



**comer industries**  
Gearboxes

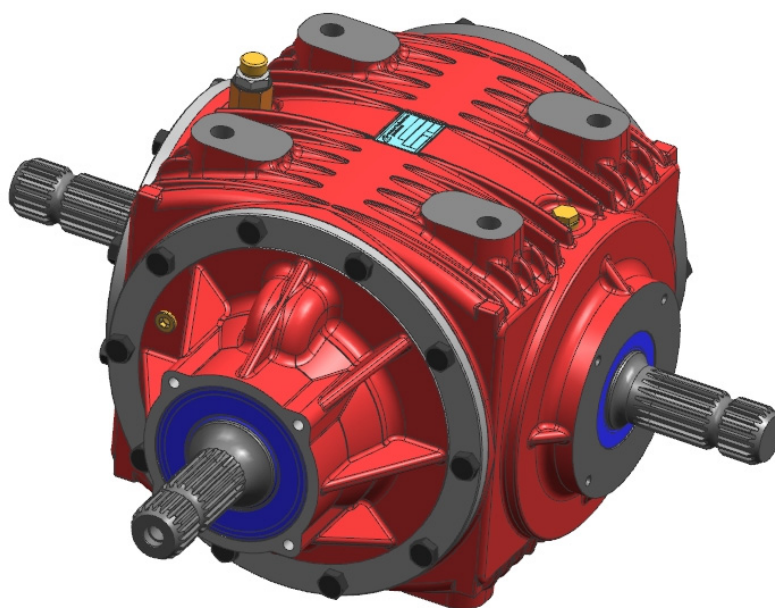
Quality System certified  
**UNI EN ISO 9001**

*Customer FALC*

# ***SERVICE MANUAL***

**Code**

**9.331.205.00**



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## Introduction

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The information contained in this manual are only a general information.

Comer Industries maintains the right of modifying or updating the content of this manual when requested without need of previous information.

In consideration of the attention and care needed for disassembly/re-assembly operations, the success and the safety of the intervention are exclusively under operator's responsibility.

The COMER INDUSTRIES gearbox is designed for installation in a more complex machine and has been designed to guarantee the best results, provided of course all assembly, installation, use and maintenance instructions described here are respected.

## Symbols used

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### MANDATORY

Read and understand the user manual before operate/working on the gearbox.



### WARNING

Operation must be carried out with extreme care, with personal injury if proper procedure are not followed.



### DANGER

Due to the high temperature of oil, the gearbox surfaces could reach high and dangerous temperatures.



### PROHIBITION

Do not work with machines in movement.



### PROTECTIVE CLOTHING

Protective clothing must be worn by all authorized operator that work on gearboxes.



### SAFETY GLASSES

Safety glasses must be worn by all authorized operator that work on gearboxes.



### SAFETY GLOVE

Safety glove must be worn by all authorized operator that work on gearboxes.



### SAFETY SHOES

Safety shoes must be worn by all authorized operator that work on gearboxes.

# 1. Safety precautions

## SAFETY INFORMATIONS



All the authorized persons to work on unit, must be informed about risks, safety conditions and Individual Protective Devices (IPG).

Always take the necessary measures to guarantee the safety of the authorized person to work on gearbox unit, supplying them with the necessary IPG.

The operator must use the personal protective equipment necessary to perform the lifting, transport, use, maintenance and cleaning of the gearbox in complete safety conditions.



Subsequent to violent knocks, overloads or other causes, that could compromise the correct functionality of the gearbox; stop operation immediately and check the integrity of the unit and if necessary place the gearbox in maintenance.

During maintenance operation :



- The gearbox must be completely stopped, before maintenance operations.
- Interrupt hydraulic connection to the power supply.
- All safety devices must be activated to guarantee maximum safety conditions.



- Avoid oil leaks, must be a source of danger.
- Before unscrewing oil plugs, waiting the completely cooler of the gearbox.
- Lifting, transport, handling and positioning, must be performed by qualified personnel.
- Before each movement, always make sure that the lifting equipment is suitable for lifting the load to be handled.



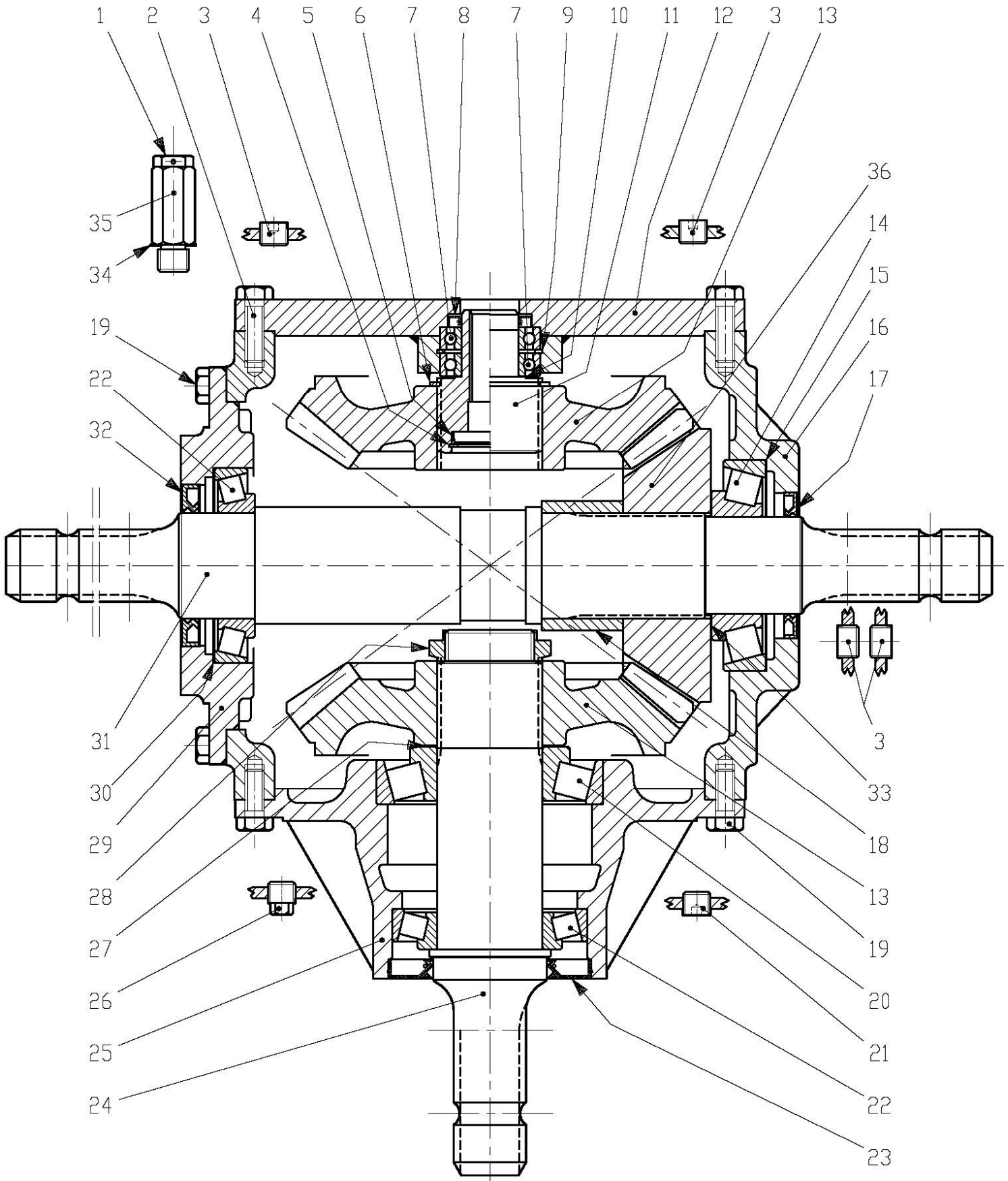
- Do not handle the gearbox that are still very hot.

## ADDITIONAL PRECAUTIONS

- Guarantee an effective prevention system, by constantly monitoring, cleaning and integrity of the structures.
- Actuate a specific periodical cleaning and maintenance plan of the gearbox.



## 2. Spare part drawing



## 2. Spare part list

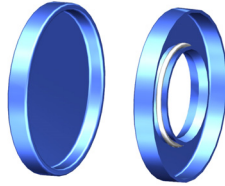
DESIGNATION	GEAR BOX	T-331A	CODE N°	9.331.205.00
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POS.	DRG. N.	PIEC	DESCRIPTION
1	0.707.7102.00	1	PLUG 1/2"GAS
2	8.1.1.00577	10	BOLT M12x40 UNI5739 8.8
3	8.6.5.00203	4	PLUG 1/2"GAS
4	8.5.2.01290	1	SNAP RING HOLE D47 UNI7437/DIN472
5	8.7.0.01362	1	CAP 47x7
6	8.5.1.01163	1	SNAP RING SHAFT D65 UNI7435
7	8.0.1.02297	2	BEARING 6007
8	8.7.3.00028	1	OIL SEAL 35X52X7
9	8.5.2.00007	1	SNAP RING HOLE D62 UNI7437/DIN472
10	0.259.7500.00	1	SHIM KIT 35.3x48.0
11	0.331.3200.00	1	SHAFT
12	2.331.1700.00	1	COVER
13	0.331.6003.00	2	CROWN WHEEL Z31 M8 R.1.35
14	8.0.9.00950	1	BEARING 30312
15	0.126.7500.00	1	SHIM KIT 110x129
16	0.331.0302.00	1	CASING
17	8.7.1.01382	1	DOUBLE LIP SEAL 60x90xx8
18	0.331.7101.00	1	SPACER
19	8.1.1.00060	18	HHB BOLT M12x30 UNI5739 8.8
20	8.0.9.01374	1	BEARING 30313
21	8.6.6.00201	1	PLUG 3/8"GAS DIN 906
22	8.0.9.01549	2	BEARING 30213
23	8.7.1.02388	1	DOUBLE LIP SEAL 70x125x12
24	0.331.2000.00	1	SHAFT 1"3/4 Z20
25	0.331.1300.00	1	EXTENSION
26	8.6.5.00006	1	PLUG EXTERNAL 3/8"GAS
27	0.110.7500.00	1	SHIM KIT 65.3x79.7
28	0.267.7107.00	1	NUT M55x2
29	0.331.1302.00	1	COVER
30	0.719.7500.00	1	SHIM KIT 108.0x118.0
31	0.331.3001.00	1	SHAFT 1"3/4Z20-1"3/4Z20
32	8.7.3.00948	1	OIL SEAL 65x100x10
33	0.248.7500.00	1	SHIM KIT 60.3x71.7
34	8.3.3.01114	1	COPPER WASHER 1/2"Gas 21,46x28x1
35	8.6.0.01113	1	OIL PLUG EXTENSION 1/2"GAS
36	0.331.5000.00	1	PINION Z23 M8 R.1.35

### 3. Usable tools

#### Disassembling-Assembling operation.

Oil seal, cap



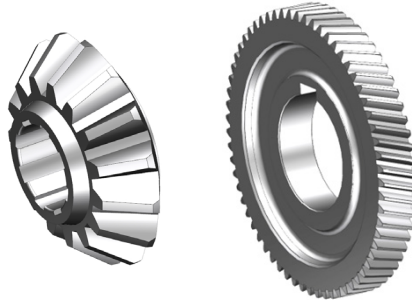
Chisel, pipe and hammer,  
hollow punch.

Bearings



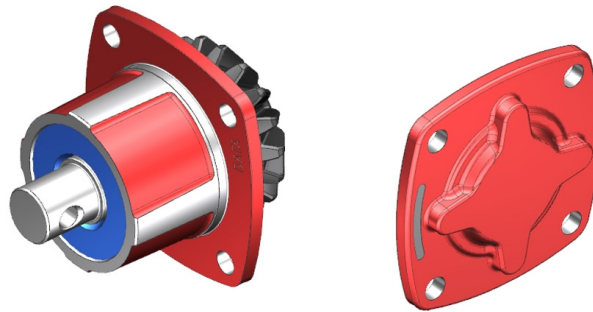
Extractor, press, or pipe  
and hammer.  
Paying attention to not  
damage the bearing,  
surfaces.

Gear



Extractor, press, or  
pipe and hammer.

Cover, extension



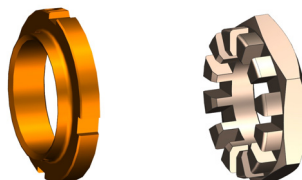
Chisel, hammer.  
Paying attention to not  
damage the housing, cover  
and extensions surfaces.

Shaft



Extractor, press, or  
pipe and hammer.

Locknut, castle nut



Chisel, hammer,  
adjustable wrench.

## 4. Disassembly

### Tools

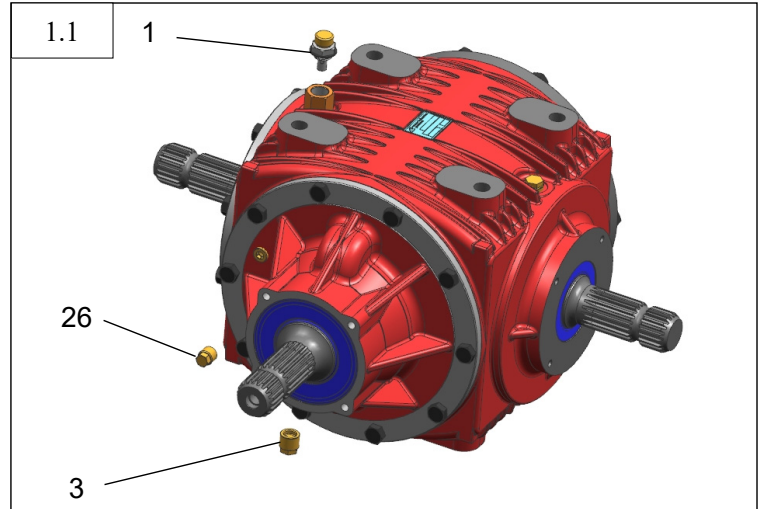
Fork wrench n° 13-17-19-24, hammer, pipe, chisel, snap ring pliers, extractor, press 5÷8 tons, adjustable wrench.

### NOTES

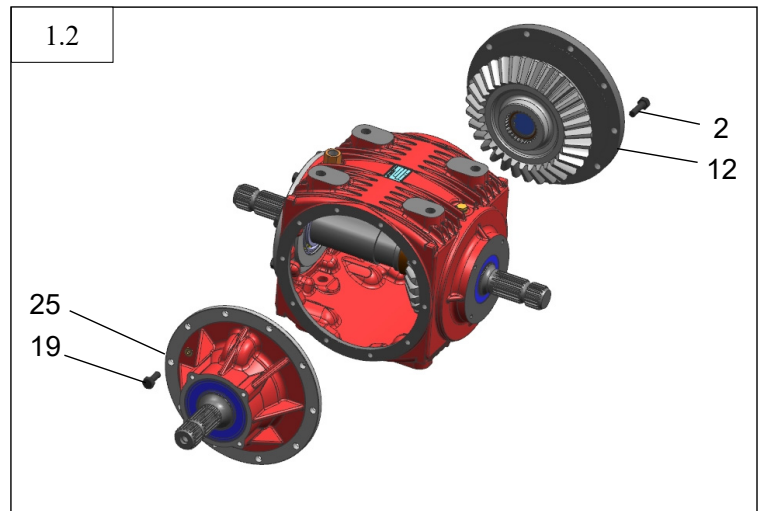
Warning : Disassembled shims and components, if not damaged, must be assembled in the same positions.

## 4. Disassembly

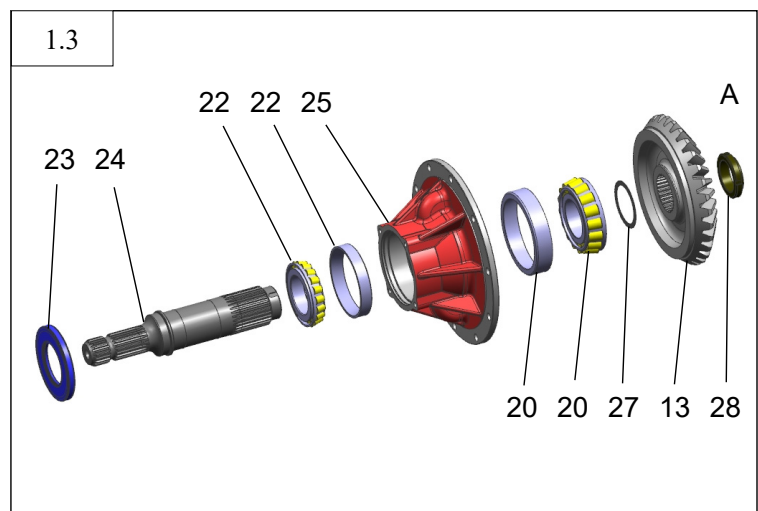
- Unscrew plugs (1),(3),(26) and empty the oil from gearbox.



- Unscrew bolts (2) and disassemble cover (12).
- Unscrew bolts (19) and disassemble extension (25).



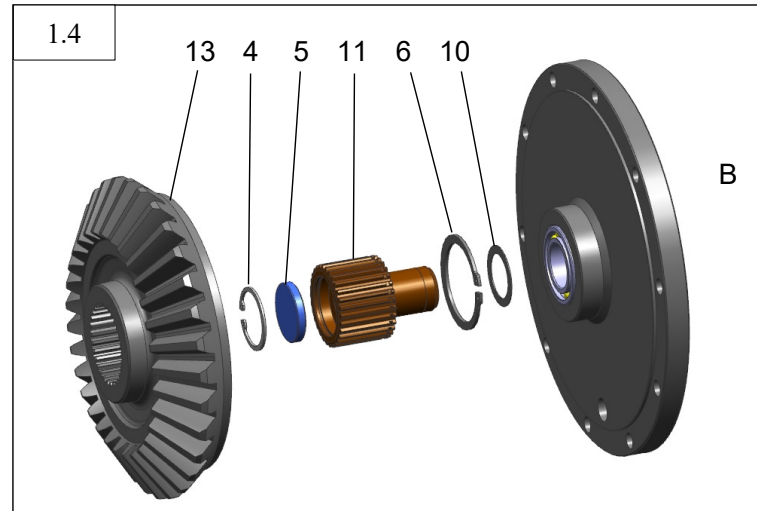
- Heating slightly the locknut (28), to facilitate the unscrewing operation.
- Unscrew locknut (28).
- Press or hit the shaft (24) from side (A), in order to disassemble it from extension (25), pick up gear (13), shim (27) and inner ring bearing (20).
- Disassemble oil seal (23), inner ring bearing (22), from shaft (24).
- Disassemble outer ring bearings (20),(22), from extension (25).



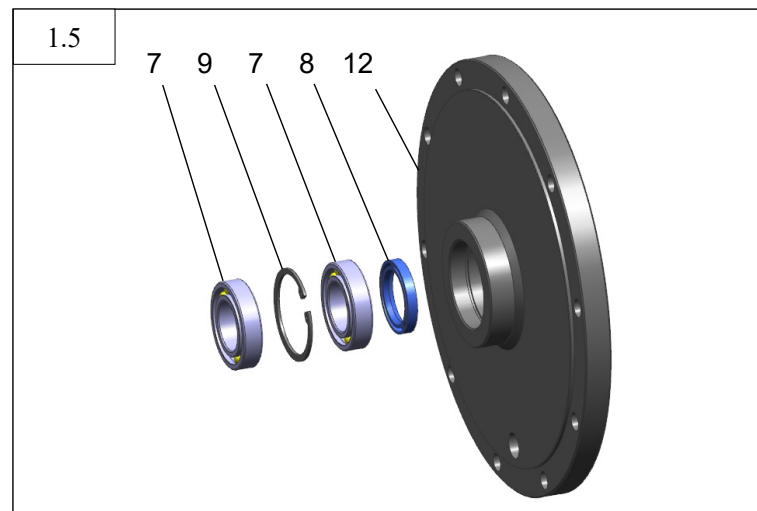


## 4. Disassembly

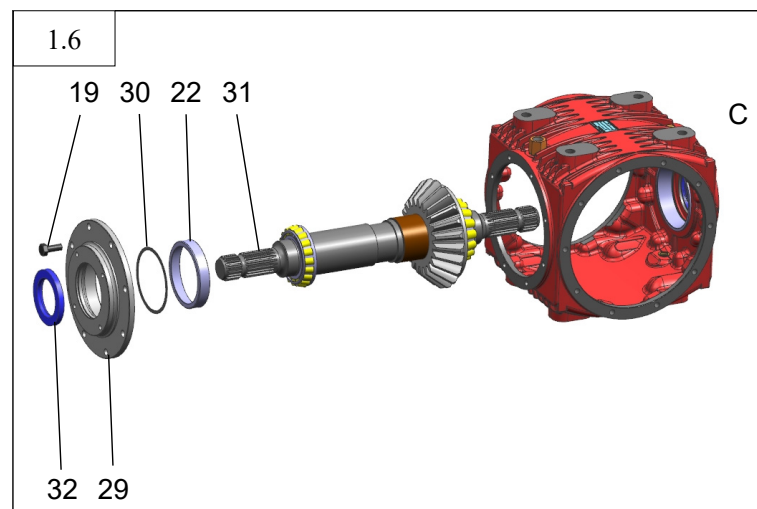
- Press or hit the shaft (11) from side (A), in order to disassemble it from extension (25), paying attention to not damage the shaft (11) surfaces, pick up shim (10).
- Disassemble gear (13), snap ring (6), from shaft (11).
- Disassemble snap ring (4), cap (5), from shaft (11).



- Disassemble ball bearing (7), snap ring (9), ball bearing (7), oil seal (8), from cover (12).

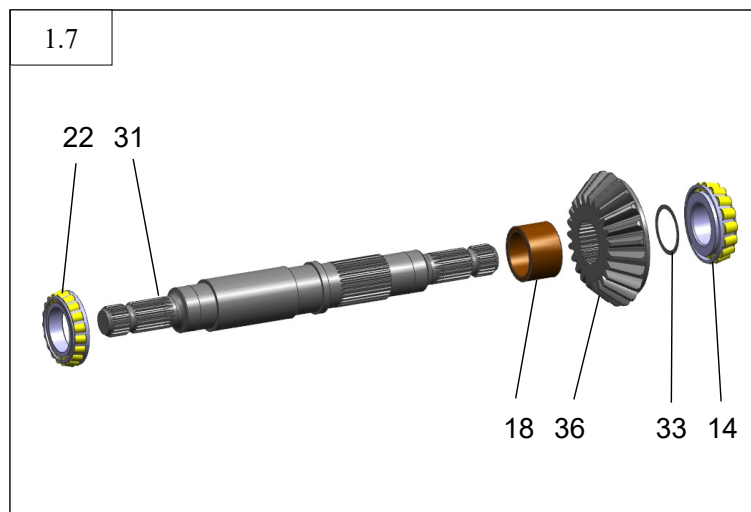


- Unscrew bolts (19).
- Press or hit the shaft (31) from side (C), in order to disassemble all axis components from housing, paying attention to not damage the shaft (31) splines.
- Disassemble oil seal (32), outer ring bearing (22), shim (30), from cover (29).

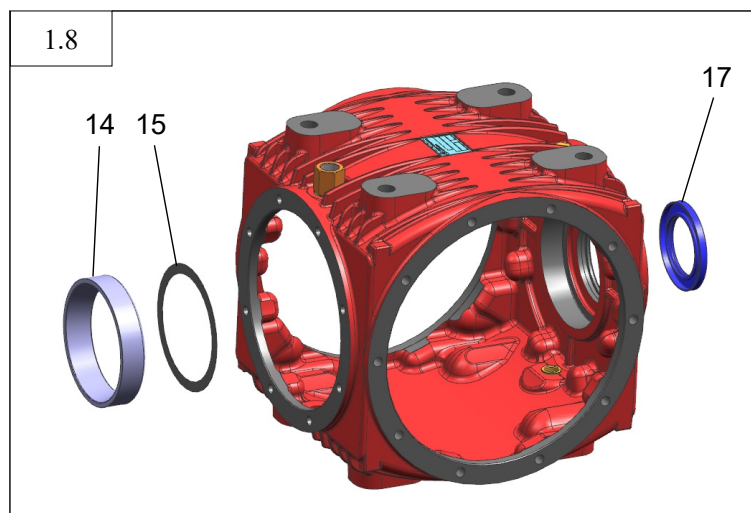


## 4. Disassembly

- Disassemble inner ring bearings (14),(22), from shaft (31).
- Disassemble shim (33), spacer (18), gear (13), spacer (18), from shaft (31).



- Disassemble outer ring bearing (14), take away shim (15), from housing.
- Disassemble oil seal (17).



## 5. Assembly

### Tools

Fork wrench n° 13-17-19-24, hammer, pipe, chisel, snap ring pliers, press 5÷8 tons, adjustable wrench, torquemeter, dynamometric wrench, caliper, comparator.

## NOTES

Clean the components from remaining grease and silicone.

Replace any component damaged.

Shims and components, if not damaged, must be assembled in the same positions

When assembling taper roller bearing, avoid to apply force on rollers, cage, in order to avoid any taper roller bearing damage.

When assembling ball bearings, apply force on both rings, or the only one ring that will contact to a shoulder.

Always use new oil seals, damaged or used oil seals will leak.

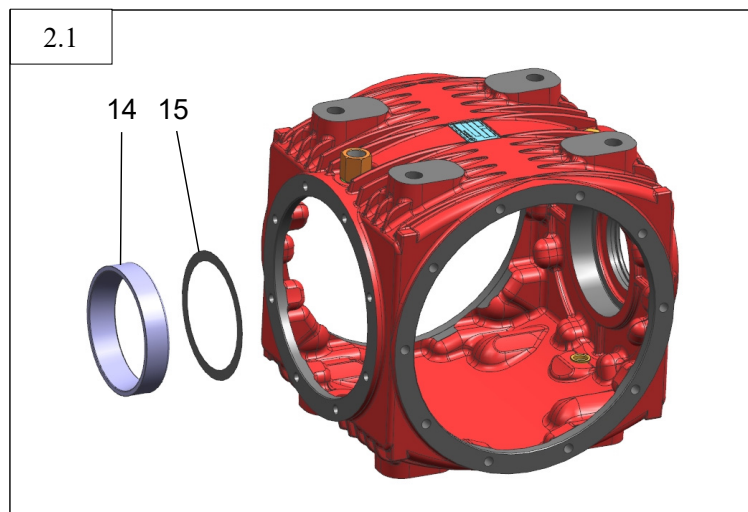
When assembling oil seals avoid contact with cutting parts to prevent any damage to the inner lip.

Insert oil seals taking care or greasing the zone of contact between oil seal and shaft.

## 5. Assembly

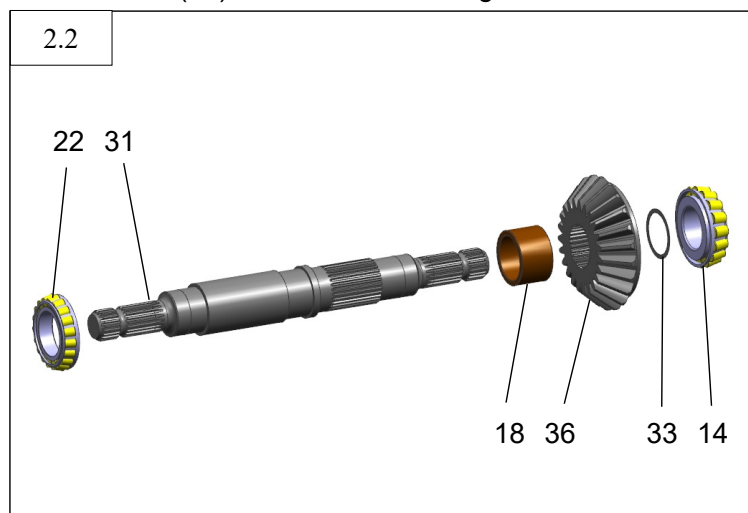
- Assemble shim (15), outer ring bearing (14), inside housing.

(15) fixed shimming 0.5 mm

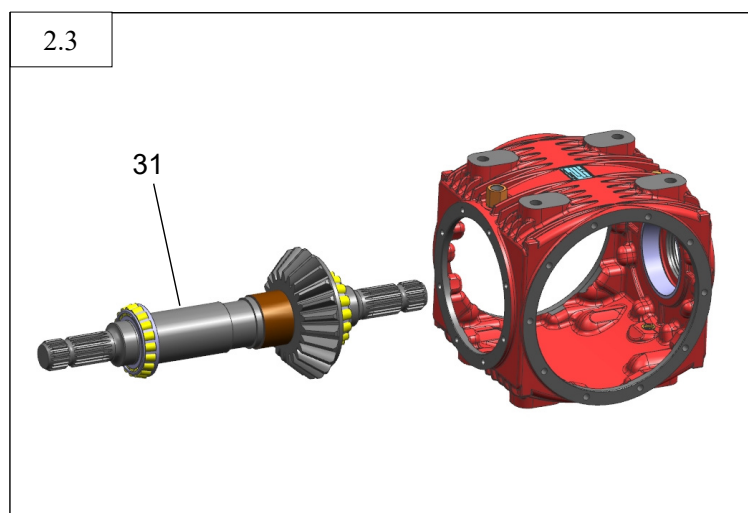


- Assemble spacer (18), gear (13), spacer (18), shim (33), inner ring bearing (14) on shaft (31).
- Assemble inner ring bearing (22) on shaft (31).

(33) theoretical shimming 0.5 mm

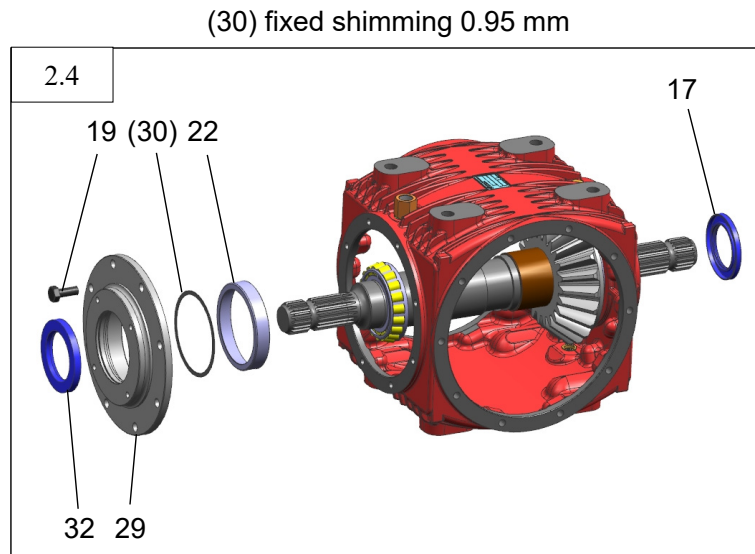


- Insert the pre-mounted shaft (31) inside housing, paying attention to fit properly the outer ring bearing, previously assembled.

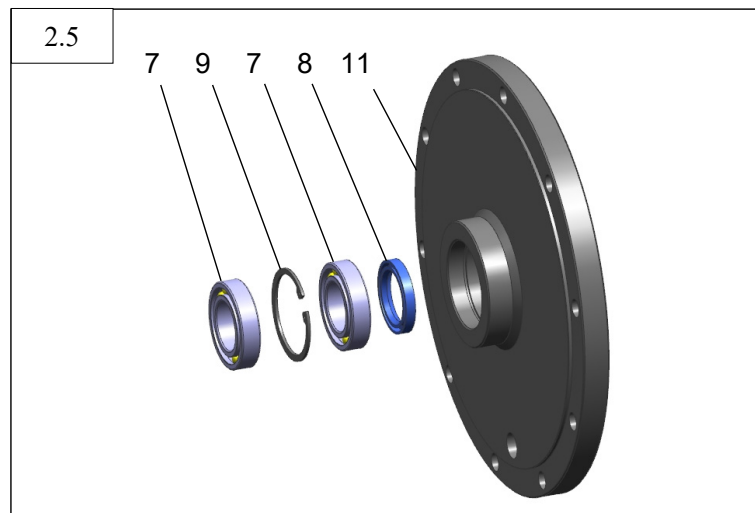


## 5. Assembly

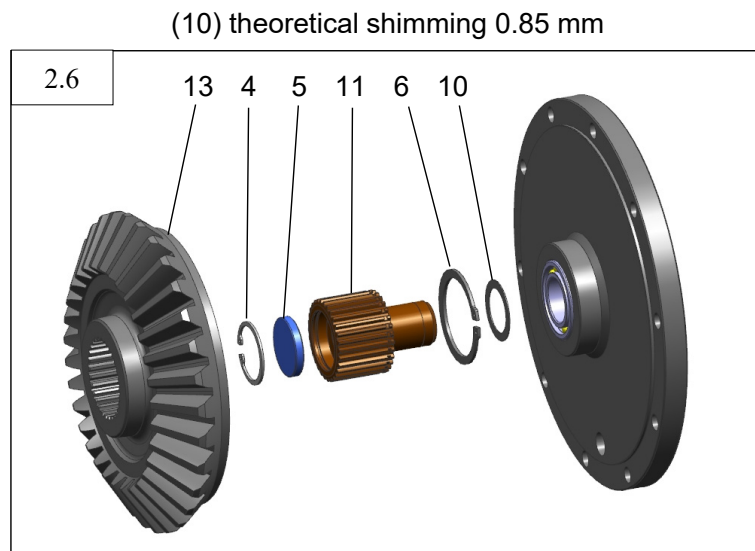
- Assemble outer ring bearing (22), inside cover (29).
- Assemble cover (29), bolts (19) and tighten manually.
- Check axis rolling torque value (K) using a torquemeter.
- Disassemble bolts (19), cover (29), outer ring bearing (22).
- Assemble shim (30), outer ring bearing (22), inside cover (29).
- Apply Silicone film between housing and cover (29) contact surfaces.
- Assemble pre-mounted cover (29), bolts (19) and tighten to 8.5÷10.9 kgm.
- Hit the shaft from both sides, in order to set the axis.
- Check axis rolling torque value (W) using a torquemeter.
- The difference between value (W) and value (K) must be 0÷3 Kgcm.
- If the value is not correct change shim setting (30), in order to obtain the right value.
- Assemble oil seals (17),(32).



- Assemble oil seal (8), ball bearing (7), snap ring (9), ball bearing (7), inside cover (11).



- Assemble cap (5), snap ring (4), inside shaft (11).
- Assemble snap ring (6), gear (13), shim (10) on shaft (11).
- Assemble pre-mounted shaft (11).



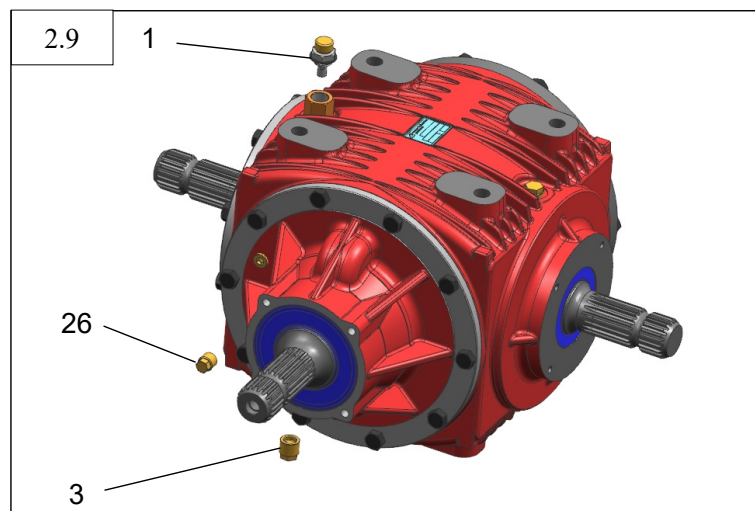
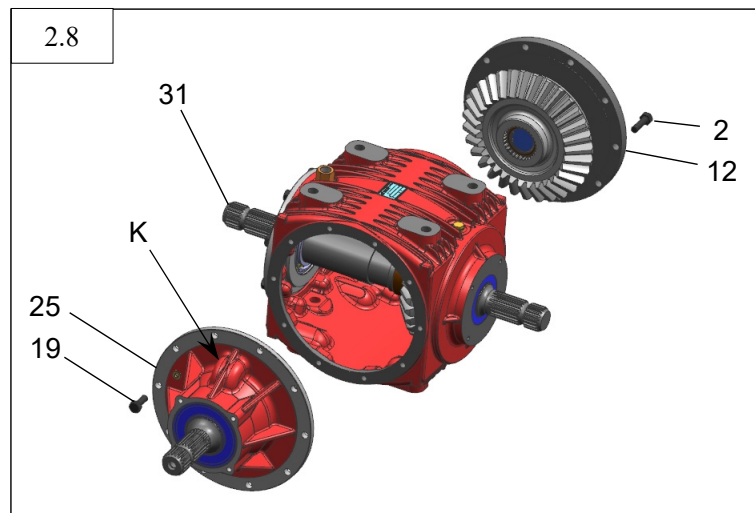
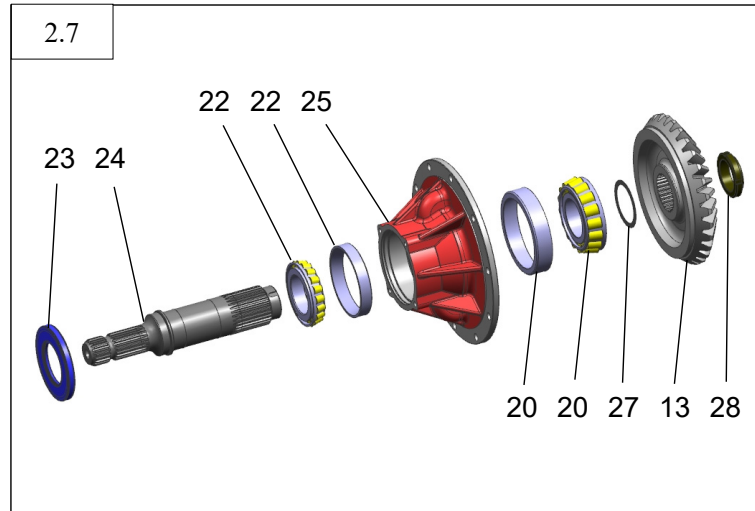
## 5. Assembly

- Assemble outer ring bearings (20),(22), inside extension (25).
- Assemble inner ring bearing (22), on shaft (24).
- Assemble pre-mounted shaft (24), inner ring bearing (20), shim (27), gear (13).
- Use a new locknut (28).
- Coat with Loctite 270 film on locknut's thread (28).
- Assemble locknut (28) and tighten in order to obtain an axis rolling torque value bigger than 11 kgcm.
- Hit the shaft (24) from both side in order to set the axis.
- Unscrew the locknut (28), in order to obtain the right axis rolling torque value of 5÷10 kgcm.
- Caulk the locknut's collar (28) into two appropriate slots on shaft (24).
- Assemble oil seal (23).

- In order to test the right mesh between the gears, use a colour like prussian blue on the gears teething.
- Assemble pre-mounted extension (25), bolts (19) and tighten manually.
- Assemble pre-mounted cover (12), bolts (2) and tighten manually.
- While locking output shaft (31), rotate in the work direction the input shaft, to obtain gear tooth contact mark.
- Verify the right gears' meshing, see technical specifications on page 15.
- In order to have the correct backlash value  $0.21 \div 0.56$  mm, change shim set (33), figure 2.2 and/or shim set (10), figure 2.6 and/or shim set (27), figure 2.7 (please be aware that when you change the shims set, you will also have to re-set the axis rolling torque value).
- Apply Silicone film between housing and cover (12), extension (25) contact surfaces.
- Assemble cover (12), bolts (2) and tighten to 8.5÷10.9 kgm.
- Pay attention that extension (25) holes for oil passages, must be located as shown on figure (K).
- Assemble extension (25), bolts (19) and tighten to 8.5÷10.9 kgm.

- Assemble plug (3) and tighten 2.5÷3.5 kgm.
- In order to prevent any leak of oil, make the following test: insufflate from the hole plug (1) to pressure bar 0.32 and verify any pressure drop with a manometer assembled on hole plug (26), for 3 minutes.
- Pressure drop admitted 0.001 bar.
- Positioning the gearbox in the work position and fill with oil (about 6.2 litres SAE140 EP) verifying the right level from hole plug (26).
- Assemble breather plug (1), level plug (26) and tighten 2.5÷3.5 kgm.

(27) fixed shimming 1 mm



## 6. Technical specifications

### Teeth contact control

A) The contact of crown wheel and pinion must be located like in Fig. A  
( mark obtained without load on bevel gears )

Use the shims in order to obtain the right contact.

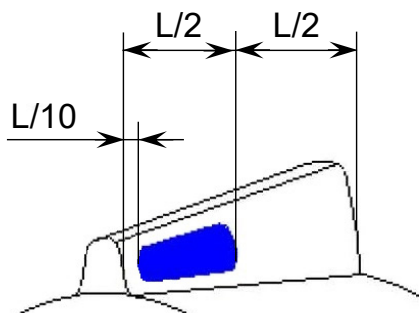
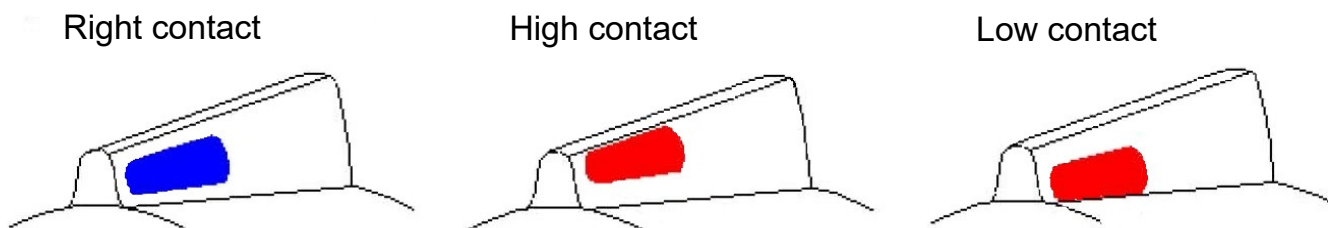


Fig. A



Pinion low contact	Crown wheel high contact	Pinion high contact	Crown wheel low contact
add shims	take away shims	take away shims	add shims

**Note :** If the right contact is obtained, but the backlash is out of the required range, move the crown wheel by adding or taking away shims.

The pinion movement, changes the contact area.

The crown wheel movement, changes the backlash.

The Ratio 1:1 does not follow the previous table, first adjust the teeth contact and later move both the gears together, in order to increase or decrease the backlash.

B) Gear backlash must be respected the following relation:

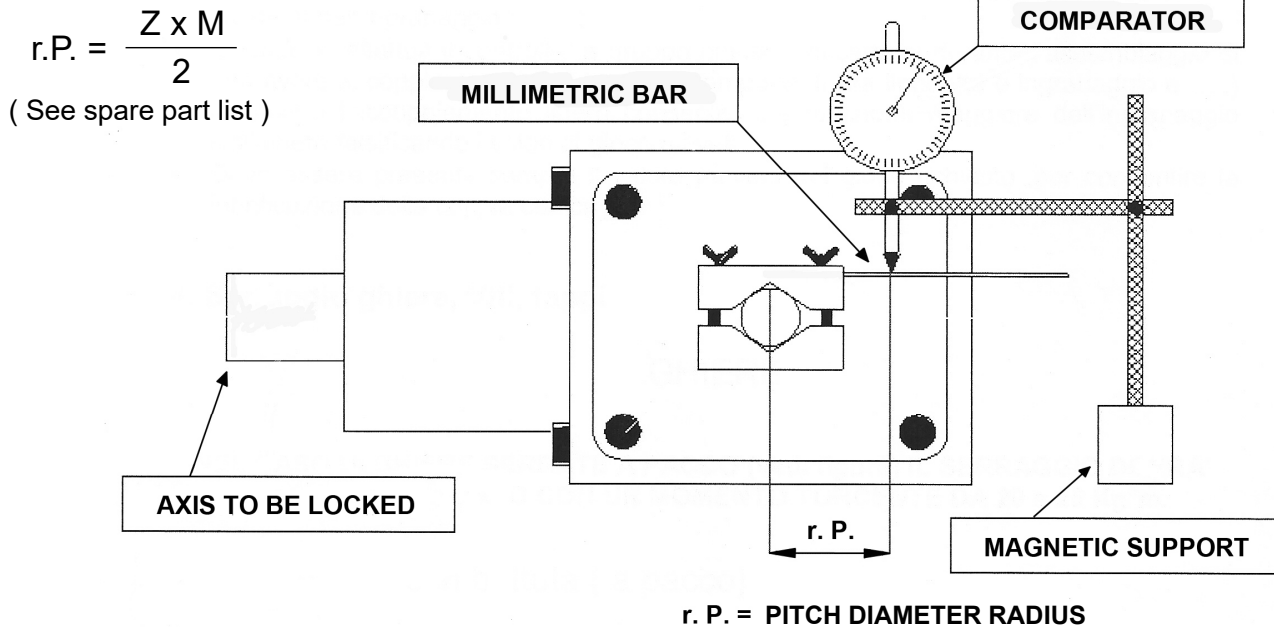
( 0.03 / 0.08 ) x module

( if module  $m=5$  gear backlash must be 0.15 / 0.40 mm )

## 6. Technical specifications

### Backlash control

The figure shows how check the backlash with gearbox closed



The figure shows how check the backlash with gearbox opened.

Fig. 1



Fig. 2



A) During the assemble operation, paying attention to not have free coupling between the components, like parallel key, gear and shaft, thus distorting the measured backlash value.

B) Fixing the comparator base on flat surface.

C) The comparator must be positioned with a perpendicular angle (90°), between gear axis and comparator sensor. (Figure 1)

D) The sensor must be positioned on heel's tooth. (Figure 1)

E) The backlash measuring as shown on figure 2, is not admitted.



# Torquemeter control

The figures show how check the rolling torque axis



- 1) Verify that torquemeter's full-scale value, is higher than requested value.
- 2) Reset the torquemeter, put the pointer aligned with the zero.



- 3) Hit the shaft axially from both sides, ( where possible) in order to set the axis.
- 4) Apply a slightly oil quantity inside bearings. Rotate manually the shaft CW and CCW, to verify that over a complete turn, the rotation is smooth.



- 5) Perform one complete rotation, without reading any value.
  - 6) Check the rolling torque value, applying a constant force, with a speed rotation, that allows to read the value.
- Note : The control must be performed on working direction.
- 7) About the swing of pointer, see the follow rules :

The value to consider, will be the average of the range of the swing pointer.

Example : Swing pointer read 2+8 kgcm       $2+8 = 10:2 = 5$  kgcm average value to use

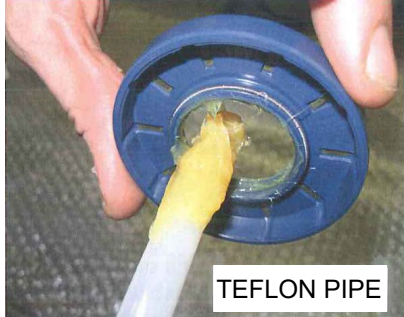
Warning : Max. acceptable range for pointer swinging

- Up to 12 kgcm is 6 kgcm
- over 12 kgcm is 10 kgcm.

## 6. Technical specifications

### O-ring and oil seal assembly

The o-ring must be lubricated, with oil type ISO VG320, before assembling operation.



- Oil seal must be greased on lips, as shown in fig. 1, before assembling operation.
- Use grease type NLGI 2 EP
- In order to obtain a right oil seal assembling, using an appropriate tool.

Fig. 1

- Oil seal must be assembled 1÷1.5 mm below housing external surface, as shown on fig. 2
- When is impossible assemble the oil seal as shown on fig. 2, align the oil seal surface against snap ring, paying attention to not preload the bearings preload fig. 3.
- Oil seal assemble as shown on fig. 4 out from its housing seat, is prohibited.
- Oil seal assemble as shown on fig. 5 out from its housing seat and inclined, is prohibited.

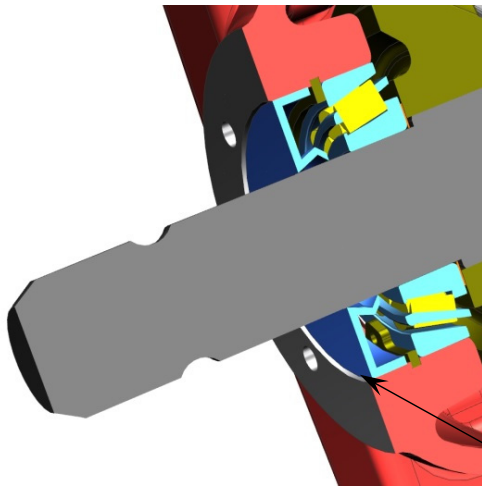


Fig. 2

Housing chamfer

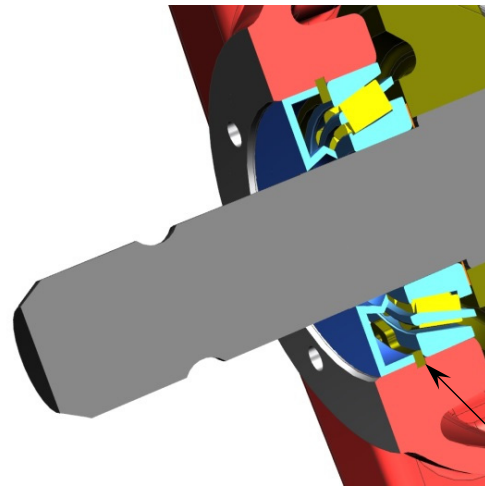


Fig. 3

Snap ring

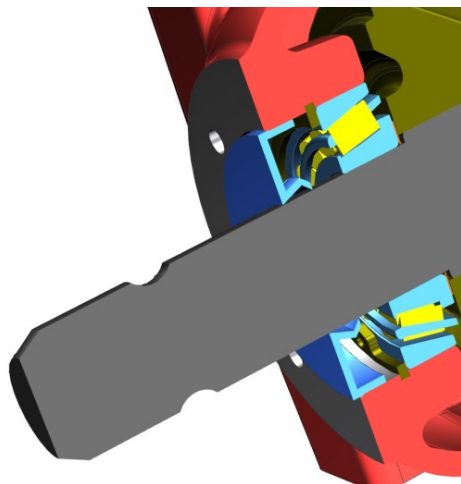


Fig. 4

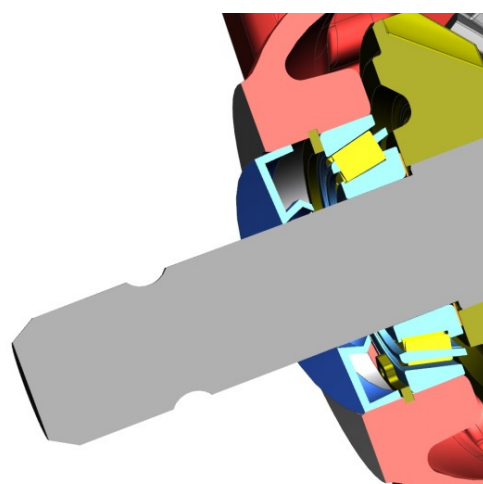


Fig. 5

## 6. Technical specifications

### Loctite ®

Loctite is a trademark of Henkel Corporation

#### Loctite type 243 – 263 - 270

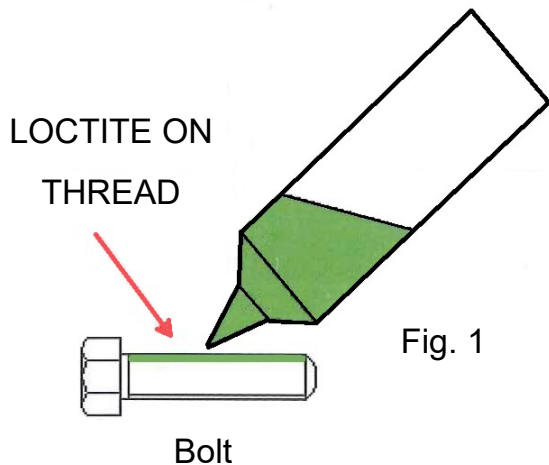


Fig. 1

The Loctite film have to be applied on thread zone, as shown on figure 1.

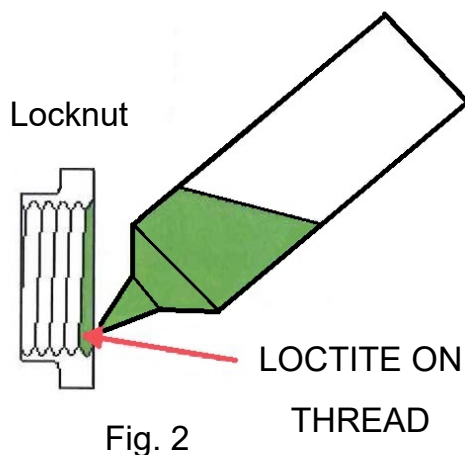


Fig. 2

The Loctite film have to be applied on the first threads, as shown on figure 2.

#### Loctite type 603

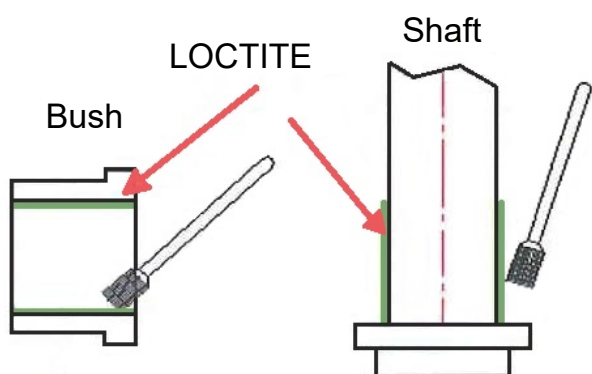


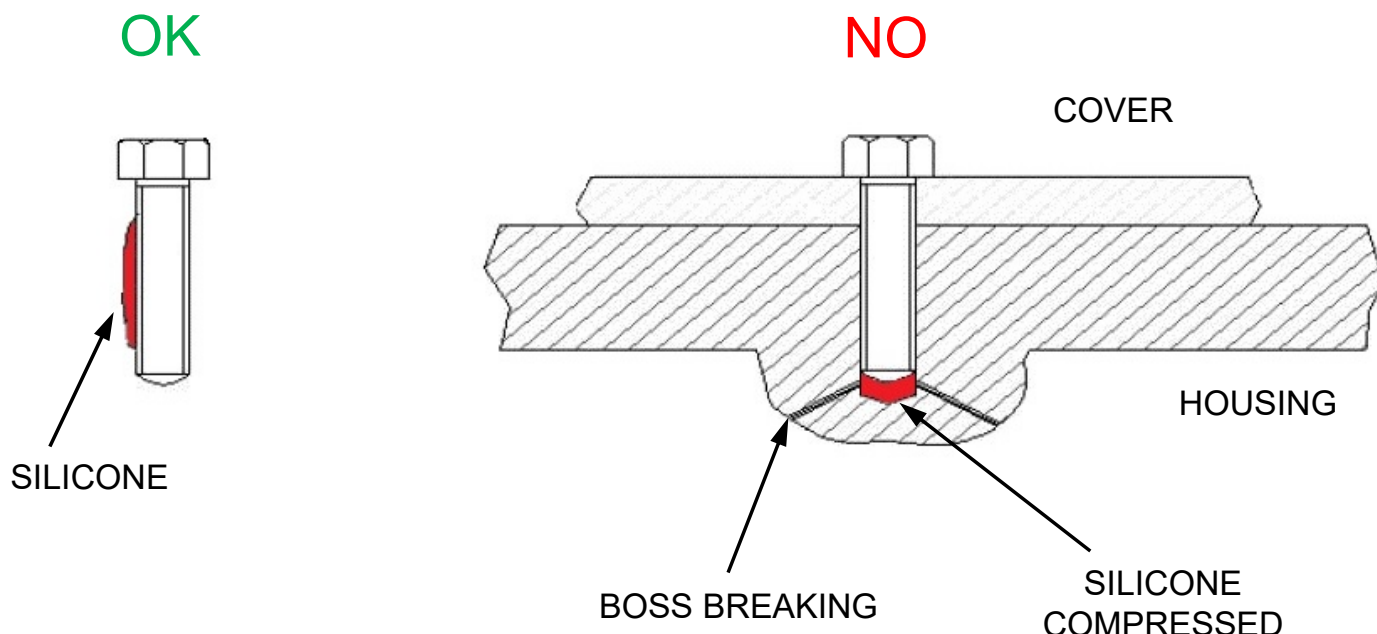
Fig. 3

The Loctite is used as locking, on contact faces for bush, shaft, bearings and gears.

The Loctite film have to be applied on contact faces, as shown on figure 3.

## 6. Technical specifications

### Silicone



### Loctite and Silicone types

UTILIZZO USE	PRODOTTO PRODUCT	COLORE COLOR	APPLICAZIONE APPLICATION
FRENAFILETTI MEDIO MEDIUM THREADLOCKER	LOCTITE "243"	Azzurro Blue	Viti da M6 a M8 M6 ÷ M8 screws
FRENAFILETTI FORTE STRONG THREADLOCKER	LOCTITE "270"	Verde Green	Viti da M10 in su + Ghiere di registrazione M10 and more screws + Registration ring nuts
FRENAFILETTI PENETRANTE PENETRATING THREADLOCKING	LOCTITE "290"	Verde Green	Prodotti con microporosità Porous metal parts
BLOCCAGGI COASSIALI CYLINDRICAL ASSEMBLIES RETAINING	LOCTITE "603"	Verde Green	
ATTIVATORE ACTIVATOR	LOCTITE "7649"		
SIGILLANTE SEALANT	DOW CORNING 7091	Grigio Grey	Tenuta piani Sealing plans