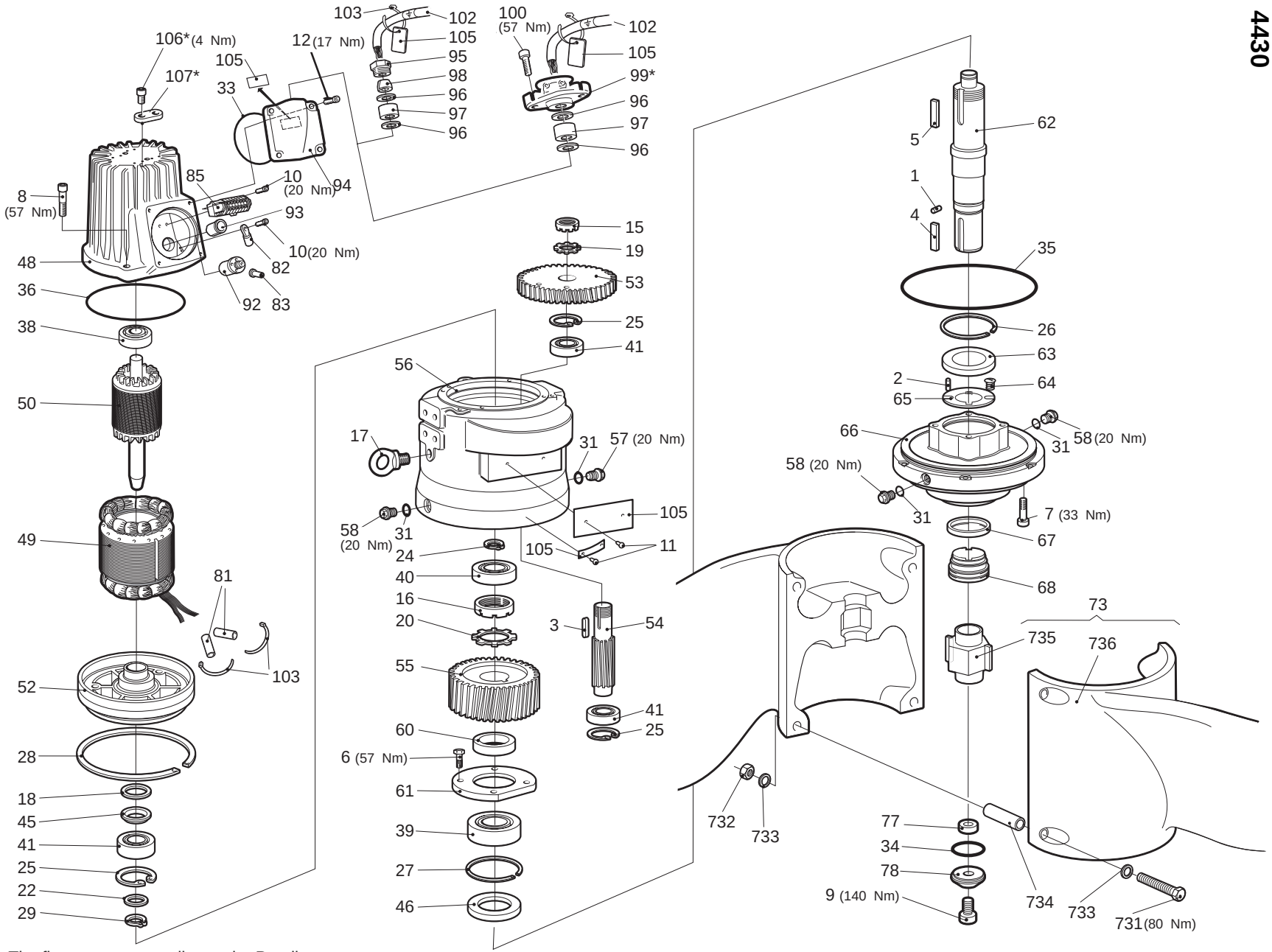
67 Fit washer and hub screw into the propeller.

Due to shrink fitness an extra long screw (M16) can be used in order to reach proper mounting.

68 Tighten the hub screw, tighten torque 140 Nm.

EXPLODED VIEW

4430



The figures corresponding to the Part list
* only for Ex version

SPECIALLY APPROVED MACHINE

This chapter describes the specially approved machine versions 4410.090 and 4430.090. For identification, see the mixer data plate and approval plate.

Specially approved machines may only be repaired and adjusted by Flygt workshop and/or workshop personnel authorized by Flygt.

General

In a specially approved product (explosion proof) the gaps between different parts, for example the bearing holder and the stator casing unit, shall prevent any sparks from the interior of the machine from getting out and igniting surrounding gases.

All joint withs and gaps shall be measured with accurate and calibrated instruments. All joint surfaces shall be inspected. No scratches, tool marks or the like are permissible.

Failure to meet the above requirements may render the special approval **invalid.** Note that the work requires experienced and specially trained personnel.

To ensure that the product complies with the regulations and approval of the authorities, use only genuine Flygt spare part when carrying out repair work.

Always check the dimensions of vital parts before assembly, see picture.

The assembled machine shall always be insulation-tested and test-run before delivery.

Workshop repair

The product must be thoroughly examined and a report must be prepared on all findings. Any measurements, dimensional checks, test regardings, details of materials, parts of windings which are found require attention should be carefully noted.

If the products have been modified and do not comply with original approval, the owner must be informed and further information on the application must be requested.

If there are any doubts during the repair as to the results of measurements, tests, the continued integrity of parts or possible reclamation of damage parts, reference must be made to your local Ex Coordinator.

Guidelines for repair

Dismantling

When dismantling Ex approved products, care must be taken as damage to flameproof faces can easily occur. For instance, if difficulties are found in separating spigoted joints, draw studs should be used wherever possible rather than trying to wedge the components apart, as not only will damage occur at the point of wedging, but the wedges are liable to be driven through and damage the flamepath surface of the spigot.

Similarly, care should be exercised when removing the main bearing assembly and bearing holder to ensure that damage does not occur on the parts that constitutes the flamepath.

Unless obviously damaged through either mechanical injury or dry or wet burn out, the stator winding should not be removed until preliminary testing has been done to determine the condition of the stator winding and monitoring devices, i.e. overtemperature thermal switches.

The users instruction should be consulted to verify whether the machine has been returned for repair because of electrical problems, such as operation of overload, short circuit or tripping out on an earth trip leakage device.

Once the machine has been completely dismantled, detailed examination of all parts should be made and a concise record kept of all findings.

Assembling

Before assembling an Ex approved product, measure the gaps and the joint widths. Inspect the joint surfaces and smear them with grease to prevent corrosion.

If a part does not meet the requirements on dimensional accuracy or surface finish, it must be discarded and a new specially approved part ordered. The new part must also be inspected.

Observe caution during assembly to prevent damage to the joint surfaces.

Flamepaths

Which parts as require special examination can be ascertained by refering to the Spare parts list and dimensional checks.

The flamepaths should be examined for any corrosive pitting or damage which may have occured.

All castings should be examined for blow holes or hairline cracks. If there is evidence that there has been an internal explosion of gases, this may be confirmed by the user and will probably be evident by smoke and debris tracking across the flamepaths.

SPECIALLY APPROVED MACHINE

Also violent damage will possibly have occurred to the stator windings, stator leads and terminal boards or bushings. In such cases, consideration should be given to the renewal of all parts forming the flameproof enclosure.

Using the dimensional check information for the particular product under repair, the length of all flamepaths can be measured using a vernier type gauge (the type incorporating a depth gauge is particularly suitable for this purpose).

When measuring flamepaths on spigoted parts, care should be taken to measure only from the outer edge of the flamepath to the outer edge of the “O” ring groove. It would be unusual for these measurements to be wrong as any corrosive or mechanical damage affecting the length of the flamepath would be evident by visual inspection.

The flameproof gap is ascertained by measuring the outside diamater (OD) of the spigoted or male part and the inside diameter (ID) of the female part of the casting into which it fits. Measurements should be taken at several points on the circumference and the smaller (in case of OD) and the larger (in case of ID) should be used to calculate the diametral clearance. Micrometers should be used for taking measurements.

The calculation is simply to subtract the OD of male part from the ID of the female part into which it fits.

Dimension checks

	Width of joint (mm) EN	**Diameter (mm)**	**Gap of joint** (mm) Min	Max
4410.011				
I	≥ 15.5	202 H7 202 f8	0.122	0.168
II	≥ 25	25 k6 27 k6 25 P7 27 P7	Shrink fit	
III	≥ 26	35 H7 $35\ ^{-0.230}_{-0.295}$	0.230 k≥ 0.075	0.320 m≥ 0.2
IV	97	89 ± 0.03 88.2 ± 0.05	0.72	0.88
V	97 (4-pole) 97 (6-pole)	145 JS7 $155\ ^{+0.1}_{-0.2}$	Shrink fit	
VI	–	–	–	–
4430.090				
I	≥ 25	205 f8 202 H8	0.050	0.194
II	≥ 25	25 k6 27 k6 25 P7 27 P7	Shrink fit	
III	≥26	35 H7 $35\ ^{-0.230}_{-0.295}$	0.230 k≥ 0.075	0.320 m≥ 0.2
IV	95	94.2 ± 0.050 95.0 ± 0.030	0.72	0.88
	110	109.2 ± 0.050 110.0 ± 0.030	0.72	0.88
V	91 (2-pole) 106 (4-pole)	175 P7 $175\ ^{+0.050}_{-0.013}$	Shrink fit	
VI	≥ 25	130 f8 130 H8	0.043	0.169

Care and experience is required when taking any of these measurements, as the tolerances are very fine.

For measuring the inside circumference of the stator core or the outside diameters of rotors, special measuring tools are required. Shaft outside diameter and inside diameters of bearing casing etc. can be measured using micrometers.

The flameproof gaps should be calculated, recorded and checked against the dimensional check table for the product under repair.

Stator and rotor

Prior to examining the stator casing, preliminary electrical testing of the stator winding should be undertaken. This requires an insulation test between windings and earth and between windings, for single phase also between windings and auxiliaries.

The two monitoring cores should be short circuited together during this test. A suitable test with a 1000 volt megger would be 20 MΩ.

The continuity of the thermal switches should be measured to ensure their continued integrity. In the rare case when thermistors and PT100 elements are used, they can be tested using a digital type high impedance instrument.

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