



SAF-HOLLAND Group

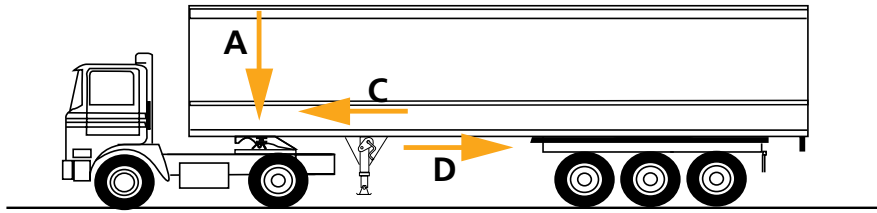
ALL ABOUT FIFTH WHEELS

DATA, FACTS AND TIPS



WHAT DOES IT DO?

In conjunction with the king pin fitted to the trailer its main function it is to connect the truck (tractor unit) with the semi-trailer



In doing so it must:

Support the weight of the trailer imposed on it **(A)**

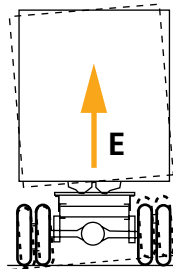
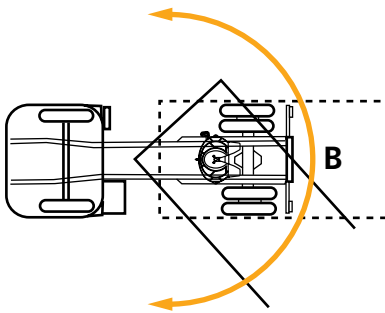
Allow the trailer to articulate (trailer pivots relative to tractor on inclines) **(B)**

Resist the forces of:

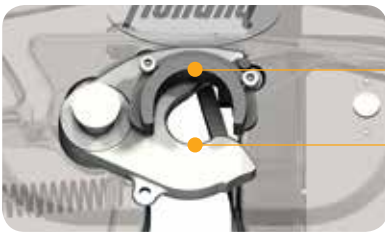
the trailer pushing forward e.g. under braking **(C)**

the trailer "pulling back" on it e.g. starting off / accelerating **(D)**

the trailer trying to lift off e.g. when cornering due to roll **(E)**



Large flat surface spreads load, supports weight and allows rotation of trailer through contact with trailer skidplate **(A)** and **(B)**



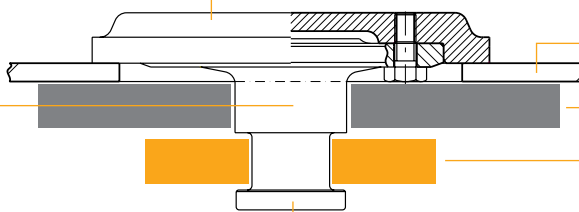
Wear Ring Contact Area Resists "Push" **(C)**

Coupler Jaw Contact Area Resists "Pull" **(D)**



To allow free and easy rotation and reduce wear, lubrication is required on the top surface. This is normally grease, note the grease grooves in the top plate to help to retain and distribute the grease

King Pin



King Pin Mounting Plate

Trailer Skidplate

Fifth Wheel Top Plate

Fifth Wheel Locks Around King Pin

Flange On King Pin Resists "Lift" **(E)**

FIFTH WHEEL RATINGS AND CAPACITIES

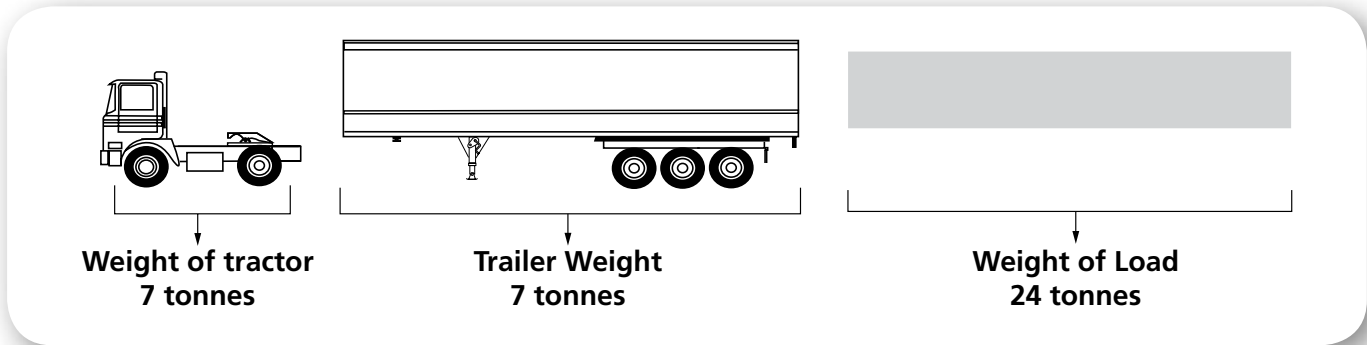
All Fifth Wheel couplings will have ratings and capacities which are normally given as:

Vertical (or Imposed) Load acting directly on the fifth wheel through the trailer skidplate. There is no vertical load applied through the king pin.

D-value which is defined as the theoretical reference force for the horizontal force between the towing vehicle and trailer.

Gross Combination Weight (GCW) is the total weight of the tractor unit, trailer and load added together – used only in certain countries as reference.

The longitudinal force exerted between the fifth wheel locks and the king pin. For this reason king pins also have a D-value rating.



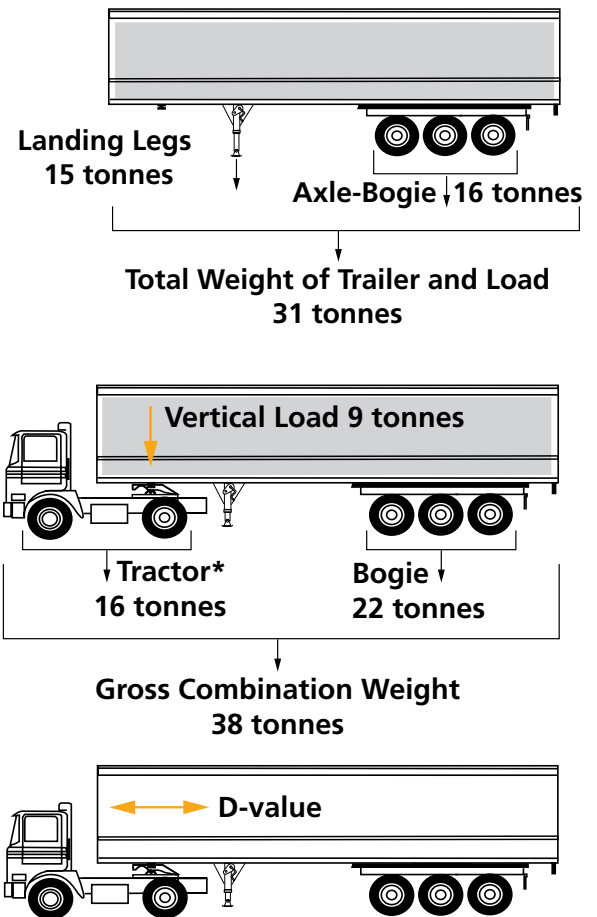
With the trailer loaded and supported on its landing legs the load (weight) is distributed between the axle-bogie and the landing legs.

When the trailer is coupled to the tractor unit the load (weight) is distributed between the axles and the fifth wheel.

The weight distribution is different because of the relative positions of the landing legs and king pin.

*The tractor unit weight now includes the 9 tonnes vertical load.

D-value – a calculation of the forces between the fifth wheel and king pin when pulling the trailer which are higher during acceleration and braking.



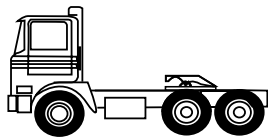
FIFTH WHEEL RATINGS AND CAPACITIES

To be correct for the application a fifth wheel must have the appropriate Vertical Load and D-value.

Vertical Load imposed by fully loaded trailer must be at or below fifth wheel rating.
D-value of fully laden combination must be at or below fifth wheel rating.

It is not possible to balance one figure against another.

Weight distribution for a typical heavy duty combination

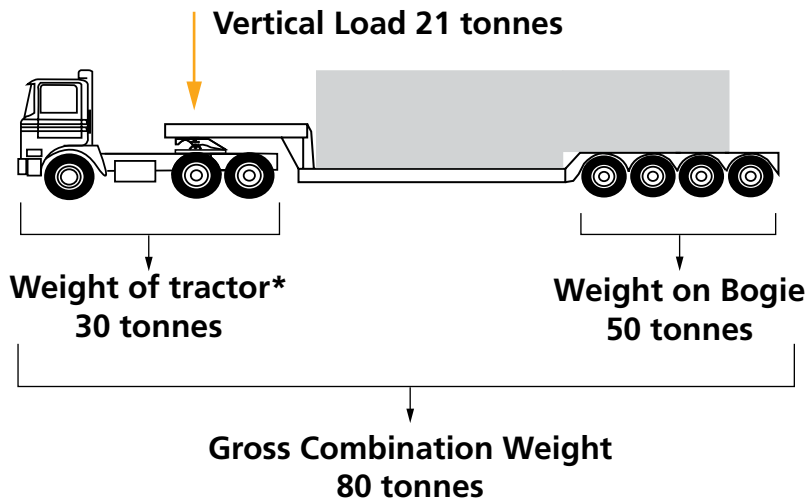


Weight of tractor
9 tonnes



Total Weight of Trailer and Load
71 tonnes

*The tractor unit weight now includes the 21 tonnes vertical load



Notes specific to Heavy Duty Fifth Wheels:

80 tonnes GCW is the maximum GCW at which a 2" king pin should be used, generally the D-value limitation will take care of this (see above example), however, we should always work to this limitation – **max. GCW on a 2" king pin is 80 tonnes** – even if the D-value calculation would allow a higher GCW.

D-VALUE CALCULATION

General Notes

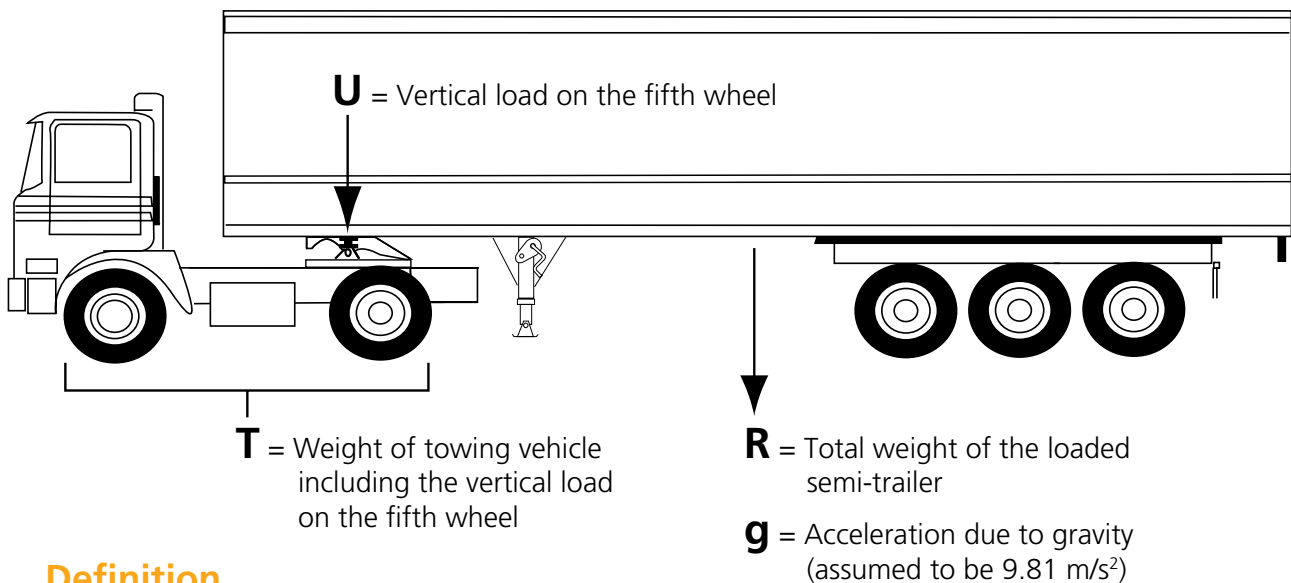
All fifth wheels and king pins, tested and approved under 94/20/EG and ECE-R55 regulations are given a D-value rating as an indication of the maximum horizontal force permitted between the towing vehicle and trailer.

In order to confirm the suitability of a particular fifth wheel or king pin for a given tractor/trailer combination it is necessary to carry out a D-value calculation.

Formula

The D-value formula for a tractor and semi-trailer combination is as follows:

$$D = g \times \frac{0.6 \times T \times R}{T + R - U} \text{ (kN)}$$



Definition

The "D-value" is defined as the theoretical reference force for the horizontal force between towing vehicle and trailer.

The D-value is taken as the basis for horizontal loads in the dynamic tests for all automatic coupling devices between a towing vehicle and trailer.

Example Calculation

T = 17 (Tractor weight 7 t plus vertical load 10 t), **g = 9.81**

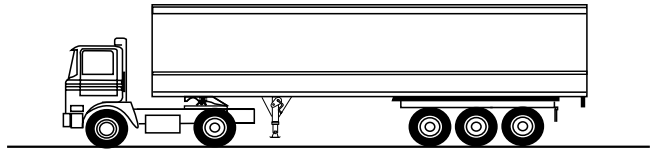
R = 33 (10 t imposed on fifth wheel and 23 t on rear bogie), **U = 10**

$$D = 9.81 \times \frac{0.6 \times 17 \times 33}{17 + 33 - 10} \text{ (kN)}$$

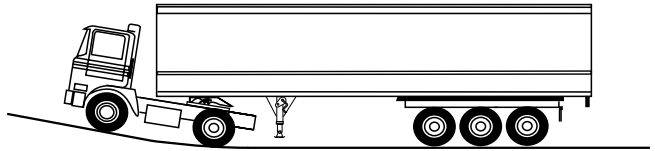
D-Value = 82.55 kN

THE EFFECT OF GRADIENTS

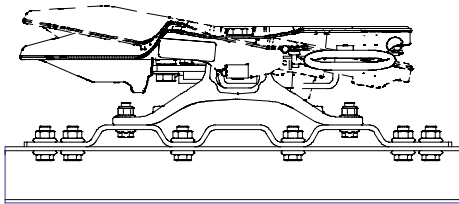
On a level road



Starting to go uphill

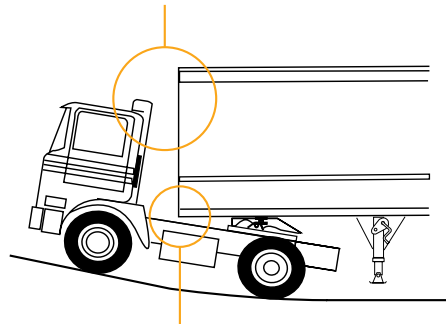


Fifth Wheel articulates (or oscillates) forward



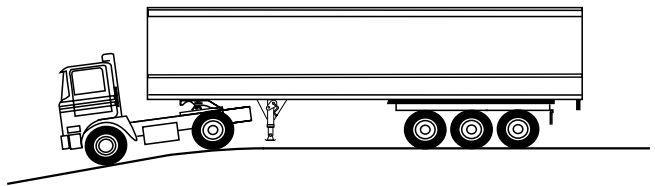
There must be a minimum of 6° free articulation when the tractor and trailer are coupled

Reduced clearance between Tractor Cab and Trailer

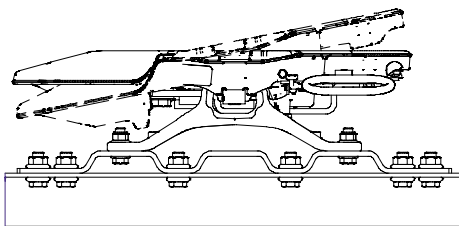


Reduced clearance between top of Chassis and Trailer

Downhill

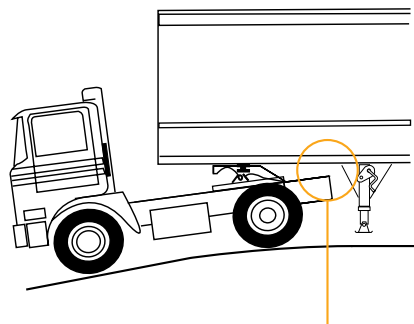


Fifth Wheel articulates (or oscillates) to the rear

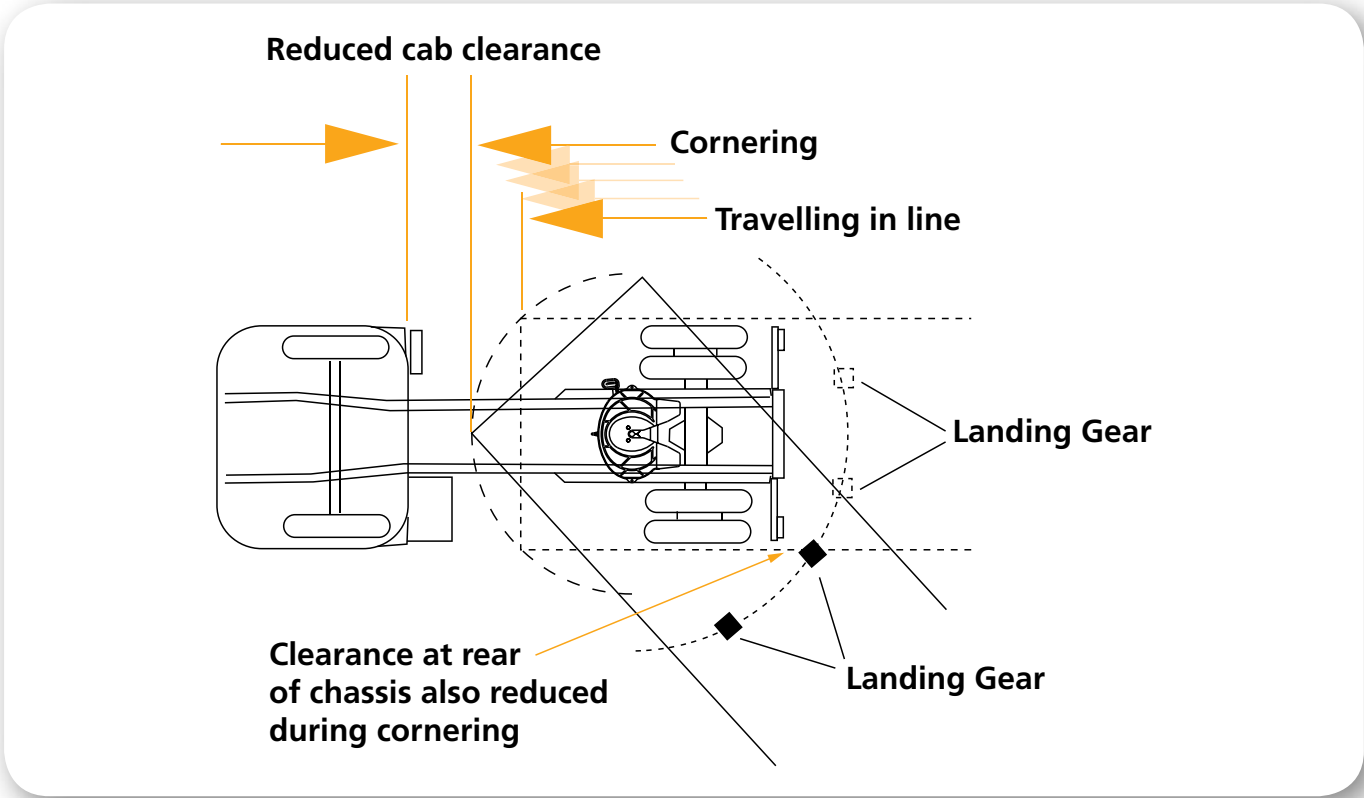


There must be a minimum of 7° free articulation when the tractor and trailer are coupled

Reduced clearance between rear of Chassis and Trailer

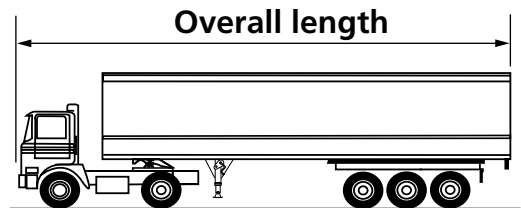


EFFECTS OF TURNING

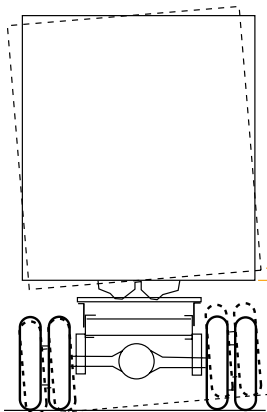


Imagine then the effect of turning and beginning to climb a hill at the same time – the combined effect of turning and climbing will reduce cab clearance even more

Fifth wheel position is therefore critical for several reasons including the overall length of the combination which is limited by legislation



ROLL BETWEEN THE TRACTOR AND TRAILER



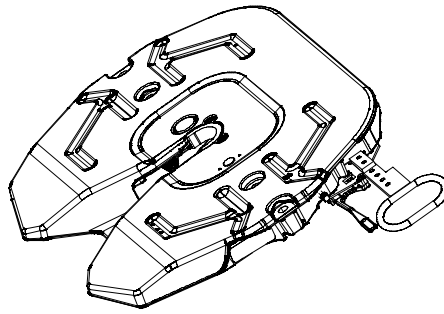
Rotation about the longitudinal axis of up to 3° of movement between the tractor and trailer is permitted.

On a standard fifth wheel this occurs as a result of clearance in the fifth wheel to bracket fit, compression of the rubber bushes and also vertical movement between the king pin and locks may allow some lift of the trailer one side.

FIXED FIFTH WHEELS AND MOUNTING

Top Plate Assembly

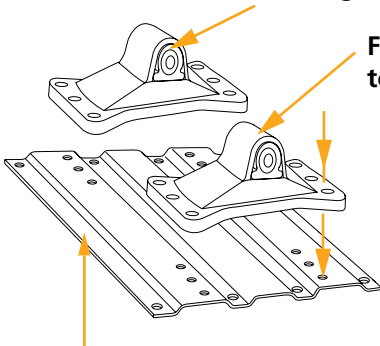
SK-S 36.20
SK-HD 38.36
etc.



Conventional ISO Mounting (Standard DIN 6 hole feet)

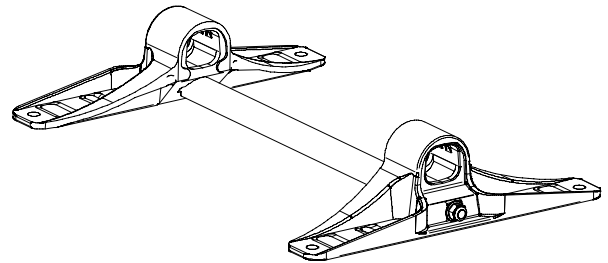
Mounting Brackets (feet)

Feet bolted to mounting plate



Separate Mounting Plate European style "ripple" plate shown

Alternative ISO Direct Mounting



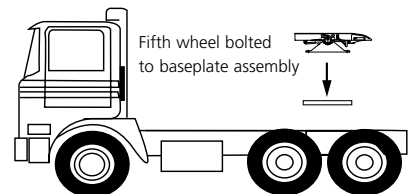
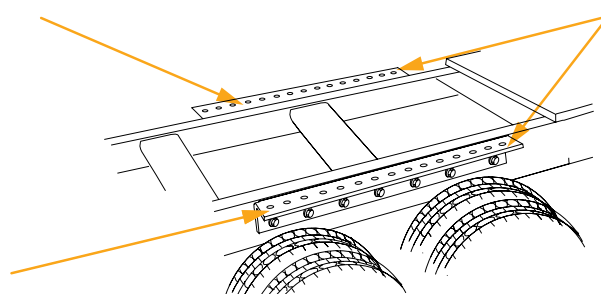
Bracket is bolted directly to L-profile eliminating mounting plate

Truck Chassis

Mounting plate sits directly onto flitch plates and is bolted to them

Standard "L" profile mounting angles (flitch plates) normally fitted on the truck by the truck manufacturer

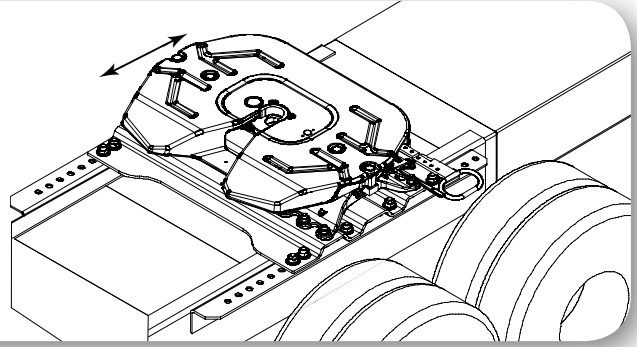
It is common for the holes used for attachment of the baseplate to be pre-drilled in the mounting angles by the truck manufacturer but hole sizes and pitch centres vary with different manufacturers



Fifth wheel bolted to baseplate assembly

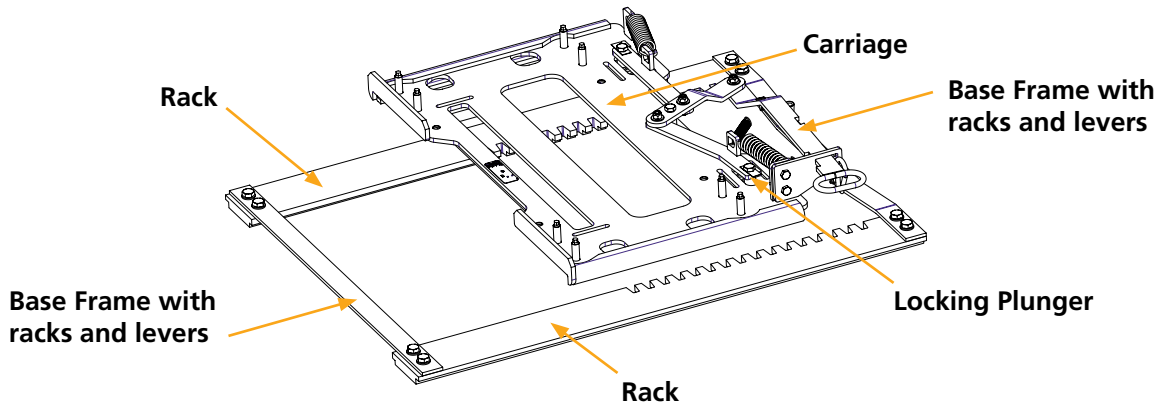
SLIDING FIFTH WHEELS AND MOUNTING

The fifth wheel can be moved forwards or backwards to accommodate different trailer lengths and/or alter weight distribution on the tractor unit



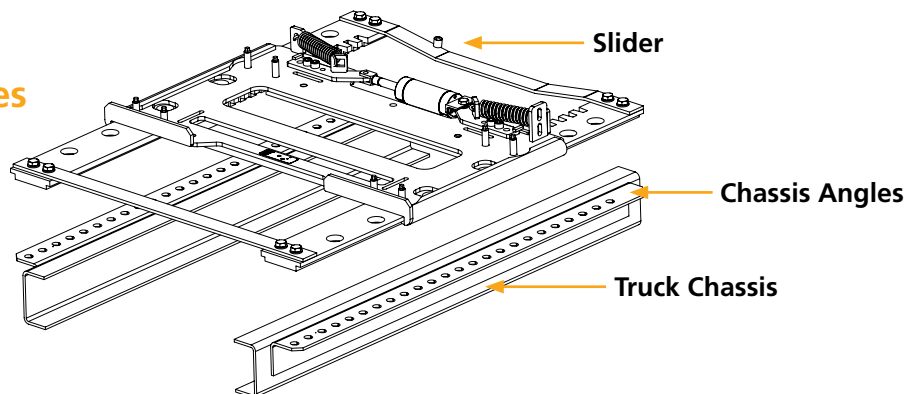
SLIDING FIFTH WHEELS – MOUNTING STYLES

Slider SK-V 20



The fifth wheel SK-S 36.20 cpl. is mounted on a carriage which can be moved forward and backward along a base frame. The carriage is locked in position by plungers which lock into of the racks of the base frame.

Slider Mounted to Chassis Angles

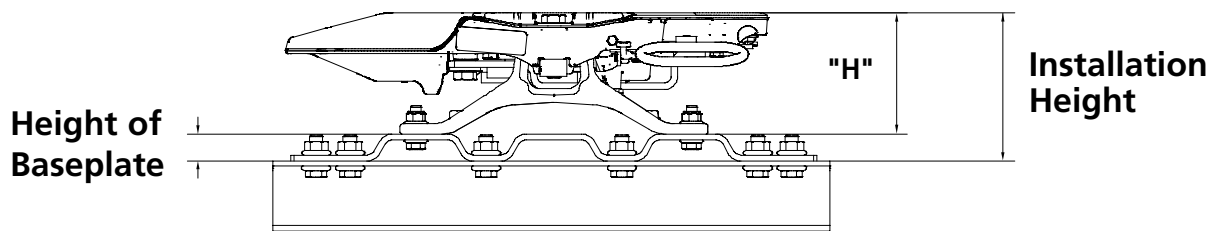


Our standard slider for normal roadgoing operations, rated up to 44 tonnes GCW and 18 tonnes vertical load.

The base frame racks are predrilled with holes so that the slider can be bolted directly to the manufacturers mounting angles without the need for a separate subframe.

FIXED FIFTH WHEELS – HEIGHT

Conventional ISO Mounting



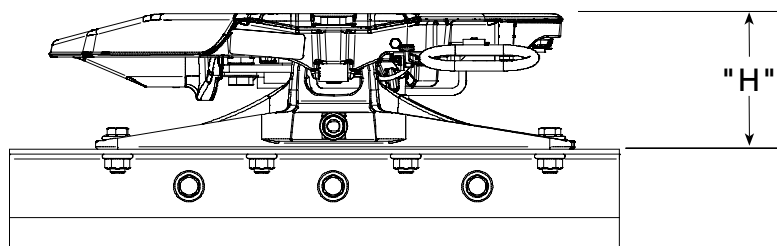
The fifth wheel height is from the bottom of the mounting bracket to the top surface of the fifth wheel. It does not include the height of the baseplate which needs to be added to the fifth wheel height "H" to give the installation height.

The baseplate/mounting plate height will vary according to the type of mounting.

The lowest will be a simple flat plate (usually 12 mm min.) an european style ripple plate is normally 22 mm or 40 mm.

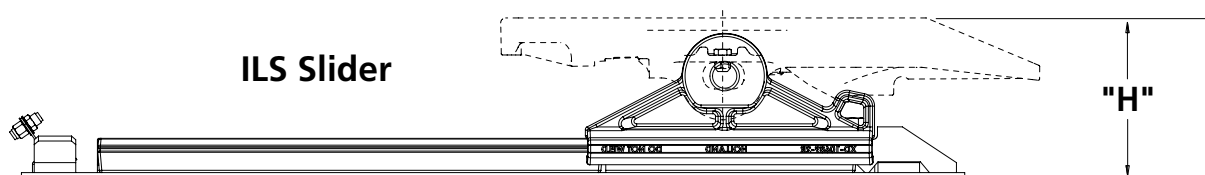
Direct Mounting

As there is no separate baseplate with a direct-mount installation the fifth wheel height "H" is also the installation height.



SLIDING FIFTH WHEELS – HEIGHT

For the standard ILS slider the slider height "H" is also the installation height.



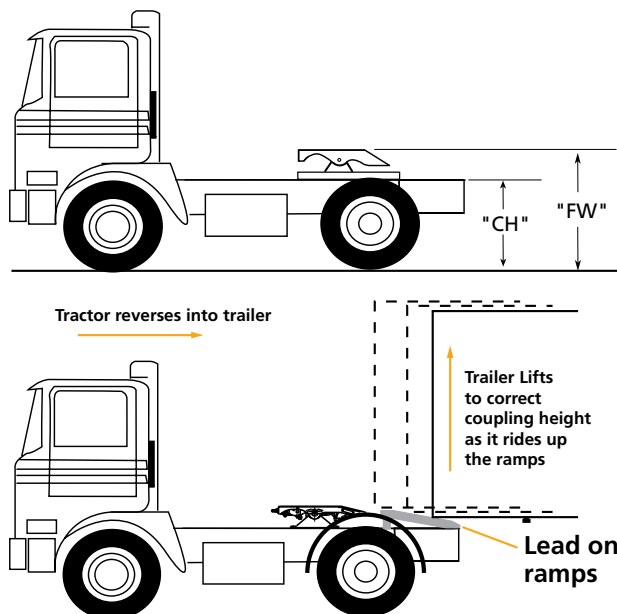
MOUNTING ANGLES/FLITCH PLATES



On most vehicles, mounting angles are referred to as being "flush" although they are not actually flush with the top of the chassis but actually 3 or 4 mm above the chassis. Some vehicles, usually for heavy duty application, have a mounting angle which is raised by up to 60 mm. Installation height is actually from the top of the mounting angle to the top of the fifth wheel as the baseplate or slider normally sits on top of the mounting angle.

"COUPLING HEIGHT" AND LEAD ON RAMPS

Some customers will ask for a fifth wheel to give a "coupling height" of (for example) 1250 mm. They are talking about the height of the fifth wheel from the ground when installed on the truck. The coupling height will be the chassis height "CH" plus the installation height e.g. a SK-S 36.20 D with 190 mm fifth wheel height installed on a tractor with a chassis height of 1060 mm will give the 1250 mm coupling height.



WARNING: Chassis height (and fifth wheel height) can be given as laden or unladen always insist on working to the unladen figures.

Lead on Ramps are required by certain (UK) customers. If the trailer is too low during coupling it may hit the rear wings or other components causing damage to the vehicle. With ramps fitted the trailer will ride up the ramps avoiding damage to the wings etc.

NOTE: The height of the ramps is critical, it must be high enough to protect the wings but low enough to allow the correct angle of articulation without the underside of the trailer skidplate hitting the top of the ramps. Sometimes this can be a compromise and where the fifth wheel installation height is low it may not be possible and/or practical to fit ramps.

DEVELOPMENTS IN FIFTH WHEEL TECHNOLOGY

NoLube-Fifth Wheels



The „No Lube“ technology means that this ductile cast iron fifth wheel with NoLube wear plates does not require regular greasing, the same is true for the special NoLube components in the locking mechanism and the bearing inserts between the fifth wheel and the mounting brackets.

Innovative Fifth Wheel of Forged Aluminium



A further development of the above where lock components, etc. are manufactured with special coatings/treatments eliminating the need for lubrication during the life of the fifth wheel. These fifth wheels can be used in a fleet where other fifth wheels/trailers are still using a greased system – the grease will not harm the NoLube components.

Terminal Fifth Wheels e.g. FW 3510-TR



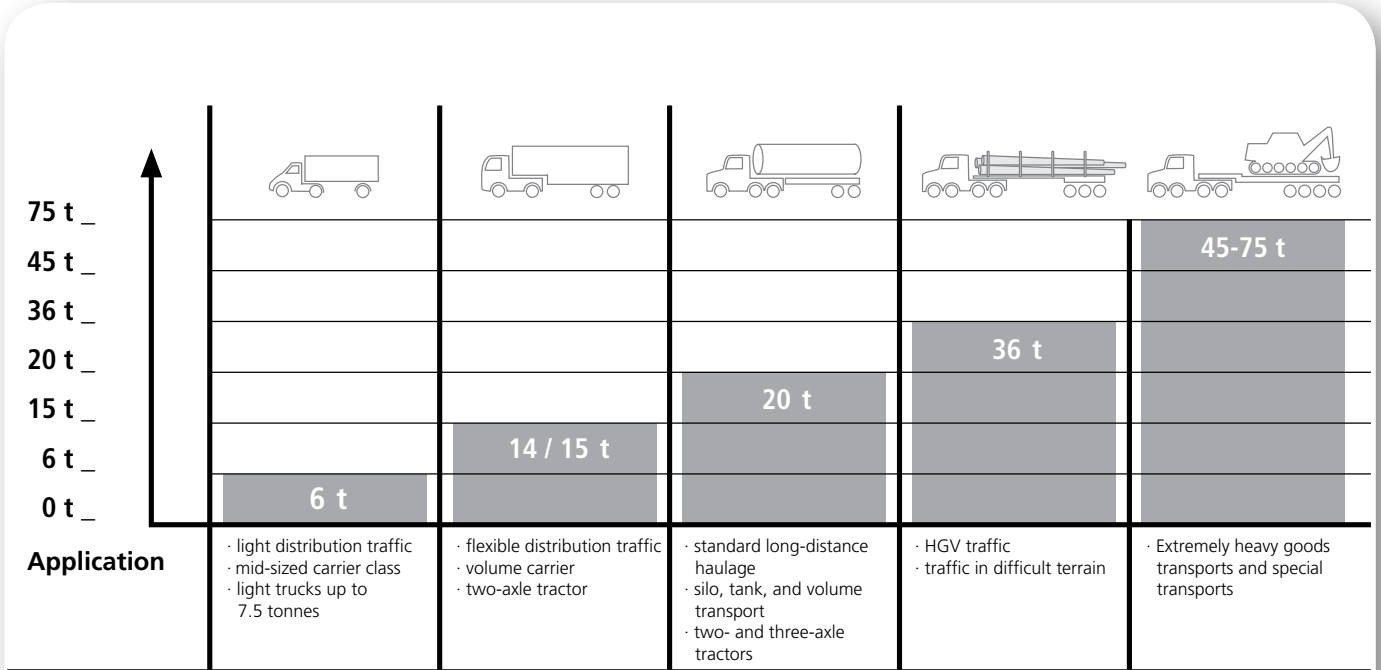
Developed specifically for use on terminal tractors cast in a specially selected extra high grade steel and tailor made for increased loads and durability in this extremely demanding environment. Available with optional manual secondary lock for movement of trailers on the public highway.

Dual Height Fifth Wheel SK-S 36.20 H



A height adjustable fifth wheel which can be used in lowered or raised position. It is designed for volume transportation with 2-axle low liner trucks and mega trailers. The dual height fifth wheel allows in uncoupling condition to elevate the lifting device by air so that trailers with different coupling heights can be coupled with the same truck. The elevating fifth wheel is available pre-drilled to fit all european vehicles.

FIFTH WHEEL SELECTION GUIDE



Fifth wheel

<p>GC 6</p> <p>Imposed load 6,000 kg D-value 49 kN Overall height 120 mm</p>	<p>FW3214 W</p> <p>Imposed load 14,000 kg D-value 104 kN Overall heights 165 to 225 mm</p>	<p>FWAL-E</p> <p>Imposed load 20,000 kg D-value 150 kN Overall heights 167, 197, 219 mm</p>	<p>SK-HD 38.36</p> <p>Imposed load 36,000 kg D-value 162/260 kN Overall heights 150, 190 mm Lock size 2"/3.5"</p>	<p>FW0100</p> <p>Imposed load 45,000 kg D-value 165/170 kN (2") 240 kN (3.5") Overall heights 230, 270 mm</p>
<p>SK-S 36.20 H</p> <p>Imposed load 15,000 kg D-value 110 kN Overall height 167 mm Lift heights 100, 150, 200 mm</p>	<p>SK-S 36.20</p> <p>Imposed load 20,000 kg D-value 152 kN Overall heights 128, 150, 185, 225, 250 mm</p>	<p>SK-HD 38.36 G</p> <p>Fifth-wheel for off-road use with gimbal mounting Lock size 2"/3.5" Imposed load 23,000 kg (2") 36,000 kg (3.5") D-value 162/260 kN Overall height 290 mm</p>	<p>FW0165</p> <p>Imposed load 74,000 kg D-value 165/170 kN (2") 240 kN (3.5") Overall heights 230, 270 mm</p>	
<p>SK-S 36.20 NoLube</p> <p>Imposed load 20,000 kg D-value 152 kN Overall heights 128, 150, 185, 225, 250 mm</p>	<p>FW3510</p> <p>Imposed load 23,000 kg D-value 175 kN Overall heights 150, 180, 200 mm</p>			

Specifications

The load data specified only applies to operation on paved roads and to transport conditions usual in Central Europe. Please contact us regarding operating conditions which deviate from these. We reserve the right to modify dimensions or design if required. No responsibility is taken for the correctness of the details provided, these are solely intended for technical information.



SAF-HOLLAND is a leading supplier of highly efficient components, systems and service programmes in the global commercial vehicle industry. Our three core product brands are recognised for delivering innovative solutions that optimise fleet operations in every corner of the world.



TRAILER AXLES AND
SUSPENSION SYSTEMS



COUPLING AND LIFTING
TECHNOLOGY



SUSPENSIONS FOR
TRUCKS AND BUSES

With our team of over 3,000 employees and a worldwide network of over 9,000 service partners, we serve our fleet customers with know-how and passion, and always focus on one target: **Engineering Your Road to Success**. Anywhere in the world. Under any conditions. 365 days a year.

HIGHLY EFFICIENT COMPONENTS AND SYSTEMS FOR TRUCKS AND TRAILERS



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