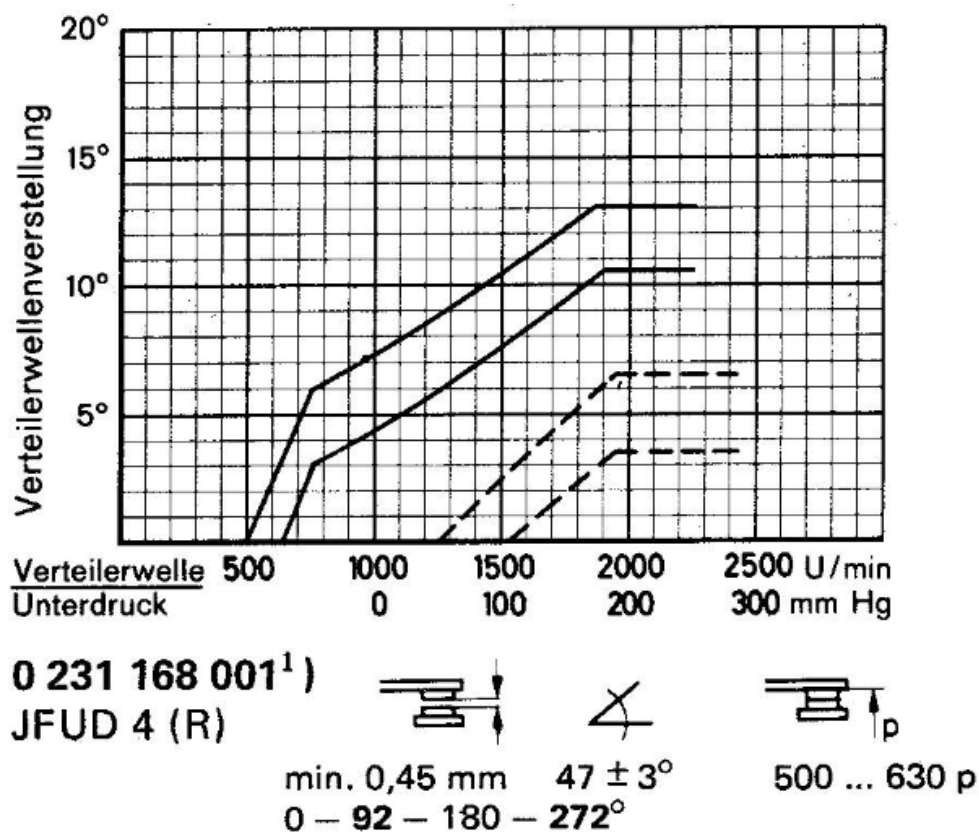


Curve tutorial

Standard ignition curve including vacuum advance

In most cases a standard engine uses centrifugal and vacuum advance. In the graph below the centrifugal curve is shown as continuous line. The vacuum curve is shown as dashed line. You'll see two lines in both cases. This is the margin between which the actual curve should be. For the calculation of our curve we take the middle. Note that the curve in the graph is based on ignition rpm. We use crankshaft rpm.



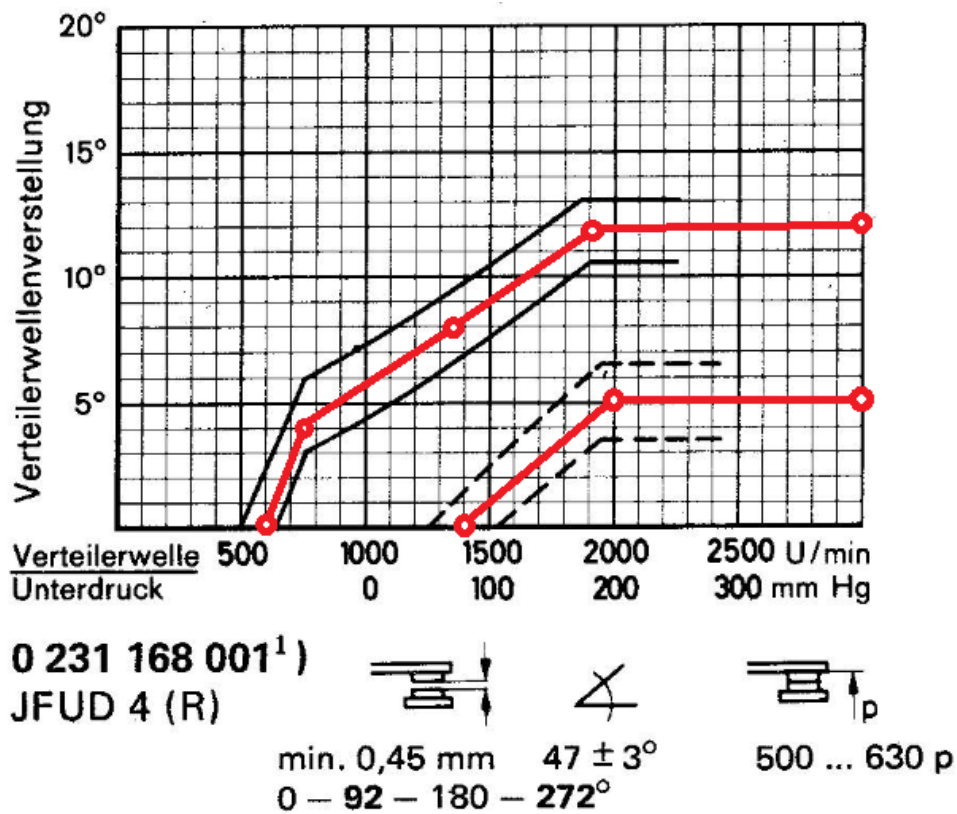
First we determine buckling points. On the graph below the points are marked.

Centrifugal points:

- 0 deg @ 600 rpm
- 4 deg @ 750 rpm
- 8 deg @ 1350 rpm
- 12 deg @ 1900 rpm

Vacuum points:

- 0 deg @ 80 mmHg
- 5 deg @ 200 mmHg



Now we start converting the centrifugal points to crankshaft values. We have to double the rpm and degrees to get the right values:

- 0 deg @ 1200 rpm
- 8 deg @ 1500 rpm
- 16 deg @ 2700 rpm
- 24 deg @ 3800 rpm

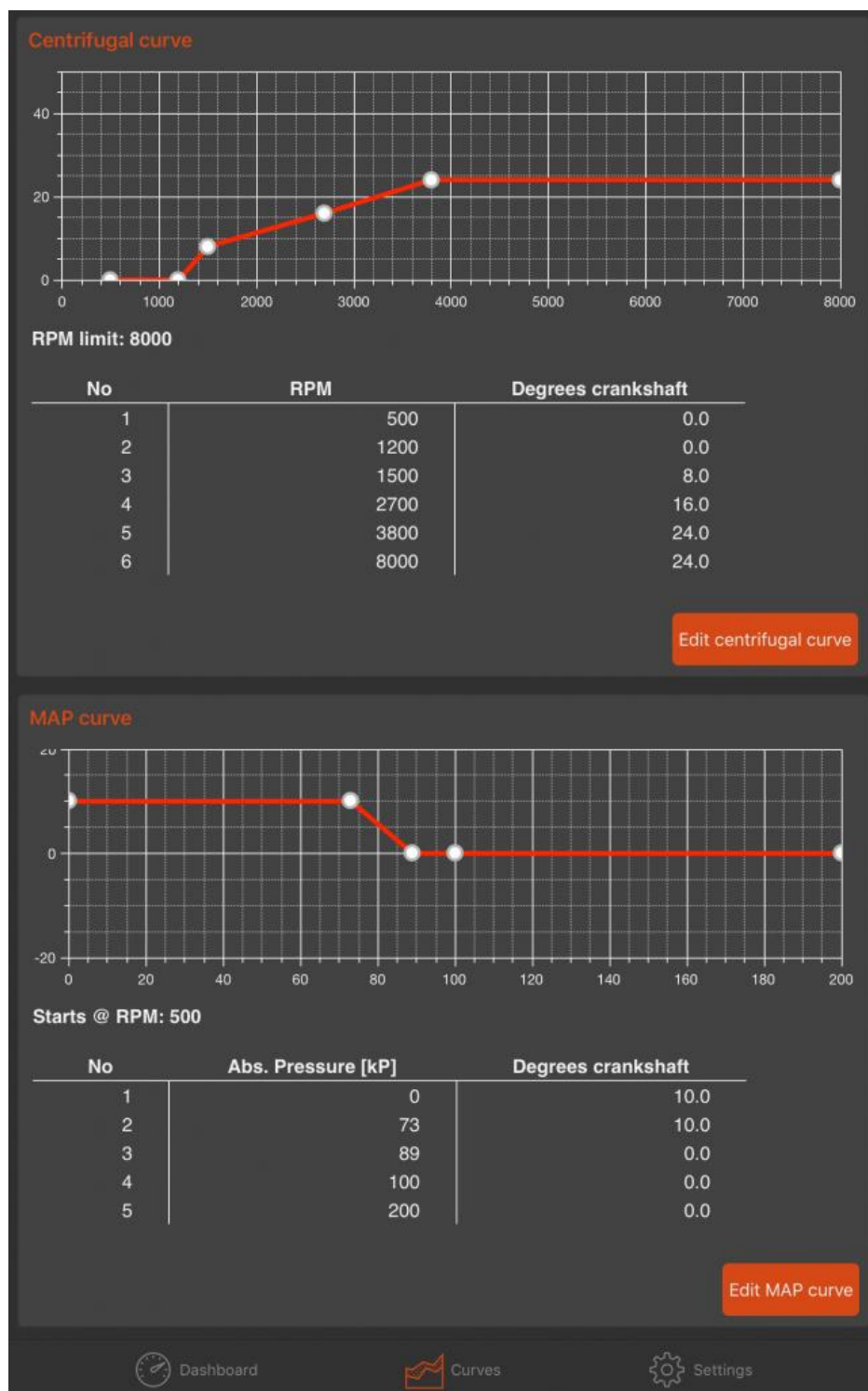
Regarding the vacuum curve, this is a little bit more complex. 123ignition works with absolute vacuum in stead of relative vacuum. The advantage of absolute vacuum is, it works also when you drive the car on high altitudes. In case of relative vacuum, you have to adjust the ignition manually. The values in the original Bosch graph are given in mmHg, 123ignition works with kPa. First we convert the values to kPa and crankshaft degrees instead of distributor degrees. You can type in Google: 80 mmHg to kPa

- 0 deg @ 11 kPa
- 10 deg @ 27 kPa

Now we have to convert the relative values to absolute values. Atmospheric vacuum at sea level is 100 kPa. So 100 kPa is our base point. All values below 100 kPa is vacuum all values above 100 kPa is pressure. in this case we have a vacuum curve, so our result will be:

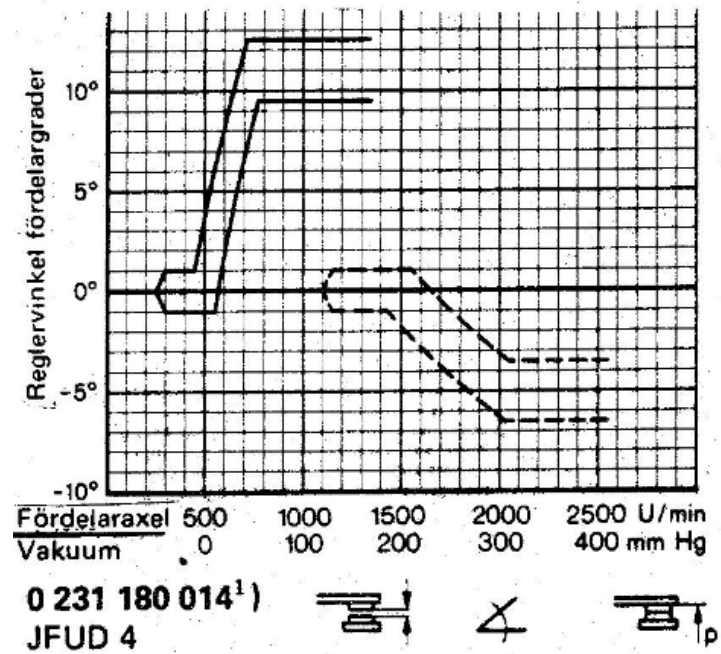
- 0 deg @ 100 - 11 kPa = 89 kPa
- 10 deg @ 100 - 27 kPa = 73 kPa
-

The curve can be programmed like the picture below:



Vacuum retard curve

In the graph below you will find two curves. The upper curve is the centrifugal curve. The ignition timing will advance as the rpm increases. The lower curve is the vacuum curve, in this case it is not a vacuum advance curve but a vacuum retard curve. This means the ignition timing retards when the vacuum value increases. You'll see two lines in both cases. This is the margin between which the actual curve should be. For the calculation of our curve we take the middle. Note that the curve in the graph is based on ignition rpm. We use crankshaft rpm.



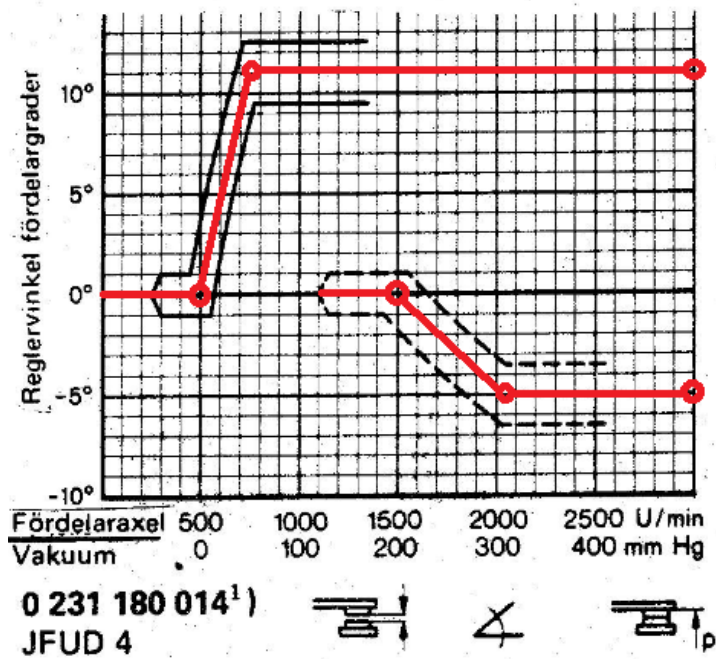
First we determine buckling points. On the graph below the points are marked.

Centrifugal points:

- 0 deg @ 500 rpm
- 11 deg @ 750 rpm

Vacuum points:

- 0 deg @ 200 mmHg
- -5 deg @ 310 mmHg



Now we start converting the centrifugal points to crankshaft values. We have to double the rpm and degrees to get the right values:

- 0 deg @ 1000 rpm
- 22 deg @ 1500 rpm

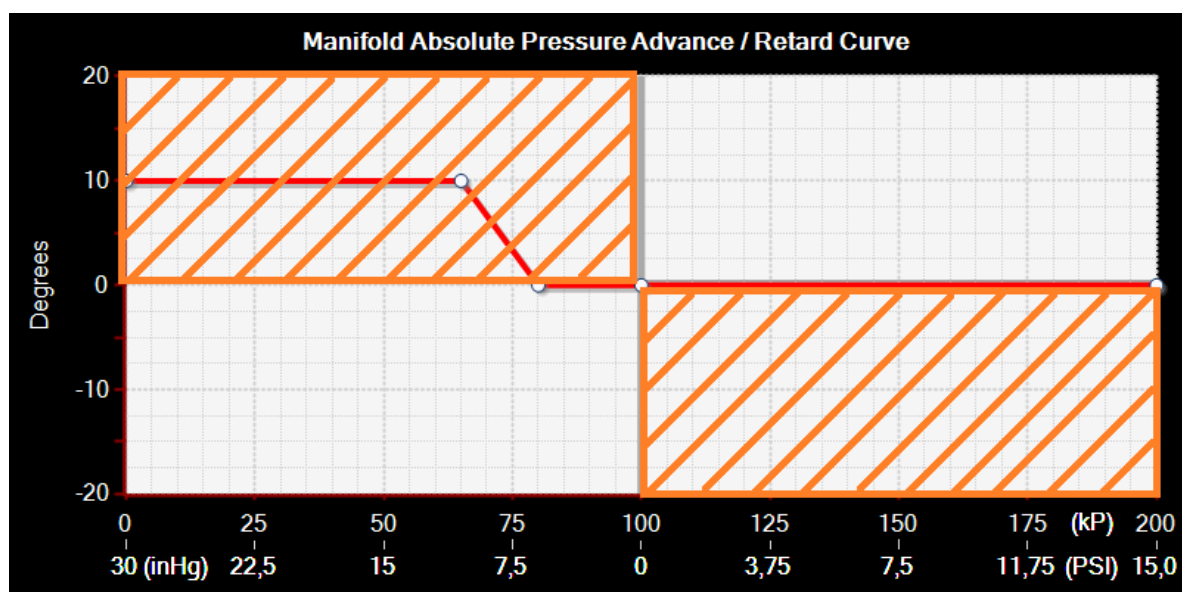
Regarding the vacuum curve, this is a little bit more complex. 123ignition works with absolute vacuum in stead of relative vacuum. The advantage of absolute vacuum is, it works also when you drive the car on high altitudes. In case of relative vacuum, you have to adjust the ignition manually. The values in the original Bosch graph are given in mmHg, 123ignition works with kPa. First we convert the values to kPa and crankshaft degrees instead of distributor degrees. The degrees values have to be doubled. For the mmHg to kPa conversion you can type in Google: 200 mmHg to kPa.

- 0 deg @ 27 kPa
- -10 deg @ 41 kPa

Now we have to convert the relative values to absolute values. Atmospheric vacuum at sea level is 100 kPa. So 100 kPa is our base point. All values below 100 kPa is vacuum all values above 100 kPa is pressure. in this case we have a vacuum curve, so our result will be:

- 0 deg @ $100 - 27 \text{ kPa} = 73 \text{ kPa}$
- -10 deg @ $100 - 41 \text{ kPa} = 59 \text{ kPa}$

Because of the vacuum retard instead of advance, we are facing a new challenge. The graph below shows that only the orange areas can be programmed. After all, normally only advance timing is applied in the vacuum area and retard is applied in case of overpressure (turbo).



To make sure that we can still use vacuum retard a trick has to be used. We increase the full vacuum curve by the maximum number of degrees we want to retard. The following information must also be entered: 10 degrees @ 99 kPa. Using this trick the unit knows the complete curve is lifted by 10 degrees. also atmospheric pressure (100 kPa) will be handled as 10 degrees. The graph will then look like this.



In this case the unit has standard 10 degrees advance timing, this advance timing will decrease when the vacuum increases. This is exactly what vacuum retard is!

Please be aware the ignition has to be rotated by 10 degrees (retard) to set the total timing correct.