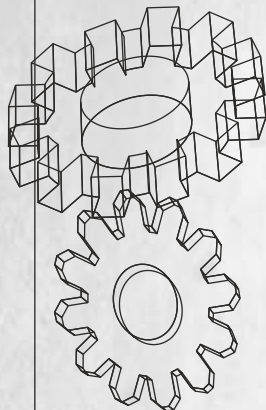




# PTO INSTRUCTION





## PTO INSTALLATION & OPERATOR'S MANUAL

### WARNING

- READ AND UNDERSTAND ENTIRE MANUAL BEFORE INSTALLATION OR OPERATION OF PTO AND DRIVEN EQUIPMENT
- ALWAYS DISENGAGE THE PTO WHEN THE DRIVEN EQUIPMENT IS NOT IN OPERATION.
- PARKING BRAKE MUST ALWAYS BE SET
- DO NOT ATTEMPT TO INSTALL OR SERVICE ANY POWER TAKE-OFF WITH THE TRUCK ENGINE RUNNING.
- PUT THE IGNITION KEYS IN YOUR POCKET BEFORE GETTING UNDER THE TRUCK.
- DO NOT ALLOW TRUCK ENGINE TO BE STARTED WHILE WORKERS ARE UNDER THE TRUCK.
- IMMOBILIZE TRUCK WHEELS WITH SUITABLE CHOCKS BEFORE WORKING UNDER TRUCK.
- TRANSMISSION MUST ALWAYS BE IN NEUTRAL OR PARK
- BE SURE TO BLOCK ANY RAISED BODY OR MECHANISM BEFORE WORKING ON OR UNDER THE EQUIPMENT.
- INSTALLED POWER TAKE-OFFS MUST NEVER BE SHIFTED IN OR OUT OF GEAR BY ANY MEANS EXCEPT BY THE CONTROLS IN THE CAB OF THE TRUCK.
- STAY CLEAR OF SPINNING DRIVESHAFTS TO AVOID BECOMING ENTANGLED AND INJURED.
- ALLOW THE VEHICLE, PTO AND DRIVEN EQUIPMENT TO WARM UP WHEN OPERATING IN WEATHER WHERE TEMPERATURES ARE NEAR OR BELOW FREEZING 32 °F (0 °C).
- INSTALL SEPARATE CONTROLS FOR PTO AND DRIVEN EQUIPMENT ALWAYS INSTALL THE SAFETY LABELS PROVIDED AND PLACE THE OPERATOR'S MANUAL IN THE VEHICLE GLOVE COMPARTMENT.

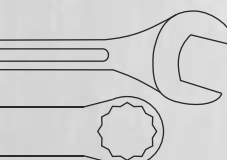
#### PTO CLASIFICATION

- |   |   |
|---|---|
| <p>1. According to the mounting place to the transmission</p> <ul style="list-style-type: none"> <li>• Rear</li> <li>• Side (left or right)</li> <li>• Bottom</li> <li>• Top</li> </ul> | <p>3. According to the control type</p> <ul style="list-style-type: none"> <li>• Pneumatic</li> <li>• Mechanic</li> <li>• Vacuum</li> <li>• Electric</li> </ul> |
| <p>2. According to the gears type</p> <ul style="list-style-type: none"> <li>• Single gear</li> <li>• Double gear</li> <li>• Twin gear</li> </ul>                                       | <p>4. According to the connection to the pump</p> <ul style="list-style-type: none"> <li>• Iso</li> <li>• Uni</li> <li>• Sae</li> </ul>                         |

#### PRECAUTIONS FOR SELECTING CORRECT PTO

- Check your vehicle's model and main gearbox number with vehicle ID plate situated on main transmission surface.
- Determine the mounting type.(rear, right, left)
- Select the exact PTO, convenient to gearbox.
- Be sure that the selected PTO is reflecting required performance and rotation.
- Be aware of the additional equipment, along with the PTO (f.e. cardan shaft, flange, coupling and etc.)
- Choose the right type of the PTO control for system.(pneumatic, mechanical, vacuum or electric)

#### PRECAUTIONS FOR ASSEMBLING PTO

- 
- Switch off the engine.
  - Drain the lubricant (oil) from the transmission. (**CAUTIONS!** Oil may be hot)
  - Remove cover plate. Clean the mounting surface and screw holes.
  - Clean and thoroughly dry all mating surfaces (including the gasket) prior to assembly. A thin coating of approved transmission oil is recommended on gasket to help seal and to hold them in place during installation. Use approved transmission oil only!
  - Position the PTO on the studs and start the nuts provided onto the studs Do Not Tighten Yet. Check for gaps between the PTO and transmission and make sure gear teeth are

properly meshed and then tighten the top and bottom nuts or cap screws.

- Torque should be 60 Nm for 6 hole PTOs, 70Nm for 8 hole PTOs and for 4 hole rear mounted PTOs. Make sure the mounting bolts are properly tightened. Failure to properly tighten capscrews or nuts can lead to leaks. PTO and/or transmission damage can occur. Improper installation, tightening, or leaks are not the responsibility of WERAHYDRAULIC.
- Start the truck engine (with transmission and PTO in neutral) for a few seconds and listen for unnatural noises. Stay clear of rotating components. A whine noise indicates the PTO is mounted too tight. Stop engine and use a thick gasket. A clatter noise indicates a loose mount. Stop engine and use a thinner gasket. Add sealant if no gasket is used. PTO should never touch to gearbox surface without sealant or gasket.

Be aware that,

- APTO will not always make these noises.
- Do not adjust backlash by noise alone, always visually check back lash. Sometimes filling the transmission with oil is the only way to reduce the noise.
- A tight mounted PTO will cause under cutting of gears and result in pre mature PTO failure, including gear or housing breakage.
- If OK, repeat test with PTO engaged.

(Caution: Keep PTO/transmission running time as short as possible until transmission is refilled with oil. Do not drive the truck without transmission oil.)

- Refill transmission with manufacturer's approved oil and run engine for 5 to 10 minutes to check for leaks. Never start the vehicle without checking the oil. Make sure the transmission

is properly filled with lubricant. Check for lubricant leaks after operating the vehicle. Stay clear of rotating components. Stop Engine! Inspect the cap screws, nuts, and studs to make sure they are properly tightened. After completing installation, installers need to check for leaks and proper mounting torque of PTO fasteners.

- Before completing the gearbox with oil, pump has to be connected to the PTO. Before bolting the pump to the PTO, place non-seizing compound or grease on the PTO shaft and pump shaft.
- Fix the hose from the compressor to the PTO. It should be minimum 6 bars.
- Finally control the PTO whether it is engaged or not. Switch on the engine around 5-10 minutes. If there is no problem during this period, the assembly is done correctly.

### PTO SHIFTING PRECAUTIONS

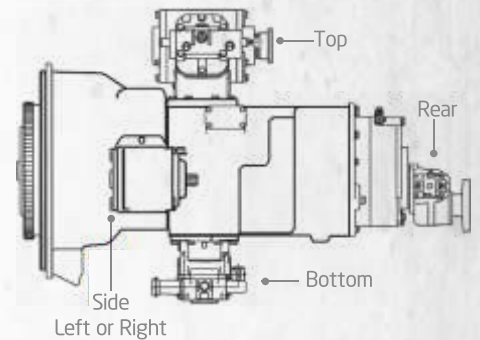
To know whether PTO is engaged or not, always press on clutch. If the operating temperature increases;

Temperature differs according to the PTO usage and following values are needed:

For a short period (less than 15 min.) max. 120°C, for a long period (more than 15 min.) max. 100°C.

In case of extreme temperature of PTO, the necessary steps should be taken to decrease temperature.

- Lubrication oil should be changed frequently, especially in heavy operations
- When PTO is side mounted, the gears' cavity has to be controlled
- When PTO is rear mounted for heavy operations, additional lubrication should be done.



## WARNING

### POWER TAKE-OFF OPERATION - VEHICLE STATIONARY

- Parking brake must always be set
- Vehicle's wheels must always be chocked
- Transmission must always be in neutral or park
- An operator must always be in the driver's seat whenever the engine is running and the transmission is in gear, in order to prevent or stop any unexpected movement of the vehicle which may cause injuries to the operator or others in the vicinity.
- Read all operators manuals and instructions for the equipment that you are operating on this vehicle.
- Obtain instructions and training for all operations of the equipment on this vehicle including those not covered by this instruction booklet.

Never work alone when repairing or going under a vehicle for repair or maintenance. Always block any

raised or moveable components or devices when working on or around the

vehicle as specified by the equipment manu-facturer. PTO's may drive driven equipment with an exposed drive shaft which may cause severe injury or death if contacted.

- Care must be taken when using a PTO for any specific application that the PTO has been properly specified to

match the transmission and auxiliary equipment. Improper specification and installation can cause severe damage to the vehicle transmission and the auxiliary components including drive shafts and driven equipment. Damaged components, equipment resulting in failure can cause serious personal injury to operators and persons in the vicinity.

- Never use a power take off that has not been specified for the output capabilities for the equipment being driven.

### ROTATING PTO DRIVE SHAFTS

It is recommended that direct couple hydraulic pumps be used whenever possible, but if your application requires the use of an exposed drive shaft it is the responsibility of the installer and purchaser to determine the best installation of a guard.

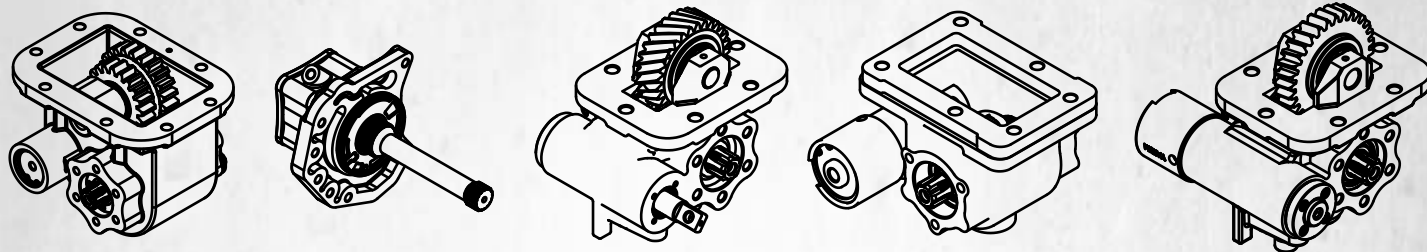
Rotating shaft can snag clothing, skin, hands, hair, etc. and will cause serious injury or death. Do not go under the vehicle when the engine is running.

Do not work near an exposed drive shaft with engine running. Auxiliary shaft can be installed with recessed or protruding set screws. If raised, square head set screws are chosen then be aware that this is a catch point for clothes, skin, hair, hands, etc. and serious injury or death may result.

The output shaft of a PTO with internal clutch packs may rotate in cold temperatures with the PTO disengaged. PTO shaft rotation can cause sudden movement of the output shaft and attached drive shaft leading to personal injury or death. allow transmission to operate for a few minutes before engaging PTO. Allow PTO to operate for a few minutes before actuating application controls.







## Mechanical Transmission

- A power take-off is, and should be, operated as an integral part of the main transmission.
- Before shifting the Power Take-Off into or out of gear disengage the clutch and wait for transmission or PTO gears to stop rotating.

Failure to follow proper shifting or operating sequences will result in premature PTO failure with possible damage to the equipment.

## PTO MAINTENANCE

The Power Take-Off, being an integral part of the transmission, should be serviced at the same intervals as the transmission. Transmission fluid changes should follow the interval recommended by the vehicle manufacturer for severe service. Transmission oil level is important. Checking for PTO leaks and checking the transmission oil level should be done on a regular basis.

Check for leaks upon delivery of the vehicle and after initial operation of your equipment. Loss of any oil can significantly affect or damage a transmission or PTO. WERA HYDRAULIC is not responsible for damage resulting from improper fastener installation, mounting torque or maintenance of the PTO.

The Power Take-Off is also part of a system. The PTO system may include the activation control parts, a driveshaft, or hydraulic pump. This PTO system requires periodic checks and service. Typically, the interval for maintenance checks of the PTO system depends on the application of the system. Every time the chassis is lubricated or a mechanic is under the vehicle the PTO system should be checked and serviced. For severe duty PTO system applications, it is recommended that the system be checked for service every 100 hours of use (this guideline can be adjusted based on past service history once you have it established). Service should include checking and lubricating direct mount pump shaft connections. PTO gears can be checked for wear by removing the inspection or shifter cover. If pitting, galling, cracking, or deformation of the gears or splines has occurred, then the PTO needs to be rebuilt or replaced. Within the first week of use, recheck the installation of the PTO. Check for leaks and loose mounting hardware (studs, cap screws, nuts). Recheck the cable or lever connections for proper adjustment and tighten any loose connections. At regular maintenance intervals, check adjustments and lubricate moving parts, tighten and repair the connections, mounting hardware, cable or lever linkages.

It is recommended that the operator/owner do a visual inspection for leaks under and around the vehicle and equipment on at least a weekly basis. Any leaks found should be corrected immediately.

Pumps which mounted directly to the PTO output require the application of an anti-seize or a high temperature, high pressure grease. The purpose of this grease is to help make the PTO easier to service and to reduce the effects of fretting corrosion on the mating PTO and pump shafts. PTO applications under severe duty cycles and/or high torque requirements may require servicing this shaft connection by periodically re-greasing the shafts. Vehicles with low speed diesel engines are also severe applications due to the vibrations inherent in these vehicles. Fretting corrosion cannot be stopped by grease, the grease is only a deterrent.

**Automatic Transmission with Manual Shift PTOs** (includes Air Shift) — Manual Shift PTOs include SG, TG, SH, RL, RG, RX, 82, 83 Series PTOs — On automatic transmissions, the gears in the transmission turn when the transmission is in neutral, therefore, gear clashing will occur if the power take-off is shifted *into gear (engaged)* or *out of gear (disengaged)* at this time. With Converter Driven Gear:

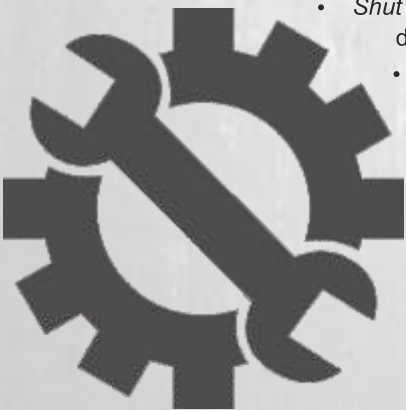
- Engine idle. With the operator seated in the driver's seat and while activating the vehicle's brake, shift transmission lever into any of the drive positions. (This will stop transmission gear from turning.)
- Shift power take-off into or out of gear.
- If the PTO does not engage release the PTO to the disengage position, shift the transmission to neutral and repeat the above steps from beginning.
- Shift transmission into park or neutral. (This will start transmission gears turning.) If you hear a grinding or ratcheting sound turn PTO off and repeat these procedures from step A.

**Automatic Transmission/Transfer Case Mounted PTO** (Also SS66 Splishaft PTO)

- Shift transmission into park.
- Caution: Apply parking brake and block wheels. Note: Applying parking brake does not insure that vehicle will not move when transfer case is in neutral.
- Engage PTO. Shift transfer case into neutral.
- Shift transmission into drive to activate PTO output shaft. Caution: Do not place the transmission selector in park or reverse while PTO is operational as damage to PTO or driven unit may occur.

To Disengage PTO:

- Shut off engine with transmission in drive mode.
- Disengage PTO.
- Shift transmission selector to park.
- Restart engine.
- Remove wheel blocks and release parking brake.
- Shift transfer case into engaged mode.
- Vehicle can now be driven.







## PTO TROUBLESHOOTING GUIDE

	Problem	Reason	Solution	Precaution
Mechanic PTO	Difficulty while engaging to transmission; Hard Shifting	Cable inner member frozen	Thaw in garage	Route cable away from road spray and seal end from moisture
		The cable can be tilted or cut. Sharp bend in cable	Straighten inner member or replace cable	Keep bends larger than the minimum bend radius. Avoid short cable runs
		Improper shifting	Make sure vehicle clutch is adjusted to allow the PTO drive gear to stop before shifting or that the proper shift procedure is followed	Always follow up the operating instructions.
		Worn or damaged shift control.	Replace or repair.	Do not connect lever rods to cable shifters.
	Delayed or partial engagement	Loose linkage or attachment. Loose or missing cable clamps	Replace or repair.	Routine maintenance
Pneumatic PTO	PTO doesn't engage	Contaminated air lines	Clear up the air channel. Remove contaminants from air cylinder.	Check out air channel in case of cracking or puncture. Bleed air system more often
		Air pressure not high enough	Wait until system pressure is above 65 PSI before engaging PTO	Systems are designed with a pressure protection valve which does not allow air to the PTO until the system pressure exceeds 65 PSI
		Improper method of shifting causing damage to the PTO shift collar	Make sure vehicle clutch is adjusted to allow the PTO drive gear to stop before shifting or that the proper shift procedure is followed	Always follow up the operating instructions.
		Worn or damaged shift control.	Replace or repair.	
		Shift fork is out of shift collar	Reassemble onto PTO correctly.	
	PTO doesn't disengage	Faulty air valve	Replace or repair.	Usually a result of contamination or dirty valve. Keep air system bled and valves free of dirt.
		Worn or damaged shift control.	Replace or repair.	
Shift fork is out of shift collar		Reassemble onto PTO correctly.		



## PTO TROUBLESHOOTING GUIDE

	Problem	Reason	Solution	Precaution
Electric shift PTO	PTO doesn't engage	Loose connection	Review wiring	Make sure wires are properly supported and connections are properly made
		Poor/improper grounding of electrical circuit	Make all grounds to the vehicle battery	Control module is very sensitive to proper ground
		Blown fuse	Replace fuse with proper rating	Make proper connections
		Improper shifting	Make sure vehicle clutch is adjusted to allow the PTO drive gear to stop before shifting or that the proper shift procedure is followed	Always follow up the operating instructions.
		Worn or damaged shift control.	Replace or repair.	
Clutch shift PTO	PTO doesn't engage	Contaminated air lines	Remove contaminants from air cylinder.	Bleed air system more often
		Air pressure not high enough	Wait until system pressure is above 65 PSI before engaging PTO or 80 PSI for the Electric/Air system.	Electric/Air systems are designed with a pressure protection switch which does not allow current to the PTO valve until system pressure exceeds 80 PSI
		Air lines are too long	Re-route lines directly to air tanks	
		Hydraulic line connected to wrong port	Review installation	
		Burned or extremely worn clutch pack	Replace worn components	
PTO doesn't disengage	Hydraulic or air lines connected to wrong ports on valve control	Re-route lines		
	Faulty air or hydraulic valve	Replace or repair.	Usually a result of contamination or dirty valve. Keep air system bled and valves free of dirt.	
	Burned or extremely worn clutch pack	Replace or repair.		



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