

DETERMINING GEAR RATIO, ROLLING CIRCUMFERENCE AND FRONT WHEEL LEAD

There is a close relationship between the measurements of the front and rear tyres on four-wheel drive tractors. To get the most from the four wheel drive, the ground speed of the front tyres must be greater than that of the rear tyres - the so-called front wheel lead. With tractors, it is normally stated which tyres can be fitted as standard. A range of sizes is often possible with a certain tractor type, within the borders of a correct front wheel lead.

To optimally exploit the four wheel drive of a tractor, the value of the front wheel lead should be between +1% and +5% (ground speed front tyres > ground speed rear tyres).

The permitted front wheel lead value is between 0% and +6%. A front wheel lead below 0% or above +6% can have a negative influence on the tractor's performance and steering (especially on corners), cause excessive wear of the front and rear tyres and premature wear of the gears.

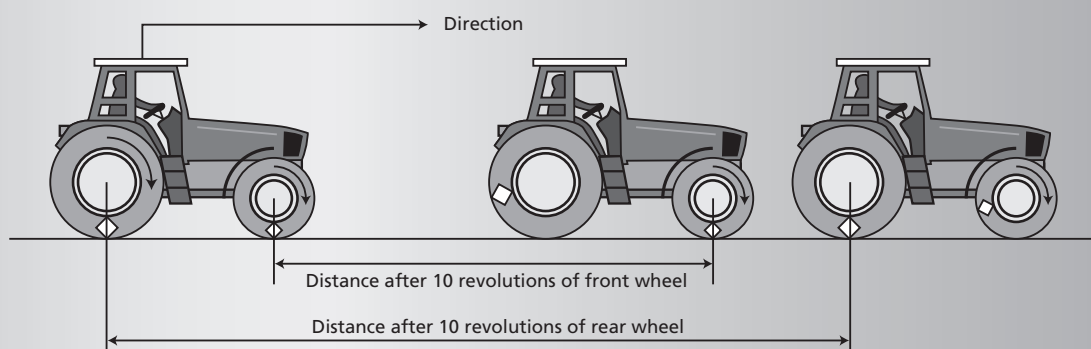
The relationship between the revolutions of the front and rear axles on a mechanical four wheel drive is fixed (determined by the cogs of the gearbox). This relationship is the gear ratio, which is usually between 1.20 and 1.50, depending on the brand and type of tractor.

The exact mechanical gear ratio is given in the manual of every tractor. The following method can also be used to determine the figure. In addition, there is an explanation of how to determine the rolling circumference of a tyre and the aforementioned front wheel lead.

DETERMINING THE ROLLING CIRCUMFERENCE OF A TYRE

Take the measurements on a smooth and hard surface as follows:

1. Switch off the 4WD (the front and rear wheels have to turn independently).
2. Mark the sidewall of a front and rear tyre in the centre of the contact area between tyre and surface.
3. Mark the surface at the point where the centre of the contact area of both the front and rear tyres meets that surface (i.e. the point of the marking on the tyres).
4. Drive the tractor in a straight line until the front wheel has made exactly 10 revolutions and mark the surface where the middle of the contact area of the tyre meets the ground (i.e. the point where the marking on the front tyre is after precisely 10 revolutions).
5. Repeat the process for the rear wheel (i.e. make and mark 10 revolutions).
6. Measure the distance between the markings of the start and finishing point of 10 revolutions of the front and rear wheels.
7. Calculate the rolling circumference of the front and rear tyres as follows:



rolling circumference front (in mm)

$$= \frac{\text{distance covered by front wheel}}{\text{number of revolutions}}$$

rolling circumference rear (in mm)

$$= \frac{\text{distance covered by rear wheel}}{\text{number of revolutions}}$$

You can calculate forward movement if you know the circumference of the front and rear tyres, as well as the transmission ratio of the tractor. Use the formula given below:

$$\% \text{ front wheel lead} = \frac{\text{front tyre rolling circumference} \times \text{gear ratio}}{\text{rear tyre rolling circumference}} - 1 \times 100\%$$

DETERMINING THE FRONT WHEEL LEAD

The following conditions are required to measure the front wheel lead: The tractor must be fitted with the standard front ballast and the tyres set to a nominal pressure. At least 60 metres of clear road is necessary.

To determine the front wheel lead:

1. Switch off the 4WD.
2. Mark the sidewall of a front and rear tyre at the contact point between tyre and ground.
3. Drive the tractor for a distance of exactly 10 revolutions of the rear wheel and accurately count the number of front wheel revolutions at the same time (i.e. including the part of the last, incomplete revolution).
4. Repeat the measuring with the 4WD switched on.
5. Calculate the front wheel lead by dividing the number of front wheel revolutions with the 4WD switched on by the number when switched off.

DETERMINING THE GEAR RATIO

To determine the gear ratio:

1. Switch on the 4WD.
2. Mark the sidewall of a front and rear tyre at the contact point between tyre and ground.
3. Drive the tractor for a distance of exactly 10 revolutions of the rear wheel and accurately count the number of front wheel revolutions at the same time (i.e. including the part of the last, incomplete revolution).
4. Calculate the gear ratio by dividing the number of front wheel revolutions by the number of rear wheel revolutions, e.g.:

$$\text{gear ratio} = \frac{\text{number of front wheel revolutions}}{\text{number of rear wheel revolutions}}$$

