INTERNATIONAL STANDARD

ISO 5673-2

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Agricultural tractors and machinery — Power take-off drive shafts and power-input connection —

Part 2: Specification for use of PTO drive shafts, and position and clearance of PTO drive line and PIC for various attachments

Tracteurs et matériels agricoles — Arbres de transmission à cardans de prise de force et arbre récepteur de la machine —

Partie 2: Spécifications relatives à l'utilisation des arbres de transmission à cardans de prise de force, et position et dégagement de la ligne de transmission de prise de force et de l'arbre récepteur de la machine pour différents systèmes d'attelage

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 5673-2 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 4, *Tractors*.

This first edition of ISO 5673-2, together with ISO 5673-1, cancels and replaces ISO 5673:1993, of which it constitutes a technical revision.

ISO 5673 consists of the following parts, under the general title *Agricultural tractors and machinery — Power take-off drive shafts and power-input connection*:

— *Part 1: General manufacturing and safety requirements*

— *Part 2: Specification for use of PTO drive shafts, and position and clearance of PTO drive line and PIC for various attachments*

Agricultural tractors and machinery — Power take-off drive shafts and power-input connection —

Part 2: Specification for use of PTO drive shafts, and position and clearance of PTO drive line and PIC for various attachments

1 Scope

This part of ISO 5673 gives the forms and applications of power take-off (PTO) drive shafts for tractors and self-propelled machines used in agriculture, and specifies the dimensions for, and clearance zone around, the implement power-input connection (PIC) for a variety of attachments. Its intent is to ensure proper clearance between the PTO drive line and adjacent components on the implement and tractor when both implement and tractor have compatible power levels. It is not intended as a complete guide for drive-line design and does not, for example, contain information on preventing drive-line vibration or sizing a torque limiting device. It is not applicable to combinations of implements with tractors having high ground clearance, such as those working in standing vegetable crops or sugar cane, nor to agricultural tractors designed for low ground clearance, such as for lawn mowing or ground care, which require a low centre of gravity; neither is it applicable to implements non-symmetrical in design by necessity due to their function.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 500-3:2004, *Agricultural tractors — Rear-mounted power take-off types 1, 2 and 3 — Part 3: Main PTO dimensions and spline dimensions, location of PTO*

ISO 730-1:1994, *Agricultural wheeled tractors — Rear-mounted three-point linkage — Part 1: Categories 1, 2, 3 and 4*

ISO 6489-1:2001, *Agricultural vehicles — Mechanical connections between towed and towing vehicles — Part 1: Dimensions of hitch-hooks*

ISO 6489-2:2002, *Agricultural vehicles — Mechanical connections between towed and towing vehicles — Part 2: Specifications for clevis coupling 40*

ISO 6489-3:2004, *Agricultural vehicles — Mechanical connections between towed and towing vehicles — Part 3: Tractor drawbar*

ISO 6489-4:2004, *Agricultural vehicles — Mechanical connections between towed and towing vehicles — Part 4: Dimensions of piton-type coupling*

ISO 24347, *Agricultural vehicles — Mechanical connections between towed and towing vehicles — Dimensions of ball-type coupling device (80 mm)*[1)]

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5673-1 apply.

4 Application and use of PTO drive shafts

4.1 Form A

A PTO drive shaft of form A with two universal joints, as shown in Figure 1, compensates for variations in angle and length of the connecting shafts between PTO and PIC. Equal angles in W- and Z-bends will ensure uniform transmission of rotary motion.

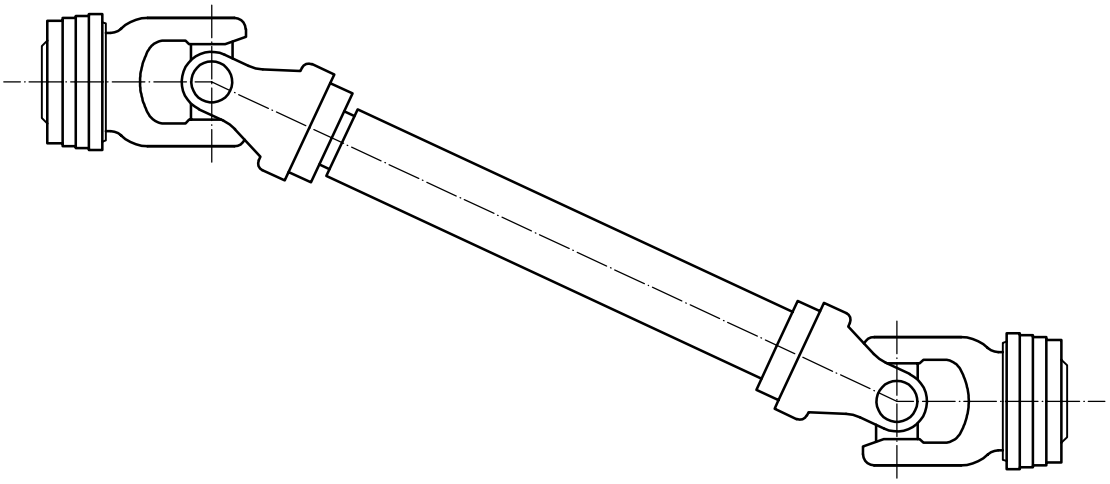


Figure 1 — PTO drive shaft — Form A

1) To be published.

4.2 Form B

A PTO drive shaft of form B with one wide-angle constant velocity universal joint and one universal joint, as shown in Figure 2, compensates for variations in angle and length of the connecting shafts between PTO and PIC. Rotary motions will be transmitted uniformly, as long as the single joint is aligned straight or at an angle below 10°.

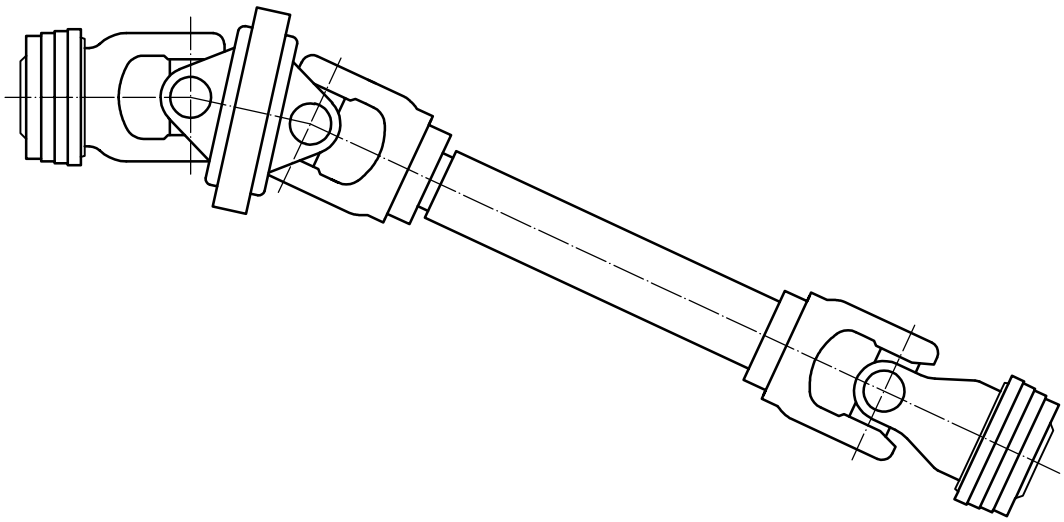


Figure 2 — PTO drive shaft — Form B

4.3 Form C

A PTO drive shaft of form C with two wide-angle constant velocity universal joints, as shown in Figure 3, compensates for variations in angle and length of the connecting shafts between PTO and PIC. Rotary motions is transmitted uniformly, even if different, or spatial bend angles are found.

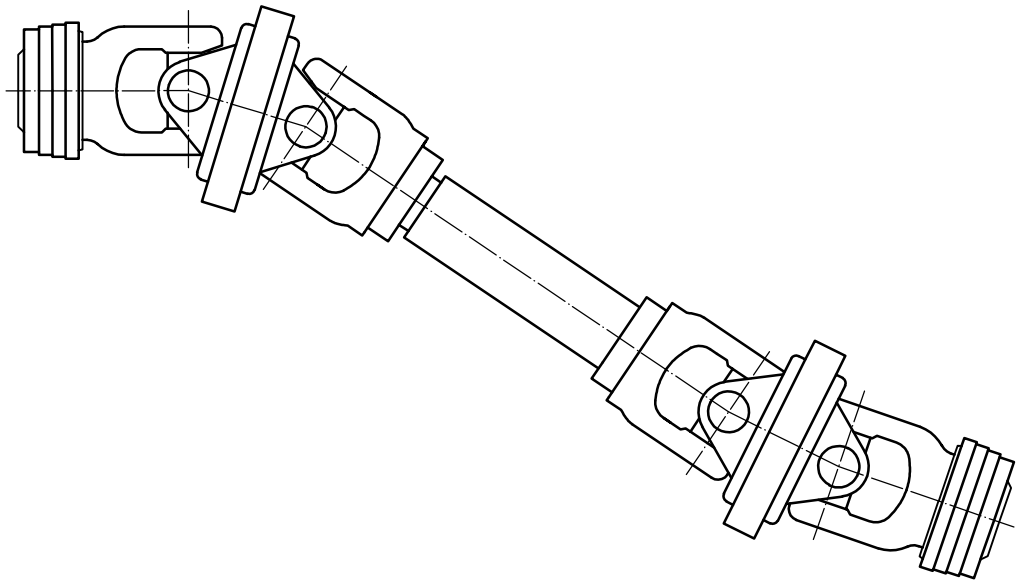


Figure 3 — PTO drive shaft — Form C

4.4 PTO drive shaft length

The length of the PTO drive shaft shall be chosen with regard to the maximum extended and minimum closed lengths that are expected during operation and manoeuvring.

4.5 Equal angle hitch

On a tractor implementing drive-line geometry, there shall be an equal distance from the tractor PTO to the drawbar pin and from the drawbar pin to the PIC.

5 Position and clearance of PIC for various attachments

5.1 General

The horizontal and vertical spacing of the implement PIC shall be as shown in Figures 4 to 11 and in accordance with Tables 1 to 8. To determine these dimensions, the tractor PTO shall be in the position specified in ISO 500-3.

Easy access to maintain the PTO drive shaft, e.g. greasing, shall be possible.

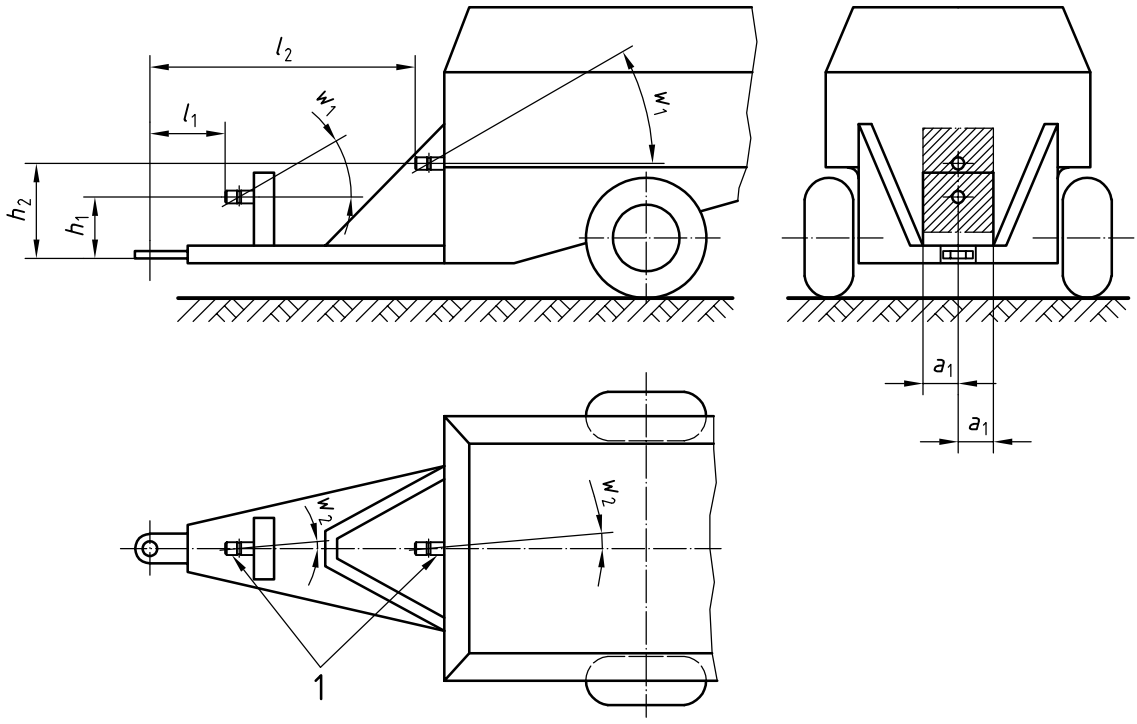
The extreme values of PIC location and clearance zone for each category according to Tables 1 to 8 shall not be used at the same time.

5.2 Drawbar attachment

5.2.1 Position of PIC

To determine these dimensions, the drawbar attachment shall be in the positions specified in ISO 6489-3. The axis of the tractor PTO and PIC shall be aligned on the same vertical plane.

See Figure 4 and Table 1.



Key

1 PIC

Figure 4 — Drawbar attachment

Table 1 — Horizontal and vertical distances for drawbar attachment

Required PTO power	Hitch category [a]	Equal angle hitch						Angle hitch not equal [b]					
		$h_{1\ min}$	$h_{1\ max}$	$a_{1\ max}$	$l_1 \pm 10$	w_1	w_2	$h_{2\ min}$	$h_{2\ max}$	$a_{1\ max}$	$l_{2\ max}$ [c]	w_1 [c]	w_2 [c]
kW		mm	mm	mm	mm	°	°	mm	mm	mm	mm	°	°
up to 28	0	200	250	25	400	0	0						
up to 48	1	220	350	25	400	0	0						
up to 115	2	250	350	25	400	0	0	b	700	100	1 000	30	5
up to 185	3	260	350	25	500	0	0						
up to 275	4	280	400	25	500	0	0						
up to 400	5	310	450	25	500	0	0						

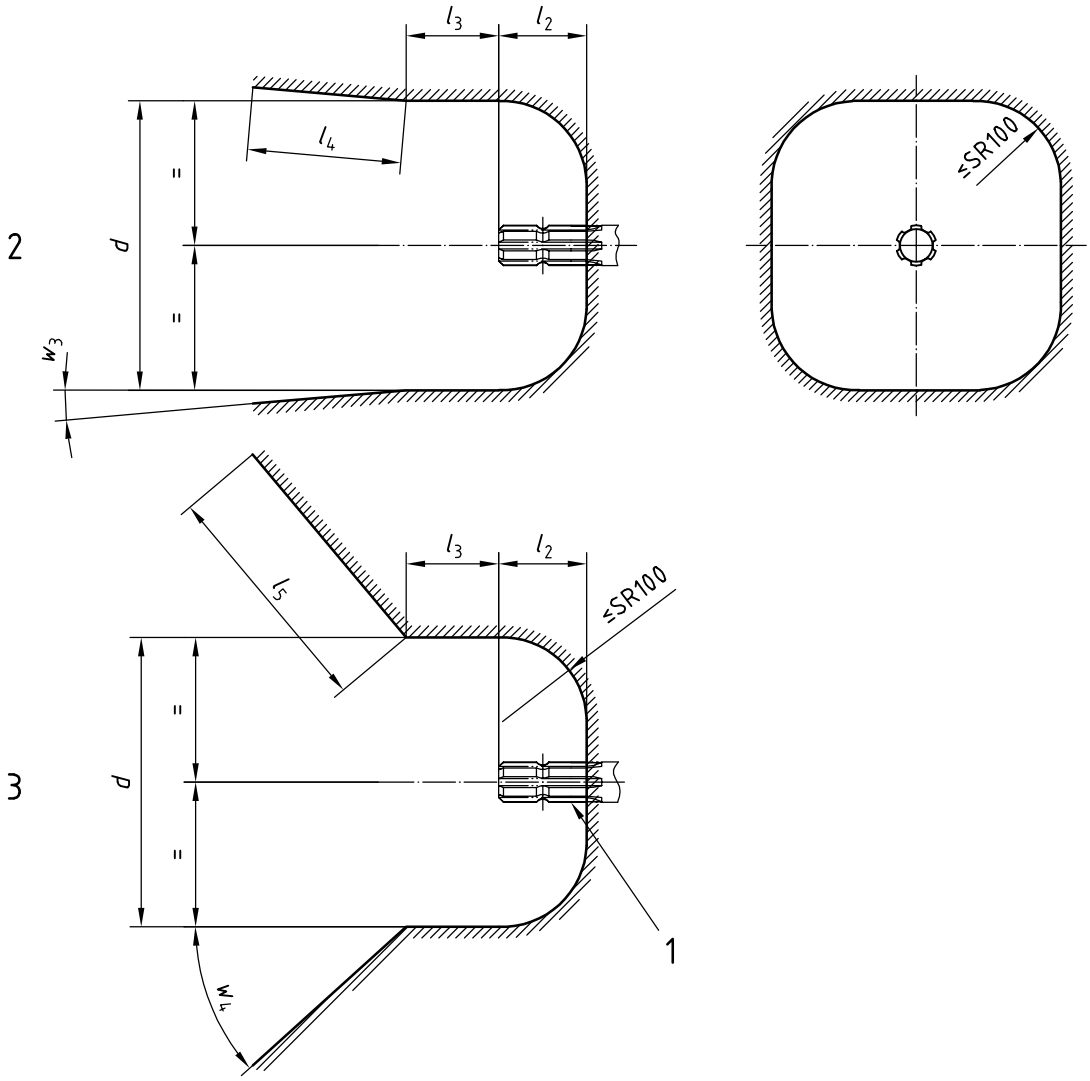
[a] See ISO 6489-3.

[b] In order to provide clearance between the drive line and the drawbar clevis, for l_2 greater than l_1 the PIC distance above the drawbar shall increase at 5° min. angle from the position l_1 and h_1.

[c] To prevent excessive vibration in the drive line, wide-angle universal joints may be required, or the PIC shaft may need to be angled to be in line with the PTO drive shaft.

5.2.2 PTO drive-line clearance at PIC

See Figure 5 and Table 2.



Key

1 PIC
2 side view
3 top view

Figure 5 — Minimum PTO drive-line clearance envelope at PIC for drawbar attachment

Table 2 — Clearance dimensions at PIC for drawbar attachment

Hitch category [a]	d_{min} mm	$l_{2\ min}$ mm	$l_3 \pm 5$ mm	$l_{4\ min}$ mm	$l_{5\ min}$ mm	$w_{3\ min}$ °	$w_{4\ min}$ °	$w_{4\ min}$ [b] °
0	300	75	85	500	500	5	10	50
1	300	75	85	500	500	5	10	50
2	350	75	85	500	500	5	10	50
3	350	90	100	500	500	5	10	50
4	400	90	100	500	500	5	10	50
5	400	90	100	500	500	5	15	50

[a] See ISO 6489-3.

[b] For equal angle hitch arrangement.

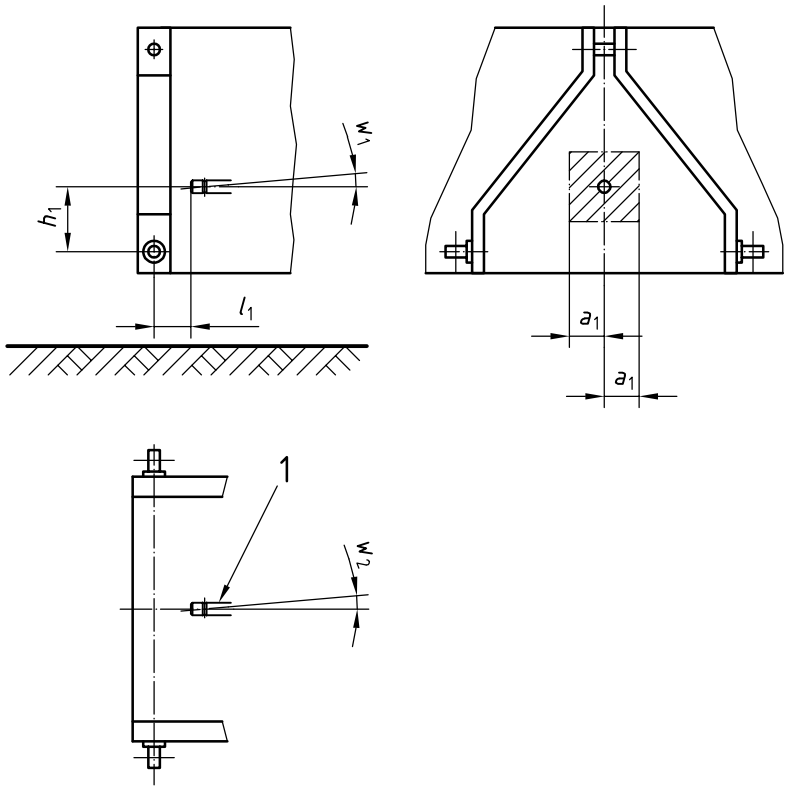
5.3 Three-point linkage attachment

5.3.1 Position of PIC

To determine these dimensions, the lower links of the three-point linkage shall be in accordance with ISO 730-1.

If an implement is used on a larger category hitch (e.g. a category 2 implement on a category 3 tractor hitch), the user may need to limit the upper or lower travel of the hitch to prevent damage to the PTO drive line.

See Figure 6 and Table 3.



Key

1 PIC

Figure 6 — Three-point linkage attachment

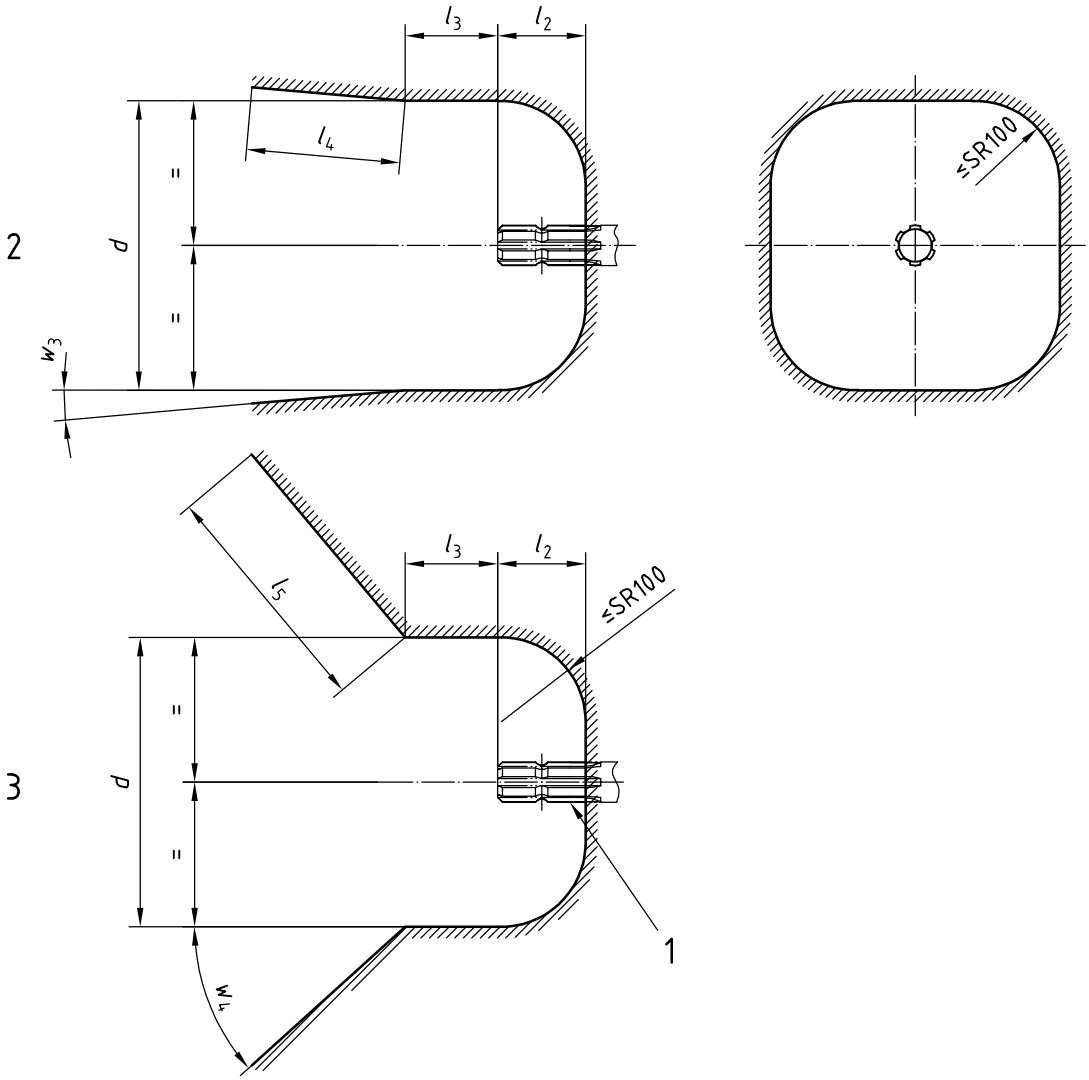
Table 3 — Horizontal and vertical distances for three-point linkage attachment

Hitch category[a]	h_1 mm	$a_{1\,max}$ mm	l_1 mm	$w_{1\,max}$ °	w_2 °
1	100 ± 30	25	180 to 300	5	0
1	100 ± 100	25	250 to 800	5	0
2	130 ± 30	25	280 to 400	5	0
2	130 ± 100	25	350 to 900	5	0
3	130 ± 100	25	300 to 900	5	0
4	150 ± 100	25	400 to 900	5	0

[a] See ISO 730-1.

5.3.2 PTO drive-line clearance at PIC

See Figure 7 and Table 4.



Key

1 PIC
2 side view
3 top view

Figure 7 — Minimum PTO drive-line clearance envelope at PIC for three-point linkage attachment

Table 4 —Clearance dimensions at PIC for three-point linkage attachment

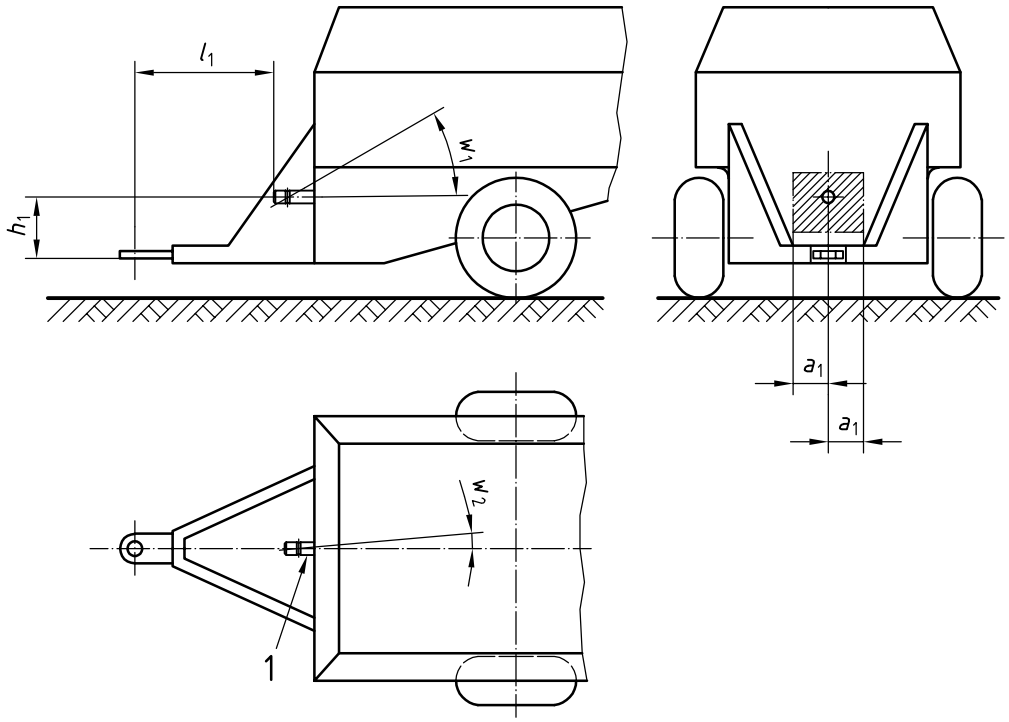
Hitch category [a]	d_{min} mm	$l_{2\ min}$ mm	$l_3 \pm 5$ mm	$l_{4\ min}$ mm	$l_{5\ min}$ mm	$w_{3\ min}$ [b] °	$w_{4\ min}$ °
1	300	75	85	500	500	45 to 15	5
2	300	75	85	500	500	45 to 15	5
3	350	90	100	500	500	45 to 15	5
4	400	90	100	500	500	45 to 15	5
NOTE For l_1 see Table 3.							
[a] See ISO 730-1.							
[b] $w_3 = 51 - (l_1/25)$							

5.4 Hitch hook/piton-fix/ball type attachment

5.4.1 Position of PIC

To determine these dimensions, the hitch hook shall be in the position specified in ISO 6489-1, ISO 6489-4 and ISO 24347.

See Figure 8 and Table 5.



Key

1 PIC

Figure 8 — Hitch hook/piton-fix/ball type attachment

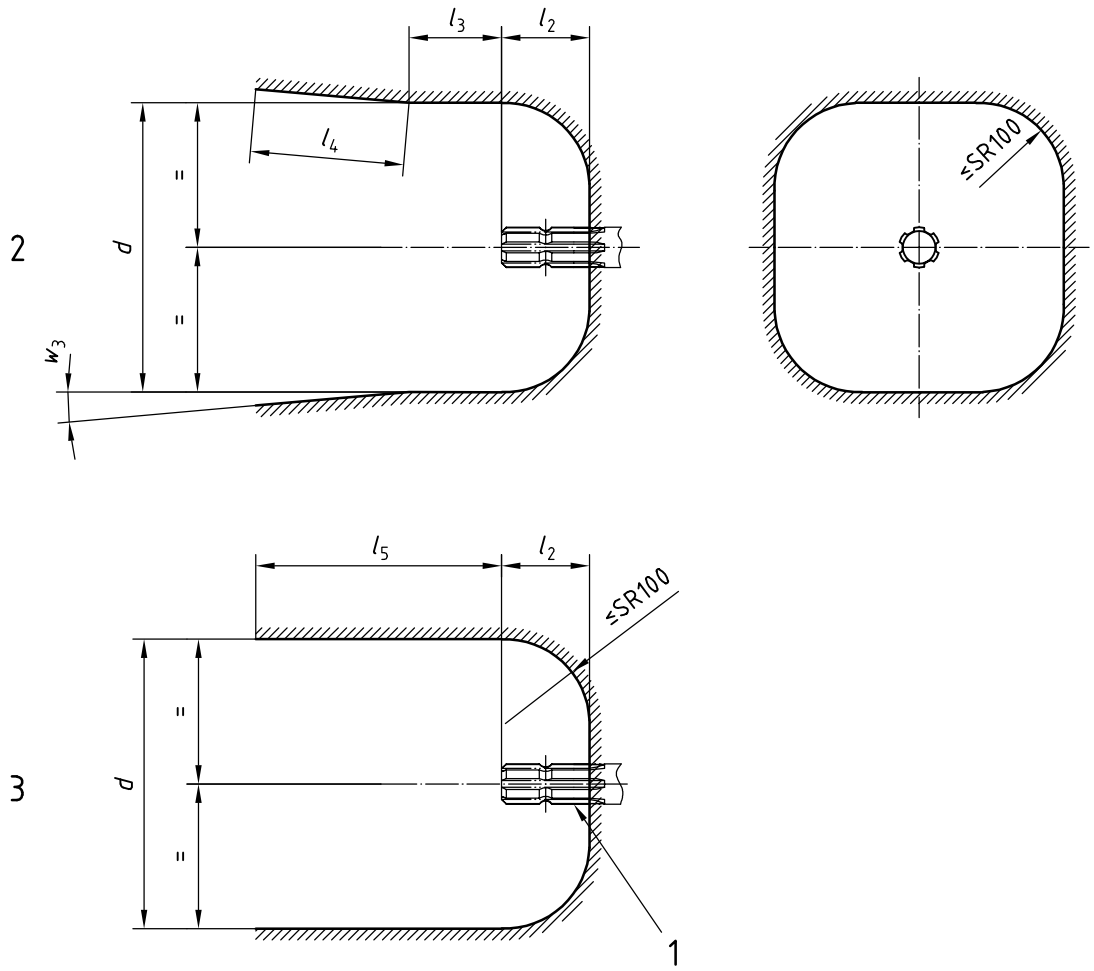
Table 5 — Horizontal and vertical distances for hitch hook/piton-fix/ball type attachment

Required PTO power kW	$h_{1\ min}$ mm	$h_{1\ max}$ mm	$a_{1\ max}$ mm	l_1[a] mm	$w_{1\ max}$[a] °	$w_{2\ max}$[a] °
⩽ 92	250	700	100	700 to 1500	30	5
80 to 185	260	700	100	800 to 1500	30	5
150 to 350	280	700	100	900 to 1500	30	5

[a] To prevent excessive vibration in the drive line, wide-angle universal joints could be required, or the PIC shaft could need to be angled to be in line with the PTO drive shaft.

5.4.2 PTO drive-line clearance at PIC

See Figure 9 and Table 6.



Key

1 PIC

2 side view

3 top view

Figure 9 — Minimum PTO drive-line clearance envelope at PIC for hitch hook/piton-fix/ball type attachment

Table 6 — Clearance dimensions at PIC for hitch hook/piton-fix/ball type attachment

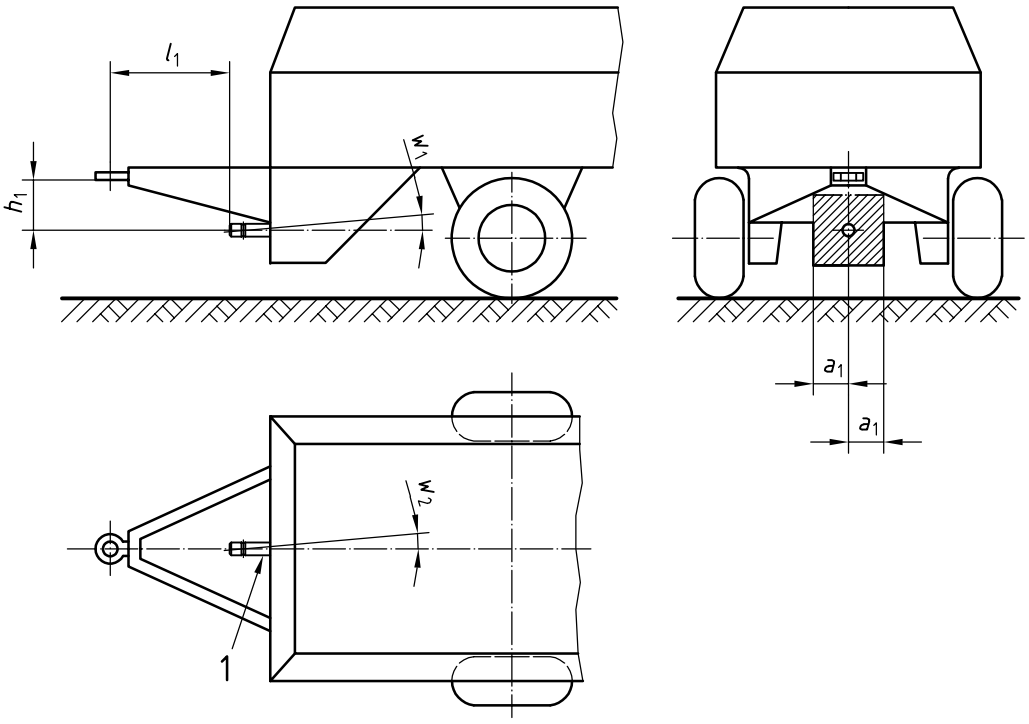
Required PTO power kW	d_{min} mm	$l_{2\ min}$ mm	$l_3 \pm 5$ mm	$l_{4\ min}$ mm	$l_{5\ min}$ mm	$w_{3\ min}$ °
⩽ 92	300	75	85	700	785	5
80 to 185	350	90	100	800	900	5
150 to 350	400	90	100	900	1 000	5

5.5 Clevis-type attachment

5.5.1 Position of PIC

To determine these dimensions, the clevis shall be in the position specified in ISO 6489-2.

See Figure 10 and Table 7.



Key

1 PIC

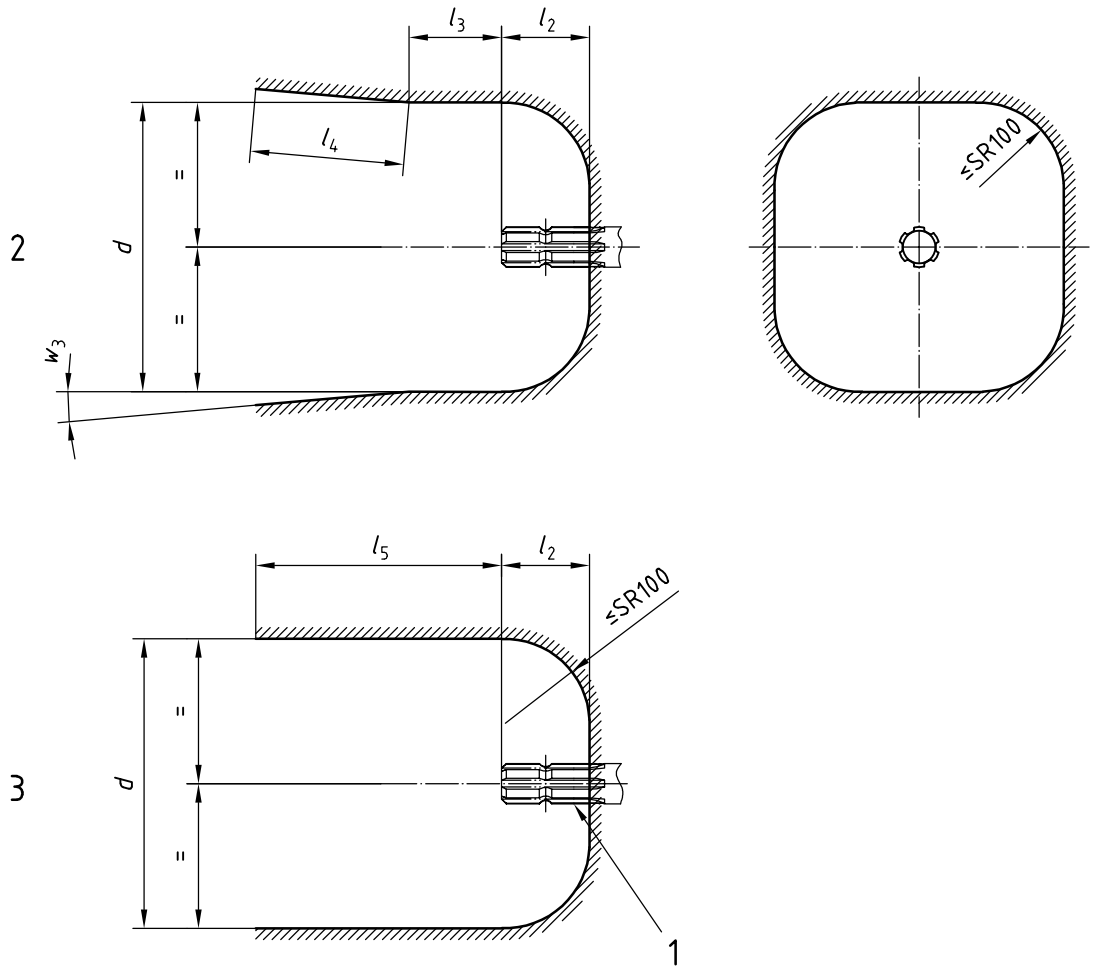
Figure 10 — Clevis-type attachment

Table 7 — Horizontal and vertical distances for clevis-type attachment

Required PTO power kW	$h_{1\ min}$ mm	$h_{1\ max}$ mm	$a_{1\ max}$ mm	l_1[a] mm	$w_{1\ max}$[a] °	$w_{2\ max}$[a] °
⩽ 92	250	400	100	700 to 1 500	5	5
80 to 185	260	500	100	800 to 1 500	5	5
150 to 350	280	500	100	900 to 1 500	5	5
[a] To prevent excessive vibration, wide-angle universal joints could be required.						

5.5.2 PTO drive-line clearance at PIC

See Figure 11 and Table 8.



Key

1 PIC
2 side view
3 top view

Figure 11 — Minimum PTO drive-line clearance envelope at PIC for clevis-type attachment

Table 8 — Clearance dimensions at PIC for clevis-type attachment

Required PTO power kW	d_{min} mm	$l_{2\ min}$ mm	$l_3 \pm 5$ mm	$l_{4\ min}$ mm	$l_{5\ min}$ mm	$w_{3\ min}$ °
⩽ 92	300	75	85	700	785	5
80 to 185	350	90	100	800	900	5
150 to 350	400	90	100	900	1 000	5

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