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Agricultural trailers — Balanced and semi-mounted trailers — Determination of payload, vertical static load and axle load

Remorques agricoles — Remorques à avant-train et semi-remorques — Détermination de la charge utile, de la charge statique verticale et de la charge par essieu

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Foreword

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Agricultural trailers — Balanced and semi-mounted trailers — Determination of payload, vertical static load and axle load

1 Scope

This International Standard specifies a method for determining the payloads, vertical static drawbar loads and axle loads of agricultural semi-mounted and balanced trailers by means of weighing the empty trailer and then calculating the requirements.

2 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

2.1
semi-mounted trailer
towed vehicle with one axle or axle group of landwheels and a drawbar towing device (drawbar) that cannot move relative to the vehicle, allowing the transmission of vertical forces from the towed vehicle through the drawbar to the towing vehicle

NOTE 1 Some slight vertical movement may occur at a rigid drawbar (e.g. due to suspension movements).

NOTE 2 A hydraulically adjustable articulated drawbar is considered to be a rigid drawbar.

2.2
balanced trailer
towed vehicle with at least two landwheel axles at least one of which is steerable, and a drawbar towing device that allows vertical movement so that vertical forces cannot be transferred to the towing vehicle

2.3
axle load
m_a
that part of the mass of the trailer and any payload carried by a particular ground wheel axle of the trailer or, in the case of multiple axles, the combined axle load

NOTE The maximum permissible axle load is specified by the manufacturer.

2.4
vertical static load
m_s
vertical load resulting from the loads produced by the mass of a semi-mounted trailer exerted at the centre of the drawbar coupling point under static conditions

NOTE The maximum permissible vertical static load is specified by the manufacturer.

2.5
maximum mass
m_{max}
technically maximum possible trailer mass and allowable payload specified by the manufacturer

NOTE This mass corresponds to the sum of the technically maximum possible axle loads and, in the case of a semi-mounted trailer, the vertical static load.

2.6
empty mass
m_{empty}
sum of the axle loads and, in the case of a semi-mounted trailer, the vertical static load, with the trailer empty but ready for operation

2.7
payload
m_p
difference between maximum mass, m_{max}, and empty mass, m_{empty}:

$$m_p = m_{max} - m_{empty} \quad (1)$$

2.8
support load
m_b
vertical load acting through the centre of the rigid drawbar support at the ground surface resulting from the mass of the trailer, with the trailer load platform in the horizontal and static position

NOTE For drawbar jacks, see ISO 12140.

2.9
semi-mounted trailer wheel space
s_s
horizontal distance between centre of the coupling point and the landwheel axle centre or, in the case of multiple axles, the point at which the combined axle loads act

NOTE See Figures 1 and 2.

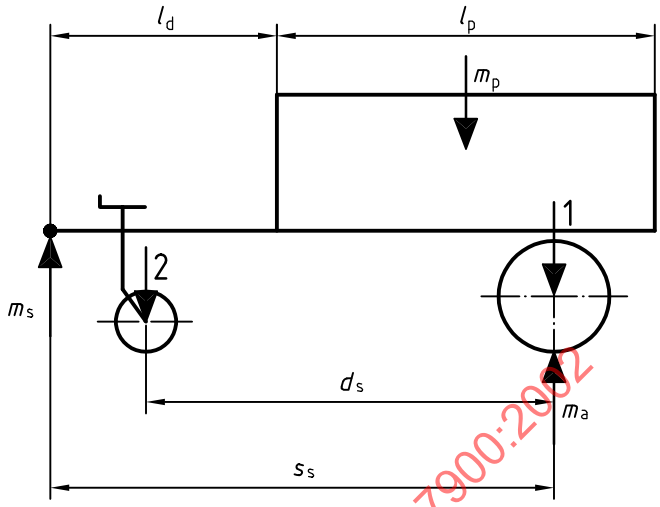
2.10
balanced trailer wheel space
s_b
horizontal distance between the landwheel front- and rear-axle centres or, in the case of multiple axles, the point at which the combined axle loads act

NOTE See Figure 3.

2.11
supporting distance
d_s
for a semi-mounted trailer, distance between the vertical centre line of the support device at the ground surface and the landwheel axle centre or, in the case of multiple axles, the point at which the combined axle loads act

2.12
load platform length
l_p
inner span of the load platform in the operating direction of the vehicle

2.13
drawbar length
l_d
horizontal distance from the centre of the coupling point to the inside front edge of the load platform of a semi-mounted trailer

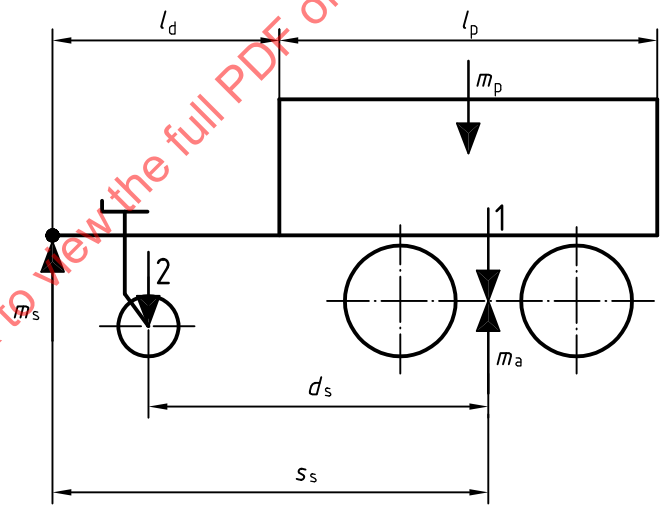


Key

1 $m_{a,\ empty}$

2 $m_{b,\ empty}$

Figure 1 — Semi-mounted trailer

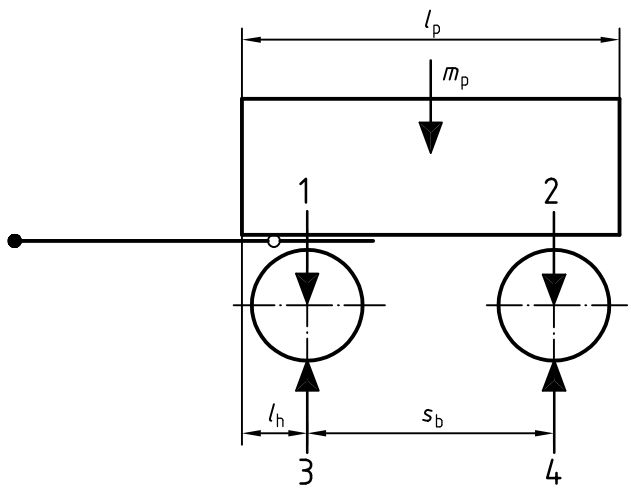


Key

1 $m_{a,\ empty}$

2 $m_{b,\ empty}$

Figure 2 — Semi-mounted trailer with multiple axle



Key

1 $m_{a,\ front,\ empty}$

2 $m_{a,\ rear,\ empty}$

3 $m_{a,\ front}$

4 $m_{a,\ rear}$

Figure 3 — Balanced trailer

3 Determination of masses, loads and dimensions

3.1 General

For all measurements, the trailer shall be adjusted so that the load platform is horizontal to within $\pm 2^{\circ}$.

All weightings, load measurements and measurements of dimensions shall be determined with an accuracy of ± 5 %.

3.2 Empty mass, m_{empty}

The trailer empty mass shall be determined and recorded using a suitably sized and accurate weighbridge, or using load pad scales, or using both.

3.3 Empty loads

3.3.1 Empty axle load, $m_{\text{a, empty}}$

This axle load shall be determined by measuring and summing the individual wheel loads of an empty trailer using load pad scales.

3.3.2 Empty support load, $m_{\text{b, empty}}$

This support load shall be measured for empty semi-mounted trailers using load pad scales.

3.4 Dimensions

The following dimensions (see Figures 1 to 3), in metres, shall be measured and recorded:

— wheel space s_{s} or s_{b};

— load platform length l_{p};

— supporting distance d_{s} (only for semi-mounted trailers);

— drawbar length l_{d} (only for semi-mounted trailers);

— auxiliary dimension l_{h}, (only for balanced trailers, see Figure 3).

3.5 Vertical static load for empty semi-mounted trailer

The vertical static load for an empty semi-mounted trailer shall be calculated using the formula:

$$m_{\text{s, empty}} = \frac{m_{\text{b, empty}} \times d_{\text{s}}}{s_{\text{s}}} \qquad (2)$$

where

$m_{\text{b, empty}}$ is the empty trailer support load, in kilograms;

s_{s}, d_{s} are the dimensions, in metres.

3.6 Maximum mass and payload

The maximum mass of the load platform (i.e. payload m_p) shall be determined and is taken to act at $l_p/2$.

NOTE It is assumed that the mass on the load platform is evenly distributed and, in the case of a balanced trailer, that the landwheel axles are arranged symetrically about the span of the load platform.

3.7 Vertical static and axle loads for trailer laden to maximum mass

3.7.1 The vertical static load of a semi-mounted trailer laden to its maximum mass, $m_{s,\,laden}$, shall be calculated using the formula:

$$m_{s,\,laden} = \frac{m_{b,\,empty} \times d_s}{s_s} + m_p \left(1 - \frac{2l_d + l_p}{2s_s}\right) \quad (3)$$

where

$m_{b,\,empty}$ is the empty trailer support load, in kilograms;

m_p is the payload, in kilograms;

s_s, d_s, l_p, l_d are the dimensions, in metres.

3.7.2 The axle load of a semi-mounted trailer laden to its maximum mass, $m_{a,\,laden}$, shall be calculated using the formula:

$$m_{a,\,laden} = m_{a,\,empty} + m_p \left(\frac{2l_d + l_p}{2s_s}\right) \quad (4)$$

where

$m_{a,\,empty}$ is the empty trailer axle load, determined in accordance with 3.3.1, in kilograms;

m_p is the payload, in kilograms;

s_s, l_p, l_d are the dimensions, in metres.

3.7.3 The front-axle load of a balanced trailer laden to its maximum mass, $m_{a,\,front,\,laden}$, shall be calculated using the formula:

$$m_{a,\,front,\,laden} = m_{a,\,front,\,empty} + m_p \left[\frac{2\,(s_b + l_h) - l_p}{2s_b}\right] \quad (5)$$

where

$m_{a,\,front,\,empty}$ is the front, empty axle load, determined in accordance with 3.3.1, in kilograms;

m_p is the payload, in kilograms;

s_b, l_p are the dimensions, in metres;

l_h is the auxiliary dimension.