



Agricultural Driveline Manufacturers Association



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Member Companies:

Bondioli & Pavesi, Inc.

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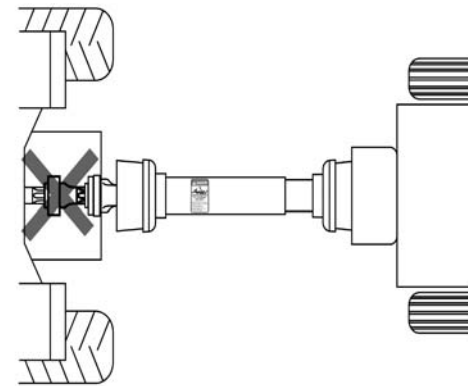
G&G Manufacturing Co.

GKN Walterscheid, Inc.

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OEM DRIVESHAFT DESIGN GUIDE TO ELIMINATE PTO ADAPTORS



Agriculture is recognized as one of the more hazardous occupations. Today's farmer spends long hours in close proximity to increasingly complex and powerful machinery. In order to avoid accidents, everyone from the component suppliers, to the company who manufactures and assembles the machinery, to the dealers and ultimately the actual user must keep safety in mind.

PTO adaptors have been used for many years to connect unmatched splines of tractor PTO shafts to implement PTO drivshafts. ADMA advises against the use of PTO adaptors which may defeat the purpose of the tractor's master shield and adversely affect the performance of the PTO drivshaft. International safety standards state, "No device (e.g. adaptors) shall be installed between the tractor PTO shaft and the primary PTO drivshaft."

ADMA is concerned that PTO drivshafts be used in the safest possible manner. This OEM Design Guide contains safety information directly related to the PTO drivshafts of agricultural implements. More information may be found in general safety literature and in the relevant standards published by the American Society of Agricultural and Biological Engineers (ASABE), the Canadian Standards Association (CSA), the International Standards Organization (ISO) and the Society of Automotive Engineers (SAE).



ADMA advises that Original Equipment Manufacturers of agricultural implements do the following:

- Eliminate the need for PTO spline adaptors.
 - For implements designed to operate at one speed only, 540 rpm or 1,000 rpm; the operator's manual should clearly state to use the PTO driveshaft provided with the implement and no PTO adaptor may be used to alter speed or geometry.
- Eliminate the need for PTO spline adaptors for implements designed to operate at either 540 rpm or 1,000 rpm.
 - Design implements and PTO driveshafts to fit all 3 types of PTO (1 3/8-6 spline at 540 rpm, 1 1/2-21 spline at 1,000 rpm and 1 1/2-20 spline at 1,000 rpm).
*Provide enough telescoping for PTO types 1, 2, and 3 drawbar length differences.
Size joints large enough to handle highest torque.
Design critical speed above all tractor PTO speeds.*
- Advise the end user if the PTO driveshaft can be modified on 1,000 rpm implements by changing the tractor end yoke from 1 3/8-21 spline to 1 1/2-20 spline, or vice versa.
- International safety standards state, "A sign shall be provided at a prominent location on the PTO-powered implement, near its PIC [Power Input Connection] specifying the nominal operating speed and the direction of rotation of the PTO driveshaft."
- If the implement has high inertia, incorporate an integral overrunning clutch on the implement end of the PTO driveshaft.
- Include the following information in the Implement Operators' Manual.
 - Never use a spline adaptor.
 - Match the right tractor PTO spline and speed with the PTO driveshaft provided with the implement. This will assure proper geometry and operating speed.
 - Never operate 540 rpm implements at 1,000 rpm.
 - Never operate 1,000 rpm implements at 540 rpm.
 - Provide information for the correct hitch geometry for each PTO type.
 - Use of adaptors will void warranty due to damage caused to the tractor PTO, PTO driveshaft or implement.
- Based on the above information we advise that the use, promotion and/or selling of adaptors be discontinued.
- ADMA recognizes this Design Guide does not cover every possible application and that the easy way to connect unmatched splines has been to use an adaptor. The use of an adaptor violates relevant safety standards and creates unacceptable guarding and operational hazards.



Further information about PTO driveshaft specifications and safety may be obtained from your ADMA PTO driveshaft supplier and the following ASABE Standards and Engineering Practices:

- ASAE S205 – Power Take-Off Definitions and Terminology for Agricultural Tractors
 - ASAE S207 – Operating Requirements for Tractors and Power Take-Off Driven Implements
 - ASAE S217 (ISO 730-1) – Three-Point Free-Link Attachment for Hitching Implements to Agricultural Wheel Tractors
 - ASAE S318 – Safety for Agricultural Equipment
 - ASAE S331 – Implement Power Take-Off Driveline Specifications
 - ASAE EP363 – Technical Publications for Agricultural Equipment
 - ASAE S370 – 2000-RPM Power Take-Off for Lawn and Garden Ride-On Tractors
 - ASAE S431 – 2000-RPM Front and Mid PTO for Lawn and Garden Ride-on Tractors
 - ASAE S440 – Safety for Powered Lawn and Garden Equipment
 - ASAE S493 – Guarding for Agricultural Equipment
 - ASABE AD500-1 Agricultural tractor – Rear-mounted power take-off types 1, 2 and 3
 - Part 1: General specifications, safety requirements, dimensions for master shield and clearance zone
 - ASABE/ISO 500-2 Agricultural tractors – Rear-mounted power take-off types 1, 2 and 3
 - Part 2: Narrow-track tractors, dimensions for master shield and clearance zone
 - ASABE/ISO 500-3 Agricultural tractors – Rear-mounted power take-off types 1, 2 and 3
 - Part 3: Main PTO dimensions and spline dimensions, location of PTO
 - ASAE S522/ISO 5674 – Guards for Power Take-Off Driveshafts- Strength and Wear Tests and Acceptance Criteria
 - ASABE S604 – Safety for Power Take-off (PTO), Implement Input Driveline (IID), Implement Input Connection (IIC), and Auxiliary Power Take-off (aux. PTO) for Agricultural Field Equipment
 - ASABE/ISO 3767-1 Tractors, machinery for agriculture and forestry, powered lawn and garden equipment – Symbols for operator controls and other displays
 - Part 1: Common symbols
 - ASABE/ISO 3767-2 Tractors, machinery for agriculture and forestry, powered lawn and garden equipment – Symbols for operator controls and other displays
 - Part 2: Symbols for agricultural tractors and machinery
 - ASABE AD6489-3 Agricultural vehicles – Mechanical connections between towed and towing vehicles
 - Part 3: Tractor drawbar
 - ASABE AD8759-1 Agricultural wheeled tractors – Front-mounted equipment
 - Part 1: Power take-off and three-point linkage
 - ASABE AD8759-2 Agricultural wheeled tractors – Front-mounted equipment
 - Part 2: Stationary equipment connection
 - ASABE AD11684 Tractors, machinery for agriculture and forestry, powered lawn and garden equipment – Safety signs and hazard pictorials - General principles
- Other standards may apply for particular types of implements.
Standards may be found at www.asabe.org