Interlink Electronics
FSR™ Force Sensing Resistors™

FSR™
Integration Guide

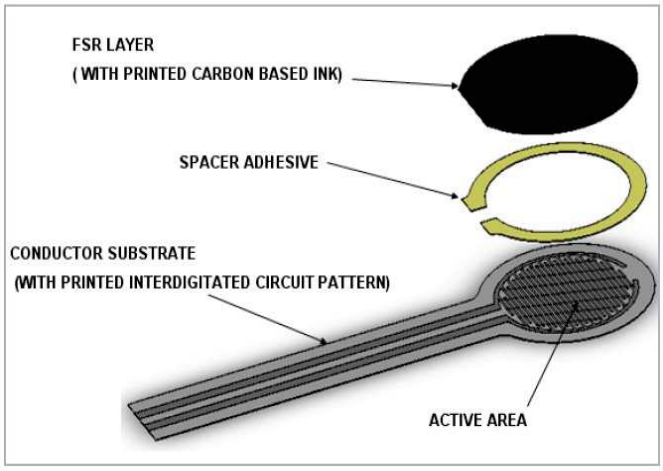


Figure 1: Basic FSR Construction

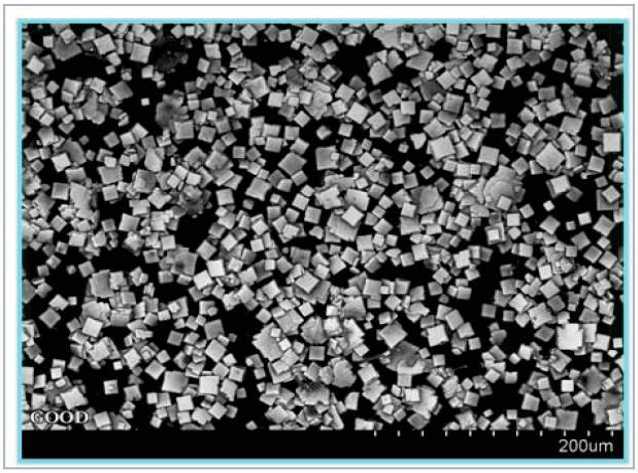
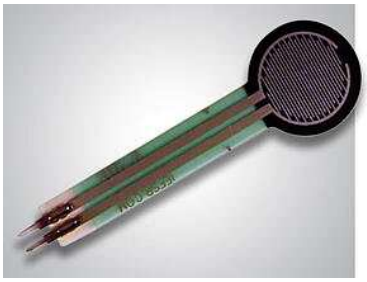
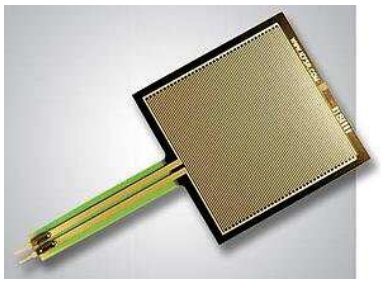
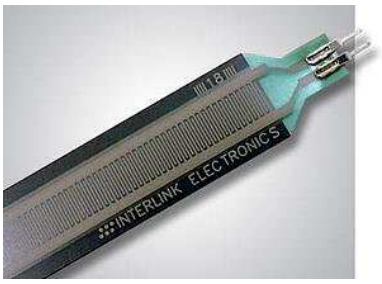


Figure 2: FSR Ink Micrograph

FSR 400 series



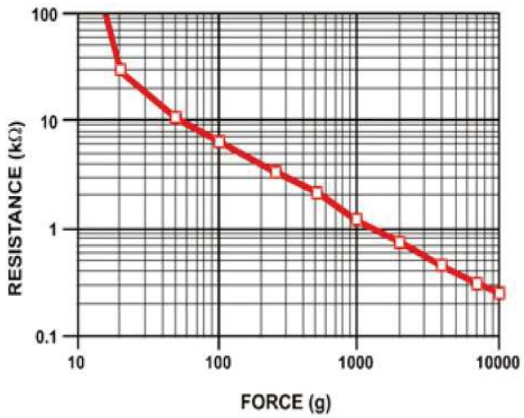


FSR 402 Data Sheet

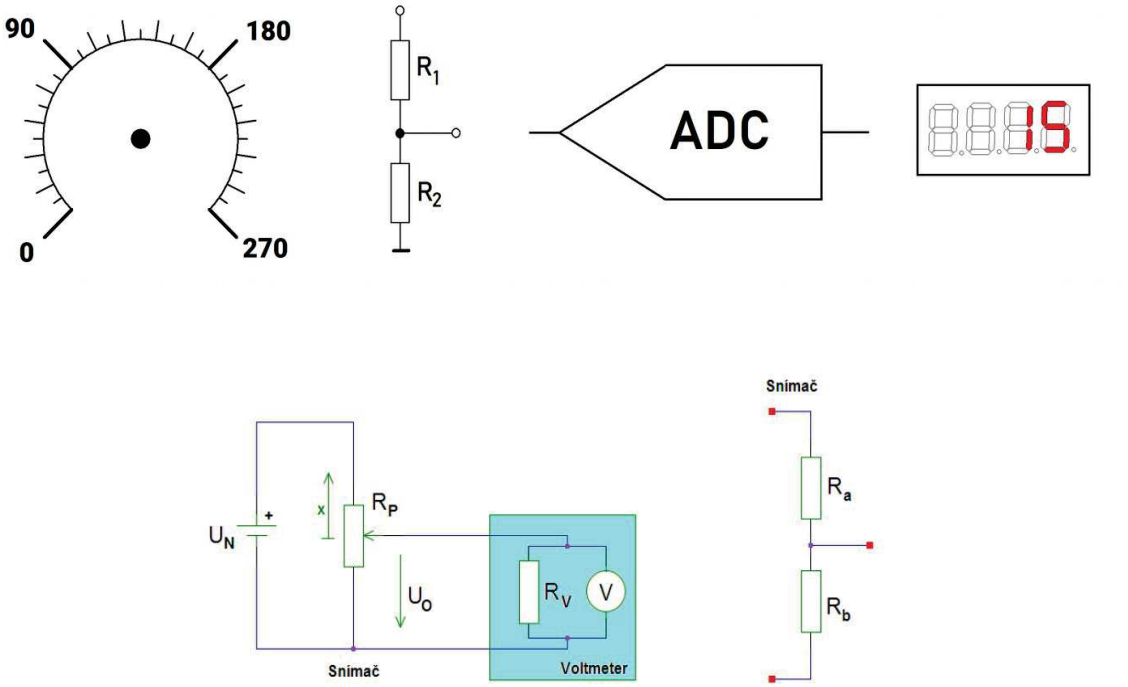
FSR 400 Series Round Force Sensing Resistor

m [g]	F [N]	RF [Ω]
50	0,5	100000
100	1	20000
200	2	7000
500	5	1700
1000	10	900
5000	50	280

Figure 1 - Force Curve



Ako zmerať A/D prevodníkom hodnotu odporu?



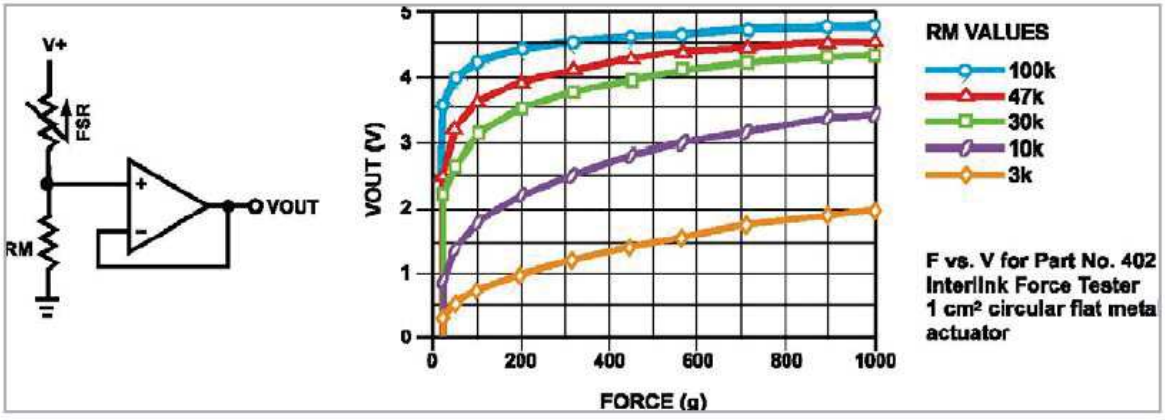
Obr. 2. *Schéma zapojenia.*

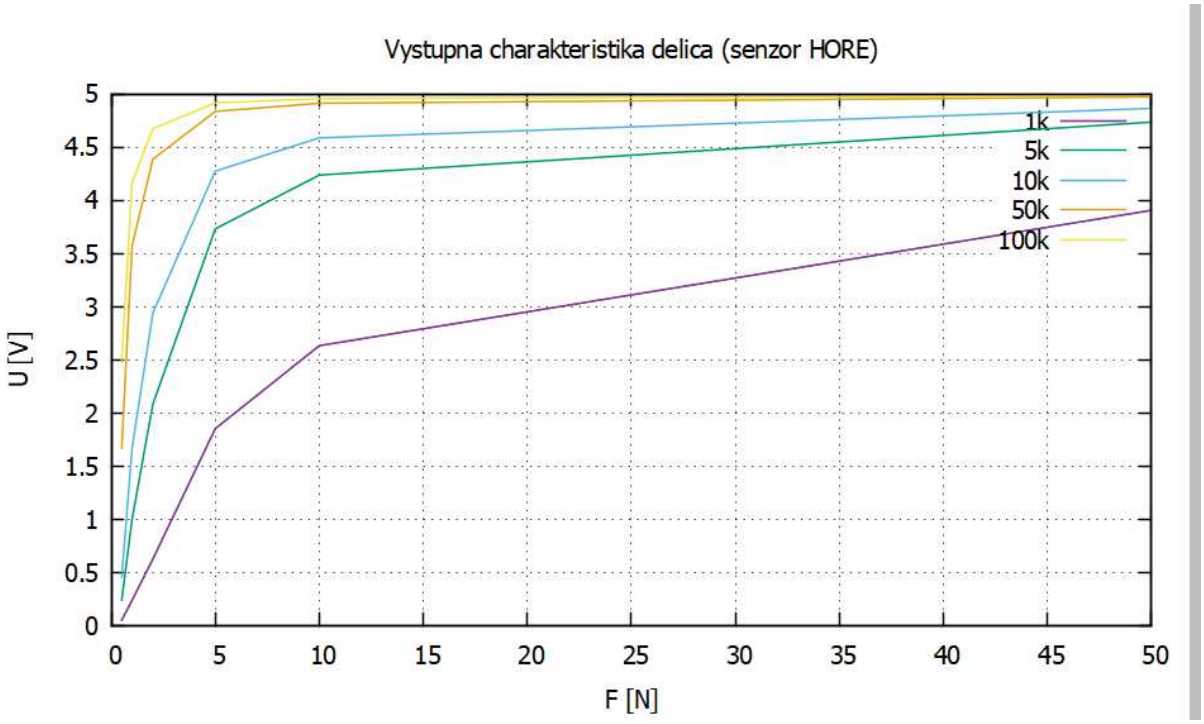
6.0 Measurement Techniques

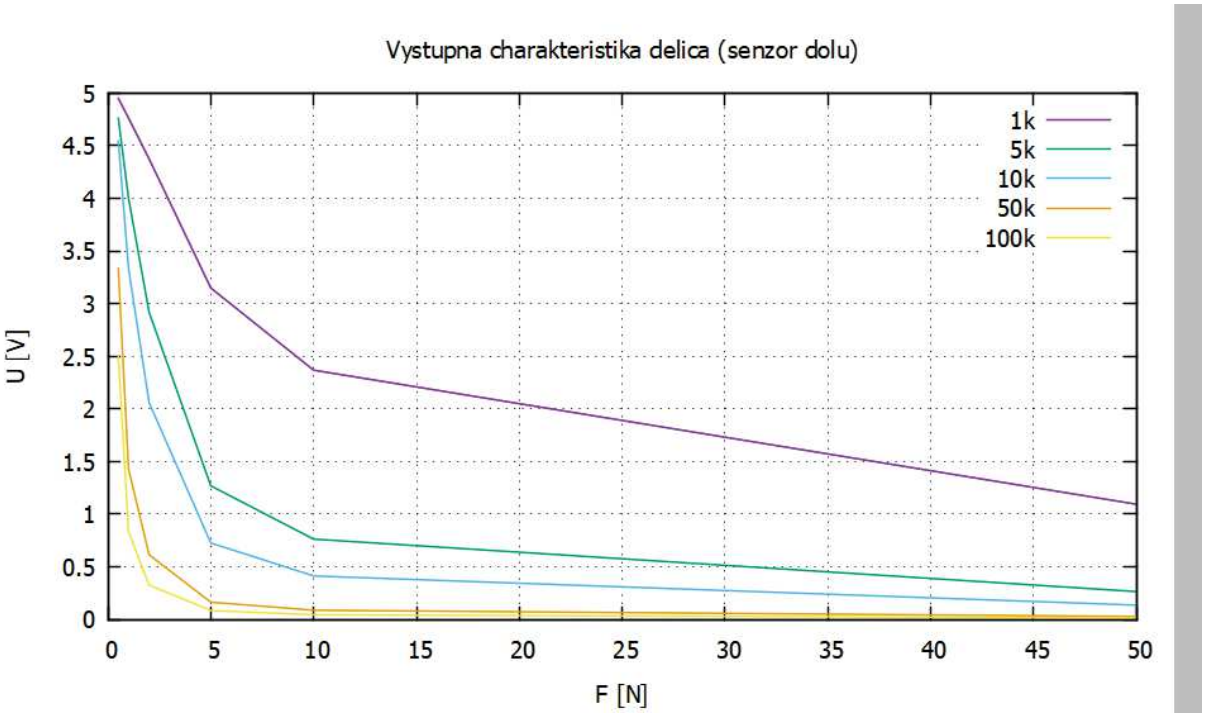
6.1 Circuit

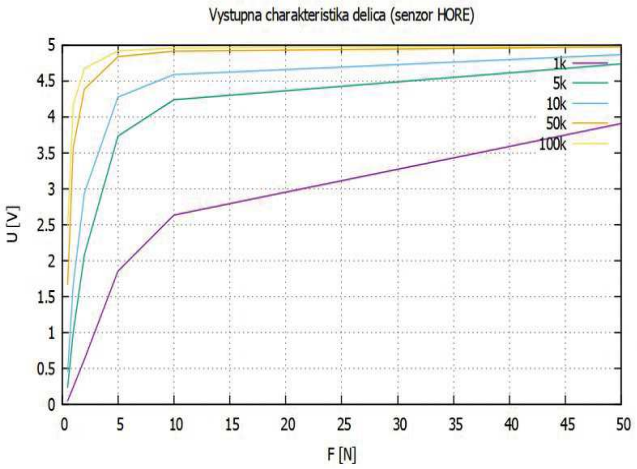
Voltage Divider

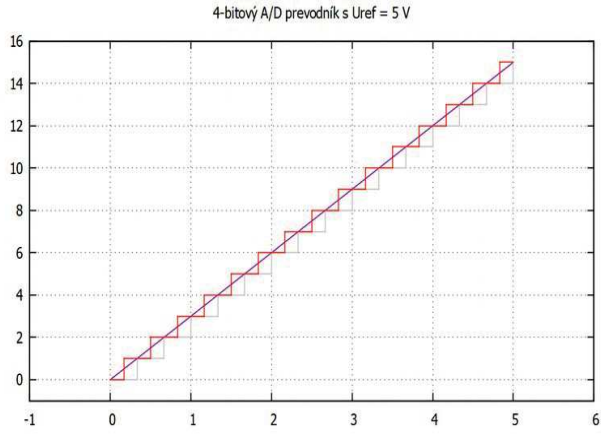
Figure 9: FSR Voltage Divider




Vystupna charakteristika delica (senzor HORE)
U [V]
F [N]
1k
5k
10k
50k
100k
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
0
5
10
15
20
25
30
35
40
45
50


Vystupna charakteristika delica (senzor dolu)
U [V]
F [N]
1k
5k
10k
50k
100k
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
0
5
10
15
20
25
30
35
40
45
50





Výsledok merania 4-bitovým prevodníkom by vyzeral takto:

Force [N]	0	1	2	3	4	...	49	50
ADC [-]	0	10	13	15	15	...	15	15

Pre 10-bitový prevodník to nebude oveľa lepšie!

INTERLINK ELECTRONICS
Sensor Technologies

FSR™ Integration Guide

FSR Current-to-Voltage Converter

In this circuit, the FSR device is the input of a current-to-voltage converter. The output of this amplifier is described by the equation:

$$V_{OUT} = V_{REF} \cdot \left(-\frac{R_G}{R_{FSR}} \right)$$

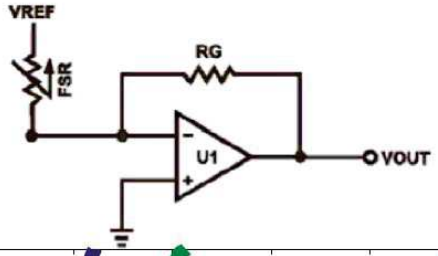
With a positive reference voltage, the output of the op-amp must be able to swing below ground, from 0V to –VREF, therefore dual sided supplies are necessary. A negative reference voltage will yield a positive output swing, from 0V to +VREF.

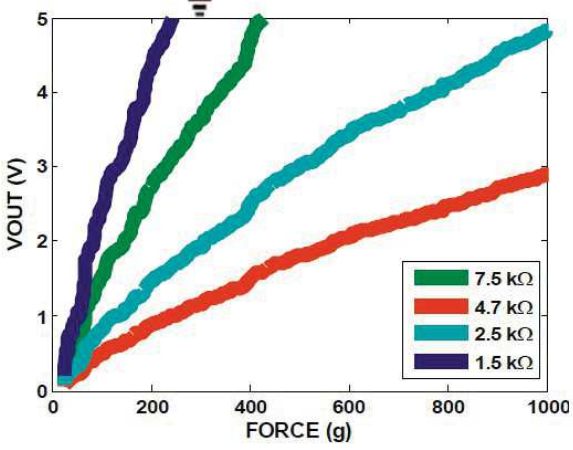
$$V_{out} = \frac{-V_{ref} * R_G}{R_{FSR}}$$

$$V_{OUT} = \frac{(-R_G \cdot V_{REF})}{R_{FSR}}$$

VOUT is inversely proportional to RFSR. Changing RG and/or VREF changes the response slope. The following is an example of the sequence used for choosing the component values and output swing:

Figure 15: FSR Current-to-Voltage





Výpočet I.

Čo vieme:

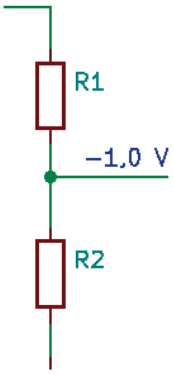
R_{FSR} = 250Ω .. 1MΩ

$$V_{out} = \frac{-V_{ref} * R_G}{R_{FSR}}$$

Zvolíme si pre jednoduchosť, že
V_{Ref} = –1 [V] (znamienko je dôležité)

Výpočet II.

Zvolíme si pre jednoduchosť, že
V_{Ref} = –1 [V] (znamienko je dôležité)



https://damien.douxchamps.net/elec/resdiv/

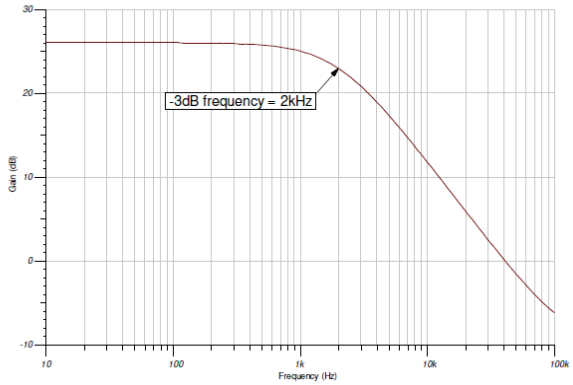
Podobný kompletný výpočet a meranie tiež tu:
https://www.youtube.com/watch?v=VtxFtzWlTgg

Vylepšenie na záver

Analog Engineer's Circuit Amplifiers

Low-Pass, Filtered, Inverting Amp

AC Simulation Results



Design Goals

Input		Output	
V_{iMin}	V_{iMax}	V_{oMin}	V_{oMax}
–0.1V	0.1V	–2V	2V

Design Description

This tunable low–pass inverting amplifier circuit amplifies the signa
cutoff frequency for this circuit. The frequency response of this circuit is the same as that of a passive RC filter, except that the output is amplified by the pass–band gain of the amplifier. Low–pass filters are often used in audio signal chains and are sometimes called bass–boost filters.