



KOZANOĞLU


**KOZMAKSAN**



## PTO MOUNTING AND USER MANUAL

## Table of Contents:

<b>1..Safety Information.....</b>	<b>3</b>
1.1 <i>Overall Safety</i>	
<b>2. Instructions for Operation in Cold Weather</b>	
<b>3. Vehicle Mounting of Side-Mounted PTO.....</b>	<b>4</b>
<b>4. Vehicle Mounting of Rear-Mounted PTO.....</b>	<b>7</b>
<b>5. Points to be Considered during Mounting.....</b>	<b>9</b>
5.1 <i>Points regarding Mechanical PTOs</i>	
5.2 <i>Points regarding Pneumatic PTOs</i>	
5.3 <i>Points regarding Vacuum PTOs</i>	
5.4 <i>Points regarding Electric PTOs</i>	
5.5 <i>Points regarding Clutch (Hydraulic) PTOs</i>	
<b>6. Connection Types .....</b>	<b>11</b>
<b>7. Shaft Mounting.....</b>	<b>11</b>
<b>8.Engaging/Disengaging.....</b>	<b>12</b>
7.1 <i>For Manual Transmission Vehicles</i>	
<b>9. Servicing and Maintenance.....</b>	<b>13</b>
<b>10. Emergency Instructions.....</b>	<b>14</b>
<b>11. Actions for Potential Failures .....</b>	<b>14</b>
<b>12. Warranty.....</b>	<b>15</b>
10.1 <i>Warranty Terms</i>	
10.2 <i>Situations Which Terminate Warranty Obligations</i>	

 The pictures used in this manual are for demonstration purposes and may not be identical to the actual purchased products.

## 1. Safety Information

The following information is for your safety. Make sure to read and understand them before attempting to use the equipment.

### 1.1 Overall Safety

- ✓ Carefully read the user manual provided and take notice of the instructions indicated.
- ✓ The important sections for operator safety and a prolonged product life are marked with symbols. Take notice of such symbols.
- ✓ Never work alone when doing repair or maintenance works under the vehicle.
- ✓ Make sure to check if the instructions you follow and the tools you use are intended for the work you are engaging in.
- ✓ Never use worn or damaged parts.
- ✓ Do not attempt any modification on the PTO or any other drive components of the vehicle.
- ✓ Ensure to mount the parts properly.

## 2. Instructions for Operation in Cold Weather

The disengaged PTO might transmit high levels of instant torque in cold weather (0°C and below), leading to rotation on the output shaft. This motion might result in injuries or damage to the PTO.

For prevention of injuries and damage to the equipment:

- ✓ Check the drive components of the vehicle.
- ✓ Do not attempt to use drive components without warming up the vehicle.

### 3. Vehicle Mounting of Side-Mounted PTO

Steps to follow;

1. The vehicle to be mounted the PTO must be fixed on a suitable platform for the operation (a canal or lift etc.). The hand brake is to be applied and the gear must be in neutral position and the engine is to be stopped.
2. Next, loosen the PTO connection cover on the main transmission and drain the oil inside to a clean container.
3. Afterwards, remove the PTO connection cover by removing the bolts. Clean the surface after the removal.

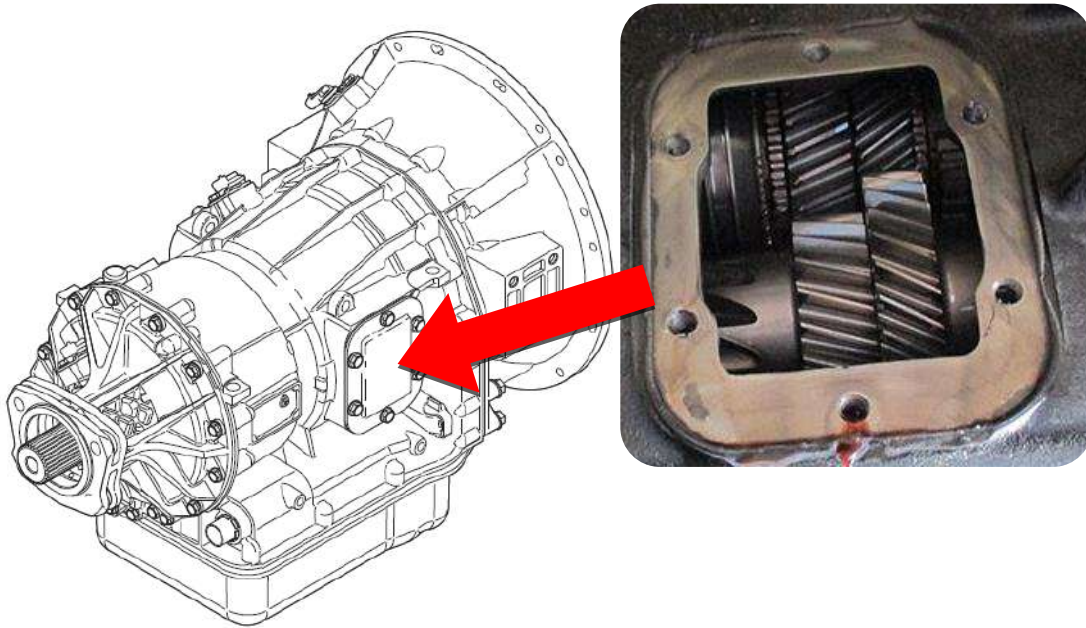
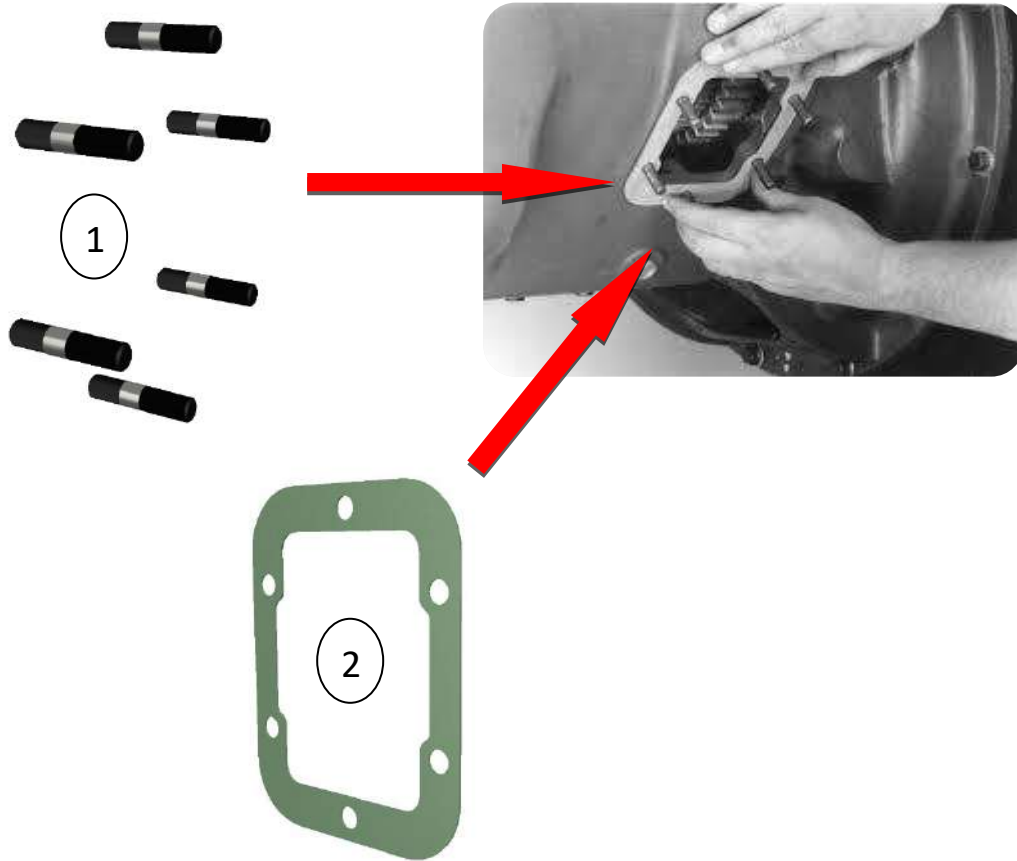


Figure 1 – PTO Connection Surface



**Avoid contacting the hot oil during oil change for your occupational health. Remember to use your required personal protective equipment during split shaft PTO maintenance keeping in mind the occupational health safety requirements. Act in accordance with the applicable regulations considering environmental protection concerns while disposing the used oil.**

4. The studs (1) are then mounted on the clean connection surface (using (50 Nm torque value and fixing liquid))



**Figure 2** – Stud and Gasket Connection

5. During the mounting operation, apply a film layer of grease on the front and rear faces of the gasket (2) that comes with the PTO package and then attach it between the main transmission and PTO connection surfaces.

6. The PTO body is to be mounted on the main transmission surface to allow matching of corresponding gears. The running backlash is checked through the inspection hole\* on the PTO.

7. Once the PTO is placed on the main transmission, the nuts are to be fastened at 40 Nm torque, completing the mounting.

*\*Backlash inspection hole might not be available on every model.*



**Figure 3-** Mounting the PTO on the vehicle

8. Once PTO mounting has been completed, the connection components need to be inspected just in case.
9. The main transmission oil is then poured back into it from the container it had been put into, and then oil plug is fastened (If the oil has expired, new oil must be added).
10. PTO engaging/disengaging system is assembled.



**Figure 4-** Already Mounted PTO



**Once mounting is over, the vehicle needs to be started and kept in idle rotation for about 30 seconds to achieve lubrication of the system. Next, inspect the PTO-main transmission connection for oil leakage.**

11. Before engaging the PTO, press the clutch pedal and wait for 10 seconds after which you can engage it. Continue to press the clutch pedal for 10 seconds and then slowly release it. This will allow checking PTO operation condition.
12. Press the clutch pedal again and hold for 10 seconds to disengage the PTO and slowly release the pedal after waiting for 10 seconds likewise.
13. Brackets need to be built to support the equipment longer than 250 mm and heavier than 15 kg when attaching such directly to the PTO.

#### 4. Vehicle Mounting of Rear-Mounted PTO

Steps to follow;

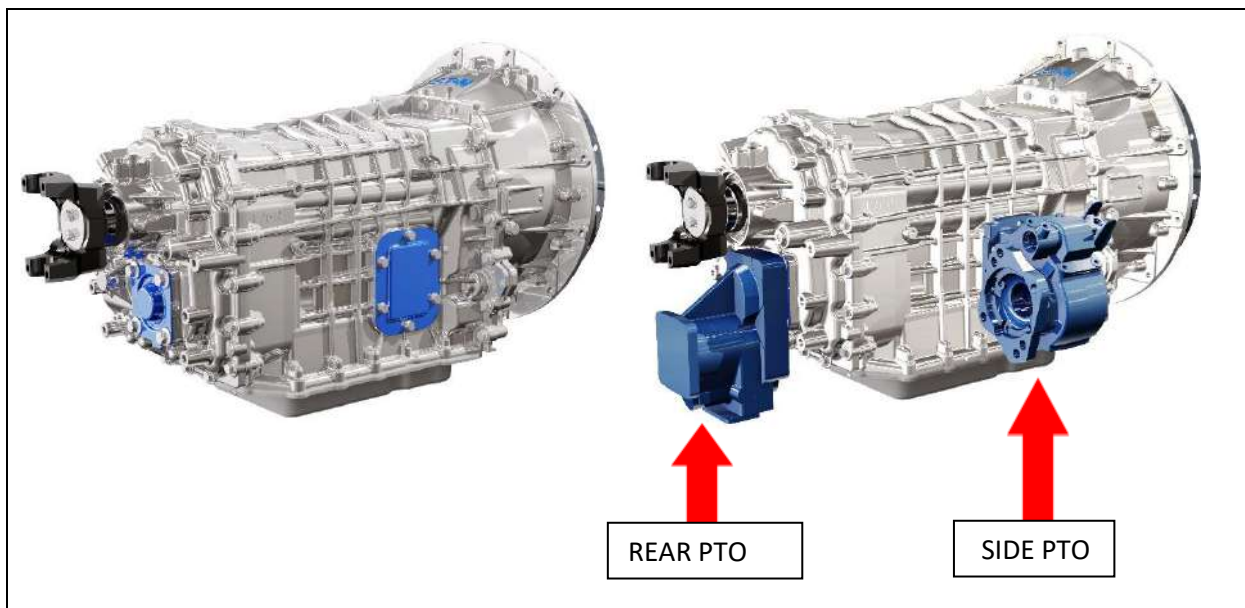
1. The vehicle to be mounted the PTO must be fixed on a suitable platform for the operation (a canal or lift etc.). The hand brake is to be applied and the gear must be in neutral position and the engine is to be stopped.
2. Next, loosen the PTO connection cover on the main transmission and drain the oil inside to a clean container.
3. Afterwards, remove the PTO connection cover by removing the bolts. Clean the surface after the removal.
4. After removing the cover, the housing and surrounding where the PTO quill shaft is to be mounted must be inspected. In case of presence of any metal chips, spring, ball pieces or similar objects, the main transmission must definitely go through a repair, servicing and oil change. The PTO must be mounted after all these procedures.
5. The studs (1) are then mounted on the clean connection surface (using (50 Nm torque value and fixing liquid).
6. During the mounting operation, apply a film layer of grease on the front and rear faces of the gasket (2) that comes with the PTO package and then attach it between the main transmission and PTO connection surfaces.

7. Once the PTO is placed on the main transmission, the nuts are to be fastened at 40 Nm torque, completing the mounting.


8. Once PTO mounting has been completed, the connection components need to be inspected just in case.

9. The main transmission oil is then poured back into it from the container it had been put into, and then oil plug is fastened (If the oil has expired, new oil must be added).

10. PTO engaging/disengaging system is assembled.



**Figure 5-** Illustration of Side and Rear Mounted PTOs

 Once mounting is over, the vehicle needs to be started and kept in idle rotation for about 30 seconds to achieve lubrication of the system. Next, inspect the PTO-main transmission connection for oil leakage.



- PTO temperature might sometimes have negative influence and the temperature needs to be lowered in case of overheating.
- More frequent oil change must be conducted in heavy duty operations.
- Where the PTO is side mounted, make sure to inspect the backlash.
- Where the PTO is rear mounted and used in heavy duty operations, extra lubrication must be provided.



## 5. Points to be Considered during Mounting

### 5.1 Points regarding Mechanical PTOs;

It must be definitely ensured when installing PTO control cable that cable support point is located either on the PTO or main transmission. If the installation is done on the chassis, the cable might get damaged or the PTO might accidentally engage due to individual vibration of the chassis and the PTO while the vehicle is moving. In consideration of these points, it must be definitely ensured that the cable is not installed on the chassis.

### 5.2 Points regarding Pneumatic PTOs

The pressurized air from the compressor must be checked. The pressure value must be 6-8 bar. Water deposits might form inside the air tube due to the moisture while the compressor is running. A separate conditioner must be installed on the compressor to prevent this. To counter both risks, the water deposit inside the air tube must be periodically drained through relief plug. Moreover, it must be made sure that air transmission hoses do not get buckled.

### 5.3 Points regarding Vacuum PTOs;

PTO vacuum leakage must be inspected on the PTO and system. It must be made sure that vacuum installation hoses do not get buckled. Vacuum suction value must be inspected. The vacuum value must be -0,8/-1 bar.


### 5.4 Points regarding Electric PTOs;

The volt value of the electrical system of the vehicle (12 V or 24 V) must be determined, and a PTO with a suitable coil should be ordered. Attention must be paid to connect the (+) and (-) poles of the vehicle accumulator correctly on the coil. Care must be taken to integrate the electrical control unit on the PTO body.

### 5.5 Points regarding Clutch (hydraulic) PTOs;

The electrical installation on the vehicle must be integrated with the PTO coil. The oil pressure sensor must be introduced to the vehicle computer while the engine is running after the PTO installation has been completed. Support must be sought from the vehicle main transmission authorized service point for this operation. In absence of this introduction, the hydraulic pressure level will fail to reach +21 bars and will not exceed +10 bars. This will lead to inefficient operation of the PTO. Also it must be ensured to check coil of the vehicle electrical system (12V, 24V).

**⚠** See Engaging/Disengaging the PTO (Page 9) in order to engage/disengage the PTO.

**⚠**  Avoid contacting the hot oil during oil change for your occupational health. Remember to use your required personal protective equipment during PTO maintenance keeping in mind the occupational health safety requirements. Act in accordance with the applicable regulations considering environmental protection concerns while disposing the used oil.

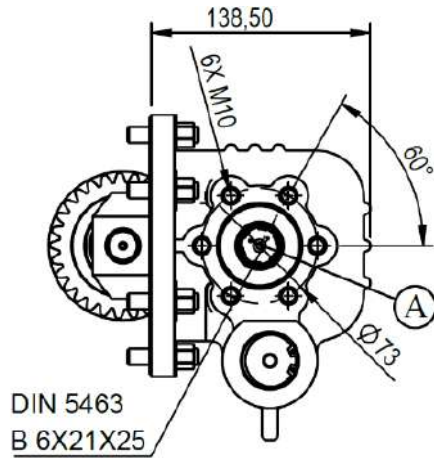
- ⚠**
- PTO temperature might sometimes have negative influence and the temperature needs to be lowered in case of overheating.
  - More frequent oil change must be conducted in heavy duty operations.
  - Where the PTO is side mounted, make sure to inspect the backlash.
  - Where the PTO is rear mounted and used in heavy duty operations, extra lubrication must be provided.



**Figure 6-** PTO output types

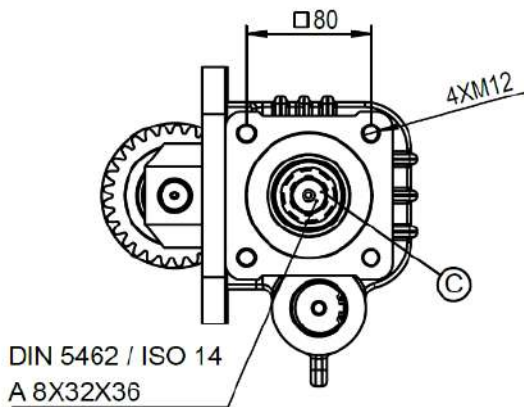
## 6. Connection Types

### 1. UNI Connection



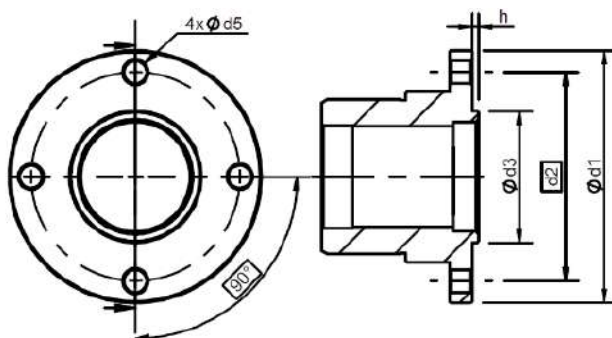
UNI connection type is the PTO type with 6 holes that are suitable for position adjustment suitable for hydraulic pumps with 3 connection points and with female spline at DIN 5463 B 6x21x25 standards.

### 2. ISO Connection



ISO connection type is the PTO type with 4 holes that are suitable for hydraulic pumps with 4 connection points and with male spline at DIN 5462 /ISO 14 A 8x32x36 standards.

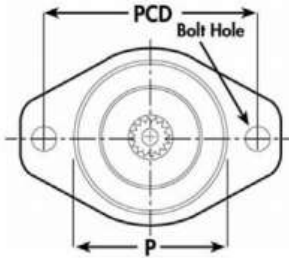
### 3. Flange Connection



This is the PTO output type mounted on the PTO with various kinds suitable flanges for the flange of the hydraulic pump used.

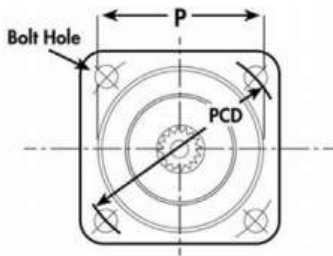
### 4. SAE Connection

This type can be used for PTOs that have 4 or 2 connection types. Besides, this type can also be classified with connection point as well as motion transmission splines.



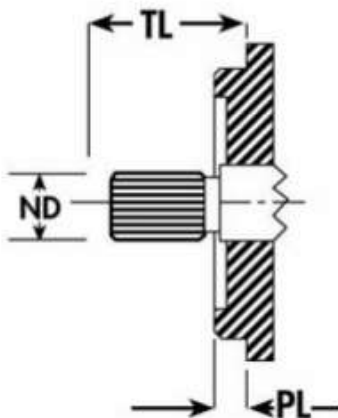
SAE CODE	PCD	Bolt Hole Diameter	(P) Pilot Diameter
AA	3.25	0.406	2.00
A	4.187	0.437	3.25
B	5.75	0.562	4.00
C	7.125	0.687	5.00
D	9.00	0.812	6.00
E	12.50	1.062	6.50

#### SAE FOUR BOLT MOUNTING



SAE CODE	PCD	Bolt Hole Diameter	(P) Pilot Diameter
B	5.000	0.562	4.00
C	6.375	0.562	5.00
D	9.000	0.812	6.00
E	12.500	1.062	6.50

Figure 7 - SAE connection points



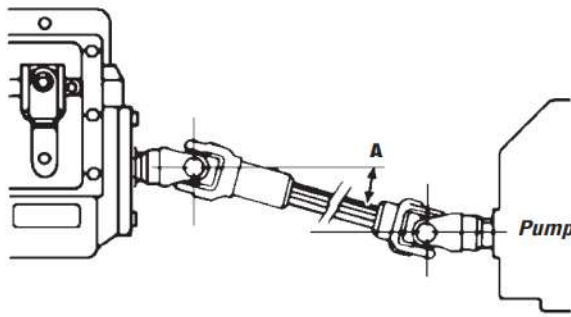
SAE CODE	(ND) Nominal Diameter	SPLINE DETAIL	(TL) Total Length
AA	0.500	9T	1.062
A	0.625	9T	1.250
AH	0.750	11T	1.250
B	0.875	13T	1.625
BB	1.000	15T	1.812
C	1.250	14T	2.187
CC	1.500	17T	2.437
D	1.750	13T	2.937
E	1.750	13T	2.937

Figure 8 – SAE connection splines

The above SAE connection measures are in inches.

## 7. Shaft Mounting

1. The shaft leads to vibrations due to twisting and axial curving. High levels of shaft angle produce potential vibrations and hence negative effects on the components attached to the shaft. Thus, the shaft must be mounted properly as described below.
2. The connection flanges must be parallel to each other and both corner curves must be identical.
3. The shaft must be long enough and end without causing any impact, and must have necessary balance.
4. For applications to be used in heavy duty conditions, contact our servicing department.



Max. Revolution (RPM)	Max. RCA
3500	5°
3000	5°
2500	7°
2000	8°
1500	11°
1000	12°

5. While calculating RCA (Resultant Connection Angle), the resultant of the angles (A) -the top view of the shaft- and (B) - the side view- must be taken into account

$$BBA = \sqrt{A^2 + B^2}$$



Once the mounting is over, the vehicle needs to be started and kept in idle rotation for about 30 seconds to achieve lubrication of the system. Next, inspect the PTO-main transmission connection for oil leakage



- PTO temperature might have negative effects in some circumstances and require heat reduction.
- Oil change procedure must be conducted at shorter intervals in case of heavy duty operations.
- Gear backlash must definitely be inspected where the PTO is side-mounted.
- Extra lubrication must be done when the PTO is mounted on the rear side and used in heavy duty operations.

## 8. Engaging /Disengaging

Make sure that the internal PTO gears are motionless before attempting to engage or disengage the PTO.

### 7.1 For Manual Transmission Vehicles;

#### Engaging:

1. The vehicle is to be stopped, and the clutch pedal is to be pressed, which stops the movement of the main transmission group gears. The PTO is to be engaged depending on its type (mechanical, pneumatic, vacuum).
2. The vehicle is put into the suitable gear and the clutch pedal is slowly released.
3. The system is to be checked by pressing the gas pedal as much as required.

#### Disengaging:

1. The vehicle is to be stopped, and the clutch pedal is to be pressed, which stops the movement of the main transmission group gears.
2. The PTO is to be disengaged depending on its type (mechanical, pneumatic, vacuum).
3. Normal drive procedures are to be followed.

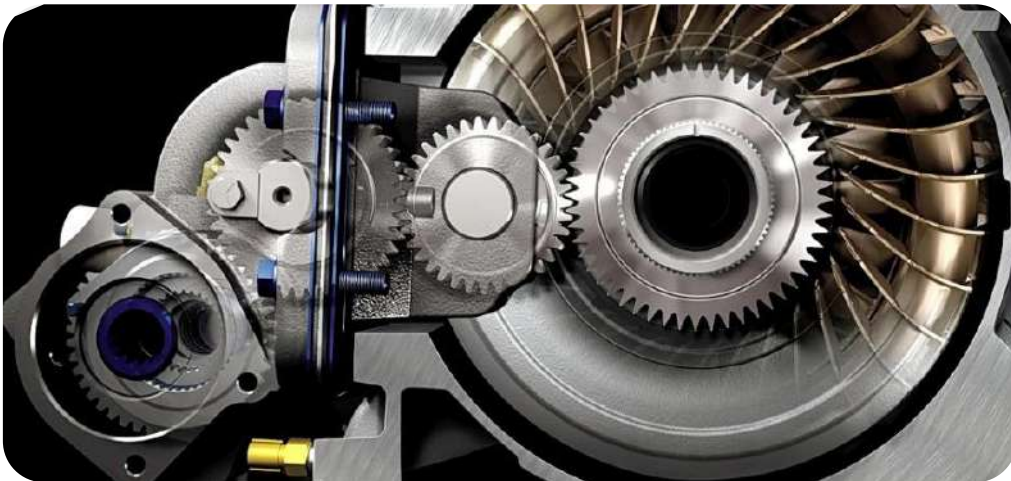


Figure 6 – Transparent View of the PTO and Main Transmission

## 9. Servicing and Maintenance

### Oil Leakage Detection

Check for oil leakage periodically. Watch for oil leakage in vehicle operation site or surroundings. Upon detecting leakage, take required action. After checking the available oil level, add oil into the main transmission where necessary. Contact KMS if the oil leakage persists in spite of the intervention.

### MATERIALS WHICH REQUIRE REPLACEMENT FOR MAINTENANCE

- ✓ **Do not forget that this is a technical product, and change the replacement parts on time for its maintenance.**
- ✓ **The rubber proofing components (orings, seals etc.) must be replaced once a year or every other year depending on the intensity of operation**
- ✓ **The bearings must be replaced every 4 years disregarding the frequency of operation.**



**Contact KMS in case of a technical failure. Removal of the PTO by someone other than authorized technician or notified servicing point would put the equipment out of warranty coverage.**

## 10. Precautions for Emergency

If the PTO is to be disengaged in case of emergency, this must be done through the emergency stop system to be installed by the superstructure manufacturer.

## 11. Actions for Potential Failures

Issues	Likely Cause	Remedy	Precaution
PTO does not engage/ disengage	Pneumatic pathway might be soiled or clogged; otherwise the hose might be twisted or bent.	Clean the pneumatic hose. Eliminate the twists or bends if any. Replace if required.	Check pneumatic hoses. Take precautions against cracking, puncture and twisting. There has to be a conditioner in the pneumatic system.
PTO does not engage/ disengage	There is not enough pneumatic or vacuum pressure.	Check if the pressure is 6-8 bars before running the PTO. The vacuum pressure must -1 bar.	Inspect if there is any issue with the pneumatic or vacuum system.
PTO does not engage/ disengage	The clutch, synchromesh or gear might not have matched its position when putting into gear.	Fully press the clutch pedal before engaging the PTO and properly engage the PTO once the assembly gear stops.	Always make sure to follow the instructions in the usage manual.



<b>Issues</b>	<b>Likely Cause</b>	<b>Remedy</b>	<b>Precaution</b>
No air in the PTO	Control mechanism worn out or damaged	Check the control mechanism. Replace any damaged part.	Contact KMS if the problem persists.
No air in the PTO	Air compressor might be damaged.	Check the air pressure. It must be 6-8 bars.	Contact the vehicle servicing point
No air in the PTO	Pneumatic valve might have failed.	If the pneumatic hose is intact make sure that the air is available by removing the hose from the fitting and engaging/ disengaging the mechanism.	If there is no air, then replace the solenoid valve that controls the pneumatic system.
PTO engages but the equipment does not work	PTO sensor connection sockets might have come loose or the sensor broken down.	Inspect sensor connection sockets. If the problem persists, replace the sensor.	Ensure that the socket does not receive any impact.
Oil leakage in the PTO	Gasket missing or damaged during installation	Make sure that the gasket is available and intact	Install the gasket as per the instructions. Replace if damaged.

Issues	Likely Cause	Remedy	Precaution
Oil leakage in the PTO	Gasket deformed or product life expired.	Replace if deformed or expired.	Install according to the instructions. Protect the PTO during repair works nearby.
Noise coming from PTO	Gasket missing or wrong gasket used	Use the gasket that comes with the PTO. Ask from the manufacturer if required.	Do not use any other method for proofing other than the original gasket.
Noise coming from PTO	Diverging from the mounting instructions provided by the manufacturer.	PTO to be installed according to the instruction.	PTO needs to be installed by trained personnel.



**Contact KMS in case of a technical failure. Removal of the PTO by someone other than authorized technician or notified servicing point would put the equipment out of warranty coverage.**

## 12. Warranty

### 10.1 Warranty Terms

1. Warranty period is two (2) years from the delivery of the product.
2. In the event that the product fails during the warranty period, the following apply;
  - Failure repair time is 1 to 8 working days depending on its nature.
  - Where the repair time lasts more than 7 working days (except transportation time), a new product shall be supplied to the customer till the failure has been repaired.
3. Where a failure occurs within the warranty period due to the defects possibly arising from the manufacturing stages, the product shall be repaired free of charge in terms of servicing and replaced part price.
4. Warranty certificate has to be presented when asking for services for the products under warranty. Where the certificate is lost or not presented, then sales invoice (invoice with waybill) has to be presented.

### 10.2 Situations Which Terminate Warranty Obligations

The warranty obligations shall become null and void in following situations:

1. Using the product for a purpose other than the intended use,
2. Changes to the product that are not approved by us,
3. Digression from defined specifications and reference limits,
4. Selling to third parties one or more products not bearing our approval seal,
5. Failing to perform indicated product maintenance,
6. Having a service provider, other than the manufacturer or trader, repair, carry out maintenance works or replace parts of the product within the warranty period,
7. Using the product against the usage terms set forth in the usage instructions,
8. Where the product is damaged due to the mounting,
9. Contact KMS in case of a technical failure. Removal of the PTO by someone other than authorized technician or notified servicing point would put the equipment out of warranty coverage.
10. The coverage shall not apply if the PTO is run without extra cooler/heater above +95 ° or below -25 ° C due to the installation and environmental conditions.