Vehicles With An Automated Manual Transmission (AMT) - Power Take-Off Diagnosis And Repair; PTO Air Leaks, Oil Leaks, Engagement, Noise

Internal Content

Related links and attachments

No content available

The service instructions for the gearbox mounted AMT PTO have not been readily available to the NA market when the PTO was made available for the AMT in NA. Although many of the parts have been available for the PTO in the NA parts system, not all parts are available because major components like gears and housing can quickly drive the cost of repair higher than the replacement cost. The parts that are available in NA parts system represent a reasonable repair option when internal inspection of the PTO and the failure mode show that a simple repair in the field is possible. See the failure mode and repair option information below for more information.

Where to find repair instructions

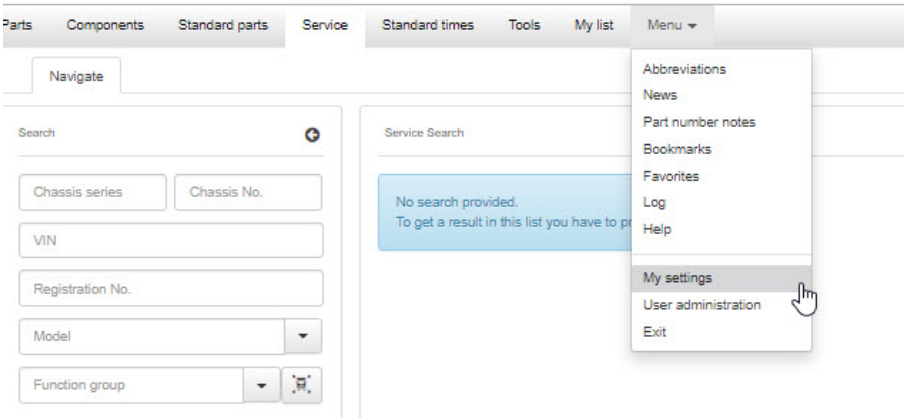
IMPORTANT

Language settings **must be returned** to English (United States) after following the instructions below. CBR will not function correctly if the language is improperly set in Impact.

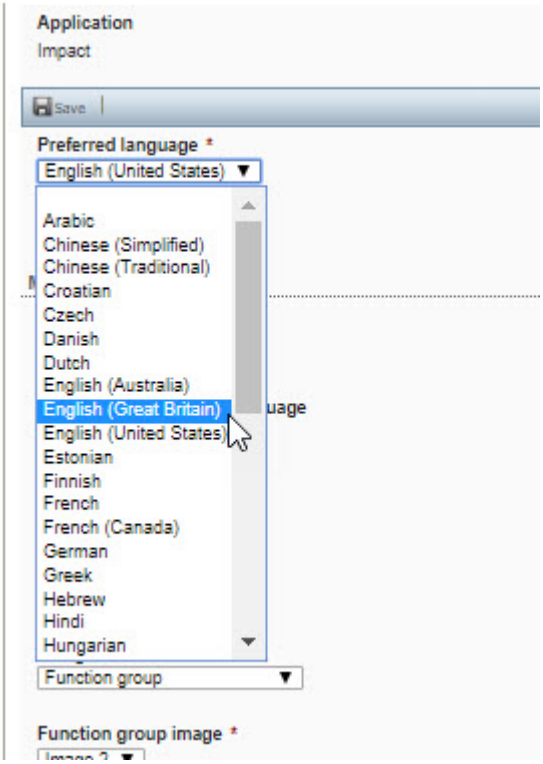
Note: Not all dealers or users are set up to be able to do this.

Service instructions are available in Europe for all of the PTOs currently available in NA. Changes are ongoing to make this information available in the NA market. Until that happens please use the steps below to find the service instructions needed.

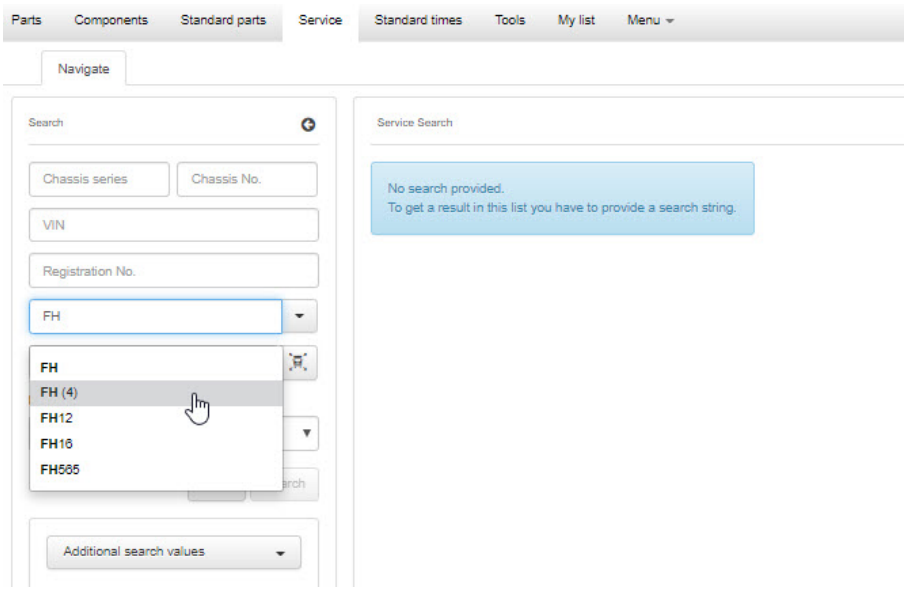
1. When looking for information in IMPACT click on the 'Menu' tab and select 'My Settings'.



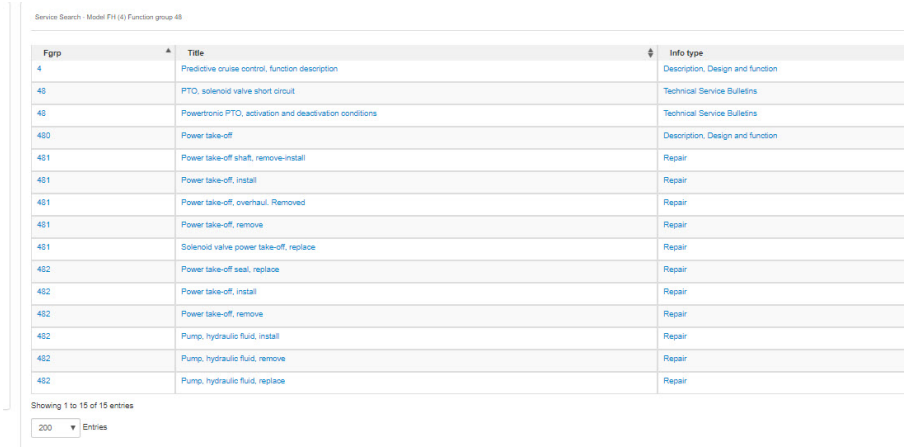
2. Change your preferred language to English (Great Britain) and hit 'Save'



3. Under the service tab search for Model 'FH (4)' -- Select Function Group 48. Power Take-Off-All service information and hit search.

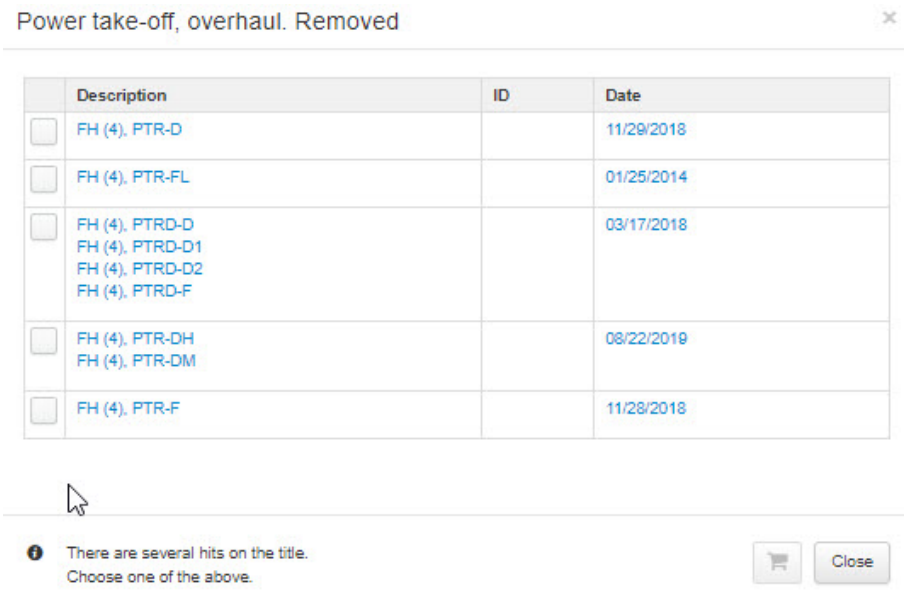


3.1. Here you will find Design and Function and service documentation.



4. Select the PTO model you have from the list and then you can download or print the document for reference.

Note: The PTO model is stamped in the case of the PTO.



Note: DO NOT forget to change language settings back when finished!

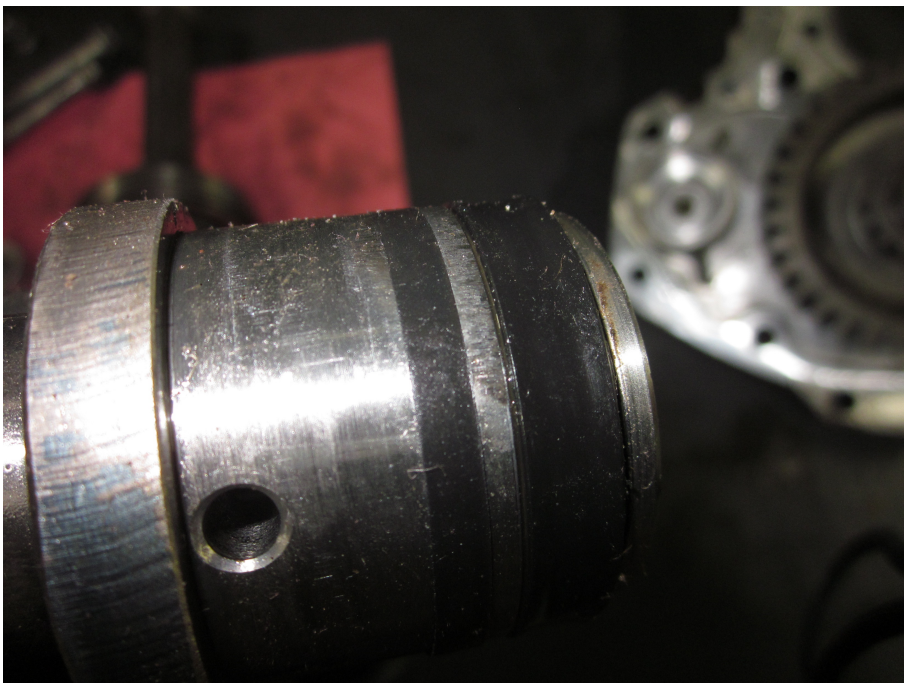
Fail modes

Note: This list assumes the PTO was previously working as designed and has stopped working properly and is not limited to these descriptions.

Air leaking from gearbox vents when the PTO is engaged.

Air leaking from the vents with PTO engaged is an air seal issue. The seals are available, as are the gaskets for the repair. The limiting factor is if the bore in the case that the piston is riding in is scored or worn.

1. Inspect the air piston for wear. Look for evidence of the piston making contact with the bore as shown in the picture below.



- If wear is found, the bore needs to be inspected.

2. Inspect the piston bore. Check for any wear or damage as shown in the example below.



- If the bore is serviceable, the unit should be repaired. Replace the air piston and seals.



- If the bore is worn, replace the PTO. The piston bore is not repairable.

3. Check the piston and bore for rust.

- **If Rust if found on the piston face**, then there has been water intrusion to the piston. An example is shown below.

○ Check the vehicle air system for moisture and correct the root cause of the water intrusion.



- If rust damage is found in the bottom of the piston bore, clean the bore and inspect the sealing surface for damage. Rust in the bottom of the bore will not affect operation.



- If the vehicle air system is dry and properly serviced, the solenoid should be checked for a good rubber cap on the top.

○ If the cap seal is damaged then replace the solenoid and fittings.



PTO solenoid electrical checks

The PTO solenoid contains two fly-back/clamping diodes to prevent high voltage reverse voltage spikes from damaging the controlling ECU. Because of the orientation of these diodes, the unit will give unexpected readings for resistance with a multi-meter.



When checking Resistance readings through the solenoid the following readings with a multimeter should be observed:

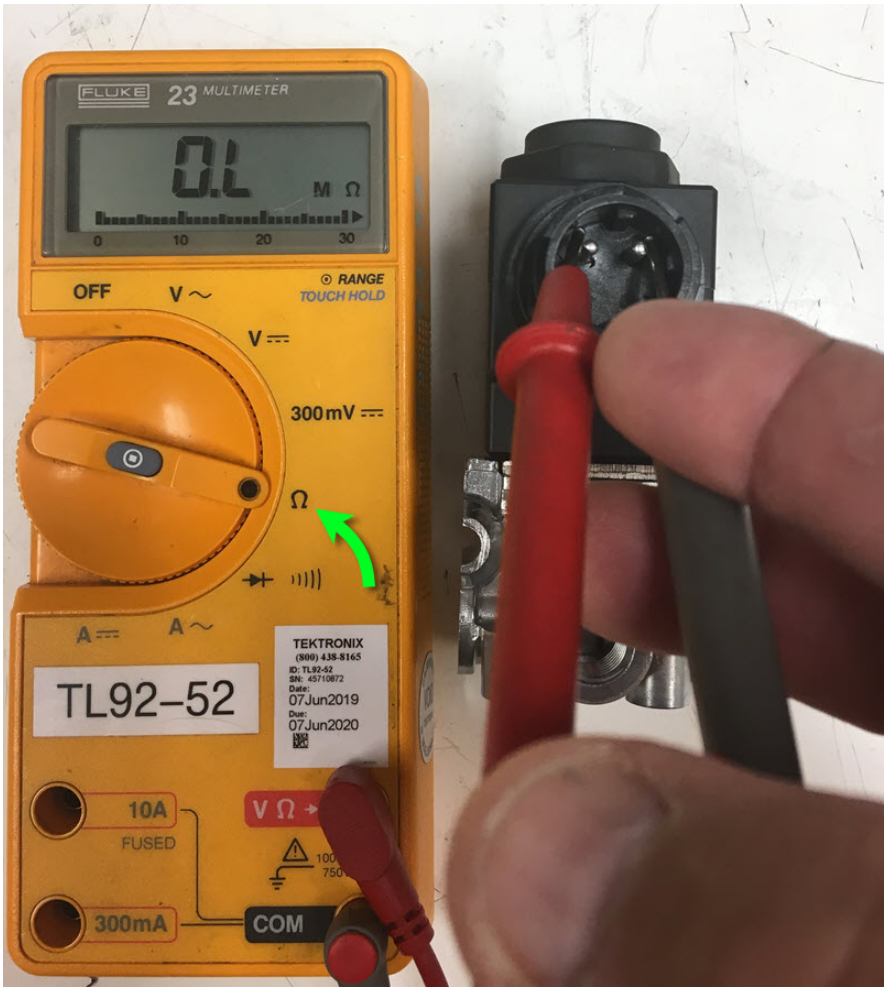
- Resistance in the Mega OHM range when measured through normal polarity:

- Positive lead to Pin 1, Negative lead to Pin 4.



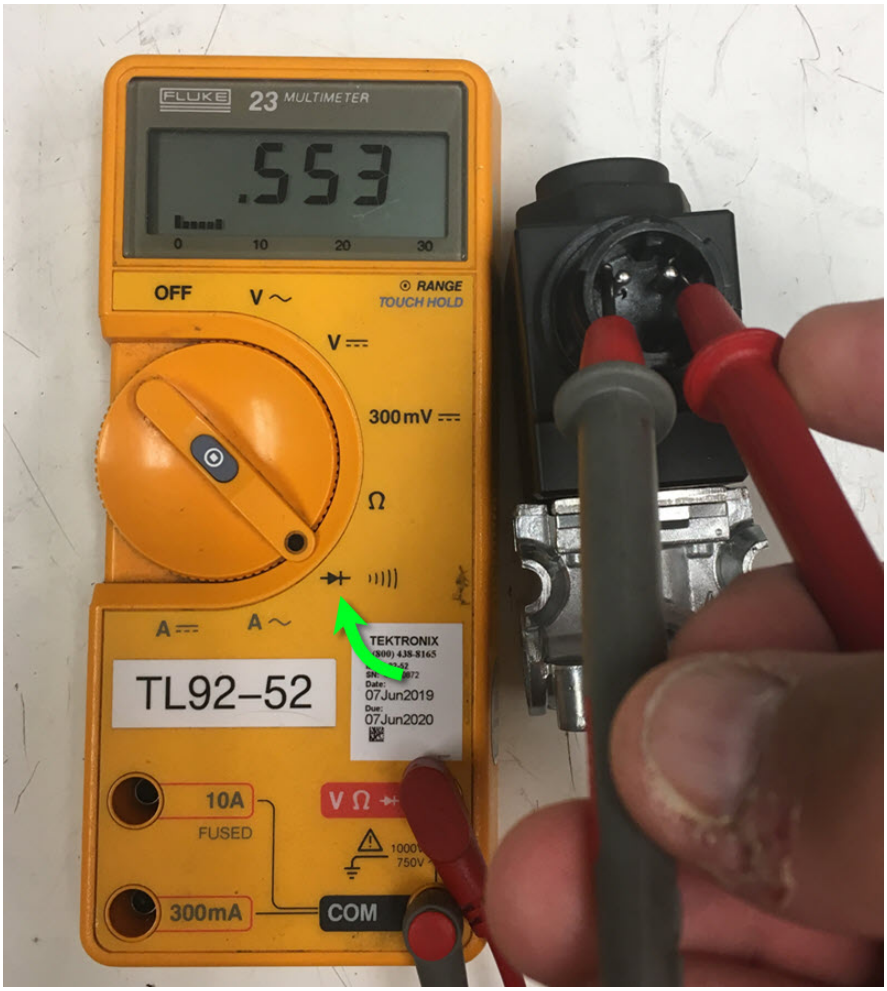
- Open Circuit (OL) when measuring Resistance through reverse polarity:

- Negative lead to Pin 1, Positive lead to Pin 4.



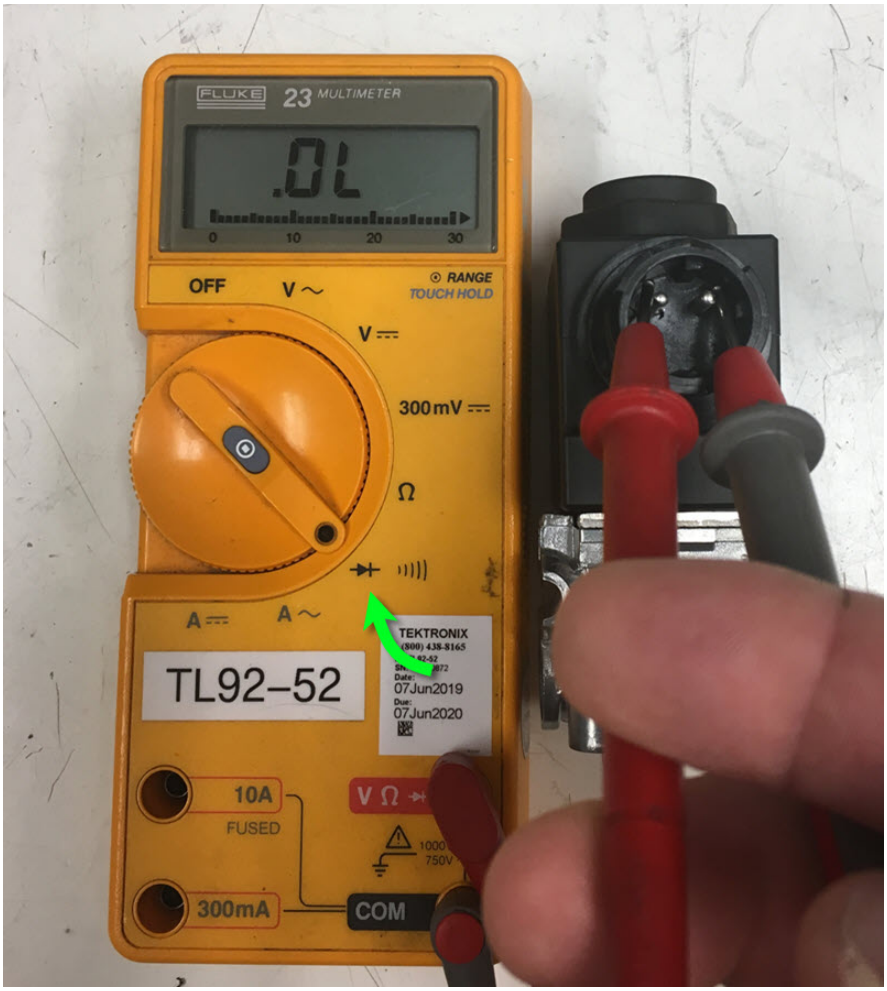
- Diode Check function: Test voltage value when measured with normal polarity:

- Positive lead to Pin 1, Negative lead to Pin 4.



- Diode Check function: OL when measured with reverse polarity:

- Negative lead to Pin 1, Positive lead to Pin 4.



- Power (12 V) and ground may be applied to the pins in normal polarity (12 V to Pin 1, Ground to Pin 4) to check the solenoid function.

⚠ WARNING
Applying power in reverse polarity will damage the solenoid.

• Oil Leaks

All seals and gaskets are available in the parts system. Repair as needed.

- **Leaking output flange seals or loose output flanges** can be repaired on the truck without removing the PTO from the gearbox if the unit does not need to be disassembled.

- Oil leaking from top of PTO solenoid will usually include air leaking from the gearbox vents when the PTO is engaged. The air leaks section above should be reviewed.

○ **NOTE:** The customer may not notice the air leak if the PTO is working properly unless the leak is large or they see an oil mist or 'smoke' coming from the vents.

• PTO Will Not Engage or Disengage, or Grinds During or After Engagement

If the PTO was functioning properly prior to the customer reporting this symptom, check to see that the PTO 'tries' to engage when the switch is turned on.

1. With the switch turned on manipulate the wiring. See if the PTO engages or disengages due to an electrical issue at the solenoids.

- **AMT-C and AMT-D (2007-2016) PTO solenoids** are controlled by wiring from the Transmission Electronic Control Unit (TECU) and will log electrical faults when the wiring to the solenoids is compromised.

- **AMT-F (2017-Present) PTO solenoids** are controlled by wiring from the Vehicle Electronic Control Unit (VECU) and/or the Body Builder Module (BBM) and will not log electrical faults when the wiring to the solenoids is compromised.

2. If the wiring is verified to be intact, the next likely item is a broken snap ring.



- The PTO drive shaft in the rear of the gearbox has a snap ring that contains the bearing to the shaft. If this snap ring breaks the pieces may end up in the PTO and get lodged under the shift fork and bind the fork.

- Depending on where the piece gets stuck will depend on how the failure is described.

A snap ring failure may cause a complaint of the gearbox not shifting properly if it causes the PTO to be stuck in the engaged position. There may also be fault codes logged like P107371 1st/Rev actuator stuck or P107471 2/3 actuator stuck.

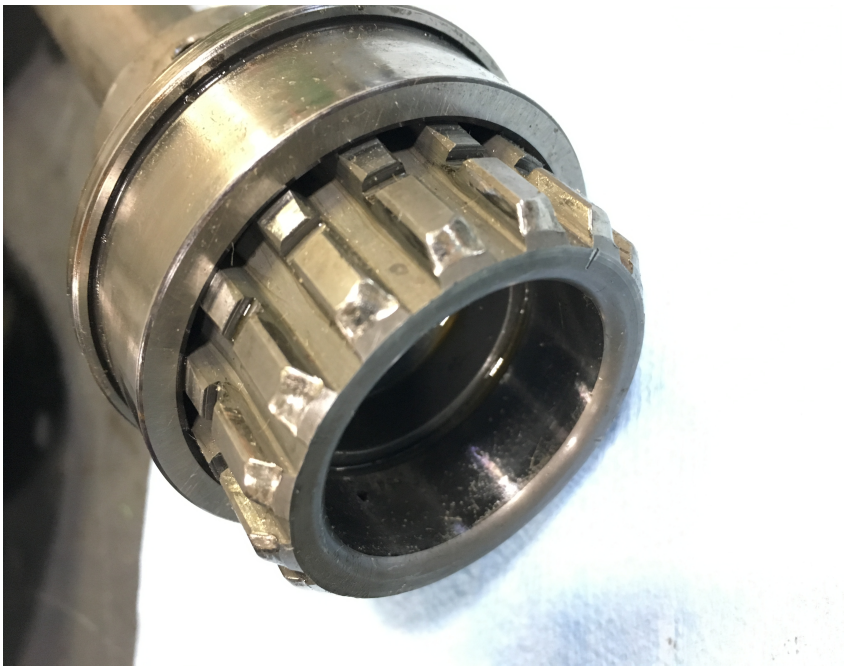
- **If it is confirmed that the snap ring is the cause:**

- Repair as needed.
- Disassemble and inspect the PTO for repair or replacement.

Examples of snap ring failure can be found below:



Pieces of ring get into the PTO and cause operational issues.





Spline and sliding clutch: Damaged components should be replaced



PTO case damage from snap ring or other debris can be cleaned up and inspected. If the damage does not affect the operation of the PTO shifter and piston seals the PTO can be repaired.

• Gearbox Low Lube, Mechanical or Contamination Failures

A gearbox that fails for a low lube condition does not necessarily mean that the PTO is failed also. Contaminated oil may pass through the PTO, but may not necessarily cause damage. In several cases, PTOs replaced with a gearbox failure that have been inspected have been deemed acceptable for reuse. The PTO does not spin when not in use and so does not necessarily damage the internal parts due to low lube or

contamination seen in the oil. The smaller single PTOs get lube all the time but the larger double PTOs do not. They only get oil from the gearbox when they are being used.

In cases of a gearbox failure of this nature, the PTO should be opened and inspected, cleaned, resealed and reused if the PTO is not failed.













Except for the dark oil in the housing, this PTO was perfect even though the gearbox failed for low lube.

Acceptable repairs and available parts

For all the fail modes listed above the repairs are typically straight-forward.

• Seals and gaskets for all PTOs are available in the parts system.

• The available parts include but may not be limited to common fasteners (nuts, bolts, washers and brackets), seals, gaskets, output flanges, sliding clutches and shift forks.

• Check parts availability for the repair.

• **When the repair starts to involve the replacement of the PTO case, gears or**

bearings the cost of parts and labor required to repair quickly exceeds the cost of replacement.

Standard Repair Times

Operation	Description		SRT
4811-03-02-02	PTO Replacement (Transmission), All Models		0.8 hr
4811-04-04-01	Power Take-Off, Overhaul. Removed (Refer to appropriate PTO model to the right)	PTR-D	0.4 hr
		PTR-DH	1.8 hr
		PTR-DM	1.8 hr
		PTR-F	0.8 hr
		PTR-FH	1.6 hr
		PTR-FL	1.8 hr
		PTRD-D	1.4 hr
		PTRD-D1	1.4 hr
		PTRD-D2	1.4 hr
		PTRD-F	1.4 hr
4814-19-03-01	Power Take-off Shaft, Remove-Install, All Models		0.4 hr

VISIBILITY: Dealer distribution

Tags

K25756018 P107371 P1073-71 P1074-71 P107471 PTO STAYS ENGAGED GEARBOX WILL NOT SHIFT PAST 4TH PTO GRINDING MACK VOLVO

Feedback

Give feedback to help improve the content of this article

48171-4 Power Take-off, Overhaul

Removed

i	Illustrations may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

i	All threaded fasteners that do not have a tightening torque specification in the information are tightened to a standard torque. Standard torques are available in the following specification. Standard Tightening Torques

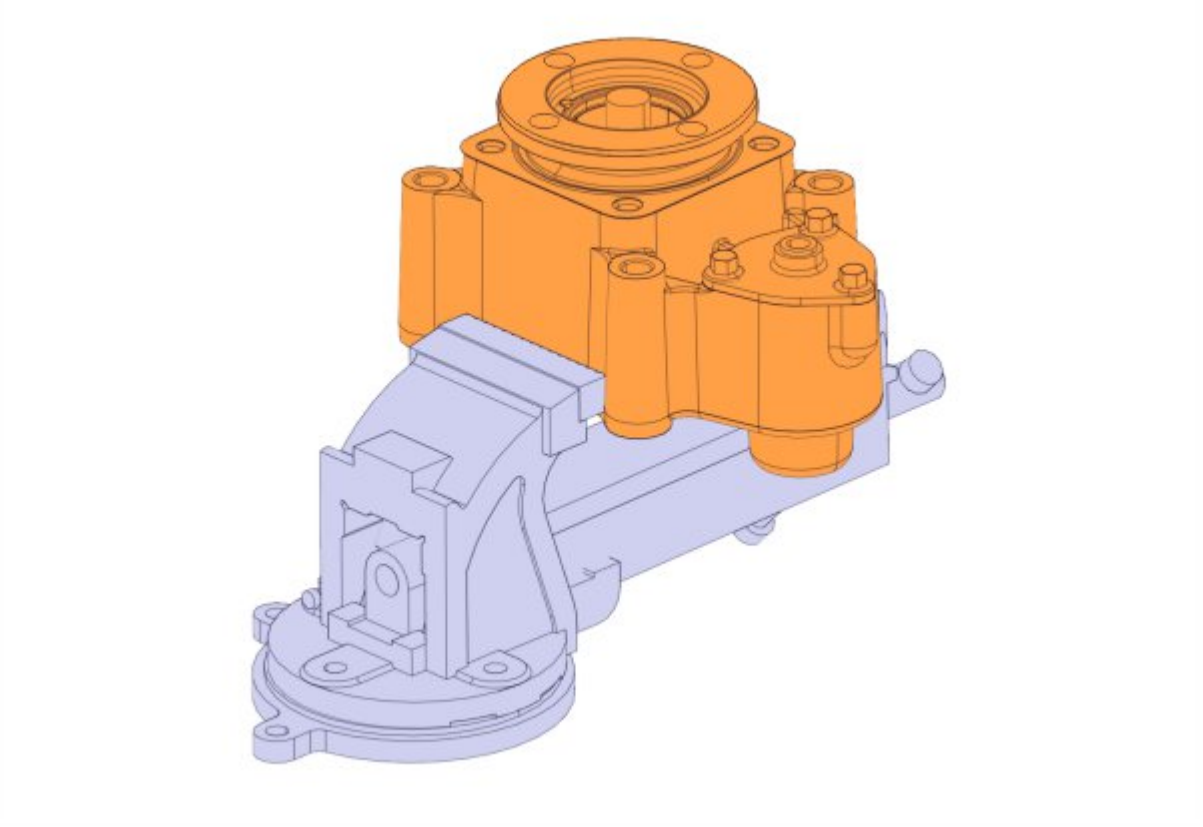
CAUTION
Service Information Advisory. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.
▸ You must read and understand the precautions and guidelines in Service Information, Function Group 4, "General Safety Practices, Transmission" before performing this procedure.

Special tools

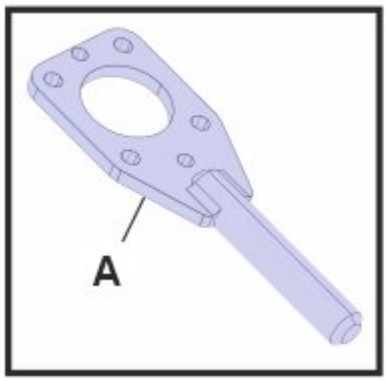
9992025	9992219	9992267	9992677	9992890
9994034				

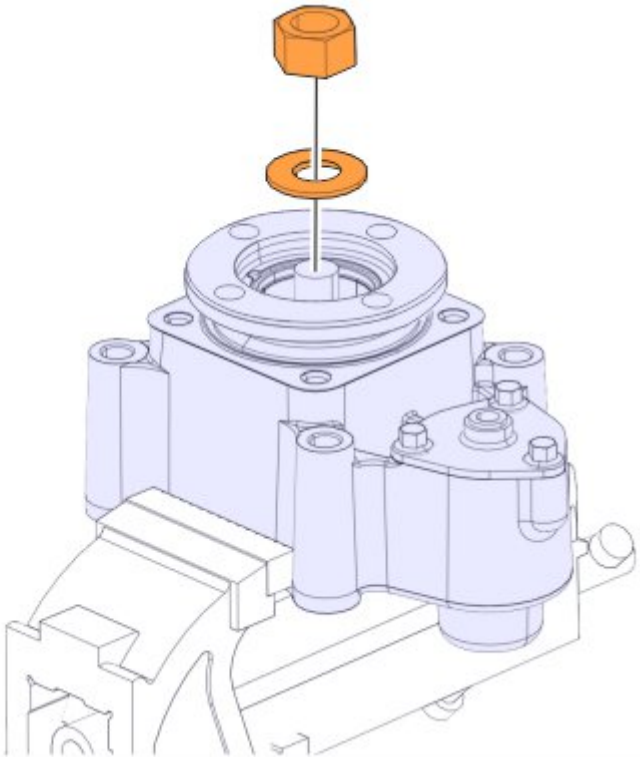
1	Position the PTO (Power Take-Off) in the vice. **Note** Use soft jaws in the vice.

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2	Remove the nut and the washer.		
	Required material		
	A	COUNTERHOLD	9992890

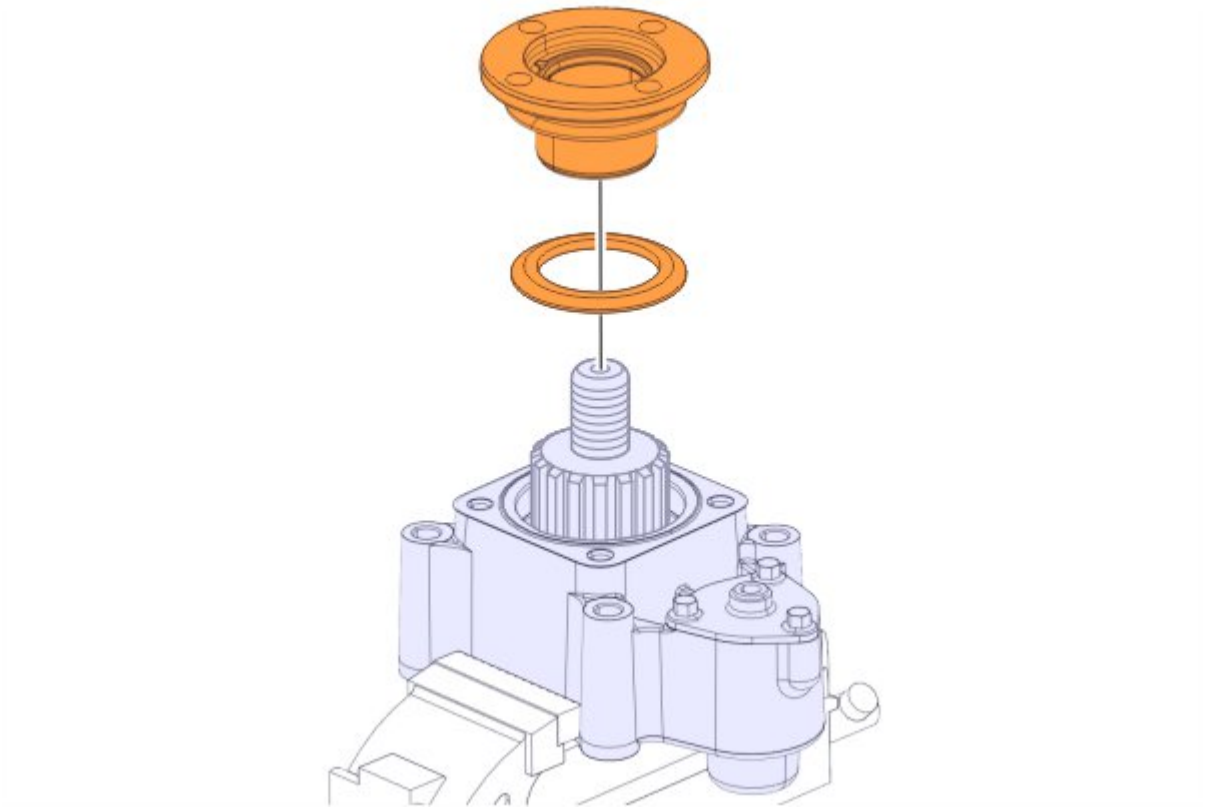




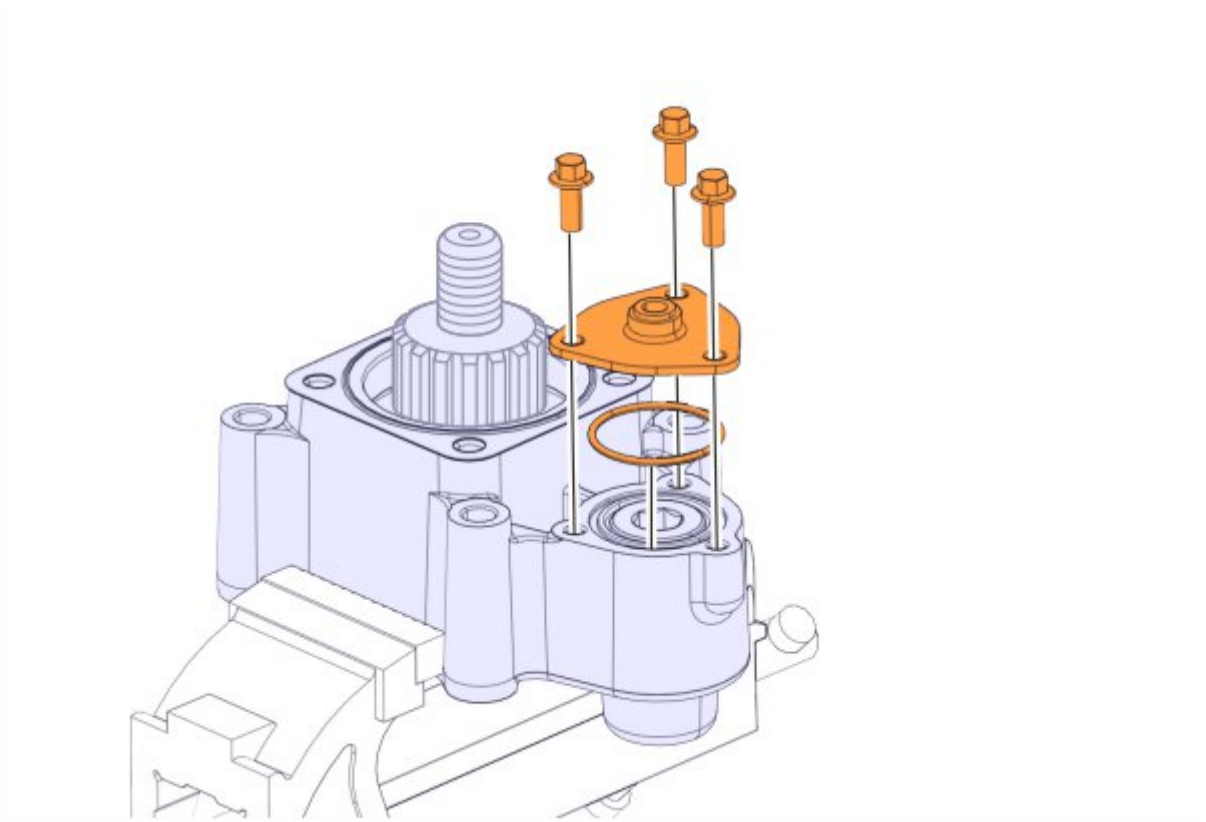
3	Remove the flange.

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4	Remove the seal.



5	Remove the screws.
6	Remove the cover.
7	Remove the O-ring.

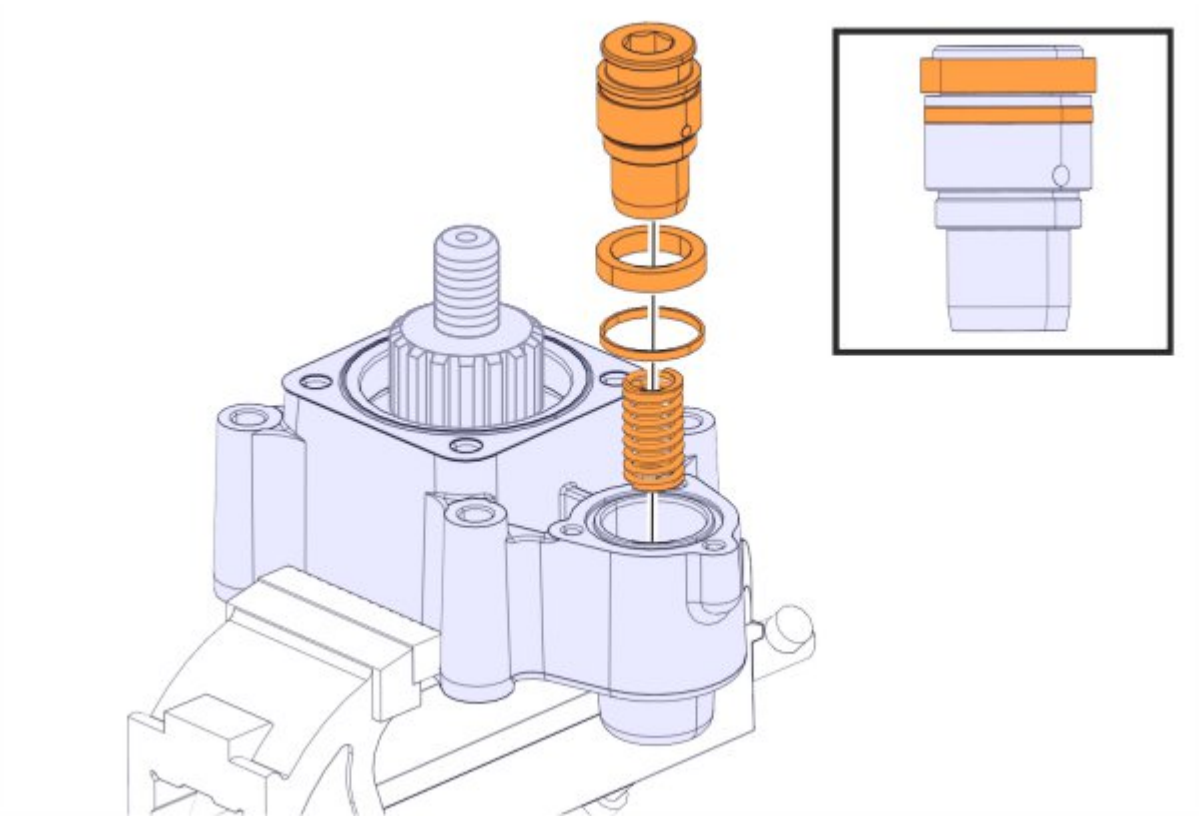


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8	Remove the piston.

9	Remove the gaskets.

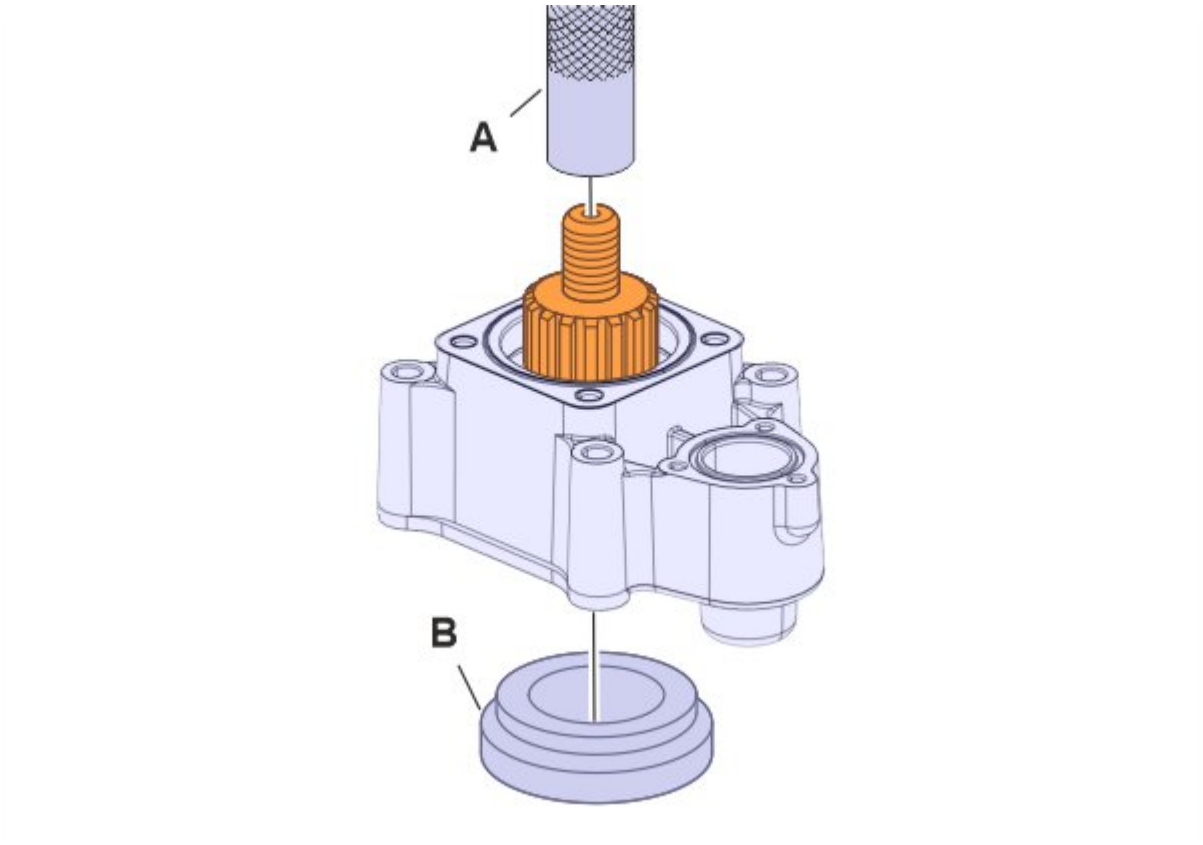
10	Remove the spring.



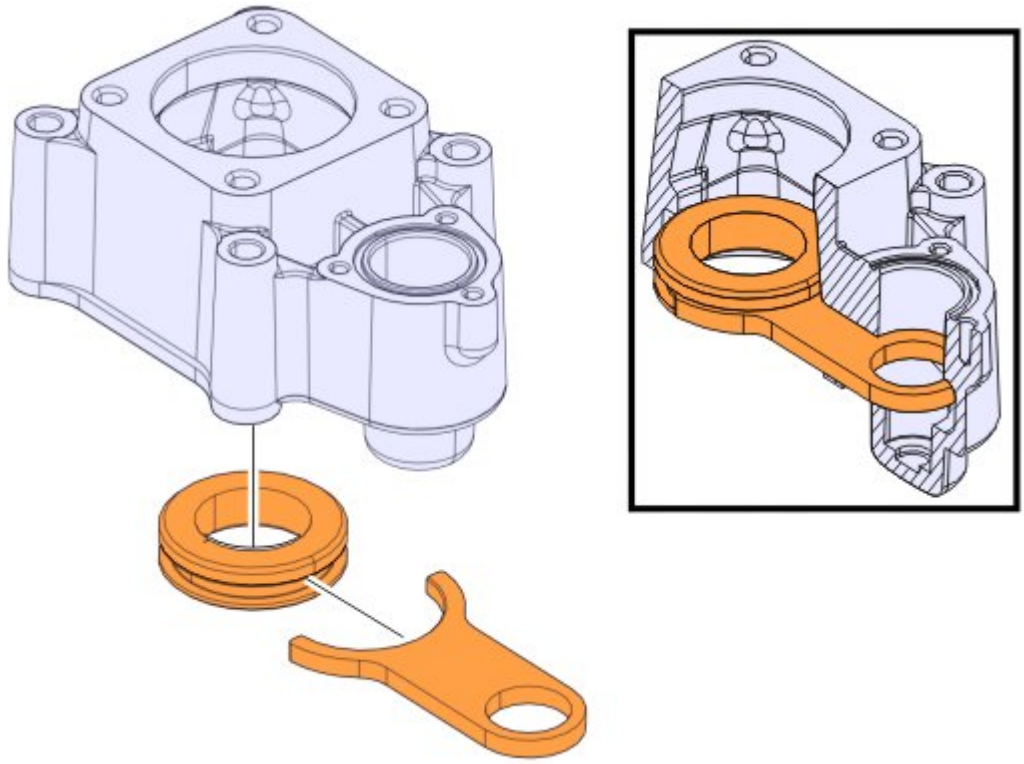
11	Remove the PTO from the vice.

12	Remove the shaft.		
	Required material		
	A	HOLLOW DRIFT	9994034
	B	PAD	9992219

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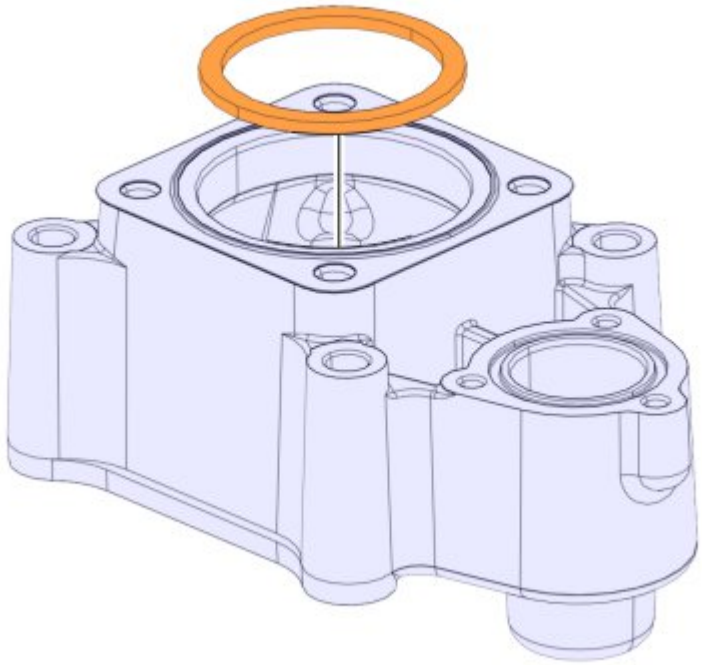


13	Remove the fork along with the sleeve. **Note** Note the positions.

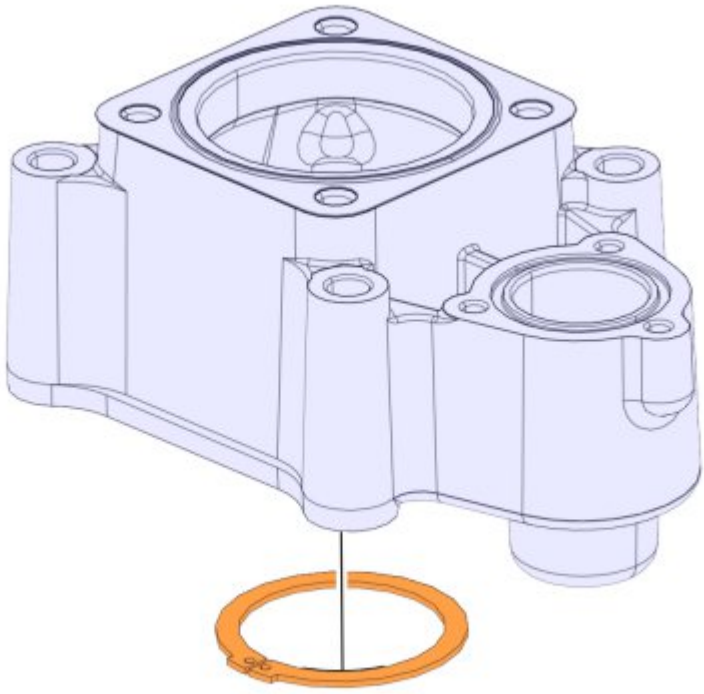


14	Remove the sealing ring.

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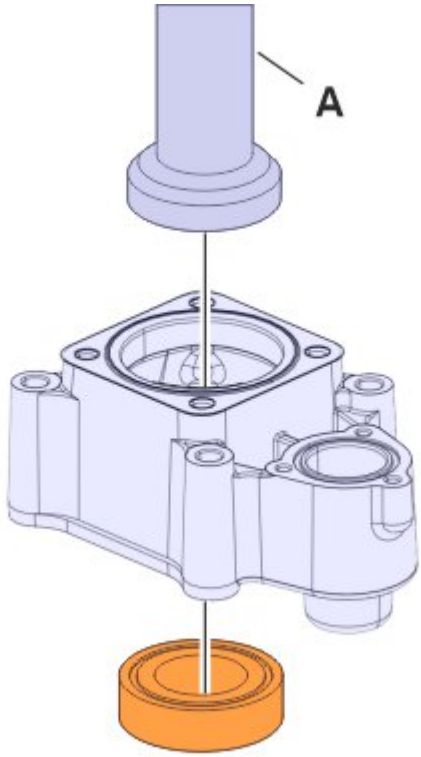


15	Remove the snap ring.

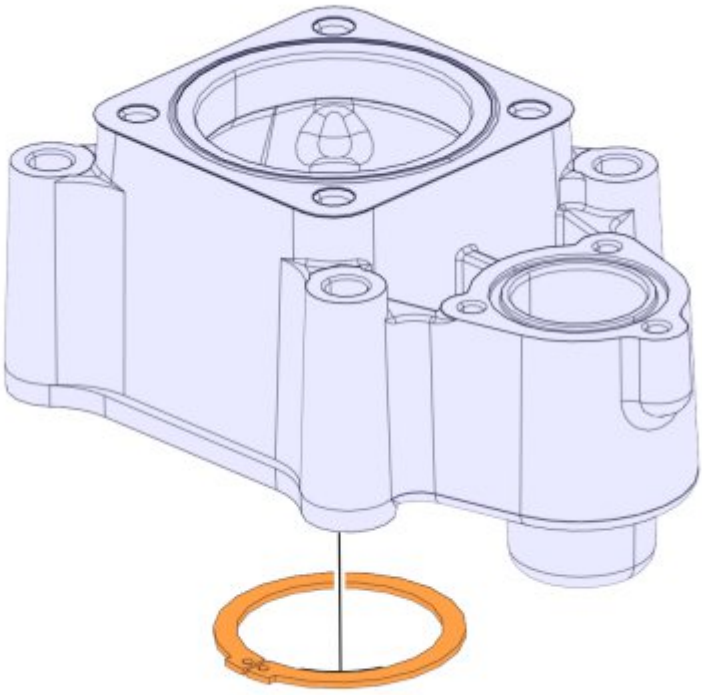


16	Remove the bearing.		
	Required material		
	A	HOLLOW DRIFT	9992267

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17	Remove the snap ring.



18	Clean the parts.
	Required material
	Cleaner

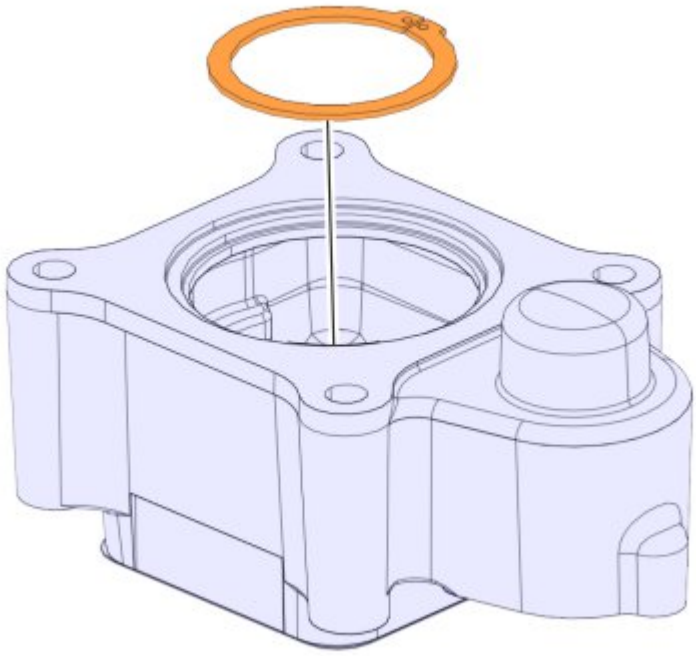
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19	Check the parts for wear and damage.

20	Perform this procedure when the condition below is met. **Conditions** • If the parts are damaged or worn out ▸ Replace the parts. **Note** Use new parts.

21	Rotate the housing through 180 degrees.

22	Install the snap ring. **Note** Use a new part.

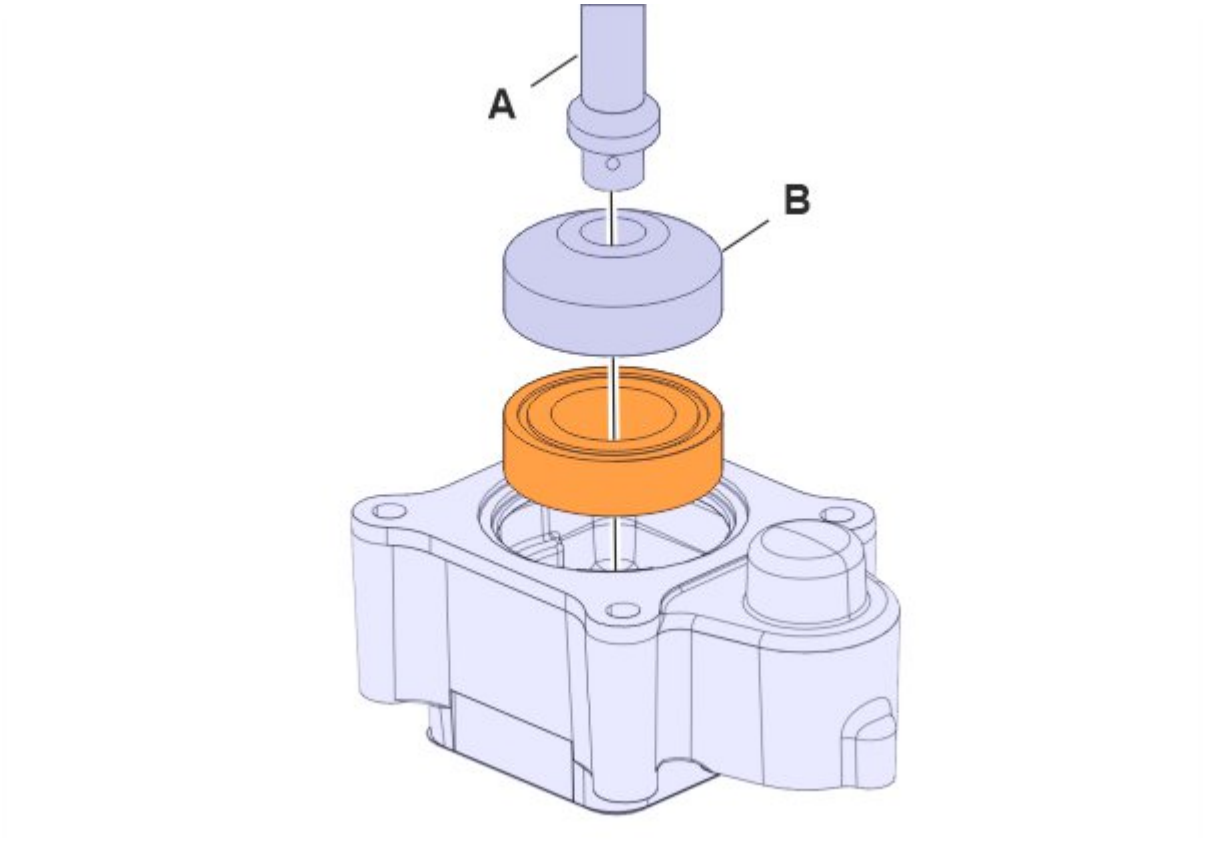


23	Lubricate the bearing. **Required material** Transmission Oil **Note** Use a new part.

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24	Install the bearing.

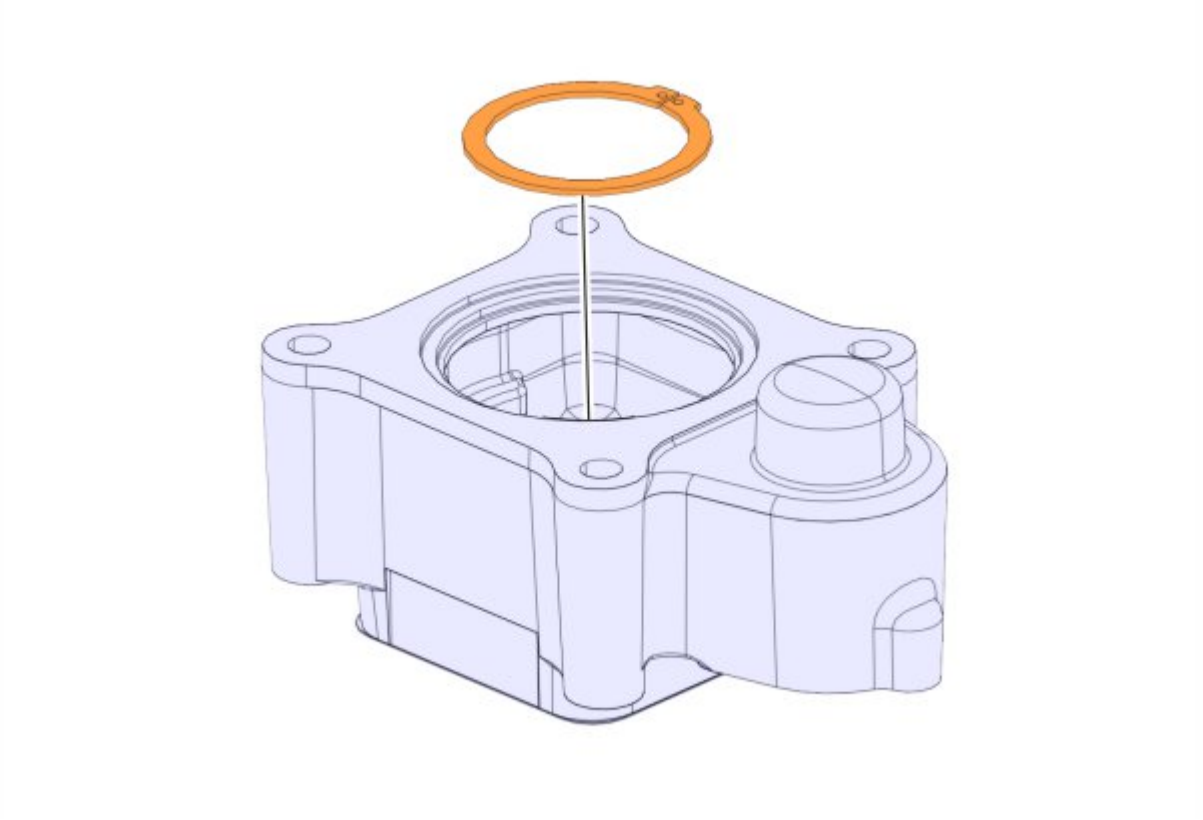
Required material		
A	MANDREL	9992677
B	MANDREL	9992025



25	Install the snap ring.

Note
Use a new part.

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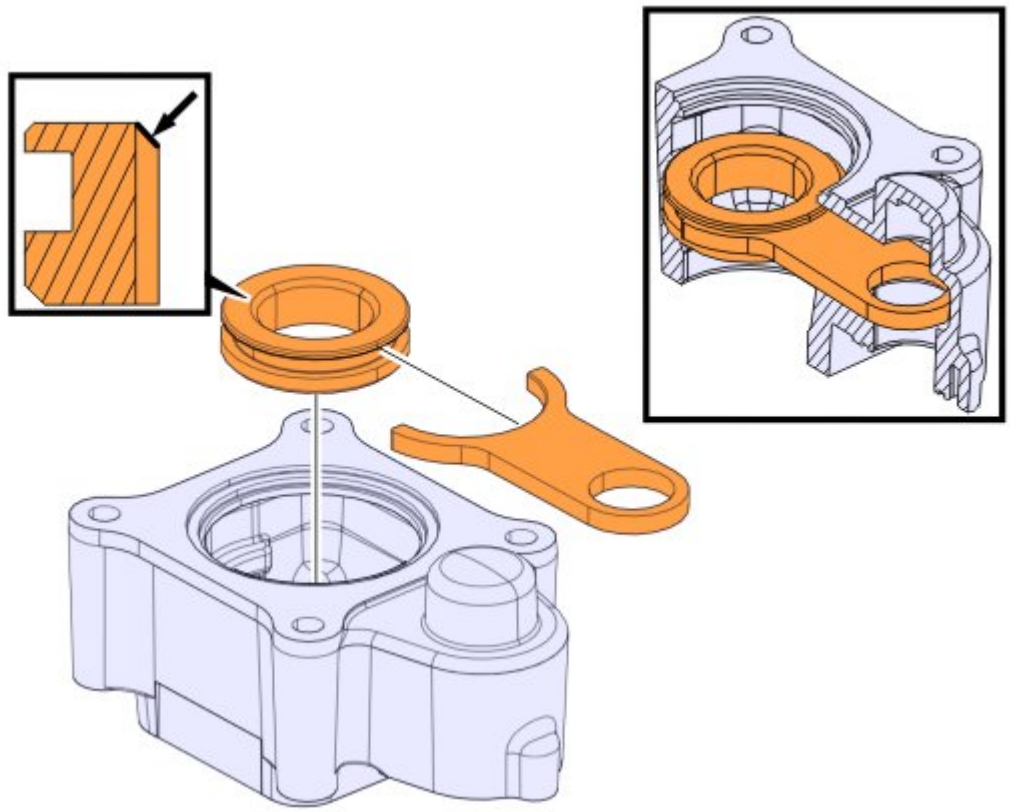


26	Lubricate the selector fork. **Required material** Transmission Oil

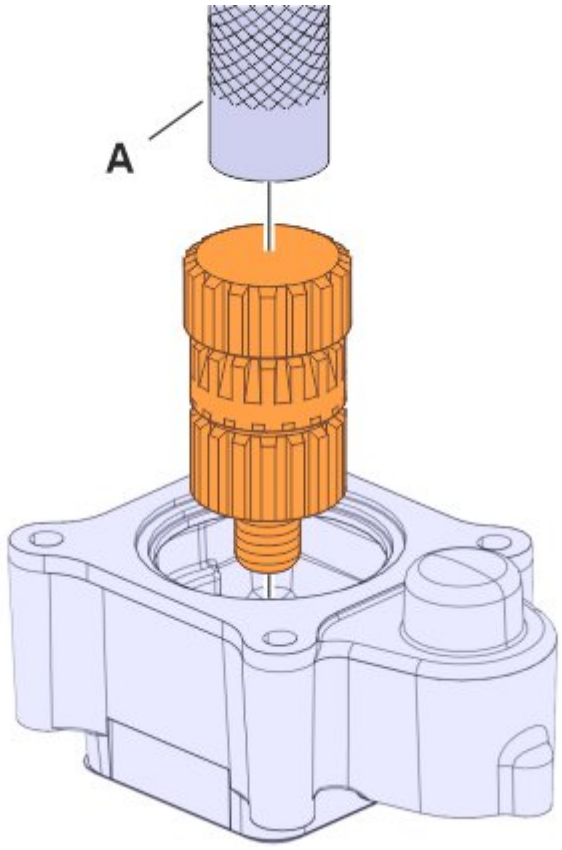
27	Lubricate the sleeve. **Required material** Transmission Oil

28	Install the fork along with the sleeve. **Note** Install as noted. **Note** Use new parts. **Note** The chamfer should face upwards.

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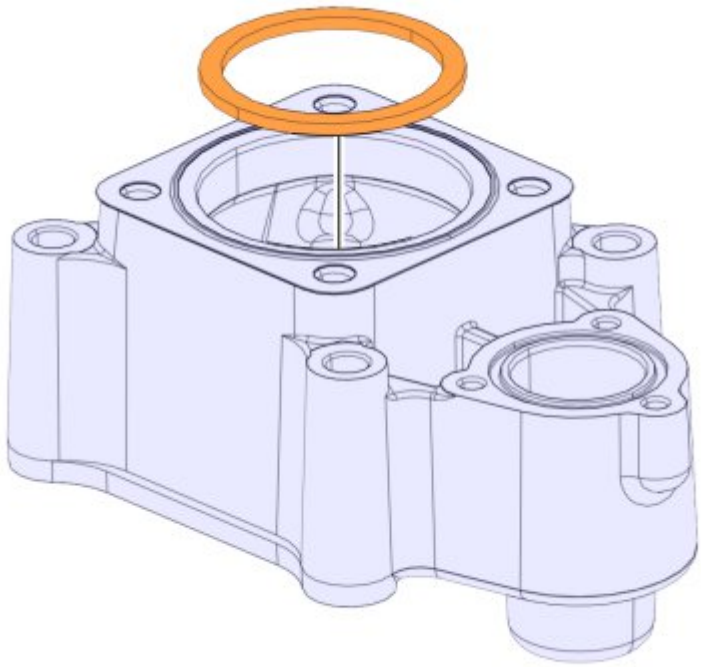
29	Install the shaft.		
	Required material		
	A	HOLLOW DRIFT	9994034



30	Rotate the housing through 180 degrees.

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31	Install the sealing ring. **Note** Use a new part.



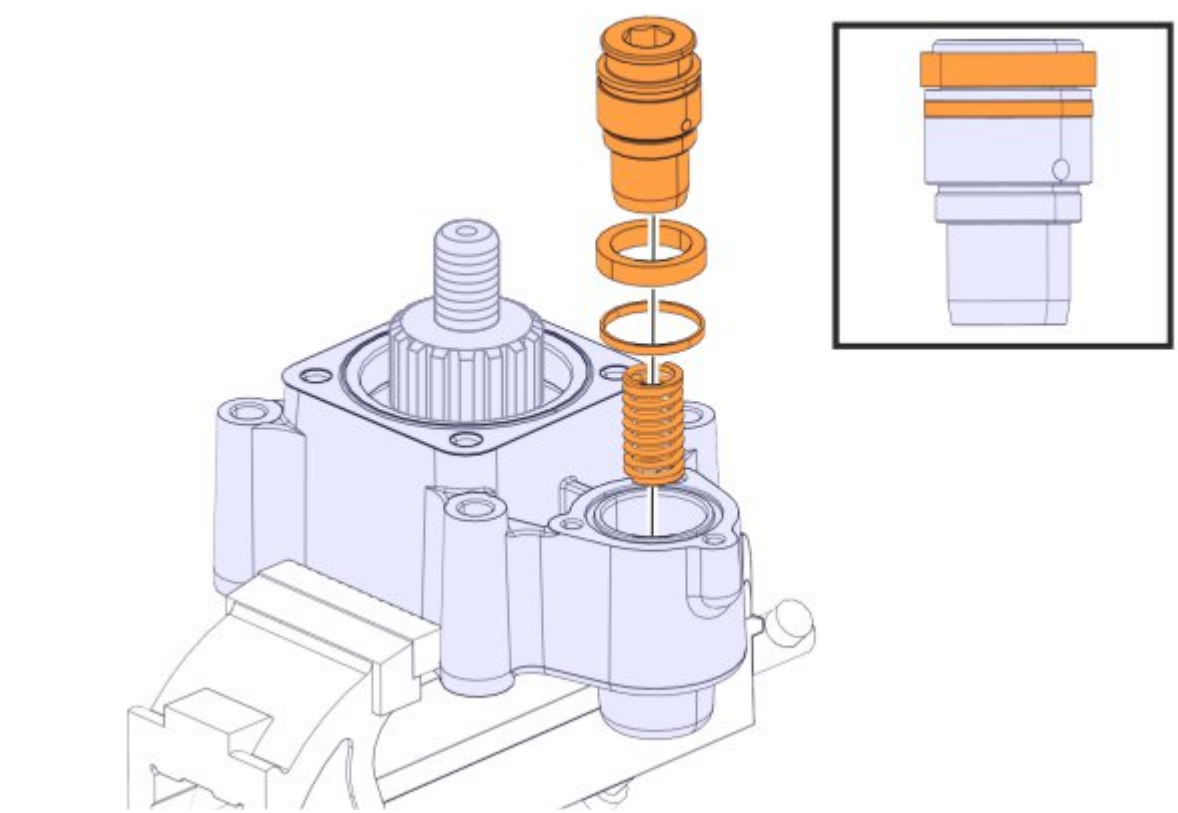
32	Position the PTO in the vice. **Note** Use soft jaws in the vice.
33	Install the spring. **Note** Use a new part.
34	Install the gaskets. **Note** Use new parts.
35	Lubricate the piston. **Required material** Transmission Oil
36	Install the piston.

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	Note Use a new part.

37	Torque tighten the piston.

Tightening torque	
PTO, piston	150 ±25 Nm (111 ±18 lb_f·ft)



38	Lubricate the O-ring.

Required material
Transmission Oil

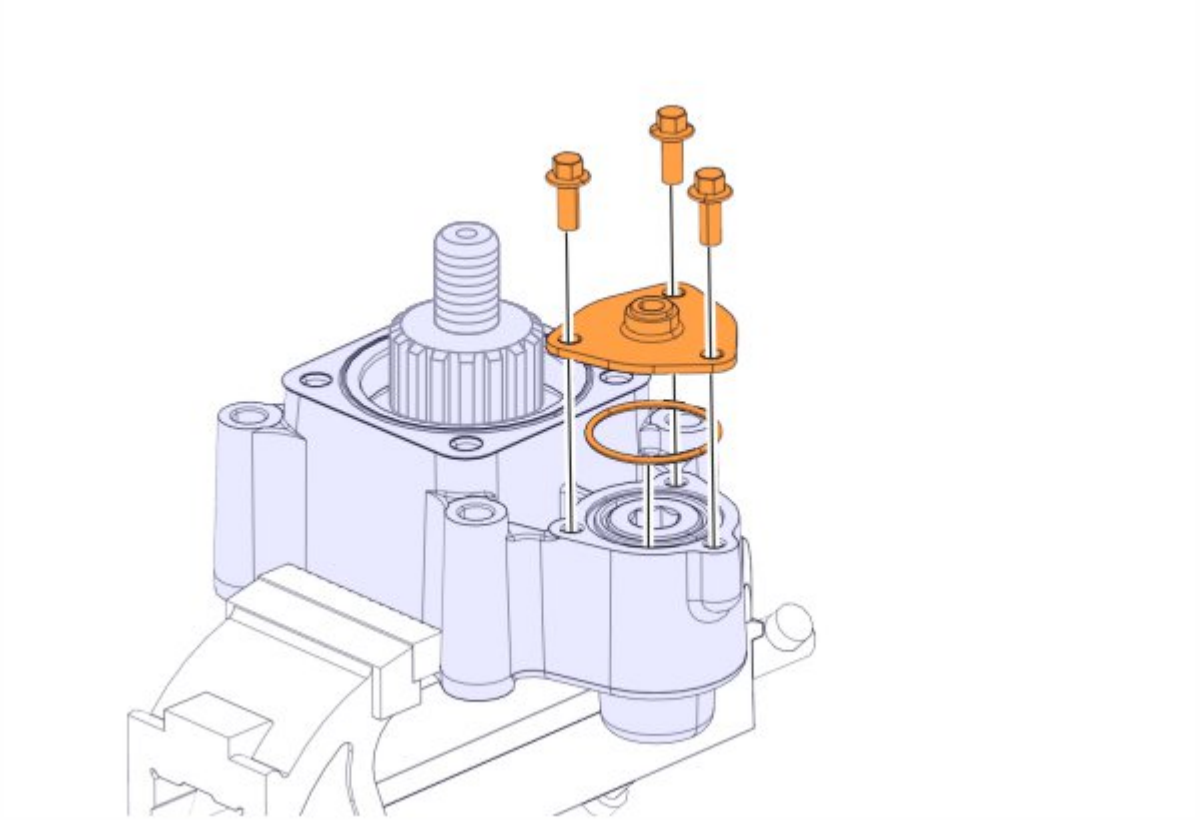
	Note Use a new part.

39	Install the O-ring.
40	Install the cover.
41	Install the screws.
42	Torque tighten the screws.

Tightening torque

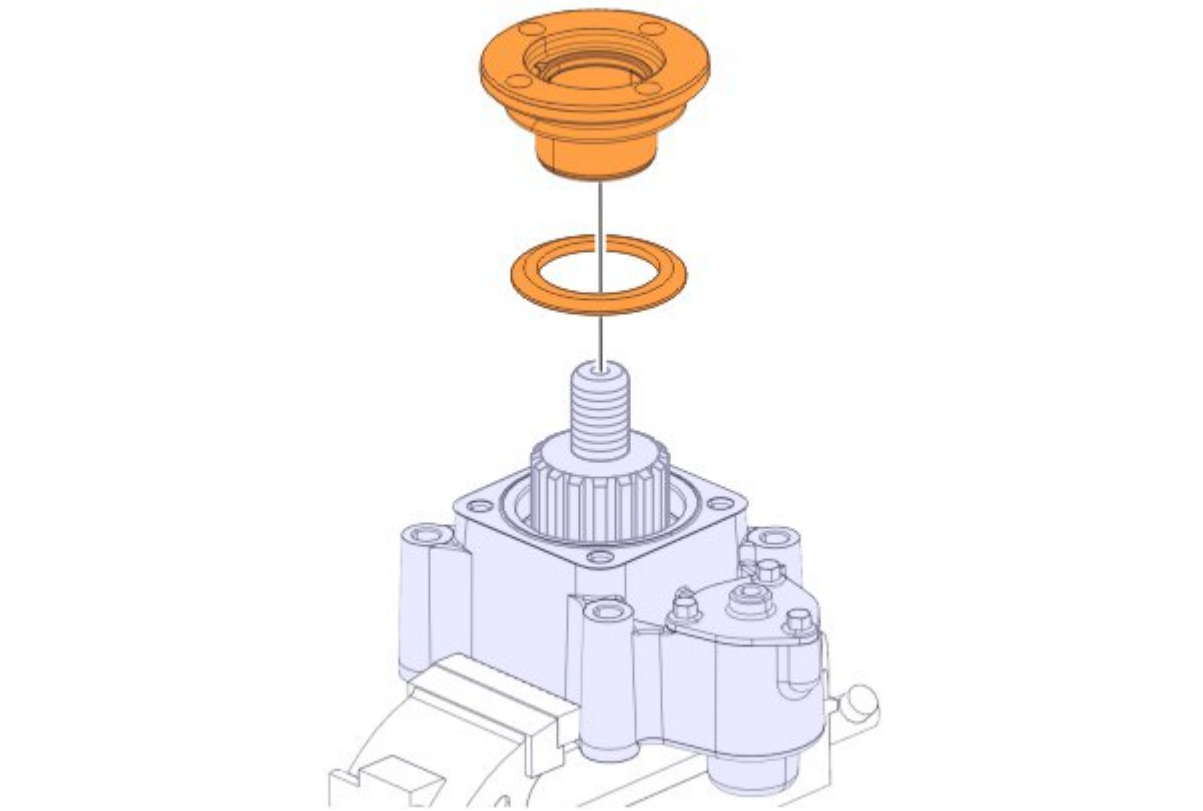
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	PTO, cover, screw	20 ±3 Nm (15 ±2 lb_f·ft)



43	Lubricate the seal. **Required material** Transmission Oil **Note** Use a new part.
44	Install the seal.
45	Install the flange.

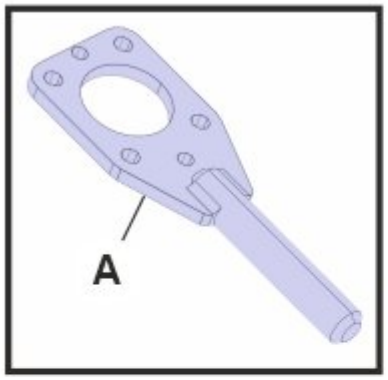
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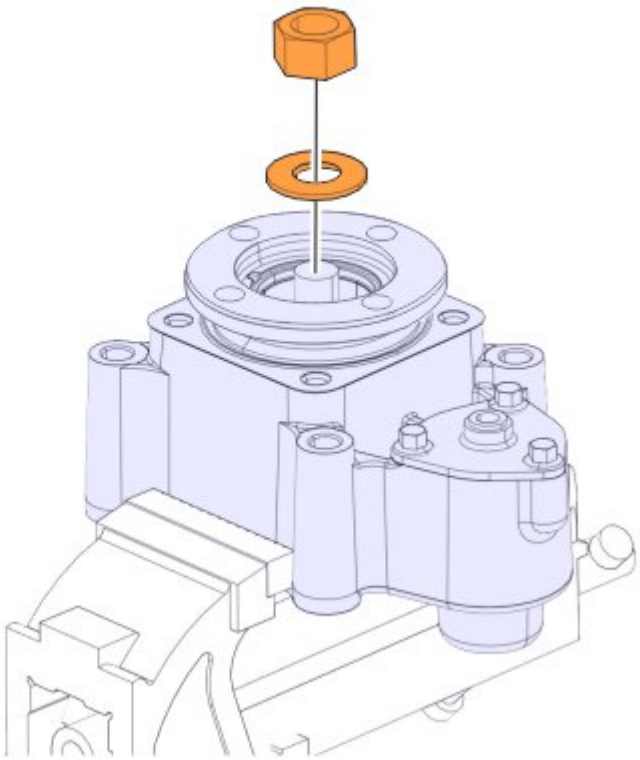


46	Install the washer and the nut.

47	Torque tighten the nut.	
	Tightening torque	
	Drive flange, nut	90 ±10 Nm (66 ±7 lb_f·ft)
	Required material	
	COUNTERHOLD	9992890

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48	Remove the PTO from the vice.

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