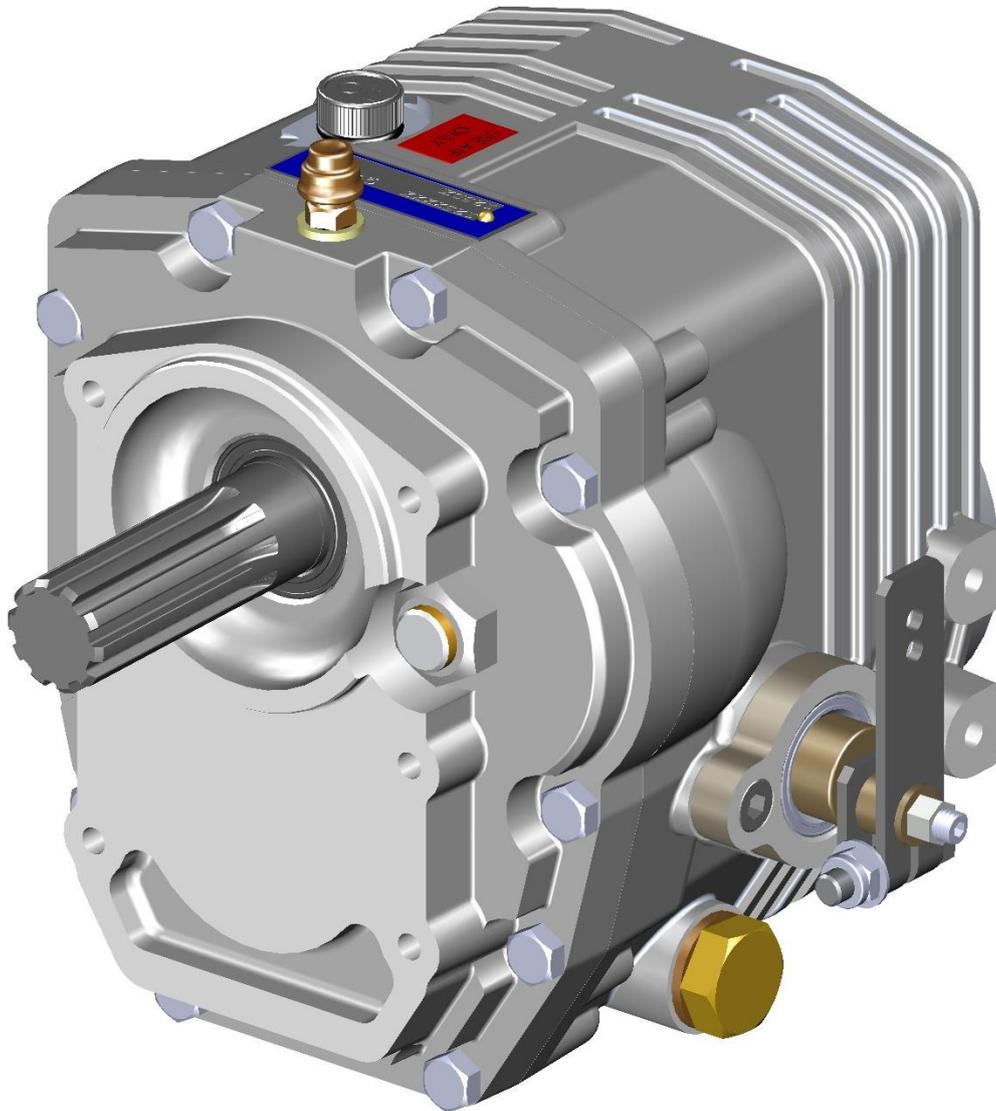


# PRM125D WORKSHOP MANUAL





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**PRM125D Manual**

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PRM Newage Ltd operates a policy of product improvement and therefore reserves the right to change specifications without prior notification. Whilst every effort is made to ensure complete accuracy of the information in this manual no liabilities for inaccuracies or the consequences thereof can be accepted by the manufacturer or the distributor who supplied the manual.

**The following international symbols are used in this service manual:**



**WARNING! THIS SYMBOL WARNS OF POSSIBLE PERSONAL INJURY**



**CAUTION! THIS SYMBOL WARNS OF POSSIBLE DAMAGE TO TRANSMISSION**

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## FOREWORD

Provided it is correctly installed, aligned and maintained, the PRM125D Gearbox should have a long and trouble-free life. This workshop manual contains important instructions to ensure that this is so, and it is of the utmost importance that these are carefully followed. PRM Newage Ltd. can accept no responsibility under warranty or otherwise for any loss or damage resulting from failure to observe these instructions.

To avoid prejudicing your rights under warranty, do not undertake any repair or other work on the Gearbox during the warranty period without first contacting PRM Newage Ltd. or an authorised distributor/dealer for advice. In the event of failure, you should do this via the engine distributor who supplied the Gearbox, or his local dealer; if this is not possible, you should notify the local Newage distributor/dealer or PRM Newage Ltd. direct, quoting the serial number.

## CLAIMS UNDER WARRANTY

Claims for replacement of parts under warranty must always be submitted with the Gearbox **serial number** to the distributor who supplied the Gearbox; if this is not possible, application may be made to the nearest distributor, who must, however, be advised of the supplier's name and address.

## SERVICE PARTS

The comprehensive illustrated parts list gives full information and ordering procedure.

## PRE-DELIVERY TEST

Before it leaves the factory, every Gearbox is subjected to a final test and inspection which includes the following:

1. Flush clean.
2. Pressurise the Case, and check for oil leaks.
3. Check drag torque in ahead, neutral and astern.
4. Run Gearbox in neutral, ahead and astern in load conditions.
5. Check force to engage and disengage ahead and astern Gear.
6. Check noise levels.
7. Check Output Nut torque.
8. Check Coupling concentricity.

## IDENTIFICATION PLATE INFORMATION

Every PRM Gearbox is fitted with an identification plate on the top half of the Gearcase before it leaves the factory; an example of such a plate is shown below.

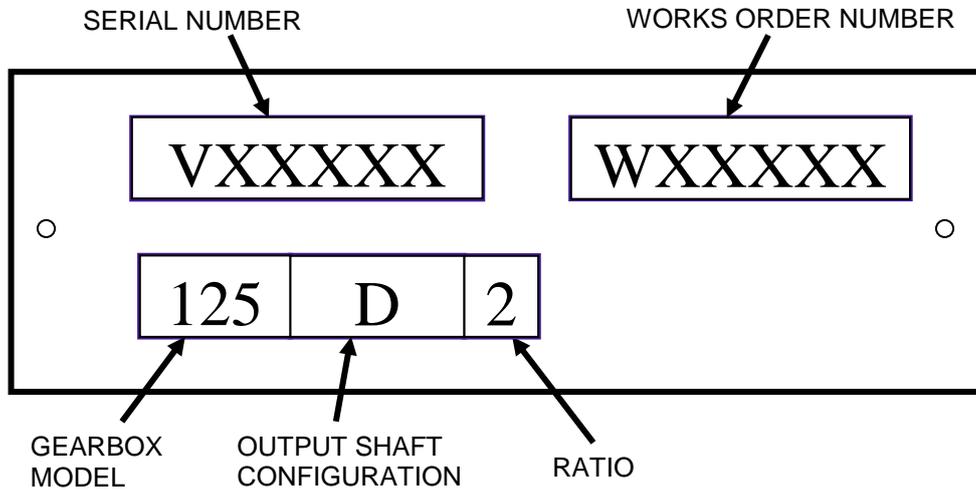


Figure 1 - Example of Serial Plate

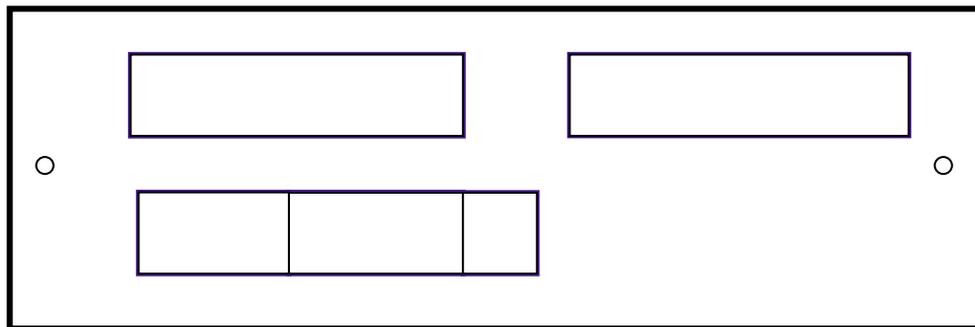
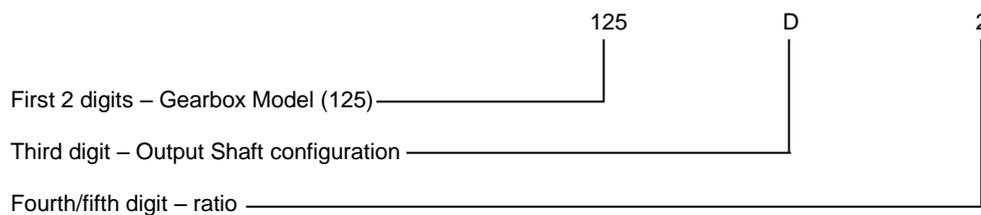


Figure 2 - Blank Serial Plate

Please complete the above box with serial number and specification of your own Gearbox.

It will be noted that there are two lines of numbers.

The top line is the Gearbox serial number, and should always be quoted when ordering spare parts; the lower line is the Gearbox specification, in the example given this translates as follows:-



**NOTE:** Throughout this manual, Engine, Gearbox and Propeller rotation are always described as seen looking forward from the propeller to the engine.

## SERVICE CLASSIFICATION DEFINITIONS

**PLEASURE** Limited to craft used exclusively for pleasure boating; operation at full engine throttle should not exceed 5% of total time, with balance of usage at 90% of full throttle engine speed, or less. Maximum operation 500 hours per year. The selection of PRM125D according to this classification for any commercial boat is not approved by PRM Newage Limited.

**LIGHT COMMERCIAL** PRM Newage Limited recommends that when considering the use of the PRM125D in boats of whatever hull form used in light commercial applications, and in displacement and semi-displacement hull boats for pleasure applications, these boats should be classed as light commercial duty and the Gearbox selected accordingly. Maximum operation – 2000 hours per year.

**IMPORTANT NOTE:** (1) It is essential for the engine, transmission model, reduction ratio and propeller size to be correctly matched so that the engine can attain its rated speed appropriate to the relevant service classification without labouring.

## 1. GENERAL DATA

### 1.1 Specifications

Gear ratios – ahead

2.04:1; 2.50:1; 2.94:1

Gear ratio – astern

2.50:1 – common

### POWER RATING

AHEAD RATIO	PLEASURE		LIGHT COMMERCIAL	
	BHP	kW	BHP	kW
2.04:1	1.75	1.31	0.95	0.71
2.50:1	1.39	1.04	0.95	0.71
2.94:1	1.15	0.86	0.80	0.60
Max. Input Power	70	52	48	36

**NOTE:** These powers are expressed in BHP and kW per rev/min engine speed, and are measured at the engine flywheel. Ratings have been established to ensure the long trouble-free life of the Gearbox which should not, therefore be used at powers in excess of those shown.

**Input speed:**

Maximum operating speed 5000 rev/min.

**Input rotation:**

For engines of left-hand (anti-clockwise) rotation as viewed looking on the flywheel from behind the engine.

**Output rotation:**

Right-hand (clockwise) in ahead direction. **IMPORTANT: RIGHT HAND PROPELLER REQUIRED.**

**Approximate dry weight:**

16 kg (35lb) excluding adaptor flange.

**Oil capacity:**

Approximately: 0.40 litres (0.7 pints).

**Working oil temperature:**

The normal operating temperature should be in the range 50°C to 95°C continuous.

**Engine Mounting Adaptors:**

Available in SAE4, SAE5 and Velvet Drive (Borg Warner).

**Input Drive Couplings:**

Flexible centre damper plate SAE 6.5" or SAE 7.5".

**Input Shaft:**

28.5mm diameter with 10 tooth spline to DIN5464.

**Propeller thrust:**

Ahead and astern thrust is carried by output shaft bearings of ample capacity for the approved rating.

**Output Flange:**

102mm diameter, with 4 holes 10.5mm diameter on 82.5 pitch circle diameter.

**Installation angle:**

The maximum fore and aft installation angle at rest is 15°.

## 2. INTRODUCTION

Prior to installation The PRM125D read and follow the instructions within this manual. Failure to do so will make the warranty void. PRM will not be responsible for poor installation, wrong handling or defficient maintainence. It is it is the responsibility of users to install guards and safety devices within maybe required by Health and Safety directives within different countries.

PRM Newage Limited. PRM125D marine transmission is a simple, lightweight, mechanically operated Gearbox for use in pleasure craft. Ahead and astern is selected by engaging a Cone Clutch which requires no adjustment. The PRM125D can only be installed onto engines that **rotate left hand (anti-clockwise)** as viewed when standing behind the Gearbox Output Coupling facing towards the engine flywheel.

## 3. CONSTRUCTION

### 3.1 Gearcase

The Gearcase is made from heavy duty Aluminium Alloy rigidly designed and externally ribbed for efficient heat dissipation. The case assembly comprises two halves vertically split to facilitate servicing.

### 3.2 Gear train

The helical Gear train is manufactured from high grade Steel with all Gears being case hardened for long life. All Shafts are supported on Taper Roller Bearings which are amply proportioned to absorb all the thrust from the Propeller.

## 4. OPERATION

### 4.1 Output Rotations

With the Control Lever in the mid, or neutral position no power is transmitted to the Propeller as the Cone Clutch is not engaged with either ahead or astern gears. Moving the Lever forward i.e. towards the Engine selects ahead, and rearwards i.e. towards the Propeller selects astern. In ahead the Output Shaft rotates in the opposite direction to the Input Shaft (which rotates as Engine). It is therefore necessary to fit a right hand Propeller.

### 4.2 Lubrication

All lubrication is supplied by internal splash with oil cooling being by radiation through the Gearbox case.

### 4.3 Approved oils and oil filling

The Gearbox is supplied direct to the distributor/ coustomer without oil and therefore prior to start up it must be filled with oil. Unscrew the Oil Level Plug located on the side of the Gearbox. Unscrew the Oil Filling Plug located on the top of the Gearbox. Fill the Gearbox with ATF DEXTRON II, III, or IV to GM specification or engineering approved equivalent until oil starts draining from the Level Hole. Refit the Oil Level Plug. Check the oil on the Dipstick. Refit the Oil Filler Plug. The oil is approximately 0.4 litres.



**CAUTION: Do not mix different brands, types or grade of oil.  
DO NOT OVERFILL THE GEARBOX AS THIS AFFECTS THE GEARBOX PERFORMANCE.**

## 5. INSTALLATION

### 5.1 General

Drive is transmitted from the Engine to the Gearbox via a flexible centre Drive Plate (damper plate) which bolts to the Engine Flywheel, the Gearbox Input Shaft is driven from the centre Spline.

These Drive Plates have a degree of torsional flexibility, the purpose being to reduce Engine torsional or cyclic vibrations and prevent them being passed to the transmission.

The strongest Engine vibrations are usually those caused by firing in the cylinders; diesel Engines which have high compression ratios, usually generate stronger vibration pulses than petrol (gasoline) Engines; and it is often the case that of two Engines of roughly equivalent size, the one having the greater number of cylinders will tend to run more smoothly than the one with fewer cylinders, although this is by no means always the case.

In all marine installations, correct alignment of the Engine, Gearbox and Propeller Shaft is extremely important – misalignment can cause noise, vibration and premature failure – and it is strongly recommended that all the procedures detailed in this manual are carefully followed.



**CAUTION:** It is particularly important to ensure the torsional compatibility of the complete propulsion system from Engine through to Propeller since disregarding this may result in Gear noise at low speed operation and in extreme cases damage or failure of components. PRM Newage Ltd. will provide all possible information and assistance to help find solutions to potential torsional problems, but it is the ultimate responsibility of the person assembling the drive and driven equipment to ensure that they are torsionally compatible.

### 5.2 Checking the engine Flywheel Housing

Attach a dial test indicator, calibrated in units of 0.025mm (0.001in.) or smaller, to the Flywheel so that the measuring stylus of the indicator is perpendicular to the bore of the Flywheel Housing (bore A on Fig.2). Rotate the Flywheel and check the deviation on the indicator over one complete revolution; this should not exceed 0.152mm (0.006in.) total indicator reading.

With the dial test indicator still attached to the Flywheel, re-position the stylus so that it is perpendicular to the face of the Flywheel Housing (face B on Fig. 2), Rotate the Flywheel and check the deviation over one complete revolution; again, this should not exceed 0.152mm (0.006in.) total indicator reading.

### 5.3 Checking the Engine Flywheel

Attach a dial test indicator, calibrated to 0.025mm (0.001in.) or less, to the engine Flywheel Housing so that the measuring stylus of the indicator is perpendicular to the bore of the register in the Flywheel (bore C on Fig. 3). Rotate the Flywheel through one complete revolution and note the deviation, this should not exceed 0.125mm (0.005in.) total indicator reading.

With the dial test indicator still attached to the Flywheel Housing, reposition the stylus so that it is perpendicular to the face of the Flywheel register (D on Fig. 3). Rotate the Flywheel through one complete revolution and note the deviation, this should not exceed 0.125mm (0.005in.) total indicator reading.

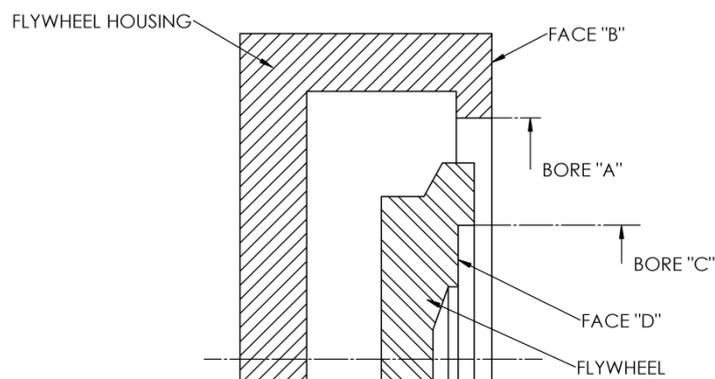


Figure 3 - Checking the Flywheel and Flywheel Housing

## BASIC INSTALLATION DETAILS – PRM125D

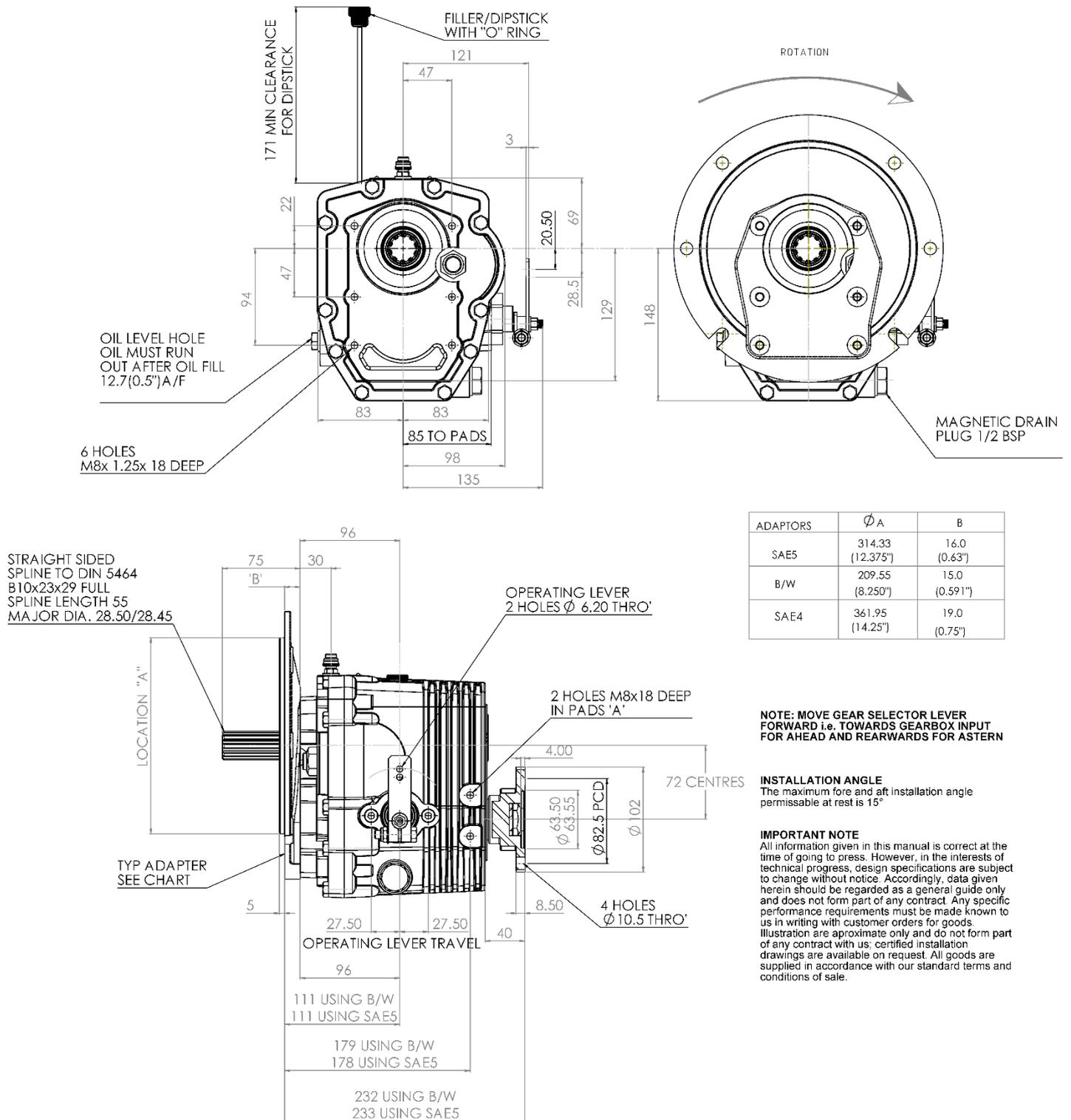
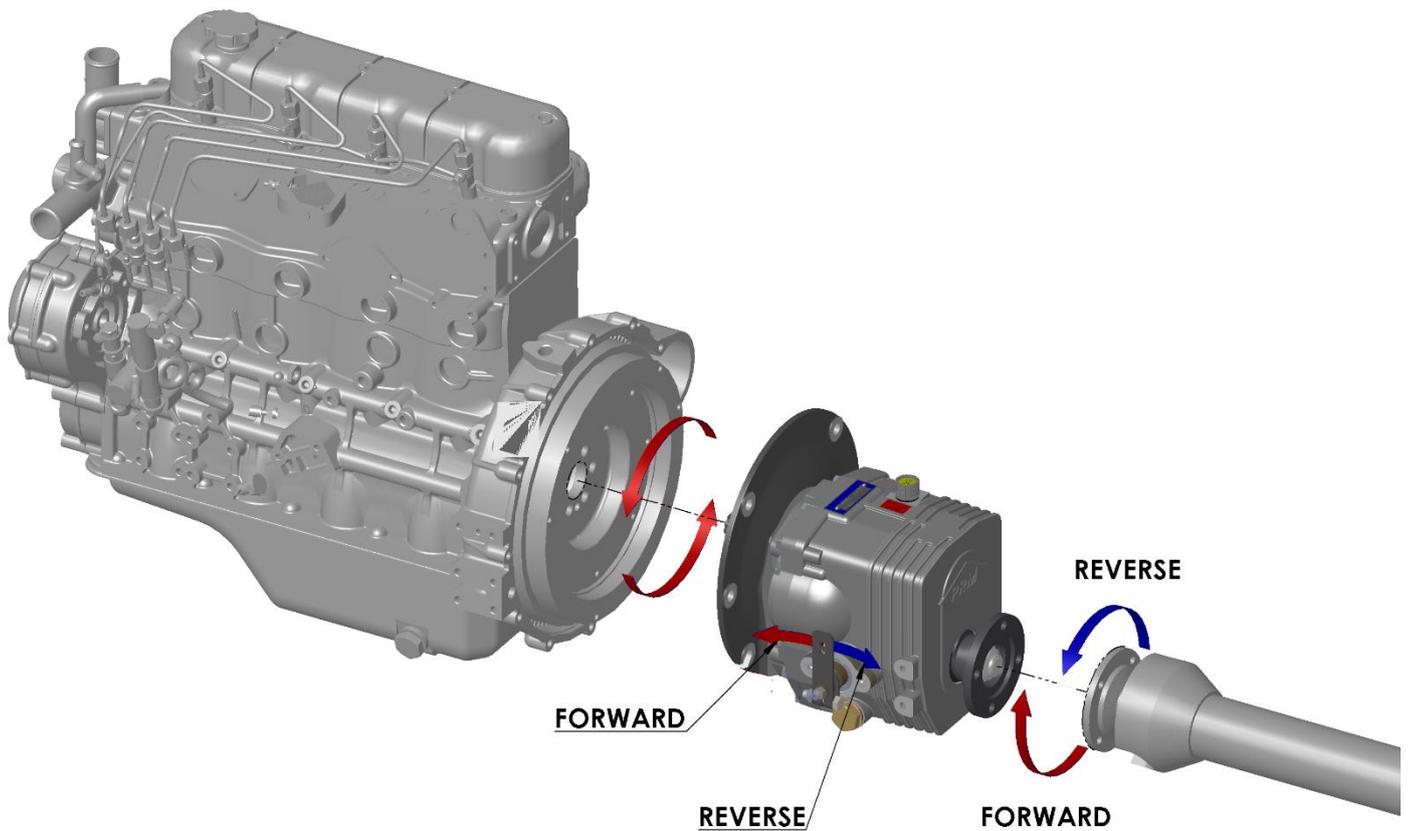


Figure 4 – Intallation Details



## 5.4 Mounting the Gearbox to the Engine

1. Mount the Drive Plate to the Flywheel, using an alignment mandrel if available, and bolt to the Flywheel. Where components to SAE standard are used, the outside diameter of the drive plate should be a close fit in the register on the Flywheel.

If a mandrel is not available, tighten the Bolts just sufficiently to prevent free movement, assemble the Gearbox to the Drive Plate and rotate the Engine two or three revolutions by hand to align the Plate.

Tighten up two or three opposite Bolts. Remove the Gearbox and fully tighten all the Drive Plate Bolts.

2. Apply a layer of water-repellent grease to the Input Shaft spline and then offer the Gearbox and Adaptor up to the Drive Plate and Flywheel Housing. Insert the Gearbox Input Shaft into the centre of the Drive Plate (it may be necessary to rock the Shaft slightly to ensure the Splines align). Press the assembly fully into position, align the holes in the Adaptor with those on the Flywheel Housing and tighten fully. See fastening torque chart 10.2.

## 5.5 Alignment to Propeller Shaft



**CAUTION:** Alignment between the Propeller Shaft and the Mating Flange on the Gearbox Output Shaft is extremely important since excessive vibration and stress may lead to premature failure if correct alignment is not achieved.

In the majority of boats whose hulls are rigid enough to prevent excessive flexing in heavy sea conditions, (which could cause the Engine and Transmission to shift relative to the Propeller Shaft), it is generally considered preferable to couple the Propeller Shaft direct to the Gearbox Output Flange by means of a rigid Coupling.

The two main conditions when a Flexible Coupling should be used are:

- a) in boats whose hulls are not sufficiently rigid to prevent the flexing referred to above,

b) in cases where the Engine is mounted on flexible mounts.

In both instances, the flexible coupling helps to isolate Engine vibration or other movement from the Propeller Shaft thus enabling correct alignment with the Propeller Shaft and stern tube to be maintained.

Whether a solid or flexible coupling is used, it is extremely important that the following points are carefully checked:

- i) the Coupling should be a tight press fit on the Shaft and the keyway accurately made to the correct size, and
- ii) the two halves of the Coupling should be carefully aligned. This should be done by bringing the two Flanges close enough together so that a feeler gauge can be used to check the vertical and horizontal alignment.
- iii) alignment should only be carried out with the boat afloat. The maximum permissible misalignment being 0.05mm.

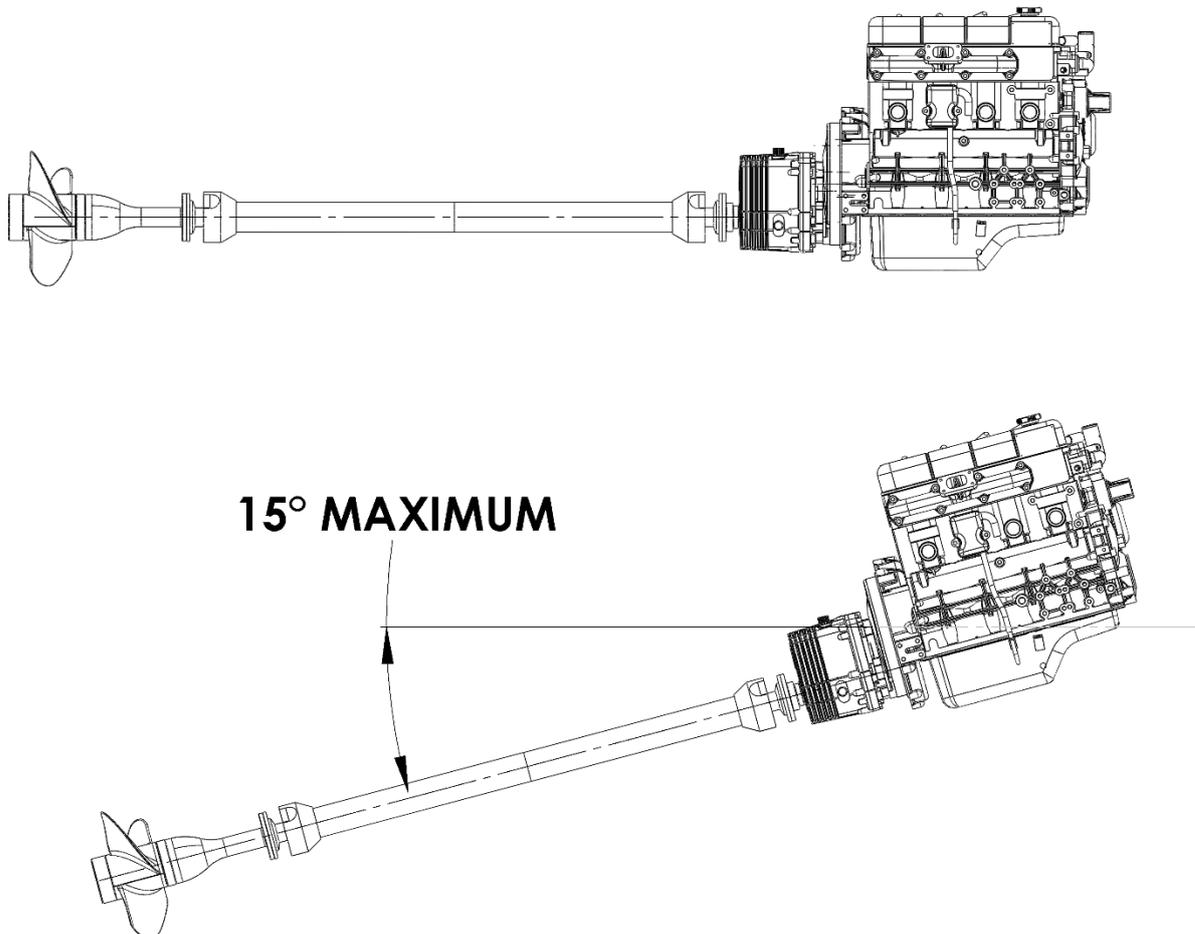
Since the Propeller Shaft line is normally fixed in the boat, alignment is usually obtained by adjusting Engine Mount Shims on the mount themselves.

NOTE: Whenever possible, the Engine and Gearbox should be installed whilst the hull is afloat, otherwise there is a danger of the hull distorting because of an insufficient support over its surface. If the Engine and Transmission are fitted before the hull is in water, the installation should be very carefully re-checked for alignment after launching.

In designing PRM125D, SAE standards were adhered to as far as possible. However, other manufacturers of similar sized Transmissions have a different, but common, Output Coupling Spigot, which is not to SAE. This Spigot size has become the industry standard and most proprietary flexible Output Couplings are made to suit.

## 5.6 Installation angle

The Transmissions should normally be installed so that the maximum fore and aft angle relative to the water line does not exceed 15° with the boat at rest. Please consult PRM Newage Ltd. if installation angles greater than this are required.



## 5.7 Remote control operating systems

The Engine must be at idle before changing direction, therefore the PRM125D should be used with remote control operating systems which must be of the single Lever type of remote control, i.e. Morse MT3 or SL3 which controls both the Engine Throttle and Gear selection. The stroke of the Lever between Forward and Reverse selection must not be less than 60mm lower hole and 70mm upper hole. Make sure the Lever Forward position corresponds to the Forward movement of the Vessel.

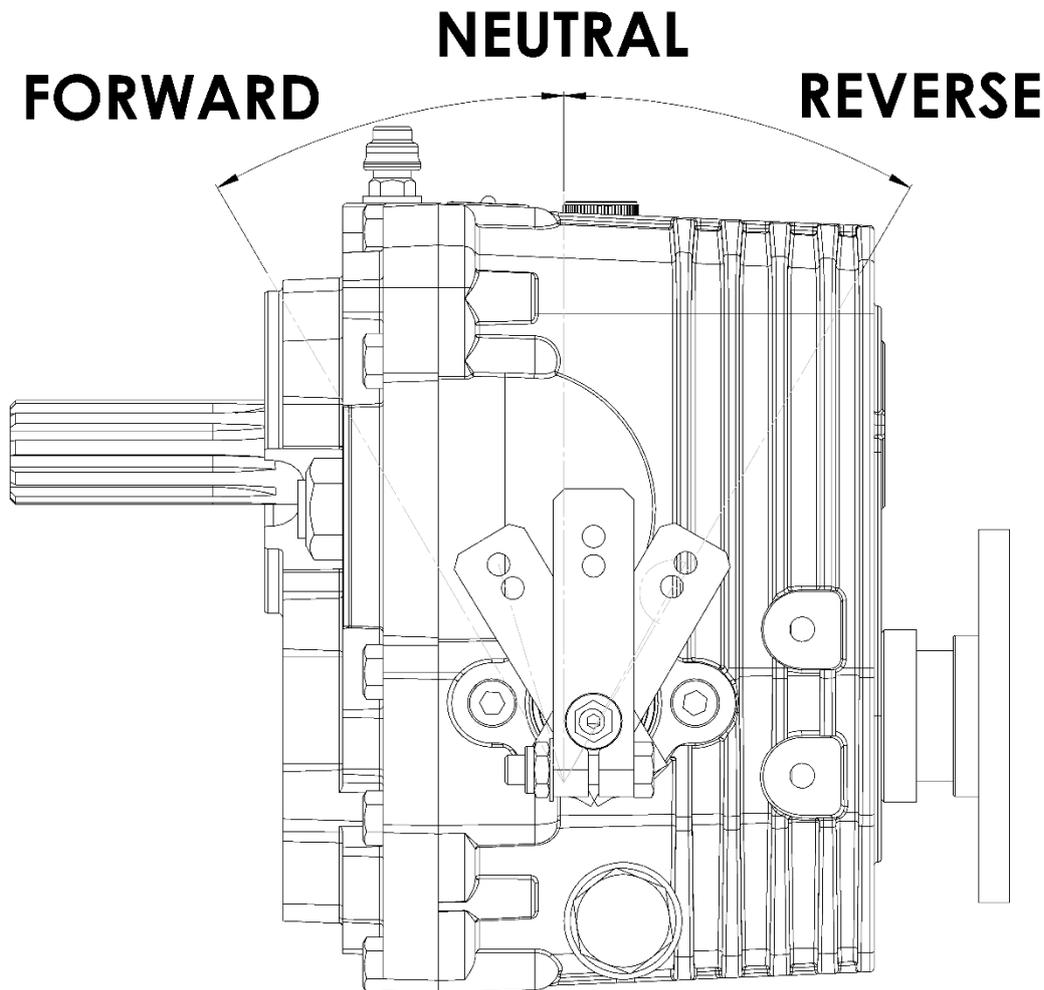
The following points should be noted:

i) The Gearbox operating Lever is provided with a positive neutral position, which greatly assists the setting up of the remote control unit.



ii) **CAUTION: CARE SHOULD BE TAKEN TO ENSURE THAT THE FLEXIBLE CABLE IS CAPABLE AND CAN MOVE THE GEARBOX LEVER FREELY TO THE FULL EXTENT OF ITS TRAVEL BOTH FORWARD AND BACKWARD AND THAT ITS NEUTRAL POSITION IS CORRECT FOR THIS TO TAKE PLACE.**

The control equipment should in all cases be connected in accordance with the manufacturer's recommendations.



## 6. OPERATION

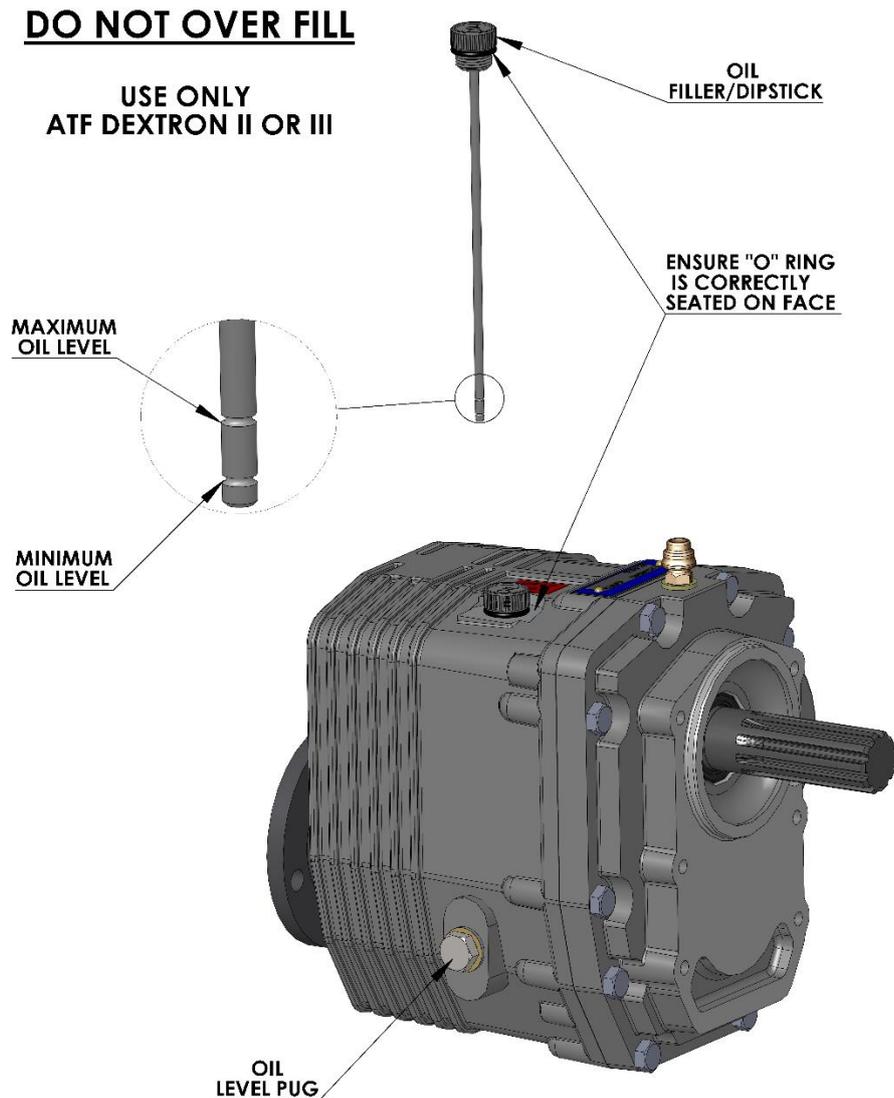
### 6.1 First time usage



**CAUTION:** Before starting the Engine fill the Gearbox to the correct level with a suitable oil (refer to recommended list, section 4.3).

Ensure the Gearbox is in neutral. Start and run the Engine for a short time so that the oil circulates through the Gearbox. Stop the Engine and allow the oil to settle for two minutes, re-check the level and top up to the marked oil level.

**NOTE:** The Dipstick should be secured firmly when checking the oil level.



### 6.2 Drive selection

The PRM125D has been designed to operate with proprietary single Lever control systems which decreases the Engine speed to idle before opposite Gear selection can be made. It is most important that when changing direction a short pause is taken in neutral at engine idle before selecting Gear. (see section 5.7)

### 6.3 Trailing (free wheeling) the Propeller

The Output Shaft can be rotated in neutral continually with the Engine shut down which makes the PRM125D particularly suited for use in auxiliary sailboats, sailing yachts etc. Never put the Lever in the position corresponding to the direction of the Vessel.

## **7. ROUTINE MAINTENANCE**

### **7.1 Initial maintenance (after 25 hours running)**

Drain all oil from the Gearbox, the Drain Plug is located on the side of the Transmission, below the Selector Lever. A 25.4mm (1.0") across flats spanner is required. Refit Drain Plug.

Refill with oil as stated in 4.3.

### **7.2 Daily checks**

Check the Gearbox oil level on Dipstick.

Visually inspect for oil leaks and general condition of the Gearbox.

### **7.3 Six monthly check**

Check the remote control operating linkage is accurately adjusted to give maximum travel (stop to stop) in both directions.

### **7.4 Annual check**

All above checks.

Propeller Shaft alignment inspection.

Change Gearbox oil and after 500 hours or annually which ever comes first.

### **7.5 Cone Clutch adjustment**

The Cone Clutch is self-adjusting and therefore needs no adjustment. Should Gear selection become difficult it is advisable to check the installation and operation of the Control Cable as described in 5.7. If this is correct then the Cone Clutch adjustment can be carried out as described in 9.7.6. If problems persist after the adjustment. It will be necessary to disassemble the Gearbox to investigate the condition of the Cone Clutch.

If the Cone Clutch shows signs of loss of coating, glazing and heat discoloration and the mating Gears shows signs of heavy groove indentations then the Cone Clutch and the Mating Gears must be replaced. If only the Gears are replaced then the adjustment of the Cone Clutch is not required. If the cone Clutch is replaced then adjustment needs to be carried out as described in 9.7.6.

## 8. FAULT FINDING

The following fault finding chart is designed to help diagnose some of the problems which might be encountered. It assumes that the installation and operating instructions in this manual have been followed and we advise that these are checked before proceeding to fault finding.

To avoid prejudicing warranty rights, no repair or other work should be done on the Gearbox during the warranty without first contacting PRM Newage Ltd. or an authorised distributor or dealer for advice.

**FAULT FINDING CHART**

SYMPTOM	CAUSE	REASON	REMEDY
No drive ahead or astern		Broken Drive Plate Broken Input Shaft Broken Output Shaft	Replace Drive Plate Replace Input Shaft Replace Output Shaft
Propeller speed does not increase with Engine speed, ahead and astern		Remote control Cable or linkage not allowing F-N-R Lever to move correct distance Too much oil within Gearbox	Remove cable and operate Lever by hand to check movement. Adjust cable if necessary Recheck oil level and adjust.
Propeller speed does not increase with Engine speed in one direction only		Damaged Clutch Cones Too much oil within Gearbox Incorrect Lever setting	Remove and examine Clutch and replace if necessary Reset lever to end stops Recheck oil level and adjust.
Excessive noise from Gearbox at low speeds	Engine idle speed set too low  Torsional vibration	Faulty adjustment  Torsional incompatibility of elements in driveline	Increase idling speed  If not cured by increasing Engine idling speed, refer to engine supplier
Excessive noise throughout operating range	Defective Input Coupling  Propeller Shaft misalignment	Input Coupling worn or damaged Hull flexing or faulty installation	Remove, examine and replace if necessary Check the alignment of the Propeller Shaft Coupling; if necessary rectify by adjusting the Shims under the Engine mounts or the Engine mounts themselves
Excessive vibration throughout operating range	Propeller out of balance  Engine/Gearbox misalignment  Defective Bearing	Propeller damaged or badly machined  Faulty installation  Bearing worn or damaged	Remove the Propeller and check that the pitch, weight, diameter and balance of all the blades are equal and rectify if necessary Remove the Transmission and check that the Flywheel face is flat and that the Flexible Input Coupling is aligned correctly Isolate defective Bearing, remove and replace
Excessive oil temperature	Power too high  Oil level too high/low	Incorrect Engine rating Incorrect oil type	Re-assess Engine power Fill with correct oil Fill to correct oil level on Dipstick
Oil level needs constant topping up	Oil leaks	Defective Oil Seal, Sealant or 'O' Ring	Clean the outside of the Gearcase, particularly around the ends of Shafts including the Output Shaft. Run the Engine and inspect the Gearbox for leaks. Replace seals as required
Escape of high pressure from Gearbox when Dipstick is removed	Defective Breather causing leaks past Oil Seals		Contact distributor or factory for advice
Difficulty in moving single Lever control	Faulty installation	Incorrect Selector adjustment  Remote control operating cable kinked or frayed	Re check adjustment see 9.7.6 for procedure Check the installation and eliminate all tight bends in the cable



**Warning:** Before carrying out any service work always ensure that the Engine is switched off and disconnect the operating cable from the Gearbox.



**Caution:** The above operations should be carried out by suitably qualified personnel and strictly in accordance with the procedures detailed in the workshop manual

## 9. SERVICING AND REPAIRS – GENERAL



**WARNING:** Before removal of the Gearbox for repair or overhaul carefully study the following procedures. Use proper hand tools, slings or hoists for the job – **WORK SAFELY**  
Keep all work areas, tools and Gearbox clean. Wipe up spilled oil fluids to prevent accidents. Wear correct safety equipment i.e. safety glasses and safety shoes to guard against personal injury.

Remember **WORK SAFELY – USE COMMON SENSE.**

Drawings showing all internal components are contained in the parts list.

### 9.1 Seals

Remove Oil Seals carefully to prevent damage if they are to be re-used, however it is best to replace these items.

### 9.2 Bearings

If removing Bearings for re-use keep them in a clean area to prevent dirt contamination.

### 9.3 Cleaning



**WARNING:** If using cleaning solvents these can be toxic, flammable, a skin irritant or give off harmful fumes. Avoid prolonged contact, vapour inhalation, or smoking. Failure to take care can result in injury or death.

Rinse all metal parts in solvent to remove dirt, grease and oil.  
Be careful to remove solvent from items before re-fitting.

### 9.4 Inspection

#### 9.4.1 Gearcase

Inspect for cracks. Check sealing surfaces for any scratches, damage etc. which will lead to oil leaks.

#### 9.4.2 Gears

Inspect for any chipped broken or cracked Gear teeth, also for any excessive wear, i.e. Gear pitting.

#### 9.4.3 Bearings

Inspect for any damage, pitting or over-heating.

#### 9.4.4 Threaded parts

Inspect for stripped or damaged threads.

### 9.5 Assembly



**CAUTION:** All threaded fasteners must be tightened to the torques listed in table 10.2, to prevent premature failure.

**CAUTION:** A new Drive Flange Nut (30) must be fitted if this is removed. Prior to assembly oil all internal parts with clean Gearbox oil.

### 9.6 Disassembly of Gearbox

Drain oil and remove Adaptor Plate. Hold Drive Flange (32) securely whilst removing Locknut (30) , carefully remove the “staked” portion of locking device so as to avoid damaging the thread of the Output Shaft (19).

#### 9.6.1 Selector assembly

Remove the Drive Flange (32). Remove the two Socked Head Cap Screws (42) securing Selector Housing (5) .  
Withdraw selector assembly ensuring Selector Shoe (9) and Spring (8) do not fall into the Gearbox.

### 9.6.2 Gearcase assembly

Remove the external Locknut (33) securing Idler Shaft (2) into Gearcase. Remove the ten Bolts (36) securing both Gearcases (1, 29) and using a soft mallet lightly tap on the end of the Input Shaft (4) to separate the two Gearcase (1, 29) halves from sealant and Dowels (44). Remove the Front Cover (29). Withdraw the Idler Shaft (2) the Output Shaft assembly and the Input Shaft (4).

### 9.6.3 Input Shaft

Using a bearing puller remove the two Bearings (25) ensuring the cups remain with their respective cones. Removal of the Bearings (25) may result in damage them, therefore it is good practice to replace these items if removed. (see 9.4.3)

### 9.6.4 Output Shaft

Carefully remove "staked" portion of locking device so as to avoid damaging the thread and remove Locknut (30) from Output Shaft (19). Using a bearing puller remove the Bearing (25) on the output end of the Output Shaft (19).

Remove the following: Thrust Washer (26), Gear (3), Needle Bearing (23) (carefully checking for wear), Thrust Washer (22) and Cone Clutch (21). Using puller remove the Bearing (25) cone on the Input end of the Shaft, Thrust Washer (26), Output Reverse Gear (20), Needle Bearing (23) (again carefully checking for wear), and Thrust Washer (22). Save Shims for rebuild.

Note: Removal of Taper Roller Bearings may result in damage, therefore it is good practice to replace these items if removed. (see 9.4.3)

### 9.6.5 Idler shaft

Remove Locknut (33) again carefully removing the stacked portion to avoid damaging the thread and supporting Gear (24) on soft material i.e. wood or similar to prevent damage to Gear (24), using a soft mallet tap the Idler Shaft (2) through the Gear (24) and remove the Bearing (28) cone. Check condition of the 'O' Ring (49) on the Idler Shaft (2).

### 9.6.6 Selector

By hand remove Selector Shoe (9) and the Spring (8). Remove the Lever (13). Pass the Selector Control Body (7) through the Selector Housing (5) and remove 'O' Ring (12) and Oil Seal (6) if replacing them.

### 9.6.7 Front Cover

If it is required to replace the Front Cover (29) then it will be necessary to remove the Oil Seal (34) and Breather (37). If the Bearings (25) are to be re-used then care must be taken not to damage them on removal. The bearing cups can be removed with the aid of two levers. It is recommended to fit a new Oil Seal (34).

Note: When re-fitting Oil Seal (34) set in 1.5mm from face as shown on page 18.

### 9.6.8 Gearcase

If it is required to replace the Gearcase (1) then again if the Bearings (25) are to be re-used care must be taken in their removal. Remove Output Seal (31), Dipstick (39), Drain Plug (46), Filler Plug (46), Level Plug (47) and the two Dowels (44).

## 9.7 Re-assembly of gearbox

(Note: coat all bearings with clean gearbox oil prior to fitting).

### 9.7.1 Input Shaft

Press the two Bearings (25) onto the Input Shaft (4) taking care to position correctly as illustrated.

### 9.7.2 Output Shaft (see 9.7.5 for shimming procedure)

All of the following components are fitted over the Output Spline end of the Shaft.

Large bore Thrust Washer (26), Needle Bearing (23), Output Forward Gear (3) with Cone towards the scroll, small bore Thrust Washer (22) and the Bearing Cone (25) (Press on).

Fit the following components from the opposite end of the Shaft (19).

The Cone Clutch (21), large bore Thrust Washer (22), Needle Bearing (23), Output Reverse Gear (20), small bore Thrust Washer (26) press on Bearing cone (25) re-shim if components have been changed (see 9.7.5) fit Locknut (30).



**CAUTION: Remember to tighten Locknuts to recommended torque.  
(SEE TORQUE CHART 10.2)**

### 9.7.3 Idler Shaft

Slide on Bearing cone (28) so that it abuts fully against the Idler Shaft (2) shoulder as shown on the drawing. Fit the internal Spring Ring (27) into the groove of the Idler Gear (24) bore and press the two Bearing cups (28) (back to back) into the Idler Gear (24) bore upto the Internal Spring Ring (27). Assemble the Idler Gear (24) onto the Bearing cone (28), slide the second Bearing onto the Idler Shaft (2) taking care to support it under the shoulder not to the threaded end as this could be damaged. Fit the 'O' Ring (49) and Locknut (33) and tighten to recommended torque (see torque chart 10.2)

### 9.7.4 Selector housing assembly

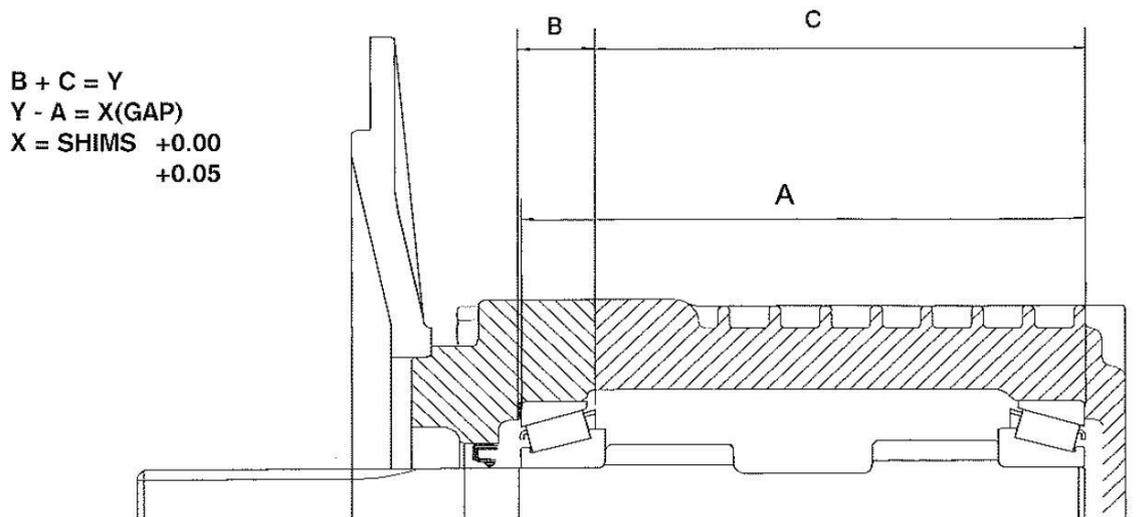
\* Before proceeding with this assembly see shimming procedure 9.7.6.

Press in Oil Seal (6) flush to the face of Selector Housing (5) . Using tool number PR29418 insert into seal to expand it whilst assembling Selector Body (7) into the Selector Housing (5) . This will displace the tool and allow the Control Body (7) to slide through the Seal (6). Fit the 'O' Ring (12) to Selector Housing (5) and smear grease onto the 'O' Ring (12), insert Spring (8) and Selector Shoe (9) into Selector Housing (5).

### 9.7.5 Shimming

Both the Input and Output Shaft Bearings must be shimmed 0-0.05mm pre-load. This is achieved as follows:

- |   |               |
|---|---------------|
| 1. Measure Shaft over the Bearing cups.   | Dimension A   |
| 2. Measure Gearcase bore depth to joint face.   | Dimension C   |
| 3. Measure Front Cover bore depth to joint face.  | Dimension B   |
| 4. Add cover and case bore depths to give "bore face lengths".                              | Dimension Y   |
| 5. Subtract bore face lengths from Shaft lengths over Bearings to achieve shim requirement. | Dimension Y-A |
| 6. Fit shims as required to within zero to 0.05mm pre-load.                                 |               |



Place the Shims into the appropriate bore of the Front Cover (29) so that they are located under the Bearing cups (25).

Fit the remaining Bearing cups (25) into the Gearcase (1) bores. Locate both Input and Idler shaft assemblies into bearings. Fit the two dowels (44) and apply silicon sealant to the joint face.

Assemble the Front Cover (29) ensuring Dowels (44) are correctly located and fit 10 bolts (36) tightening to the recommended torque. (see torque chart 10.2)

Fit Locknut (33) to the Idler Shaft (2), tighten to the recommended torque (see torque chart 10.2).

Move the Cone Clutch (21) to the neutral position and locate the Selector Shoe (9) into the groove of the Cone Clutch (21), ensuring the identification pip of the Selector Shoe (9) is uppermost.

Fit the two Cap Bolts (42) and tighten to the recommended torque (see torque chart 10.2). Secure Gear Selector Lever (13) to the Selector Body (7) using Bolt (14), Washer (16) and Nut (15). Fit Oil Seal (6) to Gearcase bore and Oil Seal (34) to the Front Cover (29). Assemble the Output Coupling (32) to the Output Shaft (19).

Apply a continuous bead of silicone sealant to the flat face of the Locknut (30) and hydraulic sealant to threads of the Shaft (19). Fit the Locknut (30).



**CAUTION: Remember to tighten Locknut to the recommended torque and stake the Nut into slot. When using sealants and locking compounds all surfaces should first be cleaned by degreasing.**

Fit Drain Plug (46) to the side of the Gearcase (1). Fit Dipstick (39) and Breather (37) and Sealing Washers (48, 38, 45). Finally adjust the Gear Selector Lever (13) into the required position.

### 9.7.6 Cone Clutch Selection

With the Selector Lever (13) in neutral position manually rotate the Output Flange (32). The eccentricity of Cone Clutch (21) groove causes an axial shift on the Selector Shoe (9). The variable distance between the end of the Selector Shoe (9) and the Output Shaft (19) vertical centre line upon rotation provides MAX & MIN axial movement of the Selector Shoe (9). With no further rotation of the Output Flange (32), screw the Dog Point Grub Screw (17) until contact is made with the bottom of the Selector Shoe (9). Fit the Nut (18) upto Selector Body (5), **not** allowing any rotation of the Dog Point Grub Screw (17). Unscrew the Dog Point Grub Screw (17) simultaneously with the Nut (18) attached until a 0.60mm gap is achieved between the Nut (18) and the Selector Body (7). With no further movement of the Dog Point Grub Screw (17) tighten the Nut (18) against the Selector Body (7) to 17 Nm (13lbf). This will give 0.60mm clearance between the bottom of the Selector Shoe (9) and the Dog Point Grub Screw (17) at max cone eccentricity.



**CAUTION:** This condition can only be maintained with the clutch at the top dead centre. If this is not achieved the gear selection will be affected, creating difficulty in gear engagement or disengagement.

## 10. SPECIAL TOOLS

Oil Seal to Selector Housing	PR29418
Oil Seal to Gearcase	PR29281
Oil Seal to Front cover	PR29283

### 10.1 Tool Kit

Socket size	13mm
	24mm
	30mm
Drain Plug	1" A/F

### 10.2 Tightening torques

RECOMMENDED TIGHTENING TORQUES			
Size	Grade	Type	Nm
M8	8.8	Nut	24
M8	8.8	Screw	30
M16	8.8	Binx Nut	56
M20	8.8	Special Nut	205
		Staked Nut Idler	1.7

## 11. REPLACEMENT PARTS ORDERING

When ordering replacement parts the following should be quoted:

- Gearbox model and serial number
- Description(s) and part number(s) of the component(s) required
- Quantity required
- Orders and enquiries for replacement parts must be made through PRM Newage distributor/dealer network

**NOTE:** Enquiries relating to a technical or service nature can be made direct to:

**PRM NEWAGE LTD.  
BARLOW ROAD  
COVENTRY CV2 2LD  
ENGLAND**

**TEL: +44 (0)24 7661 7141  
FAX: +44 (0)24 7661 1845**

## 12.PARTS LIST

ITEM NO.	Part No	Description	QTY.
1	MT8620	GEARCASE	1
2	MT8088	IDLER SHAFT	1
3	MT8410, MT8408, MT8412	FORWARD GEAR 2:1, 2.5:1, 3:1	1
4	MT8411, MT8409, MT8413	INPUT SHAFT 2:1, 2.5:1, 3:1	1
5	MT8673	SELECTOR HOUSING	1
6	0400255	OIL SEAL	1
7	MT8102	SELECTOR BODY	1
8	0311042	SPRING	1
9	MT8103	SELECTOR SHOE	1
10	MT8104	SELECTOR PIN	1
11	010-0210	SPRING DOWEL	1
12	04303524	O' RING	1
13	MT8100	SELECTOR LEVER	1
14	0040810 ZP	BOLT	1
15	0050806 ZP	NUT	1
16	0191007 ZP	WASHER	1
17	014DL535	DOG POINT SET SCREW	1
18	0050810	NUT	1
19	MT8089	OUTPUT SHAFT	1
20	MT8407	REVERSE GEAR	1
21	MT8098 MT8661	CONE CLUTCH	1
22	MT8096	WASHER	2
23	0563201	NEEDLE BEARING	2
24	MT8406	IDLER GEAR	1
25	001-0270	BEARING	4
26	0672801	THRUST WASHER	2
27	0320470	INTERNAL SPRING RING	1
28	0540252	BEARING	2
29	MT8621	FRONT COVER	1
30	MT8095	BINX NUT	3
31	0400407	OIL SEAL	1
32	MT8099	OUTPUT COUPLING	1
33	0051610	M16 BINX NUT	1
34	0400286	OIL SEAL	1
35	125D Serial Plate	SERIAL PLATE	1
36	0040810ZP	M8x35 BOLT	10
37	CP1486	RED LABEL	1
38	0081420 P	CAP BOLT	2
39	0970155	3/8 BSP FILLER/DIPSTICK	1
40	CP1003	SERIAL PLATE PINS	2
41	0210815	DOWEL	2
42	CP1204	SEALING WASHER	1
43	CP1331	½ BSP MAGNETIC DRAIN PLUG	1
44	0150125	¼ BSP LEVEL PLUG	1
45	0201714	SEALING WASHER	1
46	04301416	IDLER SHAFT 'O' RING	1
47	CP1488	BEATHER VALVE 1/8" BSP	1
48	CP1224	SEALING WASHER 1/8" BSP	1
<b>Optional Parts</b>			
4	MT8592	INPUT SHAFT 2:1 (120DA2)	1
4	MT8595	INPUT SHAFT 2.5:1 (120DA2.5)	1
4	MT8593	INPUT SHAFT 3:1 (120DA3)	1
32	MT8594	OUTPUT COUPLING DIN 90	1

### 13. Exploded view and Cross- section

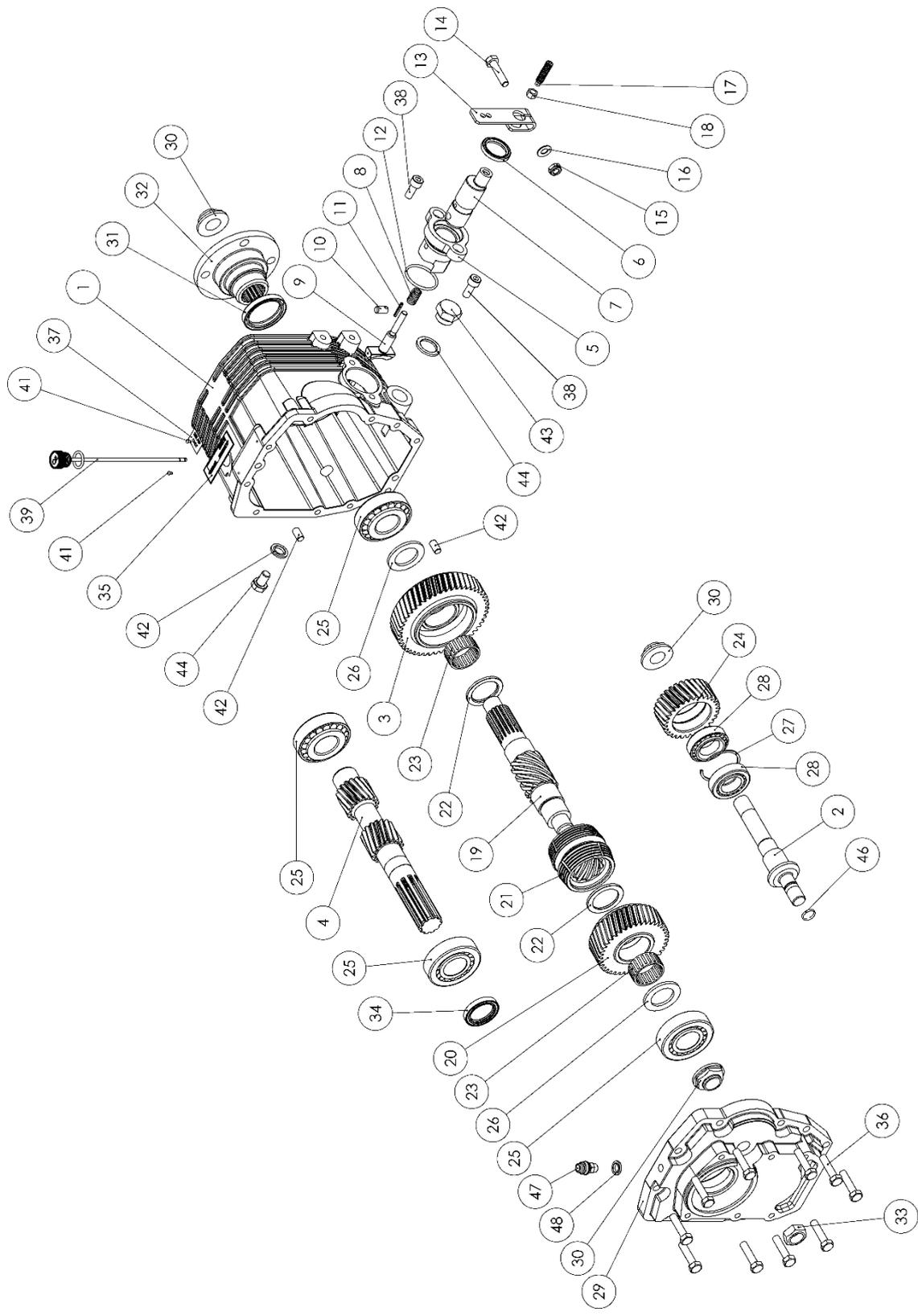


Figure 5 - Exploded view and cross-section

