General

Tractors are intended to pull a semi-trailer.

The instructions in this document were developed to optimise the vehicle with regard to the following factors:

- Lowest possible sensitivity to frame oscillations that cause discomfort.
- Load sharing.
- Attachments.

**IMPORTANT!**

In order to use the tractor optimally and not impair the vehicle’s properties, it is important to follow national and international regulations when selecting axle distance and fifth wheel position.

Example of tractor with a box trailer

More information can be found in the following documents:
- Selecting the subframe and attachment.
- Subframe design.
- Discomfort caused by vibrations.
- Axle weight calculations.
Vehicles with a fifth wheel

Preparing the vehicle with options from the factory

Order finished solutions and preparations from the factory. Retrofitting will lead to higher costs.

*More information on finished solutions and preparations available from the factory can be found on the Scania Truck Bodybuilder website.*
Vehicles with a fifth wheel

Design of the chassis

Try to achieve as short an axle distance as possible between the front axle and the first rear axle to reduce the risk of frame oscillations that cause discomfort. The axle weight limits how short the axle distance can be.

Axle distance

The shortest possible axle distance should generally be selected. Choice of axle distance is affected by factors such as the following:

- The semi-trailer’s front overhang.
- National regulations on vehicle length and gross vehicle weight.

These factors also limit the possibilities of varying the longitudinal position of the fifth wheel.
Vehicles with a fifth wheel

General guidelines for fifth wheel positioning

It is not possible to give exact recommendations for fifth wheel positioning because so many factors come into play. The following are examples of factors that affect positioning:

- Legal requirements both in terms of axle weight and vehicle dimensions.
- Positioning of chassis configuration.
- Axle distance.
- How the vehicle's driving characteristics are affected.
- Sufficient clearance for the semi-trailer to the cab and rear end of the chassis frame.

More information is provided under the heading *Clearance for the semi-trailer front overhang*.

**IMPORTANT!**

To use the maximum permitted front axle weight, the fifth wheel must be positioned relatively far forward. This has some disadvantages.

A longer distance between the fifth wheel and the rear axle results in a greater lateral force on the tractor when cornering. This is dangerous on icy roads. The effect varies depending on the load and road surface as well as on the amount of acceleration or speed reduction.
General guidelines for fifth wheel positioning

Experience shows that vehicles obtain good driving characteristics when the fifth wheel is in one of the following positions:

- The fifth wheel on 2-axle vehicles is positioned at a distance in front of the rear axle that corresponds to 10% of the configuration axle distance; see illustration.
- The fifth wheel on vehicles with more than one rear axle is positioned at a distance in front of a theoretical load centre for the rear axles that corresponds to 10% of the theoretical axle distance; see illustration.

The theoretical axle distance and configuration axle distance are specified on the vehicle’s ICD (Individual Chassis Drawing).

The above positions provide a relatively low load on the front axle. In order to increase the load on the front axle, the fifth wheel is normally positioned slightly further forward.

If the fifth wheel is moved more than 700 mm in front of the rear axle on 2-axle vehicles, this increases the risk of the vehicle’s driving characteristics being impaired. The risk of exceeding maximum permitted front axle weight also increases.

The fifth wheel gives a high concentrated load on the chassis frame. In terms of the load, the fifth wheel should be positioned less than 760 mm in front of the rear axle on 2-axle vehicles; see illustration.

On 3-axle vehicles with 6x2/4 wheel configuration, the fifth wheel is positioned more than 700 mm in front of the rear driving axle at the factory. With the tag axle lifted, the vehicle’s driving characteristics may be impaired.
Special regulations to comply with EU Directive 96/53/EC

96/53/EC (Masses and Dimensions) is an EU Directive with rules for weights and dimensions applicable to vehicle traffic.

On an EU semi-trailer, the distance between the trailer kingpin and the rear edge of the semi-trailer is 12 m.

The approved total length for vehicles is 16.5 m. To be able to transport a 13.6 m long EU semi-trailer, the distance between the front of the tractor and the centre of the fifth wheel must not exceed 4.5 m.
Adaptable equipment for different types of transport

To be able to use the tractor for different types of transport, an adjustable fifth wheel and a replaceable lock mechanism are used.

Adjustable fifth wheel
A fifth wheel that can be adjusted along the longitudinal direction of the tractor enables the following:

- Adaptation to the various countries’ national regulations for axle weight and vehicle lengths.
- Optimisation of weight distribution between the front and rear axles.
- Adaptation to different types of semi-trailers.

Replaceable lock mechanism
A replaceable lock mechanism makes it possible to pull semi-trailers with different trailer kingpin dimensions.
Combining vehicles and equipment in accordance with ISO 1726

ISO 1726 is an international standard covering the characteristics and positioning of the fifth wheel and the clearance required by the semi-trailer.

Tractors and semi-trailers that comply with the standard can be combined with one another from a purely technical viewpoint.

**Note:**
In addition to the technical capability for different combinations, it is important to take regulations for approved outer dimensions and axle weight into account for the road train.
### Vertical position of the fifth wheel

The following dimensions apply to the vertical position of the fifth wheel:

<table>
<thead>
<tr>
<th>Road train</th>
<th>Minimum permitted height (A)</th>
<th>Maximum permitted height (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loaded tractor.</td>
<td>1,150 mm</td>
<td>1,300 mm</td>
</tr>
<tr>
<td>Tractor without trailer.</td>
<td>-</td>
<td>1,400 mm</td>
</tr>
<tr>
<td>Loaded, bulk-adapted tractor.</td>
<td>1,025 mm</td>
<td>1,100 mm</td>
</tr>
<tr>
<td>Bulk-adapted tractor without trailer.</td>
<td>-</td>
<td>1,150 mm</td>
</tr>
<tr>
<td>Loaded, bulk-adapted tractor with direct-mounted fifth wheel.</td>
<td>900 mm</td>
<td>975 mm</td>
</tr>
<tr>
<td>Bulk-adapted tractor without trailer with direct-mounted fifth wheel.</td>
<td>-</td>
<td>1,000 mm</td>
</tr>
</tbody>
</table>

*A = Fifth wheel height above the ground.*
Vehicles with a fifth wheel

Minimum angle of inclination

To ensure adequate vertical clearance between the tractor and semi-trailer in all driving conditions, the semi-trailer’s inclination angle in relation to the tractor must not exceed the following values:

- Forwards: 6° ($\omega_1$).
- Rearwards: 7° ($\omega_2$).
- Sideways: 3° ($\alpha_1 = \alpha_2$).

The following angles apply to tractors with a low-mounted fifth wheel:

- Forwards: 3.5° ($\omega_1$).
- Rearwards: 4.5° ($\omega_2$).
- Sideways: 2° ($\alpha_1 = \alpha_2$).

Note:

ISO 1726 specifies the angle of inclination $\alpha$ as clearance in relation to the tyres.
Clearance for semi-trailer front overhang

In order to be able to operate the tractor freely, the diagonal dimension of the semi-trailer front overhang (front sweep radius BEP-L078) must not exceed 2,040 mm; see illustration. This corresponds to a front overhang of 1,600 mm from the trailer kingpin to the front edge of the semi-trailer.

The rear section of the tractor must also have sufficient clearance. The minimum permitted distance from the trailer kingpin to the semi-trailer supporting leg is shown as G, see illustration.

A minimum clearance of 100 mm is recommended between the radii BEP-L079 and G. Check the dimension at a steering angle of +/- 45°.

BEP-L078: Maximum 2,040 mm
BEP-L079: Maximum 2,200 mm
G: Minimum 2,300 mm

More information on measurement designations can be found in the document “Measurement designations”. 
Checking interchangeability between the tractor and semi-trailer

There is a coupling profile that can be used to ensure that the semi-trailer has enough clearance in relation to the tractor. The coupling profile indicates the most important measurement limits that guarantee interchangeability between the tractor and semi-trailer.

All tractors and semi-trailers built in accordance with ISO 1726 follow the measurement limits below:

- \( P = \) Length, minimum 750 mm.
- \( Y = \) Angle, maximum 4°.
- \( R = \) Radius, maximum 450 mm.
- \( G = \) Length, minimum 2,300 mm.
Heavy-haulage tractor

General information on heavy-haulage tractors

Scania defines a heavy-haulage tractor according to the following conditions:

- The cargo cannot be divided or is bulky, e.g. components for power stations, plant and construction machinery and such like.
- The gross laden train weight is between the maximum permitted weight and 250 tonnes.
- The transportation is carried out on roads with high load-carrying capacity.
- Due to the size and weight, special permission is required from the road authorities.
- A limited service life of the powertrain. More maintenance is often required on the powertrain than is usually required on transport vehicles.

Tractors for road trains with a gross weight of up to 250 tonnes can be ordered as a finished product from the factory.
Attaching brackets or subframe

Note:
The fifth wheel load is also limited by the maximum permitted bogie weight.

Attaching brackets are standard on tractors. The following applies to attaching brackets for 6x4 tractors and 6x2 tractors with A/B suspension:

- Attaching brackets with a thickness of 10 mm (variant code 6536A) can be used for a D value of up to 152 kN and a U value of up to 20 tonnes.
- Attaching brackets with a thickness of 12 mm (variant code 6536B) can be used for a D value of up to 260 kN and a U value of up to 36 tonnes.

Tractors can be factory-fitted with a fifth wheel using a 3.5-inch trailer kingpin. This results in a D value of 260 kN. It is recommended for road trains with a gross weight up to 70 tonnes driven on bumpy roads and road trains with a gross weight up to 150 tonnes driven on smooth roads.

Scania recommends the use of a subframe when the above limits are exceeded.

For heavy-haulage tractors up to 250 tonnes, the use of attaching brackets is permitted even though the limitations outlined above are exceeded. This assumes that the following conditions are met:

- Favourable road conditions.
- Moderate speed.
- Experienced driver.

Ordering options

<table>
<thead>
<tr>
<th>Option</th>
<th>Alternative</th>
<th>Variant code</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness of the attaching bracket for the fifth wheel mounting plate.</td>
<td>10 mm</td>
<td>6536A</td>
<td>Can be used for a D value of up to 152 kN and a U value of up to 20 tonnes</td>
</tr>
<tr>
<td></td>
<td>12 mm</td>
<td>6536B</td>
<td>Can be used for a D value of up to 260 kN and a U value of up to 36 tonnes</td>
</tr>
</tbody>
</table>
Recommendations

Scania recommends that road trains with a gross laden weight between 150 and 250 tonnes are driven on roads with an inclination of less than 3%. Road trains with a gross laden weight of less than 150 tonnes can be driven on roads with up to 12% inclination. The weights are independent of the engine’s performance and apply with Scania’s standard equipment and rear axle gears.

Contact a Scania dealer for more information.

$Y = \text{Maximum permitted gross laden train weight}, \ X = \text{Inclination.}$
Vehicles with a fifth wheel

Crossmembers and side members
When cornering, lateral forces from the semi-trailer need to be distributed between the frame side members. If only one frame member is loaded by the lateral forces, it could become deformed. Fit crossmembers on the subframe in front of and behind the fifth wheel’s attachments in order to distribute the lateral forces.

Engine torque
For heavy-haulage tractors, torque limitation is recommended to protect the clutch.

The following preparations and options can be ordered from the factory:

- Opticruise.
- Automatic clutch control.
- Hill hold.
- Retarder.

More information can be found in the document “PTO control and engine speed”.

Heavy-haulage tractor

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Vehicles with a fifth wheel

Tractors with double-drive bogie

When driving on uneven surfaces, winding roads and with a bogie weight of more than 21 tonnes, the vehicle chassis frame may need to be reinforced.

Increased frame strength

When ordering the option Increased frame strength (variant code 3822A), the vehicle is factory fitted with a reinforced crossmember. The reinforced crossmember is designed to provide increased torsional rigidity and frame strength, see illustration. The increased frame strength option is available for vehicles with axle distance 3,150-3,750 mm.

For vehicles with a longer axle distance in combination with higher bogie weight, the chassis can be reinforced further with an X-rod or reinforced crossmember via special order.

Contact a Scania workshop for more information.
Vehicles with a fifth wheel

X-rod

Use the following parts:

- Flat bar 70 x 10 mm.
- Tight-fit screw, M16.

Movement between the diagonal stays must be permitted.

A separator insert should be positioned between the diagonal stays to avoid vibration noise. The separator insert can be purchased from Scania dealers.

IMPORTANT!

Welding to the chassis frame, or the pressed or cast crossmembers, is not permitted. Welding to and screwing into the X-rods is not permitted except in the end pieces, to attach them to the chassis frame. Welding to and screwing into the X-rods can cause cracks and deformation.

More information on X-rods can be found in the document “Reinforcements”.

Vehicle with X-rod.