



SPICER[®]
Off-Highway Products

Service Manual

Axle 113

ASM-0005E
September 2013

CONTENTS

INTRODUCTION	5
SPECIFICATIONS	7
DEFINITION OF VIEWPOINTS	7
DATA PLATE	7
CONVERSION TABLES	8
TORQUE SPECIFICATIONS	9
COARSE PITCH	9
FINE PITCH	9
WHEEL NUT TIGHTENING TORQUES	10
MAINTENANCE	11
MAINTENANCE POINTS	11
MAINTENANCE INTERVALS	12
ADJUSTMENT AND CHECKS	12
LUBRICANT & SEALANT SPECIFICATIONS	13
SAFETY PRECAUTIONS	15
PLANETARY REDUCTION AND AXLE SHAFT	17
EXPLODED VIEW	17
DISASSEMBLY	18
ASSEMBLY	22
SPECIAL TOOLS	25
T1	25
T2	26
T3	26
BRAKE WEAR CHECK PROCEDURE	27
SPECIAL TOOLS	28
T1	28
SERVICE BRAKE	29
EXPLODED VIEW	29
DISASSEMBLY	30
ASSEMBLY	31
SPECIAL TOOLS	34
T1	34
SERVICE BRAKE AND NEGATIVE PARKING BRAKE	35
EXPLODED VIEW	35
RELEASE	36
ADJUSTMENT	37
DISASSEMBLY	38
ASSEMBLY	41
SPECIAL TOOLS	46
T1	46
DIFFERENTIAL UNIT	47
EXPLODED VIEW	47
DISASSEMBLY	48
ASSEMBLY	50
SPECIAL TOOLS	53
T1	53
T2	54
BEVEL PINION WITH SUPPORT BRAKING DISK	55
EXPLODED VIEW	55
DISASSEMBLY	56
ASSEMBLY	59
SPECIAL TOOLS	64
T1	64
T2	65
T3	66
T4	67



FLANGED BEVEL PINION	69
EXPLODED VIEW	69
DISASSEMBLY	70
ASSEMBLY	72
SPECIAL TOOLS	77
T1	77
T2	78
T3	78
HYDRAULIC DIFFERENTIAL LOCK	79
EXPLODED VIEW	79
DISASSEMBLY	80
ASSEMBLY	85
SPECIAL TOOLS	89
T1	89
T2	89
LIMITED SLIP DIFFERENTIAL UNIT	91
EXPLODED VIEW	91
DISASSEMBLY	92
ASSEMBLY	94
NORMAL DIFFERENTIAL UNIT	95
EXPLODED VIEW	95
DISASSEMBLY	96
ASSEMBLY	99
SPECIAL TOOLS	101
T1	101
T2	101
T3	102

INTRODUCTION

The efficiency and continued operation of mechanical units depend on constant, correct maintenance and also on efficient repair work, should there be a break-down or malfunction. The instructions contained in this manual have been based on a complete overhaul of the unit. However, it is up to the mechanic to decide whether or not it is necessary to assemble only individual components, when partial repair work is needed. The manual provides a quick and sure guide which, with the use of photographs and diagrams illustrating the various phases of the operations, allows accurate work to be performed. All the information needed for correct disassembly, checks and assembly of each individual component is set out below. In order to remove the differential unit from the vehicle, the manuals provided by the vehicle manufacturer should be consulted. In describing the following operations it is presumed that the unit has already been removed from the vehicle.

IMPORTANT: In order to facilitate work and protect both working surfaces and operators, it is advisable to use proper equipment such as: trestles or supporting benches, plastic or copper hammers, appropriate levers, pullers and specific spanners or wrenches. Before going on to disassemble the parts and drain the oil, it is best to thoroughly clean the unit, removing any encrusted or accumulated grease.

INTRODUCTORY REMARKS: All the disassembled mechanical units should be thoroughly cleaned with appropriate products and restored or replaced if damage, wear, cracking or seizing have occurred. In particular, thoroughly check the condition of all moving parts (bearings, gears, crown wheel and pinion, shafts) and sealing parts (o-rings, oil shields) which are subject to major stress and wear. In any case, it is advisable to replace the seals every time a component is overhauled or repaired. During assembly, the sealing rings must be lubricated on the sealing edge. In the case of the crown wheel and pinion, replacement of one component requires the replacement of the other one. During assembly, the prescribed pre-loading, backlash and torque of parts must be maintained.

CLASSIFICATION: This manual classifies units according to part numbers. For a correct interpretation, classification is indicated as follows:

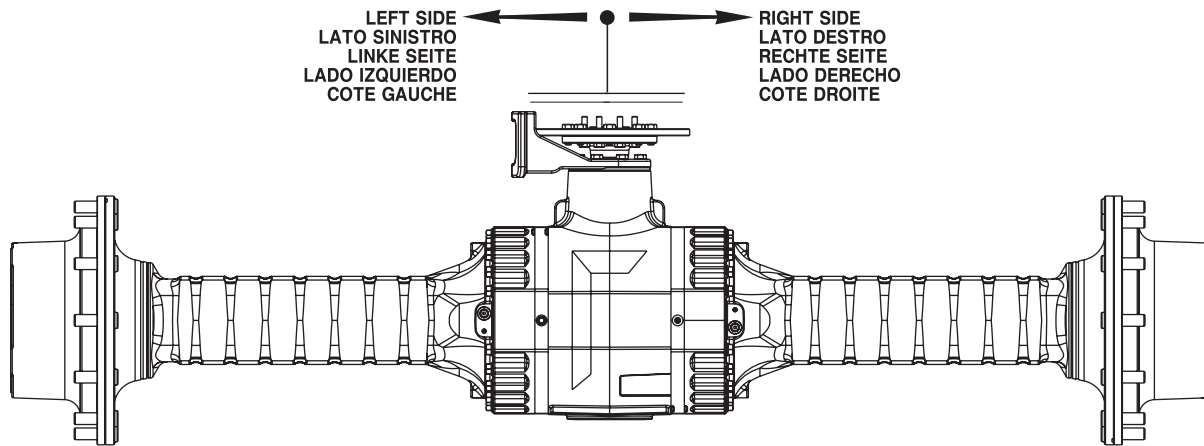
- ▶▶ □ = up to the part number
- ▶▶ = from the part number on

When no classification is given, disassembly and assembly operations are the same for all versions.

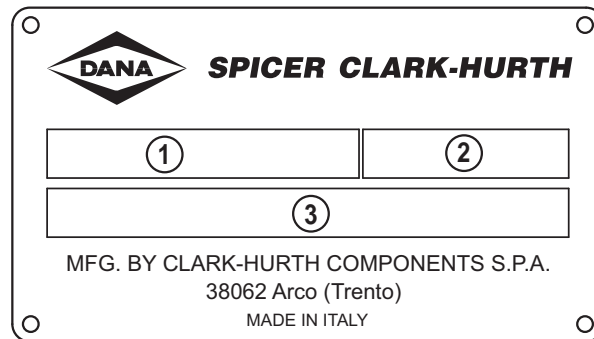
SPECIFIC EQUIPMENT AND SPARE PARTS: The drawings of all specific tools required for maintenance and repair work can be found at the end of this manual ; spare parts may be ordered either from the vehicle manufacturer or directly from the Service Centers or Authorized Distributors of SPICER.

SPECIFICATIONS

DEFINITION OF VIEWPOINTS



DATA PLATE



- 1 - Type and model unit - modification index
- 2 - Serial number
- 3 - Lubricant

CONVERSION TABLES

CONVERSION TABLES

UNITS OF PRESSURE

1 ATM=1 BAR=10⁵ PA=14.4 PSI

UNIT OF WEIGHT

	N	daN	kN	kg	lbs
1N	1	0,1	0,001	0,102	0,225
1daN	10	1	0,01	1,02	2,25
1kN	1000	100	1	102	225
1kg	9,81	0,981	0,00981	1	2,205

UNITS OF TORQUE

	N·m	daN·m	kN·m	kg·m	lb·in
1N·m	1	0,1	0,001	0,102	8,854
1daN·m	10	1	0,01	1,02	88,54
1kN·m	1000	100	1	102	8854
1kg·m	9,81	0,981	0,00981	1	86,8
1 lb·in	0,1129	0,01129	0,0001129	0,01152	1

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

COARSE PITCH

SIZE OF BOLT	TYPE OF BOLT					
	8.8	8.8 + Loctite 270	10.9	10.9 + Loctite 270	12.9	12.9 + Loctite 270
M6 x 1 mm	9,5 – 10,5 N·m	10,5 – 11,5 N·m	14,3 – 15,7 N·m	15,2 – 16,8 N·m	16,2 – 17,8 N·m	18,1 – 20 N·m
M8 x 1,25 mm	23,8 – 26,2 N·m	25,6 – 28,4 N·m	34,2 – 37,8 N·m	36,7 – 40,5 N·m	39 – 43 N·m	43,7 – 48,3 N·m
M10 x 1,5 mm	48 – 53 N·m	52 – 58 N·m	68 – 75 N·m	73 – 81 N·m	80 – 88 N·m	88 – 97 N·m
M12 x 1,75 mm	82 – 91 N·m	90 – 100 N·m	116 – 128 N·m	126 – 139 N·m	139 – 153 N·m	152 – 168 N·m
M14 x 2 mm	129 – 143 N·m	143 – 158 N·m	182 – 202 N·m	200 – 221 N·m	221 – 244 N·m	238 – 263 N·m
M16 x 2 mm	200 – 221 N·m	219 – 242 N·m	283 – 312 N·m	309 – 341 N·m	337 – 373 N·m	371 – 410 N·m
M18 x 2,5 mm	276 – 305 N·m	299 – 331 N·m	390 – 431 N·m	428 – 473 N·m	466 – 515 N·m	509 – 562 N·m
M20 x 2,5 mm	390 – 431 N·m	428 – 473 N·m	553 – 611 N·m	603 – 667 N·m	660 – 730 N·m	722 – 798 N·m
M22 x 2,5 mm	523 – 578 N·m	575 – 635 N·m	746 – 824 N·m	817 – 903 N·m	893 – 987 N·m	974 – 1076 N·m
M24 x 3 mm	675 – 746 N·m	732 – 809 N·m	950 – 1050 N·m	1040 – 1150 N·m	1140 – 1260 N·m	1240 – 1370 N·m
M27 x 3 mm	998 – 1103 N·m	1088 – 1202 N·m	1411 – 1559 N·m	1539 – 1701 N·m	1710 – 1890 N·m	1838 – 2032 N·m
M30 x 3,5 mm	1378 – 1523 N·m	1473 – 1628 N·m	1914 – 2115 N·m	2085 – 2305 N·m	2280 – 2520 N·m	2494 – 2757 N·m




FINE PITCH

SIZE OF BOLT	TYPE OF BOLT					
	8.8	8.8 + Loctite 270	10.9	10.9 + Loctite 270	12.9	12.9 + Loctite 270
M8 x 1 mm	25,7 – 28,3 N·m	27,5 – 30,5 N·m	36,2 – 39,8 N·m	40 – 44 N·m	42,8 – 47,2 N·m	47,5 – 52,5 N·m
M10 x 1,25 mm	49,4 – 54,6 N·m	55,2 – 61 N·m	71,5 – 78,5 N·m	78 – 86 N·m	86 – 94 N·m	93 – 103 N·m
M12 x 1,25 mm	90 – 100 N·m	98 – 109 N·m	128 – 142 N·m	139 – 154 N·m	152 – 168 N·m	166 – 184 N·m
M12 x 1,5 mm	86 – 95 N·m	94 – 104 N·m	120 – 132 N·m	133 – 147 N·m	143 – 158 N·m	159 – 175 N·m
M14 x 1,5 mm	143 – 158 N·m	157 – 173 N·m	200 – 222 N·m	219 – 242 N·m	238 – 263 N·m	261 – 289 N·m
M16 x 1,5 mm	214 – 236 N·m	233 – 257 N·m	302 – 334 N·m	333 – 368 N·m	361 – 399 N·m	394 – 436 N·m
M18 x 1,5 mm	312 – 345 N·m	342 – 378 N·m	442 – 489 N·m	485 – 536 N·m	527 – 583 N·m	580 – 641 N·m
M20 x 1,5 mm	437 – 483 N·m	475 – 525 N·m	613 – 677 N·m	674 – 745 N·m	736 – 814 N·m	808 – 893 N·m
M22 x 1,5 mm	581 – 642 N·m	637 – 704 N·m	822 – 908 N·m	903 – 998 N·m	998 – 1103 N·m	1078 – 1191 N·m
M24 x 2 mm	741 – 819 N·m	808 – 893 N·m	1045 – 1155 N·m	1140 – 1260 N·m	1235 – 1365 N·m	1363 – 1507 N·m
M27 x 2 mm	1083 – 1197 N·m	1178 – 1302 N·m	1520 – 1680 N·m	1672 – 1848 N·m	1834 – 2027 N·m	2000 – 2210 N·m
M30 x 2 mm	1511 – 1670 N·m	1648 – 1822 N·m	2138 – 2363 N·m	2332 – 2577 N·m	2565 – 2835 N·m	2788 – 3082 N·m

TORQUE SPECIFICATIONS

WHEEL NUT TIGHTENING TORQUES

Wheel nut tightening torques recommended from rim's O.E.M. with reference to the quality of the rim's material.

WHEEL NUT TIGHTENING TORQUES				
CHARACTERISTICS	ILLUSTRATION	WHEEL STUD THREAD	RECOMMENDED WHEEL NUTS TORQUE	
			RIM MATERIAL QUALITY	
			ST 37	**ST 52
WHEEL NUTS WITH INTEGRATE SPHERICAL COLLAR		M18 x 1,5 mm	330 N·m	460 N·m
		M20 x 1,5 mm	490 N·m	630 N·m
		M22 x 1,5 mm	630 N·m	740 N·m
FLAT COLLAR WHEEL NUTS WITH SEPARATE SPHERICAL LOCK WASHER		M18 x 1,5 mm	270 N·m	360 N·m
		M20 x 1,5 mm	360 N·m	450 N·m
		M22 x 1,5 mm	460 N·m	550 N·m
WHEEL NUTS WITH INTEGRATE SEAT CAPTIVE WASHER		M18 x 1,5 mm	260 N·m	360 N·m
		M20 x 1,5 mm	350 N·m	500 N·m
		M22 x 1,5 mm	450 N·m	650 N·m

****RIM MATERIAL ST 52 IS RECOMMENDED BY DANA ON AXLE APPLICATION. IT IS THE OPTIMUM MATERIAL FOR TIGHTENING THE RIM TO THE HUB.**

NOTE:

The wheel nut tightening torque is related only on nut thread and stud thread dry. (Without oil or any lubricant).

NOTE:

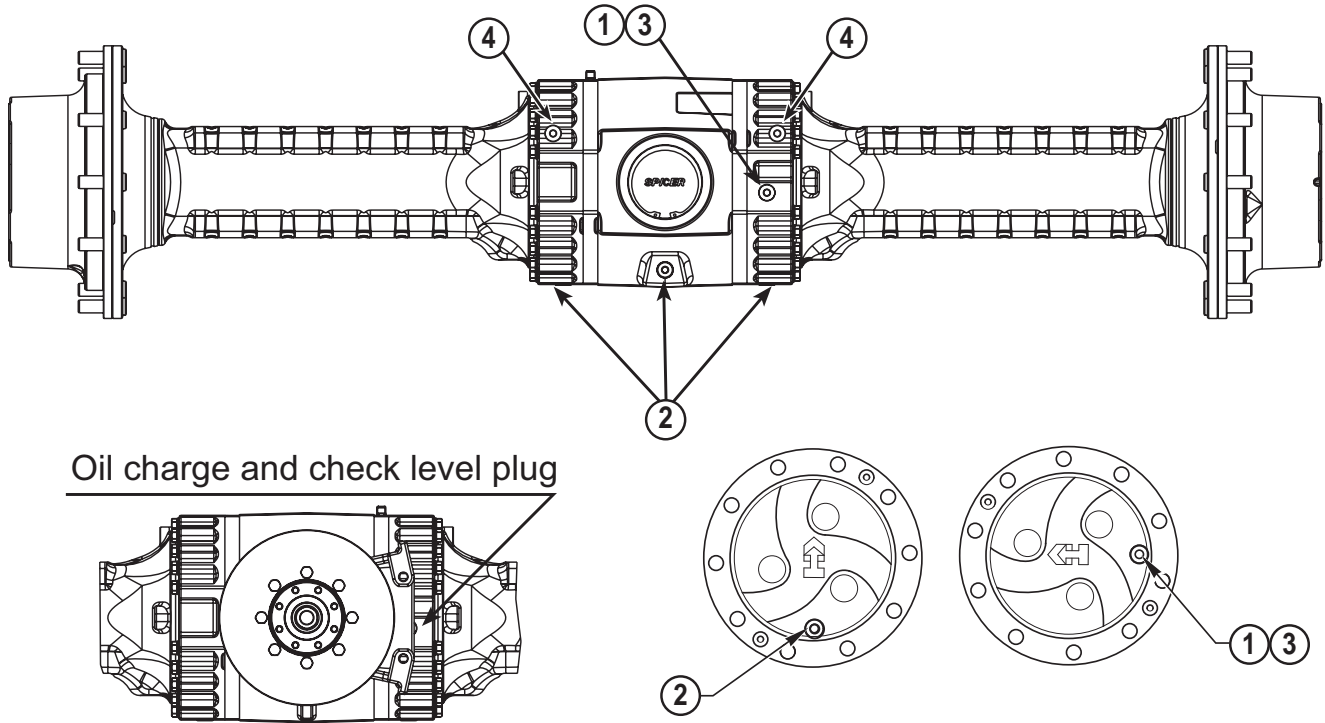
The wheel nut tightening torque takes into consideration not only the nut + stud characteristics, but also the quality of the rim material.

THE DANA OFFICIAL TIGHTENING TORQUE TABLE, THAT IS INCLUDE IN EACH SERVICE MANUAL, SHOWS THE TORQUE FIGURE RELATED TO THE BOLT CHARACTERISTIC ONLY .		
DANA OFFICIAL TIGHTENING TORQUE TABLE		
NUT MATERIAL QUALITY 8.8 & 10.9	STUD MATERIAL QUALITY 10.9	*ALLOW TIGHT TORQUE
M18 x 1,5 mm	M18 x 1,5 N·m	442 ÷ 489 N·m
M20 x 1,5 mm	M20 x 1,5 N·m	613 ÷ 677 N·m
M22 x 1,5 mm	M22 x 1,5 N·m	822 ÷ 908 N·m

***THE TORQUE FIGURE ON NUT AND STUD COUPLING MUST BE RELATED ON STUD MATERIAL QUALITY (DANA AXLE ARE 10.9 ONLY).**

MAINTENANCE

MAINTENANCE POINTS



- 1 - Oil filling plug
- 2 - Oil draining plug
- 3 - Check level plug
- 4 - Check brake disc wear
Minimum thickness between counter discs is 5.2 mm.

NOTE:

For details see BRAKE WEAR CHECK PROCEDURE p. 27

MAINTENANCE

MAINTENANCE INTERVALS

OPERATION		FREQUENCY	LUBRICANTS
Check levels	Differential	Monthly	SAE85W90 (API GL4 - MIL L-2105) With additives for oil-bath brakes
	Planetary reduction	Every 200 hours	
Oil change	Differential	Every 800 hrs *	SAE85W90 (API GL5 - MIL 2105-B) With additives for oil-bath brakes, for units presenting hypoid crown wheel and pinion and/or self-locking differential gear
	Planetary reduction	Every 1000 hrs *	
	L.S. Differential	Every 700 hrs */**	

If working in severe duty conditions half intervals should be used

* Initially after 100 working hours

** When it starts sounding noisy

OPERATION	MEMBER	LUBRICANTS	CONDITIONS	FREQUENCY
Greasing	King Pin Tapered Bearings	NLGI 2 EP or NLGI 3 EP*	Normal work	Weekly
	Seals			
	King Pin Bushings	NLGI 2 EP or NLGI 3 EP* w/Moly Additive	Severe duty	Daily
	Trunnion Bushings			

According to DIN 51825 level KP2K-30 (NLGI #2) or KP3K-20 (NLGI #3); ASTM D4950 NLGI #2 GC-LB

ADJUSTMENT AND CHECKS

UNIT	OPERATION	FREQUENCY	SERVICE BRAKE CIRCUIT
Negative brake	Adjustment	Every 1000 hours*	Only for mineral oil use e.g. ATF Dexron II. Make sure that master cylinder seals are suitable for mine- ral oil.
Service brake	Adjustment	Every 500 hours	
Wheel nuts	Tightening	Every 200 hours**	

* Initially after 100 working hours

** Initially after 10 working hours

LUBRICANT & SEALANT SPECIFICATIONS

1 - Locking, sealing and lubricating materials referred to in this manual are the same used in the shop-floor.

2 - The table below gives an account of the typical applications of each single material, in order to facilitate replacement with similar products marketed by different brand names with different trade marks.

LOCTITE 242

Anaerobic product apt to prevent the loosening of screws, nuts and plugs. Used for medium-strength locking. Before using it, completely remove any lubricant by using the specific activator.

LOCTITE 243

The oleocompatible alternative to 242. Does not require the activation of lubricated surfaces.

LOCTITE 270

Anaerobic product for very-high strength locking of screws and nuts. Before using it, completely remove any lubricant by using the specific activator.

To remove parts, it may be necessary to heat them at 80° C approximately.

LOCTITE 275

Anaerobic product suitable for high-strength locking and sealing of large threaded parts, bolts and stud bolts, for pipe sealing and for protecting parts against tampering; suitable for sealing coupling surfaces with a maximum diametrical clearance of 0.25 mm.

LOCTITE 510

Anaerobic product for the hermetic sealing of flanged units and screw holes communicating with fluids. Can seal clearances between flanges up to 0.2 mm.

LOCTITE 577

Quick anaerobic sealant for sealing threaded portions of conical or cylindrical unions up to M80. Before using it, remove any lubricant with the specific activator. After polymerisation, disassembly may result rather difficult, so heating may be necessary for larger diameters.

LOCTITE 638

Anaerobic adhesive for fast and high-strength gluing of cylindrical metal joints (hub on shaft). Can glue together parts with clearance ranging between 0.1 and 0.25 mm.

LOCTITE 648

Anaerobic adhesive for fast and medium-strength gluing of cylindrical metal joints (hub on shaft). Can glue together parts with radial clearance below 0.1 mm.

AREXONS (REPOSITIONABLE JOINTING COMPOUND FOR SEALS)

Solvent-based sealing compound for elastic seals, drying through evaporation. Used for sealing the outer diameter of sealing rings for rotating shafts with outer metal reinforcement.

SILICONE

Semi-fluid adhesive material used for sealing and filling and to protect components from environmental and physical elements. Polymerises with non-corrosive dampness.

TECNO LUBE/101 (SILICONE-BASED GREASE)

Highly adhesive synthetic grease, with silicone compounds added.

Applied to adjustment screws with hole communicating with oil-type fluids.

Used when frequent adjusting is required.

MOLIKOTE (DOW CORNING)

Lubricating compound containing molybdenum disulphide, used to lubricate articulation pins and to prevent sticking and oxidation of parts that are not lubricated on a regular basis.

(LITHIUM-BASED) GREASE

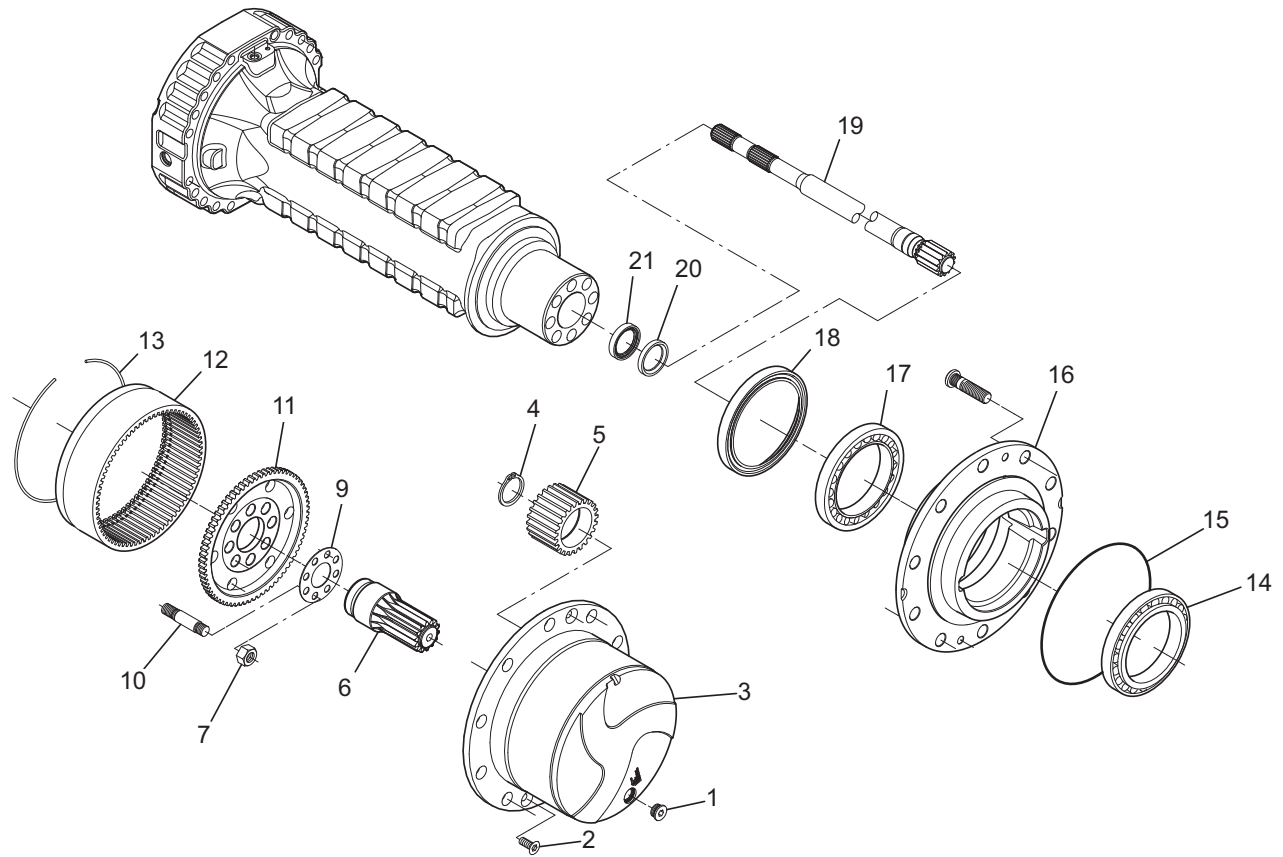
Applied to bearings, sliding parts and used to lubricate seals or parts during assembly.

SAFETY PRECAUTIONS

- 1** - During all operations described in this manual, the axle should be fastened onto a trestle, while the other parts mentioned should rest on supporting benches.
- 2** - When removing one of the arms, an anti-tilting safety trestle should be placed under the other arm.
- 3** - When working on an arm that is fitted on the machine, make sure that the supporting trestles are correctly positioned and that the machine is locked lengthways.
- 4** - Do not admit any other person inside the work area; mark off the area, hang warning signs and remove the ignition key from the machine.
- 5** - Use only clean, quality tools; discard all worn, damaged, lowquality or improvised wrenches and tools. Ensure that all torque wrenches have been checked and calibrated.
- 6** - Always wear gloves and non-slip rubber shoes when performing repair work.
- 7** - Should you stain a surface with oil, remove marks straight away.
- 8** - Dispose of all lubricants, seals, rags and solvents once work has been completed. Treat them as special waste and dispose of them according to the relative law provisions obtaining in the country where the axles are being overhauled.
- 9** - Make sure that only weak solvents are used for cleaning purposes; avoid using turpentine, dilutants and toluol, xylolbased or similar solvents; use light solvents such as Kerosene, mineral spirits or water-based, environment friendly solvents.
- 10** - For the sake of clarity, the parts that do not normally need to be removed have not been reproduced in some of the diagrams.
- 11** - After repair work has been completed, accurately touch up any coated part that may have been damaged.
- 12** - Follow all safety instructions in the Original Equipment Manufacturer (OEM) manual that came with the vehicle.

PLANETARY REDUCTION AND AXLE SHAFT

EXPLODED VIEW



DISASSEMBLY

DISASSEMBLY

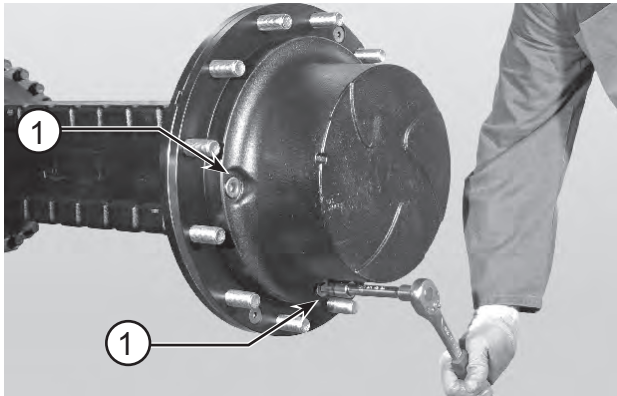


FIGURE 1: Remove oil level plug (1) and drain oil.

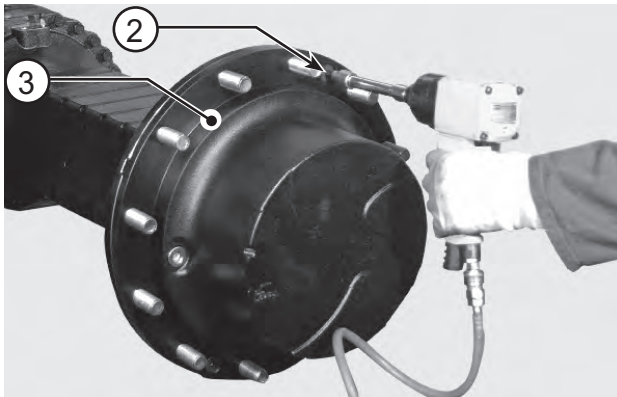


FIGURE 2: Remove the planetary cover capscrews (2).



FIGURE 3: Using two screwdrivers or two levers inserted in the slots provided, disjoin the planetary cover (3) away from the wheel hub (16).

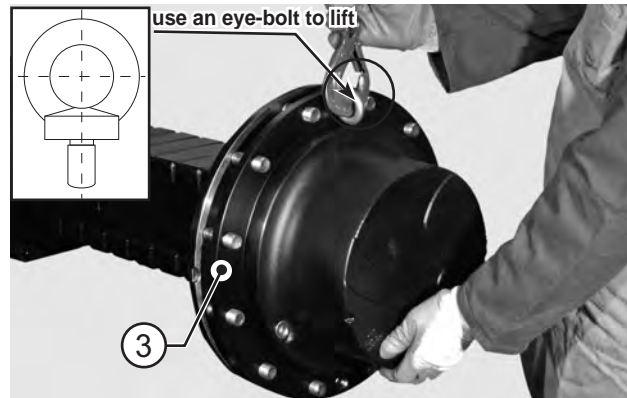


FIGURE 4: Remove the cover (3).

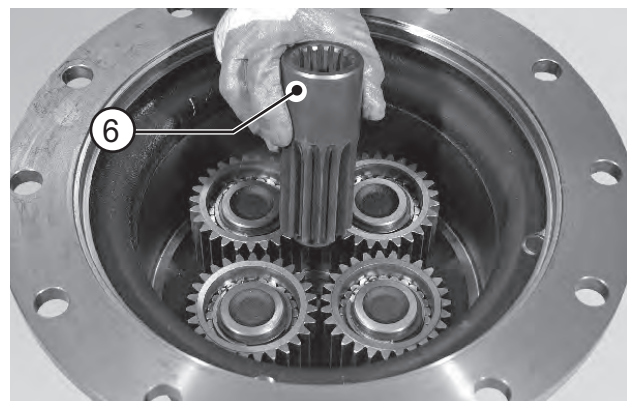


FIGURE 5: Remove the sun gear (6).

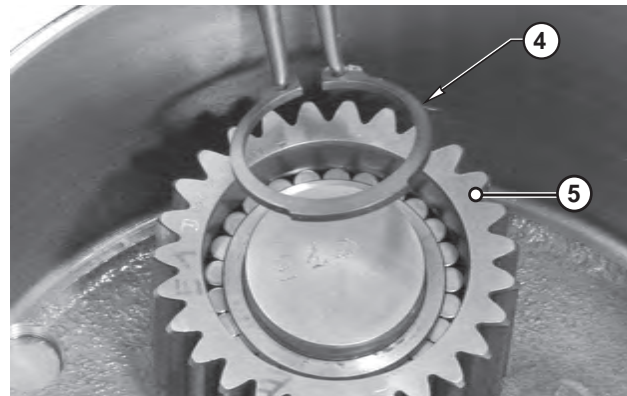


FIGURE 6: Remove the planetary gear (5) snap rings (4).

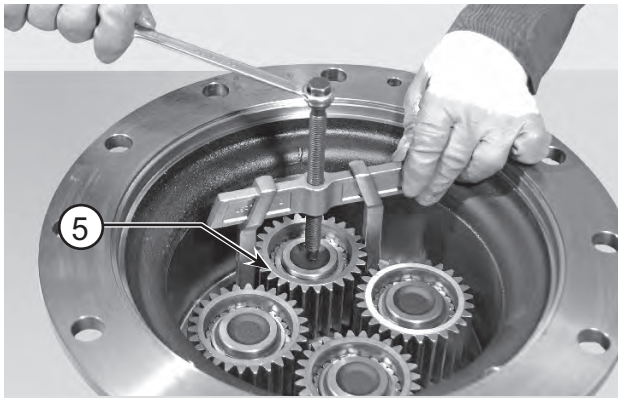


FIGURE 7: Remove the planetary gears (5).

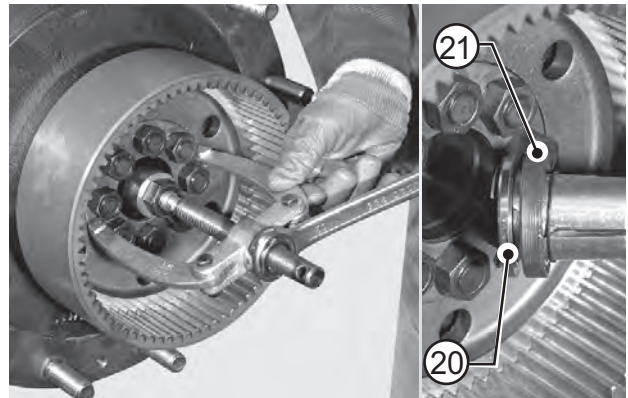


FIGURE 10: Using an extractor, remove the seal ring (21) and guide ring (20).

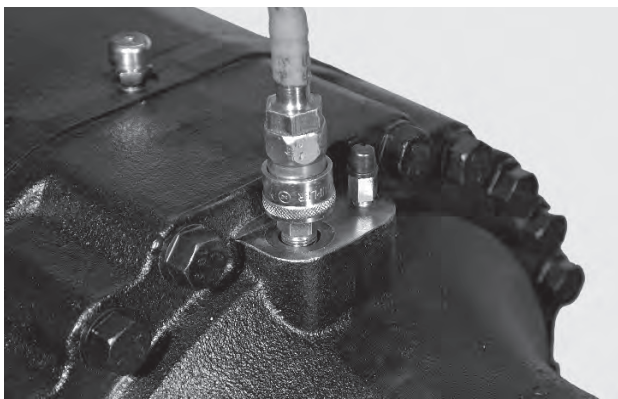


FIGURE 8: Insert air pressure to maintain the brake discs in the correct position.

NOTE:

Mark the direction of assembly of snap ring.

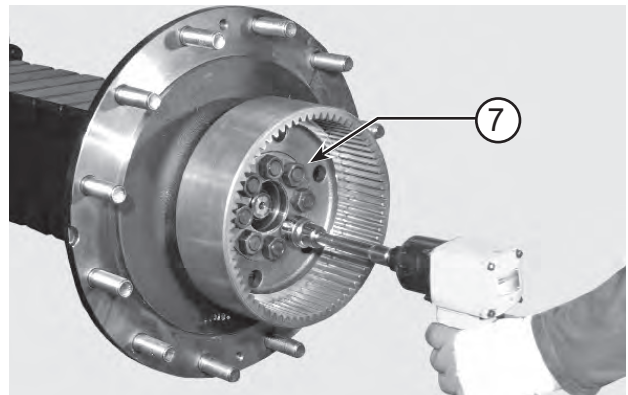


FIGURE 11: Loosen and remove the nuts (7).

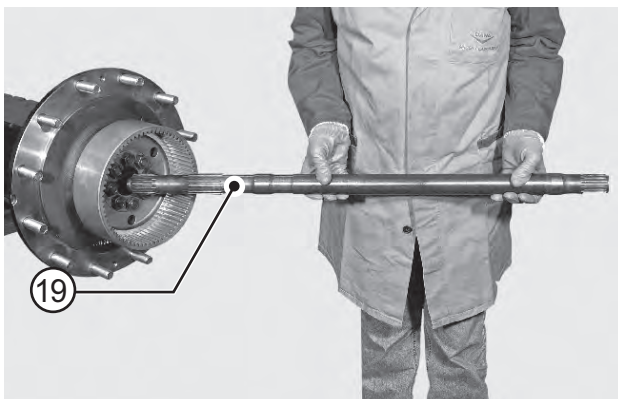


FIGURE 9: Remove the axle shaft (19).

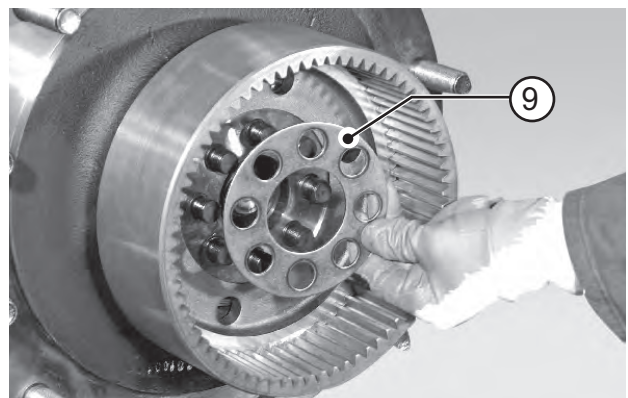


FIGURE 12: Remove the safety flange (9).

DISASSEMBLY

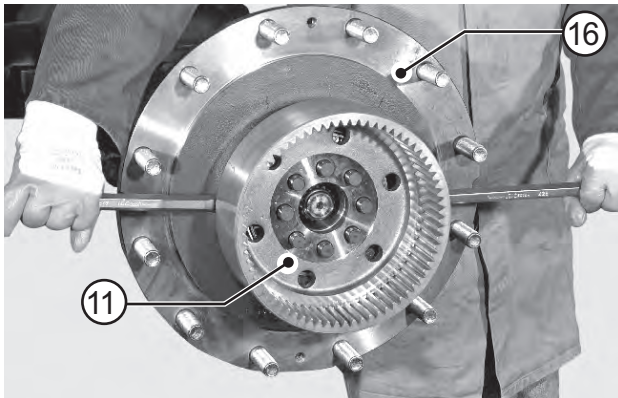


FIGURE 13: Using two screwdrivers or two levers inserted in the slots provided, disengage the crown wheel (11) from the hub (16). Remove the crown (11).

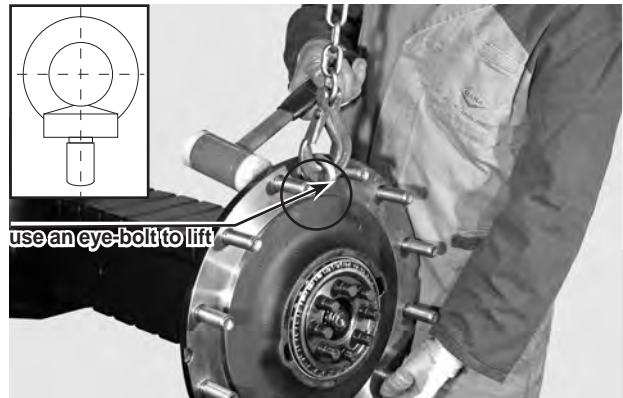


FIGURE 16: With the help of a plastic hammer, shift the hub (16) and the external bearing (13).

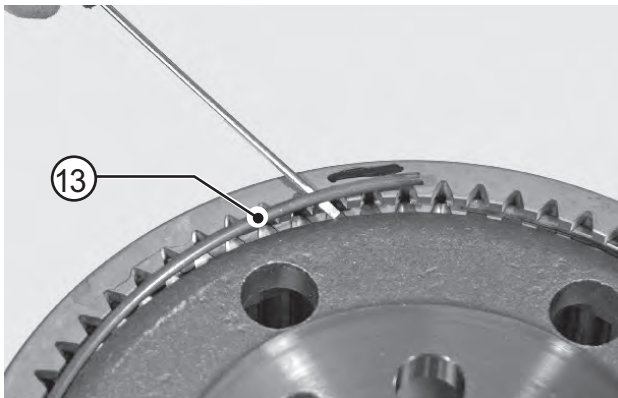


FIGURE 14: Remove the snap ring (13) from the crown (12).

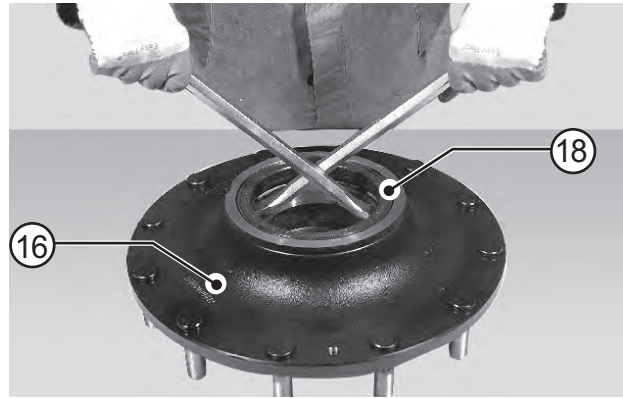


FIGURE 17: Remove the seal ring (18) from the hub (16).

NOTE:

Mark the direction of assembly.

CAUTION

The seal ring may not be reused.



FIGURE 15: Remove the crown flange (11).

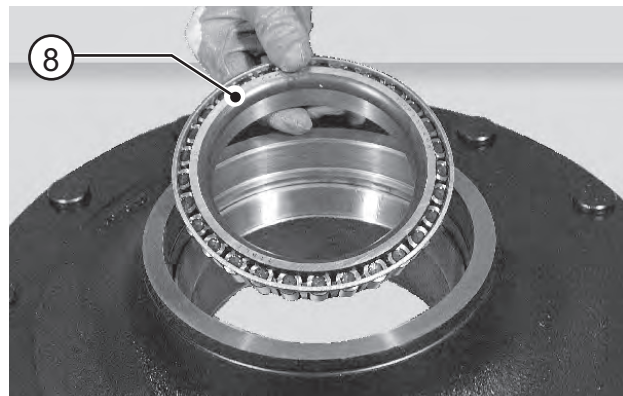


FIGURE 18: Remove the internal bearing (8).

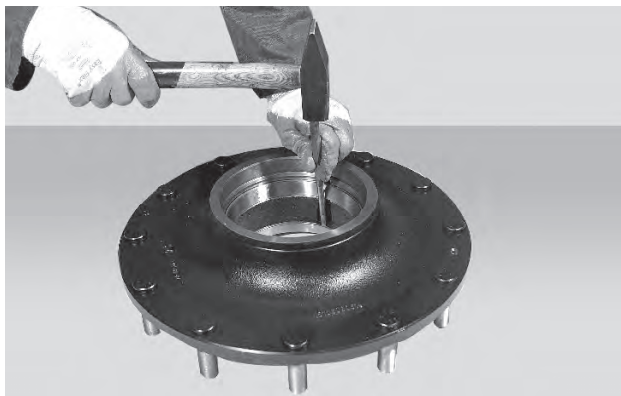


FIGURE 19: Remove the external thrust blocks of bearings (14) and (17), using a pin driver.

NOTE:

Hammer in an alternate sequence to prevent clamping and deformation of the thrust blocks.

ASSEMBLY

ASSEMBLY

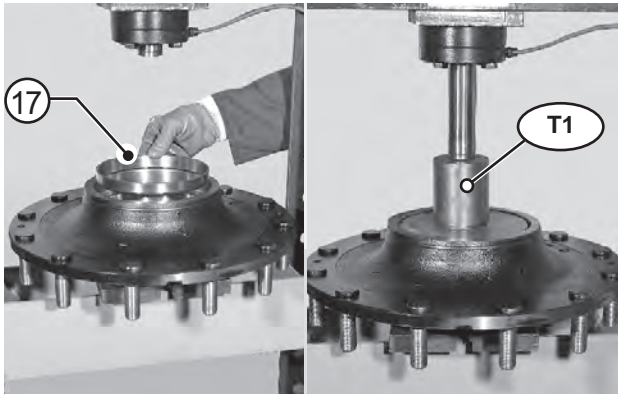


FIGURE 20: Position the wheel hub (16) under a press; lubricate the seat of the bearing cones (14)(17) and, using tool T1 (See drawing T1 p. 25), install the bearing cup of the bearing cone (14)(17).

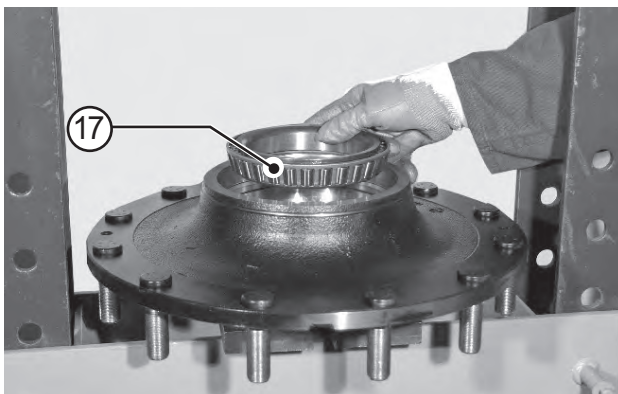


FIGURE 21: Fit the bearing (17) and seal ring (18) into the internal thrust block.

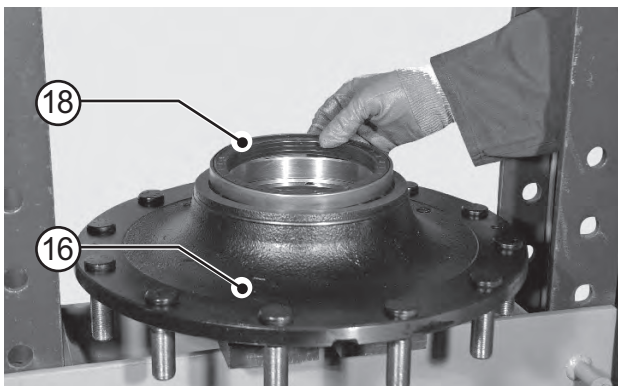


FIGURE 22: Apply a jointing compound for seals to the outer surface of the sealing ring (18). Position the sealing ring (18) in the hub (16).

NOTE:

Check that the ring (18) is correctly oriented.

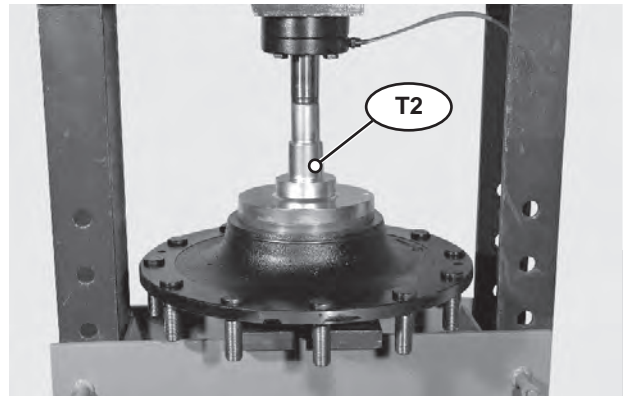


FIGURE 23: Position tool T2 (See drawing T2 p. 26) and press the sealing ring (19) into its seat. Check the flatness of seal ring.

CAUTION

Install the seal ring, taking care to maintain the predefined distance of 7.00 mm \pm 0.5.

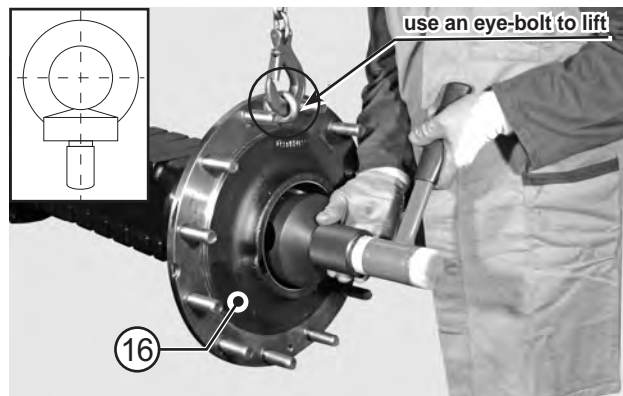


FIGURE 24: Install the wheel hub (16). If assembly is difficult, use a punch with a suitable diameter to seat it.

NOTE:

Move the bearing cone to the limit stop by hammering lightly all around the edge.

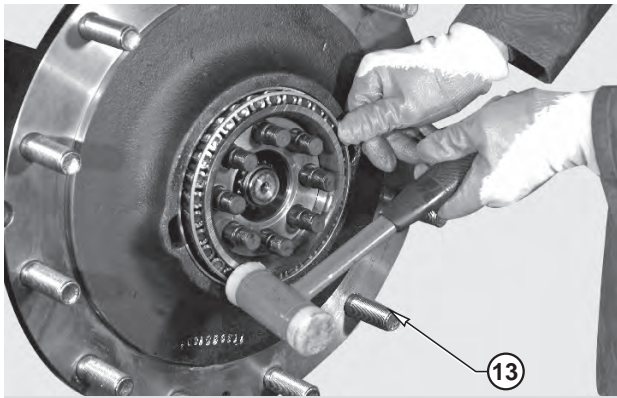


FIGURE 25: Install the external bearing cone (14).

NOTE:

Using a plastic hammer, drive the bearing cone to the limit stop by lightly hammering around the edge.

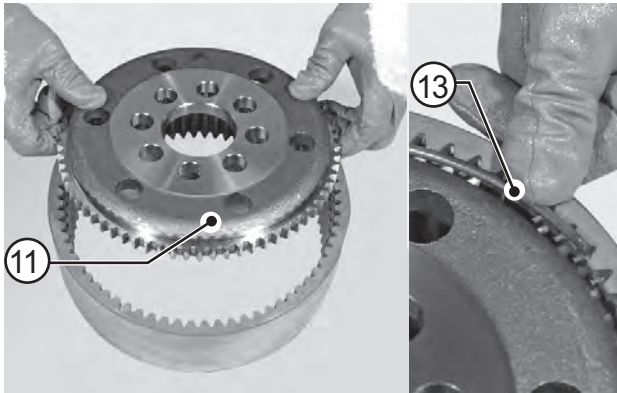


FIGURE 26: Install the crown wheel flange (11). Insert the snap ring (13) in order to fix the flange (11) in the crown (13).

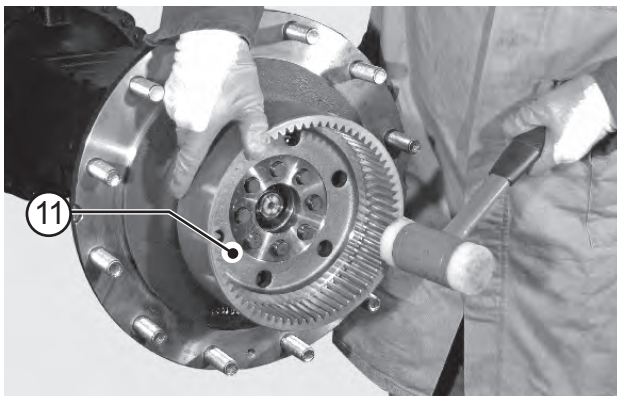


FIGURE 27: Fit the complete crown flange (11).

NOTE:

In order to fasten the flange (11), use a plastic hammer and alternately hammer on several equidistant points.

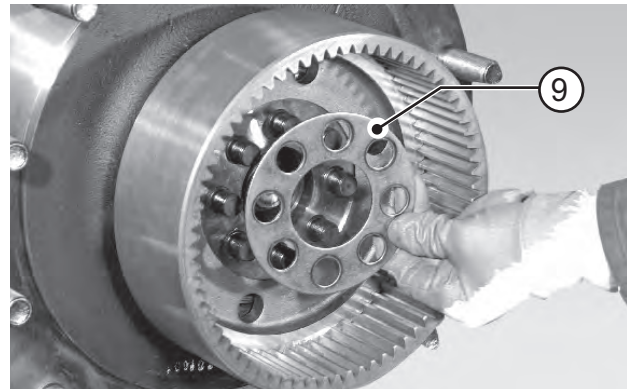


FIGURE 28: Install the security flange (9).

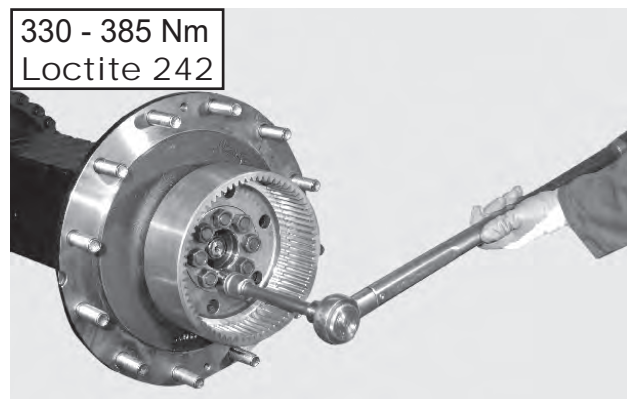


FIGURE 29: Coat the nuts (7) with Loctite 242 and tighten them. Tighten nuts (7) in two stages, using the criss-cross method. Initial torque wrench setting: 330 N·m. Final torque wrench setting: 385 N·m.

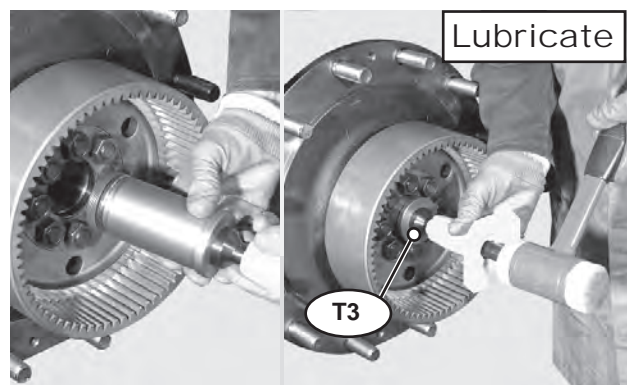


FIGURE 30: Lubricate and fit the seal ring (21) and guide ring (20) onto tool T3 (See drawing T3 p. 26); install the rings into the arm.

CAUTION

Pay particular attention to the direction of assembly of the rings.

ASSEMBLY

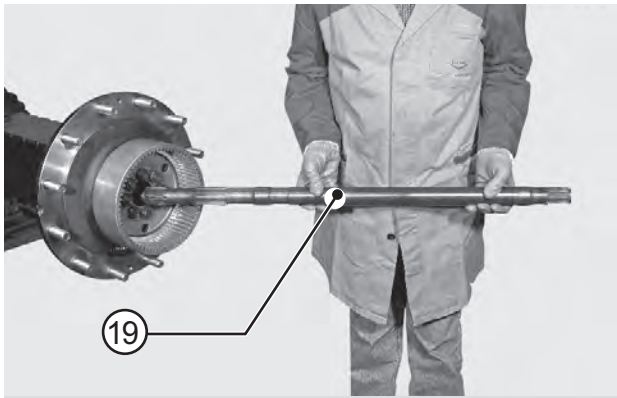


FIGURE 31: Grease sealing face of axleshaft (19). Install the axle shaft (19) making sure it is properly engaged in the braking disks and in the differential unit.

NOTE:

Be very careful not to damage the seal ring (21).

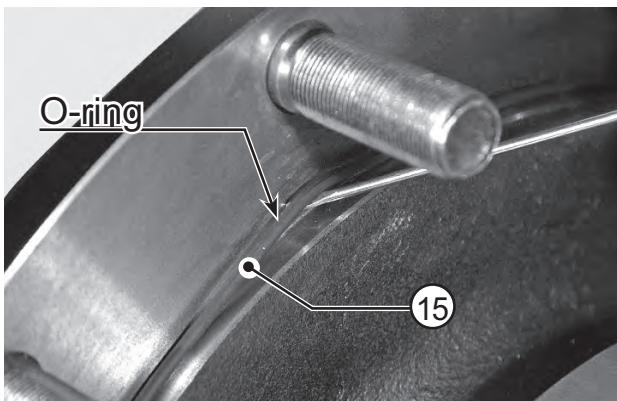


FIGURE 32: Replace the o-ring (15). Lubricate the o-ring before fitting.



FIGURE 33: Accurately check the orientation.

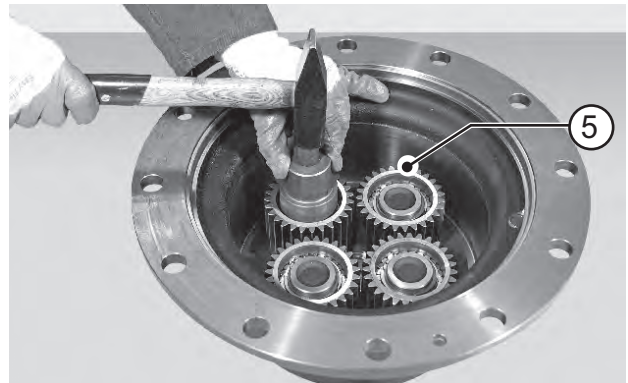


FIGURE 34: Insert the planetary gears (5) into the cover (3). Lock gears (5) into position by installing the snap rings.

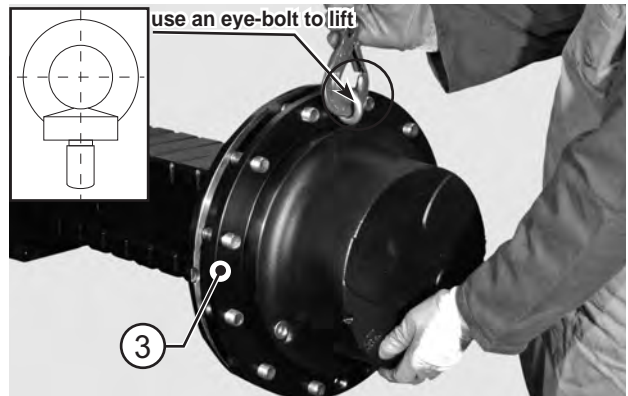


FIGURE 35: Fit the planetary carrier cover (3) onto the hub (16).

CAUTION

Check that the o-ring is in good condition and in position.

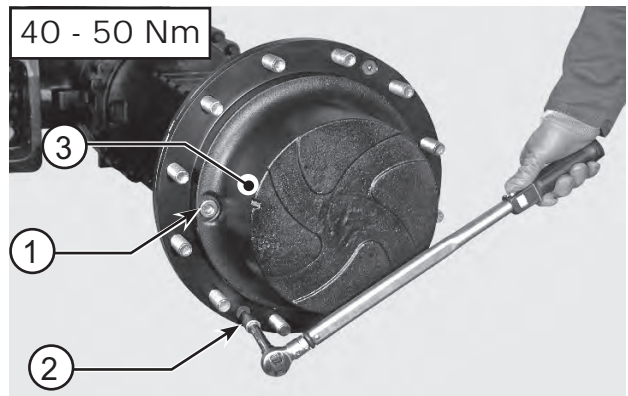


FIGURE 36: Lock the planetary carrier cover (3) by tightening the screws (2).

Torque wrench setting for screws: 182 - 202 N·m.

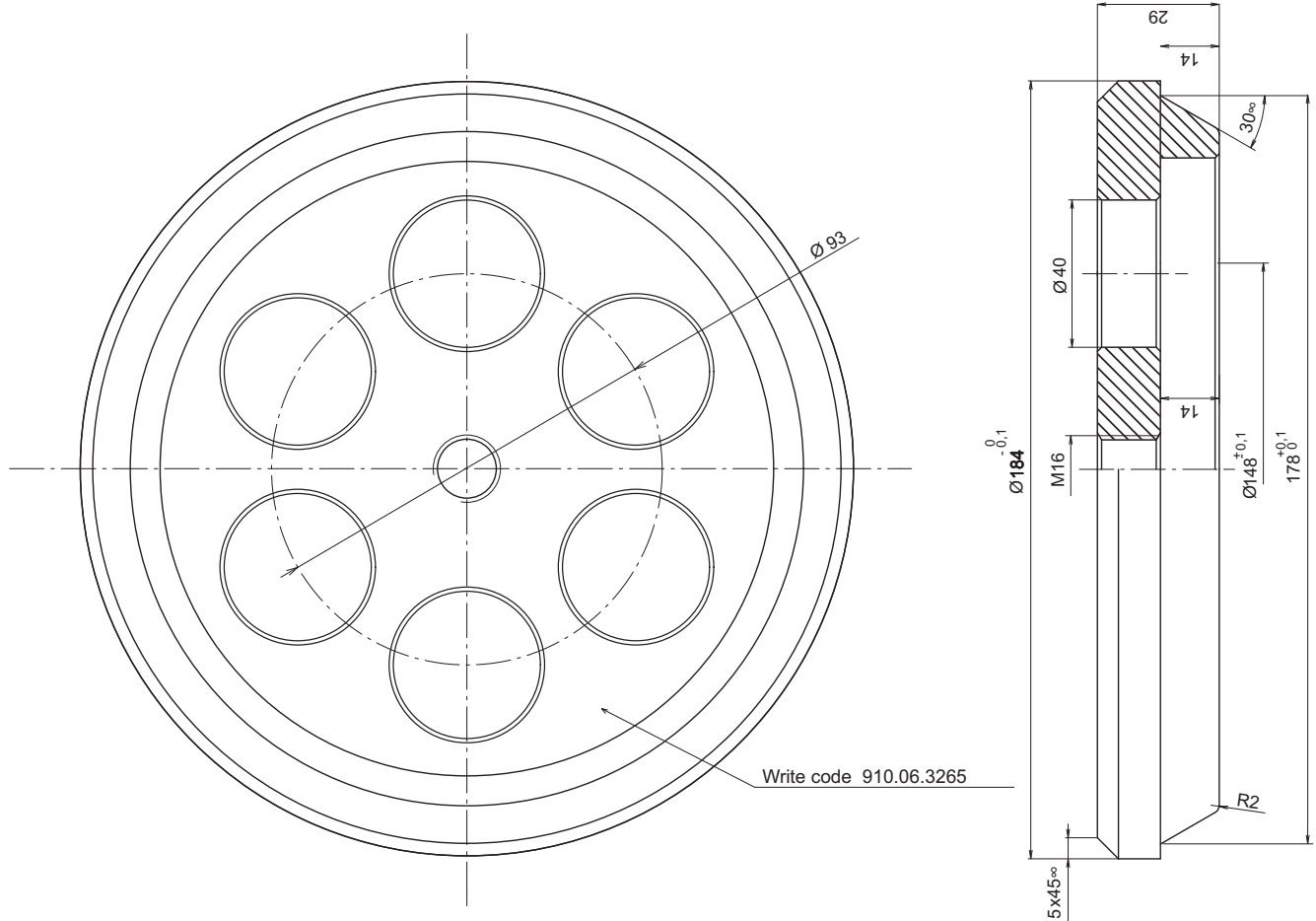
Install the oil-level plug (1).

Torque wrench setting for screws: 90 N·m

SPECIAL TOOLS

T1

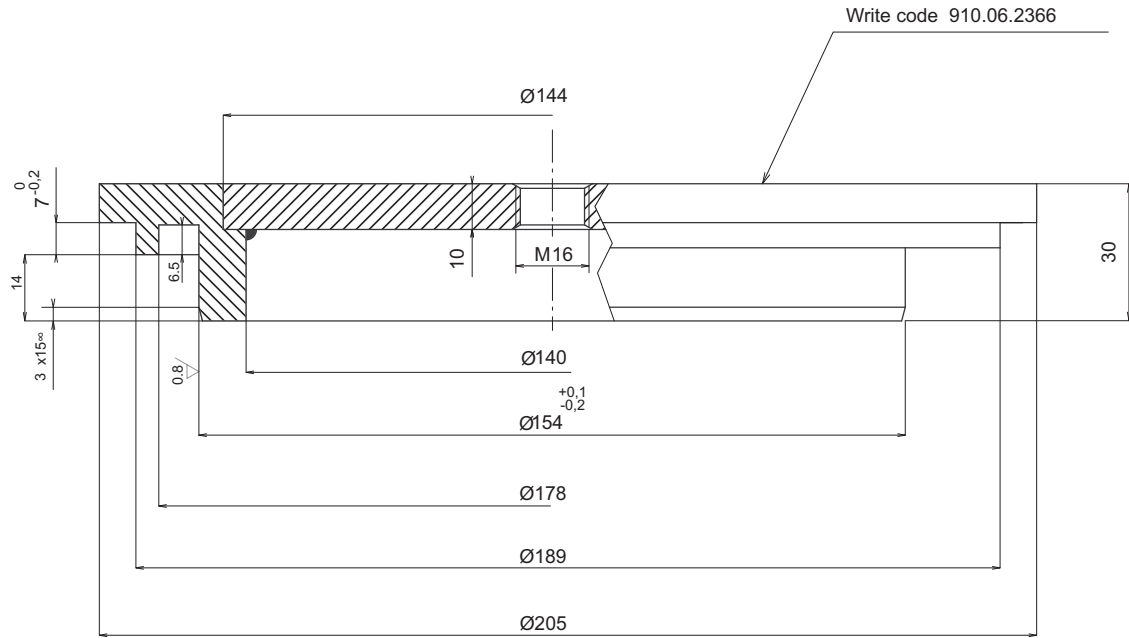
P/N: 910.06.3265



SPECIAL TOOLS

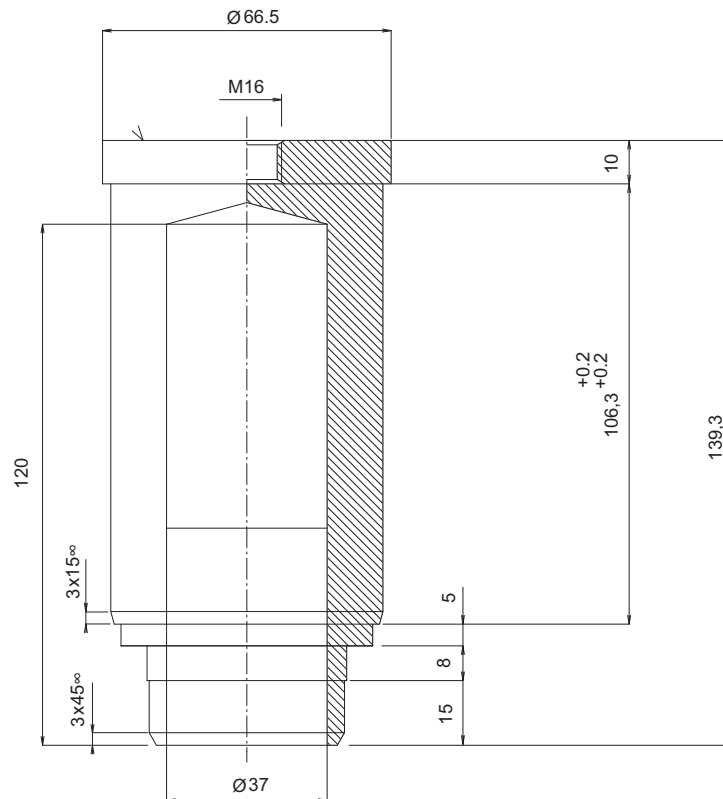
T2

P/N: 910.06.2366



T3

P/N: 910.06.4434



Write code 910.06.4434

BRAKE WEAR CHECK PROCEDURE

CAUTION

Perform all operations on both arms.

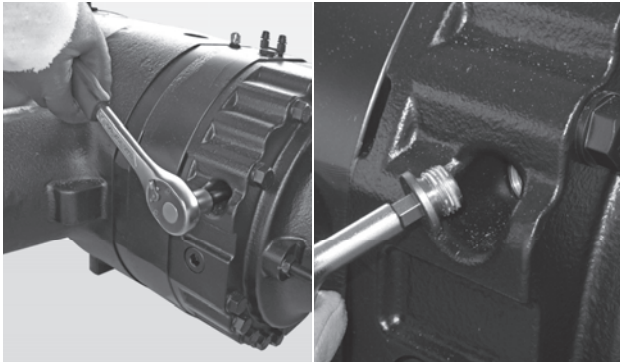


FIGURE 1: Remove the inspection plug.

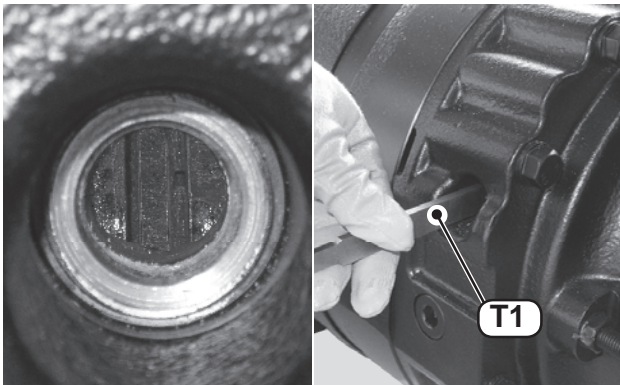


FIGURE 2: Apply the parking brake (or have someone hold the service brake) and with either brake applied, check the distance between discs using tool T1 (See drawing T1 p. 28). Minimum distance: 5,2 mm

CAUTION

Replace the braking disks and the intermediate disks on both sides if necessary.
See SERVICE BRAKE p. 29 and SERVICE BRAKE AND NEGATIVE PARKING BRAKE p. 35.

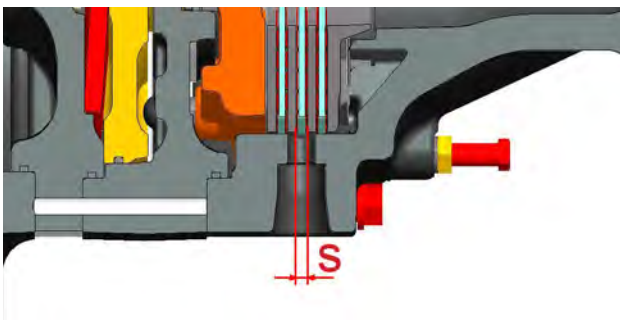


FIGURE 3: Checking brake distance with the T1 go / no-go gauge.

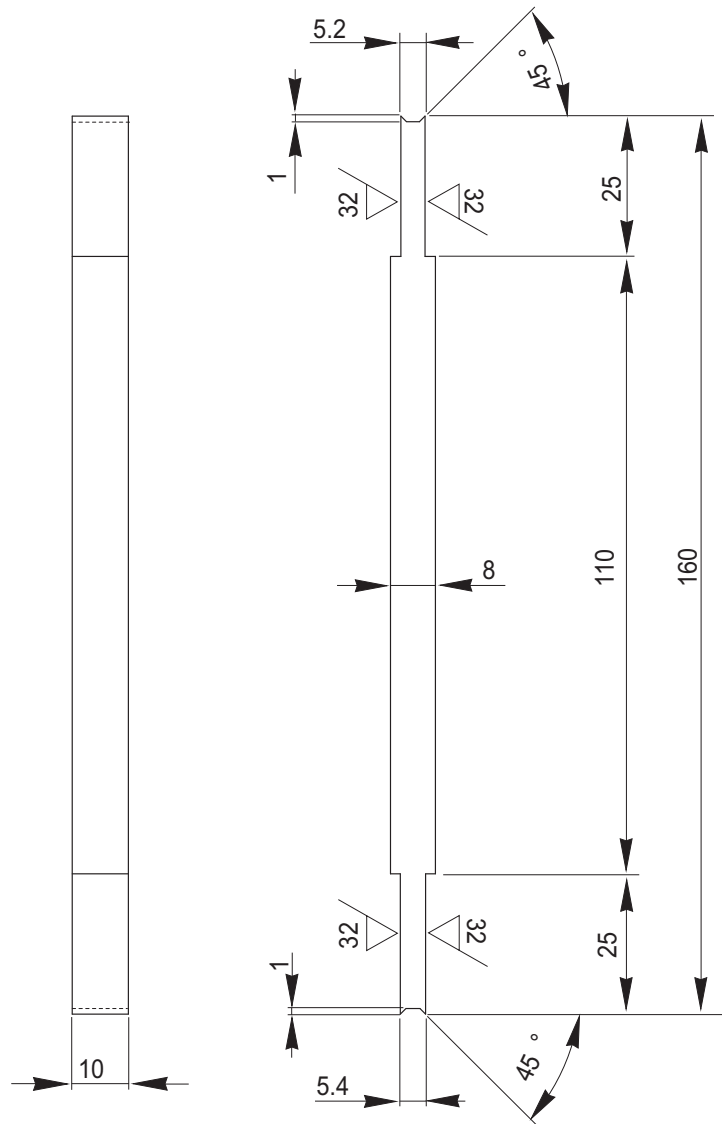


FIGURE 4: Install the inspection plug.
Torque wrench setting for screws: 35 - 50 N·m.

SPECIAL TOOLS

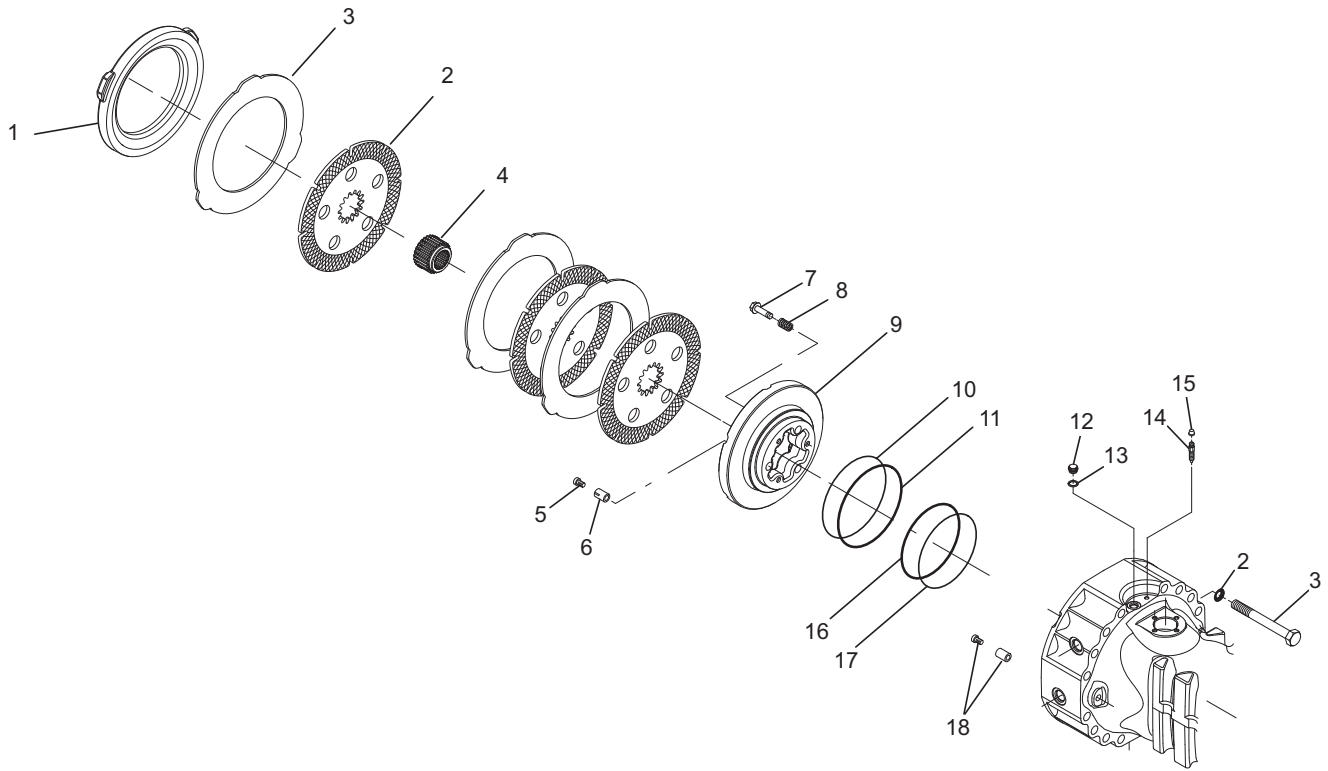
SPECIAL TOOLS

T1



SERVICE BRAKE

EXPLODED VIEW



DISASSEMBLY

DISASSEMBLY

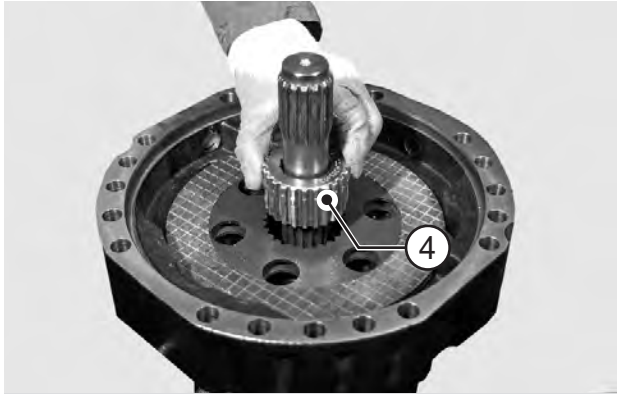


FIGURE 1: Remove the flange (4) complete with the discs. Write down direction of assembly.



FIGURE 2: Remove the axle shaft.

NOTE:

Be very careful not to damage the seal ring.

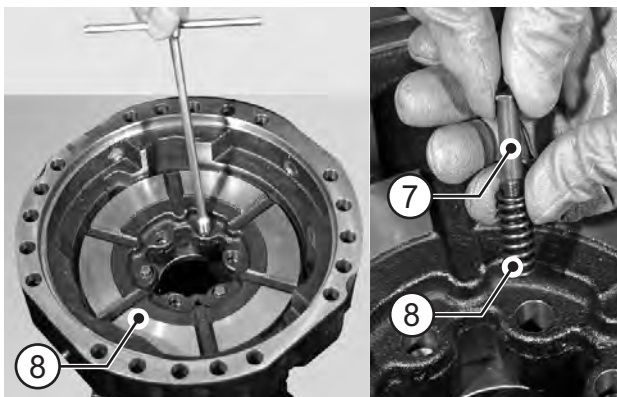


FIGURE 3: Remove the reversal springs (8) and screws (7).

NOTE:

If the springs (8) are weak or deformed they must be replaced.

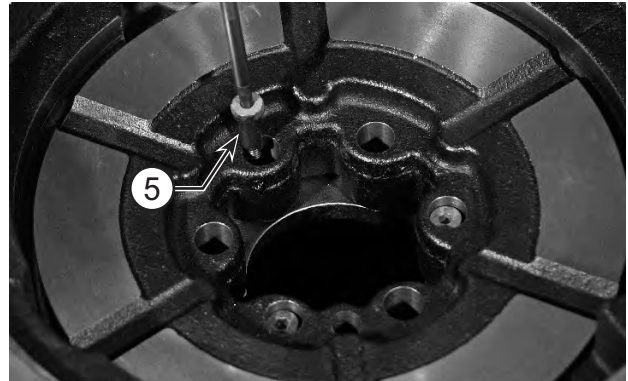


FIGURE 4: Remove the adjusting screws (5)

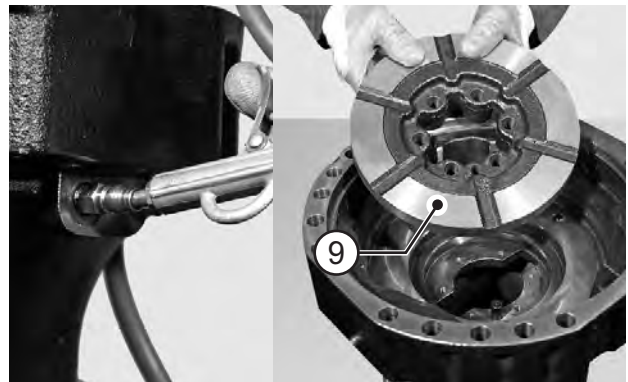


FIGURE 5: Slowly introduce low-pressure compressed air through the connection member for the service brake (P1), in order to extract the piston (9).

CAUTION

Hold the piston (9) back, as it may be suddenly ejected and damaged.

ASSEMBLY



FIGURE 6: Insert the stroke automatic regulation springs (6); place them in line with the piston (9).



FIGURE 7: Fit o-ring (11)(16) and back-up ring (10)(17) onto the piston (11). Lubricate the piston and the o-rings and install the unit into the arm.

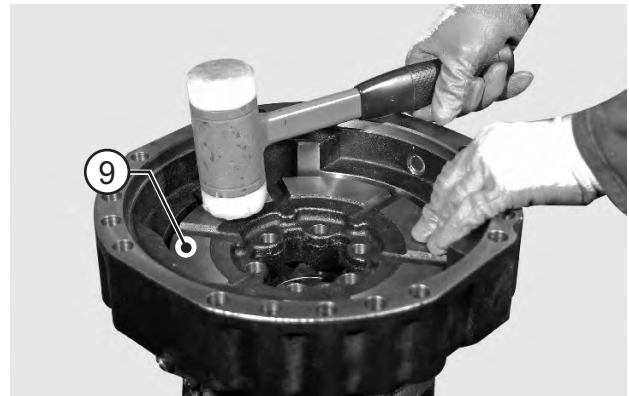
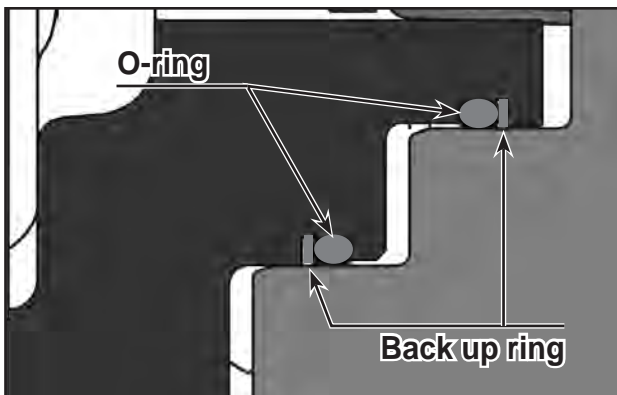


FIGURE 8: Using a plastic hammer, install the piston (9) into the arm.

NOTE:

Lightly hammer all around the edge in an alternate sequence.

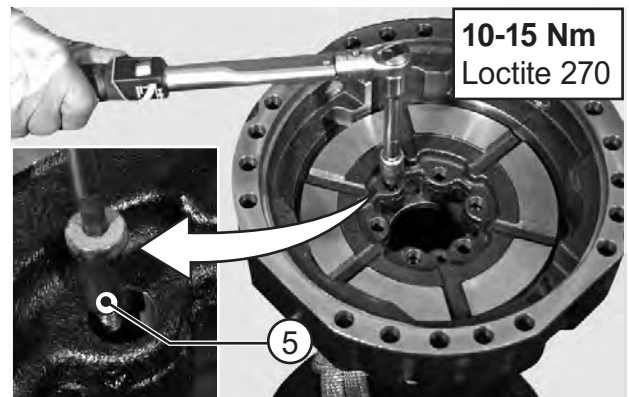


FIGURE 9: Fit the adjusting screws (5). Apply Loctite 270 to the thread. Torque wrench setting: 5 - 7 N·m

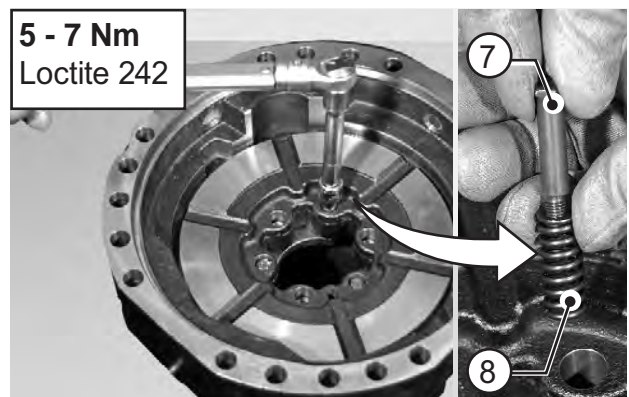


FIGURE 10: Fit the reversal springs (8) on the piston (9). Apply LOCTITE 242 to the thread of the screw. Tighten with torque wrench setting of 5 - 7 N·m

ASSEMBLY

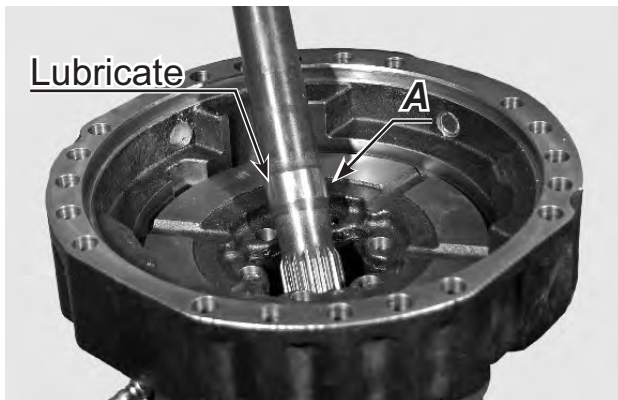


FIGURE 11: Grease sealing face "A" of axle-shaft .

NOTE:

Be very careful not to damage the snap ring.

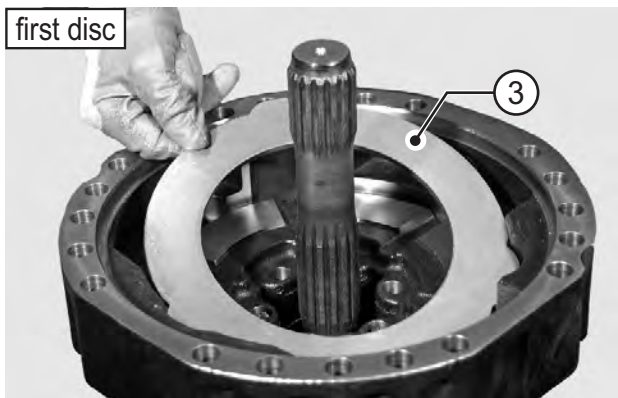


FIGURE 12: Insert the brake discs in the right sequence.

NOTE:

The first brake disc (3) to be inserted must be of steel material.

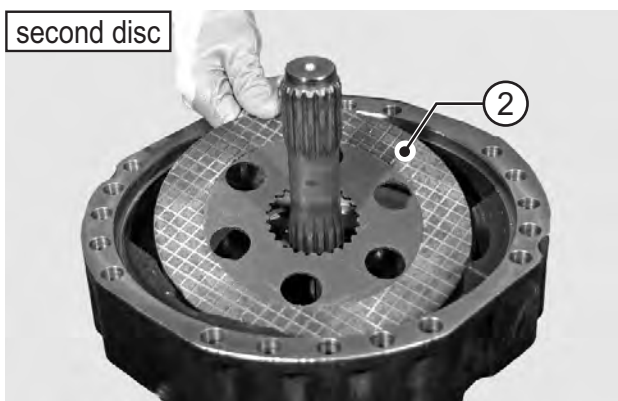


FIGURE 13: The second brake disc (2) to be inserted must be of friction material.

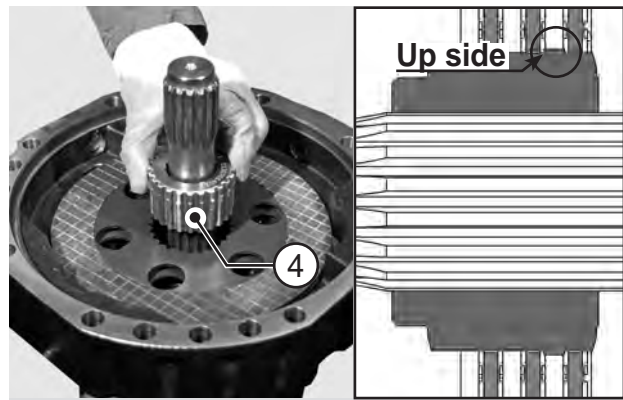


FIGURE 14: Install the flange (4) on the arm.

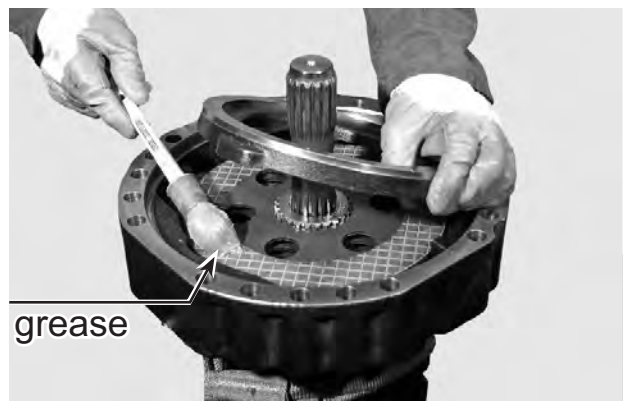


FIGURE 15: Insert the intermediate disk (1). Before installing the last brake disc and the intermediate disc, spread grease over the contact surfaces to hold them in position while mounting on the central housing.

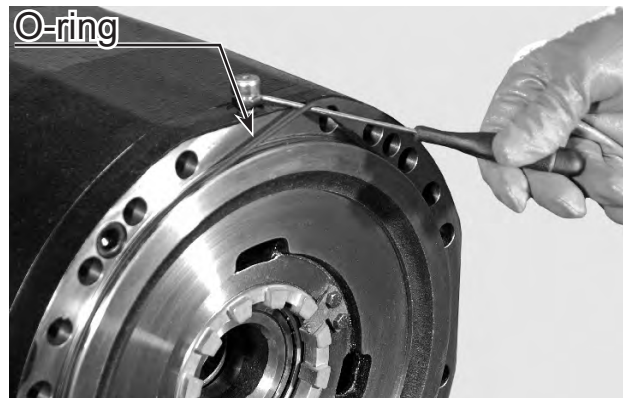


FIGURE 16: Check integrity and position of the cylinder's o-ring.

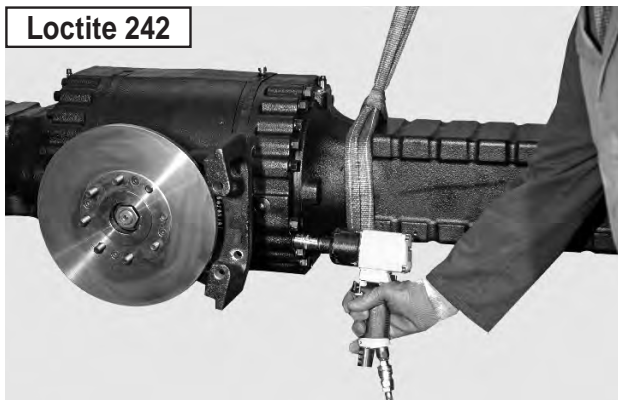


FIGURE 17: Temporarily lock the arm with nuts previously coated with Loctite 242; tighten lightly to make the unit touch the main body.

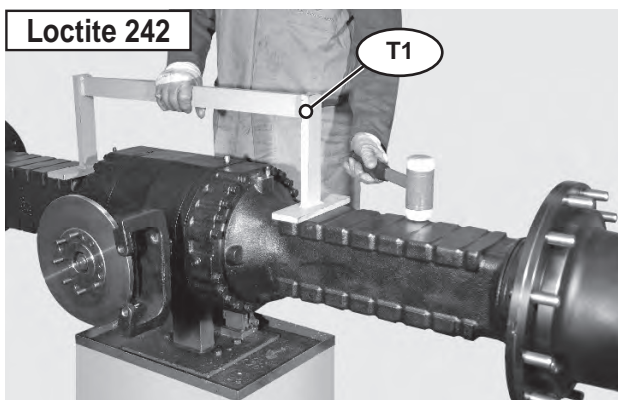


FIGURE 18: Check the flatness of the arms, using tool T1 (See drawing T1 p. 34); then lock the arms into their final position, using screws adequately coated with Loctite 242.

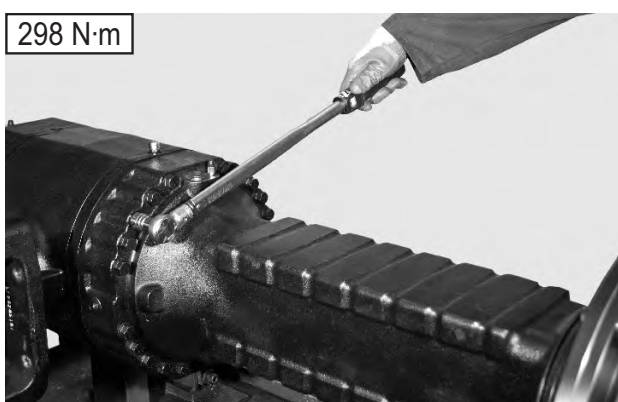


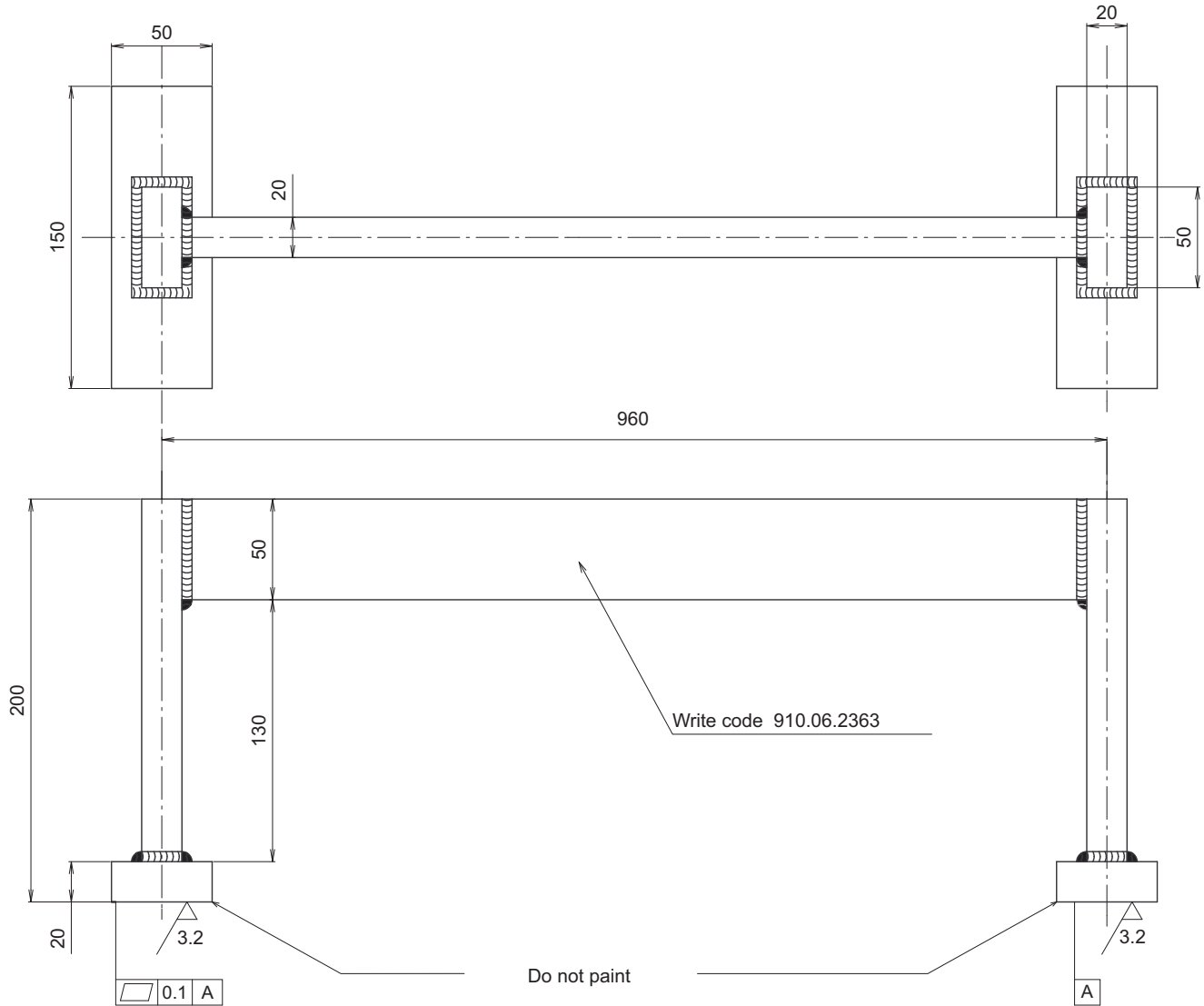
FIGURE 19: Secure in position with the screws (3) and washers (2), tightening to a torque of 298 N·m.

SPECIAL TOOLS

SPECIAL TOOLS

T1

P/N: 910.06.2363



RELEASE

RELEASE

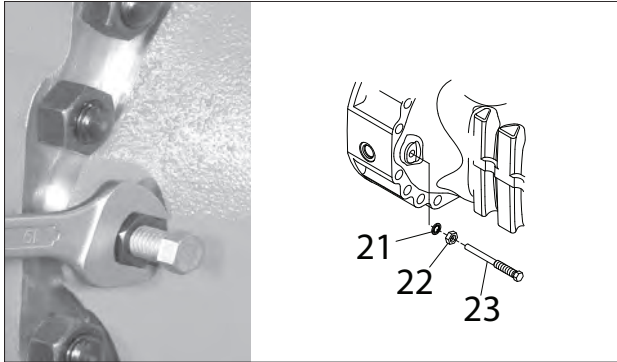


FIGURE 1: Loosen nuts (22) of screws (23) provided for the mechanical and manual release of the braking units, then move the nuts backwards by approximately 8 mm.

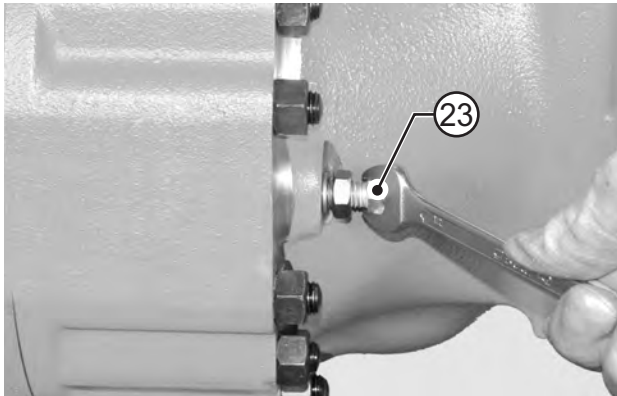


FIGURE 2: Tighten screws (23) so as to fasten them onto the pressure plate (16).



FIGURE 3: Using a wrench, tighten the screws (23) in an alternate sequence by 1/4 turn at a time so as to compress the Belleville washers (1) and disengage the braking disks.

CAUTION

Tighten maximum by one turn.

ADJUSTMENT

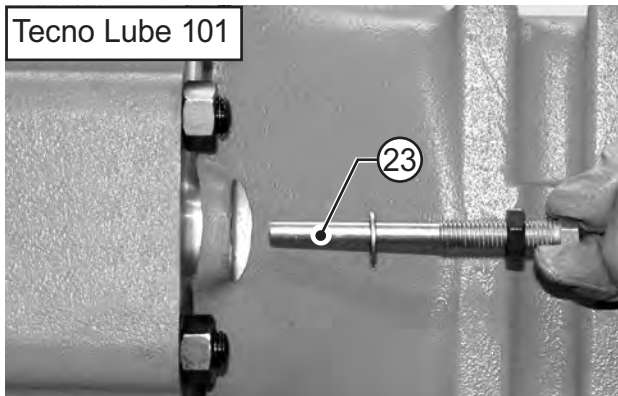


FIGURE 4: Remove screws complete with nuts and seals. Replace seals, apply silicone-based Tecno Lube /101 grease to the screws and install all parts into the arm.

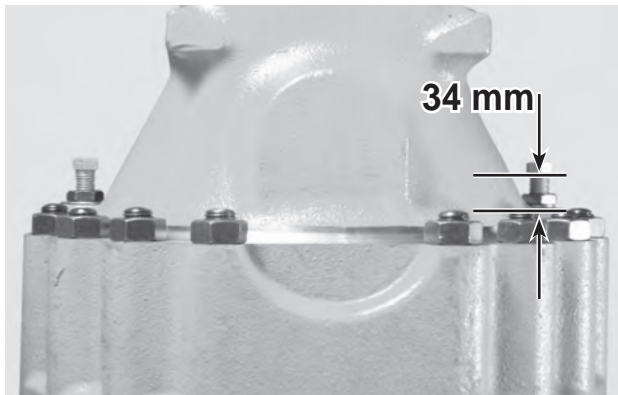


FIGURE 5: Adjust screws (23) to obtain a distance of 34 mm in relation to the arm.



FIGURE 6: Lock into position with nuts (22).

⚠ CAUTION

Hold screws (23) into position while locking the nuts (22); after locking, check the distance of screws (23) once more.

DISASSEMBLY

DISASSEMBLY

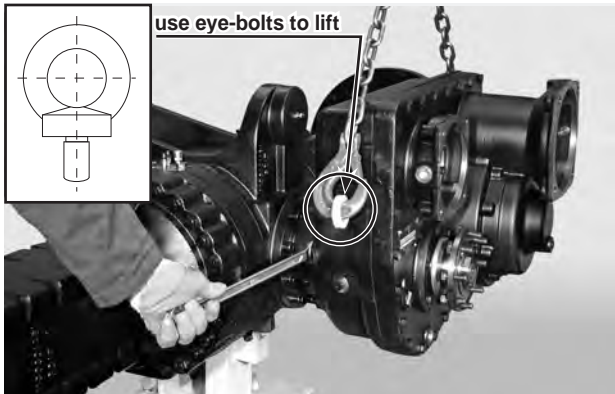


FIGURE 7: Remove fastening screws from the reduction unit.

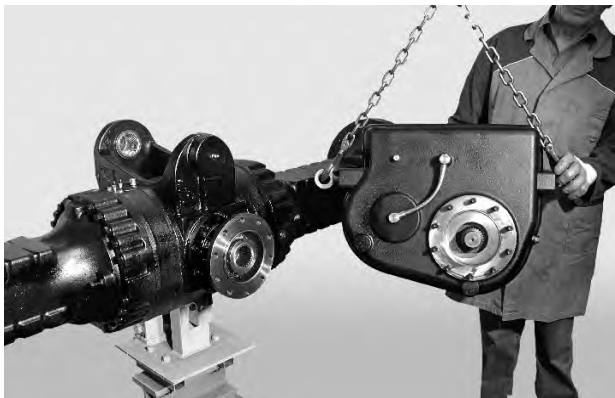


FIGURE 8: Disjoin the entire reduction unit from the axle and place it on a bench.

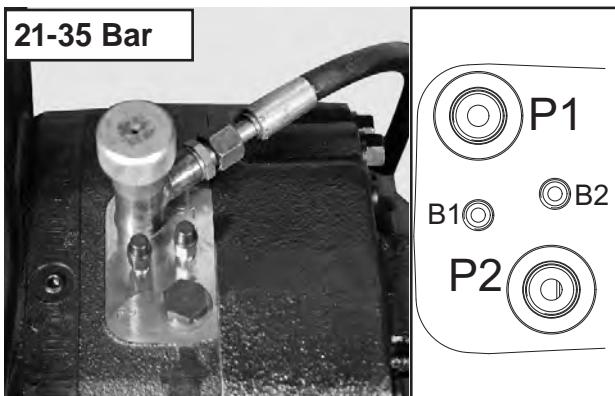


FIGURE 9: Connect an external pump to the union piece “P1” of the negative brake and introduce a pressure of 21 - 35 bar to eliminate the pressure of the Belleville washers (1).

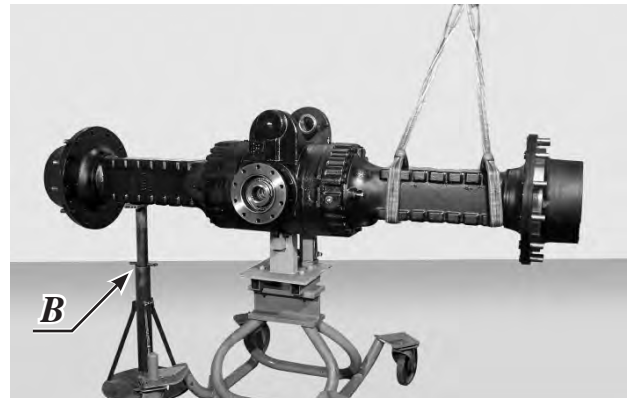


FIGURE 10: If axle is positioned on an overhaul bench, place a safety anti-tilting stand “B” under the arm that remains connected and block wheels, if any.

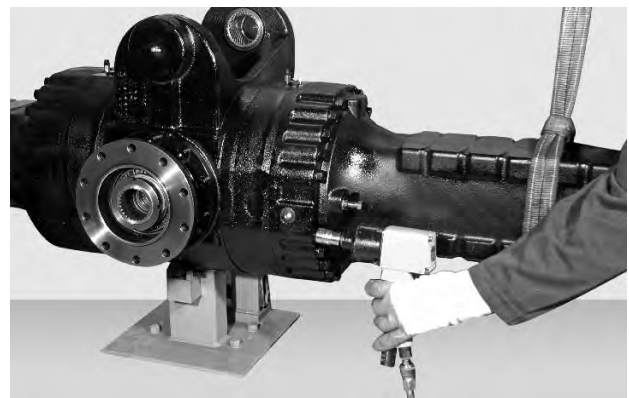


FIGURE 11: Sling the arm to be removed and connect it to a hoist. Remove the retainer screws and relative washers.

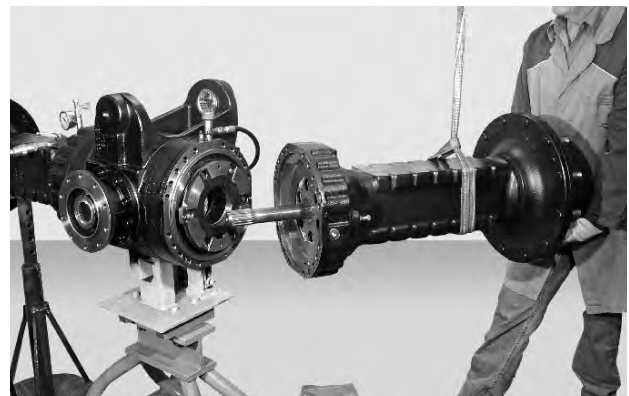


FIGURE 12: Remove arm together with brakes and axle shafts; lay down the arm vertically. Release pressure.



FIGURE 13: Remove braking discs (11)(12), noting down direction of assembly.

NOTE:

If disks are not to be replaced, avoid changing their position.

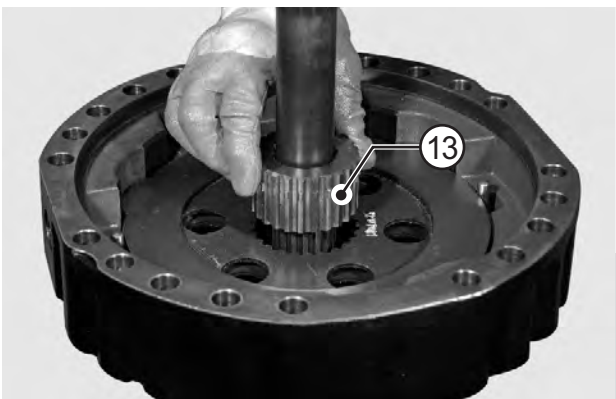


FIGURE 14: Remove the flange (13) complete with the discs. Write down direction of assembly.

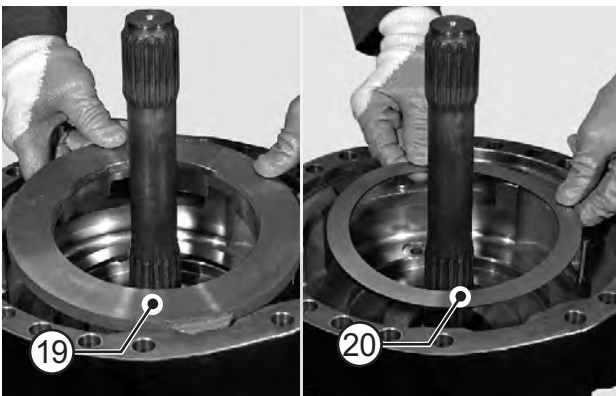


FIGURE 15: Remove spacer-braking discs (19) and shims (20), noting down direction of assembly.

NOTE:

Build a stack of washers and check the measurement.

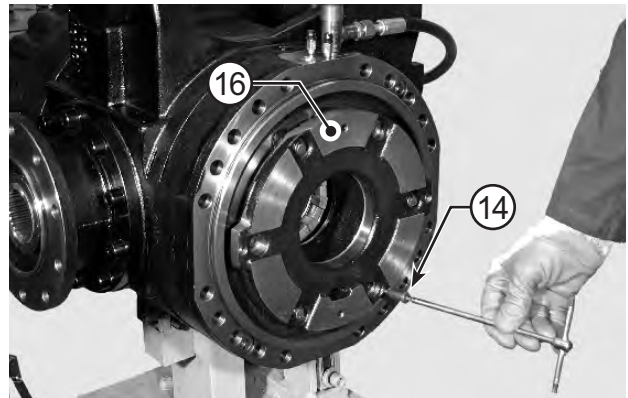


FIGURE 16: Remove the adjusting screws (14) from the counterwasher (16).



FIGURE 17: Remove the reversal springs (9) and screws (10).

NOTE:

If the springs (9) are weak or deformed they must be replaced.

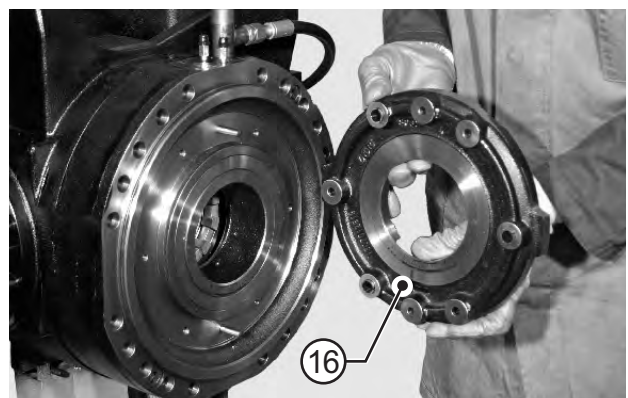


FIGURE 18: Write down the order of assembly and remove the counterwasher (16).

DISASSEMBLY

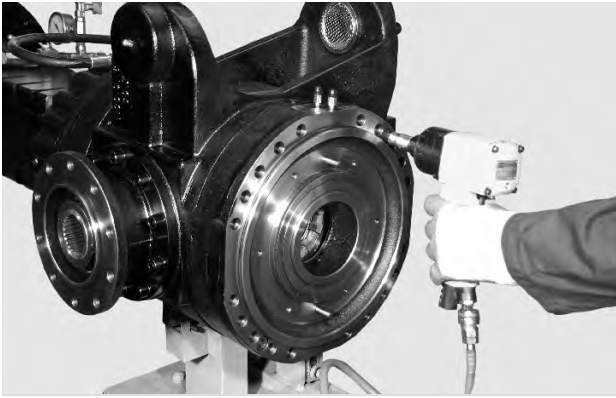


FIGURE 19: Loosen the fixing screws (29) in an alternate manner and remove them.

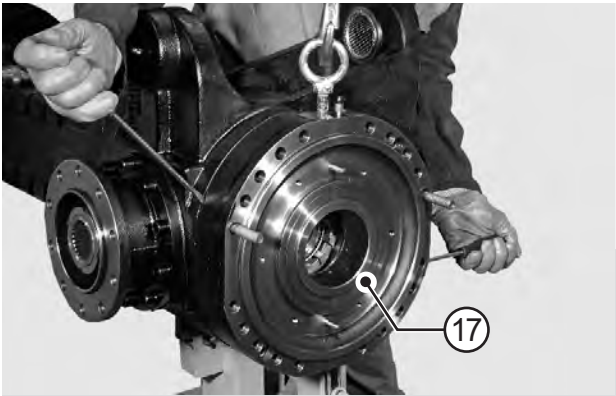


FIGURE 20: Remove the brake cylinder (17).

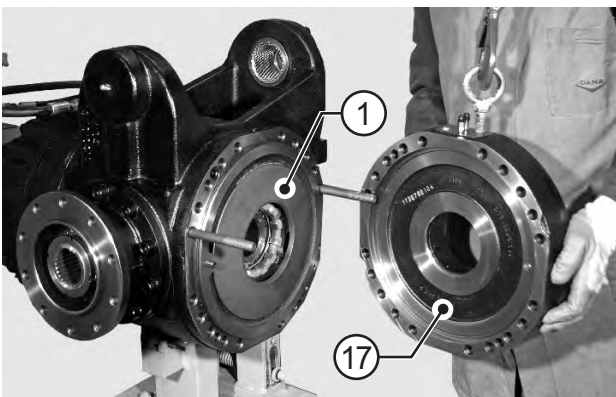


FIGURE 21: Move the cylinder (17) outwards while supporting the Belleville washers (1). Remove the Belleville washers (1) and write down direction of assembly.

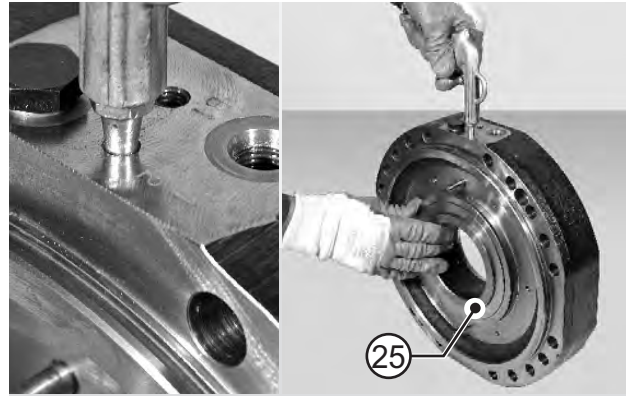


FIGURE 22: Slowly introduce low-pressure compressed air through the connection member for the service brake (P2), in order to extract the piston (25).

⚠ CAUTION

Hold the piston (25) back, as it may be suddenly ejected and damaged.

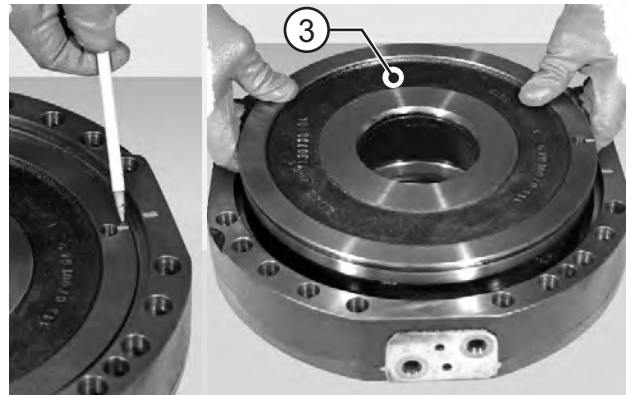


FIGURE 23: Slowly introduce low-pressure compressed air through the connection member for the negative brake (P1), in order to extract the piston (3).

⚠ CAUTION

Hold the piston (3) back, as it may be suddenly ejected and damaged. Write down the order of assembly.

ASSEMBLY

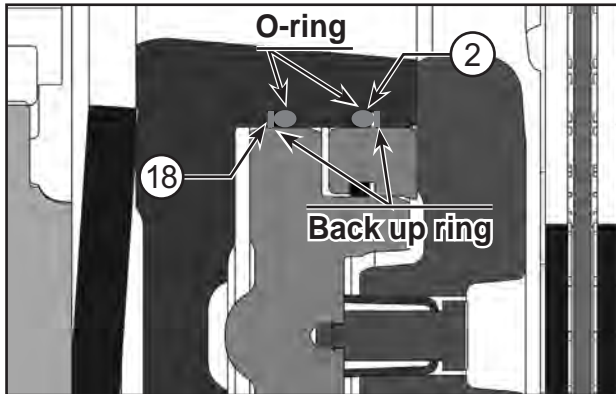


FIGURE 24: ATTENTION: The o-rings always have to be assembled from the pressure facing side.



FIGURE 25: Fit o-ring (2) and (4) and anti-extrusion ring (18) onto the piston (3).

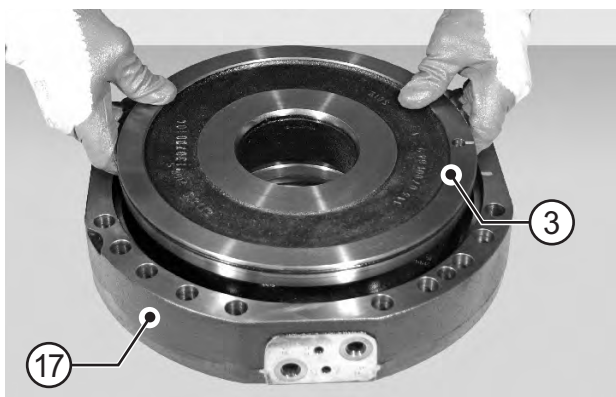


FIGURE 26: Check the position of the anti-extrusion (18) and o-rings (2) and (4). Lubricate the piston and the o-rings and install the unit (3) into the cylinder (17) .

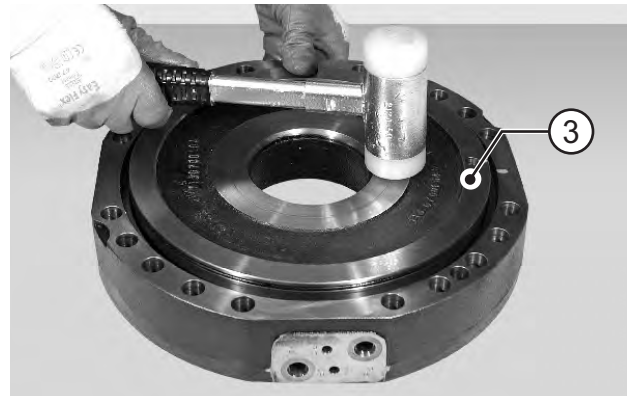


FIGURE 27: Using a plastic hammer, install the piston (3) into the cylinder (17).

NOTE:

Lightly hammer all around the edge in an alternate sequence.

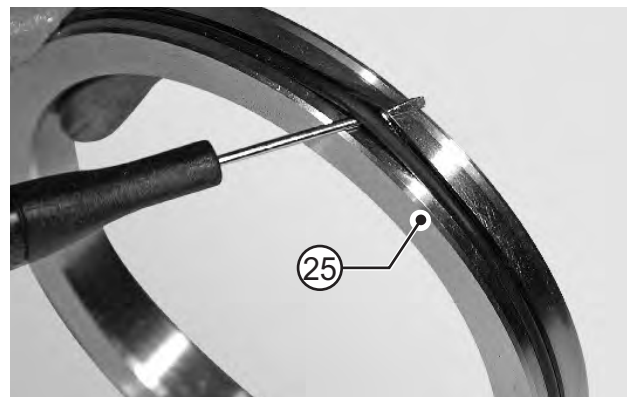


FIGURE 28: Fit o-ring (27) and anti-extrusion ring (26) onto the piston (25).

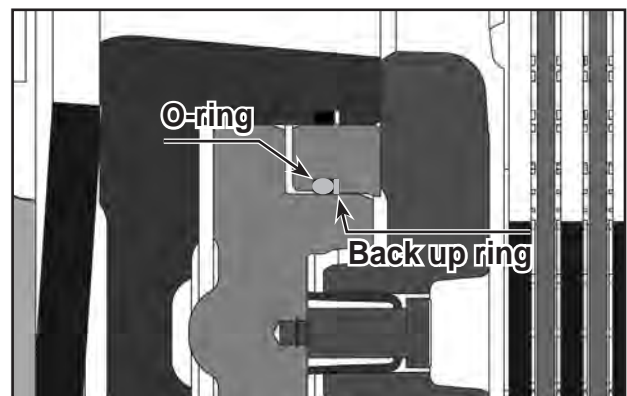


FIGURE 29: ATTENTION: The o-rings always have to be assembled from the pressure facing side.

ASSEMBLY

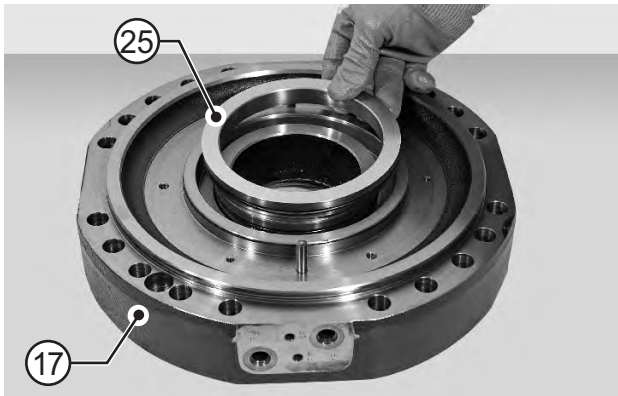


FIGURE 30: Lubricate the piston and the o-rings and install the unit (25) into the cylinder (17) .

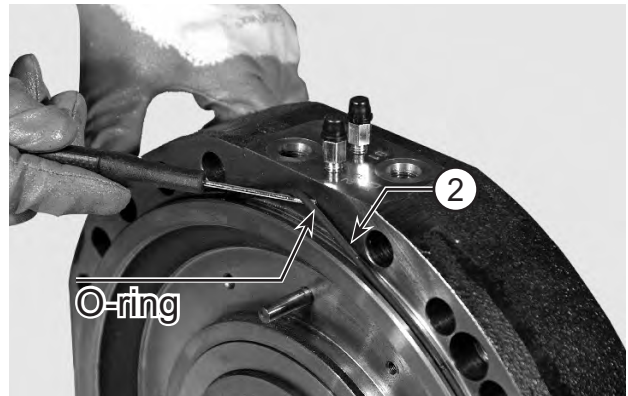


FIGURE 33: Check integrity and position of the cylinder's o-ring (2).

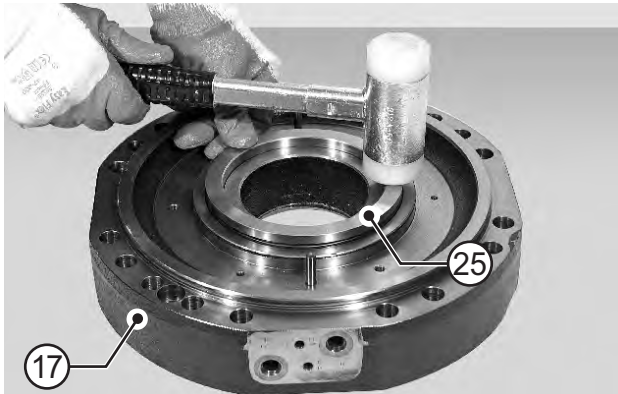


FIGURE 31: Using a plastic hammer, ram the piston (25) into the cylinder (17).

NOTE:

Lightly hammer all around the edge in an alternate sequence.

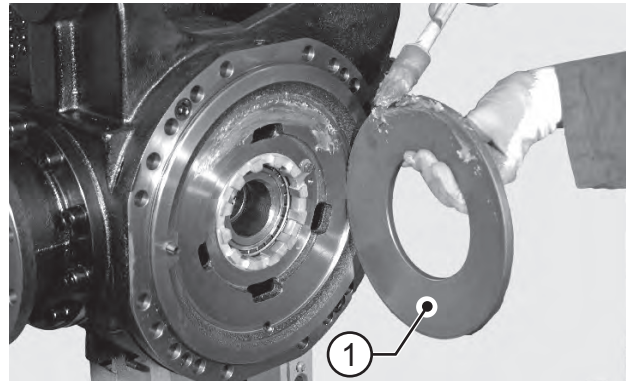


FIGURE 34: Position the Belleville washers (1) and engage the cylinder, spread grease over the contact surfaces to hold them in position while mounting on the central housing.

NOTE:

Check the direction of Belleville washers (1) and relative centering.

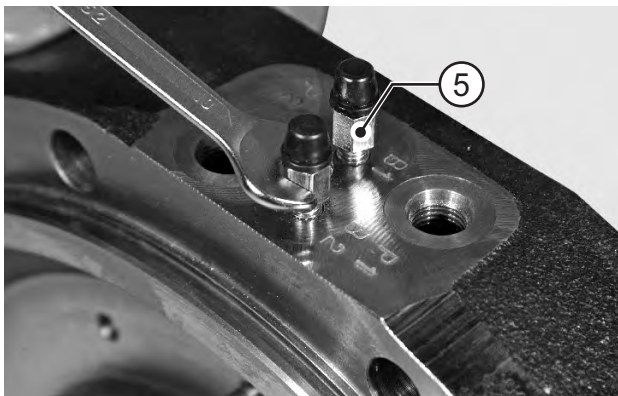


FIGURE 32: Assemble the breather (5).

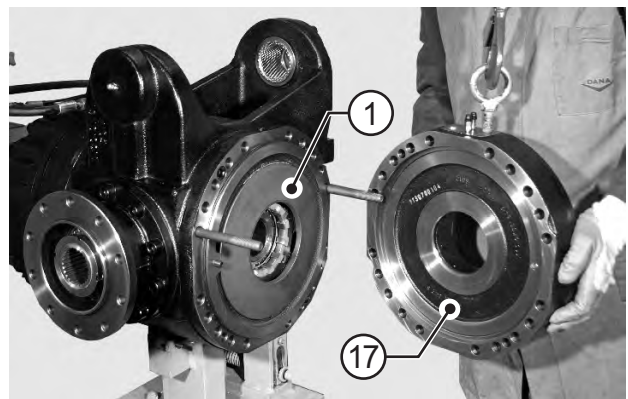


FIGURE 35: Engage the cylinder (17).

NOTE:

Check the direction of washers (1) and relative centering.



FIGURE 36: Insert the screws (29) and tighten them alternately. Lock the cylinder (17).

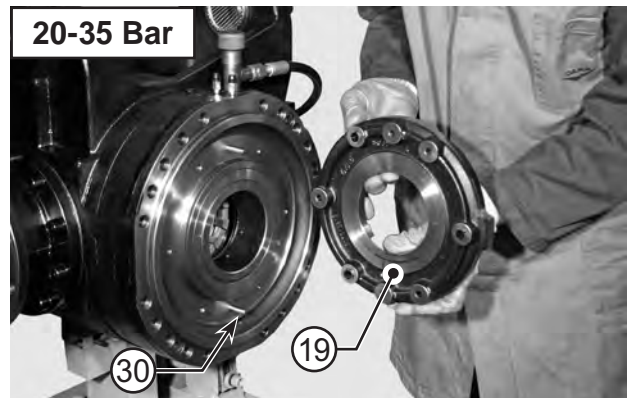


FIGURE 39: Insert the intermediate disc (19). Connect an external pump to the negative brake and introduce pressure to 20 - 35 bar.

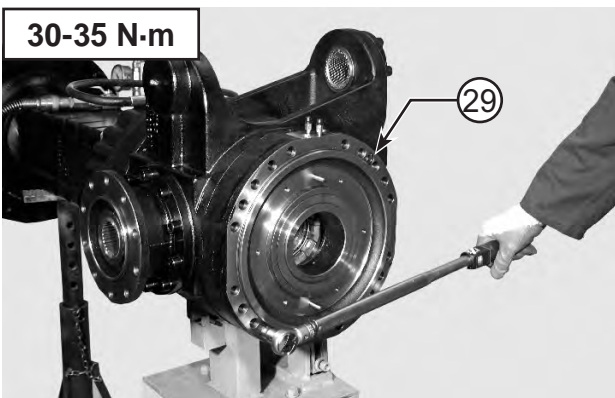


FIGURE 37: Tightening the screws (29) with a torque wrench set to 30 - 35 N·m.

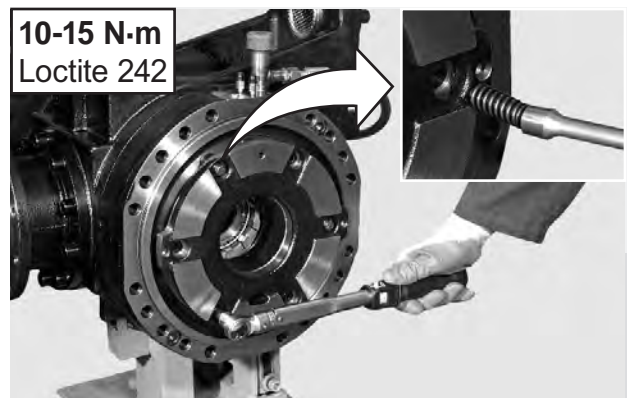


FIGURE 40: Fit the reversal springs (9) and screws (10) on the intermediate disk (16). Apply LOCTITE 242 to the thread of the fixing screw. Tighten with torque wrench setting of 10 - 15 N·m

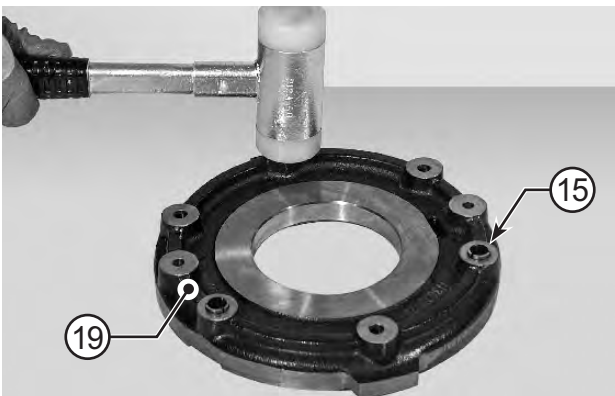


FIGURE 38: Insert the stroke automatic regulation springs (15); place them in line with the intermediate disc (19).

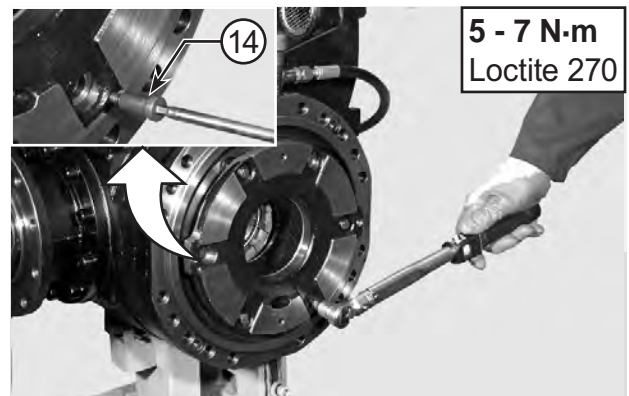


FIGURE 41: Fit the adjusting screws (14). Apply Loctite 270 to the thread. Torque wrench setting: 5 - 7 N·m.

ASSEMBLY



FIGURE 42: Take the measurement from the surface of the intermediate disk to the cover sealing surface with 20 - 35 bar of pressure introduced.
EXAMPLE: 30,6 mm

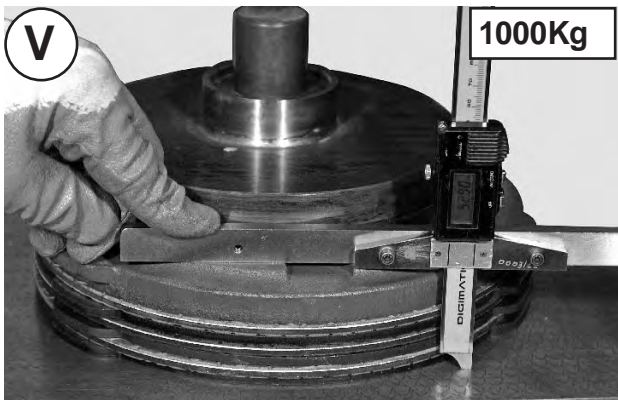
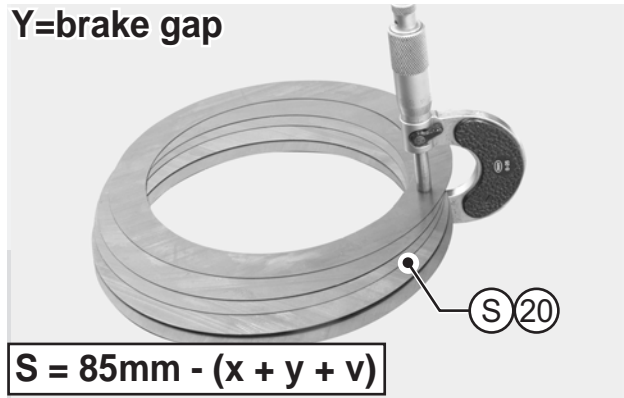


FIGURE 43: Put the brake disc pack including the shim under a press, load with 1000 kg and take the measure "V".
EXAMPLE: V = 52,9 mm



FIGURE 44: Arm fix quote = 85 mm



$$S = 85\text{mm} - (x + y + v)$$

FIGURE 45: $S = 85 \text{ mm} - (x + y + v)$ = Thickness of shims to insert under the shim washer.
EXAMPLE: $85 \text{ mm} - (30,6 + 52,9 + 1) = S = 0,5 \text{ mm}$

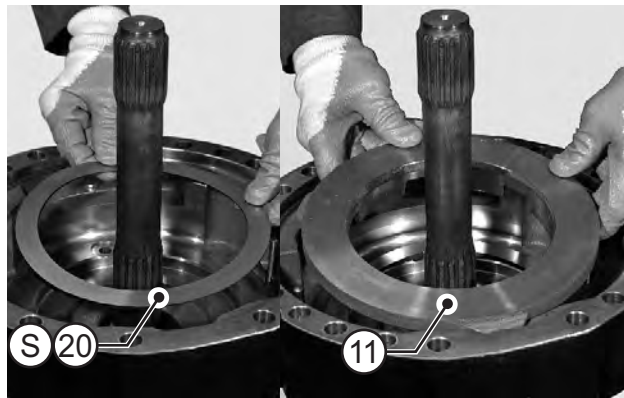


FIGURE 46: Insert under the shim washer a thickness of shims (20).

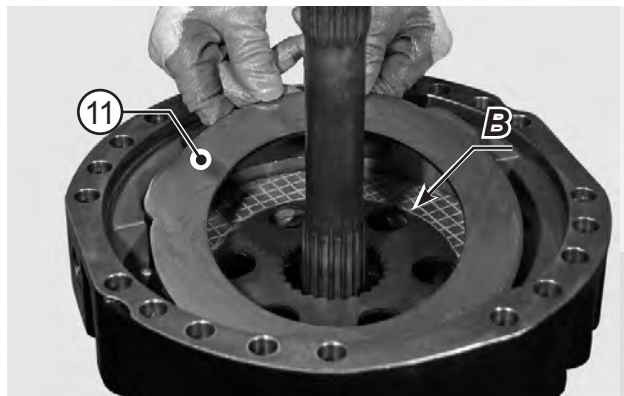


FIGURE 47: Slightly lubricate the braking disks (11) and (12) and fit them in the arm following the correct sequence; orient them so that the oil circulation holes and the marks "B" are perfectly lined up.

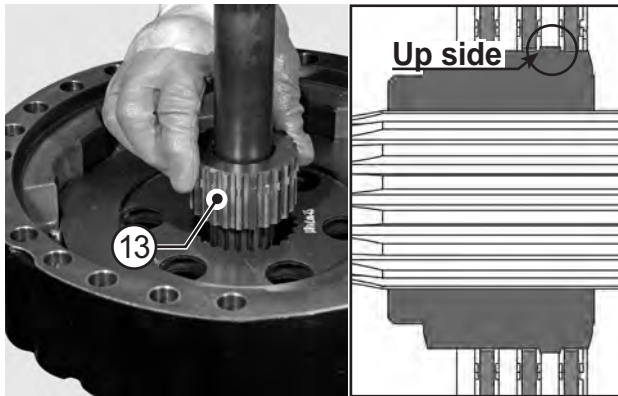


FIGURE 48: Install the flange (13) on the arm.



FIGURE 49: Insert the brake discs (11) and (12) in the right sequence.

NOTE:

The last brake disc to be inserted must be of steel material.

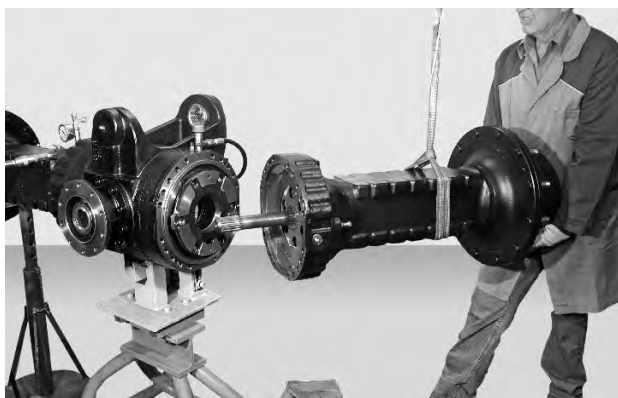


FIGURE 50: Check integrity and position of the arm's o-ring; install the complete arm.

NOTE:

To assist axle shaft centering, slightly move the wheel hub.



FIGURE 51: Temporarily lock the arm with nuts previously coated with Loctite 242; tighten lightly to make the unit touch the main body.

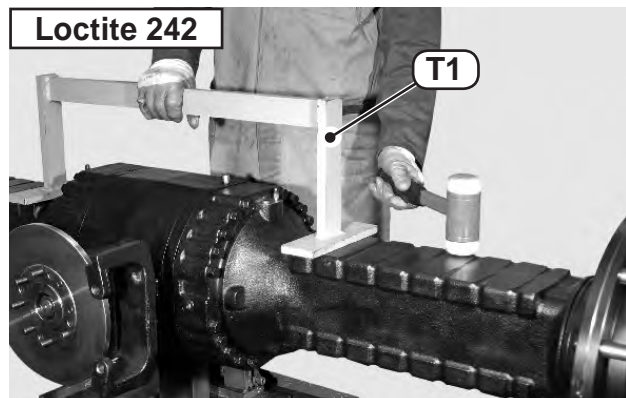


FIGURE 52: Check the flatness of the arms, using tool T1 (See drawing T1 p. 46); then lock the arms into their final position, using screws adequately coated with Loctite 242.

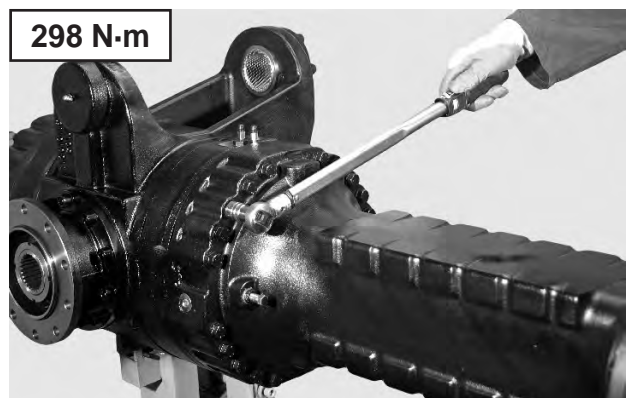


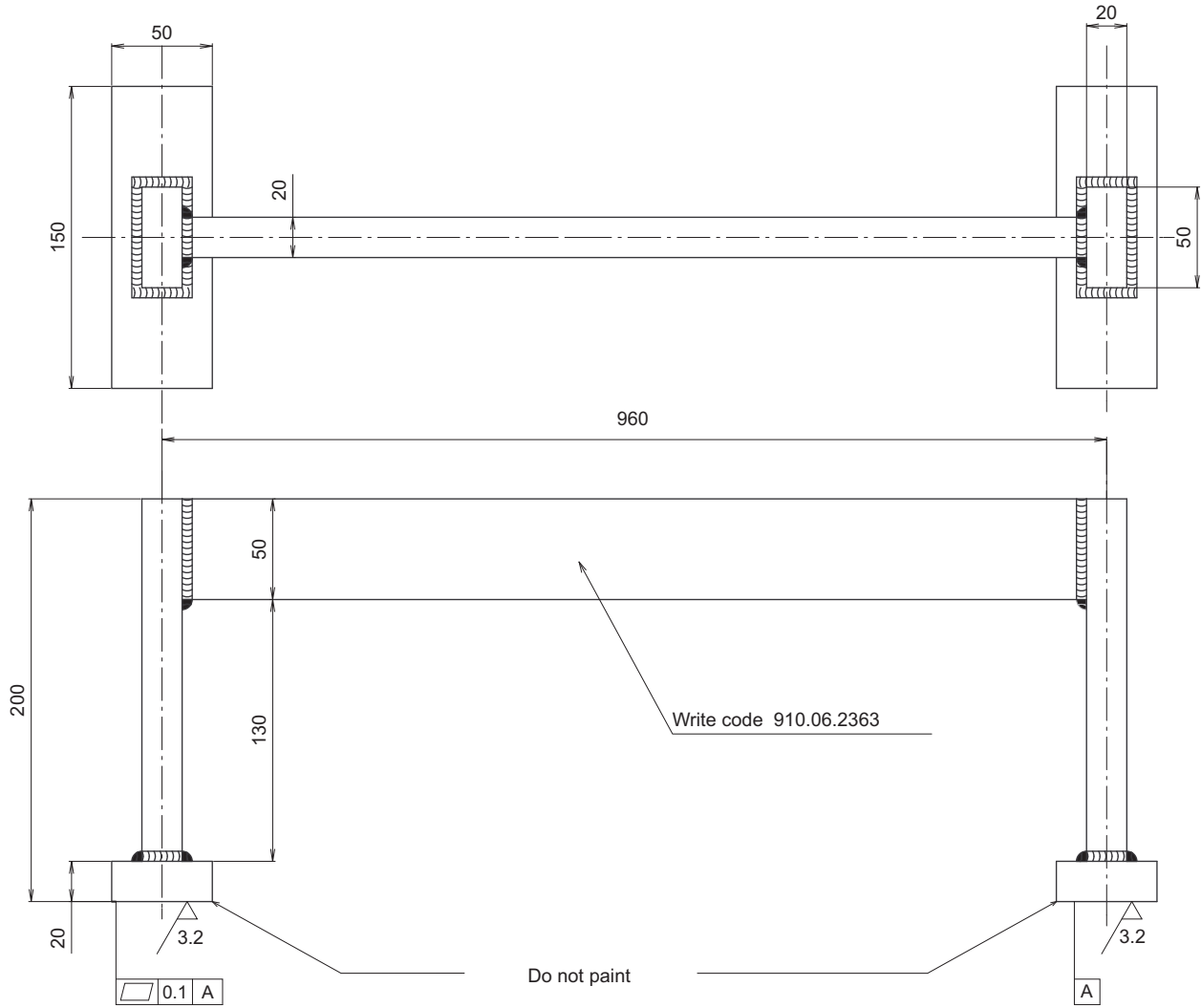
FIGURE 53: Secure in position with the screws and relative washers, tightening to a torque of 298 N-m.

SPECIAL TOOLS

SPECIAL TOOLS

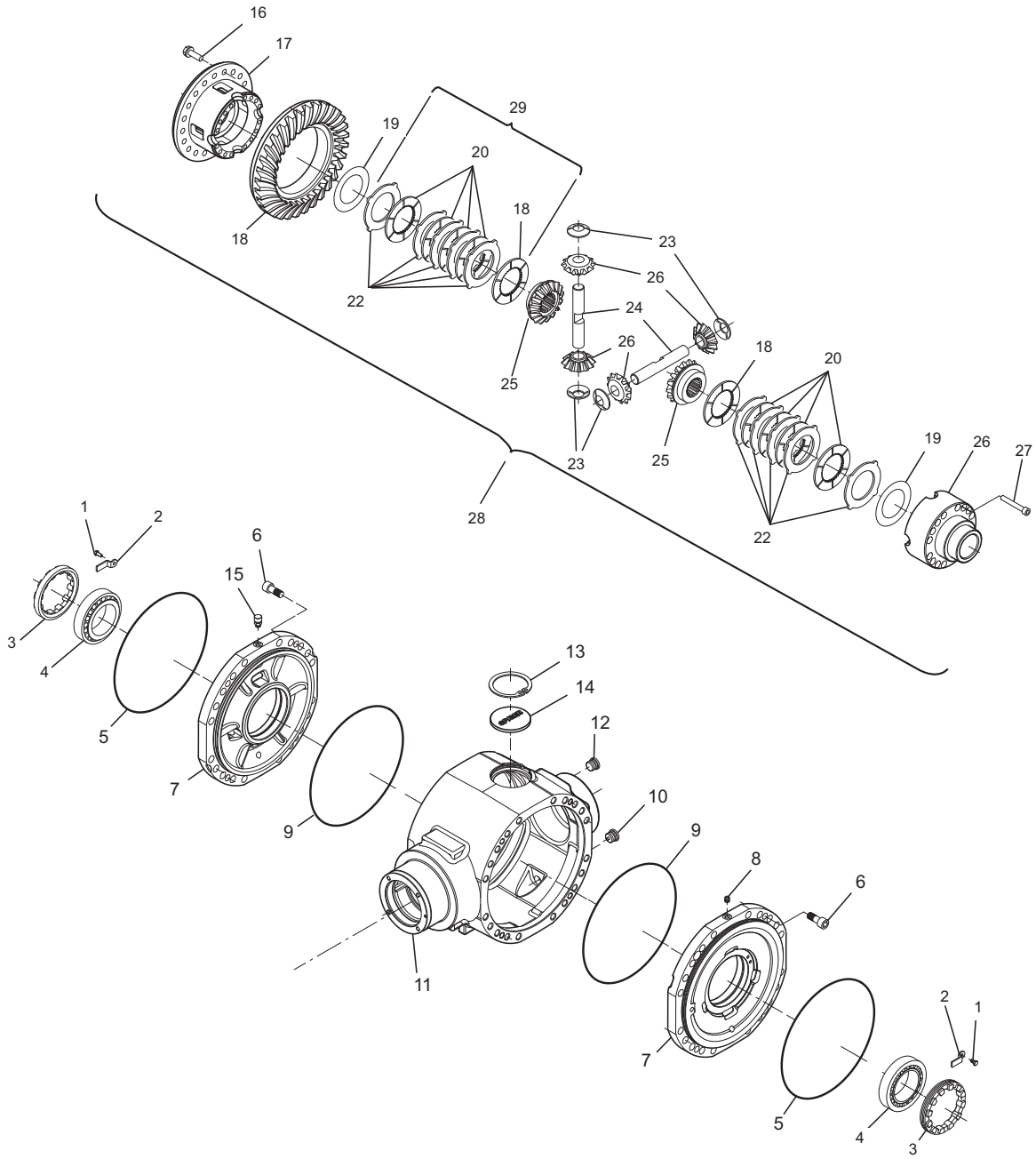
T1

P/N: 910.06.2363



DIFFERENTIAL UNIT

EXPLODED VIEW



DISASSEMBLY

DISASSEMBLY

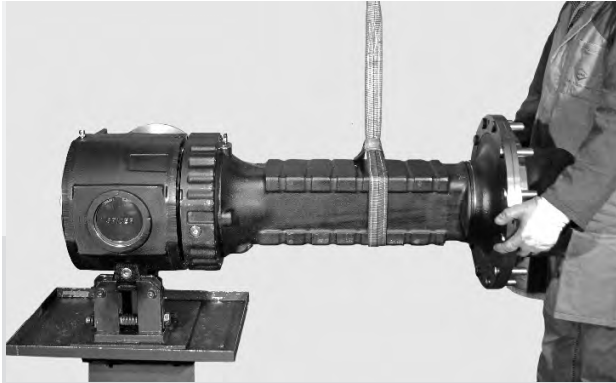


FIGURE 1: Sling the arm to be removed and connect it to a hoist.

Remove the retainer screws and washers.

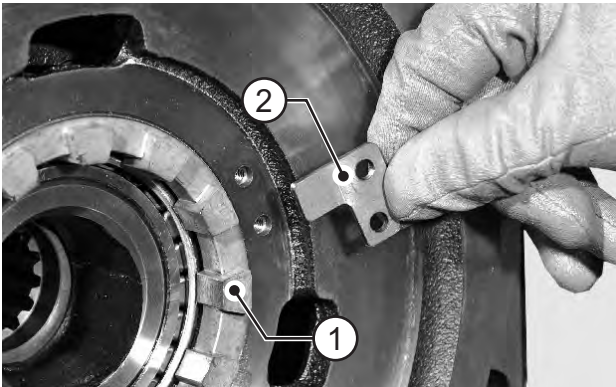


FIGURE 2: Only if need removing or adjusting. Mark the position of the ring nuts (3). Remove screws (1) and ring nut checks (2).

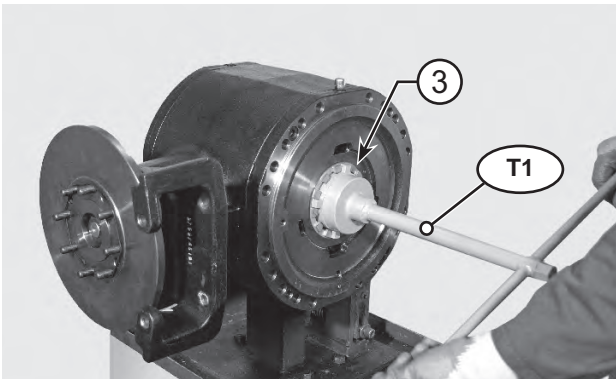


FIGURE 3: Only if need removing or adjusting. Using tool T1 (See drawing T1 p. 53), loosen and remove the ring nuts (3).

NOTE:

Accurately remove any trace of sealant from the threads of ring nuts and intermediate covers.

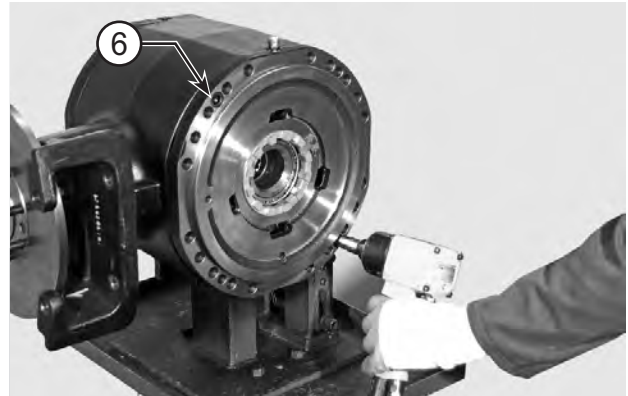


FIGURE 4: Tighten two safety M16 studs in the main body. Loosen and remove the check screws (6) of intermediate cover (7) on ring gear side.

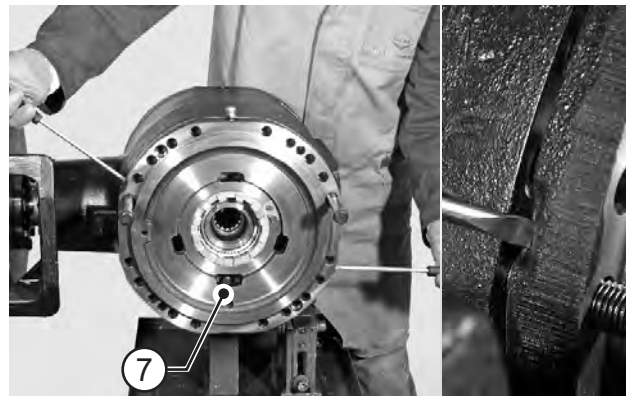


FIGURE 5: Disjoin the cover (7) crown side.



FIGURE 6: Remove the cover and studs.

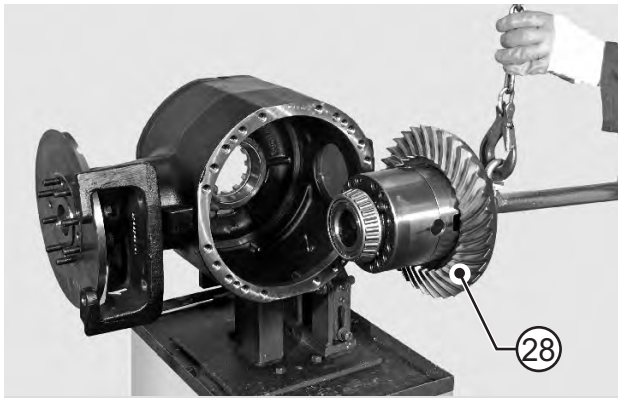


FIGURE 7: Extract the whole differential unit (28).

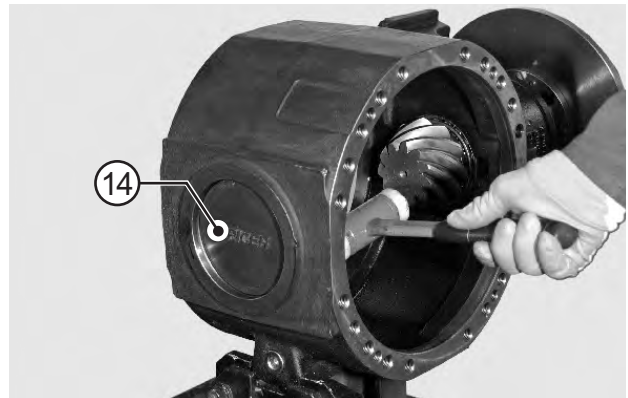


FIGURE 10: Remove the cap (14).

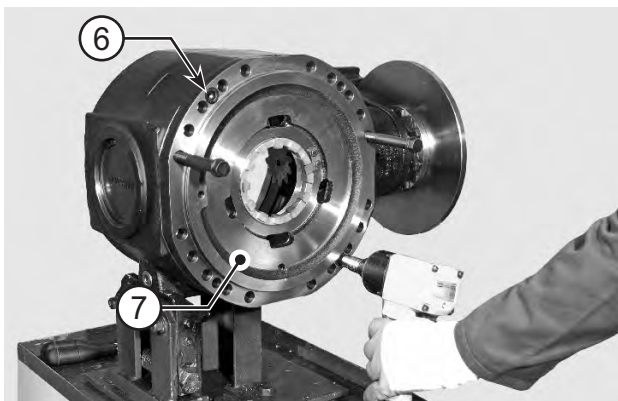


FIGURE 8: Tighten two safety M16 studs in the main body. Loosen and remove the check screws (6) of intermediate cover (4) on ring gear side.

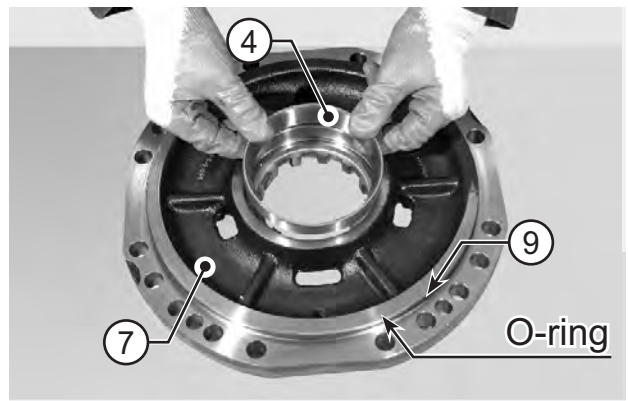


FIGURE 11: If the bearings need replacing, extract the external thrust blocks of the bearings (4) from middle cover (7).

NOTE:

Accurately check the o-ring (9).

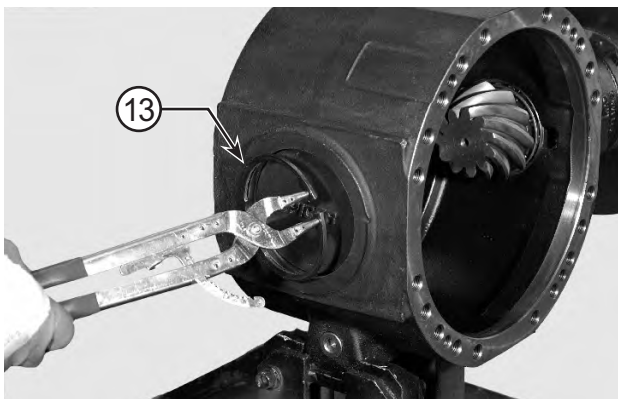


FIGURE 9: Remove the snap ring (13).

ASSEMBLY

ASSEMBLY

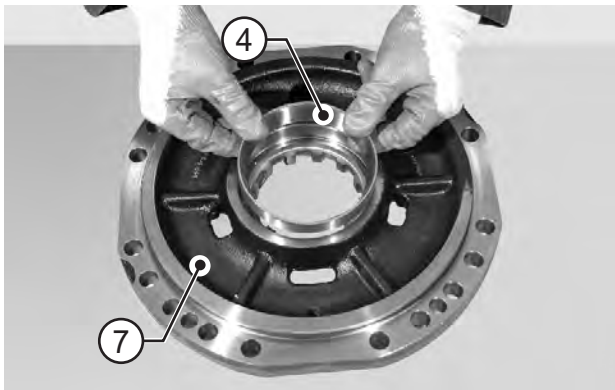


FIGURE 12: Only if bearings are replaced: Insert the thrust blocks of the bearings (4) into the intermediate covers (7).

⚠ CAUTION

Pay particular attention; position a shim with adequate diameter in order to engage the internal ring of bearing without engaging the cage.

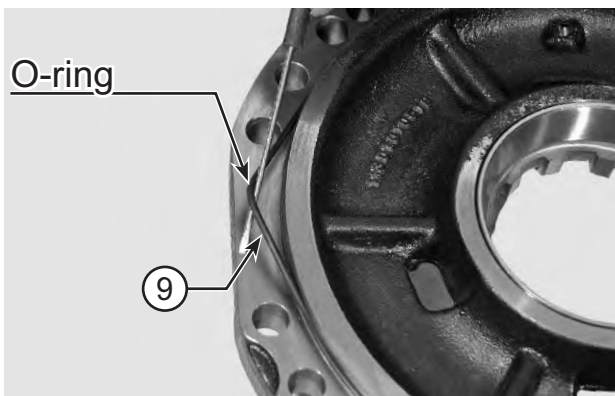


FIGURE 13: Thoroughly check the condition of the o-ring (9).

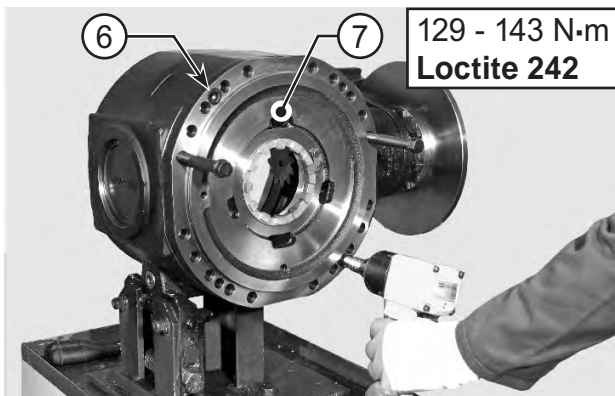


FIGURE 14: Fit the intermediate cover (7) on opposite side of ring gears: lock cover with screws (6) coated with Loctite 242. Tighten screws to a torque of 129 - 143 N·m.

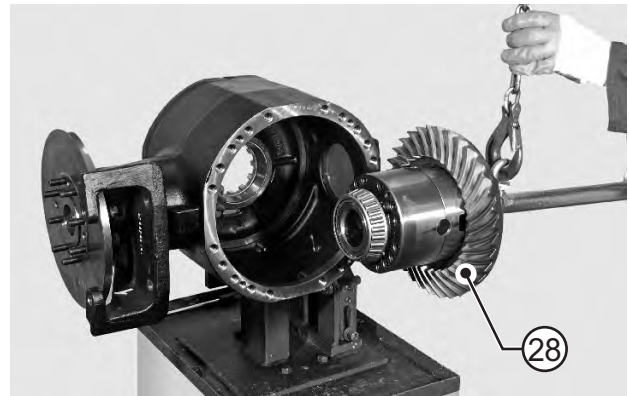


FIGURE 15: Position the differential unit (28) in the central body with the help of a bar and fit the middle cover.

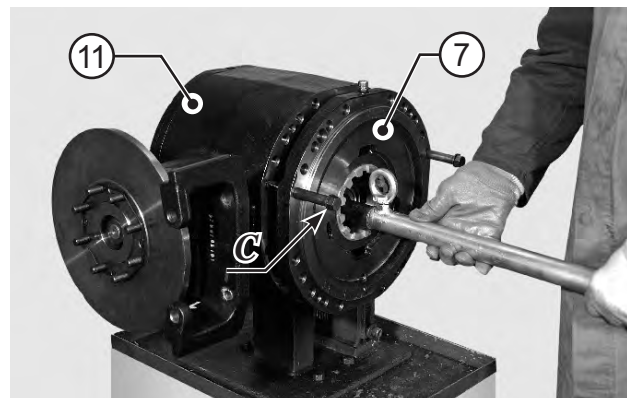


FIGURE 16: Tighten the two safety screws "C" into the main body (11) and install the intermediate cover (7).

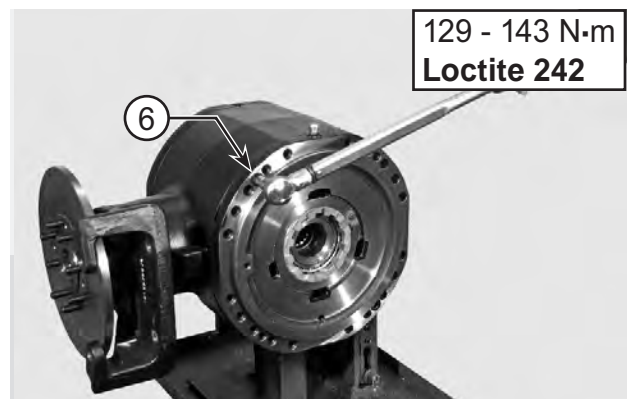


FIGURE 17: Tighten screws (6) to a torque of 129 - 143 N·m.

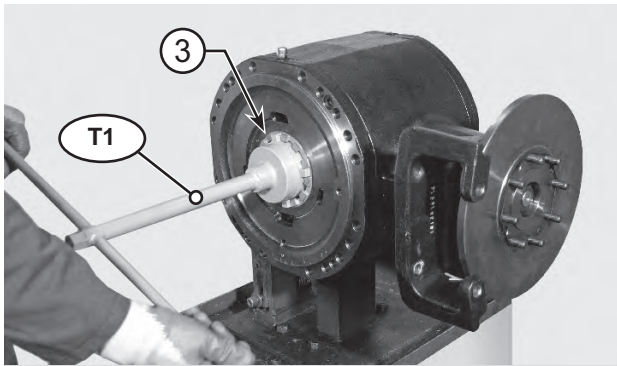


FIGURE 18: Only if ring nuts have been removed. Tighten the ring nut (3) on gear ring side until clearances between pinion and gear ring are zeroed. Then, loosen by about 1/4 turn.

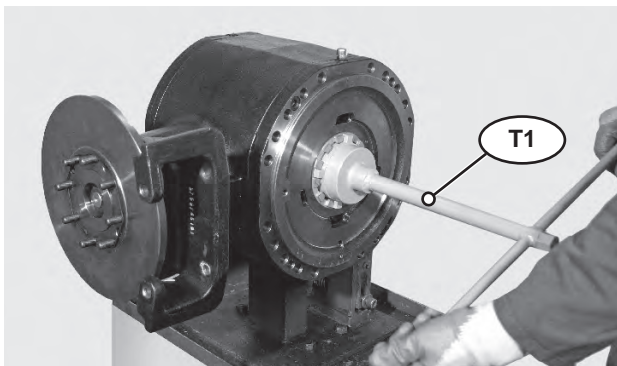


FIGURE 19: Only if ring nuts have been removed: Preload bearings with ring nut (26) on non-gear ring side in order to increase the torque of the pinion.

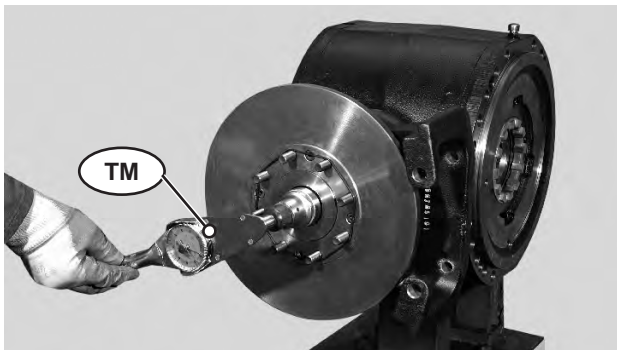


FIGURE 20: Apply torque meter TM to pinion nut and check that torque will increase by 20 - 40 Ncm as a result of differential bearing preload.
Example: pinion torque: 120 - 180 Ncm
Pinion + differential torque: 140 - 190 Ncm.

⚠ CAUTION

In the case of used bearings, check thrust torque; in the case of new bearings, check continuous torque.

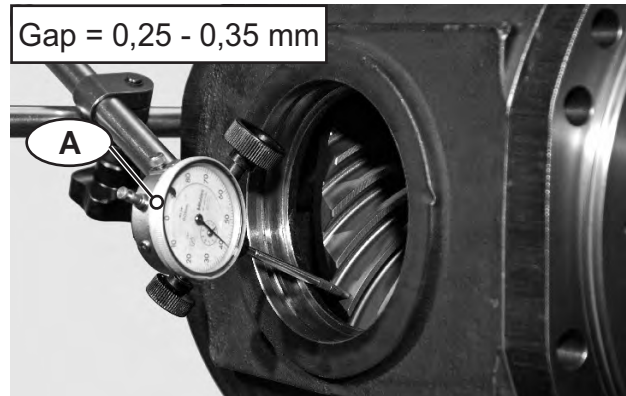


FIGURE 21: Introduce a dial indicator "A" with long tracer through the hole provided for the cap. Position the tracer on the side of a tooth of the gear ring, approximately 5 mm from the outer rim; preload by about 1 mm and zero the comparator. As you hold the pinion in position, move the gear ring manually in both directions to check clearance between pinion and gear ring. Standard clearance: 0,25 - 0,35 mm

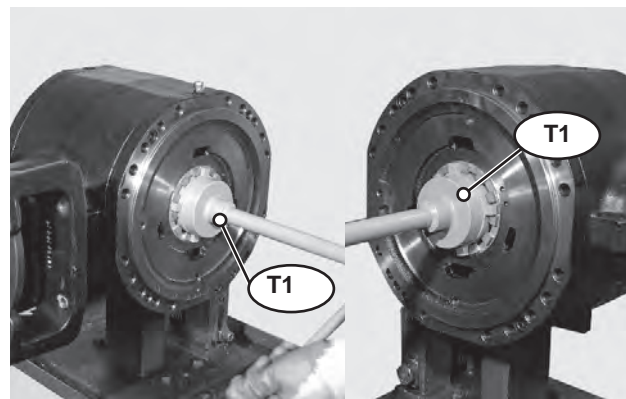


FIGURE 22: Adjusting clearance between pinion and gear ring. To INCREASE: loosen the ring nut on gear ring side and tighten the ring nut on non-gear ring side by the same measure. To DECREASE: perform the same operations inversely. To rotate ring nuts, use special wrench T1 (See drawing T1 p. 53).

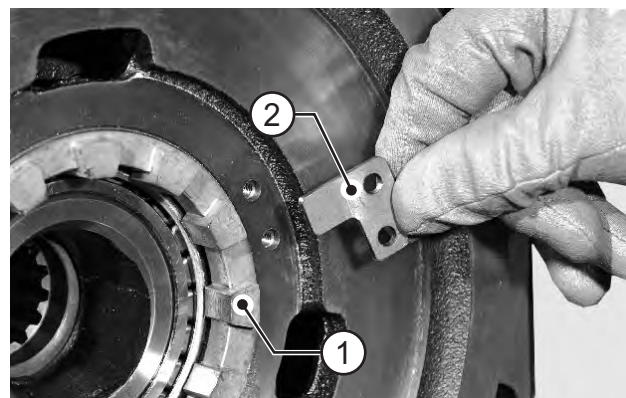


FIGURE 23: Install in correct position the safety plate (2).

ASSEMBLY

11 N·m
Loctite 270

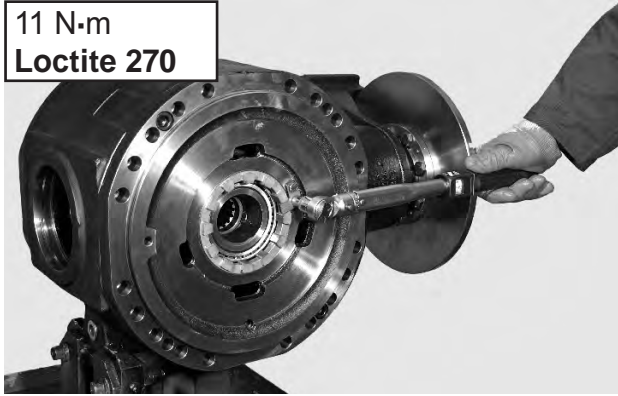


FIGURE 24: Engage screw (1) in the slot next to the holes provided for the check screws. Coat screws with Loctite 270 and tighten to a torque of 11 N·m.

Loctite 242

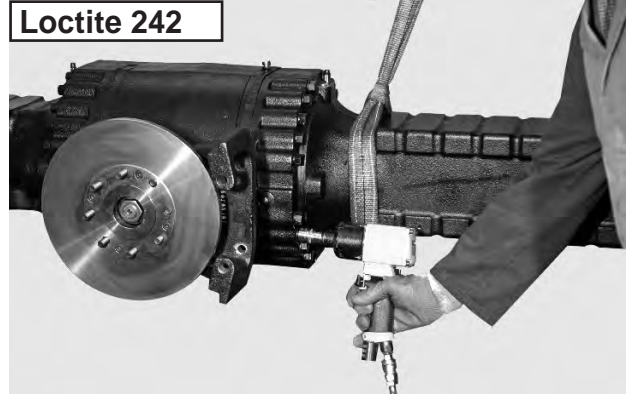


FIGURE 27: Temporarily lock the arm with screws previously coated with Loctite 242; tighten lightly to make the unit touch the main body.

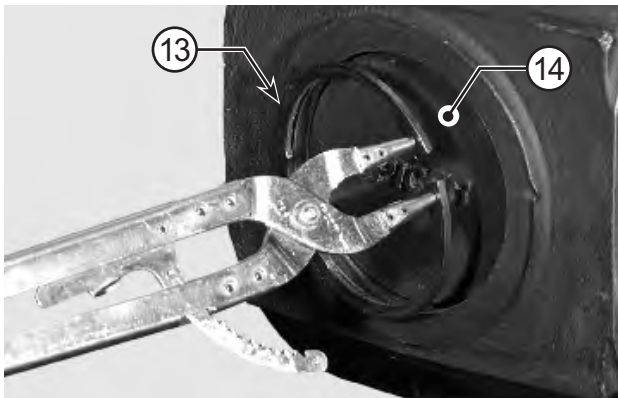


FIGURE 25: Using a driver, fit the cap (14) and secure with the snap ring (13).

298 N·m

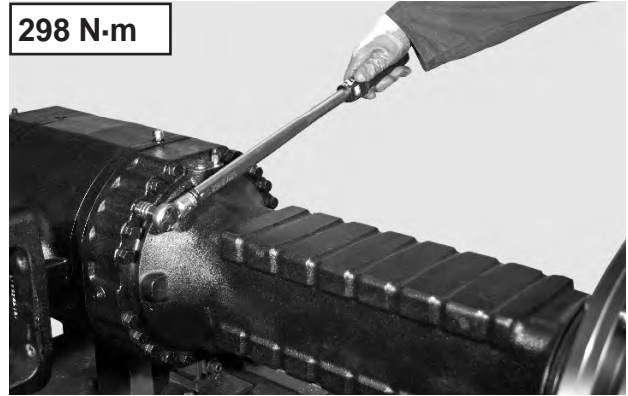


FIGURE 28: Check the flatness of the arms, using tool T2 (See drawing T2 p. 54); then lock the arms into their final position, using screws adequately coated with Loctite 242.

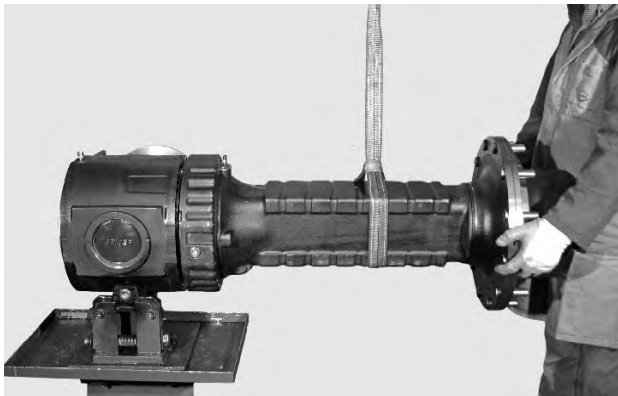
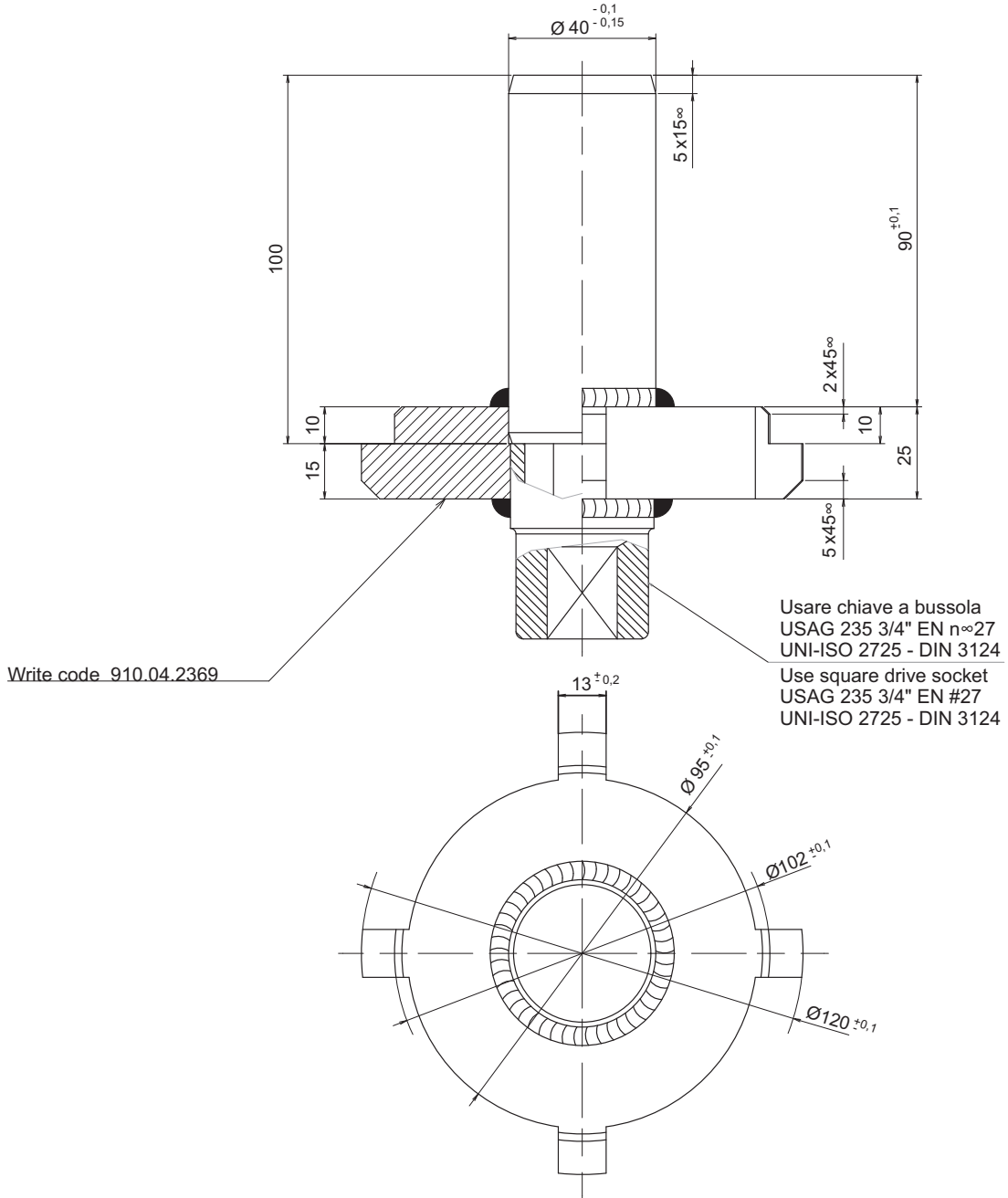


FIGURE 26: Check that the positioning of the sealing ring on the arm is intact; install the complete arm. Lock it into position using two facing screws and washers.

SPECIAL TOOLS

T1

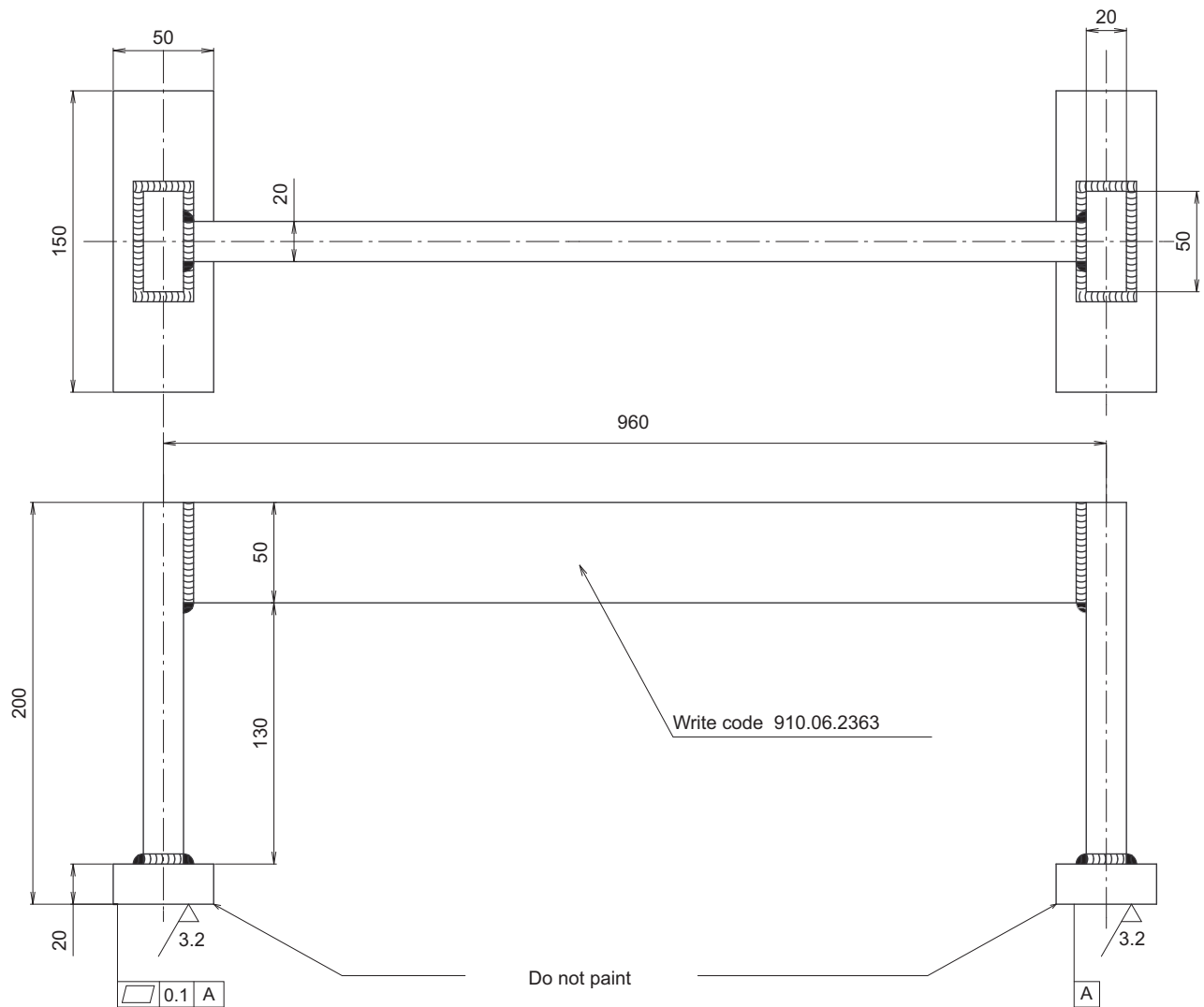
P/N: 910.04.2369



SPECIAL TOOLS

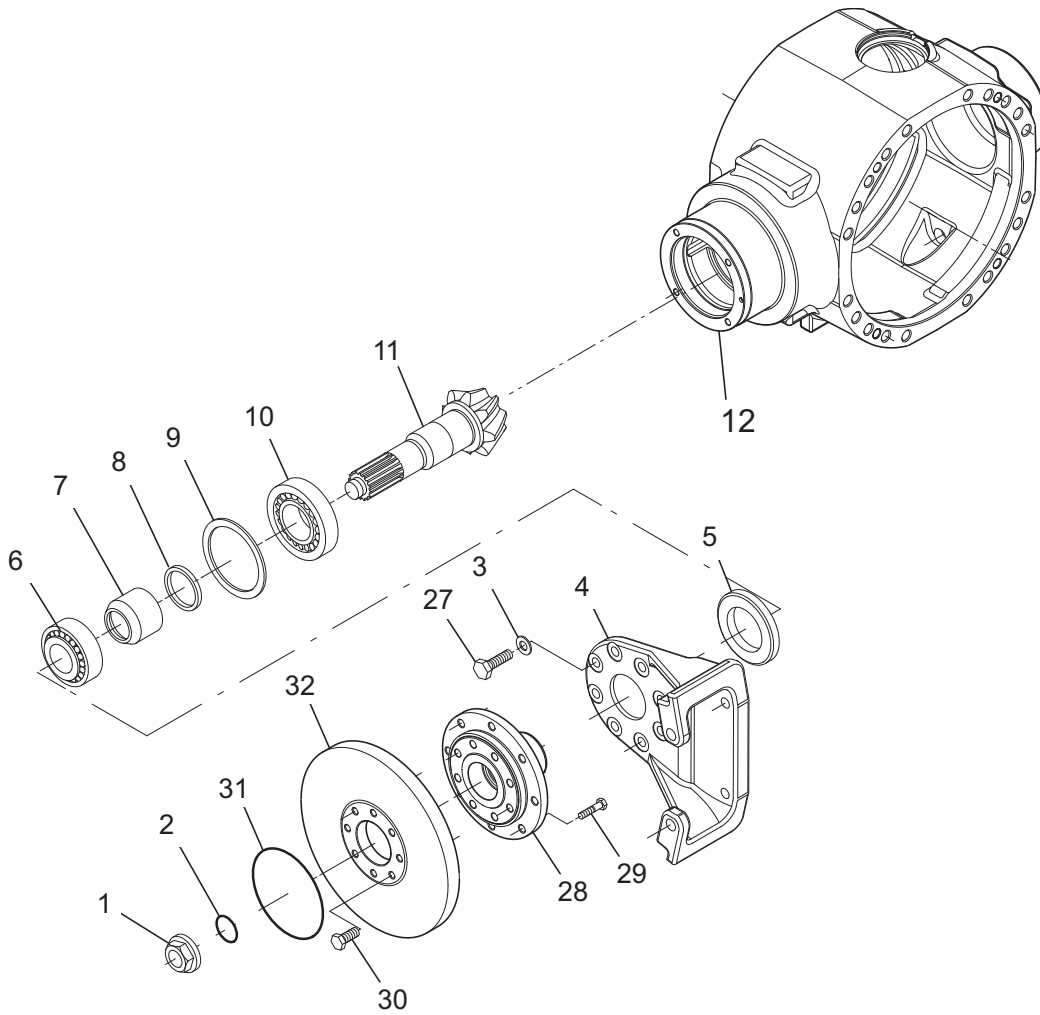
T2

P/N: 910.06.2363



BEVEL PINION WITH SUPPORT BRAKING DISK

EXPLODED VIEW



DISASSEMBLY

DISASSEMBLY



FIGURE 1: Remove the intermediate cover and the whole differential unit.
For details, see DIFFERENTIAL UNIT p. 47.

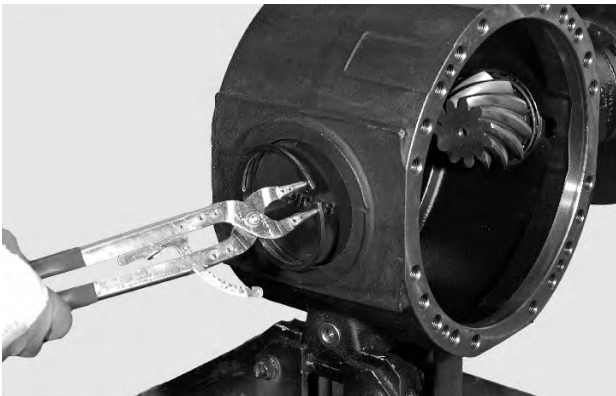


FIGURE 2: Remove the snap ring.

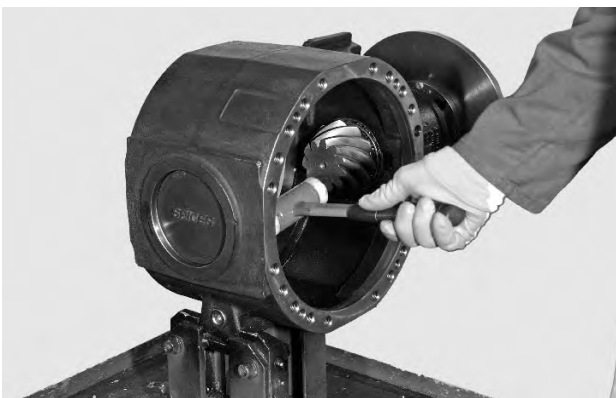


FIGURE 3: Remove the cap

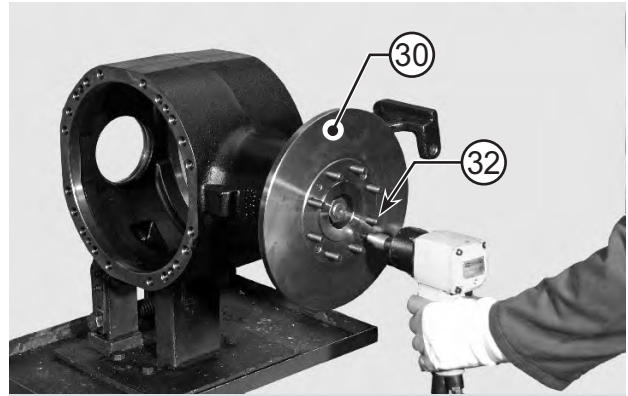


FIGURE 4: Draw out the screw (30) and remove the disk (32).

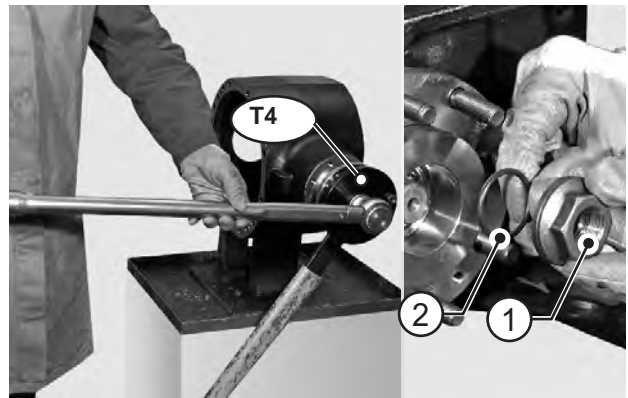


FIGURE 5: Position tool T4 (See drawing T4 p. 67), so as to avoid pinion rotation. Loosen and remove the nut (1); also remove the o-ring (2).

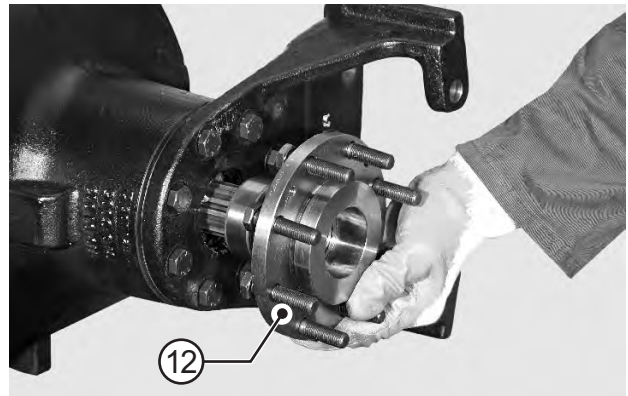


FIGURE 6: Remove the flange (28).



FIGURE 7: Remove the retainer screws (23) and washers (3).

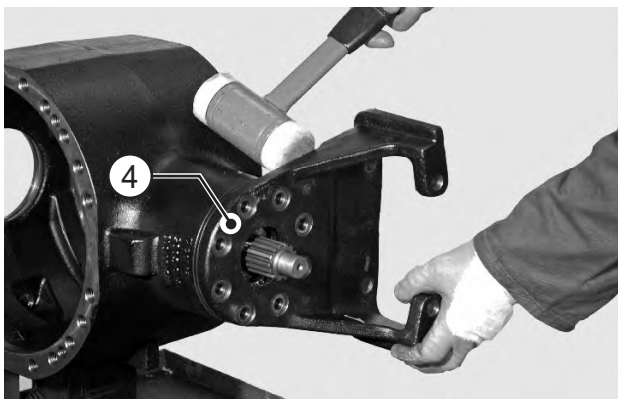


FIGURE 8: Remove the brake support (4).

NOTE:

Write down assembly direction.

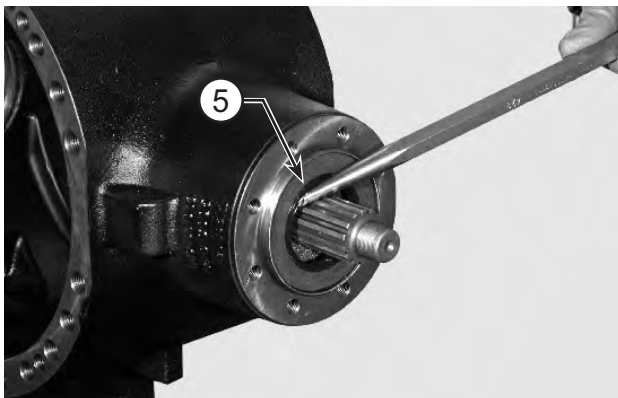


FIGURE 9: Remove the sealing ring (5).

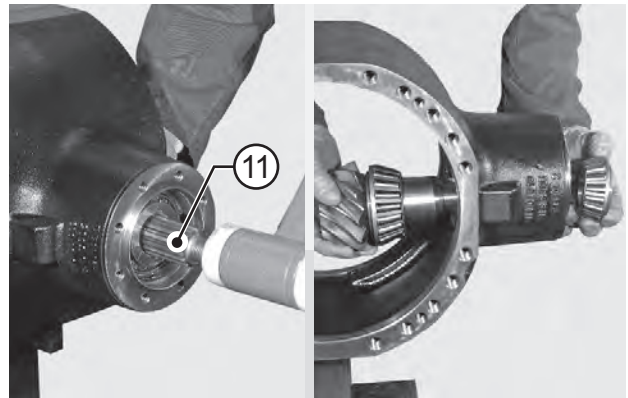


FIGURE 10: Extract the pinion (11) complete with the internal bearing cone (10), the spacer (7) and calibrated spacer (8).

NOTE:

The bearing cups of the bearing cones remain in the central body.

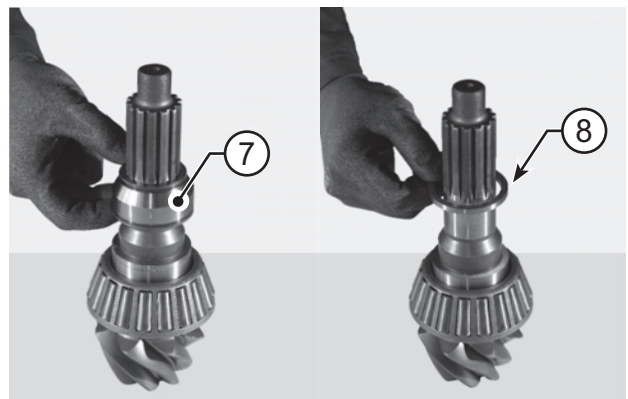


FIGURE 11: Refer and keep to the positions marked during disassembly.

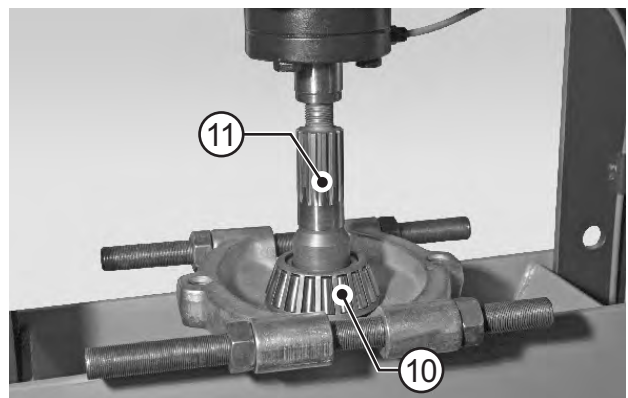


FIGURE 12: Using a puller and a press, remove the inner bearing cone (10) from the pinion (11).

DISASSEMBLY

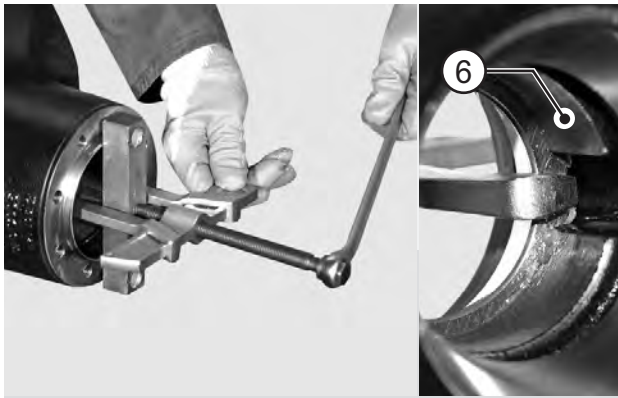


FIGURE 13: Remove the bearing cup of the tail bearing cone (6).

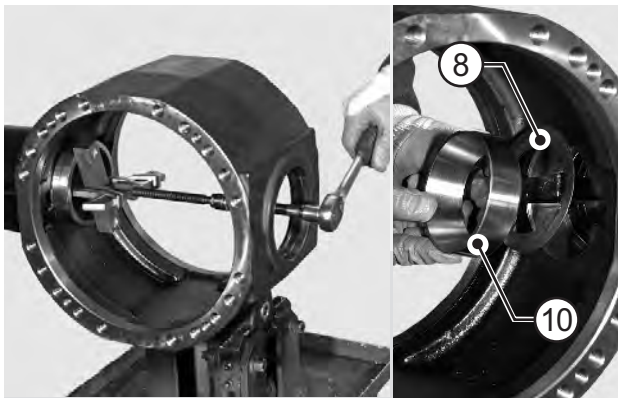


FIGURE 14: Remove the bearing cup of the internal bearing cone (10) as well as the shim washers (8).

ASSEMBLY

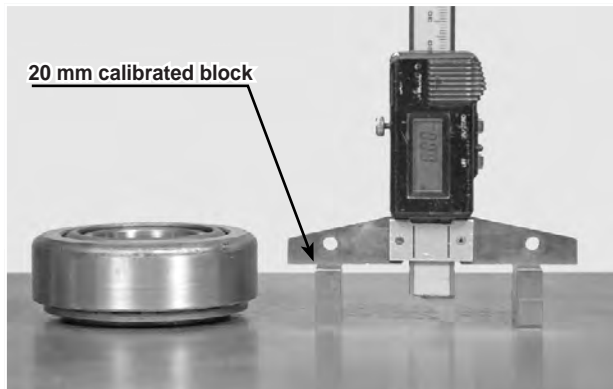


FIGURE 15: Reset a centesimal digital depth gauge on a calibrated block (whose known thickness is 20 mm.).

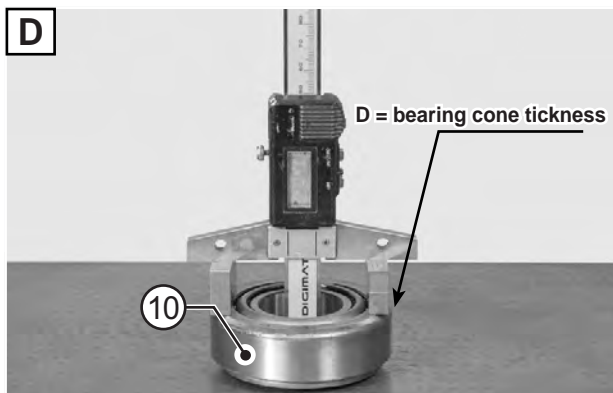


FIGURE 16: With a calibrated block on a faceplate, allow the bearing cone to set by rotating them in both directions and by applying a vertical thrust position the calibrated block on the external bearing cups. Check overall thickness of bearing. $D = 42,25$ mm

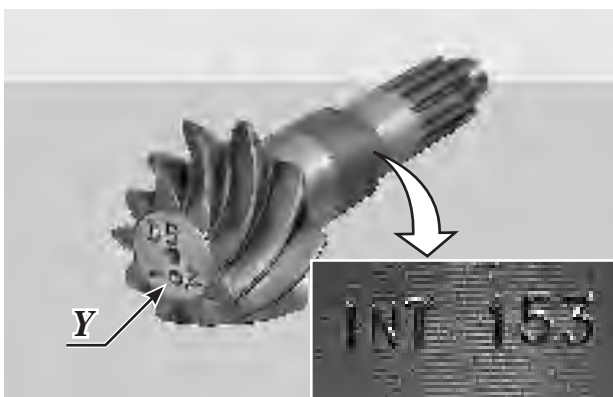


FIGURE 17: Check nominal dimension "INT" as marked on the pinion. Add up to or subtract from "INT" the variation indicated as "Y" to obtain the actual center distance "I".
EXAMPLE: $I = (INT - Y) = 153 - 0,1 = 152,9$ mm

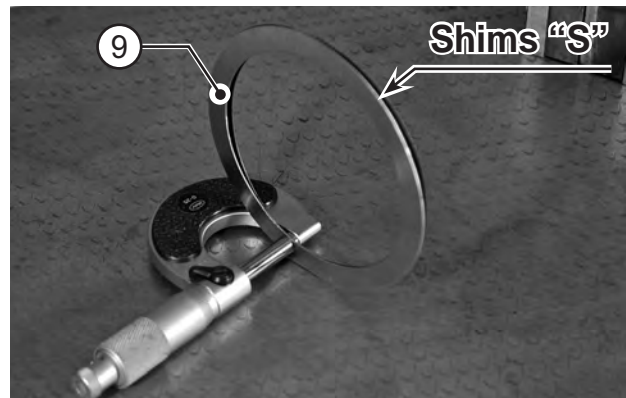


FIGURE 18: Calculate calibrated shim "S" for insertion under the bearing cup of the inner bearing cone using the following formula:

$$S = 196 - (I + D) \text{ where: } 196 = \text{fixed dimension}$$

I = actual pinion center distance

D = Total bearing thickness;

EXAMPLE: $S = 196 - (152,9 + 42,25) = 0,85$ mm



FIGURE 19: Using special tool T2 (See drawing T2 p. 65). Partially insert the bearing cup of the bearing cones (6) and (10) and shims (9).

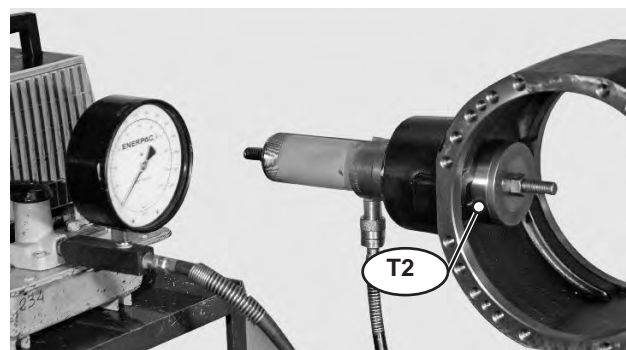


FIGURE 20: Connect the tension rod to the press and move the bearing cup of bearing cones (6) and (10) into the seats. Disconnect the press and remove the tension rod.

NOTE:

Before starting the next stage, make sure that the bearing cup has been completely inserted into its seat.

ASSEMBLY

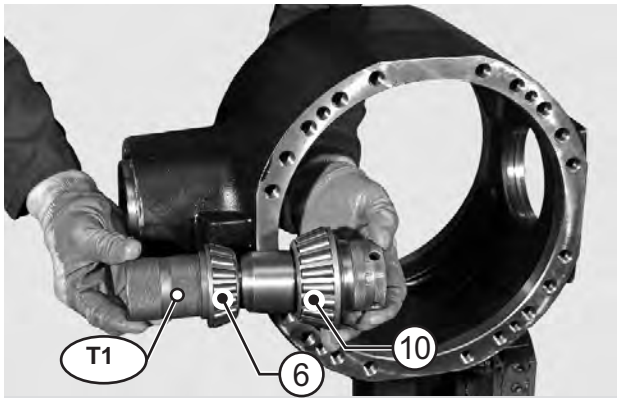


FIGURE 21: CALCULATING PINION BEARINGS ROLLING TORQUE
Introduce tool T1 (See drawing T1 p. 64) complete with bearings (6) and (10) into the central housing; tighten by hand until to eliminate the axial gap.

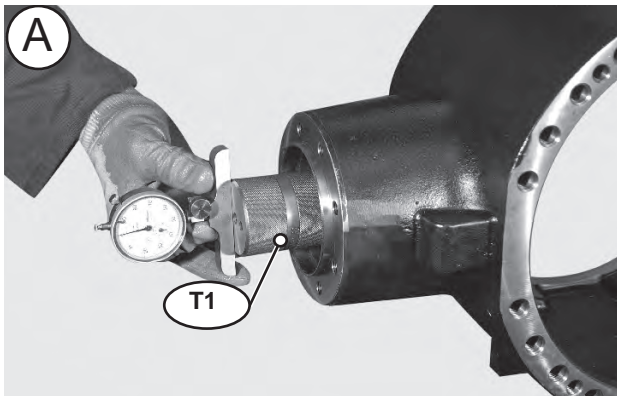


FIGURE 22: Introduce the tracer of a dial indicator into either side hole of tool T1 (See drawing T1 p. 64).

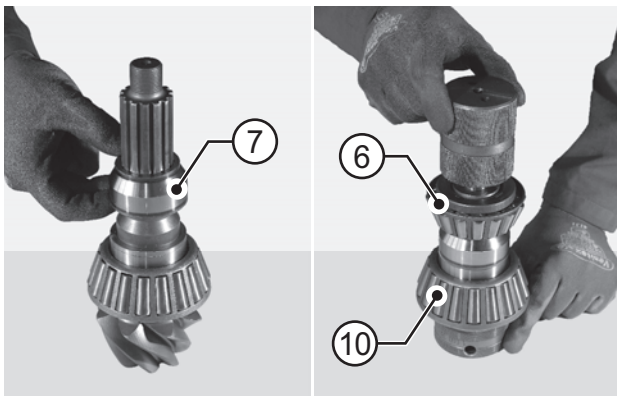


FIGURE 23: Remove the comparator and take out tool and bearing cone kits from the main body. Reinstall every part, also introducing a spacer (7) and thicker calibrated spacer between bearing cones (10) and (6). Tighten the entire pack by hand.

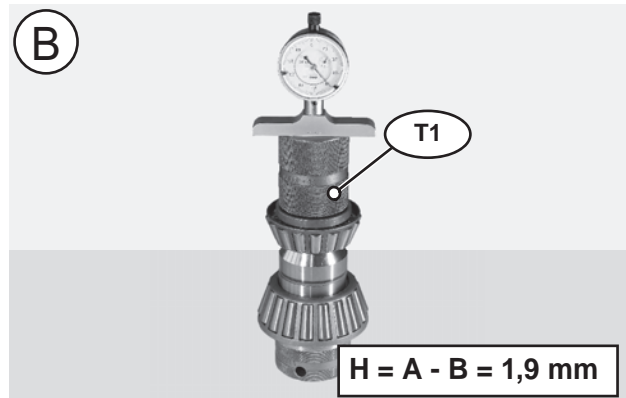


FIGURE 24: Introduce the dial indicator into either side hole of tool T1 (See drawing T1 p. 64). Reset the comparator with a preload of about 3 mm.

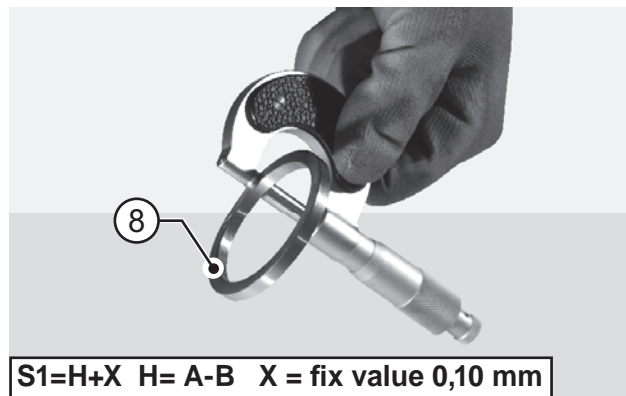


FIGURE 25: Deviation "H" must be added to a set value of 0,10 mm to obtain calibrated shim "S1" (8) for insertion between pinion (6) and spacer (7). Dimension "S1" must be rounded off to the higher 5/100. EXAMPLE: $S1 = H + X = 1,8 + 0,1 = 1,9$ mm

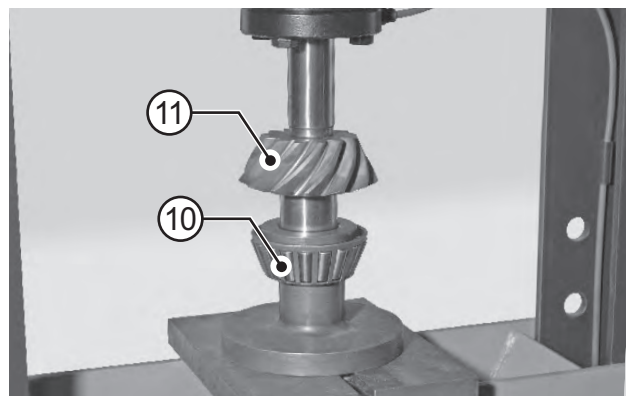


FIGURE 26: Position the internal bearing (10) and the pinion (11) under a press; force the bearing onto the pinion.

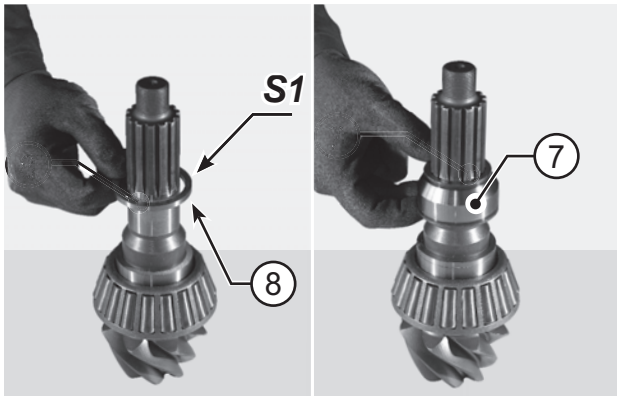


FIGURE 27: Insert spacer (7) and two calibrated spacers “S1” (8).

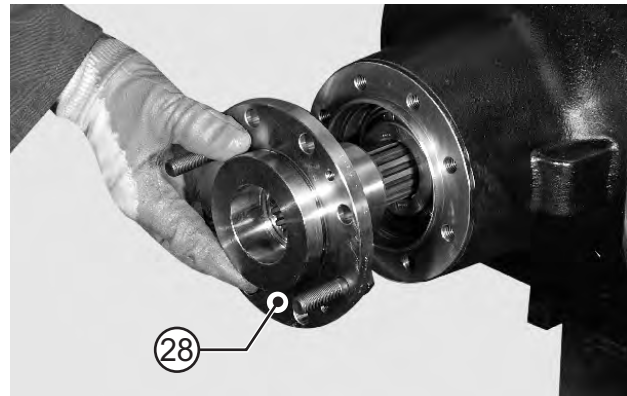


FIGURE 30: Install the flange (28) onto the pinion (11) without the sealing ring.

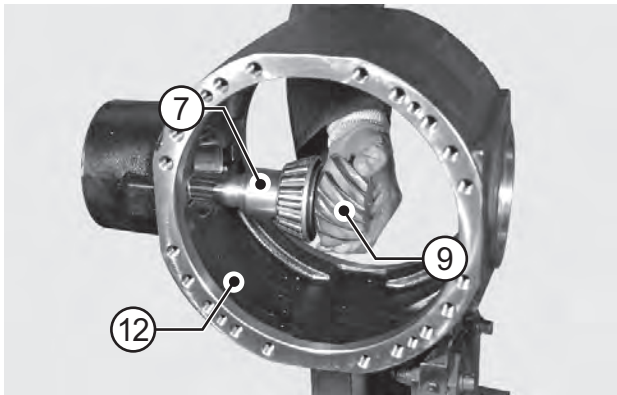


FIGURE 28: Fit the pinion (11), calibrated spacer “S1” (9) and spacer (7) in the main body (12).



FIGURE 31: Apply torque wrench to the ring nut (1) and special tool T4 (See drawing T4 p. 67) to the pinion (11). Lock the wrench T4 (See drawing T4 p. 67) and rotate the pinion using a dynamometric wrench, up to a minimum required torque setting of 880 - 1100 N·m.



FIGURE 29: Heat the external bearing cone (6) to a temperature of about 212 F° [100 C°] and fit it on to the pinion (11) so as to complete the pack as shown above.

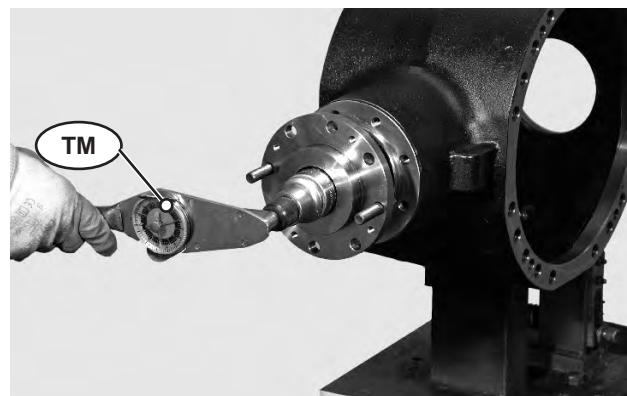


FIGURE 32: Apply onto the pinion (11) the bar-hold and with the help of a torque meter, check the torque of the pinion (11). Torque: 120 - 180 Ncm

ASSEMBLY

CAUTION

If torque exceeds the maximum value, then the size of shim "S1" (9) between the bearing cone (10) and the spacer (7) needs to be increased. If torque does not reach the set value, increase the torque setting of the ring nut (3) in different stages to obtain a maximum value of 880 - 1100 N·m.

If torque does not reach the minimum value, then the size of shim "S1" (9) needs to be reduced.

When calculating the increase or decrease in size of shim "S1", bear in mind that a variation of shim (9) of 0.01 mm corresponds to a variation of 60 Ncm in the torque of the pinion (11).

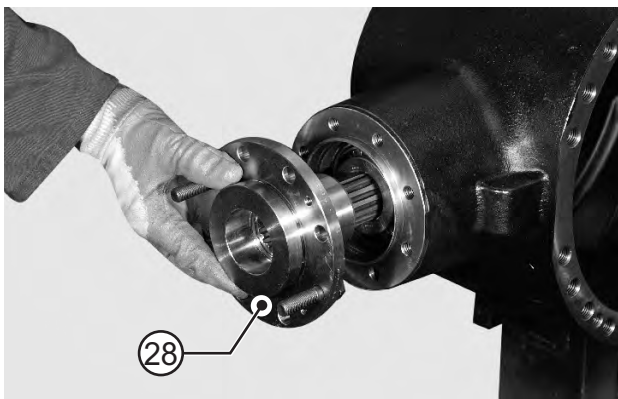


FIGURE 33: Remove nut (1) and flange (28).

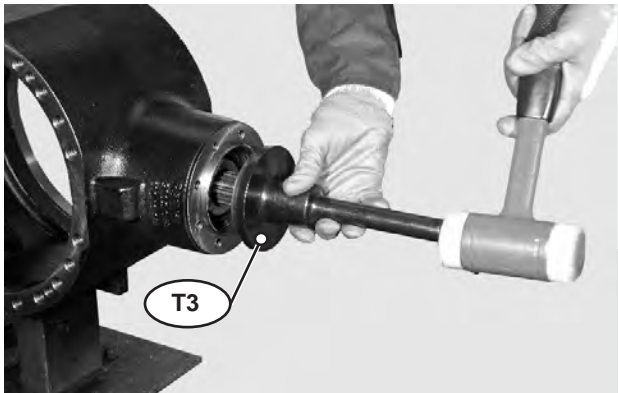


FIGURE 34: Apply Arexons rubber cement to the outer surface of the new seal ring (5) and fit ring in the main body using driver T3 (See drawing T3 p. 66).

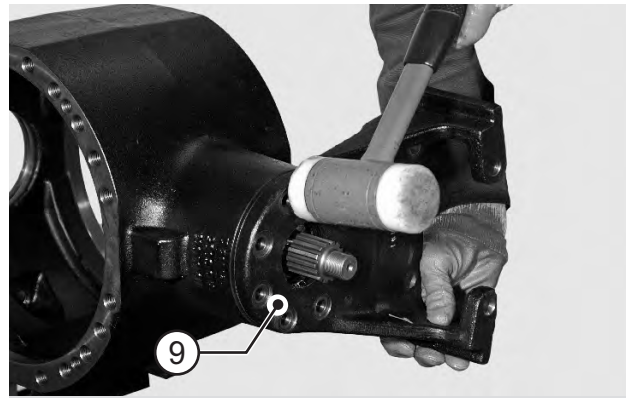


FIGURE 35: Lubricate the coupling surfaces and position the brake support (4).

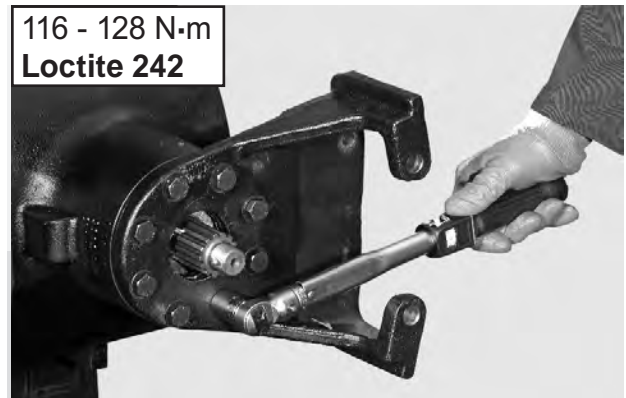


FIGURE 36: Apply Loctite 242 to the screws (13) and tighten using the criss-cross method.
Torque wrench setting: 116 - 128 N·m

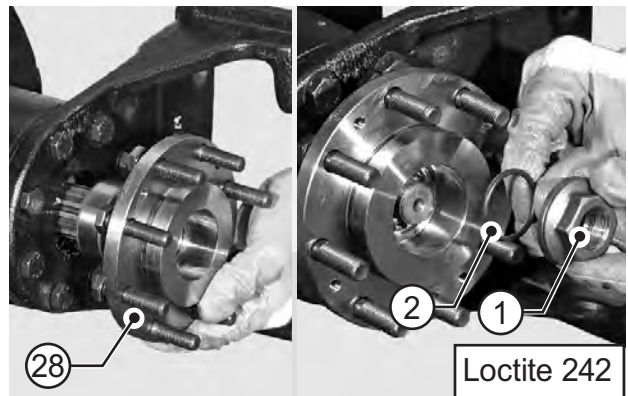


FIGURE 37: Oil seal ring lips and install flange (28).
Mount o-ring (2) and apply Loctite 242 to pinion tang; tighten nut (1).

880 - 1100 N·m

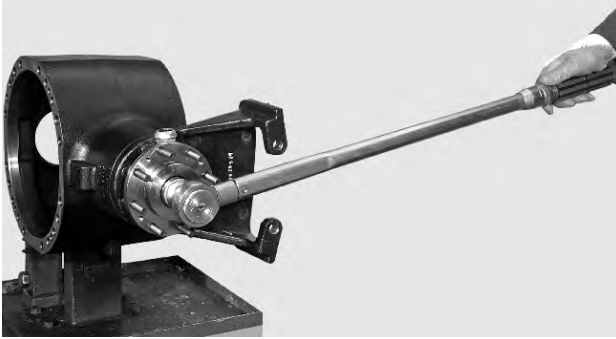


FIGURE 38: Apply wrench to the ring nut (1) and special tool T4 (See drawing T4 p. 67) to the pinion (11). Lock the wrench T4 (See drawing T4 p. 67) and rotate the pinion using a dynamometric wrench, up to a minimum required torque setting of 880 - 1100 N·m.

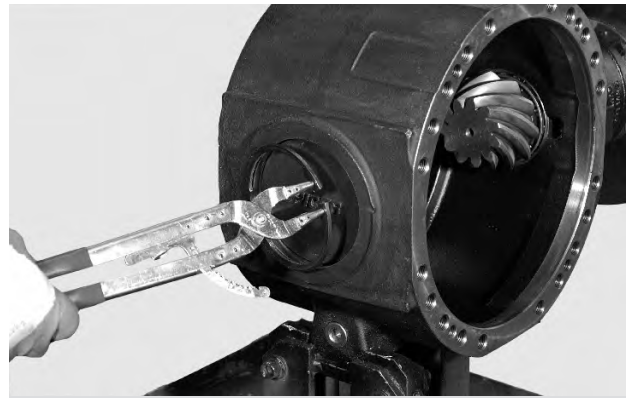


FIGURE 41: Using a driver, fit the cap and position it in its secure with the snap ring.

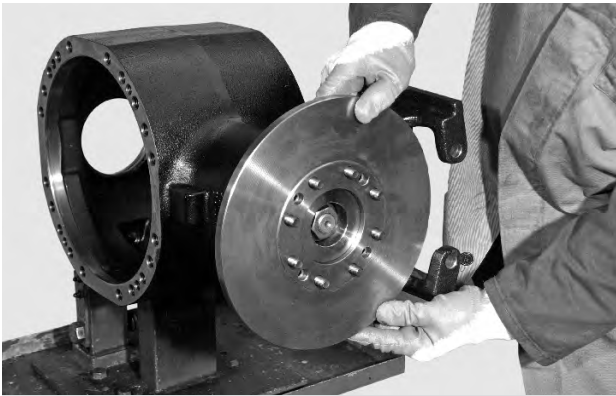


FIGURE 39: Install disk (3) and keep it into position with screws (19) and nuts (4).

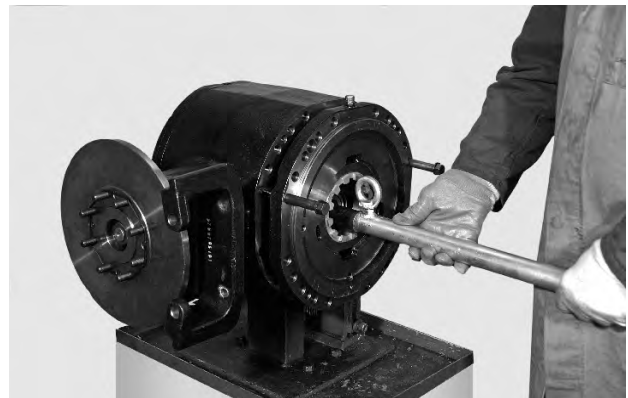


FIGURE 42: Re-install the differential unit and the intermediate cover. For details, see DIFFERENTIAL UNIT p. 47.

128 - 142 N·m

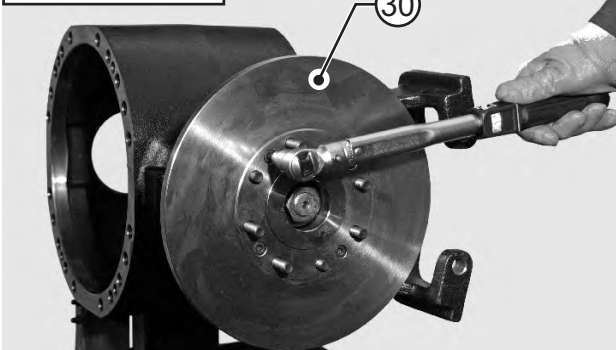


FIGURE 40: Tighten using a torque wrench to a torque of 128 - 142 N·m.

⚠ CAUTION

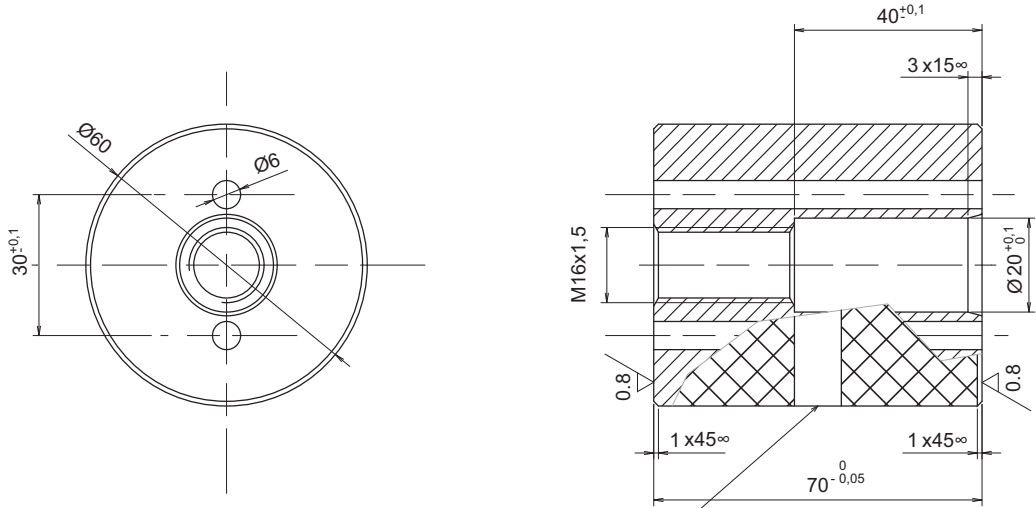
If the crown and pinion has been replaced, reinstate clearances.

SPECIAL TOOLS

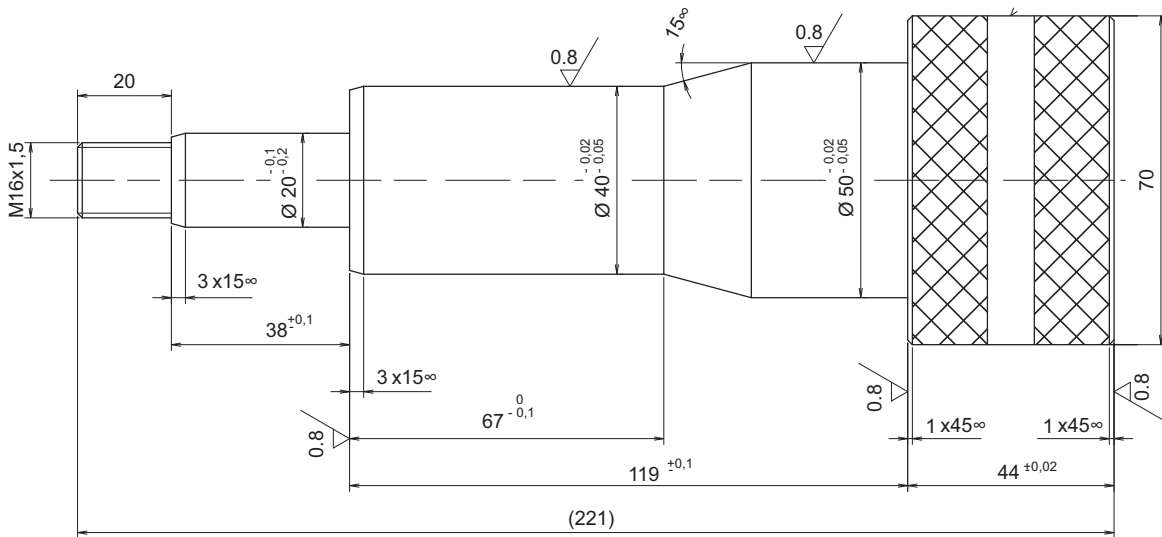
SPECIAL TOOLS

T1

P/N: 910.04.2374



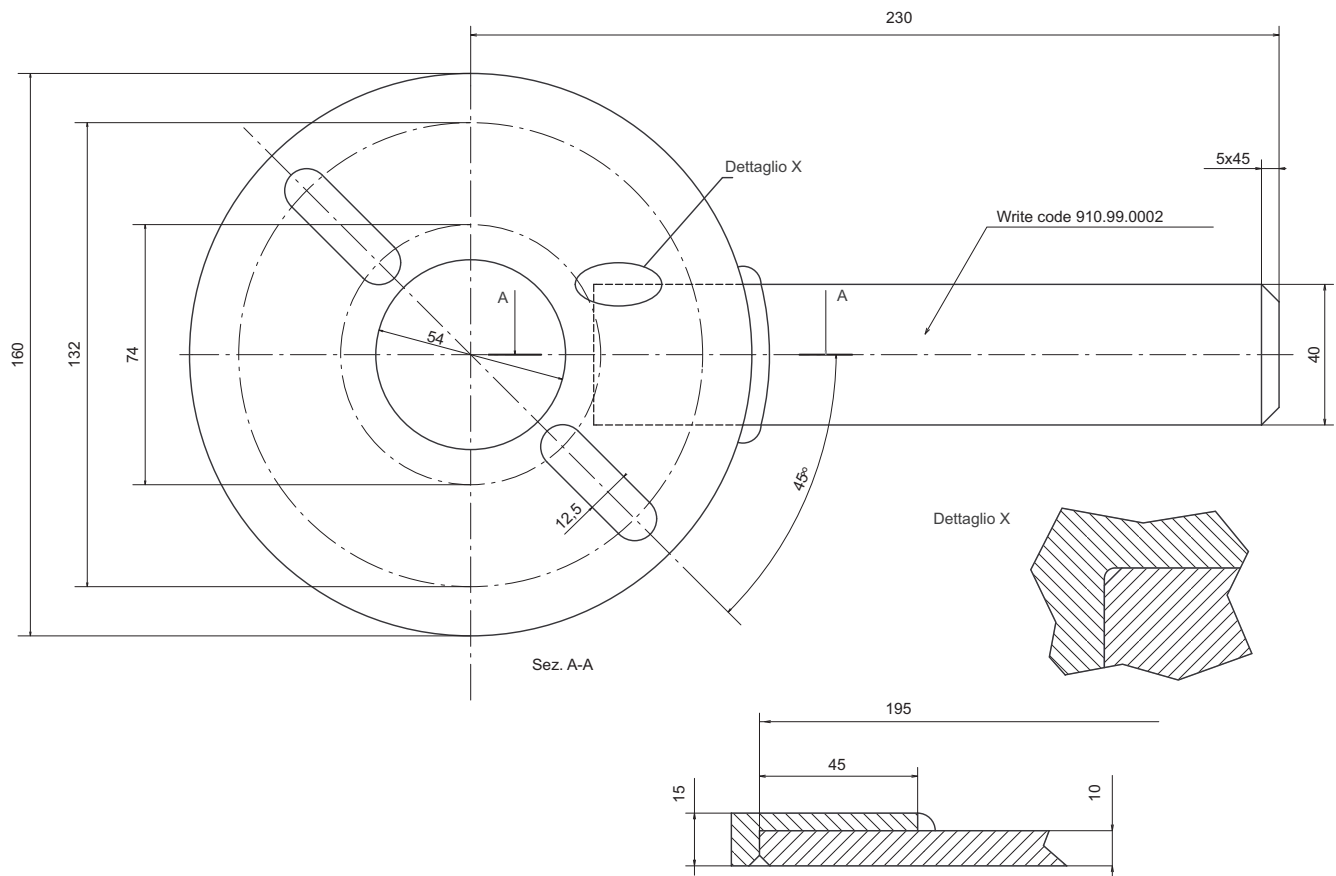
Write code 910.04.2374



Write code 910.04.2374

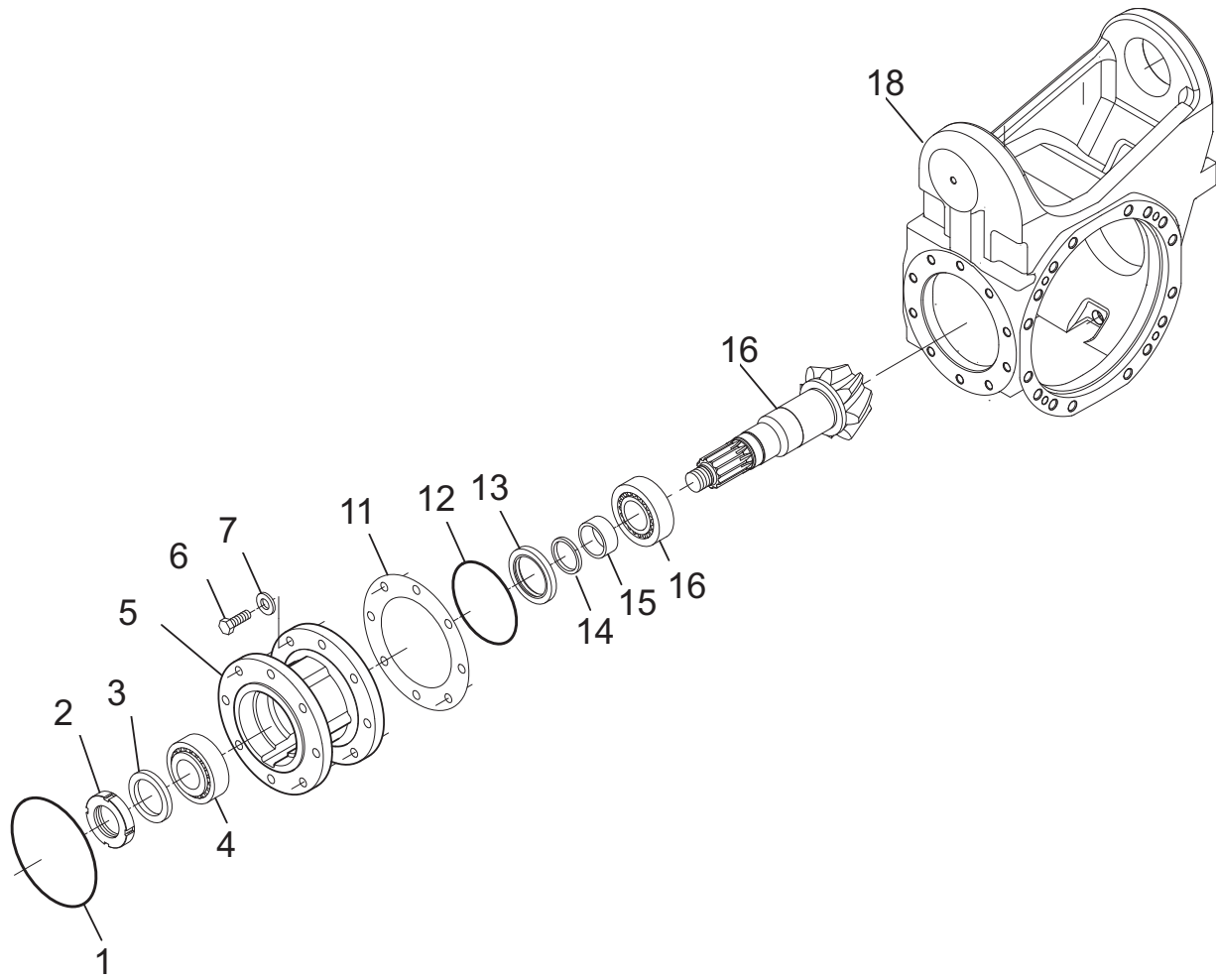
T4

P/N: 910.99.0002



FLANGED BEVEL PINION

EXPLODED VIEW



DISASSEMBLY

DISASSEMBLY

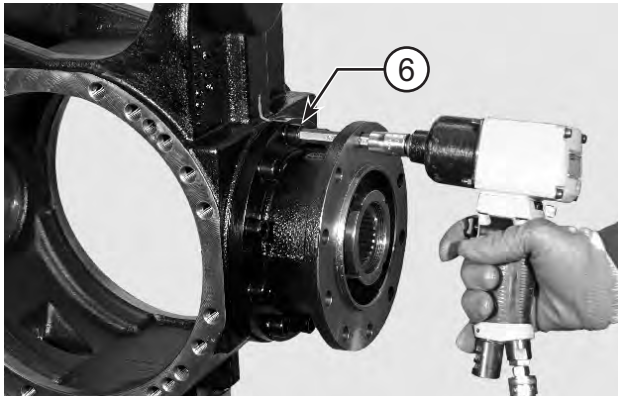


FIGURE 1: Remove the retainer screws (6) and washers (7).

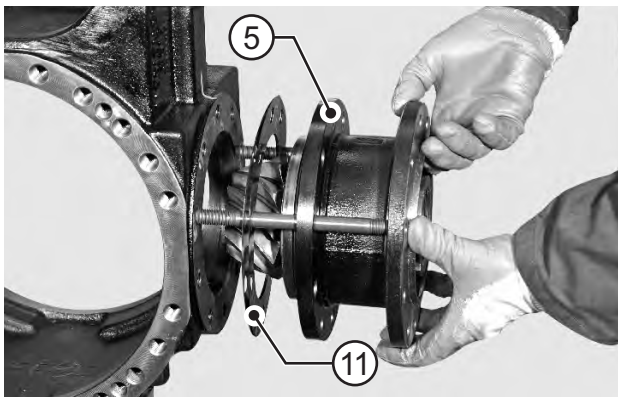


FIGURE 2: Remove shims (11) and pinion support (5). Refer and keep to the positions marked during disassembly.

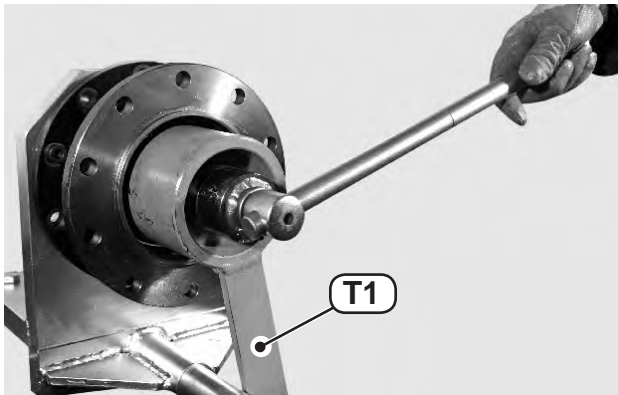


FIGURE 3: Stop wrench and rotate the pinion so as to release and remove the ring nut (2).

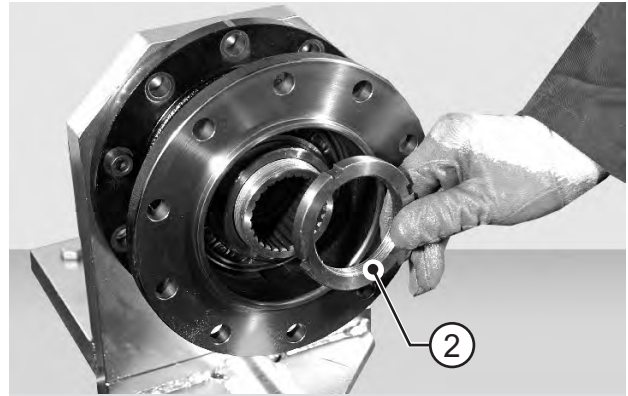


FIGURE 4: Remove pinion ring nut (2).

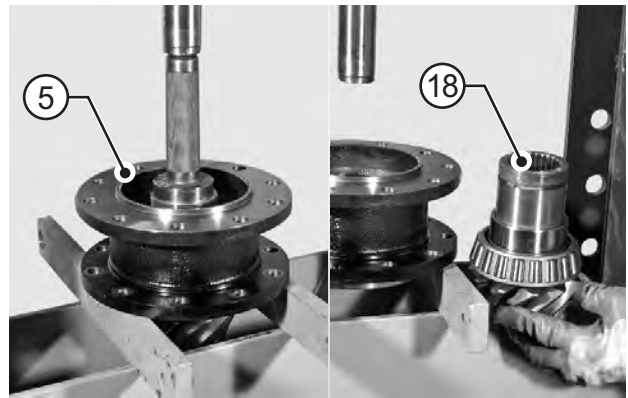


FIGURE 5: Position the cover under a press, extract the pinion (18) complete with the internal bearing (16), the spacer (15), and shims (14).

NOTE:

The thrust blocks of the bearings remain in the central body (5).

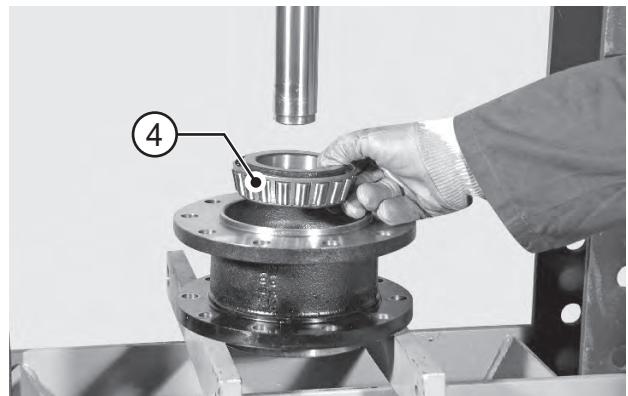


FIGURE 6: Remove sealing ring (13) and bearing (4).

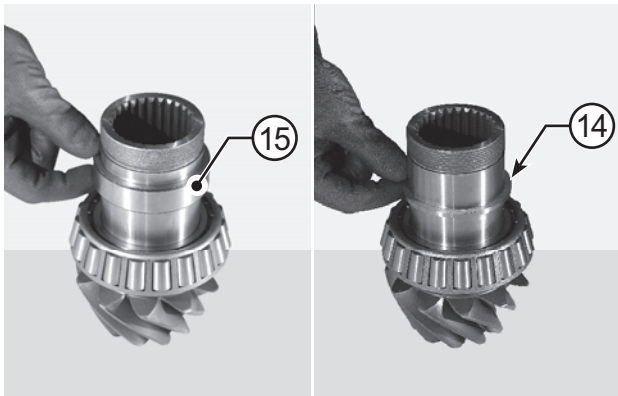


FIGURE 7: Remove spacer (15) and calibrated spacer (14).

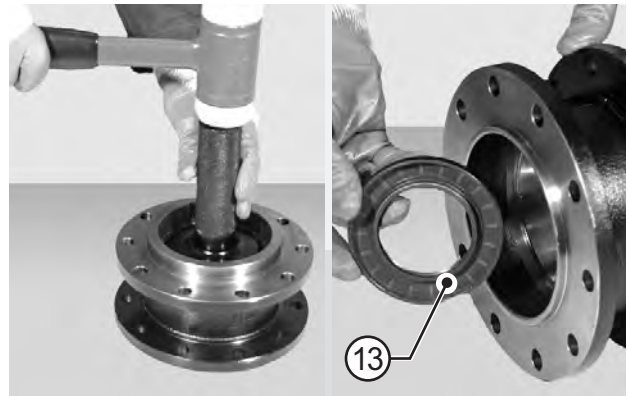


FIGURE 10: Remove sealing ring (13).

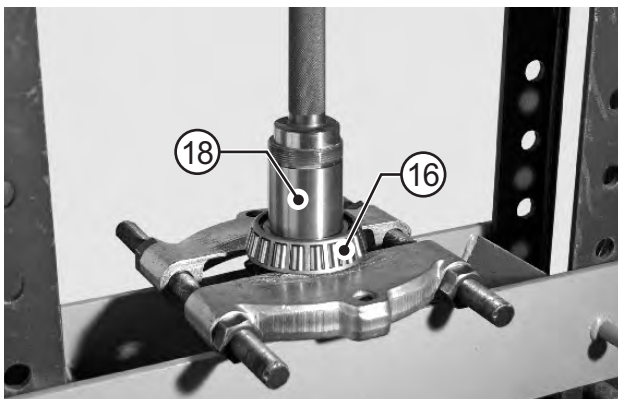


FIGURE 8: Position the pinion (18) under a press, remove the bearing (16).



FIGURE 9: With the help of an extractor, remove the thrust blocks (4)(16).

ASSEMBLY

ASSEMBLY

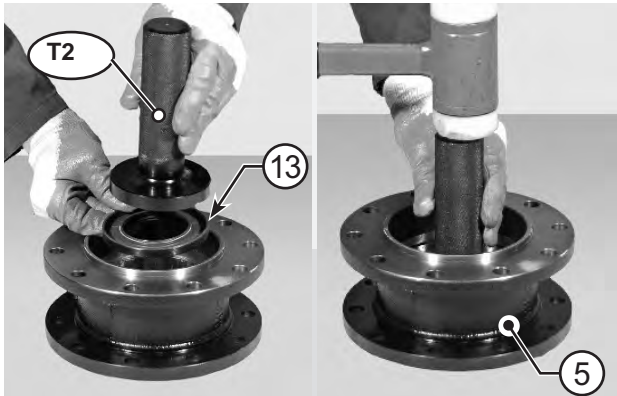


FIGURE 11: Lubricate the outer surface of the new sealing ring (13) and fit it onto the cover (5) using tool T2 (See drawing T2 p. 78) .



FIGURE 12: Using tool T3 (See drawing T3 p. 78), insert the thrust blocks of bearing (4)(16).

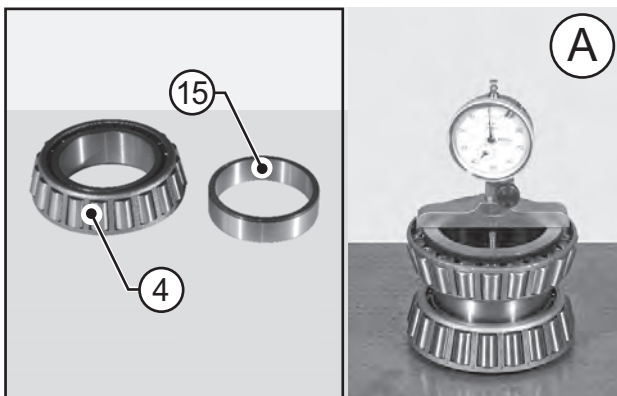


FIGURE 13: Introduce a spacer (15) and thicker calibrated spacer between bearings. Reset the depth gauge on pinion bearings (4)(16) and pinion spacer arranged (15) as in the figure above.

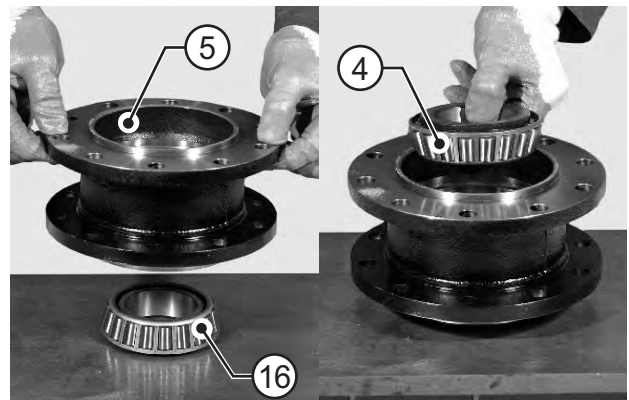


FIGURE 14: Using a surface plate, position the pinion support (5) on the outer bearing (16) and then insert the outer bearing (4) in the pinion support (5).

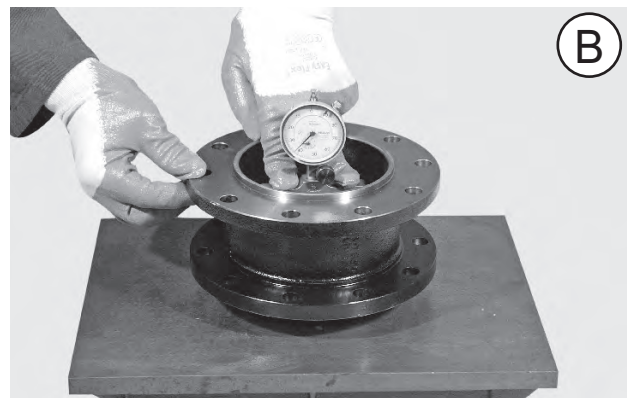


FIGURE 15: Arrange accurately the pinion bearings.

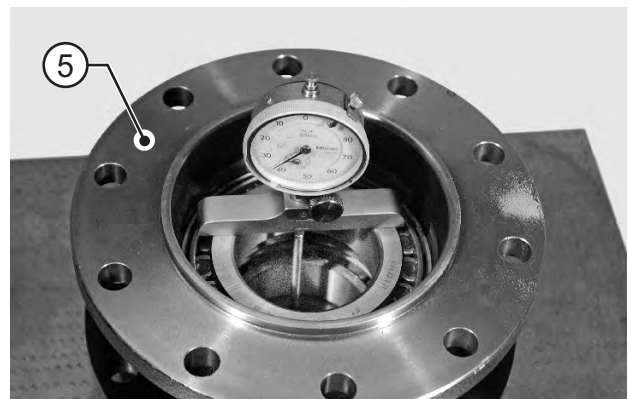


FIGURE 16: Insert depth gauge “DDG” into pinion support (5) and measure variation “H” in relation to the zero setting performed back at Figure 13.
H = 1,8 mm

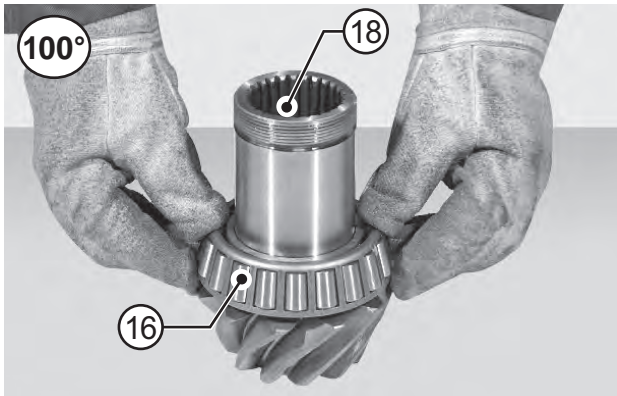


FIGURE 17: Heat the inner bearing (16) to about 212 F° [100 C°] and fit it to the pinion (18).

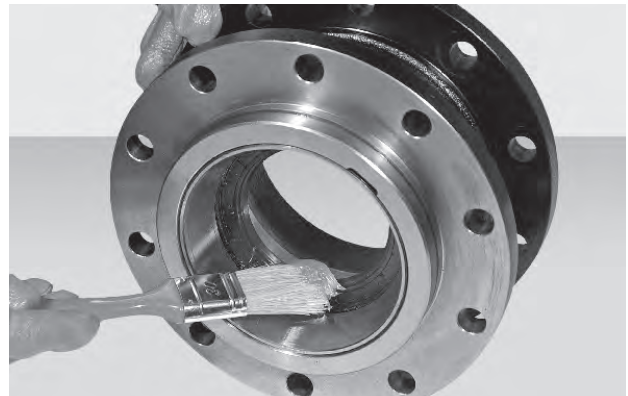


FIGURE 20: Oil seal ring lips.

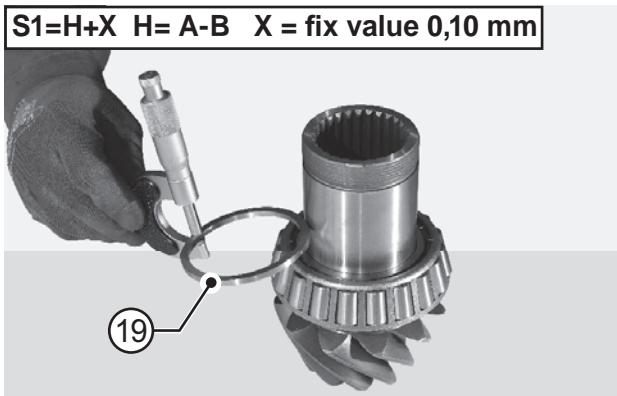


FIGURE 18: Deviation “H” must be added to a set value of 0,10 mm to obtain calibrated shim “S1” (14) for insertion between inner bearing cone (4) and spacer (15). Dimension “S1” must be rounded off to the higher 5/100. EXAMPLE: $S1=H+X= 1,8 + 0,1 = 1,9 \text{ mm}$



FIGURE 21: Insert the cover (5).

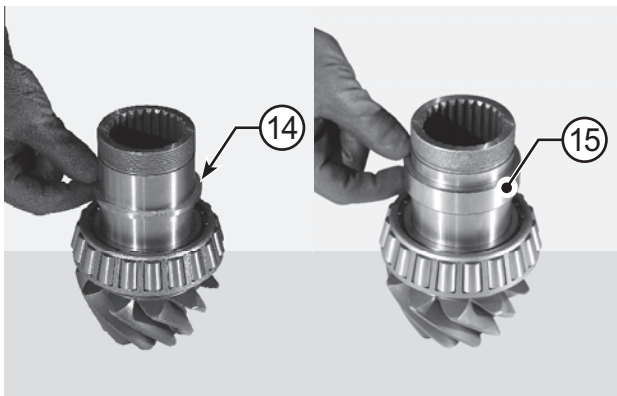


FIGURE 19: Insert spacer (15) and two calibrated spacers “S1” (14).

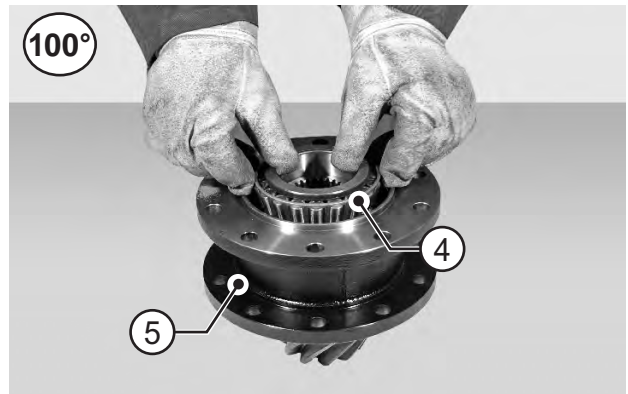


FIGURE 22: Heat the outer bearing (2) to about 212 F° [100 C°] and fit into the pinion (1).

ASSEMBLY

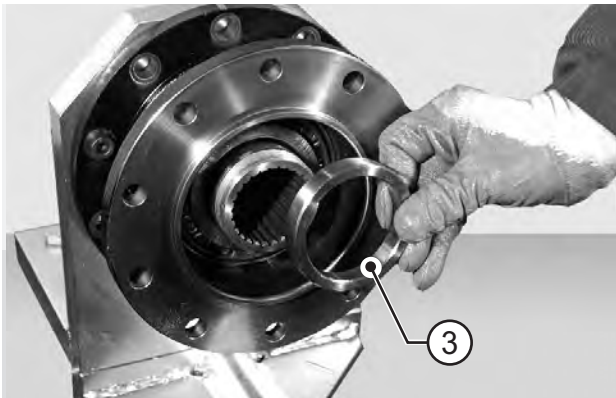


FIGURE 23: Insert spacer (3).

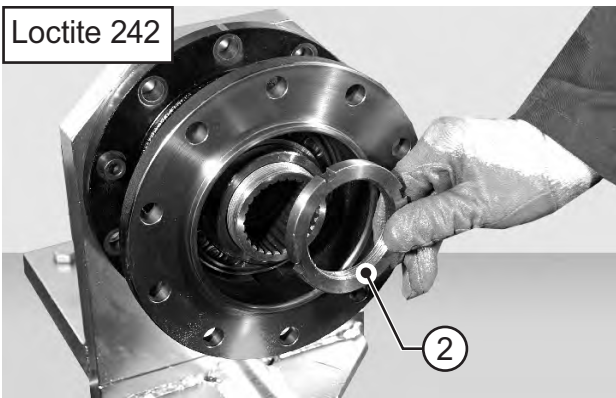


FIGURE 24: Apply Loctite 242 to the thread of the pinion ring nut (10) and tighten the nut onto the pinion.



FIGURE 25: Lock the wrench T1 (See drawing T1 p. 77), rotate the pinion using a torque wrench, up to a minimum required torque setting of 600 - 800 N-m.

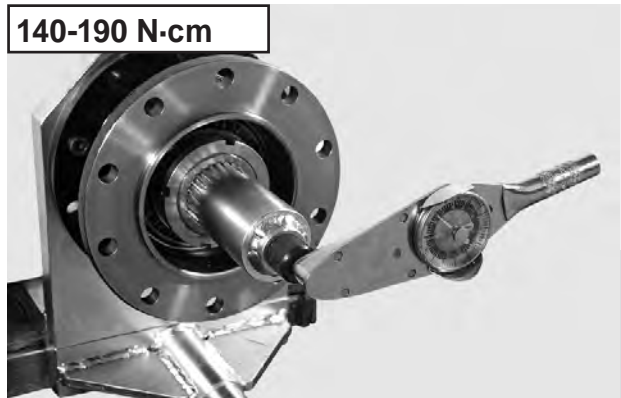


FIGURE 26: Apply onto the pinion (18) the special tool T1 (See drawing T1 p. 77) and with the help of a torque meter, check the torque of the pinion (18).
Torque: 140 - 190 Ncm

⚠ CAUTION

If torque exceeds the maximum value, then the size of shim "S1" (14) between the bearing (4) and the spacer (15) needs to be increased. If torque does not reach the set value, increase the torque setting of the ring nut (10) in different stages to obtain a maximum value of 600 - 800 N-m.

If torque does not reach the minimum value, then the size of shim "S1" (14) needs to be reduced.

When calculating the increase or decrease in size of shim "S1", bear in mind that a variation of shim of 0.01 mm corresponds to a variation of 60 Ncm in the torque of the pinion (18).

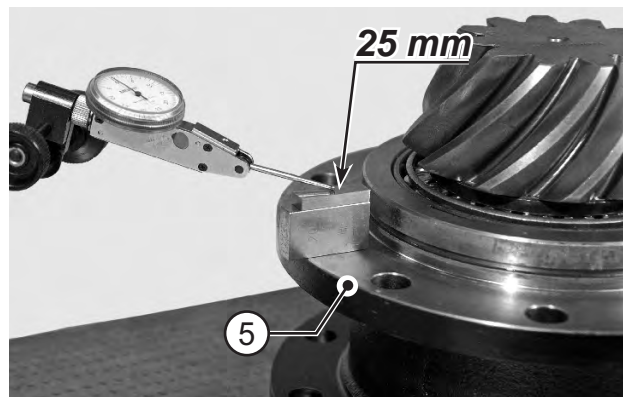


FIGURE 27: CALCULATING PINION CENTER DISTANCE
Using a faceplate, reset a dial indicator "DG" on a calibrated block (whose known thickness is 25 mm).

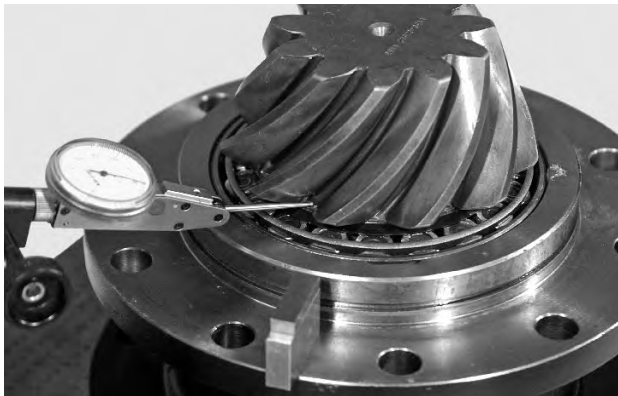


FIGURE 28: Bring internal bearing (2) under dial indicator “DG”, test the difference for calculating D.
 $D = 25 + H = 25 + 0,5 = 25,8 \text{ mm}$

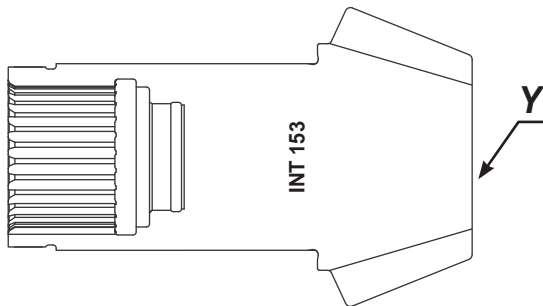


FIGURE 29: Check nominal dimension “I” as marked on the pinion. Add up to or subtract from “I” the variation indicated as “Y” to obtain the actual center distance “I”.
 EXAMPLE: $I = \text{INT} \pm Y = 153 - 0,1 = 152,9 \text{ mm}$

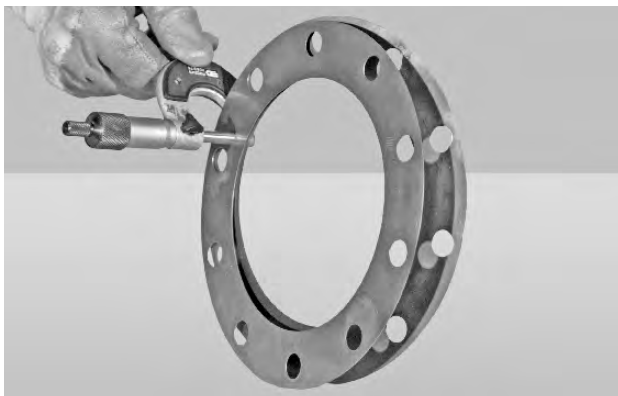


FIGURE 30: Shims “S” for insertion:
 $S = (I + D) - X = (152,9 + 25,5) - 178 = 0,7 \text{ mm}$
 I = actual pinion center distance
 D = Bearing distance
 X = 178 mm = Fix Dimension

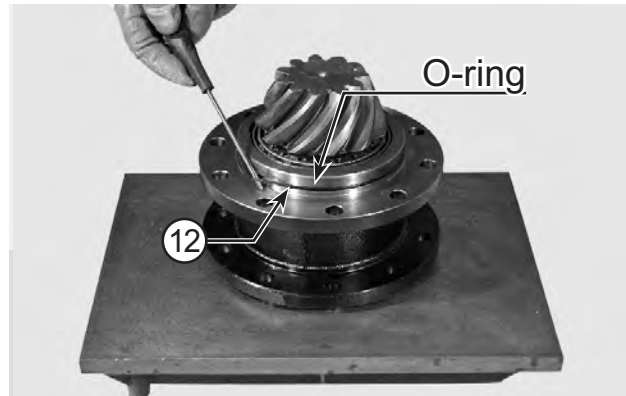


FIGURE 31: Install a new seal-ring (12). Lubricate the seal ring before fitting.

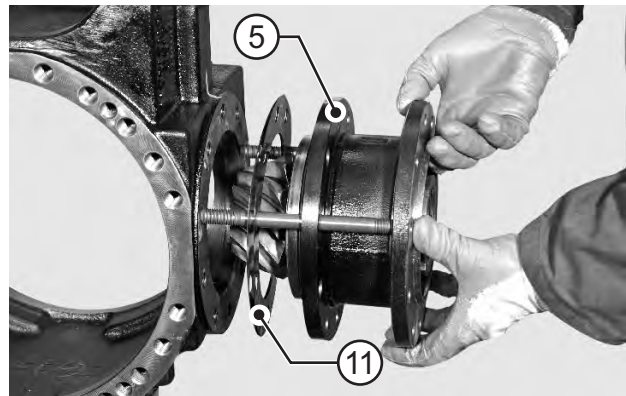


FIGURE 32: Install shims (11) and cover (5).

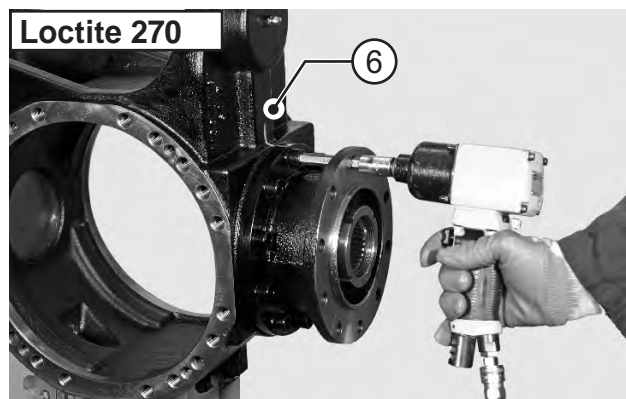


FIGURE 33: Secure in position with the screws (6) and washers (7) coated with Loctite 270.

ASSEMBLY

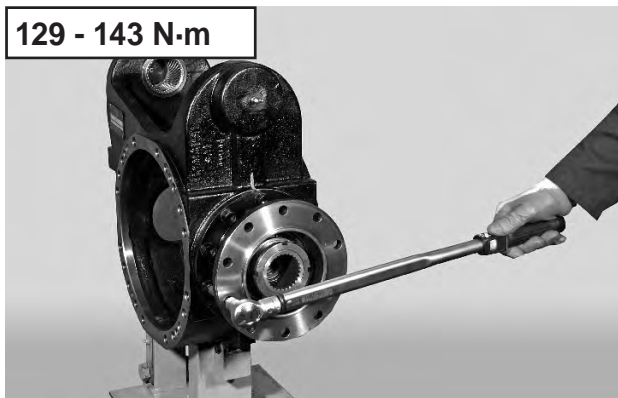


FIGURE 34: Using the criss-cross method tighten to torque of 129 - 143 N·m.

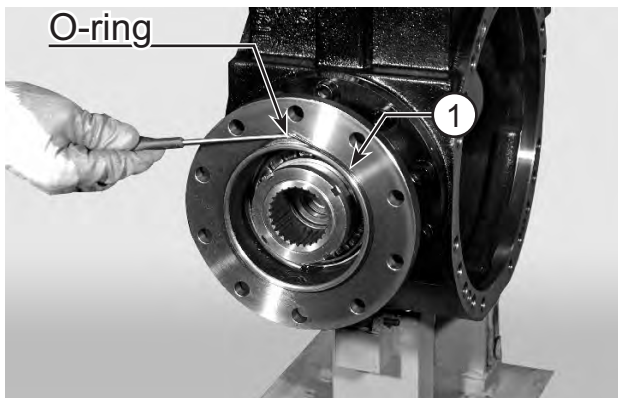


FIGURE 35: Install a new seal-ring (1). Lubricate the seal ring before fitting.

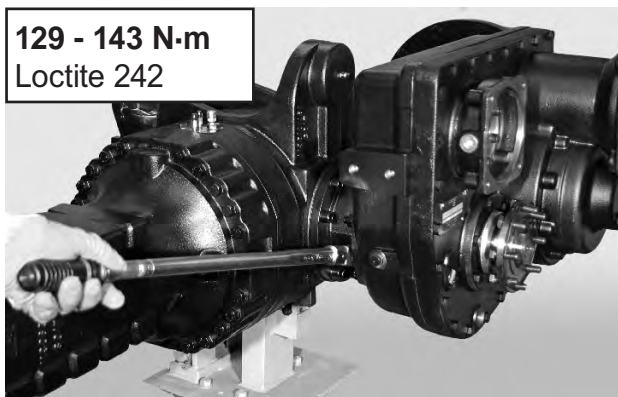
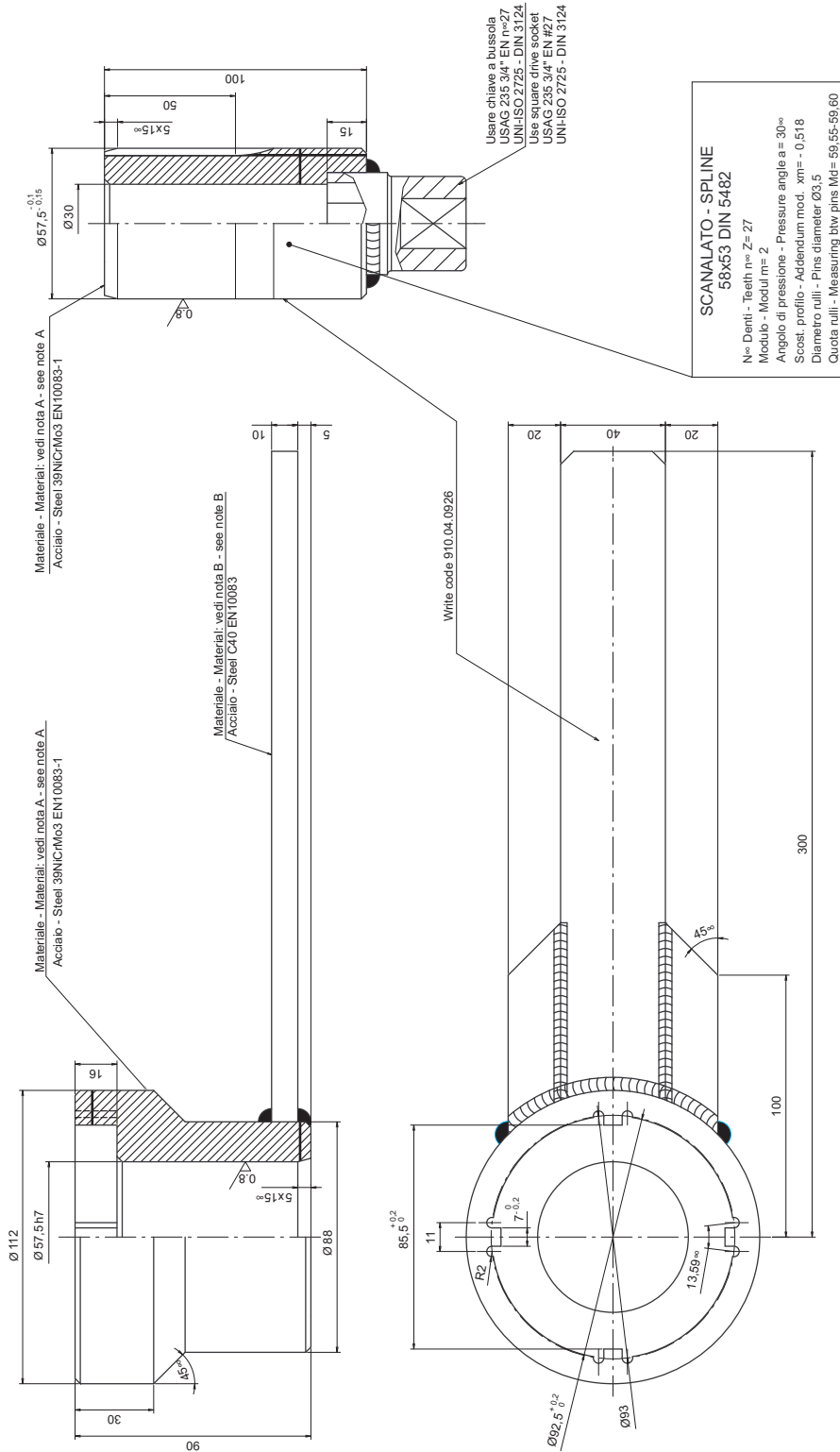


FIGURE 36: Re-fit the reduction unit onto the axle. Fasten the support planes (turn flange to assist assembly). Insert nuts by applying LOCTITE 242. Tighten nuts using a torque wrench setting of 129 - 143 N·m.

SPECIAL TOOLS

T1

P/N: 910.04.2377

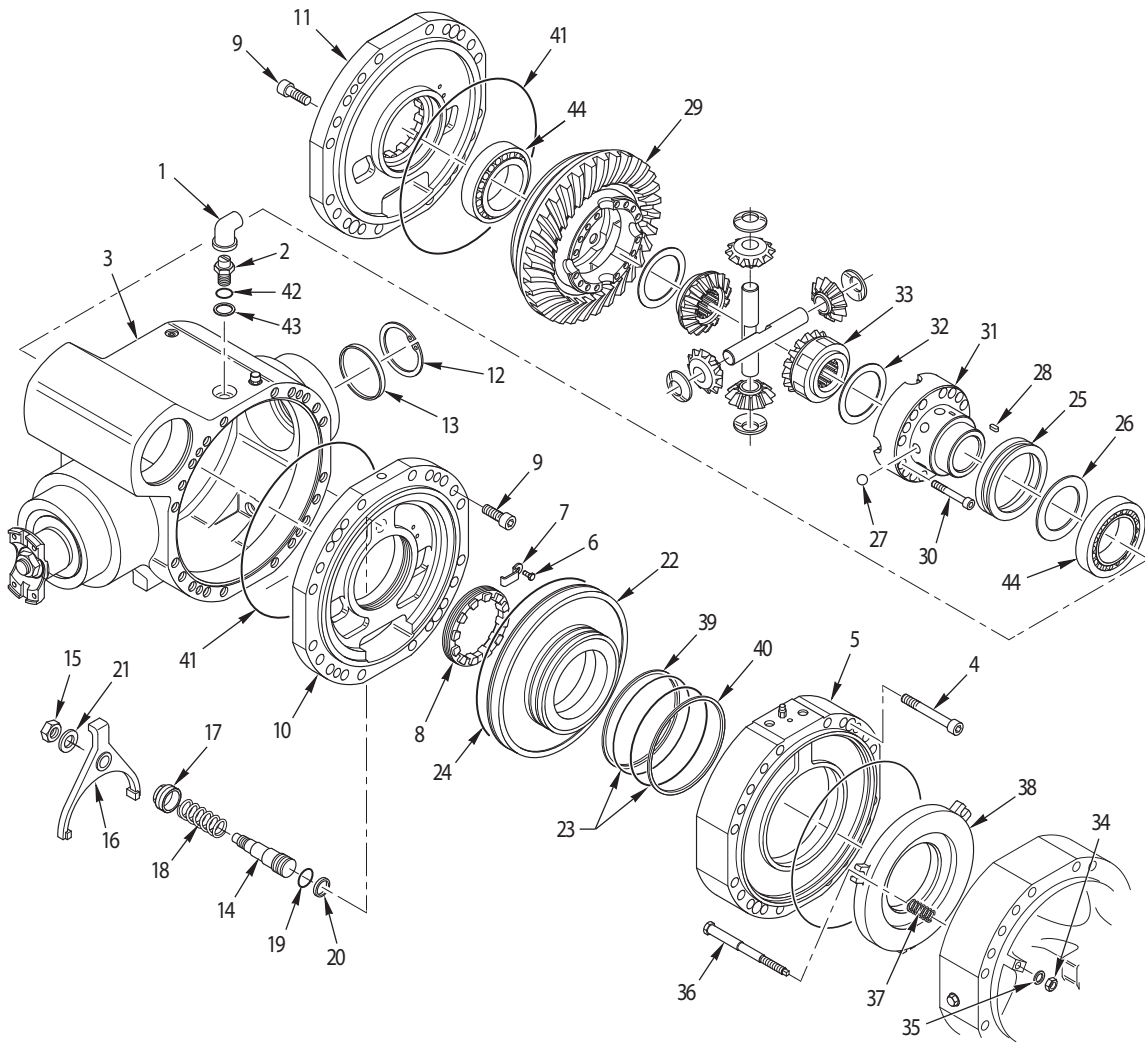


Nota A - Note A :
Nitrurato - Nitrided

Nota B - Note B :
Brunito - Burnished

HYDRAULIC DIFFERENTIAL LOCK

EXPLODED VIEW



DISASSEMBLY

DISASSEMBLY

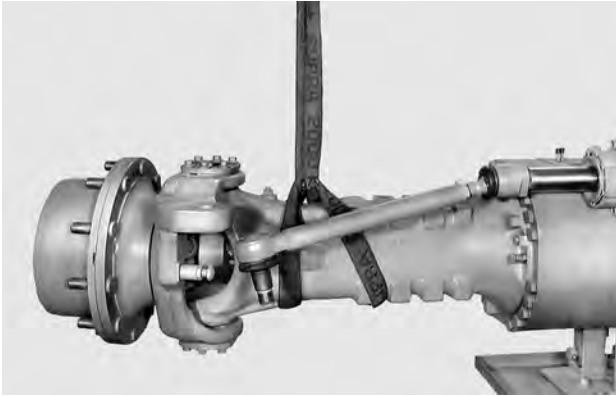


FIGURE 1: Remove the arms.
For details, see SERVICE BRAKE AND NEGATIVE PARKING BRAKE p. 35.

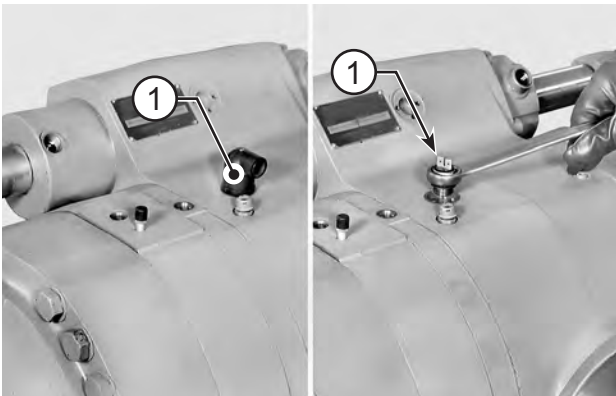


FIGURE 2: Remove both guard (1) and differential-lock indicator (2).

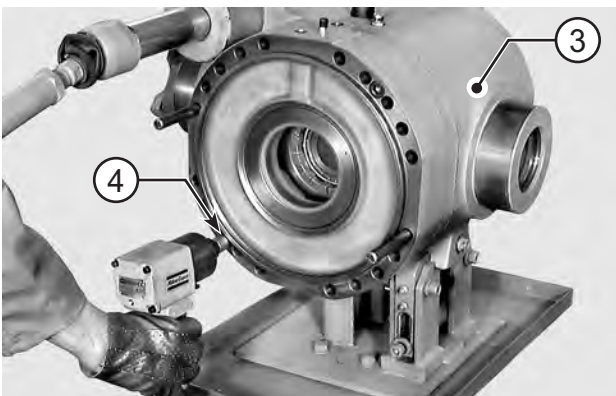


FIGURE 3: Tighten two safety studs (M16) in two opposing holes in the main body (3).
Loosen and remove the screws (4).

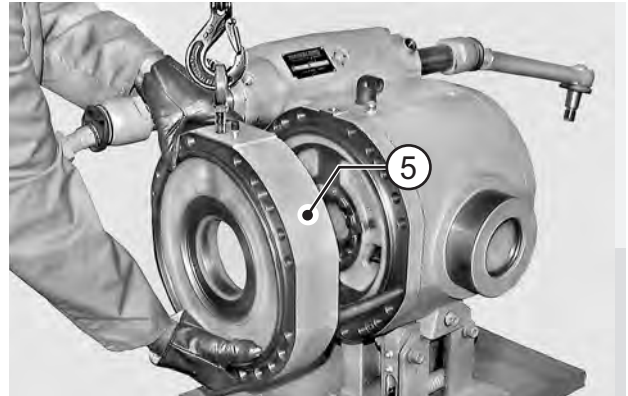


FIGURE 4: Connect to a hoist and remove the whole brake cylinders (5).

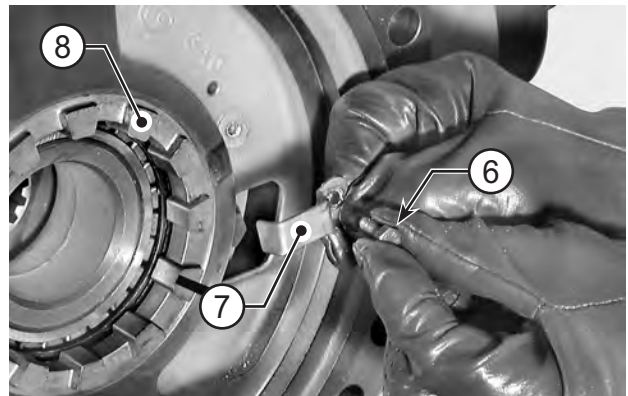


FIGURE 5: Remove screws (6) and safety stops (7) from adjustment ring nuts (8).

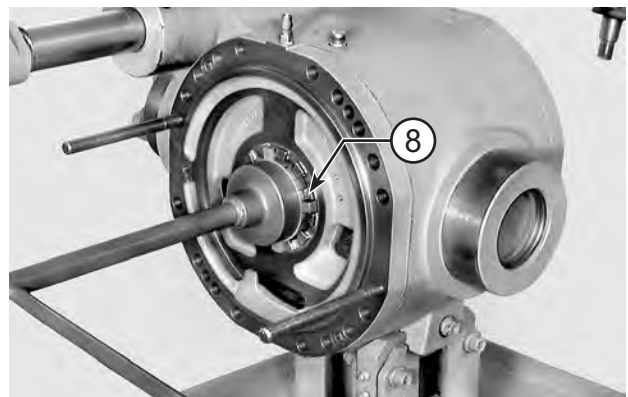


FIGURE 6: Only if locking piston seal is replaced: make positional match marks across the adjustment ring nut on non-gear ring side.
Loosen the ring nut (8) by about 6 mm (4 turns).

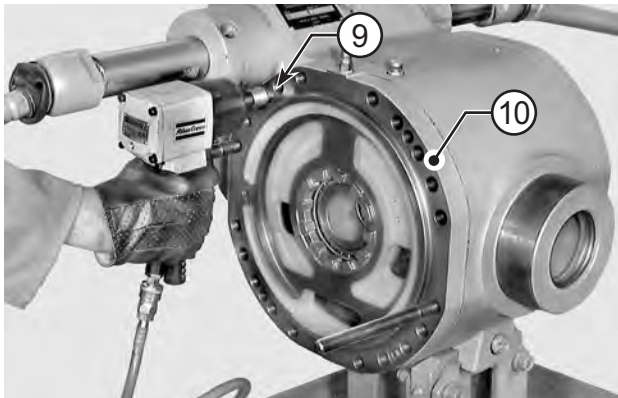


FIGURE 7: Loosen and remove check screws (9) from intermediate cover (10).

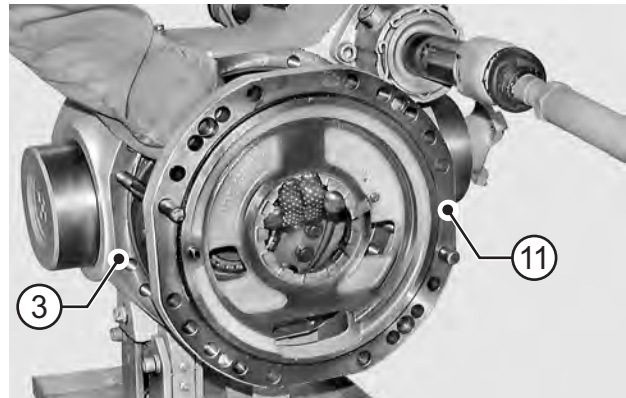


FIGURE 10: Support the differential unit and disconnect intermediate cover (11) from main body (3). Remove cover (11).



FIGURE 8: Introduce low-pressure compressed air through connection and make sure that the lock control piston comes out at end of stroke. Remove safety studs, rotate cover (10) to an angle of about 45° and remove cover.

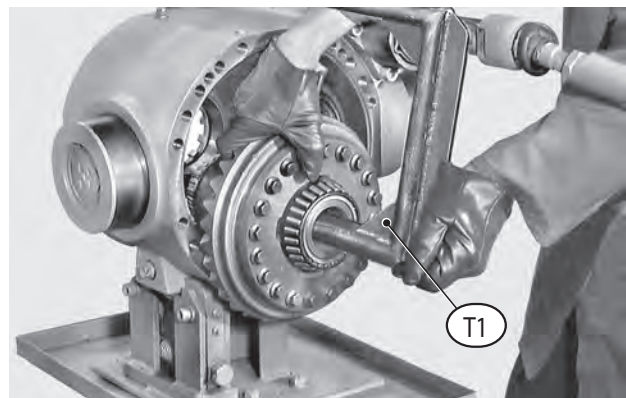


FIGURE 11: Remove the differential unit by using tool T1 (See drawing T1 p. 89); position the unit on a workbench.

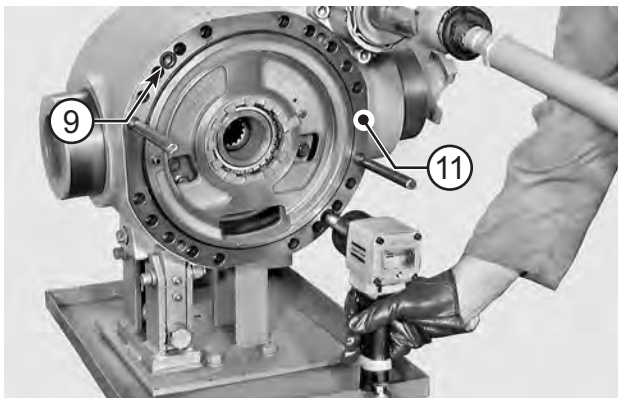


FIGURE 9: Tighten two safety studs (M16) in the main body. Loosen and pull out check screws (9) from intermediate cover (11) on gear ring side.

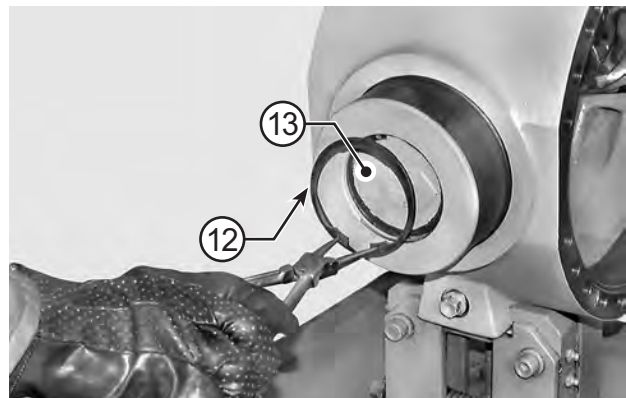


FIGURE 12: Remove the snap ring (12) and locking cap (13).

NOTE:

Replace the cap at each disassembly.

DISASSEMBLY

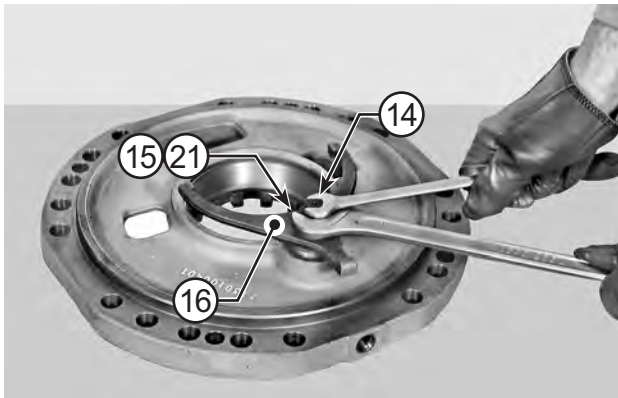


FIGURE 13: CONTROL DISASSEMBLY
As you hold piston (14) in position, loosen check nut (15) of fork (16).
Remove nut (15) and spring washer (21).

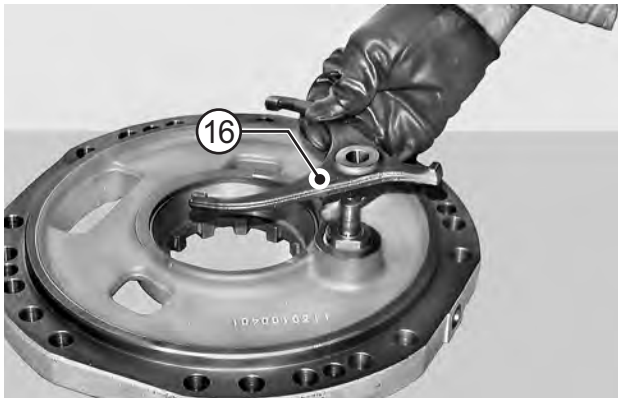


FIGURE 14: Remove fork (16).

NOTE:

Write direction of installation and thoroughly inspect pad for wear.

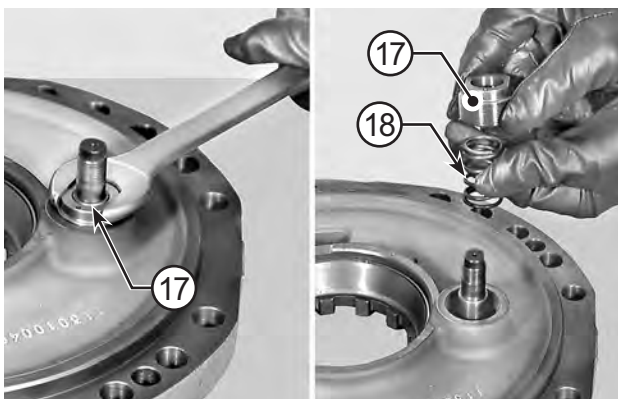


FIGURE 15: Loosen piston stop ring nut (17); remove ring nut and spring (18).

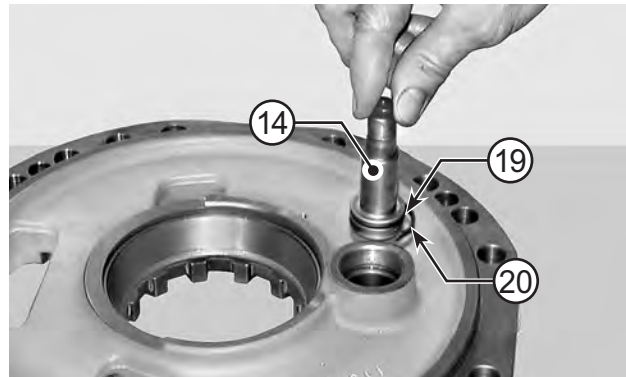


FIGURE 16: Remove piston (14) complete with o-ring (19) and guide pad (21).

NOTE:

Replace pad and o-ring at each disassembly.



FIGURE 17: If bearings need replacing, remove the outer thrust blocks of bearings (44) from intermediate covers (10) and (11).



FIGURE 18: DISASSEMBLING THE BRAKE PISTON
Gently introduce low-pressure compressed air through the connection of the working brake line and eject the whole piston (22).

NOTE:

Replace seals (23) and (24) and anti-extrusion rings at each disassembly.



FIGURE 19: DISASSEMBLING THE DIFFERENTIAL GEAR
With a puller applied under coupling (25), remove bearing (44) and shoulder shim (26) for coupling (25).

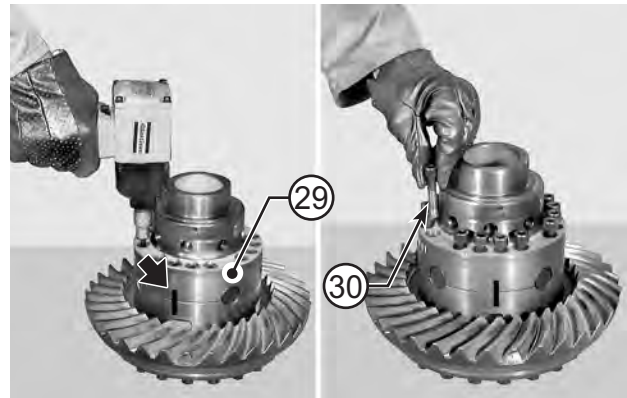


FIGURE 22: Make positional marks on the half-boxes of differential (29); loosen and remove joining screws (30).

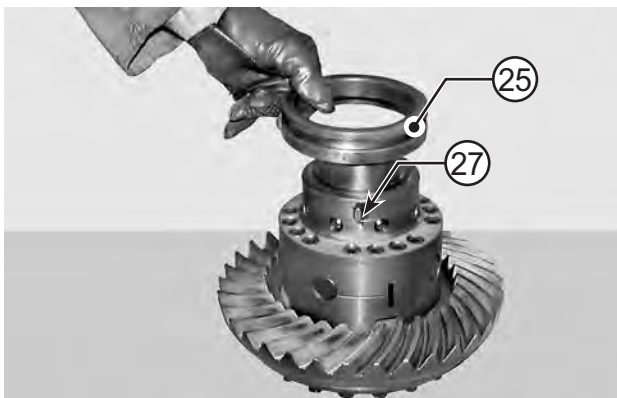


FIGURE 20: Remove coupling (25) and collect the drive balls (27).

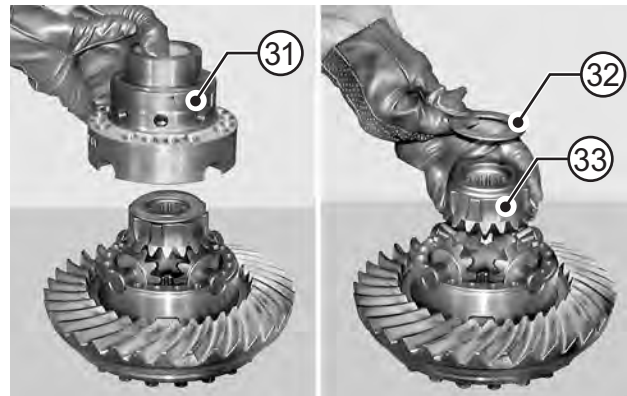


FIGURE 23: Remove upper half box (31), and then pull out shoulder ring (32) and crown wheel (33). Complete differential disassembly procedure by following the instructions given in the first part of the manual (see DIFFERENTIAL UNIT p. 47).

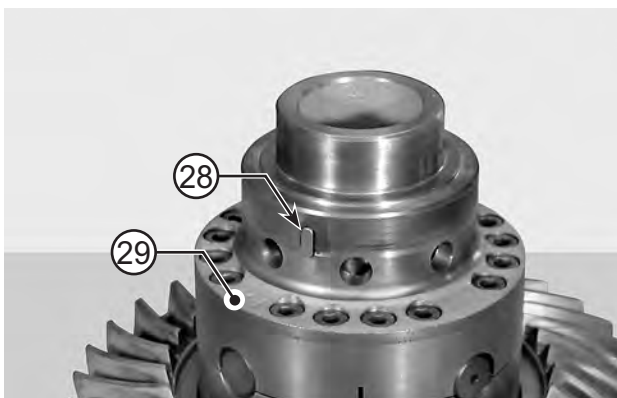


FIGURE 21: Only if necessary: remove guide key (28) from coupling (25).

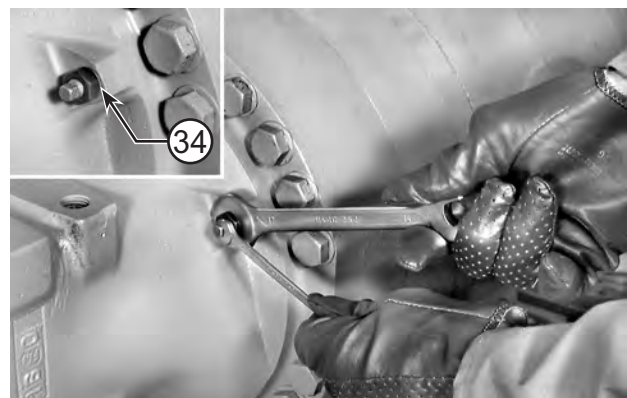


FIGURE 24: REPLACING THE BRAKE DISCS
Loosen and then remove lock nuts (34) (qty. 3); also remove seal washers (35).

DISASSEMBLY

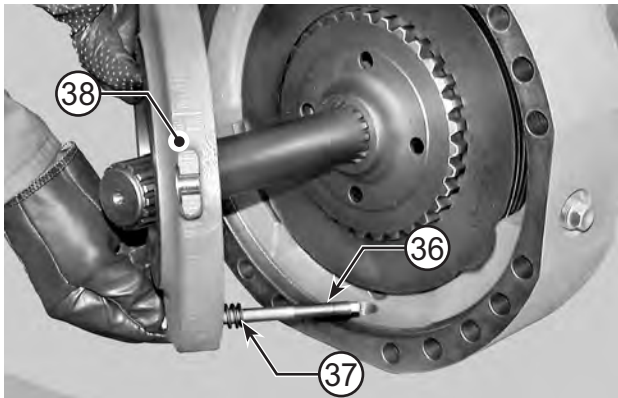


FIGURE 25: Remove screws (36), springs (37), and pressure plate (38).

Proceed by removing the brake discs.

(For details, see SERVICE BRAKE AND NEGATIVE PARKING BRAKE p. 35 in the first part of the manual).

ASSEMBLY

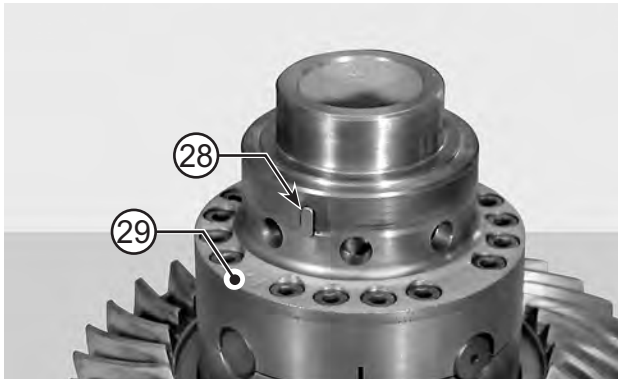


FIGURE 26: ONLY IF DIFFERENTIAL HAS BEEN DISASSEMBLED

Assemble the differential unit (29). For details, see DIFFERENTIAL UNIT p. 47 in the first part of the manual. Put the guide key (28) of coupling (25) in place.

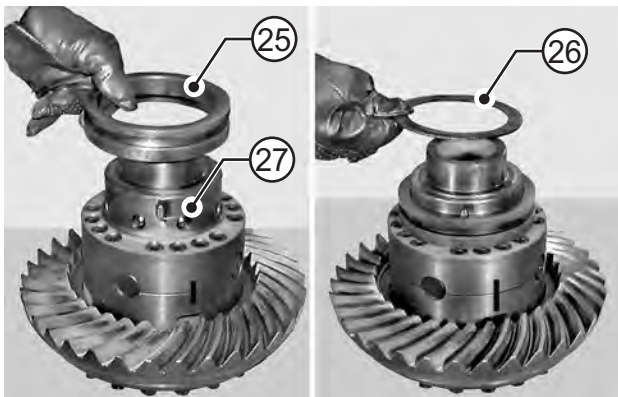


FIGURE 27: Grease the ball slots and fit in the balls (27), coupling (25) and shoulder shim (26).



FIGURE 28: Heat bearing (44) to approximately 194 F° [194 F° [90 C°]] and install on the differential.

NOTE:

Make sure that the bearing is securely engaged.

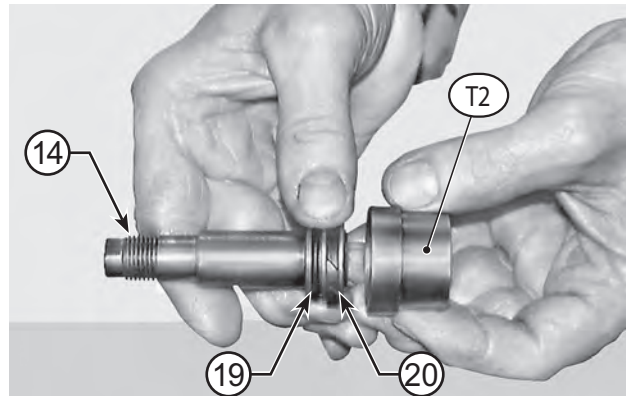


FIGURE 29: ASSEMBLING LOCK CONTROL

Fit o-ring (19) and guide ring (20) onto piston (14). Lubricate the seals and introduce the unit in tool T2 (See drawing T2 p. 89).

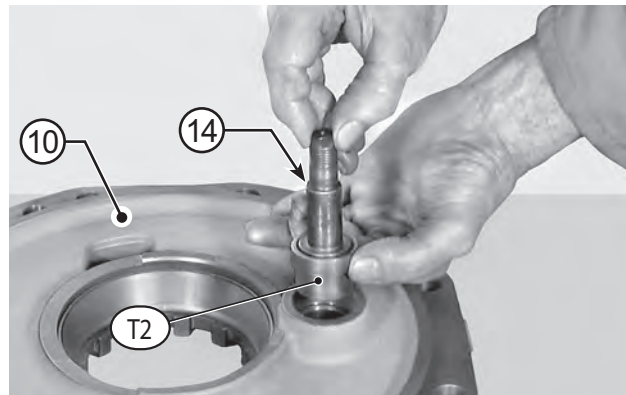


FIGURE 30: Place tool T2 (See drawing T2 p. 89) on the intermediate cover (10) and push piston (14) into its seat.



FIGURE 31: Fit spring (18) and ring nut (17) on piston (14). Tighten the ring nut by a few turns, apply a coat of Loctite 242 to the ring nut and tighten to a torque of maximum 50 N·m using a torque wrench.

ASSEMBLY

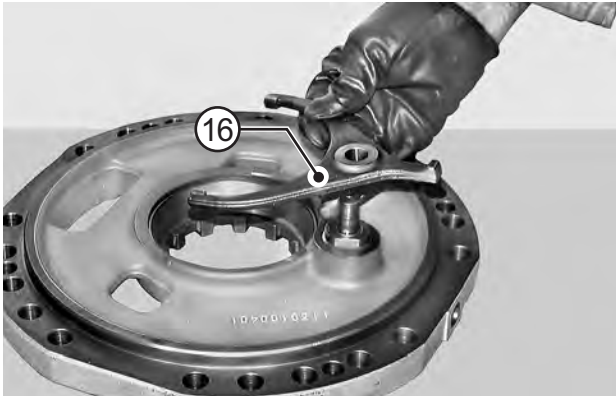


FIGURE 32: Fit fork (16) on piston (14) and make sure fork orientation is correct.

NOTE:

Microswitch activation cam "A" must face upwards.

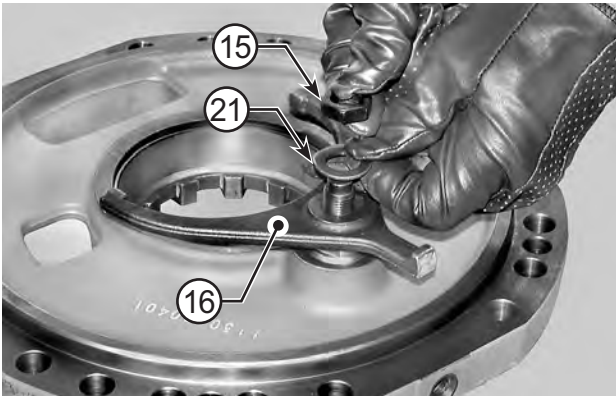


FIGURE 33: Secure fork (16) with washer (21) and nut (15).

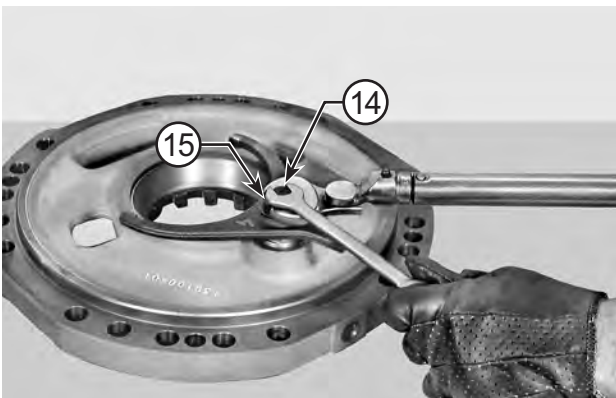


FIGURE 34: As you hold piston (14) in position, lock the nut (15) with a torque wrench.
Tightening torque: 225 - 230 N·m.

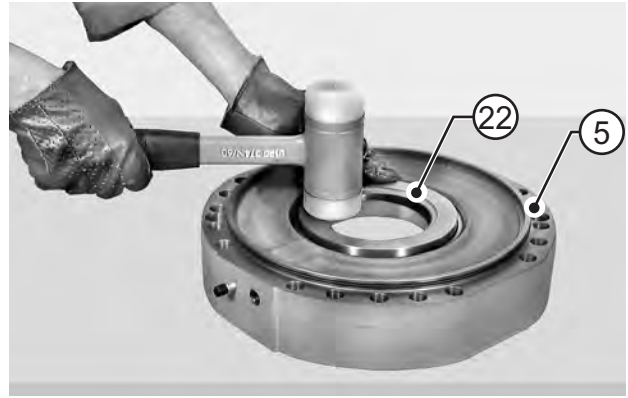


FIGURE 35: ASSEMBLING THE BRAKE PISTON
Fit o-rings (23), (24) and anti-extrusion rings (39) and (40) on piston (22).

NOTE:

Thoroughly check the positioning of anti-extrusion rings (39) and (40). Lubricate the seals and introduce piston (22) into cylinder (5).

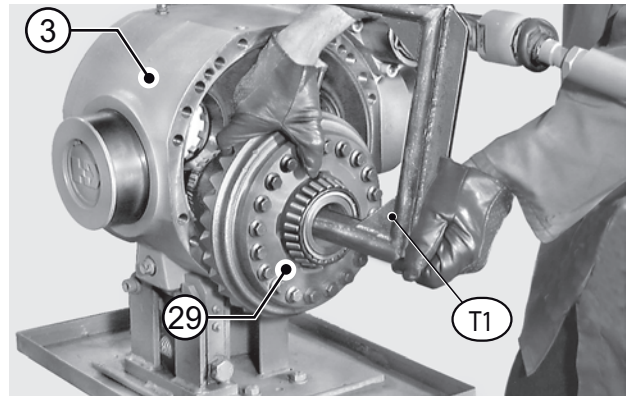


FIGURE 36: INSTALLATION
Using tool T1 (See drawing T1 p. 89), introduce the whole differential (3) into the main body (29).

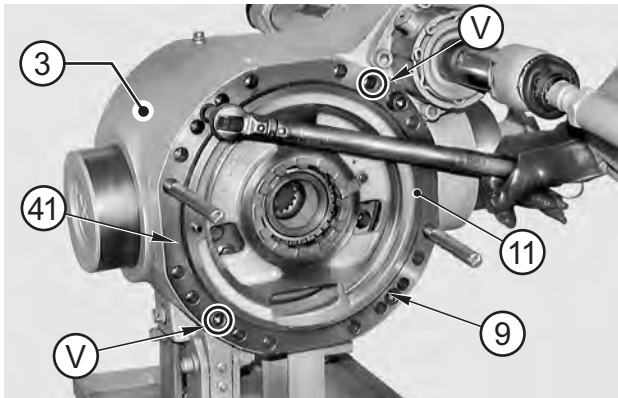


FIGURE 37: Tighten two safety studs in the main body (3) and install the intermediate cover (11). Lock in position with screws "V" tightened to a matching torque. Tightening torque: 130 - 143 N·m.

NOTE:

Check the condition of the o-ring (41).

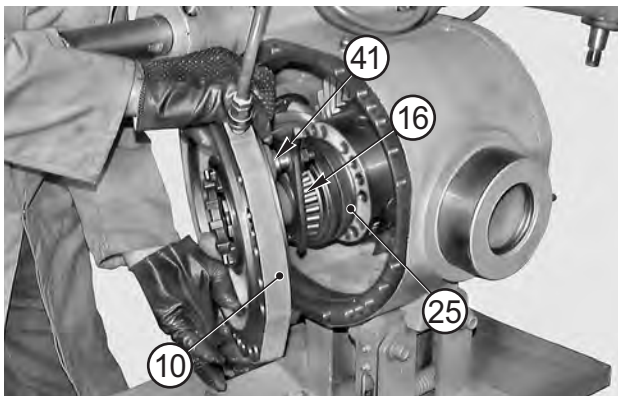


FIGURE 38: Introduce low-pressure compressed air through connection and make sure that the lock control piston comes out at the end of stroke. Rotate the intermediate cover (10) to an angle of about 45°; engage the fork (16) in the lock control coupling (25).

NOTE:

Check the condition of the o-ring (41).

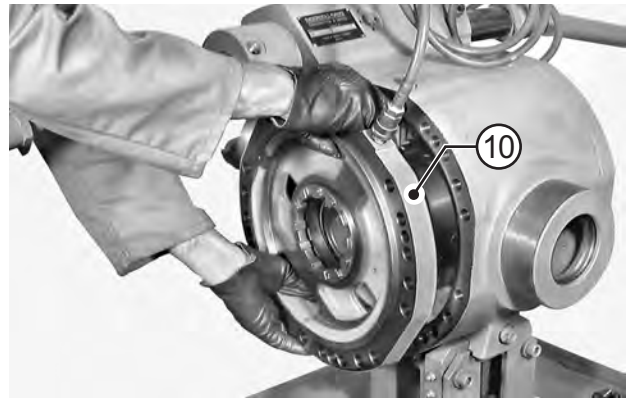


FIGURE 39: As you hold the fork in position (16), rotate the intermediate cover into its final position (10). To lock into position, tighten two safety studs in two opposing holes.

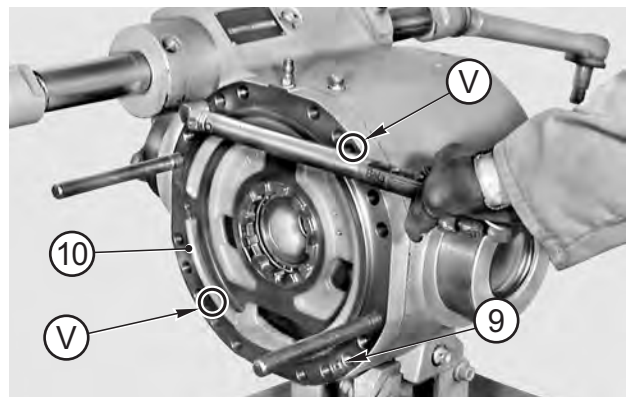


FIGURE 40: Clear any compressed air and finally move the intermediate cover (10) into its seat. Lock into position with nuts ("V" tightened to matching torque. Tightening torque: 130 - 143 N·m.

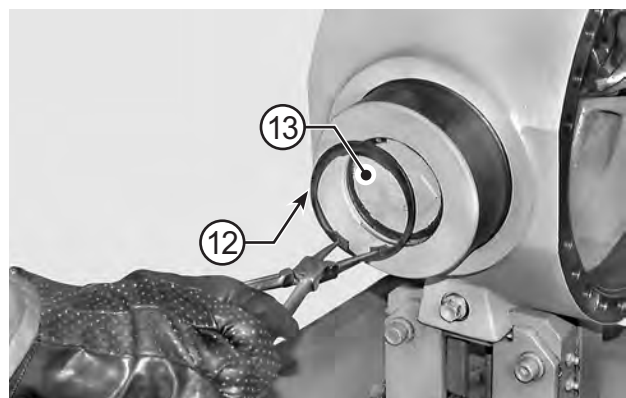


FIGURE 41: If necessary, adjust differential clearances. (See DIFFERENTIAL UNIT p. 47). Install the cap (13) and snap ring (12).

ASSEMBLY

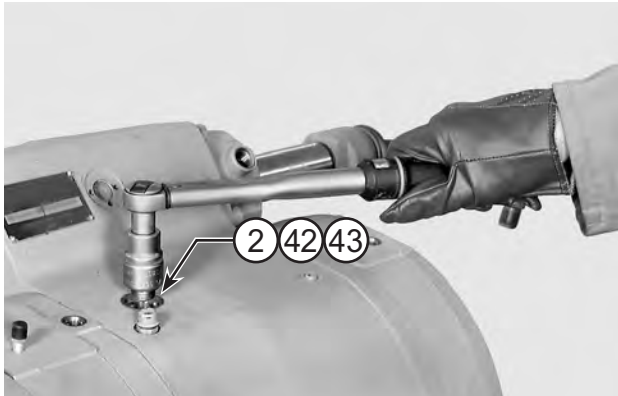
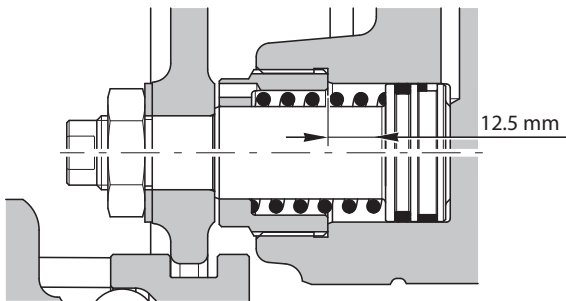


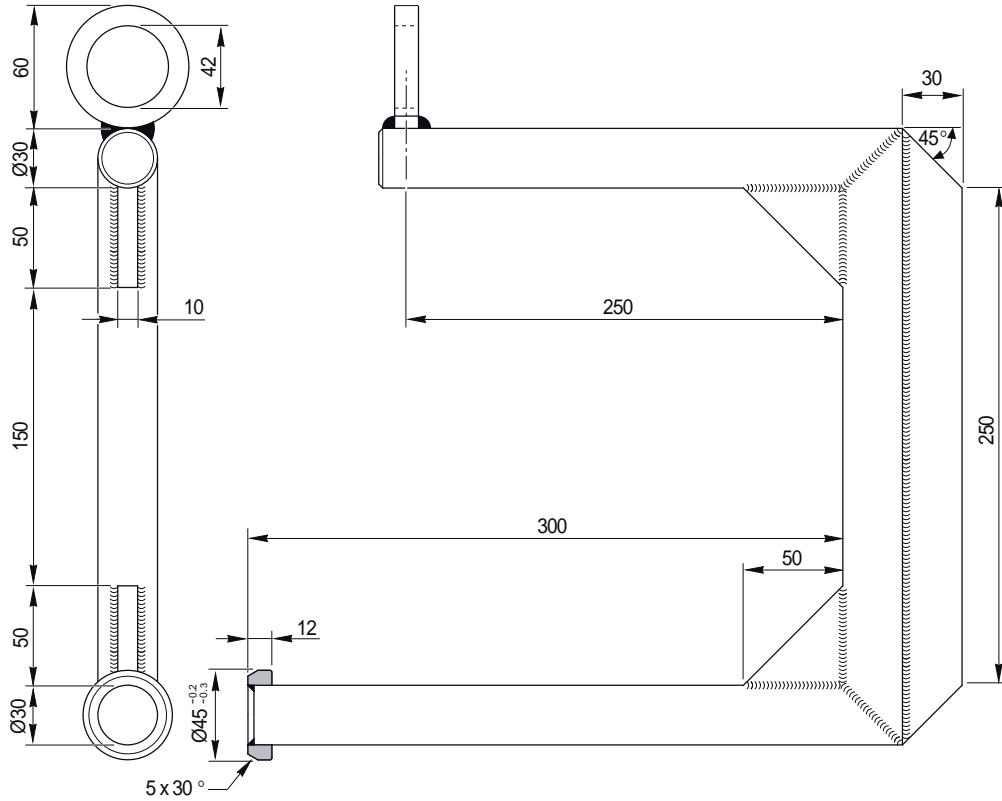
FIGURE 42: Fit the differential-lock indicator (2) complete with the o-ring (42) and the retainer ring (43). Install the arms. (See SERVICE BRAKE AND NEGATIVE PARKING BRAKE p. 35).



SPECIAL TOOLS

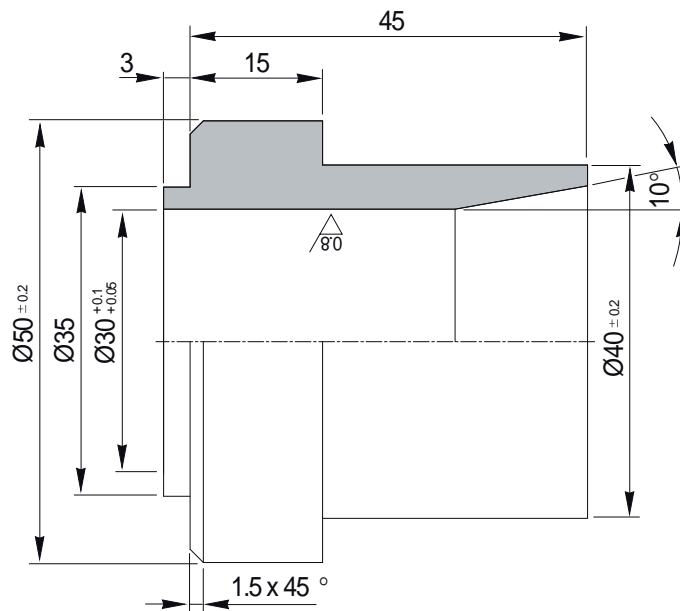
T1

P/N: 2370



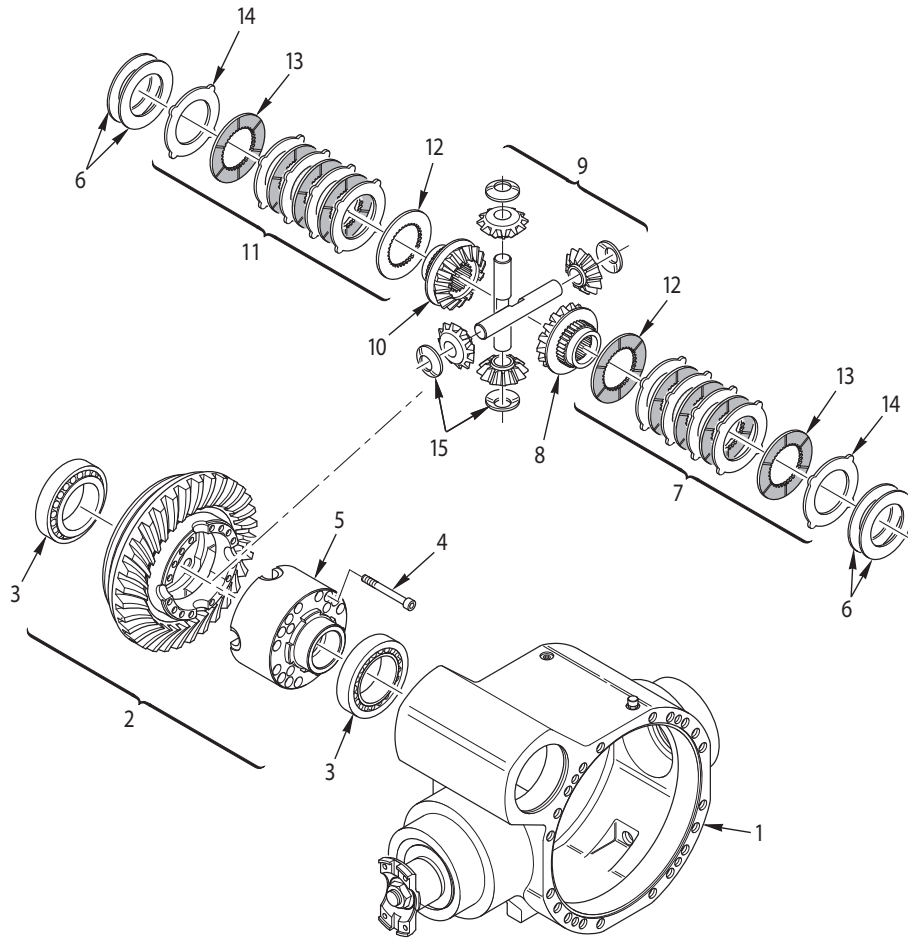
T2

P/N: 2376



LIMITED SLIP DIFFERENTIAL UNIT

EXPLODED VIEW



DISASSEMBLY

DISASSEMBLY

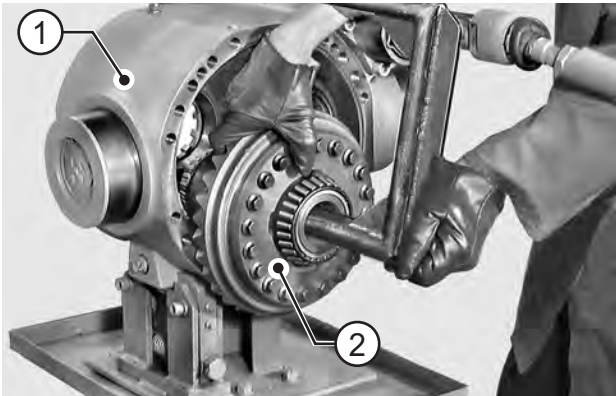


FIGURE 1: Remove the whole differential unit (2) from the main body (1).
(For details, see DIFFERENTIAL UNIT p. 47).

⚠ CAUTION

The following section includes clutch replacement procedures only; for gear ring replacement, see DIFFERENTIAL UNIT p. 47.



FIGURE 2: Using a puller, remove bearing (3).

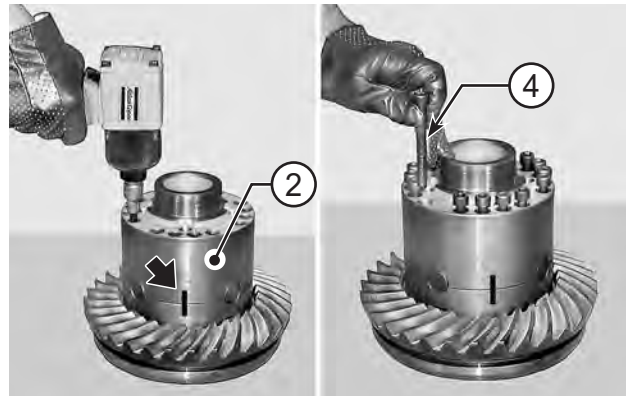


FIGURE 3: Make positional match marks on the half boxes of the differential gear (2); loosen and pull out joining screws (4).

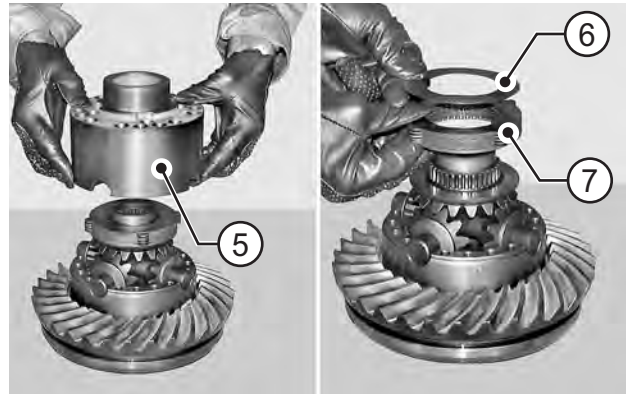


FIGURE 4: Remove the upper half box (5) and pull out shims (6) and clutch pack (7).

⚠ CAUTION

If the clutch pack does not need replacing, avoid swapping discs position.

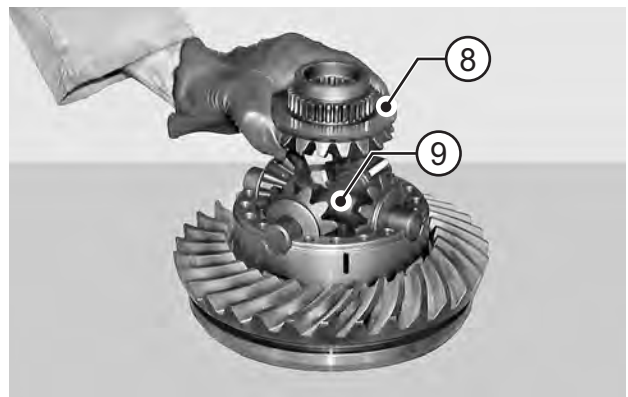


FIGURE 5: Remove the crown wheel (8) and planetary gears set (9).



FIGURE 6: Remove the 2nd planetary gear (10).

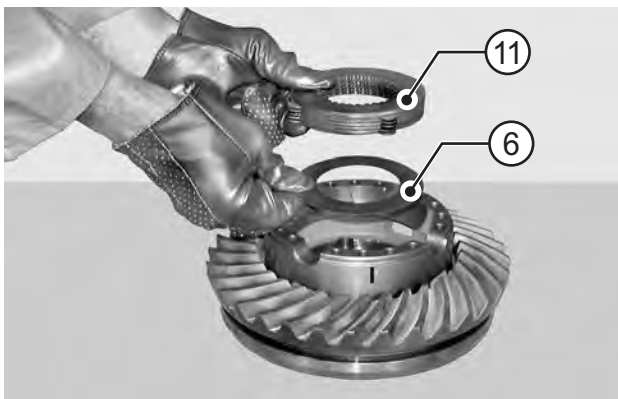


FIGURE 7: Remove the 2nd clutch pack (11) and shim set (6).

⚠ CAUTION

If the clutch pack does not need replacing, avoid swapping discs position.

ASSEMBLY

ASSEMBLY

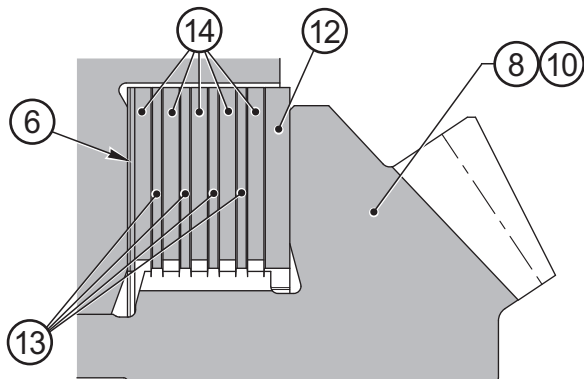


FIGURE 8: Only in case of clutch pack replacement: make up the packs with increased shims (12), clutch discs (13), intermediate discs (14) and shims (6).

⚠ CAUTION

Add shims (6) until a total size of 17.6 ± 0.05 mm is obtained.

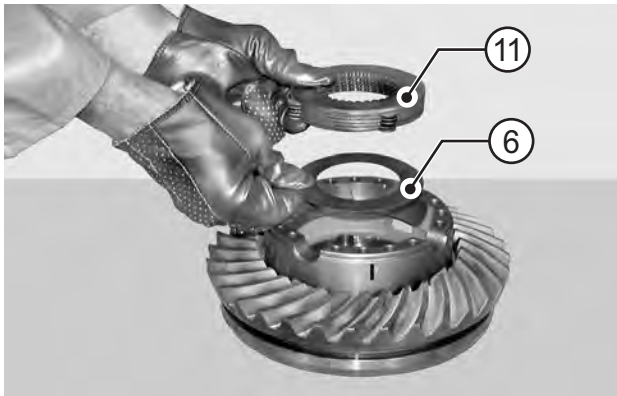


FIGURE 9: Fit shims (6) and clutch pack (11) sequentially.

⚠ CAUTION

When installing the increased shim, place shim so that it leans against the crown wheel (8, 10).

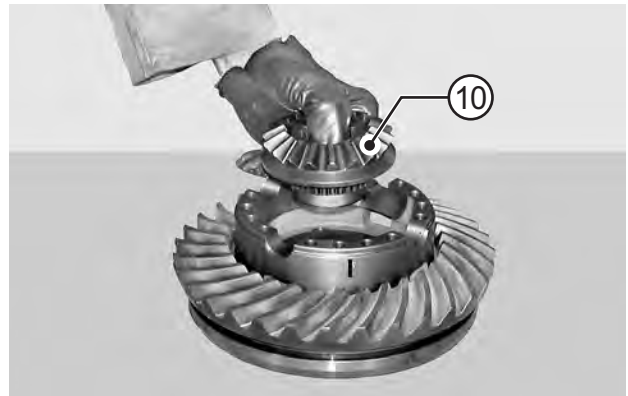


FIGURE 10: Install planetary gear (10).

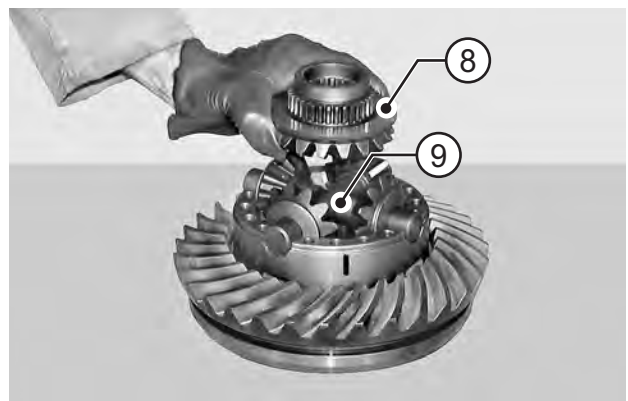


FIGURE 11: Fit the planetary gear set (9). Mount second planetary gear (8).

📌 NOTE:

Make sure that spherical thrust washers (15) are present.

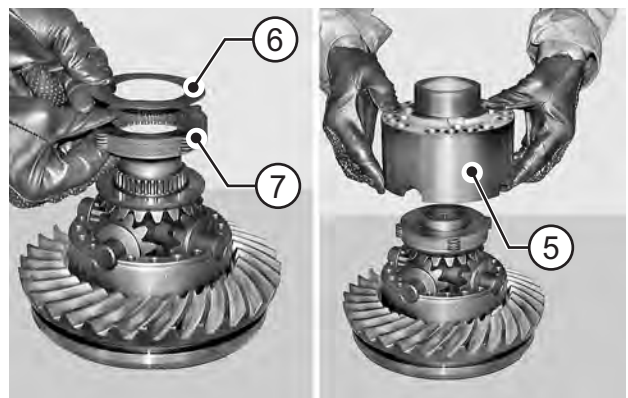
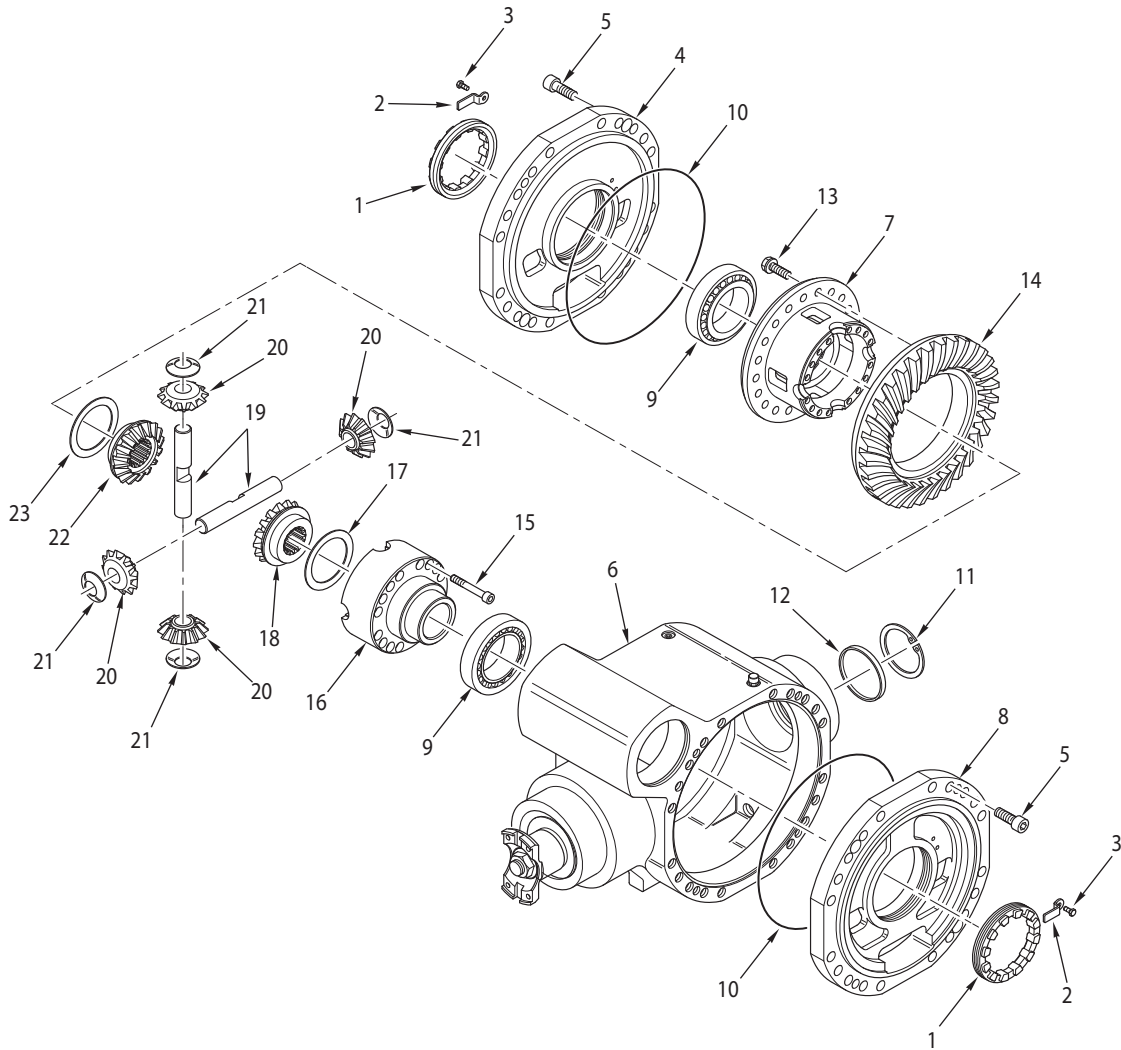


FIGURE 12: Fit increased shim (12), clutch pack (7), and shims (6) onto the crown wheel (8). Fit the upper half box (5) and make sure that the match marks line up. Complete the assembling operation and install the differential unit following the procedures described in the first part of the manual under section DIFFERENTIAL UNIT p. 47.

NORMAL DIFFERENTIAL UNIT

EXPLODED VIEW



DISASSEMBLY

DISASSEMBLY

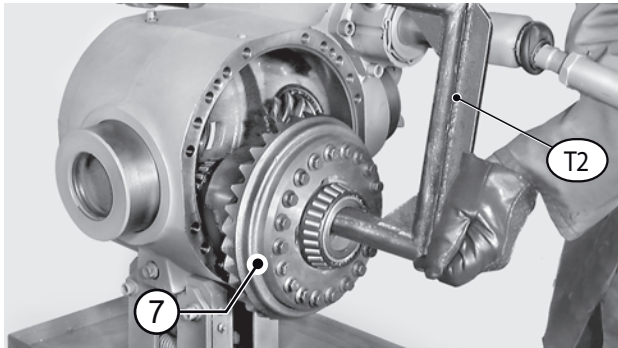


FIGURE 1: Remove the differential unit (7) and place it on a workbench.

NOTE:

Use the tool T2 (See drawing T2 p. 101) to ease removal.

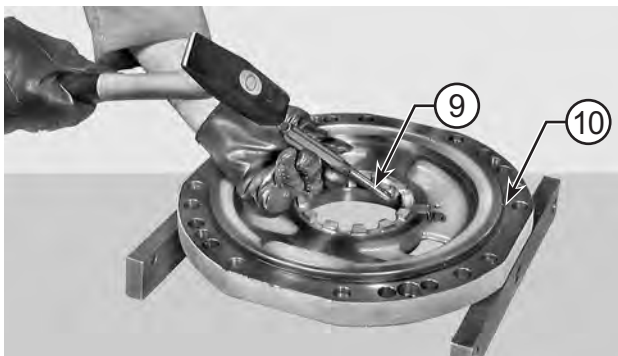


FIGURE 2: If bearings need replacing, remove the outer thrust blocks of bearings (9) from intermediate covers (4) and (8).

NOTE:

Carefully check the o-rings (10).

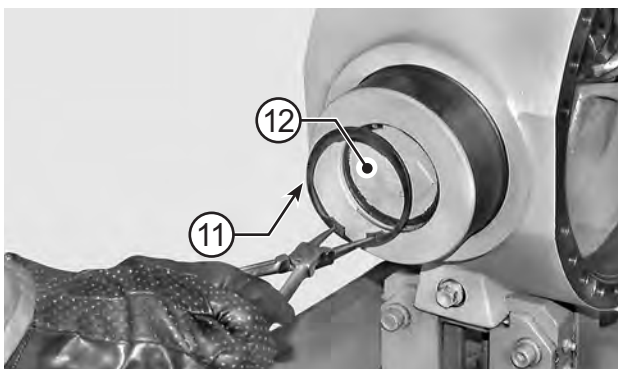


FIGURE 3: Remove snap ring (11) and cap (12).

NOTE:

Replace cap at each disassembly.

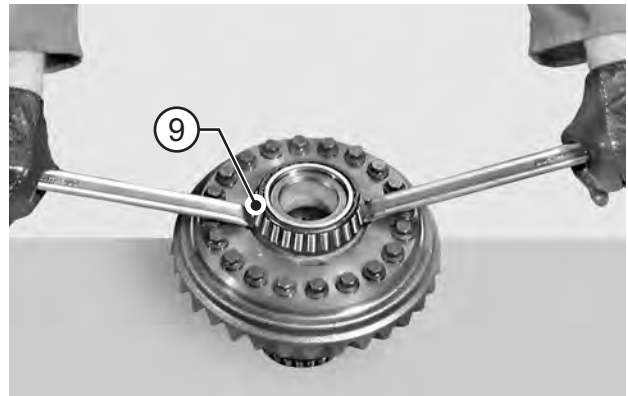


FIGURE 4: DISASSEMBLY

Using two levers, lift bearing (9) on ring gear side by about 8 mm.



FIGURE 5: Loosen and remove the check screws (13) of ring gear (14).

NOTE:

The screws must be replaced at each disassembly.



FIGURE 6: Remove the ring gear (14).

NOTE:

If necessary, use a plastic hammer.



FIGURE 7: Using a puller, remove bearings from ring gear (9) side.

NOTE:

Fit puller in connection with the slots provided.



FIGURE 8: Using a separator and a puller, remove bearing from non ring gear side.

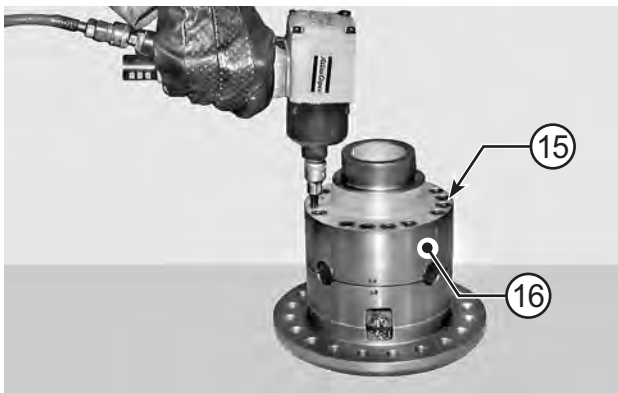


FIGURE 9: Loosen and remove check screws (15) from differential box (16).

NOTE:

The screws must be replaced at each disassembly.

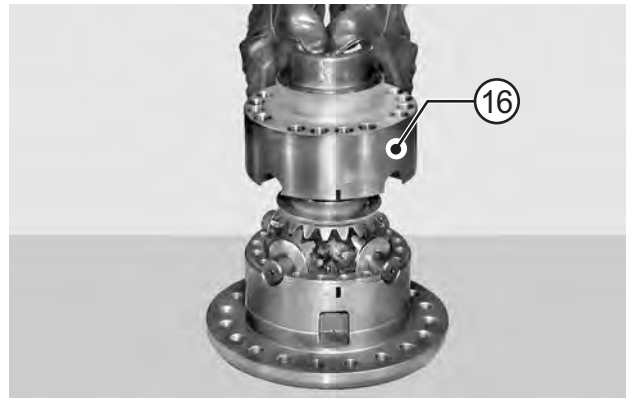


FIGURE 10: Remove half-box (16).

CAUTION

Write down reference marks for joining the two halves.

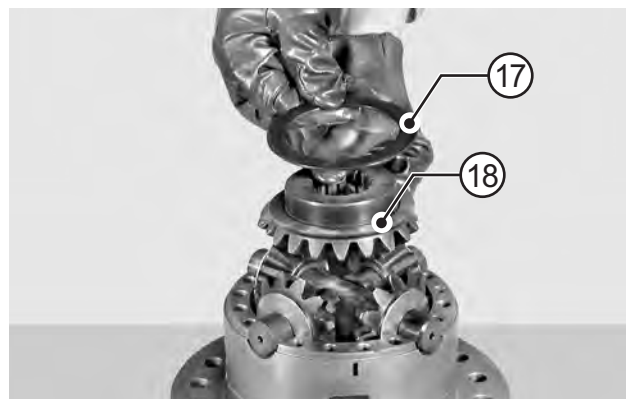


FIGURE 11: Remove shoulder (17) and first planetary gear (18).

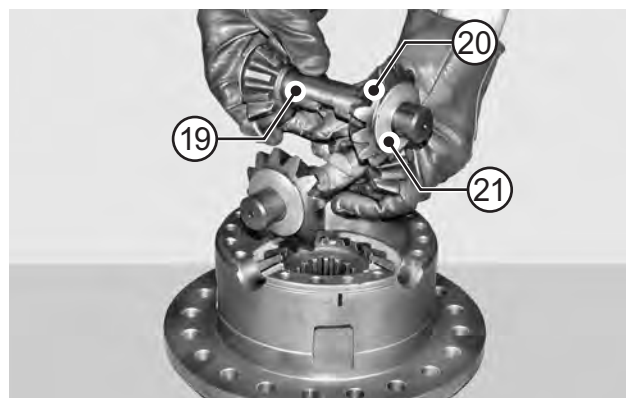


FIGURE 12: Remove shafts (19), complete with planetary gears (20) and spherical shoulder washers (21).

DISASSEMBLY

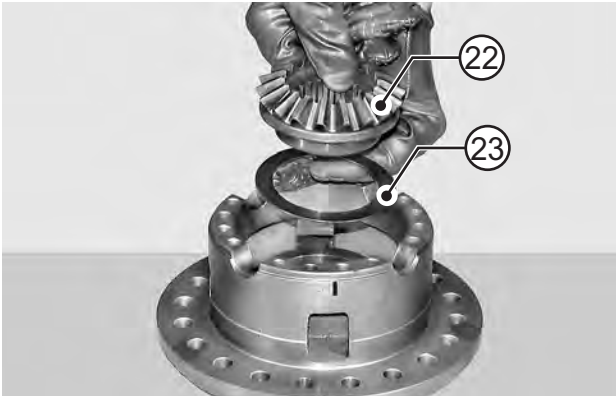


FIGURE 13: Remove the 2nd planetary gear (22) and shoulder shim (23).

ASSEMBLY

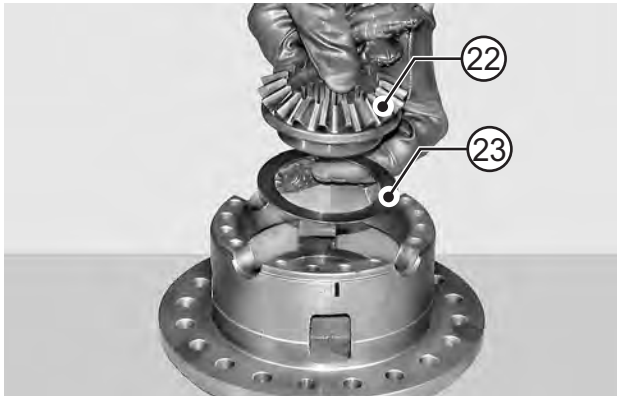


FIGURE 14: Install the shoulder shim (23) and planetary gear (22) into the half-box (7).

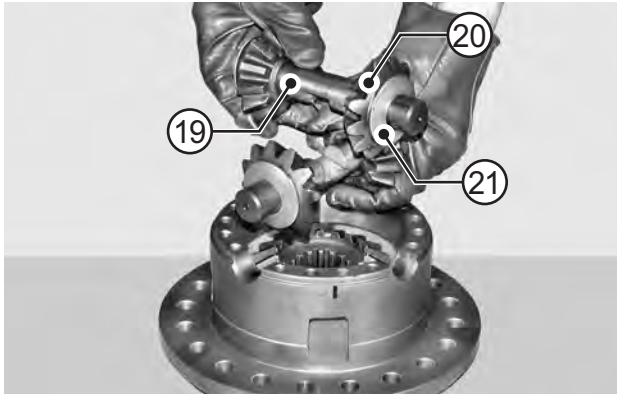


FIGURE 15: Install the planetary gears (20) and spherical shoulder washers (21) onto the shafts (19). Install the assemblies in the half-box (7).

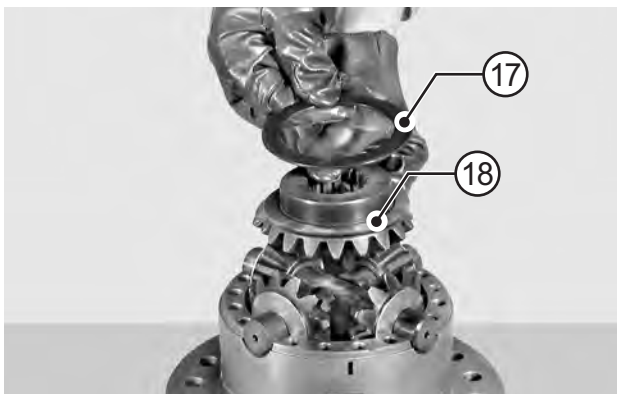


FIGURE 16: Install the planetary gear (18) and shoulder ring (17).

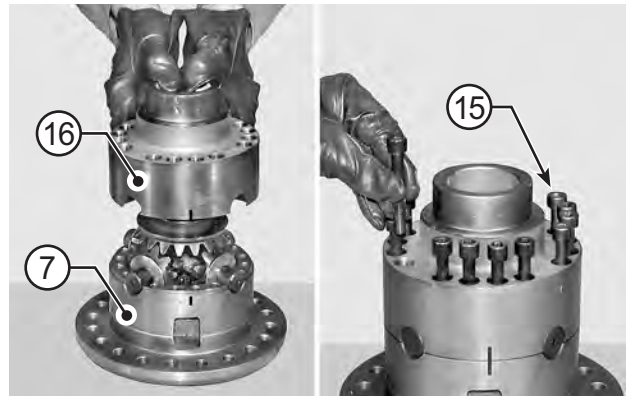


FIGURE 17: Mount the locking half-box (16) onto the half-box (7) and lock it with screws (15) coated with Loctite 270. Tighten by hand.

⚠ CAUTION

- 1 - The match marks on the two half-boxes must correspond.
- 2 - Use only new screws.

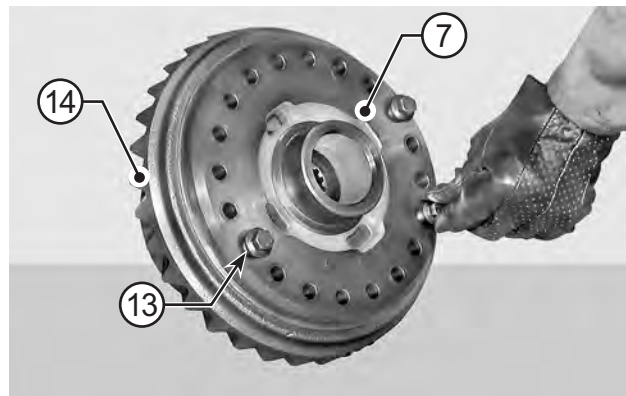


FIGURE 18: Mount the ring gear (14) and fasten it to the differential box (7) with screws (13) tightened provisionally by hand.

⚠ CAUTION

- Use only new screws.

ASSEMBLY

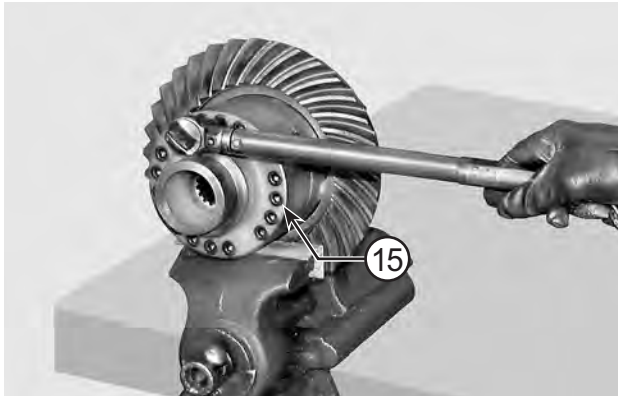


FIGURE 19: Fit the complete differential unit in a vice and tighten the screws (15) holding the two half boxes together to a torque of 71.5 - 78.5 N-m.

⚠ CAUTION

Tighten screws using the criss-cross method.

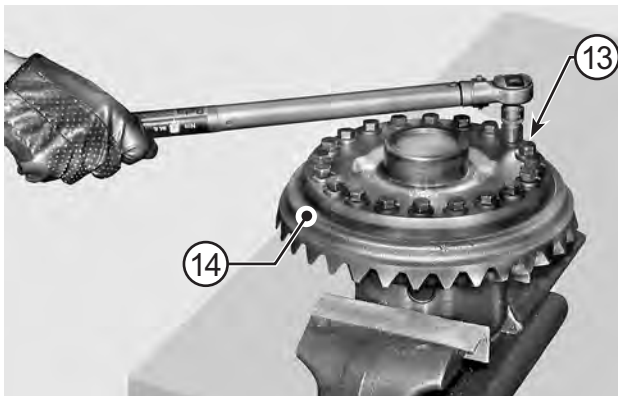


FIGURE 20: Lock the ring gear (14) by tightening the screws (13) to a torque of 115 - 142 N-m.

⚠ CAUTION

Use the alternate and criss-cross method.

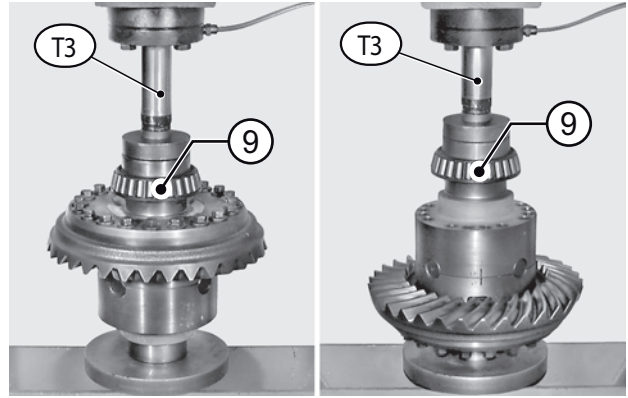


FIGURE 21: Position the differential unit under a press and fit it with bearings (9) using tool T3 (See drawing T3 p. 102).

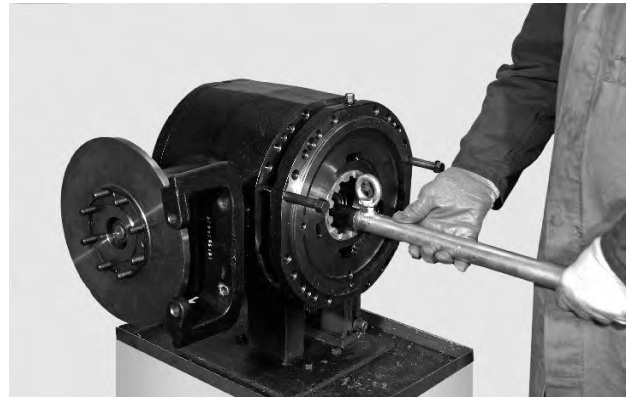


FIGURE 22: Re-install the differential unit and the intermediate cover.
For details, see DIFFERENTIAL UNIT p. 47.

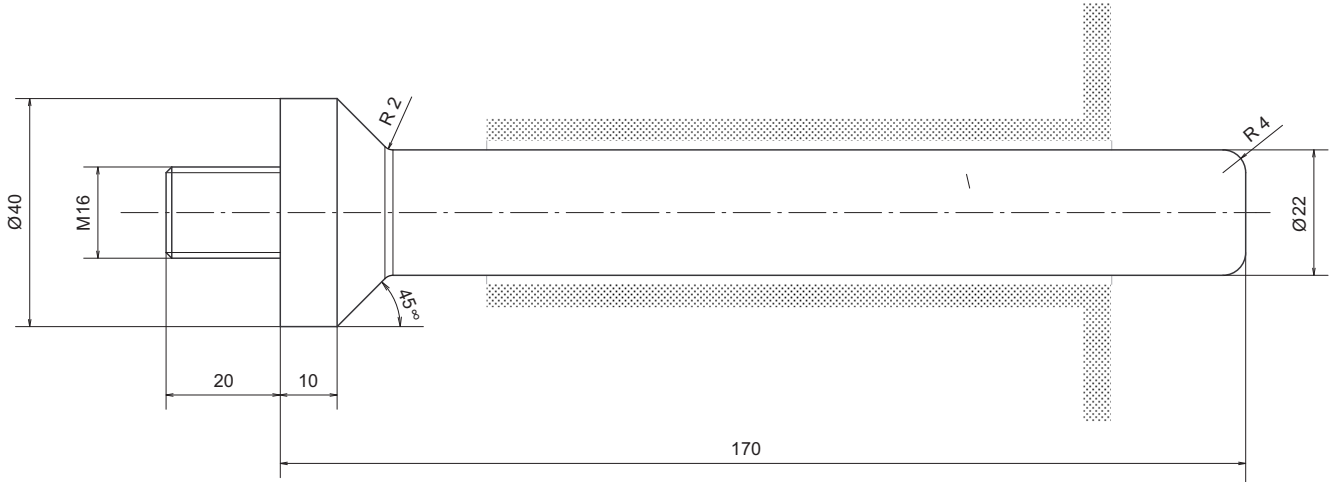
⚠ CAUTION

If the crown and pinion has been replaced, reinstate clearances.

SPECIAL TOOLS

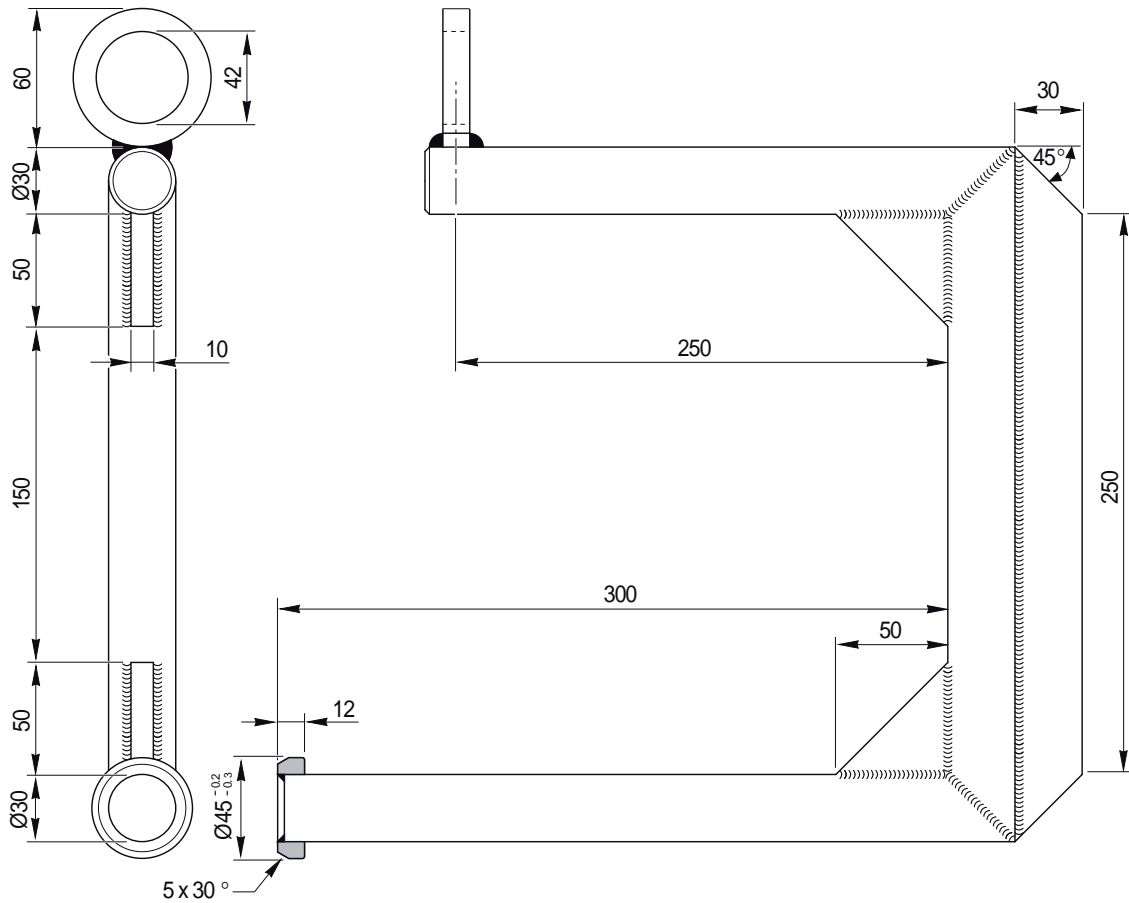
T1

P/N: 910.99.0001



T2

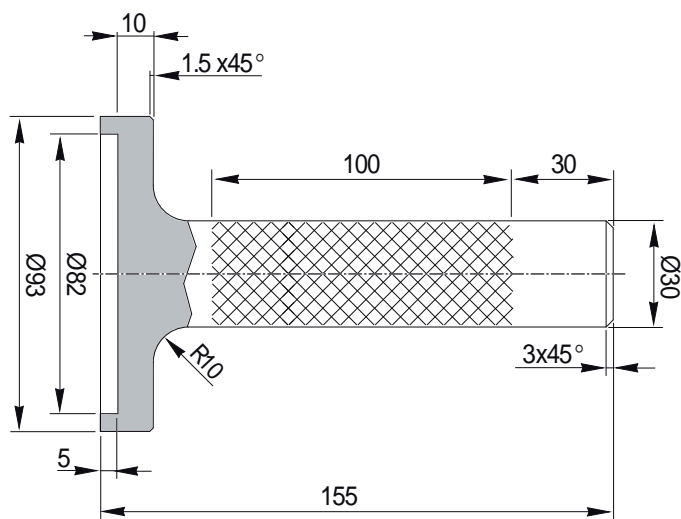
P/N: 2370



SPECIAL TOOLS

T3

P/N: 2371



© Copyright 2013 Dana Holding Corporation
All content is subject to copyright by Dana and may not be reproduced in whole or in part by any means, electronic or otherwise, without prior written approval.
THIS INFORMATION IS NOT INTENDED FOR SALE OR RESALE, AND THIS NOTICE MUST REMAIN ON ALL COPIES.

For product inquiries or support,
visit www.dana.com or call 419-887-6445
For other service publications,
visit www.SpicerParts.com/literature.asp
For online service parts ordering,
visit www.SpicerParts.com/order.asp



SPICER[®]
Off-Highway Products