Bridge Rectifier

Student Group

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In figure 1 the circuit of a bridge rectifier is shown. Enter the current arrows correctly. Draw the connection between the oscilloscope and the circuit in order to measure the output voltage $u_{\rm R}$ at the rectifier. Explain why one cannot measure the secondary voltage of the transformer and the output voltage of the bridge rectifier at the same time.

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${\rm .....}$

${\rm .....}$

Fig. 1

Build the circuit on the breadboard and connect the oscilloscope. Then sketch the voltage curve before and after the bridge rectifier, i.e. the voltages $u_{rm Sec}$ and $u_{\rm R}$. However, note that you connect the ground of the oscilloscope before or after the bridge rectifier for the respective measurement. Also give the oscilloscope settings used.

Fig. 2

Channel 1: $ \frac{V}{\rm DIV} = $

Channel 2: $ \frac{V}{\rm DIV} = $

Time basis: $ \frac{T}{\rm DIV} = $

Now connect a capacitor (electrolytic capacitor) with 100 µF in parallel to the resistor $R_{\rm L}$ and sketch the voltage curve of $u_{rm Sec}$ and $u_{\rm R}$ again in figure 2 with a different color.

Warning: When using an electrolytic capacitor (Elko) the correct polarity must be observed!
Measure the following values with the help of the oscilloscope in the circuit and enter the results into table 1 (100 µF):

Tab. 1: Bridge-Rectifier measured values

Consider a measure by which the ripple voltage can be reduced. Draw the circuit with your found solution into figure 3 and measure the voltage curves $u_{rm Sec}$ and $u_{\rm R}$. Enter these into the screen image figure 2 with a third color.

Fig. 3

Carry out the corresponding measurements – as above – again on the bridge rectifier. These were the secondary-side voltage of the transformer $û_{\rm Sec}$, the frequency of the secondary transformer voltage $f_{\rm Sec}$, the peak-to-peak value of the ripple voltage $u_{\rm PP-ripple}$, the ripple frequency $f_{\rm Ripple}$, the average value of the rectified voltage $|ū_{\rm R}|$ and the peak value of the rectified voltage $u_{\rm R,~max}$. Enter the results in the second free line of table 1.