

In the next step the conversion characteristic $n_{cfg} = f(f_{sens})$ was measured. The n_{cfg} values were obtained by the manual measuring based on the digital Photo Tachometer DT-2234A [5]. The result – calibrated conversion characteristic is displayed in Fig. 4b

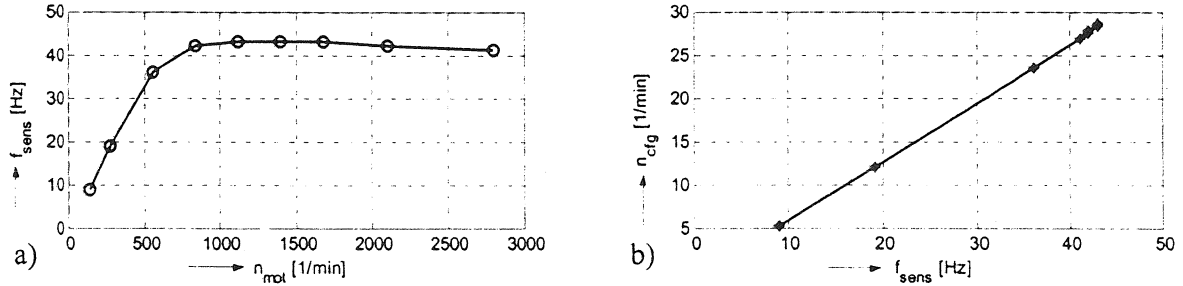


Fig. 4 Measured optoelectric sensor characteristics: motor rpm-to-frequency of output signal (a), calibrated conversion characteristic (b).

For construction of the frequency-to-voltage converter, the integrated circuit LM 2907 N-8 [3] by National Semiconductor Corporation was used. Measuring of conversion characteristics in accordance with recommended wiring scheme (see Fig. 5a) with supply $U_{cc} = 12/24$ V and different values of the feedback resistor R_x was realized. Input rectangle signal from the generator was connected through the $10\text{ k}\Omega$ coupling resistor (simulation of output resistance of optoelectrical sensor) to the pin no.1 of the circuit LM 2907 (as symbol f_{in}).

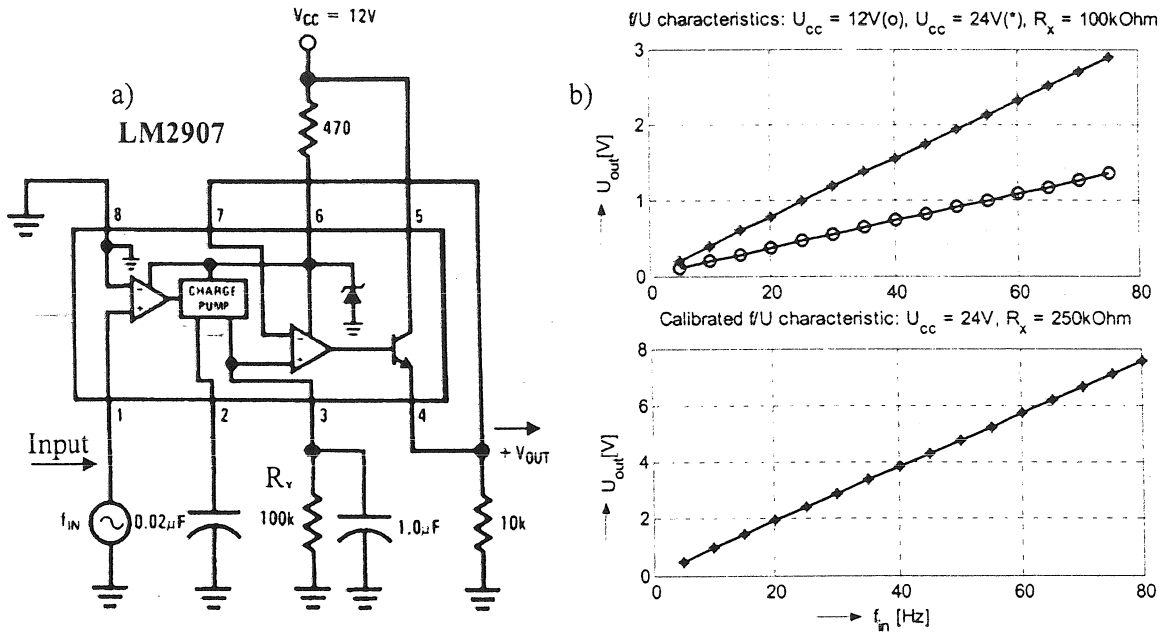


Fig. 5 f/U converter based on LM2907: measuring scheme (a), measured characteristics (b).

The defined sensitivity of the circuit is $66\text{ Hz}/1\text{ V}$ with $U_{cc} = 12\text{ V}$ and $R_x = 100\text{ k}\Omega$, the input range of MENTOR II A/D converter is $U_{in} = 0 \div 10\text{ V}$. From measurement follows that the value of U_{out} obtains the maximum of 1.35 V with the input signal frequency $f_{in} = 5 \div 75\text{ Hz}$, amplitude $\pm 5\text{ V}$, and $U_{cc} = 12\text{ V}$. To utilize the whole input range A/D converter supplied by 24 V and the $R_x = 250\text{ k}\Omega$ was chosen - see bottom characteristic in Fig 5b.

4. Experiments and Results

From the measured frequency characteristic of the optoelectrical sensor and the calibrated conversion characteristic of the f/U converter the multiplication constant k_s was specified

$$n_{cfg} = f(U_{out} * k_s), \quad k_s = 0.6744 \quad (2)$$