ASAE S207.12 FEB04
Operating Requirements for Tractors and Power Take-Off
Driven Implements

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Operating Requirements for Tractors and Power Take-Off Driven Implements


1 Purpose and scope

1.1 This Standard was prepared to assist manufacturers of tractors and implements in providing suitable means of transmitting power from the tractor power take-off to the implement and satisfactory hitching of the implement to the tractor.

1.2 ASAE S203/SAE J1170 provides dimensions relating to the tractor power take-off shaft and PTO shield; provides specifications for the splined power take-off shaft and the mating connector; and establishes and defines power take-off types 1, 2, and 3.

1.3 ASAE S217 sets forth requirements for the attachment of three-point hitch implements or equipment to the rear of agricultural wheel tractors.

1.4 ASAE S482 provides dimensions for the drawbar location and relation to the tractor power take-off shaft.

1.5 The successful performance of all tractor and implement combinations likely to be met in field service require consideration of factors other than the dimensional relationship provided in the aforementioned Standards.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Standards organizations maintain registers of currently valid standards.

ANSI/ASAE S318.10 JUL93, Safety for Agricultural Equipment

ASAE S203.13 MAR94, Front and Rear Power Take-Off for Agricultural Tractors

ASAE S217.11, Three-Point Free-Link Attachment for Hitching Implements to Agricultural Wheel Tractors

ASAE S482 MAR93, Drawbars—Agricultural Wheel Tractors

SAE J708 DECE84, Agricultural Tractor Test Code

SAE J2708 APR93, Agricultural Tractor Test Code (OECD)

3 Definitions

3.1 power take-off, PTO: An external shaft on the rear of the tractor to provide rotational power to the implements.

3.2 implement input driveline, IID: Two universal joints and their connecting member(s) and fastening means for transmitting rotational power from the tractor PTO to the implement input connection. A double Cardan, constant velocity is considered a single joint. The IID also includes integral shielding (guarding) where provided.

3.3 implement input connection, IIC: The shaft or other connecting means to which the rear joint of the IID is attached on the implement.

3.4 driveline clearance plane: The imaginary, horizontal plane which establishes the uppermost permissible limit of protrusion of the drawbar hitch assembly or any component thereof, when the tractor and implement are on a common horizontal plane.

4 Instructions for the operator

4.1 A sign shall be provided in a prominent place on the implement specifying the required tractor drawbar hitch point location and/or implement hitch adjustments.

4.2 The operator’s manual for the implement shall also include the above information.

4.3 If a conversion assembly is made available for changing tractors or implements from 540 to 1000 rpm or from 1000 to 540 rpm, these conversion assemblies shall include a sign specifying the power take-off speed and the corresponding drawbar adjustments.

4.4 For recommended safety instructions, refer to ANSI/ASAE S318.

5 Implement input driveline and hitch requirements

5.1 Driveline clearance plane. The location of the drawbar hitch and IIC shaft shall be in relationship as set forth in figure 1 and table 2.

5.2 Provision should be made in the IID, IIC, and hitch of the implement to prevent any of the following during the normal operation when attached to any tractor which conforms to ASAE S203, ASAE S217, and ASAE S482 and operated according to the instructions of the implement manufacturer:

5.2.1 The universal joints in the IID from reaching a locking angle.

5.2.2 The telescoping section of the implement driveline from separating beyond the point where there is sufficient bearing to provide for proper operation.

5.2.3 The IID from sustaining damage from telescoping to a solid position.

Table 1 – PTO thrust forces

<table>
<thead>
<tr>
<th>PTO power</th>
<th>Thrust</th>
</tr>
</thead>
<tbody>
<tr>
<td>kW (hp)</td>
<td>KN (lbf)</td>
</tr>
<tr>
<td>15–25 (20.1–33.5) PTO</td>
<td>7.00 (1575)</td>
</tr>
<tr>
<td>Over 25–40 (33.5–53.6)</td>
<td>9.00 (2025)</td>
</tr>
<tr>
<td>Over 40–60 (53.6–80.5)</td>
<td>11.00 (2475)</td>
</tr>
<tr>
<td>Over 60–110 (80.5–147.5)</td>
<td>13.00 (2925)</td>
</tr>
<tr>
<td>Over 110 (147.5)</td>
<td>14.00 (3150)</td>
</tr>
</tbody>
</table>

45 mm (1 3/4 in.) PTO

<table>
<thead>
<tr>
<th>PTO power</th>
<th>Thrust</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over 110 (147.5)</td>
<td>18.00 (4050)</td>
</tr>
</tbody>
</table>
5.2.4 The IID or its shields from sustaining damage due to contracting the implement hitch, hitch pins, or any tractor parts such as PTO shield or three-point hitch linkage.

5.3 Vertical loads on drawbars shall conform to ASAE S482.

6 Maximum bending load limitations for power take-off shaft drives employing V-belts or chains

6.1 The PTO shaft of tractors is designed primarily to transmit torsional loads. The total bending load imposed on the tractor PTO shaft by V-belt or chain drives should not be in excess of values shown in the following table:

<table>
<thead>
<tr>
<th>Position of load application</th>
<th>kN</th>
<th>lbf</th>
</tr>
</thead>
<tbody>
<tr>
<td>At the end of the PTO shaft</td>
<td>2.22</td>
<td>500</td>
</tr>
<tr>
<td>Between the PTO shaft rear bearing and/or at the groove in the outside diameter of the PTO shaft splines</td>
<td>2.67</td>
<td>600</td>
</tr>
</tbody>
</table>

The tractor PTO shaft and bearing mountings should successfully withstand this magnitude of bending loads shown above.

7 Torsional load considerations

7.1 Because of the large amount of kinetic energy available at the PTO shaft, instantaneous torsional loads and fluctuating operating loads in excess of the average rated power of the tractor may be transmitted.

8 PTO shaft and implement input driveline thrust load limitations

8.1 The tractor PTO shall be designed to accept IID telescoping thrust force values in table 1 based on PTO power at rated engine speed as established per SAE J708 and SAE J2708. A properly maintained implement at its designed power shall not impose IID telescoping thrust forces upon the tractor PTO in excess of the values in table 1, recognizing that instantaneous thrust forces may exceed those values.

9 Storage of implement input driveline, IID

9.1 A means shall be provided on the implement to secure the IID when the IID is detached from the power source to reduce the likelihood of inadvertent damage to the IID during handling, transport, or storage.