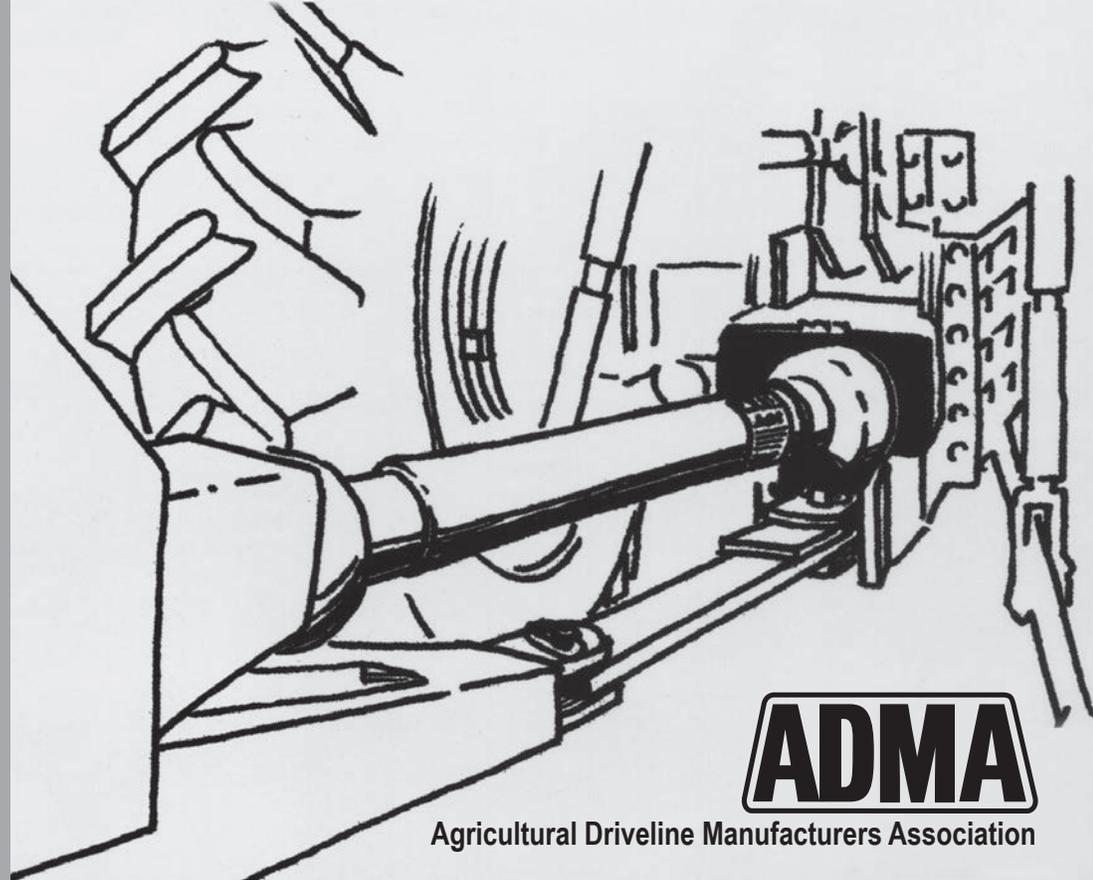


Agricultural Implement Drivelines



Safety Manual

**For owners
and operators**



ADMA

Agricultural Driveline Manufacturers Association

Acknowledgment

This booklet was prepared by members of the Agricultural Driveline Manufacturers Association (ADMA). We also wish to acknowledge the many contributions of safety professionals from farm equipment manufacturers, universities, state safety organizations and equipment industry associations in the development of this safety manual.

Please visit the ADMA website for additional safety resources, including a PTO safety training video.

www.admausa.com

LEGAL NOTICE AND DISCLAIMER

The suggestions and safety comments contained in this manual are intended solely as an educational tool and as general guidance. This manual is not a substitute for the instructions, warnings, and safety information contained in the manufacturer's manual(s) for your machine(s). ADMA and its underlying members, directors, officers, and agents are not responsible for, and expressly disclaim all liability for, damages of any kind arising out of the use or misuse of the information contained in this manual. No guarantees or warranties, including (but not limited to) any express or implied warranties of merchant ability or fitness for a particular use or purpose, are made by ADMA with respect to this manual or the information contained herein.

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Safety Alert Symbol

This Safety Alert Symbol means

- **Attention!**
- **Become Alert!**
- **Your Safety Is Involved!**

The Safety Alert Symbol identifies important safety messages on machines, safety signs, in manuals, or elsewhere. When you see this symbol, be alert to the possibility of personal injury or death. Follow the instructions in the safety message.



Why is SAFETY important to You?

3 BIG REASONS:

- **ACCIDENTS DISABLE**
- **ACCIDENTS KILL**
- **ACCIDENTS CAN BE AVOIDED**

Foreward

This Safety Manual is intended to point out some of the basic safety situations which may be encountered during the normal operation and maintenance of your power take-off (PTO) drive shaft system and to suggest possible ways of dealing with these conditions. This manual is not a substitute for the manufacturer's manual(s).

Additional precautions may be necessary, depending on the attachments used and conditions at the worksite or in the service area. The manufacturer has no direct control over machine application, operation, inspection, lubrication, or maintenance. Therefore, it is YOUR responsibility to use good safety practices in these areas.

The information provided in this manual supplements the specific information about your machine that is contained in the manufacturer's manual(s). Other information that may affect the safe operation of your machine may be contained on safety signs, in vocational-agricultural and extension training materials, or in insurance requirements, employer's safety programs, safety codes, or local, state/provincial, and federal laws, rules, and regulations.

IMPORTANT: If you do not have the manufacturer's manual(s) for your particular machine(s), get a replacement manual from your employer, an equipment dealer, or from the manufacturer of your machine. Keep this safety manual and the manufacturer's manual(s) with your machine(s). Read and understand the manufacturer's manual(s) BEFORE you begin using your machine.

A word to the user

It is YOUR responsibility to read and understand this safety manual and the manufacturer's manual(s) before operating your equipment.

In reading this manual, you should note that any illustration depicting an unsafe work procedure or situation is marked with an "  " on the illustration.

Remember that **you** are the key to safety. Good safety practices not only protect you but also protect the people around you. Study this manual and the manufacturer's manual(s) for your implement(s). Make these manuals a working part of your safety program. Practice all other usual and customary safe working precautions and above all:

REMEMBER, SAFETY IS UP TO YOU.

YOU CAN PREVENT SERIOUS INJURY OR DEATH.

Important Safety Information

PTO safety training is tremendously important, but it does not have to be difficult. Agricultural equipment with PTO drive shafts can be used safely when all of the guards are in place and when you follow proper and safe operating procedures, including the safety information given in this booklet and your machinery operator's manuals.

The area between the tractor and the PTO-driven implement is a DANGER zone. This can be one of the most dangerous places on your farm – for you, every member of your family, and employees. A PTO drive shaft rotates at a speed of 540 rpm (9 rotations per second), 1,000 rpm (17 rotations per second) or 1,300 rpm (22 rotations per second). At these speeds, a person's clothing, limb, or hair can be pulled into and wrapped around a PTO drive shaft several times before the person can react.

We know that many PTO drive shaft accidents happen when guards are missing or do not function properly because they were improperly installed, have not been properly maintained, or are damaged or worn out.

Certain operating conditions are particularly dangerous:

- If your equipment is missing guards or shields...
- If the guards or shields are not properly installed...
- If the guards or shields are not in proper working condition...
- If you are not paying attention...
- If children are playing near where you are working...
- If you are operating a stationary piece of equipment...
- If you are wearing loose-fitting clothes...
- If you are tired or in a hurry to get finished...
- If it is too dark to see...

The Function of the PTO Drive Shaft and Guarding

The purpose of the PTO drive shaft is to transmit power from one point to another. This could be between a tractor and implement, between a combine and header, or it could be within an implement. It must be able to operate safely across a wide range of performance demands and different environmental conditions.

The purpose of the drive shaft guarding system is to help prevent inadvertent contact and entanglement in the drive shaft. The safety components of the PTO drive shaft are just as important as the functional components.

The tractor master shield, drive shaft guards, and power input connection (PIC) guard form an interactive guarding system.

Because you and others are using machines with drive shafts, the purpose of this booklet is to help you use drive shafts carefully and thoughtfully and to remind you to:

KEEP ALL GUARDS AND SHIELDS IN PLACE.



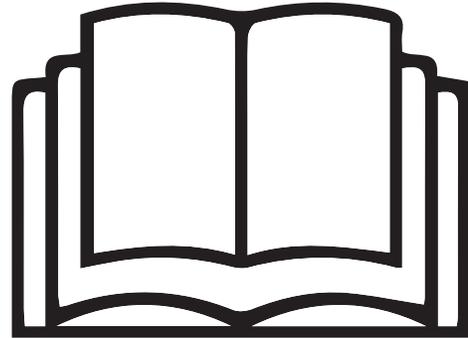
The Operator's Manual

Read the manual for each machine **before** you begin using the machine!

Understand the contents of every manual **before** you begin using the machine!

If you have any questions about a machine's operations, go to the manufacturer's web site for additional information or contact your local dealer.

Heed all safety messages in the operator's manual and safety signs on the machines.



Safety Before Operation

Implement Attachment

- Make sure that all users read and understand the operator's manuals for the tractor and the implement **before** attaching the implement and beginning operation.
- Before operating the implement, make sure that the tractor PTO speed matches the required speed of the implement. Also, if using the front PTO, make sure that the direction of rotation of the tractor front PTO matches the required direction of the front mounted implement. Consult the implement operator's manual to determine the required speed and direction of the implement.
- The PTO drive shaft and any torque limiter or overrunning clutches are designed specifically for each implement. Do not move drive shafts between implements.
- Follow the manufacturer's recommendation for attaching the implement to the tractor. Make sure the distance from the tractor PTO shaft to the hole in the drawbar is the distance recommended by the implement manufacturer in the operator's manual or on implement signs.
- If your drawbar has an offset end, be sure it is in the down position so it won't interfere with the drive shaft guard when you are using PTO-driven equipment. Make sure your three-point hitch and drawbar are correctly positioned so neither interferes with the drive shaft. Lock the three-point hitch when you are not using it.

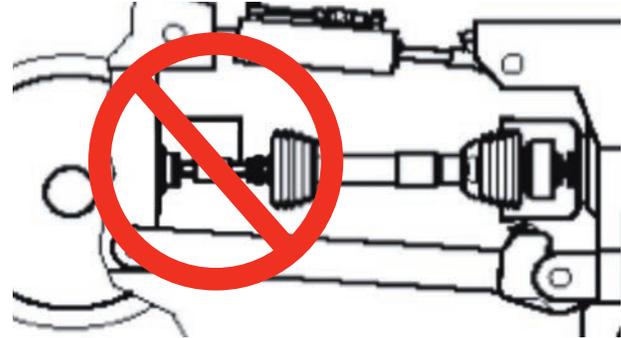


- Use a drawbar hitch pin with a low head. When the hitch pin or other parts of the drawbar connection are too close to the drive shaft, field operation on uneven or terraced terrain may result in guard damage.
- Do not weld any protruding device onto the head of your hitch pin.
- Make sure the PTO drive shaft is attached securely to the tractor and the implement. If a set screw or bolt is the recommended means for attachment, make sure it is the correct length and follow the original manufacturer's recommendations. Do not attach drive shafts with bolts or pins which are longer than recommended. Protruding bolts or pins can catch loose clothing, boot-laces or a pant cuff, and while spinning rapidly can cause serious bodily injury.



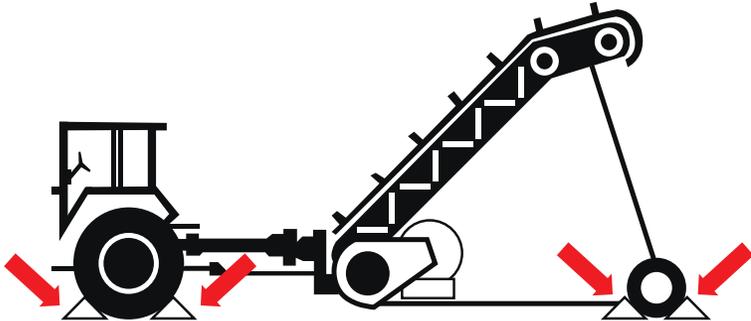
The PTO Drive Shaft Guarding System

- The PTO drive shaft guarding system is one of the most important components for your safety and the safety of others. Make sure all guards are in good repair and in place **before** hooking up your drive shaft. This will greatly reduce the risk of an accident, serious injury, or even death.
- Make sure that the drive shaft guard can rotate independent of the shaft for a full rotation and can telescope freely.
- If the drive shaft guard has been provided with a restraint chain, make sure the chain is in place and has been properly connected to the tractor or the implement attachment point. Allow enough slack in the chain to allow the drive shaft to move in all working and transport positions. For best results, attach the chain perpendicular to the drive shaft.
- Make sure that any shear pins are correctly installed and that the proper replacement pins are readily available. Check any other overload devices to ensure they are operable and have been serviced according to the manufacturer's instructions.
- Do not use PTO spline adapters or extensions. Their use will result in unguarded areas of the drive shaft and will also limit the telescoping range of the profiles. This could cause damage to the drive shaft if the profiles bottom out. Using adapters can also cause the implement to operate at the wrong speed. This could damage the implement due to overspeeding or too much torque.
- Keep the drive shaft working area free of debris which could wrap on the drive shaft or could catch fire by coming in contact with hot surfaces.



Stationary Equipment

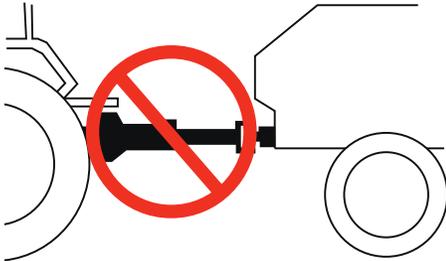
- Stationary equipment should be hitched to the tractor to insure that the PTO drive shaft is operating with adequate profile overlap, to make sure that the drive shaft is not overextended.
- Always set the tractor parking brake, and block the wheels on both the tractor and implement, **before** operating stationary equipment.



Safety During Operation

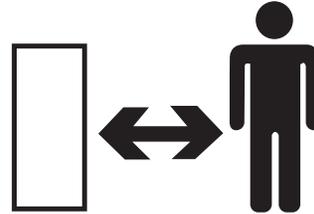
The first line of defense to prevent a PTO entanglement accident is to make sure that your tractor and implement(s) have the proper guards in place, installed properly and in good working condition.

- Never operate equipment without proper guarding. Do not operate if any part of the tractor master shield, the drive shaft guards or the PIC guard are damaged or missing.



- Always exercise extreme caution when operating machinery. Working around stationary equipment deserves special care and attention.

- Stay at least your height away from a rotating PTO drive shaft. Contact with rotating parts can cause death or serious injury.



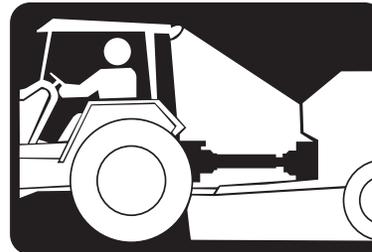
- No one should ever be between the tractor and implement during PTO operation. Make sure that no one is in the hazard zone when using external tractor or implement controls.
- Be sure to disengage the PTO drive shaft, turn off the tractor, and remove the key **BEFORE** making any inspections or working around the PTO drive shaft.

- Do not step on, over or under a drive shaft, especially an operating drive shaft.

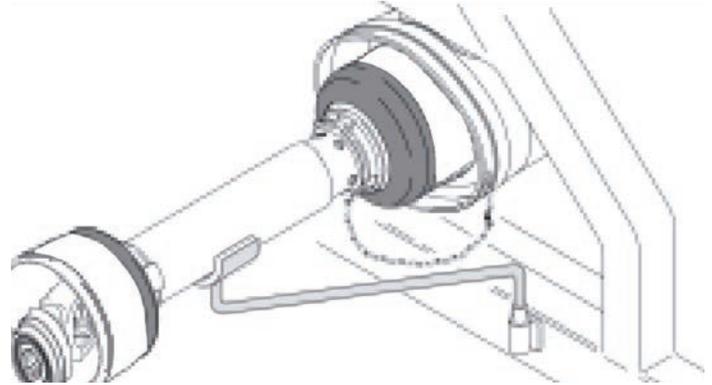


- Do not use the tractor drawbar or the implement tongue as a step.
- Be certain only a properly trained and physically able person will operate the machinery.
- Always wear close fitting clothes and keep long hair tied back or under a hat when working near PTO drive shafts. Do not wear loose clothing or jewelry.
- Do not allow any hydraulic hoses, electric cords, ropes, or other items to drape over the PTO drive shaft guard. This could result in damage to the hoses, cords, or guards.

- Ensure that safety decals, such as the “Rotating Driveshaft, Contact can cause death, Keep Away!” decal, are readily visible. Replace any decals that are missing, torn or obscured.
- Never allow the guards to pull apart. Guards could be cut or crushed when pushed back together.
- Do not remove the PTO drive shaft guard or expose guarded parts of the drive shaft by cutting or enlarging the grease access holes.
- Be aware of the increased risk when using stationary equipment due to possible increased exposure to the PTO drive shafts. Avoid contact with drive shafts in this close working environment.
- During operation at night or in poor visibility, illuminate the drive shaft operating area.



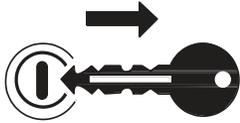
- To transport the machinery, follow the implement manufacturer's recommendation for storing the drive shaft. If no provision for storage is available, make sure the drive shaft is properly secured to prevent damage to the guarding system during transport.
- Be careful not to damage the PTO drive shaft by contact with the tractor tires when turning. This often happens during non-operational situations, such as machine transport.



Safety During Maintenance

Machinery Shutdown

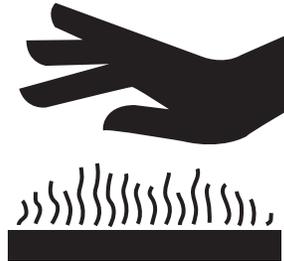
- Before performing any maintenance work, disengage the PTO, turn the tractor off and remove the key.



- Keep clear of the machine and away from the PTO drive shaft until all parts have stopped moving.

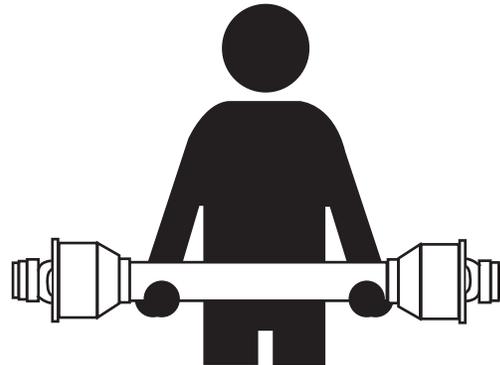
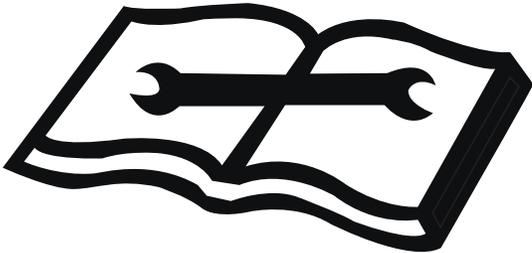


- PTO drive shaft components, especially clutches, may become hot during use. DO NOT TOUCH! Allow the components to cool before working on them.



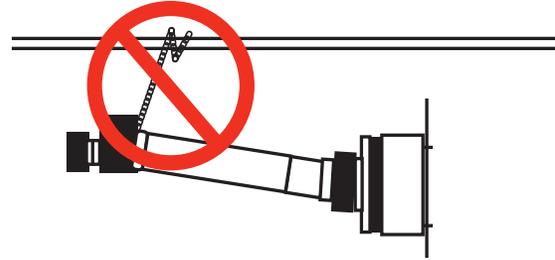
PTO Drive Shaft Inspection

- Regularly inspect the drive shaft guarding system, including the tractor master shield, drive shaft guard, and PIC guard.
- If the drive shaft guard does not rotate freely on the shaft, is damaged, or the safety signs are missing or illegible, these parts must be repaired or replaced.
- Perform regular maintenance in accordance with operator manuals. As the equipment grows older be certain to perform suggested maintenance based on years or hours of usage.
- Replace any damaged or missing guards immediately with original equipment replacement parts. Make sure the replacement parts are installed correctly.
- When handling a drive shaft, keep it horizontal to prevent the halves from sliding apart.
- Use caution when lifting drive shafts, because some drive shafts are heavy.



- Keep your hands clear of the joint pivot areas when handling the drive shaft. End yokes and clutches may pivot unexpectedly and could pinch fingers or hands.
- Keep the drive shaft guard bearings well-lubricated.
- Check the quick disconnect pin, slide, or twist collar attachment yokes for proper function. Check clamp bolts and set screws for proper torque.
- Store your equipment inside and do not allow the PTO drive shaft to rest on the ground. Make sure the drive shaft is stored in a manner which will not damage the guards. Rust and mud may interfere with the drive shaft locking device or you could unknowingly run over it with the tractor or other farm equipment.

- Do not use the guard restraint chain to support the drive shaft during transport or storage. Always use the drive shaft support provided on the implement.



- Always use original equipment replacement parts to ensure proper performance.

Drive Shaft Guards

To replace drive shaft guards and safety signs, go to your farm equipment dealer. Brand name original equipment replacement parts are recommended. If your dealer cannot supply the guarding or safety signs needed, contact the equipment manufacturer. If the manufacturer is not able to supply the guarding, retrofits are available at dealers or farm stores.

When replacing a drive shaft guard:

- Make sure the proper guard bearings are used for installation.
- Lubricate the bearing grooves per implement manufacturer's recommendation.
- Install the ADMA "Guard Missing" safety sign to the outer torque transmitting tube.
- Make sure the ADMA "Rotating Driveshaft" safety sign is on the replacement guard.
- If the drive shaft is old and will not accept a guard, replace the drive shaft!

Do not modify the drive shaft when you repair or replace it. The drive shaft was engineered and manufactured for a specific implement application.



Proper maintenance of all shields, guards, and overload devices is important for safe operation. A guard must be fitted to the power input connection (PIC) of the implement so that it will overlap with the drive shaft guard.

Overload Devices

Overrunning Clutch

- Lubricate per the manufacturer's recommendation.

Shear Bolt Torque Limiter

- Replace sheared bolts only with the manufacturer's recommended diameter, length, and grade.
- Lubricate per the manufacturer's recommendation.

Friction Disc Torque Limiter

- To avoid damage to the implement, drive shaft, or tractor, do not exceed the manufacturer's recommended settings, or use a spring that is not recommended.
- All friction torque limiters should be inspected for freeze-up after long periods of non-use. Check the operator's manual or consult your equipment dealer for the proper procedure to reestablish the correct torque setting.

Other Torque Limiters

- Maintain according to manufacturer's recommendations.

Remember, Safety First

- Always exercise extreme caution when operating machinery.
- Stay at least your height away from a rotating drive shaft.
- Never operate equipment without proper guarding.
- You have an obligation to keep children away. There is NO reason for any child to be near operating equipment.
- Recognize and accommodate those with physical limitations, including the elderly, who are assisting with farm work.
- It only takes a split-second for an article of clothing, a shoelace, a pant cuff, or even a strand of hair to become entangled in a drive shaft.
- Fatigue is a warning you should never ignore.
- Do not wear loose fitting clothes, windbreakers, jackets with long drawstrings or jewelry when working near drive shafts.
- Keep long hair tucked securely under a hat.
- Never step on, over or under any drive shaft, especially an operating drive shaft.
- Do not use the tractor drawbar or the implement tongue as a step.
- Slippery conditions increase your risk of injury.
- Working around stationary equipment requires special care and attention.
- Heed all safety warnings in the operator's manual and on safety signs.
- During operation at night or in poor visibility, illuminate the drive shaft operating area.

**This booklet has been prepared
by ADMA, the Agricultural Driveline Manufacturers Association,
for the express purpose of promoting drive shaft safety.
For additional information and safety resources,
please visit the ADMA website.**

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