MTMC 60 A - 1110

TWIN DISC

TECHNODRIVE

# TMC 60 A

## Service Manual

allpa
marine equipment

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# MARINE GEAR TMC 60 A
# INSTRUCTIONS FOR INSTALLATION, USE AND MAINTENANCE - SPARE PARTS.

## INTRODUCTION

- Prior to starting read and follow the instruction provided in this manual. Failure to do so will make warranty void.
- Twin Disc shall not be responsible for any demages caused by faulty installation, wrong handling or deficient maintenance.
- It is the responsibility of users to provide and install guards and safety devices wich may be required by recognized safety standards on the respective country.

## GENERAL INFORMATION

- TMC 60 A marine transmission is built with alloy steel, casehardened and hardened gears; the clutch-unit is a bronze double cone and the coupling device is mechanically servo controlled.
- The marine transmission unit may be coupled only to engines which turn anti-clockwise (as seen from the flywheel side).
- In forward speed, the output flange rotating direction is reversed with regard to the engine rotating direction.
- In ratios 2,00 and 2,45 the reverse ratio is 2,17.

## INSTALLATION

- The gearbox is supplied without oil. Therefore, prior to its starting, it must be filled up with ATF oil up to the maximum level marked by the dipstick.
- The connection between the engine and the reverse-gear unit must be carried out by means of a proper flexible coupling. Before carrying out the connection, protect the splined shaft by putting a layer of water-repellent grease on it.
- Carefully carry out the fitting between the reverse-gear output shaft and the propeller shaft avoiding misalignments.
- The reverse-gear unit may be installed with a maximum inclination of 15° with respect to the horizontal surface.
- The reverse-gear unit must be shifted by means of a single-lever flexible cable. During the installation of the control cable make sure that the cable neutral position corresponds to that of the reverse-gear unit lever and that the cable allows the reverse-gear control lever to complete the stroke both in forward and in reverse speed. The stroke of the lever between forward speed and reverse speed, must not be less than 60 mm (lever lower hole), 70 mm (upper hole).
- Make sure that the lever forward speed position corresponds to the acual advancement of the hull.

⚠ **Make certain that the control cable is easily movable.**

⚠ **Make sure that the control cable is able to perform the complete lever stroke both in forward and in reverse and that it is well positioned in neutral.**

## USE AND MAINTENANCE

- Employ only ATF oil; perform the first replacement after 30 working hours, then replace the oil every 500 working hours but at least once a year.
- Check the oil level weekly by means of the oil dipstick with the engine off.
- During continuous operations oil temperature must not exceed 90° C.
- The shifting from one speed to the other must be performed by pausing in the neutral lever position with the engine running at idle speed. A direct shift from the forward speed to the reverse speed without stopping in the neutral position is allowed only in case of emergency.
- When the boat is sailing (engine stopped), the gear lever must be in neutral position. Never put the gear lever in the position corresponding to the direction of travel of the boat.
- The clutch-unit is self-adjusting and, therefore, needs no adjustment.
- If, after using the reverse-gear unit for a long time, shifting (from forward speed to neutral or from reverse speed to neutral) becomes particularly difficult, it is advisable first to check the status of the control cable and of its relevant box. Then, if necessary, unlock the nut ref. 56 (spanner 13) and mantein the screw ref. 28 in its position with an alien wrench (4 mm.). Than rotate clockwise the screw ref. 28 by a 1/4 of turn and lock the nut ref. 56.
- If one or both clutches slip, it is necessary to check if the control cable runs the whole stroke needed to couple the reverse-gear unit (minimum 30 mm on each side in the lower hole and 35 mm on each side in the upper hole of the control ever). It is also critical that the neutral position of the reverse-gear unit must correspond to the neutral position of the

control cable. If the problem persists, it is necessary to disassemble the reverse-gear unit in order to check the status of clutch ref. 21. If the clutch shows signs of wear or burns on its cone-shaped surfaces or on the groove, it must be replaced. The cone-shaped surface on gears ref. 23 and 24 must also be checked; such surface must show no marks of burning or seizure end no material deposits coming from the clutch cone otherwise the gears must be replaced. In the case the clutch-unit alone is replaced, it is not necessary to disassemble adjusting shims ref. 5 and, therefore, bearings need not to be adjusted during assembly.

⚠ **The gearbox is supplied without oil. Before the first start-up it must be filled up to the maximum level marked on the dipstick. Use ATF oil.**

⚠ **Before to start the engine make sure that the gearbox is in neutral position.**

⚠ **The gearbox should only be shifted with the engine at idle speed so as to avoid that the gearbox or the coupling may be demaged.**

⚠ **Disassembly and assembly of the gearbox or of its parts is to be made by specialized technicians only.**

## GEARBOX DISASSEMBLY

⚠ **Disassembly and assembly of the gearbox or of its parts is to be made by specialized technicians only.**

In order to completely disassemble the reverse-gear unit, operate as follows:

- Remove the reverse-gear control unit by unscrewing M8 two nuts ref. 54 and extracting the whole unit (control lever ref. 16, cover ref. 2, shaft ref. 9, guide shoe ref. 20, screw ref. 28, nut ref. 56) carefully avoiding to drop guide shoe ref. 20 into the reverse-gear unit as it has no axial lock.
- Remove output flange ref. 25 from the reverse-gear unit by unscrewing nut ref. 17 and by extracting the flange from the shaft spline.
- Loosen fastening screws ref. 48, 49, 50 located between the box and the cover and, while holding the reverse-gear unit in a vertical position, gently, beat the head of output shaft ref. 11 with a copper hammer in order to separate the box from the cover.
- While the reverse-gear unit is open, remove input shaft ref. 12 together with bearing cones ref. 53 and the whole output shaft. Loosen screw ref. 55 which fastens the intermediate shaft to the reverse-gear cover and remove the whole intermediate shaft.
- In order to disassemble the clutch cone from the output shaft, extract all parts according to the following sequence: bearing ref. 53 located on the flange side, spacer ref. 7, gear ref. 23, pin housing cage ref. 37, bush ref. 29 spacer ref. 6 and clutch cone ref. 21.
- In order to complete the disassembly of the output shaft remove nut ref. 18 and extract, in the following order, bearing ref. 53, spacer ref. 7, gear ref. 24, pin housing cage ref. 37, bush ref. 29 and spacer ref. 6.
- Spacers ref. 5 are located between cover ref. 3 and bearing ref. 53; therefore, in order to remove them it is necessary to remove the cups of the taper roller bearings from their seats.
- Disassembly of intermediate gear ref. 22: straighten lock washer ref. 38 and unscrew ring nut ref. 27, extract gear ref. 22 towards the splined side of shaft ref. 10. Together with the gear also one of bearings ref. 52, distance ring ref. 4 and stop ring ref. 32 and the cup of the other bearing ref. 52 will come out.

## GEARBOX REASSEMBLY

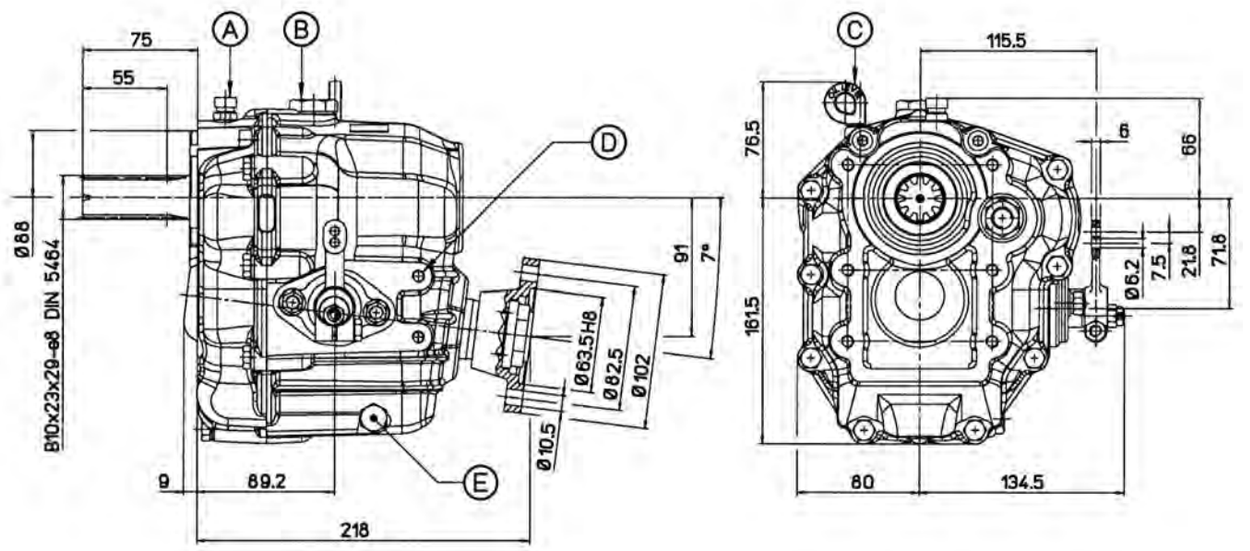
⚠ **Disassembly and assembly of the gearbox or of its parts is to be made by specialized technicians only.**

- *Output shaft unit assembly:* orderly assemble, starting from the end opposite the output flange, spacer ref. 6, bush ref. 29, cage ref. 37, gear ref. 24, spacer ref. 7, bearing cone ref. 53, nut ref. 18 (torque wrench setting 155 Nm). Tighten the stop nut in the appropriate place on the shaft. Insert clutch unit ref. 21 and moving toward the output flange end, assemble, in sequence, the following parts: ref. 6, 29, 37, 23, 7, 53.
- *Intermediate shaft unit assembly:* upon positioning stop ring ref. 32 and distance ring ref. 4 assemble the cups of the two bearings ref. 52 on gear ref. 22. Assemble the bearing cone on shaft ref. 10 making it close on the shoulder. Insert the gear on the shaft and assemble the last cone. Assemble lock washer ref. 38 and ring nut ref. 27 fastening the ring nut very tightly in order to move bearings ref. 52 to the correct position; loosen the ring nut until the gear can rotate smoothly, which corresponds to an adjustment leaving zero play of the bearing, and lock the ring nut into place by means of the lock washer.
- *Input shaft unit assembly:* the gears are enbloc with the shaft; therefore it is necessary only to assemble the cones of

bearings ref. 53.

- *Shafts assembly on cover:* place cover ref. 3 on a horizontal surface with the bearing seat upward and an opening which allows the protuding part of shaft ref. 12 and the spigot 88 mm to go through.
  Place bearing cups ref. 53 in the relevant cover seets. Insert both input and output shafts, which have been previously assembled, in the relevant positions. Insert pins ref. 47. Assemble the cups of bearings ref. 53 on box ref. 1. Close box ref. 1 using only three screws to fasten the box to its cover. Insert flange ref. 25 on the output shaft and lock it into place by means of nut ref. 17 (torque wrench setting 155 Nm). By means of a comparator measure the play end of both input and output shafts. Bearings will have to be shimmed using as many shims as required in order to build a preloading of 0,03 ± 0,02 mm. Shims must be inserted between the bearing cone and the reverse-gear cover seat; therefore, it is necessary to disassemble once again the output flange, the box, the shafts and the bearing cups located on the cover.
  Upon positioning all required shims, assemble the bearing cups on the box again, fasten the previously assembled intermediate shaft ref. 10 to cover ref. 3 by means of screw ref. 55 and of washer ref. 42, 44. Put sealing paste between the cover plate ref. 3 and the shaft ref. 10.
- Position the input and output shafts and close with box ref. 1 by inserting sealing paste into the connecting surface between the box and the cover and by tightening screws ref. 48, 49, 50.
  Assemble oil seals ref. 34 and 35. Insert flange ref. 25 on the output shaft spline, insert sealing paste and tighten the lock nut ref. 17 by a 155 Nm torque wrench setting and lock it.
- *Control unit assembly:* upon positioning spring ref. 8 on the stem of guide shoe ref. 20, insert it into the hole of drive shaft ref. 9. Guide shoe ref. 20 must be positioned with its beveled side upward (behind the v-shaped surface touching the clutch-unit). Insert the complete control unit (cover ref. 2, shaft ref. 9, spring ref. 8, guide shoe ref. 20) into the reverse-gear unit box making sure to maintain the guide shoe position described above and to avoid dropping the guide into the casing. Fasten both bolts ref. 54 and assemble control level ref. 16 fastening it by means of screw ref. 48.
- *Clutch control unit adjustment:* with the operating lever ref. 16 in neutral position, turn by hand the output flange ref. 25 and, at the same time, screw the adjusting screw ref. 28 with an alien wrench (4 mm) until the output flange rotation gets hard on a small arc only. Unscrew of 3/4 of turn the adjusting screw and fix it by locking the nut ref. 56.

## TMC 60 A - Dimensioni - Dimensions - Dimensions




(A) - Sfiato - Oil breather plug - Reniflard
(B) - Tappo carico olio - Filling plug - Bouchon de remplissage
(C) - Asta livello olio - Oil dipstick - Bouchon de niveau
(D) - Fori per staffa telecomando - Holes for control cables bracket - Trous pour bride télécommande
(E) - Tappo scarico olio - Oil drain plug - Bouchon de vidange

## Caratteristiche tecniche - Technical data - Caracteristiques tecniques

| RAPP. - RATIO - RAPP. | | POTENZA MAX MOTORE - INPUT RATINGS - PUISSANCE MAXI MOTEUR KW | | | | | |
|---|---|---|---|---|---|---|---|
| M.AVANTI FORWARD M. AVANT | RETROM. REVERSE M. ARRIERE | DIPORTO - PLEASURE - PLAISANCE | | INTERMEDIO-INTERMEDIATE-INTERMEDIAIRE | | CONTINUO - CONTINUOUS - CONTINU | |
| | | 3000 RPM | 3600 RPM | 2800 RPM | 3000 RPM | 1800 RPM | 2300 RPM |
| 2,00 | 2,17 | 41 | 49 | 32 | 35 | 17 | 22 |
| 2,45 | 2,17 | 41 | 49 | 32 | 35 | 17 | 22 |

Valocità massima motore - Max engine speed - Vitesse maxi moteur: 4500 Rpm
Potenza massima motore - Max engine power - Puissance maxi moteur: 52 Kw
La potenza in retromarcia è limitata al 33% di quella indicata.
Max power in reverse: 33% of listed ratings.
Puissance maxi en marche-arriere limitée au 33% de la puissance indiquée.

Peso a secco - Dry weight - Poids sans huile: 15 Kg
Quantità olio - Oil quantity - Quantité d'huile: 0,60 L.
Tipo di olio - Oil type - Type d'huile: ATF
Per la definizione dei tipi di servizio vedere "Tabelle di Potenza"
Duty classification definition: see "Marine Transmissions Capacity Table"
Definition du type de service: voire "Tableau des puissances"

## RICAMBI

Per ordinare i ricambi specificare il tipo di invertitore, il numero di serie, il rapporto, il numero di riferimento del disegno, la quantità.

## SPARE PARTS

When ordering spare parts specify the gearbox model, the serial number, ratio, reference number indicated on the drawing and desired quantity.

## PIÈCES D'ETACHÉES

Pour la commande de pièces d'étachées, veuillez spécifier le type de l'inverseur, le numéro de série, le rapport, le numéro de rep. du plan ainsi que la quantité.

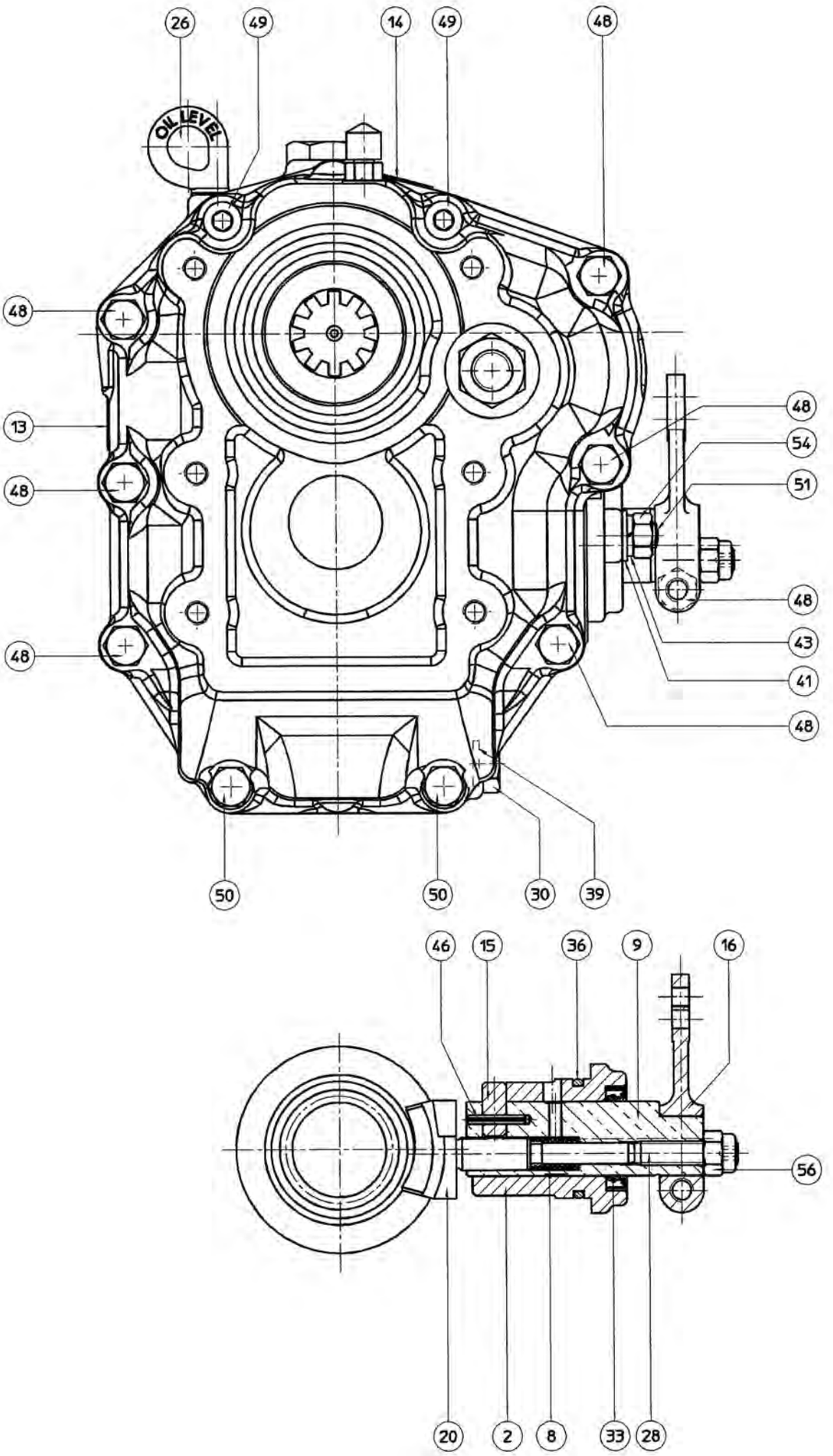
## ERSATZTEILE

Zum Bestellen von Ersatzteilen den Typ des Wendegetriebes, die Fabriknummer, die Untersetzung, die Bezugsnummer der Zeichnung und die Menge angeben.

## REPUESTOS

Para pedir los repuestos hay que especificar el tipo de inversor, el nùmero de serie, la relaciòn (ratio), el nùmero de referencia del dibujo y la cantidad.

| Rif. Ref | Denominazione Denomination | Quantità Quantity | Codice Code | Rif. Ref | Denominazione Denomination | Quantità Quantity | Codice Code |
|---|---|---|---|---|---|---|---|
| 1 | Scatola TMC 60-A - Housing | 1 | 2009169 | 28 | Vite - Screw | 1 | 4581013 |
| 2 | Coperchio laterale di comando - Cover | 1 | 2010251 | 29 | Anello interno - Cage | 2 | 4584023 |
| 3 | Coperchio TMC 60-A - Cover | 1 | 2010375 | 30 | Tappo - Plug | 1 | 4588030 |
| 4 | Spessore di registro - Shim | 2 | 2013145 | 31 | Tappo - Plug | 1 | 4588040 |
| 5 | Spessore di registro - Shim | 6 | 2013192 | 32 | Anello di fermo - Seeger | 1 | 4591013 |
| 6 | Rasamento interno - Spacer | 2 | 2013285 | 33 | Anello di tenuta - Oil seal | 1 | 4595083 |
| 7 | Rasamento esterno - Spacer | 2 | 2013509 | 34 | Anello di tenuta - Oil seal | 1 | 4595103 |
| 8 | Molla carico pattino - Spring | 1 | 2020068 | 35 | Anello di tenuta - Oil seal | 1 | 4595133 |
| 9 | Albero di comando - Shaft | 1 | 2021390 | 36 | Guarnizione OR - 'O' ring | 1 | 4598135 |
| 10 | Albero di rinvio - Intermediate shaft | 1 | 2021470 | 37 | Gabbia a rullini - Bearing | 2 | 4604015 |
| 11 | Albero secondario - Output shaft | 1 | 2021473 | 38 | Rosetta - Washer | 1 | 4608025 |
| 12 | Albero primario - Shaft R 2 | 1 | 2021622 | 39 | Rosetta - Washer | 2 | 4609011 |
| 12 | Albero primario - Shaft | 1 | 2021618 | 40 | Rosetta - Washer | 1 | 4609021 |
| 13 | Targhetta - Plate | 1 | 2028008 | 41 | Rosetta - Washer | 2 | 4610008 |
| 14 | Targhetta - OLIO ATF - Plate | 1 | 2028012 | 42 | Rosetta - Washer | 1 | 4610014 |
| 15 | Perno forato - Pin | 1 | 2035054 | 43 | Rosetta - Washer | 2 | 4611108 |
| 16 | Leva di comando - Lever | 1 | 2037036 | 44 | Rosetta - Washer | 1 | 4611114 |
| 17 | Dado di fissaggio - Nut | 1 | 2038024 | 45 | Rosetta - Washer | 10 | 4611208 |
| 18 | Dado fissaggio - Nut | 1 | 2038025 | 46 | Spina - Dowel pin | 1 | 4613034 |
| 19 | Tappo di sfiato - Breather | 1 | 2055032 | 47 | Spina - Dowel pin | 2 | 4614006 |
| 20 | Pattino di comando - Pad | 1 | 2056091 | 48 | Vite - Screw | 7 | 4615214 |
| 21 | Corpo frizione - Clutch | 1 | 2056128 | 49 | Vite - Screw | 2 | 4615215 |
| 22 | Ingranaggio rinvio - Gear | 1 | 2061709 | 50 | Vite - Screw | 2 | 4615232 |
| 23 | Ingranaggio secondario M. A. R. 2,45 - Gear | 1 | 2061717 | 51 | Prigioniero - Screw stud | 2 | 4617067 |
| 23 | Ingranaggio secondario M. A. R. 2 - Gear | 2 | 2061716 | 52 | Cuscinetto - Bearing | 2 | 4622015 |
| 24 | Ingranaggio secondario M. I. - Gear | 1 | 2061718 | 53 | Cuscinetto - Bearing | 4 | 4622036 |
| 25 | Flangia di uscita - Output flange | 1 | 2062191 | 54 | Dado - Nut | 2 | 4632008 |
| 26 | Asta livello olio - Gauge | 1 | 2071024 | 55 | Dado - Nut | 1 | 4632019 |
| 27 | Ghiera - Nut | 1 | 4579025 | 56 | Dado - Nut | 1 | 4634008 |



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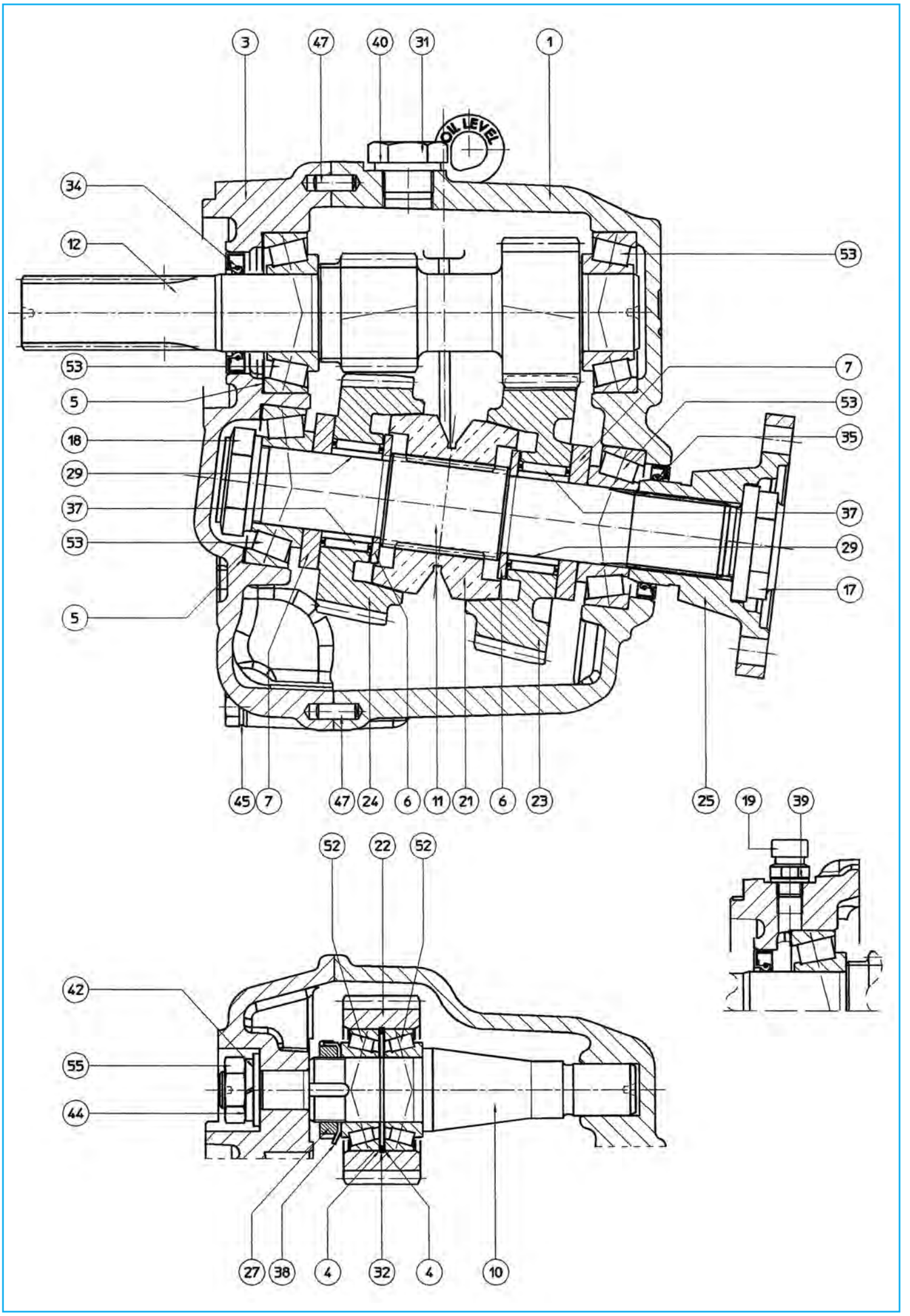




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