Telma

DRIVE SHAFT REPAIR MANUAL FOR CC – SERIES RETARDERS

with shaft end screws

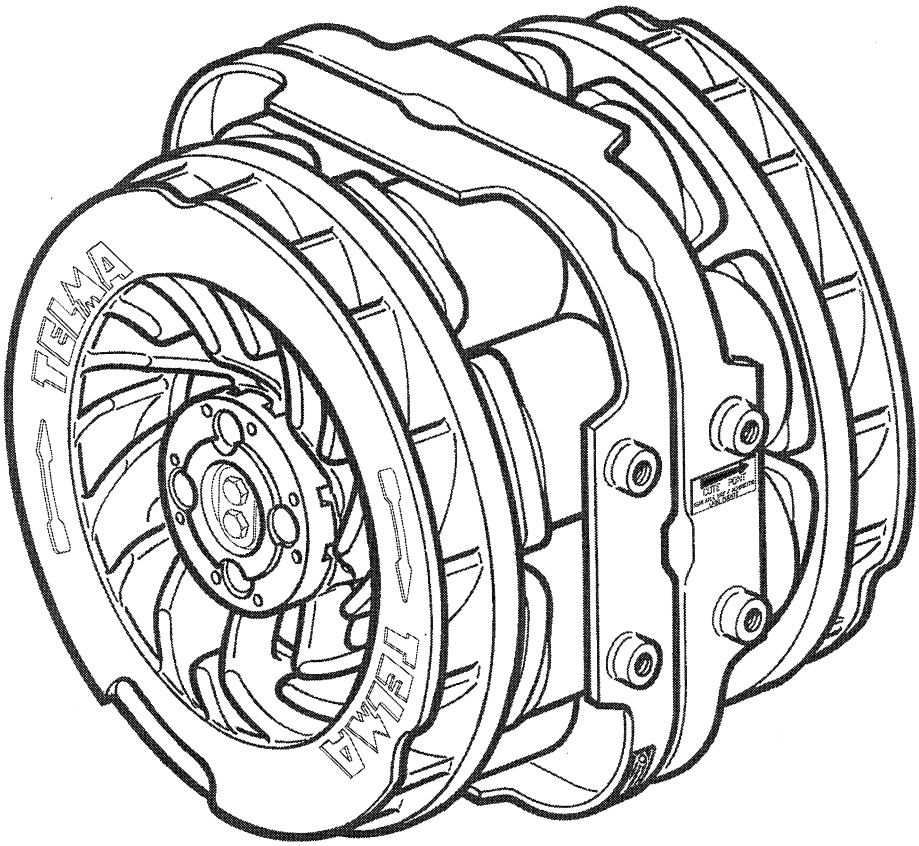

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TABLE OF CONTENTS

I – INDRODUCTION

With regard to the repair manual n° OC441190 – edition 12/92, this document takes into consideration :

- the tight fit of the "gearbox side" bearing introduced in 09/92 (refer to Technical Information n° 15/92)
- the replacement of the main shaft securing nuts to end screws (refer to Technical Information n° 05/93 and 07/93)
- the new LLG version (Long Life Greasing).

At the occasion of a repair, these improvements would apply to a retarder manufactured before these dates when replacing the shaft.

1 – NECESSARY PRECAUTIONS

- It is essential to clean the retarder completely before disassembly. **This should be performed when the retarder is cold.** The use of a stream cleaner is accepted, providing that the stream is not oriented directly on the electrical components of the stator.
- The repair must be made in a scrupulously clean environment.
- All the parts required for the repair, especially the bearings and the lip seals, must be kept in their original packing until needed.
- It is always necessary to replace the lip seals and the seal races each time the shaft is disassembled.
- During the disassembly, always separate the components of the "gearbox side" from those of the "drive axle side" of the retarder.

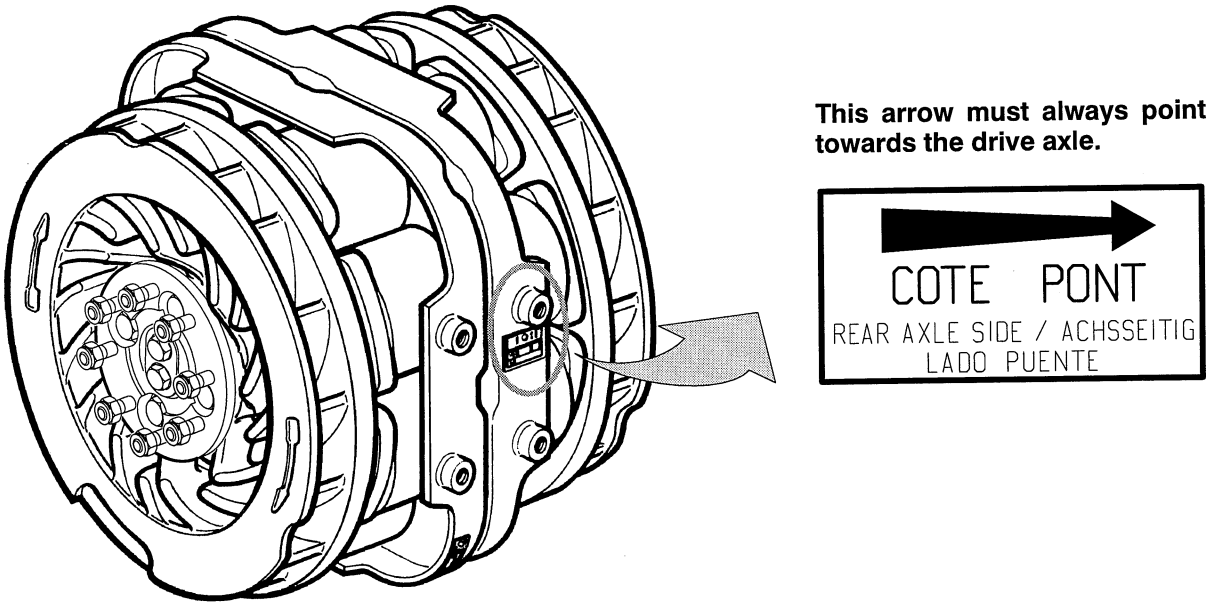


FIGURE 1

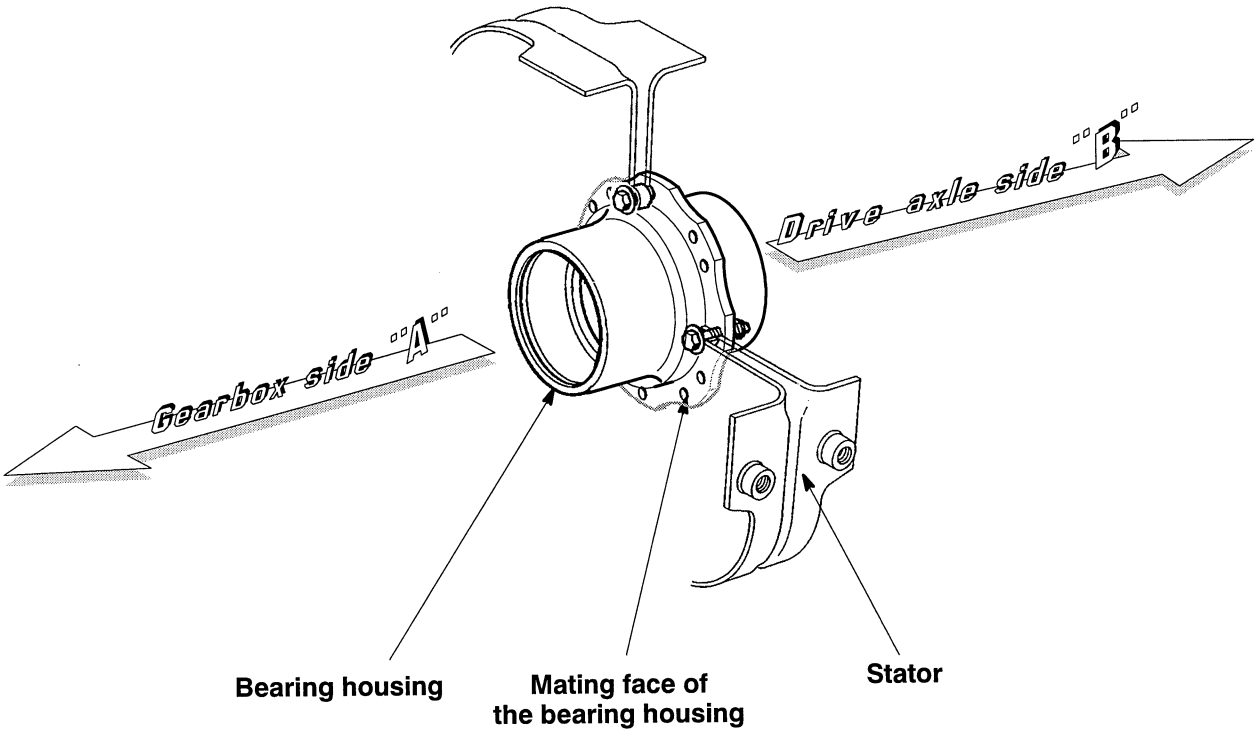


FIGURE 2

2 – OPERATING DIRECTION – Figures 1 and 2

– The "**gearbox side**" of the retarder will be referred to as side "**A**" and the "**drive axle side**" will be referred to as side "**B**" (see figures 3 and 4).

– The "**drive axle side**" can be identified by :

- the direction of the arrow on the red label on the stator (Fig. 1)
- the position of the bearing housing mating face on the stator (Fig. 2)
- the position of the main electrical connecting block of the retarder.

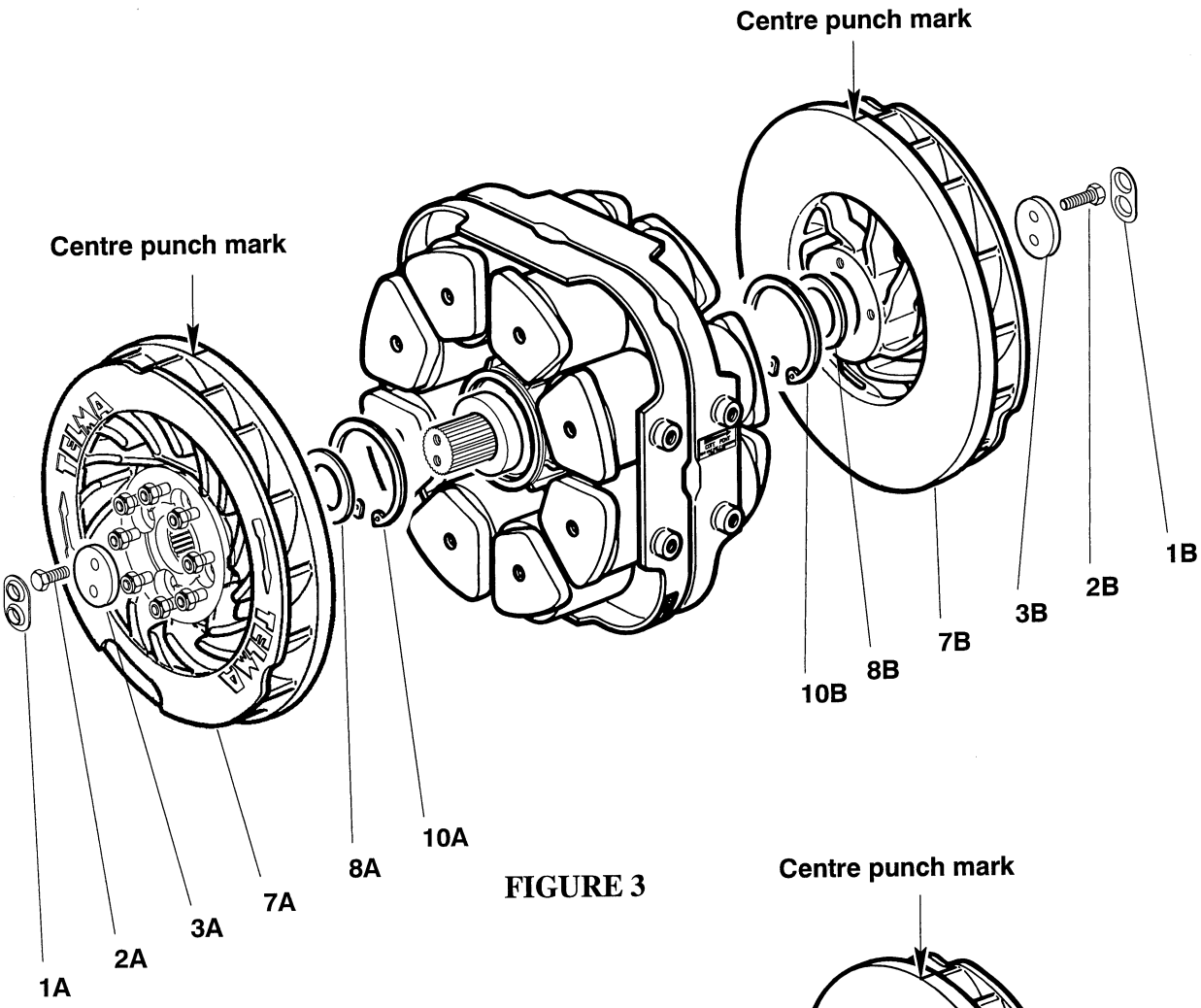


FIGURE 3

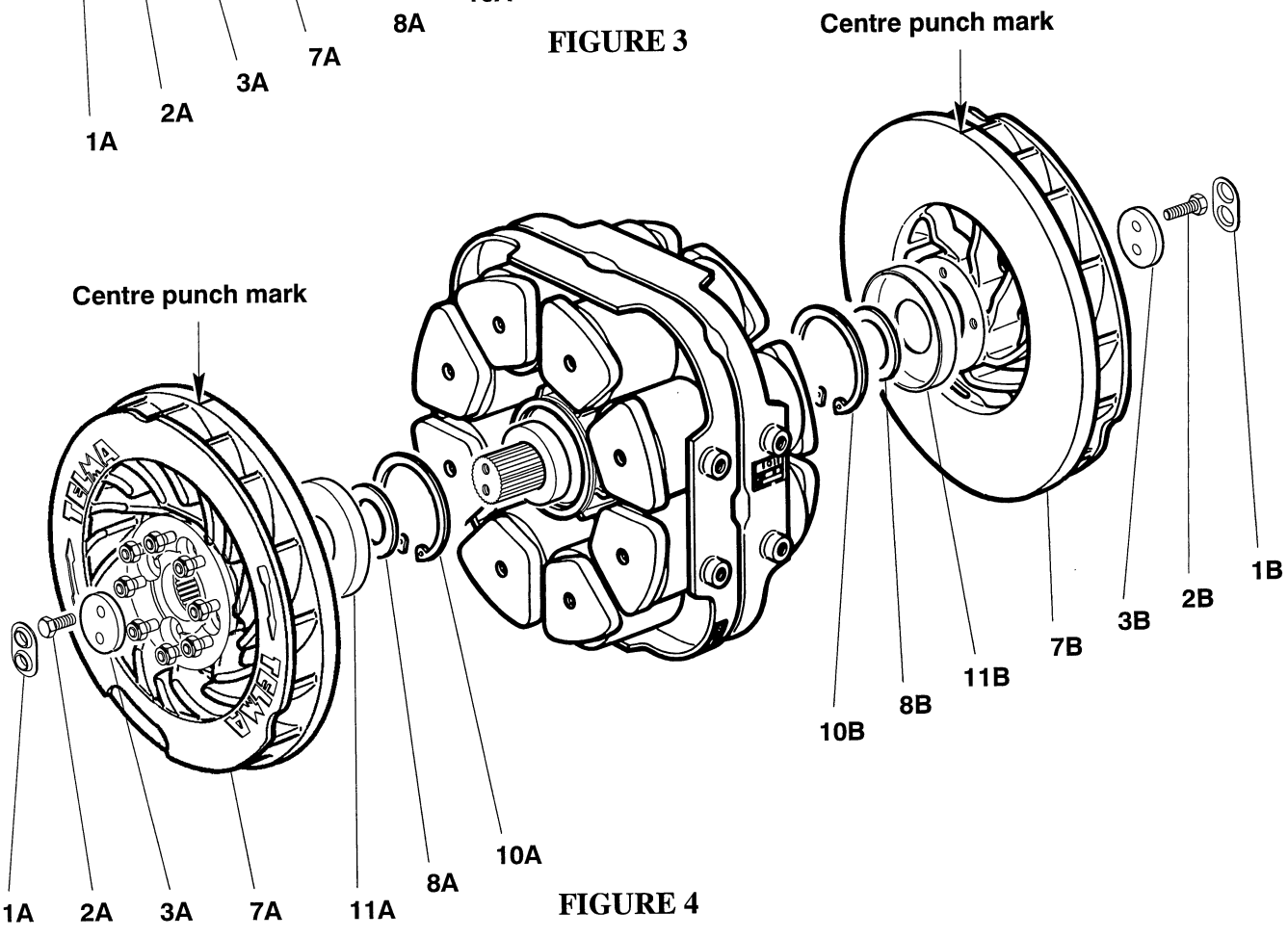


FIGURE 4

II – DISASSEMBLY OF THE SHAFT

1 – REMOVAL OF THE ROTORS

– Figure 3 : standard version
– Figure 4 : LLG version (Long Life Greasing)

– Before removing the rotors, make a centre punch mark on the edge of both rotors to enable correct alignment on re–assembly.

– Remove the following items first from the "drive axle side" (letter B) and from the "gearbox side" (letter A) :

- the tab washers, items 1A and 1B
- the shaft end screws, items 2A and 2B

CC 50 / CC 65 / CC 80 / CC 100 / CC 125 / CC 135 / CC 160 :
17 mm socket

CC 200 / CC 220 / CC 250 / CC 270 / CC 300 :
19 mm socket

- the plates, items 3A and 3B
- the rotor and coupling flange assemblies, items 7A and 7B
- the air–gap adjusting shims, items 8A and 8B
- the dust covers, items 11A and 11B, in case of the LLG version
- the snap rings, items 10A and 10B

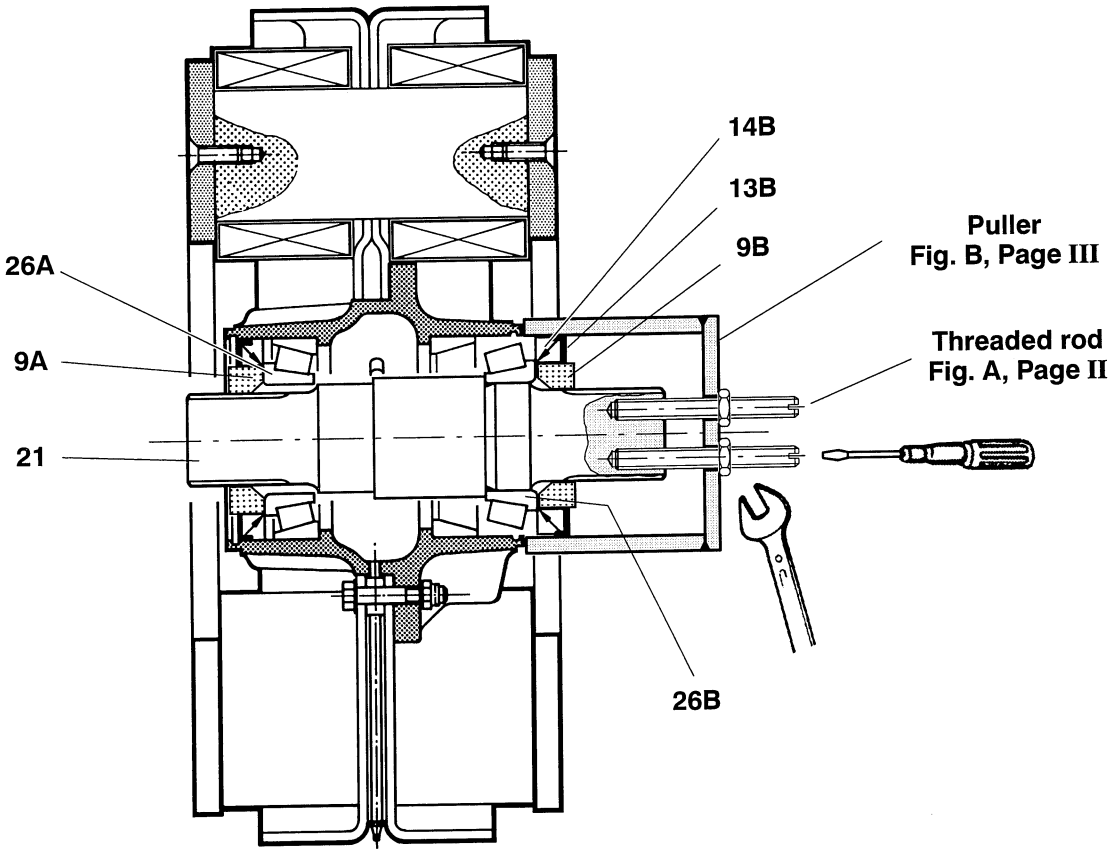


FIGURE 5

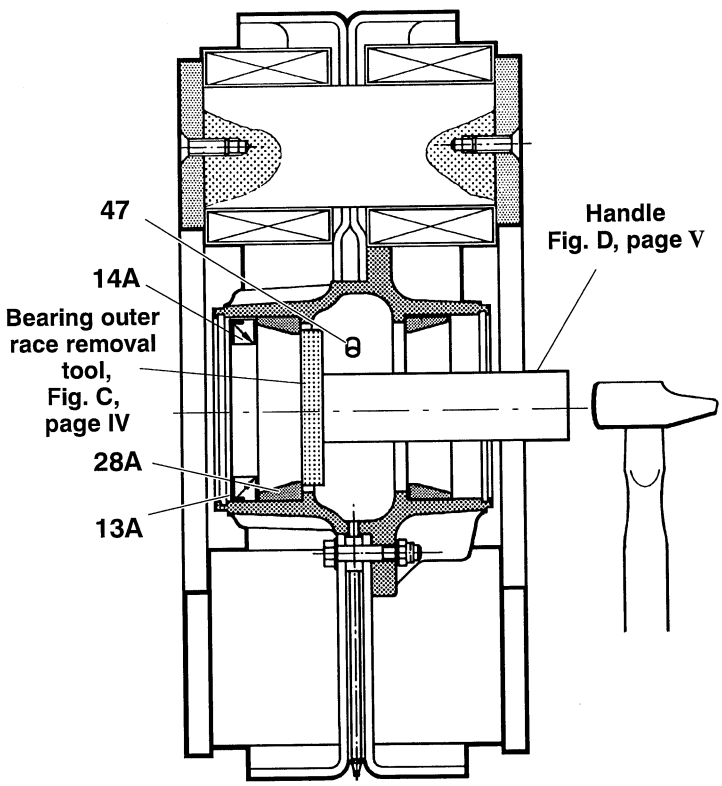


FIGURE 6

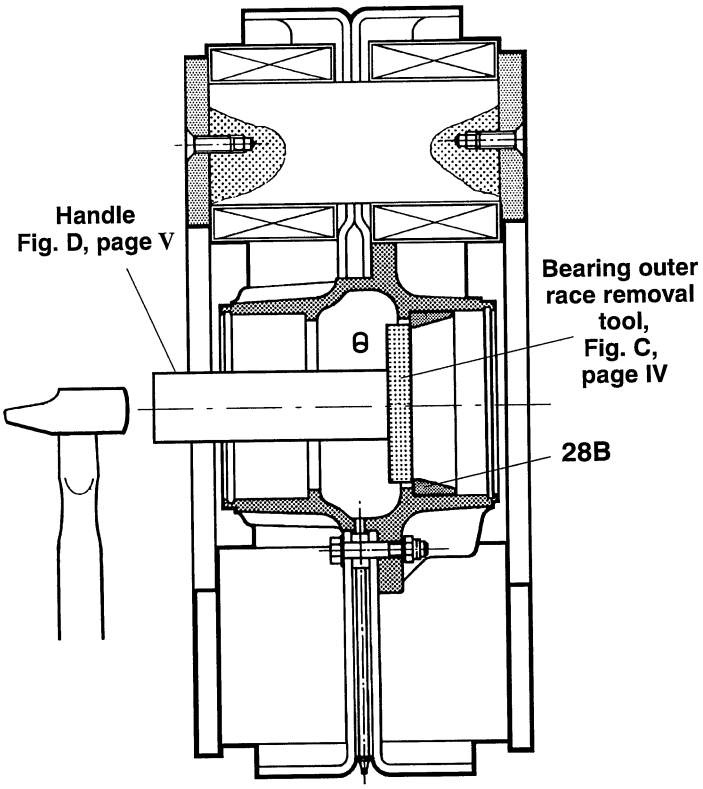


FIGURE 7

2 – REMOVAL OF THE SHAFT – Figure 5

- On the "drive axle side" of the shaft, item 21, secure both threaded rods (Fig. A, page II) until the end of the taped holes.
- Centre the puller (Fig. B, page III) on the bearing housing.
- Tighten the nuts until the shaft is free. The removal of the shaft and of the bearing inner race, item 26B, releases at the same time the seal races, item 9A and 9B for the lip seals, the lip seal, item 14B as well as the lip seal back up washer, item 13B (not for LLG version).
- Remove the shaft, item 21, from the hub and disconnect the puller.
- Take out the bearing inner race, item 26A.

3 – REMOVAL OF THE BEARING OUTER RACES – Figures 6 and 7

- Assemble the bearing outer race removal tool (Fig. C, page IV) on the handle (Fig. D, page V).
- During the installation of this removal tool inside the bore of the bearing housing, be careful not to damage the end of the vent tube, item 47.
- From the drive axle side, using the drift, remove the bearing outer race, item 28A, the lip seal, item 14A and the lip seal back up washer, item 13A (not for LLG version).
- Repeat these operations on the other side in order to remove the part 28B.

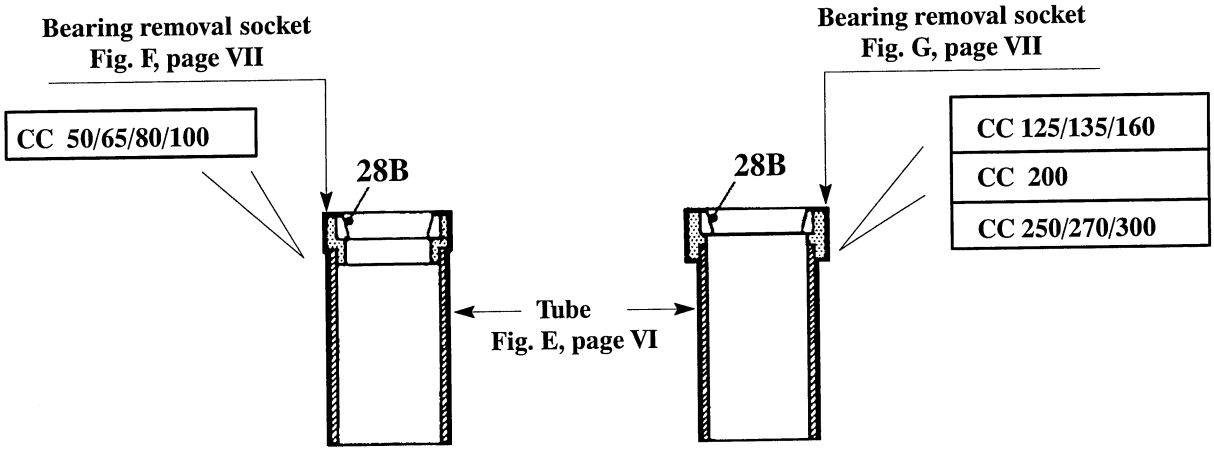


FIGURE 8

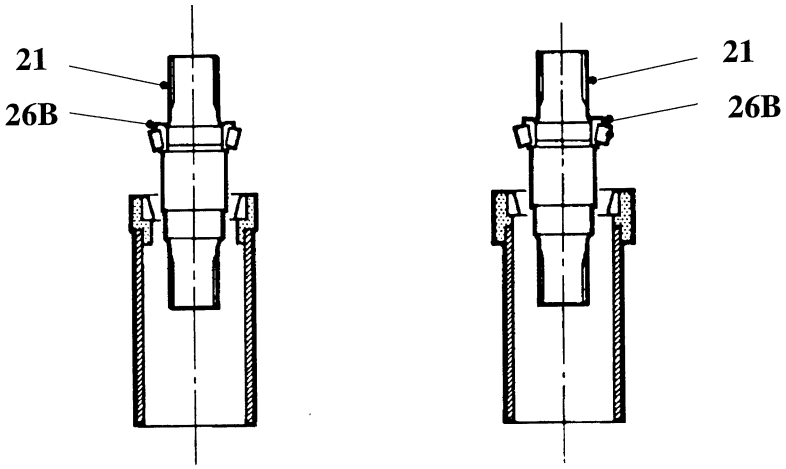


FIGURE 9

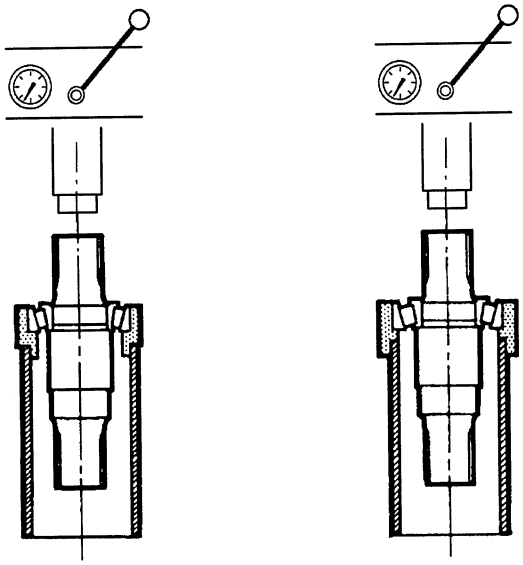


FIGURE 10

4 – REMOVAL OF THE BEARING FROM THE SHAFT – Figures 8, 9 and 10

– Place the bearing removal socket (Fig. F or G, page VII) on the tube (Fig. E, page VI).

– Install inside the bearing removal socket the bearing outer race, item 28B which has been removed earlier from the hub.

– Place the shaft assembly, with the drive axle side upwards, inside this tool and, by means of a hydraulic press, remove the bearing inner race, item 26B, from the shaft.

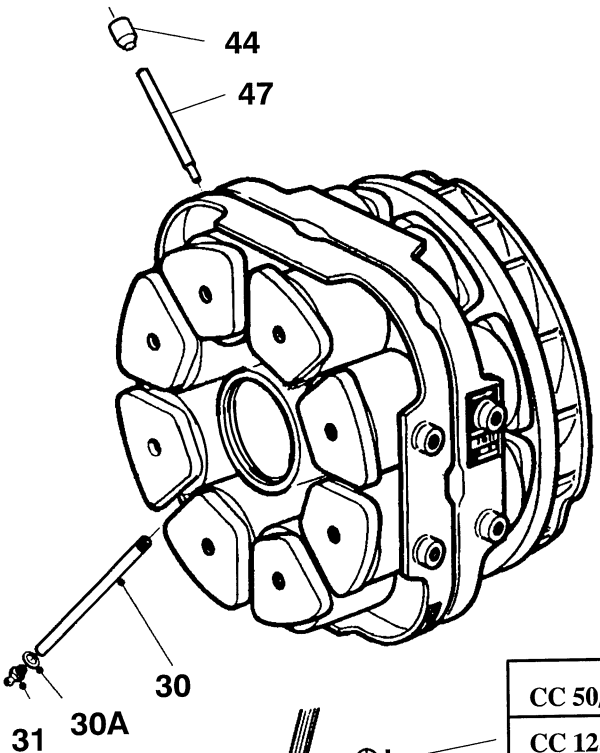
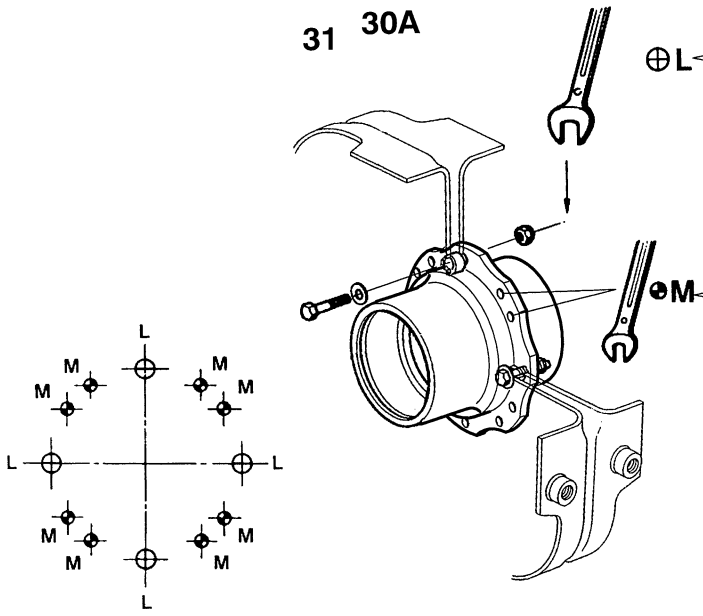


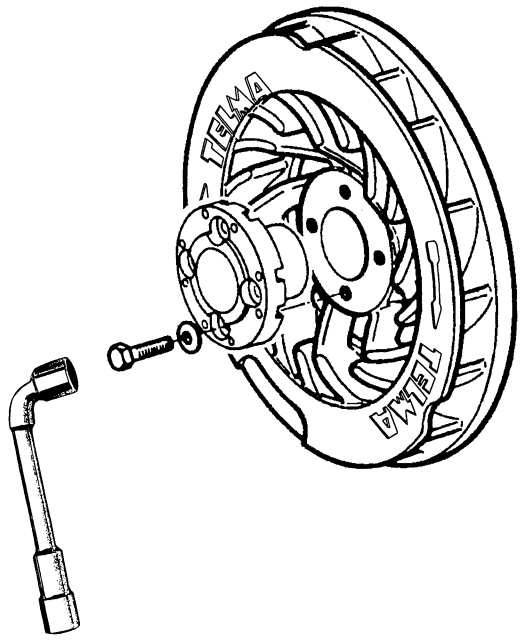
FIGURE 11



CC 50/65/80/100	70 Nm / *52 lb–ft*
CC 125/135/160 CC 200	60 Nm / *44 lb–ft*
CC 220/250/270/300	90 Nm / *66 lb–ft*

CC 50/65/80/100	30 Nm / *22 lb–ft*
CC 125/135/160 CC 200	60 Nm / *44 lb–ft*
CC 220/250/270/300	90 Nm / *66 lb–ft*

FIGURE 12



CC 50/65/80/100	100 Nm / *74 lb–ft*
CC 125/135/160	180 Nm / *132 lb–ft*
CC 200 CC 220/250/270/300	250 Nm / *184 lb–ft*

FIGURE 13

III – PREPARATION OF THE RETARDER

1 – CLEANING – Figure 11

– Before reassembling the shaft, it is essential to clean the bearing housing thoroughly in order to remove all traces of grease.

Ensure also that the vent tube, item 47, and grease tube, item 30, are not clogged. If necessary, remove the nipple, item 31, from the grease tube and clean both tubes.

Reinstall the nipple as soon as the tubes have been cleaned.

– Clean and lubricate the bearing race seats and ensure that they are in good condition and free of burrs.

– Carefully clean the grooves used for the snap rings.

– Remove the grease from all parts (except the roller bearings) before assembly.

2 – CHECKING – Figures 12 and 13

Before reassembling the shaft, ensure :

a) the correct tightening of the bearing housing securing screws (Fig. 12)

CC 50/65/80/100	– **tightening torque 30 Nm** *(22 lb–ft)*	– **Ø M**
	– **tightening torque 70 Nm** *(52 lb–ft)*	– **Ø L**
CC 125/135/160/200	– **tightening torque 60 Nm** *(44 lb–ft)*	– **Ø L and M**
CC 220/250/270/300	– **tightening torque 90 Nm** *(66 lb–ft)*	– **Ø L and M**

b) the correct tightening of the coupling flange screws on the rotors (Fig. 13)

CC 50/65/80/100	– **tightening torque 100 Nm** *(74 lb–ft)*
CC 125/135/160	– **tightening torque 180 Nm** *(132 lb–ft)*
CC 200	– **tightening torque 250 Nm** *(184 lb–ft)*
CC 220/250/270/300	– **tightening torque 250 Nm** *(184 lb–ft)*

c) the correct position of the vent tube, item 47, and grease tube, item 30.

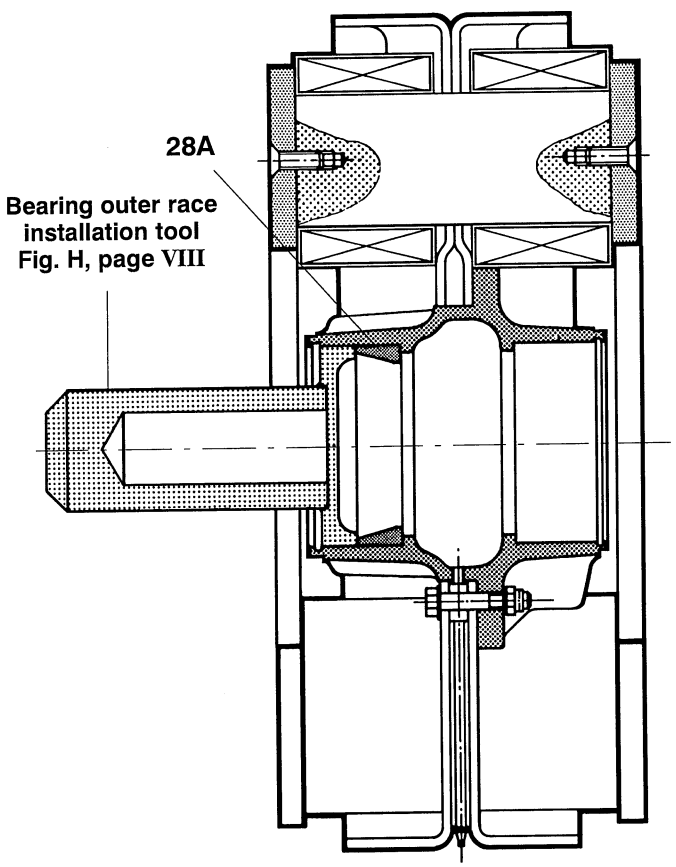


FIGURE 14

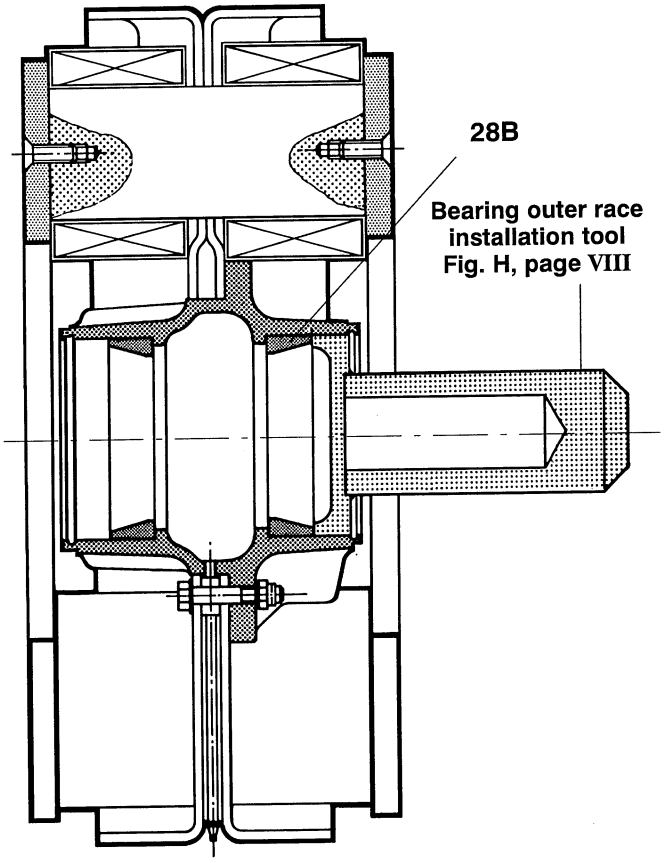


FIGURE 15

IV – MEASUREMENT OF THE BEARING PLAY BY MEANS OF A GAUGE SHAFT

1 – FITTING OF THE BEARING OUTER RACES – Figures 14 and 15

– Using the bearing outer race installation tool (Fig. H, page VIII), position the bearing outer race, item 28A, with the largest inner diameter to the outside as shown.

CAUTION : ***the bearing and race is a matched set : do not interchange the outer races and bearings.***

Ensure that the race is well seated against the bearing housing shoulder.

– In the same way, install the second bearing outer race, item 28B.

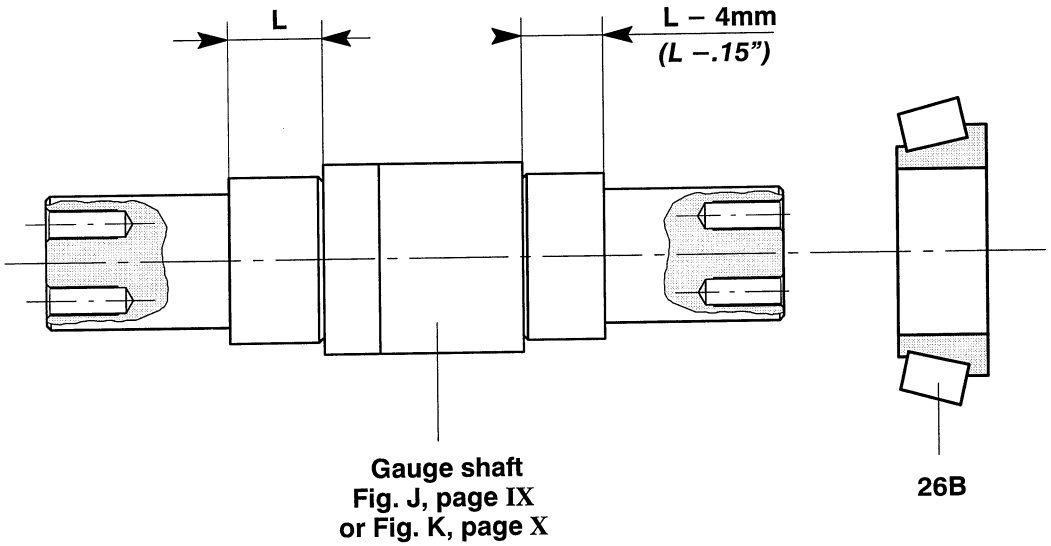


FIGURE 16

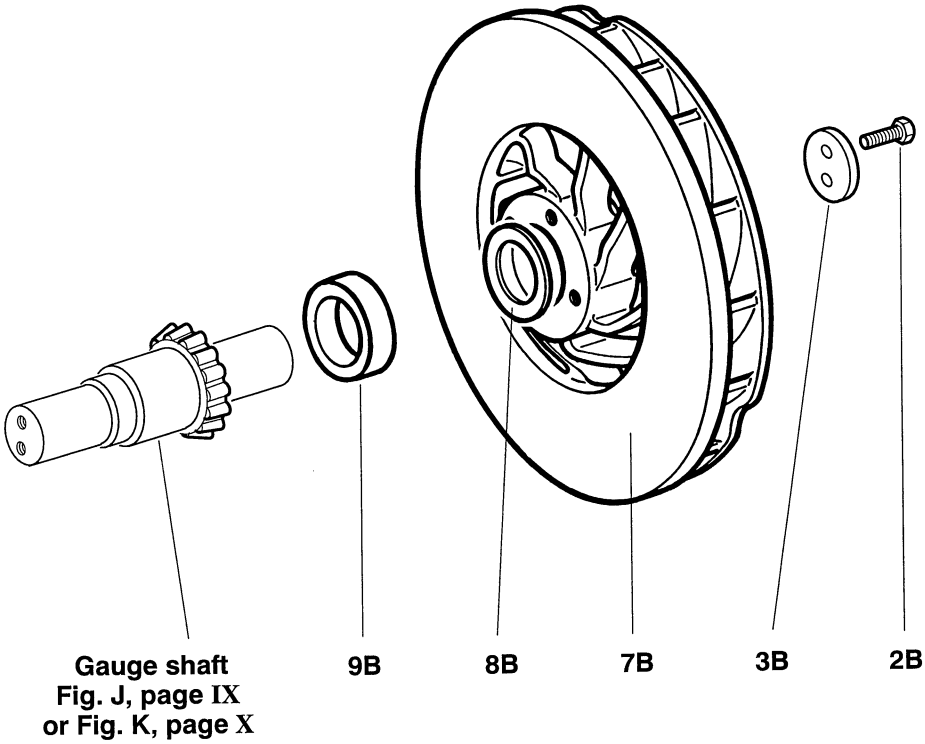


FIGURE 17

2 – INSTALLATION OF THE GAUGE SHAFT – Figures 16 and 17 (for the determination of the thickness of the bearing adjusting shims)

– Fit the inner race of the new drive axle side bearing, item 26B on the shortest bearing seat L – 4 mm (L – .15 inch) of the gauge shaft (Fig. J, page IX or Fig. K, page X).

– Take the set of air–gap adjusting shims, item 8B and after thoroughly degreasing each shim, select the shims in order to obtain a total thickness of :

CC 50 :	**2.3 mm** ***(.090")***
CC 65 :	**3.8 mm** ***(.149")***
CC 80 / CC 100 :	**3.5 mm** ***(.137")***
CC 125 :	**2.5 mm** ***(.100")***
CC 135 :	**3.3 mm** ***(.130")***
CC 160 :	**2.6 mm** ***(.102")***
CC 200 :	**3.2 mm** ***(.126")***
CC 250 / CC 270 :	**3.4 mm** ***(.134")***
CC 220 / CC 300 :	**3.8 mm** ***(.149")***

– Fit on the gauge shaft the following components :

- the seal race, item 9B, for the lip seal, with the inner chamfer towards the bearing
- the above selected air–gap adjusting shims, item 8B
- the counter–clockwise rotor equipped with its coupling flange, item 7B
- the plate, item 3B
- both shaft end screws, item 2B :
  CC 50 / CC 65 / CC 80 / CC 100 / CC 125 / CC 135 / CC 160 :
  17 mm socket tightening torque : 30 Nm ***(22 lb–ft)***

  CC 200 / CC 220 / CC 250 / CC 270 / CC 300 :
  19 mm socket tightening torque : 60 Nm ***(44 lb–ft)***

NOTE : on the CC 50, CC 135 and CC 160 retarders, both drive axle side shaft end screws, item 2B, must be replaced, in relation with the gauge shaft, by 2 screws M10 x 1.5 x 45 x 26 mm.

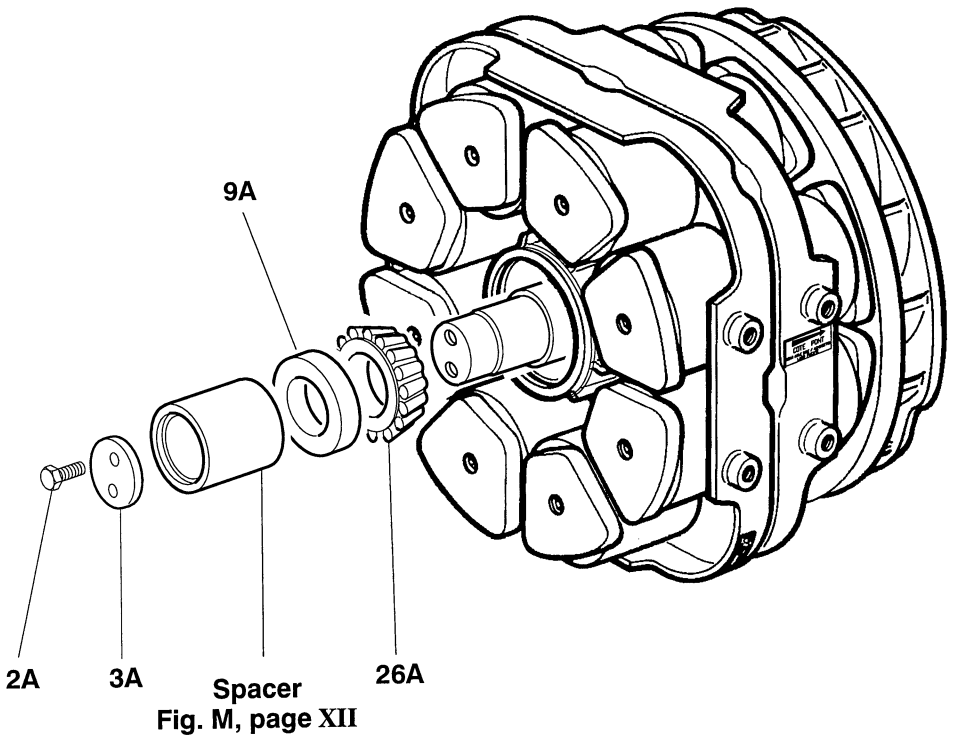


FIGURE 18

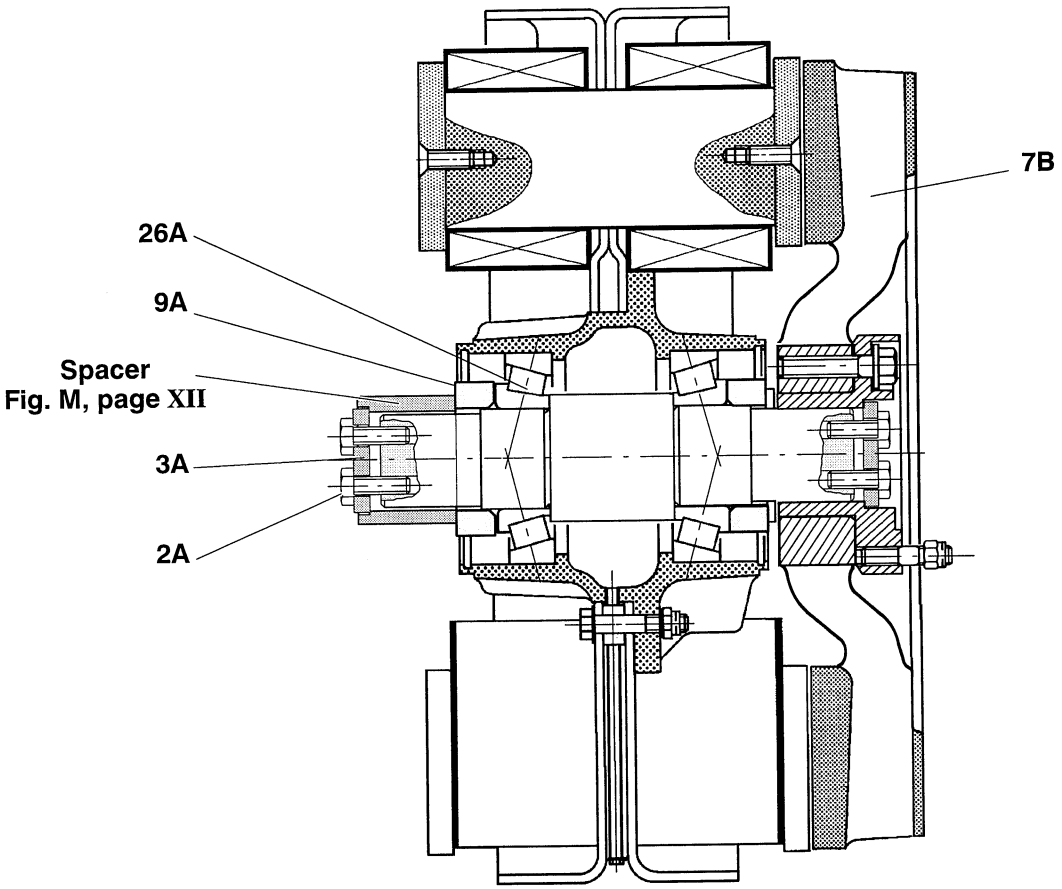


FIGURE 19

3 – FITTING OF THE GAUGE SHAFT INSIDE THE BEARING HOUSING – Figures 18 and 19

– Fit the gauge shaft assembly inside the bearing housing from the drive axle side.

– On the gearbox side, fit on the shaft the following components :

- the second new bearing, item 26A
- the seal race, item 9A, for the lip seal, with the inner chamfer towards the bearing
- the spacer (Fig. M, page XII)
- the plate, item 3A
- both shaft end screws, item 2A :

CC 50 / CC 65 / CC 80 / CC 100 / CC 125 / CC 135 / CC 160 :
17 mm socket tightening torque : 30 Nm ***(22 lb–ft)***

CC 200 / CC 220 / CC 250 / CC 270 / CC 300 :
19 mm socket tightening torque : 60 Nm ***(44 lb–ft)***

NOTE : on the CC 50, CC 135 and CC 160 retarders, both gearbox side shaft end screws, item 2A, must be replaced, in relation with the gauge shaft, by 2 screws M10 x 1.5 x 45 x 26 mm.

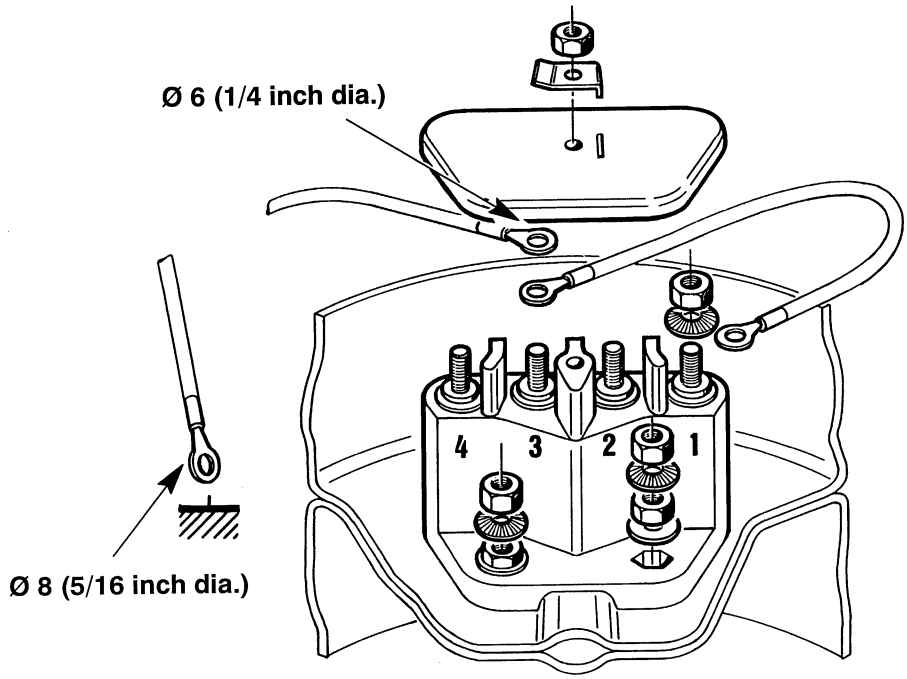


FIGURE 20

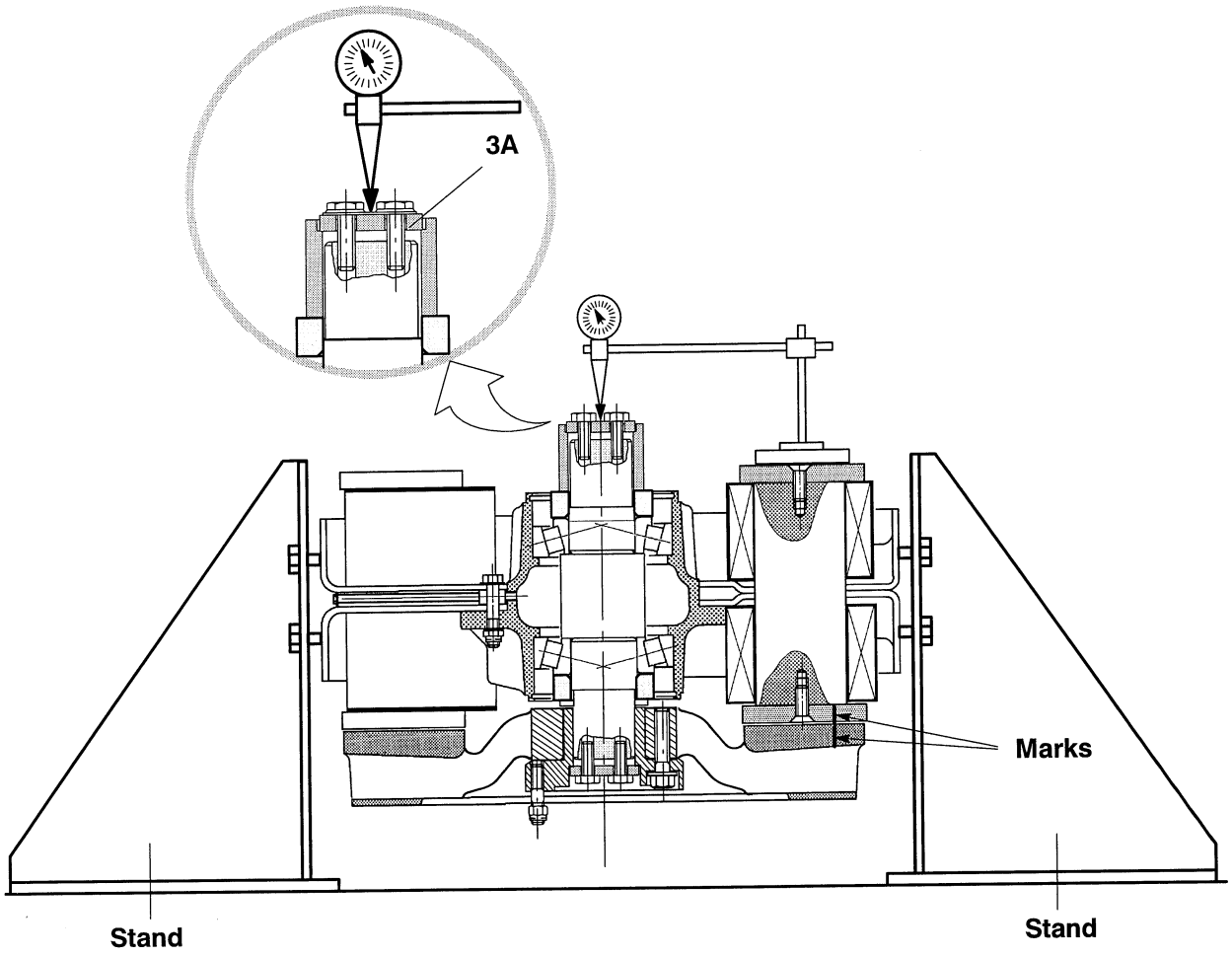


FIGURE 21

4 – ELECTRICAL CONNECTION – Figures 20 and 21

The measurement of the bearing play can be carried out by using the electromagnetic attraction force of the retarder.

- Mount the retarder on a stand with the rotor down.
- Remove the cover from the connecting block, on the rear side of the retarder.
- Shunt stages 1 and 3 of the retarder.
- Connect an earth to the earth terminal (Ø 8 mm – 5/16 " dia.) and a positive to the terminal 1 of the retarder (Ø 6 mm – 1/4" dia.).

  Caution : use correct wire size appropriate for the retarder.

- Place the magnetic base of a dial indicator on one upper pole shoe (of stage 2 or 4 of the retarder) and touch the centre of the shaft end plate, item 3A with the end of the dial gauge bearing.
- Make a chalk mark on the edge of one of the lower pole shoes and on the corresponding rotor.

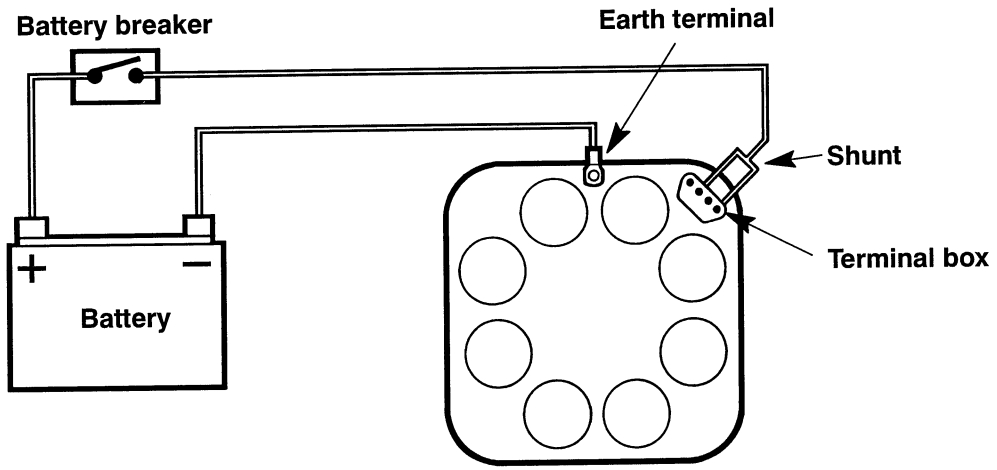


FIGURE 22

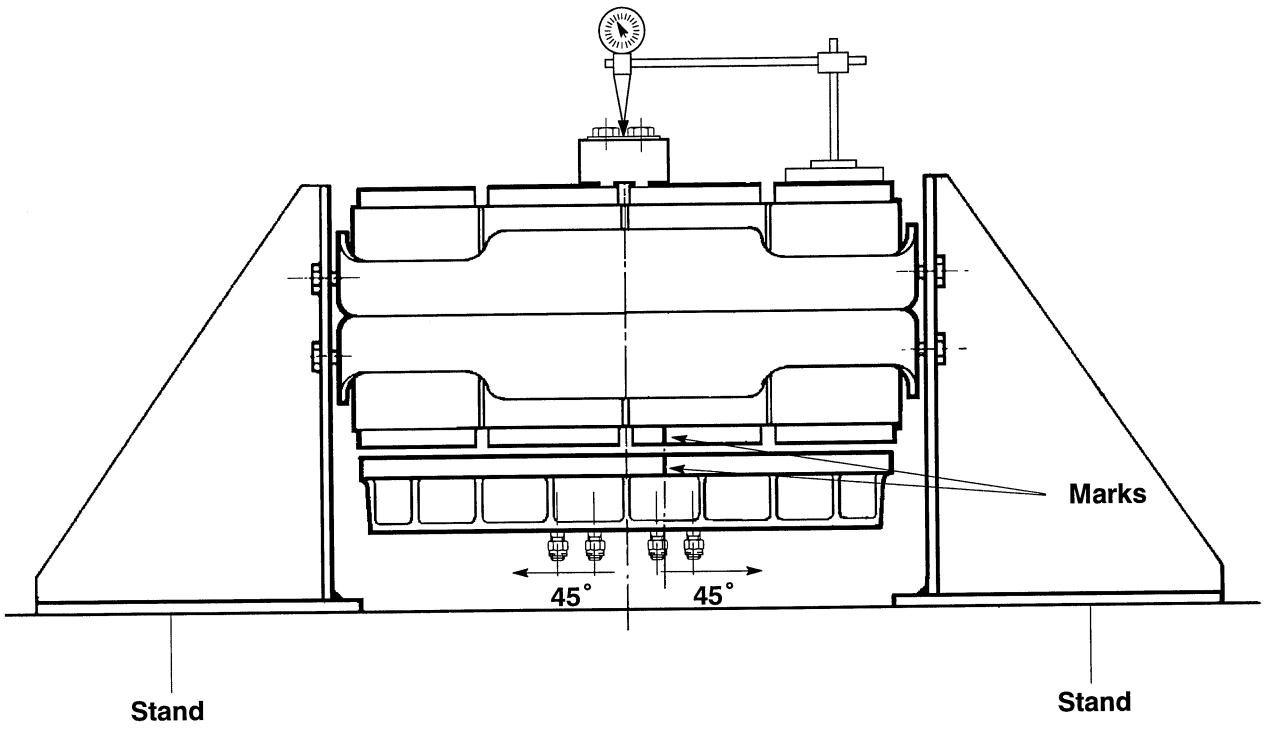


FIGURE 23

5 – ELECTRIC SUPPLY TO THE RETARDER – Figure 22

- Feed the retarder with a voltage equal to one half of the nominal voltage (e.g. feed a 24V retarder with 12 volts).

- Turn the rotor back and forth in order to bring the lower bearing rollers into proper contact with the tapered race.

- Switch off the electric supply and turn again the rotor in order to place the two marks opposite each other. Zero the dial indicator needle.

6 – MEASUREMENT OF THE BEARING PLAY WITH THE GAUGE SHAFT – Figure 23

- Feed the retarder.

- Turn the rotor back and forth through 45° on either side of the fixed mark of the pole shoe and continue until the dial indicator needle stabilizes.

- Place the two marks opposite each other and read on the dial indicator the value A obtained with the gauge shaft

  example : A = 0.18mm *(.0071")*

- Record this value and switch off the electric supply.

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V – DETERMINATION OF THE REQUIRED THICKNESS OF BEARING ADJUSTING SHIMS

– On the main shaft with splines, item 21 (figure 24), identify the index which is engraved on the central part :

example : index = 5

– On the chart which corresponds to the type of retarder :

CC50/CC65/CC80/CC100	–	**chart page 23**
CC125/CC135/CC160	–	**chart page 24**
CC200/CC220/CC250/CC270/CC300	–	**chart page 25**

- refer to the column B which corresponds to the engraved index :

example : column 5

- in the column A, refer to the line which corresponds to the bearing play which has been measured earlier in relation with the gauge shaft

example : A = 0.18 mm *(.0071")*

– At the intersection of the line and of the column, note the thickness of the bearing play adjusting shims which need to be installed with the main splined shaft :

example :
- retarder type : CC 160
- chart : page 24
- the intersection of the column 5 with the line 0.18 mm gives a shim thickness of 4.6 mm *(.181")*

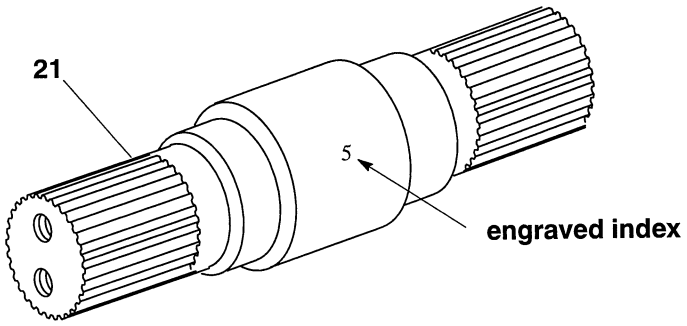

FIGURE 24

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THICKNESSES (mm) OF THE BEARING ADJUSTING SHIMS FOR CC 50 / CC 65 / CC 80 / CC 100

A (mm) Play measured with the gauge shaft	B : index engraved on the main shaft									
	0	1	2	3	4	5	6	7	8	9
0	5.70	5.65	5.65	5.65	5.65	5.65	5.60	5.60	5.60	5.60
0.01	5.65	5.65	5.65	5.65	5.65	5.60	5.60	5.60	5.60	5.60
0.02	5.65	5.65	5.65	5.65	5.60	5.60	5.60	5.60	5.60	5.55
0.03	5.65	5.65	5.65	5.60	5.60	5.60	5.60	5.60	5.55	5.55
0.04	5.65	5.65	5.60	5.60	5.60	5.60	5.60	5.55	5.55	5.55
0.05	5.65	5.60	5.60	5.60	5.60	5.60	5.55	5.55	5.55	5.55
0.06	5.60	5.60	5.60	5.60	5.60	5.55	5.55	5.55	5.55	5.55
0.07	5.60	5.60	5.60	5.60	5.55	5.55	5.55	5.55	5.55	5.50
0.08	5.60	5.60	5.60	5.55	5.55	5.55	5.55	5.55	5.50	5.50
0.09	5.60	5.60	5.55	5.55	5.55	5.55	5.55	5.50	5.50	5.50
0.1	5.60	5.55	5.55	5.55	5.55	5.55	5.50	5.50	5.50	5.50
0.11	5.55	5.55	5.55	5.55	5.55	5.50	5.50	5.50	5.50	5.50
0.12	5.55	5.55	5.55	5.55	5.50	5.50	5.50	5.50	5.50	5.45
0.13	5.55	5.55	5.55	5.50	5.50	5.50	5.50	5.50	5.45	5.45
0.14	5.55	5.55	5.50	5.50	5.50	5.50	5.50	5.45	5.45	5.45
0.15	5.55	5.50	5.50	5.50	5.50	5.50	5.45	5.45	5.45	5.45
0.16	5.50	5.50	5.50	5.50	5.50	5.45	5.45	5.45	5.45	5.45
0.17	5.50	5.50	5.50	5.50	5.45	5.45	5.45	5.45	5.45	5.40
0.18	5.50	5.50	5.50	5.45	5.45	5.45	5.45	5.45	5.40	5.40
0.19	5.50	5.50	5.45	5.45	5.45	5.45	5.45	5.40	5.40	5.40
0.2	5.50	5.45	5.45	5.45	5.45	5.45	5.40	5.40	5.40	5.40
0.21	5.45	5.45	5.45	5.45	5.45	5.40	5.40	5.40	5.40	5.40
0.22	5.45	5.45	5.45	5.45	5.40	5.40	5.40	5.40	5.40	5.35
0.23	5.45	5.45	5.45	5.40	5.40	5.40	5.40	5.40	5.35	5.35
0.24	5.45	5.45	5.40	5.40	5.40	5.40	5.40	5.35	5.35	5.35
0.25	5.45	5.40	5.40	5.40	5.40	5.40	5.35	5.35	5.35	5.35
0.26	5.40	5.40	5.40	5.40	5.40	5.35	5.35	5.35	5.35	5.35
0.27	5.40	5.40	5.40	5.40	5.35	5.35	5.35	5.35	5.35	5.30
0.28	5.40	5.40	5.40	5.35	5.35	5.35	5.35	5.35	5.30	5.30
0.29	5.40	5.40	5.35	5.35	5.35	5.35	5.35	5.30	5.30	5.30
0.3	5.40	5.35	5.35	5.35	5.35	5.35	5.30	5.30	5.30	5.30
0.31	5.35	5.35	5.35	5.35	5.35	5.30	5.30	5.30	5.30	5.30
0.32	5.35	5.35	5.35	5.35	5.30	5.30	5.30	5.30	5.30	5.25
0.33	5.35	5.35	5.35	5.30	5.30	5.30	5.30	5.30	5.25	5.25
0.34	5.35	5.35	5.30	5.30	5.30	5.30	5.30	5.25	5.25	5.25
0.35	5.35	5.30	5.30	5.30	5.30	5.30	5.25	5.25	5.25	5.25
0.36	5.30	5.30	5.30	5.30	5.30	5.25	5.25	5.25	5.25	5.25
0.37	5.30	5.30	5.30	5.30	5.25	5.25	5.25	5.25	5.25	5.20
0.38	5.30	5.30	5.30	5.25	5.25	5.25	5.25	5.25	5.20	5.20
0.39	5.30	5.30	5.25	5.25	5.25	5.25	5.25	5.20	5.20	5.20
0.4	5.30	5.25	5.25	5.25	5.25	5.25	5.20	5.20	5.20	5.20
0.41	5.25	5.25	5.25	5.25	5.25	5.20	5.20	5.20	5.20	5.20
0.42	5.25	5.25	5.25	5.25	5.20	5.20	5.20	5.20	5.20	5.15

Telma

THICKNESSES (mm) OF THE BEARING ADJUSTING SHIMS FOR CC 125 / CC 135 / CC 160

A (mm) Play measured with the gauge shaft	B : index engraved on the main shaft									
	0	1	2	3	4	5	6	7	8	9
0	4.80	4.80	4.80	4.80	4.80	4.75	4.75	4.75	4.75	4.75
0.01	4.80	4.80	4.80	4.80	4.75	4.75	4.75	4.75	4.75	4.70
0.02	4.80	4.80	4.80	4.75	4.75	4.75	4.75	4.75	4.70	4.70
0.03	4.80	4.80	4.75	4.75	4.75	4.75	4.75	4.70	4.70	4.70
0.04	4.80	4.75	4.75	4.75	4.75	4.75	4.70	4.70	4.70	4.70
0.05	4.75	4.75	4.75	4.75	4.75	4.70	4.70	4.70	4.70	4.70
0.06	4.75	4.75	4.75	4.75	4.70	4.70	4.70	4.70	4.70	4.65
0.07	4.75	4.75	4.75	4.70	4.70	4.70	4.70	4.70	4.65	4.65
0.08	4.75	4.75	4.70	4.70	4.70	4.70	4.70	4.65	4.65	4.65
0.09	4.75	4.70	4.70	4.70	4.70	4.70	4.65	4.65	4.65	4.65
0.1	4.70	4.70	4.70	4.70	4.70	4.65	4.65	4.65	4.65	4.65
0.11	4.70	4.70	4.70	4.70	4.65	4.65	4.65	4.65	4.65	4.60
0.12	4.70	4.70	4.70	4.65	4.65	4.65	4.65	4.65	4.60	4.60
0.13	4.70	4.70	4.65	4.65	4.65	4.65	4.65	4.60	4.60	4.60
0.14	4.70	4.65	4.65	4.65	4.65	4.65	4.60	4.60	4.60	4.60
0.15	4.65	4.65	4.65	4.65	4.65	4.60	4.60	4.60	4.60	4.60
0.16	4.65	4.65	4.65	4.65	4.60	4.60	4.60	4.60	4.60	4.55
0.17	4.65	4.65	4.65	4.60	4.60	4.60	4.60	4.60	4.55	4.55
0.18	4.65	4.65	4.60	4.60	4.60	4.60	4.60	4.55	4.55	4.55
0.19	4.65	4.60	4.60	4.60	4.60	4.60	4.55	4.55	4.55	4.55
0.2	4.60	4.60	4.60	4.60	4.60	4.55	4.55	4.55	4.55	4.55
0.21	4.60	4.60	4.60	4.60	4.55	4.55	4.55	4.55	4.55	4.50
0.22	4.60	4.60	4.60	4.55	4.55	4.55	4.55	4.55	4.50	4.50
0.23	4.60	4.60	4.55	4.55	4.55	4.55	4.55	4.50	4.50	4.50
0.24	4.60	4.55	4.55	4.55	4.55	4.55	4.50	4.50	4.50	4.50
0.25	4.55	4.55	4.55	4.55	4.55	4.50	4.50	4.50	4.50	4.50
0.26	4.55	4.55	4.55	4.55	4.50	4.50	4.50	4.50	4.50	4.45
0.27	4.55	4.55	4.55	4.50	4.50	4.50	4.50	4.50	4.45	4.45
0.28	4.55	4.55	4.50	4.50	4.50	4.50	4.50	4.45	4.45	4.45
0.29	4.55	4.50	4.50	4.50	4.50	4.50	4.45	4.45	4.45	4.45
0.3	4.50	4.50	4.50	4.50	4.50	4.45	4.45	4.45	4.45	4.45
0.31	4.50	4.50	4.50	4.50	4.45	4.45	4.45	4.45	4.45	4.40
0.32	4.50	4.50	4.50	4.45	4.45	4.45	4.45	4.45	4.40	4.40
0.33	4.50	4.50	4.45	4.45	4.45	4.45	4.45	4.40	4.40	4.40
0.34	4.50	4.45	4.45	4.45	4.45	4.45	4.40	4.40	4.40	4.40
0.35	4.45	4.45	4.45	4.45	4.45	4.40	4.40	4.40	4.40	4.40
0.36	4.45	4.45	4.45	4.45	4.40	4.40	4.40	4.40	4.40	4.35
0.37	4.45	4.45	4.45	4.40	4.40	4.40	4.40	4.40	4.35	4.35
0.38	4.45	4.45	4.40	4.40	4.40	4.40	4.40	4.35	4.35	4.35
0.39	4.45	4.40	4.40	4.40	4.40	4.40	4.35	4.35	4.35	4.35
0.4	4.40	4.40	4.40	4.40	4.40	4.35	4.35	4.35	4.35	4.35
0.41	4.40	4.40	4.40	4.40	4.35	4.35	4.35	4.35	4.35	4.30
0.42	4.40	4.40	4.40	4.35	4.35	4.35	4.35	4.35	4.30	4.30

Telma

THICKNESSES (mm) OF THE BEARING ADJUSTING SHIMS FOR CC 200 / CC 220 / CC 250 / CC 270/ CC 300

A (mm) Play measured with the gauge shaft	B : index engraved on the main shaft									
	0	1	2	3	4	5	6	7	8	9
0	4.70	4.70	4.70	4.70	4.70	4.65	4.65	4.65	4.65	4.65
0.01	4.70	4.70	4.70	4.70	4.65	4.65	4.65	4.65	4.65	4.60
0.02	4.70	4.70	4.70	4.65	4.65	4.65	4.65	4.65	4.60	4.60
0.03	4.70	4.70	4.65	4.65	4.65	4.65	4.65	4.60	4.60	4.60
0.04	4.70	4.65	4.65	4.65	4.65	4.65	4.60	4.60	4.60	4.60
0.05	4.65	4.65	4.65	4.65	4.65	4.60	4.60	4.60	4.60	4.60
0.06	4.65	4.65	4.65	4.65	4.60	4.60	4.60	4.60	4.60	4.55
0.07	4.65	4.65	4.65	4.60	4.60	4.60	4.60	4.60	4.55	4.55
0.08	4.65	4.65	4.60	4.60	4.60	4.60	4.60	4.55	4.55	4.55
0.09	4.65	4.60	4.60	4.60	4.60	4.60	4.55	4.55	4.55	4.55
0.1	4.60	4.60	4.60	4.60	4.60	4.55	4.55	4.55	4.55	4.55
0.11	4.60	4.60	4.60	4.60	4.55	4.55	4.55	4.55	4.55	4.50
0.12	4.60	4.60	4.60	4.55	4.55	4.55	4.55	4.55	4.50	4.50
0.13	4.60	4.60	4.55	4.55	4.55	4.55	4.55	4.50	4.50	4.50
0.14	4.60	4.55	4.55	4.55	4.55	4.55	4.50	4.50	4.50	4.50
0.15	4.55	4.55	4.55	4.55	4.55	4.50	4.50	4.50	4.50	4.50
0.16	4.55	4.55	4.55	4.55	4.50	4.50	4.50	4.50	4.50	4.45
0.17	4.55	4.55	4.55	4.50	4.50	4.50	4.50	4.50	4.45	4.45
0.18	4.55	4.55	4.50	4.50	4.50	4.50	4.50	4.45	4.45	4.45
0.19	4.55	4.50	4.50	4.50	4.50	4.50	4.45	4.45	4.45	4.45
0.2	4.50	4.50	4.50	4.50	4.50	4.45	4.45	4.45	4.45	4.45
0.21	4.50	4.50	4.50	4.50	4.45	4.45	4.45	4.45	4.45	4.40
0.22	4.50	4.50	4.50	4.45	4.45	4.45	4.45	4.45	4.40	4.40
0.23	4.50	4.50	4.45	4.45	4.45	4.45	4.45	4.40	4.40	4.40
0.24	4.50	4.45	4.45	4.45	4.45	4.45	4.40	4.40	4.40	4.40
0.25	4.45	4.45	4.45	4.45	4.45	4.40	4.40	4.40	4.40	4.40
0.26	4.45	4.45	4.45	4.45	4.40	4.40	4.40	4.40	4.40	4.35
0.27	4.45	4.45	4.45	4.40	4.40	4.40	4.40	4.40	4.35	4.35
0.28	4.45	4.45	4.40	4.40	4.40	4.40	4.40	4.35	4.35	4.35
0.29	4.45	4.40	4.40	4.40	4.40	4.40	4.35	4.35	4.35	4.35
0.3	4.40	4.40	4.40	4.40	4.40	4.35	4.35	4.35	4.35	4.35
0.31	4.40	4.40	4.40	4.40	4.35	4.35	4.35	4.35	4.35	4.30
0.32	4.40	4.40	4.40	4.35	4.35	4.35	4.35	4.35	4.30	4.30
0.33	4.40	4.40	4.35	4.35	4.35	4.35	4.35	4.30	4.30	4.30
0.34	4.40	4.35	4.35	4.35	4.35	4.35	4.30	4.30	4.30	4.30
0.35	4.35	4.35	4.35	4.35	4.35	4.30	4.30	4.30	4.30	4.30
0.36	4.35	4.35	4.35	4.35	4.30	4.30	4.30	4.30	4.30	4.25
0.37	4.35	4.35	4.35	4.30	4.30	4.30	4.30	4.30	4.25	4.25
0.38	4.35	4.35	4.30	4.30	4.30	4.30	4.30	4.25	4.25	4.25
0.39	4.35	4.30	4.30	4.30	4.30	4.30	4.25	4.25	4.25	4.25
0.4	4.30	4.30	4.30	4.30	4.30	4.25	4.25	4.25	4.25	4.25
0.41	4.30	4.30	4.30	4.30	4.25	4.25	4.25	4.25	4.25	4.20
0.42	4.30	4.30	4.30	4.25	4.25	4.25	4.25	4.25	4.20	4.20

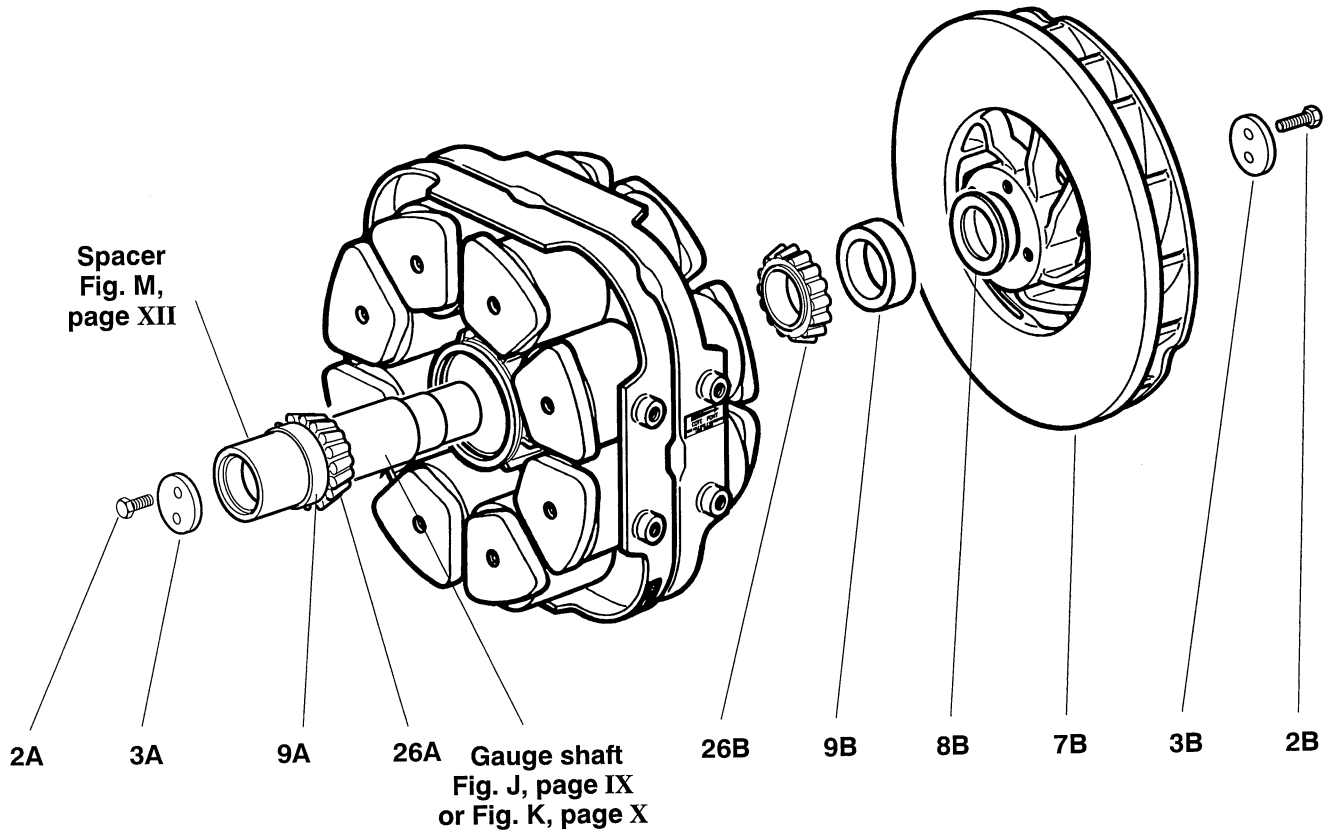
Spacer
Fig. M,
page XII
2A
3A
9A
26A
Gauge shaft
Fig. J, page IX
or Fig. K, page X
26B
9B
8B
7B
3B
2B

FIGURE 25

VI – REMOVAL OF THE GAUGE SHAFT – Fig. 25

- Remove the dial indicator.
- Turn the retarder on its stand so the shaft is horizontal.
- Remove the shaft end screws, item 2B, on the drive axle side as well as the following components :
  - the plate, item 3B
  - the rotor and flange assembly, item 7B
  - the air–gap adjusting shims, item 8B
  - the seal race, item 9B, for the lip seal
- From the gearbox side, remove the gauge shaft. The removal of the gauge shaft releases the inner race, item 26B of the rear bearing.
- From the gauge shaft, remove the spacer (Fig. M, page XII), the seal race, item 9A, for the lip seal and the bearing, item 26A.

CAUTION : ***the bearing and race is a matched set : do not interchange the outer races and bearings.***

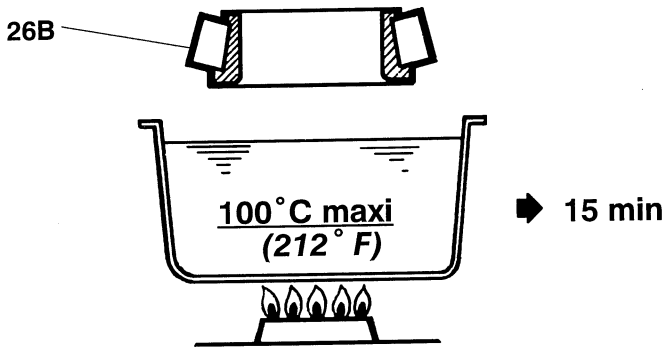

FIGURE 26

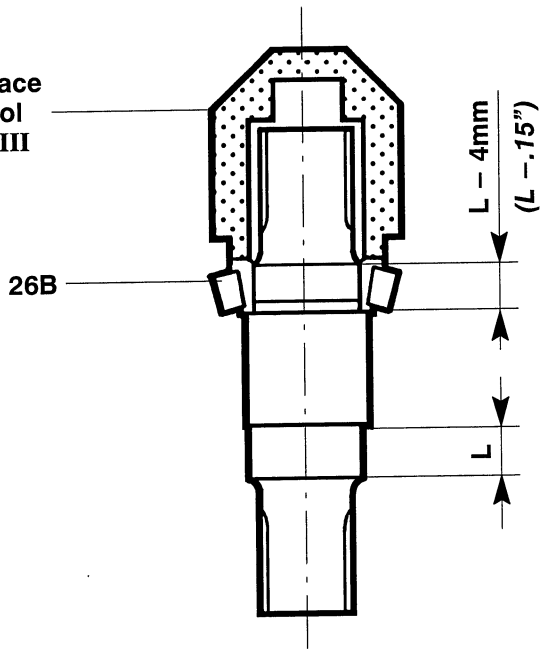

FIGURE 27

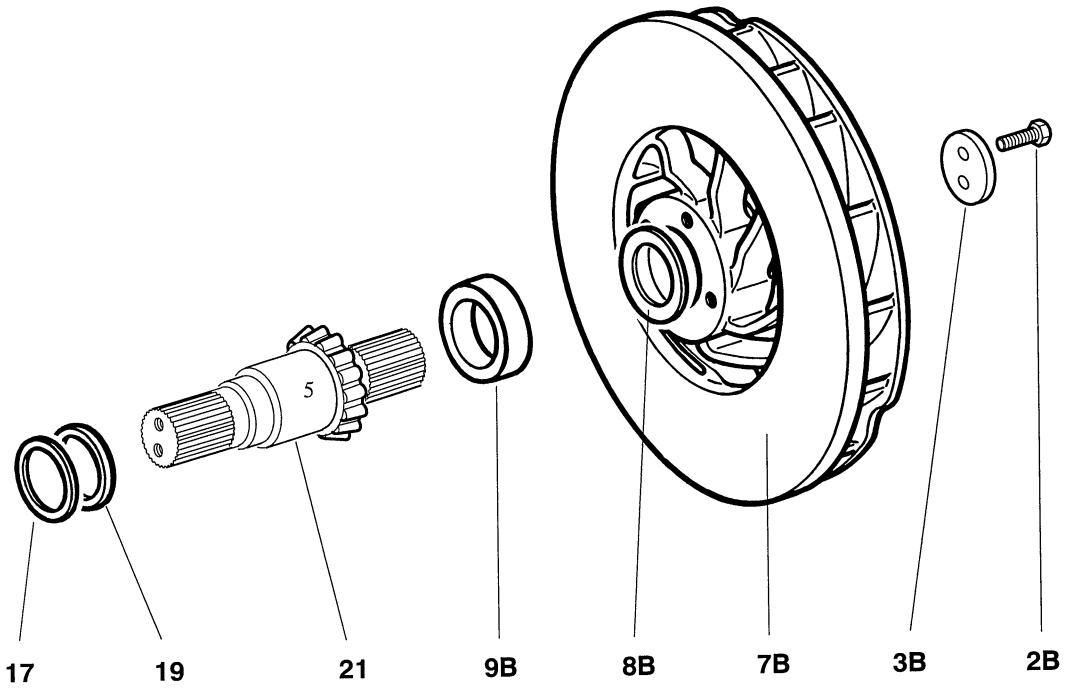

FIGURE 28

VII – REASSEMBLY OF THE MAIN SHAFT

1 – EQUIPMENT OF THE MAIN SHAFT – Figures 26, 27 and 28

– Heat the bearing inner part, item 26B for 15 min in an oil bath maintained at 100°C (212°F).

– Take the appropriate bearing installation tool (Fig. N, page XIII) and assemble the heated bearing, item 26B, onto the shortest (L – 4 mm / *L –.15"*) side of the shaft (drive axle side).
Ensure that the bearing is well seated against the shoulder of the shaft.

– Place the second bearing, item 26A, into the oil bath.

– Mount the following items on the shaft, item 21, fitted with the bearing 26B :

- the seal race, item 9B, for the lip seal, with the inner chamfer towards the bearing
- the air–gap adjusting shims, item 8B, which were used on the gauge shaft
- the counter–clockwise rotor, item 7B (drive axle side), equipped with its coupling flange
- the plate, item 3B
- both shaft end screws, item 2B :
  CC 50 / CC 65 / CC 80 / CC 100 / CC 125 / CC 135 / CC 160 :
  17 mm socket tightening torque : 30 Nm ***(22 lb–ft)***

  CC 200 / CC 220 / CC 250 / CC 270 / CC 300 :
  19 mm socket tightening torque : 60 Nm ***(44 lb–ft)***

– Take the set of bearing adjusting shims, items 17 and 19 and after thoroughly degreasing each shim, select the shims in order to obtain the thickness which has been determined in paragraph V :
example : total thickness = 4.60 mm *(.181")*, items 17 and 19

– Install on the gearbox side of the shaft first the adjusting ring, item 19, with the chamfer against the shaft shoulder and the selected adjusting shims, item 17.

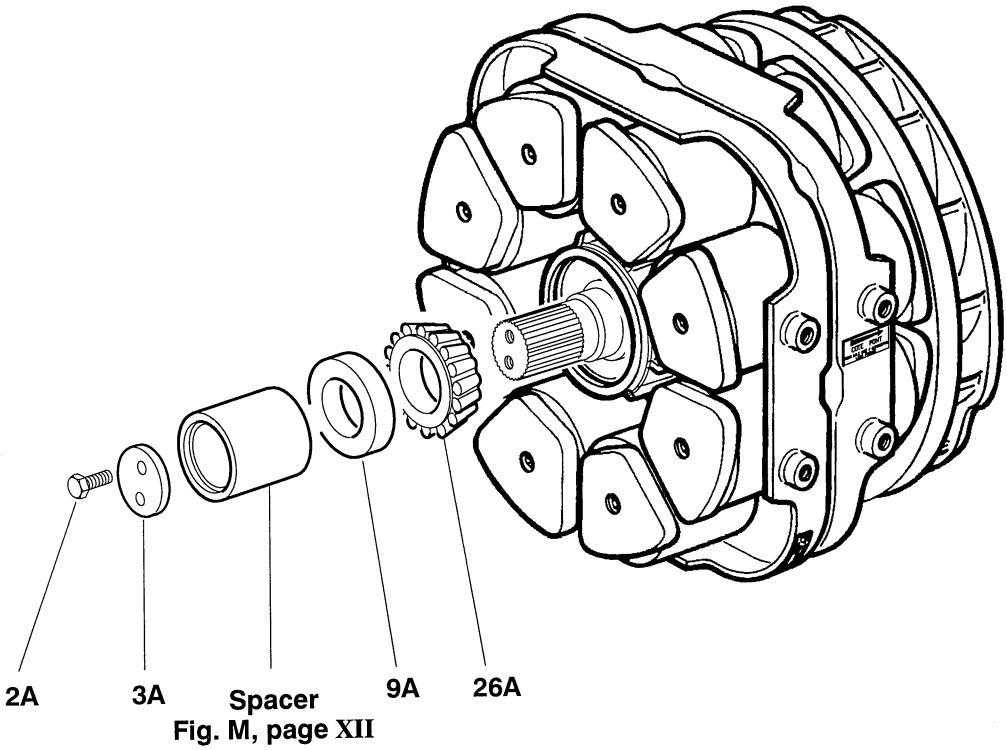

Fig. M, page XII

FIGURE 29

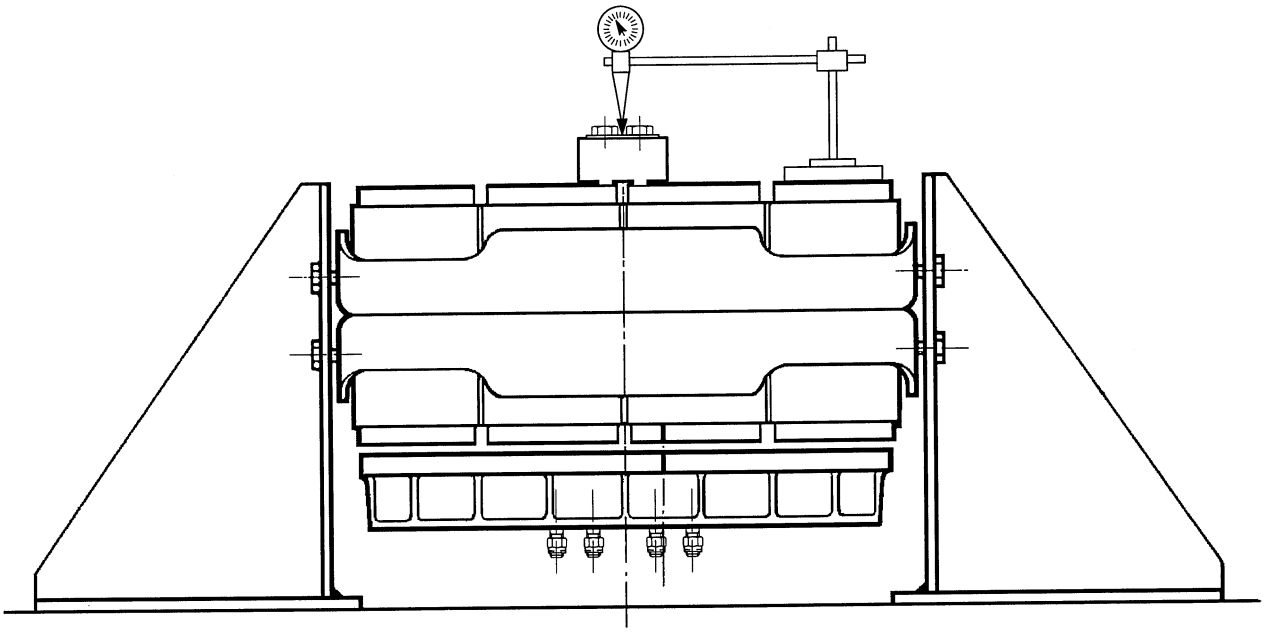

FIGURE 30

2 – INSTALLATION OF THE SHAFT – Figure 29

– Install the assembled shaft in the bearing housing from the drive axle side.

– On the gearbox side, mount the following parts :

- the second bearing, item 26A, with the bearing installation tool (Fig. N, page XIII), until it is seated against the bearing adjusting shims
- the seal race, item 9A, for the lip seal
- the spacer (Fig. M, page XII)
- the plate, item 3A
- both shaft end screws, item 2A :
  CC 50 / CC 65 / CC 80 / CC 100 / CC 125 / CC 135 / CC 160 :
  17 mm socket tightening torque : 30 Nm ***(22 lb–ft)***

  CC 200 / CC 220 / CC 250 / CC 270 / CC 300 :
  19 mm socket tightening torque : 60 Nm ***(44 lb–ft)***

3 – CHECK OF THE BEARING PLAY – Figure 30

– Wait for the complete cooling of the bearings before measuring the play.

– Proceed as described in the paragraphs IV–4 to IV–6 (pages 19 to 21) and check that the value of the bearing play is within the following tolerance :

Axial play of the shaft assembly : 0.07 $^{+0.05}_{-0.04}$ **mm**	*(.0012 to .0047")*

If not : disassemble the shaft using the puller (Fig. B, page III). Referring to paragraph II–2, page 7, check that the outer races of the bearings are well seated against the shoulders of the bearing housing.

Should the measured play be over 0.12 mm ***(.0047")*** **:**

- calculate the difference between this measured value and the theoretical value of 0.07 mm *(.0027")*
- deduct this difference from the thickness of the removed shims and select the suitable shims, item 17, with the closest thickness.

Should the measured play be under 0.03 mm ***(.0012")*** **:**

- calculate the difference between this measured value and the theoretical value of 0.07 mm *(.0027")*
- add this difference to the thickness of the removed shims and select the suitable shims, item 17, with the closest thickness.

– Reassemble the shaft and check again the obtained bearing play.

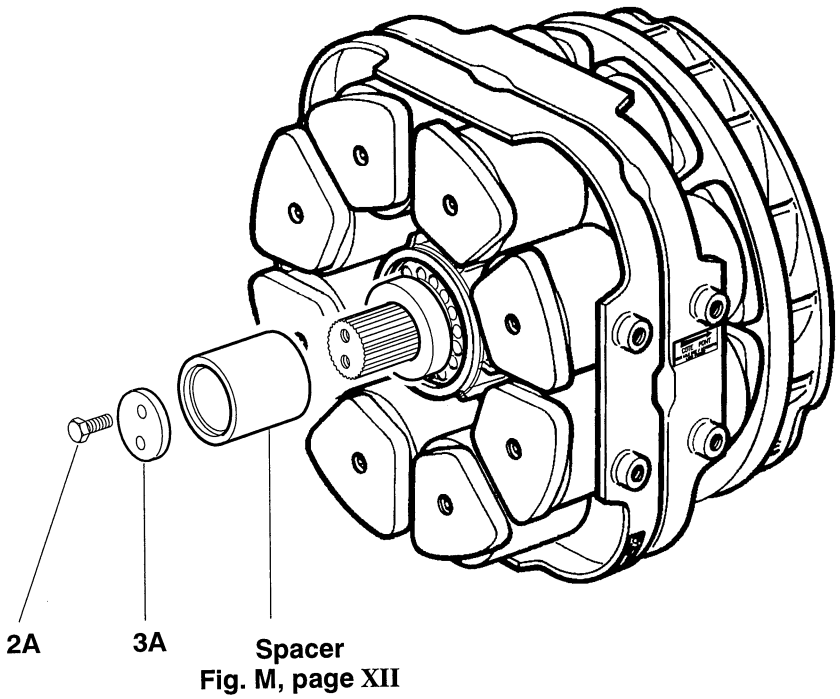

FIGURE 31

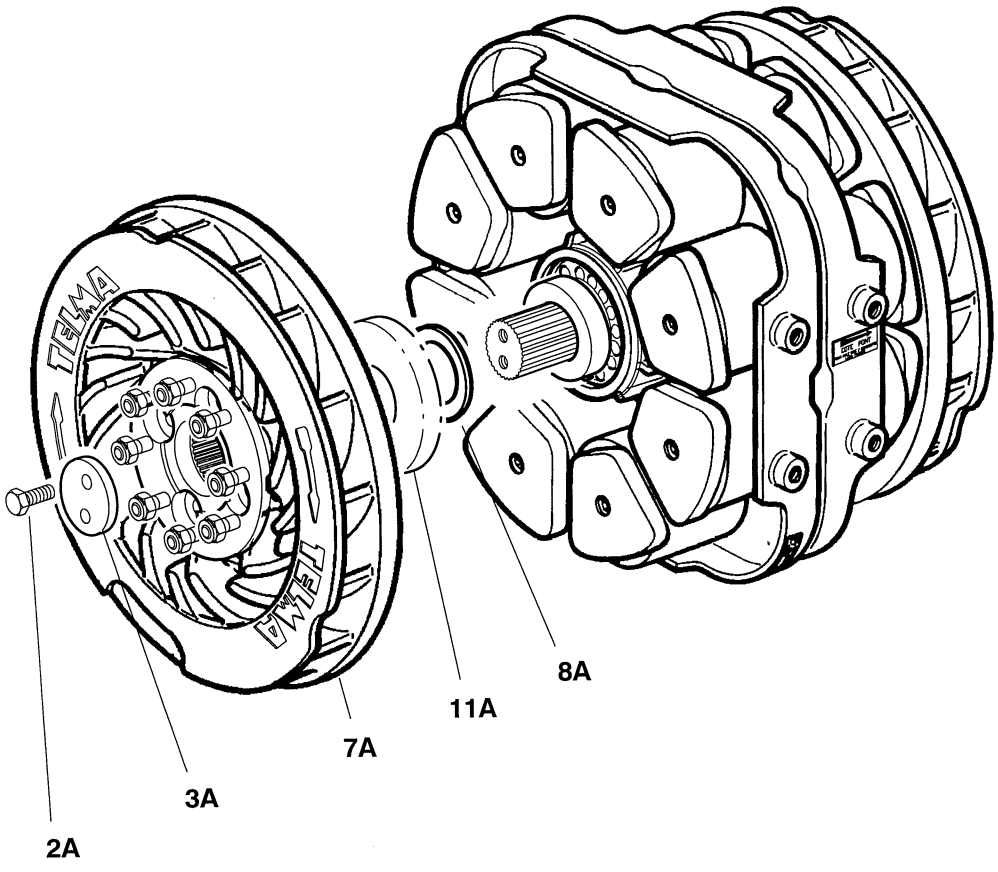

FIGURE 32

VIII – ADJUSTMENT OF THE AIR–GAPS

– Figures 31, 32 and 33

– Turn the retarder on its stand so the shaft is horizontal.

– Remove the shaft end screws, item 2A on the gearbox side as well as :

- the plate, item 3A
- the spacer (Fig. M, page XII)

– Take the set of air–gap adjusting shims, item 8 and after thoroughly degreasing each shim, select the shims in order to obtain a total thickness of :

	standard version	LLG version
CC 50	**2.3 mm** *(.090")*	**1.8 mm** *(.071")*
CC 65	**3.6 mm** *(.142")*	**3.1 mm** *(.122")*
CC 80/CC 100	**3.3 mm** *(.130")*	**2.8 mm** *(.110")*
CC 125	**2.5 mm** *(.100")*	**2.0 mm** *(.079")*
CC 135/CC 160	**1.9 mm** *(.075")*	**1.4 mm** *(.055")*
CC 200	**1.9 mm** *(.075")*	**1.4 mm** *(.055")*
CC 250/CC 270	**1,7 mm** *(.067")*	**1.2 mm** *(.047")*
CC 220/CC 300	**1.9 mm** *(.075")*	**1.4 mm** *(.055")*

Install on the shaft :

- the selected air–gap adjusting shims, item 8A
- the dust cover, item 11A, in case of the LLG version
- the clockwise rotor, item 7A equipped with its coupling flange. Ensure that the centre punch marks which have been made before disassembly (paragraph II–1, page 5) are aligned.
- the plate, item 3A
- both shaft end screws, item 2A :
  CC 50 / CC 65 / CC 80 / CC 100 / CC 125 / CC 135 / CC 160 :
  17 mm socket tightening torque : 30 Nm ***(22 lb–ft)***

  CC 200 / CC 220 / CC 250 / CC 270 / CC 300 :
  19 mm socket tightening torque : 60 Nm ***(44 lb–ft)***

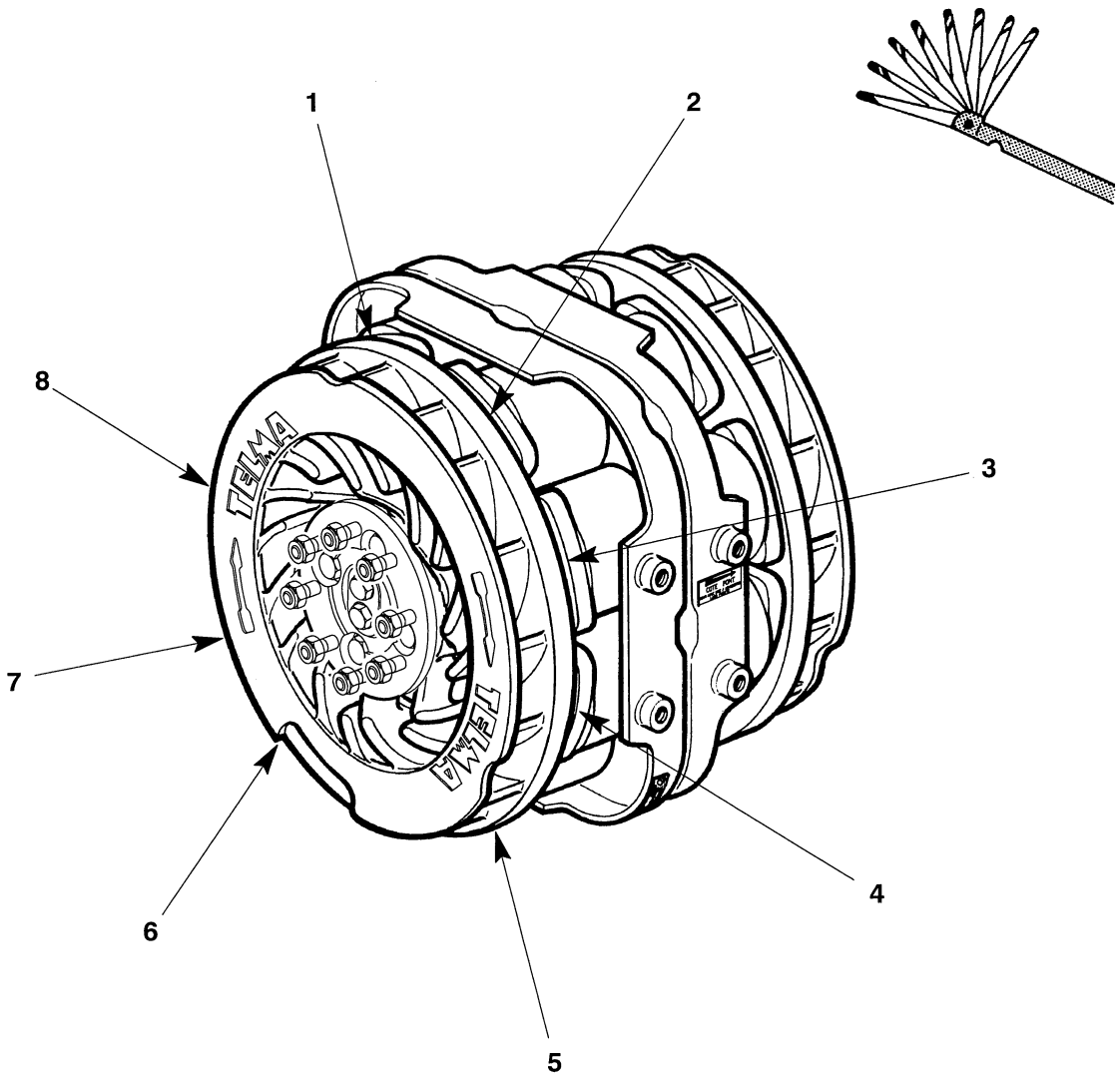

FIGURE 33

– With a feeler gauge :
  - measure the distance between the inner face of the clockwise rotor and the pole shoe facing it
  - take the measurement at each of the eight pole shoes and record
  - determine the average air–gap X by adding the eight measurements together and dividing by eight. Each of the eight value should not vary from the average value by more than ± 0.2 mm *(± .0079")*

    your result : X =
  - compare this average X with the theoretical air–gap values E as follows :

	Theoretical air–gap E	
CC 50	**0.8** $^{0}_{-0.10}$ **mm**	*(.027" to .031")*
CC 65	**1.5** $^{0}_{-0.10}$ **mm**	*(.055" to .059")*
CC 80 / CC 100	**0.8** $^{0}_{-0.10}$ **mm**	*(.027" to .031")*
CC 125	**1.0** $^{0}_{-0.10}$ **mm**	*(.035" to .039")*
CC 135	**1.9** $^{0}_{-0.10}$ **mm**	*(.071" to .075")*
CC 160	**1.2** $^{0}_{-0.10}$ **mm**	*(.043" to .047")*
CC 200	**1.2** $^{0}_{-0.10}$ **mm**	*(.043" to .047")*
CC 220	**1.6** $^{0}_{-0.10}$ **mm**	*(.059" to .063")*
CC 250 / CC 270	**1.2** $^{0}_{-0.10}$ **mm**	*(.043" to .047")*
CC 300	**1.5** $^{0}_{-0.10}$ **mm**	*(.055" to .059")*

1. If the value X is less than the nominal air–gap E, the difference represents the thickness of the shims to be added :

   E – X = e = thickness to be added

2. If the value X is greater than the nominal air–gap E, the difference represents the thickness of the shims to be removed :

   X – E = e = thickness to be removed

3. If the value X is equal to the nominal air–gap E :

   the adjustment is correct.

– If necessary, readjust the air–gap.

– Repeat these operations to adjust the air–gap on the drive axle side of the retarder, for the counter–clockwise rotor.

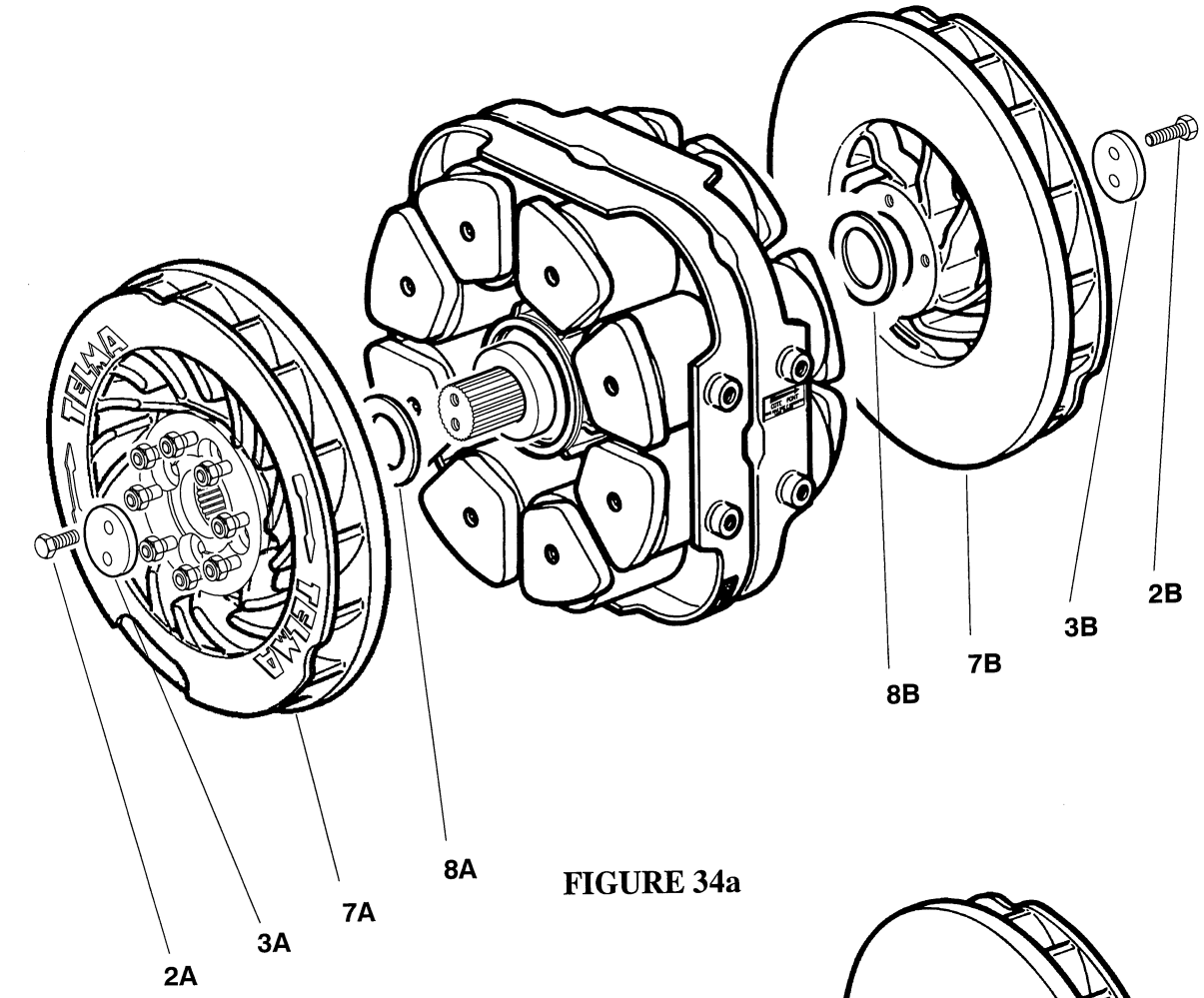

FIGURE 34a

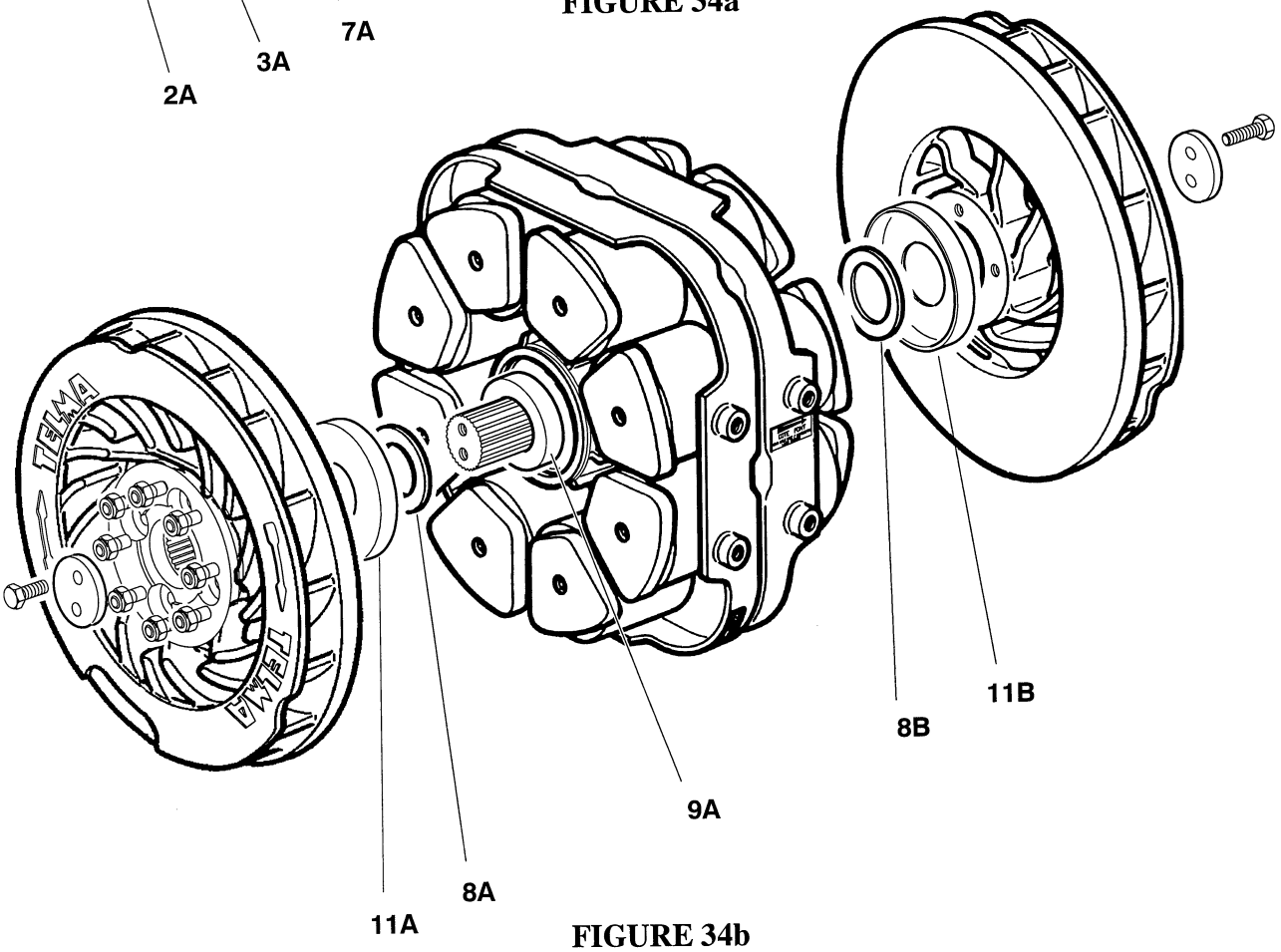

FIGURE 34b

IX – FINAL ASSEMBLY OF THE MAIN SHAFT

1 – REMOVAL OF THE ROTORS

– Figure 34a : standard version
– Figure 34b : LLG version (Long Life Greasing)

– On both sides, remove the following components :

- the shaft end screws, items 2A and 2B
- the plates, items 3A and 3B
- the rotor and coupling flange assemblies, items 7A and 7B
- the dust covers, items 11A and 11B, in case of the LLG version
- the air–gap adjusting shims, items 8A and 8B
- the seal races, items 9A and 9B, for the lip seals

– Identify with the letters A and B the rotor assemblies, the air–gap adjusting shims and the seal races to ensure reinstallation on the correct side of the shaft after fitting the lip seals.

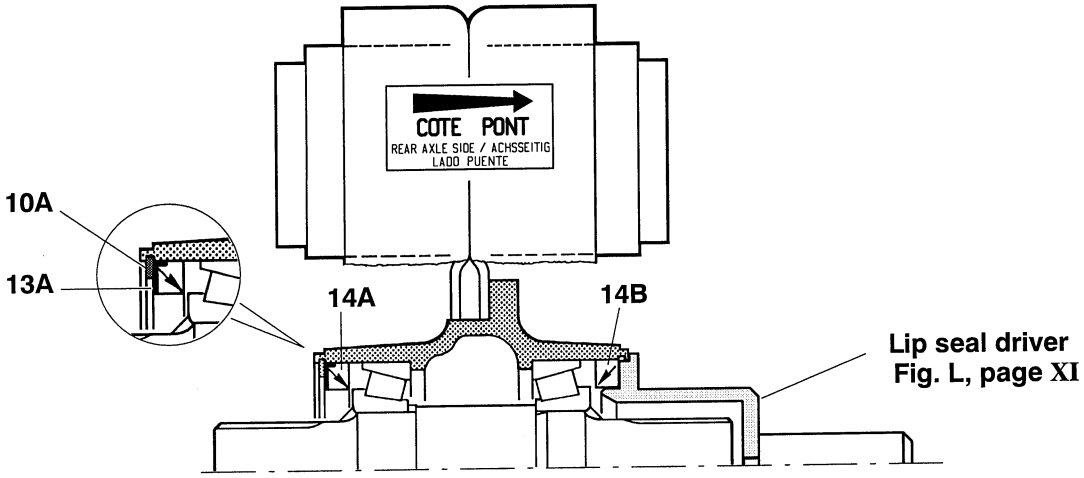

FIGURE 35

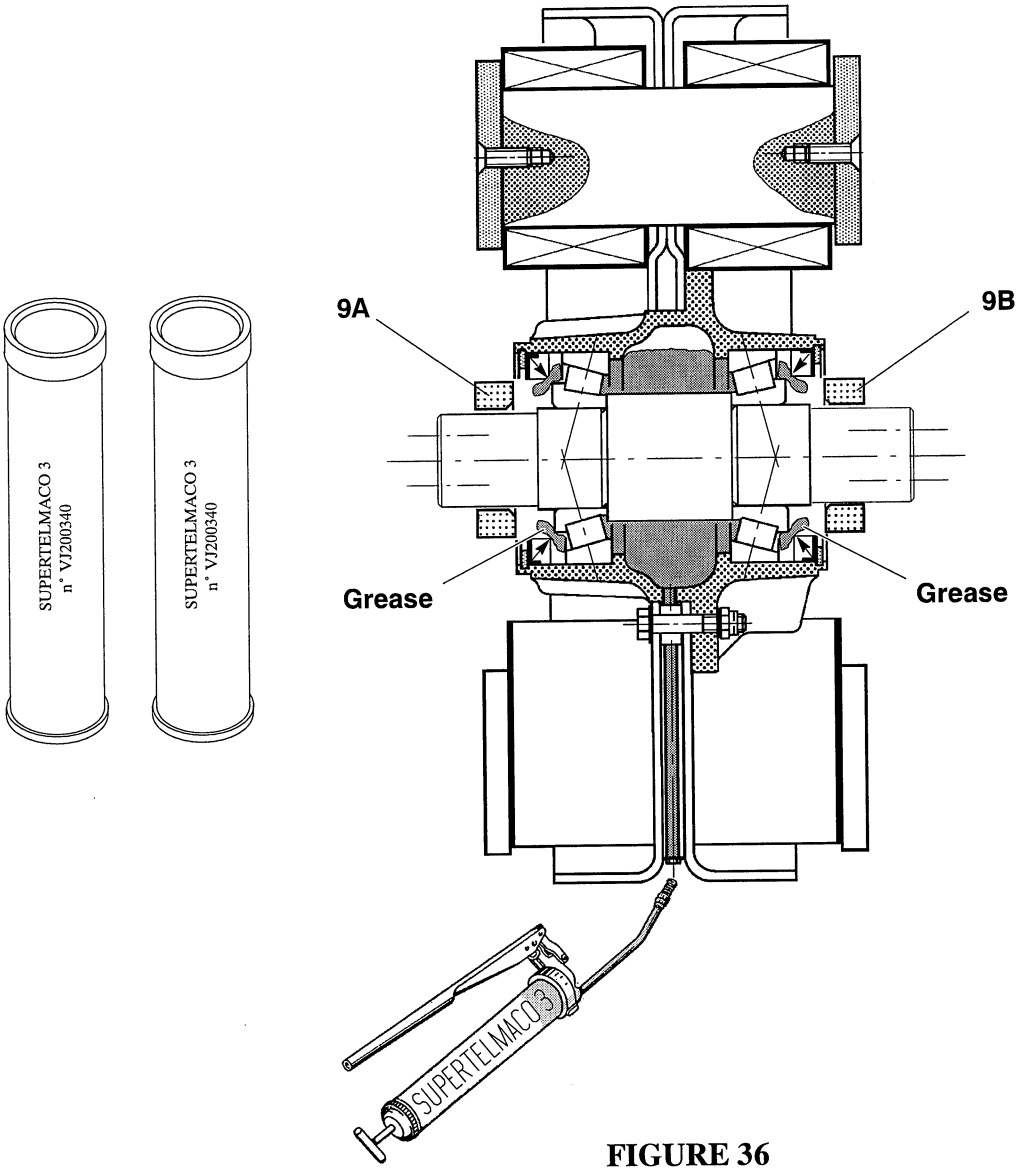

FIGURE 36

2 – INSTALLATION OF THE LIP SEALS – Figure 35

- Apply "SUPERTELMACO 3" grease on the outer faces of the two lip seals, items 14A and 14B.

- Insert the lip seals, with the lip towards the bearing, using the seal driver (Fig. L, page XI).

- On each lip seal, place the back up washer, items 13A and 13B, except on the LLG version.

- Insert the snap rings, items 10A and 10B, into the grooves in the bearing housing.

3 – LUBRICATION – Figure 36

- Using a hand pump, fill the hub of the retarder with "SUPERTELMACO 3" grease until grease appears between the bearings and the lip seals.

CAUTION : it is essential to use only "SUPERTELMACO 3" grease or an equivalent recognized by TELMA.

- Mount on the shaft, on the gearbox side, the seal race, item 9A with the chamfer against the bearing.

- Mount on the shaft, on the drive axle side, the second seal race, item 9B, with the chamfer against the bearing.

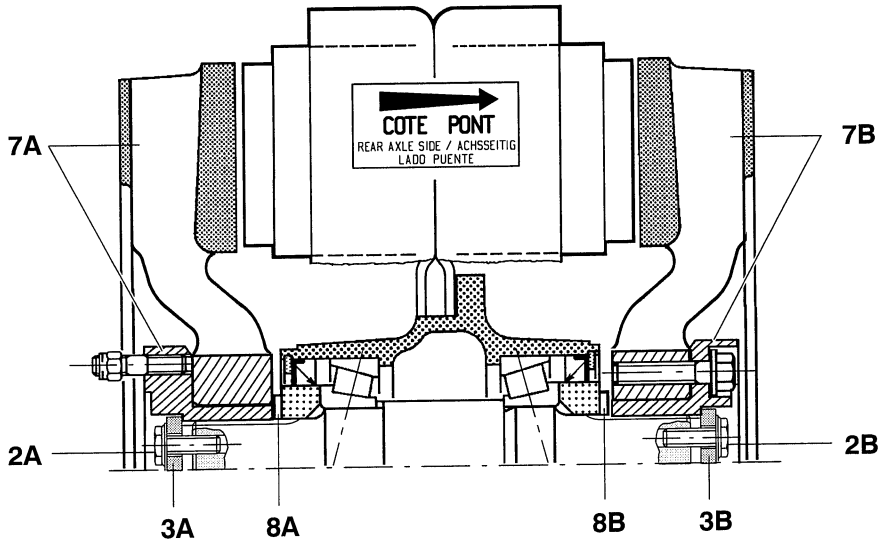

FIGURE 37

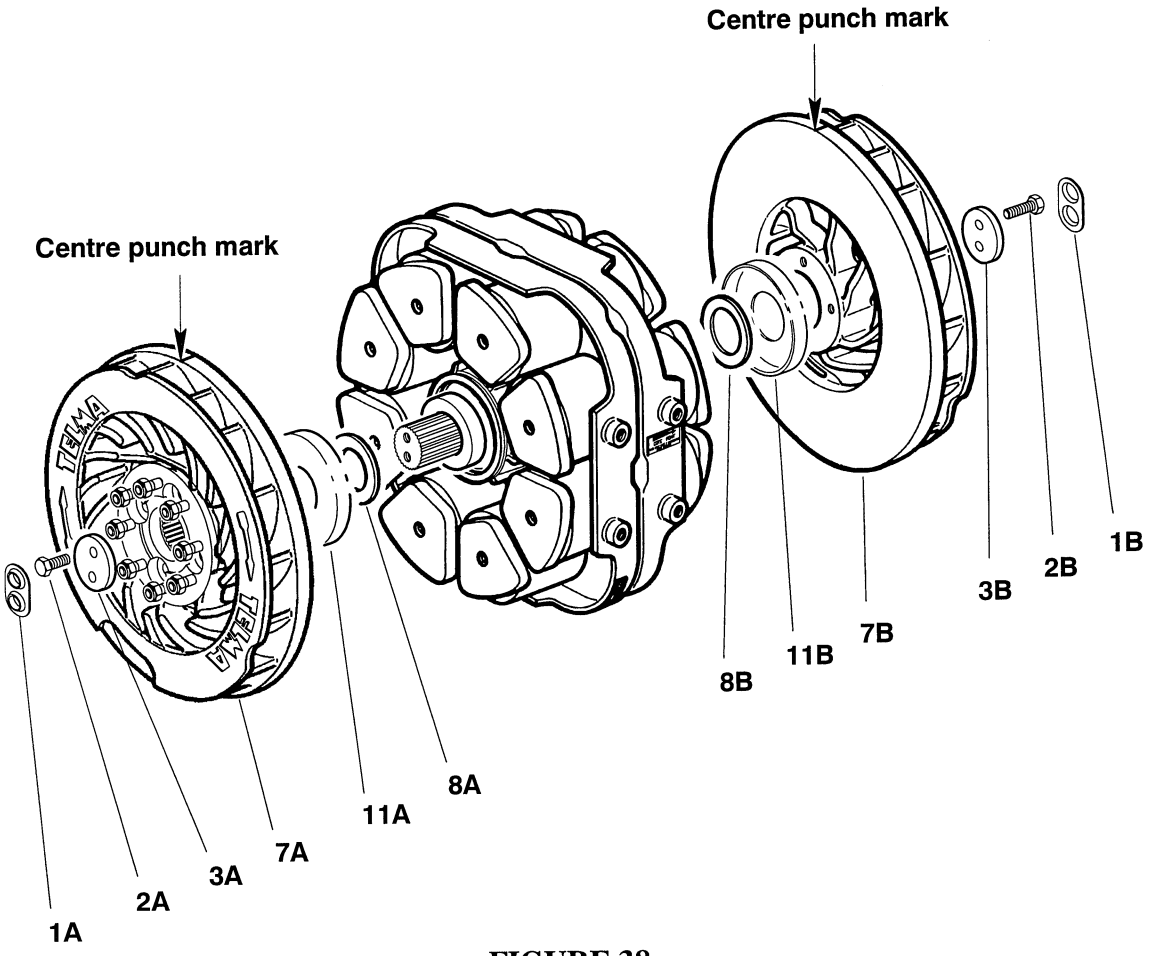

FIGURE 38

4 – REINSTALLATION OF THE ROTORS – Figures 37 and 38

– Mount on the shaft :

- the air–gap adjusting shims, items 8A and 8B
- the dust covers, items 11A and 11B, in case of the LLG version
- the rotor and coupling flange assemblies :
  item 7A : clockwise rotor on the gearbox side
  item 7B : counter–clockwise rotor on the drive axle side

  Ensure that the centre punch marks which have been made before disassembly (paragraph II–1, page 5) are aligned.
- the plates, items 3A and 3B
- the four shaft end screws, items 2A and 2B :
  CC 50 / CC 65 / CC 80 / CC 100 / CC 125 / CC 135 / CC 160 :
  17 mm socket tightening torque : 30 Nm ***(22 lb–ft)***

  CC 200 / CC 220 / CC 250 / CC 270 / CC 300 :
  19 mm socket tightening torque : 60 Nm ***(44 lb–ft)***
- new tab washers, items 1A and 1B, using the driver (Fig. P, page XIV).

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APPENDIX

LIST AND DRAWINGS OF THE SPECIAL TOOLS

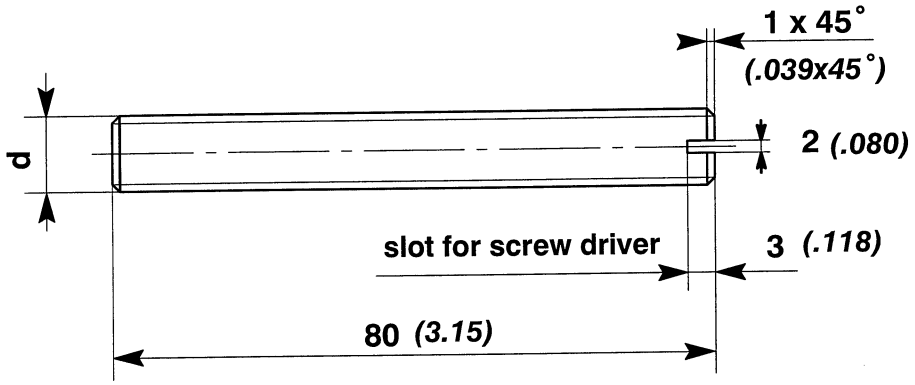
FIGURES A to P

LIST OF THE SPECIAL TOOLS

Fig.	Page	Description	Quantity per retarder			
			CC 50 CC 65 CC 80 CC 100	CC 125 CC 135 CC 160	CC 200	CC 220 CC 250 CC 270 CC 300
A	II	Treaded rods + nuts	2		2	
B	III	Puller	1	1	1	1
C	IV	Bearing outer race removal tool	1	1	1	1
D	V	Handle	1			
E	VI	Tube	1			
F	VII	Bearing removal socket	1			
G	VII	Bearing removal socket		1	1	1
H	VIII	Bearing outer race installation tool	1	1	1	1
J	IX	Gauge shaft		1		1
K	X	Gauge shaft	1		1	
L	XI	Lip seal driver	1	1	1	1
M	XII	Spacer	1	1	1	
N	XIII	Bearing inner race installation tool	1	1	1	1
P	XIV	Tab washer driver	1		1	

THREADED RODS + NUTS

FIGURE A



RETARDER	d
CC 50/65/80/100 CC 125/135/160	M10x1.5 mm 6g
CC 200/220/250/270/300	M12x1.5 mm 6g

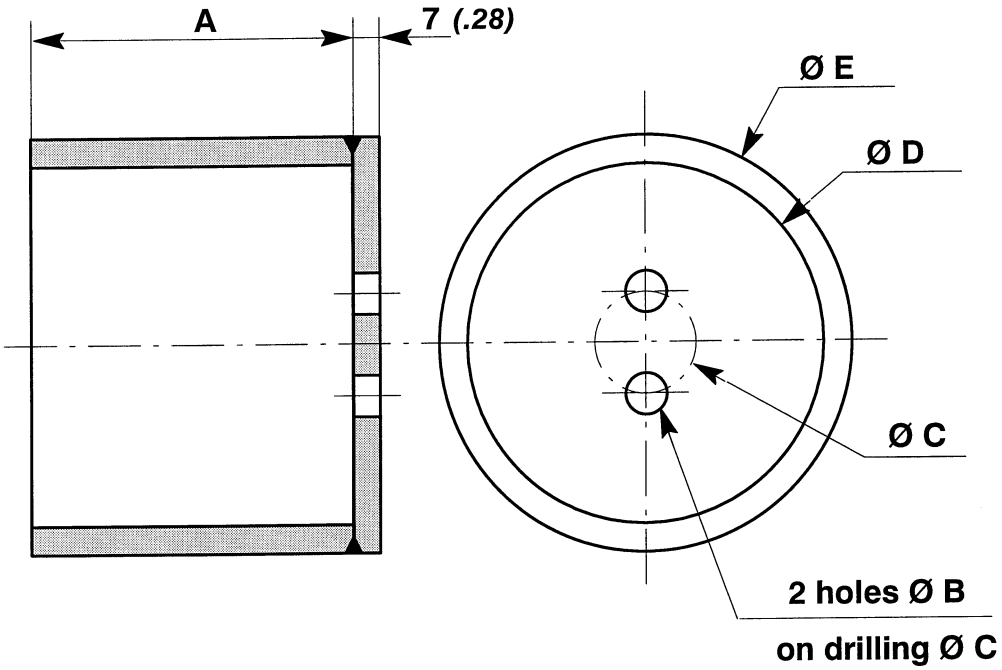
dimensions : mm (inch)

Material : soft steel

Quantity : **2 threaded rods**
2 nuts

PULLER

FIGURE B



dimensions : mm *(inch)*

RETARDER	A (A) mm *(inch)*	Ø B (dia.B) $^{+0.2}_{0}$ mm *(inch)*	Ø C (dia.C) ±0.2 mm *(inch)*	Ø D (dia.D) mm *(inch)*	Ø E (dia.E) mm *(inch)*
CC 50/65/80/100	85 *(3.35)*	11 *(.43/.44)*	27 *(1.06/1.07)*	Ø95 *(3.74)*	Ø110 *(4.33)*
CC 125/135/160	90 *(3.54)*	11 *(.43/.44)*	27 *(1.06/1.07)*	Ø125 *(4.92)*	Ø140 *(5.51)*
CC 200	100 *(3.94)*	13 *(.51/.52)*	40 *(1.57/1.58)*	Ø120 *(4.72)*	Ø135 *(5.31)*
CC 220/250/270/300	100 *(3.94)*	13 *(.51/.52)*	40 *(1.57/1.58)*	Ø135 *(5.31)*	Ø150 *(5.91)*

Material : XC48F (Rm = 630 N/mm^2 mini) (HB 230 to 280)

Protection : Oil burnishing

General machining : $^{6.3}\sqrt{}$ except $^{3.2}\sqrt{}$

General tolerance : ± 0.5 mm *(± .019 inch)*

Break sharp edges to have a 0.5 mm *(.019 inch)* chamfer at 45°.

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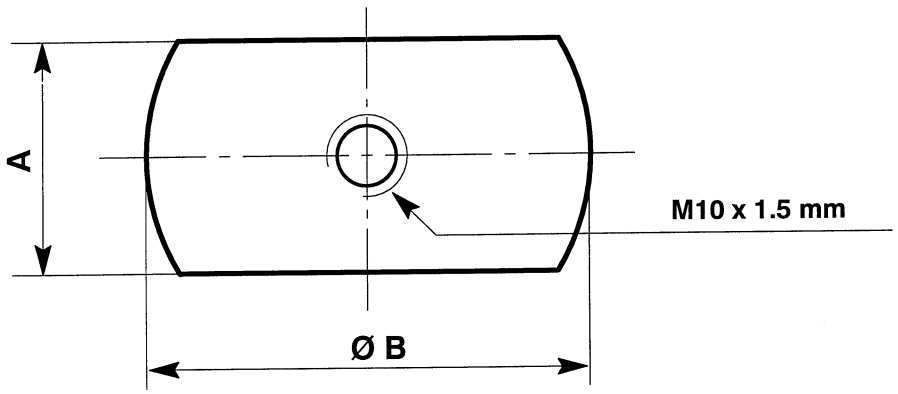
BEARING OUTER RACE REMOVAL TOOL

FIGURE C

dimensions : mm *(inch)*



RETARDER	A mm	(A) *(inch)*	Ø B mm	(dia.B) *(inch)*
CC 50/65/80/100	40	*(1.57)*	78	*(3.07)*
CC 125/135/160	50	*(1.96)*	108	*(4.25)*
CC 200	50	*(1.96)*	105	*(4.13)*
CC 220/250/270/300	60	*(2.36)*	117	*(4.60)*

Material **XC 48F** (Rm = 630 N/mm^2)
(HB 230 to 280)
8 mm *(.314 inch)* thickness

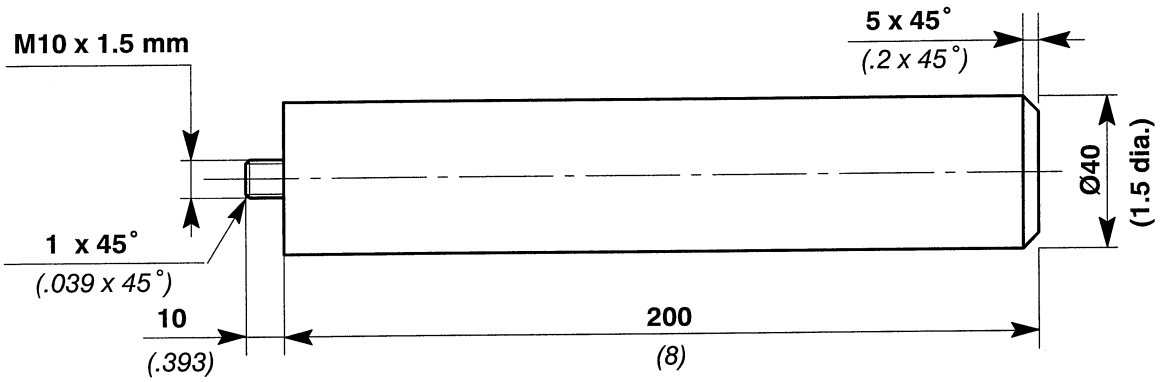
Protection : Oil burnishing
General tolerance : ± 0.5 mm *(± .019 inch)*

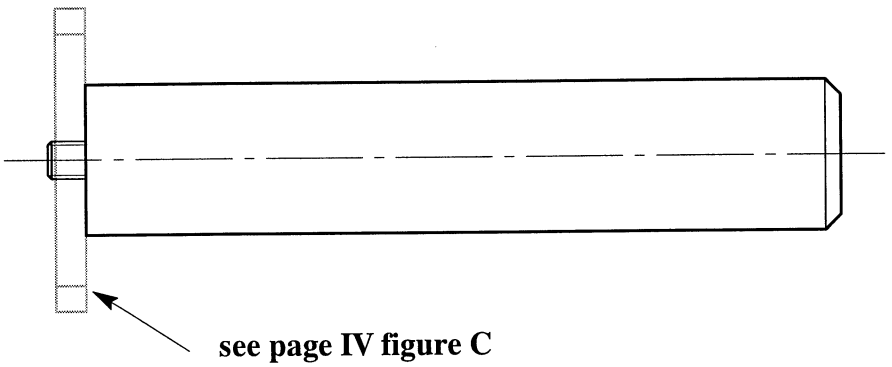
Break sharp edges to have a 1mm *(.039 inch)* chamfer at 45°.

HANDLE

FIGURE D

dimensions : mm *(inch)*





see page IV figure C

Material **XC 48F** (Rm = 630 N/mm^2) (HB 230 to 280)

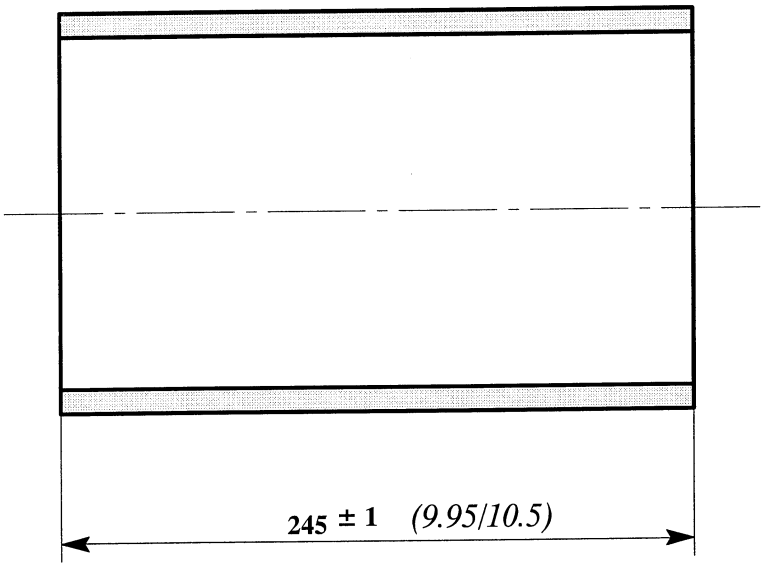
Protection : Oil burnishing
General tolerance : ± 0.5 mm *(± .019 inch)*

Break sharp edges to have a 1mm *(.039 inch)* chamfer at 45°.

TUBE

FIGURE E

dimensions : mm *(inch)*



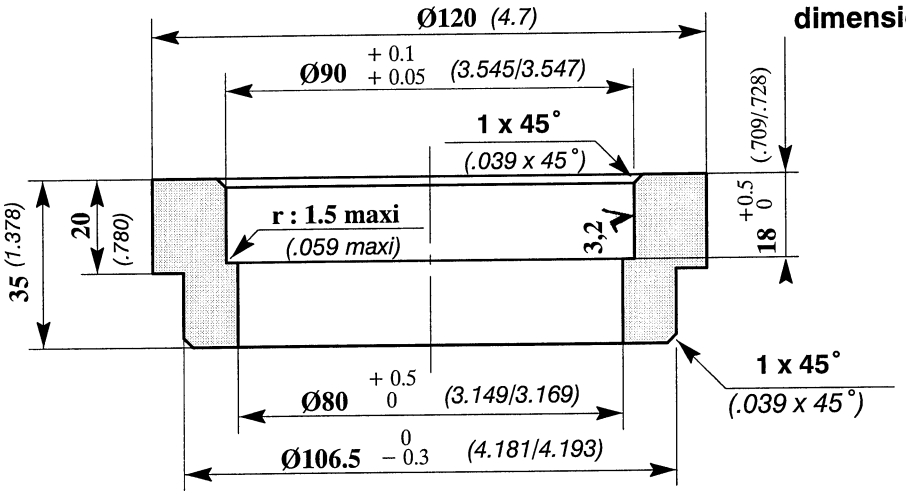
Seamless steel tube : wall thickness 3.6 mm *(.140 inch)* – Ø ext. 114.3 *(4.5 inch dia)*

Example of standard : AFNOR A 48.005

Break sharp edges to have a 0.5 mm *(.019 inch)* chamfer at 45°.

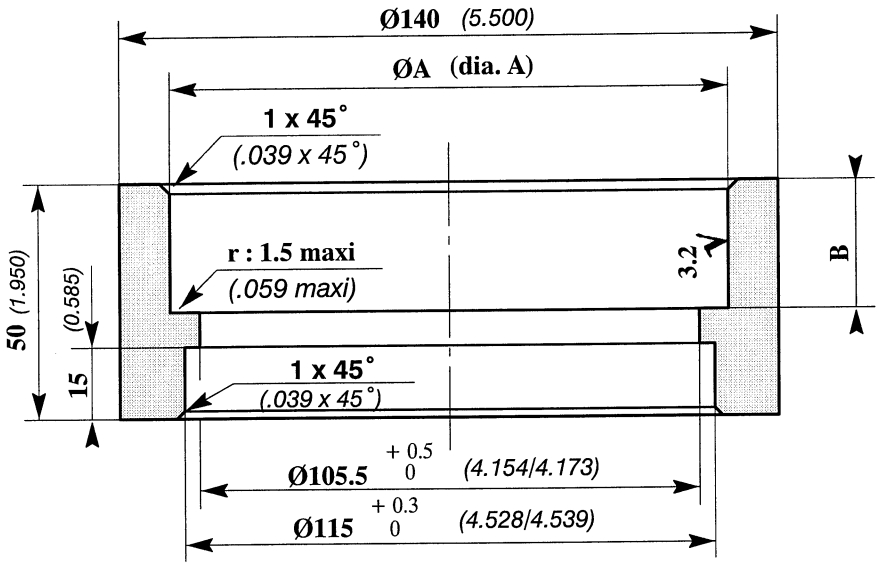
BEARING REMOVAL SOCKET
FOR CC 50 – CC 65 – CC 80 – CC 100

FIGURE F



BEARING REMOVAL SOCKET

FIGURE G



Retarder	ØA $^{+0.1}_{+0.05}$ mm	(dia. A) (inch)	B $^{+0.5}_{0}$ mm	(B) (inch)
CC 125/135/160	120	(4.726/4.728)	28	(1.102/1.122)
CC 200	115	(4.529/4.531)	26.5	(1.043/1.063)
CC 220/250/270/300	130	(5.120/5.122)	26.5	(1.043/1.063)

Material : XC48F (Rm = 630 N/mm² mini) (HB 230 to 280)

General machining : $^{6.3}\sqrt{}$ except $^{3.2}\sqrt{}$

Protection : Oil burnishing

General tolerance : ± 0.5 mm *(± .019 inch)*

Break sharp edges to have a 1 mm *(.039 inch)* chamfer at 45°.

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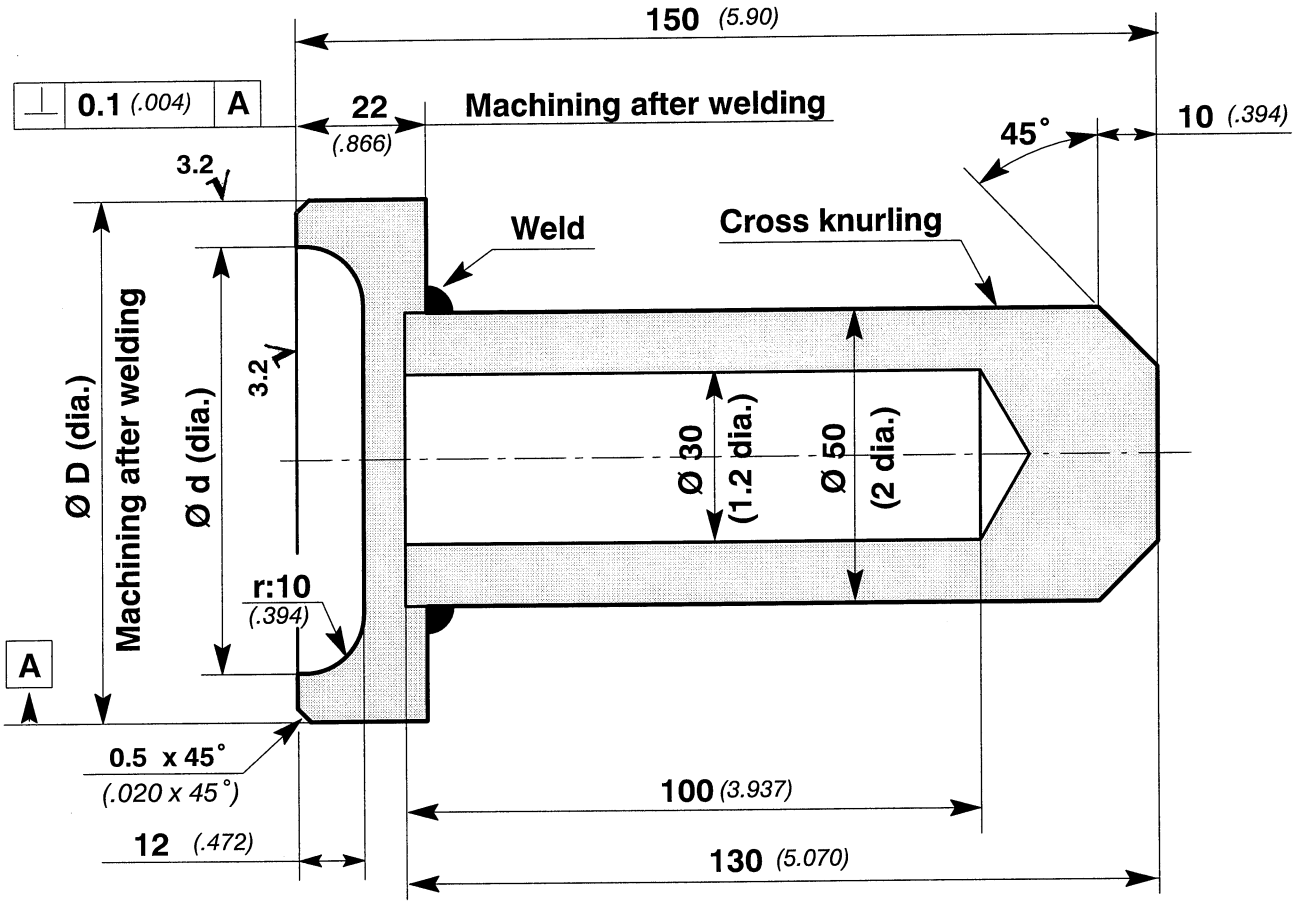
BEARING OUTER RACE INSTALLATION TOOL

FIGURE H

dimensions : mm *(inch)*



RETARDER	Ø D mm	(dia. D) (inch)	Ø d mm	(dia. d) (inch)
CC 50/65/80/100	90 $^{-0.380}_{-0.600}$	*(3.520/3.528)*	75	*3*
CC 125/135/160	120 $^{-0.410}_{-0.630}$	*(4.700/4.708)*	105	*4*
CC 200	115 $^{-0.410}_{-0.630}$	*(4.503/4.511)*	100	*4*
CC 220/250/270/300	130 $^{-0.410}_{-0.630}$	*(5.093/5.102)*	115	*4.5*

Material : E 24 (Rm = 630 N/mm^2 mini) (HB 230 to 280)

General machining : $^{6.3}\sqrt{}$ except $^{3.2}\sqrt{}$

Protection : Oil burnishing

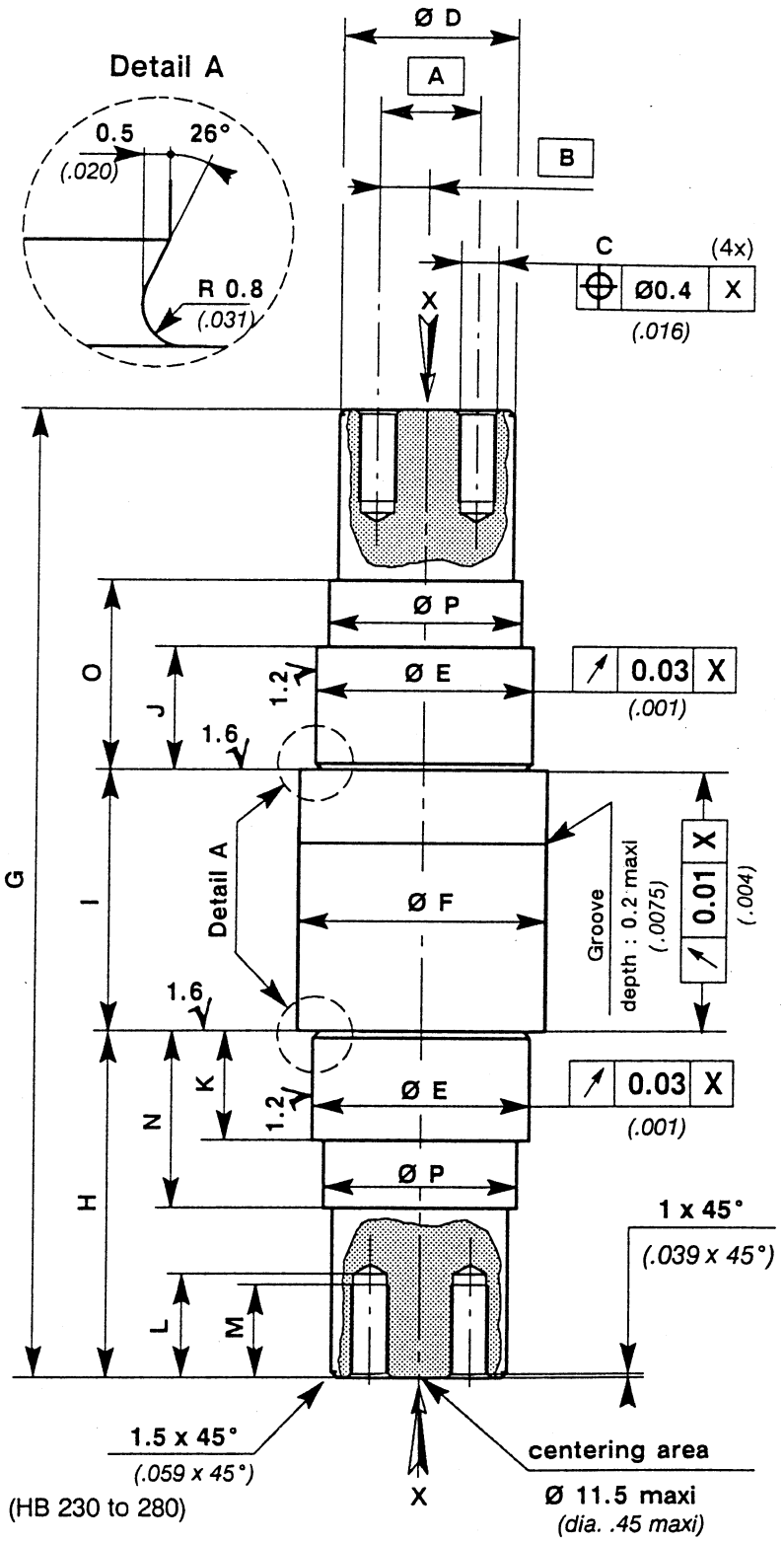
General tolerance : ± 1 mm *(± .039 inch)*

Break sharp edges to have a 1 mm *(.039 inch)* chamfer at 45°.

GAUGE SHAFT

FIGURE J

	CC 125 CC 135/160	CC 250/270 CC 300
A	27 *(1.063)*	40 *(1.575)*
B	13.5 *(0.531)*	20 *(0.787)*
C	M10 x 1.5 mm	M12 x 1.5 mm
ØD	$51\ ^{0}_{-0.2}$ *(2.000/2.008)*	$69\ ^{0}_{-0.2}$ *(2.709/2.717)*
ØE	$65\ ^{-0.015}_{-0.030}$ *(2.557/2.558)*	$85\ ^{-0.018}_{-0.035}$ *(3.345/3.346)*
ØF	$75\ ^{+0.3}_{0}$ *(2.953/2.965)*	$94\ ^{+0.3}_{0}$ *(3.701/3.713)*
G	251 ±0.5 *(9.862/9.902)*	288 ±0.5 *(11.319/11.358)*
H	90 *(3.543)*	107 *(4.213)*
I	72.19 *(2.842)*	74.59 *(2.937)*
J	28 ±0.1 *(1.098/1.106)*	27 ±0.1 *(1.059/1.067)*
K	32 ±0.1 *(1.256/1.264)*	31 ±0.1 *(1.217/1.224)*
L	$28\ ^{+1}_{0}$ *(1.102/1.142)*	$28\ ^{+1}_{0}$ *(1.102/1.142)*
M	$20\ ^{+2\ \text{threads}}_{0}$ *(0.787/0.905)*	$20\ ^{+2\ \text{threads}}_{0}$ *(0.787/0.905*
N	$52\ ^{+0.4}_{0}$ *(2.047/2.063)*	$47\ ^{+0.4}_{0}$ *(1.850/1.866)*
O	$48\ ^{+0.4}_{0}$ *(1.890/1.906)*	$43\ ^{+0.4}_{0}$ *(1.693/1.709)*
ØP	$55\ ^{+0.02}_{-0.06}$ *(2.163/2.166)*	$75\ ^{0}_{-0.03}$ *(2.952/2.953)*



dimensions : mm *(inch)*

Material : XC48F (Rm = 630 N/mm² mini) (HB 230 to 280)

General machining : $\sqrt{}^{6.3}$ except $\sqrt{}^{3.2}$

Protection : Oil burnishing

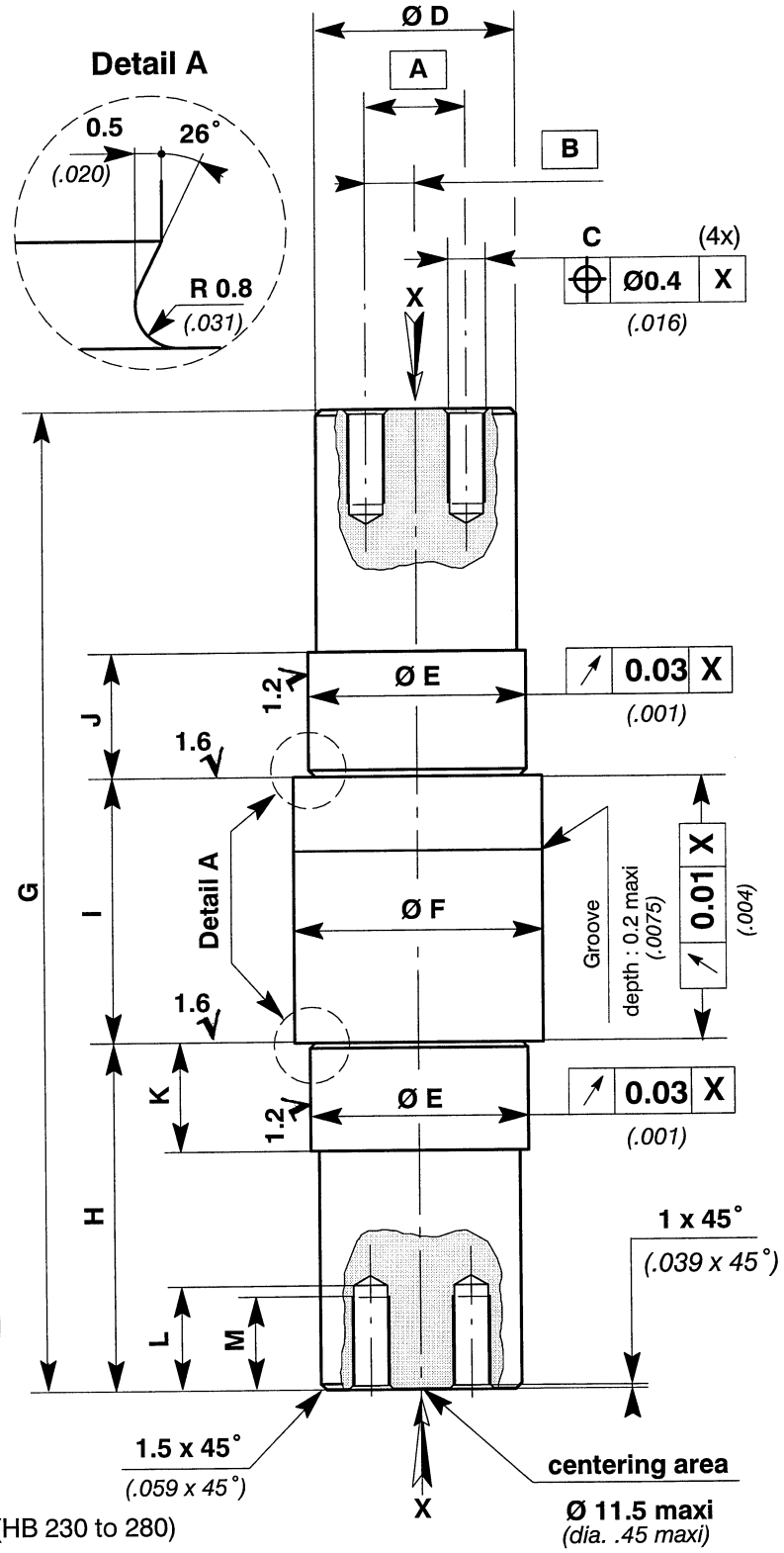
Break sharp edges to have a 0.5 mm *(.019 inch)* chamfer at 45°.

General tolerance : ± 0.5 mm *(± .019 inch)*

GAUGE SHAFT

FIGURE K

	CC 50	CC 65/80 CC 100	CC 200
A	27 *(1.063)*	27 *(1.063)*	40 *(1.575)*
B	13.5 *(0.531)*	13.5 *(0.531)*	20 *(0.787)*
C	M10 x 1.5 mm	M10 x 1.5 mm	M12 x 1.5 mm
ØD	$47\ ^{0}_{-0.2}$ *(1.843/1.850)*	$47\ ^{0}_{-0.2}$ *(1.843/1.850)*	$69\ ^{0}_{-0.2}$ *(2.709/2.717)*
ØE	$50\ ^{-0.015}_{-0.030}$ *(1.967/1.968)*	$50\ ^{-0.015}_{-0.030}$ *(1.967/1.968)*	$75\ ^{-0.015}_{-0.030}$ *(2.951/2.952)*
ØF	$58\ ^{+0.3}_{0}$ *(2.283/2.295)*	$58\ ^{+0.3}_{0}$ *(2.283/2.295)*	$82\ ^{+0.3}_{0}$ *(3.228/3.240)*
G	167.5 ± 0.5 *(6.575/6.614)*	261 ± 0.5 *(10.256/10.295*	288 ± 0.5 *(11.319/11.358)*
H	64 ± 0.1 *(2.516/2.524)*	85 *(3.346)*	108 *(4.252)*
I	40.04 ± 0.01 *(1.576/1.577)*	91.54 ± 0.01 *(3.603/3.604)*	72.61 ± 0.01 *(2.858/2.859)*
J	35 *(1.378)*	39 *(1.535)*	$48\ ^{+0.4}_{0}$ *(1.890/1.906)*
K	31 *(1.220)*	35 *(1.378)*	$44\ ^{+0.4}_{0}$ *(1.732/1.748)*
L	$28\ ^{+1}_{0}$ *(1.102/1.142)*	$28\ ^{+1}_{0}$ *(1.102/1.142)*	$28\ ^{+1}_{0}$ *(1.102/1.142)*
M	$20\ ^{+2\ \text{threads}}_{0}$ *(0.787/0.905)*	$20\ ^{+2\ \text{threads}}_{0}$ *(0.787/0.905)*	$20\ ^{+2\ \text{threads}}_{0}$ *(0.787/0.905)*



dimensions : mm *(inch)*

Material : XC48F (Rm = 630 N/mm² mini) (HB 230 to 280)

General machining : $\overset{6.3}{\sqrt{}}$ except $\overset{3.2}{\sqrt{}}$

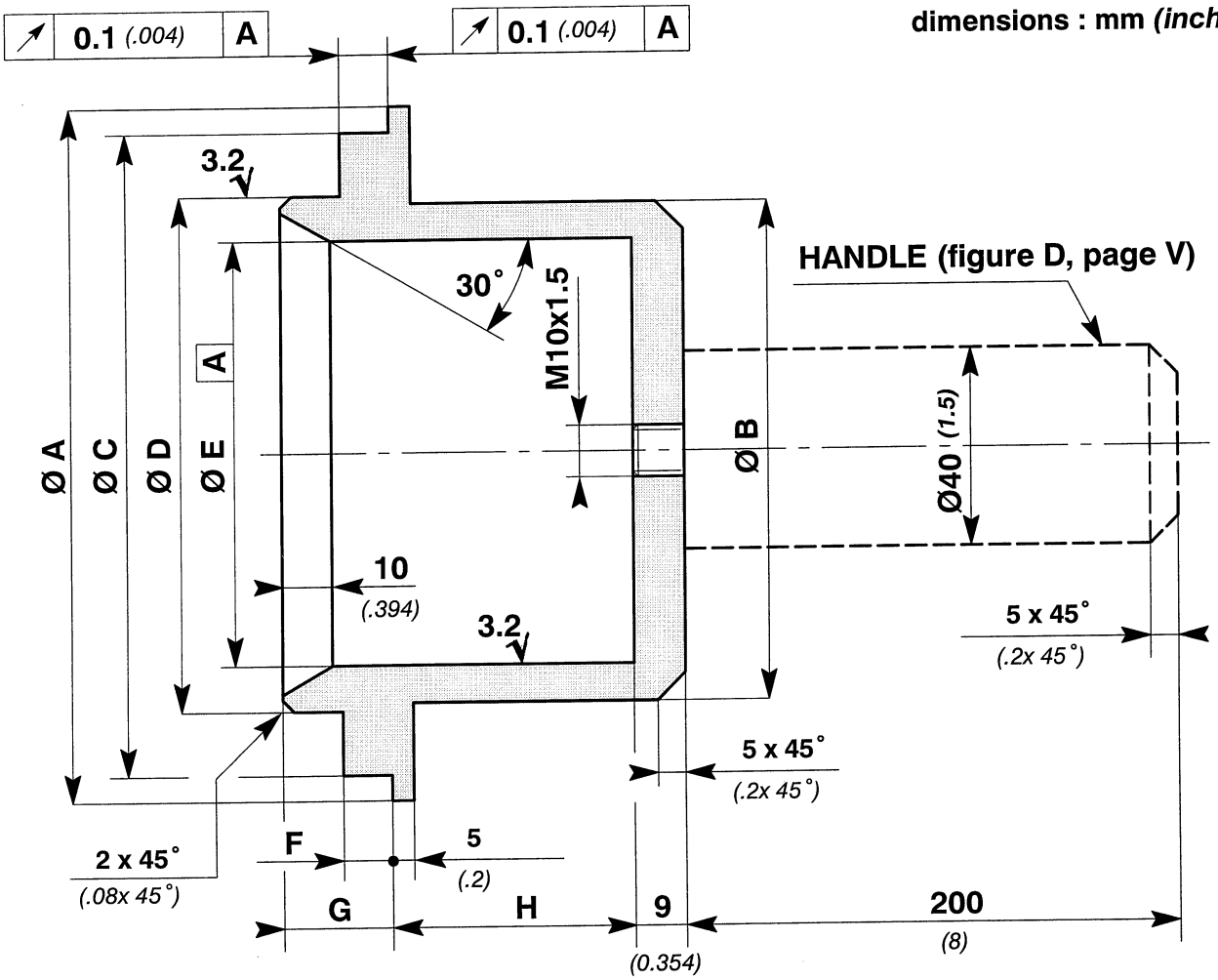
Protection : Oil burnishing

Break sharp edges to have a 0.5 mm *(.019 inch)* chamfer at 45°. **General tolerance :** ± 0.5 mm *(± .019 inch)*

LIP SEAL DRIVER

FIGURE L

dimensions : mm *(inch)*



RETARDER	Ø A	Ø B	Ø C ± 0.5	Ø D ± 0.1	Ø E ± 0.1	F ± 0.1	G ± 0.1	H
CC50/65/80/100	100 (3.937)	62 (2.440)	89 (3.484/ 3.524)	73 (2.870/ 2.878)	50 (1.965/ 1.972)	8 (0.311/ 0.319)	17 (0.665/ 0.673)	50 (1.969)
CC125/135/160	130 (5.118)	67 (2.638)	119 (4.665/ 4.705)	94 (3.697/ 3.705)	54.8 (2.154/ 2.161)	7.4 (0.287/ 0.295)	19 (0.744/ 0.752	60 (2.362)
CC200	125 (4.921)	87 (3.425)	114 (4.469/ 4.508)	94 (3.697/ 3.705)	74.8 (2.941/ 2.949)	7.4 (0.287/ 0.295)	19 (0.744/ 0.752	60 (2.362)
CC220/250/270 CC300	140 (5.512)	87 (3.425)	129 (5.059/ 5.098)	104 (4.091/ 4.098)	74.8 (2.941/ 2.949)	7.4 (0.287/ 0.295)	19 (0.744/ 0.752	60 (2.362)

Material : XC 48 F(Rm = 630 N/mm² mini) (HB 230 to 280)

General machining : $\sqrt{}^{6.3}$ except $\sqrt{}^{3.2}$

Protection : Oil burnishing

General tolerance : ± 1 mm *(± .039 inch)*

Break sharp edges to have a 1 mm *(.039 inch)* chamfer at 45°.

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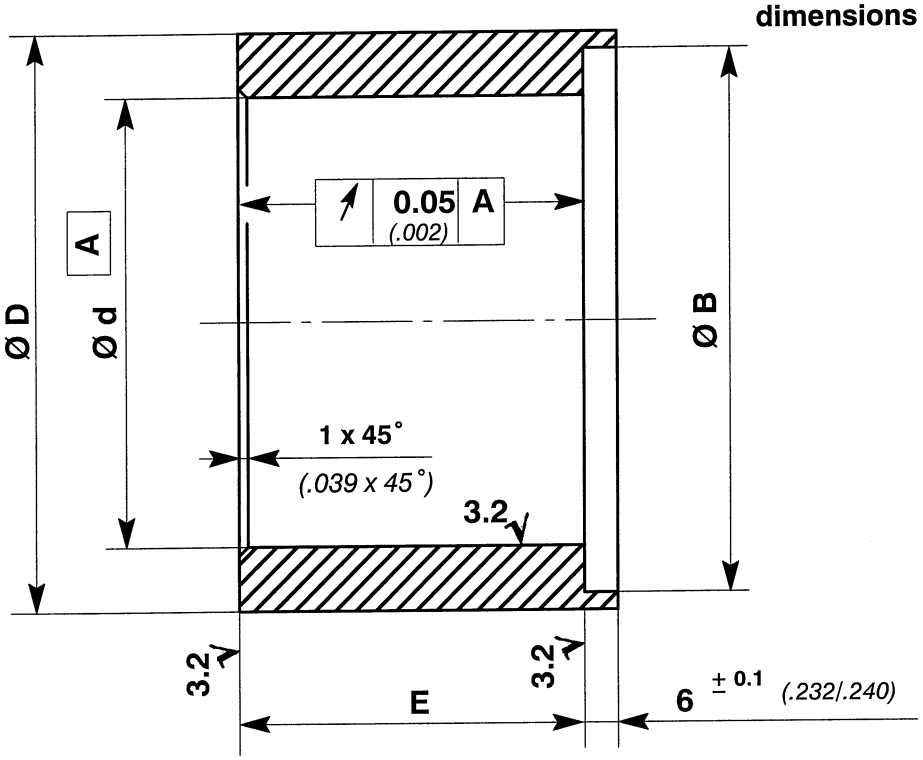
SPACER

FIGURE M

dimensions : mm *(inch)*



RETARDER	ØD mm	(dia. D) *(inch)*	Ød mm	(dia. d) *(inch)*	ØB mm	(dia. B) *(inch)*	E mm	(E) *(inch)*
CC 50/65/80/100	Ø70	*(2.756)*	Ø50 +0.169 +0.130	*(1.974/ 1.975)*	Ø65 +0.2 0	*(2.559/ 2.567)*	44	*(1.732)*
CC 125/135/160	Ø73	*(2.874)*	Ø55 +0.186 +0.140	*(2.171/ 2.173)*	Ø65 +0.2 0	*(2.559/ 2.567)*	56	*(2.205)*
CC 200/220/250 CC 270/300	Ø97	*(3.819)*	Ø75 +0.196 +0.130	*(2.958/ 2.960)*	Ø91.5 +0.2 0	*(3.602/ 3.610)*	59	*(2.323)*

Material : XC48F (Rm = 630 N/mm² mini) (HB 230 to 280)

General machining : $\sqrt{}^{6.3}$ except $\sqrt{}^{3.2}$

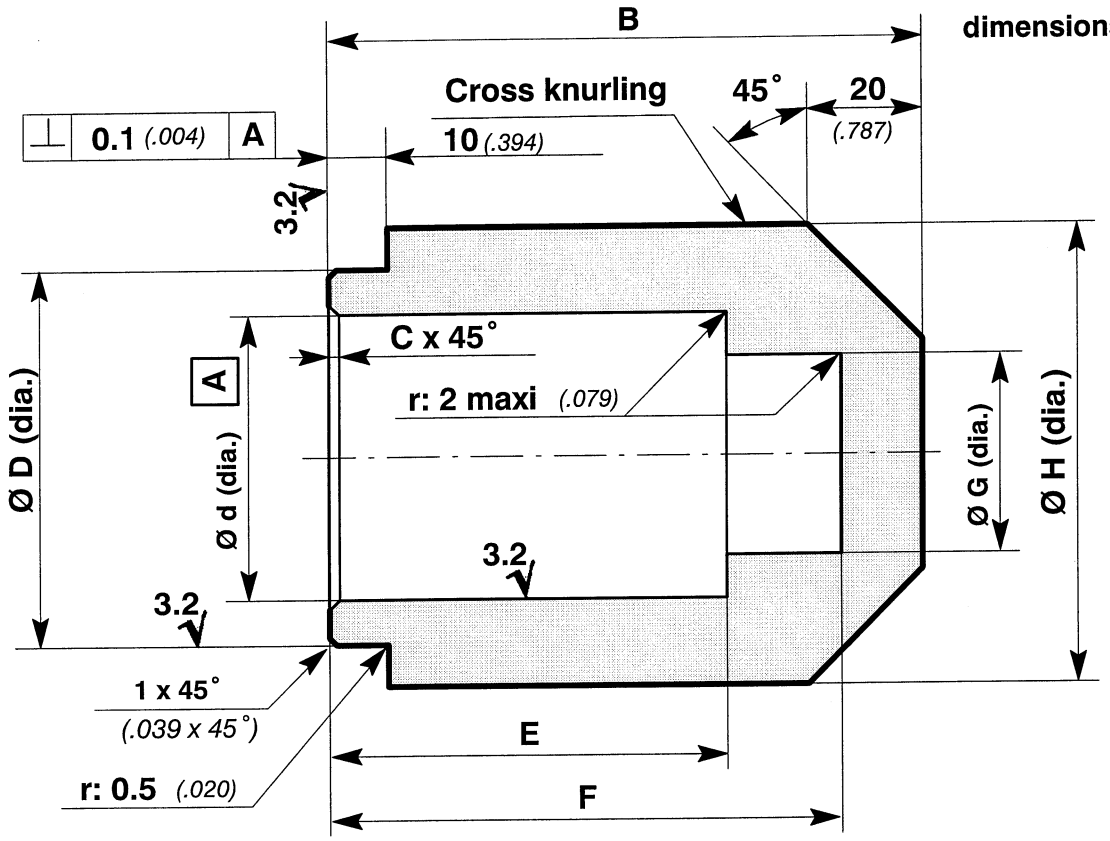
Protection : Oil burnishing

Break sharp edges to have a 0.5 mm *(.019 inch)* chamfer at 45°.

General tolerance : ± 0.5 mm *(± .019 inch)*

BEARING INNER RACE INSTALLATION TOOL

FIGURE N



RETARDER	B	C	ØD mm	(dia. D) (inch)	Ø d mm	(dia. d) (inch)	E	F	Ø G	Ø H
CC 50/65/80/100	105 (4.134)	1 (.039)	65 $^{-0.100}_{-0.220}$	(2.550/ 2.555)	50 $^{+0.119}_{+0.080}$	(1.972/ 1.973)	70 (2.756)	90 (3.543)	35 (1.378)	80 (3.150)
CC 125/135/160	125 (4.921)	8 (.314)	85 $^{-0.120}_{-0.260}$	(3.336/ 3.342)	55 $^{+0.146}_{+0.100}$	(2.169/ 2.171)	82 (3.228)	107 (4.212)	40 (1.575)	100 (3.937)
CC 200	125 (4.921)	1 (.039)	90 $^{-0.120}_{-0.260}$	(3.533/ 3.539)	75 $^{+0.146}_{+0.100}$	(2.957/ 2.959)	85 (3.346)	110 (4.331)	60 (2.362)	105 (4.134)
CC 220/250/270/300	125 (4.921)	8 (.314)	100 $^{-0.120}_{-0.260}$	(3.927/ 3.932)	75 $^{+0.120}_{+0.100}$	(2.957/ 2.959)	85 (3.346)	110 (4.331)	60 (2.362)	115 (4.528)

Material : XC 48 F (Rm = 630 N/mm^2 mini) (HB 230 to 280)

General machining : $^{6.3}\sqrt{}$ except $^{3.2}\sqrt{}$

Protection : Oil burnishing

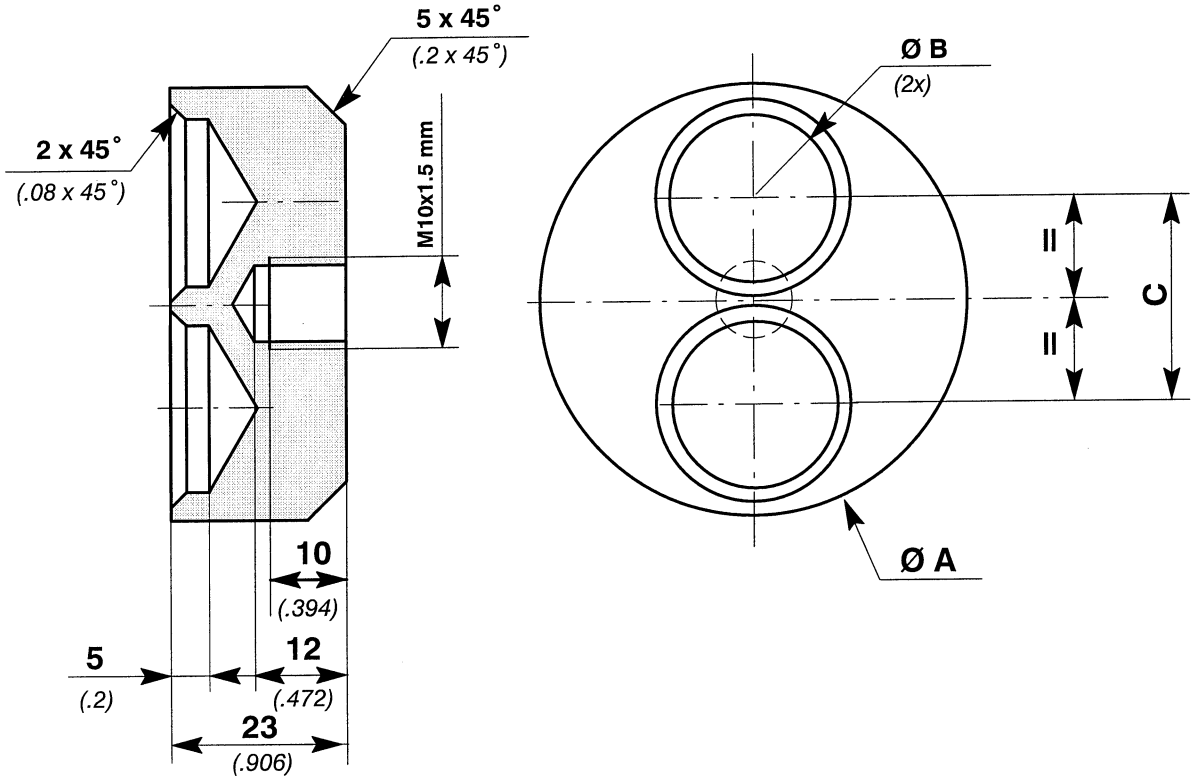
General tolerance : ± 1 mm *(± .039 inch)*

Break sharp edges to have a 1 mm *(.039 inch)* chamfer at 45°.

TAB WASHER DRIVER

FIGURE P

dimensions : mm *(inch)*



RETARDER	Ø A mm	(dia. A) *(inch)*	ØB $^{+0.1}_{0}$ mm	(dia. B) *(inch)*	C ± 0.1 mm	(C) *(inch)*
CC 50/65/80/100 CC 125/135/160	57	*(2.244)*	22	*(0.866/0.870)*	27	*(1.059/1.067)*
CC 200/250/270/300	75	*(2.953)*	24	*(0.945/0.949)*	40	*(1.570/1.579)*

Material : XC 48F (Rm = 630 N/mm^2 mini) (HB 230 to 280)

General machining : $\sqrt{}^{6.3}$ except $\sqrt{}^{3.2}$

Protection : Oil burnishing

General tolerance : ± 0.5mm *(± .019 inch)*

Break sharp edges to have a 1 mm *(.039 inch)* chamfer at 45°.