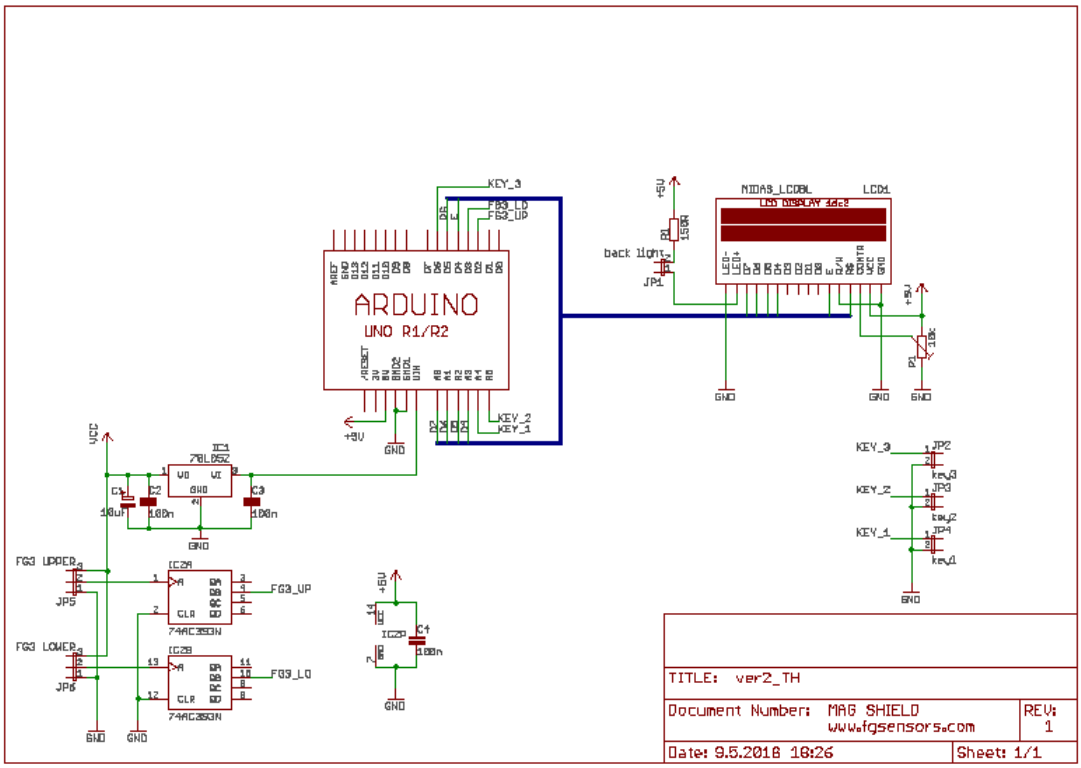
MAG-SHIELD V1.0

Because of your desire for an affordable and easy-to-assemble simple magnetometer, I decided to take Arduino as a base, because it is very affordable and easy to program. Another good thing about Arduino are so-called »shields.« Those are modular circuit boards that piggyback onto your Arduino to install it with extra functionality. A combination with multiple shields is also possible. Mag-shield is compatible with SD and GPS shield, and they can all be used at the same time in case you want to store geographic data or something else on to SD card.

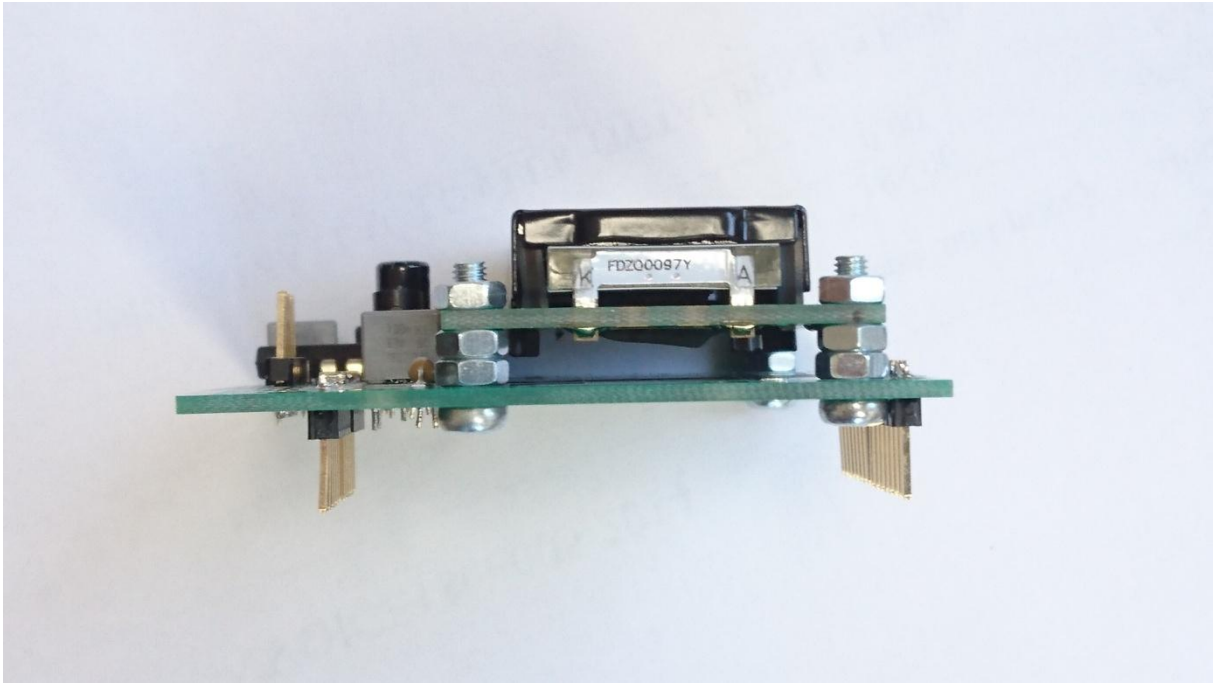
The shield scheme itself is very simple. It consists of the voltage regulator and a frequency divider. The output frequency from the FG-3+ sensors can be over 120kHz, which is quite a lot for Arduino. That's why we have added a frequency divider. Additional input and output filters are not needed, since FG-3+ has, compared to FGM-3, filters that are built in the sensor itself.



Two sensors can be connected to the circuit, namely to the JP5 and JP6 connectors. The pin (from left to right) are GND, OUT, VCC. The circuit is intended to connect the switch to JP1,

which is used to turn on the backlight of the LCD screen, and the buttons (or switches) JP2, JP3, JP4 (KEY1, 2, 3) that can be programmed as desired. In DEMO, only KEY1 is used to "null" sensors. The LCD screen I envisioned is Midas MC21605H6WK-SPTLY-V2, due to its small size. The shield can be powered by USB (not recommended) or via Arduino's external power supply. The recommended voltage is between 7 and 12VDC. Consumption is at 9V, two sensors with LCD backlight are 75mA, without LCD backlight it is only 70mA. Because of this classic 9V battery can provide enough power for a few hours. PCB is 62x69mm in size and is two-sided. However, it is designed so that the bottom side is only GND and it is not difficult to make it in the home workshop. You can find the Gerber files at https://www.fgsensors.com

The MAG-SHIELD assembly is in a classical way, from lower elements to higher ones. I recommend that you first start with all the elements, then the sensor bars, and the slats below to connect to Arduino. After that, it's time to screw in the LCD screws. Also, two nuts serving as spacers are added. Lastly, set up (do not solder!) a slate that connects to the LCD, screw in the LCD, and at the very end, solder the slate that connects LCD with the shield.



The FG-mag Demo program is located at https://www.fgsensors.com and acts as a magnetometer. A magnetometer is a device that detects the magnitude and direction of the magnetic field. It is used by archaeologists to find underground remnants of buildings, detecting aurora, detecting vehicles, it works like a metal detector...
I will not go into more details here because you probably are familiar with such things. Those, not familiar with magnetometers can find more information at https://en.wikipedia.org/wiki/Magnetometer .The program works by reading the pulses from the sensor and displaying it on the screen for each sensor separately. It also prints the difference between the sensors (Diff)
The Demo program is simple and well-commented, and therefore does not require

additional description. Only the "key1" button is used which, when pressed, sets the Diff value to 0 ("null" detector). The "updateRate" parameter is the speed between the samplings, and "measureTime" is the sampling time. The MAG-SHIELD material is standard and purchased at Farnell (code below). Perhaps the LCD screen is not the one that is standardly used. If you can not find one, you can use any standard 2x16 LCD and connect it with wires.

Parts:

#.	Tag	Element	Farnell code
1	IC2	SN74HC393N	9591516
1	R1	resistor 150OHM	9339175
3	C2, C3, C4	con. 100nF	9750878
1	C1	con. 10uF/16V	9451692
1	IC1	LM78L05	1467367
1	P1	trimer 10k	1227569
1		2x16 LCD	2675611
2		slate 1x25	2356173
4		screw M3x12	1420391 (100.parts)
12		nut M3	1419447 (100.parts)